

**REVIEW OF UNUSUAL MORTALITY
OF 17 JUVENILE WHOOPING CRANES
ON FEBRUARY 1 & 2, 2007**



Whooping Crane Eastern Partnership
<http://www.bringbackthecranes.org>
June 2007

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Unusually severe storms that swept through northwest and central Florida on February 1, 2007, intensified after midnight and into the early morning hours of February 2. They left behind a trail of death and destruction that included severe property damage and the loss of 20 human lives. In addition, 17 of 18 reintroduced endangered whooping cranes were killed at a remote pen site on the Chassahowitzka National Wildlife Refuge in Citrus County as a result of the storms. These birds represented most of the ultralight-led "Class of 2006," part of a historic effort to reintroduce a migratory flock of whooping cranes to eastern North America. Until these storms, the project has seen great success and low mortality rates over the past six years.

The loss of almost an entire year's cohort of birds was a significant setback for the project, and a blow to the substantial investment of personnel and funding that it took to raise, train and lead them on their first migration. As a result, the Whooping Crane Eastern Partnership (WCEP) has undertaken an intensive review of the mortality event with the goal of identifying and taking actions designed to minimize the damage done by such catastrophic storms in the future.

The WCEP Project Direction Team and field team leaders convened a number of conference calls during February through May to assemble the facts and data surrounding the mortalities and analyze the information to determine what might be done to minimize the losses from such an event in the future. In any project of this magnitude there is some risk involved, but by applying risk management principles, we can attempt to reduce the threat to the extent possible. Our staff, supporters and donors expect nothing less.

--The Whooping Crane Eastern Partnership Project Direction Team and Team Leaders

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FACTS AND DISCUSSION

1. Weather

The rain and thunderstorms forecast for February 1 and 2 were not predicted to be severe. Local weather radio and TV channels monitored by WCEP project personnel were not forecasting unusual weather during the day. NOAA's National Weather Service issued a storm alert which was updated during the day, with progressively worsening conditions forecast. Relying on local weather information and actual field conditions, project personnel were not directly monitoring the NOAA alerts. Weather conditions at the Chassahowitzka pen site during the afternoon check were overcast with scattered light rain showers, giving the staff no cause for alarm. As the evening progressed, NOAA storm alerts indicated conditions developing for severe storms. Around midnight there was heavy rain in the local area and strong winds. Through the media, local project personnel first became aware of tornado warnings in the area sometime after midnight. Project staff reported that the lightning seemed unusually intense at that time.

Lightning strike reports obtained from the U.S. National Lightning Detection Network (NLDN), which represent the most probable locations of strikes with a typical error of 1,600 feet, showed that between 5:30 p.m. and 6:30 p.m. on February 1, there were 18 lightning strikes within about a five-mile radius of the pen site. Later, during the period from 2 a.m. to 3:30 a.m. on February 2, there were 166 lightning strikes within a five-mile radius of the pen site. Overall there were a total of 210 lightning strikes within a five-mile radius during the night. At 3:16 a.m., the NLDN recorded a lightning strike on the pen coordinates.

WCEP also obtained tidal data from gauging stations in the local area. The tidal rise corresponded to a full moon and was enhanced by a southwest wind. Based on tidal gauges and evidence in the form of vegetation deposited on fencing at the high water mark, WCEP estimates that the maximum water depth was between 2.5 and 3 feet. The effect of the water was probably not in the form of large waves, but more likely a steady rise to a peak during the storm event followed by subsidence of the water level. Data indicated that this water rise occurred over a four-hour period beginning at 11 p.m. and peaked at 2.5 to 3 feet at approximately 3 a.m., coinciding with the time frame of the direct lightning strike on the pen site.

Wind speeds were not available for the pen site during the storm. However, despite tornados that swept through central Florida, there was no evidence of tornado activity at the pen site or in the offshore area. The pen itself was fully intact, with no apparent wind damage, and the blind located 100 yards away was also intact and undamaged.

