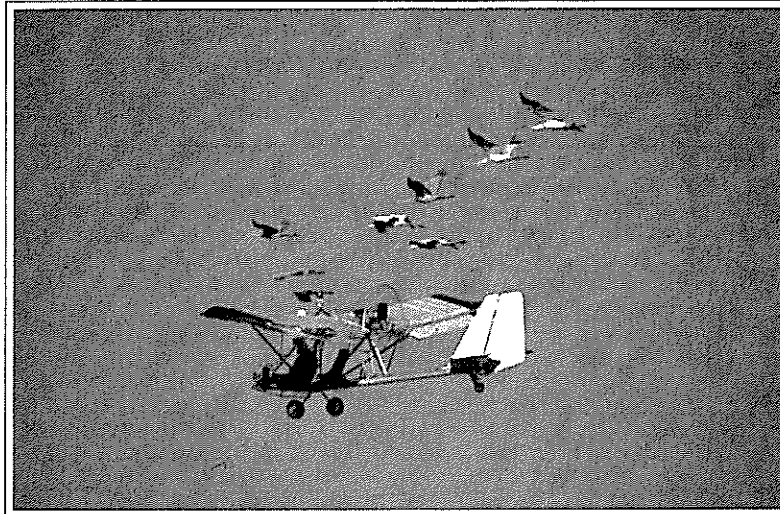


Kim Allen Scott.

## Notes

1. William T. Jackson, "The Cook-Folsom Expedition of the Upper Yellowstone, 1869." *Pacific Northwest Quarterly* 32, 2 (1941): 321-322. It must be said here that scholarship since the appearance of Jackson's article has helped clarify the role of the expedition in establishing Yellowstone National Park, but the expedition narrative itself has continued to suffer from its checkered publication history.
2. C. W. Cook, "Preliminary Statement to the Cook-Folsom Diary." *Haynes Bulletin*, December 1922, 3-4.
3. C. W. Cook, "The Valley of the Upper Yellowstone." *Western Monthly*, July 1870, 60-67.
4. "Copy of Diary of the Folsom-Cook Expedition in 1869 To The Yellowstone National Park, Amplified at Diamond City, Montana by D. E. Folsom." Victor K. Chesnut papers, Collection 1268, Merrill G. Burlingame Special Collections, Montana State University, Bozeman. This 29-page typescript bearing handwritten marginalia and corrections, is on 9 1/2 x 7 1/2 "-laid finish paper bearing the watermark "Old Berkshire Mills 1903." Two unnumbered prefatory sheets, titled "V.K. Chesnut Conversation at Helena Montana February 23 [190]4 with D. E. Folsom of White Sulphur Springs, Montana" accompany the manuscript.
5. "V.K. Chesnut Conversation at Helena Montana February 23 [190]4 with D. E. Folsom of White Sulphur Springs, Montana." Victor K. Chesnut papers, Collection 1268, Merrill G. Burlingame Special Collections, Montana State University, Bozeman. In this statement Folsom recalled giving the map to Walter De Lacy and the diary to Washburn. Handwritten notations in the Washburn diary, currently owned by Mr. Lee Parsons of Indianapolis, Indiana, confirm that Washburn had access to the diary, and Nathaniel P. Langford wrote in 1894 that both information and "a map" was provided to his group before the 1870 expedition. See: Nathaniel P. Langford, *The Cook-Folsom Expedition of the Upper Yellowstone in the year 1869* (N. P. Langford: St. Paul, Minn., 1894): 4.
6. William Turrentine Jackson, "The Early Exploration and Founding of Yellowstone National Park," (Ph.D. Dissertation; University of Texas at Austin, 1940): 139.
7. Langford confirmed in his 1894 pamphlet the receipt of the documents, but never mentioned returning them. By the time he published his own reminiscence in 1905, Langford dropped mention of the documents entirely. See: Nathaniel P. Langford, *Diary of the Washburn expedition to the Yellowstone and Firehole rivers in the year 1870* [St. Paul? Minn., c1905]: iii-xxi.
8. Vivian Paladin and Jean Baucus, *Helena, An Illustrated History* (Norfolk, Va.: Donning Co., 1983): 29.
9. Nathaniel P. Langford, *The Cook-Folsom Expedition of the Upper Yellowstone in the year 1869* (N. P. Langford: St. Paul, Minn., 1894): 8. Orrin and Lorraine Bonney have concisely described the true circumstances of the Western Monthly fire and the distribution of the Cook article. See: Orrin H. Bonney and Lorraine Bonney, *Battle Drums and Geysers* (Chicago: Swallow Press, 1970): 394-395.
10. Nathaniel P. Langford, *The Cook-Folsom Expedition of the Upper Yellowstone in the year 1869* (N. P. Langford: St. Paul, Minn., 1894): 8.
11. There is hearsay evidence that the slight to Cook's authorship was intentional. Oscar Mueller, who married Cook's daughter Josephine in 1915, maintained that Langford still harbored a grudge against his father-in-law because Cook had publicly criticized the Washburn-Langford-Doane expedition for abandoning Truman Everts in the Yellowstone country during their 1870 journey. However, the criticism, if it appeared in a Montana newspaper, has not been located. See: Oscar O. Mueller, letter to Victor K. Chesnut, February 18, 1922. Victor K. Chesnut papers, Collection 1268, Merrill G. Burlingame Special Collections, Montana State University, Bozeman.
12. David E. Folsom, "The Folsom-Cook Exploration of the Upper Yellowstone in the Year 1869," *Contributions to the Montana Historical Society*, vol. 5 (1904): 349-369.
13. *Who was Who in America*, Volume 1 (Chicago: A.N. Marquis Company, 1943): 215.
14. Victor K. Chesnut, "The V.K. Chesnut Conversation at Helena, Montana, February 23, 1904, with D. E. Folsom of White Sulphur Springs, Montana." Manuscript in the Victor Chesnut papers, Collection 1268, Merrill G. Burlingame Special Collections, Montana State University, Bozeman.
15. *Who was Who in America*, Volume 1 (Chicago: A.N. Marquis Company, 1943): 215.
16. "Flames Destroy Science Hall at MSC-Gasolene Burner Cause-Loss Heavy," *The Weekly Courier* (Bozeman, Montana), October 25, 1916, 12.
17. Victor K. Chesnut, letter to Oscar O. Mueller, December 11, 1921. Original letter in the possession of George D. Mueller of Lewistown, Montana.
18. Oscar O. Mueller, letter to Victor K. Chesnut, December 15, 1921. Victor K. Chesnut papers, Collection 1268, Merrill G. Burlingame Special Collections, Montana State University, Bozeman.
19. Oscar O. Mueller, letter to Merrill G. Burlingame, November 4, 1957. Merrill G. Burlingame papers, Collection 2245, Merrill G. Burlingame Special Collections, Montana State University, Bozeman. In Hamilton's defense it should be pointed out that his manuscript history of Yellowstone National Park cites only the known sources of the Cook-Folsom expedition diary. If Hamilton had received the manuscript from Chesnut in 1904 he doubtless would have used it. See: James M. Hamilton, "History of Yellowstone National Park, previous to 1895" typescript circa 1947, Merrill G. Burlingame Special Collections, Montana State University, Bozeman.
20. Victor K. Chesnut, letter to Oscar O. Mueller, February 12, 1922. Original letter in the possession of George D. Mueller of Lewistown, Montana.
21. Victor K. Chesnut, letter to Oscar O. Mueller, February 12, 1922. Original letter in the possession of George D. Mueller of Lewistown, Montana.
22. Victor K. Chesnut, letter to Oscar O. Mueller, May 14, 1922. Original letter in the possession of George D. Mueller of Lewistown, Montana.
23. David E. Folsom had died in Stanford, California on May 18, 1918. His copy of the manuscript became the property of his son.
24. Oscar O. Mueller, letter to Victor K. Chesnut, June 10, 1922. Victor K. Chesnut papers, Collection 1268, Merrill G. Burlingame Special Collections, Montana State University, Bozeman.
25. Oscar O. Mueller, letter to Victor K. Chesnut, July 7, 1922. Victor K. Chesnut papers, Collection 1268, Merrill G. Burlingame Special Collections, Montana State University, Bozeman.
26. Victor K. Chesnut, letter to Oscar O. Mueller, July 4, 1922. Original letter in the possession of George D. Mueller of Lewistown, Montana.
27. Oscar O. Mueller, letter to Victor K. Chesnut, August 10, 1922. Victor K. Chesnut papers, Collection 1268, Merrill G. Burlingame Special Collections, Montana State University, Bozeman.
28. Oscar O. Mueller, letter to J. E. Haynes, September 13, 1922. Jack Ellis Haynes and Haynes, Inc. Records, Collection 1504, Merrill G. Burlingame Special Collections, Montana State University, Bozeman.
29. Charles W. Cook, "Preliminary Statement to the Cook-Folsom Diary," *Haynes Bulletin* (December 1922): 7-8; "Reconstructed Diary of the Cook-Folsom Expedition in 1869 to the Yellowstone Region," *Haynes Bulletin* (December 1922): 8, (January 1923): 1, 9, (February 1923): 8 (May 1923): 7-8.
30. This version, donated to the library at Yellowstone National Park, had been provided by David S. Folsom, the explorer's grandson, on September 24, 1940. Folsom had transcribed the document from a pencil-written original which remains in the family's possession.
31. Aubrey L. Haines, ed., *The Valley of the Upper Yellowstone: an exploration of the headwaters of the Yellowstone River in the year 1869 / as recorded by Charles W. Cook, David E. Folsom, and William Peterson.* (Norman: University of Oklahoma Press, [1965]).
32. The four pages in the Chesnut papers include two identical carbon copies, indicating that Chesnut had copied them with the intention to send them on to Mueller and other interested parties but had, indeed, misplaced them until it was too late for their inclusion in Cook's reconstructed diary in the 1923 *Haynes Bulletin*.
33. The typescript has been lightly edited with spelling corrections and punctuation additions.

