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Bear River Migratory Bird Refuge

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Annual Habitat Management Plan
2004

April 20, 2004

Annual Habitat Management Plan
2004
Bear River Migratory Bird Refuge
Brigham City, Utah

April 20, 2004

Prepared by: _____ _____

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Bear River Migratory Bird Refuge
2004 Annual Habitat Management Plan

HABITAT OBJECTIVE

WETLAND
The overall wetland habitat objective for Bear River Refuge is to manage the 29,259 wetland acres for 9% deep submergent, 28% shallow submergent, 14% deep emergent, 23% mid-depth emergent and 26% shallow emergent marsh, annually.

1) 2,500 acres of deep submergent marsh with 18.1 to 36 inches of water (March-December), 60-80% coverage by sago pondweed and < 15% coverage by emergent vegetation (June-October).

2) 8,700 acres of shallow submergent marsh with 4 to 18 inches of water (February-December), 60-80% coverage by sago pondweed and < 15% coverage by emergent vegetation (June-October).

3)2,800 acres of deep emergent marsh with 12.1 to 24 inches of water (February-November), 50-70% coverage by emergent vegetation (predominantly hardstem bulrush and alkali bulrush) interspersed with 40-50% open water with submerged sago pondweed (June-October).

4) 6,600 acres of mid-depth emergent marsh with 8.1 to 12 inches of water (February-November), with 50% emergent vegetation (alkali bulrush in shallower areas and hardstem bulrush in deeper zones, phragmites, and cattail) and 50% open water with sago pondweed (June-October).

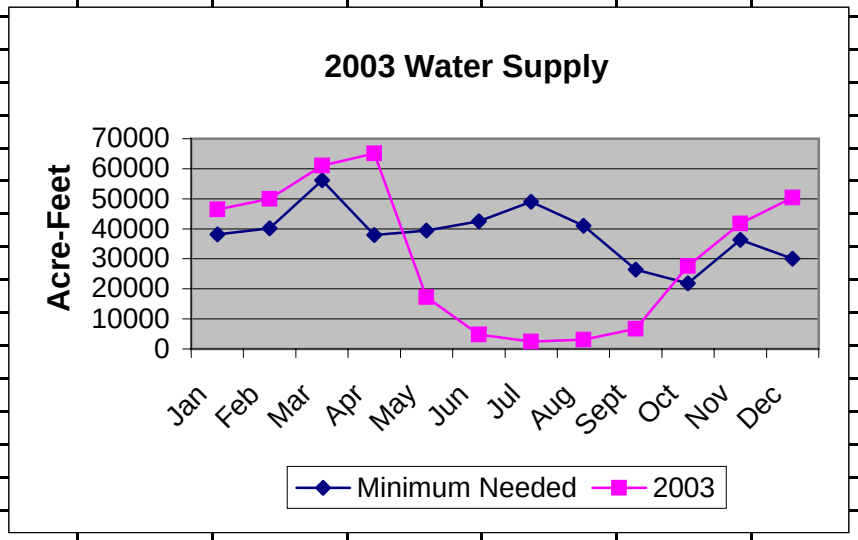
5)8,659 acres of shallow emergent marsh with 2 to 8 inches of water (February-November) with 50-70% coverage by emergent vegetation (90% alkali bulrush, 10% phragmites and/or cattail) and the remainder open water (June-October).

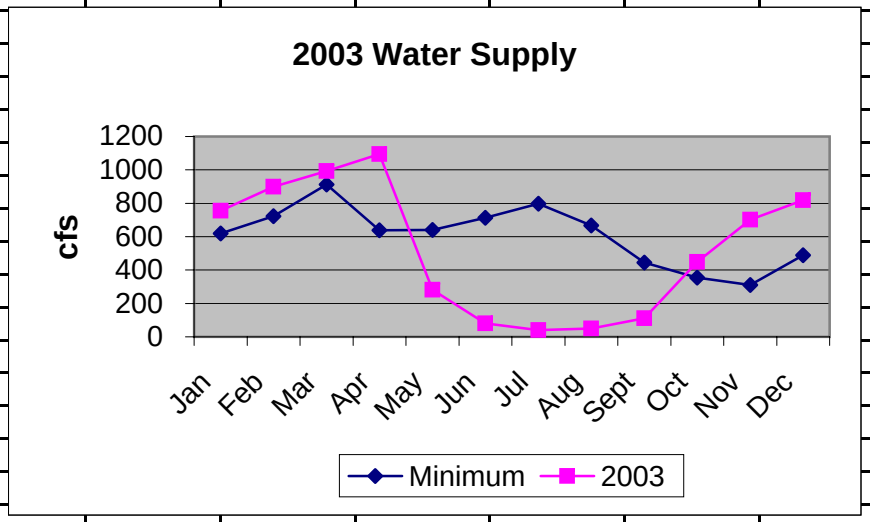
Water levels in the 26 management units are manipulated or influenced to achieve these objectives. In 2003 these objectives were unmet due to low water conditions. Target water levels (and associated habitat) were maintained in only three units through the summer months; Unit 5B, 2B and 1A. Unit 5B was the refuge's highest priority for 2003, as the emergent vegetation in the unit is occupied by a large waterbird colony of several Refuge priority bird species including White-faced Ibis and Franklin's Gull. Other units received water as available from the Bear River. The three units made up 2,564 acres of wetlands that were maintained through July and August out of a possible 29,259 acres. Graphs of the unit water levels for 2003 are found in Appendix A. Habitat and tamarisk treatment maps are found in Appendix B.

2003 Water Summary

The drought that began in 1997 with below normal snowpack, continued through 2003. The snowpack in the Bear River Basin by February of 2003 was only 67% of normal, down from 78% in 2002 and 68% in 2001. The National Weather Service forecast for streamflow based on snow-pack was for < 50% of normal amounts. The cumulative effects of six years of lower than average snowpack resulted in low soil moisture, low water levels in the reservoirs (most especially Bear

	Minimum	2003	Water Year (Oct. 2002-Sept. 2003)		
	Needed	Actual	Deficit		
	Ac.-ft.	Ac.-ft.			
Jan	38123	46460	8337		
Feb	40154	49930	9776		
Mar	56139	61070	4931	Total	
Apr	37964	65110	27146	Deficit	
May	39414	17250	22164.00	164011.00	
Jun	42487	4810	37677.00		
Jul	48990	2490	46500.00		
Aug	41013	3100	37913.00		
Sept	26417	6660	19757.00		
Oct	21793	27600	5807		
Nov	36298	41770	5472		
Dec	30008	50370	20362		
Total	**458800**	**376620**			
	Minimum	2003	Deficit		
	cfs	cfs			
Jan	620	756	136		
Feb	723	899	176		
Mar	913	993	80	Total	
Apr	638	1094	456	Deficit	
May	641	281	360.00	2699.00	
Jun	714	81	633.00		
Jul	797	40	757.00		
Aug	667	50	617.00		
Sept	444	112	332.00		
Oct	354	449	95		
Nov	310	702	392		
Dec	488	819	331		
Total	**6821**	**5457**			





Lake) and decreased river flows. The 2003 (water-year) Bear River annual mean flow rate of 520 ft^3/s was the second lowest on record while the annual runoff of 376,600 ac-ft. was the lowest on the record. The monthly discharge for July and August at 40.4 ft^3/s and 50.4 ft^3/s respectively are the lowest on record. A new daily minimum daily discharge record was also set at 25 ft^3/s on June 13 and 14, 2003.

The October (2002)-April (2003) flows were all < 50% of normal. The Bear River flow "crashed" from 50% to 10% of normal from April to May due to early irrigation demand because of the dry winter (low soil moisture) and low snow pack in the mountains. Bear River flows during June, July, August (the peak nesting period for Refuge priority bird species and a critical time for aquatic plant germination, growth and production) averaged only 6% of normal at 57 ft^3/s. The low water supply and subsequent negative effects on Refuge habitats was further exacerbated by higher than normal evaporation rates due to record high temperatures in July and August. The National Weather Service reported that July was the hottest on record with 14 consecutive days above 100EF and August was the second hottest on record. Low Bear River flows continued throughout the fall which led to only a few units re-filled to target level before the onset of fall waterfowl migration. A cold snap in early December froze over the majority of each of the units but re-opened for a brief time in mid-December. Unit by unit details follow.

Summary of 2003 management effects

Unit 1 Objective

1. Manage water levels to achieve 440 acres of deep submergent, 2160 acres of shallow submergent, 1491 acres of mid-depth emergent and 547 acres of shallow emergent wetland habitat, April 1-December 15.

Strategy: Re-fill unit 1 with clear water (sans silt) to achieve target elevation of 4204.5 by April 1 and maintain target through December 15.

A. Management Strategy Prescriptions. Unit 1 was re-filled to target by March 1, 2003 with clear water after a winter drawdown of 4203.1 to protect dikes and water-control structures from ice-damage. The target water elevation was maintained around 4204.5 until June. As this unit was not one of the priority units it was allowed to dry-out. The unit went dry by mid-July and did not receive any water until mid-September. Re-filling of this unit was initiated on September 19 and reached the target of 4204.5 on October 9 and held until mid-December. On December 18, two layers of boards (equal to about 16") were pulled to begin winter draw-down. About 502 acres in Unit 1 were treated in 2003 for tamarisk. Eight acres were treated by pulling the trees and another 494 acres were sprayed.

B. Habitat Response. At elevation of 4204.5 there are 3,460 acres of surface water. April through June, wetland types were 1380 acres of shallow emergent, 1780 of shallow submergent and 300 acres of deep submergent. Sago pondweed germination and production was good though tuber and seed production was poor as the unit became dry during critical development stages. By mid-July the unit consisted of over 11,000 acres of dry mudflat.

C. Response of *Resources of Concern*. A colonial waterbird colony consisting of about 2500 nests of Refuge priority species White-faced Ibis and Franklin's Gulls along with Black-crowned Night Heron and Snowy Egret was noted in this unit. The effects of the drying conditions on this colony is unknown though nesting success was likely negatively impacted by ground predators and abandonment of eggs and young by adults was likely. Two Snowy Plover nests were found on the alkali flats in the north end of this unit in June. Unit1 is a traditional high use unit by Tundra Swans. This unit accounted for 31% of the total Swan use of the Refuge in the spring and 53% of the Swan use in the fall. The lack of food on the Refuge resulted in Tundra Swan flocks being more evenly spread out in the Great Salt Lake marshes during the fall. This behavior resulted in a higher total harvest over 2002 during the Utah swan hunting season and a significant decrease in the number of swans harvested from the Refuge. This unit accounted for about 20% of the total duck use throughout October. Unit 1 receives very little use (<3%) by spring and fall migrant shorebirds.

Units 1A, 3A and 3K Objective

1. Manage water levels to achieve 50% interspersion of open water to 50% emergent vegetation.
A. Management Strategy Prescriptions. Unit 1A No water elevation data is available as this unit has no water gauge. The water in this unit is dictated by the height of the Bear River. A low water crossing adjacent to the river allows water to flow into this unit at elevation 4206.0. The outlet structure on the west dike is at 4204.6 and acts as a low-water crossing. A single board can be added to the outlet structure to hold water around 4205.4. As a priority, this unit was kept full of water all year by keeping enough head on the river at the Headquarters three-way gate to spill into the unit. Units 3A and 3K No water elevation data is available as these units have no water gauges. In general, the units were filled with water in the spring and went dry by May 8. Re-filling began on October 8 via the Bear River inflatable water-control-structure.
B. Habitat Response. The habitat objective was met in Unit 1A. A survey of the unit indicated that 42% or 232 acres of the unit was open water and the remaining 48% (312 acres) was emergent vegetation. About 25% of the emergent vegetation was alkali bulrush. The remaining area was covered by stands of hardstem bulrush as well as stands of undesirable species of *Phragmites*, cattail and tamarisk.
About 90 acres of this unit were treated for tamarisk. Twenty-one acres were treated by pulling and the remainder was sprayed. The unit was frozen by November 26.
Habitat objectives for Units 3A and 3K were unmet due to dry conditions. Both units were treated for tamarisk. About 8 acres of tamarisk were pulled in 3K. A total of 149 acres were treated in 3A by both pulling (55 acres) and discing (94 acres). Unit 3A was frozen by November 26.
C. Response of *Resources of Concern.* The main use of Unit 1A by priority species is migratory waterfowl. Waterbird counts do not show significant use of this unit (<1%) though it is difficult to count as the emergent vegetation obstructs the view from the tour loop. Units 3A accounted for about 10% of dabbling duck and migrant shorebird use in the spring. 3K hosted about 8% of the Refuge total dabbling duck population in late January. A Long-billed Curlew was noted in the unit on June 8th.

Unit 2A and 2B Objectives

1. Manage water levels to achieve 75% cover by alkali bulrush.

A. Management Strategy Prescriptions. No water elevation data is available as these units have no water gauges. Unit 2A was full in the spring, dry by mid-July and full in late fall. The screw gate into the unit was closed on July 31. The inlet structure to 2A was cleaned out in July and the dike by the photoblind patched. Seventy-six acres of 2A was treated for tamarisk; 43 acres were disced, 5 acres were pulled and 27 acres sprayed. As a priority, Unit 2B was kept full throughout the year. Thirteen acres of 2B were treated by pulling tamarisk along the dikes. A large hole likely caused by a muskrat, was patched in the south dike of 2B.

B. Habitat Response. The habitat objective in unit 2A was unmet due to dry conditions. There was little to no production by alkali bulrush. The habitat objective was met in Unit 2B. A survey in October indicated that 75% of the unit was covered by alkali bulrush (217 acres) with the remainder open water (74 acres). The unit was frozen by November 26.

C. Response of *Resources of Concern.* Unit 2A accounted for 10% of the migratory waterfowl population and Tundra Swan population on February 14. The unit did not contribute significantly toward supporting priority species at any other time of the year. Unit 2B was consistently occupied by Redhead throughout the summer breeding months. This unit accounted for 3 to18% of the Refuge's Redhead population during May, June, July and early August. White-faced Ibis were also found foraging in Unit 2B throughout the breeding season (May-Aug.). This unit also hosted up to 33% of the Refuge's Franklin's Gull population on April 24. Three Long-billed Curlews (family unit) were noted in the unit on September 17. Unit 2B was a study site as part of an investigation into the nesting success of American Avocet and Black-necked Stilt's on the Refuge by Dr. John Cavitt, Weber State University, Ogden, UT. Twelve avocet and stilt nests were monitored. Mayfield nest success was %18 in Unit 2B. This success rate contrasts sharply to the success rate of 4% for unit 2C where the water levels were not maintained throughout the summer months. Flooding accounted for 8% of nest failures while predation was the most common cause of nest failure.

Unit 2C Objective

1.Maintain water-level at 4204.5' msl, year-round.

2. Increase sago pondweed to cover 70% of the unit.

3. Manage water levels to achieve 504 acres of shallow submergent wetland and 216 acres of shallow emergent wetland.

A. Management Strategy Prescriptions. The unit was full to target by mid-March, and went dry by latter July. Refilling was initiated October 9, with fish screens across the inlet structure to keep out large carp. Three of the five fish screens were pulled out of the WCS on October 10 as the screens were severely impeding the water flow. The unit reached target level on October 14. The unit was held about a foot above the target level of 4204.5 to further stress the treated tamarisk by depriving the roots of oxygen. Over 800 acres of this unit was treated for tamarisk by pulling (131 acres) and mowing (543 acres).

B. Habitat Response. The habitat objectives were unmet due to drying conditions with little to no sago pondweed production and emergent vegetation. The unit was frozen by November 26.

C. Response of *Resources of Concern*. This unit hosted from 4 to 8% of the migrant waterfowl population in the spring, 38% of the American White Pelican population on June 20, and 12% of the White-faced Ibis population in latter July. The unit was favored by Black-necked Stilts as the unit

hosted from 10 to 39% of the Refuge's total population before drying from mid-May to latter July. Unit 2C was a study site as part of an investigation into the nesting success of American Avocet and Black-necked Stilt on the Refuge. Fifty-seven avocet and stilt nests were monitored. Mayfield nest success was only 4%. This success rate contrasts sharply to the success rate of 18% for unit 2B where the water levels were maintained throughout the summer months. Flooding accounted for 9% of nest failures while predation was the most common cause of nest failure. Dropping water levels allow mammalian predators easier access to shorebird nests thus negatively impacting nesting success rates of these Refuge priority species. The only nesting attempt by Black Tern's on the Refuge was noted in this unit. The nest failed.

Unit 2D Objective

1. Manage water levels to achieve 4,029 acres of deep submergent and 590 acres of deep emergent habitat.

A. Management Strategy Prescriptions. The target elevation of 4206.0 was not achieved. This is an unrealistic target due to the amount of boards the structure will hold and will be changed in 2004. The unit was re-filled starting in January from a draw-down that was meant to protect it from ice-damage. The unit did not freeze in winter of 2002-2003. A maximum level of about 4205.3 was achieved on May 22. The unit steadily lost water to evaporation throughout late spring and summer until it went dry in latter August. All boards were pulled from the outlet structure in mid-August to de-water the unit in order to facilitate surveying crews shooting contour elevations. The unit was re-filled starting mid-September and achieved a maximum elevation of 4205.4 on November 21. Two layers of boards were pulled from the outlet structure on December 18 to begin winter draw-down. Two hundred and fifty-two acres of the unit were treated for tamarisk by spraying.

B. Habitat Response. The habitat objective was met only during early spring before drying out, as sago pondweed was noted as abundant during several airboat trips. The unit was unvegetated mudflat habitat from late August to mid-September. The unit was frozen by December 5th.

