



DRAFT
PROPOSED CONCEPT PLAN FOR ENHANCING THE ROCKY
MOUNTAIN POPULATION OF TRUMPETER SWANS ON UNITS
OF THE NATIONAL WILDLIFE REFUGE SYSTEM

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I. EXECUTIVE SUMMARY

At the 17th annual conference of The Trumpeter Swan Society on September 17, 1999, the U.S. Fish and Wildlife Service (Service) announced the formation of a cross-regional team to develop integrated management objectives on National Wildlife Refuges (NWRs) with the goal for restoring the Rocky Mountain Population (RMP) of the Trumpeter Swan. The team was also directed to help define roles for other Service programs and to develop a strategy to address the role of individual refuges in the restoration of RMP. This implementation plan is the result of this directive and will be used to establish strategies for working together to achieve broader swan management goals and objectives. This plan is intended to complement and encourage a similar effort by the Pacific Flyway Council, Tribal Governments, State Agencies, other Federal Agencies and non-governmental organizations, most notably, The Trumpeter Swan Society.



Refuges that are identified in the plan include:

Refuge	State	Service Region
Bear Lake NWR (Including Oxford Slough Waterfowl Production Area)	Idaho	1
Bear River Migratory Bird Refuge	Utah	6
Benton Lake Wetland Management District	Montana	6
Camas NWR	Idaho	1
Fish Springs NWR	Utah	6
Grays Lake NWR	Idaho	1
Kootenai NWR	Idaho	1
Lee Metcalf NWR	Montana	6
Malheur NWR	Oregon	1
Minidoka NWR	Idaho	1
National Bison Range	Montana	6
National Elk Refuge	Wyoming	6
Ouray NWR	Utah	6
Red Rock Lakes NWR	Montana	6
Ruby Lake NWR	Nevada	1
Seeds-kadee NWR (including Cokeville Meadow NWR)	Wyoming	6
Stillwater NWR	Nevada	1
Turnbull NWR	Washington	1

The plan describes habitat on refuges that is suitable for trumpeter swan expansion/augmentation and delineates the Service's priorities for specific enhancement projects. It provides a site suitability check list and augmentation/expansion guidelines as a way of measuring relative importance of refuges for trumpeter swan management. Most of the proposed strategies contained in this document are, at present, unfunded by any agency or organization. Addressing many of the strategies will require additional resources or reprogramming existing resources away from other high priority issues. Participation in the development of the plan should not be interpreted as endorsement of all options by the participating agencies or organizations.

The proposals were submitted by individual Refuges. The proposals are simply a list of potential projects that need to be reviewed and ranked. These reviews will include detailed descriptions of each proposal objectives, justification, budgets, and of how each project will be monitored and evaluated. Some of these proposals need to be coordinated among Refuges to avoid duplication of effort and to complement each other. Other proposals may best be addressed in a larger context than Refuges.

The charter of this group was to coordinate swan restoration activities on Refuges, but there are some critical issues that cannot be addressed solely on Refuges. These issues can only be addressed with the cooperation of all players. Without addressing these issues first, swan restoration efforts could be inefficient, or worse misguided. Swans on the Henry's Fork are being managed on incomplete information, supposition, and assumptions, perhaps unfounded or erroneous suppositions and assumptions. A study of all the interrelated factors (swan, vegetation, fish, river flows, ice conditions, temperatures) on the Henry's Fork is needed. Several studies have looked at one, or even two factors, but never all together. Swan genetics need to be analyzed across all populations, including the Pacific Coast Population, so that restoration can continue smoothly. The lack of this basic information has led to disagreements over how to proceed. Some projects are larger in scope than single Refuges, or even all the Refuges in Regions 1 and 6. Satellite tracking will be more efficient, less expensive, and probably more valid statistically if done under a well conceived plan including the entire breeding and wintering range. The same rationale applies to demographic and management studies (e.g., nest success, survival, philopatry, and habitat preferences). In these case the information gained from studying all the sites as a whole equals more than the sum of that gained from studying all the individual sites separately.



II. INTRODUCTION

The goal of the plan is to develop a coordinated approach on National Wildlife Refuges in Regions 1 and 6 for managing the Rocky Mountain Population (RMP) of the Trumpeter Swan. This plan is designed to step down and implement the objectives listed in the Pacific Flyway Management Plan for the RMP with strategies specific to the National Wildlife Refuges involved.

Past management has been reactive and not well coordinated and has been based on untested assumptions. With this plan all National Wildlife Refuges within the range of the RMP Trumpeter Swan will contribute to the overall goals of trumpeter swan restoration.

Eventually, the Service will coordinate swan management activities with other Tribal, State and Federal Agencies and propose that the plan be incorporated into the Pacific Flyway Trumpeter Swan Management Plan (Subcommittee on Rocky Mountain Trumpeter Swans 1998).

The Service recently published policies regarding guiding principles for the National Wildlife Refuge System. The principles are derived from the National Wildlife Refuge System Improvement Act of 1997 (Act), and further described in the document entitled Fulfilling the Promise. The Act established that wildlife conservation is the singular mission of the System. The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. This Implementation Plan identifies methods by which restoration of trumpeter swans in the Rocky Mountain population can be facilitated on refuges within their historic range.

Two core principles are significantly germane to this implementation plan. The first principle is that of “biological integrity”. The Act directed the Secretary of the Interior to “ensure that the biological integrity, diversity, and environmental health of the System are maintained...”. The final policy (Federal Register, 2000) directs Service personnel to consider a particular refuge’s importance to refuge, ecosystem, national, and international landscape scales of biological integrity, diversity, and environmental health. This policy views one significant measure of biological integrity as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions (Federal Register, 2001).

Participation in this implementation plan by refuges within the trumpeter swan’s historic range is therefore consistent and expected under the Act, and can play a significant role in maintaining the biological integrity of those refuges and of meeting Service and international goals for trumpeter swan management.

Another principle is that of compatibility. A compatible use is a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgement, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposed of the national wildlife refuge. (Federal Register, 2000). Service policy directs that public uses be coordinated with other entities, and

that public involvement be accomplished through appropriate planning processes. While Refuge management activities, such as native species restoration, are generally not considered uses which require that determinations of compatibility be made, the Service has processes in place, such as intra-agency consultation, and public review through refuge planning and associated National Environmental Policy Act compliance, to help insure that refuge personnel are conducting appropriate management activities.

The population management goal listed in the Pacific Flyway Management Plan (1998) is “to restore the RMP as a secure and primarily migratory population, with a 5% average annual growth in number of wintering birds, sustained by naturally-occurring and agricultural food resources in diverse breeding and wintering sites.” Within the spirit of this goal, the long term strategy of this implementation plan for trumpeter swan management is to contribute to a stable to slowly growing trumpeter swan population (U.S. segment) that occupies all potential swan habitat within the RMP historic breeding range and to achieve wintering numbers that do not exceed the carrying capacity of the Upper Henry’s Fork of the Snake River in Idaho. These new or expanded breeding areas would include northwestern Montana and the Flathead Valley to the Canadian border, possibly areas in the Idaho panhandle, south to north central, eastern and southeast Idaho wetlands, and east into available habitat in western Wyoming, the Green River drainage, and possibly central Wyoming. Within the RMP there would be a healthy tri-state flock centered around Rock Lakes NWR, Yellowstone National Park and the Targhee National Forest that has most or all of its potential trumpeter swan breeding habitat occupied by nesting pairs, with improved wetland habitat, nest success, and cygnet survival over what it is today. The northern swan breeding segment would tie the U.S. swan flock in with the expanding Canadian trumpeter swans to the north in Alberta. The southern segment would help focus migrating trumpeters to possible new wintering areas to the south through Utah and along the Green River to the southeast, and west along the Snake River. Ongoing habitat management, priority wetland improvement projects for swans, research, protection from disturbance, coupled with augmentation efforts using sub-adults swans in areas of vacant suitable habitat would be used to meet these goals. With increased breeding birds and subsequent family groups in these new breeding areas, there would be a critical need for additional wintering habitat of good quality. Hopefully, new migration pathways will be pioneered by these newly established swans to areas outside of their historic breeding range. Other RMP trumpeters would hopefully link up with these new breeding groups and travel with them, forming migration pathways to new trumpeter swan wintering areas to the south, east and west. As this happens other Regions of the Service will become involved in this process. The above process will be a slow one and patience will be required. There will be setbacks but with planning, coordination, funding and dedication, we believe the RMP can be a healthier, more abundant flock of trumpeter swans occupying and migrating to many new areas.

III. BACKGROUND

A. Historic Breeding and Wintering Range:

This plan will use the distribution maps for historic breeding and wintering ranges published by Mitchell (1994) and Bellrose (1976). There is evidence that the historic breeding range once extended to the east coast of Canada and the United States (Alison 1975, Lumsden 1984, 1992, Bent 1962, Rogers and Hammer 1978 - all as cited in Mitchell 1994) and possibly California (Dawson 1923 as cited in Mitchell (1994). Restoration efforts have expanded the current nesting range, so this plan will use Mitchell (1994) as the current breeding range. See Appendix 1 for maps of these ranges.

B. Trumpeter Swan Management History:

The history of trumpeter swan management for the RMP is covered in greater detail in Banko (1960), the Pacific Flyway Management Plan (Subcommittee on Rocky Mountain Trumpeter Swans 1998) and in Shea and Drewien (1999). For convenience of the reader, this plan will include a short review.

Prior to the establishment of game laws in the early 1900's trumpeter swan populations and distribution were severely reduced, primarily by hunting for food and feathers. Feathers were used for bedding and for writing. Swan skins were one of the wildlife commodities sought after by major fur trading companies (Banko 1960). Both the Tri-State and the Canadian flocks were reduced to about 70 birds each in the early 1900's (Subcommittee on Rocky Mountain Trumpeter Swans 1998). This low number was the impetus to establish Red Rock Lakes NWR in 1935 to preserve swan habitat and to increase trumpeter swan numbers in the U.S. Red Rock Lakes NWR and Yellowstone National Park were the core of swan management at that time.

Winter feeding of grain was started at Red Rock Lakes in 1936-37 (Banko 1960) and continued through 1992. This practice discouraged swans from migrating from the area, improved winter survival and probably contributed to increased productivity. Keeping the swans on the refuge during winter was good for swans in the short term, as fewer swans were exposed to hazards from power lines and poaching. Swan numbers increased in the Tri-State Flock and feeding was undoubtedly a contributing factor. As Canadian and U.S. RMP swan population segments increased, large concentrations of swans (800+) wintered at the Red Rock Lakes NWR spring-fed feeding ponds. This led to concerns over potential disease problems in the RMP. Cessation of feeding at Red Rock Lakes NWR in 1992 resulted in high winter mortality of trumpeter swans during that first winter. The local population has stabilized at a lower level. Now swans from Red Rock Lakes NWR winter elsewhere and without supplemental feed.

Red Rock Lakes NWR had been a source of live birds for zoos and private waterfowl collections through the late 1800's and early 1900's (Banko 1960). Even after the Refuge was established numerous eggs and cygnets were taken for private propagators and for restoration efforts. Eggs and cygnets taken from Red Rock Lakes NWR in the 1940's and 1950's were the source birds for restoration flocks at Malheur, Ruby Lake, Turnbull and Lacreek NWR's. The Lacreek NWR flock has expanded into unoccupied historic range in the midwest. The Ruby Lake and Malheur

flocks, which were outside of or on the periphery of the historic range have persisted, but not expanded; these birds are primarily sedentary. The Turnbull NWR flock died out. In the 1980's and 1990's swans, (primarily yearlings and cygnets), from Red Rock Lakes NWR were released during summer at Grays Lake NWR, Seedskadee NWR, and Fort Hall Indian Reservation. Breeding has been recorded at Fort Hall Indian Reservation and Seedskadee NWR, but the populations have not increased. The flock at Grays Lake has increased and migrates during the winter. This large exportation of cygnets and eggs from Red Rock Lakes NWR was probably a major drain on the flock. Transplants of swans from Red Rock Lakes NWR have ceased.

A die-off of trumpeter swans at Harriman State Park during a cold snap in February 1989 was the impetus for a number of management actions. About 50 dead swans were picked up, but the loss was probably higher. The first salvage action was to encourage the Bureau of Reclamation to release more water during winter from Island Park Dam to keep the Henry's Fork from freezing, so that swans would have more feeding area available to them. The following winter swan numbers peaked at over 800 on the Henry's Fork and stripped the river clean of aquatic vegetation. The consensus was that the Canadian swans were increasing and were becoming too numerous for the wintering area and would not migrate any further south, and that the nonmigratory Tri-State swans were in danger of being out-competed by the Canadian swans. This left the river with little carrying capacity for swans, and impacted fish habitat. Concerns arose that the world-famous trout fishery found in the Henry's Fork would decline. These threats led to the winter hazing/translocation program that ran from winter 1990/91 through 1996/97.

During this time nearly 1,300 trumpeter swans were moved during early winter from Harriman State Park and Red Rock Lakes NWR to ten different locations in Idaho, Wyoming, Utah, and Oregon. This program was discontinued because of a lack of apparent success in developing a new migratory tradition. The intent was for swans to learn a new wintering area and associated migration tradition, and in doing so, teach their offspring new wintering areas in subsequent years. Unfortunately, few swans returned to the release sites. Possible complications included human disturbance at release sites, disease outbreaks, and unexpected behavior of released swans. Several hundred swans were wing clipped prior to release in an attempt to increase the site fidelity of released swans. This resulted in unexpectedly high mortality of wing-clipped swans due to predation. After cessation of the capture effort, concerted hazing effort was attempted to encourage swans to continue to migrate south. Hazing was continued through the winter of 2000-01 with limited success.

Trumpeter swans were marked with neck collars and have been monitored for years and this monitoring should continue. The level of effort varies among years depending on funding. The number of marked birds in the population is declining from mortality and collar loss.

For the past 10 years, the Wyoming Department of Game and Fish has raised trumpeter swans from captive adults or from salvaged eggs and released them the following summer as yearlings. Releases have occurred primarily in the Jackson area and in the Green River drainage. The program has successfully established breeding swans in these areas. This approach has also worked in the Atlantic and Mississippi Flyways.

Trumpeter swans have been captured at Summer Lake WMA, Oregon and released in spring at Bear Lake NWR and the Flathead Lake area of Montana, after first translocating them during winter from Harriman State Park to Summer Lake WMA. These double translocations were not successful at establishing breeding flocks. Many of these swans were also wing-clipped. In subsequent years, swans were captured in Alberta and released during summer near Flathead Lake; this effort was also unsuccessful.

The most successful aspect of the trumpeter swan program has been the cooperation among a multitude of parties and interests. Numerous Tribal, State, and Federal Agencies, NGOs, and private individuals have contributed funds, volunteer time, or in-kind services to the project. The review of management in the preceding paragraphs were efforts of these entities, not just the U.S. Fish and Wildlife Service.

C. Discussion of Issues

1. Population Affiliation

While the Service does not believe that the Tri-State breeding segment of the RMP trumpeter swan population constitutes a separate genetic entity, we do recognize that maintenance and enhancement of a diverse breeding distribution is a sound strategy for the population as a whole. We recognize the importance of maximizing the numbers of swans that breed in suitable habitat in the Tri-State region as well as re-establishing Trumpeter Swans to their former breeding range.

As yet there is no information to suggest that the various flocks are either genetically similar or different. We are aware of no published information on DNA testing to compare various nesting flocks. There is limited electrophoretic work on proteins among flocks (Barret and Vyse 1982). However, it is neither exhaustive nor very discriminating to make any conclusions of genetic similarity.

We can safely conclude that trumpeter swan populations have gone through a severe population bottleneck. The trumpeter swan once nested over much of North America (Appendix 1) (Bellrose 1976, Mitchell 1994). The population was reduced to several breeding flocks. However, population totals have recovered dramatically from the 1934 levels. Specifically, the Pacific Coast population had 16,312 birds in 1995 (Caithamer 1996), the Canadian segment was documented at 3,058 in winter 1999 (Gomez 1999a) and the Tri-State segment was estimated at 417 birds in fall 1999 (Gomez 1999b). Additionally, there are now substantial numbers of trumpeter swans nesting in the Midwest (Subcommittee on the Interior Population of Trumpeter Swans 1997).

