Bear River Migratory Bird Refuge
2003 Annual Habitat Management Plan

1. Habitat objectives

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

Water levels in management Units 1-10 are manipulated or influenced to achieve these objectives. In 2002 these objectives were unmet due to low water conditions. The National Weather Service forecast for streamflow based on snow-pack was for < 50% of normal amounts. This forecast held true.

Runoff during 2002 was well below normal, and target water levels (and associated habitat) were maintained only in two units, Unit 1 and Unit 5B. Unit 1 was the refuge's highest priority for 2002, but Unit 5B was moved to the second priority because of an ibis rookery discovered in the unit. Other units received water as available from the Bear River. Graphs of the unit water levels for 2001 and 2002 are in the appendix.

The 2002 Annual Habitat Management Plan identified the goal of production and distribution of sago pondweed and alkali bulrush habitats as the main priority for Units 1 through 10 and the increase of pair, nesting and brood habitat for upland nesting birds as the main priority for the grassland habitat units. No specific objectives were stated. The following objectives were developed while planning the 2003 strategy to best describe past actions.

Summary of 2002 management effects

Unit 1 Objective
1. Re-fill unit 1 with clear water (sans silt) to achieve target elevation of 4205.0 by April 1 through December 15.
2. 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.

A. Habitat Response. Excellent growth and production of sago pondweed and alkali bulrush were noted in Unit 1 at the elevation of 4204.5.
B. Response of *Resources of Concern*. White-faced Ibis and Franklin's Gulls both had breeding colonies within Unit 1. The Ibis colony was estimated at 1,000 nests (S. Hicks, personal observation). Use of this unit by migrating waterfowl and staging Tundra Swans was high.
C. Management Strategy Prescriptions. Unit 1 was re-filled in the spring of 2002 to about elevation 4204.5 after a winter drawdown to protect dikes and water-control

structures from ice-damage. The unit water elevation was maintained around 4204.5 throughout the summer and early fall. The strategy was to maintain existing water. In other words, inflows would be just enough to off-set evaporation in order to maintain soil salinity levels at desired levels. The target elevation of 4205.0 was not achieved until November for no other reason than not enough stop-log boards were installed. A draw-down was initiated after the early November peak to prevent ice damage to dikes and water-control structures.

Units 1A, 3A and 3K Objective

1. Manage water levels to achieve 50% interspersion of open water to 50% emergent vegetation.

A. Habitat Response. Unit 1Ais about 30% open water to 70% emergent vegetation. The emergent vegetation is dominated by undesirable species of *Phragmites* and cattail. Units 3A and 3K had good growth and production by alkali bulrush.

B. Response of *Resources of Concern.* Unit 1A received some use by staging Tundra Swans and migrating waterfowl. Units 3A and 3K had good use by migrating waterfowl.

C. 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 is another low-water crossing on the west dike at 4204.6. A single board can be added to the outlet structure to hold water around 4205.4. The unit appeared full in the spring and dried out by mid-July. The unit started to refill by high river flows around October 1. Units 3A and 3K No water elevation data is available as these units have no water gauges. In general, the unit was filled with water in the spring, went dry by mid-July and was re-filled in the fall (October).

Unit 2A and 2B Objectives

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

A. Habitat Response. Both units had poor response by alkali bulrush due to dry conditions. Unit 2A is dominated by undesirable emergent *Phragmites*.

B. Response of *Resources of Concern.* Both units received little use by priority species.

C. 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 the fall. Unit 2B was dry throughout the spring and fall as the entire south dike was reconstructed and new inlet and out structures were installed. Unit 2B was filled in the fall.

Unit 2C Objective

A. Habitat Response. At the time of filling this new unit in the fall of 2002, Unit 2C vegetation was dominated by kochia. Tamarisk spp. are also abundant in the unit. Flooding should control the tamarisk within the unit.

B. Response of *Resources of Concern.* This unit had high use by migrant waterfowl during the fall and early winter.

C. Management Strategy Prescriptions. This is a new unit that was completed in 2002.

It was filled for the first time to elevation 4204.5 by October 25, 2002. Objectives will be written and identified in the 2003 Annual HMP.

