

BIODIVERSITY
LEGAL
FOUNDATION

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Tel: 303-926-7606
E-mail: BLFROG@AOL.COM
Fax: 303-440-0434

Jamie Rappaport Clark, Director
U.S. Fish and Wildlife Service
U.S. Department of the Interior
18th and C Streets, NW
Washington, D.C. 20240

Re: Listing Petition Pursuant to the Endangered Species Act
(ESA)

Dear Director Clark:

Enclosed is our formal petition to list the Greater Yellowstone (Tri-state) breeding population of the trumpeter swan (Cyanus buccinator) as threatened or endangered pursuant to Section 4 of the Endangered Species Act (16 U.S.C. 1531 et seq.). This petition is filed under 5 U.S.C. 553(e) and 50 C.F.R. 424.14 (1990) which grants interested parties the right to petition for issuance of a rule from the Secretary of the Interior.

We understand that this petition action sets in motion a specific process placing definite response requirements on the U.S. Fish and Wildlife Service (Service) and very specific time constraints upon those responses.

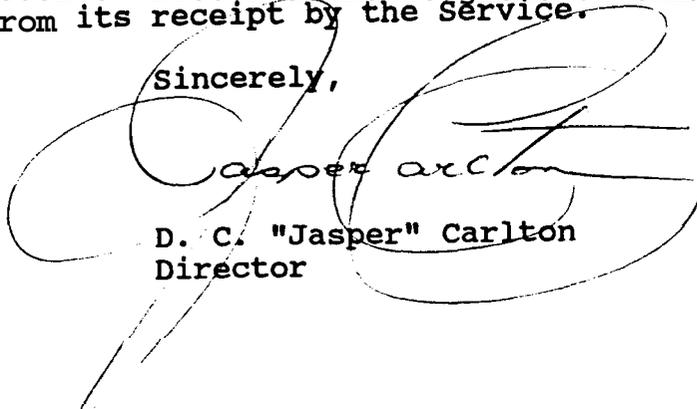
Due to the on-going severe and imminent cumulative threats to this rare and imperiled migratory bird population and its marginal winter habitat, we urge the Service to act expeditiously upon Petitioners' request. Please note that Petitioners have requested consideration for an emergency listing. Thank you for your consideration in this matter. We



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will expect to receive written acknowledgment of this petition within 30 days from its receipt by the Service.

Sincerely,

A large, stylized handwritten signature in black ink, appearing to read "D. C. 'Jasper' Carlton". The signature is written over the typed name and title below it.

D. C. "Jasper" Carlton
Director

copy: Eric R. Glitzenstein, Meyer and Glitzenstein

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Introduction

The Biodiversity Legal Foundation (BLF) and the Fund for Animals (FFA) hereby petition to list as "Threatened" or "Endangered" the Greater Yellowstone (Tri-state) breeding trumpeter swan (Cyanus buccinator) population. The trumpeter swan was originally a migratory species native to most or all of the contiguous United States and Canada but was nearly extinct by 1900 (Banko 1960, Gale et al. 1987, Rogers and Hammer 1998, Shea and Drewien 1999). The Biodiversity Legal Foundation and the Fund for Animals likewise petition for the designation of "critical habitat" under the Endangered Species Act (ESA) within a reasonable period of time following the listing, 16 U.S.C. § 1531-1543 (1982). This petition is filed under 5 U.S.C. § 553(e), 16 U.S.C. § 1533(b)(3)(A) and 50 C.F.R. § 424.19 (1987) which give interested persons the right to petition for issuance of a rule. The population of trumpeter swans proposed for ESA listing in this petition is found in the Greater Yellowstone region of the western U.S. (Montana, Idaho, Wyoming, and Utah) and constitutes the only breeding population that was not extirpated from the lower 48 states. It is generally referred to as the Tri-state (Greater Yellowstone) area population segment of the Rocky Mountain Population (RMP). For management purposes, in recent years the U.S. Fish and Wildlife Service (FWS) has lumped all nesting trumpeters in western Canada and the western lower 48

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states into what has been termed the Rocky Mountain Population (USFWS 2000). However, by reason of its geographic Separation from the Alaskan, western Canadian, Oregon and Nevada restoration flocks, and Interior breeding populations and by reason of the international boundaries separating it from the RMP/Canadian breeding population, the Greater Yellowstone breeding population may be classed as a Distinct Population Segment (DPS). In addition, marking studies in the U.S. and Canada, dating back to the 1940s, have failed to demonstrate any successful interbreeding between the U.S. and Canadian population segments of the RMP (Gale et al. 1987, Shea and Drewien 1999). The Greater Yellowstone breeding population is geographically and biologically distinct, has lost more than 30% of its adults in the past decades, and is in an imperiled situation.

The Tri-state (Greater Yellowstone) area population segment clearly qualifies as a DPS under the U.S. Fish and Wildlife Service's Distinct Vertebrate Population Segment Policy (61 FR 4722). The population is discrete since it is separated by physical, physiological, ecological, behavioral, or other factors. The Tri-state population is separated by 400+ miles from any other significant breeding groups. Trumpeters in the Tri-state area demonstrate a high degree of philopatry. The Service also evaluates discreteness based on a population being delimited by international boundaries (the

Canadian/U.S. border in this case) within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

There is no legal harvest in Canada, also no coherent policy for habitat protection; no annual population surveys are conducted (only once every five years). Trumpeters are classified as "vulnerable" in Alberta under the "Alberta Policy for the Management of Threatened Wildlife. The Alberta Wildlife website says that "without active management trumpeter swans could easily become threatened or endangered in Alberta."

Adding to its significance is the fact that the Tri-state nesting population has persisted in the high elevation (5,000-8,000) coniferous forests and wetlands of the Greater Yellowstone region, a region characterized by unique geothermal influences that are responsible for much of the very limited winter habitat.

Behaviorally, trumpeters demonstrate a high fidelity to natal area, extremely strong family bonds, and family traditions. Pair bonding is delayed until after the second year; therefore, the swan has already established high fidelity to its natal area in its yearling and second years by the time it starts selecting a mate. Marking has provided no evidence of successful interbreeding in the wild between Tri-

state and Canadian nesting populations, although they mingle in winter. Exact reasons for the reproductive separation are not known but likely relate to strong fidelity to natal area.

The Significance of the **Tri-state Population**
Is Emphasized in the Following
Documentation

Trumpeter swans[:] [c]urrently a species of special concern, the trumpeter swan was once considered in danger of extinction in North America (before the Endangered Species Act). In 1933, only 66 trumpeters were known in the United States; another remnant population existed in Alberta, Canada. The United States population in Yellowstone National Park and nearby high mountain valleys, under protection and the 1935 establishment of the Red Rock lakes National Wildlife Refuge (NWR), gave rise to what is known as the tristate (Idaho, Wyoming, Montana) subpopulation. Discovery of a substantial population (13,000) in Alaska and recovery of Canadian flocks have alleviated fears of extinction. However, the tristate subpopulation has historic and heritage values that make it one of the more important waterfowl breeding segments in the concept plan region. (Ratti and Kadlec, n.d. available, p. 19)

The RMP and IP are composed of several subpopulations. The Tri-state Subpopulation of the RMP decreased 38% since 1990 to 364 swans (Table 2). Compared to results from the 5 previous surveys, the size of the Tri-state subpopulation in 1995 was approximately 33% lower than average (mean = 541), sd = 41) and was the smallest on record. Much of this decrease can be attributed to a 71% decline that has occurred since 1990 in Montana (Gomez 1995). Decreases in the Tri-state Subpopulation may be due to (1) removal and relocation of swans to other areas of the RMP; (2) reduced productivity of swans caused by the disruption of pair-bonds during relocation efforts; and (3) reduced productivity or survival of swans because of termination of artificial feeding during the winter (B. Reising, U.S. Fish and Wildlife Service, pers. commun.). (Caithamer 1996, p. 2)

Although U.S. trumpeters intermingled with Canadian trumpeters in winter, neckbanding in this study, as well as simultaneous marking of resident swans at RRL [Red Rock Lakes], revealed only 1 instance of possible

pairing[] and no evidence of successful interbreeding between the two groups. It is not known whether the isolating mechanism was the timing of pair formation, high fidelity to natal areas, or other factors. Despite disruption of family bonds by translocation and hazing, there was no evidence of Canadian subadults summering in the Tri-state area, or vice versa. Neckbanding also showed no evidence of intermixing between Tri-state flocks and flocks in Oregon or Nevada. Although exchange occurred among the U.S. flocks through translocations, once swans settled in Oregon and Nevada, they remained geographically isolated from other breeding groups. The isolation of the U.S. flocks, both from the Canadian flocks and from each other, reduces their long-term viability. (Shea and Drewien 1999, p. 33)

This leads us to consideration of the second major issue facing this population[:] The status of the tri-State breeding segment of the RMP. The cessation of winter feeding programs at Red Rocks Lake NWR was expected to have some adverse impacts on the RMP. Additionally, trapping and translocating swans during winter was also recognized to harbor considerable risk for those swans being moved, including those that breed in the tri-State area. Therefore, the decline observed in the number of trumpeter swans associated with the tri-State area was not unexpected. Trends since 1992[] suggest the population declined substantially (about 36%)[] and then has stabilized or has begun a slow recovery with the most recent fall inventory data suggesting that the number in the tri-State region is within 100 of the pre-1992 totals. The real issue is that a large-scale winter die-off might result in disproportionate losses and jeopardize the future existence of this segment. (Trost, Corneley, and Bortner 1999)

The RMP is divided into two breeding stocks. The resident swans in the Tristate have declined 28% in the last 10 years. The Interior Canada Sub-population has increased at an average rate of 17% per year over the last 10 years to 2,076 birds in 1995. Combined, these sub-populations probably number about 2,900 birds in 1997. In February 1989, a blizzard froze virtually all habitat in eastern Idaho resulting in the death of about 100 trumpeters (Shea 1992). Since then, winters have been mild and losses have been low. The winter habitat has been over-used by swans and is not in very good condition. A vigorous program of trapping and transplanting has been undertaken to relieve the problem of over-use of winter habitat and to try to establish new migratory traditions. The

Interior Canadian Sub-population could again suffer severe losses should there be a recurrence of the severe winter of 1988-1989. (Alvo 1997)

The Hayden party, while exploring the Snake River in northwestern Wyoming, reported the presence of many beaver ponds and of Trumpeter Swans (*Cygnus buccinator*) on the Snake River near Jackson Lake (Bennett 1998). Many early explorers did not report Trumpeter Swans elsewhere in Wyoming in the late 1800s, and only a remnant population existed in the Yellowstone region, as noted by Hayden in 1987 [sic]. This population of swans was labeled the Tristate population because it inhabited the area of northwestern Wyoming, eastern Idaho, and southern Montana. (Long and Stevenson 1997)

There were three ecologically distinct regions in the United States in which trumpeters could be said to have once been a more or less common breeding species in areas of suitable habitat. These regions were--(1) the Red Rock Lakes-Yellow&one-Jackson Hole region of southwestern Montana, northeastern Idaho, and northwestern Wyoming, (2) the Flathead Valley in western Montana, and (3) southern Minnesota and northern Iowa. (Banko 1960, p. 19)

The Tri-state breeding population is undoubtedly significant since it is the only remnant, indigenous, wild breeding population remaining in the contiguous (Lower) United States. Its historic biological value is well established. Considering its extremely low population level and the cumulative threats facing it, this population segment's conservation status must be considered as being threatened or endangered. And the loss of this discrete population would result in a significant gap in the range of the taxon.

Summary of Current Genetic Knowledge

The genetics of the Pacific Coast, Interior Canada (Grande Prairie), and Tri-state populations and restoration

flocks in the midwest have received some study (Barrett and Vyse 1982, Marsolais 1993, 1994, Pelizza 1999). However, past research has not attempted to quantify the extent of genetic differences between the populations. Past studies have found that all trumpeter populations exhibit relatively low heterozygosity, indicative of a species that has lost genetic diversity due to passing through a severe population bottleneck. The Pacific Coast Population showed greater heterozygosity (Marsolais 1993, 1994) and contained some alternate alleles (Barret and Vyse 1982, Pelizza 2000) compared to the interior Canada (Grande Prairie) and Tristate populations and is likely the most outbred and healthy of the surviving remnant populations (Marsolais 1993). Other observations from Marsolais (1994) are as follows:

The objective of this research was to determine whether the natural populations differed in their level of genetic variation and whether the captive flocks had less genetic variability than the natural populations.

