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Platte River Caddisfly

Rare insect may become state's next endangered species

Text and photos by Eric Fowler

There are a few species of caddisflies that call the Platte River Valley home, but with an adult life stage that allows them just a few weeks to fly around and be seen, few people are aware of that, or would even know a caddisfly if they saw one. One caddisfly species flew so far under the radar that it wasn't discovered until 1997. Presumably found nowhere outside the Central Platte, it was aptly named the Platte River caddisfly (*Ironoquia plattensis*). Already rare when compared to other insects when it was discovered, its numbers have since dropped in some locations, raising concerns that could earn it a spot next to 13 other plants, mammals, fishes, insects and amphibians found both in Nebraska and on the federal list of threatened and endangered species.

By August 8, 2009, the U.S. Fish and Wildlife Service (USFWS) is to publish its initial review on the status of the Platte River caddisfly in the Federal Register. This court-ordered deadline is in response to a petition by WildEarth Guardians, an environmental group that in 2007 petitioned the service to list the Platte River caddisfly and 205 other species as threatened or endangered.

Facing several threats, including changes to river hydrology, loss and degradation of habitat and threats from invasive species, it appears that such protection for the Platte River caddisfly may be warranted. But little is known about the obscure insect.

"We don't know if it should be listed or not," said Robert Harms, fish and wildlife biologist with the USFWS in

Grand Island. "At this point, we're still gathering information about the species and its threats. But given the declines in the number of insects at some sites, it could very easily meet the mark to make it a candidate species."

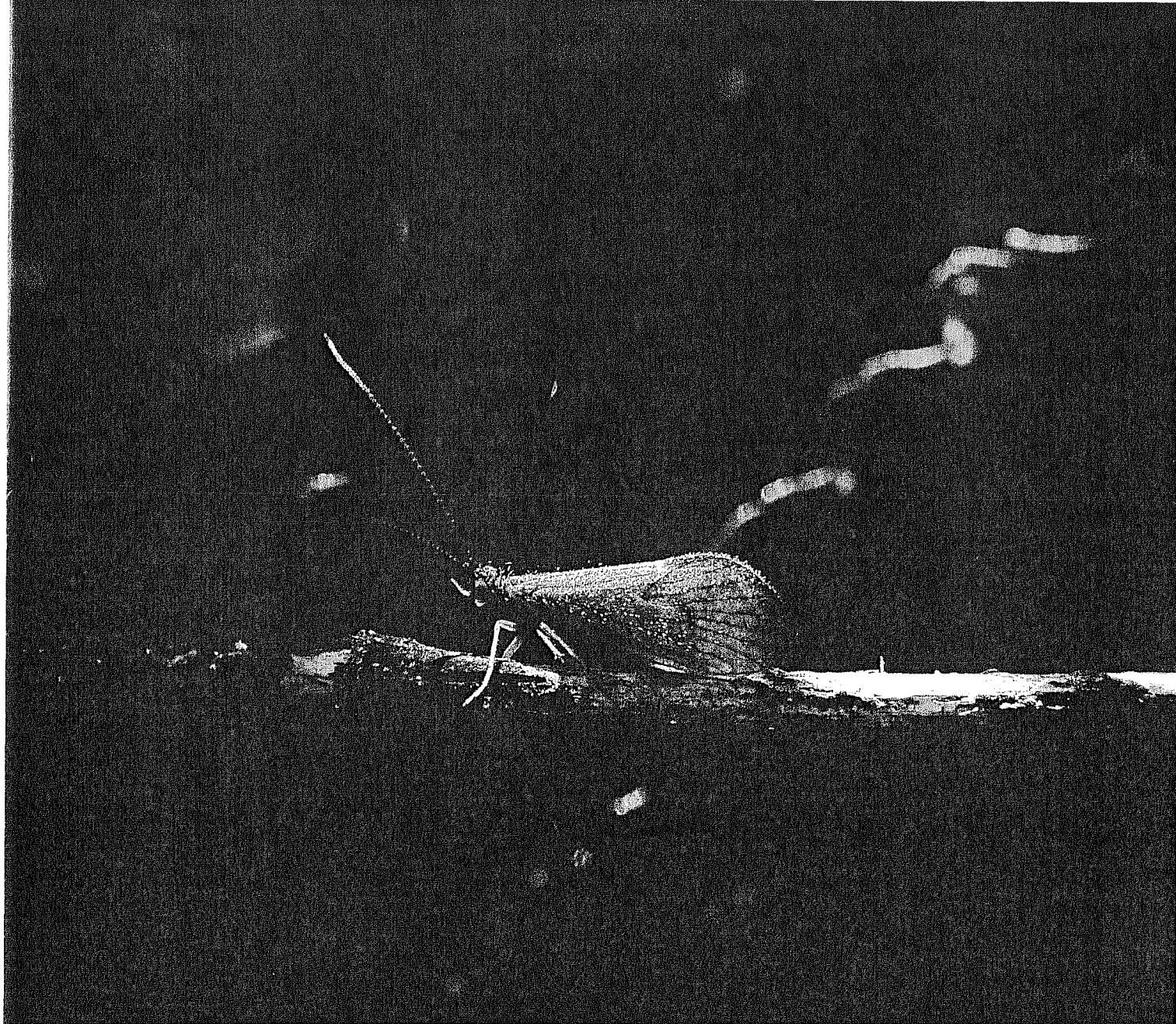
The Platte River caddisfly was discovered by Beth Goldowitz and Matt Whiles, biologists who were studying wetland sloughs and the amphibians, fishes and insects that inhabit them for the Platte River Whooping Crane Trust on its Mormon Island Crane Meadows property south of Grand Island. Following a wet year in 1995, scientists had noticed a huge spike of biological activity in the wetlands, especially in the number of frogs, toads and fish, and hoped to better understand the ecosystems, their value to migratory birds and how fluctuating water levels affected them.

