The Blackfoot Valley Trumpeter Swan Reintroduction: A Chronology and Case Study

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THE BLACKFOOT VALLEY TRUMPETER SWAN REINTRODUCTION:
A CHRONOLOGY AND CASE STUDY

By

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Bachelor of Science, Boston College, Chestnut Hill, MA, 2004

Professional Paper

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I dedicate this professional paper to my grandparents:
Charles & Florence O’Malley, Jim & Kathy Ferrasci

Your tremendous support, encouragement and love have made me the person I am today.
ACKNOWLEDGMENTS

This paper would not have been possible without the incredible support and guidance of my advisor and committee chair, Dr. Vicki Watson: I cannot thank you enough for your commitment to my education in and out of the classroom. To the two EVST department chairs during my time in the program: Dr. Len Broberg and Dr. Tom Roy. Tom: your enthusiasm for the environment and social justice is inspiring. I am grateful for the opportunity to have been taught and mentored by you. Len: I learned so much from you both in and out of the classroom. Thank you for helping me to focus this paper, and also for challenging me to grow as both a student and a person. I would also like to thank the rest of my committee: Dr. Rich Harris, and Dr. Mike Patterson. Your thoughtful questions and concerns helped me craft this paper into a comprehensive final product that reflects the influential and inspiring education I received at the University of Montana. Thanks also to Karen Hurd, the glue that keeps the EVST Department together, who was always a big help to me. Thank you as well to the members of the Blackfoot Valley Trumpeter Swan Working Group, most notably Tom Hinz, Kevin Ertl, and Wayne Slaght, for their patience and understanding with a greenhorn researcher. I would especially like to thank Greg Neudecker: you were an inspiring boss and mentor during my time in the Blackfoot. I reflect back often your guidance as I begin my own career in conservation. Finally, I would like to thank my incredibly supportive, encouraging, and funny family: my parents Kevin and Kitty, and my sister Jennifer. I would not have finished this journey without you. Thank you for supporting me all along this path. Your love and support allow me to approach life with gusto.
I. Preface

Since 2003, United States Fish and Wildlife Service (USFWS) personnel have been working together with state and local officials to reintroduce a viable population of trumpeter swans (*Cygnus buccinator*) to wetlands in the Blackfoot River Valley of western Montana. I had the great opportunity to be involved with this project while completing a Masters in Environmental Studies at the University of Montana. During the time I was involved, we conducted a habitat analysis, worked to prepare wetlands for swan use, released the first cohort of reintroduced trumpeter swans in the Blackfoot Valley, and tracked their movements until they left for winter. While the long-term viability of the trumpeter swan population in the Blackfoot cannot be known at such an early point in the effort, the return of some of the first-year birds to their release wetland the following spring has members of the reintroduction team excited for the possibility of continued success of subsequent yearly reintroductions and achievement of the final goal of a viable breeding population of trumpeter swans in the Blackfoot Valley.

The purpose of this professional paper is to provide a detailed chronological case history of the first year of the trumpeter swan reintroduction program in the Blackfoot Valley of western Montana, and summarize the key lessons learned while making recommendations for how the process could be improved. I plan to illustrate the processes undertaken by the different partners involved that are currently making the Blackfoot trumpeter swan reintroduction project a successful endeavor. Then, by analyzing what worked well and what did not work well in the Blackfoot reintroduction process, I will attempt to draw conclusions and make recommendations as to how other groups interested in similar reintroductions could learn from our experience in the Blackfoot Valley. Therefore, the target audience for this professional paper is twofold. On the one hand, this professional paper will be helpful to community-based conservation groups that have a demonstrated desire and/or ability to see trumpeter swans, as well as other threatened or extirpated species, return to a part of their historical habitat range. This professional paper will also be beneficial to state and federal wildlife agencies on the local or watershed level, as a tool to compare and contrast management decisions concerning the reintroduction of birds like the trumpeter swan.
This professional paper will not be organized in the traditional scientific style of sectioning the report into Introduction, Materials and Methods, Results, Discussion and Conclusions sections. In order to provide a popular audience with a general understanding of the process that was undertaken in the Blackfoot Valley, I use a chronological presentation of the steps of the reintroduction process. Thus, there will be descriptions of methods used at various points throughout the professional paper. However, this professional paper is structured so that the conclusions and recommendations from the entire project will be summarized and discussed at the end of each chapter in order to highlight the lessons learned from the process.

In creating a final product out of the experience of my graduate work on the trumpeter swan reintroduction in the Blackfoot Valley, I wanted to produce something that I felt was representative of all aspects of the experience. What started as a summer of field research grew over the next two years to become a unique case study of local partnerships and collaboration leading to on-the-ground conservation. I wanted to discuss the scientific study we completed to determine whether or not there was suitable habitat for the trumpeter swans in the Blackfoot, but I also wanted to provide a narrative of the experience of what it took to go from that study through to the eventual release of the first cohort of birds and beyond. I hope that the experience in the Blackfoot Valley can serve as a model for reintroductions as a form of community-based conservation in Montana, and across the Inter Mountain West.
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CHAPTER 1: A NON-TECHNICAL HISTORY OF THE BLACKFOOT VALLEY TRUMPETER SWAN REINTRODUCTION

Introduction – What Brought on This Effort?

_The Blackfoot Valley is getting quite the reputation, as a place where good things are happening. Back in 1995, the owner of this working cattle ranch, along with conservation groups and government agencies, joined together to restore this wetlands, to a level where today, this site was selected for the reintroduction of ten trumpeter swans... These birds are a great addition to the valley, but when they return, nest and raise the next generation of Blackfoot Valley trumpeters, well that’s when this effort will truly be a success.”_ ~Mike Gurnett, Montana Fish Wildlife & Parks (MTFWP 2005)

On June 23rd, 2005, the first cohort of reintroduced Blackfoot Valley trumpeter swans were released onto a restored wetland outside of Ovando, Montana. This event was an important step in the quest to return these magnificent birds to an area from which they had been extirpated. Much work went into the realization of this day on the part of USFWS, its partners, and the Blackfoot Valley community as a whole, and work continues today. In order to better understand the work that goes into achieving a reintroduction such as this, I endeavor to present a historical account of the actions taken by the different partners involved throughout the first two years of the project. Hopefully, other groups involved in similar efforts will be able to use this account as a reference, to incorporate successful tactics and learn from problems presented here.

In an effort to distill the events of a large undertaking like the Blackfoot Valley trumpeter swan reintroduction, it is inevitable that some things must be left out. In order to create the most informative report on the efforts of the reintroduction team over a two-year period, some aspects of the preparation and execution of events fall to the cutting-room floor. This report should not be considered all-inclusive; rather, it highlights the key aspects of the reintroduction effort and provides analysis of the effectiveness of these efforts. This report will discuss and analyze the main events leading up to and through the initial reintroduction: the catalyzing events that initiated the push for reintroduction, the scientific study to determine suitability, the site preparation conducted prior to release, the chronology of the first-year release, the post-release monitoring effort and the first-year results. This report will not provide an in-depth analysis of the community
outreach effort undertaken by USFWS personnel to foster support and buy-in from the locals of the Blackfoot Valley for reintroduction. In addition, this report will not discuss the inter-agency dialogue and decision-making that preceded the decision to go forward with reintroduction in the Blackfoot Valley. As I was not privy to either of these efforts, I am unable to create a first-hand narrative to complement the rest of the material covered in this report. Groups interested in a similar reintroduction should not consider this report a how-to guide for reintroduction from scratch, but rather, as an informative summary of how one group moved forward after pertinent agencies in the region agreed on proceeding with reintroduction, and after appropriate steps had been taken to bring the local community into the discussion and foster their support.

An Incident Captures the Public’s Attention

The trumpeter swan reintroduction effort in this part of Western Montana can trace its genesis back to a post & pole yard outside of Lincoln, MT, on the east side of the Blackfoot Valley. In late May of 2003, a pair of migrating trumpeter swans stopped at one of the wetlands surrounding the Bouma Post & Pole property to nest (Devlin 2005). The male swan was known to biologists as No. 17, originally born in Wyoming, of stock obtained from Red Rocks Lakes National Wildlife Refuge in Lima, MT (AP 2003). No. 17 and his mate spent almost a month incubating their four eggs. Unfortunately, midway thorough the incubation period, the female hit a power line near the wetland and died (AP 2003). Concerned citizens enlisted the help of biologists from Montana Fish, Wildlife and Parks (MTFWP), and the eggs were transferred to the facilities of the Montana Waterfowl Foundation (MWF) in Ronan, MT, where the incubation period was completed by a captive trumpeter swan (Devlin 2005). Three of the four eggs subsequently hatched and the resultant cygnets were raised for two months by biologists at MWF (AP 2003). After identification banding, the cygnets were released back to the male swan, No. 17 on the Bouma wetland in early September of 2003 (Devlin 2003). The desire at the time was that No. 17 and his offspring would return to the Blackfoot Valley the following year, signaling the possible beginning of a natural return of trumpeter swans to the valley.
Swan No. 17 and two of his three released offspring were last observed together in late November of 2003, near Jackson, WY and the National Elk Refuge (AP 2003). Unfortunately, neither No. 17, nor any of his young returned to the Blackfoot Valley in 2004 or 2005 (Devlin 2005). Regardless of this disappointment, local USFWS representative Greg Neudecker hoped that the notoriety achieved by No. 17 and his offspring would provide the kick-start needed to begin a trumpeter swan reintroduction program in the valley (AP 2003). The positive press and community support garnered by the Bouma birds did provide a lift to the idea of beginning a government-assisted reintroduction program in the Blackfoot Valley. Though the Blackfoot had numerous documented sightings of trumpeter swans, mostly during their migration period (AP 2003), the story of No. 17, his deceased mate and their cygnets captured the public’s interest anew, and helped to lay the groundwork for support of the return of the trumpeter swan.

Community Support for Reintroduction

Compared to many of the other major valleys in western Montana, the Blackfoot Valley has remained relatively undeveloped. Though the valley has seen recent efforts to increase residential subdivision, it has retained much of its rural character. Seven distinct communities, made up of a total of roughly 2,500 households, make up the population base of the Blackfoot Valley (Blackfoot Challenge 2006). Spread over an area of approximately 1.5 million acres, the valley’s residents occupy a wide and diverse landscape, following the Blackfoot River from its headwaters in the east near the Continental Divide at Roger’s Pass all the way to its confluence with the Clark Fork River just east of the city of Missoula (Blackfoot Challenge 2006).

Having the general support of the local communities within the Blackfoot Valley was essential to achieving a viable trumpeter swan reintroduction. Tom Hinz, coordinator of the Montana Wetlands Legacy described the importance of the connection between the trumpeters and the citizens of the valley in this way:

“My hope is that the trumpeter swan will be to the Blackfoot what the wolf and grizzly bear have been to Yellowstone. This could be the high-profile species that enlists people and interests people in habitat conservation in this area. My personal bias is that if we get these swans
reproducing in the Blackfoot and nests continue to develop, that more and more people will take notice of their wetlands and will want to conserve them.” (Devlin 2005)

The impact of the Bouma trumpeter swans on the people of the Blackfoot Valley played an important role in developing this local support. The valley was riveted by the plight of the cygnets and their father, and watched for their return. Numerous articles ran in the local papers during and after the discovery of the birds in 2003, and ranchers, scientists, land managers and the general public alike combined to closely monitor their status and continued health. The plight of the Bouma birds was the catalyzing event that got the overall Blackfoot Valley community acquainted with trumpeter swans, and made the public conversation about their return possible.