In summary, both the natural and reintroduced populations of trumpeter swans exhibited high overall mean BSCs [band sharing coefficients] reflecting a low level of genetic variation throughout the species.

The overall mean BSC of a species may thus be used as a general indicator of the level of genetic variability within that species. The high overall mean BSCs found for unrelated trumpeter swans from natural and reintroduced populations thus reflect the low level of genetic variation in this species and suggest the species as a whole has gone through a population bottleneck.

However, the fact that the tristate and interior Canadian populations did not have significantly different mean BSCs, suggests that the tristate population is not less genetically variable than the interior Canadian

population. This is not to say however that genetic differences do not exist. One way of examining genetic differences is to determine the inter-population BSCs. This will be accomplished by either using the existing blots and comparing the molecular weights of bands from one blot to another by making new blots which contain individuals from each of the two populations.¹

Request for Emergency Listing
Consideration

Petitioners formally request that the U.S. Fish and Wildlife Service give emergency consideration to the listing of the U.S. Tri-state (Greater Yellow&one) breeding population of the trumpeter swan under the Endangered Species Act and assign this Distinct Population Segment of the species the highest priority for evaluation and listing.

This DPS is the only wild breeding population in the lower 48 states that escaped extinction at the turn of the 20th century. This Tri-state breeding population segment currently contains less than 70 breeding pairs and faces ongoing and immediate threats of such magnitude that it could be extirpated at any time.

The Tri-state breeding segment of the RMP is in serious jeopardy due to an extremely low population size, loss of learned migration routes to the south, low reproductive rates, diminished distribution, dependence upon

¹Although this part of the program was never carried out, Marsolais demonstrated that all of the trumpeter populations show low heterozygosity, probably from passing through a severe bottleneck; but she did not go on to investigate whether the populations differed from each other.

inadequate (marginal) winter and spring habitat, isolation from other trumpeter swan breeding populations, potentially high risk of mortality due to a severe winter, competition for habitat resources with an increasing number of Canadian trumpeters also wintering in the Tri-state area, recreational hunting, human disturbance at nesting sites, pesticides and other contaminants such as lead shot, and serious degradation of breeding and winter habitat. Cumulatively these threats put this ecologically significant DPS in extreme and imminent jeopardy. Petitioners also point out, and stress, the Service's own pending decision to allow legalized hunting of trumpeter swans as an additional reason to emergency list.

In addition, the Tri-state (Greater Yellowstone) area is experiencing extreme drought conditions which will, in all likelihood, result in greatly reduced flow rates in area rivers this winter. This establishes a very high risk and an imminent jeopardy situation for the Tri-state trumpeters in the event of a severely cold winter (or even one of average severity) that would freeze over already limited, marginal winter feeding areas. Fortunately, the region has experienced relatively mild winters over the past few years, but this could change at any time.

The severely adverse conditions facing the Tri-state population segment are well documented in this petition, in the Pacific Flyway plans, and in the Service's own files, and

collectively demonstrate such an imminent threat to this last remaining wild population in the contiguous United States that the routine listing process is not sufficient to prevent large losses and the possible extirpation of this population.

Additional Background Information

The trumpeter swan is the largest waterfowl in the world, with an average wingspan of 7-8 feet, while individuals weigh 22-32 pounds (U.S.D.A. Forest Service [hereafter "USFS"] 1995). This huge low-flying, rather slow, waterfowl with handsome white plumage, presents an attractive target. A large part of the species' decline is attributable to 175 years of commercial swan skin harvest across northern breeding areas (Banko 1960, Houston et al. 1997).

Outside of Alaska, the species was extirpated from almost all of its historic range by 1900. This represents a range reduction in excess of 99 percent. Approximately 200 trumpeters persisted in remnant flocks in western Canada and the Greater Yellowstone Area. The breeding population in the Greater Yellowstone (Tri-state) region is the only breeding population in the lower 48 states that escaped extinction. Beginning in about 1919, these swans provided the nucleus for efforts to restore the species in Canada and the lower 48 states (Banko 1960, Gale et al. 1987).

The USFS summarized trumpeter swan survival in the Greater Yellowstone area as follows:

[T]he Tri-state region was energetically marginal but possessed 2 crucial attributes: 1) human-caused mortality was low due to its inaccessibility in winter, and 2) geothermal activity created small pockets of ice-free habitat where a few swans could survive regardless of winter severity. Virtually all other Trumpeters that migrated to more southerly winter habitats where settlers were more numerous were destroyed. As those migrants were extirpated, their knowledge of other migration routes and wintering areas was lost to the population (Gale et al. 1987). (USFS 1995, pp. 5-6).

The RMP, which includes the Greater Yellowstone population, faces several serious threats in varying degrees. These threats are symptoms of a much broader underlying problem. During the decline to near extinction, the damage experienced by the population was much more pervasive than merely the severe reduction in numbers. Patterns of habitat use and migratory traditions were severed and have not yet been restored. As a result both the Canadian and Greater Yellowstone breeding populations have lost the use of the varied southerly winter and spring habitats essential to their long-term security and productivity. Almost the entire RMP remains dependent upon marginal wintering habitat in the Tri-state region, where risk of a large die-off is high during a severe winter (Gale et al. 1987, Pacific Flyway 1992, 1998).

During the past 30 years, the RMP/Canadian segment has expanded in numbers and nesting distribution (Shea and Drewien 1999, USFWS 2000a). As a result, in February 2000, the Tri-state region contained the highest concentration of wintering swans censused (approximately 3,440) (USFWS 2000b). Despite

the positive potential of increasing overall size and breeding distribution of the RMP, the population remains extremely vulnerable to severe losses due to its vastly diminished winter distribution (Pacific Flyway 1992, 1998).

USFWS Assistant Director Paul Schmidt publicly explained this vulnerability again in September 1999:

Growth of the migratory Canadian segment of the Rocky Mountain Population (RMP) has created a severe "bottleneck" in eastern Idaho, southwestern Montana, and western Wyoming as increasing numbers of trumpeters arrive from Canadian nesting areas to spend the winter with the U.S. segment of the population. At Harriman State Park on the Henry's Fork of the Snake River in eastern Idaho, which receives the greatest amount of swan use, the aquatic plants may no longer provide enough winter food to support the increasing flocks of swans, Canada Geese, and ducks. During recent mild winters hundreds of trumpeters have moved into other eastern Idaho sites--the Teton River, South Fork of the Snake River, and the lower Henry's Fork. When a severe winter strikes this region, mortality will likely be high among swans that attempt to remain at Harriman State Park and these other sites. Despite the promising increase in RMP trumpeters, until we restore their migrations and help them return to more suitable wintering areas, their recovery will remain questionable. (From speech presented at 17th Trumpeter Swan Society Conference, September 1999)

Thus, it will be shown in this petition that the RMP's current confinement to the Tri-state wintering area has grave implications for the survival of the Greater Yellowstone breeding population.

The trumpeter swan has been the object of much expressed concern from biologists and conservationists for a century; repeated efforts have been made to conserve the trumpeter swan without resorting to the ESA, in deference to

conflicting citizen interests. A current estimate of trumpeter numbers recorded in September 1999, before winter migration, indicates that there are only about 312 adults and 56 cygnet trumpeters in the Tri-state area. In addition, only 35 adults and 14 cygnets were recorded elsewhere in the western U.S. in disjunct restoration flocks in Oregon and Nevada. Only 77 nesting pairs could be found in the entire western U.S.; 67 of these were in the Greater Yellowstone area (USFWS 1999).

In past decades, the Tri-state population rose in numbers until the 1960s, followed by a decline during the 1970s and early 80s. There was an upswing in response to management changes at Red Rock Lake NWR in the late 1980s and a precipitous drop following termination of winter feeding and associated translocation in the early 1990s. The impression given in the literature is that at termination of feeding (winter of 1992/1993), the loss of trumpeters may have been considerably larger than expected and that cygnet recruitment and over-winter survival (even during recent mild winters) has been less than anticipated (USFWS 1999, USFWS 2000; Shea and Drewien 1999). Using the minimum objectives recommended by the Pacific Flyway Council (1998 Plan) of at least 480 adult and subadult swans in the Tri-state breeding segment by 2002, with at least 101 nesting pairs that winter predominantly outside the Tri-state area, it can be seen that

this goal has by no means been achieved. We note that while providing no biological justification, the 1998 RMP Plan has reduced the minimum objective for U.S. nesting pairs by 10% from the 145 designated in the 1992 Plan.

An overly optimistic view of the Greater Yellowstone trumpeter's prospects results from the casual and inexact use of the terms "flocks" and "populations" in USFWS and Flyway documents, such that all the western U.S. and Canadian trumpeters are referred to as one population for management purposes. At first inspection, this method of counting seems to corroborate a belief that the species has been effectively conserved in the U.S. However, closer examination will show that, with regard to the U.S. breeding population, the reported trumpeter numbers give rise to an inflated impression of recovery. The western Canadian breeding population is increasing; the U.S. population is declining both in the Tri-state area and in Oregon (Shea and Drewien 1999, USFWS 1999, 2000). This decline is at least partly related to the termination of winter feeding at Red Rock Lakes National Wildlife Refuge (Shea and Drewien 1999). The overall impression offered the public appears to be that the trumpeter swan is recovering in the U.S. USFWS surveys clearly show that the U.S. RMP breeding population contains no more than 350 adults with only about 312 in the Tri-state area.

The Canadian nesting population contains an estimated 3,088 swans in the winter of 1999-2000. It also winters in the Tri-state area, which creates heavy pressure on the already marginal winter habitat that the Tri-state population is currently confined to, particularly in the core Tri-state areas in eastern Idaho on' Henry's Fork of the Snake River and on Teton River drainages.

As the Subcommittee on the Rocky Mountain Population of Trumpeter Swans, (Pacific Flyway Council), reports, "Canadian flocks have continued to expand and in 1997 comprised approximately 83% of the total RMP [Rocky Mountain Population]" (1998, p. 5). In 1996, the Office of Migratory Bird Management (USFWS) reported that the Pacific Population included 16,312 swans; these trumpeters breed in Alaska and along the Pacific Coast in Canada and the U.S. They are distinct from the Tri-state nesting population.

In 1989, "the Idaho Chapter of the Wildlife Society petitioned the USFWS to list the RMP as threatened due to its high vulnerability to winter mortality. The USFWS determined that listing was not warranted" (Subcommittee on Rocky Mountain Trumpeter Swans 1992). Since that time, the threats to the Greater Yellowstone segment have increased and their numbers have declined by 38% from 505 adults in September 1989 to only 312 adults in September 1999 (USFWS, 1999). At present the conservation of the breeding Tri-state trumpeter

population and its protection under the ESA are particularly urgent.

It can be seen then, that the status of the Greater Yellowstone population has been presented and promoted by lumping the Canadian and Greater Yellowstone nesting populations together in such a way that its serious vulnerability has been concealed from the public.

To state the problems briefly as background for the following document, it must first be said that the Tri-state trumpeters have a history of poor cygnet production; added to this is the long-standing disruption of its migration patterns and extirpation from more productive lower elevation habitats; high nest failure rates; high over-winter mortality, and a number of other threats that will be detailed below. The apparently increasing number of trumpeters in the RMP due to growth of the Canadian nesting segment hides the fact that there are comparatively very few U.S. trumpeter breeders.

Endangered **Species** Act Implementing
Regulations

Several sections of the regulations implementing the Endangered Species Act (50 C.F.R.) are applicable to this petition. Those concerning the listing of the U.S. breeding trumpeter swan as a threatened or endangered species are:

424.02(e) "Endangered species" means a species that is in danger of extinction throughout all or a significant portion of its range." . . . (k) "species" includes any species or subspecies that interbreeds when mature.

"Threatened species"; means a species that "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C. § 1532(20)).

424.11(c) "A species shall be listed . . . because of any one or a combination of the following factors:

1. The present or threatened destruction, modification, or curtailment of habitat or range;
2. Overutilization for commercial, recreational, scientific, or educational purposes;
3. Disease or predation;
4. The inadequacy of existing regulatory mechanisms; and
5. Other natural or manmade factors affecting its continued existence."

All five of the factors set out in § 424.11(c) are applicable to the present status of the Greater Yellowstone breeding population of the trumpeter swan.

