Administrator that the fireworks have been classed, approved, and assigned an EX number. Each application must be complete and include all relevant background data and copies of all applicable drawings, test results, and any other pertinent information on each device for which approval is being requested. The manufacturer must sign the application and certify that the device for which approval is requested conforms to APA Standard 87–1, that the descriptions and technical information contained in the application are complete and accurate, and that no duplicate application has been submitted to a DOT-approved fireworks certification agency. If the application is denied, the manufacturer will be notified in writing of the reasons for the denial. The Associate Administrator may require that the fireworks be examined by an agency listed in § 173.56(b)(1).

* * * * *

10. Add new section § 173.65 to read as follows.

§ 173.65 Exceptions for Division 1.4G Consumer Fireworks.

(a) Notwithstanding the requirements of paragraphs §§ 173.56(b), 173.56(f), 173.56(i), and 173.64, Division 1.4G consumer fireworks may be offered for transportation provided the following conditions are met:

(1) The fireworks are manufactured in accordance with the applicable requirements in APA Standard 87–1 (IBR, see § 171.7 of this subchapter);

(2) The device must pass a thermal stability test. The test must be performed by maintaining the device, or a representative prototype of the device at a temperature of 75 °C (167 °F) for 48 consecutive hours. When a device contains more than one component, those components that could be in physical contact with each other in the finished device must be placed in contact with each other during the thermal stability test;

(3) The manufacturer of the Division 1.4G consumer firework applies in writing to a DOT-approved fireworks certification agency, and is notified in writing by the fireworks certification agency that the firework has been:

(i) Evaluated, and examined, as required, for a Division 1.4G consumer firework;

(ii) Certified that it complies with APA Standard 87–1, and meets the requirements of this section; and

(iii) Assigned an FX number followed by a corresponding certification report identifier (e.g., FX–XXX–YYY, where XXX represents the firework certification agency and YYY represents the certification report identifier that is traceable to the specific manufacturer and firework device transported).

(4) The manufacturer's application must be complete and include relevant background data, copies of all applicable drawings, test results, and any other pertinent information on each device for which certification is being requested. The manufacturer must sign the application and certify that the device for which certification is requested conforms to APA Standard 87–1, that the descriptions and technical information contained in the application are complete and accurate, and that no duplicate applications have been submitted to PHMSA. If the application is denied, the DOT-approved fireworks certification agency must notify the manufacturer in writing of the reasons for the denial. Following the issuance of a denial from a DOT-approved fireworks certification agency, a manufacturer may submit the denial and original application to PHMSA for reconsideration in accordance with subpart H.

(b) *Recordkeeping requirements.* Following the certification of each Division 1.4G consumer firework as permitted by paragraph (a) of this section, the manufacturer, importer, and fireworks certification agency must maintain a record or an electronic image of the record demonstrating compliance with this section. This record must be accessible at or through its principal place of business and be made available, upon request, to an authorized official of a Federal, State, or local government agency at a reasonable time and location. A copy of this record must be retained for five years after the material is imported. Records complying with firework requirements of other Federal or international agencies may be used to satisfy the recordkeeping requirements of this paragraph to the extent that such records address the recordkeeping components specified in this section. For Division 1.4G consumer fireworks certified by a DOT-approved fireworks certification agency, the record must include:

(1) The FX number of the entity that certified that the firework device complies with APA Standard 87–1, including a certification report identifier that is traceable to the manufacturer and specific firework device transported;

(2) A copy of the approval application submitted to the DOT-approved fireworks certification agency; and

(3) A copy of any certification documentation completed by the fireworks certification agency in accordance with the DOT-approved procedures.

(c) *Hazard Communication.* Following the certification of each Division 1.4G consumer firework as permitted by paragraph (a) of this section, each package containing a Division 1.4G consumer firework must be marked and labeled in accordance with subpart D and E of part 172.

* * * * *

Issued in Washington, DC, on August 24, 2012, under authority delegated in 49 CFR part 106.

Magdy El-Sibaie,

Associate Administrator for Hazardous Materials Safety, Pipeline and Hazardous Materials Safety Administration.

[FR Doc. 2012–21360 Filed 8–29–12; 8:45 am]

BILLING CODE 4910–60–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R6–ES–2012–0040; 4500030113]

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the Platte River Caddisfly as Endangered or Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list the Platte River caddisfly (*Ironoquia plattensis*) as an endangered or threatened species and to designate critical habitat under the Endangered Species Act of 1973, as amended. After review of all available scientific and commercial information, we find that listing the Platte River caddisfly as an endangered or threatened species is not warranted at this time. However, we ask the public to submit to us any new information that becomes available concerning the threats to the Platte River caddisfly or its habitat at any time.

DATES: The finding announced in this document was made on August 30, 2012.

ADDRESSES: This finding is available on the Internet at *http://www.regulations.gov* at Docket Number FWS–R6–ES–2012–0040. Supporting documentation we used in preparing this finding is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Nebraska Field

Office, Federal Building, 2nd Floor, 203 West 2nd Street, Grand Island, NE 68801. Please submit any new information, materials, comments, or questions concerning this finding to the above street address.

FOR FURTHER INFORMATION CONTACT: Michael D. George, Field Supervisor, Nebraska Field Office (see **ADDRESSES**); by telephone (308–382–6468, extension 12); or by facsimile (308–384–8835). *mail to:* Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the Federal Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that listing a species may be warranted, we make a finding within 12 months of the date of receipt of the petition. In this finding, we will determine that the petitioned action is: (1) Not warranted, (2) warranted, or (3) warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are either an endangered or threatened species, and expeditious progress is being made to add or remove qualified species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, that is, requiring a subsequent finding to be made within 12 months. We must publish these 12-month findings in the **Federal Register**.

Previous Federal Actions

On July 30, 2007, we received a petition dated July 24, 2007, from Forest Guardians (now WildEarth Guardians), requesting that 206 species in the Mountain-Prairie Region, including the Platte River caddisfly, be listed as an endangered or threatened species under the Act, and critical habitat be designated. Included in the petition were analyses, references, and documentation provided by NatureServe in its online database at *http://www.natureserve.org/*. We acknowledged receipt of the petition in a letter to the petitioners, dated August 24, 2007, and stated that, based on preliminary review, we found no compelling evidence to support an emergency listing for any of the species covered by the petition. In that letter we also stated that we would begin to assess the information provided in the petition in October 2007.

We published a partial 90-day finding for 38 of the petition's 206 species in the **Federal Register** (74 FR 41649) on August 18, 2009; the Platte River caddisfly was one of 29 species for which we found there was substantial information indicating that listing may be warranted under the Act. In that document, we announced that we were initiating a status review. On January 12, 2010, WildEarth Guardians filed a complaint indicating that the Service failed to comply with the statutory deadline to complete a 12-month finding for the Platte River caddisfly. This complaint was consolidated with several others, and a multi-district settlement agreement with WildEarth Guardians was approved on September 9, 2011, which included an agreement that the Service would complete the 12-month finding for the Platte River caddisfly by the end of Fiscal Year 2012. Funding for completing the 12-month finding became available in Fiscal Year 2011, and we began work at that time. This notice constitutes the 12-month finding on the July 24, 2007, petition to list the Platte River caddisfly as an endangered or threatened species.

Species Information

Species Description

The Platte River caddisfly (*Ironoquia plattensis*) adult is a small, brown, moth-like insect with a body length of 5.5–6.5 millimeters (mm) (0.21–0.26 inches (in)) and forewing length of 6.5–8.0 mm (0.26–0.31 in) (Alexander and Whiles 2000, p. 2). Wing membranes and veins are light or iridescent brown with white spotting (Alexander and Whiles 2000, p. 2). The Platte River caddisfly has a short proboscis (tubular mouthpart used for feeding) and long antennae, similar to other species of caddisflies (Holzenthal *et al.* 2007, p. 648). Platte River caddisfly adults can be distinguished from those of other species in the *Ironoquia* genus by their much smaller size (forewing length of 6.5–8.0 mm (0.26–0.31 in) in Platte River caddisflies contrasting with >14 mm (0.55 in) in most other *Ironoquia* species) (Alexander and Whiles 2000, p. 2).

Like several caddisfly species, Platte River caddisfly larvae construct a case around the abdomen (Mackay and Wiggins 1979, p. 186). All caddisflies produce silk from modified salivary glands, and case-making caddisfly larvae use this silk to fuse together organic or mineral material from the surrounding environment (Mackay and Wiggins 1979, pp. 185–186; Holzenthal *et al.* 2007, p. 644). Cases are generally thought to protect larvae by providing camouflage against predation or resistance to crushing (Mackay and Wiggins 1979, p. 200; Otto and Svensson 1980, p. 855). The Platte River caddisfly case is composed of sand grains and can be up to 16.0 mm (0.63 in) long, while larvae can attain sizes up to 14.0 mm (0.55 in) in length (Vivian 2010, pers. obs.).

Platte River caddisfly larvae have a light brown head and thorax and a yellowish to whitish abdomen (Vivian 2010, pers. obs.), much like the larvae of *Ironoquia parvula* (no common name) (Flint 1958, p. 59). Larvae in the *Ironoquia* genus can be distinguished from larvae in other caddisfly genera by four morphological characteristics that are distinguishable under a microscope (Flint 1958, p. 59; Wiggins 1977, p. 248). Differences in larval size (Alexander and Whiles 2000, p. 1) and case material among species have also been noted (Wiggins 1977, p. 248).

Taxonomy

The Platte River caddisfly was formally described as a new species in the order Trichoptera (caddisflies) in 2000 by Alexander and Whiles (2000, p. 2). The Platte River caddisfly is in the family Limnephilidae, or the northern caddisflies, subfamily Dicosmoceniae, and genus *Ironoquia* (Wiggins 1977, p. 181; Alexander and Whiles 2000, p. 1).

The caddisfly family Limnephilidae is considered to be the most ecologically diverse family of Trichoptera (Holzenthal *et al.* 2007, p. 674) and is the largest caddisfly family in North America, with over 900 species in more than 100 genera (Holzenthal *et al.* 2007, p. 674). The Limnephilidae family is dominant at higher latitudes and elevations, has the widest distribution of any caddisfly family, and comprises one-third of all Nearctic (ecozone comprising Arctic and temperate areas of North America and Greenland) caddisfly species (Wiggins 1977, p. 179). Caddisflies in this family may be collected from springs, pools, seeps, marshes, bogs, fens, streams, rivers, and lakes (Wiggins 1977, p. 179). Limnephilids largely feed on larger bits of plant material, such as fallen leaves, or organic materials that form atop rock surfaces (Wiggins 1977, p. 179).

The *Ironoquia* genus belongs to the subfamily Dicosmoceniae, which mostly occurs in cool, lotic (running water) environments, except for *Ironoquia,* which occurs in temporary pools (Flint

1958, p. 59; Wiggins 1977, p. 248). The genus *Ironoquia* is comprised of six species: the Platte River caddisfly (*I. plattensis*), *I. punctatissima* (no common name) (Walker 1852), *I. parvula* (no common name) (Flint 1958), *I. dubia* (no common name) (Stephens 1837), *I. lyrata* (no common name) (Ross 1938), and *I. kaskaskia* (no common name) (Ross 1944), with the Platte River caddisfly being the most recently described (Encyclopedia of Life 2011, entire). All of these species except *I. dubia* (Europe) occur only in North America (Williams and Williams 1975, p. 829; Ćuk and Vučković 2010, pp. 232, 234).

Ironoquia is the only genus within the Dicosmoceniae subfamily that occurs in temporary waters (Wiggins 1977, p. 248). In North America, *Ironoquia* is mostly found throughout the central and eastern portions of the United States (Wiggins 1977, p. 248) and is most often collected from temporary pools or wetlands but can also occur in perennial waters (Flint 1958, p. 61; Ćuk and Vučković 2010, p. 234). The Platte River caddisfly has been found to co-occur with *I. punctatissima,* which is a common species on the Great Plains, but *I. punctatissima* is morphologically distinct and much larger than the Platte River caddisfly (Alexander and Whiles 2000, p. 1; Geluso *et al.* 2011, p. 1024).

The Platte River caddisfly is thought to be most closely related to *I. parvula* (Alexander and Whiles 2000, p. 1), which occurs in Ohio and the northeastern United States (Flint 1958, p. 59; Wiggins 1977, p. 248; Swegman *et al.* 1981, p. 141; Garono and MacLean 1988, p. 148). Platte River caddisfly adults are smaller and have lighter color and more pronounced spotting on the wings than *I. parvula* (Alexander and Whiles 2000, p. 2). We find that Alexander and Whiles (2000, entire) provide the best available information on the taxonomy of the Platte River caddisfly, and no other challenges to the taxonomy have been raised since the Platte River caddisfly was described. Therefore, we consider the Platte River caddisfly a valid species for listing under the Act.

