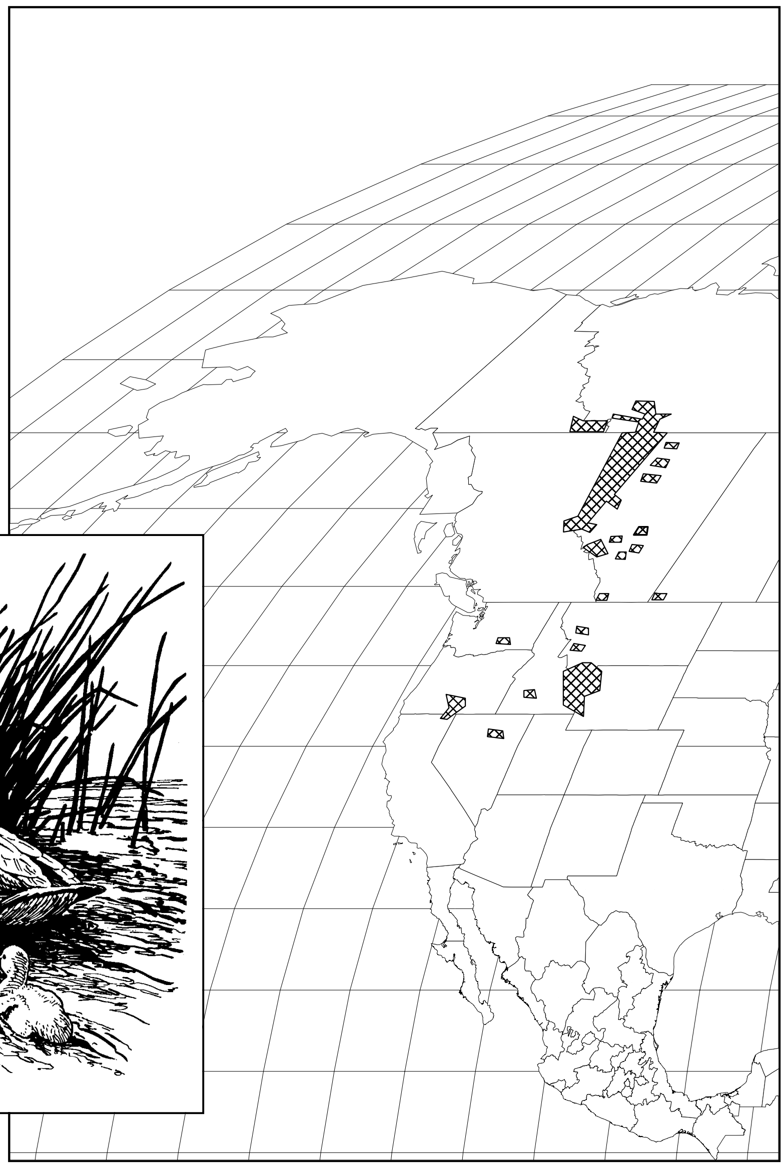
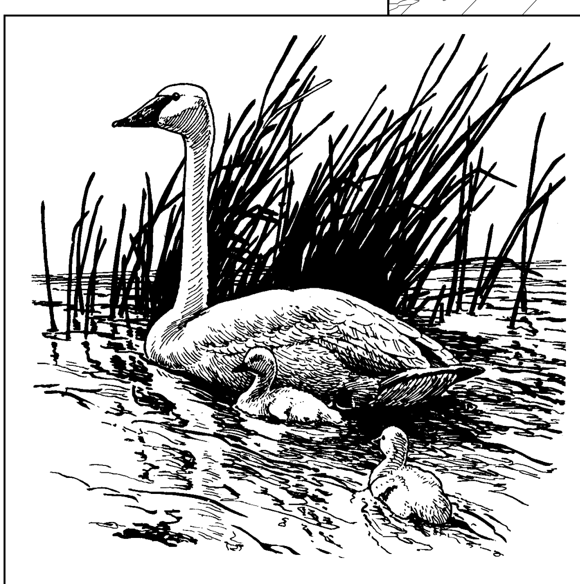
Pacific Flyway Implementation Plan for the

# Rocky Mountain Population of Trumpeter Swans





**PACIFIC FLYWAY IMPLEMENTATION PLAN**

**FOR THE ROCKY MOUNTAIN POPULATION OF**

**TRUMPETER SWANS**

Prepared for the

Pacific Flyway Council, and
U.S. Fish and Wildlife Service

by the

Pacific Flyway Study Committee

July 2002

Approved by: ______________________________________ ____________________
Chairman, Pacific Flyway Council Date

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# I. INTRODUCTION

The Pacific Flyway Plan for the Rocky Mountain Population (RMP) of trumpeter swans provides broad direction to the states, the U.S. Fish and Wildlife Service (USFWS), and other interests engaged in cooperative management of this population. The plan has been periodically updated to address evolving management challenges and to incorporate new information. The Pacific Flyway Council (Council) approved the most recent revision in 1998. The 1998 Plan included five objectives: (1) to redistribute wintering swans, (2) to rebuild the U.S. breeding flocks, (3) to encourage the growth of Canadian flocks, (4) to increase the abundance of desirable submersed macrophytes in the Henry's Fork of the Snake River, and (5) to monitor the population. In early 2001, the USFWS drafted a concept plan outlining potential activities to benefit swans within the National Wildlife Refuge System. As the Draft Refuge Concept Plan was completed, the Council requested other interest groups (federal, state, and non-governmental organizations) collaborate on the creation of an overall Trumpeter Swan Implementation Plan (TSIP). The TSIP would include portions of the Refuge Concept Plan and also address habitat and resources outside of the USFWS Refuge System. Separate subcommittees of the TSIP working group were formed in June 2001 and specific action items were developed by these subcommittees to address the objectives listed above, except Objective 3 (encouraging the growth of the Canadian flock), because the Canadian flock has been increasing steadily under current management. The entire TSIP working group met in June, August, and December of 2001, with a final meeting in February of 2002.

The TSIP assigns specific tasks and timeframes to implement the strategies listed in the 1998 Pacific Flyway Management Plan for the RMP of Trumpeter Swans. The TSIP is tiered to the 1998 RMP Plan and contains updated objectives, strategies and tasks. The tasks described cover the 5-year period from 2002 to 2007. Funding TSIP will require an ongoing effort. Strategies and cost estimates for funding priority tasks will be developed by October 2002. Potential habitat projects in Idaho, Montana and Wyoming will be identified and prioritized by December 2002. A report will be prepared and presented to the Pacific Flyway Council each July, summarizing progress made toward achieving goals and objectives of the TSIP and the Pacific Flyway Plan for the RMP of Trumpeter Swans. Goals and objectives of this plan are enumerated consistently with 1998 Flyway Plan.

