



2006

Whooping Crane
Eastern Partnership
Annual Report



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**ANNUAL
REPORT**



2006



FOUNDING PARTNERS



U.S.G.S. Patuxent Wildlife Research Center



United States Fish & Wildlife Service



Operation Migration USA & Canada Inc.



International Crane Foundation



U.S.G.S. National Wildlife Health Center



Wisconsin Dept. of Natural Resources



National Fish & Wildlife Foundation



Natural Resources Foundation of Wisconsin

International Whooping Crane Recovery Team

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PROJECT OVERVIEW

The fundamental purpose for the formation of the Whooping Crane Eastern Partnership (WCEP) was to plan and guide the reintroduction of a self-sustaining population of migratory Whooping cranes (*Grus americana*) in eastern North America.

The project also focuses strongly on efforts to promote environmental education. WCEP partners promote the development of public awareness and support for the protection and restoration of Whooping crane habitat to decision-makers and the public.

All activities are implemented through the coordinated joint and individual efforts of the WCEP partners, who work collectively with state and federal agencies with jurisdiction over the Whooping cranes and/or the habitats they use.

The goal of the project, as set by the International (Canada/United States) Whooping Crane Recovery Team, is to establish a discrete, self-sustaining population of at least 125 birds, containing a minimum of twenty-five (25) breeding pairs. This pioneer flock will augment two existing populations: the only naturally occurring population that migrates between northern Canada and southern United States in the west; and, the non-migratory flock reintroduced into central Florida beginning in 1993

The partnership is dedicated to a science-based approach, with emphasis given to the collection and review of data relevant to project goals. Collection and dissemination of such information is essential to evaluating reintroduction methods and results, and to assessing this restoration effort as a conservation model. Additionally, partners recognize the importance of engaging the public with the challenges and successes of the project, and in the lives and survival of the reintroduced birds.

Based on protocols and techniques researched and pioneered over a ten year span by Operation Migration with Canada geese, Trumpeter swans, and Sandhill cranes, WCEP inaugurated this multi-year reintroduction project in 2001.

Included in the protocols developed and incorporated are techniques that encourage human avoidance and encourage wild behavior. To this end, each year, a new generation of captive-hatched cranes is costumed-reared in isolation from human environments and influence to every extent possible, as well as being conditioned to follow custom-modified ultralight aircraft.

Upon the arrival of the migration season, the juvenile cranes are ultralight-led along a +1200 mile pre-determined migration route. The migration begins in the north at the Necedah National Wildlife Refuge in Wisconsin and over-flies seven states enroute to its southern terminus at Chassahowitzka National Wildlife Refuge in Florida. The fifty-two (52) surviving adult and sub-adult Whooping cranes led along this route during the first five project years continue to select suitable habitat, avoid humans, and unaided, self-initiate a migration twice yearly.

Since its inception, the project has received enthusiastic governmental, public, and private support, and on an ongoing basis, has stimulated interest in protecting and restoring habitats for Whooping cranes, as well as other wetland species / wildlife along the migration route.

WCEP celebrates the 'power of partnership', to which the credit is due for the tremendous advances in the work in restoring this endangered species and symbol of international conservation to Eastern North America.



2006 PROJECT YEAR IN SUMMARY

Submitted by Co-Chairs John Christian and Joe Duff

Three words come to mind immediately to describe this year and the upcoming year for the eastern migratory Whooping crane reintroduction project: CELEBRATION, EVOLUTION and MOMENTUM!

Celebration

We have much to celebrate this year regarding the project. Here's a short list:

1. 10 pairs formed this year with 5 nests producing eggs at Necedah National Wildlife Refuge!
2. The first wild chick to hatch, followed by a successful natural migration to Florida!
3. 18 chicks made their first ultralight migration with Operation Migration - with no mortality!
4. 4 chicks made a successful migration using the Direct Autumn Release technique being perfected by ICF and the U.S. FWS!
5. Wisconsin Department of Natural Resources approved a Statewide Whooping Crane Management plan designed to manage the growing flock!
6. The total reintroduced population grew to 82 birds - an all time high for the project - well on our way to a goal of a minimum of 125.

At the same time the project experienced some significant challenges. Six birds were lost during the year due to predation, power line strikes, and unknown causes. Mortality within the population is expected, so these numbers were not unusual or worrisome. Our teams continue to analyze each death to determine if there is any management intervention we could apply to future situations. While we all understand there will be mortality, our goal is to reduce it to the minimum possible.

At 76 days from start to finish, the ultralight-led migration was the longest on record. (Not including the final move from the interim stopover at Halpata Tastanaki Preserve to the Chassahowitzka Refuge.) This imparted both personal and financial stress to the project. The OM crew waited and waited for suitable weather on many days, but their proven expertise at bird care kept the flock safe and fully capable of making the migration. In fact, it was a banner year, with 18 birds and zero mortality. However, the greenbacks were also making their flight, as every day on the road increased the budget need for OM.

The tracking and monitoring team also faced a daunting task of monitoring a growing flock-without a growing field staff. And in these times of budget constraints it's unlikely that we will see a significant staff increase. So the tracking team had to set priorities for their monitoring, and at times, found it could not monitor the movements of some of the birds. This resulted in increased reliance on citizen sightings and increased activity of State agency cooperators to help fill in the gaps. In particular, Wisconsin DNR and the Florida Fish and Wildlife Conservation Commission were great in this regard.

Indeed, all primary partners experienced serious budget challenges in 2006. Coupled with rising costs and new responsibilities, national and local budget reductions affected all of the partners conducting the field portions of the project. It is clear that we need additional support to maintain our capabilities.

But 2006 was a year for us to CELEBRATE! We made outstanding progress towards our collective goal of a wild self sustaining flock.

Evolution

This is an important word for us. When we started the project we knew where we wanted to go - but didn't know precisely how to get there. Our pioneering efforts were constantly being adjusted as we learned from our mistakes and tried new techniques that held promise. This applied to all aspects of the project, from ultralight training to banding methods to the release techniques. Our project encourages constant innovation and problem solving, rather than blaming when things go wrong. After all, we hardly knew what was right!

Our short term strategy is simple: to train and release as many birds as possible each year, and, to do our best to keep mortality to a minimum. This strategy also includes paying attention to maintaining natural wildness during rearing and training so that our growing population will be wild as a result.

Our primary technique of costume based chick rearing and ultralight-led migration has proven very successful and we intend to maintain it. In addition we have been working to perfect and test a second technique called Direct Autumn Release, which holds the promise of supplementing the growing flock by costume rearing birds and releasing birds in the fall to naturally migrate with other older Whooping cranes who have been taught the migration route using the ultralight method.

The old axiom about not having all your 'chicks' in one basket holds true for us. As our project evolves, we hope to see the day come when we can rely exclusively on natural reproduction to support a self-sustaining population. But for now, we will need to continue releases into the future, and to monitor our progress before we make any decisions to change our methods or reduce our supplementation of the flock through the primary ultralight lead migration technique and the supplementary DAR technique. In 3 to 4 years we would plan a comprehensive evaluation to determine if changes are needed based on the rates of natural reproduction and mortality, and the future success of the DAR technique.

We will also try to maximize the numbers of birds released by both ultralight and DAR techniques. There have been some general concerns regarding the potential for sexual affinity to Sandhill cranes as a result of the DAR technique.

While the DAR birds are raised as Whoopers and released with Whoopers, they are known to spend much time with Sandhill cranes on migration, and we must make sure they are correctly sexually imprinted before we consider expanding the DAR releases in a major way. This will take 3 to 4 years as mentioned above, and part of the strategy will be to carefully evaluate pairing associations of the DAR birds as they reach sexual maturity.

As a result, we will be requesting up to 24 chicks for the ultralight-led migration in 2007, and 8 to 12 chicks for Direct Autumn Release. This would increase ultralight led cohorts, and more than double our DAR birds to enhance our future evaluation of that technique.

Our propagation cooperators have been working very hard (and successfully) to increase production, paying close attention to the genetic recommendations of Dr. Ken Jones that were adopted as guidelines for the project to increase the genetic viability of our growing flock. While it is possible to reach these numbers, they currently reflect the maximum we believe we could achieve given personnel and facility constraints, and the reproductive potential of the birds.

Along these lines, the Recovery team has a captive propagation group that is constantly evolving new techniques and strategies to increase production, manage genetic issues, and ensure healthy birds. Our WCEP Health Team interacts with the propagation managers to minimize disease potential and manage it when it appears.

Another critical aspect of our evolving strategy is to closely monitor this spring's nesting behavior of the returning birds. Our Whoopers are reproducing at an early age, and to date have not been very successful parents with 4 of 5 nests lost this past spring. Based on current pairings we expect a larger number of successful nests this year, and by closely monitoring both the birds' behavior, attempt to identify causes of nest failure, should it occur. The refuge is working with other partners to install cameras at some nest sites to record what happens.

Our monitoring efforts are also undergoing rapid change and evolution. We are being stressed by our success! Our small dedicated tracking team can no longer monitor every bird all of the time. It has been forced to set priorities and to rely on an expanding network of cooperators to provide sighting and behavioral information.

We have also developed a draft long-term monitoring strategy that we are continuing to review and refine so we can deploy the resources needed to gather the information that will be essential for future management of the population. The Wisconsin DNR has provided great assistance in the development of a database for the project. This supplements the more internal database of the tracking team and will make it easier for partners and other cooperators to access project data.

A final area to mention is the evolution toward population management. Early in the project our focus was limited to getting birds on the landscape. But now that we are seeing success in numbers, it is important to consider the management needs of the growing population. Wherever these birds land it creates excitement and priority for land protection activities.

There will be further circumstances of injured birds, or occasional conflicts with human activities. It is critical to have a plan for dealing with these opportunities and problems. This year the Wisconsin DNR took on the task of developing a State-wide management plan which was recently approved unanimously by the Natural Resources Board. We had worked with Wisconsin with the strategy in mind that this state plan could serve as a model for management throughout the entire flyway. The plan can serve that purpose, and we will work with other jurisdictions to follow its lead.

In summary, our project strategies continue to evolve as new knowledge is gained through our collective and individual efforts. This EVOLUTION is healthy and vital to our success. We need to guard against being critical of new ideas, and be flexible to change direction as circumstances warrant.

Momentum

We have been at this for 6 years now. And with each year we have seen new successes. At the same time it has been harder and harder to maintain momentum in area of funding. One of the 'perils of partnership' is the attitude that, 'Mikie will do it,' when budget times get tough. This is reflected in some partners or donors reducing support, believing that the partnership is so well developed that their individual contribution will not have an effect. NOTHING COULD BE FARTHER FROM THE TRUTH. For our project, the whole literally *is* the sum of the parts. We need to keep our momentum up, and we need to keep our current supporters and gain new ones. We have been introspective and concluded that we may not have done the best job of saying 'thank you,' and keeping our supports informed. So we will work harder on that in the future.

Our project staff has also been working very, very hard over the past 6 years and certainly has varying degrees of fatigue. It is critical for all of us to take the time to reflect, relax, recharge, and CELEBRATE our successes to date so that we can be energized about the future. The budget and personnel issues continue to affect our project staff's morale. We need to continue to address this as we can; to pay close attention to current staff's needs; and to take the time to thank them and recognize their efforts. We are a dedicated, self motivated lot. But occasionally we all need some TLC and R&R.

Finally, as we demonstrate our progress, we need to increase our communications through our outreach team as they 'tell our story.' We need to stress that to maintain our progress, we need to have continued support from our sponsors, donors, partners, and the public. This outreach is absolutely critical to maintaining our MOMENTUM.

And we will maintain our momentum.....

Addendum

Subsequent to the completion of this Report but prior to it going to press, we suffered the shocking loss of 17 of the 18 young cranes in the Class of 2006 when they were killed at their Florida pen site during a severe storm.

WCEP is developing an Action Plan to reduce the chance of a reoccurrence. When completed, it will be posted at <http://www.bringbackthecranes.org/>.

It is difficult to protect against a random act of nature - which is why this project is so crucial to the species' survival. We will recover from this setback however. The captive propagation facilities are reporting their best year ever and we have high hopes for the Class of 2007!



CHICK REARING AND EARLY CONDITIONING REPORT

Submitted by Dr. Glenn H. Olsen



At the beginning of the Whooping crane breeding season during the night of February 11-12, a massive snow and ice storm caused bent fencing and torn netting on 95% of the covered pens occupied by our endangered Whooping cranes at Patuxent (pictures 1 and 2). In addition to the damage, 9 Whooping cranes and 9 Sandhill cranes escaped. Every Whooping crane was recaptured within 5 days, but one Sandhill crane remained at large for 5 weeks.



We had to undertake a massive project to remove and replace torn netting and also fix the bent chain-link fencing. We had help from the Director's Office, the staff and many of the researchers from other areas, and additional help from the Patuxent Research Refuge staff, refuge staff from other National Wildlife Refuges, and volunteers from Friends of Patuxent (pictures 3 and 4). Within 4 weeks all the pens were back to normal, thanks to everyone who participated in this massive restoration effort.

When we saw the extent of the damage, we considered that our Whooping cranes might not breed this year, but a somewhat normal breeding season occurred, just delayed by about 3 weeks. In 2005 the first egg was hatched on April 20, whereas the first Patuxent laid egg hatched on May 9 in 2006; the last egg hatched on June 3 in 2005, and on June 1 in 2006. The season started 19 days later, but the final hatch dates were nearly the same.



In 2006 USGS Patuxent Wildlife Research Center, Laurel, Maryland, hatched 23 Whooping cranes, 22 for the WCEP program and one genetically valuable chick was added to the breeding flock. Of the 22 WCEP Whooping cranes hatched, 4 were from eggs shipped to us from the International Crane Foundation, 6 from the Calgary Zoo, 1 from the Audubon Species Survival Center, 9 from Patuxent, and 2 from eggs removed from a single Whooping crane nest at Necedah National Wildlife Refuge. The genetically valuable bird came from an egg laid at Patuxent.



The two eggs from Necedah were incubated at the International Crane Foundation and shipped to Patuxent shortly before hatching. Both eggs hatched, and one chick returned to the refuge with the first group of ultralight trained birds on June 26, 2006. Unfortunately, the second chick was euthanized at 46 days of age due to a severely deformed leg resulting from an injury that caused a premature closure of the epiphyseal plate on one of the long bones of the leg.

Pic. 1: Two Whooping cranes in a tight spot between collapsed netting and fence.

Photo by Judd A. Howell

Pic. 2: Top netting and bent chain link.

Photo by Glenn H. Olsen

Pic. 3: Moving Whooping cranes from damaged pens. *Patuxent file photo*

Pic. 4: Replacing netting over the pens required a whole crew of volunteer help from USGS, US FWS, and Friends of Patuxent. *Photo by Glenn H. Olsen*

Of the other WCEP chicks, one chick died from respiratory disease, and two chicks were retained for medical reasons (see the Health Team Report). Eighteen Whooping crane chicks in three groups were shipped to Necedah on June 26, July 6, and 20, 2006.

A dedicated crew of Patuxent and Operation Migration personnel once again spent many days working in silence in hot crane costumes that covered every inch of their bodies. The process to train the chicks to the ultralight aircraft is based on normal crane chick behavior, but uses behavior modification techniques to get the desired results. Whooping crane colts will follow costumed caregivers and ultralight aircraft while still being properly socialized as Whooping cranes.

The process begins before hatching with the chick still in a pipped egg, when we play tape recordings of normal crane parent vocalizations, and the sounds of the ultralight engine. After hatching, the chicks spend the next week or so learning such necessary skills as eating and drinking. In the wild, parental cranes continually coax along their chick: here is where the patience of costumed caregivers is needed.

Each chick requires multiple 15-20 minute or longer sessions of coaxing with a puppet head to learn what food and water are and how they are delivered. This process can take from 2 to 5 days. The chicks are taken on foraging walks with their costumed caregivers. In 2006 this training started on average at day 7 (range 4-9 days) and ended on average at about 39 days (range 33-43 days). Chicks received an average of 676 ± 140 minutes of "foraging with a puppet" training. As compared to 2005, in 2006 foraging with a puppet began one day later but ended at the same age on average.

The next step in chick behavioral training is to introduce them to the ultralight. This is called "foraging with trike" (ultralight) and started in 2006 at day 8.1 on average (± 1.9 days, range 5-12 days). Three birds did not receive this training and 3 birds received only one day of training. For all three groups of Whooping crane chicks, the total amount of this training was 33.1 ± 40.9 minutes (range 0-105 minutes), and the foraging with trike training ended at day 22.7 (± 20.7 days, range 7-53 days).

There is a large variation between the three groups because of socialization problems in Group 3 that led to their receiving more and longer bouts of forage with trike training than would normally occur. For comparison, Groups 1 and 2 together averaged 9.1 minutes (± 10.2 minutes, range 0-37 minutes), started this training at day 7.6 on average (± 2.1 days, range 5-12 days of age) and ended the training on day 8.6 on average (± 1.5 days, range 7-12 days of age). Group 3, on the other hand, averaged 95.6 minutes (± 6.3 minutes, range 90-105 minutes) of forage with trike training. They started this training later (average 9.2 days of age, ± 0.5 days, range 9-10 days of age) and ended the training much later (average 51.0 days of age, ± 1.6 days, range 49-53 days of age). Any comparisons of 2006 training figures with other years should take this difference into account. The forage with trike training received by Groups 1 and 2 are more typical of the use of this type of training for the WCEP project in past years.

Foraging with the trike is normally a short prelude to the next step which is circle pen training. This is where the chicks are actually led by a costumed technician taxiing the ultralight in a circle, with the chick following. The chick is separated from the ultralight wheels by a low (60 cm) fence, and the costumed trainer uses an elongated crane puppet head that is capable of releasing treats in the form of mealworms to the chick as a reward for following the trike.

In 2006, chicks received an average of 111.3 minutes (± 47.8 minutes, range 50-205 minutes) of circle pen training. This training started on day 10.9 of age on average (± 6.0 days, range 4-22 days of age), and ended on day 31.3 of age (± 3.7 days, range 25-44 days of age). On average, Circle pen training started a day later, lasted a day longer, and training time was about 42% less than in 2005. This may have been partly due to group 3 birds being reared from age 0 to 17-22 days at the Crane Chick Building (CCB) and not the Propagation Building (PB) where groups 1 and 2 were reared this year.

Group 3 birds were only exposed to the trike from 1 to 3 times until they were transferred to the PB. No circle pen training could be given due to uneven terrain. A new flat circle pen area at the CCB is being created for next year, and we hope to have a second trike available to increase the amount of this type of training groups get in 2007.

When circle pen training ends, open field training begins, and the chicks are led to a large field where the ultralight is separated from them by a low fence running the length of the field (about 50 meters). Again the chicks are kept on one side of the fence and the ultralight on the other for safety reasons.

The field is several hundred meters from the chick rearing facility, and the costumed technician leads the chicks as a group to the field. Open field training started at 36.1 days of age on average in 2006 (± 3.6 days, range 31-42 days of age), and ended near shipping at 45.6 days of age on average (± 4.9 days, range 39-52 days of age). Chicks received an average of 91.0 ± 79.0 minutes of this type of training though the range was great, 15 to 220 minutes. Again, the chicks received less of this type of training in 2006 than in 2005 by about 20%.

Wild Whooping crane chicks are reared singly, and have no contact with other chicks (except in two-chick nests) until they are fledged colts migrating with their parents. In order to follow the ultralight aircraft migration, we desire to have 18 young colts act as one group. Therefore we start a socialization process early at Patuxent that culminates in joining three groups into one at Necedah.

First, chicks are introduced to one or two other chicks, which are often chicks they have seen and observed in adjacent pens. Chicks are carefully supervised by the costumed technicians, to avoid injuries caused by the natural reaction of two sibling chicks to fight.

Socialization began at an average age of 14.8 days (± 4.9 days, range 8-25 days), and chicks received an average of 38.8 hours (± 12.2 hours, range 21.9-60.3 hours) of socialization training. Training in 2006 started almost 4 days later on average and was 10.5 hours less than in 2005. This may have contributed to the socialization problems seen in Group 3.

Exposure to ponds and wetlands continues to be an important part of training Whooping crane chicks for release (see picture 5). Ponds and wetlands are important both for foraging and as roosting locations for protection from nocturnal predators. Pond training begins early, in 2006 at 13.7 days of age (± 4.9 days, range 7-22 days), and average time in this type of training was 32.4 hours (± 9.4 hours, range 21.6-47.3 hours). This training continues after the chicks are shipped to Necedah and placed in pens with wetland access.



Closely tied to the conclusion of training and socialization is shipping the chicks to Necedah. As in past years, this was done in crates supplied by Operation Migration, and in Windway Capital's aircraft.

Age at shipment was 48.3 days (± 3.9 days, range 40-53 days of age) with a distinct difference seen between the groups. Group 1 was shipped at an average age of 47.0 days (± 3.5 days, range 42-52 days of age).

Young cranes and costumed handler in ponded pen.

Similarly, Group 2 was shipped at an average age of 46.6 days (± 3.8 days, range 40-49 days of age). However, because of the previously cited socialization problems in Group 3, this group was held at Patuxent for an extra 5 days and shipped at an average age of 52.0 days (± 1.9 days, range 50-54 days of age). Shipping dates were: Group 1, June 26; Group 2, July 6; and Group 3, July 20, 2006.

As in 2005, a behavioral study, funded by a grant from the US Fish and Wildlife Service continued. This study examined the behavior of Whooping crane chicks raised in Patuxent's traditional indoor/outdoor pens, which are small and limit the numbers of chicks that can be raised, compared to chicks partly reared in newer outdoor pens.

Whooping crane chicks older than 25 days were moved to the outdoor pens, thus freeing space for younger chicks in the indoor facility. If not for this additional space, Patuxent would be limited to hatching and rearing 16 chicks per year, so this new training method is very important.

The new facility used existing pen space that had been built for adult birds and modified it by dividing pens in half with new fencing, dividing existing feed sheds (though feed sheds are being replaced this winter), adding heat lamps to the feed sheds, adding new gates, and adding chick protective fencing to the base of the existing chain link fencing.

In addition, video cameras were mounted in the corners of the pens and a new video observation building has been sited near the pens.

This is the second year of the comparison study of the behavior of chicks in the two facilities. Because of the study requirements for chicks to be present in their pens for observations before 10:00 AM and after 4:00 PM, the number of hours available for pond exposure, socialization, and ultralight training may have been limited, although often other factors limited ultralight training this year too, (technicians available, weather). Either stormy weather or excessively hot days can limit the amount of training given the chicks.



Chick crew member uses new video equipment to observe crane colts in the new White Series pens at USGS Patuxent WRC.

Medical problems were mentioned briefly, above, and will be discussed in more detail in the Health Team Report. All chicks were vaccinated for both West Nile virus and Eastern Equine Encephalitis, and no chicks died from these diseases. All Whooping crane chicks received extensive health examinations prior to shipping including radiographs for ingested metal. No metal foreign bodies were found in the birds, like last year.

Caring for and raising Whooping cranes at Patuxent, and at any of the captive rearing facilities, is a full time job. Adult birds need daily care, decisions are made on pairing new birds, behavioral observations are made on a daily basis to determine both the physiological condition and the health of the birds. Work increases 5-fold as the breeding season opens with mating dances, nest building and egg laying in the late winter and spring.