Habitat Description

The Platte River caddisfly was discovered in 1997, in a warm-water slough (backwater area or marsh that is groundwater fed) in south-central Nebraska along the Platte River on Mormon Island (hereafter type locality), which is land owned by the Platte River Whooping Crane Maintenance Trust (hereafter Crane Trust (a conservation organization)) southwest of Grand Island, Nebraska (Whiles *et al.* 1999, p. 534; Goldowitz 2012, pers. comm.). This slough had an intermittent hydroperiod (duration of inundation) and held water 75–90 percent of the time or about 275–330 days out of the year (Whiles *et al.* 1999, p. 534; Goldowitz 2004, pp. 2–3). The area lacked trees (Whiles *et al.* 1999, p. 534) and was located within the largest remaining tract of native prairie in the Central Platte Valley (Goldowitz 2004, p. 2).

Intermittent wetlands, such as the type locality, have been described as any water body that holds water for about 8 to 10 months during the year (Wiggins *et al.* 1980, p. 100); some intermittent sites may or may not completely dry in a year (Tarr and Babbitt 2007, p. 6). These wetlands differ from ephemeral wetlands (that hold water for a relatively short period of time (e.g., 4 months)) and permanent wetlands (rarely dry) (Tarr and Babbit 2007, p. 6). Intermittent wetlands dry when the groundwater table drops below the ground surface.

Since the Platte River caddisfly was discovered, surveys have mostly found the caddisfly in sloughs with intermittent hydroperiods; however, the caddisfly has also been found in sloughs with permanent hydroperiods (Goldowitz 2004, p. 5; Meyer and Whiles 2008, p. 632; Vivian 2010, p. 54; Geluso *et al.* 2011, p. 1024). In sloughs with permanent hydroperiods, the caddisfly has been observed in lower numbers, which is true of other *Ironoquia* species, likely because of the presence of more predators in permanent waters (Wiggins *et al.* 1980, p. 148; Vivian 2010, p. 54). The caddisfly has not been observed in ephemeral wetlands (Vivian 2009, pers. obs.).

In general, the intermittent wetlands where the caddisfly occurs are found along the floodplains of the Platte, Loup, and Elkhorn Rivers in central Nebraska (LaGrange 2004, p. 15) and are shallow, linear depressions that are historical channel remnants of these river systems (Friesen *et al.* 2000, p. 4–8). The presence of water in these sloughs is influenced by groundwater levels and trapped surface run-in (Friesen *et al.* 2000, p. 4–8). Groundwater levels are controlled by river stage (flows), precipitation, and evapotranspiration (Wesche *et al.* 1994, p, iii). Platte River flows are principally tied to snowmelt from the Rocky Mountains and local precipitation events (Simons and Associates 2000, pp. 2–5), while Loup River and Elkhorn River flows are tied to the Ogallala Aquifer (Peterson *et al.* 2008, p. 5). Sloughs that support the caddisfly vary in their distance to the main river channel. Most sloughs are adjacent to the main channel, while some occur in areas more than 0.4 kilometers (km) (0.25 miles (mi)) away.

Sloughs with the Platte River caddisfly are typically described as lentic (with little to no flow) (Whiles *et al.* 1999, p. 533; Alexander and Whiles 2000, p. 2). However, two sites do contain some flow, and the caddisfly appears to occur in higher densities in areas with flowing water than in stagnant areas (Harner 2012, pers. comm.). Because of their groundwater connection, sloughs with the caddisfly may maintain thick ice cover on surface waters through the winter without completely freezing to the bottom (Whiles *et al.* 1999, p. 534; Goldowitz 2004, p. 2). Slough substrata often consist of a thick layer of detritus and silt overlying sand (Whiles *et al.* 1999, p. 534; Alexander and Whiles 2000, p. 6). Soils in the sloughs consist of a mixture of loam, sand, and gravelly sand and tend to be frequently flooded and poorly drained (Natural Resources Conservation Service (NRCS) Web Soil Survey 2009, entire).

Because it is an inhabitant of intermittent waters, the Platte River caddisfly is tolerant of large fluctuations in water chemistry (Williams 1996, p. 634; Whiles *et al.* 1999, p. 534). Large variations in water quality (e.g., pH, conductivity, total dissolved solids, dissolved oxygen, turbidity, and temperature) have been observed among five forested sites where the caddisfly occurs (Vivian 2010, pp. 81, 96). Furthermore, average conductivity and pH in sloughs with the caddisfly reported by Vivian (2010, pp. 81, 96) differed from the average values reported by Whiles *et al.* (1999, p. 534) and Geluso *et al.* (2011, p. 1022). The gradient of water chemistry observed between forested sloughs and the type locality is likely a result of the differences in habitat types, and demonstrates that the Platte River caddisfly can withstand a broad range of water quality.

Vegetation in sloughs occupied by the caddisfly is typical wetland flora, such as *Typha* spp. (cattails), *Schoenoplectus fluviatilis* (river bulrush), *Eleocharis* spp. and *Cyperus* spp. (sedges), and *Lemna* spp. (duckweed); some sloughs support nonnative, invasive vegetation, including *Phalaris arundinacea* (reed canarygrass), *Phragmites* (common reed), and *Lythrum salicaria* (purple loosestrife). Plant species along slough banks and margins include woody species, such as *Fraxinus pennsylvanica* (green ash) and *Populus deltoides* (cottonwood), and grass species, such as *Spartina pectinata* (prairie cordgrass) and smooth brome (*Bromus inermis,* invasive). Various forbs are also present throughout the slough. Most areas where the Platte River caddisfly has been observed since it was described have an abundance of woody vegetation, which contrasts with the treeless, wet meadow environment encountered at the type locality and one other population at the Crane Trust (Whiles *et al.* 1999, p. 534; Vivian 2010, p. 56; Vivian 2011, pp. 33–35). Overall, the Platte River caddisfly is tolerant of a range of conditions, including variations in hydroperiod, water quality, and vegetation, but thrives in intermittent sloughs.

Life History and Ecology

The Platte River caddisfly lifecycle was characterized by Whiles *et al.* (1999, entire). The caddisfly is univoltine (one generation per year). The adult flight period for the Platte River caddisfly is between late September and mid-October. Adults first emerge around late-September and live for about 7 to 10 days, with the entire emergence period lasting 3 to 4 weeks. While active, adults oviposit (lay eggs) on the surface film of the water, the eggs sink to the bottom of the slough, and larvae hatch as first instars (life stage between molts) sometime in November. Aquatic larvae overwinter in the slough as first instars. In late winter, larvae construct their case (Vivian 2010, pers. obs.) and begin feeding and growing rapidly and proceed through four more instars. Between late April and early June, fifth (final) instars climb upslope from the water and aestivate (pass stressful time periods in a dormant condition) during the summer months when it is typically dry along the adjacent slough banks (Whiles *et al.* 1999, pp. 535–536; Geluso *et al.* 2011, p. 1023). Platte River caddisfly larvae eventually pupate (metamorphose between larva and adult) along slough margins in the larval case. Pupation lasts about 4 weeks until adult emergence in late September.

While in its aquatic stage, the Platte River caddisfly is considered a shredder and largely feeds upon senescent (aged) plant tissue (Whiles *et al.* 1999, pp. 542–543). As one of the few shredders present in sloughs, the Platte River caddisfly plays an important role in the decomposition of organic matter in these systems (Whiles *et al.* 1999, pp. 539, 543). In its terrestrial stage, the Platte River caddisfly does not feed (Whiles *et al.* 1999, p. 537), and as an adult, the species has the ability to ingest liquids (Holzenthal *et al.* 2007, p. 648).

The Platte River caddisfly likely has a lifecycle adapted to the intermittent wetlands found along the Platte, Loup, and Elkhorn River systems (Whiles *et al.* 1999, p. 537; Vivian 2010, pers. obs.). For example, larval emigration to adjacent mesic grassland habitat and adult emergence were found to coincide with early summer drying and fall inundation of the wetlands, respectively (Whiles *et al.* 1999, pp. 537, 542). The Platte River caddisfly is dependent upon water for the egg and larval stages of its lifecycle, (e.g., for at least 7 to 8 months out of the year) (Whiles *et al.* 1999, pp. 537–539).

While most caddisflies have an entirely aquatic larval phase, all *Ironoquia* species are known to aestivate in leaf litter near the receding water line during the summer months prior to pupating (Flint 1958, p. 61; Williams and Williams 1975, p. 830; Wiggins 1977, p. 248; Johansson and Nilsson 1994, p. 21; Whiles *et al.* 1999, p. 534). However, some aestivating Platte River caddisfly larvae have been found to burrow beneath the ground surface (Geluso *et al.* 2011, p. 1024). This behavior may be a way to withstand summer drying of sloughs or to avoid desiccation, as reported for other caddisflies (Mackay and Wiggins 1979, p. 187; Wiggins *et al.* 1980, p. 179; Johannson and Nilsson 1994, p. 21; Geluso *et al.* 2011, p. 1024), as soil temperatures in unshaded areas can reach 54 degrees Celsius (°C) (129 degrees Fahrenheit (°F)) in the summer (Vivian 2010, pers. obs.). This behavior could protect aestivating larvae against late spring (May-June) flows, which are characteristic of the Platte River system and could scour (wash) larvae downstream (Simon and Associates 2000, p. 8) and other disturbances characteristic of the Great Plains ecosystem, such as livestock grazing (Geluso *et al.* 2011, p. 1024).

Historical Range and Distribution

Data collection on the range of the Platte River caddisfly began in 1999, shortly after it was discovered, and continued in 2004 (Goldowitz 2004, p. 3). Surveys were conducted at 48 locations along the Platte and Loup Rivers, and the Platte River caddisfly was found at 9 of these sites (Goldowitz 2004, p. 5). These populations occupied an approximately 100-km (60-mi) stretch of the central Platte River that extends from south of Gibbon, Nebraska (Kearney County), to Central City, Nebraska (Merrick County). Surveys for the caddisfly on the Loup River were negative (Goldowitz 2004, p. 9). Monitoring efforts in 2004 did not find the caddisfly at the type locality, despite a consistent adult emergence pattern in the preceding 7 years and the species' prior abundance at that site (Goldowitz 2004, p. 8). Because of its apparent rarity, the caddisfly was designated a Tier 1 species in Nebraska as per the State's natural legacy plan (Schneider *et al.* 2005, p. 93). Tier 1 species are those that are at risk of extinction on a global scale or at risk of becoming extirpated from Nebraska (Schneider *et al.* 2005, p. 17).

Current Range and Distribution

Through 2004, the Platte River caddisfly was only known from the Platte River (Goldowitz 2004, p. 9). However, surveys for new Platte River caddisfly populations resulted in the discovery of the species on the Loup and Elkhorn Rivers in Nebraska in 2009 and 2010 (Vivian 2010, p. 50). Close visual examination of adults and larvae at sites on the Loup and Elkhorn Rivers demonstrated that the species was not *I. parvula* and confirmed the presence of the Platte River caddisfly on these systems. However, because of the distance between some caddisfly populations on the Platte, Loup, and Elkhorn Rivers, we determined there was a need to identify potential genetic differences for the species among sites. Genetic analyses indicated that there is a low amount of gene flow among all three rivers, and that a population tested on the Elkhorn River was genetically divergent, but not different, from the populations on the Platte and Loup Rivers (Cavallaro *et al.* 2011, p. 7). This genetic divergence appears to be a product of geographic isolation as opposed to habitat fragmentation.

The Platte River is formed at the confluence of the North Platte and South Platte Rivers in west-central Nebraska, just east of North Platte, and generally flows east until it meets the Missouri River along the eastern edge of Nebraska (Williams 1978, pp. 1–2). The North Platte River originates in the Rocky Mountains of Colorado, flows north through central Wyoming and then southeast into Nebraska (Williams 1978, p. 1); the South Platte River originates in Colorado and flows northeast until it meets the Platte River at North Platte, Nebraska (Simons and Associates 2000, p. 2). Platte River flows are largely dependent upon snowmelt from the Rocky Mountains and local precipitation events (Simons and Associates 2000, pp. 2–5).