In June 1997, biologists set up drift fences and pitfall traps – buckets sunk in the ground – to collect insects and invertebrates that were migrating out of the water and onto land. When they checked their traps one day, they found a surprise: "The bottoms of our buckets were just full of thousands of these caddisfly larvae," said Goldowitz. "We literally discovered this insect completely by accident."

Both Goldowitz, a fisheries biologist working for the Crane Trust, and Whiles, a Kansas State University entomologist, immediately recognized the larvae as caddisflies. But Whiles knew there was something different about this species – it was smaller and left its wetland habitats earlier than other caddisflies

known to inhabit the region.

There are about 1,350 caddisfly species in the order *Trichoptera* that inhabit freshwater rivers, streams, lakes, marshes and other wetlands. Caddisflies in general are small, moth-like insects with two sets of hairy wings that take the shape of a tent when folded against their bodies. Adult females lay their eggs on or under the water, and sometimes even in vegetation above it. In as little as three weeks, the eggs hatch into larvae which live underwater and, depending on the species, feed upon algae, vegetation or other insects. The larvae of some species roam freely on the bottom of whatever body of water they inhabit.



A Platte River caddisfly rests on a twig near a Hamilton County slough, one of 10 sites in the Central Platte River Valley where the rare insect is currently known to exist.

Others build cases with silk they produce and silt, rocks, sand or small pieces of vegetation that they carry with them throughout their life much like a snail carries its shell. A third variety builds a net that they use both as a retreat and to catch food. Larvae go through several growth or instar stages, shedding their rigid exoskeleton between each and expanding their case as needed. After their last larval stage, the insects pupate, a process that may last weeks or months. Some species pupate underwater and others on land. When pupation is complete, they emerge as adults. As adults, their primary purpose is to mate – they do not eat and it is a short life, lasting just

one to two weeks for most species. To ensure adults have a chance to mate, emergence is synchronized, with males hatching before females. Trout anglers know this phenomenon as the “hatch,” common among caddisflies as well as mayflies and stoneflies.