Discussion – Weather

The coincidence of a rising tide, wind-driven water, full moon and extreme lightning in the area created the conditions for the 'perfect storm' in terms of threat to the birds in the pen. WCEP believes the documented lightning strikes on and near the pen, coupled with high tide conditions, were obvious factors in the mortality event.

Storms of this magnitude and intensity are relatively rare in Florida during the winter. The media reported that this was the second worst storm of its kind in Florida history. A review of weather records indicated few events of this type in Florida and some correlation with 'El Nino' weather patterns of 2006.

While this was an unusual storm event, the probability of a similar future event such as a tornado, lightning strike, destructive wind or flood cannot be discounted.

Typically, WCEP's reintroduced whooping cranes are held in enclosed pen conditions for six to eight months during the first year of their lives, and they have been exposed to numerous storm events, a few of them extreme. Patuxent Wildlife Research Center experienced a major snow storm in 2006 that collapsed some top-netted pens, but no birds were harmed. Repairs have strengthened the ability of the pens to handle snow loads that had not been experienced in the past. Other than this one instance, captive facilities reported no other prior weather related problems of a significant nature and no documented lightning strikes on pen sites.

The ultralight-led migration team encountered a severe storm event in October 2001, during the first whooping crane migration. High winds during the peak of this storm overturned the temporary holding pen, releasing the birds during the night. The proximity of the migration crew to the pen allowed them to recover the majority of the birds safely, but one bird was killed when it escaped its pen and struck a power line. As a result, the migration team modified the travel pen to fortify it against high winds. There have since been no other severe storms resulting in damage or loss on migration.

Until February, no significant weather related problems had occurred at the wintering site. The pen and birds have weathered storm systems throughout the years, and WCEP project staff did not consider storms to be a significant risk to wintering juvenile whooping cranes. The project staff member on duty checked the birds at the pen site at approximately 4 p.m. on February 1, when there was no indication of approaching severe weather. Tides were high but not sufficiently so to be of concern to the staff at the site. Only later in the night did the storm intensify, but based on past experience staff still did not feel the birds were at risk. Regardless, it would have been far too dangerous for project staff to travel to the pen site in an airboat with high winds and electrical activity.

Investigation of potential effects of lightning indicated that current generated could run through the pen and induce voltages across the water and substrate strong enough to stun or kill the juvenile cranes. However, a direct lightning strike on the pen site was estimated to be an unusual event with a probability of occurrence of about once in one hundred years. A pen designed as a Faraday cage, a metal enclosure that reduces or eliminates the voltages across the ground, could provide protection from lightning. Lightning rods would appear to have limited usefulness in an environment subject to flooding. In addition, they would create a collision hazard for cranes flying at the pen site. WCEP will continue its discussions with lightning experts to determine whether we can deploy viable strategies to control effects of lightning at any of our temporary pen sites during the summer, on migration, or at the wintering site.

2. Necropsy Results

Four of the 17 bird carcasses were selected for necropsy. Two birds were examined by veterinarians at the Laboratory of Wildlife Disease Research, University of Florida, and two by veterinarians from Disney's Animal Kingdom and Disney's Animal Programs facility. The reports on cause of death were similar from both facilities and included drowning from the aspiration of water into the lungs, and presumptive electrical shock from a lightning strike.

Discussion – Necropsy Results

The actions by the veterinarians to conduct the necropsies and provide reports were professional and timely. While the exact sequence of events will never be known, it appears that the birds were struggling in rising water when they were stunned by a lightning strike of sufficient strength to cause them to collapse and drown. The necropsy results, coupled with weather data, strongly support this hypothesis. It appears the time of death was sometime after midnight, most likely following the lightning strike at or close to the pen at 3:16 a.m.