The decision to focus on the Blackfoot Valley as the stage for trumpeter swan reintroduction was not merely based on its rich wetland complexes. The Blackfoot Valley is getting a reputation as a place “where good things happen” (MTFWP infomercial 2006). Significant efforts have been undertaken in the valley to encourage local landowners, private businesses, and local, state and federal government agencies to work together to tackle issues as varied as drought, weed management, livestock carcass pick-up, habitat restoration, land stewardship and more. The Blackfoot Valley is home to a unique and highly regarded “grass roots” community group known as the Blackfoot Challenge. The stated mission of the Blackfoot Challenge is:

“To coordinate efforts that will enhance, conserve and protect the natural resources and rural lifestyle of the Blackfoot River Valley for present and future generations. The Challenge supports environmentally responsible resource stewardship through the cooperation of public and private interests.” (FWS 2008)

The Blackfoot Challenge has been instrumental in creating the public and private partnerships that have resulted in successes for the Blackfoot Valley as a whole. These partnerships have resulted in measurable environmental and economic gains for the valley, such as: 89,000 acres of private lands placed under perpetual conservation easement; 2,600 acres of wetlands and 2,300 acres of native grassland restored; 93 landowners participating in human-wildlife conflict reduction programs; and the creation of a community-driven plan directing the resale of 88,000 acres of corporate timber lands, just to name a few (Blackfoot Challenge 2008). However, it is the shared trust and
goodwill that these partnerships have generated that is most beneficial to the trumpeter swan reintroduction effort.

Both USFWS and MTFWP are fortunate to have a strong and respected professional presence in the Blackfoot Valley, especially so in the Ovando/Helmville core area. The importance of this asset to the reintroduction movement needs to be emphasized. Greg Neudecker of USFWS has been working with members of the community on a broad range of conservation and management issues for over twenty years, and is a key member of the Blackfoot Challenge. In addition to Mr. Neudecker’s work, his co-worker Kevin Ertl of MTFWP has also been involved in the community for almost ten years (G Neudecker, personal communication). These individuals’ relationships with community members, and their working knowledge of the land are invaluable tools in any effort like the trumpeter swan reintroduction, where community support and understanding are at the core of any future programmatic successes.

The presence of the Bouma swans was extremely helpful to the eventual reintroduction process because it introduced the community to the animals and gave Mr. Neudecker, Mr. Ertl, and the conservation officers charged with management in the area an opportunity to broach the topic of reintroduction. However, it is important to restate that this high profile event on the Bouma property would not have been sufficient on its own to help catalyze trumpeter swan reintroduction. Rather, it was essential to be able to draw on a history of positive working relationships and trust built up between various landowners, community members and government agencies to accomplish this goal.

It was these working relationships that opened the door initially to the reintroduction process. Mr. Neudecker and Mr. Ertl secured permission from more than 25 different landowners whose wetlands were identified as desirable to be surveyed under the Habitat Suitability Analysis. Their work helped secure anonymous donations that made the reintroduction economically viable. Their connections to the community kept them attuned to the general feelings of local affected landowners and made it possible to respond to questions and concerns about the reintroduction process. In my experience, landowners approached about a possible reintroduction of trumpeter swans, and what that might mean for their property if it was suggested as a potential nesting or release site, were receptive to the idea because of who was bringing the message: Mr. Neudecker, Mr.
Ertl, and specifically chosen, influential local landowner partners. Most of the Blackfoot Valley farmers and ranchers, many of who have deep-seeded distrust of “big government”, were willing to listen to a discussion of species reintroduction because it was coming from individuals they work with and trust, individuals who had shown commitment to partnership, as opposed to top-down government decision-making. Now, my interactions with landowners in the Blackfoot Valley did by no means constitute a random survey, however, I do believe it illuminates the manner in which government officials and landowners interact in the valley.

For purposes of this analysis, I am moving forward under the assumption that the Blackfoot trumpeter swan reintroduction was one where the local community was engaged and supportive of the cause. This support is essential to the possibility of any potential success down the road. Communities or organizations looking at similar reintroductions need to consider their own unique relationship with the locals that will be affected by a planned reintroduction and determine if adequate support exists or not. Though I am not analyzing the effort undertaken by USFWS to work with the Blackfoot community in order to gain their support, I cannot overstate the importance of this condition.

Role of a Long-term Planning Effort by Wildlife Professionals

The discovery of the Bouma birds, while a catalyzing event in its public visibility, was not the sole genesis of the idea to reintroduce trumpeter swans in the Blackfoot Valley. Biologists and conservation officers across Montana and the tri-state region (MT, ID, WY) had been involved in discussions on the possible return of the birds to this piece of their historic range for some time. They also participated in a regional review to identify areas where this might be possible. It is important to realize that multiple avenues were being explored and pursued to bring the birds back to western Montana. Without the support of state and federal agencies, this effort would never have taken flight.

The Pacific Flyway Council (PFC) is the governing board tasked with development, management and implementation of the Pacific Flyway Plan for the Rocky Mountain Population (RMP) of trumpeter swans, which gives “broad direction to the
states, the U.S. Fish and Wildlife Service (USFWS), and other interests engaged in cooperative management of [the trumpeter swan] population” (USFWS 2004). The PFC is the arena in which agency decisions on the Rocky Mountain trumpeter swan populations are discussed, and the entity that formulates the plan for action through the Pacific Flyway Plan.

The most recent revision of the Pacific Flyway Plan occurred in 1998, and it is the priorities and goals of this plan that direct the reintroduction efforts in the Blackfoot Valley. The management plan lists five main objectives that motivate the Council’s efforts, which are: (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 a desired food (submerged macrophytes) in the Henry’s Fork of the Snake River, and (5) to monitor the swan population (USFWS 2002). Federal, state and non-governmental organizations collaborated with the Council to translate these goals into an overall implementation document that would be able to list specific actions that could be taken to achieve the objectives of the 1998 Plan. This document, the Trumpeter Swan Implementation Plan (TSIP) was finalized in February of 2002 (USFWS 2002).

One of the primary management goals enumerated by the TSIP 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” (USFWS 2002). To achieve this goal, the TSIP lists a number of necessary objectives, strategies and tasks spanning the Tri-state Area of Idaho, Montana and Wyoming, not all of which are germane to the efforts in the Blackfoot. One objective that is relevant is Objective #2: “[r]ebuild 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” (USFWS 2004). The TSIP lists five strategies to help achieve this objective, one of which ties directly with the efforts undertaken in the Blackfoot Valley. Strategy #1 reads “[i]ncrease the size and productivity of the Tri-state Area Flocks by providing adequate nesting and brood-rearing habitats” (USFWS 2004). One of the tasks listed to achieve this strategy, Task 2, was to identify “current and potential nesting and pre-breeding habitats” for trumpeter swans in the Tri-state Area, and to “develop a
strategy for landscape-level planning to help determine priorities” (USFWS 2004). Each state within the Tri-state Area assisted with identifying priority areas in their jurisdiction that have the “greatest potential for boosting the number of nesting pairs for substantially increasing winter or pre-breeding habitat” (USFWS 2004). The Upper Blackfoot River was one of the areas that met the TSIP criteria and was listed in the plan as a priority area for Montana (USFWS 2004).

In addition to being recognized as one of the Tri-state Area’s priority areas with the greatest potential for achieving the broad goals of the Council’s management plan, the Blackfoot Valley was also mentioned under another management strategy line pertaining to the physical augmentation of the breeding flocks. Strategy 3 of the TSIP outlines the goal of augmenting the Tri-state breeding flocks using “only eggs and birds of Tri-state origin” and occurring in areas “selected to avoid establishing disjunct flocks and to encourage winter migration outside the Core Tri-state area” (USFWS 2006). Task 3 of this strategy specifies that the states within the Tri-state area will “identify priority range expansion areas” (USFWS 2006). Additionally, it notes “each state will establish goals stating numbers of birds to release each year” (USFWS 2006). For Montana, it was decided that the Blackfoot River drainage provided the best possibility of achieving these strategies, so officials there were tasked with surveying suitable habitats for the release of captive-reared trumpeter swans (USFWS 2006).

At this point the two elements being pursued to bring trumpeter swans back to the Blackfoot Valley, the federal agency initiative and the support of the local community were coming together. The reintroduction effort was moving from a conceptual plan discussed in meetings and community forums, towards an on-the-ground effort.

Assessing Habitat Suitability & Selecting the Best Sites

Brief Explanation of the Habitat Suitability Analysis (HSA)

The next step of the overall process outlined under the TSIP was to conduct a study in the Blackfoot Valley to determine where there was suitable habitat for reintroduced birds, as well as to identify possible release sites. This was a critical piece of the reintroduction process and its methodology is discussed in detail in Chapter II of this paper. In addition, Chapter II contains a discussion of the habitat needs of trumpeter
swans. What follows is a brief summary of the outcomes of the study. Community
groups are encouraged to have their technical staff read Chapter II and its supporting
documents in order to gain a better idea of the breadth and scope of the analysis
conducted at this critical juncture.
    The first step towards meeting the objectives for trumpeter swans in Montana laid
out in the TSIP was determining whether or not there was sufficient habitat in the valley
to support the feeding and nesting requirements of a reintroduced population. Without
the presence of a basic level of habitat, the future of trumpeter swans in the Blackfoot
Valley would be constrained to brief stopovers by lingering migrants of other flocks,
rendering unattainable the goal of a sustainable population under the strategies of the
TSIP. To accomplish this task, USFWS and the Blackfoot Trumpeter Swan Working
Group (TSWG) conducted a Habitat Suitability Analysis (HSA) in the summer of 2004 to
gather baseline data on wetlands in the Blackfoot Valley. The purpose of the HSA was to
provide a scientific framework that would help answer the question posed in the TSIP;
whether or not there was suitable habitat for a release to help augment the Tri-state area
population.
    The completed HSA covered 71 sites across the Blackfoot Valley, and the
information gathered helped identify both potential nesting and release sites. The
following 10 main criteria were used for determining nesting site suitability: average
yearly ice-off date, percentage and length of open water, presence of irregular shorelines,
average pH, presence of emergent vegetation or muskrat/beaver houses suitable for
nesting and loafing, percentage of open water with suitable submerged aquatic vegetation
(SAV), mean water depth, water regime, level of human disturbance, and presence of
fence and power lines. USFWS used these criteria to identify 27 potential nesting sites in
the study area. The following seven main criteria were used to determine suitability as a
potential release site: wetland size, percentage of open water, quantity of preferred forage
macrophytes, presence of multiple nesting/loafing sites, proximity to fence and power
lines, level of human disturbance and social considerations. USFWS used these criteria
to identify nine potential release sites. These sites were then ranked according to greatest
potential. A more detailed discussion of this process can be found in Chapter II of this
report.
After completing the HSA and determining the potential nesting and release sites in the study area, USFWS entered into discussions with the landowners of the higher ranked potential release sites to discuss the possibility of releasing swans on their land. After careful consideration and with a level of confidentiality important to both the landowner (for personal reasons) and USFWS (for the initial safety of the birds), one of the top ranked sites was chosen for the first release.

**Setting Goals for the Reintroduction Effort**

Once the Habitat Suitability Analysis had been completed, and it was determined that there was in fact available habitat for a trumpeter swan release, representatives from USFWS and the Montana Wetlands Legacy put together a document in 2005 entitled “Blackfoot Trumpeter Swan Program Implementation & Evaluation Plan.” This document guided agencies and partner organizations to implement and subsequently evaluate a trumpeter swan reintroduction program in the Blackfoot Valley (USFWS 2006). This working document highlights the overall goals of the reintroduction and details the various management actions proposed for the program.