C. Response of *Resources of Concern.* This unit was utilized by all the refuge priority species. Significant numbers of Cinnamon Teal were found in this unit as 20 to 28% of the population in latter June and early July were observed in Unit 2D. This unit also accounted for 52% of the Redhead population on July 10. The unit was particularly important in July and August to shorebirds as it hosted, 2-20% of the Snowy Plovers, 55-74% of Black-necked Stilt, 8-68% of American Avocet, 11-36% of Marbled Godwit, 82-99% of Wilson's Phalarope, 7% of dowitchers, 54-80% of all migrant shorebirds, as well as 17-70% of the American White Pelicans, 29-77% of the White-faced Ibis, 66-76% of Franklin's Gull, 86% of migrant Black Tern, and 25% of the dabbling duck population on October 24. A single Long-billed Curlew was noted in the unit on August 7th and 21st.

Unit 3B Objective

1. Increase amount of alkali bulrush to account for 60% of emergent vegetation.

A. Management Strategy Prescriptions. No water elevation data is available as this unit has no water gauge. In general, the unit was filled with water in the spring, went dry by mid-July and was re-filled via H-canal starting October 9. Thirty-six acres of the unit were treated for tamarisk by pulling.

B. Habitat Response. The habitat objective was unmet due to drying of the unit. In spite of the dry conditions the stand of alkali bulrush was considered "good". The unit was 90% frozen by December 5.
C. Response of *Resources of Concern.* The unit provided staging habitat for migratory waterfowl in the spring (Feb.-Apr.), consistently hosting 4-12% of the Refuge population, 23% of the avocet population on April 24 and 21% of the Refuge population of Franklin's Gull. The unit received very little use by priority species the remainder of the year due to dry conditions in the summer and late filling of the unit in the fall.

Units 3C and 3D Objective

1. Maximize deep submergent wetland habitat to provide optimum conditions for production of sago pondweed.
A. Management Strategy Prescriptions. Unit 3C The target elevation of 4206.0 was never achieved. The unit reached a maximum elevation of 4204.2 on March 21and began a decline to dry-out by June 19. The unit remained dry throughout the summer months. The unit was re-filled beginning late October and reached a peak elevation of 4204.6 on December 12. The unit was 95% frozen by December 5. Tamarisk treatment in this unit consisted of pulling the plant from along the dikes for a total of 36 acres. Unit 3D The target elevation of 4205.0 was not reached in the spring. A maximum elevation of 4204.9 was noted on April 9. The unit was noted as dry by June 9 and re-filling wasn't initiated until after October 20. The 4205.0 target was achieved on November 21. The unit was frozen by November 26. About 240 aces of this unit were treated for tamarisk by pulling.
B. Habitat Response. The habitat objective was not achieved in either unit. There was little to no sago pondweed production in the units.
C. Response of *Resources of Concern.* Unit 3C This unit was favored by Redhead in early May, hosting 7-11% of the Refuge population. Eleven percent of the Pelican population was found in this unit on June 6th, while 50% of the avocet population was observed on June 20. This unit did not contribute significantly (> 5%) to any priority species during the fall. Unit 3D received fair use by migratory waterfowl in the spring hosting 11-21% of the Refuge population in February and March. The unit also hosted about 6% of the Cinnamon Teal population and 11% of the Franklin's Gulls on May 1, and 17% of Wilson's Phalaropes on June 6. There was no significant use of this unit in the fall by priority species.

Units 3E, 3F and 3G

No objectives were set for these units as they were low priority and would not be kept full of water throughout the summer months.
A. Management Strategy Prescription. Unit 3E target elevation of 4205.0 was reached by March 13, 2003. The unit slowly dried out until it was 100% dry by June 19. Re-filling of the unit did not start until after November 5th. There is no water level data available for unit 3F and 3G as they have no gauges. The same scenario described for unit 3E applies to 3F and 3G also. The units were frozen by November 26th. Both units were treated for tamarisk by pulling; 55 acres in 3F and 308 acres in 3G.
B. Habitat Response. Sago pondweed appeared to germinate in these units but no production was noted due to the dry conditions.

C. Response of *Resources of Concern*. Unit 3E This unit provided significant habitat to priority species only in April and May. The unit accounted for 9-29% of the Cinnamon Teal, 16-40% of the Redhead, 9-47% of the migratory waterfowl, 9% of White-faced Ibis, 18% of Black-necked Stilt, 8-36% of American Avocet, 18% of Dowitchers, 9-25% of migratory shorebirds and 14% of Franklin's Gull. A pair of Long-billed Curlew were noted in the unit on July 22nd. Unit 3E was a study site as part of an investigation into the nesting success of American Avocet and Black-necked Stilt on the Refuge. Fifty-four avocet and stilt nests were monitored. Mayfield nest success was 55%. This compares to 18% and 4% success rates found in units 2B and 2C respectively. Many of the avocet and stilts nesting in 3E nested in colonies. There was a significant positive relationship between nest density and nesting success. Nests of avocets, stilts, Killdeer and Snowy Plover were also monitored on the dikes around unit 3E. Mayfield nesting success on the dikes for avocets and stilts (36 nests) was 31%, Killdeer was 40% and Snowy Plovers was 54%. Unit 3F About 5% of the migratory waterfowl were found in this unit on April 6th, while 10% of the Refuge's population of Wilson's Phalarope was observed here on May 16. A pair of Long-billed Curlew were noted in the unit on July 10th. The most significant use of this unit was by post-breeding Snowy Plovers and chicks found on the alkali flats near the borrow area that was still covered by about 2" of water. 106 of the Refuge's 117 Snowy Plovers were found here on July 22nd while 16 of the total 20 were observed on August 7.
Unit 3G A pair of Long-billed Curlews were noted in the unit on July 10th and a single bird was noted on July 22nd. Also only July 22nd, the unit hosted 82% (170) of the Refuge population of Wilson's Phalarope.

Unit 3H, 3I and 3J Objective

1. Maximize emergent wetland type to encourage colonization of alkali bulrush.
A. Management Strategy Prescriptions. There is no water elevation data available as none of these units have water gauges. In general, the units were full in the spring, dry by late June and then re-flooded starting in October. The units were frozen by November 26th. A flap gate was installed in the canal from the Bear River into 3H to prevent water flowing out of 3H into the river during periods of low river flow. An outlet structure was installed in 3H to allow the unit to drain into the Unit 3 drain canal. Units 3H and 3J were both treated for tamarisk. About 131 acres in 3H and 12 acres in 3J were pulled.
B. Habitat Response. Unit 3H responded to drier than normal conditions with good growth of salt grass and pickleweed. Units 3I and 3J are about 70% emergent vegetation (cattail) and 30% open water.
C. Response of *Resources of Concern.* Unit 3H This unit hosted the 2003 Refuge peak count of 8 Long-billed Curlew on April 24. In March 3H held about 9% of the Refuge's Cinnamon Teal, 4 Snowy Plover and 27% (243) Franklin's Gull on June 20, 198 Marbled Godwit (19%), and 574 Wilson's Phalarope (95%), July 10. Unit 3I Priority species use of this unit included 14% of Refuge population of Cinnamon Teal (354) on March 28, and 11% (160) on July 10. In addition, the unit hosted 32% (306) of Refuge population of Dowitchers on August 7. Unit 3J received no significant use by priority species.

Unit 4A and 5A Objective

1. Maintain mudflat habitat for foraging and loafing waterbirds.

A. Management Strategy Prescriptions. These units have wet mudflats with less than 2 inches of standing water shortly after precipitation events otherwise they're dry, alkali mudflats. The Bear River did not flood above its banks and spread out into either of these units in the spring as it did historically. Unit 4A was treated for tamarisk mainly along the Bear River (35 acres pulled) and Whistler Canal (26 acres sprayed).

B. Habitat Response. Unit 4A had some sheet water in February. The units remained dry the rest of the year. The majority of both these units is dry alkali mudflat habitat. However, small portions of these units support scattered patches of saltgrass, pickleweed (*Salicornia rubra)* and an occasional iodinebush (*Allenrolfea occidentalis*).

C. Response of *Resources of Concern.* Though these units receive little use by priority species 4A did host 34% of the Refuge's population of migratory waterfowl on February 14 and 6 Snowy Plover on March 28th (earliest 2003 sighting).

Unit 4B Objective

As a low priority unit based on predicted water supply, no objectives were set for this unit. General goal was to provide habitat for migratory waterfowl during spring and fall.

A. Management Strategy Prescriptions. The unit was filled after November 2002 and was the first time this unit has had water since 2000 to facilitate construction of O-Canal. Unit reached a peak elevation of 4204.8 in March and began a decline until it was noted as dry on June 20. Re-filling of the unit did not began until after October 7 and was brought up to 4205. The unit was frozen by November 26th and re-opened briefly to 40% on December 12. Eight acres of tamarisk were pulled in the unit along the west dike.

B. Habitat Response. The majority of the unit is occupied by scattered patches of salicornia.

C. Response of *Resources of Concern*. This unit supported an Avocet colony on an island in the southeast corner. On May 23, 352 nests were counted as the chicks were emerging. 5-11% of the Refuge's population of migratory waterfowl were found in this unit in April while 6-14% of the Refuge's breeding population of avocets were noted here. Unit 4B also hosted migrating Marbled Godwit and Dowitchers on May 1 for a count of 9% (160) and 6% (94) of the Refuge population respectively. The unit was important in the fall once again to migratory waterfowl hosting 14-18% of the Refuge population in October and November as well as 50% of the Tundra Swan population on November 14.

Unit 4C Objective

1. Maximize deep submergent wetland habitat to provide optimum conditions for production of sago pondweed.

A. Management Strategy Prescriptions. The target elevation of 4204.5 was achieved by March 12 and was maintained until About mid-May when it began drying. The unit was noted as dry except for the borrow area immediately around the island on July 10 and completely dry by July 22. Re-filling of the unit started around September 2. Unit brought up to elevation around 4205.0 and maintained throughout the winter months. About 240 acres in the unit were treated for tamarisk by spraying (33 acres) and discing (207 acres). The unit was frozen on December 5th.

B. Habitat Response. The habitat objective was unmet due to drying out of the unit.
C. Response of *Resources of Concern.* Unit 4C hosted 14% of the migratory waterfowl during the spring migration (March-May 1) and 15% during the fall (September-November). The unit accounted for 23% of the annual Redhead use of the Refuge, mostly in the spring. During April-June from 6 to 25% of the Refuge avocet population could be found in this unit. A single Long-billed Curlew was noted on June 20. 4C also hosted about 14% (760) of the Refuge population of Marbled Godwits on September 26.

Unit 5B Objective

1. Maximize mid-depth emergent wetland habitat to encourage colonization of alkali bulrush.
A. Management Strategy Prescriptions. This unit was the highest priority unit so water in-flows were maintained throughout the summer to just off-set evaporation. The unit reached it's target elevation of around 4204.5 in March. The water level was maintained in the range of 4204.5 throughout the rest of 2003. Tamarisk stands were treated in the unit by spraying (36 acres).
B. Habitat Response. This unit had good to excellent colonization and production by both sago pondweed and alkali bulrush at this water elevation. A survey in October showed 1,033 acres of open water habitat and about 250 acres of emergent vegetation of which about 10% was alkali bulrush.
C. Response of *Resources of Concern.* The emergent vegetation attracted colony nesting birds such as priority species White-faced Ibis and Franklin's Gull. The colony was not formally surveyed though priority species nests likely numbered in the range of 1-3,000 nests each. Having water all-year round, this unit hosted 28% of the annual total migratory waterfowl, 28% of the annual total Cinnamon Teal, 40% of the Redhead, 13% of American White Pelican, and 8% of American Avocet.

Unit 5C Objective

1. Maximize deep submergent wetland habitat to provide optimum conditions for production of sago pondweed.
A. Management Strategy Prescriptions. This unit was filled to 4204.5 by early spring and remained around 4204.0 throughout most of the summer as upstream Machine Lake was drained to facilitate dike construction by the duck club. The unit did go about 80% dry for a brief period in late September-early October. The unit was again re-filled to 4205 by November. About 85 acres of tamarisk were treated by pulling (16 acres) and discing (69 acres). 30% of the unit was frozen on December 12.
B. Habitat Response. Sago pondweed colonization and production was thought to be fair to good.
C. Response of *Resources of Concern.* The unit received high use by priority species. The unit accounted for 9% of the annual total use by Tundra Swan, 10% Cinnamon Teal, 13% migratory waterfowl and American White Pelican, 11% use by White-faced Ibis, 19% use by both Black-necked Stilt and American Avocet, 22% Long-billed Curlew, 71% Marbled Godwit, 64% Dowitchers, 7% Wilson's Phalarope, 28% migratory shorebirds, 9% Franklin's Gull and 19% Black Tern.

2004 Wetland Management Plan

The wetland habitat goal at Bear River Refuge is to provide a diversity of wetland types, a diverse and abundant population of aquatic macro invertebrates, and a range of aquatic plant communities from early to late successional stages.

The following general management strategy applies to all wetlands to achieve the overall Refuge wetland habitat goal and objective. Unit by unit objectives and strategies follow for priority units.

General Management Strategy

In 2004, pools will be filled to target levels according to the availability and turbidity of water. Pools should be refilled to target levels just prior to the spring peak, to reduce sediment deposits in the pools and increased turbidity that can inhibit sago pondweed germination, growth, and production. Units should all be brought up to target elevation by April 1 and maintained, when water conditions allow, through December 15. Once at target levels, outflow should be restricted to maintain salinity levels appropriate for saline marsh vegetation (hardstem bulrush, alkali bulrush and sago pondweed). As pools are allowed to dry due to low water supplies, the dry units will filled beginning in September or when dependable water supply allows, and should be at target level by the first week in November. All units should be kept at target elevations until early December. The larger units, (Unit 1, 2D, 5B and 5C) which are subject to ice damage from wind fetch, will be lowered about 18" before ice-up and will remain in draw-down throughout the winter. All other units will be maintained at or near target levels through the winter.
Reliable streamflow forecasts are available on April 1 of each year. Using these forecasts, pools that will not be maintained through the summer will be allowed to dry naturally through evaporation.

Each year, target elevations are developed and the wetland management units are prioritized for filling (spring and fall) and water level maintenance. The following tables provide the priorities of fill and pool retention for 2004. The forecast for 2004 is for “Very Low” water supply which means < 50% of normal or about 40-50 cfs for July and August. Very low flows are a 25-year event, but the refuge has experienced several of these events during the last five years. Under very low forecast water conditions we would be able to maintain only Units 5B, 4C and possibly 2C throughout the driest period of July and August (Table 1). Unit objectives are listed only for those units that can be sustained at target levels throughout the driest part of the year. Only general management strategies are outlined for those units that the water supply allows to be filled only in the spring and fall.

Table 1. Priority order of water level maintenance of wetland management units under "very low water" condition forecast, Bear River MBR, 2004.

Very Low Forecast (<50% of average)			July-August	
Unit	Cumulative Acreage	Target Elevation	Maintenance Water Need (cfs) Unit/Cumulative	
5B	1,416	4204.6	24.4	24.4
4C	3,311	4205.5	26.3	50.7
2C	4,031	4204.5	12.4	63.1

Unit 5B Objectives

1) Manage soil salinity levels at about 5,000-8,000 ppm (8-12 m.mhos/cm).
2) Maintain water at target elevation of 4204.6' msl April 1-December 15.
3) Increase amount of alkali bulrush to account for 60% of emergent vegetation with a mix of 50% open water to 50% emergent vegetation over the entire unit.
4) Manage water levels to achieve 582 acres of mid-depth emergent wetland habitat, 207 acres of shallow emergent and 994 acres of vegetated mudflat.
Management Prescription:
1: Manage salinity levels by adding only enough water to offset evaporation losses.
2: Manage water clarity by restricting carp and reduce silt loading by filling with clear water in spring.
3: Control aquatic vegetation community composition through water depth management and by matching salinity levels with tolerance ranges of desired macrophytes.
If low water supply conditions persist in September and October, the target elevation is lowered to 4204.0.

Unit 4C Objectives

1) Maintain soil salinity levels at 5,000 - 10,000 ppm (8-15 mmhos/cm), April 1-October 15.
2) Maintain water level at 4205.75' msl, throughout the year.
3) Increase amount of sago pondweed to cover 60% of unit.
4) Manage water levels to achieve 1528 acres of deep submergent wetland habitat.

Management Prescription:
1: Manage salinity levels by adding only enough water to offset evaporation losses.
2: Manage water clarity by restricting carp and reduce silt loading by filling with clear water in early spring.
3: Control aquatic vegetation community composition through water depth management and by matching salinity levels with tolerance ranges of desired macrophytes.
The water elevation is to control tamarisk that were treated in the unit in 2003.

Unit 2C Objectives

1) Maintain soil salinity levels at 5,000-10,000 ppm (8-15 m.mhos/cm), June-August.
2) Maintain water level at 4204.5' msl, year-round.
3) Increase sago pondweed to cover 70% of unit.
4) Manage water levels to achieve 504 acres of shallow submergent wetland and 216 acres of shallow emergent wetland.
Management Strategy: After ice-out, the unit will be filled if needed, to the new target of 4205.25 to further control tamarisk. Water levels will be maintained at target for the entire calendar year.

The second table (Table 2.) illustrates the priority order of fill and maintenance of units should the water supply be better than the very low forecast.

Table 2. Management priority order of wetland units, Bear River MBR, 2004.