Patuxent has a dedicated crew working with the Whooping cranes, and was joined in 2006 by temporary staff, local volunteers, and staff from Operation Migration for the chick rearing season. We are grateful to all for their dedication. Operation Migration provided two ultralight aircraft used in training, the crane costumes and the vocalizers used in training, and the crates used for shipping the Whooping cranes to Necedah.

USGS Patuxent Wildlife Research Center Staff

- Dr. John B. French**, Research Manager
- Dr. Glenn H. Olsen**, Research Wildlife Biologist/Veterinary Medical Officer
- Jane Chandler**, Crane Flock Manager
- Jonathan Male**, Aviculturist
- Brian Clauss**, Biological Technician
- Barbara Clauss**, Biological Technician
- Robert Doyle**, Biological Technician
- Jennifer Green**, Biological Technician
- Kathy O'Malley**, Biological Technician
- Sharon Marroulis**, Biological Technician
- Charlie Shafer**, Biological Technician
- Dan Sprague**, Biological Technician
- Melody Nevins**, Temporary Biological Technician
- Ezra Link**, Seasonal laborer
- John Hager**, Seasonal laborer
- Lorie Shauli**, Volunteer
- Lillian Carter**, Volunteer
- Mary Edwards**, Volunteer
- Susan Kryszak**, Volunteer
- Paula Wang**, Volunteer



2006 OPERATION MIGRATION FIELD TEAM REPORT

Submitted by Joe Duff

Between May 5 and 31, 2006, 18 Whooping crane chicks were hatched at the USGS Patuxent Wildlife Research Center in Maryland and assigned to the ultralight-led program of the WCEP reintroduction project. These hatch dates resulted in an age range of 26 days, the narrowest we have worked with since 2001 when we had only 10 birds. The birds received early imprinting and conditioning to the aircraft by OM and PWRC staff using a protocol developed over many years by Operation Migration.

The birds are raised in isolation from human contact and only a limited number of trained handlers and veterinary staff have access to them. Each team member wears a baggy white costume that is designed to disguise the human form and covers them head to mid-calf. Each handler refrains from talking when near the birds and carries a digital vocalizer that broadcasts a Whooping crane brood call. They also use a puppet resembling an adult crane's neck and head, which is equipped with a mechanism for dispensing treats (normally mealworms) to encourage the chicks to forage.

During the early stages the chicks are penned in proximity to adult Whooping crane that serve as sexual imprint models to ensure proper sexual orientation. OM provides two ultralight aircraft for the early training that are identical to the aircraft we will fly with later in the season. They are fitted with a propeller guard to prevent prop-strikes and a speaker and amplifier to broadcast crane calls loud enough to be heard over the engine noise. The overhead hang glider type wings are removed so as to not encumber the aircraft and restrict training on windy days. To prepare the chicks for the eventual replacement of the wing a small (1.5 metre) dummy wing is used in place of the full size wing.

Until they begin to socialize the chicks are trained with the aircraft individually. Thereafter they can work with the aircraft in small groups. Each training session takes about 20 minutes so it requires a substantial effort to prepare the birds. To augment the Patuxent aviculture staff, OM provides a Supervisor of Field Operations and up to 3 interns. (For details see Patuxent early training report)

Due primarily to the late breeding season, the birds received an average of 30 percent less training in 2006 compared to other years. This change in procedures did not result in training difficulties later in the season and the birds proved to be well attached to the aircraft. This may be an indication that less training is needed which could reduce the crew workload or allow more birds to be prepared in the future.

Prior to fledging the birds were transported to the Necedah National Wildlife Refuge in central Wisconsin by private aircraft provided by Windway Capital. To accommodate their early development, 3 shipments of birds were made on June 26, July 6 and July 20. Cohort 1 was an average of 48 days of age by the time they were moved. Cohorts 2 and 3 were transported at 47 and 52 days of age respectively.

The birds were shipped in accordance to the Patuxent WRC, Protocol for Transporting Cranes. They were transported in individual containers designed and fabricated by OM. Immediately after their arrival, the birds were examined by the WCEP Health Team led by Barry Hartup DVM, of ICF. They were observed for signs of stress and injuries sustained during shipment. (see Health Team Report for details)

After their abbreviated examination the birds were transported in air conditioned vehicles to one of the three training facilities in areas of the Refuge that are not open to the public. These facilities are approximately 1 kilometre apart, and each consists of a fully enclosed pen built on dry land, containing a feeding station and shade shelter.



Costumed handlers and vets release cranes from shipping crates at Necedah NWR.

A wet pen, built entirely in 15 to 45 centimetres of water, is attached to the primary structure and is used to teach the chicks to water roost. Both pens are protected by three strands of electric fence wire. An adjacent area of manicured grass is used to train the birds and operate the aircraft.



Due to an unusually dry spring and early summer, the team was able to train with the birds more than in previous years.

Cohort 1 fledged on July 28. The birds of cohort 2 were all flying by August 10 and the youngest group fledged on August 20. Note: Whooping cranes fledge at between 60 and 80 days of age.

For the purposes of this report the cohort is said to have fledged when all the bird in that group are able to fly a small circuit around their training area. Individual birds may have fledged earlier.

The east site, our largest facility, consists of two dry and two wet pens. This area is used to mix the Cohorts after they fledge. Once the birds of Cohort 2 were able to fly at least a mile, they were led to the east site and penned next to Cohort 3, our youngest birds. They are separated by a chain link fence to prevent injury due to aggression.

Initially, they were trained separately, but eventually they learned to socialize and the barrier between them was removed on September 5. Once this occurred, the procedure was repeated with Cohort 1, our oldest birds. They were added to the flock September 21.



Using this procedure we combined all the chicks into a single socialized flock in preparation for the migration. The longest pre-migration flight with the combined cohorts was 26 minutes.

The chicks spent an average of 90 days at the Necedah NWR, and were able to roost in water on 77 nights. The weather allowed us to train with the aircraft an average of 52 days. Rain, wind and fog in the late summer and early fall frequently interrupted training and reduced the number of days we were able to fly with the birds prior to the start of the migration.

On September 6 and 7 all the birds were examined by the WCEP Health Team (see Health Team Report) and fitted with temporary radio transmitters attached to leg bands worn above the hock.

Improvements to equipment were made prior to the migration

- Brakes were added to the two travel pen trailers to accommodate the extra weight of additional panels.
- Thanks to a generous donation from the Disney Wildlife Conservation Fund, new wings were purchased for all four trikes from North Wing Aviation in the US. These innovative wings are strut based, eliminating the need for overhead flying wires and a king post. On the wings used prior to this change, the support structure above the wing often trapped birds that flew ahead or above the aircraft. Over the years these wires have caused the death of 3 birds and injured others. With these new wings, and improvements we have made over the years to our propeller guards, we have virtually eliminated the danger of injury to the birds that results from impact with the aircraft.

Migration Equipment

- Four Cosmos Phase II ultralight aircraft are used during the migration. They are powered by Rotax 503, 50HP engines and three blade Ivoprops. We use North Wing M-Pulse 17.5 meter wings. The ultralights are accompanied by a Cessna 182 that provides top cover reconnaissance and extended radio communications.
- During the migration the birds are housed in one of two travel pens. These portable structures are made up of nineteen 1.8 X 3.05 metre steel frames that hook together and are covered with 2.54 X 2.54 centimetre galvanized or vinyl coated wire cloth. These panels are carried on the outside of a custom built trailer and can be assembled in less than an hour. The trailer itself becomes part of the pen, providing a wind barrier as well as storage for feed, water and tools. The pen is top netted and a shade shelter is incorporated into the design. All surfaces are painted in camouflage to appear natural, and when erected, the entire structure is protected by three strands of electric fence.

MIGRATION

With the 26 day age range in the birds they were all able to fledge within a month of each other. We hoped to capitalize on this advantage by setting an earlier departure date for the migration. The poor flying weather that interfered with the training toward the end of the season eroded that benefit. However, we were still able to leave on October 5, approximately 9 days earlier than in previous years.

During the summer training season the birds are led in circuits of increasing size around the refuge as their endurance improves. On the first leg of the migration, normally a distance of approximately 28 km,



they are reluctant to follow us as we move farther away from familiar territory. Often they turn back, or begin to drop out, and we are lucky if 10% make it to the first stop. The others return to the pen site or land out and have to be tracked, collected and transported to the first stopover.

To avoid this situation we received approval from a generous land owner to use a small but isolated field only 6.5 km south of the Necedah NWR. For the first time in the history of this project, all the birds were successfully led to the first stopover. Unaccustomed to the new travel pen they are often more eager to follow the aircraft on day 2. Unfortunately, weather conditions were such that the second flight didn't take place until Day 6.

The Migration Team experienced more poor flying weather in 2006 than in any other year. Overall, we flew a total of 32 hours and 44 minutes, the longest single flight being 101 miles (161km), and arrived on December 19.

We had one delay of 9 days while we waited for weather favorable enough to cross the Cumberland Ridge in Tennessee. Although we flew on a normal number of days (22) and covered a normal distance (1213 statute miles /1940.8km), it took us 76 days to lead the birds to the interim site at Halpata Tastanaki near Dunnellon, Florida.



The birds were housed at the Halpata Tastanaki site in one of the OM travel pens. Florida was experiencing an extended drought, and although the site is normally in the center of a large wetland, it had been dry for most of the summer.

Volunteers from the US Fish and Wildlife Service, The Southwest Florida Regional Water District, Disney's Animal Kingdom, and others, made repairs to the pen site and build a large lined depression to create a temporary water pond. Unfortunately these efforts failed and the birds were housed on dry land.

Short-Stopping In Florida

There are now 5 generations of birds that have wintered at the release pen at Chassahowitzka NWR and many of them return there annually. Apart from the pen site, this area does not provide much in the way of good crane habitat and most of these birds only stay a short time before moving on to other wetlands.

However, if they arrive after our migration is complete, they encounter the costume handlers and a new generation of chicks. This often encourages them to stay for the winter. They partake of the food provided for the chicks and can be aggressive. Some of the chicks have been forced out of the pen resulting in predation.

Once the Tracking Team determines that most of the wild birds have completed their migration, have stopped in at Chassahowitzka and moved on, we can move the birds the final leg to the release pen. This procedure has been used with limited success for the last two years but needs to be re-evaluated for future viability.

The Final Leg

On January 11, 2007, six birds were led 26 miles (41.6km) from the Halpata site to the Chassahowitzka NWR. After a month without exposure to the aircraft, many were reluctant to follow and some turned back. Others dropped out and had to be retrieved. A penultimate site in Citrus County only 10 miles from the final destination was used to house the remaining 12 birds overnight. They were led the final leg on January 11, 2007.

Accomplishments

Although the migration took a record 78 days to complete we were very pleased with the results. For the first time no mortality occurred during the training or the migration, and all 18 birds that we transported to Necedah in the spring arrived safely in Florida in the late autumn.

One of these birds was the offspring of wild parents that we taught to migrate in 2002. In their inexperience they abandoned their nest, and the two eggs they laid in Necedah this past spring. This abandonment was witnessed by members of the Tracking Team, and the eggs were collected and transported to the USGS Patuxent Wildlife Research Center in Maryland where they were hatched. One of these chicks survived and became ultra-crane number 2- 06 and was returned to Necedah in July as a member of Cohort 1.

These two wild parents were among 10 pairs that built nests, and 5 pairs that laid eggs in early 2006. All were inexperienced, and neglected their nests, however this is not uncommon behaviour. One pair were motivated to try again and built a second nest in a different location. This time they incubated two eggs to hatch and cared for the offspring until they fledged.

One of these chicks survived and completed the migration to Florida along the route we taught their parents in 2002. This historic event, the first migratory Whooping crane to hatch in the wild in the US in over 100 years, validates the techniques we developed over several seasons. It proves that birds, costume raised and taught to follow our ultralight aircraft, will select proper habitat, breed normally with conspecifics and teach their offspring to migrate.

Improvements For The 2007 Season

Our original migration flight path was patterned after existing Sandhill crane migration routes. More or less it follows a direct line between Wisconsin and Florida. However, we must deviate around large cities and Air Traffic Control Zones. Initially we intended to stop at the Jasper-Pulaski Fish and Wildlife Area in Indiana, an important staging area for Sandhills.

After the route was established it became obvious that the idea of taking our birds to Jasper-Pulaski was likely ill-conceived and that stop was avoided. The route from this point to Florida however, takes us over the Appalachian Mountains in Kentucky and Tennessee, and clearing this obstacle has caused extensive weather delays and poses a real danger to birds and pilots.

For the last 3 years we have had ambitions to move our migration route to the west of the current pathway, but the time and money needed to develop this route has not been available. This year we hope to begin to identify the new route, including the 40 or so stopovers that would be needed along the way.

From central Wisconsin we would proceed south through the western portion of the same states we now visit. But instead of flying through the center of Georgia, would pass through Alabama before reaching the panhandle of Florida. Though it would still be weather dependant, based on the low geographic features and prevailing winds that this area experiences, we expect to shorten the duration of the migration substantially.

During the annual migration OM relies heavily on the assistance of volunteers and we are grateful for all their help.

Don and Paula Lounsbury are long time supporters, an integral part of the team, as well as friends to all the crew. They have participated in 11 migrations, and using their personal aircraft provide top cover services, keep the team in communication, clear us through air traffic control zones, and track lost birds. Because of other commitments and responsibilities they were able to work with us for only the first half of the migration. Several other pilots were able to fill in at various points along the migration route.

We are grateful to **Jeff Perry** and **Dave Mattingly** who got us around Atlanta. We also appreciate the help of Doug and Nathan Rounds who helped us through the rest of Georgia, and **Joe Garner** who shepherded us to the Florida border.

Again this year, **Gerald Murphy** took time from his busy schedule and dedicated over a month to help us move the camp and equipment from site to site. Gerald's easy manner and willingness to help make him an indispensable team member.

Walter Sturgeon has more crane experience than anyone on the team. He has raised birds for over 30 years, and undoubtedly has forgotten more than we know. He is the Assistant Director of the North Carolina Museum of Science and, and in addition to serving on many wildlife organization Boards, he found time to volunteer for Operation Migration and accompany us on the second half of the trip.

Marie Brady and **Laurie Lin** were interns for Operation Migration in 2006, which means they worked long hours for little pay. They accompanied us on the migration after working all spring and summer with the birds. Marie gained her experience working at Patuxent WCR; Laurie with the Calgary Zoo in Canada. Both were dedicated to the birds and an integral part of the team. On many occasions they went beyond the call of duty to ensure the safety of the birds.

Terry Kohler of **Windway Capital Corp** has supported the conservation of cranes since efforts began. Each spring he provides the aircraft and pilots to make three round-trips from Baltimore, Maryland to Necedah, Wisconsin to bring our pre-fledge chicks for summer training.

He has also assisted OM in meeting our annual operating costs. He provided the hangar we use in Necedah and purchased one of our aircraft. Mr Kohler also provides aircraft and pilots for the Tracking Team and supports other members of WCEP. The existence of Whooping cranes is, in no small way, a result of his efforts. Mr Kohler is high on the list of those we must thank for the continued survival of an animal with a sixty million year history. When Whooping cranes are eventually removed from the endangered list, his contributions must be recorded as major factors in the safeguarding of this keystone species and the restoration of biodiversity in North America.

2006 OPERATION MIGRATION FIELD TEAM REPORT – CONT'D

OM is grateful to the many landowners and migration supporters along the way who tolerated our long stays, provided isolated space for the birds, hangers for our aircraft, and hosted our team. Without their assistance and generosity this project would not be possible.

Staff

Mark Nipper, who began working with OM as an intern and eventually served as Supervisor of Field Operations resigned in early 2006 to continue his education. Before leaving he assisted with the early training at Patuxent WCR.

Beverly Paulan assumed Mark's responsibilities once the birds were moved to Necedah NWR. Beverly gained experience during the summer training season and the fall migration. She will also benefit from working closing with the Winter Monitoring Team, and subsequently, the Crane Ecology team at Patuxent in the spring.

Operation Migration 2006 Field Team - Early training at Patuxent WRC

Mark Nipper, Supervisor of Field Operations

Laurie Lin, Marie Brady, Interns

Operation Migration - Field Team - Summer training at Necedah NWR

Ground Crew

Beverly Paulan, Supervisor of Field Operations

Laurie Lin, Marie Brady, Interns

Robert Doyle, Charlie Shafer, Brian Clauss, Patuxent WRC Aviculturists

Air Crew

Joe Duff, Project Leader/ Pilot

Richard Van Heuvelen, Brooke Pennypacker, Chris Gullikson, Pilots,

Operation Migration - Migration Team

Ground Crew

Beverly Paulan, Supervisor of Field Operations

Laurie Lin, Marie Brady, Interns

Charlie Shafer, Patuxent WRC Aviculturist

Gerald Murphy, Volunteer Driver

Walter Sturgeon, Aviculturist, Volunteer Driver

Air crew

Joe Duff, Project Leader/Pilot

Richard Van Heuvelen, Brooke Pennypacker, Chris Gullikson, Pilots

Paula Lounsbury, Don Lounsbury, Volunteer Top Cover Pilots

Jeff Perry, Dave Mattingly, Joe Garner, Doug Rounds, Nathan Rounds, Volunteer Top Cover Pilots

Dale Richter, Taylor Richter, Volunteer Top Cover Observers

2006 OPERATION MIGRATION FIELD TEAM REPORT – CONT'D

Fig. 1 Comparison of Training and Migration History of First Six Generations of WCEP Whooping Cranes

EVENT	2006		2005		2004		2003		2002		2001	
	May 5	May31	Apr 20	Jun 3	Apr 20	Jun 5	Apr 21	May 23	Apr. 12	May 21	May 7	May 24
First / last hatch date	May 5	May31	Apr 20	Jun 3	Apr 20	Jun 5	Apr 21	May 23	Apr. 12	May 21	May 7	May 24
Age spread	26 Days		44 Days		46 Days		32 Days		39 Days		17 Days	
Gender	9F	9M	9F	12M	5F	11M	6F	11M	10F	7M	4F	6M
Age-first exp. to aircraft	Aver. 8.1 days		Aver. 7 days		8 days		8 days		9 days		7 days	
Avg. # training hrs at PWRC	3 hrs 55min		5 hrs 6 min		7 hrs 45 min		11 hrs 2 min		11 hrs 56 min		7 hrs 18 min	
Pond exposure at PWRC	32 hrs 24 min		39 hrs 48 min		55 hrs 26 min		21hrs 42min		180 hrs 40 min		19hrs 6min	
Tot. chicks trans to NNWR	18		21		16		17		17		10	
Avg. age at shipping	48 47 52		49 49 42		53 46 41 days		51 43 days		54 45 days		56 days	
Shipping Date (m/d)	6/26 7/6 7/20		6/15 7/6 7/13		6/19 6/30 7/15		6/19 7/1		6/12 6/27		7/10	
Cohort One (C1)	1,2,4,5,6,7,8,10		1, 2, 3, 5, 6, 7		1, 2, 3, 5, 6, 7, 8		1, 2, 3, 4, 5, 6		1, 2, 3, 4, 5, 7, 8		1, 2, 3, 5, 6	
Cohort Two (C2)	11,12,13,14,15,		8, 9, 10, 11, 12, 14, 15, 16		12, 14, 15, 16, 17, 18		7, 9, 10, 11		9, 10, 11, 12		4, 7, 9, 10, 11	
Cohort Three (C3)	18,19,20,22,23		19, 20 21, 22, 23, 24 26		19, 20, 22		12, 13, 14, 16, 17, 18, 19		13, 14, 15, 16, 17, 18		NA	
Total days at NNWR	102 91 77		121 100 93		117 103 88		118 106		112 107		98	
# days trained at NNWR	59 – 52 – 41 (mean50)		56		57		69		52		41	
# nights water-roosting available	84 – 75 – 72 (mean77)		93		76		99		82		9	
Fledging Date C1,C2,C3(m/dd)	7/28 8/10 8/20		7/15 8/1 8/14		7/17 8/02 9/16		7/19 7/22 7/30		8/18 8/24 9/30		8/29 9/ 6	
Pre-mig. health check (m/dd)	Sept 6, 7		Aug 30 ,31		9/5 & 6		8/27		8/26,27 & 29		9/11	
Cohorts united	Sept 5, 21		Sept 15, 23		Sept. 6 Sept. 21		Aug 14 Aug 29		Aug 25 Sept 16		Sept 5	
Longest pre-migration flight	26 min		32 min		47 min		33 min		24 min		27 min	
Migration departure	Oct 5		Oct 14		Oct 10		Oct 16		Oct 13		Oct 17	
# cranes began mig.	18		20		14		16		17		8	
Total migration distance (miles)	1239.1		1209.1		1204.4		1191		1204		1227.28	
Total Flight Time	33hrs 40 min		31 hrs 46 min		33 hrs 7 min		31 hrs 53 min		38 hrs 36 min		35 hrs 46 min	
Total flight days	22 24**		21 25*		21		20		22		26	
Total days to complete mig.	76 78**		61 – 64*		64		54		49		50	
Longest flight dist.	101 miles		115 miles		157 miles		200 miles		107.2 miles		94.7 miles	
Longest flight dur.	2 hrs 45 min		2 hrs 24 min		3 hrs		3 hrs 3 min		2 hrs 15 min		2 hrs 9 min	
Arrival Date	Dec 19 / Jan12 (07)**		Dec 13 / Jan 11 (06)		Dec 12		Dec 8		Nov 30		Dec 5	
Total cranes to complete mig.	18		19		13		16		16		7 (1 crated)	

* = Arrived 13 Dec 2005 at Halpata. Moved birds 26.1 miles to Chassahowitzka NWR on Jan 9, 10 and 11 2006

** = Arrived 19 Dec 2006 at Halpata. Moved birds 26.1 miles to Chassahowitzka NWR on Jan 11, 12 2007

Fig. 2: 2006 Migration Chart

Migration Leg	Migration Day	Date	Distance Statute Miles	Duration Hrs - Mins	Accumulated Miles	Location County	State	Duration of delay	Birds Crated Distance in Miles
1	1	Oct 5	4.1	23 mins	4.1	Necedah to 1st Stop	WI	4 days @ 1st stop	0
2	6	Oct 10	18.1	39 mins	22.2	Juneau to Juneau	WI	4 days @ Judy's	18-06= 5 miles
3	11	Oct 15	22.8	58 mins	45	Juneau to Sauk	WI	7 days @ Dana's	2-06 = 1/2 mile
4	19	Oct 23	45.9	1hr 01 mins	90.9	Sauk to Greene	WI		2-06 = 4 m 5-06 =36 m 6-06 =36m 8-06 =36m 14-06 =10m 15-06 =36m 18-06 =36 20-06 =12m 23-06 =8m Total = 9
5	20	Oct 24	36	54 mins	126.9	Greene to Winnebago	WI-IL	4 days @ Cambier	0
6	25	Oct 29	60.7	1hr 21 mins	186.6	Winnebago to La Salle	IL	2 days @ Bish	0
7	28	Nov1	96.4	1hr 55mins	284	La Salle to Benton	IL-IN	1 days @ Flook	0
8	30	Nov 3	49.4	1hr 17mins	333.4	Benton to Boone	IN	8 days @ Roush	0
9	39	Nov 12	55	1 hr 31 mins	388.4	Boone to Morgan	IN	4 days @ Presnell	0
10	44	Nov 17	58.9	1 hr 7 mins	447.3	Morgan to Muscatatuck	IN		0
11	45	Nov 18	51.5	1hr 45mins	498.8	Muscatatuck to Shelby	IN		0
12	46	Nov 19	42	1hr 3 mins	540.8	Shelby to Washington	IN-KY	1 day @ Holderman	0
13	48	Nov 21	56.9	1hr 31mins	597.7	Washington to Russell	KY		0
14	49	Nov 22	63.4	1hr 41 mins	661.1	Russell to Cumberland	KY-TN	9 days at Paton	0
15	59	Dec 2	43	1hr 3mins	704.1	Cumberland to Meigs	TN		18-06 = 20 miles
16	60	Dec 3	73.4	2hrs 31mins	777.5	Meigs to Gordon	TN - GA	1 day @ Jenkins	1-06 =73.4m 4-06 =73.4m 18-06 =73.4m
17	62	Dec 5	101	2hrs 4 mins	878.5	Gordon to Pike	GA	3 days @ Rounds	0
18	66	Dec 9	97	2hrs 45mins	975.5	Pike to Terrell	GA	5 days @ Rawls	0
19	72	Dec 15	33	1hr 20mins	1008.5	Terrell to Worth	GA		13-06 = 5 miles
20	73	Dec 16	69.1	2hrs	1077.6	Worth to Hamilton	GA-FL	1 day @ Bird	0
21	75	Dec 18	62.8	2hrs 10mins	1145.4	Hamilton to Gilchrist	FL		20-06, 14-06 = 3 miles =5 miles
22	76	Dec 19	67.6	1hr 45mins	1213	Gilchrist to Halpata	FL		15-06 =125 miles
Total Flying Days 22	76	Arrived Dec 19		Total time 32hrs 44 mins	Total distance 1213 miles			Total down days = 54 days	
23	77*	Jan 11/07	16	48 mins	1229	Halpata to Citrus Co.	FL		02-06, 08-06 =1/2 mile 22-06 = 13 miles 04-06, 06-06, 23-06 = 16 miles
24	78**	Jan 12/07	10.1	18 mins	1239.1	Citrus to Citrus	FL		0
24 stops	78 days	Arrived Jan 12 07	101	33hrs 40 min longest = 2 hr 45 min	1239.1 Statute miles				7, 10, 11, 12, 19 made entire trip



HEALTH TEAM ANNUAL REPORT

Submitted by Dr. Barry Hartup

The Health Team provides veterinary support to WCEP at all points before and after release. Our mission is to maximize individual and population health and fitness in order to promote survival and reproduction in the re-introduced cranes. Our primary method is to utilize preventative medicine approaches based on objective assessments of disease risks. When needed, primary veterinary care and consultations have been provided, and a network of veterinary consultants is available in cases of emergency along the migration corridor.