The fact that the birds were close together inside the top-netted pen was no doubt a factor that led to the mass mortality. Had the birds been released from the pen, it is possible that some would have fled the rising flood waters pushed by the advancing storm and the number of dead birds could have been reduced. The departure and survival of the one bird that escaped the top-netted pen and the two adult cranes that were known to be in the area and survived support this hypothesis. [Note: Crane 15-06, the sole survivor of the storm, was found dead on April 30 at the Halpata-Tastanaki Preserve in Marion County. The exact cause of death is not yet known but is unrelated to the storms of February 1 and 2.]

The birds were kept in the top-netted pen for their safety, to protect them from older cranes that had returned to the pen site and might drive the juveniles out of the protected area into habitat occupied by bobcats and other predators. However, WCEP recognizes that by having all the birds in the enclosed pen, a tornado or lightning strike could more easily result in a mass mortality. The risk from a tornado or lightning strike was considered to be insignificant, but not zero.

3. Winter Bird Management Protocols and Responsibilities

Winter management of the juveniles at the Chassahowitzka NWR pen site is the responsibility of the WCEP Tracking and Winter Management Team as reflected in WCEP protocols. WCEP uses a “soft release” approach, introducing the birds to the wild slowly, in a controlled manner designed to increase their chance of independent survival. In 2005, to address the problem of harassment of the juveniles by returning older whooping cranes, WCEP developed a protocol to further protect naïve whooping cranes during their first winter.

The objectives of the protocol include: 1) preventing bobcat predation; 2) minimizing harassment of juveniles by older wintering whooping cranes; and 3) ensuring that juveniles are behaviorally normal and functional in the wild before their first unassisted spring migration. WCEP project staff built a top-netted pen adjacent to the release pen to enclose the juveniles and protect them from the older birds. Beginning in the winter of 2004-2005, the birds were released from the pen for exercise and to explore their natural surroundings. In the evening, if the older birds were still present, the juveniles were returned to the pen with food and water for their safety.

Usually one or two WCEP staff members make two trips per day by airboat to check on and feed the cranes when they are in the open-topped pen, which is protected by an electric fence. At the evening roost check, staff usually remains until all the birds are safe inside the open-top pen for their nightly roosting period.

When older, more territorial whooping cranes return to the pen they are known to harass the juveniles, sometimes driving the younger birds out of the pen, exposing them to bobcats and other predators. In an effort to minimize this, a “short stop” protocol was instituted in 2005. This protocol calls for holding the juveniles upon completion of the ultralight-led migration at an inland location until the older birds have completed their migration and moved from the Chassahowitzka pen site to their final winter territories. WCEP project staff chose the Halpata-Tastanaki Preserve, Southwest Florida Water Management District in Marion County, as the stopover area, and staff and volunteers built a pen there.

Once the juveniles are moved from the Halpata site to the offshore Chassahowitzka NWR pen site, approximately a month to six weeks after the ultralight-led migration concludes, the protocol calls for them to be held in a top-netted pen when they are threatened by older birds that may frequent the site during the winter. These methods were used successfully and without incident during the winters of 2004-2005 and 2005-2006. During those two winters, the chicks spent a number of days in the top-netted pen, protected from adult cranes. The time in the top-netted pen did not seem to affect the birds' behavior adversely. All juveniles appeared to demonstrate appropriate, normal behavior during subsequent migration and summering in Wisconsin.

The winter site protocol developed in 2005 also suggests exploring alternate sites to Chassahowitzka NWR as a possible strategy, but only if such a site would be compatible with current winter management goals.

Discussion – Winter Management Protocols and Responsibilities

Overall, the winter management protocols for juvenile cranes have worked well. By intensively protecting the juveniles during the first winter at the protected pen site, WCEP has seen acceptable survival and behavior of returning cranes.