The “Blackfoot Trumpeter Swan Program Implementation & Evaluation Plan” states the following overall goal for the trumpeter swan reintroduction:

“The U.S. Fish and Wildlife Service (Service), Montana Fish, Wildlife and Parks (FWP), and partner organizations, working in concert with Blackfoot Valley landowners, plan to release trumpeter swans in the Blackfoot until such time as seven breeding pairs are established or until this evaluation suggests that the project should be terminated. (Established pairs are considered to be those that have fledged young at least twice from nests in the Blackfoot). Based on a 2004 habitat assessment in the Blackfoot, the maximum number of swans resulting from this reintroduction could approach 20 to 30 pairs, through pioneering and natural expansion of the flock. It is the intention of this restoration effort that this breeding flock be migratory, leaving the Blackfoot Valley in winter. This program has been approved by the Pacific Flyway Council and will be implemented in accordance with the Pacific Flyway Plan for the Rocky Mountain Population of Trumpeter Swans and the associated Trumpeter Swan Implementation Plan.” (USFWS 2006)

With the completion of the TSIP, the transition between initial research and planned activity began. The partners in the Blackfoot Valley trumpeter swan working
group now had approval and set guidance on how to move forward with the reintroduction program.

Preparing the Release Site

Introduction

The HSA and TSIP were completed with sufficient time for the initial trumpeter swan release to occur in the summer of 2005. However, in order for this to be possible, two additional major components of the reintroduction program needed to be in place. First, USFWS and its partners needed to secure swans from regional stock that could be used to seed the reintroduction. Secondly, the release wetlands and some of the surrounding wetlands needed to be studied for possible risks and work done to mitigate or remove those risks so that the swans would have the greatest possible chance of survival.

Site Mitigation

In the spring and summer leading up to and continuing through the inaugural reintroduction, USFWS engaged in a program to prepare the most critical wetlands in the reintroduction area, starting with the main release wetland. Work began in the spring on the main release wetland and moved out to adjacent wetlands to accommodate the swans as they expanded their range.

The various human-induced threats facing the swans that USFWS attempted to mitigate fell into two categories: physical structures, such as power lines or fencing, or behavioral patterns, such as grazing schedules or human traffic. Physical structures were mitigated to the extent that it was a) technologically feasible, b) cost-effective and c) amenable to the landowner. Behavioral patterns were discussed extensively with the landowner and altered to the extent that it did not adversely affect the day-to-day operations of the working ranch.

Power lines

One of the largest human-influenced threats to the trumpeter swan in the Blackfoot Valley is the presence of hundreds of miles of electric power lines that blanket
the flatlands of the valley. Given their large size, trumpeter swans, like other less maneuverable birds, are particularly vulnerable to collisions with power lines (Manville 2005). Weaver and St. Ores (1974) cite that of 75 trumpeter swan deaths recorded in the 25-year period between 1958 and 1973, 19% were due to collisions with power lines. In other studies, trumpeter swan mortality due to power line collisions has been seen as high as 44% (Lockman 1988). Given that mortality due to power line collision had already been recorded in the Blackfoot Valley, (the female Bouma swan in 2003), mitigating this threat to the swans was and continues to be a top priority for USFWS and the rest of the trumpeter swan partners.

With wingspans up to seven feet long, trumpeter swans are large birds and need a significant amount of space both to take off and land in open water. In addition, given their expansive wingspan, aerial maneuvers are difficult when the birds do not have a lot of time to react. Power lines are dangerous for trumpeters because they are difficult for the birds to locate against the open sky. In addition, lines near open water cause problems because the birds do not have sufficient time to gain the altitude necessary to clear the lines. Also problematic are “un-T’d” lines: power lines where the two strands run in a plane parallel to the pole and perpendicular to the ground. In these cases, birds that notice one of the lines, either the higher or the lower line, will bank to avoid it and often run into the companion line. “T’d” lines, or power lines where a crossbar has been fitted to the pole such that the power lines now run in a plane parallel to the ground and perpendicular to the pole, seem to be easier for the birds to navigate since they only need avoid one plane of trouble.

On the property where the first reintroduction release occurred, there were multiple power lines less than a mile from the core wetlands, including the release site. In one case, there was a seldom-used power line that ran directly across a wetland identified as high quality by the HSA. This line was considered by USFWS personnel to be the biggest power line threat near the release wetland. USFWS entered into an agreement with Missoula Electric Cooperative (MEC), the local electric utility, to remove that particular power line, as well as to take actions to mitigate the effects of the other power lines on the property. Overall, MEC committed to removing three miles of power line in the immediate release area.
Two distinguishing factors applied when considering which power lines on the property surrounding the release wetland were in greatest need of mitigation. First, the type of power line was deemed important. Since many of the power lines on the property were “non-T’d” lines, the threat from these was considered more important to mitigate. As such, second to the desire to remove the one power line that crossed the neighboring wetland to the release wetland was the desire to “T” those power lines adjacent to the release wetland.

Common sense dictates that it would be illogical to remove all the power lines across the Blackfoot Valley. Though the power company might want to bury a significant number of power lines to reduce the possibility of weather-induced line loss, an action that would also protect the swans, the funding for such a project is not readily available (G Neudecker, personal communication). Thus, it was necessary to come up with a way to mitigate the harm posed by those power lines it was not feasible to remove.

The choice was made to mark those power lines that were not being removed and that USFWS determined posed a significant threat to the birds (G Neudecker, personal communication). Different marking strategies were discussed and the final decision was made to use a commercial marking product, commonly known as the Fire-Fly, to attach to sections of problem power lines. The Fire-Fly is a bird flight diverter that is composed of reflective parts that spin in the wind when attached to a power line. These devices work by alerting the birds to the existence of the line far in advance of visual sighting of the plain line. Additionally, the model used in the Blackfoot Valley glows in the dark to further dissuade birds from approaching the lines.

Fence lines

Throughout the duration of the HSA, study personnel took detailed notes about the presence of fence lines terminating in, surrounding, or crossing over the various wetlands surveyed. An inventory of all fence lines near desirable wetlands allowed USFWS to begin discussions with landowners about the possibility of removing or relocating fences away from the potential paths of the trumpeters.

There were two main types of fence-related threats to consider when looking at the various wetlands surveyed as part of the HSA. First, there were those fence lines that
might pose a risk to birds in flight. Secondly, there were those fence lines that might pose a risk to birds on the water and/or during feeding. Additionally, on wetlands in the vicinity of the Year 1 release site, there were high-voltage bear-repellent electric fences with which to contend.

Similar to the situation encountered with power lines that were too close to open water, fence lines situated close to the banks of wetlands were called into question as possible sources of harm due to the birds’ inability to maneuver quickly when conducting take-off or landing on open water. Fences, especially barbed wire ones, pose a significant threat of entanglement and injury to trumpeters during these maneuvers. Additionally, the threat of electrocution from “bear fencing” had to be considered, as the birds would not be able to distinguish these “hot fences” from normal, albeit still dangerous, fence lines. In order to help gauge the potential impact of fences at each potential site, information on fence positioning in reference to the wetland, as well as distance from the wetland was recorded during the HSA to help paint an accurate picture of the potential disturbances.

Fences surrounding wetlands were not the only fence-related issues with which to contend. Many of the wetlands had submerged fence lines that crossed parts of the wetland, or as was the case with one wetland, criss-crossed the wetland in multiple places. These fences were often not marked on maps, and sometimes had been forgotten by the landowners themselves. These submerged fence lines posed a grave threat to foraging swans whose nature it is to disturb the silted wetland bottom in search of suitable submerged aquatic vegetation.

Spurred on by the imminent arrival of the first cohort of trumpeter swans, a large-scale effort was undertaken by ranch and study personnel on the Year 1 release site property to mitigate as many of the fence-related impacts as possible. Modifications to fences, up to and including total removal, were conducted not only on the Year 1 release site itself, but also on neighboring wetlands on the property, in anticipation of the trumpeter swans’ travels once they gained flight. While fencing issues surrounding the immediate release site were completed before the date of the reintroduction, work on nearby wetlands continued through the summer while the still-flightless birds were confined to the release wetland.
On the Year 1 release site itself, three different techniques were used to help reduce the amount of risk to the trumpeter swans. First, the landowner and ranch manager worked with USFWS to determine ways in which to revise their cattle grazing strategy so as to allow for removal of some of the fences surrounding the wetland. Both ranch and HSA study personnel participated in the removal of these fences. Additionally, multiple strands of submerged barbed wire and associated fence posts were removed from two fence lines that transected the wetland. Since one of these lines was part of an active fence line that the ranch needed to remain in place, USFWS helped create cattle-guard fences at the point of interface between rangeland and the wetland so as to preserve fence function, keeping cattle from using the wetland to cross from one pasture to another.

Since the Year 1 release site property is a working cattle ranch, it was inevitable that there would be fences that might be a problem for released trumpeter swans that were essential to normal operation of the ranch and could not be moved. In these situations, study personnel needed to come up with a way to alert the birds to the presence of the fence lines in enough time for them to react. Fire-fly devices used on area power lines were too expensive for the amount of fence marking that needed to occur. Instead, USFWS personnel came up with a method for marking that was both cost-effective and visually effective. Borrowing from the techniques of the power company, USFWS decided to mimic the marking strategy used on support wires for power line poles. After sufficient amounts of testing, it was determined that the orange-plastic cylindrical sections used to cover these wires would fit around both barbed wire and electric fences, and as such, be effective for purposes of fence marking.

Conversations with the ranch led USFWS to investigate how the need to mark the various fences could be balanced with the high aesthetic values the ranch owner and manager wanted to maintain on their property. Originally, the barbed wire fence that ran parallel to the south edge of the reintroduction wetland, used to section off a grazing unit, was marked using the orange-plastic method. Due to its proximity to the wetland, and the fact that it ran along the length of the wetland as opposed to the width, there was a significant amount of fence that had to be marked. When the ranch owner and ranch manager saw the finished application of the orange-plastic method to this part of the
fence, they decided they would actually prefer to alter their grazing setup and pull the length of fence for aesthetic purposes. This achieved an even better outcome for the trumpeter swans, for now instead of simply marking a hazard, it had been removed altogether.

The decision to remove the first marked fence led USFWS personnel to revisit how we would mark the remaining problematic fences on adjacent wetlands. Using a full, roughly 4’ orange-plastic section now seemed less than ideal for its detrimental aesthetic qualities. Considering that we were able to mark much longer sections of power line with a much smaller visually identifying marker, the idea was proposed to use smaller sections of orange-plastic in order to reduce the negative aesthetic effect while retaining the visual warning effect for the trumpeter swans. As such, the full orange-plastic sections were sliced in half using an electric handsaw, and further fence marking on the property was conducted using the half-pieces. The resultant marking system was more aesthetically pleasing to the landowner while still generating the desired visual warning for the swans.

**Modifying Ranch Operations**

One of the main considerations that had to be taken into account throughout the threat-mitigation effort undertaken by USFWS was how these actions would affect the working ranch where the main release wetland and many of the auxiliary wetlands were located. In the case of the Year 1 release wetland, USFWS was lucky to have a receptive landowner who was willing to discuss ways to accommodate the swans within the context of his working ranch. This manifested itself not only in the agreement to alter or outright remove fencing, but also in discussions on how day-to-day operation of the ranch might take into consideration the needs of the birds once they were released.

First and foremost, USFWS personnel worked with the ranch manager and the landowner to establish a plan to manage the level of human traffic around the main reintroduction wetland post-release. Once the birds were released, ranch personnel would limit their use of an access road that ran parallel to the wetland in order to reduce traffic near the birds. Study personnel that would be monitoring the birds would also stay clear of the access road and the open areas around the release wetland. Monitoring posts
were established in wooded areas overlooking the release wetland, and study personnel were to approach these areas on foot.