Activities Related to 2006 Cohorts

Pre-release Mortality & Withdrawals = 9/31 = 29%

- WCEP no i.d. (DAR): 6/20/06, 26d old, euthanized; chronic respiratory problem, angular limb deformity (ALD), scoliosis.
- 3-06: 6/21/06, 44d old, euthanized; rib fractures, leg fracture and deformity.
- WCEP no i.d. (DAR): 6/26/06, 4d old, euthanized; failure to thrive.
- 17-06: 6/30/06, 36d old, euthanized; bone infection in toe, acute and severe aspiration pneumonia.
- 16-06: 7/2/06, 39d old, withdrawn; chronic respiratory issue, scoliosis.
- 25-06: 7/5/06, 34d old, withdrawn; eye infection (see below).
- 29-06: 9/14/06, 102d old; withdrawn; ALD.
- 31-06: 9/14/06, 95d old; withdrawn; ALD.
- 30-06: 10/18/06, 130d old; withdrawn; L humerus fracture.



The ICF veterinary team & young volunteer take samples used to screen the health of Cohort 1 cranes arriving at Necedah NWR. Photo by B. Pennypacker

Pre-release Clinical Problems

Developmental deformities involving the long bones of the leg, the toes or wings were documented in 21 chicks in 2006, 15 of those had toe problems only. Most problems were corrected with treatment, but 3 birds were withdrawn from the project, in part, due to the severity of their deformities. Congenital scoliosis was documented in two birds withdrawn from the project.

Five cases of respiratory problems (3 at PWRC, 2 at ICF) were managed. 18-06 was still on treatment when transferred to Necedah for a respiratory wheeze, but eventually resolved. 7-06 was treated for coughing and abnormal respiratory sounds while at Necedah which later resolved.

25-06 developed a corneal ulcer in the right eye at 10 days of age. The small puncture was probably due to running into a thorn while on a walk. Antibiotic therapy was started immediately, but the chick developed a *Pseudomonas* infection that spread rapidly across the cornea, rendering it opaque and the chick blind in that eye. Extensive treatment with antibiotics and surgery failed to completely resolve the blindness and the chick was removed from the project. The chick has survived and now has partial vision in that eye.

Parasitic Disease Issues

Six out of 18 chicks shipped from PWRC to Necedah were positive for endoparasites on arrival fecal examination. Fecal exams found: unidentified larval nematodes, strongyle and ascarid ova, possible coccidia oocysts. Ultralight birds received their first deworming treatments at their pre-shipment exams at PWRC, then received weekly treatments while at Necedah and throughout migration. DAR birds were dewormed similarly once at Necedah. By the pre-migration health checks, all birds had negative fecal exam results for endoparasites. Delivery failure or under-medication is a continuing concern for parasite control.

Bacterial Disease Issues

Non-pathogenic *Salmonella* lexington (E2) was detected in 11 birds at PWRC prior to shipment. Of these, 10 were shipped to Necedah and all tested negative on arrival. Four cranes initially negative prior to shipment tested positive on arrival at Necedah. All 14 of these cranes tested negative for *Salmonella* at their pre-migration health checks. No DAR birds tested positive for *Salmonella* at ICF or Necedah. *S. lexington* appears to now be endemic at PWRC, but shedding appears transient and easily cleared by the cranes following removal from that environment.

Fecal coliform testing of water from the Necedah pen sites was suspended this year due to high costs and poor sensitivity/specificity of this measure as a health indicator for the WCEP chicks. Current management of the water features appears adequate to prevent disease outbreaks, but should be re-evaluated regularly by the ultralight migration team based on weather and other environmental conditions. Testing will be conducted if a problem is suspected or if there are substantial concerns about the conditions at a particular site in the future.



Veterinary technician processes blood samples for health checks prior to ultralight migration departure. Photo by B. Hartup

Viral Disease Issues

West Nile virus (WNV) antibody testing was suspended this year due to vaccination of all chicks prior to release and to the widespread occurrence of WNV in North America. All chicks were vaccinated against Eastern Equine Encephalitis (EEE) prior to release. All chicks were negative for antibodies to avian influenza (AI) and Newcastle disease virus (NDV) prior to migration. No positive antibody titers to Infectious Bursal Disease (IBD) virus were found in chicks prior to shipping from PWRC. IBD results from the pre-migration checks are incomplete. No WCEP bird has been observed with disease linked to IBD exposure to date.

Miscellaneous Disease Issues

All zinc and blood lead levels were within normal ranges. All pre-shipment radiographs of the chicks prior to transfer to Necedah were negative for metallic foreign bodies.

Activities Related to Post-release Whooping Cranes**Recapture/Post-release Evaluations (opportunistic during transmitter change or relocations)**

- 16-02: 4/7/06, observed with injury to L leg, much improved by 5/31/06.
- 9-03 & 20-05: 5/5/06, Lewis Co. NY (translocated to Necedah), EEE seropositive (9-03 only).
- 16-05: 5/16/06, Eaton Co MI (translocated to Necedah), primary feathers curved excessively.
- 2-05: 6/1/06, Necedah, no problems identified.
- 2-01: 7/15/06, Necedah, ascarid and trematode ova positive.
- 21-05: 8/9/06, Necedah, no problems identified.
- 20-05: 8/11/06, Sandhill SWA WI, WNV pos (640), trematode ova positive.
- 8-04: 8/28/06, Necedah, no problems identified.
- 13-02 & 18-02: 9/7/06, Necedah, IBD seropositive (13-02 only), both *Salmonella* positive.
- 11-02: 9/15/06, Necedah, positive for hemoproteus (blood parasite), trematode ova positive.
- W1-06: 9/15/06, Necedah, 2 oral plaques (disseminated visceral coccidiosis?), trematode ova, nematode larva, and coccidia positive.
- 2-02: 9/24/06, Necedah, trematode ova positive.
- 12-03: 9/26/06, Necedah, alkaline phosphatase, lactate dehydrogenase enzymes elevated. Cause unknown.
- 11-03: 10/20/06, Necedah, no problems identified.
- 1-03: 11/8/06, Necedah, trematode ova and nematode larva positive.

Post-release Mortalities Recorded in 2006

- 17-04: late 5/06 estimated, Sandhill SWA WI. COD undetermined; evidence of traumatic injury, suspected fence/powerline strike.
- 22-05: 7/1/06 estimated, Mason Co MI. COD undetermined; contributing factors unknown, predation not generally supported by physical evidence.
- 2-03: 7/5/06 estimated, Meadow Valley SWA, Monroe Co WI. COD undetermined; poor water levels at site where found, predation suspected.
- 3-02: 7/22/06 estimated, Necedah NWR, WI. COD undetermined, poor water levels at site where found, predation suspected.
- 8-02: 12/27/06, Goose Pond FWA, Greene County, IN. COD aspiration; found immobile near powerline, died in rehabilitation at Indy Zoo. Necropsy results pending.

Health Team 2006 Progress Report

Mortality Report 2001-2006

The following table provides post-release mortality findings from a preliminary analysis of field reports, photographic documentation and pathology results by Gretchen Cole (UW-Madison) and Barry Hartup with generous assistance from Richard Urbanek and Sara Zimorski of the tracking team and Nancy Thomas (NWHC) and Marilyn Spalding. A final analysis focusing on potential causes of death and supporting pathological analyses will be submitted in April 2007 for publication and presented at the American Association of Zoo Veterinarians and American Association of Wildlife Veterinarians conference in October 2007.

Table 1. Selected statistics, known causes / suspected hazards involved in mortalities of re-introduced eastern migratory Whooping cranes, 2001-06.

Date of Death	Bird#	Age (yrs)	State	Confirmed COD	Primary Hazard	Result of Contact with Hazard	Contributing Factors to Contact with Hazard	Soft Tissue Condition	Carcass Status
12/17/01	4-01	0	FL	Predation	Predator	Predation	Poor roosting behavior	Fresh	Partial
5/2/05 est	6-01	4	WI	Predation	Fence/powerline	Impact trauma	Unknown	Fresh	Partial
1/10/02 est	10-01	0	FL	Undetermined	Predator	Predation suspected	Poor roosting behavior	Decomposed	Scant
7/22/06 est	3-02	4	WI	Undetermined	Unknown	Unknown	Poor water levels	Decomposed	Scant
8/30/03	7-02	1	WI	Aspiration	Translocation	Myopathy & handling trauma	Dispersal	Fresh	Complete
12/27/06	8-02	4	IN	Aspiration	Fence/powerline	TBD	TBD	Fresh	Complete
2/2/05 est	14-02	2	FL	Undetermined	Predator	Predation suspected	Intraspecific aggression	Decomposed	Scant
12/23/04 est	15-02	2	AL	Undetermined	Gunshot	Gunshot trauma	Waterfowl hunting	Fresh	Partial
7/5/06 est	2-03	3	WI	Undetermined	Predator	Predation suspected	Poor water levels	Decomposed	Partial
10/22/05 est	4-03	2	WI	Open	TBD	TBD	TBD	Fresh	Complete
11/12/04 est	5-03	1	SC	Undetermined	Predator	Predation suspected	Poor roosting behavior	Decomposed	Partial
7/23/04 est	19-03	1	MI	Undetermined	Unknown	Unknown	Traumatic injury, gunshot	Decomposed	Partial
3/14/05	5-04	0	FL	Predation	Predator	Predation	Poor roosting behavior	Fresh	Partial
5/3/05 est	14-04	1	WI	Undetermined	Predator	Predation suspected	Poor water levels	Decomposed	Scant
late 5/06 est	17-04	2	WI	Undetermined	Unknown	Impact trauma suspected	Unknown	Decomposed	Partial
7/9/05 est	18-04	1	WI	Undetermined	Fence/powerline	Impact trauma suspected	Unknown	Decomposed	Scant
7/1/06 est	22-05	1	MI	Undetermined	Unknown	Unknown - not predation	Unknown	Decomposed	Scant

We defined post-release as follows for the two sub-groups of the WCEP flock: 1) ultralight-led birds = day of arrival at the Chassahowitzka NWR pensite, 2) DAR birds = date of release in Wisconsin. Pathologists from the following institutions provided necropsy reports: NWHC, UF-Gainesville, USFWS Forensic Laboratory, and ICF.

Between December 5, 2001 and December 31, 2006, 17 post-release mortalities have been recorded by the tracking and health teams, representing 21% (17/80) of all released Whooping cranes in the eastern migratory population during that period (Table 1). 16 ultralight-led birds and 1 DAR bird were represented. The mean age (\pm SE) at death was 758 ± 116 days (2 yr, 1 mo). The average length of survival from release until mortality was 548 ± 115 days (1 yr, 6 mo). The greatest number of deaths occurred in yearlings (Figure 1) and during the month of July (Figure 2). The geographic distribution of the mortalities was: Wisconsin n=8; Florida n=4; Michigan n=2; Alabama n=1; South Carolina n=1; Indiana=1. Two of these mortalities had iatrogenic (human-induced) influences. One occurred in an otherwise healthy individual that was translocated for management purposes (7-02), the other was compromised with poor prognosis following an possible powerline strike in Indiana and would likely have died on its own (8-02).

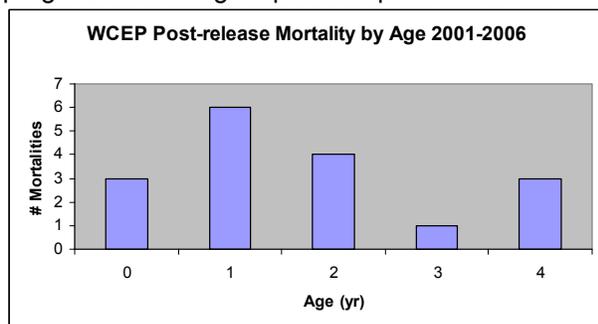


Figure 1: Age distribution of WCEP cranes at death. 0 = hatch year.

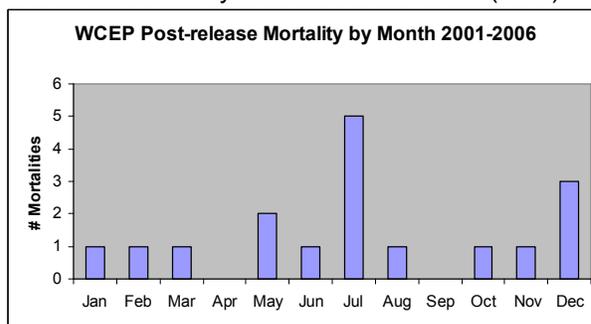


Figure 2: Monthly distribution of WCEP crane mortalities.

In most instances, the condition of the remains precluded an unequivocal determination of the cause of death for the crane. We therefore constructed a list of suspected or known hazards that each crane likely encountered based on a combination of the following information: conditions that were observed in the field during recovery, ranging and behavioral observations just prior to death, and physical signs among the remains that were consistent with pathology incurred from contact with the same hazards in Whooping cranes in other areas (Florida and AWBP population). We also summarized what we believed to be the most important factors that contributed to the exposure of each crane to the particular hazard. We agree that many of these determinations are subjective and may remain open to interpretation, but each has been thoroughly evaluated by multiple investigators with experience in Whooping crane anatomy, pathology and ecology. Discussion is welcome.



Pic3: Crane 30-06 following surgery to repair his fractured wing. This crane was withdrawn from the DAR release, but hopefully will become a contributing member to the captive breeding flock as an adult. (Photo: M. Wellington)

Our analysis suggests predation was a likely hazard in 7 of 16 finalized cases (44%). Traumatic injury from impacts with an artificial fixed structure (believed in most instances to be either fences or powerlines) appeared to be a factor in 3 deaths (19%), though full post-mortem evaluation is pending in one of these cases. Gunshot trauma was clearly identified as a primary hazard in 1 death (6%). A crane with a single shotgun pellet in a toe was not believed to have died from the wound, but we believe this could have been a contributing factor to the unknown primary hazard that led to this crane's death. Capture and translocation of 1 crane led to the development of exertional myopathy and death despite treatment (6%). The primary hazard leading to death remains undetermined for 4 cases (25%).

These statistics offer contrast and similarities with the Florida non-migratory re-introduction. Data courtesy of M. Spalding (January 2004, North American Veterinary Conference, Orlando, FL) shows roughly similar percentages of predation (58%), human related trauma (gunshot, powerlines, fences 8%), and undetermined (27%) causes of death in re-introduced Whooping cranes in Florida in comparison to eastern migratory cranes. However, we have yet to identify disease as a primary hazard in any WCEP death; in contrast, 8% of Florida non-migratory Whooping cranes have been documented with disease as a primary mortality factor. In addition, the overall proportion of dead birds among those released is significantly lower in the eastern migratory population 17/80 (21%, 2001-06) than the Florida non-migratory population 186/279 (67%, 1992-2003), chi-square = 52.2, $p < 0.001$.

We feel these preliminary data are instructive on several levels. Predation is likely the primary cause of mortality in the WCEP population. Unfortunately, we still do not have a positive identification of the predator(s) involved in the northern states. The remains that have been found to date do not exhibit the physical patterns typical to bobcat kills in Florida, have not been accompanied by field signs that make predator identification clear, and frankly, have been too degraded or scavenged to determine the initial predator. There is a strong suspicion of raccoons, coyote or possibly mustelid predators in these cases, but information from USDA specialists has been lacking so far. The health team will explore new resources to help in these determinations in the coming year.

A secondary hazard appears to be artificial structures such as fences and powerlines, but no pattern has yet emerged. We cannot determine what factors were at play that influenced the probability of these cranes to strike these objects. We recommend continued monitoring at key high risk sites frequented by cranes to see whether mitigation is warranted (i.e., marking).

The lack of evidence supporting disease is not unusual given the degraded condition of most of the carcasses that made them unsuitable for microbiological or histological analysis. We agree that many of these cases could have been influenced by primary or underlying disease syndromes that ultimately went undetected due to delayed retrieval of the carcass. In support of the lack of disease findings however, is the fact that virtually none of the birds included here exhibited gross abnormalities in behavior or ranging prior to death according to field observations.

Only more instances of rapid retrieval of carcasses in the field will yield better information on the impacts of disease in WCEP cranes and provide clearer information on predation and other mortality factors. We would encourage WCEP to consider more intensive monitoring of subsets of the population or consider other strategies that may meet these goals.

Avian Influenza

Avian influenza is a viral disease primarily found in poultry and wild birds. The viral strains are designated as high or low pathogenicity depending on the genetic makeup of the virus and the severity of disease caused in poultry. The virus is spread directly through feces, saliva and nasal discharge from infected birds and indirectly through contact with contaminated equipment and materials. Wild birds such as waterfowl, shorebirds, gulls and terns can be natural reservoirs for influenza viruses however historically the majority of isolates from wild birds have been of low pathogenicity.

In 1996-97, a virulent new strain of highly pathogenic avian influenza virus (HPAI H5N1) was detected in poultry in Asia and has since spread through Asia, Africa and Europe resulting in the largest and most severe outbreak to occur in poultry. Since 2003 there have been over 400 human cases with 157 deaths. An unusual aspect of this viral strain is that it has also caused mortality in over 80 species of wild birds. The role of wild birds in the outbreak is unclear. The USGS National Wildlife Health Center (NWHC) is involved in extensive, ongoing avian influenza wild bird surveillance projects throughout the US. As of January 2007, HPAI H5N1 has not been detected in poultry, people or wildlife in North America.

The US Dept. of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) along with the Dept. of Interior and Dept of Health and Human Services is developing a multi faceted national response plan for a rapid response in the event HPAI is detected in the US. A summary of the current draft plan can be found at www.aphis.usda.gov/newsroom/hot_issues/avian_influenza/avian_influenza_summary.shtml.

Emergency response actions are outlined. Specific actions will depend somewhat on the circumstances surrounding a presumed or confirmed HPAI outbreak. A final version of the response plan is under development. Updated information on Federal Response plans will be relayed to WCEP by NWHC, as it is available.

The WCEP Health Team recommends that disease management and control procedures at the captive centers take precedence over WCEP activities when a conflict arises or when instructed following consultation with a regulatory authority. We do not expect WCEP activities to be significantly impaired in the event of an HPAI outbreak, but responsibility to the preservation of the captive flock and assurances to the general public that Whooping cranes are not the source of spread of HPAI may take precedence over meeting WCEP's short-term goals.

We believe preventive strategies will have the greatest success in overcoming regulatory hurdles preventing WCEP activities from going forward. Therefore, ICF has shared a copy of its HPAI prevention plan for approval from the state Division of Animal Health (WDAH), which holds final authority on control procedures in the event of an outbreak in Wisconsin. ICF has also shared this plan with the Sauk County Public Health office, which may be important if HPAI becomes a significant human health issue. A response plan for the PWRC flock has been submitted to the center's administrative staff, and a plan is in place at the Calgary Zoo. Disease management strategies at other captive breeding centers (ACRES, San Antonio) will need to be assessed by the Whooping Crane Health Advisory Team.

Disease management and control procedures for captive cranes at Necedah NWR will be coordinated by the WCEP Health Team with the assistance of the Direct Autumn Release and Ultralight Training & Migration Teams working in conjunction and under the direction of FWS, USDA-APHIS, and WDAH. The Health Team will continue to carefully document the health status of all WCEP cranes coming from captive centers and prior to and following migration. This will be vitally important during discussions with other agencies while assessing risks from/to the cranes and formulating outbreak management plans.

Fortunately, current management of the cranes decreases the likelihood of HPAI introduction or transmission among the cohorts or to people (the cohorts are separated and are predominantly isolated from wild counterparts at the pen sites, caretakers wear costumes and boots that are regularly laundered and dipped in a bleach footbath prior to entry of bird areas, etc.). However, no specific recommendations can be made at this time regarding changes to protocols in the event of an outbreak at Necedah without a full written account of field procedures from both the DAR and Ultralight Training & Migration Teams. These should be prepared as soon as possible in 2007.



Pic. 4: Dr. Betsy Stringer of the Indianapolis Zoo and WCEP Veterinary Network helps provide emergency treatment for injured crane 8-02 in December. (Photo: R. Urbanek)

Disease management and control procedures for free-ranging cranes in other areas of Wisconsin will be coordinated by the Wisconsin Department of Natural Resources wildlife veterinary program working in conjunction with the FWS, USDA-APHIS and WDAH. Currently, the State of Florida will work in conjunction with and under the guidance of USDA if HPAI occurs in that state. Wildlife management objectives during an HPAI outbreak in domestic poultry will focus on assessing risks to susceptible wildlife in these areas, determine whether surveillance is needed, and whether there is spread and ongoing transmission in wildlife. The Health Team feels that the best approach for managing the risk from HPAI is to continue to monitor the health status of the WCEP cranes at several points during their development to demonstrate the low potential of the cranes being exposed to, spreading or transmitting the disease.