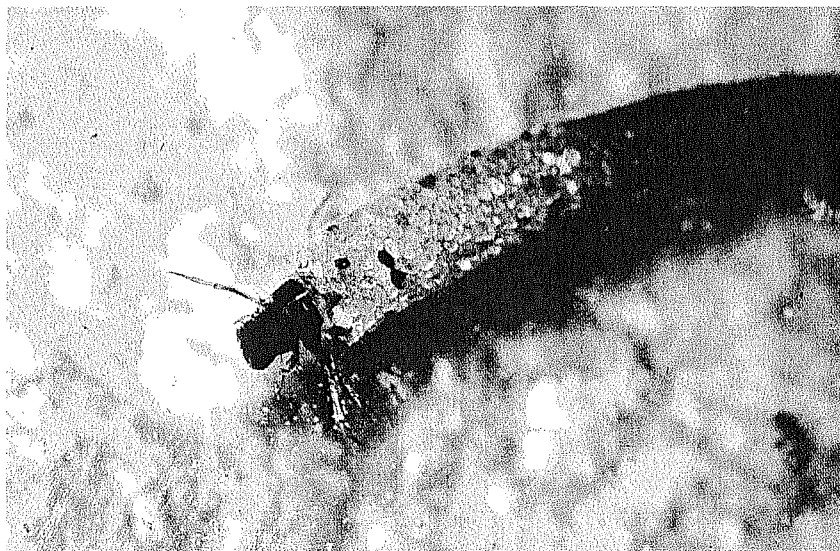
While the caddisfly Goldowitz and Whiles found was similar to *Itronoquia parvula*, a species more common east of Nebraska, further work in the lab failed to match them to that or any other member of the genus. “At that point we had to collect adults in order to be able to definitively identify them,” said Goldowitz.

Screened boxes were built and placed around the wetland at an elevation near

where the caddisfly larvae had been collected. Technicians working on the wetland study, which was funded in part by the U.S. Environmental Protection Agency, checked the traps daily for the next three months before adults finally emerged in late-September.

Specimens were sent to the science department at Wayne State College, where Kevin Alexander used a scanning electron micrograph to visually dissect male and female samples and confirm the find was indeed a new species. The insect was accepted by the American Entomological Society in 1999.

“That first year what we learned is that all of the adults emerge within about a 10-day period,” Goldowitz said.



A Platte River caddisfly larva pokes its head out of its case in the entomology lab at the University of Nebraska at Kearney.

"That was it. Boom, boom, and it was over."

In 1998, Goldowitz and Whiles collected larval samples monthly to study the lifecycle of the species, which they learned is closely adapted to the hydrologic regime of the sloughs and wet meadows it inhabits. After adults emerge from late-September through mid-October, they mate and lay their eggs on the surface film of water in shallow sloughs, linear depressions that were once river

channels. The eggs sink to the bottom, but do not hatch for about a month, presumably a safeguard against wetlands drying once more before becoming wet for the winter.

Unlike similar *Isonychia* species, Platte River caddisflies grow very little after hatching in the fall and spend most of their first larval stage dormant on the bottom of the wetland, which can freeze solid during winter. Larvae build a case with small particles of sand and soil bound with silk and live in and carry

this case until they emerge as adults.

In February, the larvae begin growing and feed by shredding aquatic vegetation and plant material found beneath the water. In late-May or early-June, during the fifth and final growth stage, larvae move from the wetland to the adjacent wet meadow. The timing of this emigration occurs when wetlands often dry out for the summer, and is much earlier than other caddisfly species that pupate on land. Larvae spend the summer beneath the vegetative litter of the adjacent wet meadow, where they remain somewhat active but do not feed.

In early September, the insect pupates within its case and emerges later that month when surface and groundwater levels are rising and water is returning to the wetlands. Unlike other species of caddisflies, which fly upstream to lay eggs that then develop as they drift, Platte River caddisflies are poor fliers and don't range far from the slough.

"They don't need to because this is a wetland slough," said John Reins, a University of Nebraska at Kearney (UN-K) graduate student who has studied the Platte River caddisfly. "The water stays relatively constant. They probably lay their eggs the same place that their mother laid her eggs, or pretty close, within 10 feet or so."

Goldowitz continued to monitor the Platte River caddisfly on Mormon Island through 2003. In 1999, she branched out to look for other populations of the insect's larvae at 17 sites between Overton and Chapman, finding them at five new locations, all within a 46-mile stretch of the Platte between Gibbon and Central City. In the fall of 2004, she conducted another search for the Nebraska Game and Parks Commission, taking sweep net samples at 28 sites along the Platte and Loup River in eastern Nebraska in hopes of capturing adults, but finding them in only two sites where she had previously found larvae. None were found on the Mormon Island site where the species was discovered. Bad weather scuttled plans to search similar habitats along the Elkhorn River.