## Background

U.S. flocks of the RMP currently summer in three locations (See Figure 1 in the 1998 RMP Plan): (1) the Tri-state Area of eastern Idaho, southwestern Montana, and western Wyoming, (2) the Ruby Lake NWR, and (3) Malheur NWR and Summer Lake area of Oregon. In September 2001, these areas collectively contained 416 adults, including 362 in the Tri-state Area, 23 in Oregon, and 31 in Nevada (USFWS 2001). Trumpeter swans at Ruby Lake and Malheur NWRs were derived primarily from swans that were transplanted from Red Rock Lakes NWR, beginning in 1941.

The geographic scope of the "Tri-state Area" has changed since 1988, because the summer distribution of swans has expanded in SE Idaho, SW Montana, and western Wyoming. The Tri-state Area corresponds to the area for which Tri-state data have been reported in the USFWS 1990-2000 Rangewide Survey reports, past USFWS Tri-state September Survey reports, and includes the few swans occasionally reported nesting in central Montana along the East Front of the Rockies.

The "Core Tri-state Area" is a smaller area. This is the portion of the Tri-state Area within which almost all Tri-state trumpeters summered and most Canadian and Tri-state swans wintered during much of the 20$^{th}$ century, prior to expansion efforts that began in the late 1980s. The more recently occupied portions of the Tri-state Area (such as the Green River drainage in Wyoming, or Idaho south of the South Fork of the Snake River) are sometimes referred to as the "Tri-state expansion areas." In this document, swans that summer in the Tri-state Area are referred to as the "Tri-state Area Flocks"; all RMP/ U.S. nesting trumpeters are identified as the RMP/U.S. Breeding Segment (see the 1998 RMP Plan for a more complete discussion of these terms).

## II. POPULATION MANAGEMENT GOAL AND OBJECTIVES

### Population Management Goal

The management goal is to restore the RMP as a secure and primarily migratory population, with a 5% average annual growth in number of wintering birds, for the period of this plan, sustained by naturally-occurring habitats and waste grain on agricultural lands in diverse breeding and wintering sites.

### Objectives

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

*Strategy 1.--* Encourage swans to migrate to wintering areas outside the Core Tri-State Area, especially outside Harriman State Park (HSP).

*Task 1.--* Reduce fall and early winter swan habitat on HSP by manipulating water levels while giving consideration to fisheries, irrigation, and hydropower concerns. See Objective 4 for additional detail on the planned actions, and Appendix 1 for the rationale for these decisions.

Subtask A: Manage water levels of Golden and Silver Lakes to encourage early freezing and reduce the availability of swan feeding and resting sites. Refill both lakes by March 1 to provide maximum late winter foraging opportunity. Lead: Idaho Department of Parks and Recreation (IDPR); Ongoing.

Subtask B: Encourage the U.S. Bureau of Reclamation (BOR) to maintain lower flows on the Upper Henry's Fork in the fall to reduce habitat available for migrating swans and to store water for emergency mid-winter releases. Use stored water for emergency release of water from Island Park Reservoir to break up ice if low temperatures freeze the river. Also see Objective 4. Lead: Idaho Department of Fish and Game (IDFG); Ongoing.

*Task 2.--* Evaluate effectiveness of winter translocations of cygnets to promote use of wintering areas outside the Core Tri-state area. (see Objective 2, Strategy 5, Tasks 2 and 3 for specific tasks and assignments).

*Strategy 2--.* Release captive-reared cygnets or yearlings of Tri-State origin during summer to establish new breeding flocks that winter outside the Core Tri-state.

*Task 1.--* Release salvaged and captive-reared swans of Tri-State ancestry in the upper Green River drainage (Wyoming) during summer. Monitor and evaluate results of these releases. Lead: WGFD and USFWS in cooperation with others; Ongoing. Report due April 1 following summer of release.

(See Objective 2, Strategies 5-6 for other tasks and assignments.)

*Strategy 3--.* Work with partners to protect, enhance and increase trumpeter swan winter habitat.

*Task 1.--* Identify and prioritize winter habitat restoration, acquisition, and enhancement projects within each state; work with partners and the Intermountain West Joint Venture to secure funding. Lead: States; 12/02.

*Task 2.--* Identify and address specific factors limiting swan use of winter habitats, including disturbance and site-specific mortality factors (such as lead poisoning, powerlines, fences, etc.). Lead: States; 12/02.

**Objective 2. Rebuild U.S. breeding flocks to at least 141 nesting pairs (614 adults/ subadults) that use natural, diverse habitats and winter predominately outside the core Tri-state Area. The goal is to make progress toward this objective during the 5-year term of the TSIP. The desired distribution of nesting pairs is as follows:**

Table 1. 2001 Population Levels and Short-term (Year 2007) Objectives
[updated with September 2001 survey data]

| Location | Nesting Pairs [a] 2001 | Nesting Pairs [a] Plan Objectives[c] | Adults [b] 2001 | Adults [b] Plan Objectives |
|---|---|---|---|---|
| Montana/Centennial Valley | 8 | 33 | 91 | 160 |
| Montana/Other | 4 | 5 | 49 | 10 |
| Wyoming/Yellowstone NP | 2 | 10 | 17 | 40 |
| Wyoming/outside Yellowstone | 17 | 18 | 81 | 120 |
| Idaho/Targhee NF | 6 | >10 | | |
| Idaho/Other sites | 17 | 25 | 126 | 150 |
| **Total Tri-state Area Flocks** | **54** | **101** | **364** | **480** |
| Oregon | 4 | 25 | 23 | 100 |
| Nevada | 6 | 5 | 31 | 14 |
| Flathead Valley/W. Montana | 0 | 10 | 0 | 20 |
| **Total Other U.S. Flocks** | **10** | **40** | **54** | **134** |
| **Total RMP/U.S.** | **64** | **141** | **418** | **614** |

[a] "Nesting pair" is a swan pair that displays evidence of nesting (e.g., nest building, incubation, brooding posture, visible eggs); determination may require on-site verification. Tabulation of nesting pairs provides more accurate information about reproductive activity than does breeding pairs, but may not always be available because of the need for verification.

[b] White birds only, yearling and older, counted during the September Survey.

[c] These are objectives (except those for the Flathead Valley) were identified in the 1998 RMP Plan but achieving them may not be possible in the next 5 years.

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*Strategy 1.--* Increase the size and productivity of the Tri-state Area Flocks by providing adequate nesting and brood-rearing habitats.

*Task 1.--* Develop a Tri-state habitat evaluation procedure. Work cooperatively with Canadian Wildlife Service to standardize the habitat evaluation procedure. Lead: Greater Yellowstone Trumpeter Swan Working Group (GYTSWG); 12/02.