Sections relevant to the designation of critical habitat for this precariously situated species are:

424.12(a)(2) Critical habitat is not determined when one or both of the following situations exist: . . . (ii) The biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat.

424.12(b) In determining what areas are critical habitat, the Secretary shall consider those physical and biological features that are essential to the conservation of a given species and that may require special management considerations or protection. Such requirements include, but are not limited to the following: (1) Space for individual and population growth, and for normal behavior; (2) Food, water, air, light, minerals, or other nutritional or physiological requirements; (3) Cover or shelter; (4) Sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and generally (5) Habitats that are protected from disturbances or are representative of the historic, geographical, and ecological distributions of a species.

424.14(d) Petitions to designate critical habitat. . . .
Upon receiving a petition to designate critical habitat .
to provide for the conservation of a species, the
Secretary shall promptly conduct a review in accordance
with the Administrative Procedures Act (5 U.S.C. 553) and
applicable Department regulations, and take appropriate
action.

Based on the documentation provided below, petitioners contend that the provisions of 50 C.F.R. compel the expeditious listing of the Greater Yellowstone trumpeter swan population as "threatened" or "endangered" where it occupies habitat within the Idaho, Montana, Wyoming, and Utah² area of the United States, and a review and appropriate action to designate "critical habitat" for the species.

Petitioners

The Biodiversity Legal Foundation (BLF) is a non-profit, science based organization dedicated to the preservation of all native wild plants and animals, communities of species, and naturally functioning ecosystems. Through reasoned educational, administrative, and legal actions, the BLF endeavors to encourage improved public attitudes and policies for all living things. The BLF has monitored the biological status of the trumpeter swan and worked for its conservation for more than a decade.

²The population currently nests in Wyoming, Montana, and Idaho, south to within about five miles of the Utah border. Marked Greater Yellowstone birds have been documented wintering in Utah, as well as in Montana, Idaho, and Wyoming (Shea and Drewien 1999).

The Fund for Animals Inc. (FFA) is a national non-profit animal-protection organization whose purpose is to preserve wildlife and promote humane treatment of all animals. The FFA serves primarily as an advocacy group and as an information and education agency to help domestic and wild animals.

Taxonomy

". . . C. cygnus AND C. buccinator have been considered conspecific by some authors (AOU 1983). See Meng et al. (1990) for information on variability of DNA fingerprints in C. cvanus and C. columbianus" (Wyoming Natural Diversity Database 1999). The foregoing suggests that the taxonomic uncertainty described by the USFS (1995) has not been resolved:

World-wide, there are 4 forms of closely related all-white swans breeding in the high latitudes of the northern hemisphere, with a set of two (1 large and 1 small) occurring in both the Old and New Worlds. The extent of speciation of these swans is unresolved and taxonomists differ as to whether they form two species, each with two subspecies, or if they represent four full species. In recent years the genus has been designated both as Olor and as Cvsnus, and either may be encountered in current literature. The situation was best summarized by Baldassare and Bolen (1994:56), "Regardless of these taxonomic uncertainties, however, two large white swans occur in each of the Palearctic and Neararctic realms, and the fact of their occurrence necessitates appropriate management decisions for each of the four populations." (p. 10)

Description of the **Species**

The trumpeter swan has been extensively studied and described, but as will be demonstrated, the species presents special conservation difficulties. The USFS (1995) described the bird as follows:

The Trumpeter Swan is the largest of the world's waterfowl species, with a wingspan of 7-8 ft. and adult weights commonly ranging from 22-32 lbs. On the average, males are more massive than females, although considerable overlap in measurements exists (Banko 1960, Hansen et al. 1971, Drewien and Bouffard in press [1995]). Adult plumage is all white, commonly stained with rust from iron-rich waters and sediments. Legs are usually black or less commonly dark olive. On the adult's black bill, a salmon-colored "grinning streak" frequently marks the lower mandible edge. Cygnet (<1 year old) plumage is usually gray with a pink bill that gradually darkens to black by late winter. In the rare leucistic color phase, cygnets have a pink bill, white down, yellow feet and legs, and molt to typical adult plumage while retaining yellow legs and feet. Yearling plumage is all white with occasional scattered gray feathers retained, particularly on the head and neck. (pp. 9-10).

Perhaps because identification of this species, as against that of other large, white, migratory waterfowl, is difficult and highly pertinent to conservation of the trumpeter, the USFS (1995) description continues:

Trumpeters are very difficult to visually distinguish from the smaller Tundra Swans, although vocalizations are diagnostic. Few observers can reliably distinguish the two species; specific training is necessary. The species rarely overlap during the nesting season when Tundra Swans are far to the north in their arctic breeding grounds. The two species intermingle in the western U.S. from October-May, however, and occasional Tundra Swans (usually sick or injured) may summer in the western states. Commercially available tapes or records of bird calls clearly demonstrate the diagnostic vocalizations. (p. 10)

The USFS (1995) adds that a "slide-tape swan identification training program" is available from the Trumpeter Swan Society. It is clear, then, that the USFS regards identification of these birds as a problem. Bailey (1991) and Patten and Heindel (1994) also emphasize the difficulty of distinguishing between trumpeter and tundra swans in the field.

The Wyoming Natural Diversity Database (1999) offered "Non-technical" and "Technical" descriptions of the bird:

Non-technical Description: Largest swan in the world, typically weighing between 21-30 pounds and standing four feet high. All white, with red-brown head and neck; eyes brown, feet and legs black. Sexes alike, although males larger. Pink stripe at base of black bill is diagnostic characteristic, as is the deep, sonorous, rasping call "like horn of old-fashioned French taxi" (Terres, 1980)

Technical Description and Identifvina Characteristics: Large, white swan, head and neck often stained rufous by iron-rich waters. Bill is all black, very rarely snows small yellow spot in front of eyes, and often has pink streak along rear upper edge of lower mandible. Culmen profile straight. Total length of adult male is 1.47 meters; adult female is 1.45 meters. May reach 30 pounds. Immature swans gray-brown with yellowish feet and pink bills; mostly white during second year, with black feet and bill (Mitchell, 1994). (p. 2)

This source, too, adds a brief description of "similar species," no doubt because of the conservationally crucial question of identifying each of these species.

Similar Species: Similar to but larger than Tundra Swan (*C. columbianus*), which has a yellow spot in front of eyes and a concave culmen profile. These species are very hard to distinguish in the field, and the best differentiating characteristic is their calls. Tundra swans have a high-pitched quaver [rather] than the deep, trumpet-like Trumpeter swan call. (p. 2)

Status of Trumpeter Swan Populations

For management purposes the U.S. Fish and Wildlife Service currently recognizes three trumpeter swan populations (USFWS 2000a). The Pacific Coast Population nests primarily in interior and south central Alaska and winters along the Pacific Coast from southern Alaska to Oregon. It contained an estimated 16,312 swans (12,289 adults and 4,023 cygnets) when last surveyed in 1995. Through decades of efforts to restore breeding trumpeters to their historic midwestern range, several restoration flocks have been created. These flocks comprise the Interior Population and included 927 swans (698 adults and 229 cygnets) during the most recent USFWS Rangewide survey (Gale et al. 1987, USFWS 1996). Interior flocks have been restored from mixed Alaskan and Tri-state ancestry (Mississippi and Central Flyways 1997). The Rocky Mountain Population includes all the breeding population of the Greater Yellowstone area (the Tri-state Population), small disjunct restoration flocks in Oregon and Nevada, and all the breeding flocks of Alberta, British Columbia, the Northwest Territories, southeastern Yukon, and southwestern Saskatchewan (the Interior or western Canada Population) (Gale et al. 1987; Pacific Flyway 1984, 1992, 1998, Shea and Drewien 1999).

Historic Range

The trumpeter's historic range in the contiguous U.S. extended coast to coast and over much of the entire country

where suitable marshland/lake habitat existed, as well as across Canada and in Alaska. Gale et al. (1987) reviewed various efforts to identify the historic range of the trumpeter (Banko 1960, Rogers and Hammer 1978, Schorger 1964, Hansen et al. 1971, Lumsden 1984). Considerable effort has gone into making this determination, although extirpation began so early in Anglo settlement as to make the eastern historic ranges perhaps less certain than the western. Gale et al. (1987) wrote:

Prior to the settlement of North America by Europeans, the trumpeter swan was a migratory species which ranged across much of the United States and Canada. By 1832, when Sir John Richardson first described the characteristics of the trumpeter swan that distinguish it from the smaller tundra swan (C. columbianus columbianus), the trumpeter had already been eliminated from eastern portions of its range. (p. 6)

These authors (1987) also note two factors that continue to add to various difficulties in trumpeter swan conservation: the fact that the trumpeter and tundra swans are difficult to distinguish in the field (as well as other large, white migrating birds); and that the trumpeter swan, generally a migratory species, is largely nonmigratory in its major U.S. population in the Tri-state area. Presently, one of the great difficulties in trumpeter conservation lies in the fact that many of the birds can be induced to migrate only with the greatest difficulty. It appears that the trumpeters of the Tri-state area survived the swan holocaust of the nineteenth century by staying in this remote corner of the Rocky Mountain

West.

The conclusions reached by researchers concerning this species' historic range in the contiguous United States were depicted in a map given by Gale et al. (1987): the bird likely bred as far south as a line extending southeast from central Washington through Idaho, Wyoming, Nebraska, and Utah (Woodbury et al. 1949); its breeding range may have extended further south in the Mississippi valley, perhaps as far as northern Louisiana, across Kentucky and Virginia/West Virginia, including Chesapeake Bay (Bay Journal, November 1999). The trumpeter's wintering range, according to Gale et al.'s map (Figure 1), extended from southern California through northern Arizona and New Mexico, encompassing most of eastern Texas and the Gulf Coast, and extending as far south as northern Florida. Shea and Drewien (1999) also reviewed archaeological and historic records of early trumpeter distribution in Utah and other western states.

Another view of the historic range encompassing North America is from the Wyoming Natural Diversity Database (1999):

Breeding: Formerly throughout North America from central Alaska to western Hudson Bay (James Bay) and then southeast to Nova Scotia, with the southern limit extending to northwest Mississippi and eastern Arkansas in the east and possibly California in the west. (p. 2)

Non-breeding: Formerly from the present range in southeast Alaska (a few small flocks along the Gulf of Alaska), along the British Columbia coast, Washington, Oregon, and occasionally California but historically extending to southern California, possibly Arizona and New Mexico, along Gulf Coast to central Florida, and along

Atlantic coast as far as ice free waters existed. . . .
(p. 2)

In other words, the trumpeter swan's historic range probably encompassed, between its breeding and wintering ranges, most of the contiguous United States in any location where suitable wetland/lake/stream habitat could be found.

Late Twentieth Century
Distribution

As of the late twentieth century, trumpeter swan populations occupy only three limited areas in the contiguous U.S. : there is a population of approximately 16,312 birds on the North Pacific coast the "Pacific Coast Population [PCP] (USFS, 1995). This population breeds in Alaska; its wintering area extends south into Washington and Oregon (Gale et al., 1987). There is a also small restoration population of mixed Alaskan and Tri-state ancestry in the northern midwestern states ("the Interior Population" [IP]). U.S. birds in this area are a reintroduced population, the trumpeter having been exterminated in the region during the 1800s. And then there is the "Rocky Mountain Population" that winters primarily in the Tri-state Area. The "Tri-state area" surrounds the juncture of the state boundaries of Idaho, Montana, and Wyoming where geothermal areas help maintain some open water throughout most winters.

The summary on the trumpeter swan provided by the Wyoming Natural Diversity Database (1999) again provides an

overview encompassing the entire North American population:

[Breeding:] Presently Alaska (Interior, Southcentral, Gulf of Alaska, and Chilkat basin), Yukon, British Columbia, Alberta, Washington, Oregon, Nevada, Montana, Idaho, Wyoming, South Dakota, Minnesota, Wisconsin, Michigan, Saskatchewan, and Ontario. . . . Alaska contains over 85% of the world's breeding population, and breeding areas outside of Alaska are very localized. . . .