	Total	Wet	Spring	Priority	Maintenance	Fall Fill	Fall
Unit	Acres	Acres	Target	Order	Needs	Order	Target
			Elevation	2004	(July-Aug.)	2004	Elevation
			2004		cfs		**2004**
1	12,204	3,460	4204.50		59.7	6	4204.00
1A	544	544	4205.40		9.4	7	
2A	135	135	4205.50	5	2.3	5	
2B	294	237	4206.00	4	5.1	4	
2C	720	720	4204.50	3	12.4	3	
2D	4,619	4,619	4205.25		79.6	8	
3A	505	505	4206.00		8.7	13	
3B	1,085	1,085	4205.00		18.7	12	
3C	549	549	4205.00		9.5	11	
3D	1,045	1,045	4205.50		18.0	10	
3E	1,448	1,448	4205.00		25.0	14	
3F	903	903	4205.20		15.6	15	
3G	1,545	1,047	4205.70		18.1	16	
3H	655	295	4206.00		5.1	N/A	
3I	211	211	4205.50		3.6	N/A	
3J	166	166	4206.00		2.9	N/A	
3K	230	230	4206.00		4.0	N/A	
4A	2,698	1,523	4205.50		N/A		
4B	1,242	1,242	4205.50		21.4	17	4205.00
4C	1,528	1,528	4205.75	2	26.3	2	
5A	2,405	495	4205.50		N/A		
5B	1,416	789	4204.60	1	24.4	1	
5C	2,558	2,558	4205.50		24.4	9	4205.00
5D	939	0	N/A		N/A		
6	3,185	3,185	N/A		54.9	N/A	
7	2,581	2,581	N/A		44.5	N/A	
8	4,158	4,158	N/A		71.6	N/A	
9	5,171	5,142	N/A		88.6	N/A	
10	15,262	1,014	N/A		17.5	N/A	
Total	70,001	41,414			671.1		

Only general management strategies are outlined for the following units that the water supply is inadequate to maintain at target level through July, August and September.

Unit 1
Management Strategy: See general management strategy above. If by September 15, water supply is low, the target elevation of this unit will be changed to 4204.0.

Unit 1A
Management Strategy: The unit will be filled in the spring and drawn-down or allowed to dry in the summer. The drive-through inlet structure will be modified by installing a stoplog pier to allow regulation of inflows into the unit. After the nesting season (late July) the unit will be grazed with cattle to remove the above ground vegetation. Upon completion of the new inlet structure the unit will be re-filled to 4205.4 in an attempt to stress the emergent vegetation that had been reduced by grazing and maintained throughout the winter.

Unit 2A
Management Strategy: A water measurement gauge will be added to this unit in 2004. The unit will be filled in the spring to the maximum level allowed when all boards are put into the outlet structure (4205.5) to further stress any surviving tamarisk. It may be possible to hold the water even higher at about 4206.0 by keeping the radial gate shut. In low water supply conditions, the unit will be allowed to dry in the summer and re-filled in the fall as conditions allow.

Unit 2B
Management Strategy: After ice-out, the unit will be filled in the spring (4206) if needed and allowed to dry by mid-summer. The unit will be grazed post-breeding season (July 15-October1) to decrease density and height of undesirable emergent vegetation (cattail and phragmites). After grazing, the unit will be re-filled to the maximum by putting in all the boards (3) in the outlet structure. The elevation at the outlet structure needs to be determined.

Unit 2D
Management Strategy: The target elevation is 4205.25'. The unit will be re-filled from low winter level with clear water by April 1 and allowed to dry if water supply is low. Cattle will be grazed in the northern portion of the unit after the nesting season (July 15-October 1). The unit will be re-filled in the fall as water supply allows. After December 15, the unit will be drawn-down to about 4204 to prevent ice-damage.

Units 3A and 3K
Management Strategy: The units will be filled in early spring with clear water from the river. These units will be allowed to dry-out by mid-summer for maintenance work. The interior dike between these units will be breached to allow flow through waters, essentially creating a single unit. Both units may be grazed by cattle after the nesting season from July 15-October 1 to decrease height and density of emergent vegetation. If water supply is sufficient, water will be added until the target elevation is reached.

Unit 3B
Management Strategy: The unit will be filled to maximum pool (3 boards in outlet structure) in the spring and allowed to dry-out with low water supply.

Unit 3C
Management Strategy: The target elevation is 4205.0 based on observed stands of sago pondweed before drying out in 2003. The unit will be filled to the target, allowed to dry in the summer and re-filled as the water supply allows in the fall. Target elevation will me maintained through the winter.

Unit 3D
Management Strategy: The target elevation is 4205.5. The unit will be filled to the target, allowed to dry in the summer and re-filled as the water supply allows in the fall. Target elevation will me maintained through the winter.

Units 3E, 3F and 3G
Management Strategy: The units will be filled to maximum capacity (3 boards in outlet structure) in the spring, allowed to dry in the summer and re-filled as the water supply allows in the fall. These units are difficult to fill to maximum pool as O-Line Canal needs to be kept fully charged before water will flow into 3G as it's inlet structure is at a high elevation.

Units 3H, 3I and 3J
Management Strategy: Units 3H and I are both subject to fill by Bear River flows. No active management for filling. Unit 3J will be filled in the spring by lowering the inflatable gate on the Bear River.

Units 4A and 5A
Management Strategy: Both units receive water in the spring from sheet water. Unit 5A is subject to management actions of 5C. No active management for filling.

Unit 4B
Management Strategy: The unit will be filled in the spring to target elevation 4205.5, allowed to dry in the summer and re-filled as the water supply allows in the fall. Under low water conditions in September and October the target elevation becomes 4205.0.

Unit 5C
Management Strategy: The unit will be re-filled from winter low level to target of 4205.5 by April 1. A complete draw-down of the unit will be initiated on May 1 in order to treat the unit for tamarisk upon drying. The unit will be re-filled in the fall as the water supply allows to 4205.0.

In the fall the units will be filled in the following order: The units along L-Canal (2C, 2B, 2A, 1, 1A), 2D, charge Reeder and fill 5C, the H-Line units (3D, 3C, 3B and 3A), and finally the O-Line sub-units (3E, 3F, 3G, 4B and 4A). The unimpounded units (6-10) will only begin to receive water once the other units are full and we begin to bypass the excess water.

Grassland Ponds

In 2003, the objectives for the grassland ponds were:

1). Manage ponds to achieve mix of 50% open water to 50% emergent vegetation or hemi-marsh conditions, year-round.
2) Maintain water level at 1' below the top of the dike year-round unless otherwise stated.
A. Management Strategy Prescription. All the units were filled in the spring to the objective level. There are no water level data available as there are no staff gauges on the outlet structures. However, water inflow data was collected from April 1 to October 12 from the three flume gauges to each of the Nichols, White and Stauffer tracts. Nichols inflow was around 0.25 cfs in April, 0.05 in June, 0 in July, and 0.16 in September. White inflow averaged 0.22 cfs in April, May and June, 0.15 cfs in July, 0.16 in August and 0.14 in September. Stauffer inflow averaged 0.17 cfs in April, 0.25 cfs in May, 0.075 in June, 0.17 cfs in July, 0.10 cfs in August and 0.14 in September. With low water supply the units were mostly dry by July 11; N-1 75% dry, N-2 80% dry, N-3 95% dry, N-4 80% dry, N-5 90% dry, N-6 and N-7 100% dry, W-3 and W-6 100% dry, W-7 40% dry, S-1 100% dry. Units N1,3, 4,5,6, and 7 were disced to decrease density of cattail and phragmites in August. The units began to fill again in mid-October and reached maximum height by mid-December.
B. Habitat Response. The habitat objectives were not met due to drought conditions.
C. Response of *Resources of Concern*. The grassland ponds are utilized primarily by migratory waterfowl in the spring, Cinnamon Teal and Redhead as pair and brood rearing ponds throughout the spring and summer, as feeding areas for White-faced Ibis, Long-billed Curlew, and nesting, resting, feeding and brood rearing areas for Black-necked Stilts and American Avocet. Total 2003 count (15 surveys) of ducks for the ponds was 2,244, 499 White-faced Ibis, 4 Long-billed Curlew, 112 Black-necked Stilt, 94 American Avocet, and 20 Wilson's Phalarope. Peak count of waterfowl was April 9. Peak count or highest use date by shorebirds was May 16. Ponds N1 and N5 consistently had the highest counts of waterfowl or received the most use by all waterbirds.

2004 Wetland Management Plan for Grasslands

The 2004 objectives for the grassland ponds remain the same as last year.

Management Prescription: To meet the first objective, the density of cattail needs to be reduced in several ponds. W5 and/or W7 will be drawn down in mid-summer and allowed to dry then disced or grazed to decrease amount of cover by cattail. All the other ponds on the Nichols, White, and Stauffer units will be kept as full as the available water supply will allow.

Grassland Uplands

Nichols, White, Stauffer Unit objectives
Based on the soils, each of the units supports three habitat types and associated plant communities. The objectives describe climax plant communities for each habitat type.

Alkali Bottom Objectives:
1) Increase cover of grasses (saltgrass, alkali sacaton, wheatgrass, Basin wildrye) to 60% by 2015.
2) Increase forb cover to 5% (silverscale, fireweed, and hollyleaf clover) by 2015.
3) Increase shrub cover to 5% (greasewood) by 2015.
4) Decrease cheatgrass cover to < 10% by 2015.

Salt Meadow Objectives:
1) Increase grass cover (alkali bluegrass and saltgrass) to 65-75% by 2015.
2) Increase forb cover (lanceleaf goldenweed, fiddleleaf hawksbeard and sunflower) to 10% by 2015.
3) Increase shrub cover (iodinebush, rabbitbrush and greasewood) to 1-3% by 2015.

Wet Meadow Objectives:
1) Increase grass cover (*Carex* spp.) to 80% by 2015.
2) Increase forb cover (alkali marsh aster and common silverweed) to 5% by 2015.
3) Decrease shrub cover (rabbitbrush and greasewood) to 1% by 2015.

A. Management Strategy Prescriptions. A dormant season graze was initiated in November 2002 and continued until late March 2003 on the Refuge grassland units. The goal of the grazing program is to invigorate perennial native grasses (wheatgrass species, salt grass, alkali sacaton, Great Basin wildrye and alkali cordgrass) while suppressing annual cheatgrass. Grazing is a tool to improve habitat for ground nesting migratory birds and to improve habitat conditions for other non-target grassland community species. Dormant season grazing reduces the litter layer that inhibits new plant growth. The removal of residual vegetation allows more sunlight penetration to raise soil temperatures. In addition, several areas were broadcast seeded with a native grass mix (Table 3) at about 20 lbs./acre (bulk) prior to being grazed with the thought that the animal impact during the graze period will set the seed. A test plot on the Nichols tract was seeded in December of 2003 and the site will be monitored in 2004 to determine success. The site was approximately 5 acres and the approximate center of the plot is photopoint N-5.

Table 3. Grass mixture and variety planted in 2003.

Species	Variety	Purity of mix	Germination Rate	Origin
Slender Wheatgrass	Revenue	28.38	93.00	MT
Bluebunch Wheatgrass	Secar	3.62	96.00	WA
Alkali Sacaton	VNS	2.56	94.00	CO
Western Wheatgrass	VNS	18.33	96.00	MT
Alkaligrass	Fults	2.50	90.00	CO
Alti Wildrye	VNS	22.76	94.00	CO
Thickspike Wheatgrass	Bannock	19.33	91.00	UT

The grazing areas and utilization rates for the winter of 2002-03 were as follows:

Nichols Unit

A total of 7 areas within the Nichols Unit were grazed (Figure 1). The N1 Unit consisted of 59 acres and was grazed for 17 days from November 12 - November 20, 2002. A total of 120 head grazed the unit from November 12-20 and then 160 head grazed from November 21–28. The total utilization rate for the unit was 1.3 A.U.M.'s per acre. A total of 79 A.U.M.'s were removed.

Unit N2 consisted of 150 acres and was grazed for 10 days from November 29, - December 8, 2002.

A total of 160 head grazed the unit from November 29 - December 3 and then 360 head grazed from December 4-8 with a utilization rate of 0.58 A.U.M.'s per acre. A total of 87 A.U.M.'s were removed from N2.

Unit N3 consisted of 239 acres and was grazed for 16 days from December 9-December 24, 2002. A total of 360 head grazed the unit with a utilization rate of 0.80 A.U.M.'s per acre. A total of 192 A.U.M.'s were removed from N3.

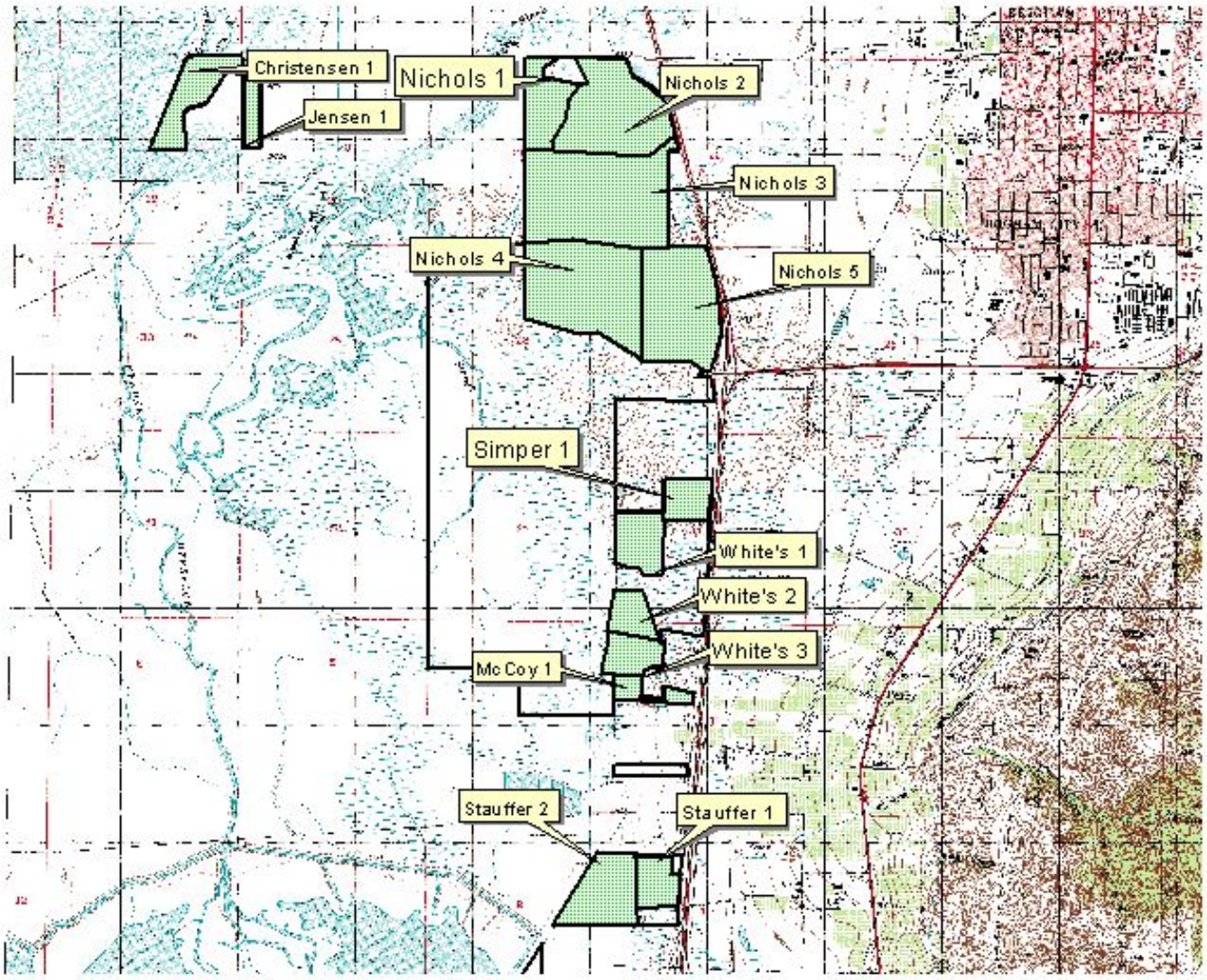
Unit N4 consisted of 194 acres and was grazed for 12 days from December 25, 2002-January 5, 2003. A total of 360 head grazed the unit with a utilization rate of 0.74 A.U.M.'s per acre. A total of 144 A.U.M.'s were removed from N4.

Unit N5 consisted of 156 acres and was grazed for 15 days from January 6 - January 20, 2003. A total of 360 head grazed the unit with a utilization rate of 1.15 A.U.M.'s per acre. A total of 180 A.U.M.'s were removed from N5.

The Christensen Unit consisted of 64 acres and was grazed for 26 days from December 17, 2002-January 11, 2003. A total of 52 head grazed the unit with a utilization rate of 0.70 A.U.M.'s per acre and a total of 45 A.U.M.'s.

The Jensen Unit consisted of 22 acres and was grazed for the first time since it was seeded to native grasses in the spring of 2001. The unit was grazed for 17 days from January 12-28, 2003. A total of 52 head grazed the unit with a utilization rate of 1.36 A.U.M.'s per acre and a total of 30 A.U.M.'s.

2002-03 Grazing Map



Refuge Boundary

2002-2003 Grazing Units

N

W E

S

White Unit

A total of 5 areas within the White Unit were grazed (Figure 1). The W1 Unit consisted of 50 acres and was grazed for 9 days from February 27- March 7, 2003. A total of 319 head grazed the unit with a utilization rate of 1.9 A.U.M.'s per acre. A total of 96 A.U.M's were removed.

The W2 Unit consisted of 33 acres and was grazed for 7 days from January 29- Feb. 4, 2003. A total of 360 head grazed the unit with a utilization rate of 2.55 A.U.M.'s per acre. A total of 84 A.U.M's were removed from W2.