Subtask A: Circulate habitat evaluation criteria developed for Draft Concept Plan for National Wildlife Refuges to GYTSWG and implement until Task 1 is completed. Lead: Southeast Idaho National Wildlife Refuge Complex (SEINWRC); 10/02.

*Task 2.--* Identify current and potential nesting and pre-breeding habitats. Develop a strategy for landscape-level planning to help determine priorities. Lead: GYTSWG; 12/02

Subtask A: Include trumpeter swan habitat needs in appropriate refuge comprehensive conservation plans. Lead: USFWS; Ongoing.

*Task 3.--* Develop site-specific plans to protect, and (where possible) enhance habitat within nesting territories in Tri-State core and expansion areas. Implement management actions where needed. Give priority to: a) productive territories threatened by foreseeable problems, b) occupied sites with poor productivity but correctable problems, and c) unoccupied historic sites with good habitat. Lead: Land management agencies and private landowners; 12/02.

Subtask A: Complete or develop habitat restoration projects on National Wildlife Refuges:

1. Continue the Centennial Valley Easement Program to protect trumpeter swan breeding habitat. Lead: Red Rocks Lake NWR; 9/02**.**
2. Develop a restoration proposal for the Bun Lake wetland enhancement project at Bear Lake NWR. Lead: Southeast Idaho NWR Complex; 12/03.
3. Relocate a well to develop the Sandhole Lake wetland complex. Lead: Camas NWR; 12/03.
4. Develop five nesting islands where there is suitable emergent cover. Lead: Minidoka NWR; 12/04.
5. Construct water control structures in Nowlin ponds on the National Elk Refuge(NER). Lead: NER; 12/04.
6. Evaluate and implement restoration of spring ponds. Lead: Ruby Lake NWR 12/04.
7. Assess the potential for restoring wetlands on Kootenai NWR for breeding swans. Lead: Kootenai NWR, 12/04.

*Task 4.--* Work with Joint Venture partners, extension biologists, and local land trusts to identify high priority swan habitat improvement projects in currently unoccupied swan habitat. Lead: States and Intermountain West Joint Venture; 7/03.

Subtask A: Prepare small grant North American Wetlands Conservation Act proposal for restoration of swan nesting ponds on the National Elk Refuge. Lead: National Elk Refuge; 7/03.

Subtask B: Evaluate opportunities for protecting existing or unoccupied swan breeding habitat through acquisition of refuge in-holdings and easements. Lead: USFWS; Ongoing.

*Task 5.--* Produce a brochure describing how to enhance or construct wetlands to provide nesting, pre-breeding, and winter habitats for trumpeter swans. The brochure will target landowners and agencies. Lead: Wyoming Wetland Society, Intermountain West Joint Venture and States; 7/2003.

*Strategy 2.--* Decrease mortality of Tri-state trumpeter swans.

*Task 1.--* Reduce mortality sources including problem fences, powerlines, illegal shooting, and lead poisoning by identifying problems and by implementing remedial actions, including public education and law enforcement. Lead: All groups; Ongoing.

Subtask A: Continue replacement of existing above-ground powerlines on the National Elk Refuge. In 2001 approximately 7/10 of a mile of power line was buried using funding from the Refuge, Lower Valley Energy, the Jackson Hole Wildlife Foundation and private donors. Lead: USFWS National Elk Refuge; 12/04.

Subtask B: Assess lead poisoning risk and develop lead shot monitoring study as appropriate at Camas NWR, Red Rocks Lake NWR, and Seedskadee NWR. Lead: USFWS; 12/04.

Subtask C: Implement voluntary conversion to non-lead fishing sinkers by providing non-toxic alternatives. Lead: USFWS Ruby Lake NWR; 12/03.

*Strategy 3.--* Augment US breeding flocks. Only eggs and birds of Tri-state origin will be used to augment the Tri-state flock. Expansion areas will be selected to avoid establishing disjunct flocks and to encourage winter migration outside the Core Tri-state area.

*Task 1.--* Salvage eggs and cygnets, and continue production of eggs and cygnets from captive swans for release into areas that will expand breeding distribution**.** Lead: States and USFWS; Ongoing.

Subtask A: Since Grays Lake NWR represents a large proportion of nesting attempts by trumpeter swans in Idaho and continues to experience drought conditions and water management problems salvage of eggs will continue for the foreseeable future. Lead: USFWS Grays Lake NWR and IDFG; Ongoing.

*Task 2.--* Review safeguards used by captive-rearing facilities that produce stock to augment wild populations. Establish mandatory rearing and release protocols to ensure captive-reared swans do not cause health, genetic, or behavioral influences that could jeopardize the wild nesting population. Lead: USFWS with Bill Long; 12/02.

*Task 3.--* Identify priority range expansion areas. Each state will establish goals stating numbers of birds to release each year. Lead: States; 12/02.

*Task 4.--* Determine capacity of current breeding facilities to propagate captive-raised swans. Investigate other possible sources, both private facilities and wild stock, that might provide additional stock if needed. Lead: USFWS with Bill Long; 12/02.

*Task 5.*-- Determine the best age (cygnet or yearling) to release captive-reared swans. Lead: USFWS, States and Bill Long; 12/02.

*Task 6.*-- Establish a committee to annually prioritize releases based on available stock. Annual release sites are to be identified and approved by the PFC at the Spring PFC Meeting. Lead: PFC in cooperation with GYTSWG, USFWS and States.

*Task 7.*-- Monitor the success of all released captive reared birds. Lead: States; Ongoing.

Subtask A: Releases on National Wildlife Refuges will be monitored and evaluated to determine effectiveness of this program. Lead: USFWS; Ongoing.

*Strategy 4.*-- Increase the number of trumpeter swans wintering in the Bear River drainage and the Snake River drainage from Fort Hall downstream. Winter use of these drainages outside Idaho and Wyoming will be increased through natural dispersal rather than active translocations.

*Task 1.*-- Release salvaged and captive-reared swans of Tri-State ancestry at Bear Lake NWR during summer. Monitor results of these releases. Report due April 1 following summer of release. Lead: USFWS and IDFG; Ongoing;

*Task 2.*-- Trap and translocate a limited number of cygnets (30-50) from the vicinity of Harriman State Park each year during November and December, 2002 through 2004. An equal sample of cygnets will be marked and released on site (as a control group) so managers can assess the effectiveness of this effort. A similar program was conducted during the winter of 2001-2002. Translocated cygnets would be moved to the Bear River near Grace and Preston, Idaho. Fort Hall Reservation will be an alternate release site if logistical or other problems occur. The goal of this 3-year experiment is to determine the efficacy of translocation of cygnets for expanding winter distribution. This effort will also increase the number of neck-collared swans to assist in RMP monitoring. Lead: IDFG; winters 2003-2005; Annual reports due May 1 and final report due 12/1/05.