The Loup and Elkhorn Rivers are tributaries of the Platte River system. The Loup River contains several tributaries, including the North Loup, Middle Loup, South Loup, and Cedar Rivers in Nebraska. The Loup River is formed at the confluence of the Middle Loup and North Loup Rivers near St. Paul, Nebraska, and flows east until it meets the Platte River at Columbus, Nebraska, in the eastern third of the State. The Loup River drains groundwater from the Sandhills and the underlying Ogallala Aquifer, and its tributaries flow northwest to southeast, while the Loup flows east or northeast until it meets the Platte River (Peterson *et al.* 2008, pp. 2–5). The Elkhorn River drains wet meadows and plains in north-central Nebraska, and flows east-southeast until it meets the Platte River near Omaha, Nebraska (Peterson *et al.* 2008, pp. 2–5).

In Nebraska, there is a gradient of precipitation from west to east. Just east of the Rocky Mountains in central Nebraska there is a predominant rain shadow effect that results in low amounts of precipitation in western Nebraska. Precipitation generally increases as one travels east towards Nebraska's eastern border (Simon and Associates 2000, p. 2).

Surveys for the Platte River caddisfly between 2009 and 2011 identified 35 caddisfly populations out of 115 sites visited, including 5 of the 9 sites identified by Goldowitz (2004, entire) (Vivian 2010, p. 46; Geluso *et al.* 2011, entire; Figure 1 below). With these recent survey efforts, the caddisfly is now known from a 390-km (240-mi) stretch of the Platte River that runs from near Sutherland, Nebraska (Lincoln County), to near Schuyler, Nebraska (Platte County), and from the Loup and Elkhorn River systems (Figure 1 below). Within this range, there is approximately a 155-km (93-mi) gap in the distribution of the caddisfly between Hershey, Nebraska, and Elm Creek, Nebraska (Vivian 2010, p. 51). Twenty-four surveys for the caddisfly were conducted in this gap, and the caddisfly was not found (Vivian 2010, p. 50).

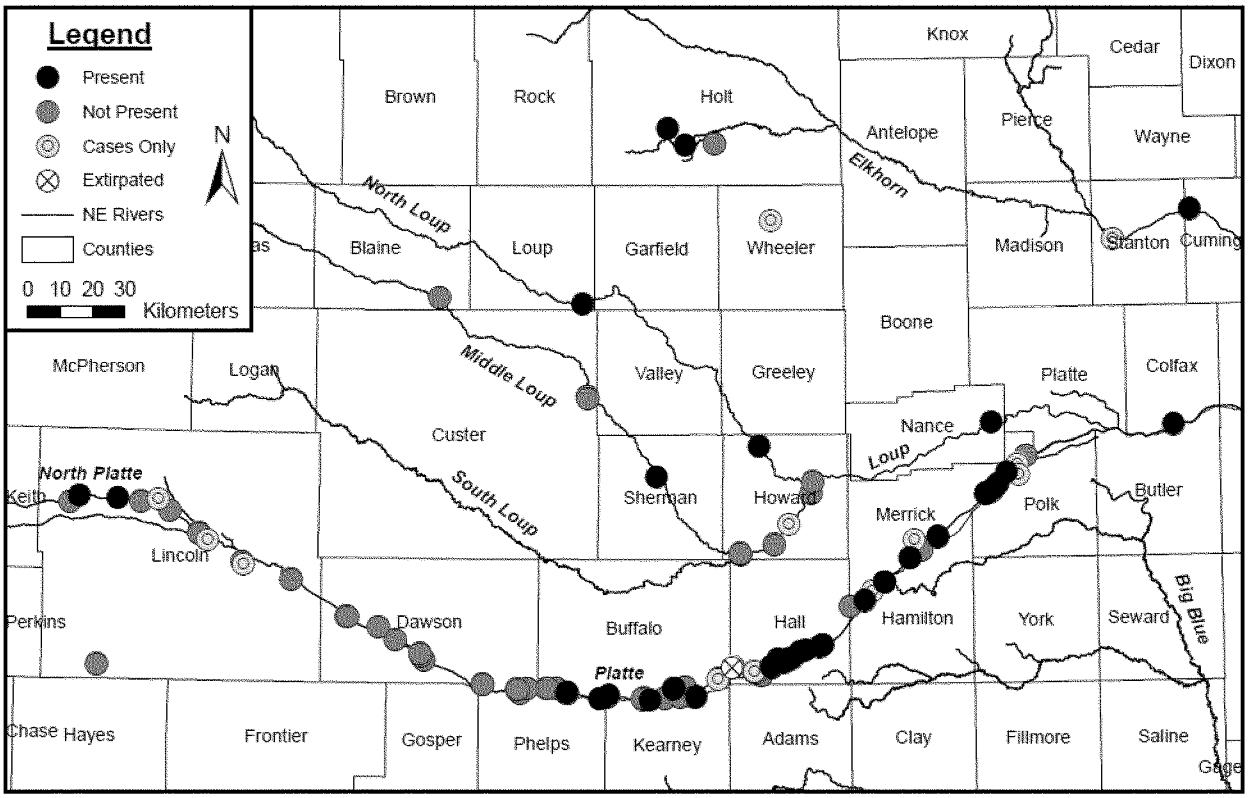

Figure 1. Survey results for the Platte River caddisfly from 1999 and 2004 (Goldowitz 2004, entire) and 2009-2011 (Vivian 2010, pp. 46-47; Geluso *et al.* 2011, p. 1024).

From recent survey efforts, one site near Shelton, Nebraska, is presumed extirpated (Riens and Hoback 2008, p. 1; Vivian 2010, p. 48). Also, the Platte River caddisfly was observed at the type locality in 2010 (Geluso *et al.* 2011, p. 1023), after not having been observed there during surveys in 2004 and 2007–2009 (Goldowitz 2004, p. 8; Riens and Hoback 2008, p. 1; Vivian 2010, p. 53). Survey work in 2009–2011 also identified 13 sites along the Platte, Loup, Elkhorn, and Cedar Rivers that contained discarded larval cases but no live individuals (Vivian 2010, p. 46). Finding a site with a caddisfly case in a slough along the Cedar River indicates that the Platte River caddisfly is likely present in the basin. However, observing live individuals at a site is needed to confirm its presence there, because it is thought that discarded larval cases degrade slowly and could represent generations from previous years (Vivian 2010, pp. 49, 55–56).

Aside from the Cedar River, it appears that more surveys for the Platte River caddisfly could result in the discovery of additional populations on other river drainages in Nebraska, including the Niobrara and Republican Rivers. More survey work on the Platte, Loup, and Elkhorn drainages would likely result in the discovery of new populations on these systems as well. Between 2009 and 2011, satellite imagery was used to identify potential caddisfly habitat throughout Nebraska prior to conducting surveys (Vivian 2010, p. 38). There are additional areas of remaining potential Platte River caddisfly habitat along Nebraska's major river systems that have yet to be surveyed (Vivian 2011, pers. obs.). Thus, ongoing surveys are likely to expand the known range of the Platte River caddisfly.

Population Densities

At the type locality, the Platte River caddisfly was considered an abundant component of the slough ecosystem. In 1997–1998, an average of 805 ± 194 larvae per square meter (m^2) was observed throughout the aquatic life stage of the caddisfly lifecycle, and 410.67 larvae per m^2 were present in the aquatic environment in May 1998 (Whiles *et al.* 1999, pp. 537, 540). Geluso *et al.* (2011, p. 1022) reported a mean density of 553 ± 284 Platte River caddisfly larvae per m^2 (n = 19) from a site at the Crane Trust on Shoemaker Island (hereafter ''Wild Rose Slough''), which is located about 5 km (3.2 mi) upstream of the type locality. With the exception of these two sites, the Platte River caddisfly has been found to occur in lower densities (Whiles *et al.* 1999, pp. 539–540).

In May of 2009 and 2010, aquatic larval densities were measured at 18 sites with a Platte River caddisfly population on the Platte River only, and larval densities ranged from zero to 125.7 individuals per m^2 (Vivian 2010, p. 64). Aestivating (terrestrial life stage) larval densities at 12 of 13 sites sampled ranged from zero to 116 individuals per m^2 (Vivian 2010, p. 65). Day and nighttime sampling found anywhere between zero and eight adults per hour of observation (Vivian 2010, pp. 65–66).

The aquatic and terrestrial larval densities reported by Vivian (2010, pp. 40–41) are not directly comparable to Whiles *et al.* (1999, p. 535), because different methodologies were used, and a different volume of sediment was sampled during the aquatic sampling period (Meyer *et al.* 2011, p. 110). Meanwhile, Geluso *et al.* (2011, p. 1022) used the same aquatic sampling method as Vivian (2010, pp. 40–41) but sampled slightly earlier in 2010. Nonetheless, the methods used during 2009–2010 sampling were internally consistent, and these results demonstrate that the caddisfly occurs in varying densities across its range (Vivian 2010, pp. 40–41; Harner 2012, pers. comm.). Although some densities reported by Vivian (2010) are low compared to what has been reported for other caddisfly species (Mayer and Likens 1987, p. 266; Roeding and Smock 1989, p. 152; Bunn and Hughes 1997, pp. 343–344; Stewart and Downing 2008, p. 145), observations on the numbers and density variations of Platte River caddisfly larvae and adults are consistent with those reported for other *Ironoquia* species (Flint 1958, p. 60; Swegman *et al.* 1981, p. 131; MacLean and MacLean 1984, p. 56; Garono and MacLean 1988, p. 147; Gray and Johnson 1988, p. 180; Ćuk and Vučković 2010, pp. 233–234). Therefore, the Platte River caddisfly and *Ironoquia* spp., in general, are more abundant in some areas than in others.

Although population densities have been reported for over half of all known Platte River caddisfly populations, there is a lack of general information on population trends for this species, with the exception of a few sites, including the type locality, Wild Rose Slough, one site near Shelton, Nebraska, and one site near Chapman, Nebraska, where restoration work conducted by the Service in 2007 resulted in a population decline at that site. Sites with lower population densities may always remain naturally low. Therefore, with the information available and the increase in the number of known populations, it is difficult to discern if the number of Platte River caddisfly individuals and populations is remaining steady, increasing, or decreasing.

Summary of Information Pertaining to the Five Factors

Section 4 of the Act (16 U.S.C. section 1533) and implementing regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be an endangered or threatened species based on any of the following five factors:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

In making this finding, information pertaining to the Platte River caddisfly in relation to the five factors provided in section 4(a)(1) of the Act is discussed below. In considering what factors might constitute threats to a species, we must look beyond the exposure of the species to a particular factor to evaluate whether the species may respond to that factor in a way that causes actual impacts to the species. If there is exposure to a factor and the species responds negatively, the factor may be a threat and, during the status review, we attempt to determine how significant a threat it is. The threat is significant if it drives, or contributes to, the risk of extinction of the species such that the species warrants listing as endangered or threatened as those terms are defined in the Act. However, the identification of factors that could impact a species negatively may not be sufficient to compel a finding that the species warrants listing. The information must include evidence sufficient to suggest that these factors are operative threats that act on the species to the point that the species may meet the definition of an endangered or threatened species under the Act.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range

Landscape-Level Changes in Hydrology

Reductions in groundwater levels or river flows as a result of water development can adversely impact aquatic habitats and their associated macroinvertebrate communities. Existing and future water development along the Platte, Loup, and Elkhorn Rivers could adversely impact the Platte River caddisfly and its habitat. Adverse impacts could occur through the loss of water during critical life stages or changes in hydrology that result in intermittent wetlands becoming too ephemeral to support the Platte River caddisfly. We examine this topic in detail below.

Hydroperiod can be an important factor in determining the composition of macroinvertebrate communities in wetlands. For instance, Whiles and Goldowitz (2005, p. 466) found that slough hydroperiod influenced macroinvertebrate taxa diversity and abundance, with more taxa present in intermittent sloughs than in sloughs with more ephemeral or permanent hydroperiods. Sloughs with intermittent hydroperiods typically have fewer predators than permanent wetlands and can offer safe refugia for various taxa if they can withstand habitat drying (Williams 1996, p. 634; Wissinger *et al.* 1999, p. 2103; Tarr and Babbitt 2007, p. 3). Sites with more permanent hydroperiods likely offer a more suitable environment for potential predators of the caddisfly, such as fish and amphibians, thereby reducing larval densities (Whiles and Goldowitz 2001,

p. 1836; Whiles and Goldowitz 2005, pp. 468, 470). Certain permanent sloughs with the Platte River caddisfly also appear to be more food-limited than others as these areas have less standing vegetation (Vivian 2011, p. 18). The amount of available food can limit the abundance of shredder species (Roeding and Smock 1989, p. 149), such as the Platte River caddisfly (Vivian 2011, p. 18).