[Non-breeding:] Present range includes the Gulf of Alaska coast, southeast Alaska, British Columbia, western Washington, western Oregon, occasionally California, e. Nevada, w. Utah, s. Montana, e. Idaho, nw Wyoming, sw South Dakota, and small resident populations in the midwestern states, Saskatchewan, and Ontario. . . . In the contiguous U.S. and adjacent Canada, the highest winter densities occur in eastern Wyoming, western British Columbia (coast and interior lakes), southeastern Oregon, and southwestern Montana, mainly on wildlife refuges and captive propagation) consists of flocks in Lacreek National Wildlife Refuge, South Dakota, and Hennepin County Park Reserve District, Minnesota; these gradually are exhibiting southward movement in fall but still are dependent on supplemental feeding. The Rocky Mountain population nests in the Rocky Mountains of Canada and the U.S. (Idaho, Montana, Wyoming) and winters primarily in the Greater Yellowstone Ecosystem (Spahr et al. 1991). Breeding areas in Canada include Peace River area of Alberta and British Columbia and Toobally Lakes area of Yukon, plus some areas farther north in Northwest Territories (Johnson and Herter 1989). Has been introduced at Summer Lake in southern Oregon. Formerly nested south to Nebraska, Indiana, and Manitoba, and wintered formerly also in the eastern U.S.

Life History

Migration

The trumpeter swan is basically a migratory bird, and the species' migration, or lack of it, is a major factor in the Tri-state population's present plight. The only surviving native trumpeter population in the contiguous United States, the Tri-state population, may have survived in part because

some individuals did not migrate south into areas where they could be shot. During the nineteenth century, as we have seen, the species was almost hunted out of existence: "In the United States, only about 50 adults and subadults, and their cygnets escaped extinction by remaining year-round in the isolation of the Tristate region" (Gale et al. 1987, p. 8).

Outside of Alaska and British Columbia, the only trumpeters known to have survived the decline were those that wintered in the Tristate region. Truly unique on the continent, this remote geothermal area remained virtually unexplored until the 1970's. Despite the region's high elevation and severe winter weather, its isolation from human settlement and the availability of ice-free habitat, created by the runoff from warm springs, provided the last winter refuge for the trumpeters of both the United States and Canada. (pp. 247-248)

'A major feature of the trumpeter swan, and one that has hampered late twentieth-century attempts to conserve it, is that these swans learn a substantial proportion of their behaviors from their parents and their social group. Migration behaviors and traditional routes are especially pertinent (Hochbaum, 1955). As the U.S. Forest Service publication, "Conservation Assessment for the Rocky Mountain Population of Trumpeter Swans (Cygnus buccinator) (1995) stated the case: "Trumpeter Swans are long-lived, social birds that are highly dependent upon strong family bonds and traditional patterns of habitat use that are passed from parents to offspring" (p. 12). Through the deaths of swans that migrated further south, the species was forced into very constricted habitat corners where they could stay in some

safety. Many of these birds have lost critical knowledge concerning traditional southward migration routes.

The Canadian population, from Grande Prairie, Alberta, that winters in the Tri-state area, is also a survivor group, and, like the surviving Greater Yellowstone population, they may owe their survival to the peculiar environment available to them in the Tri-state area. Those who attempted to winter in all other locations were extinct by the early 1900s (Gale et al. 1987).

These authors (1987) summarized the resulting difficulties that have befallen the trumpeters of the Tri-state area: 1) This population of trumpeters has descended from a very small surviving population, perhaps rendered smaller by the apparent fact that the Canadian and Tri-state populations do not interbreed (they are not regarded as a separate species). Thus, "Although the effects might not be obvious, a loss of genetic variability could render their descendants somewhat less fit to cope with environmental stresses, and increase the likelihood of defects due to inbreeding" (1987, p. 248). Gale et al. (1987) did not indicate whether they considered that some of the deformities and disease/parasite susceptibilities they described at the time of their study might be related to these circumstances.

The second consequence of trumpeter survival on this small area of habitat was that

[A]s the vast majority of trumpeters were eliminated, most of the Population's cumulative knowledge of traditional migration routes to other winter and spring habitats was also destroyed. The few surviving families retained only two basic annual movement patterns to pass on to their offspring: they either remained in the Tristate area year-round, or wintered there and migrated to Canada to nest. . . . This loss of knowledge of other migration routes and alternate winter and spring habitats is the underlying cause of several of the problems now facing the Rocky Mountain trumpeters.

Although management actions were able to increase the numbers of trumpeters, the migratory traditions that were destroyed during the species' decline were not restored. Therefore, increasing numbers of nonmigrants and wintering swans became dependent upon the Tristate habitat. (1987, pp. 248-249)

The increase in numbers (p. 249) in the Tri-state area is attributed in large part to artificial winter feeding 1935-1992/1993, protection from shooting, and open water habitat below dams.

Gale et al. (1987) mentioned still another result of the loss of "traditional movement to more southerly winter and spring habitats has been that the increased numbers of nonmigratory Tri-state trumpeters have access to only very marginal, high elevation spring feeding areas" (p. 249). This could result in poorer nutrition for egg laying females; and hence to low egg production and cygnet survival.

At present, in the year 2000, it seems to be generally agreed among persons concerned with trumpeter swan survival and restoration that the Tri-state and Canadian breeding populations need to re-learn or re-build migratory patterns that will help restore use of additional winter habitat--that

is, the trumpeter needs to make use of new wintering areas. Although there are too few trumpeters in the contiguous U.S., too many of that remnant population are using a comparatively small and marginal area for wintering. This condition has not only led to strains on the carrying capacity in the area, but intensified fears of the possible spread of disease or "catastrophic loss" due to starvation or, possibly, severe weather conditions (Subcommittee on Rocky Mountain Trumpeter Swans 1992, 1998).

This has led to a variety of attempts to disperse the wintering RMP swans, largely through trapping (for translocation), lowering of winter water levels by use of the dams on Henry's Fork, and hazing. Artificial feeding was discontinued in the winter of 1992/1993 on the RRL Refuge. It had been found that when artificial feeding was continued, in 1990/1991, more swans were attracted to the area despite hazing and trapping (Subcommittee on Rocky Mountain Trumpeter Swans 1992).

Persuading the trumpeters to relocate for wintering has, thus far, proved to be complex and not very successful (Shea and Drewien 1999). Tundra swan concentration areas in Utah and Nevada have been suggested as possible additional wintering sites for the Tri-state population; however, as early as 1987, Gale et al. noted that some trumpeters attempting to use Utah habitat were regularly "harvested."

"This mortality on the few pioneering migrants may have been an important factor in preventing the reestablishment of a migratory tradition through Utah" (p. 15). These authors added (1987) that "only recently" had some trumpeters begun to pioneer outside of the Tri-state area. "[B]ut no regular use of these areas has been documented. The high mortality rates of these few migrants has likely slowed the reestablishment of migratory traditions" (p. 17).

As the Process Paper D--Wildlife Analysis for the Targhee Forest Plan Revision (1997) reported, however, the upshot of human attempts to encourage swan dispersal have not been very encouraging. With regard to attempts to relocate the birds: "Relocation efforts have not successfully established consistent migration to new wintering sites and several difficult problems remain (Shea 1994)" (p. 51). The Plan mentions the increasing load placed upon the carrying capacity of the Tri-state area and the increased risk of mortality from starvation or severe weather (p. 51), or as might be added, the spread of disease or parasites.

"Inadequate security from human disturbance, particularly waterfowl hunting and boating, has reduced success of swans at winter relocation sites and discouraged pioneering to new wintering sites" (Targhee, Process Paper 1997, p. 51. And, as this paper notes, "The viability of these flocks is precarious and could further decline if they fail to locate

adequate wintering sites. . . . Migrant Canadian Trumpeters continue to arrive in the Tri-state area in autumn and a severe winter population bottleneck will remain until substantial migration southward from the Tri-state area is restored" (p. 51).

Mating, Nesting, Egg Laying, Hatching, and
Brood Rearing

Trumpeter swans generally mate for life and do not find mates until their second or third year; normally they begin nesting only in their fourth and fifth years. As can be seen, these birds are not prolific reproducers. They tend to return to the same nesting territory every year (they are philopatric) (USFS, 1995).

According to the trumpeter swan summary provided by the Wyoming Natural Diversity Database (1999),

Primarily breeds in freshwater, on edges of large inland waters; typically in emergent marsh vegetation [vegetation protruding above water level], or on a muskrat house, beaver lodge, or island. The nest is a large mass of plant material. (pp. 3-4).

Nesting pairs are highly territorial and rarely allow another pair to nest on the same water body. Pairs return to territories as spring thaw begins; nest building begins as ice recedes in April or early May. Clutches usually contain 2-7 eggs, laid at 39-48 hour intervals. Hatching normally occurs in June after an incubation period of 32-37 days. Cygnets are precocial and follow their parents from the nest mound within 48 hours of hatching. Cygnets require 90-122 days to fledge. The \pm 160 day period required for nesting and cygnet rearing restricts Trumpeter nesting to habitats with a sufficiently long ice-free period to allow fledging before freeze-up, and precludes successful reneating (Banko 1960, Mitchell in press [1995]). (USFS 1995, p. 13)

The last statement in this excerpt indicates another of the swan's reproductive liabilities. Some bird species, if their nests are disrupted, can reneest; not so the trumpeter. Still another may lie in Gale et al.'s (1987) observation that successful pairing and reproduction between members of the Tri-state and Canadian populations has not been detected in the wild. Gale et al. (1987) also indicate that the range of ages for first nesting may be from 3-6, but 4-5 appears to be common; and that the swan's nesting territory (which they defend against other swan pairs) may consist of a portion of a larger body of water. "Pairs nested closer together when visual barriers, such as emergent vegetation, existed" (Gale et al. 1987, p. 72).

On the other hand, "In summer, nonbreeding flocks of 20-100 individuals may occur on large lakes and reservoirs. [Pairs] defend breeding territory of about 5-10 acres" (Wyoming Natural Diversity Database 1999, p. 4).

Henson and Cooper (1993) summed up the Tri-state populations's difficulties: "The Tri-state subpopulation was recently considered for listing as threatened by the U.S. Fish and Wildlife Service . . . because it experiences slow growth, poor cygnet production, low recruitment, and has failed to colonize other breeding and wintering areas" (p. 709). It appears that these largely reproductive difficulties in the Tri-state area begin with egg laying.

Clutch size in the Tri-state area was smaller than in the Grande Prairie, Alberta, area in the 1980s (Gale et al., 1987). Additionally, "[l]ow hatchability of eggs has long been considered a problem at RRL (Banko 1960:130). Recent [1987] records from RRL, YNP, and the National Elk Refuge, WY, showed that only about 50-56% of the eggs hatched" (p. 47). These figures were contrasted with 61-91% in lower elevations of Wyoming and 70-75% in Idaho.

Nest success is defined as the percentage of nests hatching at least one egg. In 1987, Gale et al. reported "In good years, nest success has been 85-95%; in the wet years of 1980, 1982, and 1984, it ranged from 26-35%. . . . Studies in 1971-73 found that nest success varied significantly between different areas of the Refuge" (Gale et al. 1987, p. 47). These cases involved such factors as inability of the pair to produce eggs. Again, the Grande Prairie population "was substantially higher than at YNP or RRL" (p. 49).

A summing up of hatching success at RRL was made by Gale et al. (1987):

Across all years of available data (1943-1985), hatching success ($p = 0.0001$) and survival to fledging ($p = 0.0001$) were the factors most highly correlated with cygnet production to fledging. . . . Clutch size ($p = 0.01$) and the proportion of eggs not removed ($p = 0.02$) were highly significant also. The proportion of adults breeding was weakly related ($p = 0.20$), and size of adult population was not significant at all ($p = 0.75$). (p. 54)

After fledging in September, cygnets remain with their parents until the following spring. Siblings may remain together into their third year and may join their parents

on traditional wintering sites in subsequent years. Parents sometimes allow subadults, particularly yearlings, to enter their nesting territory, most typically after incubation terminates. The processes by which Trumpeters pass on traditional patterns of habitat use to their progeny are dependent upon these strong family associations and likely extends over several years. (USFS 1995, p. 13)

"The energy stored by the female in the weeks preceding egg-laying and incubation is a critical factor in determining subsequent reproductive success (King 1973, Scott 1973, Ankney and MacInnes 1978, Krapu 1981)" (Gale et al. 1987, p. 73). In this, the swan resembles many other species whose reproductive success may be helped or hindered by the adequacy, or inadequacy of available diet. A related factor may be found in Gale et al.'s (1987) description of some close observations of swan "constancy" to incubation. The energy build-up that precedes egg laying is expended in incubation; according to Gale et al. (1987), nest constancy varied somewhat according to the region and flock, and noted during some 1979 observations that "The pairs which fledged cygnets laid larger clutches, had higher incubation constancies, took fewer recesses per day (time off the nest), and had higher hatching success than did the pairs whose entire broods died prior to fledging" (p. 75). Gale et al. (1987) further note that human disturbance of nesting trumpeters can cause nest abandonment, or cause the swans to hide and to hide their young. According to these authors, writing in 1987, "[H]uman

disturbance in Refuge nesting areas has increased substantially since the 1930's and 1940's" (p. 76). It seems certain that this disturbance has been rising further with the sharply increasing popularity of outdoor/back country recreation that has grown up in the last decade and will continue to rise with western human population growth.