*Task 3.*-- Develop a study plan for translocating swans as described in Task 2. This would include marking protocols, monitoring protocols, identifying and evaluating specific release sites on the Bear River, determination of adequate sample sizes for control and translocated groups, and cost estimates. The plan should also include a hazard analysis for capture operations. Annual reports will be prepared. The winter translocation program will be evaluated after 3 years. Lead: IDFG; 8/02.

*Task 4.*-- Develop a strategic outreach and education plan to inform public and government officials about the pros and cons of Task 2 and alternatives. Lead: IDFG and

USFWS; 10/02.

*Strategy 5.--* Maintain existing restoration flocks in Oregon and Nevada.

*Task 1.--* Continue to assess current status of the Oregon and Nevada flocks. Lead: Oregon DFW and Nevada DOW in cooperation with the USFWS; Ongoing.

*Strategy 6.--* Establish a new restoration flock by direct augmentation in the Flathead Valley of Montana.

*Task 1.--* Captive-rear 35-50 cygnets/year for reintroduction on the Flathead Indian Reservation and monitor restoration effort. Lead: Salish and Kootenai Tribes, Montana FWP, USFWS; Ongoing.

*Task 2.--* Improve habitat at Pablo NWR and elsewhere in the valley. Lead: Salish and Kootenai Tribes, USFWS, public and private landowners; Ongoing.

Subtask A: Determine presence of carp in Pablo NWR impoundments, implement management actions to eliminate carp and install fish screens. Lead: USFWS 12/05.

*Task 3.--* Reevaluate this effort if Flathead trumpeters establish a migration to the Tri-state area. Lead: Salish and Kootenai Tribes, PFC, USFWS, as needed.

**Objective 3. Encourage growth of Canadian flocks.**

No tasks are currently assigned because of consistently strong growth of this flock.

**Objective 4. Manage flows to decrease winter use of the Upper Henry's Fork by swans, and address winter emergencies for swans due to icing (this objective is revised from 1998 RMP Plan).**

*Strategy 1.--* When surplus water is available, store 5,000 to 10,000 acre-feet of water in excess of that needed to meet the uniform-flow regime prescribed by the Bureau of Reclamation (Reclamation). The water will be stored through the early winter period for release later in the winter to break up river ice, should the need arise. In low-water years, instead of reducing flows in an attempt to store water for later ice breakup, any emergencies associated with the freezing river should be addressed with pre-arranged water exchanges that allow for such a release. In years with very low autumn temperatures, reduce flows from Island Park Reservoir to 180 cfs to increase the likelihood of a late-autumn freeze, when the swans may still retain the migratory desire and energy reserves to migrate elsewhere. See Appendix 1 for the IDFG/BOR unpublished report "Optimizing flows on the Henry's Fork of the Snake River: to best accommodate trumpeter swans, rainbow trout, and aquatic vegetation" for more details on flow management.

*Task 1.*-- Prior to the adverse storage (see Appendix 1 for a description of “adverse storage”) meeting each fall (see Task 2), a meeting shall be organized by the Idaho Department of Fish and Game (IDFG), Upper Snake Environmental Staff Biologist to prepare recommendations to water managers regarding winter flows on the Henry’s Fork. Representatives from Harriman State Park (HSP), USFWS SE Idaho Refuge Complex, The Trumpeter Swan Society (TTSS), Reclamation, the Greater Yellowstone Trumpeter Swan Working Group (GYTSWG), the Henry’s Fork Foundation (HFF), The Fund for Animals (TFA), and the Committee of Nine will be invited. Lead: IDFG; Ongoing.

*Task 2.*-- Each fall, the IDFG will contact the Fremont-Madison Irrigation District (FMID) and Reclamation and arrange for some participants of the meeting outlined in Task 1 to attend the annual meeting on adverse storage and make their recommendations. Should water exchanges be considered, the costs would depend on negotiations with willing partners and on the proportion of exchanged water that is refilled prior to irrigation season. Lead: IDFG; Ongoing.

*Task 3.*-- If needed, IDFG will initiate a conference call to quickly address freezing conditions on the Henry’s Fork. At a minimum, IDFG, FMID, TTSS, Reclamation, HSP, USFWS SE Idaho Refuge Complex, GYTSWG, HFF, The Fund for Animals, The Committee of Nine, and potential partners for water exchanges will be invited to participate. If the winter progresses without unusually harsh conditions on the Henry’s Fork, then a conference call should occur by February 10th to consider release of the stored water for the benefit of juvenile fish in Box Canyon. Lead: IDFG; Ongoing.

*Task 4.*-- By May 31 each year, IDFG will summarize the water-regime and swan-monitoring results in a report. Data on water flow will be provided by Reclamation. This report will allow managers to track the response of swans to different flow regimes. Lead: IDFG and BOR. Ongoing.

**Objective 5. Monitor the population.**

*Strategy 1.*-- Survey (count) RMP trumpeter swans during nesting, post-breeding and mid-winter periods.

*Task 1.*-- Conduct the RMP portion of the continental survey of breeding trumpeter swans at 5-year intervals, and report results within 9 months of concluding the survey. Lead: Region 9, DMBM, CWS, States, Canadian Provinces and other cooperators; Ongoing.

*Task 2.--* Conduct the annual Fall (September) survey of RMP/U.S. Breeding Segment trumpeter swans throughout their range in the conterminous United States and report results annually. Report due 30 days after survey. Lead: USFWS Region 6, DMBM lead, support from USFWS Region 1 and Region 9, assistance from State and Tribal cooperators as needed. Ongoing.

*Task 3.--* Conduct the annual midwinter (January-February) survey of RMP trumpeter swans throughout their range in the conterminous United States and report results annually within 30 days. Lead: USFWS Region 6, DMBM lead, support from USFWS Region 1 and Region 9, assistance from State and Tribal cooperators as required; Ongoing.

*Task 4.* Conduct an annual inventory of nesting-pair abundance and distribution of RMP trumpeter swans throughout their range in the conterminous United States and report results annually. Canada will conduct a similar survey at five-year intervals (see Task 1). Develop inventory protocols, a common reporting format and data repository. Lead: GYTSWG; Ongoing with a common format and data repository by 12/02.

*Task 5.--* Increase sample collection and develop necropsy protocol and a centralized database for mortality data. Lead: BRD, National Health Lab: 12/02.

*Task 6.--* Maintain weekly ground counts during the winter in the Centennial Valley. Lead: USFWS Red Rocks Lake NWR; ongoing.