The type locality from which the Platte River caddisfly was described had an intermittent hydroperiod (Whiles *et al.* 1999, p. 536). The Platte River caddisfly was not found at four other sloughs near the type locality during the time of the life history study; these sloughs had hydroperiods that differed from that of the type locality—they were thought to be either too ephemeral or permanent for the caddisfly (Whiles *et al.* 1999, p. 542; Whiles and Goldowitz 2001, p. 1832; Whiles and Goldowitz 2005, p. 466). Also, the Wild Rose Slough site contains ephemeral, intermittent, and permanent reaches, and the Platte River caddisfly has only been observed in the intermittent (Vivian 2010, pers. obs.) and permanent reaches of the slough (Geluso *et al.* 2011, p. 1022). In other parts of its range, the Platte River caddisfly has been found in sloughs with more permanent hydroperiods, albeit in lower numbers than in sloughs with intermittent hydroperiods (Vivian 2010, p. 54; Geluso *et al.* 2011, p. 1022).

The caddisfly occurs in higher densities in intermittent sloughs than in sloughs with permanent hydroperiods. For instance, the type locality and Wild Rose Slough have intermittent hydroperiods (Vivian 2010, pers. obs.) and have supported or currently support the largest known larval densities of the Platte River caddisfly (Whiles *et al.* 1999, p. 536; Vivian 2010, pers. obs.; Geluso *et al.* 2011, p. 1022). Relatively low densities of the caddisfly have been found at other sites that have longer hydroperiods and experience less water level fluctuation (Vivian 2010, p. 54). Thus, it is thought that sloughs with intermittent hydroperiods are ideal for the Platte River caddisfly. Although intermittent wetlands represent ideal Platte River caddisfly habitat, permanent wetlands may become important during and following a drought as sites that support source populations for recolonization following extended dry periods. However, ephemeral wetlands do not remain wet long enough to support the species' lifecycle.

Overall, landscape-level changes in hydrology that result from reservoir construction, river channel diversions, and groundwater withdrawal for irrigation could adversely impact the Platte River caddisfly and its habitat through the loss of water during critical life stages or degradation of its habitat. Since European settlement in the 1850s, the Platte, Loup, and Elkhorn Rivers have all experienced some degree of water development for various purposes; the Platte River has experienced the largest amount of modification of these systems. Starting in the mid-1800s, the tributaries of the Platte River were gradually developed to deliver water for irrigation via main and lateral canals, and eventually larger water storage projects along the main channels of the river were constructed (Eschner *et al.* 1981, pp. 3, 5). Water development projects were implemented to make the region more suitable for agriculture, and more than 7,000 canals were constructed along the river between 1851 and 1930 (Simons and Associates 2000, pp. 5–9). Over-appropriation of water in the Platte Basin became an issue as early as 1876, and dams were constructed to create more reliable supplies of water (Eschner *et al.* 1981, p. 10; Simons and Associates 2000, pp. 7–8).

Several hundred storage reservoirs and six principal dams are present in the Platte River Basin, and together they impound more than 7.6 million acre-feet of water for irrigation (Simons and Associates 2000, p. 8). Each reservoir project contains several miles of associated canals (Simons and Associates 2000, p. 13). Because of dams and diversions along the Platte Basin, over 70 percent of the Platte River flow is estimated to be diverted before it reaches Lexington, Nebraska (Currier *et al.* 1985, p. 120; Sidle *et al.* 1989, p. 91), which is about 48 km (30 mi) upstream of where most Platte River caddisfly populations along the Platte River are found. As a result of this development, the river has been described as one of the most heavily managed river systems in the United States (Simons and Associates 2000, p. 14; LaGrange 2004, 274 15).

The Loup River has also been impacted by water development projects. The Loup Basin includes the North, Middle, and South Loup Rivers, and within the basin there are four mainstem diversion dams (U.S. Bureau of Reclamation (USBR) 2011, entire). The largest diversion dam, the Loup Diversion Dam, diverts around 69 percent of the Loup River flow away from the main channel for a distance of 35 miles in Nance and Platte Counties in Nebraska (Loup Power District and HDR Engineering 2008, p. 4–39). Each diversion dam has several miles of associated lateral canals to divert water to irrigated farmland (USBR 2011, entire). Also, three impoundments are present along tributaries of the Loup River Basin (Loup Power District and HDR Engineering 2008, pp. 3–5), but the system lacks mainstem dams. The Elkhorn River is generally free of impoundments and diversions (LaGrange 2004, p. 21; Peterson *et al.* 2008, p. 5).

Habitat Loss Resulting From Changes in Hydrology

Dams and diversion projects are known to result in changes in hydrological, geophysical, and ecological characteristics of river systems (Simons and Associates 2000, p. 15; Schramm *et al.* 2008, pp. 237–238). Dams and diversions dampen the natural flow regime and change the hydrology of river systems, contribute to the downcutting and degradation of the river bed, reduce the amount of sediment flowing downstream, and reduce the amount of water reaching floodplain wetlands (Kingsford 2000, p. 109; Bowen *et al.* 2003, p. 809). These changes affect the ability of managed river systems to remain in a state of dynamic equilibrium, which contributes to the creation and maintenance of a diversity of habitats along a river's floodplain (Bowen *et al.* 2003, p. 809). Water development projects may ultimately cause a river to become disconnected from its floodplain (Bowen *et al.* 2003, p. 809) and reduce the ability of rivers to continually inundate and create new backwater habitats via peak flows (Schramm *et al.* 2008, pp. 237–238).

Channel Narrowing

As a result of reduced flow through the Platte River system, the main channel of the Platte River narrowed by about 65 to 80 percent between the mid-19th century and 1969 (Williams 1978, p. 8; Eschner *et al.* 1981, p. 45) and further narrowed by up to 25 percent between 1970 and 1999 (Murphy *et al.* 2004, p. 102). Channel narrowing has resulted in a reduction in wetland habitat along the Platte River through a drying of adjacent sloughs. Between 1938 and 1982, an estimated 45.2 percent of wet meadow habitat along the central Platte River was lost (Sidle *et al.* 1989, pp. 98–99), and this corresponded to a 53.4 percent reduction in active channel width during the same time period (Peake *et al.* 1985, entire; Sidle *et al.* 1989, pp. 98–99). The drying of linear slough depressions along the river also facilitated the development of row crops along what used to be wet bottomlands (Currier *et al.* 1985, p. 113).

Many wetlands were initially converted to cropland through wetland draining via ditches and land leveling (Currier *et al.* 1985, p. 113). Wetland losses and channel shrinkage data for the Loup River are currently unavailable; however, wetland losses have likely occurred concurrent with the narrowing of the river channel downstream of diversion projects.

Historically, channel narrowing on the Platte and Loup River systems resulting from water development likely resulted in direct losses of suitable Platte River caddisfly habitat prior to the species' discovery in the late-1990s. During recent survey efforts, the Platte River caddisfly was not found between Hershey and Elm Creek, Nebraska, despite 24 surveys being conducted in this reach (Vivian 2010, p. 50). We do not know if the caddisfly ever occurred in this stretch of river, but it is present upstream and downstream of Hershey and Elm Creek, Nebraska, respectively (Vivian 2010, p. 50), and this stretch is likely one of the most dewatered and incised (disconnect of a river from its floodplain as a result of a decline in river bed elevation) portions of the Platte River (Murphy *et al.* 2004, p. 56). Since the species was first described in 2000, no known population losses have occurred as a result of channel narrowing and subsequent wetland drying.

Aside from the draining of adjacent wetlands, channel narrowing has resulted in an increase in woody vegetation cover along the Platte River (Johnson 1994, entire). Downstream of Kearney, Nebraska, channel narrowing continues to reduce the amount of active channel area, and the amount of forest cover continues to increase (Murphy *et al.* 2004, p. 95), despite no new impoundments having been constructed in the Platte basin since 1956 (Johnson 1994, pp. 77–78). The establishment and proliferation of woody vegetation along the river acts to stabilize the river and can further contribute to channel narrowing through the trapping of sediments (Friedman *et al.* 1996, p. 341). Meanwhile, an increase in forest cover is not thought to have an adverse impact on the Platte River caddisfly, because most known caddisfly populations are found in forested wetlands, and some forested sloughs support relatively high larval densities of the Platte River caddisfly (Vivian 2010, p. 64). It is unlikely that any future increases in forest cover will adversely affect the Platte River caddisfly.

Channel Degradation

Aside from channel narrowing, impoundments and diversions can contribute to the downstream degradation of river systems, and these projects can have lasting impacts. Impacts to the Platte River resulting from past water development projects, which may affect the caddisfly, are ongoing. For instance, reduced sediment loads resulting from impoundments that block the passage of sediments and water discharges below diversion returns and dams are known to impact river systems and result in channel bed degradation. The North Platte River historically provided the majority of the sandy sediment to the Platte River system, but the amount of sediment inputs to the river greatly declined with the closing of the mainstem dams on the North Platte River (Murphy *et al.* 2004, p. 101). Near Overton, Nebraska, the Johnson-2 (J–2) diversion return releases sediment-free water into the Platte River and creates localized scour and an additional sediment imbalance.

As a result of impoundments and diversion returns, less sediment flows into the Platte River than flows out, and this contributes to the erosion and a lowering of elevation of the river bed (Murphy *et al.* 2004, p. 101). Erosion may also result from a coarsening of sediments in the river, which is a result of coarser sediment being supplied from the South Platte River as opposed to the fine sands that used to come from the North Platte River (Murphy *et al.* 2004, p. 115). Erosion results from a change in sediment size, because smaller sediment is transported downstream more quickly than coarser sediments (Murphy *et al.* 2004, p. 119). This downcutting (or incision) further narrows the active channel and acts to drain adjacent floodplain wetlands (Murphy *et al.* 2004, p. 129). Channel incision resulting from the sediment imbalance along the Platte River is thought to be largely complete upstream of Kearney, Nebraska, but has only slightly affected the river between Kearney and Grand Island, Nebraska, indicating that the trend of degradation is moving downstream (Murphy *et al.* 2004, pp. 113, 129). Channel incision and degradation resulting from the sediment imbalance in the Platte River and a coarsening of sediments is anticipated to take decades to be fully complete (Murphy *et al.* 2004, pp. 128–130).

The effects of channel degradation and its impacts on the Platte River caddisfly and its habitat can be observed downstream of the J–2 return. Diversion returns, like the J–2 return, that put clear water directly into the main channel of the Platte River, can contribute to the downcutting of the river bed and subsequent draining of adjacent floodplain wetlands. For instance, in 2010, surveys for the Platte River caddisfly were conducted downstream of the J–2 return near Overton, Nebraska, at Dogwood Wildlife Management Area (WMA). Within the WMA, several linear depressions were observed, and these areas were dry but showed signs of past beaver (*Castor canadensis*) activity, indicating that the area had once supported slough habitat (Vivian 2010, p. 51). Given that the depressions were dry, habitat for the caddisfly was absent (and so was the species) and, therefore, it seems that the downcutting of the Platte River near Overton, Nebraska, has contributed to the loss of potentially suitable caddisfly habitat at Dogwood WMA.

The effects of the J–2 return can be observed up to 29 km (18 mi) downstream of the return, although these effects are most pronounced closest to the return (Murphy *et al.* 2004, p. 142). Between 1989 and 2002, the Platte River bed depth eroded 1.8 meters (6 feet) immediately downstream of the J–2 return, and eroded 0.76-meter (2.5 feet) 29 km (18 mi) downstream from the return during the same time period (Murphy *et al.* 2004, p. 106). At Grand Island, Nebraska, the river bed eroded 0.27-meter (0.89-foot) between 1933 and 1995 (Murphy *et al.* 2004, p. 113). It is anticipated that the process of incision as a result of the J–2 return will continue downstream all the way to Grand Island, but it is expected to progress slowly (Murphy *et al.* 2004, pp. 113–114). For instance, the river could incise by 0.60-meter (2 feet) from 1940 bed elevation levels within 100 years, 48 km (30 mi) downstream of the return. However, these same impacts are expected to take 400 years to affect the area 100 km (60 mi) downstream of the return (Murphy *et al.* 2004, p. 114), an area where seven of the 35 known Platte River caddisfly populations occur. This incision could further narrow the central Platte River and contribute to the draining of adjacent wetlands and sloughs occupied by the Platte River caddisfly.