Modifications to the original facility and procedure have been made over the past five years to accommodate circumstances as they arose. The principal modification has been to build a smaller, top-netted pen adjacent to the large open pen to exclude adult whooper's from past release years. Adult whoopers can harass the juveniles, preventing them from accessing the food hoppers and often chasing them out of the pen, thus exposing the young birds to the risk of predation. The top-netted pen achieves the goal of excluding adults, but with the cost of preventing the birds of the year from coming and going at will. Hence the top-netted pen is used only when needed.

The current protocol, however, does not directly address protecting juvenile cranes from extreme and unpredictable storm events such as tornados or lightning strikes. The primary reason for this was that

such weather events were considered to be such a low probability that no special precautions or protocols were considered.

In addition, over the past six years the birds—both in the pen and in the wild--had been subjected to rain and thunderstorms without consequence as part of the normal cyclical patterns of weather. From a risk management perspective, the likelihood of a tornado or lightning strike was not considered a significant threat, though WCEP project staff realized that the probability of such an event was not zero. Additionally, it is difficult to predict the effects of such severe weather events, as was demonstrated by the unforeseen loss of human life in this storm event

But the unthinkable did happen, and it is appropriate to re-evaluate our protocols, procedures, and facilities to see what could be added or changed to help reduce the risk of a future catastrophic loss as was experienced in February.

4. On-site Actions – February 1-2, 2007

The majority of WCEP staff was attending the Whooping Crane Recovery Team meetings held the week of January 29 in Lafayette, La. A winter management team member remained in Florida to care for the birds at the pen site. Two older birds had returned to the pen that week and the project staff person was instructed to keep the juveniles in the top-netted pen to protect them from harassment. One other project staff person not attending the recovery team meetings was also present to assist as needed. In addition, Chassahowitzka refuge staff was available for airboat transportation or in case of problems or emergencies.

The WCEP team member on duty checked on the birds at the pen site on February 1 at approximately 4 p.m. Water levels were characteristic of a high tide condition and not of concern. All the chicks were healthy and feed was provided. Weather at the time was overcast skies with scattered light rain showers and light winds from the west. There was no indication at the site of impending extreme storm conditions approaching. After checking the pen, the rest of the evening was spent working with other WCEP staff members, capturing crane 5-01 at the Homosassa Springs State Wildlife Park and relocating him to an inland site. That task was completed at midnight.

Another WCEP winter management team member returned to Chassahowitzka NWR from the recovery team meeting around 5 p.m. and immediately was asked to assist in the capture and relocation of 5-01. That individual indicated that she monitored local radio stations on the drive to Homosassa Springs, and although there were reports of storm warnings for other areas of Florida, there was no mention of severe weather, wind or tornado warnings for Citrus County. Upon return from the inland site at 11:45 pm, heavy rains were beginning to fall but were not seen as cause for concern by project staff.

Since there seemed to be no reason for concern about the chicks in the pen, the priority on the morning of February 2 was to check on 5-01. There was some concern about how he would fare in an enclosed pen since 5-01 had been wild for five years. After checking on 5-01, WCEP staff went out to the Chassahowitzka NWR pen site around 2 p.m. and discovered the dead birds.

Staff initially believed all 18 birds had perished. However, when the Chassahowitzka NWR law enforcement officer, other refuge staff and WCEP staff went back to the pen site to assist in the recovery of the dead birds, they found only 17 carcasses. The 17 birds were individually bagged, and four were selected for necropsy. The rest were put in the freezer at the refuge. It was assumed that the 18th bird would be found buried in the mud when the site was searched the following morning.

The next morning the refuge manager, law enforcement officer, and WCEP staff went to the pen site. They could not find the carcass of the 18th bird. WCEP staff using a radio receiver got a signal from the 18th bird, crane 15-06, indicating it was outside of the pen. On Sunday, February 4, WCEP staff confirmed that 15-06 had indeed escaped.