In addition to these day-to-day changes proposed, USFWS and the landowner agreed upon changes to other operational aspects of this working ranch. The decision was made to move cows out of the grazing units immediately adjacent to the release site for some time after the initial release, to allow the birds time for initial acclimation. The cows would be returned later in the summer to restore that function of the land and acclimate the birds to stock animals.

Selecting the Birds for Release

USFWS and the TSWG spent a considerable amount of time determining just what kind of trumpeter swans would be acceptable for use as part of the overall reintroduction effort. Two main characteristics of available birds became the determining factors in the search for acceptable trumpeter swans: age and genetic makeup.

The Blackfoot Trumpeter Swan Program Implementation and Evaluation Plan (I&E Plan) calls for the use of one to two-year old trumpeter swans to be used when available, but notes that “when necessary to create a release of adequate size in any given year” (Neudecker and Hinz 2005), hatching year trumpeter swans may be used. In addition to using young swans, the I&E Plan instructed that only “genetically acceptable trumpeters” were to be released (Neudecker and Hinz 2005).

At the time that the I&E Plan was written, August of 2005, the results from a late 2005 USFWS swan genetics study were not yet available, so there was continued uncertainty about whether or not the Tri-State population of trumpeter swans was genetically dissimilar enough from the Pacific Coast Population and the Rocky Mountain Population to warrant consideration as a separate population. When the effort to recover the trumpeter swan population was undertaken, USFWS made the administrative decision to divide the Western population range into two populations: the Pacific Coast and the Rocky Mountain Populations (Smith 2006). The few trumpeter swans in and around Yellowstone National Park were deemed the Tri-State population, and were included under the umbrella of the Rocky Mountain Population. However, when the recovery effort in the Tri-State area started to gain traction at the beginning of the new millennium,
USFWS acted to determine if this Tri-State population, a non-migrating population of trumpeter swans, was in fact a distinct subspecies of trumpeter swans, or if it was simply a part of the Rocky Mountain Population whose particular ecosystem and recorded inbreeding had led it to its current position. Genetic analysis conducted for USFWS by the University of Denver concluded that while the Pacific Coast and the Rocky Mountain Populations of trumpeter swans do have significant genetic differences, they do in fact interbreed where their territories overlap (Smith 2006). Furthermore, the study found that the Tri-State population of trumpeter swans was genetically consistent with that of the Rocky Mountain population. For the purposes of the Blackfoot Valley trumpeter swan recovery, this was a positive discovery because it allows for the continued use of eggs salvaged from the Tri-State flock to help recover the Rocky Mountain population. Organizations looking at similar reintroductions should consult with local biologists well in advance of any reintroduction effort in case the need for genetic testing arises.

Releasing the Birds

Pre-Release Handling

The first cohort of swans released in the Blackfoot Valley were fitted with two types of identification, and an additional visual identification aid. The birds each received uniquely numbered neck collars and tarsal bands, as well as standard U.S. Geological Survey metal leg bands to help USFWS personnel identify individual birds.

It is also important to note the reasons behind not choosing radio collars for tracking the trumpeter swans. This question of whether of not to use radio collars was addressed at the first TSWG meeting in August of 2004, but the decision was made that the collars would be too costly, too bulky, and possibly ineffective due the anatomical structure of the bird (BTSWG 2005). Any radio collar would have to be able to withstand being underwater for significant portions of time, as neck collars on trumpeter swans often sit below the water line due to the bird’s posture on the water. Also, the weight of the collar on a young bird was questioned as a possible contributor to negative growth. While the ability to more comprehensively track the birds was appealing, the chance of negatively affecting the birds’ survival rate was deemed unacceptable.
The decision had been made by USFWS and the TSWG to attach the neck and leg bands to the birds prior to their transport from Wyoming to Montana. This was accomplished by Bill Long of the Wyoming Wetland Society and associates prior to loading the birds into the transport trailer that would bring them to the Blackfoot Valley from Wyoming. Mr. Long and two members of the TSWG accompanied the birds overnight on the trek from Wyoming to the Blackfoot Valley. Upon arrival at the release wetland, TSWG members brought two birds at a time out from the transport trailer and held them immobile, or as close to immobile as possible, while Mr. Long applied the wing dye. Once the dye was given approximately five minutes to dry, the birds were carried to the edge of the wetland and released to the water as cameras clicked and flashed.

Day of Release Handling – June 23, 2005

It took more than two years of hard work on the part of agency employees, community leaders, business leaders and members of the general public to arrive at June 23rd, 2005, the day trumpeter swans finally returned to the Blackfoot Valley. The following chronology of events gives a brief snapshot of the release day activities.

- 2:00pm
  - The Trumpeter Swan Working Group meets at the Ovando Fire Station where an initial staging area has been set up. Biologists, community members, agency personnel and invited media guests carpool up to the ranch and park on a hillside above the release wetland (Photo 1) behind the tree line. From here, on the southwest side of the wetland, the reintroduction team and the local media had a good view of the entire
wetland.

![Photo 1](image)

**Photo 1**

- 2:30pm
  - Greg Neudecker of UWFWS and Tom Hinz of the Montana Wetland Legacy make introductory remarks and introduce the members of the TSWG. They discuss the background of the project and talk about the history of the wetland, how it had been previously restored, the mitigation effort as well as discussing how the reintroduction would proceed.
  - Everyone present walks down to the release site while Mr. Long drives the transport trailer containing the swans down to the water (**Photo 2**). Mr. Long then gives an introductory talk about what the birds have already experienced, details protocol for handling the birds and encourages everyone to stay a fair distance away from the trailer to reduce the stress
on the birds.

Photo 2
- 3:00pm
  o Mr. Long and Mr. Hinz enter the trailer via side door and remove the first pair of birds. Mr. Hinz and Mr. Neudecker will hold, transfer and release the first two birds (Photo 3).
The first pair of birds are removed from the trailer and moved to the painting staging area behind the trailer. Their wings are painted and the birds are held still for approximately five minutes while the paint is given.
time to dry (Photo 4).

Photo 4
- 3:10pm

Mr. Hinz and Mr. Neudecker pick up the birds and carry them to the waters edge. They pose for a quick photograph and gently release the birds into the water (Photo 5).
Photo 5

- 3:13pm – 3:35pm
  o The previous protocol is repeated four times as the remaining birds are removed from the trailer, painted and released.

- 3:35pm
  o TSWG personnel notice three swans getting out of the water on the opposite side of the wetland and heading upland. Mr. Long, Mr. Bouma and I (Ferrasci-O’Malley) set off on an ATV to track down the three swans and return them to the release wetland. At this time, the remaining observers return to the staging area up on the hillside behind the wetland (Photo 6).
Mr. Bouma, Mr. Long and I chase down the three birds, and Mr. Long carries each bird back to the wetland, encouraging them into the water and waiting until they rejoin the rest of the birds before heading back up the hillside, away from the release site, where the rest of the reintroduction team waited.

Unanticipated Problems & Suggestions for Solution

The first release, while ultimately successful in placing the ten swans on the wetland, was not without its share of complications. In regards to wing dye marking, it was decided to complete this aspect of the marking protocol post-transport, immediately prior to the reintroduction. Given that the application of wing dye to large birds can be quite a messy ordeal, this decision made sense in the abstract. The goal was to only mark
one wing, and painting wings before transport was likely to lead to the birds spreading the dye all over their bodies and the transport trailer.

However, this decision resulted in several unintended consequences for the released birds and the reintroduction team. The first issue was with the wing dye itself. The initial decision by the TSWG was to dye one wing of each bird red for identification purposes. When the reintroduction team arrived on that late June morning, the dye turned out to be more a purple shade than true red. Since application of the dye had been saved until immediately before release, there was no time to address this issue (Photo 7).

![Photo 7](image)

When applied, the color difference did not make much of a visual difference, but as the seasons progressed that first year, it became clear to observers that this particular shade of wing dye, when it fades with weather and time, turns pink. It was postulated at a later TSWG meeting that this occurrence might actually increase the public’s reporting...
of the reintroduced birds, as a “pink wing” would be immediately noticed as unnatural, whereas observers might see red and merely think the otherwise healthy bird had been bloodied.

Additionally, for unknown reasons, the dye did not dry as fast as the TSWG had planned. When the first two released birds hit the water, they generated a reddish-purple trail that extended approximately 10 to 15 feet behind them in the water and followed their path around the wetland (Photo 8).

![Photo 8](image)

To the naked eye, as the dye mixed with the clear blue wetland, it appeared that the swans were bleeding into the water as they swam away from the reintroduction team. This was not exactly the media moment that the TSWG had planned when drawing up its marking protocol.

Finally, applying the dye to the trumpeter swans’ wings on-site directly before the reintroduction dramatically increased the amount of time the reintroduction took. Since
the dye took time to apply, as well as time to dry, the birds had to be handled for approximately 25 additional minutes each before they were released to the wetland. Since this extended the amount of time the birds were in contact with the members of the reintroduction team between transport trailer and the water, the likelihood is high that the decision to mark the birds on-site contributed to an increased initial disturbance level around the release site, and caused the three swans to leave the release wetland.

It became immediately apparent that the decision to leave both of the ATVs at the secondary staging area up on the hillside had been a mistake once the three swans left the release wetland. While it may have lessened the stress on the swans by having everyone walk to the shore of the wetland, it delayed pursuit of the fleeing swans. By the time one of the ATVs was fetched and the three members of the team had raced around the wetland, two of the three fleeing birds had already progressed through the field behind the wetland and into the forested area north of the site. Personal experience allows me to report that trumpeter swans are much more difficult to catch in wooded areas as opposed to out in open fields.

In retrospect, it seems that the time spent accomplishing the actual release of the birds was flawed in two main ways. First, the three to five minutes each bird’s wings were given to dry before being thrust into the wetland was too little time to allow for sufficient drying. More time between application of the dye and release into the wetland would likely have reduced the amount of dye that bled into the wetland. Secondly, the nearly one hour that the entire release team and accompanying media members were on the banks of the wetland was likely too long for the swans to gain a small level of comfort with their new habitat. The noise and activity forced each pair across the wetland once they hit the water, and eventually encouraged the three fleeing birds to leave the relative security of the wetland for an escape to the woods.

In future releases, it was noted that efforts would be made to keep the actual release as quick and quiet as possible. Limiting the number of people present at the release would go a long way to limiting noise and delays, but as is often the case with a community-wide effort, there are a lot of people who have invested significant time and resources into this culminating event, and it can prove hard to justify keeping them away. The more likely scenario would be to have the birds’ wings painted before their transport,
so that the release would not be limited to two birds at a time. In this scenario, multiple birds could be released at one time, potentially all ten at once. This would allow for the release team to quickly retreat from the wetland and observe the swans from a less stressful distance.

Post-Release Handling

Once the escapee trumpeter swans had all been returned to the wetland, and the reintroduction team had retreated a significant distance up the hill to avoid further disturbing the birds, the next step in the process began: post-release monitoring. This portion of the reintroduction continued up until the birds left for the winter.

The desire of the TSWG was to construct a monitoring protocol that allowed USFWS and ranch personnel to keep a close eye on the trumpeters as they became acclimated to their new habitat with the least amount of disturbance possible.