HEALTH TEAM ANNUAL REPORT – CONT'D

Contributions from New Partners

Veterinarians from Disney's Animal Programs (DAP) have taken on the responsibility of providing clinical services for WCEP cranes in Florida. Activities included one Chassahowitzka pen visit prior to spring migration and the post-migration health checks of the 2006 ultralight-led cohort. On December 20, 2006 a team of 5 people (Scott Terrell, Don Neiffer, Lidia Castro, Leanne Blinco, and Vicki Sikorski) traveled to the Halpata pensite to perform the exams. Full physical examination, sample collection, and documentation were performed on 17 birds in the morning and on 1 late arriving bird in the afternoon.

Samples were processed for complete blood counts, chemistry analysis, blood lead, serum zinc, fecal parasite screening, and testing for a variety of viral diseases (WNV, EEE, AI, NDV, IBD). Medical records were generated for each of the birds using Disney's ZooMR medical records computerized database. Images of the procedures were archived in Disney's Vision photo management software. Sample results are being interpreted and processed at the time of this writing and will be summarized and collated for archiving as per protocol.

WCEP 30-06 (DAR) was transferred to the Milwaukee County Zoo on October 19, 2006 following successful surgery for a left humerus fracture at the School of Veterinary Medicine, University of Wisconsin in early October. The cause of the trauma remains unknown, but predator disturbance at the pensite seems likely. The bird has recovered from its injuries and the implant that was placed to assist with fracture healing has been completely removed. The bird remains in the hospital pen, but preparations are underway on a new exhibit enclosure that should be available by March 2007.

Other Objectives

ICF, WDNR and DAP veterinary staff have continued to provide the various teams with basic medical supplies to carry in the field as needed for sampling of birds, for emergency first aid, and to manage the shipping of dead birds for postmortem analysis. The Health Team will continue to offer training to field personnel for biological sampling, and coordinate handling practice as requested.

No problems with vaccinations for EEE and WNV were encountered this year. Health Team protocols for 2007 will continue to include vaccination against these two viruses.

The WCEP migration veterinary network now consists of 26 volunteer and partner institutions. All WCEP bird teams should have an annually updated migration veterinary network list.

WDNR have continued to coordinate with the monitoring team to obtain health data during re-captures. WDNR has recently developed a standardized data form for field use during both recaptures and capture of wild hatched chicks, so that consistent health data can be obtained when a WDNR representative is not available to attend captures. We hope to have this in use this coming spring.

The Health Team thanks all other teams and partners for providing copies of relevant materials for archiving purposes. We now have a complete record of all recapture health evaluations and post-release mortalities. We will attempt to complete an inventory of all veterinary methods used with WCEP veterinary data this year.

WCEP Related Publications in Preparation

Cole, G., N. Thomas, M. Spalding, R. Stroud, R. Urbanek and B. K. Hartup. Post-release mortality of reintroduced migratory Whooping cranes in the eastern United States. For submission to: Journal of Wildlife Diseases.

WCEP Related Publications and Manuscripts Under Review

Kelley, C. and B. K. Hartup. Risk factors associated with developmental limb abnormalities in captive Whooping cranes. Proceedings of the North American Crane Workshop vol. 10, under review.

Hansen, C. H., B. K. Hartup, O. D. Gonzalez, D. E. Lyman, and H. Steinberg. West Nile encephalitis in a captive Florida sandhill crane. Proceedings of the North American Crane Workshop vol. 10, under review.

Hartup, B., J. Langenberg, G. Olsen, M. Spalding and K. Miller. 2006. Health management for the re-introduction of eastern migratory Whooping cranes (*Grus americana*). *Wildlife Rehabilitation*, 23: 13-16.

WCEP Related Presentations

Hartup, B. K. "Veterinary Care of Endangered Species." UW-Washington County Science Club Seminar, West Bend, WI, 2006.

Hartup, B. K. "Surveillance for West Nile Virus exposure at the International Crane Foundation, 2000-2004." Tenth North American Crane Workshop, Zacatecas, Mexico, 2006.

Hartup, B. K. and H. S. Sellers "Serosurvey for Infectious Bursal Disease virus exposure in cranes." Tenth North American Crane Workshop, Zacatecas, Mexico, 2006.

Spalding, M., H. S. Sellers, B. K. Hartup and G. H. Olsen. "A wasting syndrome in released Whooping cranes in Florida associated with Infectious Bursal Disease." Tenth North American Crane Workshop, Zacatecas, Mexico, 2006.

Hartup, B. K. "Preventive medicine at the International Crane Foundation" and "Update on avian influenza (H5N1)". CCCC, CAZG, Qiqihar, People's Republic of China, 2006.

Hartup, B. K., J. Langenberg, G. Olsen, M. Spalding and K. Miller. "Conservation medicine in action: Health management for the re-introduction of eastern migratory Whooping cranes." CCCC, CAZG, Qiqihar, People's Republic of China, 2006.

Olsen G. H. and J. French. "Behavior comparisons for Whooping cranes raised by costumed caregivers and trained for an ultralight-led migration." Tenth North American Crane Workshop, Zacatecas, Mexico, 2006.

Olsen G. H., K. Miller, D. Docherty and V. Bochsler. "West Nile virus in crane chicks." Tenth North American Crane Workshop, Zacatecas, Mexico, 2006.

WCEP Health Team: Barry Hartup (Chair, International Crane Foundation), Julie Langenberg (Wisconsin Department of Natural Resources), Kim Miller (USGS National Wildlife Health Center), Glenn Olsen (USGS Patuxent Wildlife Research Center), Marilyn Spalding (University of Florida – Gainesville), Scott Terrel & Don Neiffer (Disney's Animal Programs).

Many thanks are extended to all of our WCEP colleagues, including aviculturists, technical and laboratory staff, who have contributed to the health care of the WCEP flock. Special thanks go out to Joanne Paul-Murphy, Kurt Sladky, Susan Schaefer, Gretchen Cole and Ann Stewart (UW-Madison), Jan Ramer, Jeff Proudfoot and Betsy Stringer (Indianapolis Zoo), Roberta Wallace and Vickie Clyde (Milwaukee County Zoo), Murali Pai (Wildlife Trust of India), Christina Hansen (U of Illinois), Richard Urbanek and seasonal staff of FWS, Marianne Wellington, Nat Warning, Sara Zimorski, Kelly Maquire and seasonal staff of ICF, Mark Nipper, Bev Paulan and seasonal staff of OM, Brian Clauss, Robert Doyle, Charlie Schafer, Barbara Clauss, Jennifer Green, Sharon Marroulis, and Melody Nevins (PWRC), Nancy Businga (WDNR) and Lidia Castro, Leanne Blinco, and Vicki Sikorski (DAP).



TRACKING AND DIRECT AUTUMN RELEASE

Submitted by Dr. Richard Urbanek

This report documents the biology of Whooping cranes in the reintroduced eastern migratory population during calendar year 2006 and with additional notes from January 2007. A recently implemented reintroduction technique, direct autumn release (DAR), is also described. The distribution during this report period, overlaid on total distribution during the course of the reintroduction, appears in Fig. 1. Identification information for all Whooping cranes in the eastern migratory population as of 20 January 2007 appears in Appendix A.

Winter 2005/2006

Movements and Distribution

On 1 January 2006 the population included 45 individuals (25 males, 20 females). They were distributed in Florida (35), Tennessee (7 at 2 sites), South Carolina (1), North Carolina (1) and location undetermined (1) (Table 1). The largest concentration was on cattle ranchland in Pasco County (9). Two DAR juveniles wintered in Tennessee and 2 in Florida, all with Sandhills.

A few birds made significant movements mid-winter. These included two pairs that left west-central Florida together on 1 February: nos. 1-03 and 11-03 moved to a previous winter territory in South Carolina, and nos. 3-02 and 17-03 probably also moved to South Carolina (tracking resources inadequate to confirm). No. 18-03 moved from Columbus County, North Carolina, to Georgetown County, South Carolina, on ~19 Feb.

A few birds, (e.g., nos. 16-02 and 3-03 from 28 January to 5 February), exhibited erratic, widespread movements before returning to their usual territory.

Chassahowitzka NWR Pensite

The 19 ultralight-led juveniles (11 males, 8 females) had arrived at the holding site on Halpata Tasthanaki Preserve, Marion County, on 13 December 2005. The final migrating adults cleared the Chassahowitzka pensite on 25 December. Eighteen of 19 ultralight-juveniles were led to the pen on 9-11 January. One (no. 16-05) appeared flight-impaired, did not follow the aircraft, and was transported by truck and boat on 19 January. All 19 juveniles were released from the topnetted enclosure on 21 January and were joined by no. 9-03.

No. 9-03 arrived at the Chassahowitzka pensite on 14 January. She had been retrieved from North Carolina and released near Hixtown Swamp on 16 December 2005. She remained at the pensite and joined the juvenile flock during the remainder of the winter.

Juveniles were occasionally returned to the topnetted enclosure (30 Jan-2 Feb, 5 Feb, 14 Feb [13 juveniles only], and 15-18 Feb) either to avoid adults or to accommodate logical/staffing concerns.

Spring Migration

HY2001-04

Dates of departure from the winter areas appear in Table 1. Except for nos. 9-03 and 18-03 (see below), migration was within the Florida-Wisconsin corridor. The earliest bird to migrate was no. 7-01, reported in Ewing Bottoms, Jackson County, Indiana, on 15 February. She had last been reported on Hiwassee Wildlife Refuge, Meigs County, on 8 February.

By 20 March, 15 Whooping cranes were confirmed returned to the Necedah NWR area and 2 others were on the Wisconsin River.

Nos. 16-02 and 3-03 were reported off-course on Hatchie NWR, Haywood County, western Tennessee, 13-18 March. The male no., 16-02, was next reported with an injured leg in Todd County, Minnesota, 7-12 April. The female, no. 3-03, returned to their territory on Necedah NWR on 12 April. No. 16-02 returned with the injured leg to their territory on 18 April. Apparently because of the injury, he eventually lost his mate and his territory. However, by June he had recovered from the injury and was again capable of normal movement.

Nos. 1-03 and 11-03 were reported in Mason County, Michigan, 1-4 April. This area was occupied by nos. 1-03 and 18-03 in 2004 and 2005, before those birds were retrieved and returned to Necedah NWR on 30 June 2005. Nos. 1-03 and 11-03 appeared on their territory on Necedah NWR on 6 April. They apparently flew over Lake Michigan to complete migration. Lake Michigan has typically blocked migration of younger birds. The pair disassociated after return, with no. 1-03 ranging widely in eastern Wisconsin during spring wandering. The pair did reform during the summer.

HY2005 DAR

After wintering together at Hiwassee Wildlife Refuge, Tennessee, females nos. 27 and 28 separated during migration and then used stopovers in northwestern Indiana, where they were present from 27-28 Feb to 30 March. They never rejoined, but then moved to different sites in Green Lake County, Wisconsin. They remained with large numbers of Sandhills.

No. 28 moved from White River Marsh, Green Lake County, to complete migration to Necedah NWR on 23 April. No. 27 completed migration to Necedah NWR on 27 April. Both birds exhibited typical yearling behaviors, staying in the area only 1 night and then leaving. By mid-May they had moved to general summering areas near Rush Lake, Winnebago County (no. 27) and Shortville, Clark County (no. 28). After more wandering, by 2 June no. 28 arrived on McMillan SWA, Marathon County, where she spent the summer just north of the core reintroduction area.

No. 32, not encountered during migration, was found near Black River Falls, Jackson County, in the core reintroduction area of Wisconsin on 5 May. He returned to Necedah NWR on 18 May before moving to the Leola area of Adams County to spend the early summer.

No. 33 migrated to southwestern Barry County, Lower Michigan. She arrived on 18 April and summered near Guernsey Lake. She was with a small number of sandhill cranes, which resulted in failure of a retrieval attempt on 20 June.

HY2005 Ultralight-led Flock

No. 20-05 began migration with no. 9-03, an older female with a history of errant migration, from the Chassahowitzka pensite on 27 March (Table 1). Both migrated together to Indiana, Lower Michigan, Ontario, New York, and Vermont (Fig. 1, all red points in Michigan thumb, near Lake Ontario and farther east). On 5 May both birds were retrieved in Lewis County, New York, where no. 9-03 had spent the previous summer, and transported and released back on Necedah NWR.

The remaining 18 juveniles began migration from the pensite on 28 March and separated into three groups.

The main migrating group contained 14 HY2005 juveniles (all except nos. 11, 16, 20, 21, and 22, see below). They migrated directly within the Florida-Wisconsin corridor with stops in Turner/Crisp Counties, Georgia; Hamilton County, Tennessee; Spencer County, Kentucky; Jefferson County, Indiana; DuPage and McHenry Counties, Illinois; and Sauk County, Wisconsin, before completing migration by overflying Necedah NWR to roost in Trempealeau County, Wisconsin, on 6 April.

Nos. 11 and 21 were not tracked from their first stop in Turner County, Georgia. They returned to Necedah NWR on 19 April.

Because of an injury, no. 16 had missed a significant portion of the northern part of the ultralight-led migration during autumn 2005. He also appeared to be flight-impaired during the winter in Florida.

TRACKING AND DIRECT AUTUMN RELEASE – CONT'D

However, no flight impairment was apparent during spring migration. Nos. 16 and 22 migrated together to Lower Michigan and then separated. No. 16 was reported near Grand Ledge, Eaton County, Michigan, on 12 May. He was retrieved on 16 May and released on Necedah NWR.

No. 22 was reported near Amble, Montcalm County. A retrieval attempts there on 19 May failed. He moved to the Walkinshaw Wetlands area, Oceana County, on 2 June. By this time he had joined Sandhills. No. 18-03 was molting at the same site. Another attempted retrieval of no. 22 on 14 June also failed. No. 22 was not found alive again. He died during summer and his decomposed remains were found in Mason County on 28 October.

Spring, Summer, and Autumn

As in previous years, almost all birds except some with a history in Lower Michigan returned to Necedah NWR or adjacent areas at the completion of spring migration. The spring wandering period, most pronounced in yearlings, then began. As in previous years, the yearlings separated into smaller groups and wandered extensively during spring. Areas used in 2006 by the most ultralight-led birds were Fleming Creek and Neshonoc Lake, LaCrosse County, Wisconsin, and Winnebago, Fayette, and Chickasaw Counties, Iowa (Fig. 1).

With some exceptions (see below), released Whooping cranes generally summered in or near the core reintroduction area in Central Wisconsin (Table 2, Fig. 2). Most birds were settled on summering areas by mid-June.

Autumn distribution was similar to summer distribution for most birds in the population (Tables 2 and 3). The main exceptions were as follows:

No. 18-03 staged in or near Baker Sanctuary, Calhoun County, southern Lower Michigan.

Nos. 7-04 and 8-05 left Necedah NWR on 29 August and moved to Morrison and Benton Counties, Minnesota, through mid-September. No. 7-04 had spent autumn 2005 there with nos. 1-04 and 8-04. Nos. 7-04 and 8-05 returned to spend autumn in Wisconsin, first along the Big Eau Pleine River and later on George W. Mead SWA, Marathon County.

HY2005 nos. 2, 3, and 7 returned to spend autumn in Winnebago and Hancock Counties, Iowa, in the same general area occupied during spring wandering.

Nos. 5-05 and 6-05 moved to Bass Creek, Rock County, in southern Wisconsin and remained there during autumn.

No. 9-05 returned from northwestern Wisconsin and staged with Sandhills in or near the northwestern part of the core reintroduction area.

No. 27-05 (DAR) remained with staging Sandhills and moved briefly to northwestern Marquette County, before settling on a large staging area along Neenah Creek, southwestern Marquette County.

Autumn Migration

Migration departures in approximate order by date were as follows:

Nos. 23-05 and 24-05: 22 October

No. 9-05 remained with Sandhills and left Clark/Jackson Counties, Wisconsin, shortly after 22 October. He was reported in Fayette County, Georgia, on 28 October. He was one of the first birds to arrive in Florida.

Nos. 26-06 (DAR) and 28-06 (DAR): 28 October (see below)

No. 7-01 in late October: Observed at Jasper-Pulaski SFWA, Indiana, on 28-30 October and in Ewing Bottoms, Jackson County, by 12 November.

HY2005 no. 2, 3, and 7-05: 31 October from Winnebago County, Iowa. First group to arrive in Florida (Hixtown Swamp, Madison Co.) on 6 November. By 10 November they were on their wintering area near Williston, Levy County, Florida.

Nos. 8-04 and 1-05: 3 November
No. 15-04: ~1 November
Nos. 1-02 and 6-03: 9 November
Nos. 7-03 and HY2005 nos. 10 11 12 and 19: 9 November
No. 20-04: 9 November
Nos. 14-05 and 21-05: 11 November
Nos. 1-02 and 2-02: 11 November

Excellent migration conditions occurred on 19 November and resulted in mass initiation of migration by sandhill and Whooping cranes. On that date 28 Whooping cranes began migration and 4 others moved farther south in Central Wisconsin. By 20 November only 12 Whooping cranes remained (5 pairs and 2 DAR juveniles). Cranes departed in the following groupings on 19 November:

No. 2-01
Nos. 5-01, 4-02, and 5-02
Nos. 9-02 and 16-04
Nos. 11-02, 17-02, and W1-06
Nos. 16-02, 16-05, and 32-05 (DAR)
Nos. 1-03 and 11-03
Nos. 3-03 and 17-03
Nos. 9-03 and 20-05
Nos. 10-03, 2-04, 3-04, and 12-04
No. 1-04
Nos. 5-05 and 6-05
No. 27-05 (DAR)
No. 28-05 (DAR)
No. 33-05* (DAR)

An arctic air mass moved into Wisconsin on 29 November and resulted in initiation of the remaining 12 Whooping cranes on 29 and 30 November:

Nos. 8-02 and 13-03 and nos. 13-02 and 18-02: 29 November
Nos. 12-02 and 19-04: 30 November
Nos. 12-03, 16-03, 27-06 (DAR) and 32-06 (DAR): 30 November (see DAR below)
Nos. 7-04 and 8-05: 30 November

The following cranes passed through Jasper-Pulaski during autumn migration: Nos. 1-01 and 2-02; 7-01; 20-04; 27-05; and 28-05.

Nos. 9-03 and 20-05 completed migration to the Chassahowitzka pensite on 18 December. This was the first successful unassisted migration between Wisconsin and Florida for either bird. No. 9-03* had made three spring migrations to Michigan, New York/Vermont, and New York and two previous autumn migrations to North Carolina. She was retrieved in North Carolina in autumn 2005 and re-released in northern Florida. She moved to the Chassahowitzka pensite on her own and wintered there with the HY2005 cohort. In spring 2006, no. 20-05 migrated with no. 9-03 to New York, where the two birds were retrieved and re-released to summer in Wisconsin (see above).

TRACKING AND DIRECT AUTUMN RELEASE – CONT'D

The only bird to deviate strongly from the Wisconsin-Florida corridor was no. 8-05. After separating from no. 7-04 during migration, no. 8-05 took a westerly track alone through western Kentucky and then southward to Alabama and extreme western panhandle Florida on the Gulf Coast. She was then with small numbers of sandhill cranes. By 3 January 2007, she had moved farther west to Tangipahoa Parish, southeastern Louisiana.

Winter 2006/2007

Arrivals were as follows (on listed territory in Table 4 unless otherwise specified):

Nos. 1-01 and 2-02: 23 November

No. 2-01: to Chassahowitzka pensite on 10 December; moved to Stafford Lake, Hernando County, following day

Nos. 5-01 and 4-02: by 24 November

No. 7-01: 8-16 December

Nos. 1-02 and 6-03: to Tsala Apopka Lake, Citrus County, on 10 December, and then moved to their winter territory on Lake Woodruff NWR the following day

No. 5-02: by 24 November

Nos. 9-02 and 16-04: by 18 December

Nos. 7-03 and HY2005 nos. 10, 11, 12, and 19-05: to Priest Prairie, Levy Co., by 2 January. Moved to winter on Paynes Prairie, Alachua County, by 7 January.

Nos. 13-02 and 18-02 arrived on former territory near Winchester, Franklin County, Tennessee, on 4 December. Apparently because of low water levels and poor habitat conditions, moved to Wheeler NWR, Alabama, on 27 December.

No. 16-02: 5 December

Nos. 1-03 and 11-03: confirmed on territory on Donnelley WMA, South Carolina, on 9 December.

Nos. 3-03 and 17-03 arrived on Stafford Lake on 11 December.

Nos. 9-03 and 20-05: to Chassahowitzka pensite on 18 December

No. 10-03 separated from HY2004 nos. 2, 3, and 12-04 in southern Georgia on 6 December. He changed course and arrived on his winter territory on Ace Basin NWR, South Carolina, on 9 December.

Nos. 12-03 and 16-03: by 15 Dec on Paynes Prairie (previous territory unsuitable due to drought)

No. 1-04: in flight over Pasco County, Florida, on 24 November; arrived NE of Gowers Corner on 30 November.

HY2004 nos. 2, 3, and 12-04: After separating from no. 10-03 in southern Georgia, these subadults were found in Nichols Lake, Lafayette County, Florida, on 8 December. Their previous wintering area in nearby San Pedro Bay was in drought condition. They were last recorded at Nichols lake on 26 December and since moved to an undetermined location.

Nos. 7-04 and 8-05 separated during migration. No. 7-04 arrived at Crews Lake, Pasco County, by 28 December.

Nos. 8-04 and 1-05 arrived northeast of Gowers Corner, Pasco County, on 5 December.

No. 20-04: by 7 December; with large numbers of Sandhills

No. 15-04: by 22 November.

HY2005 nos. 5, 6, and 21: at Halpata by 24 November, then moved.

No. 8-05: Baldwin County, Alabama, on 9 December. By 3 January in Tangipahoa Parish, Louisiana.

No. 9-05: arrival undocumented at Lake Minneola and Cherry Lake, Lake County, before, possibly much earlier than 22 November.

No. 14-05 arrived northeast of Gowers Corner, Pasco County, on 5 December.

No. 21-05: detected south of Chiefland in flight on 22 November.

No. 27-05 (DAR): by 9 December

No. 28-05 (DAR): 8 December

No. 16-05: arrived Hixtown Swamp, Madison County, on 22 November; landed at Chassahowitzka pensite on 23 November.

Nos. 23-05 and 24-05: found north of Halpata pensite on 22 November, then gone next day. By 30 November on wintering area at Big Wolf Arbor.

No. 32-05 (DAR): in flight near Cross City, Dixie County, on 22 November

No. 33-05 (DAR): by 20 November

Nos. 8-02 and 13-03: by 4 December.

Early arrivals at the Chassahowitzka or Halpata pensites could not be intensively monitored in 2006 because of insufficient staff. Many arrivals, especially yearlings, demonstrated pre-winter wandering before settling on a wintering site. This process remained ongoing for several birds in January 2006.

Survival

Of 99 Whooping cranes released as juveniles since the reintroduction began in 2001, 81 were alive as of 20 January 2007. Primary contributing factors to the 18 mortalities (Table 5) were predation (9), powerline strike (2), gunshot (2), predation of an injured bird (1), capture myopathy (1), and undetermined (3). Mortalities due to predation resulted from bobcats in southeastern U.S. (5), an undetermined predators in Wisconsin. Three incidents of predation in Wisconsin in 2007 appeared related to drought and low water levels near predator cover. A protective protocol, initiated shortly after two birds in the first cohort were killed just after release, has been effective in reducing potential bobcat predation at the winter release site on Chassahowitzka NWR. No mortalities occurred during winter 2005/06.

Nesting

Except for pair nos. 16-02/3-03, containing the male with the injured leg (see above), 6 of the pairs which had demonstrated some type of breeding activity in 2005 had returned by April 2006, and 1 new pair had formed. Five of these pairs nested (Table 6). All original nests apparently failed because of inadequate attention and/or subsequent predation. One pair, nos. 11-02/17-02 successfully renested and hatched 2 eggs.