Discussion – On-site actions

WCEP project staff on site followed existing winter management protocols on February 1. The juveniles were kept in the top-netted pen due to the presence of two older whooping cranes. The afternoon pen check was conducted without incident or indication that severe storms were on the way based on observed conditions and local weather reports. The return of additional project staff from the recovery team meetings was complicated by the need to capture and relocate crane 5-01 in the early evening. However, this did not compromise the care of the juveniles at the pen since the routine evening pen check had already been performed following existing protocols.

The actions of project staff on site were at all times in the best interest of the birds and consistent with existing guidance and protocols and prudence with regard to human safety. Staff response to the tragedy was professional, and every attempt was made to document the scene and obtain information to assist in this review.

5. Media and Public Outreach

On Friday, February 2, soon after the discovery of the mortalities, the co-chairs of the WCEP Communications and Outreach Team were informed of the presumed deaths of the 18 Class of 2006 cranes. The outreach team co-chairs and WCEP project leadership decided to direct all media inquiries to the WCEP project co-chair, who would serve as the spokesperson for the partnership in the aftermath of the incident.

An initial press release was issued on February 2 with a 350-word statement expressing WCEP's distress about the loss of the cranes and 20 human lives as a result of the storms. The statement was approved by available WCEP leadership and sent to the news media via e-mail at 10 p.m. Central time on February 2. Media calls had already begun coming in.

On February 3, after discovering only 17 bird carcasses in the pen, WCEP monitoring staff picked up the radio signal of Crane 15-06, apparently headed back toward the Chassahowitzka pen site. Media had picked up on this news by the early afternoon and WCEP co-chairs, Communications and Outreach Team members and other WCEP members were quickly inundated with phone calls and e-mails. An effort was made to continue directing all media calls to the designated WCEP co-chair but it was quickly realized that this was an untenable solution. Communications and Outreach Team leaders and others on the ground simply tried to share as much new information with other WCEP members as quickly as possible so that they could answer media and questions.

On February 4, once it was confirmed that crane 15-06 was indeed alive, outreach team leaders drafted a media advisory announcing that only 17 of 18 birds had been killed and that trackers were monitoring the location of one survivor, 15-06. This statement was approved by WCEP leadership and released to the media via e-mail at about 8 p.m. Central time that day. All statements were posted on the WCEP Web site and WCEP partner Web sites, as well.

Meanwhile, in Florida on February 4, news media began contacting project staff who had been at the pen site; other members of the monitoring crew; the refuge manager and other refuge staff; and various project partners, all of whom conducted a number of phone and on-camera interviews throughout the day and following week as media attention to this story remained high.

Operation Migration in Canada responded to more than 4,400 telephone and email messages throughout the period; other partners also responded to hundreds of public and media queries. By midweek more than 500 media articles had been published/aired on the incident, and media interest remained high for the next several weeks.

Discussion – Media and Public Outreach

The actions of the Communications and Outreach Team to get the facts out as quickly as possible and organize WCEP's response to the flood of media inquiries was as swift as the changing situation allowed. There was little negative speculation since key known information was being made available to as many sources as possible via e-mail.

An issue did arise regarding media access to the pen site. Both print and broadcast media outlets, but especially TV news crews, asked to be taken out to the pen site. Requests were turned down because of the potential for older cranes to return to the site and be impacted by the presence of news media; the sensitivity of revealing the exact location of the site; and the need to keep the site clear so project staff could continue to investigate. Media requests for access to the pen site were generally turned over to the Chassahowitzka NWR refuge manager since the pen site is on refuge land.

Internal communications to and among WCEP members during the aftermath of this crisis went as smoothly as possible but could be improved in the future. Information was becoming available and changing quickly, and it was a challenge for the WCEP project and communications leadership at times to stay on top of the situation and share information before it became outdated. Some WCEP members felt that information could have been shared more quickly at an internal level, so that those who were handling public and media queries were up-to-speed. The Communications and Outreach Team will be examining its own internal crisis communications plan in the coming months.