*Strategy 2.--* Develop an operational banding program to capture, legband and mark a representative sample of RMP trumpeter swans. Develop, maintain and enhance a comprehensive database of encounters that can be used to help assess management programs.

*Task 1.--* Capture flightless RMP trumpeter swans on or near breeding and brood-rearing areas and mark all with leg-bands. Protocol will be developed to avoid disrupting nesting pairs. Report of results due annually by October 15. Lead: USFWS and CWS; Ongoing.

Subtask A: Develop marking protocol and mark swans nesting and produced on National Wildlife Refuges including Red Rocks Lake NWR, National Elk Refuge, Grays Lake NWR and Bear Lake NWR. Lead: USFWS, Ongoing.

*Task 2.--* Maintain records of sightings and other encounters of marked swans, in the database established at the S.E. Idaho National Wildlife Refuge complex. Provide annual data summaries and provide access to data by all management agencies and organizations. Prepare an annual report detailing locations, sexes, ages and numbers of individuals marked and a summary of encounters. Annually, distribute report to all cooperators by mid-July. Lead: USFWS SE Idaho National Refuge Complex; Ongoing.

*Task 3.--* Maintain and improve the network of trained trumpeter swan observers throughout the Pacific Flyway. At a minimum, maintain paid observers in southeastern Idaho and northern Utah to conduct observations of marked swans throughout the fall and winter. Additionally, improve the volunteer network to provide swan observations throughout the range. Lead: USFWS SE Idaho Refuge Complex (Bear Lake NWR) and UDWR; Ongoing.

*Strategy 3.--* Develop a formal, adaptive management strategy to assess the key questions/components of the objectives of the Management Plan. Provide rigorous structure to such design and provide the appropriate management alternatives, a reasonable set of competing models, monitoring requirements, and associated structure that would enable implementation.

*Task 1:--* Critically evaluate and, if feasible, develop an adaptive management process to guide selection of appropriate management alternatives to meet key objectives of the RMP Trumpeter Swan Management Plan. The proposal is to establish a working group, similar to that in existence for Adaptive Harvest Management of Waterfowl, with representation of all interested parties. Shared Lead: USFWS R6-DMBM, R1-DMBM, USGS-BRD, and Rick Sojda, with support from all other agencies that have been actively involved in this issue; 11/02.

*Strategy 4.--* Inventory the availability and suitability of seasonal habitats throughout the range of RMP trumpeter swans.

*Task 1.--* Develop and validate a habitat model to identify suitable trumpeter swan nesting habitat and develop a comprehensive database of potential nesting habitat throughout the RMP range, Lead: USGS-BRD; 9/02.

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*Task 2.--* Develop and validate a winter habitat model similar to the one for nesting habitat and develop a comprehensive database of potential wintering sites. Lead: USGS-BRD; 9/02.

*Task 3.--* Initiate study to assess and model both the hydrologic component and vegetation successional cycles of montane wetlands in the Northern Rocky Mountains for management of trumpeter swan breeding habitat. Lead: USGS and USFWS 12/05.

## III. PUBLIC INFORMATION

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

*Strategy 1.--* Develop an effective public information program, coordinate press releases, and generate interpretive materials and distribute them the RMP range.

*Task 1.--* Develop and implement an outreach program to inform the public about the winter expansion issue and explain the rationale for management actions. The plan should emphasize this is a complex problem that is interconnected with fisheries and irrigation concerns. It is a problem that crosses international boundaries. There are no easy solutions and any management action involves tradeoffs. Lead: FWS, IDFG and IDPR; 9/02, ongoing.

*Task 2.--* Develop and distribute interpretive materials as needed. Lead: All; Ongoing.

*Task 3.--* Develop and distribute new interpretive materials articulating the problems caused by winter feeding and the potential for winter mortality. Lead: IDFG; 9/02.

## IV. RESEARCH (in order of priority)

**Objective 1: Conduct research to improve management of the Rocky Mountain Population of Trumpeter Swans.**

*Strategy 1.--* Design and implement needed research projects.

*Task 1.--* Assess genetic composition of trumpeter swans associated with the major recognized breeding areas within the Rocky Mountain Population. Lead: USFWS Region 6; 2002-2006.

*Task 2.--* Use satellite transmitters to determine seasonal movements of Canadian and Tri-state trumpeter swans. Lead: CWS, USFWS, States and TTSS; ongoing as funding is available.

Subtask A: Develop study design for Task 2 utilizing both conventional radio transmitters and satellite transmitters. Utilize design for fundraising. Lead: USFWS R1 and R6 DMBM, USGS-BRD; 12/02.

*Task 3.--* Using existing data, compare reproductive and survival rates of Canadian and US flocks. Lead: Dave Duncan, CWS and USFWS; 3/04.

## V. STRATEGIES

The first two strategies below are distinguished by the water supply conditions in any particular year, the first applies to a near average or better-than-average year and the second addresses low water years. The third strategy could be used in combination with either of the first strategies and would be triggered by very cold temperatures in October and/or November. Reclamation calculates a uniform-flow estimate for the flow that likely can be maintained all winter long and satisfy physical and legal conditions of reservoir fill and water rights throughout the Upper Snake River system. Both of the strategies share the common approach of allowing for "emergency" increased discharge from Island Park Reservoir to break up ice if it were to form on the Henry's Fork River. In order to minimize harm to the fishery, all flow changes associated with the following strategies should be conducted in accordance with the ramping requirements of the Island Park hydroelectric project. For both up-ramping and down-ramping, this includes conducting flow changes between 7 p.m. and 5 a.m. and allowing changes of no more than 50 cfs per 0.5 hour.

A. In years when water conditions make it possible, store between 5,000 and 10,000 ac-ft of water over and above that stored under Reclamation's uniform-flow regime. This strategy will not be possible every year, but when it is, the water would be stored early in the winter for use later in the winter to break up river ice, should the need arise. About 7,000 ac-ft were used in 1989-90 to break up multiple ice events, so this amount is recommended as the initial storage target. Figures 1 and 2 illustrate how long it would take to achieve different storage targets under different uniform-flow scenarios. The rate of storage drops dramatically when the uniform-flow estimate is below 220 cfs, suggesting that too little water would be stored too late in the season to be of use in an ice emergency. Therefore, attempts to increase storage above the uniform-flow regime should be approached with caution when Reclamation's uniform flow is below 220 cfs for a given winter. Should no icing emergency occur, the water stored above the uniform-flow regime would be released between late-January and 1 April for the benefit of swans. In addition, such a late-winter release would benefit juvenile trout as well.

   Constraints:

   1. The reservoir content on 1 April will be the same as under Reclamation's uniform-flow regime (approximately full). Figures 3 and 4 illustrate discharge from Island Park and reservoir content under the scenario in which water is stored early and released later to break up ice. Figures 5 and 6 illustrate discharge and reservoir content under the scenario in which water is stored early and released later in the winter to provide higher flows to the benefit of swans, trout, and the general health of the aquatic system.