Chick Rearing and Recruitment

Central Wisconsin was experiencing extreme drought by early summer. The nest marsh of nos. 11-02 and 17-02 east of East Rynearson Pool (ERP) was dry by 9 July, after which the family moved to the west (pool)

side of the dike. Green frogs (*Rana clamitans*) were abundant and concentrated at this time and comprised the major component of the diet.

Nos. 11-02 and 17-02 continued rearing both of their chicks in their territory on East Rynearson Pool until 12 September. On that date the parents and the largest chick left their territory and flew just off the south boundary of the refuge. This chick was captured and returned to ERP by costumed project staff and after several short flights on the east side of the pool remained to roost on ERP. The parents did not return but roosted on the East DU Unit. The other chick remained on ERP, and the two chicks did not reunite. On the morning of 13 September, the chick that had left the refuge on the previous day left again and rejoined the parents in a farm field south of the refuge and on the East DU Unit. The parents and this chick remained together on or near the East DU Unit during the remainder of the week. On 15 September this chick was captured, colorbanded, and equipped with a radiotransmitter.

The chick that had remained on ERP was not observed alive again after the evening of 12 September. The remains of the latter chick were found on an island in East Rynearson Pool on 23 November. This island had frequently been used as a roost site by the family during the summer and was less than 100 m from the location where the chick was last seen alive on 12 September. The chick was likely killed by a predator shortly after that observation, probably on that night.

The family did not return to their territory until 20 September, and they continued to return to the DU Unit. They returned to consistently roost the majority of the time on ERP on 29 September. They continued to forage at both of these sites and in farm fields just off the southern refuge boundaries. They also occasionally roosted on Necedah Lake and later on Pharm-Becker Pool.

On the evening of 18 November, the family moved to West Rynearson Pool, where they roosted in the large staging flock containing 19 Whooping cranes and more than 1,000 sandhill cranes. This was the first time that the family had used this roost site. The family moved to Necedah Lake on the following morning and then departed on migration. They landed to roost in floodings along the Wabash River, near Newport, Vermillion County, Indiana.

They resumed migration on 7 December and were detected migrating through south-central Tennessee during mid-afternoon on that date. They landed at the Chassahowitzka NWR pensite, where they remained to roost, on 9 December. The family completed migration to their winter territory on ranchland in Pasco County on 10 December, an that was experiencing severe drought. The family moved back to roost at the Chassahowitzka pensite on 11 December. On 12 December they returned to their territory in Pasco County but then again roosted back at the Chassahowitzka pensite.

They remained on Chassahowitzka all day on 13 December and left during afternoon on 14 December. They were found the next day on Tooke Lake, Hernando County, on a lake in a large housing development. They were in full view of houses circling the lake and <50 m from backyards. The family remained at this site in January 2007.

Pair Formation

Only pairs with at least 1 member age 2 years or older are included in the following summary.

Breeding pairs dissolved or lost due to mortality or injury during 2006-07:

Nos. 5-01 and 4-02

Nos. 3-02 and 17-03 (active nest in 2006)

Nos. 9-02 and 2-03 (sibling pair, active nest in 2006)

Nos. 16-02 and 3-03

Surviving pairs that have produced eggs as of 20 January 2007:

Nos. 1-01 and 2-02

Nos. 11-02 and 17-02

Nos. 13-02 and 18-02

Adult pairs with no history of egg production:

Nos. 1-02 and 6-03 (sibling pair)

Nos. 11-03 and 1-03

Nos. 16-03 and 12-03

Pairs formed spring/summer 2006:

Nos. 8-02 and 13-03 (lost after mortality of no. 8-02, December 2006)

Nos. 9-02 and 16-04 (no. 9-02 repaired after death of mate no. 2-03)

Nos. 12-02 and 19-04

Nos. 3-03 and 17-03 (sibling pair; no. 3-03 paired with no. 8-04 after pair bond with no. 16-02 dissolved; after death of mate no. 3-02, no. 17-03 disrupted pair bond of nos. 8-04/3-03 and repaired with no. 3-03)

Nos. 7-04 and 8-05 (dissolved during autumn migration)

Nos. 8-04 and 1-05

Pairs possibly forming winter 2006/07:

Nos. 2-01 and 16-02 (sibling pair)

Nos. 7-04 and 9-03 (sibling pair)

HY2006 Direct Autumn Rel (DAR)

Year 2006 was the second in which Whooping crane chicks were specifically reared for release with older cranes on the northern reintroduction area. Juveniles were released during the autumn staging period to learn survival skills and the migration route from older, experienced cranes.

Rearing

Seven Whooping crane chicks (5 males and 2 females) were costume/isolation-reared at ICF for DAR, hatching between 25 May and 16 June. Five eggs were produced at ICF and 2 at Calgary. The chicks were transferred to the isolation-rearing field facility (Site 3) at Necedah NWR on 3 July when chicks were 17-39 days of age. The chicks were frequently attended by costumed parents in the chickyard and surrounding field and marsh during the day and locked in their individual compartments in the building at night. Nos. 29 (male) and 31 (female) were eventually removed from the project as a result of developmental leg deformities (hock rotations). No. 30 (male) was removed after he fractured his left humerus while in the wet pen during a thunderstorm on the night of 1 October. Recovery would not have been in time for the upcoming migration. All removed birds were remanded to permanent captivity.

No. 2-01 returned to Site 3 on 11 July and remained through the summer. She was generally dominant over the chicks and overall an aggressive nuisance. A resident pair of sandhill cranes was also present at the site throughout the summer. At least 14 different adult or subadult Whooping cranes visited the rearing site during the summer or autumn, however no. 2-01 dominated the site, and none of these other cranes consistently remained for more than a day.

Chicks fledged (cleared 100 m without touching the ground) by mid-August to mid-September (76-82 days after hatching). They were moved from the rearing building to the topnetted wet pen during mid-August. They were allowed to roam freely in the immediate area during daytime with frequent checks by costumed parents, and the group was locked in the wet pen at night, where they roosted in water.

The premigratory health check was performed on 14 September; results were normal. Juveniles nos. 26, 27, 28, and 32 were banded and equipped with transmitters on 17 October.

Release

All juveniles were released at sites occupied by older Whooping cranes. Released juvenile Whooping cranes roosted and foraged in appropriate habitats with older Whooping cranes and/or Sandhills during the release period.

Nos. 27 and 32 were released on eastern Sprague Pool on the evening of 20 October. They remained on the pool on 21 October. Nos. 26 and 28 were released on ERP on the evening of 21 October and quickly returned to Pharm-Becker Pool (in their rearing area at Site 3) and remained there to roost.

Nos. 27 and 32 remained on eastern Sprague Pool on 22 October and associated with resident pair nos. 11-03/1-03. On the morning of 22 October, nos. 26 and 28 returned to ERP and associated with nos. 10-05 and 11-05. After moving back to Site 3, these juveniles returned to ERP in late afternoon and associated primarily with nos. 7-03, 12-05, and 19-05 (Fig. 4) before remaining there to roost.

HY2006 nos. 26 and 28 remained mainly on ERP until they began migration with Sandhills on 28 October. They also used Site 3 and a cornfield east of the refuge. The two juveniles were usually together and sometimes associated with Whooping cranes or sandhill cranes.

HY2006 nos. 27 and 32 remained on eastern Sprague Pool, usually together but sometimes apart. The only recorded exception occurred on 28 October, when no. 32-06 left the refuge and was with nos. 1-02 and 6-03 in a large sandhill flock on a cranberry farm southeast of Finley. During November, the 2 DAR juveniles became closely associated with nos. 12-03 and 16-03, and they migrated with them on 30 November.

Migration and Wintering

Nos. 26 and 28 left ERP on the morning of 28 October and were subsequently detected in flight south of the refuge but soon outdistanced the single ground tracker. No. 28 was equipped with a PTT, but no reading was received on that night. PTT readings for the following two nights indicated that no. 28-06 was roosting along the East Fork of the White River bottoms, Jackson County, southern Indiana. This is a major sandhill crane migration stopover area. A roost check on the night of 30 October confirmed that both nos. 26-06 and 28-06 remained there together until 4 December when they continued migration to Hiwassee Wildlife Refuge, Meigs County, Tennessee. They left Hiwassee on 7 December. They were next detected in southbound flight over Citrus County, Florida, on 8 December landing to roost on the winter territory of nos. 5-01 and 4-02 at Stafford Lake, Hernando County. They moved to several other locations in Hernando and Pasco Counties and eventually settled on a sandhill wintering area, Pasco County. Several older Whooping cranes were also present in that area.

Nos. 27 and 32 began migration with adult Whooping crane pair nos. 12-03 and 16-03 from Sprague Pool on 30 November. This group of four birds roosted that night along Morgan Creek, east of Yorkville, Kendall County, Illinois and then continued southbound on 1 December to north of Manteno Lake, Kankakee County, Illinois. They foraged in harvested cornfields and remained at that site until 7 December, when they resumed migration and, according to low precision PTT readings, roosted that night on or near Green River Lake WMA, Adair County, Kentucky. The juveniles were next recorded roosting on Duval Pond, Madison County, Florida, on 8 December without the adult pair. The two juveniles continued southbound on 9 December to Koon Lake, Lafayette County, where they remained in a large sandhill flock. By late December only a few Sandhills remained at Koon Lake. Nos. 27 and 32 remained there into January.

HY2006 Ultralight-led flock

The ultralight-led migration departed from Necedah NWR on 5 October. Except for 1 bird that had dropped out in northern Florida and was later retrieved, the ultralight-led juveniles arrived at the holding site on Halpata Tasthanaki Preserve, Marion County, Florida, on 19 December. The following day, all juveniles were banded and equipped with transmitters. Ultralight aircraft led juveniles nos. 5, 7, 11, 12, 13, and 19 from Halpata to the pen on Chassahowitzka NWR on 11 January. The remaining 12 juveniles (nos. 1, 2, 4, 6, 8, 10, 14, 15, 18, 20, 22, and 23) spent the night on a cattle ranch southeast of Crystal River, Citrus County and were successfully led to the Chassahowitzka pen on 12 January. The 18 juveniles were retained for a brief acclimation period in the topnetted pen at Chassahowitzka and then released on 20 January 2007.

Winter Management Strategy

The use of Chassahowitzka NWR as the release site continued to be successful in facilitating survival of naive ultralight-led juveniles. The use of Halpata Tastanaki Preserve as a holding site, now for the second year, continued to be successful in reducing interference of older returning birds with management and care of the juveniles.

Human Avoidance and Conflicts with Human Activity

In general, released Whooping cranes satisfactorily avoided close proximity to humans and human structures. However, because they have been reared in captivity, they can be easily tamed after release if precautions are not taken. It remains critical that approach of birds by the public is carefully controlled on areas where this is possible, and that on other areas the public is aware of the need to view these birds only from a distance. The guidelines for viewing (no closer than 200 m for persons on foot or 100 m while in a vehicle on a public road) should continue to be emphasized.

The most serious problem encountered in 2006 was movement of the family (11-02, 17-02, and W1-06) to a wintering area on a lake surrounded by residential development. This relocation was probably related to drought on the parents' usual wintering area on ranchland in Pasco County. Nonmigratory sandhill cranes, which tolerate people and do not foster an environment that facilitates avoidance of humans and human activity by reintroduced birds, also occur at the newly occupied site.

There continues to be ongoing, significant loss of wintering habitat to development in Florida. Several cattle ranches in Pasco County have become major wintering areas for project birds, and ranchland is particularly vulnerable to this threat.

Although the population of Whooping cranes has grown and the area near Mill Bluff has continued to be a major use area, there were no significant incidents involving birds on nearby Volk Field during the year. Volk Field, a U.S. Air Force Base used for Air National Guard training in the core reintroduction area, had problems early in the project, mainly associated with nos. 5-01 and 4-02.

Interactions with Non-Migratory Whooping cranes

The only significant interaction between reintroduced migratory Whooping cranes and members of the nonmigratory flock during the year occurred in early winter 2005/06, when HY2004 males nos. 1, 7, and 8 occupied ranchland near Lake Gordon, Polk County, Florida. They consistently associated with a HY2000 nonmigratory female while at this site. However, the migratory subadults left that area on 11 or 12 February and moved to ranchland in Pasco County, where they reassociated with other reintroduced, migratory Whooping cranes. The nonmigratory female remained at the site in Polk County.

Summary and Conclusions

The winter management protocol, when rigorously implemented, continued to be effective in protecting newly released juvenile Whooping cranes from predators and exposure to humans. Problems involving conflicts between newly released and older birds at the release site have been greatly relieved by addition of a new site in which to hold birds until older returning Whooping cranes have cleared the Chassahowitzka release site and moved to inland wintering areas.

Survival in the population remained high, although significant mortality among older birds, especially breeding adults, has become cause for additional concern. Drought and resulting effects on wetland habitat have appeared as new factors influencing survival.

Social behavior was normal, and pair bond formation was progressing. Five breeding pairs produced eggs in 2006, and 2 chicks hatched from one re-nest. Even with dissolution of some pairs because of mortality, more breeding pairs are expected in 2007.

Habitat use, roosting, and foraging behavior of most birds were generally satisfactory. Only a small portion of suitable habitat has so far been used in the core reintroduction area, and there is much room for expansion by new territorial pairs.

TRACKING AND DIRECT AUTUMN RELEASE – CONT'D

Human avoidance was generally adequate, but the most notable exception was the wild-hatch family. Promoting avoidance of humans remains a general concern, especially for relatively naive yearlings during spring and early summer. Increased visitor interest in viewing released Whooping cranes also needs to be carefully managed to ensure that birds of any age in the population remain wild and do not become habituated to people.

Natal site fidelity remained high. Except for a few birds blocked by Lake Michigan, all yearlings completed spring migration to the core reintroduction area in 2006. Winter site fidelity has also been good; all ultralight-led yearlings except one returned to Florida in 2006.

The four direct autumn release juveniles all migrated appropriately and reached wintering areas in Florida. The four DAR juveniles released in 2005 all survive.

After release of the 19 ultralight-led juveniles in January 2006, the eastern migratory population consisted of 81 individuals. Number of individuals in each year class was as follows: HY2001 (4), HY2002 (10), HY2003 (12), HY2004 (10), HY2005 (22), and HY2006 (23).

Appendix A: Whooping cranes in eastern migratory population, 20 January 2007.

Hatch year	Crane no.	Sex	BBL Band no.	Color code (left:right) L=long bands with transmitter	PTT ID	Studbook no.			Mate
						Own	Sire	Dam	
2001	1	M	659-00215	L G/W:G/R/G		1629	1114/114 4	1119	2-02
2001	2	F	659-00201	L G/W:R		1630	1147	1142	
2001	5	M	659-00213	L G/W:R/G		1633	1147	1142	
2001	7	F	659-00214	L G/W:W/R		1635	1127	1154	
2002	1	F	599-32111	L R/W:L G(PTT)	--	1660	1133	1135	6-03
2002	2	F	599-32112	L R/W:G/W		1661	1133	1135	1-01
2002	5	M	599-32118	L R/W:G/R/W		1664	1133	1135	
2002	9	F	599-32127	G/W:L R/W		1670	1133	1135	
2002	11	M	599-32114	L R/W:R/G		1672	1147	1142	17-02
2002	12	M	599-32121	L R/W:W/R/G		1673	1114	1119	
2002	13	M	599-32122	L R/W:G/R/G		1674	1127	1154	18-02
2002	16	M	599-32125	L R/W:R/G/R		1677	1147	1142	
2002	17	F	599-32115	L R/W:G/R		1678	1144	1136	11-02
2002	18	F	599-32126	G:L R/W		1679	1128	1101	13-02
2003	1	F	599-34041	W:L G/R		1696	1175	1188	
2003	3	F	599-34056	L G/R:W		1698	1144	1136	
2003	6	M	599-34047	G/W/G:L G/R		1701	1133	1135	1-02
2003	7	M	599-34048	R/W/G:L G/R		1702	1133	1135	
2003	9	F	599-34042	L W/G(PTT):L G/R	--	1704	1144	1136	
2003	10	M	599-34049	W/G/R:L G/R		1705	1175	1188	
2003	11	M	599-34050	G/W/R:L G/R		1706	1127	1154	
2003	12	F	599-34043	W/R:L G/R		1707	1133	1135	
2003	13	F	599-34051	R/W/R:L G/R		1708	1133	1135	
2003	16	M	599-34052	R/G/W:L G/R		1711	1144	1136	
2003	17	M	599-34053	W/G/W:L G/R		1712	1144	1136	
2003	18	M	599-34054	G/R/W:L G/R		1713	1147	1142	
2004	1	M	599-37449	R/G/W:L W/G		1744	1133	1135	
2004	2	M	599-37450	W/R/W:L W/G		1745	1127	1154	
2004	3	M	599-37451	G/R/W:L W/G		1746	1133	1135	
2004	7	M	599-37453	W/R/G:L W/G		1750	1144	1136	
2004	8	M	599-37454	G/R/G:L W/G		1751	1133	1135	
2004	12	M	599-37455	G/W/R:L W/G		1755	1127	1154	
2004	15	F	599-37446	L R/G(PTT):L W/G	--	1758	1144	1136	
2004	16	M	599-37457	W/G/R:L W/G		1759	1144	1136	
2004	19	F	599-37447	L W/R(PTT):L W/G	--	1762	1128/1100	1263	
2004	20	F	599-37448	L G/R(PTT):L W/G	--	1763	1133	1135	
2005	1	F	599-37231	L G/W:R/G/W		1782	1162	1167	
2005	2	F	599-37237	L R/W(PTT):L G/W	62169	1783	1144	1136	
2005	3	M	599-37232	L G/W:W/R/W		1784	1144	1136	
2005	5	M	599-37233	L G/W:G/R/W		1786	1133	1135	
2005	6	M	599-37234	L G/W:R/W/G		1787	1133	1135	
2005	7	F	599-37235	L G/W:W/R/G		1788	1144	1136	
2005	8	F	599-37239	L W/R(PTT):L G/W	44263	1790	1127	1154	
2005	9	M	599-37236	L G/W:R/W/R		1791	1162	1167	
2005	10	F	599-37240	R/G/W:L G/W		1792	1560	1135	

TRACKING AND DIRECT AUTUMN RELEASE – CONT'D

Hatch year	Crane no.	Sex	BBL Band no.	Color code (left:right) L=long bands with transmitter	PTT ID	Studbook no.			Mate
						Own	Sire	Dam	
2005	11	M	599-37241	W/R/W:L G/W		1793	1041	1197	
2005	12	M	599-37242	G/R/W:L G/W		1794	1560	1135	
2005	14	M	599-37243	R/W/G:L G/W		1796	1182	1098	
2005	16	M	599-37244	W/R/G:L G/W		1799	1189	1195	
2005	19	F	599-24696	G/R/G:L G/W		1802	1560	1135	
2005	20	F	599-37238	L R/G(PTT):L G/W	62170	1803	1182	1098	
2005	21	F	599-24697	G/W/R:L G/W		1804	1189	1195	
2005	23	M	599-24699	W/G/R:L G/W		1806	1130	1292	
2005	24	M	599-24700	R/G/R:L G/W		1807	1560	1135	
2005	27	F	599-32128	L G/W:L R/W(PTT)	15045	1811	1128	1263	
2005	28	F	599-32129	L G/W:L R/G(PTT)	15050	1812	1128	1140	
2005	32	M	599-37459	L G/W:G/W/R		1817	1560	1135	
2005	33	F	599-32130	L R(PTT):L G/W	38635	1819	1128	1140	
2006	W1	F	599-34058	L R/G:W/G/W		1874	1672	1678	
2006	1	M	599-55905	L R/G:R/G/W		1832	1041	1197	
2006	2	F	599-55906	L R/G:G/R/W		1833	1674	1679	
2006	4	F	599-55913	L W(PTT):L R/G	72160	1835	1216	1202	
2006	5	F	599-55907	L R/G:G/W/G		1836	1127	1154	
2006	6	M	599-55908	L R/G:R/W/G		1837	1127	1154	
2006	7	M	599-55909	L R/G:W/R/G		1838	1041	1197	
2006	8	F	599-55910	L R/G:G/W/R		1839	1165	1164	
2006	10	M	599-55911	L R/G:R/W/R		1841	1144	1119	
2006	11	F	599-55912	L R/G:W/G/R		1842	1254	1156	
2006	12	M	599-55916	W/G/W:L R/G		1843	1041	1197	
2006	13	F	599-55914	L W/G(PTT):L R/G	72161	1844	1189/1190	1195	
2006	14	M	599-55917	R/G/W:L R/G		1845	1216	1202	
2006	15	M	599-55918	W/R/W:L R/G		1846	1127	1154	
2006	18	M	599-55919	G/R/W:L R/G		1849	1237/1386	1261	
2006	19	F	599-55915	L W/R(PTT):L R/G	15330	1850	1216	1202	
2006	20	F	599-55920	G/W/G:L R/G		1851	1237/1386	1261	
2006	22	M	599-55921	R/W/G:L R/G		1852	1216	1202	
2006	23	F	599-55922	W/R/G:L R/G		1853	1165	1164	
2006	26	M	599-55904	L R/G:W/R/W		1862	1041	1197	
2006	27	M	599-55902	L R/G:L R/W(PTT)	70396	1864	1182	1219	
2006	28	M	599-55903	L R/G:L W/R(PTT)	70397	1865	1182	1098	
2006	32	F	599-55901	L R/G:L W(PTT)	70398	1871	1138	1322	

TRACKING AND DIRECT AUTUMN RELEASE – CONT'D

Appendix B: Tables

Table 1: Wintering areas of Whooping cranes in the reintroduced eastern migratory population, winter 2005/06. Location of no. 7-03 was undetermined. R = Direct Autumn Release.

Crane nos.	Location	County	Spring Departure
Florida			
1-01, 2-02	Shamrock Acres	Citrus	12 Mar
2-01, 12-02	NE of Gowers Corner	Pasco	28 Feb
5-01, 4-02	Bystre Lake	Hernando	20-22 Mar
1-02, 6-03	Lake Woodruff NWR	Volusia	27-28 Mar
3-02, 17-03 (until 1 Feb)	Stafford Lake	Hernando	
5-02, 13-03	NE of Gowers Corner	Pasco	28 Feb
8-02	NE of Gowers Corner	Pasco	28 Feb
11-02, 17-02	NE of Gowers Corner	Pasco	28 Feb
16-02, 3-03 (until Feb)	SW of Gowers Corner	Pasco	
16-02, 3-03 (after 9 Feb)	Honeycut Lake	Lake	5-7 Mar
1-03, 11-03 (until 1 Feb)	Stafford Lake	Hernando	
9-03, 15-04	S of Hixtown Swamp	Madison	
15-04 (after 28 Feb)	Hixtown Swamp	Madison	25 Mar
9-03, 20-05 (after 14 Jan)	Chassahowitzka NWR	Citrus	27 Mar
12-03, 16-03	Long Pond	Marion	2/3 Mar
HY2004 1, 7, 8 (until 11 Feb)	E of Lake Gordon	Polk	
HY2004 1, 7, 8 (after 15 Feb)	NE of Gowers Corner	Pasco	8 Mar
HY2004 2, 3, 12, 16, 17	Fire Pan Sog, San Pedro Bay	Taylor	27-28 Mar
19-04, 20-04	N of Hixtown Swamp	Madison	28 Mar
32-05R	Kissimmee Prairie	Osceola	9-23 Mar
33-05R	Levy Lake, Paynes and Kanapaha Prairies	Alachua	29 Mar
18 HY2005 not listed elsewhere	Chassahowitzka NWR	Citrus	28 Mar
Tennessee			
7-01	Hiwassee Wildlife Refuge	Meigs	13/14 Feb
9-02, 2-03	W of Winchester	Franklin	9 Mar
13-02, 18-02	W of Winchester	Franklin	14 Mar
27-05R, 28-05R	Hiwassee Wildlife Refuge	Meigs	26 Feb
South Carolina			
3-02, 17-03 (after 2 Feb)	probable, undetermined location		<6-8 Mar
1-03, 11-03 (after 7 Feb)	Donnelley WMA	Colleton	23-24 Mar
10-03	Combahee Unit, ACE Basin NWR	Colleton	9 Mar
18-03 (after 19 Feb)	Kinloch Plantation, South Carolina	Georgetown	1-2 Apr
North Carolina			
18-03 (until 19 Feb)	Seven Creeks/Waccamaw River	Columbus	

TRACKING AND DIRECT AUTUMN RELEASE – CONT'D

Table 2: Primary summering areas of Whooping cranes in the reintroduced eastern migratory population, 2006. R = Direct Autumn Release.