UN-K entomology professor Wyatt Hoback and his students are continuing the search for the insect in known and new locations. This spring, Lindsay Vivian, using a Geographic Information



Platte River caddisflies use sand and silk to form a case they carry with them until they pupate and emerge as adults.



Lindsay Vivian holds a larval case left behind by a Platte River caddisfly that she found while searching the area around a Hamilton County slough with fellow University of Nebraska at Kearney graduate student John Reins.

System model she helped develop as part of a graduate study to help identify likely habitats, as well as studying aerial imagery on Google Earth, found larvae in six new locations, stretching its known range west to Kearney and east to Silver Creek.

"We thought it was so very rare, so to keep finding more populations is good news," Vivian said. "I was definitely excited."

While that is good news, the number of insects remains high in only two of the original sites where they were found. They are very low in number at two of the original sites as well as the eight new ones, and are not found two others.

Changes to the historic flow regime of the Platte River are the primary threat to the survival of the Platte River caddisfly and its wetland and wet meadow habitats. Winter ice jams and high spring flows once regularly sent water over a broad swath of landscape, creating new backwater and slough

habitat and scouring vegetation from old ones. High spring flows are now stored in irrigation reservoirs and seldom occur. Diversions and the proliferation of groundwater wells for irrigation in the region have reduced summer river flows and lowered groundwater levels, which provide water for wetlands and wet meadows in the valley that are utilized by many other fish and wildlife species. The effects of these changes were readily visible during the recent prolonged drought, in which the Central Platte ran dry each summer from 2002 to 2006, sometimes for months.

Additionally, the conversion of 75 percent of the historic wet meadows and sloughs to cropland, and intensive grazing on many of the remaining native grasslands, are also factors that have affected Platte River caddisfly numbers.

"Its evolutionary adaptation to the Platte River system and the historic flow regime makes it an important component of that whole system," said Mike Fritz, zoologist with the Commission's Natural Heritage

Program. "It represents how that system used to function with historical flooding and drying cycles and groundwater regimes that are unique to the Platte River and created and maintained those backwater sloughs and wet meadows.