It is likely that channel incision has contributed to a loss in available Platte River caddisfly slough habitat in the past and could adversely affect the remaining sloughs on the central Platte River (Lexington, Nebraska to Chapman, Nebraska, where several populations of the Platte River caddisfly occur) in the future. The impacts of channel degradation on Platte River caddisfly habitat are best demonstrated by the effects observed at Dogwood WMA and at the Crane Trust on Shoemaker and Mormon Islands. Harner and Whited (2011, pp. 17–18; Harner 2012, pers. comm.) demonstrated that although there was two times more river discharge in the Platte River in 1999 than in 1951, less slough habitat was available at the Crane Trust in 1999 than was present in 1951. Between 1951 and 1999, the amount of available slough habitat declined by 0.3-hectare (0.8-acre) at Wild Rose Slough (which is deeper and more entrenched, resulting in less surface area lost) on Shoemaker Island and 3.6 hectares (8.8 acres), or about 28 percent, at the type locality on Mormon Island (Harner and Whited 2011, pp. 17–18). Declines in the amount of slough habitat were attributed to channel incision of the Platte River, or a drop in the groundwater table, or both, as land leveling has not occurred along the stretch of the river owned by the Crane Trust. These results demonstrate that even though river discharge in 1999 was greater than in 1951, more water in the Platte River does not necessarily mean that the floodplain will be inundated enough by elevated groundwater to support sloughs where the Platte River caddisfly occurs (Harner and Whited 2011, p. 23).

Currently, the Crane Trust area supports the highest known densities of the Platte River caddisfly (Whiles *et al.* 1999, p. 537; Vivian 2010, p. 47; Geluso *et al.* 2011, p. 1022) and is one of the largest remaining stretches of intact prairie in the Central Platte Valley. However, although the Crane Trust protects the parcel where the caddisfly occurs, this area is not buffered from the effects of upstream water development and nearby groundwater pumping (Harner and Whited 2011, pp. 23–24; Harner 2011, pers. comm.). The documented decline in the amount of available slough habitat between 1951 and 1999 (Harner and Whited 2011, entire) illustrates that effects of past and current degradation to the river channel are ongoing even though there have been no major water projects implemented on the Platte River since 1956 (Johnson 1994, p. 78). If left unchecked (Murphy *et al.* 2004, p. 114), future channel degradation could eventually result in as much as a total loss of Platte River caddisfly habitat at the Crane Trust and other nearby sloughs. For instance, Harner and Whited (2011, p. 14) demonstrated that groundwater declines greater than 0.5-meter (1.5–2.0 feet) from 1999 levels could result in slough drying at the type locality in years with similar precipitation and river discharge (Harner and Whited 2011, p. 20).

Although Harner and Whited (2011) demonstrated an ongoing trend in channel degradation within the central Platte River near the Crane Trust at Alda, Nebraska, the Platte River caddisfly is still present at the type locality and Wild Rose Slough more than 10 years following 1999 (year of reference used in the study). There are also extant Platte River caddisfly populations upstream of the Crane Trust, where the effects of channel degradation are more pronounced, such as near Elm Creek, Nebraska, where the channel bed incised by 0.76-meter (2.5 feet) between 1989 and 2002 (Murphy *et al.* 2004, p. 106). Meanwhile, the type locality and Wild Rose Slough occur more off channel than the forested sloughs adjacent to the river channel and may be less buffered from the effects of channel incision, because hydroperiod is known to decrease with increasing distance from the river channel (Whiles *et al.* 1999, p. 533). Therefore, habitat loss at the Crane Trust likely does not represent the norm throughout the range of the Platte River caddisfly.

If left unchecked, future channel degradation could result in future losses in slough habitat and subsequent extirpation of the Platte River caddisfly from the central Platte River. However, various programs and entities are acting to maintain current habitat conditions on the central Platte River. The central Platte River is actively managed by several organizations to benefit endangered (E) and threatened (T) species (whooping crane (*Grus americana*) (E), interior least tern (*Sterna antillarum athalassos*) (E), piping plover (*Charadrius melodus*) (T), and pallid sturgeon (*Scaphirhynchus albus*) (E)) that depend on an open and braided river system. One such organization is the Headwaters Corporation, which is the nongovernmental organization responsible for overseeing the Platte River Recovery Implementation Program (PRRIP) (discussed more below and under Factor D).

PRRIP was established in 2006, by an agreement between the Bureau of Reclamation, the Service, and the States of Colorado, Wyoming, and Nebraska to manage Platte River flows and habitat to meet the needs of endangered and threatened species that use the Platte River. For instance, PRRIP plans to clear and lower vegetated islands in the river to create a more open channel to benefit endangered species, and this action would increase the amount of sediment in the river (Murphy *et al.* 2004, p. 143; U.S. Department of the Interior (DOI) 2006, p. 5–60). PRRIP also seeks to offset the sediment imbalance in the river by adding sand to the central Platte River (DOI 2006, p. 5–55) and release pulse flows to maintain present channel conditions (DOI 2006, p. 3–11). Outside PRRIP, some work of removing riparian vegetation has already been executed by organizations such as the Nebraska Public Power District (Kinzel *et al.* 2006, entire). Other entities, such as the Partners for Fish and Wildlife Program (PFW), are actively restoring sloughs along the central Platte River to benefit wildlife, and these areas could eventually provide suitable habitat for the Platte River caddisfly. Ongoing efforts to maintain and improve current conditions along the central Platte River should help stem the ongoing degradation of the river and reduce the amount of potential losses of slough habitat throughout the Platte River portion of the species' range.

As mentioned previously, water development on the Loup and Elkhorn Rivers has not been as extensive as it has along the Platte River. While there are diversions in place along the Loup River, these diversions have not resulted in extensive channel incision and degradation as has been observed along the Platte River. This can be demonstrated by the lack of vegetation encroachment onto the active river bed. Channel narrowing downstream of diversion projects on the Loup River Basin has likely resulted in a loss of slough habitat in the past. However, the Platte River caddisfly is present immediately upstream of Kent Diversion Dam, and the species is present immediately downstream of the Loup Diversion Dam. The populations in the vicinity of these projects appear secure, because there appears to be ample slough habitat to support the caddisfly at these sites (Vivian 2010, pers. obs.). Potentially suitable habitat that has not been surveyed is also present downstream of all four main diversion projects in the Loup River Basin (Vivian 2012, pers. obs.). Meanwhile, no large-scale projects on the Loup or Elkhorn Rivers are planned. Because of ongoing efforts to maintain present channel conditions in the central Platte River, which is the most degraded portion of the range of the Platte River caddisfly, and because of a general lack of channel degradation on the Loup and Elkhorn Rivers, we conclude that channel degradation does not pose a threat to the Platte River caddisfly.

Altered Hydrograph

An altered hydrograph (graph of stream flow through time) can result from dams and diversion projects. For instance, dams impound water and reduce the amount of water flowing through a river system. Diversion projects can result in a changed hydrograph by altering the timing of flows through a river system and can reduce the amount of water flowing downstream. Historically, the Platte River received a late-spring rise as a result of runoff from Rocky Mountain snowmelt, and water levels then receded through the summer months, with the river nearly drying completely in some years (Eschner *et al.* 1981, pp. 19–20; Simons and Associates 2000, p. 8). Because of water development projects, primarily dams, the historical hydrologic regime of the Platte River has been altered. For instance, at North Platte, Nebraska, peak flows declined from 20,000 cubic feet per second (cfs) in the late 1800s to less than 5,000 cfs after 1940 (Simons and Associates 2000, p. 16). Dams are also known to augment base flows in a river system, meaning that some floodplain wetlands never go dry (Kingsford 2000, p. 111). Following water development on the Platte River, periods of no or little flow have decreased (Simons and Associates 2000, p. 44). A reduction in natural periods of low flow could impact the intermittency of sloughs where the Platte River caddisfly occurs by increasing the permanency of water in certain areas. Despite the potential for sloughs along the Platte and Loup Rivers to be more permanent, the Platte River caddisfly has presumably existed with the presence of dams on the landscape for over 100 years. The species also occurs in permanent sloughs, and these areas could become important source populations for other intermittent wetlands following extended dry periods or drought. Wetlands that were historically intermittent may have become ephemeral wetlands unsuitable for the caddisfly concurrent with water development. However, we have no information to indicate that this has occurred since the species was described in 2000.

At this time, there is no available information to indicate that an altered hydrograph is adversely affecting any populations of the Platte River caddisfly or has resulted in population losses throughout its range. Therefore, we do not consider a changed hydrograph to pose a threat to the Platte River caddisfly.

Invasive Species

Along the Platte River, changes in hydrology have contributed significantly to the encroachment of woody and exotic vegetation onto what used to be the active river bed (Currier *et al.* 1985, p. 119; Johnson 1994, p. 47). In 2002, several areas of the Platte River went completely dry for 2 months because of drought, and in 2003, low to zero flows were recorded for extended periods of time within the Big Bend reach of the Platte (80-mile stretch of the Platte River between Overton and Chapman, Nebraska) (Service 2006, p. 113). During this time, dense invasive vegetation grew within the Platte River channel as a result of lower flows. *Phragmites australis* (common reed or *Phragmites*) and *Phalaris arundinacea* (reed canarygrass), two non-native, invasive species, have proliferated on previously barren sandbars and in wetlands along the Platte River in the last decade. Historically, encroaching vegetation would have been washed away by ice scour, or high spring flows (now dampened by water development), or both (Service 2006 p. 163), but active removal is now required to keep invasive species in check. Invasive species have not proliferated on the Loup and Elkhorn Rivers as much as on the Platte. Only *P. arundinacea* has been observed in sloughs along the Loup River and in lower abundances than in sloughs along the Platte River.

In the United States, there are introduced and native varieties of *Phragmites australis,* and the introduced and hybridized forms have become highly invasive in several States, including Nebraska (NRCS 2002, entire; Blossey 2003, entire). *P. australis* can be up to 15 feet tall and quickly crowds out native wetland species once established (Michigan Department of Environmental Quality 2011, entire). There are also native and introduced ecotypes of *Phalaris arundinacea,* and the species can be aggressive and invade wetlands. *P. arundinacea* has been observed to form dense, monotypic stands and impenetrable mats of stems and leaves and crowd out native plant species (Wisconsin Department of Natural Resources 2007, entire). *P. arundinacea* was introduced from Europe for agricultural use (Maurer *et al.* 2003, p. 16) and may be the most pervasive emergent plant in wetlands in the Midwest (Spyreas *et al.* 2010, p. 1254). Both *P. australis* and *P. arundinacea* have likely spread along the Platte River as a result of deliberate introductions and changes in hydrology (Andersen *et al.* 2004, p. 787; Strayer *et al.* 2006, p. 649).

Both *Phragmites australis* and *Phalaris arundinacea* have been observed in sloughs where the Platte River caddisfly occurs; however, *P. arundinacea* is more abundant and more often encountered in these wetlands (Vivian 2010, pers. obs.). These invasive plant species have been observed at 24 out of 35 sites with the caddisfly (Vivian 2011, pers. obs.) and appear to have degraded habitat at five sites with the caddisfly along the Platte River. At three sites, *P. arundinacea* appears to have grown thick enough to completely dry out slough margins and to have reduced the amount of available Platte River caddisfly habitat at these sites (Vivian 2009, pers. obs.). *P. australis* is or was the dominant vegetation present at two sloughs where the caddisfly occurs when these areas were surveyed (Vivian 2009, pers. obs.); this plant has potentially reduced the habitat quality at these sites, as these sites support the lowest known densities of the Platte River caddisfly (Vivian 2010, p. 64.). Nonetheless, no extirpations have been observed as a result of displacement by invasive species, and work is underway along the central Platte River to control and reduce the spread of *P. australis* (The Nature Conservancy 2011, entire). In other sloughs that support exotic vegetation, there is no evidence to suggest that *P. australis* or *P. arundinacea* are encroaching to the point where habitat quality is being reduced or will be reduced in the near future. Because invasive species appear to be impacting the Platte River caddisfly at only a small number of sites throughout its range, we do not consider invasive plant species to pose a threat to the Platte River caddisfly.

Groundwater Development

Following dam construction in the Platte Basin, irrigation demands were met through the pumping of groundwater (Eschner *et al.* 1981, p. 10), particularly along the central Platte River (Currier *et al.* 1985, p. 87). The central Platte River remains the most heavily irrigated region in Nebraska, with an average of 2 to 16 registered groundwater wells per mile (University of Nebraska at Lincoln, School of Natural Resources (UNL–SNR) 2011a, entire). As of 2008, there were 1.3 million acres of irrigated cropland within the Loup Basin (Loup Power District and HDR Engineering 2008, p. 3–1). Throughout most of the Loup and Elkhorn Basins, there are up to 4 registered irrigation wells per mile, but there can be up to 16 wells per square mile in the Loup Basin (UNL–SNR 2011a, entire).