Unit 2D Objective

1. Manage water levels to achieve 4029 acres of deep submergent and 590 acres of deep emergent habitat.

A. Habitat Response. Tamarisk invaded this unit because it went dry. Due to the dry-out situation there was poor response by both emergent and submergent desirable vegetation.

B. Response of *Resources of Concern.* This unit received only marginal use by priority species and species groups.

C. Management Strategy Prescriptions. The target elevation of 4206.0 was not achieved. This may be an unrealistic target due to the amount of boards the structure will hold. The maximum depth of about 4205.3 was achieved on May 5, 2002. The unit was dry by August 2 and was re-filled in the fall by September 2.

Unit 3B Objective

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

A. Habitat Response. The alkali bulrush responded with good growth and productivity despite the sub-optimal management conditions.

B. Response of *Resources of Concern.* The unit received good or medium levels of use by migratory waterfowl.

C. 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 in the fall (October).

Units 3C and 3D Objective

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

A. Habitat Response. The growing conditions favored pickleweed which grew abundantly. Unit 3D also had a fair response by alkali bulrush.

B. Response of *Resources of Concern.* Unit 3C The shallow conditions in this unit provided ideal foraging opportunities for migratory dabbling ducks and seemed to favor teal and pintail. The unit received high use by migratory waterfowl as well as shorebirds as 3 Marbled Godwits were observed in December. Unit 3D received fair use by migratory waterfowl.

C. Management Strategy Prescriptions. Unit 3C The target elevation of 4206.0 was never achieved. On March 2, 2002 the water level was at 4204.2 and continued a sharp decline to dry-out by mid-May. The unit remained dry throughout the summer months. The unit was re-filled beginning in mid-September and reached a peak elevation of 4203.52 on October 25. Unit 3D This unit reached it's target elevation of 4205.0 on May 25, 2002 but went dry by August 2. A new outlet structure through D-line was installed in this 3D. The unit was re-filled to target elevation by October 25, 2002.

Units 3E, 3F and 3G
These units were kept dry throughout the year to facilitate construction of the O-Line Canal.

Unit 3H, 3I and 3J Objective
1. Maximize emergent wetland type to encourage colonization of alkali bulrush.
A. 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.
B. Response of *Resources of Concern.* These units received low to fair use by migratory waterfowl in the fall.
C. 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 June and then re-flooded in the fall.

Unit 4A and 5A Objective
1. Maintain mudflat habitat for foraging and loafing waterbirds.
A. Habitat Response. Portions of these units support saltgrass and pickleweed (*Salicornia spp.)*.
B. Response of *Resources of Concern.* These units receive little use by priority species.
C. 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. Unit 4A did receive some overflow waters from the Canadian Goose Club in the spring and fall period.

Unit 4B
This unit was kept dry throughout 2002 to facilitate construction of O-Line Canal.

Unit 4C Objective
1. Maximize deep submergent wetland habitat to provide optimum condtions for production of sago pondweed.
A. Habitat Response. The unit was colonized by kochia and ragweed with some tamarisk and Canada thistle in the upper contours.
B. Response of *Resources of Concern.* This unit received fair use by migratory waterfowl in the fall.
C. Management Strategy Prescriptions. The target elevation of 4206.0 was amended to 4205.0 to protect new dike that was completed in 2001. An elevation of 4205.75 was achieved in January and maintained throughout May. The unit went dry by early September but was re-filled by November.

Unit 5B Objective
1. Maximize mid-depth emergent wetland habitat to encourage colonization of alkali bulrush.
A. Habitat Response. This unit had excellent colonization and production by both sago pondweed and alkali bulrush at this water elevation.

B. Response of *Resources of Concern.* The alkali bulrush stands attracted colony nesting birds and a WFIB colony was established. A survey in early June yielded "numerous thousands" (pers. comm. Al Trout) along with nests of Black-crowned Night Heron, Snowy Egret, and Great Blue Heron. The islands in the unit were colonized by nesting Franklin and California Gulls along with a few Caspian Terns. The unit did experience an episode of botulism in the fall though it was considered mild by Bear River's standards.
C. Management Strategy Prescriptions. This unit was our second highest priority unit so water levels were maintained throughout the summer to just off-set evaporation. The unit reached it's target elevation of 4204.0 around late April. The boards in the stop-log structure were likely left in so the unit continued to raise to a peak level of 4205.0 by May 28. The water level was maintained in the range of 4205.9 to 4025.4 throughout the rest of 2002.