Once the release was successfully conducted, management of the birds entered a new phase. The birds were no longer being kept in a captive-rearing situation, as they had been in Wyoming; they were now out in the wild, free to move as they pleased. For the first few months after the reintroduction, the young trumpeter swans were confined to the release wetland and the nearby upland areas they could reach overland due to their under-developed flight muscles. Given the attempted overland escape of several of the birds during the initial release, there was concern from USFWS that the birds would continue to leave the relative security of the release wetland and attempt additional overland travel. Trumpeter swans are at a much greater risk of predation when traveling overland as compared to time spent on open water, so this was a matter of concern. As a result, USFWS established a strict protocol for the initial post-release monitoring of the trumpeter swans. TSWG and ranch personnel checked on the birds daily from strategic, covered vantage points a significant distance from the release wetland. Binocular use allowed for identification of individual birds and overall observation with minimal disturbance. ATV and vehicular traffic was restricted on the ranch access road running parallel to the length of the wetland for the first couple of weeks post-release.

Now, since the initial plan of USFWS’ trumpeter swan reintroduction plan was to establish a migratory flock of trumpeter swans, it was expected that the birds would
eventually leave the release wetland to fly south, hopefully to return in the following spring. In a wild population, young trumpeter swans have the older, more seasoned birds among them to encourage flight trials and dictate the beginning of the migration south. Given that all of the reintroduced birds would be young, immature swans, USFWS had to devise a strategy by which the birds would be encouraged to start developing this habit of testing their wings. For the young birds’ wings to develop enough to facilitate their winter migration, they had to be using them in the fall in what essentially amounted to practice flying. Additionally, in order for these practice flights to be possible, the birds had to try to fly. It was not as though the birds were one day going to be able to transfer from swimming to full-scale flight without interim muscle building with their wings.

So, USFWS devised a plan to encourage the birds to develop their wings. USFWS personnel and HSA study personnel began to engage in a calculated, minimally-disturbant practice of rushing the swans when they were near the shoreline. Personnel would approach the release wetland from behind a rise or a ridge so that their presence was less likely to be detected. Then, as they were nearing the wetland, the personnel in question would begin to sprint towards the birds with arms waving and accompanied with shouts and encouragements. At first, the swans reacted by swimming away, or rushing back to the water and swimming away if they had been loafing. As time progressed, however, the birds became able to take short flights, and would respond to the disturbances by attempting to fly away. As they grew stronger, they eventually were able to achieve a successful take-off and perform short flights around the reintroduction wetland, as well as neighboring wetlands.

As the summer progressed into fall, USFWS personnel noticed that one of the swans was not making gains in attempting flights. After much discussion as to how to proceed, and continued futility in encouraging short flights through the rushing technique, USFWS decided that the bird needed to be further encouraged to take flight. It was determined that the swan in question needed to be removed from the wetland to see if it had sustained some sort of injury that was keeping it from completely exercising its wings. As a comparison, at this point in time, the rest of the swans were successfully traveling between neighboring wetlands and beyond, so there was valid concern that there was something wrong with the one particular swan.
Mr. Ertl and I took a canoe out on the release wetland in an attempt to capture the swan in question and bring it in for testing. Upon arriving at the release wetland, we were unable to find the swan in question. Since there were significant amounts of emergent vegetation that the swans used as cover on the western side of the wetland, we began to search the narrow passageways amongst the reeds for the missing bird. We sighted a swan deep within the reeds but could not get a visual on the neckband in order to determine if it was indeed the swan we were looking for. Since none of the other released birds were present on the wetland after our arrival, we assumed the bird in the reeds was the swan in question and attempted to catch up with it. After close to an hour of pursuit, at no time during which did the bird show any attempts to take flight, we herded it into open water and closed the distance only to discover, both through visual identification of the neckband, and the subsequent escape flight, that it was not the swan in question.

Over the next few weeks neither ranch personnel or USFWS personnel recorded any observation of the missing, possibly injured, last remaining flightless swan. Unfortunately, an overland search of the ranch property for another purpose located the carcass of the missing bird. USFWS personnel determined that a coyote had recently attacked the bird, though it was not determined whether this was pre- or post-mortem (G Neudecker, personal communication).

Results Since the Initial Release

First Year Results

Of the initial 10 birds that were released in the summer of 2005, two birds were still known to be alive and had been recently located as of the second TSWG meeting in the spring of 2006 (BTSWG 2006). Of the remaining eight birds, five were unaccounted for and three were known or reported dead.

Since most of the wetlands in the valley at the time of the second TSWG meeting were still frozen, it is not surprising that the two birds known to be alive were seen waiting out the winter on the Blackfoot River and its various tributaries. These two birds were bird 1P0 and bird 0P5, as confirmed by neckbands (BTSWG 2006). Bird 1P0 had
been seen spending at least part of the winter at the Warm Springs WMA near Galen, MT. It disappeared from the valley around May 1st, but later showed up in the Mission Valley on June 14th, 2006, the last known sighting (BTSWG 2007). Bird 0P5 was reported multiple times to be wintering with Canada geese and mallards on the Blackfoot River itself. In addition, Bird 0P5 was seen in late March on Monture Creek, a creek off of the Blackfoot River (BTSWG 2006). Later in 2006, Bird 0P5 molted on Klenschmidt Lake, and was last seen on October 5th, 2006 on Jones Lake, a lake and wetland complex near the release site.

Three of the initial 10 reintroduced trumpeter swans were known or reported as dead by the TSWG meeting (BTSWG 2006). Bird 0P8 was considered by the TSWG to have been killed by coyotes in October of 2005 in an area near the release site. Bird 0P4 was found dead by study personnel on the shore of Upsata Lake, a lake due west of the release wetland on November 19th, 2005. Finally, Bird 0P7 was reported to USFWS as found dead outside Bonner, MT by a woman whose given name and address could never be confirmed by authorities in Bonner or Ovando (BTSWG 2006). Neither the carcass or the identification markers were ever recovered.

With three birds known or reported killed, and two birds recently sighted alive, the TSWG was left with five birds unaccounted for since freeze up in early December, 2005 (BTSWG 2006). While it is possible that these birds are outside of the reporting area and may return to the Blackfoot in subsequent years, it is more likely that the five either perished during migration or chose another area to live.

Subsequent Years Update

Year 2 of the Blackfoot Valley trumpeter swan reintroduction program saw 17 trumpeter swans released onto three wetlands in the Ovando Valley on June 3rd, 2006 (BTSWG 2007). These birds were all yearling birds from the same Wyoming Wetland Society Facility as those from the Year 1 release. As of the summer of 2007, six of the 17 trumpeter swans released in 2006 were confirmed dead (BTSWG 2007). One was killed after colliding with a power line, four were found dead on wetlands in the Blackfoot Valley due to emaciation and parasitism, and one died of unknown causes. Five of the 2006-released birds wintered on American Falls Reservoir in Idaho, two of
which returned the following spring to the Blackfoot Valley (BTSWG 2007). These two birds were spotted numerous times in May and June on various wetlands in the Blackfoot, last seen on June 15th, 2007 (BTSWG 2007).

Year 3 of the Blackfoot Valley trumpeter swan reintroduction program saw ten trumpeter swans released together as one cohort on a single wetland near Ovando on June 16th, 2007. An additional four cygnets were released on a single wetland near Lincoln on August 9th, 2007. All 14 birds were again of Wyoming Wetland Society Facility stock. As of October 16th, 2007, all 14 birds from this cohort were known to be alive and flying near the respective release sites (BTSWG 2007).

The Blackfoot Valley trumpeter swan reintroduction program will continue in 2008 in a similar manner to the last three years. The number of birds released in 2008 is expected to be higher than recent years, due to increased availability of birds from the Wyoming Wetland Society Facility (BTSWG 2007). In 2008 the TSWG plans to release birds in the general vicinity of the 2005-2007 release sites, possibly on previous release sites, depending on returning birds. Additionally, some of the 2008 releases may take place earlier in the spring in hopes of having birds on the water to visually encourage past Blackfoot birds returning to the area in the spring that might otherwise continue north with the migration to stop in the Blackfoot (BTSWG 2007).

All in all 41 different individuals, from USFWS personnel and local landowners to other community members, have reported 219 observations of the released trumpeter swans over the past three years (BTSWG 2007). USFWS personnel are working with the Blackfoot Challenge and MTFWP to generate maps of these observations and begin to analyze the data to see what information can be learned to assist with further releases.

Reflections on Lessons Learned

I find it helpful to consider all that the reintroduction program has accomplished and what its future might hold. The first reintroduction event took place on schedule and occurred with minimal hiccups in the plan. While the specific pros and cons of the methodology employed during the first year reintroduction will hopefully be helpful to
other groups considering similar projects of their own, it’s important not to lose sight of the fact that for the Blackfoot Valley as a whole, this process was one big win.

As with any pilot effort, there are bound to be some things that look great on paper during planning and strategy sessions, but which turn out to have unanticipated and sometimes detrimental effects during application. In the case of our reintroduction effort, the most glaring miscalculation has to be the elongated initial release timeline. Considering that the birds had already been confined to the transport trailer for two days, and then were thrust out onto a completely foreign body of water to the sounds of clicking cameras and two dozen humans, it does not seem surprising now that some of the birds attempted to get away, no matter how perplexing it was in the moment. Releasing all the birds simultaneously would likely keep them bunched together, rather than scattered across the wetland. Indeed, it was suggested by Ruth Shea of the Trumpeter Swan Society that you want the cohort to be released all at once so they develop some cohesion (R. Shea, personal correspondence).

The chronology I have described in this paper is only Year 1 of what is planned to be a multi-year effort. The goal of the restoration is to continue releasing birds until the point at which seven breeding pairs are established in the valley. Given that the Trumpeter Swan Working Group is defining established pairs as “those that have fledged young at least twice from nests in the Blackfoot” and that released birds are yearlings unable to breed for another three years at minimum, we’re looking at a long-term process (MTFWP 2008). However, this timeline means that there is great opportunity for further study of the overall effort. The partnership between USFWS and the University of Montana that grew out of the HSA work could be expanded to include things such as: studying the effect of fence and power line mitigation on swan survival, analyzing consumed food versus assumed swan macrophyte preference, studying behavior of returning reintroduced swans versus newly released swans, and analyzing actual wetland use as compared to expected use as identified in the HSA. The opportunity to learn more about trumpeter swans through additional research surrounding this effort has the possibility to benefit the scientific community at large, as well as to increase the effectiveness of this particular reintroduction program.
It is important to remember that this small reintroduction, its successes notwithstanding, is only a part of a much larger, multi-state effort to restore the Rocky Mountain Population of trumpeter swans. The ten to twenty birds reintroduced each year in the Blackfoot over the last four years represent only a small percentage of the total North American population, yet they represent a possibility for the future. Establishing another flock that will pick up a winter migration and expands the current range of this threatened species make the Blackfoot trumpeter swans important to regional biodiversity as well as the local community.

One of the biggest take-home lessons of this report, in fact of my entire body of graduate work, is that in the realm of community-based conservation, both science and social understanding are intrinsic to successful conservation. In this example of the Blackfoot Valley in western Montana and its fledgling trumpeter swans, it was important to understand the physical characteristics of the valley and its numerous wetlands, yet it was also important to understand the sociology of the valley, for it dictates the manner in which the birds will or will not be accepted. The Blackfoot Valley is in many respects lucky to have an established history of partnership and collaboration, most notably through the Blackfoot Challenge, that forms a solid foundation from which projects like this reintroduction can be formed and built successfully. In many cases, especially in the large rural areas that are found across the Intermountain West, it is not just “hard science” that should be considered when making management decisions. Some decisions are simply better made on the ground using the experience of conservation professionals who have both a scientific background and a strong understanding of and connection to the local community. This second piece is often the most important, simply because it’s often the most overlooked; how having an individual who knows the history, dynamics and values of a valley, a town, a city, a state, can be much more effective when looking to incorporate a conservation effort into the overall fabric of a community, as opposed to top-down government decision-making.