A further difficulty in trumpeter reproductive problems will be discussed below under "Mortality": the apparent difficulty this species has in keeping its young alive long enough to produce the next generation.

Habitat

The Wyoming Natural Diversity Database (1999) provides a broad summation of trumpeter swan habitat:

Rangewide: Ponds, lakes, and marshes, breeding in areas of reeds, sedges or similar emergent vegetation, primarily on freshwater, occasionally in brackish situations, wintering on open ponds, lakes and sheltered bays and estuaries (AOU [American Ornithological Union] 1983). In the intermountain western U.S., winters in areas of geothermal activity, springs, and dam outflows (Spahr et al. 1991). Primarily breeds in freshwater, on edges of large inland waters; typically in emergent marsh vegetation, or on a muskrat house, beaver lodge, or island. The nest is a large mass of plant material. (pp. 3-4)

[P]referred sites provide a water barrier between the nest and shoreline human activity or predators. Trumpeters may construct a semi-floating nest within a stand of emergent vegetation or nest on the shore if a suitable island is lacking. Preferred materials are Typha or Scirpus, although they will use Carex, submerged vegetation, sod or even sticks from a beaver lodge if preferred material is lacking (Banko 1960, Shae 1979, Maj 1983). (USFS 1995, p. 17)

The Targhee Forest Plan Revision (1997) confirms this, generalizing the bird's requirements:

Nesting habitat consists of marshes, lakes, beaver ponds, and oxbows and backwaters of rivers. They prefer quiet shallow water with dense aquatic plant and invertebrate growth. Tall emergent vegetation is essential for cover for both adults and brood. In winter, trumpeter swans need areas with plentiful aquatic vegetation that remains ice-free all winter. (p. 48)

The Targhee Forest Plan Revision (1997) also mentions a rising hazard to the trumpeter. Noting that several of the lakes in the NF's administrative territory are stocked with fish, the Plan adds: "Because of the recreational use, these lakes are not expected to receive nesting use by swans" (p. 50). In other words, the trumpeter is one of those species sensitive to human disturbance, especially of their nesting cycle.

Food Habits

Food supply for the Tri-state population is a particularly important question in present conservation considerations because of the inroads on the space/resources in the Tri-state area made by the expanding Canadian wintering population.

Trumpeters feed primarily on aquatic plants, although invertebrates may comprise a significant portion of their diet, particularly during the first weeks of life. In flowing water, foraging efficiency declines as water velocities increase. Optimal feeding habitat is 1-2 feet deep with little or no current. In shallow waters, Trumpeters can easily dig tubers with their powerful feet, creating feeding craters up to a foot deep and 2-3 feet wide. Where lush beds of aquatic plants grow near the water surface, Trumpeters can successfully forage in deeper waters. By tipping up, adults can reach

approximately 3 feet beneath the water surface. (USFS 1995, p. 14-15)

Trumpeters have a low digestive efficiency (Squires 1991) and adults may consume 20 lbs (wet weight) of forage per day (Page 1976). Aquatic plants differ in their forage value and digestibility. Though abundant and consumed on some wintering sites, water milfoil (Mvrionhvllum snicatum) is low in digestibility and food value. In the Tri-state region, Trumpeters show some preference for sego pondweed (Potamoetion nectinatis), and waterweed (Elodea canadensis) over muskgrass (Chara spp.) and water milfoil (Mvrionhvllum spcatum), however, virtually all available species are consumed, particularly when winter forage options are limited (Banko 1960, Hampton, 1981, Shea 1991, Squires 1991). Throughout their range, Trumpeters utilize a wide variety of aquatic plants and when given the opportunity, have readily adapted to new food sources, including pasture and agriculture cop residues. (USFS 1995, pp. 14-15)

It may be noticed, however, that Tri-state trumpeters have not, as some trumpeters in the Pacific population have done, taken markedly to field feeding, likely because fields are snow covered in winter and there is little opportunity (Shea, April 4, 2000, personal communication). The USFS (1995) points out that the heaviest feeding takes place in early spring before egg laying and before the mid-summer moult. The agency further points out the damaging character of trumpeter swan feeding methods in places where excessive swan density occurs: the water plants are "ripped" up and the bottom "cratered."

The abstract of a study conducted by Squires and Anderson (1995) in the Tri-state area reported the following results:

We documented the winter, spring and summer food habits of trumpeter swans (Cygnus buccinator) in the greater Yellowstone area (the intersection of Idaho, Montana and Wyoming) and studied the diet preference of nesting swans. Although 23 foods were detected in trumpeter swan diets during the winter, spring and summer, only 8 contributed at least 3% to the diet during any one season. . . . Dominant foods (over 10% of the diet in at least one season) included Chara spp. (21.7%, 4.1%, mean, SE), Elodea canadensis (11.4%, 3.1), Potamogeton spp (32.3%, 4.2), and Potamogeton pectinatus tubers (15.7%, 3.6). Potamogeton nectinatus tubers were highly preferred by swans and tuber consumption significantly ($P = 0.03$) increased from winter (23.4%, 10.5) to spring (38.5%, 10.0). The primary food in summer was Potamogeton foliage which accounted for 48.2% of the summer diet. Nesting trumpeter swans significantly ($P = 0.039$) prefer Potamogeton spp. when it was available at feeding sites within their territories. Chara p . was eaten in proportion to its availability, and swans avoided eating Ceratophyllum demersum and Myriophyllum exalbescens.

Or, as the Targhee National Forest (1997) Forest Plan Revision put it,

Trumpeter swans feed mainly on aquatic plants such as pondweed, waterweed, duckweed, and water milfoil. Cygnets feed mainly on aquatic insects and crustaceans after hatching and gradually include more and more aquatic plants in their diet as they grow. (p. 48)

Food and its availability are, of course, vitally important for any species; and like many other species, the nutrition of the female may significantly affect her reproductive success. Henson and Cooper (1993) compared the nutrition available to the Alaskan flock to that available to the Tri-state flock and found that female nest attendance in the Alaskan flock was higher than in the Tri-state flock.

Our data are consistent with the hypothesis that the Tristate Region is lower quality swan habitat than that in Alaska because it appears to lack food resources necessary female swans to maintain a high incubation

constancy in an area with a short and harsh breeding season. (p. 709)

Mortality

The Wyoming Natural Diversity Database (1999) reports that "Swans greater than 24 years old are known (Kennard, 1975)" (p. 4). The USFS (1995) Conservation Assessment of the swan noted that trumpeters "can live at least 25 years in the wild" (p. 13), although few do because of "collisions with powerlines or fences, lead poisoning from ingested shot pellets or fishing sinkers, or emaciation during severe winters" (p. 13).

Gale et al. wrote in 1987: "Low cygnet survival has been documented at RRL since the 1940's and at YNP since the 1920's (Banko 1960:131; Page 1976; Shea 1979, 1980)" (p. 92). They further observed that cygnet survival in Alberta, and "lower elevation Wyoming and Idaho" had higher survival rates; however, these authors do not seem to suggest that cygnets at the latter locations showed very high survival rates, and they noted that, in 1987, "[T]he declining number of nesting pairs and low hatching success, in addition to low prefledging survival, have combined to reduce cygnet production on the Refuge [RRL]" (p. 95).

This led Gale et al. (1987) to examine the causes of cygnet mortality at RRL. Generally, they found that heavy parasite infections afflicted this population. They noted

that [cygnet survival] "is negatively correlated with increasing July rainfall and water levels, as well as a late peak of hatching" (p. 99), indicating deaths of cygnets that have not fledged prior to the winter freeze, but in any case showed lower survival rates than the members of an earlier hatch.

Gale et al. (1987) also observed that higher survival rates for cygnets was associated with origin in larger broods; they associated these larger clutches with spring nutrition of the egg-laying female as well as the ability of the parent birds to care for their broods. Tabulating the causes of death of trumpeter swans at that time, these authors attributed 26% to "emaciation of undetermined origin" (p. 99).

Outright mortality of cygnets does not comprise the entire problem. "During incubation studies at RRL in 1963, the Refuge staff noted that most of the newly hatched cygnets were weak, had poor coordination, and seemed to lack basic instincts. Some had difficulty breaking through the shell membrane; others could not adapt to cool temperatures comfortably. The staff suggested that these traits would contribute to the low survival of the cygnets (RRL Ann. Narr. Rept. 1963)" (p. 106). RRL trumpeters in this study also were found to have a variety of abnormalities including deformities.

The lead shot mentioned above has been accumulating in some locations for many years, and the birds swallow it as a result of their digging in shallow bottoms for "roots and tubers" (USFS 1995, p. 13). Lead shot use has been banned by U.S. law, but the accumulations remain and continue to take their toll of the bottom-feeding birds. Gale et al. (1987) discussed the lead shot problem and noted that at the time of their report, 15% of trumpeter mortality was attributable to lead shot ingestion.

The USFS (1995) also mentions "Documented mortality from disease (fowl cholera, avian tuberculosis, aspergillosis) has been infrequent"; it appears that these and similar diseases may present a larger threat in the now overcrowded swan conditions in the Tri-state area.

However, a factor that stands out in trumpeter mortality, and once extremely relevant to the viability of the species is also pointed out by the USFS (1995):

Cygnets mortality prior to fledging is highly variable and may occasionally exceed 80%. High levels of internal parasites and stunted growth have been reported at Red Rock Lakes and Yellowstone National Park (Banko 1960, Page 1976, Shea 1979). In the Tri-state region, high cygnets mortality may be associated with low nutritional levels of nesting females and delayed development of food resources for adults and newly hatched cygnets following severe winters and late, cold springs. High cygnets mortality is chronic at particular territories and may be due to inferior territory quality (Banko 1960, Shea 1979, Gale et al. 1987, Squires 1991, Henson and Cooper 1993). . . . After fledging in September, cygnets suffer nearly 50% mortality during their first winter. Survival rates improve among yearlings and subadults as they gradually learn successful habitat use patterns from their parents

and other more experienced birds Annual adult mortality is normally < 10% (Anderson et al. 1986, Lockman 1988a). (pp. 13-14)

Low cygnet survival has been a feature of the trumpeter, especially in the Tri-state area. Gale et al. (1987) indicated that "Low prefledging cygnet survival has been chronic in the Tri-state area, particularly at RRL and in Yellowstone, and to a lesser extent in Idaho and lower elevation Wyoming habitats. Since 1964 [writing in 1987], cygnet survival at the Refuge has averaged somewhat less than 46%" (p. 108)

The most frequently diagnosed mortality factors in the Tristate area were emaciation, parasites, lead poisoning disease, and accidents. Approximately 50 trumpeters were known to have died in Idaho and Yellowstone during the winter of 1984-85. Of 18 trumpeters necropsied, most were severely emaciated and suffered from high parasite loads. Toxic levels of lead were found in five carcasses and sublethal lead toxicosis was involved in the death of a sixth bird. . . . Only isolated instances of disease related mortality have been detected, including cases of fowl cholera, avian tuberculosis, aspergillosis, generalized peritonitis/pericarditis, and system infections by Pseudomonas sp. and E. coli.

It appears that water from Island Park dam (and other water projects) is subject to drafts by private water rights holders without regard to impact on wildlife. One of the factors Gale et al. (1987) listed as responsible for the leveling off of trumpeter gains in 1954 was "periodic total curtailment of water releases from Island Park Dam" (p. 244). It has also been suspected that releases of sediment from this dam may have damaged the substrate in which the trumpeter's food

plants grow (Gale et al. 1987).

Thus far, it seems, researchers have recorded some close observations of the factors involved in prefledging, cygnet, and adult losses, especially in the Tri-state area; but the basic causes of these losses still seems not to have been pinpointed.

Illegal shooting, as well as legalized hunting, of trumpeters is another source of mortality for the trumpeter.