# The Pied Piper of Whooping Cranes



*Kent Clegg grew up on a ranch in southeastern Idaho and, while still in high school, began working at Gray's Lake National Wildlife Refuge, where he first encountered whooping cranes, perhaps the most endangered bird in North America. Since then, he has continued working with a variety of wildlife monitoring and management projects while still ranching and farming. Clegg visited with the editor during a visit to Yellowstone in July 1998. When asked whether, compared to ranching, he would describe wildlife research as a vocation or a hobby on the side, he laughed, "I'm not sure which—neither of them pay very well!" He commented that although "sometimes people think there's either one or the other and they can't coexist, I've always found it an interesting challenge to be able to put the two together."*

## A Most Endangered Bird

**YS:** Am I right in that we have just the two species of cranes here in North America, sandhills and whoopers?

**KC:** Right. There are subspecies of the sandhill, the Greater, the Lesser, and the

Canadian Sandhill.

**YS:** And the sandhills have never been threatened or endangered?

**KC:** Not as a species. Sandhills in Mississippi almost became extinct before conservation efforts to restore them began.

**YS:** Can you briefly summarize for us the status of whooping cranes? They've been endangered for a long time.

**KC:** In the 1940s, the whooping crane population consisted of 15 or 16 individual birds that migrated from Texas to the Northwest Territories of Canada. Basically, all the whooping cranes existing today came from that group of 15 birds. There are currently about 180 birds in the wild flock migrating from Texas to Canada each year.

The balance are either in captive propagation centers or in a group that has been released in Florida and now consists of about 65 birds. The flock in Florida was created to ensure a second population of whooping cranes in the event of a disaster with the original flock. It has been successful to a certain extent; however, to date no young have been produced. The birds have paired and put down nests but have never laid eggs.

The total population of whooping cranes is about 360 individual birds.

**YS:** What was it that endangered whooping cranes in the first place—hunting?

**KC:** Hunting and the loss of habitat around the turn of the century contributed largely to their decline in numbers. A lot of wetlands were drained, which is the primary habitat for whooping cranes.

**YS:** Are they susceptible to disease at all?

**KC:** Like any species there is a risk of disease. There are concerns about tuberculosis in whooping crane populations, but there have been no known die-offs of cranes from tuberculosis.