SUMMARY OF FINDINGS

The 17 juvenile whooping cranes died presumptively as a result of electric shock and drowning in the early morning hours of February 2 enclosed in their top-netted pen. One juvenile was able to escape the pen and survived the mass mortality.

The severe storms that swept through central Florida left a trail of death and disaster of major proportions. In addition to the loss of 17 whooping cranes there were 20 human lives lost and much property damage. The severity of the storm was unusual for this time of the year. It was reported to be the second worst storm of its kind in Florida history.

The WCEP project staff on site followed existing protocols on February 1 before the storm, monitoring local weather, which reported routine rain and thundershowers but did not indicate the potential for an extreme storm event until after midnight. NOAA weather bulletins issued in the late afternoon and evening did advise of the potential for worsening weather, but WCEP staff relied on local weather information.

The on-site project staff responded to the mass mortality professionally and thoroughly documented the scene and properly secured the dead birds. Necropsies were also performed professionally and in a timely manner.

ACTION PLAN TO REDUCE THE RISK OF CATASTROPHIC MASS MORTALITY

1. Introduction

The goal of this section is to use “lessons learned” from the events of February 1 and 2, 2007, to outline actions to minimize the risk to the reintroduced whooping cranes from extreme weather events. This was an act of nature, but WCEP must fully examine our procedures, protocols and facilities to see what we can do to reduce the risks of injury to birds or people associated with such storms.

Our project goals clearly put the safety of the reintroduced whooping cranes and our project staff as our highest priorities. However, under no circumstances will WCEP recommend or support any action that would jeopardize the lives of project personnel or compromise their safety.

The objective of WCEP’s winter management protocol is to release the ultralight-migrated whooping cranes to the wild by letting them gradually become accustomed to the habitats of Florida and become independent of human assistance. To do this, specific actions are taken:

- 1) Minimizing the potential for predation and disease by providing a large, open, predator-proof pen for night roosting that includes a food supply
- 2) Preventing exposure to unclothed humans
- 3) Minimizing harassment of juveniles by older wintering whooping cranes.
- 4) Ensuring that juveniles are behaviorally normal and functional in the wild before their first unassisted spring migration

Based on the events of February 1 and 2, WCEP will add a fifth objective:

- 5) Minimizing the risk of catastrophic loss of birds due to extreme weather events.

We can never completely eliminate the risk of storm-related bird deaths, but by modifying our existing protocols, we believe we can reduce the risk.

The primary factor in the catastrophic loss of so many birds at one time was their confinement in a top-netted pen from which they could not escape that was subjected to rising storm tides during a severe lightning event.

The secondary problem we address is broader in nature: how to increase protection from severe storm events for the birds in any pen at any location given that for six to eight months during rearing, training and migration, the birds are kept in top-netted pens at propagation facilities. By addressing the wintering site issue we can learn and apply appropriate protocols, procedures or pen modifications that can reduce the potential for catastrophic loss at other locations.

2. Risk Management Considerations

WCEP’s approach to developing more protective protocols has to take into account the various risks to the birds under differing conditions. Since all risk cannot be eliminated, it is important to approach the problem stated above from a risk management point of view. For example, there have been instances when birds have left the open pen which reduces the risk of a mass mortality during severe storms. At the same time, the risk of death by predation increases when birds leave the security of the predator-proof open pen, although this risk is mitigated when the surrounding land is flooded.

WCEP standard protocol allows birds to leave the open pen during the day to forage and explore their surroundings, but we make every effort to return them to the open, predator-proof pen each night to roost when predation pressures are the greatest.

The presence of older returning whoopers that may harass the juveniles and cause them to leave the open pen increases the risk of predation and is the primary reason for occasionally keeping the juveniles confined to the safety of a top-netted pen. During a severe storm such as the one of February 1, the risk of a mass mortality of birds confined in the top-netted pen increases; we also know that cranes that are unconfined elsewhere seem to survive storms quite well. Therefore, a primary strategy to minimize risk

from future severe storm events must focus on reducing or eliminating the time the birds are confined to the top-netted pen, particularly when severe storms are predicted.