Unit 5C Objective
1. Maximize deep submergent wetland habitat to provide optimum conditions for production of sago pondweed.
A. Habitat Response. Due to the dry period in mid-summer colonization and production by sago pondweed and alkali bulrush were only fair.
B. Response of *Resources of Concern.* The unit received good or moderate levels of use by migrant waterfowl.
C. Management Strategy Prescriptions. This unit was filled to 4204.0 by early spring but went dry by mid-summer due to low water supply. The target of 4206.0 was never reached. The unit was again re-filled to 4204 by November.

2003 Wetland Management Plan

Habitat management during 2003 will provide the maximum amount of habitat possible for the functional use requirements of wildlife species or species groups identified in the Habitat Management Plan based on available streamflow. Wildlife and habitat response will be monitored and evaluated. In 2003, the following are unit objectives designed to achieve the overall wetland habitat objective for the Refuge.

In 2003, pools will be filled to target levels according to the availability and turbidity of water. Pools should be refilled to target levels following 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 (alkali bullrush and sago pondweed). If some pools are allowed to dry due to low water supplies, those dry units can be filled beginning in September, 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 and 2D) which are subject to ice damage from wind fetch, will be de-watered 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 should be allowed to dry naturally through evaporation. The following tables (1-4) provide the priorities of fill and pool retention for 2003. Under very low forecast water conditions we would be able to maintain only Units 5B, 2B and 1A throughout the driest period of July and August (Table 1).

Very low flows are a 25-year event, but the refuge has experienced several of these rare events during the last decade. As 2003 is predicted to be a year of "Very Low Flows", unit objectives are listed only for those units that can be sustained under "Very Low" conditions.

Table 1. Order of fill and water level maintenance of wetland management units under "very low water" condition forecast, Bear River MBR, 2003.

Very Low Forecast (<50%)					July-August	
Unit	Sago Pondweed	Alkali Bulrush	Cumulative Acreage	Target Elevation	Maintenance Water Need (cfs) Unit/Cumulative	
5B		789	789	4204.5	13.6	13.6
2B		237	1,026	4206.0	4.1	17.7
1A		565	1,591	4205.0	9.7	27.4

Below normal flows can be expected about 25 percent of the time (Table 2). Upstream diversions and the relative low priority of the Refuge's water right, exacerbate negative low flow habitat effects during the hottest months of the year (July and August).

Table 2. Order of fill and water level maintenance of wetland management units in "below normal" water condition forecast, Bear River MBR, 2003.

Below Normal Forecast (50% - 90%)					July-August	
Unit	Sago Pondweed	Alkali Bulrush	Cumulative Acreage	Target Elevation	Maintenance Water Need (cfs) Unit/Cumulative	
1	2,600	2,058	6,249	4204.5	80.3	107.7
2C	720		6,969	4204.5	12.4	120.1
4C	1,528		8,497	4204.5	26.3	146.4
3C	549		9,046	4204.0	9.4	155.8

3D	1,045		10,091	4205.0	18.0	173.8

Normal flows can be expected 50 percent of the time, but still suffer from shortages during July and August (Table 3). Years with low storage levels in Bear Lake will be more severe than years with adequate storage.

Table 3. Order of fill and water level maintenance of wetland management units in "normal" water condition forecast, Bear River MBR, 2003.

Normal Forecast (90% - 110%)					July-August	
Unit	Sago Pondweed	Alkali Bulrush	Cumulative Acreage	Target Elevation	Maintenance Water Need (cfs) Unit/Cumulative	
5C	2,558		12,649	4206.0	44.1	217.9
3E	1,448		14,097	4204.0	25.0	242.9
3F		903	15,000	4205.2	15.6	258.5
3G		1,047	16,047	4205.7	18.0	276.5
3H		295	16,342	4206.0	5.1	281.6
4B		1,242	17,584	4204.0	21.4	303.0
2D	4,029	590	22,203	4204.8	79.6	382.6
3A		735	22,938	existing	12.7	395.3

The Bear River is a river of extremes. During wet years, all the refuge can do is open all the gates and allow water to flow through to Great Salt Lake. These flows can be expected about 25 percent of the time (Table 4).