**YS:** What do whooping cranes eat?

**KC:** Anything and everything! For the most part, invertebrates and tubers on plants. In this flyway they feed mostly on corn produced specifically for the cranes and other waterfowl by national wildlife refuges. During the summer they feed in natural habitats like Slough Creek, where we have observed them feeding heavily on salamanders and even water snakes. Whooping cranes tend to be more aquatic by nature than sandhills.

**YS:** How big does a whooping crane get?

**KC:** They stand about 5 feet tall with a wing span of about 7 feet. The weight is surprising—only about 13 to 15 pounds.

**YS:** When you were younger and first got involved with whooping cranes, the fostering parenting experiment [*in which eggs were taken from the nests of whooping cranes in Canada and placed under nesting sandhill cranes in hopes that sandhills would raise the "foster" offspring to inhabit this flyway*] was going on at Gray's Lake; it obviously did not succeed.

**KC:** It didn't succeed in the fact that for some reason they never did pair and mate. It is thought they were imprinted too strongly on sandhills and that they didn't recognize their own species. They were raised by sandhills and were dispersed all over the Rocky Mountain area, and so they never really associated with each other, except on the wintering grounds for short periods of time. The project was successful getting birds to migrate back and forth, which was one of the objectives. That project was discontinued in the late 1980s because of high mortality and the fact that they never reproduced.

**YS:** How many birds actually were produced as a result of the foster parent experiment?

**KC:** Two hundred and eighty-nine eggs were put under sandhill cranes over a 13-year period, with only 89 of those surviving to migrate south. The mortality was high and can be attributed to many things: behavior, predation by animals, possibly because a chick wasn't able to communicate with the parents properly. For whatever reason, the mortality was unusually high. Of the ones that did survive, there were a number lost to powerline strikes in Colorado.

**YS:** What's the mating behavior of whooping cranes—at what age do they mate, and where does it occur?

**KC:** Whooping cranes usually pair and mate when they are three to five years of age and some even later than that—five to seven, although you will see some actually start hanging out together at two and three years old. They are thought to mate for life, providing they are successful in raising young together. They are extremely territorial and will come back

to defend the same territory year after year.

**YS:** Whooping cranes can live to be quite old, can't they?

**KC:** The average life span is estimated to be 25 to 30 years, and yet, in captivity, one has lived to 82 years of age! Some of the birds from the foster program lived 18 to 20 years. Part of our research deals with trying to overcome the mortality experienced during the first year of a crane's life, which will increase their average life span a great deal.

### Developing a New Technique

**YS:** At what point did you establish some formal research relationships—I understand you have worked with the Whooping Crane Recovery Team and have permits from the U.S. Fish and Wildlife Service?

**KC:** In 1994 Jim Lewis, who was the Whooping Crane Coordinator, and I met and talked over the possibility of doing a research project which would consist of training cranes to follow an ultralight aircraft. I had raised a number of sandhills over the years and had an idea that they would follow an airplane. Jim secured the necessary federal permits and helped initiate the project as a co-investigator on the research.

In 1994, we raised six sandhill cranes and took them on local flights around the valley to determine if they would follow the airplane. Once we proved that the cranes would follow the airplane we began the permit process necessary to make a migration from Idaho to New Mexico. We used sandhill cranes as surrogates for the endangered whooping cranes to see if a migration was possible and to work out some of the bugs. In 1995, we did the first migration from Grace, Idaho, to Bosque Del Apache National Wildlife Refuge in New Mexico; it took us 11 days to make the migration. We started with 11 birds, but one of them turned back and disappeared the first day—it later ended up back at the ranch. Two others were killed by golden eagles while in flight behind the airplane. We arrived in New Mexico with eight sandhill cranes. Unfortunately, two of them were killed during the sandhill crane hunt a few days after arriving. The next spring, the survivors re-

turned to Idaho on their own without any assistance from us. We repeated the same process again in 1996 to further develop our technique and to work out more of the migration details.

Then this past year, 1997, we applied for permits and received approval from the recovery team/USFWS to raise and migrate a small group of whooping cranes.

**YS:** Your birds were born in captivity, but it was at a very young age that they were brought to your ranch and at least somewhat weaned into the wild?

**KC:** We hatched them at the Patuxent Wildlife Research Center in Laurel, Maryland. They were kept there for the first 15 days because of Patuxent's expertise and facilities. They were then flown to Idaho to be reared on the ranch and trained to follow the airplane. While raising the young whooping cranes, we spent about four to six hours a day out in the fields exposing them to the environment just as they would if they were wild cranes. As soon as they started feeding, I would leave them there alone to take care of themselves. They soon became content to be with each other and did not require my presence to survive. We monitored them from a distance so as to not be seen. That was part of the process which enabled us to release them into the wild and have them survive.

We also raised a group of sandhill cranes that were integrated with the whooping crane chicks just before fledging. We did this to allow the whooping cranes time to develop a social dominance before being released at the end of the migration with 10,000 wild sandhills cranes.

**YS:** To clarify, you mentioned you are



*Young whooping cranes following Clegg on his Idaho ranch. All photos courtesy Kent Clegg.*

not doing a reintroduction. The purpose of your research was...?

**KC:** The purpose of our research is to develop a technique for reintroducing birds into areas where they no longer exist. There are many things that need to be learned before an actual reintroduction can take place. The first is to determine if birds can be raised wild enough to survive. Second, can a migration be taught to young cranes, and will they follow the migration route in subsequent years? Third, will they act like normal cranes, and will they eventually pair and reproduce?

Our primary objective is to develop a technique that will answer those three questions. If we are successful, it is conceivable that it may be used with any number of endangered species around the world. Just in the case of cranes alone, half of the 15 different species are endangered. The Japanese, the Russians, and many others are looking to this project in hopes of finding a way to help conserve their cranes.

**YS:** Let's talk about your plane, the ultralight. This was a skill and a hobby you had prior to being involved with the cranes. You didn't learn this skill because of them.