3. Risk Reduction Strategies

WCEP examined two primary winter management strategies to reduce the risks outlined above:

Strategy #1: Modify procedures, protocols and facilities at the Chassahowitzka NWR pen site to reduce the risk of a mass mortality from a severe storm event.

Strategy #2: Consider moving some or all of the juvenile birds to another location in Florida to reduce the risk of a mass mortality from a severe storm event.

These two strategies and accompanying actions are explained in detail below.

Strategy #1: Modify procedures, protocols and facilities at the Chassahowitzka NWR pen site to reduce the risk of a mass mortality from a severe storm event.

The following list includes some actions that WCEP project staff already take as a matter of protocol, along with some new actions that will be implemented to further minimize risk to the juvenile whooping cranes or to improve facilities, operations or staff access at the current wintering site.

1. At the morning or evening check, release the birds into the large open-top pen (if they are not there already) if a severe thunderstorm or tornado watch has been forecast or unusually high water levels are expected or predicted. Monitor the NOAA Website for storm warning information as well as local weather reports prior to the morning and evening pen check. Buy and use “weather alert” radios.
2. Reduce the use of the top-netted pen by planning and implementing techniques to allow the chicks to remain in the open pen in the presence of older birds. Keep the juvenile birds in the open pen to the maximum extent possible and only hold them in the top-netted pen if management steps designed to allow the younger birds to co-exist with the older birds are not effective. When the birds are in the top-netted pen, remove food from the open pen to encourage older birds to leave the site. Let the chicks out of the top-netted pen periodically for exercise and to explore the marsh. These changes should result in the birds spending less time overall in the top-netted pen.
3. Consider extending or moving the top-netted pen to include higher ground, and/or build a dirt mound or temporary floating structure on which the birds can roost during high water events.
4. Before December 2007, install an automatic system to open the door of the top-netted pen in the case of rising flood waters, giving the birds’ access to the open pen during storm events.
5. The Tracking and Winter Management Team will develop a more formal training program and a notebook for any new team members on management protocols for bird care at the winter site. A check list will be posted in the blind as a reminder.
6. Continue to consult with lightning experts to determine actions to add protection against lightning at the pen site. This is an extremely difficult issue and no easy solutions have been found in initial discussions.

Strategy #2: Consider moving some or all of the juvenile birds to another location in Florida to reduce the risk of a mass mortality from a severe storm event.

Splitting the flock between two release sites would reduce the risk of losing an entire year class of birds in a single mass mortality event. However, risks of mortality at any new release site are unknown at this time and relocating may not reduce overall mortality of juveniles. Inland sites are generally expected to have a greater risk of predation, and the risk from lightning and storm damage may be equal to or greater than that at the Chassahowitzka NWR site. In the first six years of the project, mortality has averaged 3.3 birds per winter. This average includes the loss of 17 birds in February, 2007. This low mortality rate while releasing captive birds into the wild is unprecedented for whooping cranes.

This strategy will require a detailed evaluation of alternate sites. WCEP conducted a preliminary analysis of alternate sites in 2004 that, in part, led to the development of the pen at the Halpata site. However, the Halpata site is currently considered acceptable only as a temporary holding area because of the lack of consistent water in the wetlands. If water levels increase and remain through the winter, WCEP may consider using Halpata as an alternate location.

WCEP will identify and evaluate other sites as possible wintering locations. A senior WCEP project biologist did a preliminary evaluation of two potentially promising alternate sites at Lower Suwannee National Wildlife Refuge and St. Marks National Wildlife Refuge. Other WCEP partners have suggested that sites be considered in Tennessee, Georgia, South Carolina and Alabama.

There are three primary reasons to move at least some of the birds to a different site.