The W3 Unit consisted of 38 acres and was grazed for 7 days from Feb. 5-11, 2003. A total of 10 bulls grazed the unit with a utilization rate of 2.2 A.U.M.'s per acre. A total of 84 A.U.M's were removed from W3.

The Simper Unit consisted of 34 acres and was grazed for 8 days from January 21-28, 2003. A total of 360 head grazed the unit with a utilization rate of 2.82 A.U.M's per acre. A total of 96 A.U.M.'s were removed from the Simper Unit.

The McCoy 1 Unit consisted of 22 acres and was grazed for 36 days from December 6, 2002 - January 10, 2003. A total of 48 head grazed the unit with a utilization rate of 2.59 A.U.M's per acre. A total of 57 A.U.M.'s were removed from McCoy 1 unit.

Stauffer Unit

The Stauffer Unit 1 consisted of 36 acres and was grazed for 6 days from Feb. 12-17, 2003 (Figure 1). A total of 360 head grazed the unit from Feb. 12-13 and then 319 head grazed from Feb. 14-17. The total utilization rate for the unit was 1.86 A.U.M.'s per acre. A total of 67 A.U.M.'s were removed from S1.

The Stauffer Unit 2 consisted of 80 acres and was grazed for 9 days from February 18-26, 2003. A total of 319 head grazed the unit with a utilization rate of 1.2 A.U.M.'s per acre. A total of 96 A.U.M.'s were removed from S2.

B. Habitat Response. A vegetation survey was conducted in the fall of 2003. Preliminary results of the survey show that currently, the current condition of the Alkali Bottom community on the White and Nichols Units is comprised of 60 % non-native grasses such as cheatgrass, *Bromus tectorum*, *B. japonicus*, and *B. commutatus*, rabbitsfoot grass, *Polypogon monspeliensis*, and bulbous bluegrass, *Poa bulbosa*, 35% native grasses such as wheatgrass (21%), squirreltail (5%), Nuttall's Alkaligrass, *Puccinella nuttalliana*, (3%), and 4% forbs. Shrubs comprise <1% canopy cover. Salt Meadow plant community composition by percent frequency of occurrence is 74% saltgrass, 21% emergent marsh, 4% non-native grass and 1% of noxious weed (medusahead). Forbs and shrubs are currently missing in this habitat. The Wet Meadow plant community composition by percent frequency of occurrence is 91% rush and sedges, 3% reed canarygrass, *Phalaris arundinacea*, 1% non-native grass and 5% noxious weed (medusahead).

C. Response of *Resources of Concern*. No formal surveys of the upland portions of the units was conducted. In general, the units support upland nesting waterfowl. A pair of Long-billed Curlew as evidenced by a chick seen in August, were thought to nest in the White unit, north and west of the Perry sewer ponds.

2004 Grassland Upland Management Plan

The objectives for 2004 in the upland grasslands remain the same as last year.
Management prescription: A late spring graze will be implemented in 2004 on the Nichols unit as an experiment in the control of cheatgrass. Dormant season grazing (November-January) of western portions (marshy areas) of the three grassland units will be attempted for cattail and phragmites control in 2004.

MONITORING AND EVALUATION

Weekly waterbird surveys of the 26 wetland management units and the grassland ponds will be conducted to determine use by priority species on a unit by unit basis. Canada Goose pair counts, waterfowl nesting transects and brood counts will be conducted to estimate nesting success as a measure of the success of the predator control program.

Soil salinity probes will be purchased and installed in the priority wetland units and weekly readings will be taken.

The water depth at the outlets of priority units will be recorded regularly, to determine amounts and types of habitat associated with the different water depths.

In late June at the peak of sago pondweed flowering, airboat surveys of the priority units will be conducted with the aid of a GPS unit. The amount of habitat occupied by submergent and emergent vegetation as well as the aquatic plant species diversity will be calculated in order to determine if habitat objectives are being met.

Plots where different salt cedar treatments were employed in 2003 will be marked and monitored for re-sprouting by salt cedar or re-colonization by native species. The salt cedar in the main river delta of unit 2D and a along D-Line will be the focus of saltcedar control efforts in 2004. Treatment methods will include herbicide spraying, discing, mowing and pulling.

The photo points on the Nichols, White, and Stauffer Units should be maintained to monitor any changes in upland habitat.

On the grasslands, the amount of water flowing through the measurement flumes should be recorded regularly, and note made of the amount of water in unmeasured diversions. The condition of gates (open, closed, partly open) should be noted at the same time. Records of diversions that are shared with other water right holders should be particularly noted. Staff gauges need to be installed on all of the ponds and the water depths recorded regularly.

UNMET NEEDS AND STRATEGIES TO ADDRESS THEM

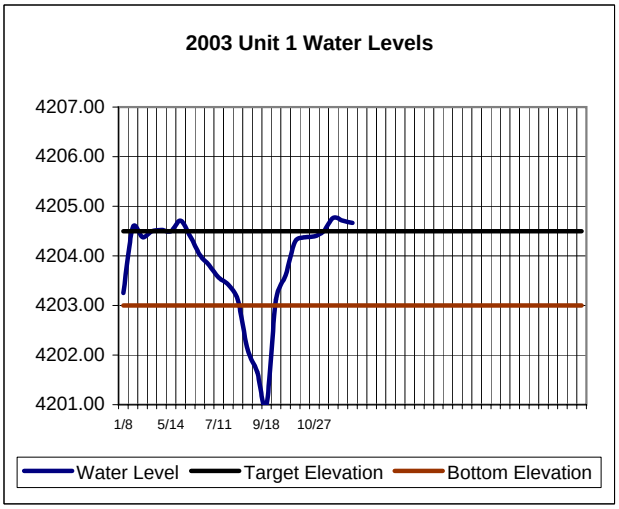
The chief impediment to improved habitat on the Bear River Migratory Bird Refuge is the shortage of water during the summer months, especially July and August. Many strategies have been advanced to remedy this problem, most recently a plan to increase the storage pool at Hyrum Reservoir by 50,000 acre-feet, or a yield of 24,200 acre-feet delivered to the refuge in July and August. This amount of water would allow the refuge to maintain an additional 8-10,000 acres of wetland habitat.

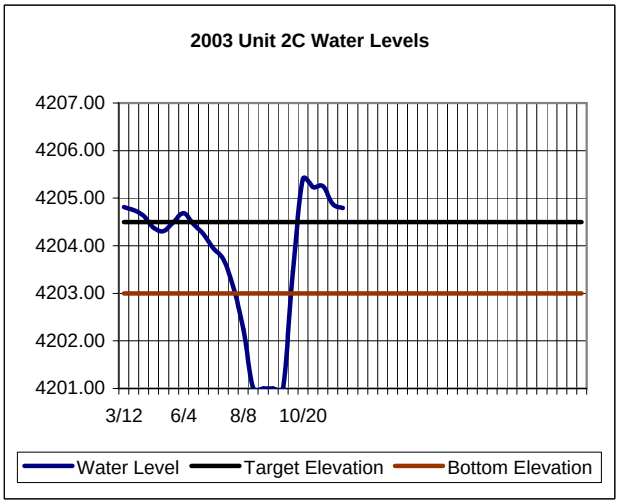
Water is limited on the Nichols, White, and Stauffer Tracts as well. Any opportunity to acquire additional water for those units (such as water under subdivisions in Perry and Brigham City) should be pursued actively.

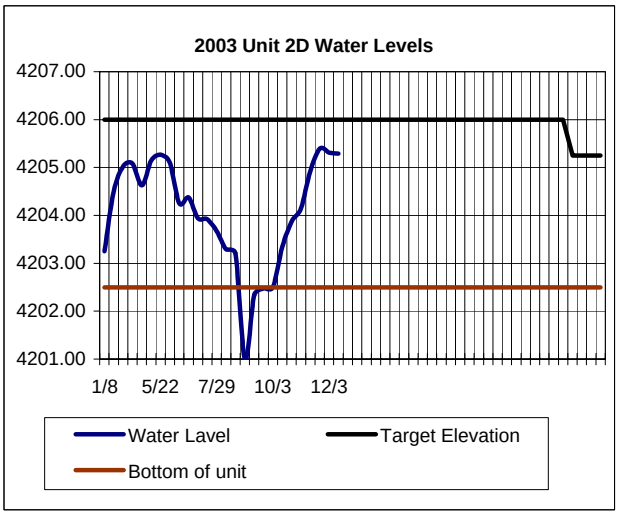
Populations of small mammalian predators have continued to increase on the refuge. The striped skunk has always been on the refuge, but large populations of red fox and racoon have inhabited the refuge only since the flood. Wildlife management efforts through predator control activities will be implemented again in 2004 in partnership with USDA Wildlife Services, Salt Lake City, UT. Canada Goose pair counts, waterfowl nesting transects and brood counts will be conducted to estimate nesting success as a measure of the success of the predator control program.

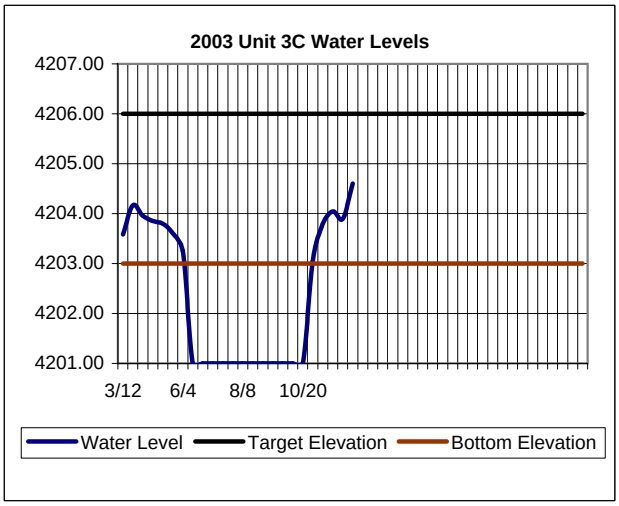
Another permanent, year-round staff position is needed at the Biologist or Biological Technician level to accomplish all the necessary monitoring activities. Currently, only portions of needed monitoring activities are completed in a timely manner with little to no inventory work being completed.

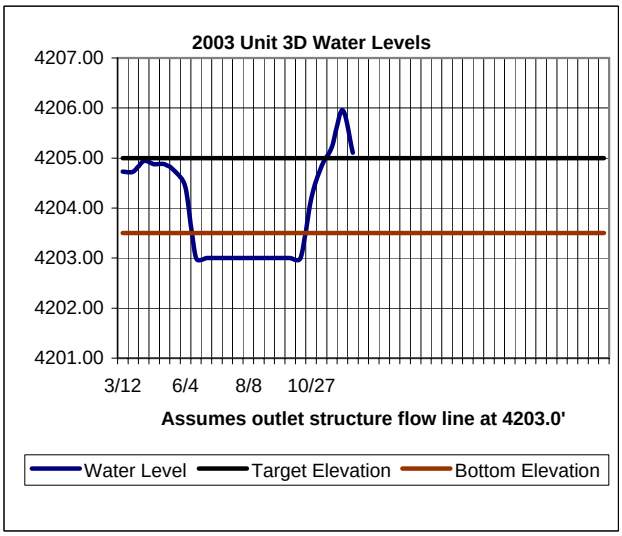
Appendix A.
2003 Unit Water Levels

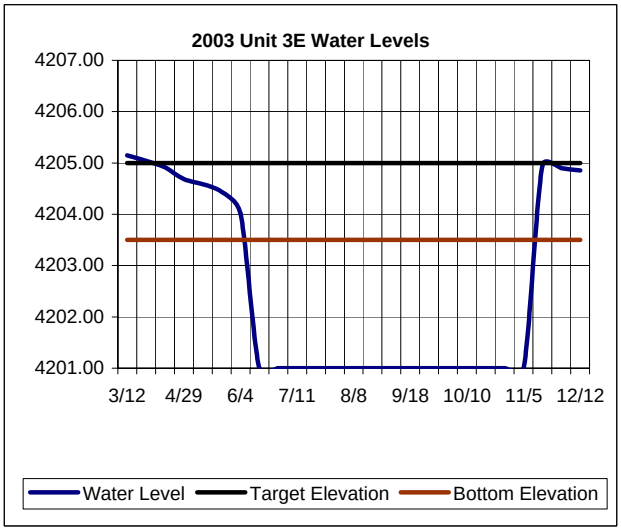

2003 Unit 1 Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
1/8
5/14
7/11
9/18
10/27
Water Level
Target Elevation
Bottom Elevation

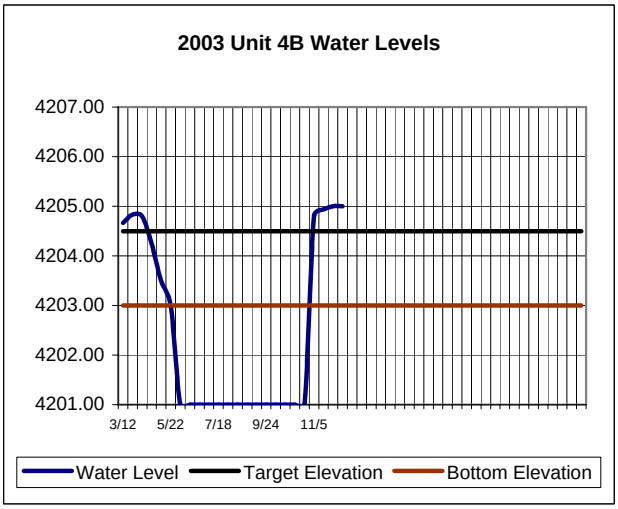

2003 Unit 2C Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
3/12
6/4
8/8
10/20
Water Level
Target Elevation
Bottom Elevation

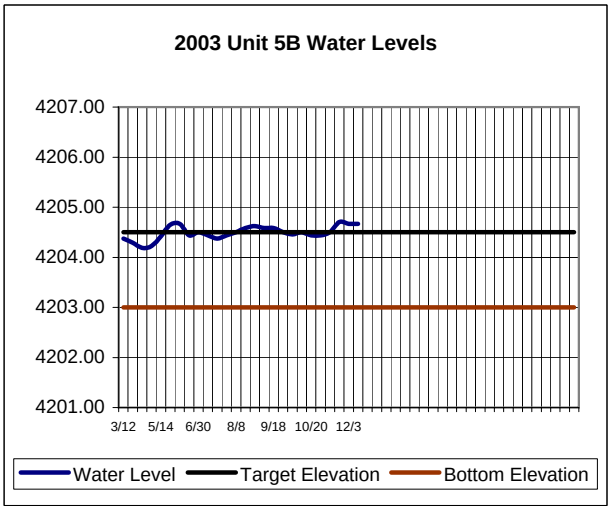

2003 Unit 2D Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
1/8
5/22
7/29
10/3
12/3
Water Lavel
Target Elevation
Bottom of unit

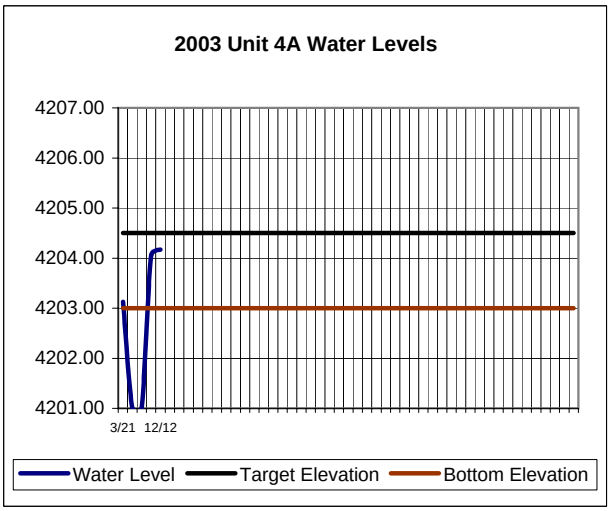

2003 Unit 3C Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
3/12
6/4
8/8
10/20
Water Level
Target Elevation
Bottom Elevation

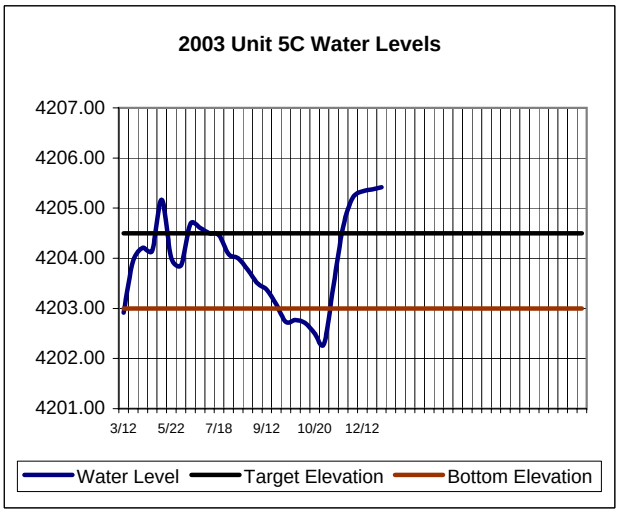

2003 Unit 3D Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
3/12
6/4
8/8
10/27
Assumes outlet structure flow line at 4203.0'
Water Level
Target Elevation
Bottom Elevation