2. Winter Translocation

Nearly 1,300 trumpeter swans were translocated during winters 1990/91 through 1996/97 from wintering areas in Harriman State Park and Red Rock Lakes NWR to 10 different sites in Idaho, Montana, Oregon and Utah (Shea and Drewien 1999). It appears that the winter translocation program did not achieve its goal to teach trumpeter swans new migration routes

and wintering areas. Statistical protocols necessary for sound analysis of winter transplants were not established; therefore, any analysis of this program must be based on casual observations. About 40% of the birds translocated have not shown up in reports of collar observations and are presumed lost (Shea and Drewien 1999). Productivity of the survivors probably suffered too, when pairs were broken up when one member was translocated and the other was not. If the program were successful there should be large numbers of wintering swans at release sites, but there is not. At Summer Lake, OR where 585 swans were released from winter translocation, only 21 were present during the 2000 Mid-Winter Survey (Reed and Gomez 2000). These were likely residents resulting from the 52 swans released there in summer 1996, as summer released swans are more likely to remain at the release site. At Bruneau Dunes State Park, ID where 229 swans were translocated in winter (Shea & Drewien 1999) none were reported during the 2000 Mid-Winter Survey (Reed and Gomez 2000).

3. Hazing

Hazing at Harriman State Park near Island Park, Idaho, has been employed as a management technique from 1990 to the present. The objectives of the hazing program at Harriman State Park were to encourage further migration downstream, minimize the overuse of submergent vegetation in Henry's Fork, and minimize the risk of a large die-off in the event of a severe winter. In recent years, efforts were confined to several people on snow machines using pyrotechnic devices hazing swans from late October through late December and occasionally into early January. By late December and early January managers thought that hazing would unnecessarily stress birds that were unlikely to migrate further south once day length started increasing. Hazing after this time was thought to be ineffective and merely caused swans to use up energy reserves without moving them out of Harriman State Park. Some swan experts contend that hazing at any time is of absolutely no value, contending that hazing wastes energy from the birds' reserves, splits up pairs, and, separates cygnets from parents. There is no question that it increases energy costs, as swans are forced to fly more often.

The problem that hazing was designed to address was described by the Pacific Flyway Council's Rocky Mountain Trumpeter Swan Management Plan (1998) as follows:

The current (1985 to present) winter distribution of the RMP is too restrictive to provide for desired population growth and security. This winter distribution may contribute to high winter cygnet mortality and to depressed productivity in adults, particularly for resident swans that remain on these sites until immediately prior to nesting (Gale et al. 1987). High concentrations of swans and other waterfowl in the Henry's Fork area have the potential to damage both plants and fish habitat by their heavy use of submerged macrophytes during the winter.

The Management Plan also established that the goal of this effort is to "carry out organized and deliberate hazing annually inside Harriman State park, beginning in late October to early November as needed, and continuing through early January, to maintain approximately 200 swans but discourage use by ducks and geese; maintain a maximum of approximately 300 swans in the entire Island Park area".

It is not possible to statistically analyze the effectiveness of the hazing program, but our conclusion is that hazing, at the level employed during 1999-2000, did not encourage most swans to move further south. Peak number of swans in the Island Park area last winter totaled 751 despite efforts to haze swans away. Hazing at this level did not seem to reduce the numbers of other waterfowl present at Harriman State Park either; these birds are also feeding on the submergent vegetation (Bouffard 1999, 2000). Although a formal survey of submergent vegetation was not conducted this year, casual observation of this resource indicated that vegetation was not overly grazed (Shea, personal communication). It must also be noted that water levels in the river were above average and this may have contributed to the maintenance of submergent vegetation.

The Service, Pacific Flyway Council and the State of Idaho committed to conducting hazing during the winter of 2000-01. Alterations of the hazing program were made during the winter of 2000-2001 to attempt to put more pressure on swans by hazing several days in a row. Distribution of swans was again monitored and results were again mixed. Early freeze up of lakes and rivers in Montana accelerated the build up of swans at Harriman State Park (Table 1). Swan numbers peaked at 1227 on November 13. Hazing was initiated on November 15 and was conducted more aggressively than in the previous year. Hazing days occurred back to back each week from ATV's and snowmachines that enabled hazing to be more concentrated throughout the day. By the end of December 2000, swan numbers documented on HSP stabilized at about 750, which indicates a possible influence on distribution of about 475 swans from the peak in November. Where swans moved to is not known conclusively. The Mid-winter Swan Survey conducted on February 8 and 9, 2001, documented 989 swans in the Island Park Area, or only 238 less than the peak in November. The HSP total was 582 swans, or 645 less than the peak number. Further analysis of neck collar sightings is necessary before the question of hazing efficiency can be answered. It can be definitely stated that the number of swans wintering in the Island Park Area, especially on Harriman State Park, is dramatically higher than the goal called for in the Five Year Pacific Flyway Management Plan for the RMP.

Table 1. Summary of pre and post hazing swan surveys conducted at Harriman State Park from November 6 to December 31, 2000.

Date	Trumpeter Swans		Tundra Swans		Total
	Adults	Cygnets	Adult	Cygnets	
11-6	419	95	53	7	574
11-13	969	227	26	5	1227
11-15/16	Hazing days				
11-17	494	134	18	4	651
11-20/21	Hazing days				
11-22	359	114	5	2	480
11-27	622	192	9	6	829
11-27	183	43	0	0	226
12-4	617	169	4	5	795
12-5/6	Hazing days				
12-7	322	104	2	2	430
12-11	397	126	2	1	526
12-12/13	Hazing days				
12-17	332	93	0	0	425
12-19/20	Hazing days				
12-21	179	64	0	0	243
12-27	524	154	1	0	679

4. Historic Breeding Range Expansion and Conflicts

There is general agreement that a key part of any coordinated trumpeter swan restoration effort would be habitat management and/or augmentation efforts directed at restoring nesting pairs of trumpeter swans throughout their historic breeding range. National wildlife refuges in Regions 1 and 6, other public lands and partnership projects on private lands would be used to restore or improve wetlands that meet swan breeding habitat criteria within historic ranges. The goal of this effort would be to establish new nesting pairs of trumpeter swans in previously used habitats, thereby strengthening the breeding population through geographic diversity and numbers. Another important benefit would be the fall/winter migration of these new breeding segments to possibly new wintering habitats. An important issue deals with the possible impacts to public use programs such as the Utah tundra swan hunt if increased

numbers of protected trumpeters move through the western portion of the state en route to winter areas to the south.

5. Trumpeter Swans and Trout Fishing

One of the primary wintering grounds of the trumpeter swan is the Henry's Fork River. This river supports a world class trout fishery that depends primarily on natural reproduction. Too many swans wintering on the river remove the vegetation that is important for trout. Quality of fishing opportunities may be impacted by increasing concentrations of swans at Harriman State Park. Swans have nearly denuded aquatic vegetation from the river in the past. Fishing provides important economic benefits for the area in the way of fishing guide services, fly fishing shops, and support businesses. Anglers are generally supportive of trumpeter swans and were vital in providing funding for the first year of translocation operations. However, should swans continue to increase to the point where trout fishing is degraded, trumpeter swan restoration could negatively impact this key constituent. The possibility of concentrating more public visitation along the river has been suggested as a method to replace hazing. This idea needs to involve Idaho Department of Parks and Recreation and Idaho Department of Fish and Game before final recommendations can be made. Initial discussions have identified several public use alternatives that might be employed next year. This includes, 1) opening a cross country ski trail along the Henry's Fork in an area of HSP that is currently closed; 2) developing outreach that encourages bird watching along the river including the possibility of a festival; and, 3) increasing fishing pressure on the Henry's Fork during November.

6. Mortality Factors

There are a number of mortality and disturbance factors that must be considered when transplanting swans. These factors can vary from site to site. Things such as lead pellets and sinkers, fences, power lines, and disturbance from hunters and fishermen can be a problem at various sites. These need to be evaluated for each augmentation and emergency release site.

IV. Brief Description of Refuges Involved

The Refuges involved in this plan are in Regions 1 and 6 in the States of Idaho, Montana, Nevada, Oregon, Utah, and Wyoming. Trumpeter swans use these Refuges for breeding, migration and wintering habitats.

1. Bear Lake NWR

Bear Lake NWR is located in southeast Idaho near the town of Montpelier. It lies in the Bear Lake Valley at an elevation of about 6,000 feet. The refuge encompasses about 18,000 acres of the old Dingle Marsh and is comprised of a bulrush-cattail marsh, open water and flooded meadows of sedges, rushes and grasses. Siltation from the Bear River and feeding activity of carp reduce productivity of the marsh. However, impoundment projects have resulted in large expanses of carp free waters that are very productive. The vastness of the marsh provides the isolation from disturbance needed by trumpeter swans for successful nesting.

2. Bear River Migratory Bird Refuge

Bear River MBR is located 15 miles west of Brigham City, in northwestern Utah at the mouth of the Bear River. Historically, the refuge was comprised of 64,500 acres of marsh and open water impoundments maintained by an extensive system of dikes and water control structures. In 1983, the refuge was reduced to ruins by flooding of the Great Salt Lake. Extensive restoration efforts began in 1989 and the total acreage of the refuge is now 74,000 acres of wetland and upland habitat, which includes over 75 miles of dikes and channels, and 50 primary water control structures. The refuge has a history of providing migrational habitat for tundra swans. Use by trumpeter swans has been limited.

3. Benton Lake WMD

The Benton Lake Wetland Management District encompasses ten counties in north central Montana. The Blackfoot Valley in Powell County and the East Front of the Rocky Mountains in Lewis and Clark, Teton, Pondera and Glacier Counties contain outstanding natural wetland complexes. Several pairs of Trumpeter Swans nest in Lewis and Clark County and migrating birds are seen annually on the Blackfeet Indian Reservation in Glacier County and on the Jarina Waterfowl Production area in Pondera County.

The Fish and Wildlife Service administers three Waterfowl Production Areas (WPA) in the Blackfoot Valley that total approximately 4400 acres. The Service also has Conservation Easements on 28,000 acres in the Valley. The wetland complex in the Blackfoot is outstanding and would provide excellent nesting habitat for Trumpeter Swans. The Blackfoot WPA has more than 100 acres of seasonal and semipermanent wetlands and the H2-0 WPA has almost 400 wetland acres. Private ranches in the valley also have numerous wetland basins.

The Service administers one 640 acre WPA along the East Front in Pondera County and a

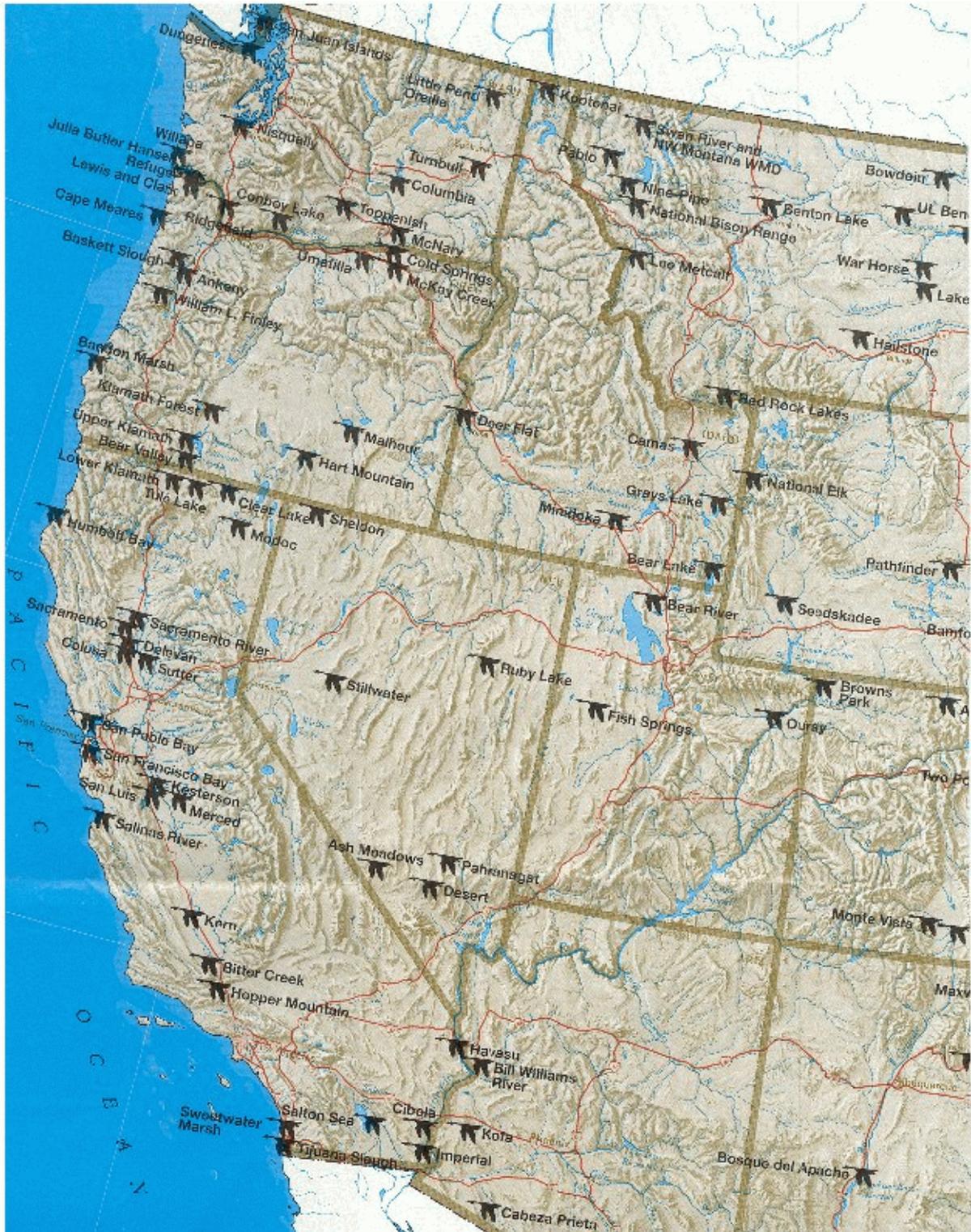


Figure 1. Locations of National Wildlife Refuges in the Western United States, including refuges discussed in the Trumpeter Swan Implementation Plan.

640 acre unit and an 800 acre unit in Teton County. The Service also administers almost 19,000 acres of conservation easements along the East Front

4. Camas NWR

Camas NWR is located in southeastern Idaho, 36 miles north of Idaho Falls at an elevation of about 4,800 feet in the Upper Snake River Plain. About half of the refuge's 10,578 acres are lakes, ponds and marshlands. The remainder consists of grass/sagebrush uplands and meadows. Camas Creek flows for eight miles through the length of the refuge and is the source of water for many of the refuge lakes and ponds. Several wells on the refuge also provide water for wildlife during the dry summer months. Mud Lake and Market Lake Wildlife Management Areas managed by the Idaho Department of Fish and Game, are near Camas NWR. All three areas are used by swans share a common watershed. Undoubtedly swan interchange occurs between the areas.

5. Fish Springs NWR

Fish Springs NWR is situated at the southern end of the Great Salt Lake Desert in Western Utah and encompasses 17,992 acres between two small mountain ranges 150 miles southwest of Salt Lake City. Water supply is from five major springs and several lesser springs and seeps that flow from the base of the eastern front of the Fish Springs Range. These warm, saline springs provide virtually all of the water for the 10,000 acres of wetlands on the refuge. The refuge provides what appears to be good swan habitat especially during years of severe winter weather to the north. However, due to a possibly endemic problem with *histomoniasis*, that surfaced among trumpeter swans transplanted to Fish Springs NWR during the 1970's, no further attempts have been made to encourage swan use of this refuge.