The Greater Yellowstone Nesting Population

This is the sole population of native trumpeter swans in the contiguous United States that was not extinct by 1900. Its future survival is not assured, however. The reason for this reservation lies in the Tri-state breeding population's uniquely perilous habitat situation. It should be kept in mind that with the inadequacy of the Tri-state habitat for swans in this area, many kinds of untoward events could seriously damage, even potentially destroy, that population. In other words, it would not require, for example, anything more spectacular than an unusually severe winter or an unfamiliar pathogen, or the continued piecemeal loss of nesting habitat.

Shea and Drewien (1999) described the situation that precipitated recognition of the need for dispersal of the trumpeters that occurred in the winter of 1989/1990.

The vulnerability of the RMP worsened during the following winter when the aquatic macrophyte community at HSP (Harriman State Park] collapsed. Severe regional drought reduced habitat at most Tri-state wintering sites and record numbers of trumpeters (>750) and other waterfowl wintered at HSP in 1989-90. Vegetation in the Henry's Fork River was of normal abundance during surveys in October 1989, but declined to <4% cover by February 1990 (Vinson 1991, Vinson 1992, Vinson et al. 1992). Lacking adequate food at HSP, hundreds of Canadian trumpeters moved to RRL where over 800 swans (approx. 40% of the RMP) massed at the 2 feeding ponds and exhausted grain supplies by late March (Herbert 1992, Shea et al. 1994). (Shea and Drewien 1999, p. 10).

Hence began urgent efforts to disperse the swans, a program that combined cessation of feeding, hazing, and translocation.

Montana

The Montana Natural Heritage Program, upon inquiry, wrote, "Information in our databases provides only a brief summary of the far more comprehensive data available from the refuge" (Beer, letter, September 9, 1999). The refuge in question is the centrally important one at Red Rock Lakes.

Gomez (1999) reports on the success of hazing in the RRL: "Hazing was conducted at Harriman State Park on 11 occasions from 19 Nov 98 to 5 Jan 99" (p. 2). This reduced the wintering trumpeter population at the lake from 456 "(including 61 tundras)" before the program started to 152 "after hazing on 25 Nov 98. Numbers then ranged from 249 to a high of 444 trumpeters on 5 Jan 99 (no tundra swans) during the hazing period. Hazing appeared less effective later in the winter as 412 trumpeters were observed on 14 Jan 99 after

hazing ended on 5 Jan 99" (p. 2). This report suggests that the trumpeters only waited for the commotion to die down before returning. It will be noticed in the report's charts that the rise in trumpeter numbers coincides with the disproportionate rise in the numbers of Canadian trumpeters in comparison with U.S. trumpeters. The reader is reminded that this report counts swans during the winter when all of the swans, U.S. and Canadian, are wintering in the U.S., especially in the Tri-state area.

Utah

Utah, though not in the Tri-state area, contains historic trumpeter swan habitat and has been proposed as an additional wintering area for trumpeters. It also contains potential nesting habitat, contiguous with nesting sites in southeast Idaho (Shea and Drewien, 1999). The information from eastern Utah at Ouray National Wildlife Refuge, Vernal, Utah, is somewhat sparse, however. USFWS spokesman for the Refuge reports that "Trumpeter swans occasionally (ca. every 3 out of 5 to 7 years) use the Ouray NWR during the fall/winter months. We have no documented nesting use of the Refuge by trumpeter swans" (De Leon, Refuge Biologist, letter, September 17, 1999).

According to "[a] report to the Pacific Flyway Study Committee at their meeting in Reno, NV July 26-28 1999," interest in swan hunting was down for a few years because of

"flood related losses of habitat and hunter opportunity and declining hunter numbers flyway wide (Pacific Flyway)" (Aldrich, Trost, Conant, Herbert, Saake, and Rothe, [1999]). Ominously, however, since 1990, hunter interest has rebounded as habitat conditions and swan use of migrational areas in Utah improved. Harvest of trumpeter swans was legalized in the Pacific Flyway in 1995 (USFWS 2000a). This report revealed that "In 1998, an estimated 85% of the permittees in the Pacific Flyway actually hunt[ed] and expended nearly 12,000 hunter-days in pursuit of swans. The estimated total retrieved harvest for the Flyway was 1,642 swans, which was 38% above that of 1997," and not retrieved were about 308 swans (Aldrich, Trost, Conant, Herbert, Saake, and Rothe, [1999]). Most of these were tundra swans; in fact, as the report makes clear (and as is made clear in a number of other related documents), the main object of the legalized trumpeter harvest is to protect tundra swan hunters who may make a mistake and shoot a trumpeter.

Wyoming

The northwestern corner of Wyoming (which includes Yellowstone National Park) contains part of the major Tri-state population. A map from the Wyoming Natural Diversity Database (1999) delineates the sightings of trumpeters as of September 30, 1999. These have occurred mostly in Teton and Park Counties, with two breeding season sightings in Sublette

County. This distribution, as can easily be seen, largely coincides with the area of Yellowstone National Park and Jackson Hole.

The Wyoming Natural Diversity Database (1999) provides the following information about the trumpeter's status in the state: it is classed in Wyoming as S1B, S2N, and the WNDD adds some further comments: "Although this is a migrant species, the rank of S2 applies to both breeding and non-breeding status. Rare; specialized breeding habitat required; few nesting sites; low population size; specialized foraging habitat; some threats" (p. 1).

The foregoing refers to the WNDD rank; the bird's state rank (Wyoming Game and Fish Department, is that of "Species of Special Concern" Priority 2). Additionally, "Listed as 'Resident, uncommon' by the Wyoming Game and Fish Department. Relatively few suitable nesting sites; very low numbers overall" (WNDD 1999, p. 3). This source further reports occurrences in 17 counties, mostly, however, in the northwest-Yellowstone portion of the state; also the fact that the Wyoming population is nonmigratory.

A report from Grand Teton National Park (immediately south of Yellowstone NP) describes the RMP as consisting of:

Two breeding flocks. The more sedentary U.S. segment which includes swans occupying parts of southeast Idaho, southwest Montana and northwest Wyoming (referred to as

the Tri-state Area), and the migratory Canadian segment (Subcommittee on Rocky Mountain trumpeter Swans 1992). Swans in the Tri-state Area face competition for winter forage from the nonresident Canadian flocks, contributing to high over-winter mortality, especially for juvenile birds (Subcommittee on Rocky Mountain Trumpeter Swans 1992). High mortality, coupled with low recruitment, led to a cooperative effort by state and federal agencies of the Tri-state Area to monitor population trends by documenting trumpeter swan distribution and productivity. (Vander Heyden 1999, p. 1)

This report of monitoring, issued in 1999, states that "Five of 10 historical territories monitored in GRTE/JODR [Grand Teton/John D. Rockefeller, Jr. Memorial Parkway] were occupied by swan pairs, 4 of which were reproductively active" (Vander Heyden 1999, p. 2). Table 4 from this report indicates territory occupancy, nesting, and nest success and shows that although territories occupied has been higher in the last decade (6 to 8 occupancies; 5 in 1999), 5 or 6 have been about average. Nesting pairs have ranged between 2 and 4; cygnets fledged have ranged from 9 (in 1997; the highest year since 1987) to 3. As can be seen in Table 4, cygnet losses tend to be high.

General breeding difficulties mentioned (Vander Heyden 1999, pp. 4, 7) include human disturbance, flooding of nest sites, infertile eggs, and, as mentioned, high cygnet losses.

The Trumpeter Swan on Public Lands

For U.S. Forest Service Regions 2 and 4, the species is assigned a Management Status of S-USFS R2 and S-USFS R4. The WNDD (1999) listed only one breeding record Swamp Lake, Shoshone NF (under Region 2 Fine Filter Project, Distribution).

Gallatin National Forest

This National Forest joins the boundaries of Yellowstone National Park on the northwest and contains winter swan habitat. According to G. Benes of Gallatin National Forest,

The Hebgen Lake Ranger District of the Gallatin National Forest has not and is not completing any research on trumpeter swans that I am aware of. Although swans are observed on Hebgen Lake and some its associated tributaries, there are no active nest sites in this area. We do not have a conservation plan for the management of this species. (Benes, letter, September 22, 1999)

The foregoing was in answer to an inquiry regarding possible data on the trumpeter on the Gallatin NF, and may have included an inquiry about Hebgen Lake which is believed to have harbored trumpeters historically.

Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway

The 1999 trumpeter monitoring report for these public lands expressed concern about hazards to the trumpeter and its low reproductive success.

In addition to competition with migratory flocks on marginal winter range, other potential causes of low recruitment include human disturbance of courting and nesting swans, flooding of nest sites, infertility, and high loss of cygnets. To assist with swan recovery in the Tri-state Area, all instances of nest failure should be investigated and attempts to improve productivity initiated. (Vander Heyden 1999, p. 4)

This National Park area reported cause for serious concern: only "five of 10 historical territories monitored in GRTE/JODR were occupied by swan pairs, 4 of which were reproductively active. . . . Three of the 5 cygnets hatched in 1999 survived at least 75 days, and were considered fledged" (Vander Heyden 1999, p. 2).

Red Rock Lakes National Wildlife Refuge

Following the 1999 fall trumpeter monitoring, the Refuge's report was abstracted thus:

This fall's survey found 417 trumpeter swans, a decrease from last year's 469 trumpeters and the lowest count since 1993. Most locations experienced high cygnet loss this summer. While cygnet losses are common, factors other than weather appear to be having an effect on cygnet survival and recruitment is low. The ratio of cygnets to adults (17%) remains consistent with historical trends, but more birds were present before the end of the winter feeding program. Although more widely distributed, trumpeter swan numbers remain lower than may have been anticipated since the end of winter feeding. (Gomez November 24, 1999, memorandum; Gomez November 23, 1999)

In the November 24, 1999 memorandum that accompanied the Red Rock Lakes monitoring report of November 23, 1999, there were reported

[s]ome general conclusions [that] can be drawn from recent trends:

*The Rocky Mountain Population is generally increasing due to continued growth of the Canadian Flock.

•U.S. Flocks (tri-state) are fluctuating as before the end of winter feeding, but at lower numbers (354-469 compared to 469-658).

•Some pioneering by dispersing trumpeters is evident but tenacity to certain sites may be a factor.

•In some areas, such as Henry's Lake or Island Park, ID, increasing human use of key wetlands has led to abandonment of historical trumpeter swan nesting territories. (Gomez November 24, 1999, memorandum)

Other points in this list (apart from personnel and cooperative organization changes) included notation of the apparent failure of an attempted translocation of trumpeter cygnets from Alberta to the Pablo National Wildlife Refuge, and good cygnet production in the Centennial Valley (Montana) in 1999, followed by extremely high cygnet loss.

Seedskadee National Wildlife Refuge

An attempt was initiated in 1996 to translocate some trumpeters to this NWR on the Green River in Wyoming. Shea and Drewien (1999), reporting on trumpeter translocation successes, indicated that there were 23 known survivors out of a total of 54 swans translocated (1990-1995). Of these only 3 returned at least two winters to the NWR, while 7 returned to the RRL/Harriman State Park/Island Park dam area. and the rest (13) were distributed across a range of behaviors (classed by desirability) between the two.

The Targhee National Forest

This NF, which is critically important for the trumpeter swan, is situated in eastern Idaho and northwest Wyoming. It is in the heart of the Tri-state area, encompassing the important trumpeter-use waters of Henry's Fork of the Snake River. National Forest lands in Montana are continuous with its boundaries (Beaverhead National Forest), and it also abuts Yellowstone National Park and Grand Teton National Park.

The following figures, concerning trumpeter swan occupation and nesting on the Targhee NF, were also taken from the apparent US Forest Service monitoring brief (1999) mentioned in the section on Idaho occupation/nesting above: On the Targhee NF: Occupied Territories, 8 in Idaho, 1 in Wyoming; Active Nests, 7 in Idaho, 1 in Wyoming; Successful Nests, 3 in Idaho, 1 in Wyoming; Cygnets Hatched, 9 in Idaho, +5 in Wyoming; "Cygnets Alive as of 9/1/99: Swan (2), Thompson Hole (4) [Swan and Thompson Hole are locations on the NF]" ([U.S. Forest Service] 1999).