Crane nos.	Location	County
Central Wisconsin Core		
1-01, 2-02	south Upper Rice Pool, Necedah NWR	Juneau
2-01	Site 3, Necedah NWR	Juneau
5-01, 4-02	mid/northeastern Sprague Pool, Necedah NWR	Juneau
1-02, 6-03	Meadow Valley Flowage, Meadow Valley WMA	Juneau
3-02, 17-03	Pools 9/18/19, Necedah NWR	Juneau
5-02	Egret, N Carter-Woggon Pool, Necedah NWR	Juneau
8-02, 13-03	Carter-Woggon Pool, Necedah NWR	Juneau
9-02, 2-03	Monroe County Flowage and vicinity	Monroe
11-02, 17-02	eastern East Rynearson Pool, Necedah NWR	Juneau
12-02, 19-04	Sandhill SWA	Wood
13-02, 18-02	Site 2, northern East Rynearson Pool, Necedah NWR	Juneau
16-02	Sprague Pool, Necedah NWR	Juneau
1-03, 11-03	northeastern Sprague Pool, Necedah NWR	Juneau
3-03, 8-04	Goose Pool, Necedah NWR	Juneau
3-03 17-03	Pools 9/18/19, Necedah NWR	Juneau
7-03, HY2005 nos. 2, 3, 7, 12, 19, 23, 24	East Rynearson Pool, Necedah NWR	Juneau
7-03, 12-05, 19-05, 23-05, 24-05	Little Yellow River, S of Necedah NWR	Juneau
10-03	West Rynearson Pool area, Necedah NWR	Juneau
1-04, 1-05, 5-05, 6-05, 14-05	Sprague Complex, Necedah NWR	Juneau
2-04 3-04 12-04 16-04	Suk Cerney Pool, Necedah NWR	Juneau
7-04 8-05	Pool 19 and vicinity, Necedah NWR	Juneau
9-03, 20-05	Gallagher Flowage, Sandhill SWA	Wood
12-03, 16-03	Yellow River Cranberry	Juneau
8-04	Goose Pool, Necedah NWR	Juneau
15-04	N of Quincy Bluff	Adams
2-05, 3-05, 7-05	East Rynearson Pool, Necedah NWR	Juneau
32-05R	Leola area	Adams
32-05R	Mill Bluff and Lemonweir River	Juneau
Wisconsin Outside of Core		
7-01	Horicon NWR area	Dodge
20-04	Marsh Lake and vicinity	Rusk/Chippewa
9-05	Loon Lake SWA and vicinity	Barron/Polk
10-05, 11-05, 21-05	W of Lewiston	Columbia/Sauk
16-05	Waunakee SWA/Springfield	Dane
27-05R	Uihlein WPA, NE of Rush Lake	Winnebago
28-05R	McMillan SWA	Marathon
Michigan		
18-03	Custer area	Mason
22-05	Manistee NF area/unknown	Mason/Oceana
33-05R	Guernsey Lake	Barry

TRACKING AND DIRECT AUTUMN RELEASE – CONT'D

Table 3: Primary autumn use or staging areas of Whooping cranes in the reintroduced eastern migratory population, 2006. Only areas different from or in addition to summer areas (Table 2) are listed. R = Direct Autumn Release.

Crane nos.	Location	County
Central Wisconsin Core		
2-01	East Ryneerson Pool and Site 3, Necedah NWR	Juneau
5-01, 4-02	Mill Bluff	Juneau
1-02, 6-03	Sprague Pool, Necedah NWR/Finley	Juneau
5-02	Necedah NWR and Yellow River Cranberry	Juneau
9-02, 16-04	Monroe County Flowage and Mill Bluff	Monroe/Juneau
12-02, 19-04	Seneca and vicinity	Wood
16-02	Mill Bluff	Juneau
12-03 and 16-03	Sprague Pool, Necedah NWR	Juneau
1-04	Sprague Complex, Necedah NWR	Juneau
2-04 3-04 12-04	Mill Bluff	Juneau
9-03, 20-05	Tomah area	Monroe
8-04, 1-05	NW Sprague Complex, Necedah NWR	Juneau
9-05	Shortville/Ammundson Marsh	Clark/Jackson
10-05, 11-05	East Ryneerson Pool, Necedah NWR	Juneau
14-05, 21-05	Mill Bluff	Juneau
23-05, 24-05	Cattail Valley Creek, S of Mauston	Juneau
26-06R, 28-06R	East Ryneerson Pool, Necedah NWR	Juneau
27-06R, 32-06R	Sprague Pool, Necedah NWR	Juneau
Wisconsin Outside of Core		
7-04 8-05	Big Eau Pleine River/Mead WMA	Marathon
5-05 6-05	Bass Creek, S of Hanover	Rock
27-05R	Neenah Creek, Oxford/Briggsville	Marquette
Iowa		
2-05, 3-05, 7-05	Myre Slough and Crystal Lake WMA's	Winnebago/Hancock
Michigan		
18-03	Baker Sanctuary and vicinity	Calhoun/Eaton
33-05R	Delton area	Barry

TRACKING AND DIRECT AUTUMN RELEASE – CONT'D

Table 4: Primary or most recent wintering areas of Whooping cranes in the reintroduced eastern migratory population, winter 2006/07, as of 26 January 2007. R = Direct Autumn Release. Nos. 12-02/19-04 and no. 18-03 have not yet been located in the winter range.

Crane nos.	Location	County
Florida		
1-01, 2-02	Shamrock Acres	Citrus
2-01, 16-02	SW of Gowers Corner	Pasco
5-01, 4-02 (died ~9 Jan)	Stafford Lake	Hernando
1-02, 6-03	Lake Woodruff NWR	Volusia
5-02	NE of Gowers Corner	Pasco
11-02, 17-02, W1-06	Tooke Lake	Hernando
3-03, 17-03	Mud Lake	Sumter
7-03, 10-05, 11-05, 12-05, 19-05	Paynes Prairie	Alachua
9-03, 7-04 (until 12 Jan)	Crews Lake	Pasco
12-03, 16-03	Paynes Prairie	Alachua
1-04, 20-05	Crews Lake	Pasco
2-04, 3-04, 12-04	Nichols Lake (until 26 Dec)	Lafayette
8-04, 1-05, 14-05 (until 15 Jan)	NE of Gowers Corner/Crews Lake	Pasco
8-04, 1-05, 14-05	Cockroach Bay	Hillsborough
15-04	Hixtown Swamp	Madison
2-05, 3-05, 7-05	Priest Prairie	Levy
5-05, 6-05, 21-05	Lonesome Point, Tsala Apopka Lake	Citrus
9-05	Cherry Lake	Lake
16-05	Salt Sick Lake	Marion
23-05, 24-05	Big Wolf Arbor	Levy
32-05R	W of Cross City (22 Nov, 1 record in flight only)	Dixie
26-06R, 28-06R	Crews Lake	Pasco
27-06R, 32-06R	Koon Lake	Lafayette
HY2006 ultralight-led flock (18)	Chassahowitzka NWR	Citrus
Tennessee		
7-01	Hiwassee Wildlife Refuge/Tennessee River	Meigs
27-05R	Hiwassee Wildlife Refuge	Meigs
28-05R	Mud Creek	Obion/Weakley
33-05R	Hiwassee Wildlife Refuge	Meigs
South Carolina		
1-03, 11-03	Donnelley WMA	Colleton
10-03	Combahee Unit, ACE Basin NWR	Colleton
Alabama		
13-02, 18-02	Wheeler NWR	Morgan
Indiana		
9-02, 16-04	East Fork of White River	Jackson
8-02 (died 27 Dec), 13-03	Goose Pond SFWA	Greene
20-04	East Fork of White River	Jackson
Louisiana		
8-05	near Loranger	Tangipahoa

Table 5: Mortalities of Whooping cranes in the eastern migratory population, 2001-07 (2006-07 mortalities in bold).

Hatch year	Crane no.	Sex	Stud-book no.	BBL Band no.	Mortality date	Location	Primary contributing factor (immediate cause if different)
2001	4	M	1632	659-00216	17 Dec 2001	Chassahowitzka NWR, Fla.	Bobcat predation
2001	6	M	1634	659-00209	~2 May 2005	Jackson Co., Wis.	Fractured tarsus (predation)
2001	10	F	1640	659-00217	10 Jan 2002	Chassahowitzka NWR, Fla.	Bobcat predation
2002	3	F	1662	599-32116	~21 July 2006	Necedah NWR, Wis.	Predation
2002	4	F	1663	599-32117	~9 Jan 2007	Hernando Co., Fla.	Necropsy results pending
2002	7	F	1667	599-32119	30 Aug 2003	n. a.	Capture myopathy (euthanized)
2002	8	M	1668	599-32113	27 Dec 2006	Greene Co., Ind. (retrieved alive 23 Dec)	Powerline collision/myopathy (tube feed asphyxia)
2002	14	F	1675	599-32123	2 Feb 2005	Chassahowitzka NWR, Fla.	Bobcat predation
2002	15	F	1676	599-32124	23 Dec 2004	Limestone Co., Ala.	Gunshot
2003	2	M	1697	599-34044	~5 Jul 2006	Monroe Co., Wis.	Predation
2003	4	M	1699	599-34045	23 Oct 2005	Necedah NWR, Wis.	Necropsy results pending
2003	5	M	1700	599-34046	13 Nov 2004	Cape Romain NWR, S.C.	Bobcat predation
2003	19	M	1714	599-34055	~23 Jul 2004	Oceana Co., Mich.	Gunshot
2004	5	M	1748	599-37452	14 Mar 2005	Chassahowitzka NWR, Fla.	Bobcat predation
2004	14	M	1757	599-37456	3 May 2005	Juneau Co., Wis.	Predation
2004	17	M	1760	599-37458	~25 May 2006	Wood Co., Wis.	Predation
2004	18	M	1761	599-34057	~9 Jul 2005	Green Lake Co., Wis.	Powerline collision
2005	22	M	1805	599-24698	Summer 2006	Mason Co., Mich.	Necropsy results pending
2006	W2	F?	1875	--	~13 Sep 2006	Necedah NWR, Wis.	Abandonment (predation)

Table 6: Whooping crane pairs producing nests with eggs, reintroduced eastern migratory population, 2005-06.

Male	Female	Territory	Incubation began	No. eggs	Fate of eggs
1-01	2-02	Necedah NWR, Site 4	16 April 2005	1	destroyed 17 April
11-02	17-02	Necedah NWR, East Ryneerson Pool-East Dike	18/19 April 2005	1	destroyed 19/20 April
1-01	2-02	Necedah NWR, Site 4	7 April 2006	unk.	destroyed 15/16 April
17-03	3-02	Necedah NWR, Pools 18/19	6/7 April 2006	2	destroyed 15/16 April
2-03	9-02	Meadow Valley SWA, Monroe County Flowage	12/13 April 2006	unk.	destroyed 26/27 April
11-02	17-02	Necedah NWR, East Ryneerson Pool-East Dike	10 April 2006	1 found	destroyed 19/20 April
13-02	18-02	Necedah NWR, Site 2/Rice Pool	5/6 April 2006	2	collected 24 April
11-02	17-02	Necedah NWR, East Ryneerson Pool-East Dike	23 May 2006	2	hatched 22 June

Appendix C: Figures

Fig. 1. Distribution of Whooping cranes in the reintroduced eastern migratory population, 2001-07.

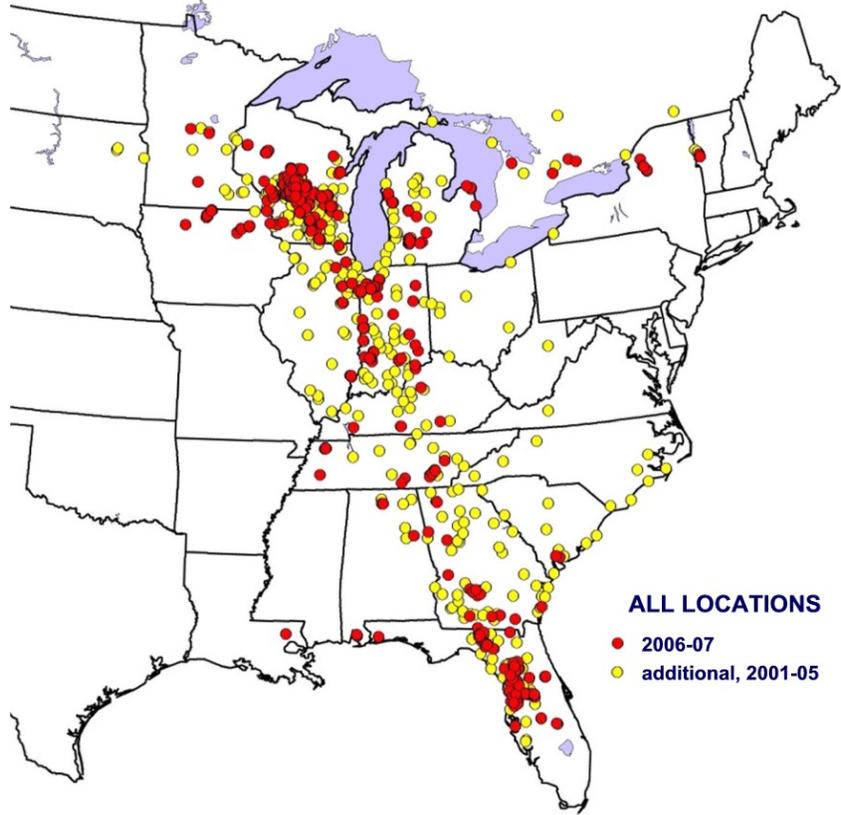


Fig. 2. Primary summer use areas of Whooping cranes in the eastern migratory population, 2006.

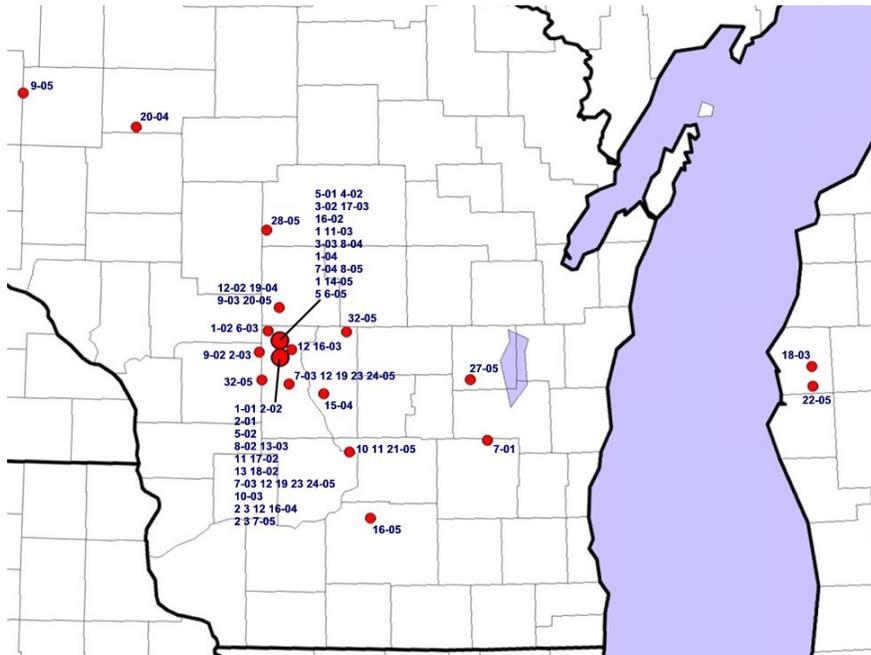


Fig. 3. Primary winter use areas of Whooping cranes in the eastern migratory population, winter 2006/07.

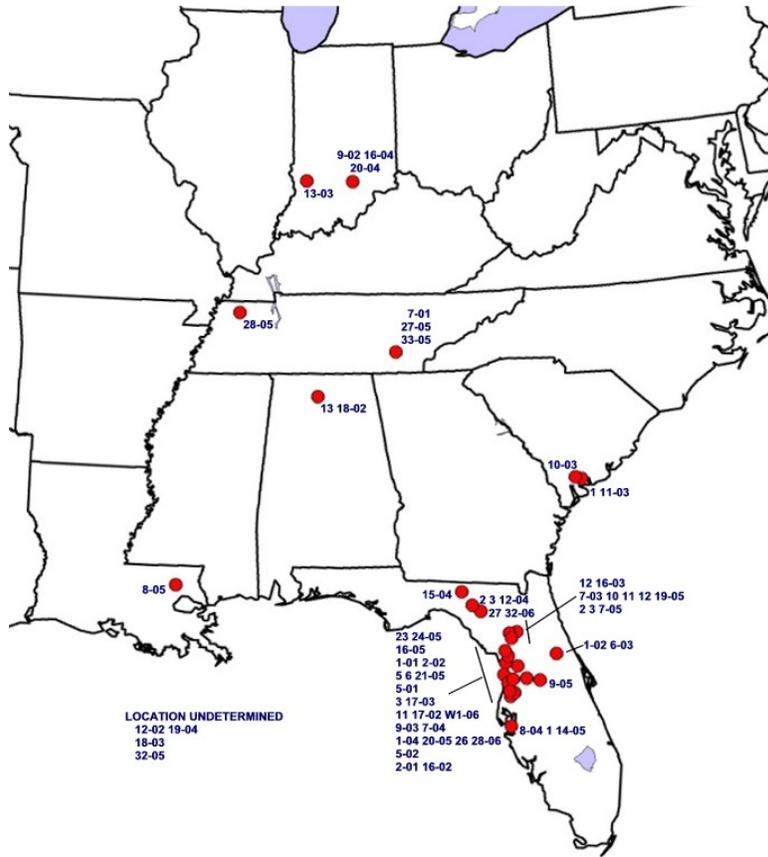


Fig. 4. DAR no. 28-06, nos. 12-05 and 19-05, DAR no. 26-06, nos. W1-06, 17-02, and 11-02, and no. 7-03, East Rynearson Pool, Necedah NWR, 22 October 2006.





COMMUNICATIONS AND OUTREACH TEAM REPORT

Submitted by Rachel Levin

Introduction

The sixth year of Whooping crane reintroductions by the Whooping Crane Eastern Partnership saw a continued successful effort by the Communications and Outreach Team to keep the project in the media and public spotlight.

Comprising communications specialists representing WCEP founding members and other partners -including volunteers - the Communications and Outreach Team remains essential to building support for the project through education, media relations and coordinated public outreach efforts.

The team is responsible for and directs all aspects of external communications and public contact on behalf of the project. The WCEP partners' mandate to the team is to advance public understanding and continued support for the protection and restoration of Whooping cranes and their habitat in eastern North America. The partnership recognizes that a cohesive voice is critical to the project's success. In keeping with the mandate, the Communications and Outreach Team is responsible for developing and implementing specific procedures and protocols for dealing with all communications aspects of the project.



Delivering WCEP education programs to schoolchildren (Photo: WCEP)

Joan Garland, education outreach specialist with the International Crane Foundation, and Rachel Levin, public affairs specialist with the U.S. Fish and Wildlife Service's Midwest Region, chaired the Communications and Outreach Team in 2006.



Thank you notes from Florida schoolchildren who saw WCEP education programs (Courtesy of WCEP)

Several milestones for Whooping crane reintroduction occurred in 2006 that refocused the public and media spotlight on WCEP in the sixth year of ultralight migrations and provided opportunities for the Communications and Outreach Team — and other WCEP members — to reinforce key messages about conservation and the power of this partnership effort.

The hatch in captivity of the first eggs produced by reintroduced cranes and the first wild hatch of the offspring of WCEP cranes captured the imaginations of people around the world and led to extensive media coverage. The wild hatch in particular continued to make news throughout the summer and the migration season as media followed the progress of the "First Family". They received extensive coverage as they raised their young and headed south for the winter. WCEP members responded to numerous media and public inquiries and the coverage of these significant events was overwhelmingly positive.

Another significant WCEP story that caught the media's attention this year was the Direct Autumn Release program. The continued success of this reintroduction technique as a supplement to successful ultralight-led migrations, has garnered more and more media attention.

Communications and Outreach Team Accomplishments for 2006

Outreach effort for first captive-hatched and wild-hatched chicks

As noted above, the hatch at Patuxent Wildlife Research Center of the first second-generation WCEP crane and, more significantly, the first wild-hatched WCEP chicks, generated significant interest from the media and the public. The Communications and Outreach Team distributed official WCEP press releases on both occasions to media throughout the migration flyway, and Team members as well as others from WCEP partner organizations fielded numerous media calls. The 'First Family' continued to attract media attention as they migrated from Necedah NWR and arrived in Florida.

Web site improvements

Following a re-design of the www.bringbackthecranes.org home page, the Communications and Outreach Team tackled the content of the WCEP Web site. To make the site more user-friendly to those who are unfamiliar with the project and the roles of the partners. The site is being re-vamped to feature the many phases of the project, and will function as a conduit to the partner sites describing and highlighting their contributions and work.



Delivering WCEP programs to schoolchildren (Photo: WCEP)

The site will also be reinforced as a repository for information on the life history and biology of Whooping cranes and the Endangered Species Act. The team aims to have the site re-worked by the spring wild migration.

WCEP education efforts along the migration route strengthened

Joan Garland of the International Crane Foundation leads WCEP's education efforts. Besides giving presentations on WCEP in classrooms throughout the year, Garland travels throughout the eastern portion of the migration flyway (Kentucky, Tennessee, Georgia, Florida) during the ultralight-led migration, giving presentations to as many schools as she can get to. This year she expanded her efforts, reaching more schools, especially in urban areas such as Louisville and Atlanta. For details on education

efforts, see the Environmental Education section.

News releases protocol reviews, partner recognition procedure established

In September, the Communications and Outreach team reviewed its news release protocols and re-stated the purpose of official WCEP press releases: To state the latest WCEP news, to review WCEP events since the last press release, to provide a small amount of background information on WCEP and to refer people to the WCEP Web site. The team instituted a formal effort to recognize the unique contributions to the partnership of each major partner. Each "milestone" WCEP news release throughout the year will feature a quote from the director or CEO of a major partner, addressing that partner's significant role in the milestone being announced.