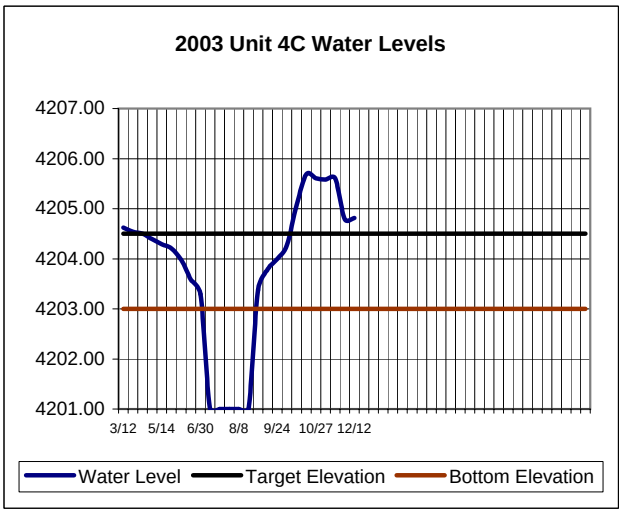

2003 Unit 3E Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
3/12
4/29
6/4
7/11
8/8
9/18
10/10
11/5
12/12
Water Level
Target Elevation
Bottom Elevation


2003 Unit 4B Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
3/12
5/22
7/18
9/24
11/5
Water Level
Target Elevation
Bottom Elevation


2003 Unit 5B Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
3/12
5/14
6/30
8/8
9/18
10/20
12/3
Water Level
Target Elevation
Bottom Elevation


2003 Unit 4A Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
3/21
12/12
Water Level
Target Elevation
Bottom Elevation


2003 Unit 5C Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
3/12
5/22
7/18
9/12
10/20
12/12
Water Level
Target Elevation
Bottom Elevation


2003 Unit 4C Water Levels
4207.00
4206.00
4205.00
4204.00
4203.00
4202.00
4201.00
3/12
5/14
6/30
8/8
9/24
10/27
12/12
Water Level
Target Elevation
Bottom Elevation

Appendix B.
2003 Habitat Conditions
and
Tamarisk Treatments

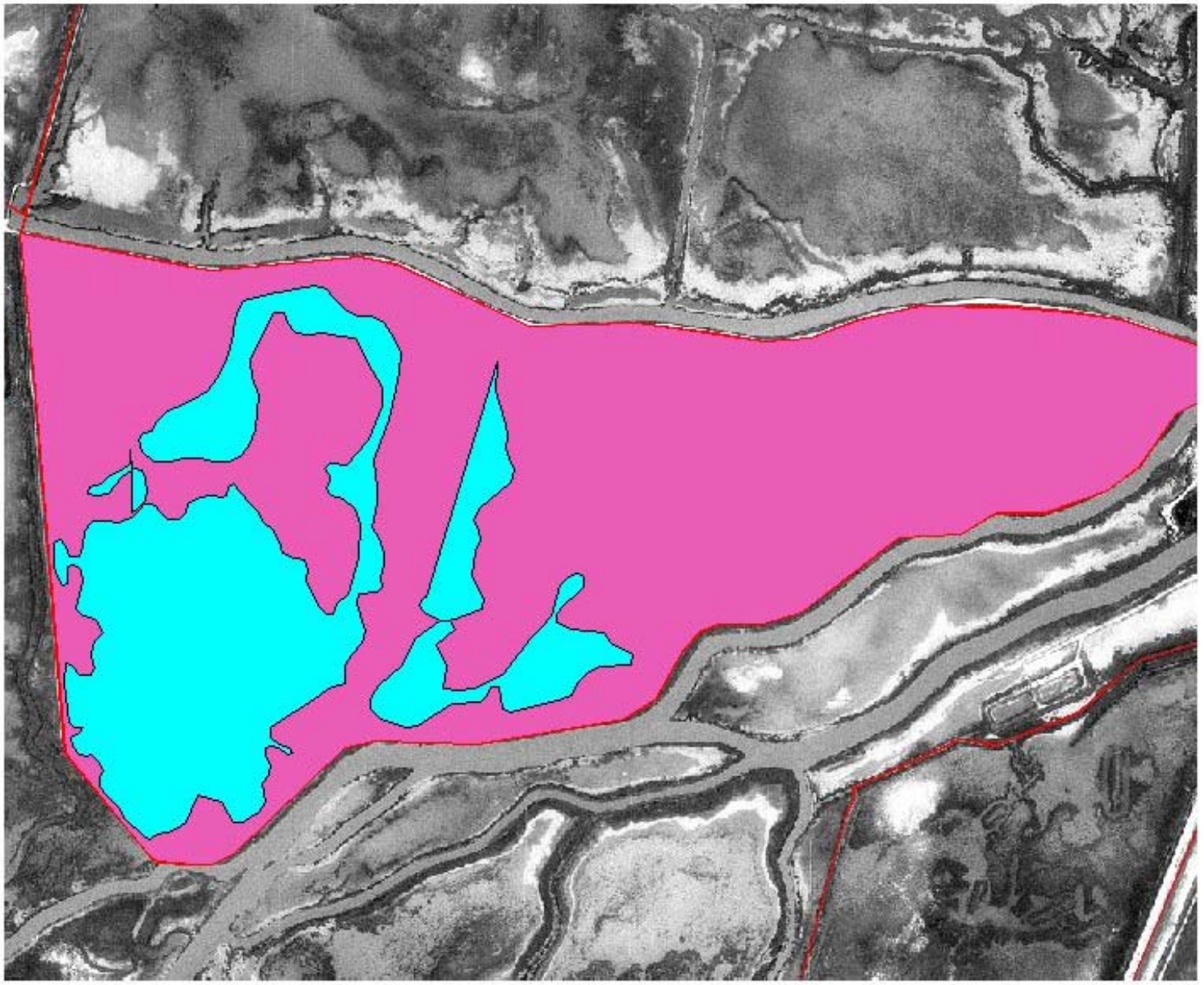
Unit 1A Habitat Conditions, October 2003.

Unit Boundary
Alkali Bulrush=79 Acres
Open Water area=232 Acres

N
W
E
S

0.4 0 0.4 0.8 Mi

Unit 2B Habitat Conditions, October 2003.

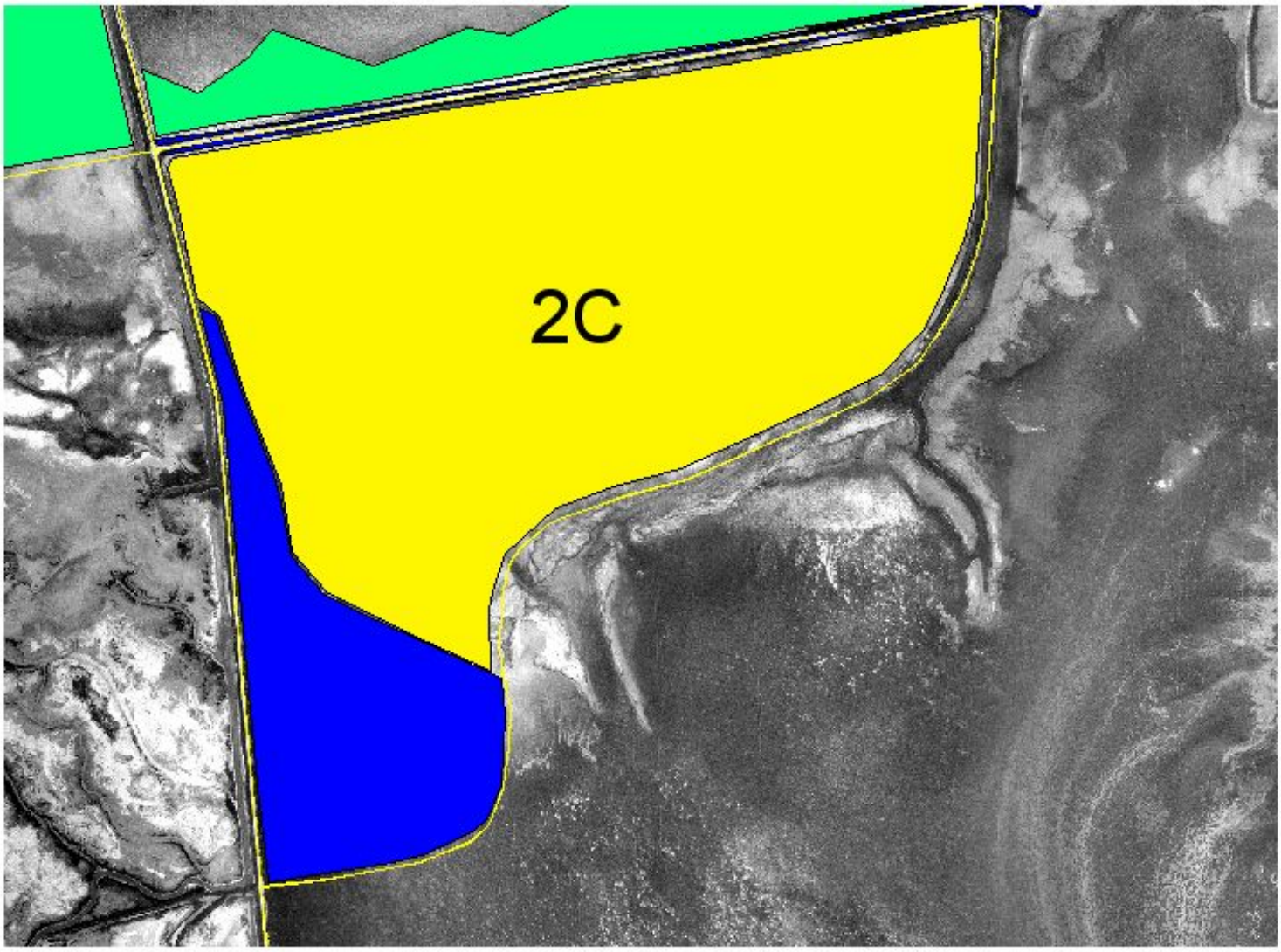


Unit Boundary
Alkali bulrush=217 Acres
Open Water=74 Acres

N
W E
S

0.1 0 0.1 0.2 Miles

Tamarisk Treatment 2003
Unit 2C



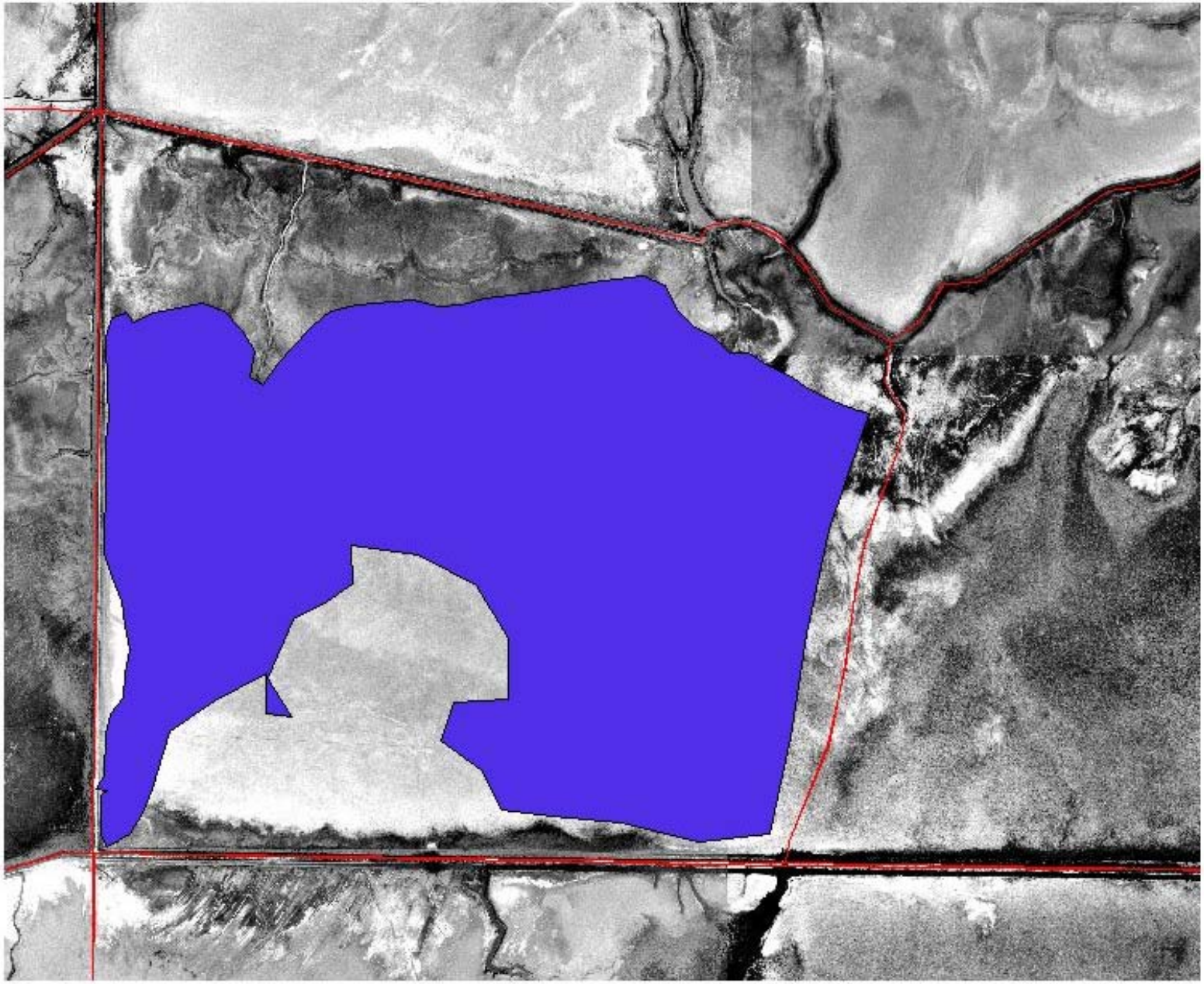
0.2 0 0.2 0.4 Miles

Treatment Method

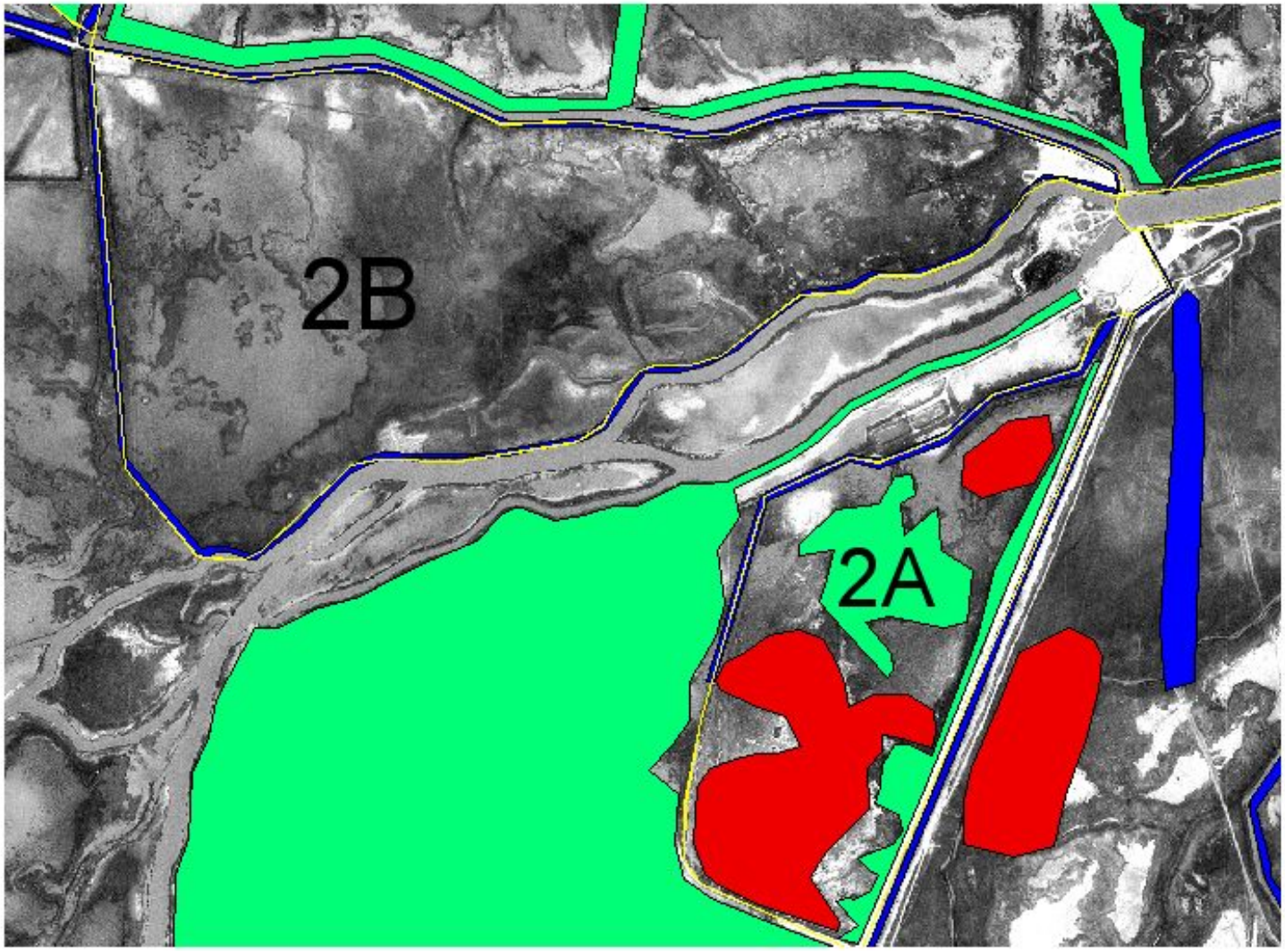
- Pull = 131 acres
- Spray
- Disc
- Mow = 543 acres