**KC:** No, not at all. I learned to fly when I was just a kid. My dad was a private pilot and had several small aircraft over the

years. I used to fly with him all the time, and he taught me the basics of flying. I bought my first ultralight from a neighbor. He had built and flown it a few times before crashing it. I brought it home, reassembled it, and then taught myself to fly—but I wouldn't recommend that to anybody! The first time I took off, I nearly hyperventilated before getting back on the ground. With no one else there to land the plane, that is not a good thing.

I did eventually get a private pilot's license. I used ultralights on different projects before the whooping cranes. I used one counting and hazing swans on the Henry's Fork, and also used one doing aerial photography for local farmers monitoring fertilizer applications.

**YS:** How fast does this plane go? How high up do you fly when you're leading the cranes?

**KC:** The average flight speed with the cranes is about 35 mph, although at times we calculated ground speed at 59 mph. Of course, that is with a tail wind pushing the plane and the birds along. The plane I fly is called a Dragonfly and is made by Moyes Microlite in Australia. The plane was shipped to Florida and assembled there. After doing all the test flights, the plane was disassembled and shipped to Idaho. The plane was designed to pull gliders and hang-gliders and has a very low stall speed, which is necessary for

flying with the cranes.

On average, we fly about 1,500–2,500 feet above the ground. It takes us a while to get up to that altitude. Often we use thermals to help us climb and to save energy. As we cross the Continental Divide near Price, Utah, we are at about 10,000 feet MSS. It is impressive from that altitude to look at the mountains and valleys below and then at the birds off your wing tips and know that you are part of a unique migration.

### Heading South for the Winter

**YS:** Back to 1997...so you led the whoopers you had raised back to wintering grounds at Bosque Del Apache National Wildlife Refuge in New Mexico. Tell us about the journey.

**KC:** The migration took us nine days to go from Idaho to New Mexico. We left Idaho with four whooping cranes and eight sandhill cranes and arrived with all but one sandhill that was fatally injured during the trip. One of the whooping cranes was attacked by a golden eagle near Price, Utah, and was trailered the rest of the way.

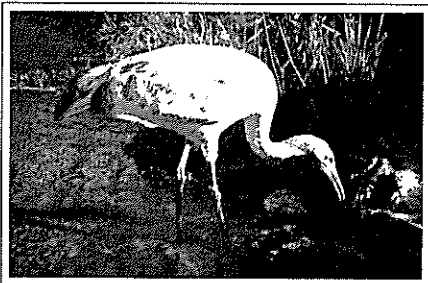
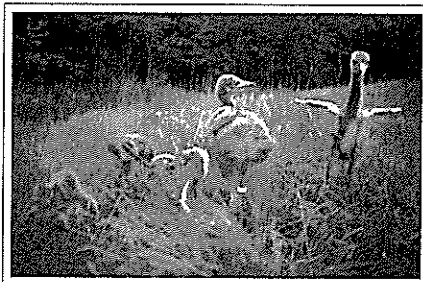
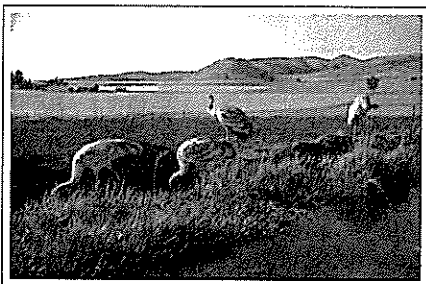
**YS:** Obviously you have to put down somewhere along the way. Is that a function of your exhaustion level, the birds getting tired, or a little bit of both?

**KC:** Both. We'd try to stay in the air as long as possible and get as much distance as we could out of each flight. We'd have about three hours of fuel on board and can cover about a hundred miles in that amount of time. Often we had to land because the birds were tired due to unavoidable encounters with golden eagles, head winds, and climbing over mountains. We have also run low on fuel a time or two and had to land.

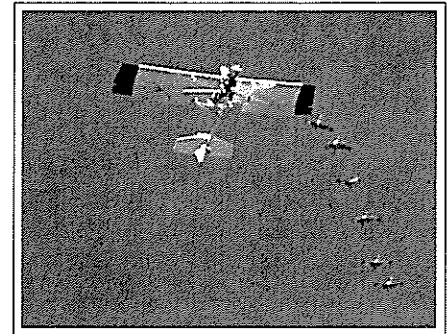
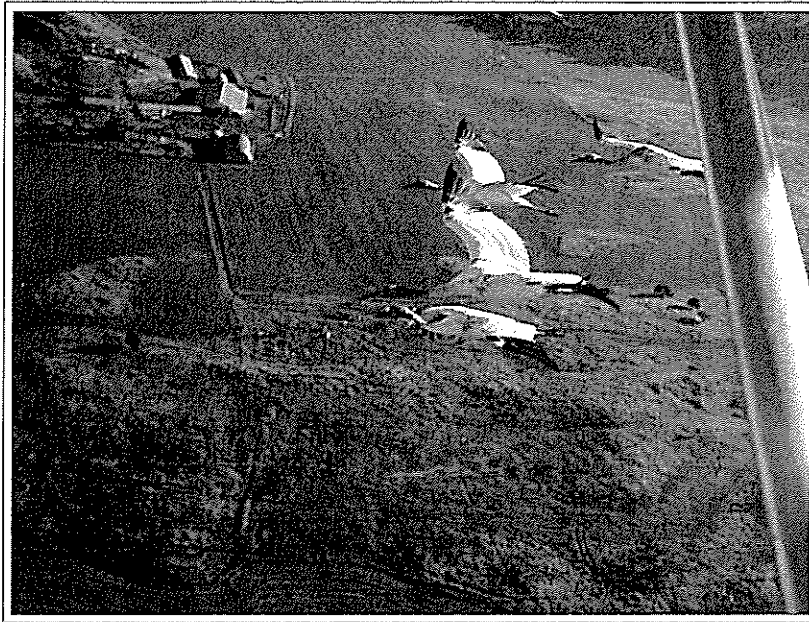
**YS:** How did you figure out where you were going to stop every night?

**KC:** Our stops are not planned. We try and get as much distance as we can each day and then camp where ever we end up that night. We only need about 300 feet to land and take off, which does not limit us too much.