New WCEP outreach products

The Communications and Outreach Team rolled out two outreach products this year: cloisonné lapel pins to be given to very special friends of WCEP, and WCEP stickers, re-designed in a smaller size and crisper graphics.

Necedah Whooping Crane Festival

The annual Necedah Whooping Crane Festival, sponsored by Necedah NWR, WCEP and the Necedah Lions Club, was held Sept. 16. Attendance was approximately 3,000 people representing seven counties and 25 states, with more than 346 people participating in Whooping crane bus tours of the refuge.

WCEP partners represented at this year's festival included Operation Migration Inc., U.S. Fish and Wildlife Service, International Crane Foundation, USGS Patuxent Wildlife Research Center, Wisconsin Natural Resources Foundation and the Necedah National Wildlife Refuge. Special guest speakers at the event included: Joe Duff, Cofounder of Operation Migration; Carolyn Belisle, falconer; Sarah Boles, educator; Berry Fletcher, cartoonist; Tom Jordaski, Wisconsin Department of Natural Resources; Kerry Morrison, International Crane Foundation-South Africa; Steve Norling, wildlife photographer and freelance writer; Terry Whipple, Juneau County Economic Development Corporation; and Adrian Wydeven, Wisconsin Department of Natural Resources, Necedah NWR.

Operation Migration Inc., and The Necedah Lions Club staff participated in the Town of Necedah summer parade, exhibiting the crane puppets and ultralights. Outreach booths at festivals throughout Wisconsin reached 5,900 people. These included the Monroe County Fair, Juneau County Fair, Volk Field Open House at Camp Douglas, Wisconsin Literary Bash, and the Ducks Unlimited Festival in Oshkosh, WI.

VIP visits to Necedah NWR

Once again, the northern "WCEP headquarters" saw a number of VIP visitors. Twenty-three people visited Necedah National Wildlife Refuge and spent time touring and learning about WCEP. VIP visitors included U.S. Congressman Ron Kind and his aides; representatives from the Juneau County Economic Development Commission, Crane Festival, Village of Necedah, International Crane Foundation, Ho Chunk Nation, Wisconsin Waterfowl Association, Glacial Lake Cranberry Company; and regional office staff from the Wisconsin Department of Natural Resources and U.S. Fish and Wildlife Service.

Media Relations

Media highlights for 2006 included the wild hatch in June and the departure and arrival of the ultralight migration in the fall. Other peak media times included the eggs being taken to and hatching at Patuxent in the spring, and the migration of the "First Family." There was also extensive media coverage of crane 9-03, which once again wandered around the northeastern United States and southern Canada.

The damage caused to pens and other facilities at Patuxent following a winter storm also received significant media coverage, especially in the Washington, D.C. area. The Baltimore Sun also did an extensive feature story on the Patuxent facility and its role in the reintroduction of the Whooping crane. National Geographic featured on its Web site coverage of the ultralight migration departure and arrival and video clips from the ultralight migration.

2006 Media Coverage

The following list represents the *known* media coverage of WCEP activities during 2006 as well as recorded media queries to the Communications and Outreach Team. The number next to the name of the outlet represents how many separate new stories appeared in that outlet or how many contacts were made. In some cases the stories that appeared in listed media outlets were Associated Press wire stories or appeared on the Web site of the media outlet.

"Adventures in Juneau County" Central Wisconsin travel guide

10 News, Tampa Bay, Fla.

6abc.com, Philadelphia

ABC7Chicago.com x2

ABCNews.com x5

Access North Georgia, Gainesville, Ga.

Adams County (Wis.) Times & Friendship Reporter

Aero-News Network x2

Akron (Neb.) Farm Report

Arizona Daily Star, Tucson, Ariz.

Associated Press (multiple)

Audubon Minnesota newsletter

Baltimore (Md.) Sun

Baraboo (Wis.) News Republic x3

Belleville (Ill.) News Democrat x4

Benton (Iowa) Crier
Big River magazine, Winona. Minn.
Biloxi (Miss.) Sun Herald x6
BirdNote
Boston Globe
Bradenton (Fla.) Herald x7
Brett (Iowa) News-Tribune
Brocktown (Nev.) News x6
Buffalo (N.Y.) News
Burlington (Vt.) Free Press x2
Calhoun (Ga.) Times
Canton (Ohio) Repository
Capital Times, Madison, Wis. x3
Carlisle (Penn.) Sentinel
CBS2chicago.com
CBS5, Green Bay, Wis. x4
CBS58, Milwaukee, Wis.
CBSNews.com x5
Central Kentucky News Journal, Campbellsville, Ky.
Centre Daily Times, State College, Penn. x4
Chandler (Minn.) Dispatch
Charlotte (N.C.) Observer
Chattanooga (Tenn.) Times Free Press x2
Chicago Sun-Times x3
China Post (Taiwan)
Chippewa Herald, Chippewa Falls, Wis. x5
Christian Broadcasting Network (Va.)
Citrus County (Fla.) Chronicle x10+
CNN.com
Columbus (Ga.) Ledger Enquirer x3
Companion Messenger, Juneau County, Wis. x24
Contra Costa (Calif.) Times x6
Corpus Christi (Texas) Caller Times
Courier, Lincoln, Ill.
Courier-Journal, Louisville, Ky.
DailyIndia.com, India
Daytona Beach (Fla.) News Journal x6
Detroit (Mich.) Free Press x2
Duluth (Minn.) News-Tribune x9
Dunton Springs (Colo.) Evening Post
Ely (Nev.) Times x6
Examiner.com, San Francisco, Calif.
Fayetteville (N.C.) Observer
Florida Times Union, Jacksonville, Fla.
Florida Today, Melbourne, Fla. x2
Fond du Lac (Wis.) Reporter
Forbes.com x5
Fort Wayne (Ind.) Journal Gazette x5
Fort Wayne (Ind.) News Sentinel x4
Fort Worth (Texas) Star Telegram x6
Fox 12, Boise, Idaho x4
FOXNews.com x3
Gainesville (Fla.) Sun x3
Gazette Newspapers, Maryland x2
Globe and Mail, Toronto
Green Bay (Wis.) Press-Gazette x2
Griffin (Ga.) Daily News

Guardian Unlimited, Manchester, UK
HappyNews.com, Texas x3
Herald News Daily, Williston, N.D. x7
Hindu, India
Hinesburg Journal, Canada x6
Houston Chronicle x7
Howell (Utah) Times and Transcript
Indianapolis Star
International Herald Tribune
Jackson (Wyo.) News Tribune x6
Jacksonville.com x2
Janesville (Wis.) Gazette x8
Jordan Falls (Iowa) News
Journal Review, Crawfordsville, Ind.
Journal Times, Racine, Wis. x4
KAIT TV, Jonesboro, Ark. x4
KAJ TV, Kalispell, Mont. x3
KAN TV, Austin, Texas
Kansas City (Mo.) Star x3
KATC TV, Lafayette, La.
KBSD TV, Wichita, Kan.
KBZK TV, Bozeman, Mont. x2
KCAU TV, Sioux City, Iowa x4
KCTV5 TV, Kansas City, Mo.
Kentucky.com x6
KESQ TV, Palm Desert, Calif. x4
KFMB TV, San Diego
KFVS TV, Cape Girardeau, Mo. x3
KGBT TV, Harlingen, Texas x2
Kindred Times, Utah x5
KLAS TV, Las Vegas x3
KLFY TV, Lafayette, La. x3
KLTV TV, Tyler, Texas x4
KNDO/KNDU TV, Yakima, Wash.
Knoxville (Tenn.) News Sentinel x2
KOIN TV, Portland, Ore.
KOLD TV, Tucson, Ariz. x4
KOTV, Tulsa
KPAX TV, Missoula, Mont. x3
KPLC TV, Lake Charles, La. x3
KRIS TV, Corpus Christi, Texas x3
KRON TV, San Francisco x3
KRTV TV, Great Falls, Mont. x2
KTRE TV, Nacogdoches, Texas x4
KTVO TV, Kirksville, Mo. x3
KTVQ TV, Billings, Mont. x3
KUNM, New Mexico Public Radio
KVIA TV, El Paso, Texas x3
KVOA TV, Tucson, Ariz. x4
KWWL TV, Waterloo/Cedar Rapids, Iowa x4
KXAN TV, Austin, Texas x3
KXLF TV, Butte, Mont. x3
La Crosse (Wis.) Tribune x5
Lake County (Wis.) Snapshots x2
Lakeland (Fla.) Ledger x3
Lansing (Mich.) State Journal x3
Laurel (Md.) Leader

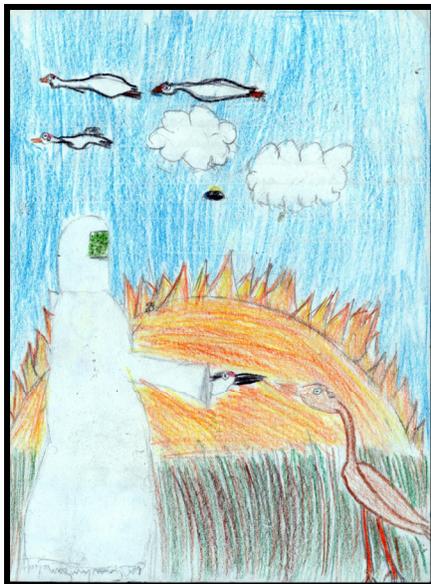
Leading the Charge (Australia) x5
Lexington (Ky.) Herald Leader x2
Louisville (Ky.) Courier-Journal
Macon (Ga.) Telegraph x3
Meadow (Idaho) Free Press
Meadowood (Fla.)
Miami Herald
Milwaukee Journal Sentinel x10
MLive.com, Michigan x2
Monroe (Wis.) Times
Monstersandcritics.com, UK
Monterey County (Calif.) Herald x5
MSNBC.com x2
Myrtle Beach (S.C.) Sun News
National Geographic Explorer/Wild Chronicles
National Geographic magazine
NationalGeographic.com x2
NBC5.com, Chicago
Nebraska Public Television
News and Observer, Raleigh, N.C.
News Tribune, Tacoma, Wash. x2
NewsChannel5.com, Nashville, Tenn.
Newsday, New York, N.Y. x4
Ocala (Fla.) Star Banner x3
Olberlin (Kan.) News Leader x6
Orlando (Fla.) Sentinel
Ottawa (Canada) Recorder x3
Patriot Ledger, Quincy, Mass.
PennLive.com, Pennsylvania
Phillyburbs.com, Bucks County, Penn. x5
PhysOrg.com x2
Pierceland Herald (Canada) x4
Pioneer (N.M.) Times-Journal
Pioneer Press, St. Paul, Minn. x8
Playfuls.com, Romania
Political Gateway, Florida
Prescott (Ariz.) Herald
Postchronicle.com, New York, N.Y.
Racine (Wis.) Journal Times x2
Reedsburg (Wis.) Radio
Rene Featherstone, freelance writer, Seattle, Wash.
Rhineland (Wis.) Daily News x2
Rock River Times, Rockford, Ill.
Rockford (Ill.) Register Star
Rutland (Vt.) Herald
Sacramento (Calif.) Bee x2
San Diego Union Tribune
San Francisco Examiner
San Jose (Calif.) Mercury News x5
San Luis Obispo (Calif.) Tribune
Sarasota (Fla.) Herald Tribune x2
Seattle (Wash.) Post Intelligencer x4
Siliconvalley.com, California x5
Sioux City (Iowa) Journal
Sky Valley Journal x5
Southwest Fly Fishing magazine
Sparta (Wis.) Herald x3

St. Petersburg (Fla.) Times x10
Star Tribune, Minneapolis, Minn. x2
Star-Times, Juneau County, Wis. x6
Team 4 News, Harlingen, Texas
Tennessean, Nashville, Tenn.
The Birmingham (Ala.) News
The Capital, Annapolis, Md.
The Daily Herald, Everett, Wash.
The Independent Register, Brodhead, Wis.
The Isthmus, Madison, Wis.
The Post and Courier, Charleston, S.C.
The Seattle (Wash.) Times
The State, Columbia, S.C. x6
The Westfall Weekly News (Canada)
Tim Eisele, freelance writer, Madison, Wis. x3
Times Herald, Newnan, Geo.
Times Picayune, New Orleans, La. x3
Tomah (Wis.) Journal x7
Toronto Star
Toronto Sun
Town Hall, Washington, D.C.
Tuscaloosa (Ala.) News
United Press International
Victoria (Texas) Advocate
WALB TV, Albany, Ga. x4
WANE
WANE TV, Fort Wayne, Ind. x4
WAOW TV, Wausau, Wis.
Washington (D.C.) Times
Washington Post x7
WAVY TV, Hampton Roads, Va. x3
WBAY TV, Green Bay, Wis. x7
WBOC TV, Salisbury, Md. x4
WCAX TV, Burlington, Vt.
WCNC TV, Charlotte, N.C.
WEAU TV, Eau Claire, Wis. x4
Westfall Weekly News, Canada x3
WFRV TV, Green Bay, Wis. x2
WFTV.com, Florida x2
WHBF TV, Rock Island, Ill. x4
White Rock (S.D.) Reviewer
WHNS TV, Greenville, S.C./Asheville, N.C.
WHO TV, Des Moines, Iowa x4
Wildlife in North Carolina (North Carolina Wildlife Resources Commission)
Wilmington (N.C.) Morning Star
Winona (Minn.) Daily News x2
Winter Haven (Fla.) News Chief
Wired News
WiscNew.com, Wisconsin
Wisconsin Outdoor News
Wisconsin Public Radio x5
Wisconsin Rapids (Wis.) Daily Tribune x6
Wisconsin State Journal, Madison, Wis. x2
WISH TV, Indianapolis, Ind. x2
WISN TV, Milwaukee, Wis.
WJZ TV, Baltimore, Md.
WKYT TV, Lexington, Ky. x2

WKZO radio, Kalamazoo, Mich.
WLBT TV, Jackson, Miss. x4
WLNS TV, Lansing, Mich. x4
WLUC TV, Escanaba, Mich. x4
WMTV TV, Madison, Wis.
WOI TV, Des Moines, Iowa x4
WPRI TV, Providence, R.I. x4
WPVI TV, Philadelphia, Penn.
WQAD TV, Moline, Ill.
WRAL TV, Raleigh, N.C.
WREG TV, Memphis, Tenn. x3
WRIC TV, Richmond, Va. x3
WSB TV, Atlanta
WSTM TV, Syracuse, N.Y. x4
WTVF, Nashville, Tenn. x2
WTVM TV, Columbus, Ga. x4
WVEC TV, Hampton Roads, Va.
WVLT TV, Knoxville, Tenn. x3
WWAY TV, Wilmington, N.C. x2
WWTI TV, Watertown, N.Y.
Wyoming News x3
Yahoo! News
Zee News, India



Delivering WCEP programs to schoolchildren
(Photo: WCEP)



Thank you notes from Florida schoolchildren
who saw WCEP education programs
(Courtesv of WCEP)

Web sites

WCEP partner and related Web sites continue to be effective and efficient means of communicating up-to-date information to large numbers of stakeholders, news media, students and the general public.

Available statistics show that major WCEP-related Web sites received a combined average total of around 30 million total visits in 2006.

WCEP partnership site: www.bringbackthecranes.org/

39,706 unique visits

International Crane Foundation: www.savingcranes.org

16,316,040 total visits

572,376 unique visits

Operation Migration: www.operationmigration.org/

1,638,468 total visits

USGS Patuxent Wildlife Research Center: whoopers.usgs.gov/

147,809 total visits

18,029 unique visits

Journey North: www.learner.org/jnorth/

11,000,528 total visits (2005 available)

Environmental Education

Environmental education accomplishments in 2006 involved the continued partner arrangement with Journey North to extend educational outreach efforts into schools throughout North America. Journey North is an internet-based education project that links students across North America to track wildlife migration and seasonal change. Now in its 14th year, Journey North reaches more than 590,000 students

in 14,000 classrooms. It is the nation's largest real-time, "citizen science" project specifically for children. Through Journey North's website, students and teachers track the WCEP cranes' status and general locations during the fall and spring migrations.

Communications and Outreach Team member Joan Garland contacted registered Journey North teachers in the eastern flyway states prior to migration. The teachers were informed of WCEP's educational offerings, including the opportunity to have an interactive program presented at their school. Joan accompanied the southern half of the migration and provided education programs to these schools.



Thank you notes from Florida schoolchildren who saw WCEP education programs (Courtesy of WCEP)

The programs are also presented throughout the year at schools, universities, conservation and birding clubs, professional conferences, birding festivals, civic organizations, and zoos. During these visits, education materials are distributed, including posters, brochures, videos, and CDs that can be used to interpret cranes, migration, endangered species, behavior, and ecology, among other topics.

In 2006, WCEP partners provided environmental education outreach programs to more than 15,500 adults and children. In addition to the seven eastern flyway states, programs were presented in California, Colorado, Minnesota, New Mexico, South Carolina, Texas and Washington.

The Whooping crane reintroduction project has offered a strong opportunity to inform and motivate students along the flyway about cranes and wetland conservation. The migration of these birds highlights the dependence of cranes and other wildlife on wetlands along the migration route. Most of these wetlands are privately owned, so the decisions and conservation outlook of future generations are critical to the survival of these cranes.

Approximately 100 people witnessed the ultralight migration departure on Oct. 5 at the Necedah National Wildlife Refuge.

About 80 spectators observed the cranes and ultralights as they left the Hiwassee National Wildlife Refuge in Tennessee.

Approximately 800 people observed the arrival-day flyover in Dunnellon, Florida. Many stayed to hear an informative talk and project summary by WCEP partners from Chassahowitzka National Wildlife Refuge, Operation Migration, International Crane Foundation, and Friends of the Chassahowitzka National Wildlife Refuge. Volunteers from Chassahowitzka NWR, Friends of the Chassahowitzka National Wildlife Refuge, and the Citrus County Chapter of the Audubon Society volunteered their time to coordinate this event.

Public flyovers at Muscatatuck NWR in Indiana and in northern Georgia also attracted the crane faithful.

Festivals/conferences where ICF staffed a booth and WCEP information/materials were distributed:

- Port Aransas, TX Whooping Crane Festival—1,500 people
- Necedah Whooping Crane Festival
- Sandhill Crane Festival, Lodi, California—1,000 people
- Othello Sandhill Crane Festival, Othello, Washington—600 people
- Midwest Audubon Society Annual Conference, Baraboo, WI—400 people
- WI Wetlands Assoc. Annual Conference, Madison, WI—800 people
- Int'l Migratory Bird Day Festival, Milwaukee, WI—2,500 people
- Ducks Unlimited Great Outdoors Festival, Oshkosh, WI—20,000 people



On the observation deck at Necedah NWR (Photo: WCEP)

Necedah NWR Environmental Education

Visitors received WCEP education at all programs offered on and off the refuge (visitors include K-12, college and general public audiences).

WCEP Programs at Necedah NWR reached 4,929 people.

The Traveling Whooping Crane Trunk reached 340 people.

Over the course of the summer 322 visitors used the Necedah National Wildlife Refuge Crane Blind at Site One either in tours or individual visits. Scheduled blind tours were arranged for the public as well as for WCEP team members. WCEP team members could use the blind and bring guests after approval by the Refuge.

Approximately 75 people witnessed the ultralight migration departure on Oct. 5 at Necedah NWR. Supporters watched from the DU overlook on Headquarters Road.

The refuge received 266 entries to the 2006 Whooping Crane Art Contest for grades 1 through 8 during the Necedah Whooping Crane Festival.

Wisconsin DNR education and outreach activities

Karen Sonnenblick, an outreach specialist with the Wisconsin DNR worked on updating various education materials such as signage, displays, etc., for DNR regions. She also updated the Crane Trunk manual, identified Wisconsin public education standards applicable to Whooping crane outreach for fourth to eighth grade students; outlined key Whooping crane topics and issues to be covered in outreach program and how each applies to Wisconsin public school standards; reviewed outreach programs involving other endangered species designed for fourth to eighth grade students, and began work on a Whooping crane PowerPoint for dissemination to all WCEP partners for use in public talks/outreach programs. The DNR also began updating Whooping crane information on the website for its Endangered Resources Bureau, with plans for more in 2007.



Delivering WCEP programs to schoolchildren (Photo: WCEP)

The DNR provided materials and presentations to various groups, including the board members of the Friends of Wisconsin State Parks, the Wisconsin State Natural Resources Board, State Parks and Wildlife Areas, etc.

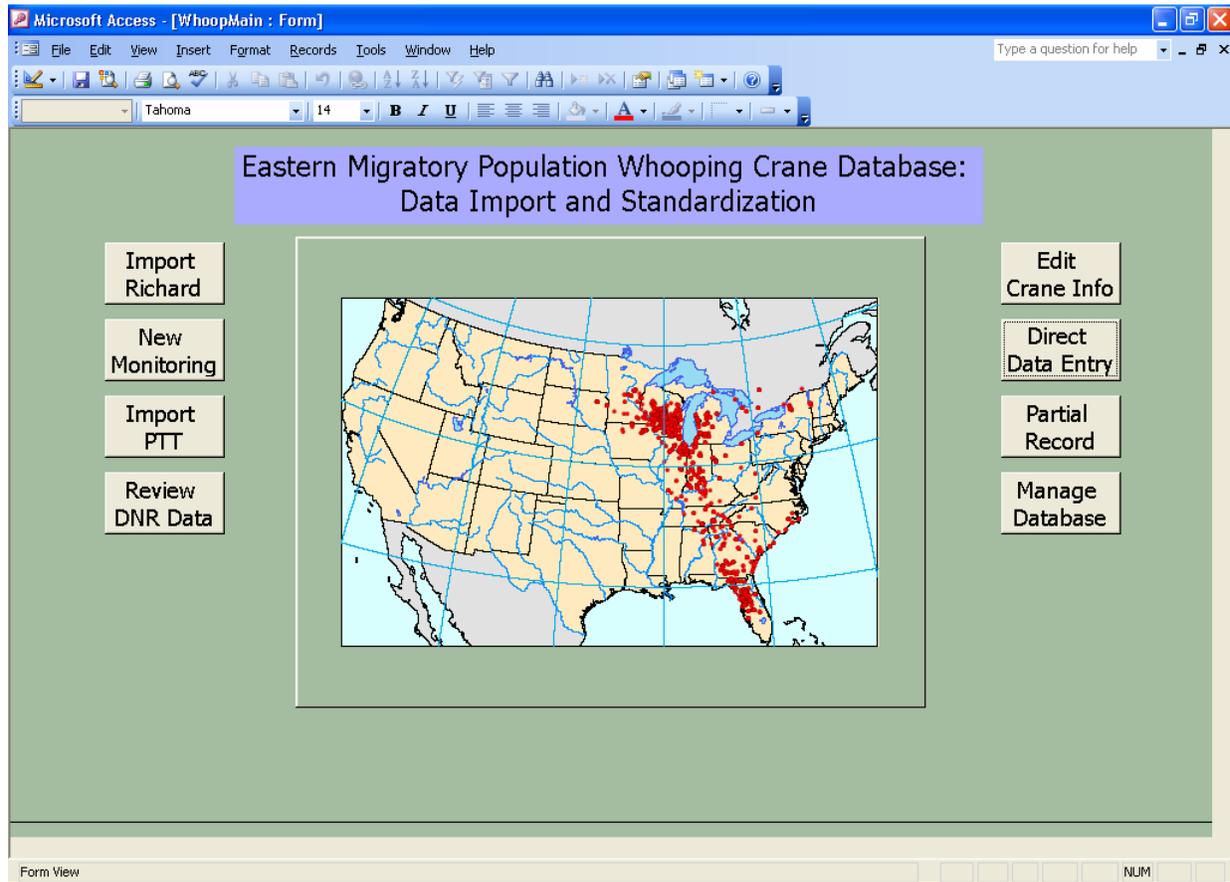
Environmental Education by Volunteers

Volunteers also provide educational programs on behalf of WCEP. Members of the Friends of Chassahowitzka NWR are especially dedicated, providing presentations throughout Florida. Venues for presentations given in 2006 by members of the Friends of Chassahowitzka include the Silver River Museum in Ocala, Academy of Environmental Science, Clearwater Audubon, Homosassa State Wildlife Park, and the Citrus County Audubon Society.