6. Grays Lake NWR

Grays Lake National Wildlife Refuge is situated in eastern Idaho near Wayan at an elevation of about 6,300 feet. This 22,000 acre montane marsh is composed principally of hardstem bulrush and cattail with scattered, small, shallow ponds. Snow melt from surrounding mountains, the valley, and on the lake provide the marsh with water. Grays Lake water rights are held in trust by the BIA for use in the Fort Hall Irrigation Project. Efforts to transplant swans to Grays Lake were very successful in establishing nesting pairs. However, the marsh is drained annually by June 25 for irrigation of croplands on the Fort Hall Reservation which is undoubtedly contributing to the very poor survival of cygnets.

7. Kootenai NWR

Kootenai NWR was established in 1964 to reclaim some of the Idaho Panhandle wetlands lost to development. Water supply for this 2,774 acre refuge is provided by diversions from Myrtle Creek and pumping from the Kootenai River and Deep Creek to maintain permanent ponds and to flood waterfowl food plots in the fall. Currently, no trumpeter swans are found on the refuge but 300-500 acres of suitable nesting habitat is available and the Kootenai River stays open throughout the winter and may provide suitable wintering habitat. In addition,

significant land protection and wetland enhancement is ongoing on adjacent areas managed by the Idaho Department of Fish and Game and The Nature Conservancy. The Creston Management Area in Canada also contributes 17,000 acres of protected lands at the southern end of Kootenay Lake. Managed as an ecosystem these units represent an area that should be explored for swan enhancement.

8. Lee Metcalf NWR

9. Malheur NWR

Malheur National Wildlife Refuge is located in the sagebrush desert of southeastern Oregon. Situated at 4,100 feet above sea level. It covers over 186,000 acres of the Malheur-Harney Lakes Basin, a watershed with no outlet to the sea. Annual precipitation averages 9-11 inches, occurring primarily as snow from November through March.

Water availability in this desert determines how much habitat can be maintained, whether for trumpeter swans or other water-dependent species. In the last decade, trumpeter swans have restricted their nesting to about ten sites of interspersed emergent marsh/deep pond habitat in the Blitzen Valley. In the past, there was some use of Malheur Lake as well, but carp invasion of the lake and refuge water system in the early 1950's has severely deteriorated habitat conditions.

10. Minidoka NWR

Minidoka NWR includes both shores of Lake Walcott, an irrigation reservoir on the Snake River in south central Idaho near the town of Rupert. The Refuge is 25 miles long and encompasses about 11,300 acres of wetlands, primarily open water, and 9,400 acres of upland. The water level is high and stable from April through September, then is lowered and stable throughout the winter. From Spring through fall the Refuge offers extensive beds of aquatic vegetation, especially sago pondweed, that is used by large numbers of migrating and molting waterfowl. The shallower areas supporting the submergent vegetation are closed to boats, giving waterfowl freedom from disturbance in these areas. There are areas with emergent vegetation that could support a few nesting pairs of trumpeter swans.

11. National Bison Range Complex

The National Bison Range Complex is located in the northwest corner of Montana about 50 miles north of Missoula in the Mission and Flathead Valleys. It is comprised of five units: National Bison Range, Pablo, Ninepipe, Swan River, and Lost Trail National Wildlife Refuges and the Northwest Montana Wetland Management District (14 Waterfowl Production Areas). In the Complex, Pablo, Swan River and Lost Trail NWRs with a few of the WPAs, provide the highest probability of swan habitat. Pablo NWR comprises 2,542 acres of refuge of uplands surrounding a reservoir that is 1850 acres of water at full pool. Pablo and Ninepipe NWRs are superimposed on BIA Flathead Irrigation Project reservoirs. There are also four impoundments with meandering shorelines of emergent and submergent vegetation. Swan River is 1,568 acres of mainly reed canary grass within the floodplain of the

Swan River above Swan Lake about 38 miles southeast of Creston, Mt. Lost Trail is 9,325 acres of prairie grassland, forest, and wetlands 50 miles west of Kalispell. Lost Trail NWR includes Dahl Lake, which is a lacustrine wetland system surrounded by a large, emergent wetland complex (1,300 acres). WPAs are located in Lake and Flathead Counties and consist of grasslands interspersed with a high density of wetlands.

12. National Elk Refuge

National Elk Refuge is located in the Jackson Hole area of northwestern Wyoming. Although known for its value as elk winter range, the refuge also hosts diverse aquatic habitats including two major streams, the largest calcareous fen in Wyoming, and 23 ponds. The southwest portion of the refuge is dominated by the largest wetland in Northwest Wyoming.

13. Ouray NWR

Ouray NWR is located about 30 miles southwest of Vernal within the Uintah Basin of northeastern Utah. The Refuge is long and narrow covering about 19 square miles and encompassing approximately 16 miles of the Green River. Elevations range between 4,655' near the river to 5,072' on top of Leota Bluff. Habitats are characterized as a mix of riparian woodlands, bottomland wetlands or floodplains, and grasslands which border the river and lie on top of the benches.

14. Red Rock Lakes NWR

Red Rock Lakes NWR is located in southwestern Montana in the Centennial Valley and totals about 45,000 acres. Habitat is characterized as a high elevation montane wetland complex. Most of the refuge is designated wilderness, which helps to provide protection and isolation for trumpeter swans. Trumpeter swan management at Red Rock Lakes NWR has been a focal point since establishment in 1935. Recently, the Centennial Valley Initiative (spearheaded by the Nature Conservancy and the Service) has targeted Conservation Easements on about 50,000 acres of surrounding private lands that will protect existing range land from development.

15. Ruby Lake NWR

Ruby Lake NWR is located at the south end of the Ruby Valley in Elko and White Pine counties in northeast Nevada. The refuge is 65 miles southeast of the town of Elko and lies along the eastern flank of the rugged and scenic Ruby Mountains at an elevation of 6,000 feet above mean sea level. It is one of the most important waterfowl nesting areas in the Great Basin and the Intermountain West, and consistently provides high quality upland and wetland habitats. Because of its strategic location along migration corridors serving both the Pacific and Central flyways, birds converge on the refuge from the Humboldt River drainage to the west, the Owens Valley to the southwest, the Great Salt Lake to the east, the Klamath Basin to the northeast, and the Colorado River and imperial Valleys to the south.

16. Seedskadee NWR & Cokeville Meadows NWR

Seedskadee NWR is located 37 miles northwest of Green River, WY. The entire refuge is within Sweetwater County in the heart of the Green River basin of Southwestern Wyoming. Geographically, the refuge is long and narrow, and bisected through its length by the Green River. The north boundary of the refuge is seven miles below Fontenelle Dam. From the north boundary the refuge extends 34 miles downstream and ranges in width from one to two miles. Total relief within the refuge is 300 feet. The highest elevation is 6,490 feet near the north end of the refuge at McCullen Bluff. The lowest elevation is 6,190 feet at the south end of the refuge, below Big Island.

Cokeville Meadows NWR is located in Southwestern Wyoming along a portion of the Bear River and is characterized with wet meadows, deep water wetlands, ponds, upland sagebrush, forested riparian, upland grasslands, and irrigated farmlands. The 20 mile stretch of the Bear River Valley in Wyoming has been recognized as the best waterfowl production area in the state and identified as the number one priority area in the Bear River Focus Area Plan for the Intermountain West Joint Venture.

Cokeville Meadows NWR became a reality on October 12, 1993 with the purchase of 203.91 acres. Currently the Refuge System owns 5,204 acres in fee title, 1,689 acres in Conservation Easements, and 784 acres in FmHA easements (Total = 7,677 acres). The final acquisition size of the refuge is projected to be about 27,000 acres.

17. Stillwater NWR Complex

Stillwater NWR Complex is located in western Nevada, 60 miles east of Reno in Churchill County. The refuge lies within the ancient subbasin of Lake Lahontan along the western front of the Stillwater Mountains at an elevation of 3,865 feet above mean sea level. The SNWR Complex encompasses 137,500 acres within the Carson Desert region of the Great Basin ecosystem and consists of gently rolling to flat desert shrub lands and alkali flats. Wetlands comprise a small proportion of the landscape characterized by shallow and deep emergent vegetation

In 1990, the approved boundary of Stillwater NWR Complex was expanded, under subsection 206(b)(1) of the Truckee-Carson-Pyramid Lake Water Rights Settlement Act (Title II of Public Law 101-618), to encompass Stillwater Marsh, most of which was previously in the Stillwater WMA. In addition to boundary expansion, Public Law 101-618 also outlined four purposes for which the Service must manage 14,000 acres of wetland-habitat, over the long term, at Stillwater NWR Complex: (1) maintaining and restoring natural biological diversity within the refuge; (2) providing for the conservation and management of fish and wildlife and their habitats within the refuge; (3) fulfilling international treaty obligations of the United States with respect to fish and wildlife; (4) providing opportunities for scientific research, environmental education, and fish and wildlife oriented recreation.

Enactment of Public Law 101-618 shifted the legal authority for managing the lands now within Stillwater NWR from the Tripartite Agreement to the Refuge Administration Act and

the refuge purposes identified in Public Law 101-618. The Public Law enacted a shift in priorities whereby wildlife conservation became the single highest priority.

18. Turnbull NWR

Turnbull NWR is located approximately 25 miles southwest of the city of Spokane on the eastern edge of the Columbia Basin in northeastern Washington. The refuge protects 15,628 acres of an area referred to as the 'channeled scablands'. The channeled scablands were formed approximately 15,000 years ago by a series of ice age floods originating from ancient Lake Missoula in northwestern Montana that scoured out large flood channels in the basalt and loess formations of the Columbia Plateau. Within these large flood tract numerous channels and pothole depressions were formed that later became a diverse complex of lakes, deep water marshes and ponds. The surrounding uplands are a mosaic of ponderosa pine forest, perennial bunch grass grasslands and deep water wetlands. Turnbull NWR with over 1700 acres of semi-permanent wetlands and permanent wetlands has suitable habitat for several trumpeter swan breeding pairs. Twenty- two large sloughs contain extensive aquatic beds of sago and flatstem pondweed, horned pond weed coontail and others surrounded by emergent plant beds of hardstem bulrush and common cattail. The refuge was the site of a restoration flock established in the 1960's by relocation of 33 cygnets from Red Rock Lakes NWR. Establishment of eight breeding pairs and peak recruitment of 14 cygnets fledged in 1975 indicates the quality of this breeding habitat. Wintering habitat is limited and the restoration flock disappeared following cessation of pond aeration and supplemental feeding in 1976. The surrounding channeled wintering habitat may be available along the Palouse , Snake, and Columbia Rivers.

V. Goals, Objectives, Strategies and Tasks

The following goals, objectives, strategies and tasks will be utilized to implement the plan. Goals and objectives listed below are found in the Pacific Flyway Management Plan for the RMP (Subcommittee on Rocky Mountain Trumpeter Swans 1998). Strategies and tasks are designed to implement these goals and objectives. None of these strategies and tasks are intended to meet goals and objectives alone, but rather were established to work in concert and to provide a range of options to address trumpeter swan management issues.

A. Pacific Flyway Management Plan Goals/Objectives (as revised in 1998)

Goal 1. Population Management

Objective 1. Redistribute wintering swans to wintering areas outside of the core Tri-State Area, reducing the number of wintering swans in the core Tri-state Area to a maximum of 1,500.

Objective 2. Rebuild U.S. breeding flocks by the year 2002 to at least 131 nesting pairs (594 adults and subadults) that use natural, diverse habitats and winter predominately outside of the core Tri-state Area.

Objective 3. Encourage growth of Canadian flocks.

Objective 4. Increase the abundance of most desirable submerged macrophytes in the Henry's Fork of the Snake River in and near Harriman State Park.

Objective 5. Monitor the population.

Goal 2. Public Education

Objective 1. Provide cooperating agencies, concerned non-governmental organizations, and the general public with up-to-date, clear, and accurate information on management activities, problems, and accomplishments in a timely and professional manner.

Goal 3. Research Needs

Objective 1. Investigate the vulnerability of trumpeter swans to hunter-caused mortality, diseases, and parasites at potentially new release sites and on new migration routes.

Objective 2. Ascertain the seasonal movements of Canadian and Tri-State trumpeter swans using satellite tracking of transmitters.

Objective 3. Continue evaluation of potential habitat range wide (particularly on the Bighorn River, Wyoming; northern Idaho; western Montana; eastern Nevada; eastern Oregon; eastern Washington). Coordinate habitat evaluation with appropriate states and NWR's.

Objective 4. If university interest exists, obtain graduate student help to investigate movements, habitat use, behavior, and factors affecting success of recent translocation (particularly Summer Lake, Oregon; Green River drainage, Wyoming; Bear Lake NWR, Idaho; Bear River marshes, Utah).

Objective 5. Investigate the use of morphological measurements to differentiate between trumpeter and tundra swans.

Objective 6. Develop methods to routinely monitor vegetation trends at key wintering sites.

Objective 7. Assess trumpeter swan interactions with tundra swans and competition with tundra swans and other waterfowl for resources in tundra swan hunt area.

Objective 8. Ascertain epizootiology of the protozoan responsible for the 1991-92 swan mortality at Fish Springs NWR. Identify factors contributing to outbreak and means of preventing or reducing risk.

B. Trumpeter Swan Refuge Implementation Plan Strategies/Tasks

Strategy 1- Restore trumpeter swans to unoccupied breeding habitat within the RMP's historic range (subset of Goal 1, Objective 2)

Tasks

10. Manage/restore wetland habitat to allow for natural redistribution of nesting trumpeter swans.

11. Augment breeding population where feasible.

Strategy 2 - Encourage broader winter distribution (subset of Goal 1, Objective 1).

Tasks

1. Encourage swans to winter outside the Tri-State Core Area.
2. Identify and enhance relatively disturbance-free wintering areas.
3. Continue to discourage sedentary flocks and prohibit supplementary feeding.

Strategy 3 - Conduct appropriate research (subset of Goal 3).

Tasks

1. Monitor success of restoration.
2. Analyze migration behavior/pathways.
3. Delineate alternate winter distribution techniques.
4. Define habitat suitability.
5. Develop monitoring protocols for restoration efforts.
6. Evaluate current population surveys.

Strategies 4 - Develop outreach plans (subset of Goal 2).

Tasks

1. Coordinate and expand program-wide outreach efforts and establish a trumpeter swan management web site.
2. Prepare refuge specific outreach plans for each augmentation action.

Strategies 5 - Reduce swan mortality (subset of Goal 1, Objective 2)

Tasks

1. Research the impacts of chronic or low lead levels in swans.
2. Power line strikes; reduce or eliminate problem strike areas where possible.
3. Protection; improve swan awareness by public, reduce poaching, improve LE.
4. Disease/parasites; identify problem areas and focus research.
5. Reduce Environmental Mortality Factors; development, human disturbance, flooding, contaminants, loss of water, excessive predation.
6. Analyze effects of hazing on productivity/survival.

VI. Refuge Specific Swan Management Tasks (See Appendix 2 for Site Suitability Criteria Checklist):

1. Bear Lake NWR (southeast Idaho):

Habitat Suitability:

Bear Lake NWR (BL) is an 19,000 acre refuge comprised of some 14,000 acres of semi-permanent bulrush marsh suitable for swan maintenance and production. The refuge marsh has

problems from siltation coming down the Bear River and from carp, which reduce water quality and aquatic plant productivity. Two units totally 2,700 acres have been enhanced through diking, carp control and screening water inflows. These management efforts have been successful and provide good quality wetland habitat for swan migration and production. BL is located on the southern edge of trumpeter swan's historic breeding range. Under the Site Suitability Checklist guidelines BL, meets the criteria established for trumpeter swan production and migration (spring and fall) habitat, but would not be considered as wintering area due to early freeze-up. A fairly high potential for increased trumpeter swan production, migrational use, and spring augmentation (sub-adult releases) exists at this station.