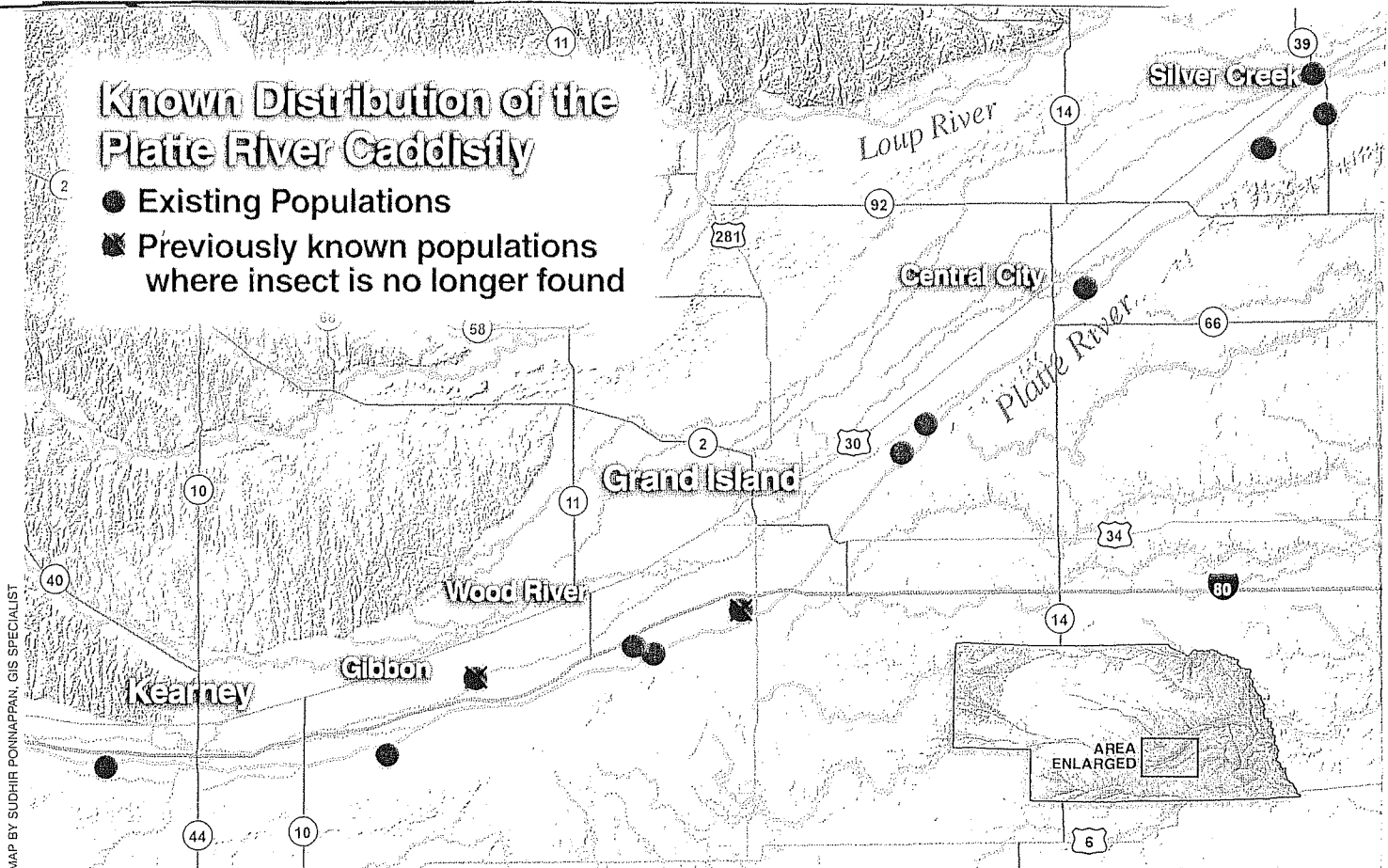
"But most of those habitats have been either significantly reduced or severely degraded, so working on the conservation of the caddisfly works toward the conservation and restoration of those types of plant communities in the Central Platte River."

Other threats to the Platte River caddisfly include invasive plants, some of them nonnative, such as phragmites, purple loosestrife, reed canarygrass, eastern red cedar and Russian olive that are encroaching on the Platte River caddisfly's known habitats.

Also, the nonnative mosquitofish (*Gambusia affinis*), a minnow-sized fish introduced to Nebraska waters to help control mosquito populations, is known to feed on all aquatic invertebrates and has expanded its range since the discovery of the Platte

Known Distribution of the Platte River Caddisfly

- Existing Populations
- Previously known populations where insect is no longer found



River caddisfly. Hoback said mosquitofish are present at one of the two sites that have healthy caddisfly populations, as well as other locations where the insects' numbers have declined. Laboratory studies are underway at UN-K to determine how much

the fish might be affecting the insect.

Hoback and his students are also studying the longevity of caddisfly cases left on the banks of sloughs after adults emerge. "We don't know how long they persist, but we suspect they last more than a year," he said. Knowing the answer to that question will help make population estimates, which can include counts of cases found on land, more accurate.

The UN-K studies, funded by grants from the Service and the Commission, are leading to other new information about the insect. Hoback said that while collecting larvae this spring, they also collected sediment from the bottom of the wetland to take back to the lab. "We looked at the container and pretty soon we saw five more larvae we didn't know were there, and a little while later we found some more," he said. "So we learned they burrow into sediment, presumably to hide from predators. We're learning a lot by happenstance."

Still, much is yet to be learned about the insect. Researchers do not know whether flooding might carry larvae from one wetland to another, but it is believed the limited mobility of adults prevents females from seeking water in which to lay their eggs if the wetland

they emigrated from is dry.