MONITORING DATABASE FOR EMP

Submitted by Beth Goodman



Goals and Objectives

The Eastern Migratory Population (EMP) Whooping crane monitoring database was created by Wisconsin DNR to aid with compilation, exchange, extraction, and application of monitoring data associated with Whooping Crane Eastern Partnership (WCEP) project goals (see Wisconsin WC Mgmt Plan). With WCEP collaboration, the EMP Whooping crane monitoring database can become a crucial analytical tool for making informed decisions on issues of habitat quality, landowner needs, Whooping crane biology and conservation, and assessment of Whooping crane management and recovery goals. The database and GIS interface will enable WI DNR and USFWS staff, ICF biologists, the International Whooping Crane Recovery Team, and other WCEP partners to analyze results of reintroduction efforts systematically and efficiently as a breeding population becomes established in Wisconsin. The expected outcome is a tool for use by WI DNR policy and regional land managers, staff biologists, and WCEP biologists in assessment of Whooping crane management and recovery goals.

Wisconsin DNR has committed to: 1) developing, implementing procedures, and maintaining a Whooping crane monitoring database from information collected by USFWS, ICF and WI DNR biologists; 2) determining appropriate tool(s) for data access, defining and resolving problems with the application database, and training and supporting staff in use of data access tools; and 3) identifying factors limiting Whooping crane populations in Wisconsin (a Species of Greatest Conservation Need).

To be most useful, Whooping crane data should be recorded and electronically submitted by all field staff; WI DNR staff use an electronic monitoring form available on the WI DNR server. Others submit data via a variety of methods explained later in this document. Data can be submitted by email or phone to the Wisconsin Whooping Crane Coordinator and/or Database Manager. Information will be compiled, consistently formatted and used for the following:

1. Documenting bird location, health, behavior, habitat, and relocation needs
2. Analyzing pair formation and reproduction, behavior, and habitat use
3. Comparing release strategies and setting future population goals for Wisconsin
4. Evaluating genetic pedigree of EMP chicks produced in the wild
5. Guiding land management, land acquisition, and public use decisions
6. Conducting environmental analyses for state and federal permit issuance (i.e., power line or cell tower placement, wastewater discharge, waste spreading, and water flow regulation)
7. Preparing outreach, education, and funding proposals

Future Needs

Improved plans for consistent sharing of monitoring data need development and implementation. Thereafter, partners will be able to more quickly account for and describe movements and habitat use of individual Whooping cranes (or cohort groups), for agency needs and private landowners. This is a comprehensive database with GIS capability that will assist land managers and administrators in identifying and prioritizing conservation actions locally and at the landscape level. Partner investment to help maintain a workable EMP database will assure compilation, exchange, extraction, and application of Whooping crane data to address WCEP needs.

The CraneObs.mdb database component used internally by DNR (described below) could become a template for developing systems for external users. Security features such as automatically loading forms, hidden and locked tables, and record editing limitations ensure that new records may be entered, but previously recorded observations will not be accidentally corrupted or deleted. This database can therefore be easily duplicated and provided to other agencies who become involved in monitoring cranes, such as staff at Horicon National Wildlife Refuge, NRCS Wetland Reserve Program biologists, County Conservationists, etc., to enable electronic data submission in a compatible format.

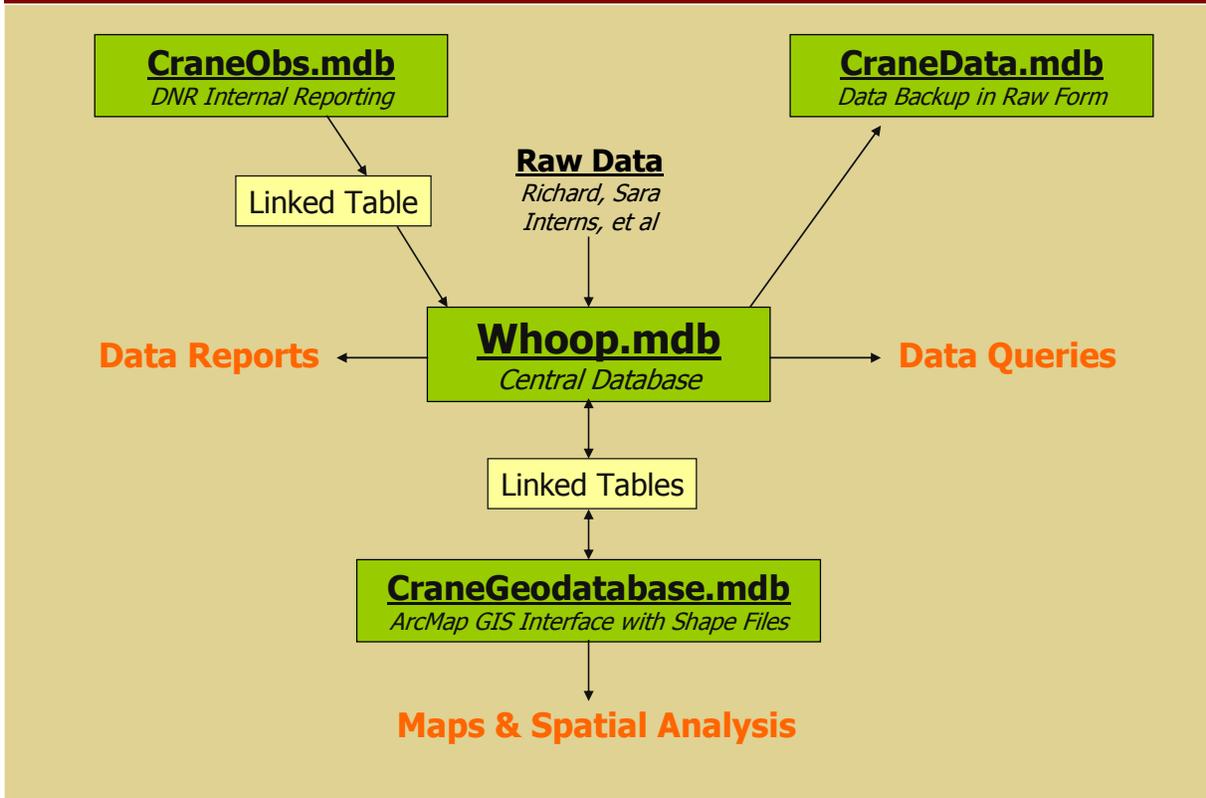
Data management and analysis will promote adaptive management strategies and refinement of the Whooping Crane Management Plan during the course of the reintroduction effort.

Funding this database needs consideration by the WCEP Project Direction Team in relation to overall project goals. It is currently funded through annual grant applications. It would be beneficial to have at least a 2-year funding commitment.

Overview

The database is actually a *series* of databases (see figure below) designed to function according to the sources and purpose of the data. Whoop.mdb is the main (central) database which combines data from all sources into main data tables where they can be used as a whole. The components are as follows:

Database System Structure



CraneObs.mdb

This database is located on the Wisconsin DNR network drive. It is a temporary holding structure consisting of a few tables and an entry form to allow DNR staff to report crane observations directly. Data are verified for accuracy and validity by the Database Manager and/or Whooping Crane Coordinator before they are added to Whoop.mdb.

CraneData.mdb

This is a storage database to maintain a backup of all raw data submitted. Since data are not immediately compatible with each other, they frequently require reformatting or the separation into discrete fields in order to function as a coherent set. This database maintains the data in an original, unedited submitted format.

Whoop.mdb

As mentioned above, this is the central database used to combine data from all sources into one comprehensive database. Records entering this database are standardized for field names, coordinate systems, location descriptions, field contents, etc in order to be used as one main data set. Reports, queries, etc can then be executed, drawing upon all available data based on any number of different criteria.

Crane Geodatabase.mdb

This Geodatabase serves as the GIS interface for the observations contained in the database. The main information tables from Whoop.mdb are linked to the Geodatabase tables, where the XY coordinates of each record can be displayed in a GIS view and grouped with other available GIS layers or shapefiles such as hydrology or counties. This data can also be converted into static shapefiles with the same attribute

tables within the Geodatabase. These shapefiles can be used for spatial analysis of crane distribution as it relates to other geographic features in the GIS view such as land use, management purposes, and regional boundaries.

When exploring this system, please bear in mind that the design has come about opportunistically rather than as a result of a comprehensive analysis of partner data needs and prioritized monitoring protocols. This database has undergone several retrospective restructure efforts, and it is continually being redesigned to capture information as data needs and/or priorities are defined and data collection methods become standardized. Therefore, it may contain redundancy and/or features that would not have otherwise resulted.

Whoop.mdb Components: Listed by Source Import Function

Many features and components have been designed to address data needs as they arise, so the best way to discuss them is with regards to which purpose they serve. Eventually, data from all sources should strive to be compatible / complementary with the others, at which point these components can likely be simplified & streamlined. (Shaded components are also used in other processes.)

Data Submissions – DNR and public

Management of the data reported through CraneObs.mdb is accessed by the database manager and Whooping crane coordinator via Whoop.mdb form “FRM_VerifyDNRSUBmission. This form allows them to review all records and approve or reject data for the main data set.

The following components contained in Whoop.mdb are part of the process to add data from this source to the main data set.

Form

WhoopMain (Main form when database is launched)

DNRObsManageFrm (Shows data from TBL_1VerificationTemp for verification)

Tables

TBL_3MainData (Main observation repository)
 TBL_1VerificationTemp (Linked to WC_WIDNR_Obs_tbl in CraneObs)
 TBL_2QueryStorageTemp (Work table used for temp storage during queries)
 TBL_3UnverifiedObsMain (Houses data that is unverifiable)

Queries

QRY_UpdateTempStorage (Copies data from the linked table into TBL_2Initial Backup)
 QRY_AppendMainData (Appends verified data to TBL_3MainData)
 QRY_AppendUnverifiedData (Appends verified data to TBL_3UnverifiedObsMain)
 QRY_DeleteProcessedEnd (Deletes processed data from linked tables after the append queries)

Command Buttons

Step 1: Import Data (Executes QRY_UpdateTempStorage)
 Step 2: Update Table (Executes other 4 queries)

Data Submissions - Richard Urbanek

In the past, data submissions were in the form of Access tables. Generally, there was one table for cohort records, and occasionally an expanded table that also included breakdown by individual (w/cohort still included). These cohort data were entered, unmodified by DNR, in the original database structure developed prior to November 2005.

Currently, data submission is via daily delimited text e-mail that can be imported first into TBL_NewData, formatted, and then added to TBL_TrackingImport. These data continue to be in the form of Cohort Observations, so they need to be broken down into individual records either manually or with code. Important to note, these e-mails do not include coordinate information, therefore generalized coordinates are added from Richard's 2005 location table when possible (& noted as such in locational precision) in order to improve the spatial utility of the database.

The following components contained in Whoop.mdb are part of the process to add the data from this source to the main data set.

Forms

WhoopMain (Main form when database is launched)
 FRM: ImportRichard (facilitates data formatting)
 SubFRM: Individual (Adds new records to Main Table)

Tables

TBL_NewData (Initial import location for .txt data)
 TBL_TrackingImport (Adds field names to imported e-mail)
 DATA_Individual (where formatting occurs)
 TBL_DataSubmission (Working table, backups taken, several additional fields added)
 TBL_3MainData (Main observation repository for individuals)

Queries (All accessed from within forms via command buttons)

QRY_1Add to Tracking Table
 QRY_2ClearNewDataTableRecords
 QRY_3AddDate&State
 QRY_4AddRoostRecordDesignation
 QRY_5Add SandhillPresentdesignation
 QRY_6AddCounty
 QRY_7Format change and Location Addition
 QRY_8AddtoLocations2001_05
 QRY_9AddCoordinates
 QRY_9UpdateLocation Approx
 QRY_AddToLocApp

QRY_TrackingImportToIndividual
 QRY_AddData to Submission Table
 QRY_Add_ssid (Adds a numeric format crane id to aid in sorting)
 QRY_ImportDate
 QRY_AddDatatoMain
 Several Append queries to back up data
 Several delete queries for data tables

Modules

Data_Repair (Program to convert dates to correct format)
 Richard_Date (Program to convert from a date/time format to text for Richard)

Data Submissions-Interns

To date, data submitted by interns are either in the form of access or excel tables for cohort records. These data are exported to CraneData.mdb for permanent storage. In order to maintain compatibility with other data, it is necessary to also break these data down into individual records. This is currently done by hand as a cut and paste operation, although a code could certainly be adopted to automate this process in the future.

The following components contained in Whoop.mdb are part of the process to add the data from this source to the main data set.

Forms

WhoopMain (Main form when database is launched)
 SubFRM: Individual (Adds new records to Main Table)

Tables

New Records (First import location for this data)
 Data_Individual (Main observation repository for individuals)
 TBL_DataSubmission (Working table where edits are made)
 TBL_3MainData (Main observation repository for individuals)

Queries (All accessed from within forms via command buttons)

QRY_Add_NewRecords_to_Tracking
 QRY_TrackingImportToIndividual
 QRY_AddData to Submission Table
 QRY_Add_ssid (Adds a numeric format crane id to aid in sorting)
 QRY_ImportDate
 QRY_1AddData (Adds data from the submission table to TBL_3MainData)
 Several Append queries to back up data
 Several delete queries for data tables

Direct Data Entry- Database Manager

Direct entry is used for functions impractical to automate, such as adding aerial survey data, new crane IDs, transmitter frequencies, information about nest success, inbreeding, etc. As the crane population grows, we anticipate increasing numbers of reports from birders, state and federal government agency partner groups. Once these records are verified for accuracy and validity by the Database Manager and/or Whooping Crane Coordinator, or other WCEP partners, they are entered directly into the database.

Forms

WhoopMain (Main form when database is launched)
 FRM_Crane_Edit (Form for crane info such as new crane, new freq, pairing, etc)
 FRM_Obs_entry (Form to enter crane observations directly)
 FRM_CohortEntry (Form to enter crane observations directly to TBL_4CohortMain)
 FRM_Vague Entry (Form to enter crane observations into TBL_3UnverifiedObs)
 FRM_Production (Form to eventually nesting success information for pairs)

FRM_BondSummary (Form to add pairing specifics)
FRM_PairBonds (Form to add successive pairing information)
FRM_Mortality (Form to add mortality information)
FRM_SignificantEvents (Form to add general noteworthy information)

Tables

TBL_Crane ID (Holds crane biological data, transmitter frequency, etc.)
TBL_Mortality (Table to house info pertaining to individual mortality)
TBL_PairBonds (Can hold serial pairings & links to production info for each bond)
TBL_PictureLibrary (Holds available individual photos- not comprehensive!)
TBL_Production (Hatch/laying numbers, dates, success, etc)
TBL_SignificantEvents (Anecdotes related to individual birds)
TBL_Signal Equipment

Additional queries, reports, Look-up Tables, etc can be developed on an as-needed basis. With more discussion, these can develop into permanent, useful features.

PTT Data

ARGOS PTT data are sent via e-mail to designated individuals within WCEP. These e-mails are converted by RU and sent in a text file, however it requires less reformatting to convert the original e-mail directly into an Excel file since importing from Excel is a standard Access function which maintains field formatting. Incorporation of PTT data into the database, either from the original e-mail or from RU, is automated through form interfaces & linked queries.

Data Submissions-Kelly Maguire

Based on meetings in spring of 2006, Kelly collects data in a similar format to the Whoop.mdb FRM_Obs_entry. If this is the case, future incorporation of her data can be conducted through a basic Append Query.

Database Development

Discussions need to take place in order to establish data needs and priorities. Areas of particular need are:

Type of information collected / submitted

If WCEP strives for more standardized data fields among field personnel, then easier import and extraction of a wide range of data summary needs will result. It would be beneficial to create similar data fields across entry forms used by USFWS, ICF, DNR, and intern use so that partner data needs described in the Whooping Crane Management Plan, as well as future needs, can be met. Joel Trick has agreed to help draft a Monitoring Plan, which should help guide data collection towards this goal.

How data are submitted

Microsoft Access can convert directly from numerous formats (see comprehensive list below). Each data collector will likely have different submission issues and methods can be tailored to make submission as efficient for the individual as possible.

Importable Data formats

In theory, Microsoft Access can import directly from the following electronic formats:

1. Access table/tables, zipped files, etc. (including Geodatabase tables w/ shapes)
2. Excel file (3,4,5-7, 97-2002)
3. Text files (ANSI, ASCII, DOS, OS/2, delimited, fixed length)
4. dBase III+, IV, and 5
5. FoxPro (all types using ODBC drivers)
6. Paradox 3.x, 4.x, 5.0, 7, and 8
7. Lotus WK1, WK3, and WJ2 (DOS)
8. ODBC databases

9. HTML Tables, lists, documents
10. XML documents
11. Outlook & Outlook Express
12. Exchange Documents
13. Microsoft IIS 1 and 2
14. Sharepoint Team Services
15. Microsoft Active Server Pages
16. Microsoft Word Merge Documents
17. Rich Text Format documents

However, the first 3 formats (.mdb, .xls, .txt) are the preferred methods for data submission. Both Excel and Text documents can be sent directly via e-mail. Access tables can also be sent, however Microsoft Outlook will not deliver a database attachment directly. One option is to zip the file. Another is to remove the “.mdb” from the file before it is sent. The receiver then needs to replace “.mdb” at the end before attempting to open the attachment. Data CDs may also be sent through the mail.

Data Import Process

Preliminary attempts to efficiently standardize the data import process have not been successful due to differences associated with each dataset. Some require coordinate correction and therefore need to begin in Crane Geodatabase.mdb for verification and coordinate edits. Other datasets have format and spelling issues that require changes (either manual or w/code) to make them searchable with other records.

Cohort Record Separation

Code should be written to automate this process, although it should be noted that Cohorts are not listed in a consistent format among data collectors. This also should be standardized.

Data Submission Timeline

In order to maintain an accurate and up-to-date database, data need to be submitted on a regular basis. For the sake of facilitating accurate and useful uploads, a submission every 2 weeks when the birds are in WI (May-Nov) and monthly December – April is desirable to avoid applying the necessary compatibility verification to thousands of records at a time. An up-to-date database would benefit the project's reputation and funding options.

Potential e-Bird records

As e-Bird promotion increases among birding groups in Wisconsin and throughout the flyway, Whooping crane sightings are expected to be reported to this site in increasing numbers. There is great potential for collecting complementary data through this source with minimal additional effort needed to add it to the database.

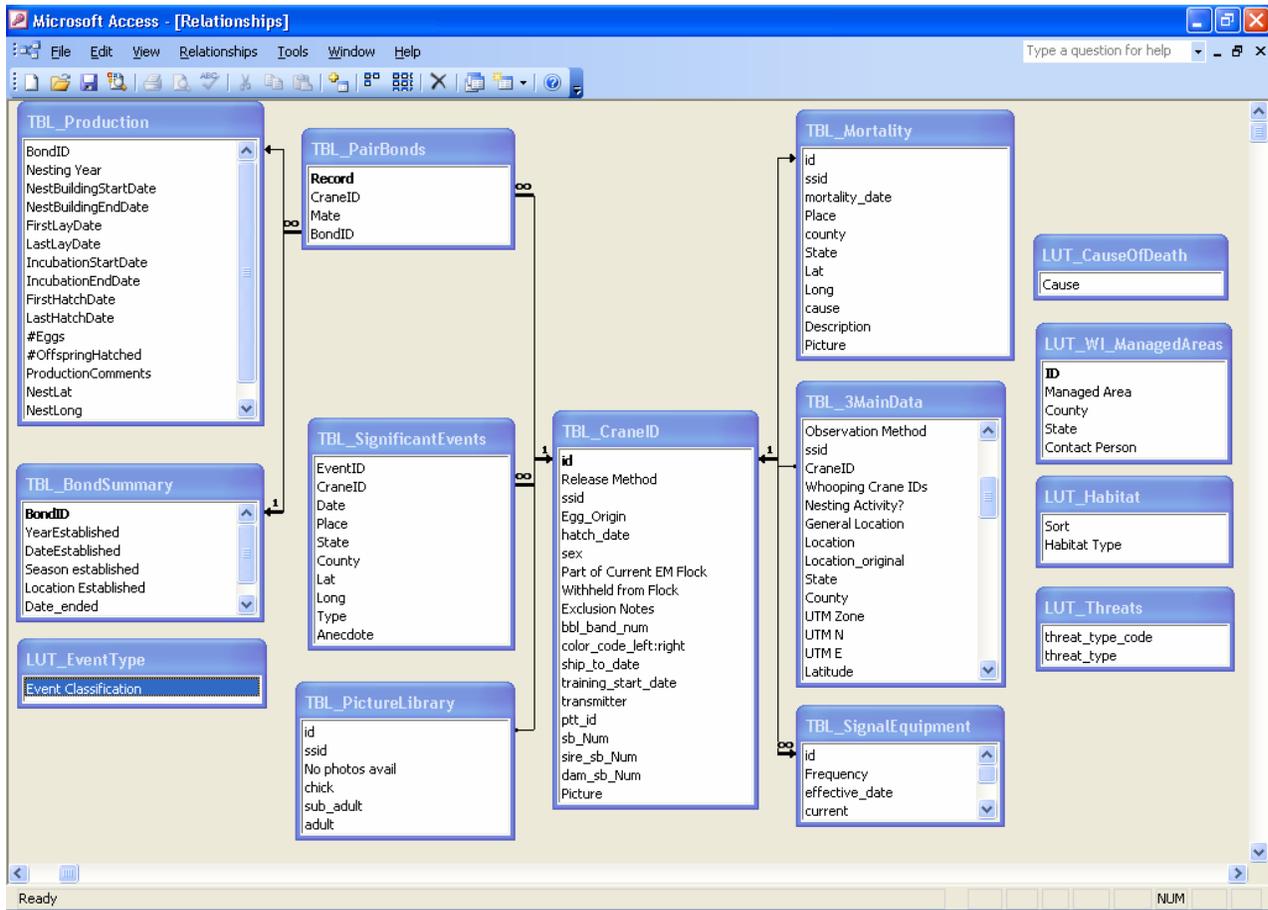
Semi-annual database status updates / development meetings

Since any good database needs to grow and adapt to inevitably changing project demands and focus, regularly-scheduled partnership meetings are necessary to assure that the collected data and database structure continue to be as appropriate and efficient as possible.

Development of a Fully Online System

A goal for this project could be to develop a secure online reporting and data access system. While this is technologically feasible through a variety of methods, different options need to be investigated to determine the best method to attain this goal in terms of partner hardware/software capability, data security, and cross-agency protocols/requirements. Since this will still rely on having an up-to date, consistently formatted source of data, current formatting, submission, and monitoring planning issues should be resolved before this is attempted.

Whoop.mdb Data Table relationships



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