Though it will be years until it is known whether or not this reintroduction results in an established trumpeter swan flock in the Blackfoot Valley, the indicator of ultimate success, we can analyze success to date. USFWS and its many partners in this effort started the process with only an idea: the chance to bring a vibrant species back to the
valley. Moving from that idea to today, a situation where more than 40 birds have been released back into the Blackfoot Valley, some of which have returned back the following spring, is quite a feat. The success of the program to this point is deeply rooted in this ethos of partnership and collaboration, a combination of sound science and sound management.
CHAPTER 2: TRUMPETER SWAN HABITAT SUITABILITY ANALYSIS FOR THE BLACKFOOT VALLEY

Introduction

Brief Overview of the Blackfoot Valley Landscape

I spent the summer and fall of 2004 working with Greg Neudecker, Kevin Ertl and two other field working conducting a habitat suitability analysis of the Blackfoot Valley. Our work was reported in Trumpeter Swan Habitat Suitability Study in the Blackfoot River Watershed of Montana, which I co-authored and which is referred to herein as the “Habitat Suitability Analysis” report and included in its entirety as Appendix A. The following passage is taken from the introduction to this piece and provides a brief snapshot of the Blackfoot Valley useful for those not familiar with the valley.

“The Blackfoot River has its headwaters atop the Continental Divide at Roger’s Pass and flows 132 miles west to its confluence with the Clark Fork River near Missoula. The Blackfoot River Watershed totals about 1.5 million acres and is nestled between the Continental Divide, Bob Marshall/Scapegoat Wilderness Areas, and Garnet Mountains. Land ownership in the Watershed is 49% Federal, 5% State of Montana, 20% Plum Creek Timber Company and 24% private. The open valley elevation is about 4400 feet, dropping to 3340 where it joins the Clark Fork River near Missoula. The mountains surrounding the Blackfoot Valley rise to elevations over 8500 feet. In general, public lands and significant portions of Plum Creek Timber Company land comprise the forested, mountain areas while private lands are located in the foothills and lower valley floor.

The middle reach of the Blackfoot Valley hosts an unusually diverse complex of habitats as a result of distinct glacial events. Glacial carving and deposition formed the unique knob and kettle topography north and east of Ovando. A large stagnant sheet of Pleistocene ice shaped the broad Helmville/Ovando Valley. This glacial action also greatly affected the local hydrology. Many spring creeks arise from the porous gravels on the valley floor. The glacial pothole prairie landscape is unique because it is so isolated from other prairie pothole areas like those in northeastern Montana.

Predominant vegetation in the Ovando Valley is prairie grasslands dominated by rough fescue, Idaho fescue, and bluebunch wheatgrass and sagebrush steppe dominated by big sagebrush, three-tip sagebrush and grasses. Large expanses of forest dominated by Douglas fir, ponderosa
pine and lodgepole pine do occur in the surrounding hillsides. The main source of biodiversity within the Blackfoot watershed are the wetland features, including glacial lakes and ponds, bogs and fens, spring creeks, riparian swamps and cottonwood forests.

Unlike most other major valleys in western Montana, the Blackfoot Valley is relatively undeveloped. The valley has seen limited residential subdivision, and ranching remains the principle agricultural use.”

Brief Overview of the Ecology and Habitat Needs of Trumpeter Swans

Trumpeter swans (Cygnus buccinator) are the largest waterfowl in North America, growing up to five feet in length, and capable of having a wingspan of nearly seven feet (MTFWP 2008). Male trumpeter swans are generally larger than females, weighing over 20 pounds, but the sexes are otherwise similar in appearance. An entirely white bird with black legs, webbed feet and bill, the trumpeter swan shares a similar coloring to its more abundant relative the tundra swan (MTFWP 2008). Trumpeter swans are larger than tundra swans, and do not possess the tundra’s trademark yellow spots in front of the eyes. While it can be difficult to visually distinguish a trumpeter swan from a tundra swan, it is much easier to audibly differentiate the two birds. Trumpeter swans are less vocal than tundra swans in general, and their tone has a much lower-pitched, nasal quality than the loud, clear soundings of tundra swans (Mitchell 1994).

Trumpeter swans were abundant across North America prior to the 1800’s, when hunting pressures exploded and resulted in the extirpation of trumpeter swans from much of their historic range. By 1932, less than 100 trumpeter swans remained in the contiguous United States, taking refuge in remote areas of Montana, Idaho, and Wyoming (Slater 2006). However, trumpeter swans were, and still are given a significant amount of attention by government agencies, non-profit organizations, private foundations and the general public because of their size and beauty. Since 1935, management of trumpeter swan populations and coordination at the state, national and international levels have resulted in the recovery of the trumpeter swan to the point that, as of 2005, the North American population was estimated to be 34,803 (Slater 2006). Management is coordinated by a national waterfowl management plan and three regional
trumpeter swan management plans, though on-the-ground management of birds is usually on a flock-by-flock basis (Slater 2006).

Though their population numbers have recovered from the absolute depths of the early 20th century, trumpeter swans are still classified by multiple state and federal agencies as a “species of concern”. On the strength of Canadian flock numbers, the trumpeter swan at the global level is classified as G4 (apparently secure), by the National Heritage Program because of its regained wide distribution across North America and its increasing population trends (Slater 2006). Within the United States, trumpeter swans are listed as a Species of Management Concern by the US Fish and Wildlife Service (USFWS), and as a “sensitive” species by both the US Forest Service and the Bureau of Land Management (MTFWP 2008). In Montana, trumpeter swans listed as a “species of concern” and are ranked “at risk because of very limited and potentially declining numbers, extent and/or habitat, making it vulnerable to extirpation in the state” (MTFWP 2008). In recent years, the state of Montana has received federal funding to develop Comprehensive Fish and Wildlife Conservation Strategies for species of concern. Under this additional management tool, trumpeter swans are listed as Tier I, the highest tier, and classified as of “greatest conservation need. Montana Fish Wildlife & Parks has a clear obligation to use its resources to implement conservation actions that provide direct benefit to these species, communities, and focus areas” (MTFWP 2008).

All of this focus on the trumpeter swan, combined with its large size, white coloring and specific habitat associations make it a species easy to count and identify through ground and aerial surveys. However, landscape-scale habitat characteristics associated with breeding and the growth and maintenance of trumpeter swan flocks have not been quantified and there is no current information on home range areas (Slater 2006). Territory size for trumpeter swans varies from 1.5 to 100 ha and depends on variables such as shoreline complexity and amount of available food (Slater 2006). Their distribution across North America results not surprisingly in an overall broad diet, through swans in the tri-state area of Montana, Idaho and Wyoming feed predominantly on submerged macrophytes, such as duck potato (*Potamogeton* spp.) and water weeds (*Elodea* spp.) (Mitchell 1994).
The breeding season for trumpeter swans begins in late April when pairs begin nest building (Banko 1960). Fidelity to previous sites is extremely strong with trumpeter swans, and exhibited by both males and females (R. Shea, personal communication). Breeding pairs will often return to and refurbish the previous year’s nest, especially if they had been successful in fledging young with that nest (Banko 1960). Trumpeter swans usually breed for the first time between four and seven years of age, through pair bonding can begin as early as 20 months (Banko 1960). Within the tri-state subpopulation, clutch size is between two and nine, usually about five (MTFWP 2008). Cygnets maintain close association with their parents after hatching and this strong family bond results in surviving young usually returning the following year with the mated pair (Slater 2006, R. Shea personal communication).

Limited banding data have provided a broad range of survival estimates for cygnets surviving to breeding age, anywhere from 40% to 100%, and no data currently exists on the difference in survival rates for captive versus native swans (Mitchell 1994, R. Shea personal communication). Under the best of conditions, cygnet survival is expected to be lower than that of one- and two-year olds, which in turn is expected to be lower than that of swans greater than two years old. Because of this, most reintroduction efforts use yearlings instead of cygnets to increase the odds of survival over the first winter (R. Shea personal communication). Very little information also exists for trumpeter swan annual reproductive success or lifetime reproductive success (Slater 2006). To this end, significant research remains necessary on age- and sex-specific differences in survival, reproductive success, habitat usage, differences between native and captive or reintroduced swans, and landscape characteristics to aid in the future management and recovery of the species (Mitchell 1994, Slater 2006).

**Establishing Study Parameters**

**Explanation of the Habitat Suitability Analysis**

The first step towards meeting the objectives for trumpeter swans in Montana laid out in the Trumpeter Swan Implementation Plan (TSIP) was determining whether or not there was sufficient habitat in the valley to support the feeding and nesting requirements of a reintroduced population. Without the presence of a critical minimum level of
habitat, the future of trumpeter swans in the Blackfoot Valley would be constrained to brief stopovers by lingering migrants of other flocks, and the goal of a new, sustainable Blackfoot Valley flock under the strategies of the TSIP would be unattainable.

To accomplish this TSIP task, USFWS personnel planned to conduct a Habitat Suitability Analysis (HSA) in the summer of 2004 to gather baseline data on wetlands in the Blackfoot Valley. The purpose of the HSA was to provide a scientific framework that would help answer the question posed in the TSIP of whether or not there was suitable habitat for a release to help augment the Tri-State population. If suitable habitat was identified, the information gathered by the HSA would direct the reintroduction effort in making the decision as to which wetlands would be the most conducive to trumpeter swan release.

There are over 30,000 acres of wetlands in the Blackfoot Valley according to the National Wetland Inventory (Figure 1). At the beginning of this project, Montana Partners for Fish & Wildlife (MPFW), a division of USFWS, identified over 400 distinct semi-permanent and permanent depressional wetlands in the core 300,000 acres of the Blackfoot Valley through the use of National Wetland Inventory (NWI) data (G Neudecker, personal communication). In some places in this core area of the Blackfoot Valley, the Ovando/Helmville Valley, the density of all wetland types, not merely semi-permanent or permanent, is as high as 100 depressional wetlands per square mile (G Neudecker, personal communication). This high wetland density, and presence of a large number of semi-permanent or permanent wetlands formed a key piece of the decision to begin looking at the core Ovando/Helmville Valley for possible reintroduction sites for the Blackfoot Valley trumpeter swan reintroduction project.

Once the Ovando/Helmville core area was chosen as the geographic focal point within the Blackfoot Valley for purposes of the trumpeter swan study, work began on devising a strategy for analyzing the wetlands present in the core area to see if there was suitable habitat to move forward. A subset of appropriate wetlands in the Ovando/Helmville core area was identified, and criteria were developed for identifying and ranking potential release and nesting sites.

Classification Structure Used by the United States Fish and Wildlife Service
Data from the NWI database provided some types of basic information for wetlands considered part of the HSA. The NWI data were prepared primarily by stereoscopic analysis of high altitude aerial photographs. Wetlands were identified on the photographs based on vegetation, visible hydrology, and geography in accordance with Classification of Wetlands and Deep Water Habitats of the United States (G Neudecker, personal communication).