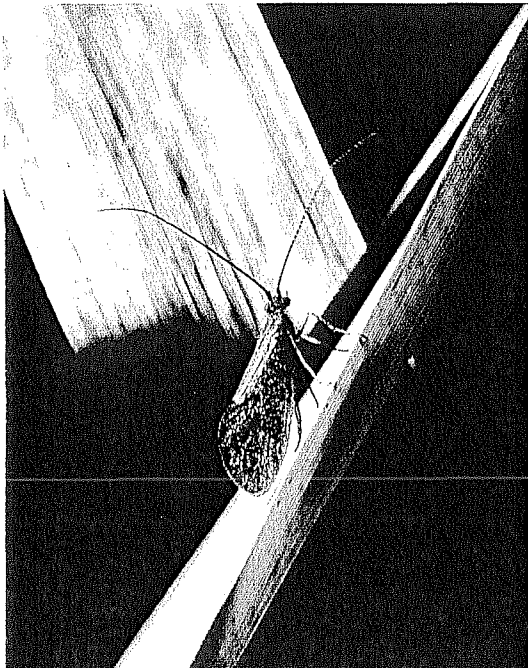
Scientists also do not yet know if another wet period similar to the one that preceded the discovery of the species in 1997 could result in a significant increase in the number of the insects that are found, as well as the locations they are found in. Some sloughs where the species was found in 1999 were dry for several years, but have been wet for the past three and still no caddisflies have been found.

"I don't see any evidence of that happening, but I don't know what is causing the decline," Hoback said. "Nobody does, or even if it is declining."

"This particular insect has a life cycle of only one year, so it's a lot like the [endangered] Salt Creek tiger beetle – it's probably not hiding out for 10 years and then showing up in mass numbers."

No doubt many will question the need to provide federal protection to an obscure insect that may have never been abundant in number, but as has been the case with other species listed under the Endangered Species Act, the Platte River caddisfly is considered an indicator species – its decline mirrors that of its natural habitat.

Certainly, this caddisfly's value to



The small hairs on a Platte River caddisfly's wings sparkle in the sunlight.

the world is not fully known, but its feeding habits – shredding vegetation on the bottom of wetlands – may help improve the health of the wetland. It may have also once provided an important food source for fish, birds and other creatures. In the slough where it was originally discovered, the Platte River caddisfly comprised 30 percent of the total insect biomass found there. Its decline is “a huge loss for everything that would prey on and use it as a forage base,” Fritz said. “So that’s what the value of something as small as these individual caddisflies are.”

If the Platte River caddisfly is added to the list of threatened and endangered species, it may have an effect on property owners, especially if they need to obtain a federal permit, authorization or funding. But because caddisflies are not found in crop fields, farming would not be affected, nor would grazing and even some cases of wetland and river habitat restoration projects.

In this case, even becoming a candidate for listing could be a significant step toward its recovery. “It would definitely bring money to the table,” said Harms. “That would allow us to do more research to see if we can restore these habitats or transplant these insects to restoration sites.”

Federal funding could also allow more extensive searches for additional populations. Goldowitz said she never imagined she would be involved in the discovery of a new species when she started her work. “The fact that we happened to have selected a study site in this particular spot, that was really pure dumb luck,” she said. “I don’t know how else to describe it.”

While initially dumbfounded by that luck, she then realized that finding a new insect wasn’t that rare of an occurrence simply because so little research has been done on insects in Nebraska. Indeed, Hoback said that hundreds of new insects are described worldwide each year. “Careful observation leads to new information,” he said.

Already that thought is playing out. “There are a lot of those little sloughs and drainages back through those areas that by and large we haven’t been able to get on because they’re on private land,” Fritz said. “Once we start looking more, or if we can get access to more

sites, I don’t think there’s any question that we’ll find more [caddisflies]. Now whether we find enough that it changes their status is hard to say.

“We might find that the listing isn’t to the level of endangered. Maybe it’s threatened, or maybe it doesn’t get listed, but because it is a declining species it means it is one we have to look at and focus conservation work on.”

“It’s pretty clear that this species is

probably in trouble,” said Harms. “We’re trying to do something in the 11th hour. It’s hard to work with a species when we don’t have many populations left. We’re in triage mode.” ■

For more on the Platte River caddisfly, visit the site developed by University of Nebraska at Kearney students and staff at <http://cgi.unk.edu:16080/hoback/prcf/>.