1. It is more difficult for project staff to safely access the existing Chassahowitzka NWR site during a weather emergency.
2. The Chassahowitzka NWR site is not optimal habitat; the older birds do not choose to remain in this location. (This also has had the beneficial effect of moving older birds away from the site, which has helped to minimize the problem with returning birds.)
3. The top-netted pen has to be used more frequently at Chassahowitzka as older birds returned, increasing a risk of mass mortality. At a new site, a top-netted pen may not be needed for the first year except on a limited basis since no or few older birds would be expected at this site. However, multiple sites may have to be used over time to deal with returning older birds after a few years.

Regardless of which wintering site is used in the future, WCEP will continue bobcat management activities as a tool to reduce predation risk for juveniles that leave the predator-proof open pen.

4. Implementing the Action Plan

The actions outlined in Strategy #1 will be implemented as soon as is practical after a decision is made by WCEP to remain at Chassahowitzka for the 2007-2008 season. WCEP will continue discussions with lightning experts regarding possible protection strategies that could apply to any location.

In addition, the WCEP Project Direction Team has established a new **Winter Management Strategy Committee** that will immediately begin considering alternative locations and winter release strategies consistent with WCEP's objective to release the juveniles into the wild gradually, allowing them to become acquainted with their habitat and becoming independent of human management assistance. The committee will give strong consideration to options that would split the juvenile cranes at different locations as a risk reduction strategy to prevent the death of all the birds as occurred on February 2.

The committee will evaluate alternate winter release sites and new strategies for winter bird management based on the following primary considerations:

1. Minimize the risk of catastrophic loss of birds due to extreme storm events
2. Reduce and optimize the use of a top-netted pen
3. Minimize the risk of predation or disease
5. Minimize the risk of harassment of juveniles by older whooping cranes
6. Prevent the exposure to unclothed humans and tame, nonmigratory sandhill cranes
7. Provide adequate site access for project staff under all conditions as necessary for the welfare of the birds
8. Ensure the site will support normal behaviors and survival in the wild
9. Ensure the site has appropriate habitat for roosting in water during all/most environmental conditions

The modified Chassahowitzka NWR pen site and management strategy described in Strategy #1 will serve as the benchmark for evaluating any new sites or management strategies

This committee will provide a report of findings by July 31, 2007 so that the Project Direction Team can make a final decision regarding site modifications either at the Chassahowitzka NWR pen site or alternate locations.

If the investigation of alternate sites does not identify a suitable site that would reduce the risks while supporting reintroduction protocols, the wintering site will remain at Chassahowitzka NWR for the 2007-2008 season with the risk reduction protocols implemented as outlined above under Strategy 1.

CONCLUSION

There is no easy answer to this situation. While this disaster was clearly the result of a random act of nature, it is incumbent on WCEP to explore and take actions likely to reduce the risk of future catastrophic loss due to extreme storm events such as those that occurred in Florida on February 1 and 2, 2007.

Reintroducing a migratory flock of whooping cranes has required creativity, vision, imagination and risk taking. While there will always be some risks, WCEP must apply its assets to reducing them as much as possible while maintaining the momentum toward our goal of a self-sustaining population.

The detailed list of actions at the Chassahowitzka NWR site will be implemented as soon as a decision is made by the Project Direction Team. However, WCEP staff will immediately begin developing plans to carry out these actions. We will also work over the spring and summer to determine the viability of an alternative site(s) that would allow us to match the benefits of the Chassahowitzka NWR site while reducing the risk from severe storms, predators and other hazards.

In addition, since the risk of severe storm damage is present at all stages of the project including the propagation facilities, the training site in Wisconsin and on migration, WCEP partners will evaluate possible modifications for other project locations based on our findings and future actions.

While our goal is to reduce risk to the maximum extent feasible, there will always be a risk of storm related death or injury despite our best efforts. There can be no perfect solution when it comes to an unpredictable act of nature.