      The objective of the uniform-flow regime is to fill the reservoir by 1 April. In reality, flood control rules usually dictate that the reservoir is slightly less than full on 1 April (Benjamin and Van Kirk 1999), but application of flood control rules is unaffected by our recommendations.

   2. Water stored early in the winter over and above that which would be stored under the uniform-flow regime will be released later in the winter.

      This constraint is implicit in the first constraint but merits explicit statement to avoid confusion. If not used for an icing emergency prior to 1 February, the water stored over and above the uniform-flow regime should be released beginning no later than 1 February to provide optimum benefits to swans, fish, and the general health of the aquatic system.

Not releasing this water would result in the need to flush even higher flows near the end of the storage season in order to avoid over-topping the dam. There would be more benefit to the swans and trout to have the higher flows late in the winter rather than early in the spring.

3. Winter discharge should remain at or above 180 cfs, if possible.

   If Reclamation's uniform-flow estimate is less than 180 cfs, then we recommend no alteration of the uniform-flow regime. We use 180 cfs as a minimum threshold because of the results of the study by Cochnauer and Buettner (1978), who recommended that discharge at Island Park equal or exceed 177 cfs for minimal maintenance of trout habitat below the dam. When rounded to the nearest 10, this value becomes 180 cfs, which, coincidentally, is the minimum discharge required for the Island Park hydroelectric plant to operate.

4. In the interest of maintaining winter flows as high as possible while still storing water for a freeze event, winter discharge at Island Park should not be reduced from the uniform flow by more than 100 cfs.

B. In low water years, instead of reducing flows in an attempt to store water for later ice break-up, any emergencies associated with the freezing river should be addressed with pre-arranged water exchanges that would allow for such a release. Such water exchanges could include, but are not limited to, agreements with irrigation districts and power companies. An environmental cost of flushing ice with exchanged water exists in that flows subsequent to the release would be reduced below the uniform-flow estimate in order to refill the voided storage space. Such diminished flows could have equally or more severe consequences compared to the initial ice event.

C. In years with very low autumn temperatures, reduce flows out of Island Park Reservoir to 180 cfs. This strategy attempts to increase the likelihood of a late autumn freeze event when the swans still retain the migration impulse and the energy reserves to continue traveling. An early freeze on the Henry's Fork could lower the density of in that location and enhance their winter distribution. This would reduce the reliance of swans on the winter habitat offered by the Henry's Fork.

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## APPENDIX A

### Optimizing Flows on the Henry's Fork of the Snake River: To Best Accommodate Trumpeter Swans, Rainbow Trout, and Aquatic Vegetation

During much of the 20th century, the Harriman State Park reach of the Henry's Fork River has been an important wintering site for the last remnant of trumpeter swans (*Cygnus buccinator*) of Canada and the lower 48 states (Snyder 1991, Vinson 1991, Shea *et al*. 1996). These trumpeters consist of two breeding groups: the resident Greater Yellowstone group and the migratory western Canada group (Gale *et al.* 1987, Shea and Drewien 1999a). A primary threat to both groups is that increasing numbers of swans continue to winter in the limited habitat of the Core Tri-state Area of the Greater Yellowstone region. Though several areas within the Core Tri-state offer high quality wintering swan habitat, the swans have exceeded the area's carrying capacity and need to expand their winter distribution. For perspective, the number of trumpeter swans wintering on the Henry's Fork above Pinehaven increased from fewer than 200 in 1972 to about 950 in 2001. Swan numbers in the Tri-state have increased from less than 500 in 1972 to about 1,984 in 1990 to about 3,600 in 2001 (USFWS mid-winter data). During the winter of 1989-90, low flows released from Island Park Dam on the Henry's Fork allowed the large number of wintering birds maximum access to aquatic macrophytes (rooted aquatic plants). That year, the foraging waterfowl caused a severe decline in the abundance of macrophytes in the river between Last Chance and Pinehaven (Vinson 1992, Shea *et al*. 1996). Avoiding this type of damage to this important fishery habitat is an important goal of the water management described in this document.

The Henry's Fork downstream of Island Park Dam, including the Box Canyon and Harriman State Park reaches, also supports one of the most popular rainbow trout (*Oncorhynchus mykiss*) fisheries in the United States (Van Kirk and Griffin 1997). During the same time period that the number of wintering trumpeter swans increased on the Henry's Fork, the rainbow trout population in Box Canyon declined 80 percent (Van Kirk and Gamblin 2000). Although wintering trumpeters do not use Box Canyon, its trout population serves as an index for the trout populations further downstream in the Last Chance and Harriman State Park reaches where wintering swans do forage. The increase in swan numbers and concomitant decrease in trout numbers led to speculation that swan foraging may have impacted trout by removing vegetative cover used by the juvenile fish. Low flows and loss of macrophyte cover have been associated with poor over-winter survival of age-0 juvenile rainbow trout in the Henry's Fork below Island Park Dam (Griffith and Smith 1995), illustrating that management of swans, flows and fisheries are interrelated in this reach of river. These management issues are tied together by macrophytes.

Macrophytes play an important ecological role in low-gradient streams such as the Henry's Fork between Last Chance and Pinehaven (Van Kirk and Martin 2000). Macrophyte beds slow water velocity (Gregg and Rose 1982, Sand-Jensen and Mebus 1996), trap fine sediment (Gregg and Rose 1982, Barko *et al*. 1991), and provide habitat for macroinvertebrates and fish (Dionne and Folt 1991, Wright 1992). Macrophytes provide an important food source for crayfish, snails, fish, waterfowl, and invertebrates (Lodge 1991, Jacobsen and Sand-Jensen 1992). Macrophytes obtain most of their nutrients from sediments deposited on the stream bottom, thereby providing a mechanism for the introduction of sediment-derived nutrients into the aquatic food web (Barko *et al*. 1991). On the Henry's Fork, maximum macrophyte biomass occurs in October (Angradi 1991, Vinson *et al.* 1992), and minimum biomass occurs in February or March (Angradi 1991, Vinson 1991, Griffith and Smith 1995). As day length and temperature increases again in the spring, new growth begins from tubers or rhizomes buried in the stream bottom. However, as flows increase during the spring, growth may be inhibited by bed scour (Shea *et al*. 1996, French and Chambers 1997).