Groundwater pumping can result in a lowering of the water table and contribute to subsequent wetland drying and loss (van der Kamp and Hayashi 1998, p. 51; LaGrange 2004, p. 13). It is possible that pumping groundwater for irrigation contributed to some Platte River caddisfly habitat loss historically throughout the species' range, particularly in the central Platte River (Big Bend reach) where irrigation dominates the valley (Currier *et al.* 1985, p. 87). However, available data on monitored groundwater levels do not indicate that this has occurred or is occurring on a wide scale throughout the range of the Platte River caddisfly.

Along the eastern portion of the central Platte River (east of Buffalo County line), groundwater levels in some isolated areas near the river declined 1.5 to 3.0 meters (5 to 10 feet) between pre-development (1950 or later for some parts of Nebraska) (McGuire 2011, pp. 1, 4) and spring 2011 (UNL–SNR 2011b, entire). The remainder of the groundwater table near the Platte River experienced little to no change or an increase (UNL–SNR 2011b, entire). Throughout the entire central Platte region and near the river, the groundwater table declined 0.3 to 1.5 meters (1 to 5 feet) between spring 2001 (species described in 2000) and spring 2011 (UNL–SNR 2011c, entire) but increased 0.6 to 1.5 meters (2 to 5 feet) between spring 2006 and spring 2011 (UNL–SNR 2011d, entire). The groundwater level declines observed between 2001 and 2011 may be attributed to drought conditions in Nebraska during the first half of the 2000s (see Climate Change, below).

Aside from a few small, isolated areas where groundwater levels declined close to the Loup River, between 1950 and 2011, groundwater levels increased by at least 1.5 meters (5 feet) throughout most of the Loup and part of the Elkhorn Basins (UNL–SNR 2011b, entire). Elsewhere in the Elkhorn Basin, there was no change in observed groundwater levels between 1950 and 2011 (UNL–SNR 2011b, entire). It is unlikely that observed increases in the groundwater table along the Loup and Elkhorn Rivers have contributed to losses in the amount of slough habitat available to the caddisfly.

Where groundwater levels have dropped within the range of the Platte River caddisfly, it is possible that a loss in slough habitat has occurred through the loss of inundated wetland acres. However, since the species was described, drops in the groundwater table due to pumping are not known to have resulted in extirpations of any caddisfly populations. Also, the amount of loss in slough habitat is likely limited, because the groundwater table dropped in only three isolated areas within the range of the caddisfly between 1950 and 2011 (UNL–SNR 2011b, entire). Only one of these areas overlaps with extant Platte River caddisfly populations, and this area is along the central Platte River. The other two areas near where groundwater levels have declined since pre-development support slough habitat that has not yet been surveyed for the caddisfly.

There is the potential for ongoing and future groundwater withdrawals to adversely impact the Platte River caddisfly and its habitat in the future, particularly given the recent increase in demand for grain. For instance, in the Lower Loup Natural Resources District (LLNRD), which encompasses the Loup River and its tributaries upstream of Columbus, Nebraska, to the west end of Loup and Custer Counties, 10,000 additional acres were approved to be added to the amount of irrigated acres between 2010 and 2013 (Lower Loup Natural Resources District 2011, entire), and so the groundwater table in that region may see declines with the increase in irrigation. Within the Central Platte Natural Resources District (CPNRD), 2,500 new acres were opened for development in 2012 downstream of Chapman, Nebraska. Future declines in the amount of slough habitat on the Platte, Loup, and Elkhorn Rivers associated with the increased demand for groundwater usage may occur.

Although the amount of slough habitat available to the caddisfly has the potential to decline in the future concomitant with the increase in grain production across at least some of the species' range, existing regulations are likely to limit the extent to which this can occur. Along most of the central Platte River, we have determined that groundwater sources are relatively secure, because, presently, there is a moratorium on new groundwater wells that pump more than 50 gallons per minute, and no new well permits can be issued unless the amount of consumptive water use is offset (retired elsewhere in the basin) (CPNRD 2011, pp. 3–4). Therefore, current conditions are not anticipated to worsen with respect to groundwater pumping in the central Platte Basin, which is considered to be the most degraded portion of the species' range. Also, because the sloughs along the Platte River are closely tied to surface water flows within 0.8 km (0.5 mi) of the river (Hurr 1981, p. H7), efforts to increase shortages to target flows in the Platte River under the PRRIP should maintain current conditions in sloughs along the river. Elsewhere in the Loup and Elkhorn Basins, groundwater and surface water resources are being managed by Nebraska's natural resources districts, and by State law, these areas cannot exceed the fully appropriated designation.

As part of Nebraska State law LB 962, passed by the State legislature in 2004, groundwater well permits and surface water permits are carefully managed so that river flows do not reach the over-appropriated designation, because it has been recognized that surface flows are tied to groundwater levels near the river and vice versa. Nebraska State law requires that there be a balanced use of ground and surface waters in Nebraska to ensure the long-term sustainability of these supplies (Peterson *et al.* 2008, p. 2). Limited numbers of acres are being allowed for well drilling on an annual basis in the Loup and Elkhorn Basins. However, stays are placed on the construction of new wells once a river basin is deemed fully appropriated (Ostdiek 2009, p. 2). A fully appropriated designation ((Neb. Rev. Stat. § 46–713(3) (Reissue 2004, as amended)) means that based on current groundwater and surface water usage, average streamflows are insufficient to meet the long-term demands within a basin (Peterson *et al.* 2008, p. 5). Following any fully appropriated designation, the Nebraska Department of Natural Resources (NDNR) and applicable natural resource district must create an integrated management plan to achieve a sustainable balance between water demands and supplies (Peterson *et al.* 2008, p. 5). If an area becomes over-appropriated, State law requires that the applicable natural resource district work with its stakeholders on returning the basin to a fully appropriated status (Ostdiek 2009, p. 2).

Since the Platte River caddisfly was described in 2000, no information has become available to indicate that any net loss in slough habitat has occurred as a result of groundwater pumping. At this time, the Service does not have data showing that the quantity of water has been lowered or that the current water withdrawals are impacting the Platte River caddisfly habitat or will impact the Platte River caddisfly in the near future. Declines in the groundwater table due to drought resulted in two localized caddisfly extirpations; however, the species is now found again at the type locality, and the groundwater table has since rebounded in that area. If habitat loss has occurred, we estimate that the amount has been negligible, because groundwater declines between 1950 and 2011 have occurred only within a small portion of the species' range. The Platte River caddisfly is extant in the area of the Platte River where the largest documented drops in the groundwater table have occurred. The species is also present in the area of the Platte River where there is the highest density of registered irrigation wells (UNL–SNR 2011a, entire). Elsewhere, groundwater levels have increased, possibly because of seeps that parallel the river channel (Murphy *et al.* 2004, p. 47) and groundwater recharge from lateral canals (Peterson *et al.* 2008, p. 13), and, therefore, habitat losses cannot be attributed to a declining aquifer.

Current moratoria in the Platte Basin, which includes a moratorium on new surface water diversions (NDNR 2008, entire), should prevent current conditions from worsening throughout the most degraded portion of the species' range along the central Platte River. Current State law and management by the State's various natural resources districts on the Loup and Elkhorn Rivers should maintain the groundwater table at sustainable levels in those areas. For instance, the Loup and Elkhorn River Basins are subject to limited surface water appropriations, because the NDNR has to ensure adequate flows exist in the Lower Platte Basin for endangered species, such as the pallid sturgeon (NDNR 2006, p. E–11). Overall, we have determined that groundwater withdrawal does not pose a threat to the species. However, additional stress from water demand is likely to be placed on Nebraska's river systems in the future as a result of climate change and projected increases in floods and droughts (discussed below).

Climate Change

Global climate change is a concern, because it has the potential to reconfigure the spatial distribution of species and their habitats worldwide throughout the 21st century and beyond. Our analyses under the Act include consideration of ongoing and projected changes in climate. The terms ''climate'' and ''climate change'' are defined by the Intergovernmental Panel on Climate Change (IPCC). The term ''climate'' refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007a, p. 78). The term ''climate change'' thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007a, p. 78).

Scientific measurements spanning several decades demonstrate that changes in climate are occurring, and that the rate of change has been faster since the 1950s. Examples include warming of the global climate system, and substantial increases in precipitation in some regions of the world and decreases in other regions (IPCC 2007a, p. 30; Solomon *et al.* 2007, pp. 35–54, 82–85). Results of scientific analyses presented by the IPCC show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is ''very likely'' (defined by the IPCC as 90 percent or higher probability) due to the observed increase in greenhouse gas (GHG) concentrations in the atmosphere as a result of human activities, particularly carbon dioxide emissions from use of fossil fuels (IPCC 2007a, pp. 5–6 and figures SPM.3 and SPM.4; Solomon *et al.* 2007, pp. 21–35). Further confirmation of the role of GHGs comes from analyses by Huber and Knutti (2011, p. 4), who concluded it is extremely likely that approximately 75 percent of global warming since 1950 has been caused by human activities.

Scientists use a variety of climate models, which include consideration of natural processes and variability, as well as various scenarios of potential levels and timing of GHG emissions, to evaluate the causes of changes already observed and to project future changes in temperature and other climate conditions (e.g., Meehl *et al.* 2007, entire; Ganguly *et al.* 2009, pp. 11555, 15558; Prinn *et al.* 2011, pp. 527, 529). All combinations of models and emissions scenarios yield very similar projections of increases in the most common measure of climate change, average global surface temperature (commonly known as global warming), until about 2030. Although projections of the magnitude and rate of warming differ after about 2030, the overall trajectory of all the projections is one of increased global warming through the end of this century, even for the projections based on scenarios that assume that GHG emissions will stabilize or decline. Thus, there is strong scientific support for projections that warming will continue through the 21st century, and that the magnitude and rate of change will be influenced substantially by the extent of GHG emissions (IPCC 2007a, pp. 44–45; Meehl *et al.* 2007, pp. 760–764, 797–811; Ganguly *et al.* 2009, pp. 15555–15558; Prinn *et al.* 2011, pp. 527, 529). (See IPCC 2007b, p. 8, for a summary of other global projections of climate-related changes, such as frequency of heat waves and changes in precipitation. Also see IPCC 2011 (entire) for a summary of observations and projections of extreme climate events.)

Various changes in climate may have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007a, pp. 8–14, 18–19). Identifying likely effects often involves aspects of climate change vulnerability analysis. Vulnerability refers to the degree to which a species (or system) is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the type, magnitude, and rate of climate change and variation to which a species is exposed, its sensitivity, and its adaptive capacity (IPCC 2007a, p. 89; see also Glick *et al.* 2011, pp. 19–22). There is no single method for conducting such analyses that applies to all situations (Glick *et al.* 2011, p. 3). We use our expert judgment and appropriate analytical approaches to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

As is the case with all stressors that we assess, even if we conclude that a species is currently affected or is likely to be affected in a negative way by one or more climate-related impacts, it does not necessarily follow that the species meets the definition of an ''endangered species'' or a ''threatened species'' under the Act. If a species is listed as endangered or threatened, knowledge regarding the vulnerability of the species to, and known or anticipated impacts from, climate-associated changes in environmental conditions can be used to help devise appropriate strategies for its recovery.

The effects of climate change, such as an increase in the global average air surface temperature since 1970, are already being felt in North America and around the world (U.S. Global Change Research Program (USGCRP) 2009, pp. 9, 17). In the Rocky Mountains and Northern Hemisphere, there has been a decrease in overall snowpack cover over the past 100 years (IPCC 2007, p. 30), and the proportion of precipitation falling as snow is decreasing (USGCRP 2009, p. 43). More precipitation now falls in the form of extreme rain events (Rieman and Isaak 2010, p. 4). A decrease in annual snowpack is projected to lead to earlier spring snowmelt and runoff, reduced runoff and stream flow, decreased recharge of aquifers, an increase in drought frequency and intensity, and shorter wetland hydroperiods (USGCRP 2009, p. 45; Johnson *et al.* 2010, p. 137; Rieman and Isaak 2010, pp. 4, 6, 8). Flooding risk is also projected to increase in association with warmer winters and earlier snowmelts (Saunders and Maxwell 2005, p. 1), and summer flows are expected to be lower (USGCRP 2009, p. 46). Decreases in the amount of snowfall and earlier snowmelt in the Rocky Mountains are most likely to affect the sloughs along the Platte River, because its flows are tied to Rocky Mountain snowmelt, while Loup and Elkhorn River flows are tied to the Ogallala Aquifer and local precipitation events.