We've found farmers and ranchers to be the most hospitable, so we looked for hay fields and pastures in which to land. We did land on a golf course once and were met with by a hostile police depart-



Above and below left: Whooping cranes feeding. Top right: Young whoopers stretch their wings. Below right: A young captive crane is checked over prior to being released from a pen.



*Above: Whooping cranes following Clegg in his ultralight plane. Left: View of whoopers in flight.*

ment and had to leave.

**YS:** Other than that one incident, you've never had a landowner deny you permission to stay?

**KC:** No. In fact, most people were fascinated with the fact that a plane drops out of the sky with a bunch of birds following it. Everybody has been very nice and helpful, some even put us up for the night. We had a ground crew following along with portable pens and our necessary ground equipment.

**YS:** The birds are penned up at night when you're on this journey?

**KC:** We penned the birds at night to protect them from predators and to avoid having them wander off in an unfamiliar area. We were also concerned about golden eagles attacking the young cranes. We had incidents on two of the migrations where cranes were attacked by golden eagles and injured or killed.

**YS:** Are there ground predators that go after them?

**KC:** Few predators will challenge a full grown crane. They will often hang around large flocks and pick off the injured or sick. Coyotes will occasionally rush a large roost of cranes at night, catching the unsuspecting crane.

**YS:** Are your birds marked to help you keep track of them?

**KC:** Each bird has a radio transmitter attached to a leg band. There are two types of transmitters. One is conventional and emits a signal that can be picked up

with a hand-held receiver. The other is a satellite transmitter that sends a signal to a satellite which is relayed to a computer giving us the latitude and longitude of each bird. It all *sounds* good as long as it is working. However, we have a lot of problems with the cranes breaking off the antennas, making them useless.

**YS:** It sounds like there were great opportunities to educate people along the flight to New Mexico.

**KC:** Not just along the migration. It's one of the few projects that I have been associated with that seems to capture the imagination and interest of the general public. I think it is a great way to educate and make people aware of the need for conservation.

**YS:** When you ended your journey that fall, at Bosque Del Apache, what was your reception?

**KC:** We were surprised by the number of people who were there when we arrived. Because it is a research project and we did not want the birds to associate with people, we had not allowed the media and others to be around while raising or migrating the birds. It was a nice climax after making the 800-mile migration to see so many people there in support of our efforts.

### **Returning to Greater Yellowstone**

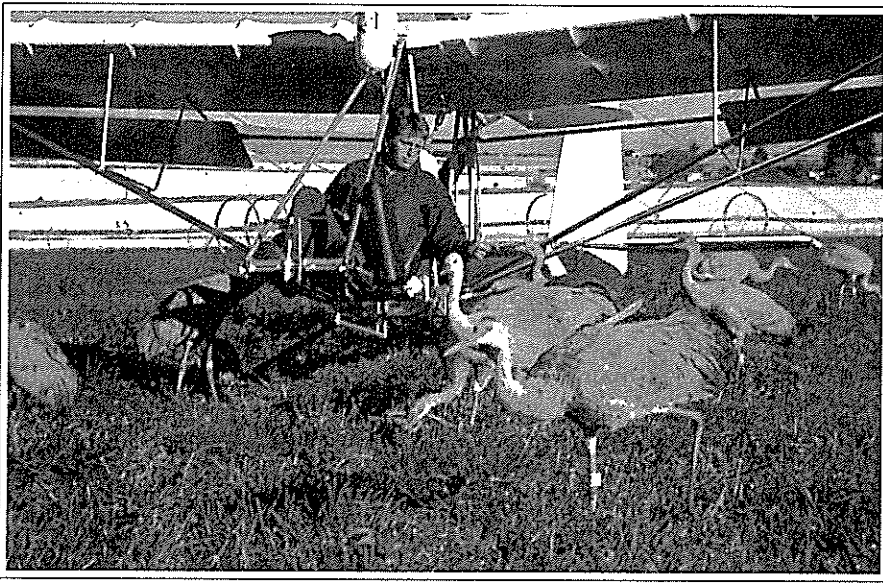
**YS:** Two birds from this experiment, the winter of 1997-98, ended up in

Yellowstone National Park. How did that transpire?

**KC:** Two of the four whooping cranes survived the winter to migrate north in the spring. The other two were killed by predators during the winter. We suspect one of them was killed by a bobcat because we found the remains buried in the ground, which is typical of cats. The other time, we found only feathers and the transmitter, and coyotes in the area. There are a large number of predators on the refuge, so releasing captive-reared cranes into a wild environment will have a certain amount of mortality.

We feel that it has been successful considering that 8 of the 11 cranes released into the wild this year survived the winter to migrate north. All six sandhills and the two whooping cranes migrated back north into Colorado in early March and, after spending six weeks in Colorado, migrated on north, ending up in Wyoming. The two whooping cranes were found in separate locations and in poor habitat. Both were caught with the intent of locating them into a habitat that would ensure their survival and also determine if they would return to specific summer sites in subsequent years. Once the birds were captured we ran into strong opposition from both state and federal agencies that did not want whooping cranes in their state or region. Basically, we were not allowed to release the birds. Fortunately, Yellowstone Park agreed to a re-





*Clegg on the ground in his ultralight plane surrounded by whooping cranes.*

lease which saved the birds from ending up in a zoo.

**YS:** Although you originally did have permits from the states to do your migration.

**KC:** I work under a federal permit that allows me to work with whooping cranes. We are required to also have state permits to work with cranes that may end up in a particular state. As a private contractor, it sometimes seems as though you need a permit to hold a permit. I apparently did not have the proper permit to transport the cranes from Wyoming back to Idaho. Again, it was fortunate for the birds' sake and for the sake of science that we were allowed to bring the two whooping cranes here to Yellowstone Park.

**YS:** Somewhat unfortunately, perhaps, they're both females, right?

**KC:** According to blood tests they are both females. The only way to tell the sex of a whooping crane is through a blood test, and the tests indicate they are both females.

**YS:** For the last eight to ten summers we have had one or two whooping cranes from the foster flock that have showed up in Yellowstone. Is there any chance that these birds might meet up someday and possibly mate?

**KC:** One of the cross-fostered whooping cranes summers at Red Rocks, Montana; the other summers here in the park in Bechler Meadows. We were able to get

the ultralight cranes to associate with the cross-fostered cranes during the winter in New Mexico.