For the HSA, USFWS used the classification structure developed by the NWI Mapping Convention to describe the state of the water regime for each particular wetland being studied. Each of the wetland areas identified in the Blackfoot Valley by the NWI data was classified as one of the following types of waterbody: permanent wetland, semi-permanent wetland, seasonal wetland, temporary wetland, saturated wetland, or riparian area. The riparian areas were included in the NWI data because trumpeter swans passing through the Blackfoot Valley in previous years had been seen using the rivers and surrounding riparian habitat, especially as winter took hold and the non-flowing sources of water iced over (G Neudecker, personal communication). The NWI classification structure defines each of the five wetland types as the following (Cowardin and others 1979):

- **Permanent** – *wetlands that hold water throughout every year, though classification often extends to bodies of water that only dry up in periods of extreme drought.*
- **Semi-permanent** – *wetlands that hold water throughout most years, but may dry up during extended droughts.*
- **Seasonal** – *wetlands that accumulate and hold water for extended periods during the growing season, but which do not hold water year-round. In addition, when not retaining water, the water table is usually near or at ground level.*
- **Temporary** – *wetlands where surface water is present for short periods during the growing season, but where the water table is usually well below ground level for most of the season.*
- **Saturated** – *wetlands where the substrate is saturated to the surface for extended periods during the growing season, but where surface water is seldom present.*

Important to the discussion of how each of the wetlands in the Blackfoot Valley were classified is a mention of the fact that at the time of the HSA, the state of Montana as a whole had been in the grips of persistent drought conditions since 1999 (NCDC 2005). Because the area had seen so little precipitation over the five years prior to the
HSA, local USFWS representatives in charge of administering the HSA in the Blackfoot Valley felt confident asserting that those wetlands classified as permanent in 2004 would likely be permanent for the foreseeable future, given that in drought conditions they still held water (G Neudecker, personal communication). It was suggested that in wetter years, or after a series of years of normal precipitation, many of the wetlands that were classified as semi-permanent might hold more water than they had over the recent decade, and could actually expand the amount of possible habitat for the trumpeter swans.

**Using the National Wetland Inventory Database to Identify Survey Sites**

As mentioned earlier, the initial analysis of the Blackfoot Valley using the NWI database showed over 30,000 acres of wetland across the valley. However, not all 30,000 acres would necessarily be useful to a trumpeter swan, especially one looking to nest. Many of the wetlands in the core 300,000 acres of the Blackfoot River Valley identified through the use of the NWI database did not fall under the classification of permanent or semi-permanent wetlands. A fair number were seasonal, temporary or saturated wetlands that would not hold water year-round, or even on a year-to-year basis. Since one of the overall goals of the trumpeter swan reintroduction project was to establish a long-term, self-sustaining population in the area, the idea of releasing birds in a wetland that might not support them the next year, not to mention simply later in the season, seemed counter-productive (G Neudecker, personal communication). Focusing on permanent and semi-permanent wetlands and wetland complexes would ensure that for the near future, USFWS would be dealing with wetlands that had a high likelihood of holding water, a critical factor in their ability to support trumpeter swans. Therefore, USFWS established palustrine emergent wetlands with semi-permanent or permanent water regimes as the minimum requirement for a wetland to be considered a potential site for trumpeter swans. Using this qualification, analysis of the NWI data identified over 400 eligible wetlands in the core Ovando/Helmville Valley.

This list of over 400 wetlands was further winnowed down to 71 permanent and semi-permanent wetland complexes to be surveyed under the HSA (Figure 2). USFWS biologists and staff personnel arrived at this list of 71 wetlands through a combination of
analysis of NWI data, and personal knowledge of the Blackfoot Valley (G Neudecker, personal communication). In addition to requiring potential release and nesting sites to be semi-permanent or permanent in nature, the decision was made to eliminate almost all wetlands less than 5 acres in size, as determined by the NWI database, owing to issues of open water space and potential for drying up. Most of the wetlands eliminated from the over-400-strong starting list were removed due to this factor. Wetlands that were eliminated from the list for reasons other than their size were taken off because of the known presence of disturbance factors and/or water fluctuations. The goal of this aspect of the winnowing was to take into account known disturbances that would render a wetland site an ill fit for trumpeter swans, and remove these sites from consideration before the survey began. For example, some of the wetland complexes identified through NWI data were removed from the final survey list of 71 wetlands because of known high recreational disturbances, such as the wetlands around Upsata Lake, Coopers Lake and Browns Lake (G Neudecker, personal communication). These sorts of edits to the list would not have been possible without the advantage provided by having local USFWS and MTFWP personnel who had a keen working knowledge of the valley as a whole. A few lakes in the Blackfoot Valley were also removed because of significant hunting pressures, while other wetlands were removed because their water levels were artificially controlled, and were subject to frequent draw-downs (G Neudecker, personal communication). At the end of their deliberations, USFWS biologists had a final list of 71 wetlands in the Ovando/Helmville Valley that they planned to field survey as part of this effort.

Field Methodology

Researchers Involved

The Montana Partners for Fish and Wildlife (MPFW), USFWS and the Montana Wetland Legacy (MWL) reached out to the University of Montana’s Watershed Health Clinic to staff the fieldwork necessary to complete the HSA. Three graduate students in Environmental Studies from the UM Watershed Health Clinic were hired to carry out the HSA fieldwork: Brian Ferrasci-O’Malley (author), Matthew Frank and Erica Curry. These students worked as partners to complete the survey of the 71 wetlands between
August and October of 2004. The students had two contacts in USFWS at their disposal to aid in completing the fieldwork: Greg Neudecker, Assistant State Coordinator of the MPFW, out of the Benton Lake National Wildlife Refuge in Great Falls, MT, and Kevin Ertl, Manager of the USFWS H2-O Ranch in Helmville, MT. Mr. Neudecker and Mr. Ertl were instrumental in introducing the graduate student researchers to the Blackfoot Valley, and assisting with the focus and direction of the study. In addition, their knowledge of the valley and its residents proved invaluable in areas such as obtaining access to the myriad private lands on which many of the wetland complexes were located, providing maps and trail directions, and serving as mentors during the process.

Wetland Sites Baseline Data Gathered

A data collection sheet was developed in collaboration with local USFWS personnel to reflect all of the pertinent data that needed to be collected on each of the wetland sites to provide the baseline information necessary to continue with site selection (Figure 3). These data were categorized as falling into one of the following subjects: physical characteristics of the wetland and surrounding lands, human-impacted characteristics of the wetland and surrounding lands, and map data.

When looking at a wetland site as a possible release site and future nesting habitat site for the trumpeter swans, it was important to consider a broad spectrum of variables that contribute to the overall physical makeup of the wetland and the land surrounding it. Each of the physical characteristics considered in the HSA is related to the biology or social behavior of the trumpeter swan in one way or another. These indicators were adopted from characteristics used for determining potential suitability for nesting from the work done on trumpeter swans by Carl D. Mitchell at the Grays Lake NWR in Wayan, ID (Mitchell 1994). The HSA looked at 22 different criteria at each wetland site, but 10 main criteria emerged as the most important tools in determining whether or not a wetland would be classified as a possible nesting site for trumpeter swans (Table 1). The following 10 main criteria were used for determining nesting site suitability: average yearly ice-off date, percentage and length of open water, presence of irregular shorelines, average pH, presence of emergent vegetation or muskrat/beaver houses suitable for nesting and loafing, percentage of open water with suitable submerged aquatic vegetation
(SAV), mean water depth, water regime, level of human disturbance, and presence of fence and/or power lines. All 22 criteria are discussed in the Habitat Suitability Analysis, which is included as Appendix A to this report. At this time, I will explore the 10 criteria used for determining nesting site suitability.

First, the HSA considered three physical characteristics of the wetlands in the study: ice-off date, length of open water and irregularity of the shoreline. Mitchell (1994) suggests that wetlands should be ice-free by mid-April at the latest to ensure that the wetland will be available to return migrants. Since the HSA was conducted entirely over the summer, it was impossible to test when the ice-off date was for each of the wetlands. Instead, the assumption that most of the 71 HSA wetlands, indeed most all the wetlands in the Blackfoot Valley, conform to the requirement of being ice-free by mid-April came from the personal knowledge of local USFWS personnel (G Neudecker and K Ertl, personal communication). In addition to ice-off date, each of the HSA wetlands was assessed to determine whether or not there was at least 100 meters of open water present at the site. Mitchell (1994) had determined it was important that wetlands have at least 100m of open water for swan take-off, landing and flight. Finally, though it did not show up as a listed factor on the HSA data sheet, the presence or absence of irregularities in the shoreline was noted under the “Comments” section on each survey, and was also incorporated into the site maps. This was done because Mitchell (1994) suggests that wetlands with highly irregular shorelines are preferred for swan habitat, as they allow for more cover and nesting/loafing sites.

In addition to the wetland characteristics already described, the average pH of the water at each wetland site was measured. Mitchell (1994) suggests that water should not be acidic, stagnant or highly eutrophic for a wetland to be suitable for trumpeter swans. The pH of the water in the 71 wetland sites was measured as ranging from 7.0 to 10.6.

Wetlands were also scrutinized for potential nest sites, with the ideal being a wetland with multiple potential nest sites where at least one was away from the shoreline (Mitchell 1994). The HSA looked specifically at the number of islands, as well as beaver or muskrat houses at each site in order to gain a measure of the number of potential nesting sites at each wetland. Additionally, emergent vegetation was characterized as one
of three types: cattails, sedges or rushes, and broken down by percentage of potentially available nesting material.

Perhaps the most important information gathered as part of the HSA was assessment of the submerged vegetation present at each wetland. Mitchell (1994) showed that the preferred forage food species of trumpeter swans were Chara spp., Potamogeton spp., Elodea spp., Hippuris spp., Myriophyllum spp., Polygonum spp., Ranunculus spp., Utricularia spp., and Zannichellia spp. Additionally, Nuphar spp. are not used for food, although swans have been shown to use it for cover from predators. Though it did occasionally appear as one of many submerged plant species present in a wetland, most often when Nuphar spp. was encountered, it had effectively pushed out all other submerged vegetation. Special note was taken when these situations were encountered, and sites composed mainly of Nuphar spp. were effectively disqualified from consideration as nesting or release sites owing to their lack of preferred food stock. HSA study personnel ran transects at each study wetland to determine the identity of present submerged species. In addition to determining the makeup of the different species of food plants, an informal percentage of suitable submerged macrophytes was calculated for the overall basin. Multiplying the wetland size by the noted percentage of suitable submerged macrophytes gave USFWS a rough approximation of the total acres of available food for each wetland.

Water depth was another extremely important variable to consider when analyzing the data collected from the 71 potential sites. Average depth measurements were taken at each site to determine if the site was comprised of depths suitable for trumpeter swan foraging and production of the submerged aquatic vegetation (SAV) that they feed on. Mitchell (1994) found that mean water depth for wetlands under consideration should be less than 1.2 meters, as the swans’ feeding depth is limited to around 1m and most foraging occurs at sites < 0.75m deep. This limiting factor took most large lakes in the Blackfoot Valley out of consideration as release sites unless they were part of a larger wetland complex that met these conditions. The nature of both the trumpeter swans and the SAV they feed on is that water depth is a biologically limiting factor. If the water is too deep, most of the preferred SAV species can’t grow. More
importantly, the necks of the trumpeter swans are only so long, and restrict underwater feeding to certain depths.

The HSA also looked at the water regime of the different wetlands. Mitchell (1994) found that water levels should be stable, or at least have predictable changes, such as slow drawdown due to evapotranspiration or human management actions. Rapid changes to water levels were considered unacceptable under these tenants. Sites were classified as either “closed-basin” or “flow-through” in the HSA to help determine effects on water levels, and it was noted if there were water control structures at any of the sites that could be used for water management. The local knowledge of both Mr. Neudecker and Mr. Ertl played a large role in the extensive reach of this element of the data collection, as they were aware of many water control structures that were not identified on maps but were still in use.