Current Management Summary:

BL has one nesting pair of trumpeter swans that has nested at the refuge since 1997. This is a young pair of swans that have successfully hatched and raised three cygnets (1 cygnet in 1998 and 2 cygnets in 2000). These three cygnets were raised to fledging. BL currently (10/2000) has a family group of four trumpeters (pair plus two cygnets), one subadult (2 year old) from 1998, and two released sub-adult swans. Since the summer of 1994, BL has had one or two trumpeters spending the summer and fall, showing a pioneering effort by sub-adult swans from successful production areas to the north such as Grays Lake NWR. To date BL trumpeter swans spend most of their time on the refuge's higher quality units such as the 1,800 acre, carp controlled Rainbow Unit, showing the benefits of this type of project. The new 1,900 acre Bloomington Unit will come on line in 2001 providing additional good quality swan habitat next spring. The release of 25 trumpeter swans of various age classes from Summer Lake WMA, OR in April, 1996, from winter translocated swans failed to establish new breeding pairs at BL. Much like Grays Lake NWR in the late 1980's, the refuge does have important potential for properly planned, spring sub-adult swan releases that may more quickly establish breeding pairs in newly available habitat.

Swan Management Goals:

1. Continue to emphasize refuge wetland management and restoration efforts to encourage increased reproduction from resident trumpeter swans, augmented with annual spring releases of propagated sub-adult swans.
2. Management would also emphasize good waterfowl habitat maintenance for swans during spring and fall migration periods.
3. Investigate other potential swan habitat restoration projects and potential augmentation sites in the area.

Swan Management Plans/Proposals:

BL is becoming an important trumpeter swan use and production area due to its expansive unoccupied wetland habitats, its successful wetland restoration efforts, and its location on the southern edge of historic swan breeding range. BL's slowly increasing trumpeter swan flock should continue to be encouraged and locally produced and released sub-adult swans allowed to follow their migrational instincts to wintering areas. As indicated by previously marked swans, these migration pathways may include routes through Utah and hopefully the upper Bear River and lower Green River in southeast Wyoming.

Swan Management Proposals, Duration and Funding Estimates:

1. Evaluate the success of the new 1,900 acre Bloomington Unit wetland improvement project for the next five years, look at other possible wetland projects off-refuge, and begin planning another new project(s) if feasible. Hire biological help to study Bloomington Unit and work on NAWCA partnership proposals. Cost: \$40K/year for three years(\$120K) evaluate project then proceed.
2. Swan Augmentation: Release 6-8 sub-adult trumpeter swans propagated one year at Long's facility in Wyoming early each spring to maximize imprinting on refuge wetland habitat. Monitor success with satellite transmitters. Cost: \$30K/year for five years, then evaluate release effort success (\$150K).
3. Coordinate swan management efforts with the State of Utah and adjacent refuges in Region 6. Begin satellite radio telemetry monitoring of some of Bear Lake's trumpeter swans to more accurately track their movements in the region and during their winter migration. Mark and track 6-8 swans from Bear Lake over a 3 year period. Cost: \$50K/year for three years.
4. Construct new wetland unit within the refuge marsh. Approximately 1,500 to 2,000 acres in size and includes: five miles of dike, four water control structures, fish screening, fish control, partnership setup, administration, engineering and surveying and permit clearances. Cost: \$750K and 5-8 years to complete. Pursue as a NAWCA project.

2. Bear River MBR (northern Utah)

Habitat Suitability Discussion:

Bear River Migratory Bird Refuge (BRMBR) is located at the delta of the Bear River where it enters the north end of the Great Salt Lake in northern Utah. The refuge boundary encompasses 72,473 acres of wetlands ranging from mudflat to deep water, submergent habitats. An additional 940 acres are classified as upland grassland. Water from the Bear River is diverted into diked impoundments and held at specific depths to meet habitat management goals as outlined in the Comprehensive Management Plan (CMP) for the Bear River MBR (USFWS 1997). Irrigation return flows from the Malad River to the north and from springs along the east contribute lesser amounts of water to parts of the refuge. River flows during the summer may fluctuate dramatically between years depending on the snowpack the previous winter. Periods of extreme drought or flooding are not uncommon.

Bear River MBR is south of the historic breeding range of trumpeter swans as defined by Banko (1960) and Bellrose (1976). No breeding by swans has been recorded at the refuge or in the Great Salt Lake Basin.

Trumpeter swans are sighted on rare occasions during the fall migration. Large flocks (30,000 to 40,000 individuals) of tundra swans are also present in the fall and reliably detecting small numbers of trumpeters is difficult. Sago pondweed tubers are generally abundant on the refuge and available during the fall flight until mid-November when the ponds freeze. In most years (>80%) the entire refuge freezes by early December and few waterfowl remain.

Current Management Summary:

Bear River staff manage resources to provide a variety of wetland and upland habitat types to meet the diverse needs of the wildlife that occurs throughout the year. Current objectives for foraging waterfowl are to provide 18,000 acres of deep water (18-36") with submergent vegetation (primarily sago pondweed) and 8,500 acres of shallow water (4-16") , submergent habitat. Large flocks of waterfowl, including tundra swans roost on mudflat. The refuge provides about 35,000 acres of mudflat in large, undisturbed blocks. Trumpeter swans may or may not prefer these wide open vistas.

Biologists at Bear River monitor for trumpeter swans several times a week during the fall and early winter. Utah DWR counts all swans on weekly aerial surveys of the refuge.

Trumpeter Swan Management Goals:

The primary goal of the refuge is to provide habitat to meet the life requirements of native migratory birds. Trumpeter swans benefit from having secure staging and feeding habitats. Objectives include providing 34391 acres of vegetated mudflat for staging and resting, and 9146 acres of shallow submergent and 3591 acres of deep submergent habitat for feeding. Other habitat specific goals and objectives are found in the CMP (USFWS 1997).

Trumpeter Swan Management Plan/Proposals:

1. Monitoring: Monitor all swans within the Great Salt Lake Basin from the ground and air. Costs include hiring a technician (6 months) and providing a vehicle and optical equipment (8K); and costs associated with hiring A pilot/biologist and plane from Utah Division of Wildlife Resources (5K). Total cost = 13 K per year.
2. Habitat Management:
 - (a) Negotiate the acquisition and/or development of summer storage water from the Bear River to supply the refuge during low river flows in July and August. Cost will be in the multiple millions to construct a dam and storage facility upstream from the refuge. Negotiations are ongoing at this time.
 - (b) Develop, construct, and install fish barriers on all inlets to limit carp and improve production of sago pondweed. Cost has been estimated at 1 million dollars to outfit all structures.
3. Research
 - (a) Apply flight energetic models to trumpeter swans to help determine the feasibility of migration through the Great Basin and the vulnerability of trumpeter swans during staging and foraging at Bear River. Cost 120K.
 - (b) Research historical records of trumpeter swan occurrence in the Great Basin and publish findings in peer review journal. Cost: 1K

3. Benton Lake Wetland Management District

4. Camas NWR (southeast Idaho)

Habitat Suitability:

Camas NWR contains 10,578 acres with approximately 6,000 acres of wetlands ranging from sub-irrigated meadows to open-water lakes. About 140 acres can be used for producing cereal grains and alfalfa to provide food for migrating waterfowl. The remaining acreage are grass and sagebrush-grass uplands.

Camas creek, which bisects the refuge, is one of the principal sources of water for the refuge. Because its flow is dependent on the mountain snowpack, nine wells have been drilled on the refuge to supplement the creek flow. Some years, these wells are our only source of water during the summer and fall.

Camas is within the historic breeding range of trumpeter swans. Based on recent history of breeding success, the breeding habitat at Camas NWR is suitable for trumpeter swans. In addition, up to 18 non-breeding and unsuccessful nesting trumpeter swans have summered on the refuge. Sufficient breeding pairs are present on Camas NWR and the surrounding area so that releases are not considered necessary to augment or increase the breeding population.

Swans use the refuge for feeding throughout the fall. The refuge marshes become completely frozen by late November and most birds leave the refuge. Throughout the winter one or two pair of swans show up for a day or two on the nesting territories and then leave again to nearby wintering areas.

As soon as water opens up again in March, trumpeter swan pairs return to the nesting territories and other trumpeter swans use the refuge for feeding and staging.

Current Management Summary :

Trumpeter swans have nested at Camas NWR since 1976 and initiated nesting in 18 of the 25 years through 2000. Nests have hatched in 16 years and young have fledged in 13 of the 25 years. Fifteen broods and 58 young were fledged.

Marsh units are filled early and held at stable water elevations during the nesting season to prevent flooding of swan nests. The most commonly used nest site is in among a white-faced ibis colony but no swans have fledged since 1997. We have not been able to identify any single factor for why the nests have been unsuccessful.

Camas NWR Swan Management Goals:

1. Provide optimum wetland habitat by filling marsh units prior to nest initiation using Camas Creek and ground water diversions
2. Maintain stable water levels during the nesting season
3. Minimize nest disturbance.

Swan Management Plans/Proposals:

1. Ground water depletion has lowered the water table such that wetland basins dry up unless they are maintained by supplemental water from Camas Creek diversions and ground water pumping. The refuge will restore and maintain wetland habitat on the refuge by seeking adequate funding for pumping and moving of an existing well.

We need funding to move one well to a new location so that the well can then be used to restore a complex of wetlands between Sandhole Lake and I-15. This will provide additional wetland habitat to increase potential swan territories. The cost for moving the well is \$200,000 with an annual operating cost of \$15,000. The new well could be operational within two years of funding and the pumps would be in operation the first irrigation season.

Inadequate funding to operate irrigation pumps to maintain wetland habitat is a recurring and long standing problem. The cost for electricity to operate the pumps to full capacity is \$70,000 per year. This would allow the maintenance of all wetland areas on the refuge.

We will also continue to scrutinize water right transfers to determine if they may potentially affect Refuge water rights and water table.

2. There is a history of lead poisoning of swans at Market Lake which may be limiting swan success locally. We do not know if this is leading to mortality of birds nesting or produced at Camas. We propose that this issue and any other factors which may be affecting swan nest success and survival should be studied. 2) An investigation into the possibility of chronic lead poisoning of local trumpeter swan would entail a five year study, costing \$200K.
3. Mark locally produced birds with satellite radio telemetry determine summer and winter use areas. This would be a three year study costing \$150K.

5. Fish Springs NWR

6. Grays Lake NWR (southeast Idaho)

Habitat Suitability:

Wetland habitat within Grays Lake's expansive marsh is considered to be good swan nesting habitat as evidenced by the successful augmentation program conducted in the 1980's and 1990's. The large marsh, with areas of open water, abundant emergents and aquatic plants free of the impacts from carp provides habitat for up to eleven nesting pairs of trumpeters each year. This refuge is within the historic breeding range of trumpeters and meets the suitability criteria as a breeding area for swans. A major limiting factor for successful fledging of cygnets is the lowering of water levels during the summer for irrigation. Areas with swan family groups often dry up entirely, forcing intervention by the refuge to move swans to nearby reservoirs or marshes for survival. This lowering of water is the result of a water draw down schedule that is mandated by cooperative agreements that enabled establishment of the refuge.

From a migration stand point, Grays Lake NWR is considered as only fair habitat for swans for these reasons: 1) the refuge is fairly remote from a migration standpoint, not being on a main flyway route, 2) it has late ice in the spring reducing migratory swan use, and, 3) lower water levels in the fall reduce fall migration opportunities and freeze-up is early. No over wintering habitat is available for swans at Grays Lake NWR.

Current Management Summary:

Swans of Grays Lake probably provided a nucleus for swan expansion to surrounding areas during 1993-99. The newly established (1997) nesting swan pair at Bear Lake NWR (60 miles south) is thought to have come from the Grays Lake flock. Because no suitable winter habitat is found at Grays Lake, the flock is forced to disperse, typically to lower elevation sites within a 40 mile radius of Grays Lake (vicinities of Soda Springs, ID, and Star Valley, WY).

Swan Management Goals:

- a. Continue to work with local landowners and the BIA to improve marsh habitat condition.
- b. Conduct baseline research with partners to identify best water management.
- c. Resolve land status questions through adjudication process.
- d. Determine mitigation mechanisms for compensation to landowners for flooded land.
- e. Determine appropriate amount and variation of inundation of lake shoreline including private land.
- f. Negotiate with BIA and private landowners to change water management.

Swan Management Plans/Proposals:

- a. During years of when severely reduced water levels and summer/fall drying of the marsh is anticipated, eggs from selected swan nests in probable impact areas of the marsh would be collected and used as propagation stock for augmentation efforts elsewhere. Egg collection criteria would follow plan guidelines with the objective that Grays Lake NWR nesting pairs would be protected from undue disturbance and collection frequency to maintain their territorial integrity. Funds needed to propagate, release and monitor up to 30 swans is \$75,000.
- b. Develop an Emergency Augmentation Plan at the refuge following plan guidelines to address the continual problem of what to do with late summer cygnets that may be running out of water prior to fledging. Establish approved priority emergency release sites for cygnets and capture guidelines. As part of this plan, captured cygnets could also be moved to propagation facilities over winter, to be subsequently released back to Grays Lake NWR or other augmentation areas the next spring.

Swan Management Proposals, Duration and Funding Estimates:

1. Marsh Habitat Condition:

- a. 2 - 5 years of negotiations; 3 - 5 years of research with funding at \$80-100K per year. Fund a permanent full time (PFT) Asst Mgr Trainee or Refuge Operation Specialist) ROS and a PFT Refuge Biological Technician position (RONS funding) \$246K, with \$116K support annually.

- b. Study the feasibility of developing several wells in prime locations around the refuge for use in providing late summer water for resident trumpeter swan family groups during years of severe water shortages and drying of critical habitat areas 1-2 year study: \$60K.

2. Conflicts with Local Landowners/Water Owners:

Ultimate costs unknown; dependent on lake bed legal ownership determinations. To solve this issue through land protection a minimum of \$5-8 million dollars over 10 years is needed to purchase land or establish easements. Fund sources would possibly include land acquisition funds from the Duck Stamp or Land and Water Conservation funds.

7. Kootenai NWR

8. Lee Metcalf NWR

9. Malheur NWR

10. Minidoka NWR (southeast Idaho)

Habitat Suitability:

Spring through fall the Refuge offers extensive beds of aquatic vegetation, especially sago pondweed, that is used by large numbers of migrating and molting waterfowl. The shallower areas supporting the submergent vegetation are closed to boats, giving waterfowl year round freedom from disturbance in these areas. There are areas with emergent vegetation, though not extensive in area, that could support a few nesting pairs of trumpeter swans. The Refuge meets the suitability criteria for nesting, for augmentation and for migration habitat. While few trumpeter swans use the Refuge during migration each year, the Refuge and several miles of the Snake River upstream of the Refuge are heavily used by tundra swans during spring and fall migration. As many as 1000+ tundra swans may be present over this reach. During mild winters some swans may stay all winter, but in normal years wetlands on the Refuge are frozen. Because the wetlands normally freeze, nesting trumpeters will have to migrate. It is more likely that they will move downstream along the Snake River to winter, rather than north to the Island Park Area. During December 1990, 16 trumpeter swans were released on the refuge. There were no records of these marked birds on the Refuge in subsequent years.

Current Management Summary

There are no current trumpeter swan management actions on the Refuge, other than periodic monitoring to detect trumpeter swan presence during migration.

Trumpeter Swan Management Goals:

To establish a stable breeding flock of 3-5 pairs that are not isolated from other nesting pairs in the Tri-State Flock and that do not winter in the Island Park Area.

Trumpeter Swan Management Plans/Proposals:

1. Nest Structures: Construct 5 small islands or floating platforms in places where there is suitable emergent cover, but no adequate nest site. Islands would require rock and gravel for construction. Floating platforms will be made from foam filled plastic pipe. Timing: Construction of islands and platforms would be conditional on plans to release of trumpeter swans on the Refuge, and would take place anytime from FY 2001 until the year prior to release of trumpeter swans. Adequate lead time will be needed to obtain permits. Costs: \$15-20k depending on the difficulty of transporting rock into the wetlands.
2. Establish Breeding Flock: Release yearling, captive reared trumpeter swans during summer on the Refuge. Release at least 5-7 per year for at least 3 years (see Grays Lake proposal to cross reference).
Timing: Collect eggs from Grays Lake NWR in 2001; incubate and over winter cygnets at the Wyoming captive rearing facility; release swans as yearlings at prioritized locations in spring 2002.
Costs: Current estimates are \$3k per bird released in the spring of their second year. Logistics and monitoring costs would increase the total to about \$75k.