There is a slim possibility that the birds could mate provided they are of the opposite sex. We are not completely sure on the sex of the older cross-fostered birds. At any rate, they do not pair until they are 3 to 5 years of age, so it will be a while before that could happen. Getting them to survive to that age is our main objective right now.

**Post-interview note:** The two whooping cranes were released in the Slough Creek area on May 1, 1998. As a result of human activity in that area it was decided that it would be better to relocate the birds to a more remote part of the park.

Catching a flighted bird is always easier said than done. Three unsuccessful attempts were made to capture both cranes. In mid-July one of them was caught and moved to the Bechler Meadows area. It readily joined with an old cross-fostered whooping crane that has been coming to the park for several years. In late September, both ultralight cranes and the cross-fostered whooping crane migrated to Teton Basin, which is a typical staging area in the fall for cranes. The two ultralight cranes joined back together after being separated for about two months. They remained in the valley for nearly a week before leaving. Both cranes were found in New Mexico but were in sepa-

rate locations. One returned to the Bosque Del Apache NWR while the other was seen near Farmington, New Mexico, in early November 1998, and was seen near Wilcox, Arizona in January 1999.

### Prognosis for the Future

**YS:** Given that these are one of the most, if not *the* single most endangered bird in North America, people are still concerned about its overall prognosis. To sum up, the chances for recovery in this flyway are not good?

**KC:** Not with the opposition of the states. The reason we have pushed so hard to do the research here is that we feel like this flyway has specific characteristics that increase the chance of success with this technique. The cranes in the Rocky Mountains are funneled up and down the Rockies in a very concentrated flyway. The wintering area is a narrow strip of agricultural lands along the Rio Grande River, which concentrates thousands of birds. Consequently, we stand a better chance of associating and manipulating crane behavior there than anywhere else. Twenty years of research has been conducted here in this flyway during which time a lot has been learned. We are using that information and new ideas to develop a new and better reintroduction technique.

**YS:** And your personal involvement with whooping cranes seems a little bit up in the air?

**KC:** Up in the air is one way to put it, I guess—we're grounded right now! It has been a personally rewarding experience and probably one that not too many will ever have the opportunity to do. It has been disappointing to be stopped by politics and bureaucracy, especially when the technique has so much promise. Personally, I feel there are still a lot of unknowns and many things yet to discover before we can really make a difference in the ultimate recovery of whooping cranes.

**YS:** Do you plan to write up your results?

**KC:** We write an annual report that is sent to interested parties and contributors.

**YS:** We'll look forward to seeing that.



## Book Review

*Interpreting the Landscape of Grand Teton and Yellowstone National Parks: Recent and Ongoing Geology*, by John M. Good and Kenneth L. Pierce, Grand Teton Natural History Association, Moose, Wyoming, 1996, 58 pages. \$12.95 (softcover).

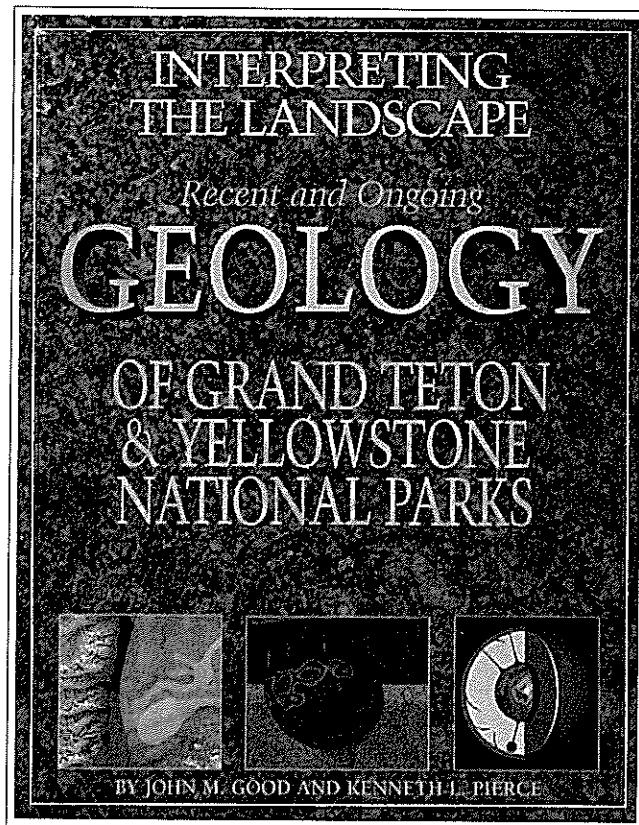
Reviewed by Neysa Dickey

If there were only one word allowed to describe this book it might be "contrasts." Pierce brings his strong background in geology to the effort while Good's interpretive skills breathe life into rock-hard concepts. They succeed in sharing their knowledge of and excitement about the geologic past, present, and future of this unique area.

"This book is aimed at growing numbers of interested, better informed visitors to Grand Teton and Yellowstone who want to learn about the youngest mountain range in the Rocky Mountain chain, one of the largest mountain ice fields in the lower forty-eight states, mountain lakes, and the sources of heat in geyser basins." The authors know their subject and the target audience, and generally hit the mark. But their task is not an easy one; explaining geologic theories, especially of the Yellowstone and Grand Teton area, never is!

Yet in less than 60 pages, these co-authors manage to fill the reader with images of mountain-building, caldera formation, the Yellowstone Hot Spot, glaciations, and the resultant geologic landscape of today.

The concepts covered, such as convection cells, exsolution, and the complexities of multiple glaciations and nearly infinite faulting, could be intimidating for the average reader, but the active language, full of color and analogies, helps save the day. Chapter Two, "A Flight of Fancy," gives a real feel for the time and place through the eyes of a high-flying eagle. Phrases early-on such as "flowing liquid fire," "violent gaseous currents," "rolling masses of incandescent, hot ash," and "the gun was loaded and cocked," keep even a novice reader anxious for more.