Table 4. Order of fill and water level maintenance of wetland management units in "above normal" water condition forecast, Bear River MBR, 2003.

Above Normal Forecast (110% - 150%)					July-August	
Unit	Sago Pondweed	Alkali Bulrush	Cumulative Acreage	Target Elevation	Maintenance Water Need (cfs) Unit/Cumulative	
3B		1,085	24,023	4206.0	18.7	414.0
6	2,360	825	27,208	N/A	54.9	468.9
3I		166	27,374	4205.5	2.9	471.8
3J		211	27,585	4206.0	3.6	475.4
3K		230	27,815	4206.0	4.0	479.4
2A		135	27,950	4205.5	2.3	481.7
10		1,014	28,964	N/A	17.5	499.2
9		5,142	34,106	N/A	88.6	587.8
7		2,581	36,687	N/A	44.5	632.3
8		4,158	40,845	N/A	71.6	703.9
4A	Mudflat			N/A		
5A	Mudflat			N/A		

Unit 5B

Goal: Maximize mid-depth emergent wetland habitat to encourage colonization of alkali bulrush.

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 4204.5' 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.

Strategy:
1: Manage salinity levels by implementing strategy 1b. Maintain existing water.
2: Manage water clarity using strategies 2a. Restrict carp and 2b. Reduce silt loading.
3: Control aquatic vegetation community composition using strategy 3a. Manage water depths, and 3b. Match salinity levels with tolerance ranges of desired macrophytes.

Desired habitats: Mid-depth emergent 6-12" = 582 acres

Other habitats: Shallow emergent 2-8" = 207
Vegetated mudflat 0-2" = 994 acres

Prescription:
Unit 5B will be maintained at a mid-successional plant stage dominated by alkali bulrush by holding water at elevation 4204.5 at the structure. The salinity will be kept in the range of 5,000 - 8,000 ppm by holding a constant water level throughout the summer. Inflow amounts should equal evaporation losses.

Unit 2B

Goal: Manage marsh for deep, mid-depth and shallow emergent wetland types to encourage colonization of alkali bulrush.

Objective:
1) Maintain soil salinity levels at 5,000-8,000 ppm (8-12 m.mhos/cm).
2) Maintain water elevation of 4202.5' msl, April 1-December 15.
3) Increase amount of alkali bulrush to cover 60% of unit.
4) Manage water levels to achieve 55 acres of deep emergent, 96 acres of mid-depth emergent, and 86 acres of shallow emergent habitat.

Strategy:
1: Manage salinity levels by implementing strategy 1b. Maintain existing water.
2: Control aquatic vegetation community composition using strategy 3a. Manage

water depths, 3b. Match salinity levels with tolerance ranges of desired macrophytes.

Desired habitats: Deep emergent 12-18" = 55 acres
Mid-depth emergent 6-12" = 96 acres
Shallow emergent 0-6" = 86 acres

Other habitats: Vegetated mudflat 0-2" = 57 acres

Prescription:

Unit 2B will be maintained at a mid-successional vegetative stage dominated by alkali bulrush. The salinity will be kept in the range of 5,000 - 8,000 ppm by holding a constant water level through the summer. Inflow amounts should equal evaporative losses.

Unit 1A

Goal: Manage shallow and mid-depth emergent wetlands for 50% interspersion of emergent vegetation and 50% open water.

Objectives:

1) Manage water levels to achieve 454 acres of mid-depth emergent and 90 acres of shallow emergent wetland habitat and 50% open water.
2) Maintain water level at 4205' msl, April 1-December 15.
3) Maintain soil salinity levels around 5000 ppm (8 m.mhos/cm).

Strategy:

1: Manage salinity levels by implementing strategy 1b. Maintain existing water.
2: Control aquatic vegetation community composition by using strategy 3a. Manage water depths, 3b. Match salinity levels with tolerance ranges of desired macrophytes,
3. Encourage muskrat colonization to set back succession (Strategy 3c.).