11. National Bison Range Complex (northwest Montana)

Habitat Suitability:

Pablo NWR comprises a 2,542 acre refuge superimposed on a reservoir that is 1850 ac of water at full pool. Approximately 700 ac of mixed grasslands surround the reservoir in a narrow band around the refuge, with a small stand of cottonwood at the north end of the refuge and willows along southern and western edge. On the west edge of the reservoir a dike separates the reservoir and four impoundments that create a wetland complex of meandering shorelines and oxbows with emergent and submergent vegetation. The impoundments provide good swan habitat with adequate food resources, shallow foraging sites, and limited disturbance. Water levels can be controlled. There is no hunting at Pablo and no use of lead sinkers so lead exposure should be minimal, if at all. Fishing is not allowed in the impoundments so there is minimal disturbance.

Waterfowl Production Areas cover 3000+ acre of intermountain grassland interspersed with high densities of wetlands. Many of the wetlands have emergent and submergent vegetation, but some would need to be improved for quality swan habitat. A few of the WPAs are large enough where the wetlands would have minimal disturbance. However, two of the WPAs are next to a highway yet have large congregations of foraging tundra swans and usually 1-5 trumpeter swans during spring migration. It is unknown what the level of food resources are, and water levels cannot be controlled, but many should have good shallow foraging. The wetlands also need to be evaluated for size to make sure they are large enough for gaining flight. Powerlines may need to be evaluated.

Lost Trail NWR comprises 9,325 acres composed of prairie grassland, riparian areas, coniferous and deciduous timber and wetlands composed primarily of reed canary grass. The Dahl Lake wetland complex consists of semi-permanent and temporary wetlands with large components of emergent and submergent vegetation. There is minimal elevational changes in the valley floor so there is possibly many areas for shallow foraging sites. Ice-out typically occurs in early April and

freeze-up in mid-November, and water levels will be under management control. The refuge is fairly isolated from much human visitation, and the Dahl Lake wetland complex is off of the main road such that it could be closed to human disturbance during nesting season. There is a powerline that needs to be evaluated for potential danger to swans. Lost Trail is in the process of developing its Comprehensive Conservation Plan, in which trumpeter swan restoration efforts would need to be reviewed.

Swan River NWR is 1,568 acres within the floodplain of the Swan River above Swan Lake and between the Swan Mountain Range to the east and Mission Mountain Range to the west, 38 miles southeast of Creston, MT. Eighty percent of the floodplain is composed of reed canary grass. There is no water control available and no information on food resources or water levels for foraging sites.

All of the units of the Complex are within the historic breeding range of trumpeter swans. Trumpeters were observed as breeding birds in the Flathead Valley during the mid-late 1800s by Father DeSmet. Banko (1960) distinguished Flathead Valley as one of the three ecologically distinct regions in the United States in which trumpeters were said to have once been a more or less common breeding species in areas of suitable habitat.

Pablo NWR and the WPAs are in the Mission Valley south of Flathead Lake. Tundras and a few trumpeters migrate through the valley each spring, and many winter on Flathead Lake when the bays stay clear of ice. The refuge and WPAs normally freeze up. There also is often open water in the winter on Flathead River, Clark Fork River, and Thompson River where many tundras are surveyed each year. Hunting season should not be a problem. Even though we have a white goose season, there usually aren't any white geese that come through here. However, the public would need to be educated or reminded about the swans.

Lost Trail is located in Pleasant Valley that is part of an ecosystem that has several other large lakes in the area that may provide additional swan habitat currently or did historically. We are in the process of researching any historical records of swan occurrence in the Pleasant Valley area of Lost Trail NWR and the Swan Valley for Swan River NWR with Montana Fish, Wildlife & Parks.

Current Management Summary:

Pablo NWR is the only unit with active swan management occurring, and that is only in the form of a release site. Management does not specifically control water levels or conduct management practices specifically for swans. The Confederated Salish & Kootenai Tribes are spearheading a restoration effort for the Flathead Indian Reservation, of which Pablo NWR and several Waterfowl Production Areas are within the exterior boundaries.

In 1996 initial reintroduction efforts commenced with the capture of 19 (11 adults, 8 yearlings) trumpeter swans originally captured at Harriman State Park (natal area in northern Alberta) and relocated to Summer Lake Wildlife Management Area in south-central Oregon. These birds were released at Pablo NWR in May 1996. The birds acclimated immediately and thrived throughout the summer. In early October the swans began to leave the area and ranged northward into the migration path between northern Alberta and eastern Idaho. None of these birds returned to the valley.

This effort did not establish breeding swans but did provide evidence of a successful site for future efforts. No activity took place in 1997 due to poor reproduction in Grand Prairie Alberta and no available cygnets. Ten cygnets were made available from Grand Prairie in 1998 and released on Pablo NWR. These birds stayed until late October. Efforts could not follow their movements, but five were observed at Lee Metcalf NWR in the Bitterroot Valley (145 km from Pablo). In May 1999, one of the swans observed at Metcalf was observed again near Bigfork, Montana in the company of an unmarked bird, but then not seen again.

In 1999, no release was conducted due to poor reproduction again in Canada. Reevaluation of the project in 2000 by the Tribes led to a cooperative relationship with the Trumpeter Swan Fund at Jackson, Wyoming. The Tribes purchase 4-5 pairs at this facility and one additional pair at a local facility in the Flathead Valley to produce cygnets for release. Progeny are held in captivity during their first winter and then transported to the release site, wing-clipped and banded during the summer of their release, and released and monitored until they fledge and hopefully after they fledge.

In 2001, the Tribes will release 15 yearlings in May or June on Pablo NWR. Five of the 15 will have satellite transmitters so that their migration movements can be monitored.

Waterfowl Production Areas have no current trumpeter swan management actions other than periodic monitoring to detect swan presence during spring migration.

Lost Trail and Swan River NWRs have no current trumpeter swan management.

Swan Management Goals:

Pablo NWR

1. Provide adequate water levels in the Ducks Unlimited impoundments prior to trumpeter swan releases
2. Maintain stable water levels for optimal trumpeter swan foraging sites
3. Minimize disturbance to trumpeter swans released on impoundments or if the birds move to the reservoir.
4. Educate the public about trumpeter swan presence in the valley

Waterfowl Production Areas

1. Provide optimal trumpeter swan nesting habitat for 1-3 pairs

Lost Trail NWR (pending CCP)

1. provide optimal trumpeter swan nesting habitat for 1 pair on Dahl Lake
2. collaborate with Montana Fish, Wildlife & Parks and private landowners to foster optimal trumpeter swan nesting habitat for 2-5 pairs within the Pleasant Valley Ecosystem

Swan River NWR

1. Provide optimal trumpeter swan nesting habitat for 1 pair

Swan Management Plans/Proposals:

Pablo NWR

- a. The Tribes have funded five satellite transmitters out of the 15 birds being released in spring 2001 to monitor migration movements. Two to three more transmitters would increase the chance of covering the birds if they break into groups during migration. This would cost \$10 K.
- b. Evaluate powerlines around Pablo and determine if need to be put underground. Inform power company and CSKT to try to put any new powerlines underground. Cost is estimated at \$100 K.
- c. Determine whether carp are present in Pablo impoundments, if so implement management to reduce their presence. Install fish screens. Cost is estimated at \$150 K.
- d. Increase LE to keep fishermen out and inform public about presence of trumpeter swans during hunting season. Cost estimate is \$30 K.

Pablo NWR, Waterfowl Production Areas, Lost Trail NWR, and Swan River NWR

Hire technician to evaluate habitat suitability for swan nesting and foraging habitat among the units for three months at GS-5 level for cost of \$7K (site reconnaissance, vegetation sampling and mapping, invertebrate sampling, water depth profiles, track trumpeter swan occurrence and locations in Flathead Valley during migration, coordinate with private landowners for potential swan habitat, reports).

Lost Trail NWR, Waterfowl Production Areas

Kerr Dam mitigation dollars are earmarked for wetland restoration and goose nesting platforms on Dahl Lake and McGregor Meadows. There may be a possibility to create the platforms such that trumpeters could use them instead and restore the wetlands to an optimal condition for swans. Funding of \$3 K per bird released for two pair would require \$12 K.

12. National Elk Refuge (northwest Wyoming)

Habitat Suitability:

The National Elk Refuge (NER) is 24,606 acres in size with 3,700 wetland acres. Wetlands range from spring fed ponds and streams to sub-irrigated grassland meadows. NER is within the historic trumpeter swan breeding range and is part of the core tri-state flock. Since 1938 NER has averaged 5.54 breeding and non-breeding adults per year during the summer months. 2000 was the best breeding season on record with 3 pairs fledging 7 cygnets. Because there are ample breeding pairs at NER, there is no need to augment the breeding population with released birds.

NER is an important fall and spring staging area with as many as 107 trumpeters counted during recent migrations. However, most Refuge wetlands freeze solid during parts of the winter, with small, isolated, spring-fed areas remaining open in all but the coldest weather. One to 3 pairs of swans are present during ice-free periods, but swans abandon the Refuge during extreme cold periods. We speculate that wintering swans use running water habitat in the Snake River and its

tributaries when the Refuge is unsuitable, but neck collars or satellite telemetry are needed to determine where resident birds are wintering.

Current Management Summary:

Trumpeter swans were reintroduced to NER in fall of 1938 and established breeding territories by 1944. NER has averaged 1.46 breeding pairs, 2.69 eggs hatched, and 1.64 cygnets fledged per year since 1938. Production tends to follow a boom and bust cycle with several years of little to no production interrupted by a good year with 2-7 cygnets fledged.

Most swan production occurs in the main marsh in the southern end of the Refuge, where it is not possible to manipulate water levels. Therefore, past management activities have been limited to preventing all public entry in this portion of the Refuge and use of a “cookie cutter” boat to open water channels.

Refuge ponds offer the greatest opportunity for management action to improve swan habitat. Construction of the Jackson Lake Dam in Grand Teton National Park permanently flooded several swan breeding territories, and six Refuge ponds were created as mitigation. Flooding from the Gros Ventre River drained one pond in 1999, and the dike was repaired by Refuge personnel. Because the mitigation ponds are all located within the flood plain of the Gros Ventre River, inspection and maintenance of these dikes is an ongoing task. Most water control structures in these ponds are in disrepair, and water levels have remained stable for several years. Due to stable water levels, emergent plant communities are not well developed, submergent plant communities are dominated by milfoil (*Myriophyllum*) species, and swan production has been poor. Repairing water control structures and manipulating water levels to produce more desirable vegetation for nesting and foraging is a high priority.

Swan Management Goals:

Improve forage and nesting substrate conditions in Refuge wetlands to encourage increased production of resident trumpeter swans.

Decrease mortality risks for wintering swans associated with power line collisions.

Monitor swan winter habitat use to help guide management strategies for lands surrounding the Refuge.

Swan Management Plans/Proposals:

Maintenance and Water Level Management for Mitigation Ponds: Water control structures in these ponds need to be repaired to allow manipulation of water levels for vegetation management. Dikes are subject to flooding from the Gros Ventre River and often require inspection and repair. Cost: \$40K

“Cookie Cutter” Operation and Maintenance: The cookie cutter boat is used to maintain open water channels in the main marsh. It has not been operated since 1993 and requires maintenance before operation. Cost: \$6K

Floating Nest Platforms: In areas where water levels cannot be manipulated and emergent vegetation is limited, floating platforms can be used to increase swan nesting opportunities. Cost for construction of 10 platforms: \$4K

Burial of Problem Power Lines: At least 2 trumpeter swans have been killed due to collision with power lines immediately adjacent to Flat Creek. Sleeves have been added to the lines to improve visibility, but burial of the lines is the only option that will completely solve the problem. \$30,000

Monitoring Winter Movements of Resident Swans: We speculate that swans that breed on NER winter both on the Refuge and on private lands adjacent to the Refuge. Winter monitoring is necessary to determine the best management actions to improve and protect winter habitat on adjacent private lands. Cost for satellite transmitter monitoring for three year period \$150,000.

13. Ouray NWR

Habitat Suitability:

Six floodplains, which include Brennan Bottom, Johnson Bottom, Leota Bottom, Wyasket Bottom, Sheppard Bottom, and Woods Bottom, comprise more than a **a** of the existing habitat and are managed according to river flows. Due to the dikes and levees (some natural most manmade) a mix of classified wetlands exists within each bottom and range from palustrine to lacustrine and temporarily, seasonally, and semi-permanently flooded. Presently, we are incorporating a “rest/rotation” scheme for the wetlands within the bottoms; therefore, not all wetlands are filled during the year. Regardless, attempts are made to keep water, if conditions allow, in at least **a** to ½ of the units. Additionally as previously mentioned, about 16 miles of the Green River occur within the Refuge boundary.

Current Mgmt. Summary:

Most trumpeter swan observations (3-4 sightings during the past 6 years, according to Refuge files) have occurred during late fall/winter and thus the swans have access to all open water habitats on and off the Refuge. During this time of year, the wetlands are ideally kept shallow and are sparsely vegetated (emergents) for use by waterfowl, presumably including trumpeter swans, waterbirds, and shorebirds. Typically, most wetlands begin to freeze about the third week in November but it is usually about the first or second week in December when the units are frozen entirely. The river, however, can remain “open” but also has been known to freeze entirely within the Refuge boundary.

Swan Mgmt Goals:

None identified at present.

Swan Management Plans/Goals:

Specifically for trumpeter swans, none are identified at present. However, as previously stated, we are incorporating a “rest/rotation”(keeping some units dry for a period of 2 years-if conditions allow) scheme of our wetlands which should aid in overall health and productivity of these units. Additionally, we are using prescribed burns to reduce/remove cattail/bulrush cover and release nutrients within wetlands which may also aid in overall health, productivity, and use by birds.

14. Red Rock Lake NWR (southwest Montana)

Historical and Present Day Management:

Prior to the establishment of the refuge, the entire population of trumpeter swans that wintered and nested in the tri-state area numbered less than 70. Supplemental winter feeding of grain occurred on the refuge from 1936 - 1992, boosting the calorie and carbohydrate intake of swans wintering in the area. The protection afforded by the Refuge and supplemental feeding helped boost trumpeter swan numbers in the RMP tri-state area to over 500 by the early 1970's. These efforts also provided over 500 swans for restoration efforts. Swans were periodically trapped and translocated from Red Rock Lakes to numerous other areas, including northwest Wyoming, eastern Oregon, eastern Washington, Nevada, southeastern Idaho, Wisconsin, Michigan, Minnesota, and Canada. This translocation program has had mixed success, and is no longer occurring.

Winter feeding ended in 1992 to encourage trumpeters to winter in more temperate climates further south and to ease overcrowding at the Refuge. Swans that consumed winter grain appeared to be in better physical shape at the initiation of spring nesting season than those that currently winter in the tri-state area on scarce natural foods. After the cessation of winter feeding, numbers of wintering swans at Red Rock Lakes NWR dropped from approximately 250 to around 30. Numbers of nesting pairs dropped significantly as well.

Today, the Refuge and surrounding Centennial Valley remain a stronghold for trumpeter swans and current trumpeter swan management at Red Rock Lakes NWR focuses on maintaining the wilderness characteristic of the landscape on and near the refuge and the trumpeter habitat that exists in this landscape.

Swan Management Goals

Perpetuate trumpeter swan recovery efforts within their historic range while maintaining a nesting level of 20 - 30 pairs on the Refuge with minimal artificial enhancement.