By contrast, the reader is tossed back and forth from quite technical and complex language, ideas, or graphics to wonderful metaphors, simplified explanations, or understandable drawings. Chapter Six, "Tracking the Yellowstone Hotspot," begins with a clear analogy: the Earth an egg, the crust its shell, the yolk its core, and so on. It continues to say that the deepest drill hole in America is only six miles deep, leaving the next part unexplained; that is, how do we know the mantle extends about 2,000 miles or that the crust is generally 25 miles thick?

The next chapter, "Building the Yellowstone Ecosystem," with its "busy" map showing "boundaries of neotectonic fault belts" and "lesser and reactivated Holocene" fault types, requires the reader to slow down, flip pages, and seek out the glossary frequently. Later, we're lost in stream flow and diverging terraces of the Bighorn Basin, then rescued by a clear word-picture of a tiny boat (Billings, Montana) afloat on the surface of a hot swell.

Another "saving" sentence, one that hits the reader like a two-by-four on the forehead, is found earlier, on page 16. We

are wading through "hydrothermal features, heat flow, seismicity, earthquakes, gravity, and historical altitude change" to show evidence consistent with a "large, partly molten magma body at shallow depth that extends northeast of the caldera rim." We continue through low-density rocks, low seismic velocities, hot-but-not-molten-rocks, and emerge to the perfect summary: "Thus we see that Yellowstone's fires are only banked, not out."

Other comparisons move us along comfortably: likening the eruption of the Lava Creek Tuff to a shaken bottle of carbonated water, the "...north end of the Teton range was like a ship's prow, separating ice streaming to the south from that to the west;" viewing a glacier as a conveyor belt; and "That's a geological rocket!" referring to the uplift rate at LeHardy Rapids. Geology comes alive.

Humor inserts its smiling face, too. In discussing the unique properties of water comes, "This is why ice floats on lakes and gin." And, yes, even poetic language coaxes us to enjoy that often-dreaded subject—geology! In dealing with snow, ice, and glaciers, "The crystals (snow-

flakes) are so delicate a baby's breath melts them or the sweep of your hand sends thousands dancing from your car roof."

At times, the language approaches "slang" and may hinder the message. "Miles of streams man [sic] hasn't messed with..." might be gentler on the mind's ear as "humans haven't tampered with..." It would seem more appropriate in a book like this to avoid anthropomorphism and personal opinion, too. In writing about how adaptable lodgepole pine forests are to sterile rhyolitic and silicic soils the authors state, "Their adaptability is why you see so many miles of boring forest along Yellowstone roads." Boring? And towards the end of the book: "We know beavers were splashing happily and munching willows..." Splashing? A certainty. Happily? Well...

The bulk of hardcore science throughout the book is supported, whether by

referring to the research work of Pierce and Morgan concerning the hotspot or turning our minds to the convincing evidence of seismic studies. The frequent summaries, glossary, index, and selected additional reading list all help to clarify or substantiate the authors' words. With that said, then, it is unfortunate that this book didn't receive the high quality of proofreading, binding, and design factors it deserves. There are many typographical and occasional grammatical errors. Other items range from tiny glitches (inconsistencies in the diagrams on page 11) to distracting, inaccurate references (on page 24, we are referred to a map on pages 20–21 when it is actually on pages 22–23; page 34 text refers us to Figure 9.8 when 9.7 is meant instead).

Although this book isn't intended to go into details of the particular features of the Yellowstone-Grand Teton landscape, an explanation of the formation of the

Grand Canyon of the Yellowstone River, a critical chunk of the geologic mosaic, seems to be missing. It could come on page 33 as the authors talk about glaciers. "In early Pinedale time before the Yellowstone Plateau was ice-covered, ice from the Beartooth uplands flowed southward up the Grand Canyon of the Yellowstone River, then ice-free. This advancing ice front dammed the Yellowstone River creating ancestral Hayden Lake whose silts, sands and gravel form the rolling, grassy hills of Hayden Valley today." Or perhaps it belongs on page 46, with the relating of torrential flooding of the Yellowstone River's Black Canyon and Yankee Jim Canyon. Instead, we lack the connections of glacial dams, Hayden Lake, and flooding to the formation of the Grand Canyon, one of the area's primary features.

Still, the strong points of *Interpreting the Landscape* far outweigh its weaknesses. The authors have captured the excitement of this geologic story—the realization that volcanic events forming Yellowstone and Grand Teton national parks weren't just projects of millions of years, but a sequence of explosions and flows on a short time scale; that it all required a heat source much larger and younger than ever before imagined; that in hours (most likely), more than 240 cubic miles of Lava Creek Tuff lay within and around the caldera, and that thermal features, waterfalls, lakes, rivers, plants, and animals, so much a part of the Yellowstone story, all are dependent on the area's geology.

Return to page 1. Read the goal of their efforts. "We describe the geologic events and processes that created the landscape we see today, the stage that defines play and players." Yes, gentlemen, you do and you do it well.

*Neysa Dickey has served in six national parks and two regional offices since she began her NPS career in 1975. She came to Yellowstone in 1994 as Canyon District Naturalist, where she and her staff regularly explain Yellowstone's geology to thousands of curious park visitors. She has written and edited articles for a number of newsletters and Park Service publications. ❄️*