In the Great Plains, the average annual temperature has increased by 0.83 °C (1.5 °F) since the 1970s and is expected to increase 2.5 °C (4.5 °F) by 2050 (USGCRP 2009, p. 123) and between 4.2 °C (8 °F) and 5.0 °C (9 °F) by the 2080s across the range of the Platte River caddisfly (The Nature Conservancy 2007, entire). Should GHG continue at the current rate, average annual precipitation is expected to remain steady or decrease by 5 percent from today's levels across the range of the Platte River caddisfly by 2050 (The Nature Conservancy 2007, entire).

Between the 1930s and 2011, average maximum temperatures have remained steady in the Lower Platte Basin (downstream of the North Platte/South Platte confluence), while there has been an increase in average maximum temperatures in the Upper Platte Basin (upstream of the confluence) for the same time period (Stamm 2012, pers. comm.). During the same time period, there has been a wetting trend in the Lower Platte Basin and a drying trend in the Upper Platte Basin (Stamm 2012, pers. comm.). Meanwhile, average minimum temperatures increased across the entire Platte Basin between the 1930s and the decade ending in 2011 (Stamm 2012, pers. comm.). Available models for the Loup and Elkhorn River Basins demonstrate similar trends (*http://www.climatewizard.org/,* accessed June 25, 2012).

Should worldwide GHG emissions remain the same as today's levels, starting in 2030, average temperatures are projected to increase dramatically across the entire Platte Basin and continue increasing through at least 2050, and precipitation is projected to remain steady or decrease slightly compared to the decade ending in 2011 (*http://www.climatewizard.org/,* accessed June 25, 2012). Average winter, spring, and fall temperatures are projected to increase by 1.0–2.5 °C (2.7–4.5 °F), and summer temperatures will likely increase by 3.5–4.0 °C (6.3–7.2 °F) by 2050 when compared to the decade ending in 2011 (*http://www.climatewizard.org/,* accessed June 25, 2012).

Compared to the decade ending in 2011, by 2030, fall and winter precipitation is projected to remain steady or slightly decrease; spring precipitation could decline by 20–30 mm, and summer precipitation is projected to decrease by 50–60 mm for the Lower Platte Basin (*http://www.climatewizard.org/,* accessed June 25, 2012). Conditions are also expected to become hotter and drier in the Upper Platte overall (*http://www.climatewizard.org/,* accessed June 25, 2012). Because the sloughs along the Platte River receive snowmelt from the Rocky Mountains (Williams 1978, p. 1) and there is anticipated to be reduced snowpack, sloughs along the Platte River are likely to be more vulnerable to drying than sloughs along the Loup and Elkhorn Rivers during droughts.

Although some models indicate parts of the range of the Platte River caddisfly could experience wetter winters and springs, projected increases in temperature could negate the effects of increased precipitation through increases in evaporation and transpiration (evaporation of water from plant leaves), particularly in the summer months (Sorenson *et al.* 1998, pp. 344–345, 355–356; Johnson *et al.* 2010, p. 128). Increased evapotranspiration (combined effect of evaporation and transpiration) is expected to create drier conditions in the northern Great Plains, thereby increasing the frequency and severity of droughts (Sorenson *et al.* 1998, pp. 344–345; USGCRP 2009, p. 126). Overall, by 2030, the entire area will likely be hotter and drier compared to the decade ending in 2011 (Stamm 2012, pers. comm.). A hotter and drier climate represents the worst-case scenario for the Platte River caddisfly.

The Great Plains system is known for its extensive inter-annual climate variability (Ojima *et al.* 1999, p. 1445), and episodic floods and droughts are characteristic of prairie streams (Dodds *et al.* 2004, pp. 205–206) where the Platte River caddisfly occurs. Species found in Great Plains aquatic systems and in intermittent waters, such as the Platte River caddisfly, are well-suited to survive these disturbance events and environmental extremes (Lytle 2002, pp. 370, 371). However, disturbances that occur outside the time when such events normally occur could cause mortality to species such as the Platte River caddisfly.

Despite the projected increase in the frequency of droughts, projected increase in temperature, and projected decrease in hydroperiod length, the Platte River caddisfly presumably survived historical drought periods, particularly through the Dust Bowl (1930s). In 2004, following a dry spring, the type locality for the caddisfly was dry by early April, and adults were not found at that site in the fall of 2004, despite consistent emergence in the 7 years prior (Goldowitz 2004, p. 8). Platte River caddisfly adults were also not observed during surveys between 2007 and 2009 (Riens and Hoback 2008, p. 1; Vivian 2010, p. 48). In 2007 and 2009, the Platte River caddisfly was not observed at one site near Shelton, Nebraska, following the drought in central Nebraska in the early 2000s, and this site is still presumed to be extirpated (Riens and Hoback 2008, p. 1; Vivian 2010, p. 48). Following wetter years in 2008 and 2009, the caddisfly was found at the type locality in 2010 (Geluso *et al.* 2011, p. 1023), indicating the species has the ability to recolonize suitable habitats following disturbance events. Alternatively, Platte River caddisfly population levels could have decreased to undetectable levels and then rebounded following wetter conditions, as it is easy to miss individual adults when conducting surveys in the autumn (Harner 2012, pers. comm.). It is unknown if the species has recolonized the site near Shelton, Nebraska.

In normal years, the Platte River caddisfly is able to withstand normal summer dry periods through aestivation (Whiles *et al.* 1999, p. 542). The burial behavior observed during the aestivation period in the Platte River caddisfly lifecycle likely protects the species against heat and desiccation (Geluso *et al.* 2011, p. 1024), and affords the species added protection during extended droughts. Furthermore, the related *Ironoquia punctatissima* (no common name) has been found to lay its eggs in a gelatinous matrix on a dry streambed with the larvae hatching once waters return (Clifford 1966, entire). It is unknown how long the eggs of this species or the Platte River caddisfly could survive without water, but this adaptation could provide the Platte River caddisfly protection in years with shorter hydroperiods, if it does exhibit this behavior. A shorter hydroperiod would likely be more detrimental in the spring if a slough dried too early as it could prompt the caddisfly to emigrate earlier from the aquatic environment, possibly reducing the size of the larva and overall fitness of the individual (Harner 2011, pers. comm.).

Recent modeling efforts demonstrated the potential effects of shorter periods of slough inundation on the Platte River caddisfly. Using long-term well data, Harner and Whited (2011, entire) created a model that demonstrated that during a dry period in the record (2000–2003), the type locality slough held water for approximately 249 days, whereas during a wet period (1997–1999), the slough was wet for approximately 340 days (Harner and Whited 2011, p. 21). Most of this drying occurred in summer and fall, and adults were observed in 2003. Larvae were also present at the type locality in the spring of 2004; however, the slough dried more than 2 months earlier in 2004 than what had been observed in years prior, and adults were not observed in the autumn of 2004 (Goldowitz 2004, p. 9). Therefore, droughts that result in sloughs drying too early would likely be more detrimental to the caddisfly than prolonged drying into the autumn and could lead to localized extirpations.

Drought has been implicated in at least the temporary loss of two Platte River caddisfly populations, one of them being the formerly robust type locality. Following the drought, the caddisfly is now again present at the type locality (Geluso *et al.* 2011, p. 1024) and possibly could have migrated downstream to a more permanent portion of the slough during the extended drought of the early 2000s (Vivian 2011, pers. obs.). Also, the type locality and population near Shelton, Nebraska, occur farther away from the main channel of the Platte River; these areas are less likely to withstand droughts than sloughs closer to the main channel, because hydroperiod decreases with increasing distance from the river (Whiles *et al.* 1999, p. 533). Throughout the rest of the range of the Platte River caddisfly, historical aerial imagery from 2003–2006, a period of drought, indicates that the remaining 33 sloughs where the caddisfly is known to occur likely held enough water to support the caddisfly (Vivian 2012, pers. obs.). Thus, it appears that the recent drought had localized effects on a few populations but was not an issue across the range of the species.

Hotter and drier summers in the future are likely to result in increases in evapotranspiration, which may also lead to drier soil conditions (Sorenson *et al.* 1998, p. 344; Johnson *et al.* 2010, p. 134), and these conditions could impact aestivating caddisfly larvae in areas with an open canopy. However, most caddisfly populations occur in sloughs surrounded by a forest canopy, and this shade cover is likely to provide some protection against evaporative losses from soil and reduce the risk of desiccation (Vivian 2009–2010, pers. obs). The distribution and habitat of the Platte River caddisfly likely confer added protection for the species during times of drought and future climatic extremes. For instance, the species is known from the Platte, Loup, and Elkhorn Rivers, and the Loup and Elkhorn Rivers are tied more to groundwater inputs than snowmelt and precipitation. However, the sloughs along all three river systems are tied to groundwater levels to some degree, and groundwater-fed wetlands are thought to be less vulnerable to climate change than those more tied to inputs of precipitation (Winter 2000, p. 308). Because the caddisfly: (1) Presumably survived the Dust Bowl, a period of extreme dryness on the magnitude expected by climate change; (2) exhibits behaviors that enable it to survive extended dry periods; (3) spans a large geographic area that encompasses a range of annual average precipitation; and (4) is present in more than one habitat type across its range, including in areas that maintain water during droughts, we have determined that habitat impacts associated with climate change do not pose a threat to the caddisfly throughout its range.

Flooding

The frequency and intensity of floods are projected to increase with the onset of climate change (Saunders and Maxwell 2005, p. 1). However, flooding is not likely to pose a significant threat to the Platte River caddisfly and could be of some benefit. Flooding events can scour aquatic organisms downstream in some systems (Feminella and Resh 1990, p. 2083), but the velocity at which Platte River caddisfly larvae are moved downstream is unknown. The caddisfly may not be subject to scouring flows, because it is found in lentic waters. *Ironoquia punctatissima* survives flood events with discharges of 100 cm/s by seeking refuge in tangled grass roots (Williams and Williams 1975, p. 829), and the Platte River caddisfly may exhibit similar behavior. It has also been recognized that the hyporheic zone (saturated subsurface region, area where groundwater and surface water mixing occurs (del Rosario and Resh 2000)) can be important in the recolonization of benthic macroinvertebrates following flood events (Williams and Hynes 1974, p. 234; Williams and Hynes 1976, p. 266; Boulton *et al.* 1998, p. 64), and the Platte River caddisfly has been found within the hyporheic zone in all five instar stages (Whiles *et al.* 1999, p. 535; Vivian 2010, pers. obs.). After high water in May to June 2010, which is during the terrestrial stage of the Platte River caddisfly lifecycle, several live individuals were found along the slough banks at two sites immediately after flood waters had receded (Vivian 2010, p. 52). The burial behavior observed in the Platte River caddisfly may protect a certain portion of terrestrial larvae from late spring floods (Geluso *et al.* 2011, p. 1024).

Even if mortality of larvae were to occur due to scouring, flooding is likely important in the creation of backwater habitats and the subsequent increase in habitat availability to the Platte River caddisfly. Downstream larval drift is considered an important means of dispersal (Neves 1979, p. 58), but only in habitats that are connected by water (Petersen *et al.* 2004, p. 934). Caddisflies found in isolated habitats or pools are more likely to disperse via flight than by downstream larval drift, because these habitats are not connected (Williams 1996, p. 644; Petersen *et al.* 2004, p. 934). Some inhabitants of temporary wetlands may be strong fliers, such as some limnephilids (Svensson 1974, p. 174); however, observations conducted during the adult life stage suggest the Platte River caddisfly is a weak flier (Vivian 2010, p. 39). An increase in habitat availability due to flooding may increase the chances for the species to colonize new populations and link up areas of suitable habitat. Overall, flooding could increase the amount of suitable habitat for the Platte River caddisfly, and this would likely benefit the species. Because of various behaviors exhibited by the Platte River caddisfly that likely enable it to withstand flooding events, we do not consider flooding or the projected increase in flooding to pose a threat to the caddisfly.