Management objectives focus on managing recreational uses away from swan territories, maintaining, and potentially increasing, appropriate swan nesting and brood rearing habitat, and expanding protected areas off the refuge for the benefit of trumpeter swans.

Swan Management Plans/Proposals:

1. Monitor the post-feeding recovery of the Centennial Valley trumpeter swan flock by conducting at least three aerial production surveys in the Centennial Valley during May, June, and July (\$3K per year).
2. Conduct the two major fall and mid-winter, area-wide trumpeter swan aerial surveys. Prepare and distribute results to the mailing list of over 70 people (14K per year).
3. Continue to capture and leg band from 10 - 20 adults or cygnets in summer as needed (2K per year).
4. Because of potential icing, minimize neck collars unless needed for critical spot monitoring, for example, in any transplanted birds. Explore use of patagial tags or other low impact marking techniques (2K per year).
5. Perpetuate and encourage swan nesting or brood use at Culver, Macdonald, and Widgeon Ponds by continuing the seasonal closure during the nesting season.
6. Maintain Culver and Macdonald Ponds as trumpeter swan winter roosting areas by continuing the seasonal closure.
7. Monitor lead levels in trumpeter swans by submitting carcasses when found to the National Wildlife Health Laboratory and/or submitting blood samples from captured swans to the laboratory in a timely manner (5K per year).
8. Assist in genetics research (5K).
9. Develop satellite transmitter placement and tracking methodology suitable for monitoring movements of trumpeter swans within the restoration areas (10K per year).

15. Ruby Lake NWR (northeast Nevada)

Habitat Suitability:

Ruby Lake NWR encompasses 37,632 acres within a closed hydrologic basin and consists of a shallow permanent marsh bordered by meadows, grasslands, and brush-covered uplands. The pristine marsh is a mosaic of open water, bulrush stands, and grass/brush-covered islands. The marsh has been subdivided into management units.

About 165 springs emanating from the basin and along the base of the southern half of the Ruby Mountains supply the marsh with water. The snow volume and water content of the snowpack on the mountains directly influences the amount of water provided by the springs. Water from some of these springs is collected in a ditch where it can be diverted to five small marsh units and three larger wetland areas. Water reaching the end of the Collection Ditch flows into the 7,300-acre South Marsh, a natural depression at the south end of the refuge. Water can also be diverted through the small west marsh units to the North and East marsh units to maintain shallow wetlands that are especially attractive to waterfowl and shorebirds. Water is managed to provide

optimum nesting and feeding habitat for migratory waterfowl and other wetland-dependent bird species. Manipulation of water elevations and flows provides up to 17,000 acres of high quality marsh habitat during consecutive years with average or above average precipitation.

Trumpeter swans are not known to be native to the Ruby Valley. They were introduced to Ruby Lake NWR in the 1940s and 1950s in an attempt to establish a reserve population in the event disease or other factors decimated the population at Red Rock Lakes NWR in Montana. Altogether, 102 trumpeter swans were transferred from Red Rock Lakes NWR, and 96 were released at Ruby Lake NWR.

Current Management Summary:

Trumpeter swan production is the highest priority output listed in the refuge management plan, with an objective level of 15 birds and a management target of 12 birds. The first successful nesting was documented in 1958, when 6 cygnets were fledged. In the last 10 years (1990-1999) an average of 5 pairs have fledged an average of 5 cygnets per year.

An average of 40 trumpeter swans use the refuge during winter months, with a high of 60 in recorded in February 2000. The population of wintering swans has gradually increased over the last 10 years. This build-up in numbers from the nesting population would seem to indicate that swans are migrating to or through Ruby Valley.

In terms of habitat management, marsh units are flooded to objective levels by the end of March each year, and maintained at stable elevations through the nesting period. Water levels are allowed to decrease naturally for feeding and foraging. De-watering for other management purposes (i.e. prescribed burning) is not initiated until broods have fledged.

Swan Management Goals:

Emphasize refuge wetland management to encourage continued nesting by resident trumpeter swans. Provide optimum wetland habitat by flooding marsh units to objective levels by the end of March and maintaining at stable elevations through the nesting period. Minimize nest disturbance.

- A. Emphasize good waterfowl maintenance habitat for swans during the spring and fall migration periods.
- B. Emphasize refuge wetland management to encourage continued use by wintering trumpeter swans. Investigate potential winter habitat restoration and expansion projects.

Swan Management Plans/Proposals:

1. Implement voluntary conversion to non-lead sinkers for fishing by providing non-toxic sinkers in exchange for lead sinkers.
Cost: \$5K
2. Evaluate and implement, where appropriate, the rehabilitation and construction of spring ponds to provide wintering habitat for trumpeter swans.

- Cost: \$75K per year for two years
3. Sample and study DNA of trumpeter swans utilizing Ruby Lake NWR to determine if inbreeding has resulted in a less vigorous flock of birds.
Cost: \$50K
 4. Introduce new genetic material into the Ruby Lake flock by replacing eggs in active nests with eggs from the Tri-State Management Area.
Cost: \$25K over three years
- E. Determine the migration pathway of trumpeter swans produced at Ruby Lake NWR using satellite transmitters/telemetry.
Cost: \$52K over three years
- F. Conduct a study to determine whether predation (mammalian and avian on eggs and cygnets) is having an effect on trumpeter swan production.
Cost: \$25K per year for three years

16. Seedskadee NWR & Cokeville Meadows NWR (southwest Wyoming)

Habitat Suitability:

Seedskadee contains five primary wetland impoundments (Hamp, Upper Hawley, Lower Hawley, Pal, and Dunkle). These units combined provide approximately 335 acres of wetland habitat. The Dunkle, Hamp and Hawley units are the primary wetland units providing a mix of open water, short emergent and tall emergent wetlands. The Pal unit is primarily a wet meadow habitat interspersed with some short and tall emergent vegetation. There is very little open water in the Pal Unit.

The primary source of water is the Green River. Water from the Green River is diverted into three primary ditches (Hamp 1, Hamp 2, and Superior) using gravity flow. At River flows of 2000 cfs or greater, adequate water exists to maintain most of the units at full pool. With the exception of the Pal Unit, pool depths range from one to four feet. Depths in the Pal unit are one-two feet.

Seedskadee NWR is adjacent to the historic breeding range according to Bellrose (1976), but meets the suitability criteria as a breeding area for swans. Based on the recent history of breeding success, the man-made wetland impoundments provide suitable breeding habitat for trumpeter swans. One pair has successfully nested on the Refuge in the Hawley unit for the past four years (1997-2000). At least one other pair has summered on the Refuge the past three years but has not nested. The Hamp Unit has not been flooded the past two years in order to complete repairs and conduct invasive species management for pepperweed.

Approximately 20-30 trumpeter swans have wintered on the Refuge since 1996. The habitat afforded by the Green River meets the suitability criteria as migration and winter range habitat. The Green River section from Fontenelle Dam to Highway 28 often remains open and primarily free of ice during the critical winter months (November - April). The River apparently contains sufficient submersed vegetation to maintain a wintering population of swans. The exact wintering

carrying capacity is undetermined at this point. It should be noted that the winter area for swans also supports a trophy trout fishery. The primary drawbacks associated with this wintering are: 1) there is disturbance by duck hunters and fisherman year round (6 swans have been shot), 2) contamination by lead split shot used in fishing is a concern (no documented cases, although a cygnet was killed in 2000 because a fish hook was stuck in its bill) and 3), the area is designated a trophy trout fishery.

Cokeville Meadows NWR is also adjacent to the historic breeding range. This refuge is new and currently 7,677 acres are under Service management. There is no staff or funding currently allocated to the Refuge and therefore development of the Refuge has remained at a minimum. Eventually, this Refuge holds great potential swan breeding and migration habitat. There are no records of swans nesting or migrating through the Refuge. Current land use is primarily agriculture crops, hay production, and grazing. Creation of future wetland impoundments along the Bear River should provide excellent waterfowl habitat. This refuge will likely not provide wintering habitat due to freeze up of the Bear River. Eventual releases may be suitable at this Refuge to establish a breeding population.

Current Management Summary:

Starting in 1992 trumpeter swans were released on Seedskafee NWR from Red Rock Lakes NWR, Harriman State Park, and the Wyoming Wetland Society Trumpeter Swan Fund. Trumpeter swans have nested on Seedskafee since 1997 and wintered on the refuge since 1992. It is believed that the same pair has nested in the past four years and one of the birds is from RRL (the female of the pair has a leucycstic foot).

Wetland impoundments are filled as early as possible in the spring and water levels held stable during the nesting season to prevent flooding of swan nests. So far the only unit with a nest is the Hawley Unit and refuge staff are careful to maintain adequate water to this impoundment during the nesting season. The nest site is within cattails and bullrush. Predator trapping is conducted in the spring for raccoons, foxes, and skunks.

There are no swan management activities currently conducted at Cokeville Meadows NWR .

Seedskafee/ Cokeville Meadows NWR Swan Management Goals:

1. Provide optimum wetland habitat in the Hawley and Hamp Units prior to nest initiation to encourage nesting of one to three pairs of trumpeter swans.
2. Maintain stable water levels in wetland units where nests are initiated to ensure swan nests are not flooded.
3. Minimize disturbance to nesting and wintering sites. This may involve closures of certain sections of the Refuge during various times of the year.
4. Educate the public about trumpeter swans and swan management

5. Work with the BOR and Wyoming Game and Fish Department to maintain river flows which provide open water areas during winter to provide wintering habitat for swans.
6. Initiate planning for management of wetlands and public use at Cokeville Meadows NWR.

Swan Management Plans/Proposals Seedskadee NWR-Cokeville Meadows NWR (southwest Wyoming):

1. At Seedskadee NWR the future emphasis is on improving and maintaining the current wetland impoundments. Invasive species, like pepperweed, have invaded all major impoundments and need annual control. To maintain a good water/vegetation ratio in wetland impoundments management needs to control cattail and bullrush stands via mowing and draw downs. The infrastructure of dikes in several of the wetland units needs to be improved by adding additional fill material and water control structures. Predator management should continue annually to help minimize predation of nests. Additional outreach material should be supplied to educate the public about the Service's trumpeter swan management program. Finally, a greater understanding of the winter carrying capacity at the Refuge, and the migratory patterns of swans utilizing the Refuge, would help to fill some of the overall information gaps about trumpeter swan management in the west.
2. Management at Cokeville Meadows NWR simply needs to be planned, initiated, and eventually implemented on the ground.

Specific project proposals include:

- a. Develop brochure highlighting RMP management program that informs the public about the overall strategy for the RMP and specifically addresses the strategies implemented in Wyoming to assist with the swan recovery program. Step down this message to informational signs that will be strategically posted where swans are currently nesting.
Cost: \$20 K
- b. Monitor winter populations of swans from Fontenelle Dam south on all open water areas to assist in the development of winter closed zones.
Cost: \$13 K (2 years)
- c. Evaluate the availability of winter forage for trumpeter swans below the Fontenelle Dam.
Cost: \$40 K for three years
- d. Conduct a predator control program designed to minimize nest depredation.
Cost: \$2 K per year
- e. Implement the Integrated Pest Management plan that targets habitat that is overrun by pepperweed on Seedskadee and Cokeville Meadows NWR's.
Cost: \$10 K/refuge/year - until populations are controlled.
- f. Plan and implement wetland restoration projects on Cokeville Meadows NWR.

Cost: \$65 K annually

- g. Conduct radio-telemetry on swans breeding and wintering on the Refuge to determine where birds disperse to. This should be conducted in connection with other Refuge efforts.
Cost: \$40 K
- h. Rehabilitate Hawley wetland impoundment - improve dikes and water control structures.
Cost: \$ 60 K

17. Stillwater NWR Complex Nevada)

Habitat Suitability:

Stillwater NWR is not within the historic breeding range and is irregularly used during migration by trumpeter swans. The refuge is used by large numbers of migrating tundra swans both spring and fall. It is assumed that habitat adequate for tundra swans would be suitable for trumpeter swans since both species share habitat elsewhere during migration.

Current Management Summary:

Current management is to provide a natural range of habitats for all wetland species. This would include any trumpeter swans that use the refuge.

Swan Management Goals:

There are no specific goals for trumpeter or tundra swans at Stillwater NWR. Refuge goals are to maintain 14,000 acres of wetlands for wetland species, which would include both swan species. The refuge aims to mimic natural hydrological and other ecological processes in wetland management.

Swan Management Plans/Proposals:

Continue monitoring swan populations at Stillwater NWR. No projects are proposed specifically for trumpeter swans at this time.

18. Turnbull NWR:

Habitat Suitability:

Turnbull NWR is a 15,628 acre refuge comprised of 1700 acres of semi-permanent and permanent wetlands suitable for swan maintenance and production. The absence of rough fish such as carp and exotic aquatic weeds such as purple loosestrife results in high aquatic plant productivity in all wetlands. The presence of several natural and man-made islands provide potential nest locations. Some water quality issues with nutrient loading and eutrophication have been identified for some of the refuge watersheds. Under the Site Suitability Checklist guidelines, Turnbull NWR meets the criteria established for trumpeter swan production and migration (spring and fall) habitat. Based on past production of the restoration flock and present habitat conditions, a high potential exist

for trumpeter swan production with the reestablishment of a breeding population, migrational use, and spring augmentation at this refuge.

Current Management Summary:

The refuge maintains one adult male trumpeter swan during the ice free months. This swan is all that remains of the restoration flock that dwindled following the cessation of pond aeration and supplemental feeding. Over the past ten years one or two unmarked trumpeter swans have been observed in the spring and fall of most years. A family group was observed in the fall of 2000. One female that arrived in 1995 established a pair bond with the male and remained with him for over two years. No nesting was documented. The female has not been seen since the winter of 1998. Current wetland management focuses on the maintenance of adequate emergent marsh and aquatic plant beds in the 22 wetlands with water management capability to meet habitat objectives for species requiring emergent vegetation and productive open, aquatic bed habitat.

Swan Management Goals:

No specific goals have been established for trumpeter swans. Habitat goals and objectives were established for refuge wetlands to meet the reproductive and foraging needs of emergent and aquatic bed breeding and foraging guilds. If these goals and objectives are met, refuge wetlands will provide production and maintenance habitat for trumpeter swans.

Wetland Goals and Objectives:

Goal#1. Provide habitat conditions essential to the conservation of migratory birds and other wildlife within a variety of wetland complexes.

Objective 1A. Manage the 22 refuge wetlands with water control capability at a level that maintains between 500 and 750 acres of permanent open water annually to support the water surface breeding guild.

Objective 1B. Establish an annual operating level for the 22 managed wetlands that maintains an emergent plant strata that covers between 10% and 30% of each wetland basin to support the emergent stratum breeding and foraging guilds. Fifty percent of this zone should have a width of greater than 100 feet.

Objective 1C. Manage water annually to maintain water depths of at least 18 inches in the emergent plant zone of managed wetlands from April 1 through July 30 for nesting birds in the emergent strata breeding guild.

Goal#2. Protect and restore water quality and quantity sufficient to maintain native wetland flora and fauna.

Objective 2A. By 1999, review the status of current adjudicated water rights and all claims for water rights and update to coincide with current water management objectives.

Objective 2B. Annually monitor wetland recharge and water losses for the 22 managed wetlands to quantify water usage and the status of local groundwater resources.

Objective 2C. Restore and maintain the natural water yield of refuge watersheds through restoration of open forest conditions and deciduous riparian habitats within annual forest treatment areas.

Objective 2D. By 2000, identify properties adjacent to the refuge that contain large portions of the four major drainage systems that enter the refuge and their watersheds, and coordinate with federal, state, and local agencies to identify and reduce non-point sources of pollution to protect water quantity.

Swan Management Plans/Proposals:

Turnbull NWR has demonstrated in the past that it can provide excellent production and spring and fall maintenance habitat for trumpeter swans. It is possible that through relocation and augmentation efforts the refuge may again host breeding swans and migrant birds. Wintering habitat is, however, limited in this area and migration of breeding birds is imperative as demonstrated by the loss of the restoration flock after 1976. The only plans or proposals the refuge has are for the improved management of refuge wetlands and acquisition and restoration of wetlands in the channeled scabland region adjacent to the refuge. The feasibility of reestablishing a breeding population at Turnbull needs to be studied and proposals developed.