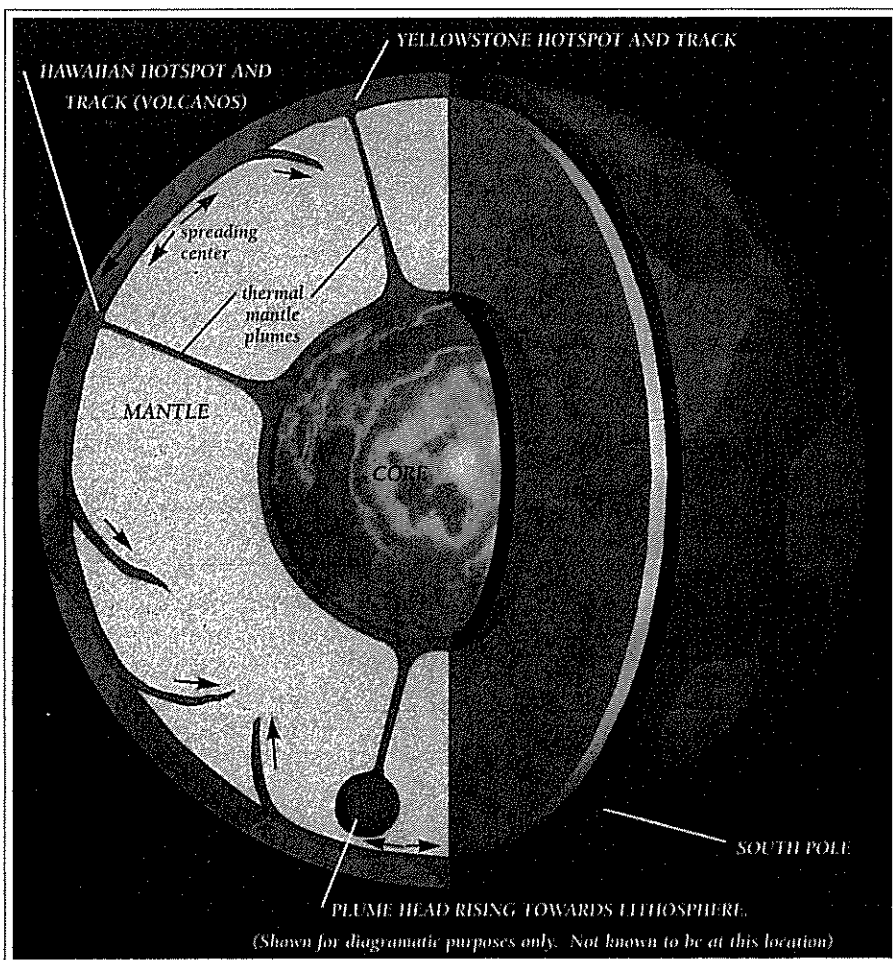
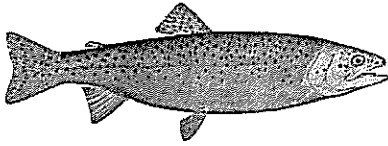


Illustration on page 17 in *Interpreting the Landscape of Grand Teton and Yellowstone National Parks: Recent and Ongoing Geology*.



## Whirling Disease Found in Yellowstone



During the 1998 field season, staff from Yellowstone's Aquatic Resources Center confirmed the presence of whirling disease in the park. In recent years, the disease, caused by a parasite that attacks the cartilage of young fish, has been found in streams around the park, but previous sampling efforts had not indicated its presence within Yellowstone. In three separate tests, native cutthroat trout taken from near Clear Creek, a major spawning tributary to Yellowstone Lake, tested positive for whirling disease. The affected fish are unable to feed normally, which often results in the victim being more subject to predation, starvation, and premature death. Biologists will test additional cutthroat trout from in and around Yellowstone Lake during the summer of 1999 to learn more about the extent of the disease.

## NAS Begins Review of Natural Regulation Policy

In 1998, Congress requested the National Academy of Sciences (NAS) to initiate a comprehensive and objective review of the so-called "natural regulation" policy in Yellowstone. A budget of \$500,000 was allocated for the task, estimated to take two years, and 12 scientists were named to serve on the group. An initial visit to Yellowstone took place in January 1999; subsequent field trips to the park and visits with academicians are planned during the course of the committee's investigation. The policy, initiated after a major review of wildlife management in the national parks was completed in 1963, has often been criticized by game and range managers. The committee members are expected to review voluminous amounts of research, particularly related to the ecology of Yellowstone's northern range.

## Legislation Gives NPS New Mandate for Research

On October 13, 1998, Congress passed an omnibus bill that provided for a number of improvements to National Park Service (NPS) programs. Title II of the act provides "clear authority and direction for the conduct of scientific study in the National Park System and to use the information gathered for management purposes; to ensure the appropriate documentation of resource conditions...to encourage others to use the NPS for study to the benefit of park management as well as broader scientific value...and to encourage the publication and dissemination of information derived from studies...."

The legislation directs the Secretary of Interior to undertake a program of inventory and monitoring to establish baseline resource conditions in the national park system, to be coordinated with other federal information collection efforts. Information concerning the nature and specific location of resources that are endangered, threatened, rare, and commercially valuable, and objects of mineral, paleontological, or cultural patrimony may be withheld unless determination is made that disclosure "would not create unreasonable risk of harm, theft, or destruction of the resource or object...."

## Wolf Monitoring Continues to Show Success

Douglas Smith



Biologists successfully captured and radio-collared 24 wolves from 7 packs in and near the park since January. The goal, as in previous years, was to capture and radio-collar 30 to 50 percent of the pups in each pack and replace or install collars on the two lead adults in each pack. This

will ensure continued monitoring of up to 11 wolf groups or packs that have become reestablished in the greater Yellowstone area. The capture operation is a part of a monitoring plan approved in 1995. During this year's helicopter-darting, a female pup, one of a litter of 10 born last spring to the Rose Creek pack, was injured and had to be euthanized on January 17. In a fluke accident, the animal was hit directly on the hind leg bone by a capture dart, causing a compound fracture of the tibia. Before the decision was made to euthanize the animal, the wolf was examined by two veterinarians who felt that there was low likelihood the animal would avoid infection, be successfully treated, and be able to be returned to the wild after treatment, especially during the winter months when wolves tend to move long distances through heavy snow. Since wolves were reintroduced into Yellowstone in 1995, 69 animals have been captured and radio-collared without any previous injuries.

## Fifth Biennial Science Conference to Focus on Alien Species

"Exotic Organisms in Greater Yellowstone: Native Biodiversity Under Siege" is the theme of the Fifth Biennial Science Conference on the Greater Yellowstone Ecosystem, to be held October 11-13, 1999, in Mammoth Hot Springs. The conference series provides a forum for researchers, managers, and other interested persons to discuss scholarly work and professional resolution to issues that affect Yellowstone's resources. Potential topics for presented papers and panel discussions include: defining exotic or alien species; environmental history of non-native resources; effects of alien species on native resources and human experiences; biocontrols and other management techniques; and ethical considerations in managing exotic organisms. Abstracts will be accepted through March 15, 1999. For more information contact Joy\_Perius@nps.gov or call (307) 344-2209.