The legal status of a particular wetland site and its surrounding land was of particular interest to the architects of this trumpeter swan reintroduction, as it was related to the level of human disturbance at each site. Data were collected on who owned the land, whether or not there were any easements or restrictions placed on the land, and the legal description of the land in terms of township and range. The 71 sites considered in the HSA had the following breakdown of ownership:

- 6 sites owned by Montana Fish, Wildlife & Parks,
- 2 sites owned by a private timber company
- 6 sites privately owned with no easement protection
- 2 sites with joint ownership between private landowners and public entities (BLM & MTFWP)
- 3 sites privately owned with conservation easements administered by Montana Land Reliance,
- 6 sites privately owned with conservation easements administered by The Nature Conservancy
- 26 sites privately owned with conservation easements administered by USFWS
- 4 sites on Montana State Trust lands with no easement protection
- 1 site on Montana State Trust land with a conservation easement administered by USFWS
- 2 sites owned by The Nature Conservancy with conservation easements administered by USFWS
- 4 sites owned by the University of Montana with conservation easements administered by USFWS
- 7 sites owned by USFWS with no easement protection
These numbers help to illustrate the wide variety of legal statuses held by the wetlands considered for trumpeter swan reintroduction through the HSA. This type of checkerboard ownership is characteristic of the Blackfoot Valley as a whole. There simply are not swaths of land held by a single owner large enough to accommodate the needs of a species with the range of a trumpeter swan. Even if the reintroduction occurred on public lands, it was a virtual assurance that the birds would also use private lands. Of the 71 wetlands, more than half (45 in total) occur on private lands, while the remainder exist on some form of public land. This fact reinforces the idea that partnership between the public and private sectors is essential to the success of this and other reintroduction efforts.

To help finalize the determination of suitability for nesting, the HSA looked at human-caused disturbance levels at each of the wetlands in the form of the presence of power lines, fence lines, boats, nearby roads, nearby houses or the presence of hunting in the area. Mitchell (1994) found that disturbance should be minimal for optimal swan habitat, or at the least, predictable, and should occur no closer than 100m from the nest site. Hence, the HSA collected data for the four main types of disturbance: boats, roads within 100m, houses within ¼ mile and hunting on or around each wetland. However, the two most pervasive of the disturbance-related threats are power lines and fence lines, which Mitchell (1994) noted should not cross the wetland or be present as an adjacent flight obstruction. This requirement was considered extremely important by USFWS personnel, as it was a power line strike that killed the Bouma swan that nested in the Blackfoot Valley in 2003. The HSA documented the presence of fences and/or power lines nearby, entering, crossing, or submerged underneath each of the wetlands, to help gauge just how much of a potential problem fence lines and power lines would be at each site. In total, it was important to have an understanding of the level of disturbance that would be present at each wetland site, as too much disturbance would likely push the swans off of the wetland and potentially out of the valley.

Using these 10 criteria, USFWS biologists determined that 27 sites (Figure 4) conformed to the habitat requirements for nesting laid out by the work of Mitchell and the specific characteristics of the Blackfoot Valley, and could be considered as
potentially suitable nesting sites (G Neudecker, personal communication). These 27 sites were further analyzed to determine their suitability as potential release sites for the reintroduction process. The following seven criteria were used to determine suitability as a potential release site: wetland size, percentage of open water, quantity of preferred forage macrophytes, presence of multiple nesting/loafing sites, proximity to fence and power lines, level of human disturbance and social considerations.

The working knowledge of the Blackfoot Valley held by Mr. Neudecker and Mr. Ertl, with assistance from USFWS biologists, was key to the development of the seven criteria used to identify potential release sites. It was determined first that in order for wetlands to be considered as potential release sites, they needed to be at least 10 acres in size. An exception to this rule was made for one site, Site #29 at 9.46 acres, since it was the wetland the Bouma birds had used. Additionally, potential release wetlands needed to have a high percentage of open water, and a large quantity of preferred forage macrophytes. Wetlands with multiple loafing and nesting sites were preferred, as were those that did not have fence or power line issues in or surrounding the wetland. In a few cases, sites with fence and/or power line issues were selected as potential release sites because USFWS was confident in their ability to mitigate these issues pre-release. This work is explained in greater detail in Chapter 1 of this report. It was also preferred that there be no public roads near potential release wetlands, and that hunting disturbances be little to none. Finally, social considerations were taken into account.

Social consideration of selecting a site as a potential release site was a key component of the decision-making process undertaken by USFWS. Taking into account the social and/or community-related ramifications of releasing birds at a given location is critical to the long-term success of the program. As discussed earlier, the importance of partnership and collaboration amongst members of the Blackfoot Valley community has resulted in much good work in the valley. Not surprisingly, the situation is never idyllic, and though a majority of individuals and organizations in the valley subscribe to the goals of collaboration espoused by groups like the Blackfoot Challenge, not everyone comes to the table. As a strong partner committed to working together with the various landowners, agencies and individuals in the Blackfoot Valley, USFWS and its local representatives had to be aware of how this particular project fit in the valley. Being
aware of community dynamics, and making sure the trumpeter swan reintroduction was a unifying event, rather than a dividing one, was critical if USFWS was to achieve any programmatic success.

Using these seven criteria, USFWS biologists determined that nine sites (Figure 5) conformed to the requirements for release as defined above. These nine sites were then ranked in order of their greatest potential as release sites. This was the last piece of the HSA, and concluded the work of the survey team. All of the data gathered under the HSA can be found in Appendix A of this report. When considered as a body of work, it provides a baseline of the wetland makeup of this part of the Blackfoot Valley in 2004, in addition to illustrating the differences between those sites considered best suited for supporting trumpeter swans, and those not as well suited.

**Reflection on Lessons Learned**

Taking a step back from the HSA and looking at ways it could have been improved, as well as its applicability to other reintroduction efforts, it is important to remember that the initial impetus behind this study was to determine feasibility of a management action. This was not designed as a purely scientific study. To that end, it has a limited transferability in the research world, as much of the HSA was tailored to fit the specific situation in the Blackfoot Valley. However, from a management perspective, much can be learned from this endeavor. USFWS had to answer the question of whether reintroduction would be possible, and the HSA was the tool they used to answer the habitat component of that question. Building a survey that was comprehensive enough to ask that question, and took into account the best available science, was essential to the eventual success of the survey.

As we were conducting the survey, and during analysis of the data after completion of all 71 site surveys, some ways to improve the HSA did surface. For one, the researchers felt it would have been helpful to have aerial photos of each site prior to the on-the-ground surveying, instead of after the fact when the report was being put together. In some cases, this would have allowed for a better choice of transect given greater perspective on the size and shape of the wetland as it currently existed, rather than as it previously was recorded on our maps. Related to that, it bears considering whether
completing multiple transects at each wetland when surveying for submerged aquatic vegetation would have been helpful. Again, remembering that the HSA was designed to answer a management question rather than a more rigorous scientific hypothesis, USFWS felt that one transect sufficed. Finally, as is the case for many surveys, it would have been helpful to have more time, possibly to extend the HSA over two field seasons to record any changes, as well as to ground-truth the ice-off date data.

All things considered, the Habitat Suitability Analysis achieved its initial purpose: to gather data that would help USFWS determine if there were potential nesting and release sites for trumpeter swans in the core Blackfoot Valley, and if so, where they were located. The data gathered under the HSA showed that indeed, there are suitable wetlands for trumpeter swans in the Blackfoot Valley, and helped USFWS winnow the NWI list of over 400 wetlands in the core 30,000 acres down to 27 potential nesting sites, and nine potential release sites. Given this knowledge, USFWS biologists and personnel could move forward with plans for a reintroduction project. Identifying which wetlands had the greatest potential as release sites allowed USFWS personnel to go out and begin discussions with landowners about the possibility of using their land in the reintroduction process. Identifying which wetlands had the greatest potential as nesting sites allowed USFWS biologists and personnel to go out and determine how best to mitigate threats that reintroduced birds might encounter. A more detailed discussion of this aspect of Year 1 of the trumpeter swan reintroduction that followed this survey can be found in Chapter I of this report.
Works Cited


53


(G. Neudecker, personal communication) Greg Neudecker, Assistant State Coordinator of the Montana Partners for Fish and Wildlife. Great Falls, MT.


(R. Shea, personal communication) Ruth Shea, Trumpeter Swan Society Director-At-Large. Vale, OR.


Tables & Figures

Table I: Criteria Used in the Site Winnowing Process

<table>
<thead>
<tr>
<th>Criteria</th>
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<tr>
<td>National Wetland Inventory (NWI) Data identified over 400 depressional semi-permanent and permanent wetlands in the core 300,000 acres of the Blackfoot River Valley</td>
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<tr>
<td>US Fish &amp; Wildlife Service biologists narrowed this list to 71 sites for survey using the following criteria:</td>
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<tr>
<td>- Wetland size &gt; 5 acres</td>
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<td>- Personal knowledge (which included):</td>
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<td>- Significant known human disturbance</td>
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<tr>
<td>- Significant known water fluctuations</td>
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<td>Those 71 sites were surveyed through the Habitat Suitability Analysis (HSA), and based on data from the HSA, USFWS biologists identified 27 wetlands that could serve as possible nesting sites, using the following criteria:</td>
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<tr>
<td>- Ice-free by mid-April</td>
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<td>- At least 100m of open water</td>
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<td>- Have irregular shorelines</td>
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<tr>
<td>- Are non-acidic</td>
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<td>- Presence of a possible nesting/loafing area</td>
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<tr>
<td>- Have preferred forage macrophytes</td>
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<td>- Mean water depth of &lt; ~3ft</td>
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<tr>
<td>- Stable water level or predictable, controlled water level</td>
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<tr>
<td>- Low human disturbance</td>
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<tr>
<td>- Not crossed by fence or power lines</td>
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<tr>
<td>Those 27 sites were then analyzed further by USFWS biologists to determine their suitability as release sites. 9 of the 27 nesting sites were found to be suitable release sites using the following criteria:</td>
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<tr>
<td>- Wetland size &gt; 10 acres</td>
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<td>- High % of open water</td>
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<tr>
<td>- Large quantity of preferred forage macrophytes</td>
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<tr>
<td>- Multiple nesting/loafing sites present</td>
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<tr>
<td>- Few nearby fence and/or power line issues</td>
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<tr>
<td>- Minimal human disturbance</td>
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<tr>
<td>- Social considerations</td>
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Figure 1: Blackfoot Valley Overview Map
Figure 2: Map of Habitat Suitability Analysis Study Sites
Figure 3: Sample Habitat Suitability Analysis Data Sheet

Sample Data Collection Sheet
1 Ownership:
2 Legal Descrip.: 
3 Date of Survey:
4 Surveyed By:
5 Protection Level:
6 Photograph #:
7 Wetland Type:
8 Wetland Size:
9 Water Depth:
10% & length of Open Water:
11 pH:
12 Emergence sufficient for nest:
13 Islands or Muskrat/Beaver houses:
14 % of open water with suitable submergence:
   (by species %)

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<td>S4</td>
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Quadrant 1 | Quadrant 2 | Quadrant 3 | Quadrant 4
15 Powerlines:
16 Fence lines:
17 Boats:
18 Roads:
19 Houses:
20 Water Regime (closed basin or flow-through)
21 Hunting Disturbance:
22 Ice-off Date:
   Comments:
Figure 4: Map of Potential Nesting Sites identified by Habitat Suitability Analysis
Figure 5: Map of Potential Release Sites identified by Habitat Suitability Analysis
Potential Release Sites

Wetland Types:
- Permanent
- Semi-permanent
- Seasonal
- Temporary
- Plum Creek
- Saturated
- Public Land
- Easement

Rock Creek
Blackfoot River
Dick Creek
Warren Creek
Ward Creek
Monture Creek
North Fork Blackfoot River

Potential Release Sites