Swan Management Proposals, Duration and Funding Estimates

- 1) Evaluate the possibility of reestablishing a breeding population of trumpeter swans at the refuge, develop a proposal and identify project. Costs: \$5K.
- 2) Developed contour mapping of 22 managed refuge wetlands and establish piezometer wells and water level recorders at each structure to allow monitoring of water depths through out wetland basin and refinement of water level management to meet habitat objectives. Costs \$165K RONS 98004 and \$30K RONS 97007
- 3) Study nutrient enrichment of refuge wetlands and determine potential sources of nutrient from off-refuge sources. Costs \$100K

VII. Service Habitat Management and Funding Priorities:

The following represents the general priorities recommended by the Trumpeter Swan Working Group to the Service as the implementation strategy for management of the RMP of trumpeter swans. The Working Group in collaboration with State and private partners would be responsible for selecting the specific priority projects by area. The development of funding packages needed to implement these swan management and research projects would be developed also through this process. The group would then submit project packages to Refuge Supervisors and Migratory Bird Coordinators for competition for funds during the annual appropriation processes. The Regional Refuge Supervisors, Migratory Bird Coordinators, and Flyway Representatives will

have input in the final selection of projects and will help develop funding packages needed to implement these projects. They will also help the Trumpeter Swan Working Group to coordinate among the many individual refuge projects and they will take the lead in coordinating Service planning with other Tribal, Federal, and State agencies, and non-governmental organizations.

Several general concepts guided the prioritization. Coordinated efforts are better than a series of individual efforts. Monitoring, and marking, especially satellite tracking needs to be coordinated to avoid duplication and for more efficient use of time and funds. The Tri-State flock should also be the core of Refuge efforts. Expansion should take place from the core outward, always maintaining connectivity with established breeding flocks and eventually connecting with other breeding flocks nearer the core of the trumpeters historic range. For example expansion should occur eastward towards Lacreek NWR and northward toward the Canadian flock of the RMP. Expansion sites where trumpeter swans will be forced to migrate south and/or where they are not likely to migrate to the Island Park area of Idaho will be prioritized higher than sites where these conditions are unlikely to be met.

Finally, there are questions that cannot be answered only on refuges, but should be answered before trumpeter swan restoration continues. The two major issues are, a review of trumpeter swan genetics among the various flocks, and the interrelationships of all factors on the wintering areas on the Henry's Fork River. Because of the importance of these issues, they are proposed in this document even though they will entail efforts beyond refuge boundaries.

Management and Research Priorities:

A. Continue to maintain the Tri-State trumpeter swan flock within United States segment of the RMP as a high management and research priority. This historically and biologically important trumpeter swan population centers around the Centennial Valley/Red Rock Lakes NWR (southwest Montana), Yellowstone National Park, the Targhee National Forest, the Jackson Valley/ Grand Teton National Park, and the National Elk Refuge. Its critical that proper funding resources be allocated for priority trumpeter swan management projects in this Tri-State area. These would include: wetland restoration, swan augmentation efforts, research needs that might include: concerns about chronic lead poisoning in swans, cygnet mortality problems, swan genetic health, better habitat criteria for swans, what type of coordinated marking programs work best, and migrational information (satellite tracking telemetry) to hopefully answer questions that have persisted for many decades.

Objective: To improve the overall population health and numbers of the Tri-State flock, and thereby, the overall reproductive and migrational viability of the RMP.

B. Establish additional nesting populations of trumpeter swans in the more southern regions of the RMP, such as eastern/southeastern Idaho (Grays Lake NWR, Camas NWR, Minidoka NWR, and Bear Lake NWR/Oxford Slough WPA), western/southwestern Wyoming (the Afton Valley, Seedskaadee NWR, the Green River drainage, Cokeville Meadows NWR along the upper Bear River, and possibly central Wyoming). Management projects that encourage natural pioneering into restored swan habitat from northern swans and selected augmentation releases in suitable priority wetland habitat would be used. Closely coordinated marking and tracking protocols

should be established, with the objective that researchers try to find out where southern trumpeters migrate to, which pathways do they follow, what are their seasonal movements, how does this effect Utah and Nevada tundra swan hunting programs? Augmentation efforts would require swan propagation facility certification, support and funding. As part of this southern effort, more southern refuges identified as winter homes for trumpeters would need to emphasize where possible, wetland and aquatic food management for swans.

Objective: To improve the overall southern breeding densities of Rocky Mountain trumpeter swans within their historic breeding range, and to encourage these swans along with their northern segments to move to more southern habitats for wintering.

C. The Service should continue or renew its efforts to restore trumpeter swan breeding numbers to the wetland units within the National Bison Range, the Flathead Valley, the northern Idaho panhandle that includes Kootenai NWR, and possibly northeast Washington wetlands at Turnbull NWR, and any other suitable breeding wetland habitats, private or public, that would provide for nesting pairs of trumpeter swans closer to the Canadian border. This would also include setting up new swan management partnerships (and maintaining existing ones) with the tribal entities in this area. RMP swan management efforts should also try to move south into the Bitterroot Valley (Lee Metcalf NWR) and other portions of southwest Montana and central Idaho, in an attempt to establish some connectivity with the more southern nesting trumpeters and the Tri-State flock. These efforts would involve a variety of funded projects that would include: wetland habitat restoration, wetland habitat maintenance, spring swan augmentation at select sites, important research needs, proper marking/tracking, and fall/winter habitat maintenance for swans where applicable.

Objective: To expand trumpeter swan breeding numbers north, closer to the expanding Canadian nesting segment of the RMP in Alberta and south to the tri-state flock.. This would improved overall RMP continuity with the United States and Canadian segments, and hopefully encourage more breeding and migrational interchange.

D. Coordinate marking and monitoring of trumpeter swans.

Objective: Delineate a process through which priorities of how to mark swans and where to best use limited research dollars. Designate a person to act as the clearinghouse with the objective of consolidating and analyzing data collected. First step should be hiring a graduate student to analysis existing neck collar data.

E. Analyze the genetics among the various flocks

Objective: Review the genetic status of trumpeter swans and recommend where funds should be spent to clearly define this issue.

F. Study the interrelationships of all the factors influencing trumpeter swan use of the Henry's Fork of the Snake River.

e. Turnbull NWR	30 K
SUBTOTAL	\$165K

4. Conduct three aerial surveys throughout the breeding season at Red Rock Lakes NWR to monitor breeding success and distribution. Cost: \$15K

TOTAL: \$660K

Wetland Enhancement/Rehabilitation

Wetland enhancement and rehabilitation projects identified in this report are presented to stimulate a discussion about priorities during the facilitated scoping session planned for May 2000 by the Pacific Flyway Council. We recommend that these projects once prioritized and complemented by projects on State and private land, be packaged as a NAWCA project by the Intermountain West Joint Venture Office.

1. Continue Phase 3 of the Bear Lake NWR wetland enhancement project by constructing another carp free impoundment totally 2000 acres. Cost: \$750K.
2. Move well on Camas NWR to restore the Sandhole Lake Wetland Complex. Cost: \$200K
3. Construct nesting islands at Minidoka NWR in preparation for transplants of captive reared swans. Cost: \$20K
4. Install carp excluding screens on water control structures at Pablo NWR. Cost: \$150K
5. Construct nesting platforms at Dahl Lake and McGregor Meadows on the National Bison Range Complex in preparation for transplants of captive reared swans. Cost: \$12K.
6. Repair non functioning water control structures in the mitigation ponds at National Elk Refuge. Cost: \$40K.
7. Rehabilitate Spring Ponds at Ruby Lake NWR. Cost: \$75K.
8. Restore wetlands at Cokeville Meadows in preparation for transplants of captive reared swans. Cost: \$65K.
9. Enhance Hawley wetland complex at Seedskadee NWR. Cost: \$60K

TOTAL of Identified Wetland Projects: \$1,372K

Translocation/Augmentation Projects

1. Salvage 30 eggs from Trumpeter Swan nests at Grays Lake for propagation at the Wyoming Captive Rearing Facility for release at priority locations in Idaho.
Cost: Propagation Fee \$15K

Satellite Transmitters	\$20K
BioTech-Monitoring	\$30K
SUBTOTAL	\$65K

2. Restore vigor of the Ruby Lake NWR flock by importing eggs from the captive rearing facility into nests of resident swans. Cost: \$25K.
3. Study the feasibility of restoring swans at Turnbull NWR. Cost: \$5K.
4. Develop protocol for emergency releases of swans salvaged from Grays Lake NWR during drought years. Cost: \$5K.

TOTAL \$100K

Research

1. Convene a group of scientists with expertise in hydrology, fish, swans, fishing birds, aquatic plants, and ice formation in rivers to lay out a comprehensive research project that would study and explain these interrelationships and how they relate to trumpeter swan management.
Cost: \$25K
2. Convene a population genetic specialists panel to review existing data and identify data gaps that should be addressed with research dollars, with the goal of determining whether species differentiation exists between RMP breeding segments through DNA analysis.
Cost: \$25K
3. Evaluate winter forage carrying capacity below Fontenelle Dam on Seedskadee NWR.
Cost: \$40K
4. Study nutrient loading of wetlands on Turnbull NWR. Cost: \$100K.
5. Initiate lead poisoning studies throughout the wintering area to determine where exposure is occurring and if sub lethal levels of lead are impacting swan health. Cost: \$200K.
6. Continue Grays Lake NWR water management study to monitor the response of swans to proposed water level changes. Cost: \$100K.
7. Initiate a predator study to determine impacts on nesting success at Ruby Lake NWR.
\$25K.

TOTAL: \$515K

Land Protection

1. Resolve lakebed ownership issue at Grays Lake NWR and purchase easements of fee title warranty deeds from willing sellers. Cost: \$5 million from Land and Water Conservation Fund to match \$5 million spending authority already in place and managed by the BIA.
2. Increase law enforcement at Pablo NWR to reduce disturbance and mortalities. Cost: \$30K
3. Maintain seasonal closures on nesting areas within Red Rock Lakes NWR with increased law enforcement. Cost: \$10K.

TOTAL: \$5,040K

Refuge Operations Projects

1. Bury powerlines that have been associated with swan mortalities at National Elk Refuge and Pablo NWR. Cost: \$130K.
2. Initiate lead sinker exchange program on the fishing program at Ruby Lake NWR. Cost: \$5K.
3. Develop educational brochure on the trumpeter swan issue at Seedskadee NWR to reduce mortalities. Cost: \$20K.
4. Initiate predator control to improve nesting success at Seedskadee NWR. Cost: \$2K.
5. Increase pepperweed control efforts at Seedskadee NWR. Cost: \$10K.
6. Initiate water management study to maximize values of wetlands found at Turnbull NWR. Cost: \$165K.
7. Increase base budget at Camas NWR to maintain water pumping capability. Cost: \$70K.

TOTAL: \$402K

Equipment

1. Repair "Cookie Cutter" used at National Elk Refuge to maintain openings in wetlands used by swans. Cost: \$6K.
2. Purchase a hydraulic excavator for use on wetlands throughout the Tri State Area. Cost: \$160K.

TOTAL: \$166K

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APPENDIX 1. BREEDING AND WINTERING RANGE MAPS

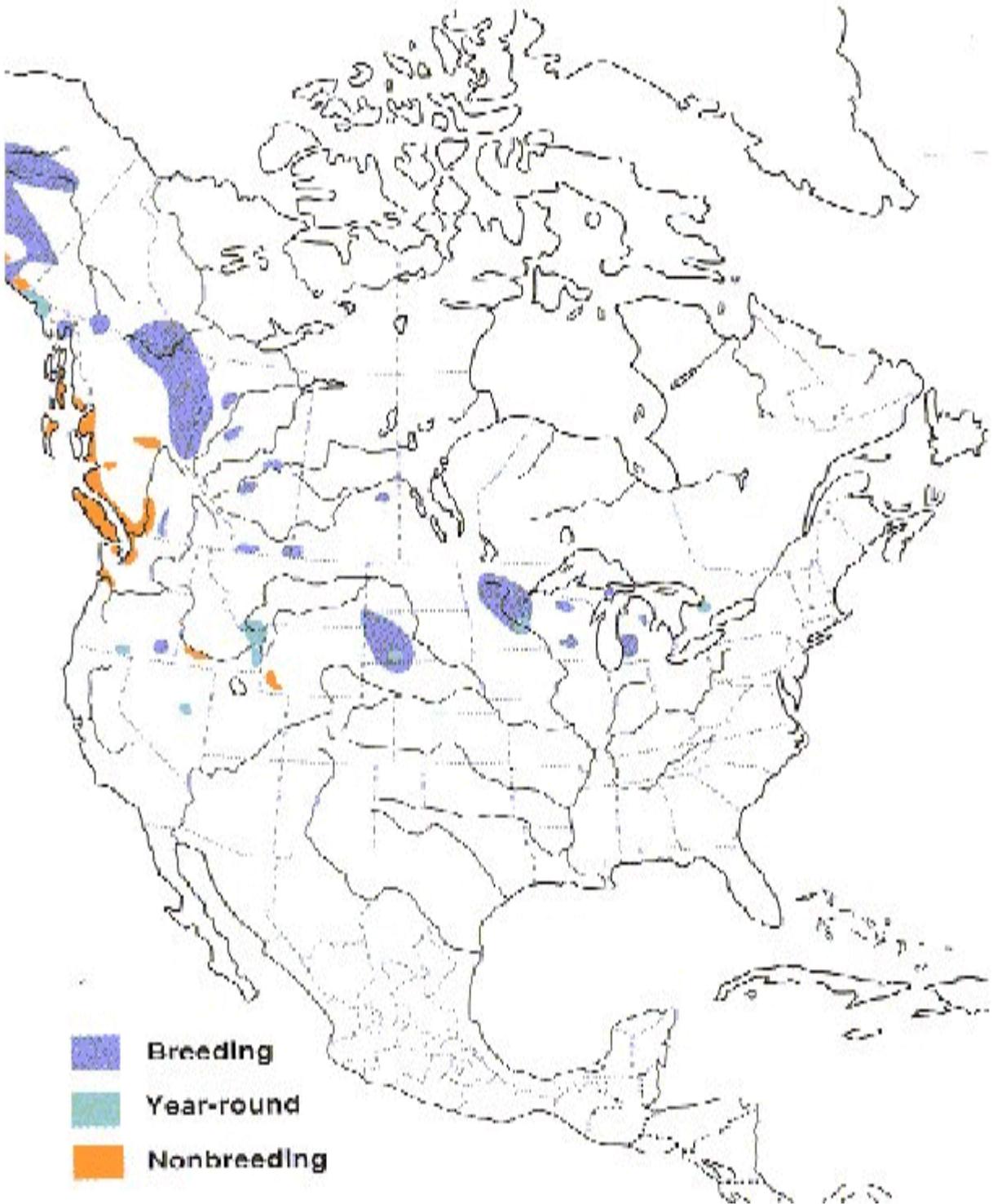


Figure 2. Distribution of the Trumpeter Swan in North America. Alaskan and Canadian flocks are mostly migratory, most U.S. flocks generally sedentary or move only short distances (Mitchell 1994).