Desired habitats: Mid-depth emergent 6-12" = 454 acres

Other habitats: Shallow emergent 0-6" = 90 acres

Prescription:

Unit 1A is directly connected to the Bear River by a large drive-through spillway. Fresh water flows through the unit at river elevations above 4206' msl. The flushing lowers salinity and encourages the growth of dense cattail, hardstem bulrush and *Phragmites*. Salinity will be increased by holding a stable water level through the summer. This will require blocking the drive-through spillway and filling from the L-line canal. To help create open water conditions, water levels

will be maintained above 4205' msl through the winter to encourage over-wintering of muskrats. Muskrat activity will help keep the cattail in check.

GRASSLAND PONDS

In 2002, Pond N1 was drawn down to facilitate rehabilitation and the construction of Pond N7. There was sufficient water available to maintain all other ponds on the Nichols, White, and Stauffer Units through the spring and summer. Ponds W1, W2, and W4 were drawn down in September to facilitate construction of Ponds W5 and W7. Four ponds (N2, N7, W5, and W7) were constructed in 2002, and three additional ponds (N1, N5 and N6) were rebuilt. In addition, several ditches were cleaned to facilitate delivery of water to the desired ponds and wetlands.

In 2003, the objectives for the grassland ponds are:

1). Manage ponds to achieve mix of 50% open water to 50% emergent vegetation or hemi-marsh conditions.

2) Maintain water level at 1' below the top of the dike year-round unless otherwise stated.

N3 and S1 will be drawn down in mid-summer and allowed to dry to decrease amount of cover by cattail. Pond N6 will be filled as soon as the cattails have been removed from the pool area. The other new/rebuilt ponds will be filled slowly in the spring to permit vegetation of the banks and to avoid stress on the dikes. 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

Summary of 2002 activities and response. Grazed spring and winter? What months? Number of AUM's and general observations of plant response.

Unit: Nichols

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.

Unit: White

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.

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.

Unit: Stauffer

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.

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.

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.

A rest/rotation pattern of grazing will be followed in FY2003 to improve plant vigor and diversity

on the grasslands, and to provide early nesting cover for mallards and cinnamon teal. The areas will be grazed during the winter to minimize impacts on waterfowl, and to avoid conflicts with hunters.

4. Monitoring and evaluation

Initial monitoring will entail establishing an environmental baseline, particularly on Units 1-10. Work should continue on evaluating the ikonos satellite imagery as a monitoring tool. If the small-scale test is satisfactory, coverage of the entire refuge should be purchased during the growing season (probably June). The evaluation should include the applicability of periodic repetitions of the data acquisition to monitor changes in habitat as a result of changes in management. In particular, the impact of different target elevations for the pools could be assessed.

Salinity control is an important factor in the establishment and maintenance of the deep emergent vegetation, especially alkali bullrush. Finding the optimum target water level for each pool is also important. Existing water level and conductivity monitors will be installed on the pools after ice-out (probably April). Another desirable monitoring tool is the reestablishment of the weather station (temperature, humidity, precipitation, evaporation) at the old headquarters site. Estimated cost is approximately $5,000.

Progress in noxious weed control, especially saltcedar and phragmites, will need to be monitored periodically to determine the efficacy of the methods employed, and to select the most appropriate method for use on the refuge.

The photo points on the Nichols, White, and Stauffer Units should be maintained to monitor any changes in upland habitat. Conditions should be evaluated to determine the need for additional photo points.

During 2001 and 2002, the water levels of units adjacent to the D-Line were measured regularly. One unit, 3D, does not have an elevation established for the outlet structure. This outlet, and others not adjacent to the D-Line, need surveys to establish elevations. The water depth at the outlets of active units needs to be recorded regularly, and associated with the amounts and types of habitat that is supported. 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.

5. Unmet needs and the strategies to address them

Clearly, 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.

The salt cedar in the main river delta and along the river channel and a few of the larger stands of phragmites in unit 2 and unit 5B will be the focus in 2003. A variety of tools including burning, cutting, and herbicide spraying will be used.

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 since the flood. In 2001 and 2002, a trapping effort by USDA-APHIS, Wildlife Services (based in Salt Lake City) did see a decrease in predator populations and an increase in waterfowl broods (both from casual observation). Wildlife management efforts through predator control activities will be implemented again in 2003. Brood counts and casual predator counts will continue.