The role of macrophytes in providing cover for juvenile trout in the Henry's Fork during the winter has been studied extensively (see Gregory 2000). When water temperatures fall below about 48 ºF, age-0 trout seek daytime cover that will completely conceal them from predators (Smith and Griffith 1994), emerging from the cover only at night to feed (Contor and Griffith 1995). Preferred concealment cover is provided by interstitial spaces within complex arrangements of cobbles and boulders on the stream bottom (Meyer and Griffith 1997a). When this cover type is limited, as it is in the Last Chance, Harriman, and Pinehaven reaches, competition among individual age-0 trout occurs for existing concealment spaces (Meyer and Griffith 1997b). The limited availability of winter concealment habitat for age-0 fish in the Henry's Fork below Island Park Dam results in a trout population that is limited by survival of individuals through their first winter (Mitro 1999). Although macrophyte beds sufficient in density to provide concealment cover for age-0 fish are present in the Last Chance and Harriman reaches during the fall and early winter, persistence of macrophytes is not sufficient to provide concealment cover for significant numbers of fish throughout the entire winter (Griffith and Smith 1995, Mitro 1999). Macrophytes decline in these reaches because of natural senescence, waterfowl foraging, and/or ice shearing. Most juvenile trout present in these areas during autumn emigrate during mid- to late winter as macrophyte biomass approaches its minimum. Some of these fish migrate to better winter habitat in the Box Canyon and Riverside reaches, but many die or leave the Island Park-to-Riverside reach altogether (Mitro 1999).

The direct effects of macrophytes in providing summer cover and foraging habitat for trout in the Henry's Fork have not been studied. Trout in other streams use channels along bed edges as optimal locations to forage in relative security (Sand-Jensen and Mebus 1996, Trebitz and Nibbelink 1996), and anecdotal observations by anglers suggest that this is also true in the Henry's Fork during late summer and autumn. When combined with the role of macrophyte beds in providing cover and food for macroinvertebrates, the primary food for rainbow trout in the Henry's Fork (Angradi and Griffith 1990), it is likely that the presence of dense macrophyte beds in the Henry's Fork provides increased foraging opportunities for rainbow trout and associated angling opportunities during the summer and early autumn. Thus, dense macrophyte growth probably does benefit the rainbow trout fishery, but the inability of macrophytes to provide winter cover for juvenile trout in a population that is limited by juvenile overwinter survival makes it unlikely that this benefit translates directly into a larger trout population size. Therefore, macrophyte losses on the Henry's Fork due to waterfowl foraging and/or ice-shearing likely do not equate to declines in the rainbow trout population.

Shea (1997) sampled macrophyte biomass along transects at Last Chance and Harriman State Park that had been sampled previously in 1979 and 1986. Shea (1997) reported that: 1) total macrophyte biomass in 1986 and 1997 was about half of what it had been in 1979; and 2) there had been a shift in macrophyte species composition from dominance by the so-called “Group-1” species -- tall, robust erect species that thrive in low velocity, silt-rich environments (*Potamogeton pectinatus, P. richardsonii, Elodea canadensis,* and *Myriophyllum exalbescens*) -- to greater representation by “Group-2” species -- shorter, bottom-dwelling species more tolerant of higher water velocities and capable of colonizing disturbed sites (*Callitriche hermaphroditica, Ranunculus aquatilis, Eleocharis acicularis,* and *Zannichellia palustris*) (Van Kirk and Martin 2000). Two species in Group 1, *Elodea* and ***Myriophyllum*,** are generally capable of persisting in greater densities throughout the winter, and, because of their growth forms, have a greater ability to slow current velocities and provide concealment cover for juvenile trout. The decline in total macrophyte biomass and in relative Group-1 species biomass that occurred during the early 1980s was likely initiated by release of sediment from Island Park Dam in 1979 and exacerbated by high spring flows in the early 1980s (Shea *et al*. 1996, Shea 1997). A slight increase in biomass and a shift back towards Group-1 species was noted during the late 1990s (Shea and Drewien 1999b), as the macrophyte assemblage recovered from the effects of waterfowl herbivory during the winter of 1989-90 and a sediment release from Island Park Reservoir in 1992.

Swans and other waterfowl are attracted to Harriman State Park in autumn because it is closed to waterfowl hunting and because of the macrophytes available in the river and Silver and Golden lakes prior to freeze-up. However, despite the volume of macrophytes available in Harriman State Park and adjacent river reaches, forage is still inadequate to sustain the more than 1,500 trumpeter swans estimated to arrive on the Henry’s Fork each autumn. Hazing at Harriman State Park has occurred at varying intensities since 1988 in an attempt to encourage trumpeter swans and other waterfowl to use other areas in November and December, thereby reducing herbivory on macrophytes in the Last Chance to Pinehaven reach. Although trumpeter swans have increased their use of more southerly portions of southeastern Idaho, most Canadian and Greater Yellowstone trumpeters continue to winter in sites that will freeze in a severe winter (Shea and Drewien 1999a).

Flows in the Henry’s Fork have been regulated at Island Park Dam since 1938. The hydrologic impacts of regulation and suggestions for improved dam management are discussed in Benjamin and Van Kirk (1999) and summarized here. Island Park Reservoir provides 135,000 acre-feet (ac-ft) of storage for the Fremont-Madison Irrigation District (FMID). Prior to 1972, the reservoir was usually filled by reducing flows to near zero on 15 November and increasing them in February or March, when the reservoir was nearly full. Under near zero-flow conditions at Island Park Dam, the only discharge into the Henry’s Fork in Box Canyon was provided by the Buffalo River, a spring-fed tributary with a winter flow of about 200 cfs. Although near-zero flows were released at Island Park Dam for at least a portion of most winters between 1938 and 1972, high flow years resulted in an average winter release of 200 cfs in addition to the flow provided by the Buffalo River. In contrast, reservoir inflow (unregulated flow) is generally about 450 cfs. Furthermore, the pre-1972 management regime allowed significant increases in winter discharge over short periods of time to satisfy peak-power demands downstream. Coefficients of variation in winter flows at Island Park under the pre-1972 management regime were nearly an order of magnitude greater than those observed in the relatively constant, spring-fed natural flow regime of the upper Henry’s Fork.

Beginning in 1972, dam operations changed in response to hydroelectric needs downstream, resulting in winter flow releases from Island Park Dam that averaged about 300 cfs. Higher winter flows under the post-1972 regime are obtained in large part by commencing storage on 1 October rather than 15 November, thereby increasing the length of time over which the reservoir is filled. Reservoir storage that occurs prior to 15 November is termed "adverse storage," and is allowed by a formal agreement signed in 1984 by the FMID, the U.S. Bureau of Reclamation (Reclamation), Utah Power and Light, and the City of Idaho Falls. It is likely that improved winter flows at Island Park Dam allowed wintering trumpeter swan numbers to increase throughout the 1970s and 1980s by reducing both ice formation and the dewatering of aquatic macrophyte beds. However, even under this management scenario, ice formation can still occur when sustained periods of cold weather coincide with low flows (84-230 cfs) out of Island Park Dam, as they did during the winter of 1988-89. A run-of-the-river hydroelectric plant was constructed at Island Park Dam in the mid-1990s; it has a minimum operating requirement of 180 cfs and a maximum capacity of 960 cfs. When possible, all discharge from the dam at flows between 180 and 960 cfs is routed through the power plant, which has some downstream water quality benefits because of regulatory requirements and accompanying equipment and monitoring associated with the hydroelectric project that do not apply to the dam itself.