The Targhee NF has Standards and Guidelines for trumpeter swan management, as follows:

1. Maintain suitable trumpeter swan nesting habitat conditions including (but not limited to) the following lakes and ponds: Boundary Pond, Swan Lake, Lily Pond, Hatchery Butte, Railroad Pond, Mesa Marsh, Bear Lake, Upper Goose Lake, Long Meadows, Thompson Hole, Twin Lakes, Chain Lakes, Widgit Lake, Rock Lake, Indian Lake, Putney Meadows, Unnamed Pond (Sec. 19 T9N, R46E). (S)

2. Change livestock grazing through management or fencing when grazing is adversely affecting trumpeter swan use or productivity. (G)
3. No vegetation management will occur within 300 feet of the lake or pond shoreline unless necessary to improve riparian habitat conditions favorable for trumpeter swans. Management may occur after the swans have left the lake or pond. (S)
4. Maintain constant water levels; allow no drawdowns from May 1 to September 30 when not in conflict with preexisting water rights. (G)
5. Do not take any recreation management actions that would encourage dispersed recreation activity at these lakes and ponds. Close these areas to recreation activity if this activity is adversely affecting trumpeter swan use or productivity. (G)
6. Implement habitat improvement projects at these lakes and ponds, such as dredging to maintain proper water depths and aquatic vegetation control. (G). ([US Forest Service] 1999)

Some of these standards and guidelines suggest that the U.S. Forest Service's ability to manage for the trumpeter may be hampered by non-biological considerations. It should be remembered that these are standards and guidelines only, and do not provide trumpeters and their habitat adequate statutory protection.

Pacific Flyway Management Plan

Although this management plan does not pertain to specific localized areas, it has been produced by the Pacific Flyway Council's RMP Trumpeter Swan Subcommittee (1984, 1992, 1998).

The 1998 Pacific Flyway management document strongly opposes winter feeding and supports such actions as hazing and lake drawdown on Harriman State Park to discourage swans from seeking food or resting sites there. These recommended actions, however, fail to obscure that the primary concern of the Pacific Flyway Council is to "[m]aintain trumpeter-swan-compatible, tundra swan sport hunting opportunities in the Pacific Flyway." The Council designates several objectives, the first of which is to redistribute trumpeters to additional winter habitat to alleviate the congestion in the Tri-state area. Curiously, the affirmation of the Council's determination to maintain swan hunting is listed as one of the "strategies" to be used, in some unexplained manner, to achieve this goal.

A second objective is to "Rebuild U.S. breeding flocks by year 2002 to at least 131 nesting pairs (594 adults and subadults) that use natural, diverse habitats and winter predominantly outside the core Tri-state Area." The reader is reminded that no biological basis is given for this number and that such a number does not begin to approach needed trumpeter restoration and recovery for long term viability. The Plan lists by locality the numbers the Council expects to see in 2002, but provides no explanation of how this increase in numbers or winter distribution of swans will occur. The Pacific Flyway Management Plan merely reiterates the usual

measures: maintain at least minimal habitat, discourage wintering in the Tri-state area, and maintain swan hunting.

Necessary to this major effort to perpetuate swan hunting is a document included in the appendix of the Pacific Flyway Council's management plan: a "Finding of No Significant Impact" from the cooperative USFWS. The core of this document lies in the next to last paragraph:

Based on review and evaluation of the information contained in the supporting reference below, I have determined that the proposed action to amend 50 CFR part 20, subpart K, to allow the hunting of certain migratory birds during the 1995-99 seasons will provide adequate protection to the affected swan species and that this is not a major Federal action that would significantly affect the quality of the human environment within the meaning of section 102(2)(c) of the National Environmental Policy Act of 1969. Accordingly, the preparation of an environmental impact statement on the proposed action is not required. (Pacific Flyway Management Plan, rev. 1998, appendix, p. 53).

However, the core assertion of this document, namely that permitted swan hunting would be compatible with the restoration of the trumpeter swan, is open to serious question. Assertion is not proof, nor even a very reliable predictor.

RMP/Canada

G. W. Beyersbergen, wildlife biologist of the Canadian Wildlife Service at Edmonton, Alberta, wrote (letter, September 27, 1999) that

The Trumpeter Swan was removed from the endangered species list, referred to as the COSEWIC list (Committee on Status of Endangered Wildlife in Canada) in April 1996. This

de-listing was a result of data provided by the 1995 International Trumpeter Swan survey in North America which showed trumpeter swans to be increasing across their range. These surveys are conducted every five years. Trumpeter Swans summering and/or nesting in western Canada are found in W/N.W. Alberta, N.E. British Columbia, the Yukon and S.W. Mackenzie District of the Northwest Territories. The trumpeter swans nesting in these areas are increasing, based on population estimates derived from the five-year surveys. Survey totals for western Canadian trumpeter swans are as follows: 379 (1980), 614 (1985), 1,117 (1990), and 2,076 swans in 1995.

Because survey methods changed substantially in 1995, in the Yukon and northern B.C., it is not evident that 1995 data are comparable to previous surveys. This spokesman added that in the area he surveys (Elk Island National Park, Alberta), "The annual number of pairs of swans and the lake occupancy rate in the survey area has remained fairly stable, indicating that excess swans (annual production) are likely expanding to lakes outside my current survey area" (September 27, 1999).

Threats to the Swan

Development of Trumpeter Problems

The Greater Yellowstone population faces a series of threats. Some of these are more or less unique to the trumpeter, while others sound depressingly familiar from other wildlife preservation efforts. By 1932, as we have seen, there were only about "50 adults and subadults" in the Tri-state area and some 77 more in Alberta, Canada (Gale et al. 1987). Thus it was that in 1935, supplemental feeding was instituted, especially at Red Rock Lakes in Montana, which

became a National Wildlife Refuge (Shea and Drewien, 1999). According to Shea and Drewien (1999), another purpose of grain feeding in the winters was to persuade the swans to stay away from areas where there was known to be illegal shooting.

An undated brochure issued by the USFS states:

Numerous factors limit the complete recovery of the bird to its historic range and abundance:

- Availability of food on wintering sites
 - *Severe winter weather
 - *Loss of suitable breeding habitat and traditions to historic wintering areas
 - *Predators
 - *Shooting
 - *Diseases and parasites. (USFS, Ogden, Utah, U.S. Govt. Printing Office.

The feeding program at Red Rock Lakes continued until 1992-1993. It seems probable that this feeding program prevented the total extinction of the trumpeter swan in the United States. But, like many other human-contrived "fixes" of the natural ecosystem, this one fixed the original problem but generated new ones. The Tri-state population grew at about 10% per year until about 1954; Banko (1960, cited by Shea and Drewien 1999) "concluded that population growth after 1954 was limited by summer habitat availability, and that cygnet production was depressed by density-dependent social interactions. . . . The lack of growth of the Grande Prairie population [Alberta] in the 1940s-1960s also was thought to result from breeding habitat limitations (Banko and MacKay 1964)" (p. 6). It appears, then, that with the Tri-state population at 654 in 1954, it was initially believed that

lacking additional breeding habitat, the population could not be further expanded. Gale et al. (1987), however, demonstrated that winter habitat, not breeding habitat, was the more likely limiting factor.

The 1960s saw the population high point for the trumpeter in the Tri-state area (Shea and Drewien 1999).

After that,

high pre fledging mortality of cygnets (62-83%) and winter losses of up to 35% of resident adults caused increasing management concern after 1960. By 1968, Tri-state adults had decline 22% from peak numbers and previously occupied breeding habitat was vacant. As adults declined, cygnet production did not increase in the inversely density-dependent manner that was expected. Studies in the 1960s (FWS Bear River Research Station, annual summaries in RRL Annual Narrative Reports, 1962-66) and 1970s (Page 1976, Shea 1979) found pre fledged cygnets to be adversely affected by high parasitism, cold wet weather shortly after hatching, general weakness, and occasional leg deformities, but found no ultimate cause for the problems (Gale et al. 1987). (Shea and Drewien 1999, p. 7)

Winter swan feeding and changes in flow management in the Henry's Fork allowed swan numbers to increase. The balance between the Tri-state (largely resident) and Canadian (migratory) flocks began to shift.

By the early 1980s, cygnet production, adult numbers, and nesting effort of Tri-state flocks had further declined. This decline, which centered at RRL, also reduced dispersal to adjacent breeding areas such as YNP. By 1986, Tri-state adults were about 40% below their 1964 peak, and nesting pairs at RRL and YNP were 60% below peaks of the 1950s-60s. In contrast, Canadian trumpeters began increasing in the late-1970s and expanding their summer distribution; their numbers at Tri-state wintering sites rose from < 200 in 1974 to 1,100 by 1986 (Gale et al. 1987). (Shea and Drewien 1999, p. 7)

One result has been an overload on the Tri-state area swan habitat during the winters.

From only 30 known trumpeter swans in 1940 and 1,200 in the early 1980s, the Rocky Mountain flyway now contains an estimated 3,000 trumpeters, although most are based in Canada [emphasis added]. Meanwhile the Pacific Coast population grew five fold from 3,000 in the 1970s to 15,000 today, officials said. (Kohlman September 9, 1996)

The decision was reached in these years to attempt systematic dispersal of the Tri-state population, especially from its core at Red Rock Lakes and surrounding territory. Kohlman's (September 9, 1996) informant, Dave Lockman, was further quoted as saying

[O]fficials in the West were trying to entice the birds into new wintering areas, such as Utah and along Idaho's Snake River. . . . the Yellowstone area . . . supports about 500 of the Rocky Mountain population's trumpeters year-round; the rest descend from Canada to vacation for the winter. "They're a vulnerable bird. If hit by real cold years, the birds will need migratory strategies," Lockman said.

[(Wyoming) State Game Warden Bill] Long said Yellowstone-based swans are more vulnerable than their Pacific or Canadian counterparts. He noted that the Red Rock Lakes population historically produced 60 cygnets a year. This year [1996] it had none. . . . (Kohlman September 9, 1999)

There does not appear to be any significant disagreement with the propositions that the now immobilized U.S. trumpeter "needs migratory strategies" and that the congested Tri-state area needs fewer swans; however, concerted campaigns to get the swans to migrate have not been very successful. It will be noticed that in the quotations above, possible habitat in

Utah was mentioned for future occupation. Restoring use of more southerly habitat will be complex at best; for example, it surely must require careful consideration in light of the Pacific Flyway Plan's specific disclaimer of willingness to provide safe habitat for the species before it has, of itself, established its own migratory routes (Pacific Flyway Council, 1998), even though the trumpeters have so far proven unable to do so.

Other Threats

There are other hazards to the continued existence of the trumpeter. One of the most pathetic is the damage to the trumpeter that the bird incurs by ingesting lead shot. Gale et al. (1987) noted that, in addition to the direct injury done to individual birds by the lead shot, there are definite indications of lead contamination among the species. Lead shot has been outlawed; the layers of shot in the food-growing sediments of trumpeter habitat remain, and it appears that no one has seriously proposed any effective means of trying to rehabilitate this habitat damage.

Growing human disturbance in trumpeter habitat is causing the abandonment of nesting sites (Gomez, November 24, 1999, memorandum). The trumpeter's naturally rather fragile reproductive cycle suffers from human disruption (Vander Heyden, October 1999) in the course of recreation; given that the human population trend is still rapidly increasing in the

Tri-state area, and given the apparently ever-burgeoning popularity of outdoor recreation, the situation can only get worse.

Still further hazards to the trumpeter: the Targhee National Forest Plan (1997), for example, in its trumpeter swan section, offers cautions concerning one of the "usual suspects" in many wildlife imperilments: cattle grazing. This does, indeed, affect water quality and quantity in many ways and constitutes an extremely serious hazard to species of wildlife other than the trumpeter. It appears, as seems likely enough, that it may well also affect trumpeter habitat. As one report from the Targhee's report of potential nest locations (a pond), tersely commented: "Many cows--no swans."

In the western U.S., where water has always been scarce, private ownership has often resulted in a nearly complete dismemberment of the natural watershed structure, including both stream systems and wetlands.

Failed nests cannot be reattempted; infertile eggs appear to be a problem in the core area; poor nutrition may leave the female in inadequate condition to produce a brood. The season may be too late in the Tri-state area to give cygnets much margin for survival.

Swan Hunting

The U.S. is the only nation left in the world that permits recreational swan hunting and that situation exists

despite the fact that the Greater Yellowstone breeding population is presently at serious risk for the reasons described above.