N
W E
S

Unit 5B Habitat Conditions, 2003



Tamarisk Treatment 2003
Units 2A & 2B



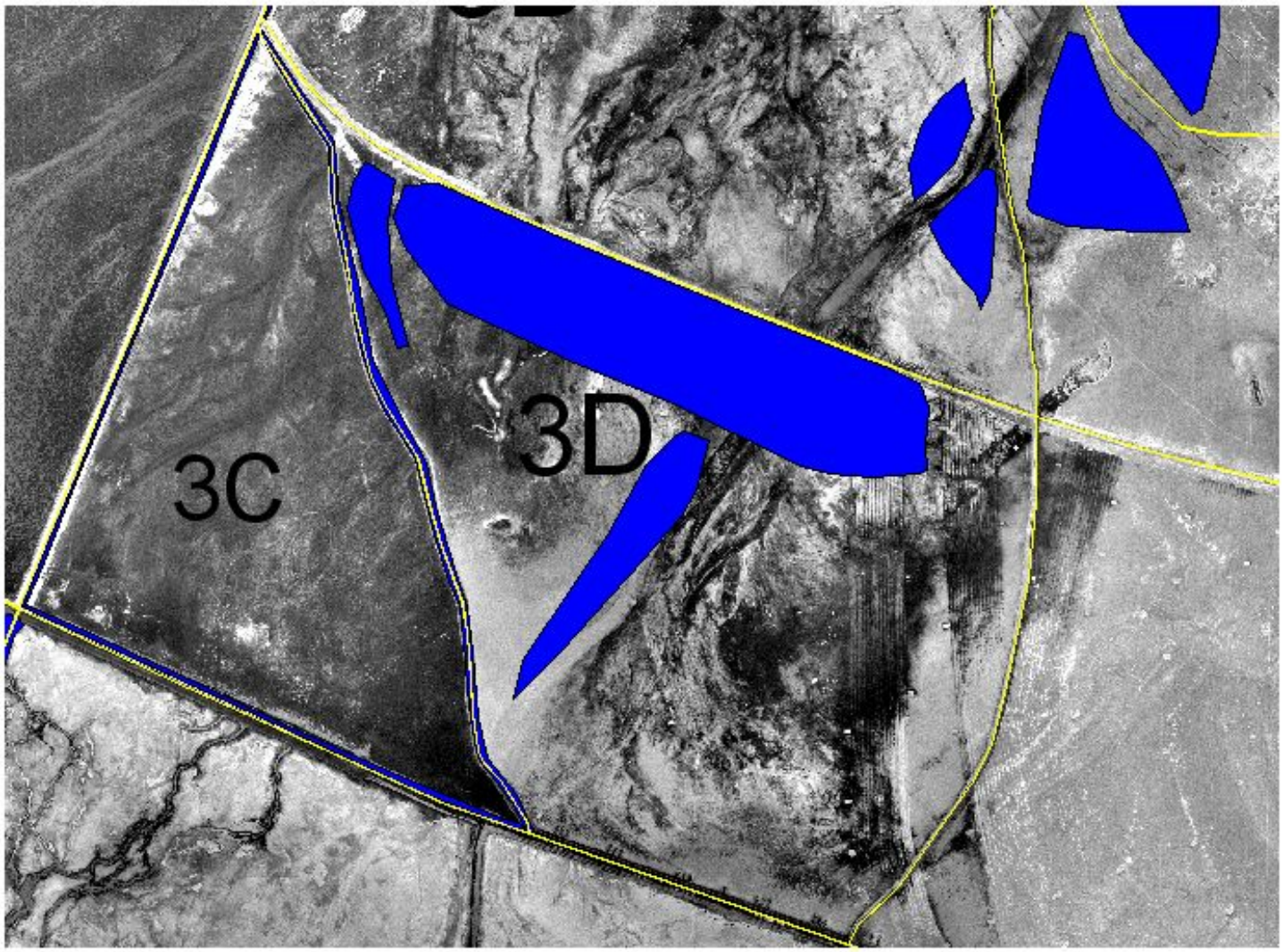
0.09 0 0.09 0.18 Miles

Treatment Method

- Pull (2A 5 acres, 2B 13 acres)
- Spray (2A 27 acres)
- Disc (2A 43 acres)
- Mow