The largest discrepancy between the managed and natural flow regimes at Island Park Dam is the decrease in winter flows under the managed regime (Benjamin and Van Kirk 1999). If air temperatures are relatively mild and the river does not freeze, then low winter flows reduce the amount of foraging habitat available to swans by dewatering macrophyte beds (Vinson 1991), yet allow swans greater access to macrophytes in areas where water is present (Shea *et al*. 1996). When air temperatures are very cold, the river can freeze, and wintering swans and other waterfowl lose access to the macrophyte food source. During the winter of 1988-89, between 50 and 200 trumpeter swans died on the Henry's Fork as a result of freezing of the river (Vinson 1992, Shea and Drewien 1999a). Three different freeze events occurred during January and February of that winter. Mean daily flows of approximately 84 cfs and minimum ambient temperatures ranging from –27 to 19 degrees F measured at the Island Park Dam Operating House resulted in the first freeze event. Subsequently, mean daily flows of approximately 117 cfs and minimum ambient temperatures ranging from –25 to 21 degrees F at Island Park Dam resulted in the second freeze event. The third freeze event occurred during mean daily flows of approximately 230 cfs and minimum ambient temperatures at the dam ranging from –29 to 16 degrees F. Temperatures at other places in Island Park might have varied from those recorded at the dam because conditions, such as the location of the thermometer (about 100 ft above the river) and the proximity of a large body of water, may have buffered the local ambient temperatures. Emergency releases of approximately 300 cfs, 700 cfs, and 300 cfs were required to clear ice from the river during each respective freeze in order for waterfowl to access aquatic plants for forage.

A range of flows has been recommended for various management purposes, yet many of these recommendations are not attainable in most years. Vinson (1991) recommended a minimum flow of 500 cfs below the Buffalo River (i.e. about 300 cfs from Island Park Dam and 200 cfs from the Buffalo River) and a flow of 700 cfs (i.e. about 500 cfs from Island Park Dam) to achieve the maximum amount of wetted habitat and reduce ice formation. This recommendation exceeds the river's natural flow (about 450 cfs plus 200 cfs from the Buffalo River) at that time of year. Moreover, constraints of fulfilling storage rights preclude winter discharges exceeding 300 cfs at Island Park Dam except in years when the reservoir is nearly full at the beginning of the storage season (Benjamin and Van Kirk 1999). A flow release of 500 cfs at the dam exceeds inflow during most years and is therefore essentially unattainable regardless of initial reservoir content. Flows sufficient in magnitude to discourage swans from attempting to winter on the Henry's Fork have been considered as a means of encouraging winter range expansion. However, even the high flows of 1996 and 1997 (flows consistently over 600 cfs and as high as 1000 cfs) did not effectively discourage swan foraging in the flat portions of the river. In most years, the system cannot provide enough water to substantially reduce swan use. On the other end of the spectrum, Cochnauer and Buettner (1978) recommended a minimum discharge of 177 cfs from Island Park Dam for short-term maintenance of trout habitat.

A flow regime at Island Park that results in higher winter flows and more consistent springtime flows will, in general, benefit macrophytes. It is likely that the changes in biomass and species composition that have been observed over the past several decades have in part been responses to perturbations related to winter flow releases and dam operations. For instance, even after a dry summer, natural inflows into Island Park Reservoir remain near 450 cfs. However, because of the conditions created by such a dry summer, water managers would need to limit releases from the reservoir in order to meet storage rights under Idaho water law. On the Henry's Fork, these reduced flows can increase either the probability of icing or waterfowl herbivory, or both. Following disturbances such as sediment deposition, increased herbivory, ice scour, or high spring flows, Group-2 species dominate. Shift in composition towards Group-1 species occurs as the macrophyte assemblage matures. The macrophyte assemblage present in 1979 may have represented the most mature successional state, and its occurrence was probably the result of the improved flow regime implemented in the early 1970s. The first disturbance following this flow management adjustment did not occur until the Island Park Reservoir sediment release in 1979, and subsequent disturbance in the form of increased waterfowl herbivory did not peak until 1990. The Henry's Fork macrophyte assemblage will likely continue to move through its successional cycle in response to herbivory, scour, and periodically high spring flows because, in filling storage rights, water managers do not have complete control over the factors that lead to such disturbances.

From a fisheries perspective, the observation that age-0 trout require concealment cover when water temperatures drop below 48 ºF early in autumn suggests that higher flows during autumn and early winter would benefit their survival by buffering the effects of rapidly decreasing atmospheric temperatures and by providing more available habitat (Gregory 2000). However, sufficient macrophyte biomass is available to provide cover for trout during autumn and early winter (Griffith and Smith 1995, Mitro 1999, Gregory 2000). Furthermore, in autumn when macrophytes are present at or near their maximum biomass, they act to increase water depth at a given discharge (Vinson 1991, Vinson *et al*. 1992), thereby providing adequate water depths at relatively low flows. Later in the winter when macrophyte biomass decreases, virtually all age-0 trout in the Last Chance and Harriman reaches, where macrophytes provide the majority of the available cover, migrate to the narrower, deeper sections of the river in the Box Canyon and Pinehaven to Riverside reaches, where cover is provided by cobble-boulder substrate and woody debris. Because these reaches are relatively narrow compared to the Last Chance and Harriman reaches, small increases in discharge result in relatively larger increases in amount of trout habitat. This suggests that higher flows during mid- to late winter would benefit age-0 trout survival more than high flows during autumn. Indeed, Mitro (1999) found a strong positive correlation ($r^2 = 0.98$) between springtime abundance of age-0 rainbow trout in Box Canyon and late-winter (15 January to 31 March) discharge from Island Park Reservoir (see also Gregory 2000). However, Lawrence (2001) failed to observe this type of relationship in subsequent years. Discrepancies between the results of these two studies could be due to the flow levels at which they were conducted. Mitro's (1999) data were collected during above-average flow years, whereas Lawrence's data were collected during winters with average to below-average flows. Discrepancies could also be due to differences in sampling methodology. Thus, it appears that increased flows later in the winter probably increase juvenile trout survival during high-flow years, but this may not necessarily be the case during low-flow winters.