Some are attempting to migrate south into the Utah swan hunt area, and migrants from the Red Rock Lakes nesting flock have been found shot in the swan hunt (Shea and Drewien 1999). The USFWS document, "Proposal to Establish Operational General Swan Hunting Seasons in the Pacific Flyway," states that "Sport hunting programs are endorsed by all Flyway Councils with a harvest objective of generally less than 10 percent of the winter population", (p. 13). However, as described in some detail elsewhere in the present document, hunting is an imminent threat to the Tri-state trumpeters, because it has been maintained by the Pacific Flyway Management Plan for the last several years, and the organization proposes to continue the tundra swan hunt with an allowable, but unprovable, trumpeter take. Trumpeters attempting to migrate into Utah are at risk of being shot; and these prospective migrators are the ones that are needed to expand this essential behavior in the Greater Yellowstone population.

ESA Listing Criteria as Applied
to the Trumpeter Swan in the
Tri-state/Yellowstone Area

For purposes of ESA listing, the threats to the swan will be described under the five listing criteria:

1. The present or threatened destruction, modification, or curtailment of habitat or range;
 2. Overutilization for commercial, recreational, scientific, or educational purposes;
 3. Disease or predation;
 4. The inadequacy of existing regulatory mechanisms;
- and
5. Other natural or manmade factors affecting its continued existence.

1. The Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

*Severely restricted breeding and winter distribution has resulted in dependence upon marginal winter habitat where risk of mortality is high and there is severely reduced access to adequate pre-nesting habitat (Gale et al. 1987, Pacific Flyway 1992, 1998, Schmidt 1999, USFWS 2000a).

*The likely future loss of nest sites, spring, summer, and fall/winter habitat due to increasing human activity and loss of wetlands (USFWS 1999, Shea et al. 1999). The Greater Yellowstone region is experiencing some of the highest rates of subdivision and growth in the western U.S. Increasing year-round pressure from fishermen is further diminishing winter and summer habitat suitability.

*The continued restriction of useable winter habitat due to inadequate water flows. Flows in several of the key

wintering areas are controlled by federal dams. The USFWS has failed to obtain minimum flow guarantees for Henry's Fork, as anticipated in the Federal Register decision (April 26, 1990). Habitat in the Henry's Fork is subject to future potential degradation due to winter dewatering of the Henry's Fork for Snake River aquifer recharge, and a current proposal to transfer title of Island Park Dam and Reservoir from the federal government (Bureau of Reclamation) to private irrigation interests (R. Shea, pers. comm. December 1999).

'Serious habitat (water management) inadequacies at Grays Lake NWR, Idaho threaten the future productivity of nesting swans in this location (Shea and Drewien 1999).

*Deterioration of aquatic macrophyte communities in the Henry's Fork below Island park Dam and elsewhere in eastern Idaho, such as the Teton River in Teton Basin (Vinson 1991; Shea et al. 1996; Shea and Drewien 1997).

*Swan hunting in Utah and Nevada has effectively removed swan habitat in these states from use in trumpeter restoration efforts (Pacific Flyway 1992, 1998; Shea et al. 1994, Shea and Drewien 1999).

'Since 1990, winter food resources in the Tri-state region have diminished due to termination of supplemental winter feeding and reduction of aquatic macrophytes at Harriman State Park, while the numbers of wintering Canadian trumpeters has increased. High mortality has been avoided

primarily due to an unusual series of milder than average winters. Many hundreds of swans have become dependent upon habitat that will freeze in a severe winter (Shea and Drewien 1999).

2. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

● Historically, the RMP was reduced to near extinction by overutilization by commercial and subsistence harvest.

*Current proposals to permanently legalize recreational harvest of trumpeters in Montana, Utah, and Nevada jeopardize Tri-state trumpeters that disperse outside the Tri-state area. Survival of the individuals that disperse outside the Tri-state area is crucial to expansion of the population's distribution. Because they mate for life, shooting of a breeding adult can disrupt the surviving mate's productivity for years. Federal and state agencies are unable to quantify all hunt-related mortality. The USFWS has sole jurisdiction over swan hunting in the U.S. and has failed to prevent it from displacing trumpeters, causing direct mortality, and precluding use of key habitats, such as Bear River National Wildlife Refuge and extreme southeast Idaho, in trumpeter restoration efforts.

3. Disease or Predation

*As previously noted, the dependence of virtually the entire population on a single, marginal wintering area leaves

all the Canadian flocks, as well as the Tri-state subpopulation, vulnerable to rapid disease transmission. Disease is a particular risk to wintering swans that are weakened by inadequate winter nutrition and severe weather. Parasitism, emaciation, avian cholera, avian pox, and histomoniasis have been identified as potential disease concerns (Pacific Flyway 1998).

*Problems of acute lead poisoning and sublethal lead have been documented on Red Rock Lakes NWR, among dead swans on the Henry's Fork, and at Market Lake WMA, Idaho. The vulnerability of swans to lead poisoning, due to feeding on tubers in soft sediments has been widely documented (Gale et al. 1987, Pacific Flyway 1992, 1998, USFS 1995)

*Predator densities in Tri-state nesting areas are increasing due to recent increases of red fox and raccoon, restoration of wolves and grizzly bears, increasing coyote populations following curtailment of 1080 and other poisons, and reductions in predator control on public lands.

4. Inadequacy of Existing Regulatory Mechanisms

*Due to the trumpeter swan's social organization and dependence upon migratory traditions, the necessary restoration of migrations and secure distribution is unlikely to occur without significantly increased management intervention. Existing regulatory mechanisms have not provided the necessary management direction, budgets, clarity

of agency roles, accountability, or a cohesive program to effect a successful recovery of this population. Despite a decade of range expansion efforts, the USFWS still has no goals and objectives for the Tri-state subpopulation (or the entire RMP), no management plan, no federal program to prevent further decline and population loss, no viable range expansion strategies, and has no coherent vision of where range expansion should be attempted. The USFWS cannot even conclude that south is the necessary direction to expand winter distribution. Existing mechanisms have allowed efforts to protect swan hunting to fundamentally shape strategies to reduce the vulnerability of Tri-state trumpeters and to prevent effective use of release sites in southeast Idaho and northern Utah (Shea and Drewien 1999, Pacific Flyway 1998).

It should be noted also that the FWS apparently has not produced a legally defensible SEA for the purpose of assessing the impacts of the proposed tundra swan hunt to the trumpeter swan. It has been pointed out that the present SEA is in gross violation of NEPA, of the Migratory Bird Treaty Act, and the National Wildlife Refuge System Act and Refuge Hunting Regulations as well (Schubert and Associates June 19, 2000). Additionally, it appears that Utah's retaliatory refusal to accept more translocated trumpeters because of a reduction in the length of the tundra swan hunting season has been tolerated by the FWS, even on a federal National Wildlife

Refuge.

5. Other Natural or Manmade Factors Affecting
Its Continued Existence

*Preliminary data suggest that the Tri-state subpopulation contains an extremely low level of genetic heterozygosity (Gale et al. 1987; Marsolais 1997).

'Manmade factors such as lead poisoning, powerline collision, and shooting are primary sources of mortality (Gale et al. 1987, USFS 1995, Shea and Drewien 1999).

In summary, all five of the criteria for determining endangerment, as specified in the ESA, are met by the Tri-state subpopulation. Additional detailed documentation of the threats to the U.S. breeding segment of the RMP are given in Pacific Flyway (1984), Gale et al (1987), Federal Register (April 25, 1990), Pacific Flyway (1992), U.S. Forest Service, 1995, Pacific Flyway (1998), Shea and Drewien (1999), USFWS (1999), and USFWS (2000b).

Summary and Conclusion

As we have seen, the trumpeter swan (Cyanus buccinator) was exterminated in the contiguous United States by about 1930 except for a few birds that persisted in the then-remote Tri-state area that lies at the boundary junctures of Montana, Idaho, and Wyoming, where local geothermal areas provided a small amount of open water and food during even the most severe winters.

Early efforts to save the species in the 1930s resulted in winter feeding of the swan at the Red Rock Lakes National Wildlife Refuge. The feeding operation undoubtedly saved the species from total extinction in the lower 48 states. However, it produced further difficulties for the trumpeter as time passed.

Another population, the western Canadian population (that breeds in Alberta, British Columbia, the Yukon, and the Northwest Territories), also winters in the Tri-state area; its migrations to other historic wintering areas have been eliminated. This has resulted in serious inadequacy of the available swan habitat. As of 2000, the Greater Yellowstone population is the only potentially viable native population in the lower 48 states.

It can be readily seen from the data presented in this petition that the Tri-state population has not yet been securely restored. There are, at present, fewer than 80 nesting pairs in the entire western U.S., and the adult component of the Greater Yellowstone population has declined by 38% in the past decade. During that decade, the Tri-state population has declined substantially, while the Canadian population expanded. The Tri-state population, and indeed the entire RMP, are vulnerable due to inadequate winter habitat.

TO help disperse winter trumpeters, winter feeding was discontinued, apparently with the expectation that there would be some trumpeter loss; but the literature gives the impression that the ensuing losses were larger than contemplated. The object of this discontinuance of feeding, of course, was to induce the trumpeters to find new places to winter, especially south of the Tri-state area, but in 2000, it appears that the various attempts to persuade the swans to move have not been very successful, and the FWS has identified no southern habitat where wintering trumpeters will be encouraged.

It appears then, that the trumpeter swan is clearly in need of more efficient protection and coordinated management such as federal management under the ESA could provide. Under the Migratory Bird Treaty Act, restoration of the Greater Yellowstone population is a federal (USFWS) responsibility. The USFWS should not abrogate this responsibility and allow the Pacific Flyway to dictate restoration objectives and strategies. The Flyway's objective appears to be able to continue hunting tundra swans without any legal liability should a hunter kill one of the wrong kind (i.e., a trumpeter). It is contended, in the present document, that any hunting mortality is too much in a population as small and perilously situated as the Tri-state breeding population of the trumpeter swan. A continuation of

a limited trumpeter swan hunt in parts of Utah would continue to put at serious risk those individual swans that most need to be protected--those that demonstrate a willingness to reestablish more southerly migratory patterns.

In summary, some of the major threats to the Tri-state trumpeter swan include: its low numbers, its severely diminished distribution, low productivity, lead contamination of its food sources, hunting, habitat loss, and disease, as well as the inadequate winter and spring habitat described.

Additionally, the trumpeter suffers from a number of parasites and diseases that need further research. The literature suggests strongly that more research is needed in the area of cygnet loss and poor hatching rates, which, at least in the Tri-state area, are high and do not seem to be entirely explained.

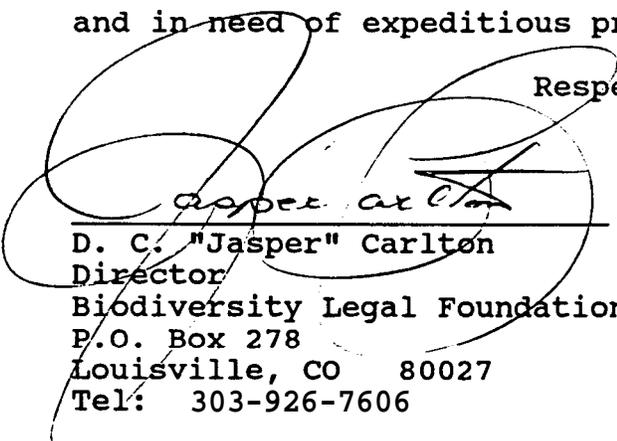
For too long, too much deference has been paid to the swan hunting interests of the western states who have repeatedly maneuvered to avoid adequate protection and ESA listing for the trumpeter swan and to block restoration into more southerly habitat, but one thing they have not done successfully is to restore the trumpeter swan securely. The decline of the Greater Yellowstone population and its current precarious status are clear proof of this.

This petition documents the fact that the Greater Yellowstone trumpeter swan is threatened or endangered on all

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five counts of the criteria for ESA listing and faces imminent and continuing threats. The best scientific data available clearly demonstrate that the Greater Yellowstone population of trumpeter swans is biologically threatened or endangered and in need of expeditious protection under the ESA.

Respectfully submitted,



D. C. "Jasper" Carlton
Director
Biodiversity Legal Foundation
P.O. Box 278
Louisville, CO 80027
Tel: 303-926-7606



Michael Markarian
Executive Vice President
Fund for Animals
World Building
8121 Georgia Ave., Ste. 301
Silver Spring, MD 20910
Tel: 301-585-2591