N
W E
S

Tamarisk Treatment 2003
Units 3C & 3D



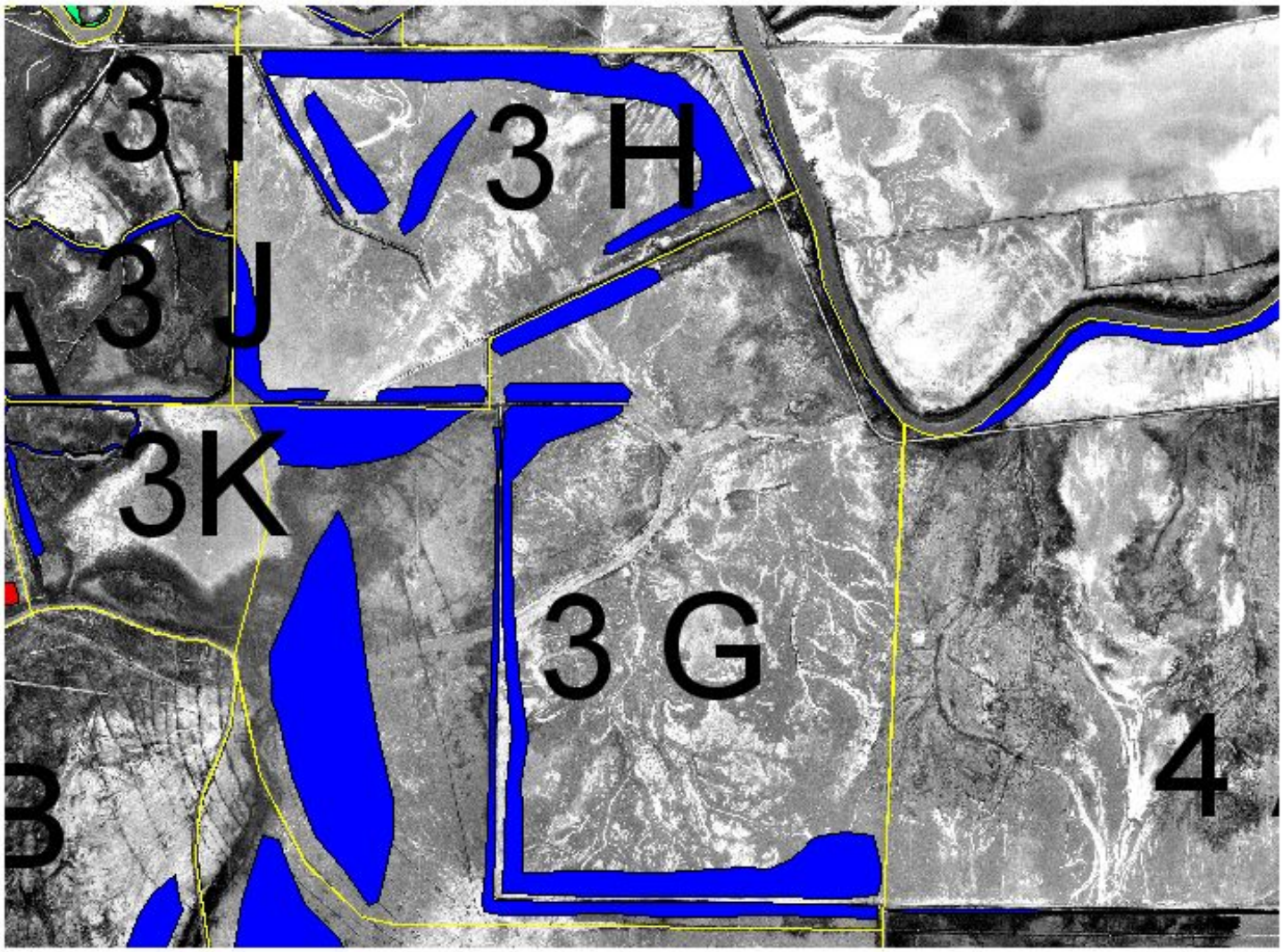
0.2 0 0.2 0.4 Miles

Treatment Methods

- Pull (3C=36 acres, 3D=240 acres)
- Spray
- Disc
- Mow

N
W E
S

Tamarisk Treatment 2003
Units 3G & 3H



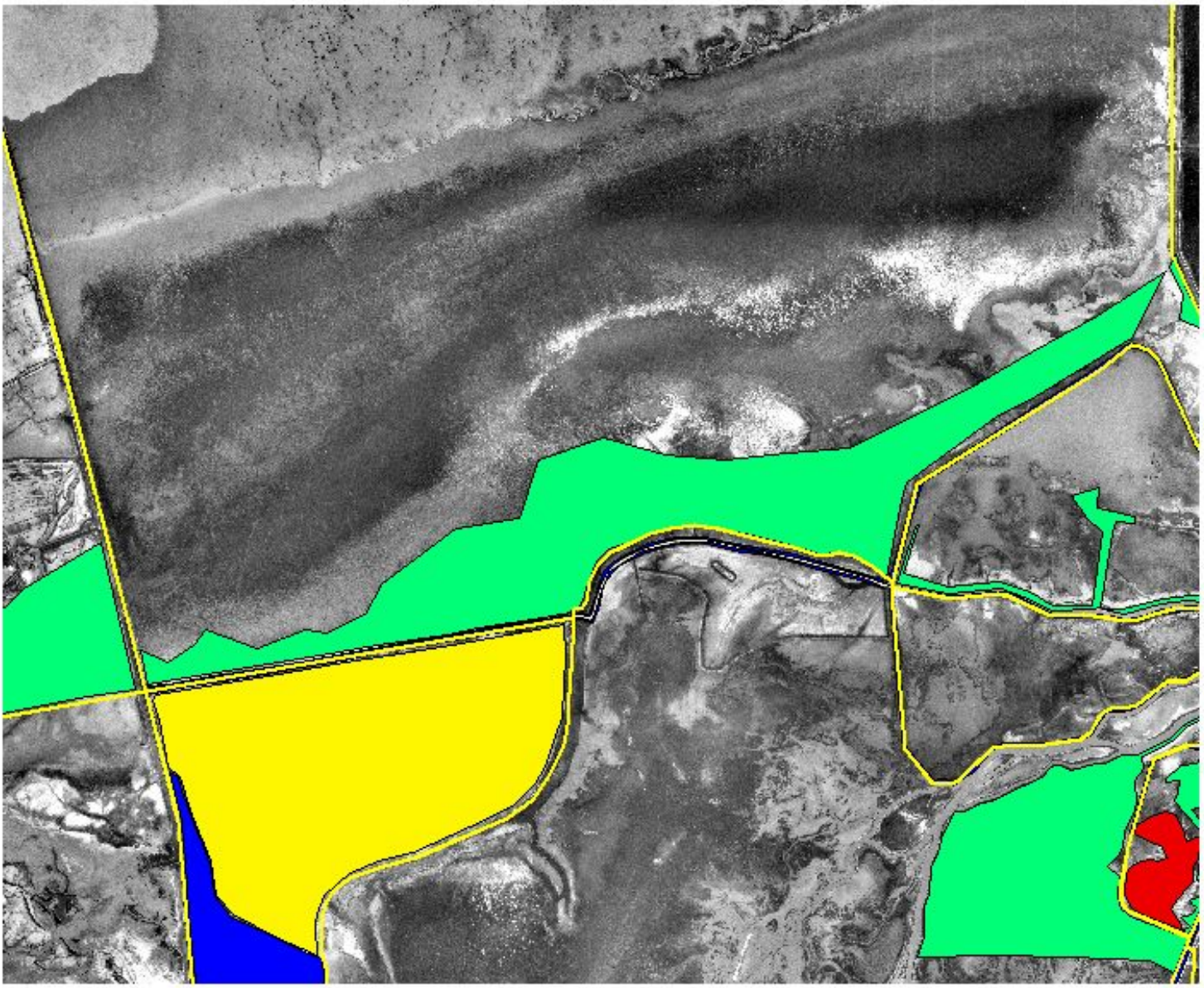
0.2 0 0.2 0.4 Miles

Treatment Methods

- Pull (3G=308 acres, 3H=131 acres)
- Spray
- Disc
- Mow

N
W E
S

Tamarisk Treatment 2003
Unit 1



0.4 0 0.4 0.8 Miles

Treatment Methods

- Pull=8 Acres
- Spray=494 Acres
- Disc
- Mow

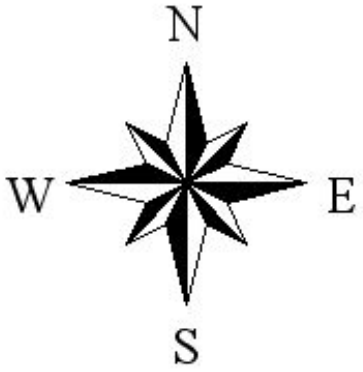
N
W E
S

Tamarisk Treatment 2003
Unit 1A

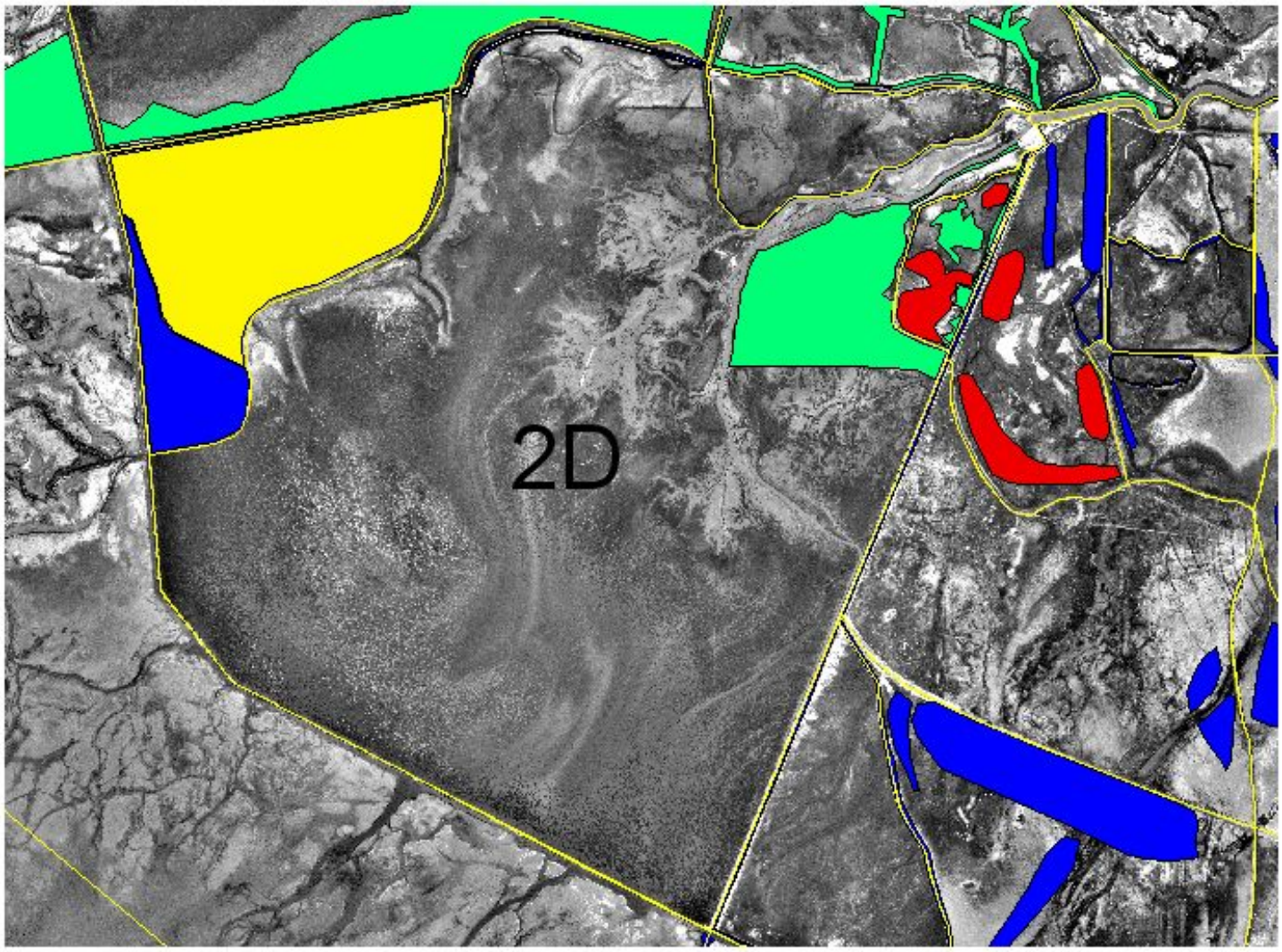
0.1 0 0.1 0.2 Miles

Treatment Methods

- Pull=21 Acres
- Spray=70 Acres



Tamarisk Treatment 2003
Unit 2D



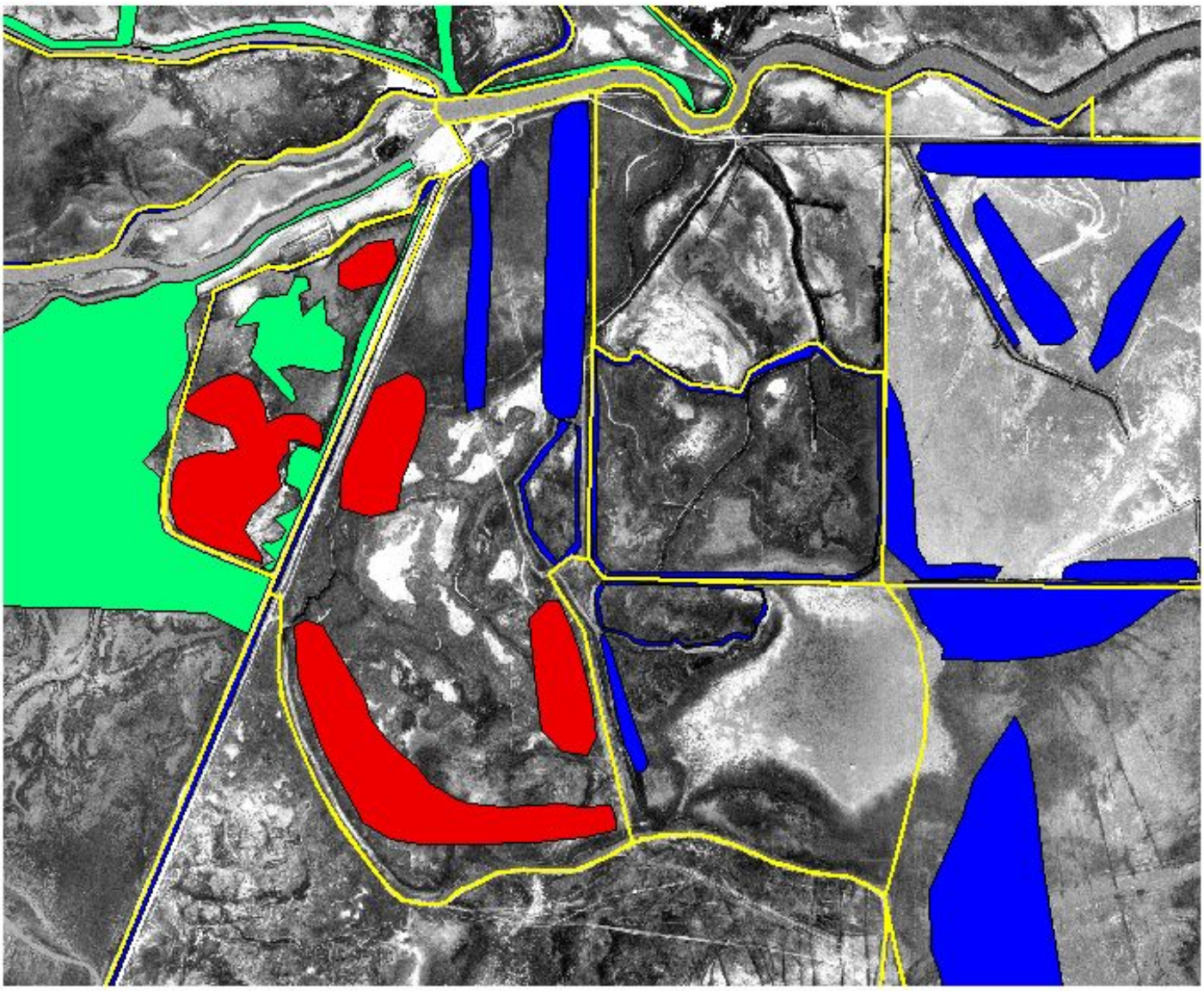
0.4 0 0.4 0.8 Miles

Treatment Method

- Pull
- Spray= 252 acres
- Disc
- Mow

N
W E
S

Tamarisk Treatment 2003
Units 3A and 3K



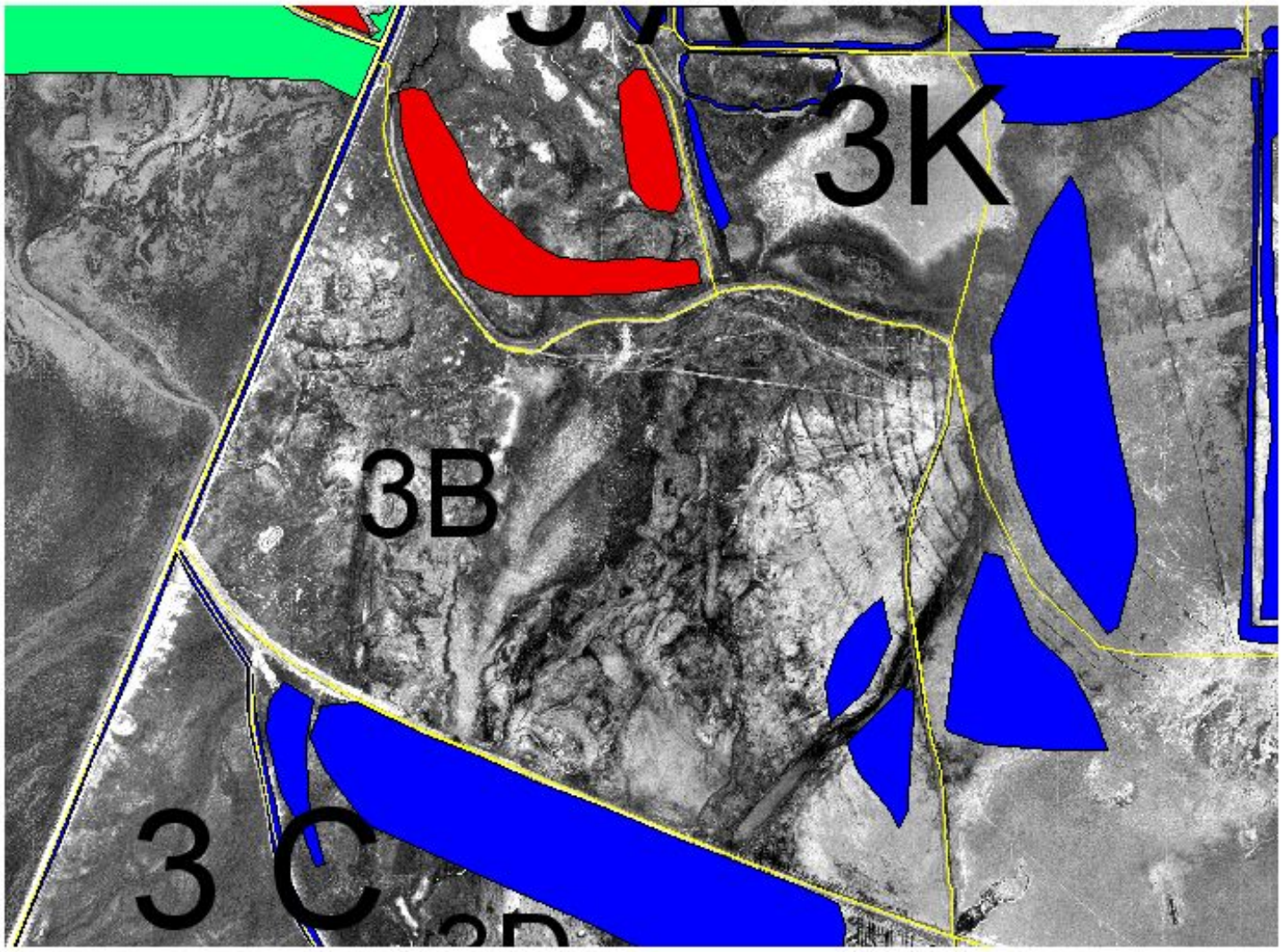
0.2 0 0.2 0.4 Miles

Treatment Methods

- Pull (3A 55 acres, 3K 8 acres)
- Spray
- Disc (3A 94 acres)
- Mow

N
W E
S

Tamarisk Treatment 2003
Unit 3B



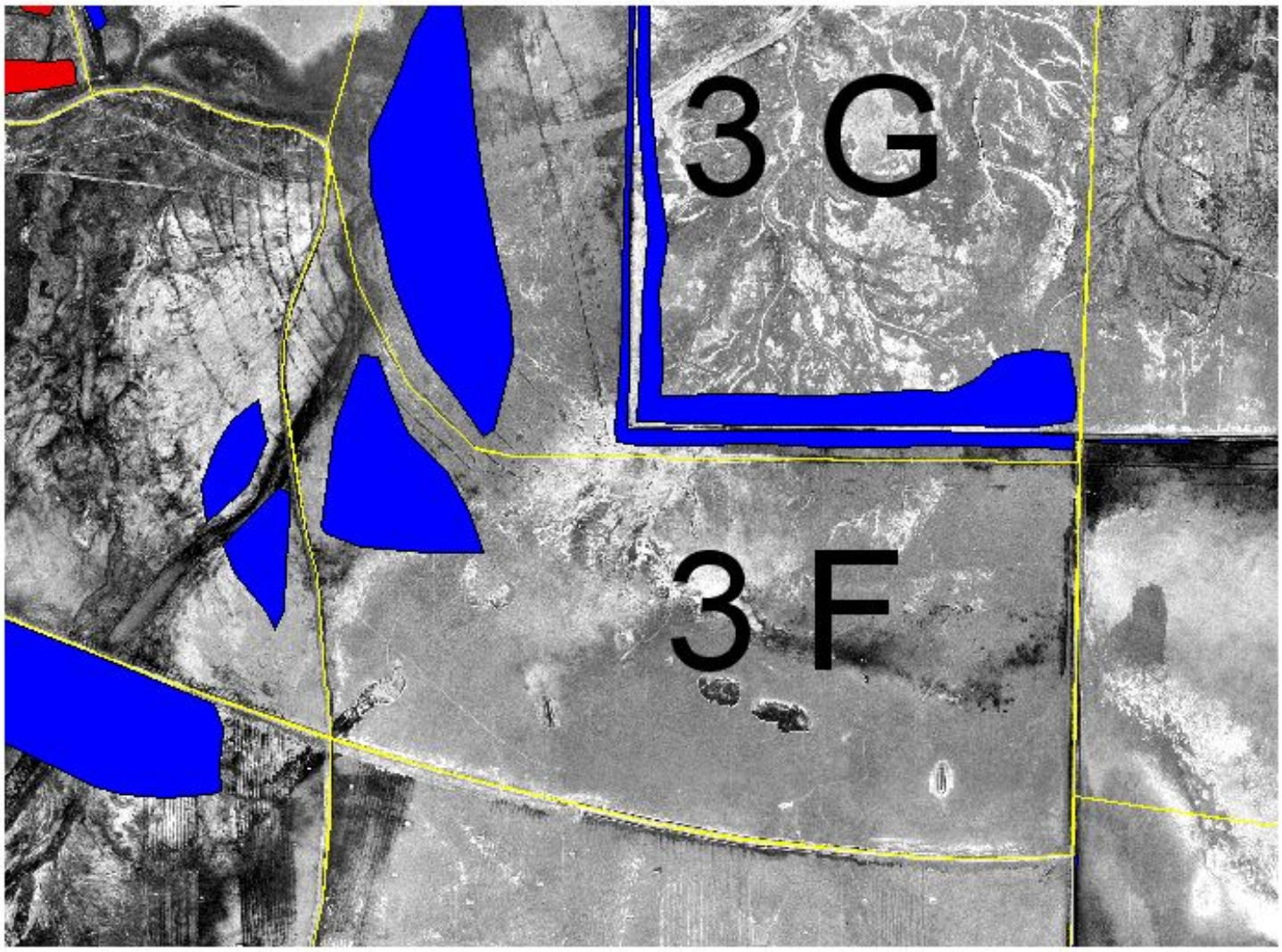