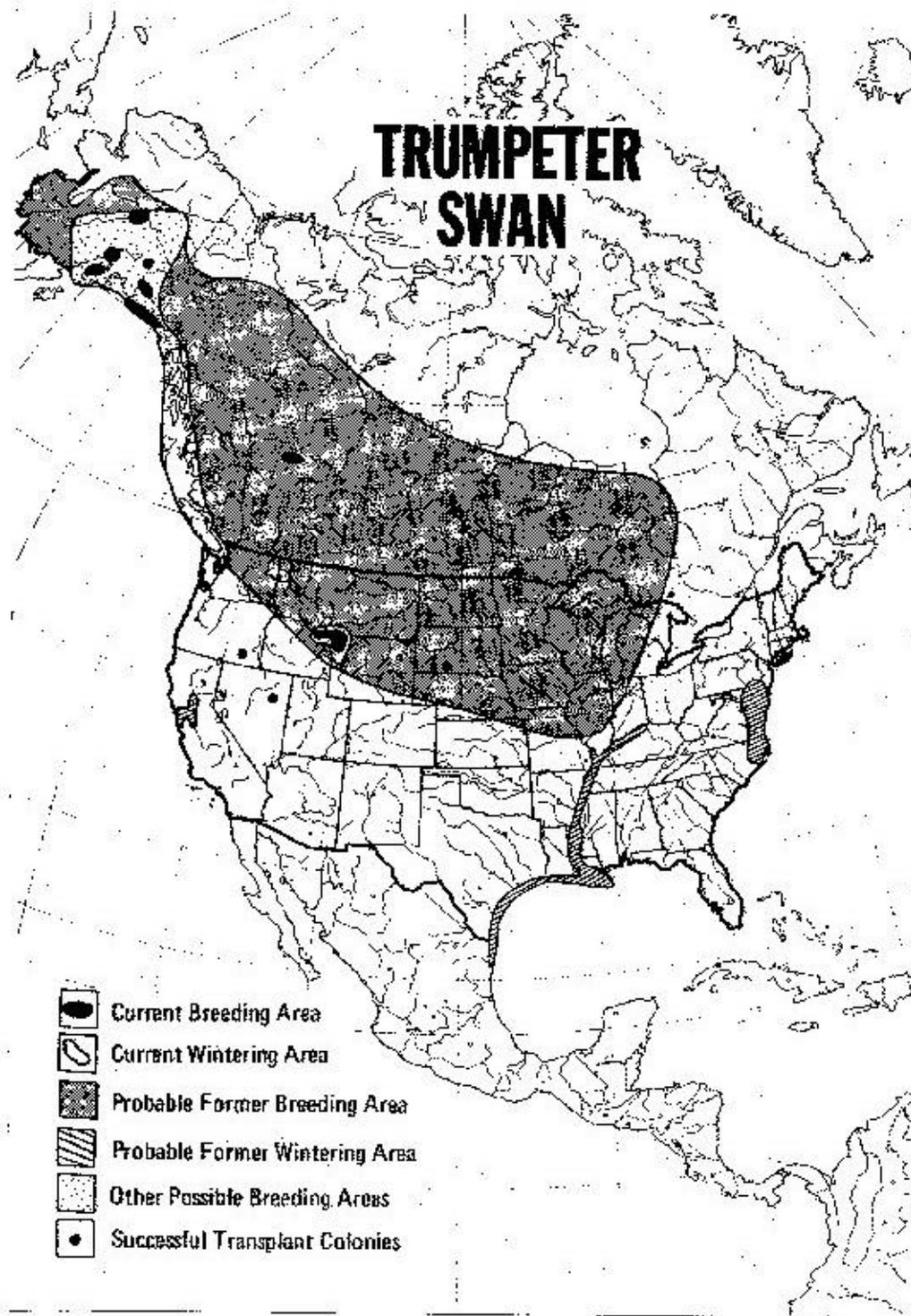


Figure 3. Trumpeter Swan current and historic breeding and wintering range as denoted by Bellrose 1976.

APPENDIX 2. SUITABILITY CHECKLISTS FOR MANAGEMENT ACTIONS

SUMMER BREEDING RANGE

The following questions about summer breeding habitat can be answered by “yes” or “no” responses.

If the response to question 5.1.1 is “no”, the site will not be considered as a candidate site for restoration of nesting trumpeter swans or for any management action specifically targeted to benefit nesting trumpeter swans. If the answer is “yes” then proceed to question 5.1.2.

If the response to any question in 5.1.2 is “no,” the site will not be considered for trumpeter swan releases, but would be considered for habitat management actions to correct any problems. Once these problems are corrected, the site would be re-evaluated and could be considered for trumpeter swan releases. At this point if the habitat is suitable, the site manager has the option of letting breeding trumpeter swan expand into the area on their own or actively transplanting birds into the site using approved protocols and with proper permits.

If transplanting is the option chosen proceed to step 5.1.3. For trumpeter swan releases the criteria in 5.1.1 and 5.1.2 represent minimum conditions that must be met. Other factors in 5.1.3 should be considered before releasing trumpeter swans. These factors could also be used to prioritize releases among competing sites.

5.1.1 Breeding Range

- a. Is the site within historical breeding range of trumpeter swans as shown by Banko (1960) and Bellrose (1976), or is adjacent to or is a site where trumpeter swans currently nest?

5.1.2 Breeding Habitat

- a. Are there marsh complexes of suitable size for breeding territories (high interspersion best; irregular shoreline best; minimum territory size about 70 acres - larger is preferable; site should have space for several territories)?
- b. Does the marsh complex include adequate emergent vegetation (escape cover; material for nest construction; substrate for invertebrates)?
- c. Does the marsh complex include adequate submergent vegetation (for food and for substrate for invertebrates; tuberous species best; < 4 feet deep; preferably soft substrate)?
- d. Does the marsh complex include adequate open water (minimum open water surface about 100 yards to allow room for take off)?
- e. Do suitable nest sites exist (muskrat mounds, beaver lodges, small islands, etc; multiple nest sites per territory best)? These sites will also be used for roosting.
- f. In normal years is water management capability suitable to prevent nest flooding or drying out of the marsh before cygnets can fledge?
- g. Are nesting swans protected from disturbance? Some disturbance may be acceptable if confined and predictable e.g. fisherman allowed on a dike, or tourists on a roadside pullout.

h. Is the site free of unacceptable mortality factors, such as lead poisoning, power lines, heavy parasite loads, heavy predation, etc?

5.1.3 Releases into Breeding Range

- a. Is public support favorable, or at least neutral?
- b. Is this a priority release site identified in this plan or other plan?
- c. Are there partners in the project?
- d. Is there funding for the releases and follow-up monitoring?
- e. Are the released birds likely to establish or use “new” migration routes or wintering areas, and winter outside the Island Park Area?
- f. Are there nesting trumpeter swans at an adjacent location?

MIGRATION/WINTER RANGE

Because winter relocations have not shown much success in establishing new migration routes or wintering areas, management actions for migration and winter areas will focus primarily on habitat management and hazing. The following questions about migration and winter habitat can be answered by “yes” or “no” responses.

If the response to questions in 5.2.1 are “no”, the site will not be considered as a candidate site for management action specifically targeted to benefit migrating and wintering trumpeter swans.

If the answer is “yes” proceed to step 5.2.2 to evaluate wintering and migration habitat.

Responses to these questions would focus subsequent habitat management actions on a particular site. If it is thought that there are too many swans for the available habitat on a given site proceed to step 5.2.3. If all answers under step 5.2.3 are “yes” hazing could be considered.

5.2.1 Migration and Winter Range

- a. Do trumpeter swans presently use the area during migration or winter in most years?
- b. Is the site an area that trumpeter swans could realistically be expected to use during migration and winter in the next 5-10 years?

5.2.2 Winter and Migration Habitat

- a. In normal years is there sufficient area of ice-free water during the period when swans are likely to be present (minimum width of stream about 50 feet; at least 300 feet of open water for take off; about 75% of surface area open)?
- b. Is the water shallow enough for trumpeter swans to feed (less than 4 feet deep)?
- c. If the water is flowing, is the current slow enough for swans to feed (less than 15-20 feet per second)?
- d. Is there sufficient submergent vegetation, including tubers, and other naturally occurring foods for forage for the swans when they are present (substrate should be soft)?
- e. Are there sufficient roosting sites (gravel bars; ice shelves; open snow fields; slope of bank or roosting site no more than 1:2)?
- f. Are banks free of tree and shrub cover?
- g. Are the feeding areas, roosting areas and travel lanes free of disturbance from boating, fishing, hunting, poaching, predation, snowmobiling, etc?

h. Are mortality factors, such as lead poisoning, power lines, contaminants, hunting/poaching, disease, etc, on the area at an acceptable level?

5.2.3 Hazing

- a. Are trumpeter swans causing resource damage (i.e. submergent vegetation, fisheries, etc.) on migration or wintering areas?
- b. Can resource damage be reduced or eliminated by hazing swans?
- c. Can swans be displaced from the area in question without undue negative effects on the swans?
- d. Is public support for hazing favorable, or at least neutral?
- e. Are there partners for hazing projects?
- f. Is there adequate funding to effectively displace the swans and for follow-up monitoring?
- g. Are there seasonal constraints on when swans should be hazed?

NOTE: These criteria are based on the available knowledge and information at the time. As new information becomes available these criteria can be improved. Printed sources include the following: Banko 1960, Bellrose 1976, Palmer 1976, Lockman et al 1987, and Mitchell 1994. Bellrose (1976), Palmer (1976) and Mitchell (1994) are primarily summarizations of published and unpublished work on the trumpeter swan. While these sources are cited here, the work behind them comes from a large number of authors.

Evaluation of each site based on these criteria will require some qualitative judgement from site managers. As criteria improve the site evaluations could become more objective. However, some things will never be wholly objective or predictable. It is not possible to predict new areas where trumpeter swans might migrate or winter with great precision.

When evaluating an area the site manager should provide more than just “yes” or “no” answers where possible, to give reviewers a better understanding of the area. For suggested format see the examples below:

Question	Answer	Details
5.1.2f	NO	In 3 out of 5 years the marsh dries up in late August before cygnets are fledged.
5.2.2a	YES	2000 acres of water (or 12 miles of stream) remain open all winter
5.2.3		Not applicable

A blank form is printed on the following page.

**SUITABILITY CHECKLISTS FOR MANAGEMENT ACTIONS
FOR ROCKY MOUNTAIN POPULATION OF TRUMPETER SWANS**

SITE: _____

NAME: _____
of evaluator

DATE: _____

Question	Answer	Details
5.1.1a		
5.1.2a		
5.1.2b		
5.1.2c		
5.1.2d		
5.1.2e		
5.1.2f		
5.1.2g		
5.1.2h		
5.1.3a		
5.1.3b		
5.1.3c		
5.1.3d		
5.1.3e		
5.1.3f		
5.2.1a		
5.2.1b		
5.2.2a		
5.2.2b		
5.2.2c		

5.2.2d		
5.2.2e		
5.2.2f		
5.2.2g		
5.2.2h		
5.2.3a		
5.2.3b		
5.2.3c		
5.2.3d		
5.2.3e		
5.2.3f		
5.2.3g		

APPENDIX 3. AUGMENTATION AND EMERGENCY RELEASE GUIDELINES:

SWAN AUGMENTATION:

Augmentation is defined as the release of sub-adult (1-3 year old) swans from an approved propagation facility into potential trumpeter swan breeding habitat that meets established habitat and breeding range suitability criteria as delineated in Appendix 2. These propagated swans would come primarily from collected eggs or in some cases cygnets taken from the wild. Yearling swans will be the preferred age class for release to reduce imprinting on the propagation facilities and improve chances for success in new breeding habitat.

Needs Statement:

Within trumpeter swan historic breeding habitat there is an important need to use augmentation programs to help re-establish swans more quickly into those areas that may now or in the near future support new nesting pairs. Augmentation is a valuable management tool in support of natural range expansion of the trumpeter swan. This technique can quickly help increase localized swan nesting densities in priority habitat areas. Augmentation efforts using propagated swans from the entire RMP (including possibly Canada) will promote genetic diversity and population health. This is an important key to the success and reproductive viability of the RMP. Augmentation efforts would primarily use sub-adult trumpeter swans hatched from selected egg clutches and propagated for one year at an approved facility. These young swans would then be released at the optimum time for maximum imprinting the following spring in priority wetland habitats that meet the suitability and augmentation guidelines set forth in this management plan.

GUIDELINES:

1) Augmentation Planning: An Augmentation Plan would be required of each refuge approved for a swan release effort. This plan would be relatively short and include the following: discussion of the rationale and goals to augment swans at this site, delineate procedures, egg/cygnets collection sources, identify propagation facilities, site suitability as an emergency release area, who will do the work, the release timing for that site and why, marking and monitoring follow up, longevity of the effort and funding proposals to get the work done. This draft Plan would then be reviewed and finalized by the Service Migratory Bird Office, the Service Regional Refuge Division (including other possibly impacted Regions/refuges), the respective states, other agencies—such as the U.S. Forest Service, and other involved groups such as the Trumpeter Swan Society). Every three years an approved augmentation effort would be reviewed and evaluated as to progress, success or failure, before proceeding with continued yearly efforts. Plan amendments could be added at any time that would improve the effort. These would have to be reviewed by all involved participants as well. The plan would also be put out for public comment and input prior to implementation.

2) Propagation facilities must be inspected and approved by the Service and the respective state natural resource agency. The facility personnel must have sufficient biological expertise to incubate and hatch swan eggs and rear cygnets. The propagation facility must have sufficient size and wetland quality as it relates to raising and maintaining trumpeter swans, and afford adequate isolation from most human contact and disturbance. The facility must be able on its own or in concert with other approved facilities, be able to propagate trumpeter swans from eggs and cygnets in sufficient numbers to meet regional augmentation efforts on an annual basis.

3) Egg Selection for propagation:

a) In existing nesting territories within the RMP that have a history of frequent nest failure (failed to hatch a clutch over three consecutive years) or high cygnet loss, biologists would collect trumpeter swan eggs (or possibly young cygnets) from these sites every other year. This collection frequency would hopefully not discourage the swan pair from abandoning this territory.

b) Eggs should be collected over a fairly wide area if possible and not be too localized. Nesting swan pairs that frequently suffer from nest failure due to flooding, water loss, high predation, or human disturbance would have priority over failed nests with no apparent reasons. These nesting pairs may be indicative of inherent breeding weaknesses, disease, contaminants or genetic problems and should be avoided.

c) Egg collection and propagation from trumpeter swans within the Canadian segment of the RMP should be looked at as well. The high reproductive success of these swans is well known and would provide healthy breeding stock for U.S. augmentation efforts. Collection, transfer, and incubation of Canadian swan eggs would have to meet with individual provincial and state approvals as part of an Augmentation Plan for a particular release area.

4) Cygnet propagation:

a) Cygnets are not the preferred stock to use in propagation for yearling swan releases. The reason for this is that successfully hatched clutches resulting in family groups tied to specific habitat should be allowed to grow, fledge, and hopefully reach maturity, populating the localized area naturally.

b) However, in swan habitat of reoccurring high cygnet mortality there is the potential for cygnet use in propagation-augmentation efforts. Potential cygnet capture for propagation purposed would come from areas where over half of all of cygnets within a family group die each year or all cygnets within a family group die three years out of five or more.

5) Emergency release of cygnets from problem areas:

a) There will be situations when trumpeter swan family groups are threatened by environmental conditions where there will be an emergency need to save those birds that cannot fly. This would require the Service or respective states to capture threatened swans and release them into good quality habitat in pre-approved emergency release sites. Holding these older cygnets for propagation stock could be the first option here. If not needed for propagation, then they would be released immediately into selected release sites.

A prime example of this is the loss of late summer water at Grays Lake NWR, ID. On certain years, this can result in an almost complete drying of trumpeter swan family group use areas by fall. Capture and placement of these pre-fledged cygnets becomes a necessity. This usually occurs in September-October, and these cygnets are then released into area wetlands sites that have sufficient water, food and will stay open long enough for the cygnets to gain flight and be able to migrate when freeze-up occurs, usually in mid to late November.

b) Emergency release areas should meet the appropriate swan habitat maintenance guidelines as discussed in Appendix 2. They should not freeze over entirely until well into November, and several sites should be pre-approved for emergency releases within each state involved in RMP management.

6) Marking:

A marking protocol for identifying individual augmentation swans from a particular area will be developed by the Service Migratory Bird Office. This will probably entail using colored neck collars (number/letter coded) or palatial wing markers, metal leg bands, and some swans marked with satellite radio telemetry devices for tracking during migration.