0.2 0 0.2 0.4 Miles

Treatment Methods

- Pull=36 acres
- Spray
- Disc
- Mow

N
W E
S

Tamarisk Treatment 2003
Unit 3F



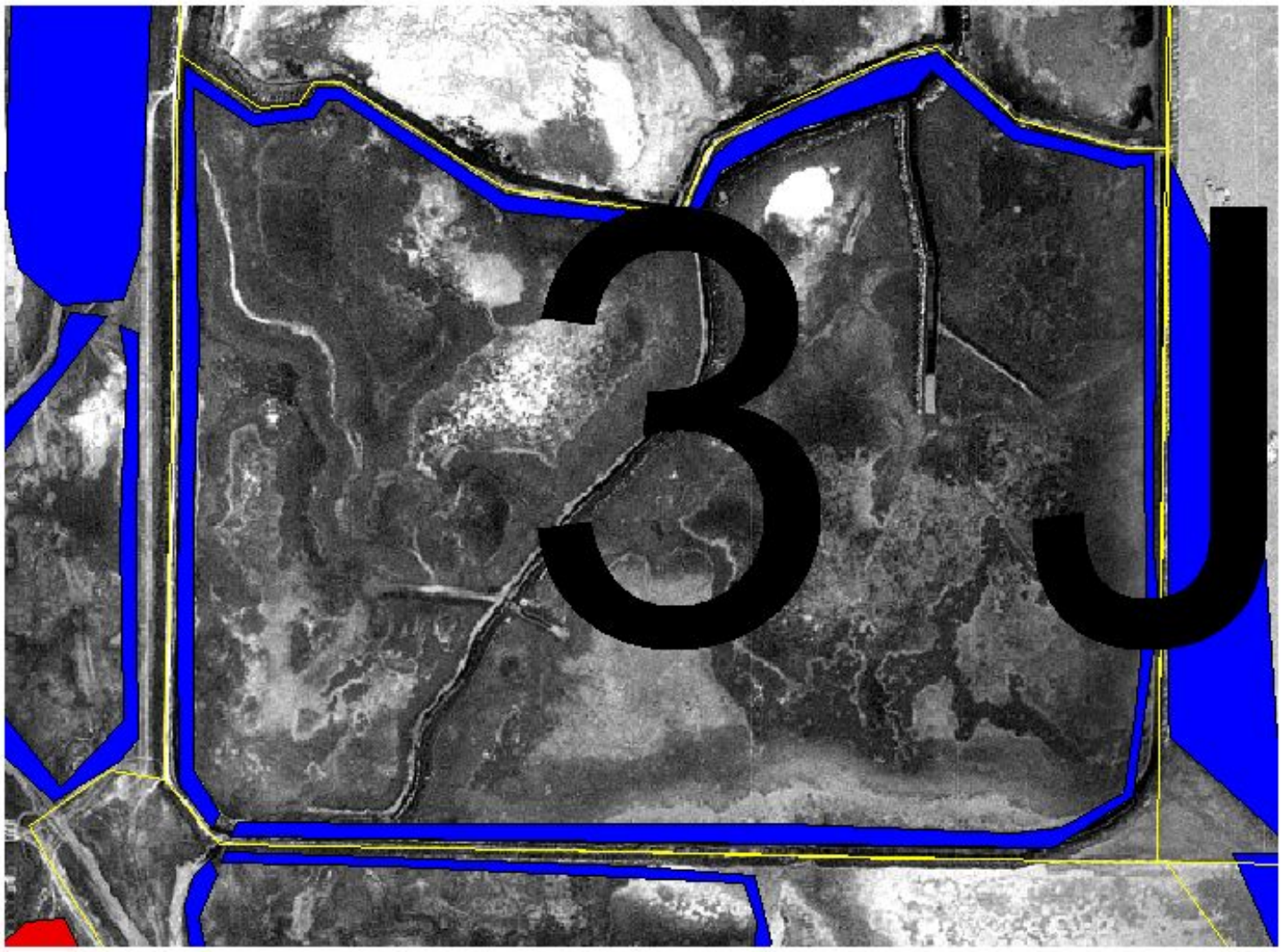
0.2 0 0.2 0.4 Miles

Treatment Methods

- Pull=55 acres
- Spray
- Disc
- Mow

N
W E
S

Tamarisk Treatment 2003
Unit 3J



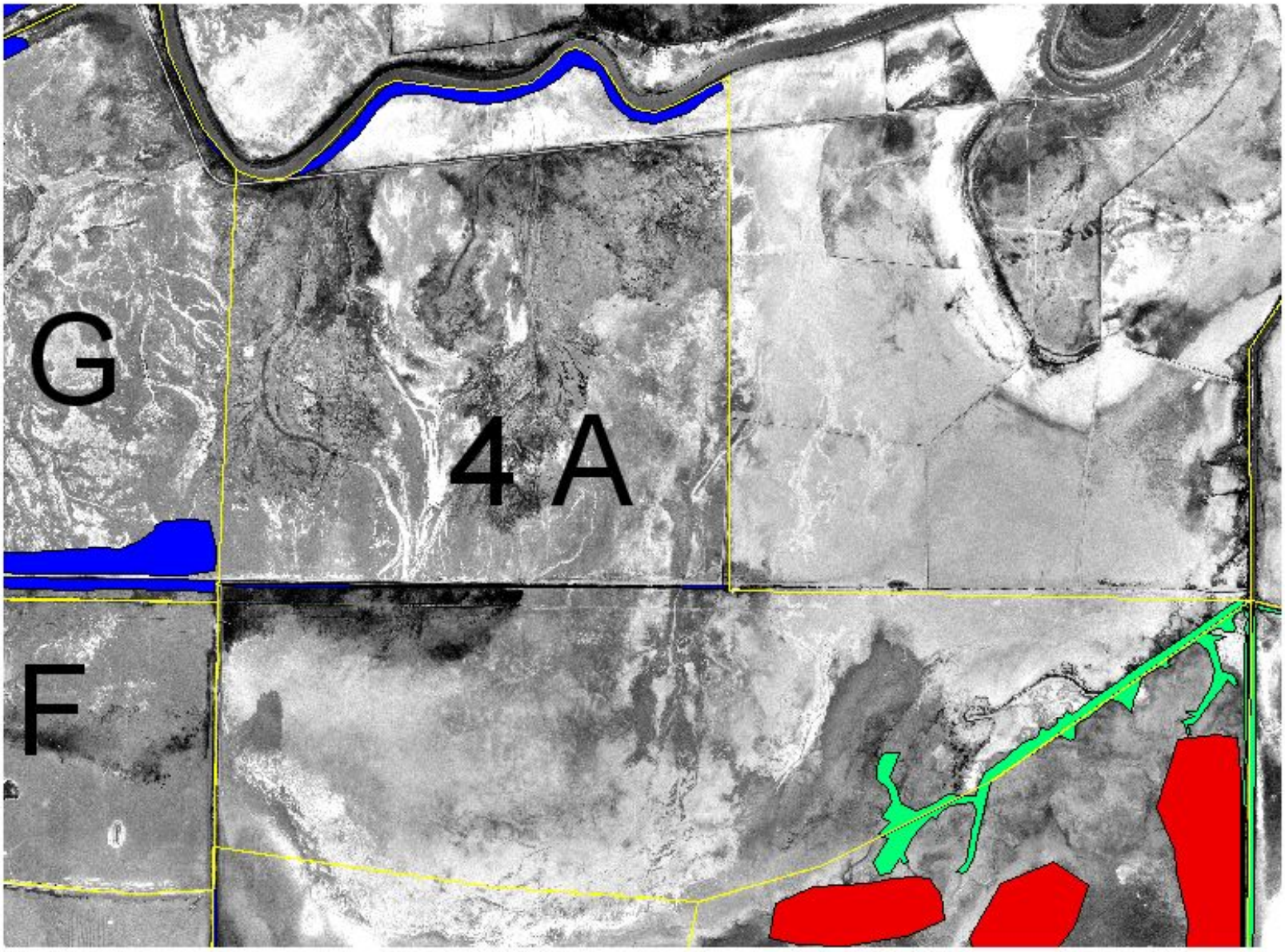
0.06 0 0.06 0.12 Miles

Treatment Methods

- Pull= 12 acres
- Spray
- Disc
- Mow

N
W E
S

Tamarisk Treatment 2003
Unit 4A



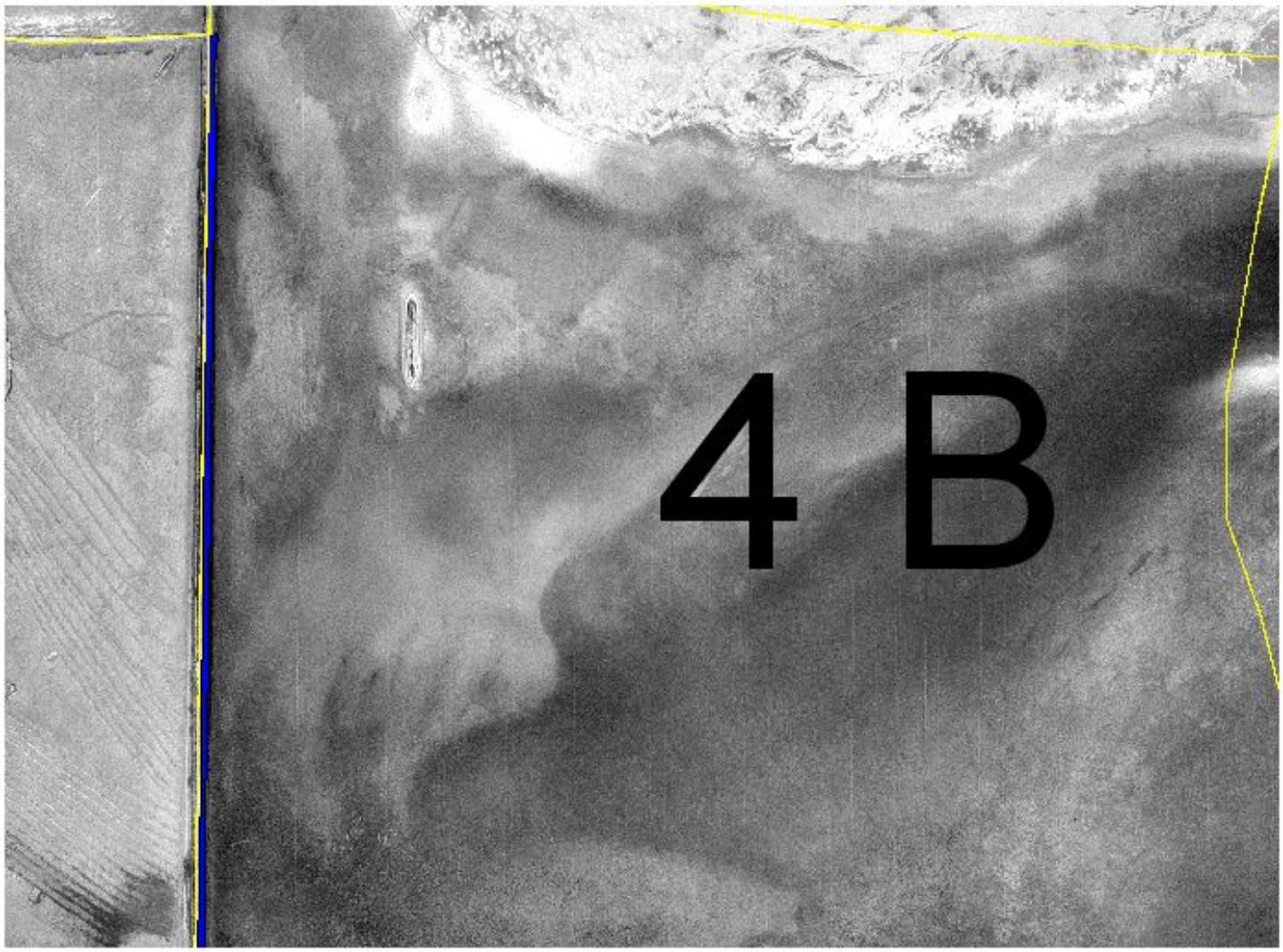
0.3 0 0.3 0.6 Miles

Treatment Methods

- Pull=35 acres
- Spray=26 acres
- Disc

N
W E
S

Tamarisk Treatment 2003
Unit 4B



0.1 0 0.1 0.2 Miles

Treatment Method

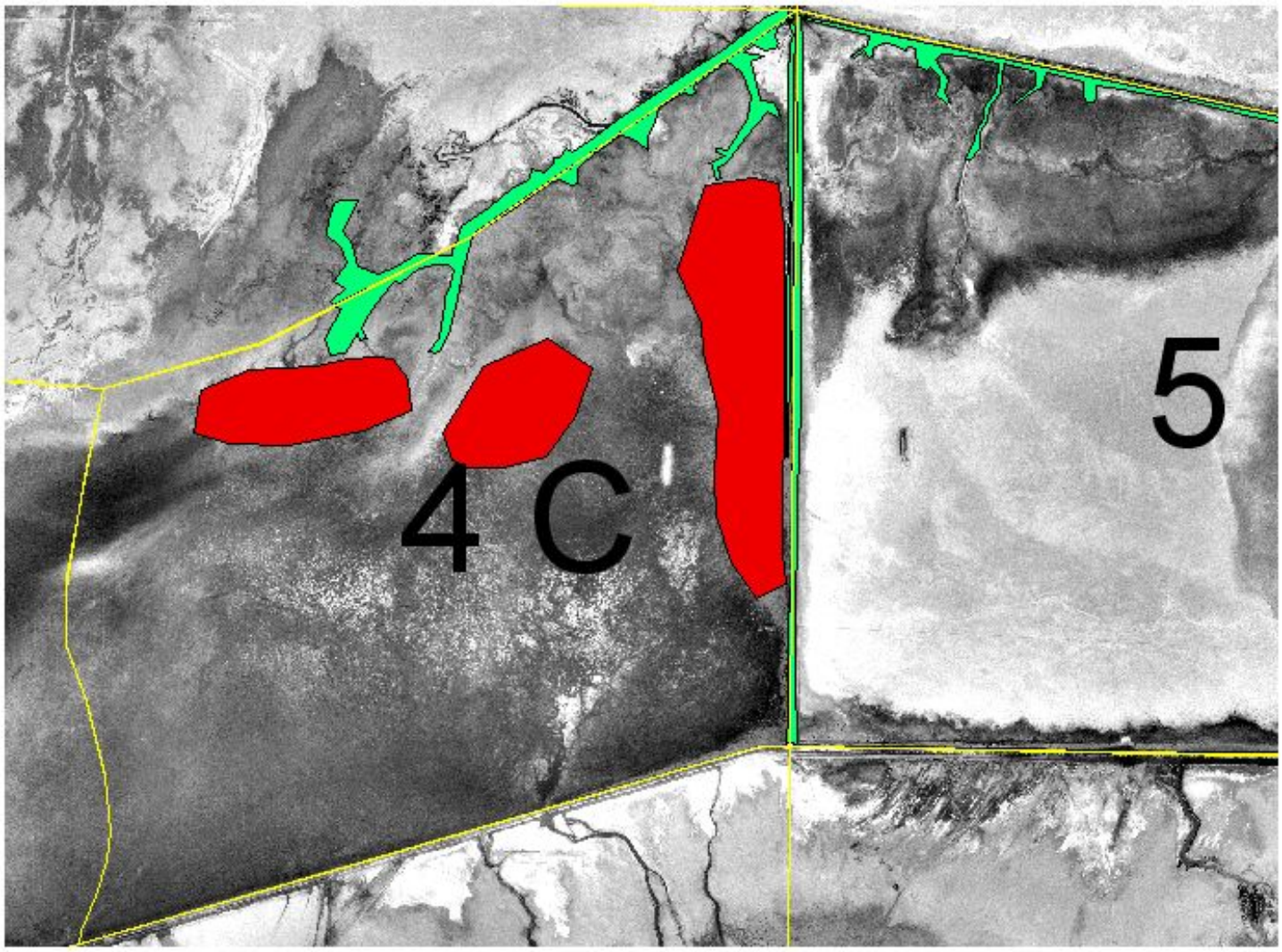
Pull=8 acres

N

W E

S

Tamarisk Treatment 2003
Unit 4C



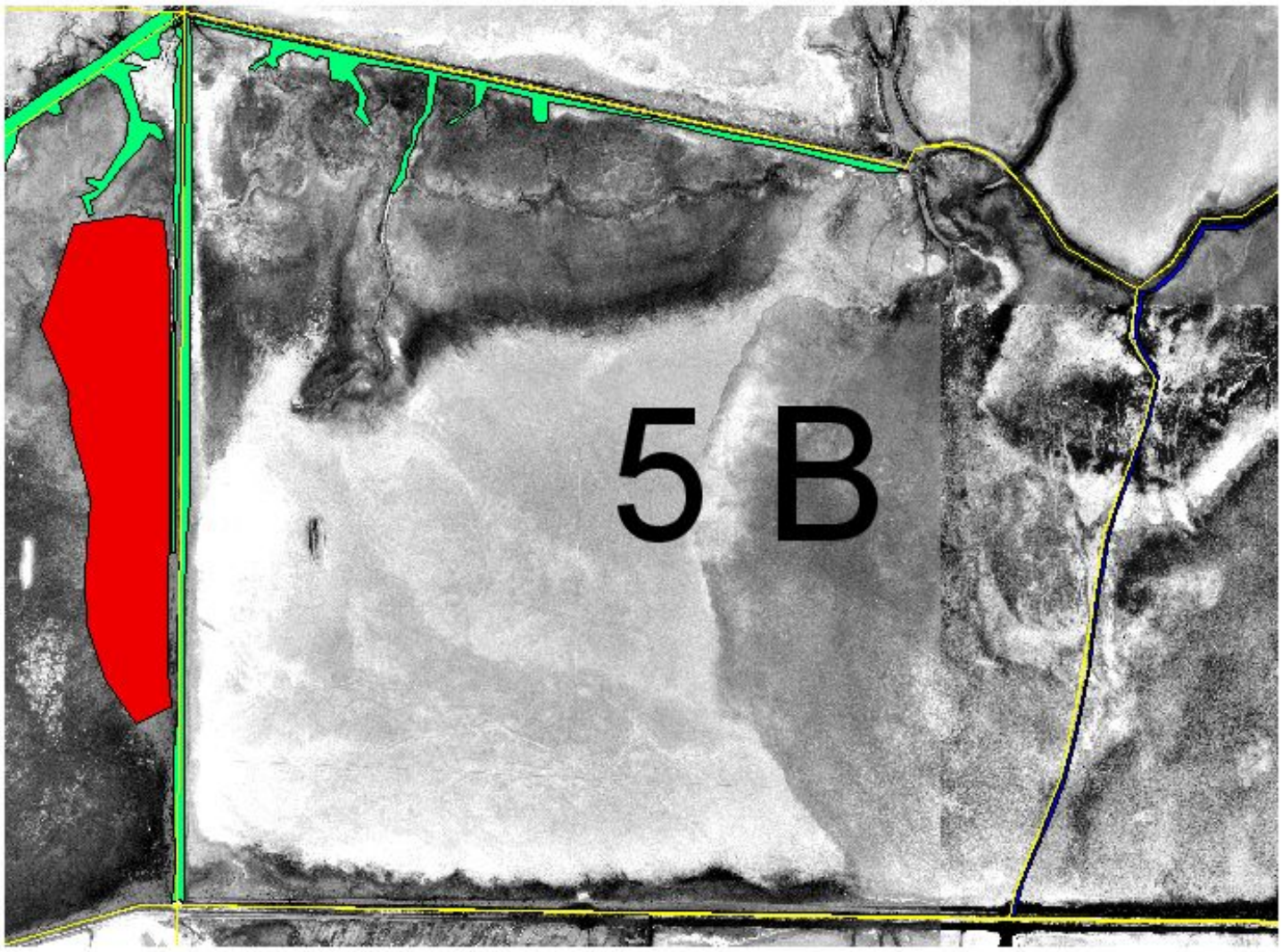
0.2 0 0.2 0.4 Miles

Treatment Methods

- Pull
- Spray=33 acres
- Disc=207 acres

N
W E
S

Tamarisk Treatment 2003
Unit 5B



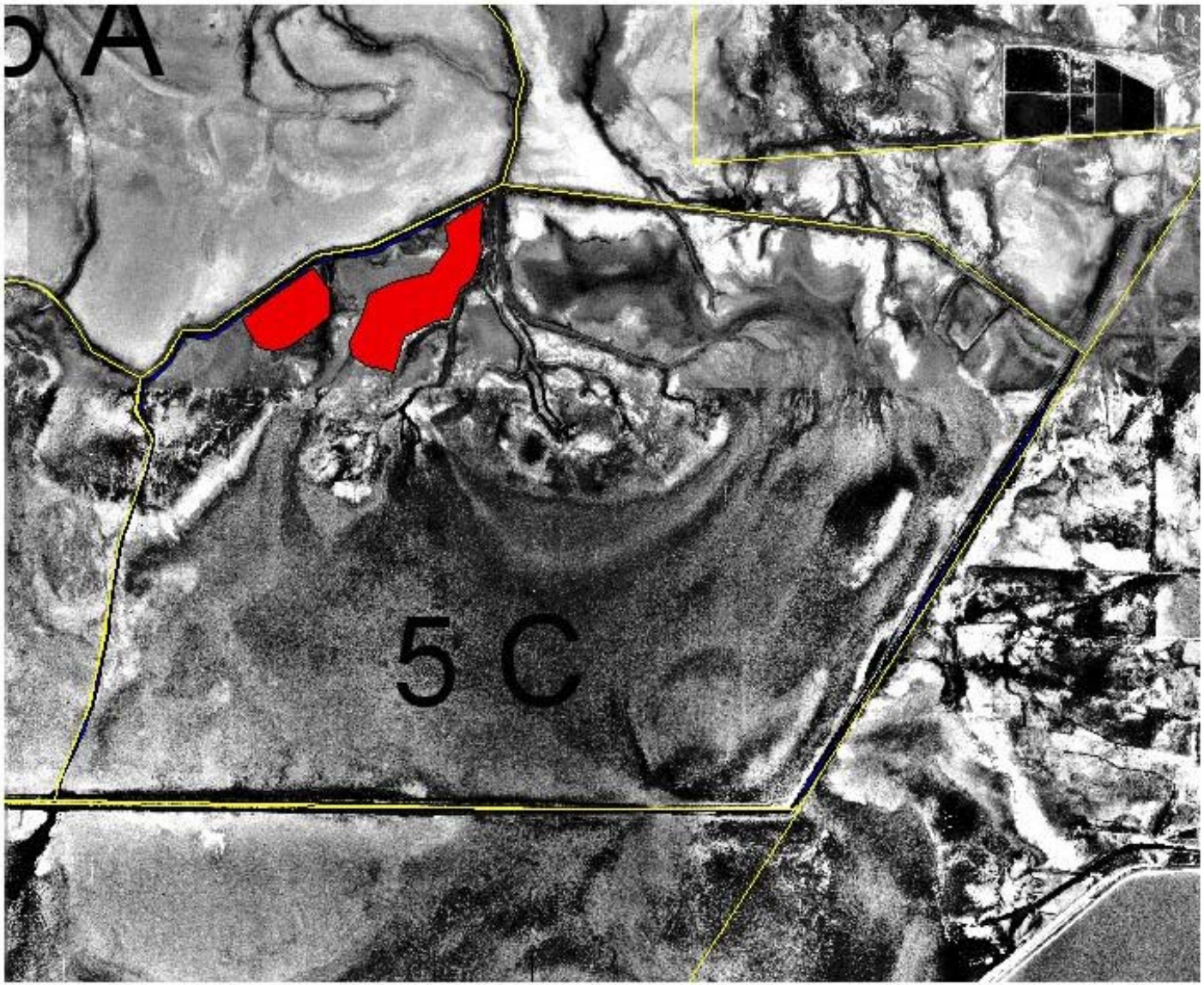
0.2 0 0.2 0.4 Miles

Treatment Method

Spray=36 acres

N
W E
S

Tamarisk Treatment 2003
Unit 5C



Treatment Methods

- Pull=16 acres
- Disc=69 acres

N
W E
S

0.4 0 0.4 0.8 Miles