Wetland Conversion and Modification

As previously mentioned, historical water development in the Platte Basin contributed to a decline in the active floodplain, and opened up former wet bottomlands for crop development (Currier *et al.* 1985, p. 113). Active efforts to drain wetlands to make an area suitable for row crops also historically contributed to wetland habitat loss, and there has been an estimated 73.5 percent loss of meadows within 3.5 miles of the Platte River as a result of channel narrowing and conversion for agriculture (Currier *et al.* 1985, p. 119). As of 1911, approximately 1.5 million acres of grassland had been converted to row crops in the Platte Valley (Currier *et al.* 1985, p. 113). Agriculture, including the production of row crops, is the predominant land use in Nebraska, and in recent years, a rise in ethanol production has led to an increase in grain prices, which in turn has led to an increase in the number of acres of corn planted in Nebraska (Nebraska Corn Board 2011, entire). Currently, the United States produces around 13 billion gallons of ethanol annually, but the Energy Independence and Security Act of 2007 (42 U.S.C. 17001 *et seq.*) mandates that this number increase to 36 billion gallons by 2022. Increases in the world's population also will likely lead to an increase in the demand for grain, and, in Nebraska, increasing grain production is contributing to a decline in grassland habitat.

Concurrent with the increase in the planting of more acres of corn in Nebraska, ongoing wetland modification may result from the conversion of adjacent grasslands to row crops at a limited number of sites. In 2011, we consulted with the NRCS on approximately 70 sodbuster applications received from Nebraska landowners. Sodbuster applications are submitted by individuals who desire to convert highly erodible grassland into crop production. The increase in sodbuster applications demonstrates that grassland habitats are continually vulnerable to the development of row crops.

The Platte River caddisfly was discovered in a large, grassland complex. At the type locality and Wild Rose Slough, the caddisfly uses adjacent grassland habitat in which to aestivate and complete adult emergence. However, most Platte River caddisfly populations occur in forested sloughs adjacent to the main river channel, and these areas are thought to be buffered against conversion into row crops. Sloughs adjacent to the river also appear to be too deep to be suitable for filling and conversion for agriculture, and these sloughs are also protected from fill under the U.S. Army Corps of Engineers (Corps) 404 program (discussed under Factor D). Therefore, there is not likely to be much overlap between the ongoing conversion of grassland into corn and Platte River caddisfly habitat. As a result, we do not consider wetland conversion to constitute a threat to the species.

Wetland Restoration

Several nongovernmental organizations (NGOs) are actively restoring degraded wetlands in the central Platte region (Whiles and Goldowitz 2005, p. 462); however, restored wetlands often do not equal natural wetlands in terms of floral and faunal diversity (Galatowitsch and van der Walk 1996, entire). Differences in wetland hydrology between natural and restored wetlands can affect the outcomes of restoration projects (Galatowitsch and van der Walk 1996, entire; Meyer and Whiles 2008, entire). For instance, in central Nebraska, it has been shown that some aquatic taxa are missing entirely from restored sloughs as compared to natural sloughs (Meyer and Whiles, 2008, entire).

Restored wetlands, although beneficial in providing habitat for some species, may not immediately provide suitable habitat for the Platte River caddisfly. Between 2009 and 2010, 12 restored sloughs were surveyed for the Platte River caddisfly, and only one slough had evidence of caddisfly presence (Vivian 2010, p. 46). One discarded case was found at this site, and it is unknown whether there is an extant population at this location, as no live individuals were found (Vivian 2010, p. 17). When surveyed, restoration work had occurred 4 years prior to the survey (Schroeder 2011, pers. comm.), and it is unknown if the caddisfly was present before the restoration work had occurred. One other restored slough on Crane Trust property was previously found to support the Platte River caddisfly, but the site supported a low number of individuals. This site was near the type locality (Meyer and Whiles 2008, p. 632; Meyer 2009, pers. comm.), which may represent a source population. These observations suggest that restored sloughs may not be immediately suitable to the caddisfly but could become more suitable over time as the restored sloughs become established.

To date, only one restoration project is known to have resulted in adverse impacts to the Platte River caddisfly. At Bader Park near Chapman, Nebraska, a 2007 restoration project within a slough where the caddisfly was known to occur resulted in a decline in larval densities at that site (Harms 2009, pers. comm.). The caddisfly still occurs at that site, but at a density of less than one individual per m^2 (Vivian 2010, p. 64), possibly because the slough now harbors various fish species that were not present before the restoration activities occurred. Since the Bader Park project, the Service has drafted guidelines to avoid adverse impacts to the caddisfly while conducting restoration work in sloughs where the species occurs. Overall, we think that restoration projects, if conducted with the Platte River caddisfly in mind, could provide benefits to the caddisfly in terms of an increase in the amount of available habitat, particularly in the long term. Thus, we have determined that wetland modification done as a part of restoration work does not pose a threat to the Platte River caddisfly.

Urbanization and Infrastructure

It is likely that urbanization of the Platte River valley has impacted the habitat of the Platte River caddisfly in the past. For instance, 14 bridges span the North Platte and Platte Rivers between Chapman, Nebraska, and Lewellen, Nebraska, a distance of about 380 km (240 mi) (Currier *et al.* 1985, p. 56). Bridge construction can result in localized channel narrowing, because sediments get deposited upstream of the bridge site, and scour occurs downstream of the bridge site for at least a half-mile (Simons and Associates 2000, p. 67). Underneath bridges, channel incision may occur, leading to the degradation of adjacent wetlands as incision can lead to drawdowns of alluvial aquifers (Kondolf 1997, p. 542). Bridge choke points (areas immediately upstream and downstream of bridges where the river has narrowed) can also become open to sandpit development following channel narrowing.

Beginning in the 1980s, the Federal Highway Administration (FHWA) implemented new requirements for bridges to prevent the encroachment of bridge embankments into river channels (Murphy *et al.* 2004, p. 52). Therefore, any present and future bridge projects are required to allow for sufficient room for a river to migrate and create and maintain backwater habitats. Ongoing effects to Platte River caddisfly habitat can be expected at bridge choke points, because no new habitat is being created in those areas. Recently, FHWA contacted the Service to coordinate ways to avoid and minimize impacts to slough habitat during a bridge project at Fullerton, Nebraska. No survey for the Platte River caddisfly has been conducted at that site, but coordination with FWHA demonstrates that potential adverse impacts on the caddisfly resulting from current and future bridge projects can be avoided. For bridge projects and other projects that are federally funded or authorized, the Service has the opportunity and does provide comments to addresses any concerns to listed species, candidate species, and species of concern, such as the Platte River caddisfly (see Factor D).

Along Interstate 80, several sandpit lakes were created to extract gravel used for interstate construction in the 1960s (Currier *et al.* 1985, p. 70); these past operations have been linked to wetland losses along the Platte River (Sidle *et al.* 1989, p. 99). Many of these areas now support housing developments adjacent to the river, and these developments further confine the river to its banks through bank armoring, which reduces the ability of the river to create new channels and backwater areas (Schramm *et al.* 2008, p. 238), which are important habitat for the caddisfly. The construction of Interstate 80 has also contributed to a large amount of direct wetland losses north of the Platte River as the interstate runs within 0.25 mile of the river for over 100 miles in Nebraska (Currier *et al.* 1985, p. 122).

Bank stabilization and armoring projects constructed to protect property against erosion can also cause the localized scouring of a river channel and have the potential to lead to the drying of adjacent wetlands. Bank stabilization efforts, particularly under the Corps' nationwide permitting process, are ongoing throughout Nebraska and have the potential to impact occupied sloughs. However, only one of 35 sites with the caddisfly is currently adjacent to a bank stabilization project, and this site is just upstream of a bridge and does not appear to be degrading the quality of the slough (Vivian 2009, pers. obs.). We have no evidence to indicate that bank armoring along the Platte, Loup, and Elkhorn Rivers is occurring at a large enough scale to adversely impact the caddisfly and its habitat. We do not know of any current or future bank stabilization projects that are scheduled to occur near areas where the caddisfly has been found. Most Platte River caddisfly populations are considered to be protected from bank armoring projects, as 21 out of 35 sites with the caddisfly occur on protected lands.

Overall, most impacts from urbanization and infrastructure projects largely occurred in the past and are localized in their effects. Since the Platte River caddisfly was described in 2000, there is no available information that suggests any habitat losses as a result of bridge construction, road, sandpit, or bank armoring development have occurred. We are not aware of planned projects within caddisfly habitat, and therefore we conclude that urbanization and infrastructure are not likely to pose threats to the Platte River caddisfly.

Livestock Grazing

The Platte River caddisfly and its habitat could be adversely impacted by some cattle grazing regimes. Cattle have a strong affinity for riparian areas because of the availability of water, shade, and high-quality forage (Kauffman and Krueger 1984, p. 431). Cattle can impact wetlands through the reduction of vegetation cover along wetland bottoms and shorelines, increased sedimentation and erosion, increased nutrient and organic inputs from urine and manure, increased water temperatures, and degraded water quality, particularly when cattle have unrestricted access to streams (Schulz and Leininger 1990, pp. 297–298; Fleischner 1994, pp. 631–636; Evans and Norris 1997, p. 627; Downes *et al.* 2000, p. 569; Braccia and Voshell 2006a, p. 269; Braccia and Voshell 2006b, p. 2). A reduction in vegetation cover can lead to decreases in the inputs of coarse particulate organic matter on which the Platte River caddisfly feeds (Kauffman and Krueger 1984, p. 43; Braccia and Voshell 2006a, p. 269). Despite potential impacts, we have no evidence that the species is currently being adversely affected by cattle grazing to the point that grazing would contribute to localized extirpations. Cattle grazing occurs at or adjacent to 6 of 35 Platte River caddisfly sites, and there is no evidence of grazing occurring directly in the sloughs (Vivian 2010, pers. obs.). Also, Wild Rose Slough, which is one of the six sites where grazing occurs, supports the largest known caddisfly population.

A study conducted at Wild Rose Slough to investigate the effects of grazing on the Platte River caddisfly found vegetation productivity to be lower in grazed plots than in ungrazed plots 6 months following the removal of cattle from the study site in spring 2010 (Harner and Geluso 2012, p. 391). In September 2010, fewer adult caddisflies were observed in grazed plots than in ungrazed plots, and in 2011, lower densities of aquatic caddisfly larvae were found in grazed plots than in ungrazed plots (Harner and Geluso 2012, pp. 391–392). Meanwhile, a positive relationship between vegetation productivity and larval densities was observed (Harner and Geluso 2012, pp. 391–392).

Results from the cattle grazing study demonstrated that although cattle were not allowed access to the study area in 2011, the effects of grazing on caddisfly larval densities could still be observed up to one year after grazing occurred (Harner and Geluso 2012, p. 392). These data also suggest that reduced vegetation cover contributed to decreased larval densities in intensely grazed areas within the study plots (Harner and Geluso 2012, p. 392). However, because larvae were not eliminated in grazed areas, this study demonstrates that intense grazing may not be detrimental to the caddisfly for short time periods or under a rotational grazing regime (Harner and Geluso 2012, p. 392) and that this species can likely withstand moderate amounts of grazing, particularly at sites where larval densities are relatively high. Continuous grazing in areas where the caddisfly is less abundant could contribute to localized extirpations, and the caddisfly has not been found at sites that show signs of intense grazing (e.g., more than 40 percent of the bank exposed) (Braccia and Voshell 2006a, p. 271; Vivian 2010, p. 52). However, none of the six sites with the Platte River caddisfly where grazing occurs show signs of overgrazing (Vivian 2010, pers. obs.). Therefore, we have determined that grazing is not likely to pose a threat to the caddisfly.

Pesticides and Herbicides

Corn and soybean fields dominate the river valleys of Nebraska, and both represent potential sources of pesticide exposure to the Platte River caddisfly and its habitat. Should insecticides and herbicides enter occupied habitats of the Platte River caddisfly through runoff, they have the potential to directly impact the species through mortality or indirectly through mortality of aquatic vegetation in the aquatic environment (Fleeger *et al.* 2003, entire; Liess and Von Der Ohe 2005, entire). Pesticides also may enter wetlands through groundwater inputs and could affect aquatic organisms (Spalding *et al.* 2003, p. 92). Surfactants designed to facilitate pesticide and herbicide application have also been shown to have direct and indirect effects on caddisfly larvae (Belanger *et al.* 2000, entire; Fleeger *et al.* 2003, entire, respectively).

There have been no studies to evaluate the potential effects of pesticide exposure on the Platte River caddisfly. Past studies have demonstrated mortality in other species of caddisflies exposed to pesticides (Liess and Schulz 1996, entire) and documented the absence of caddisflies from polluted waters (Ketelaars and Frantzen 1995, entire). Reduced abundances of aquatic insect species considered sensitive to poor water quality have been observed in habitat adjacent to agricultural areas (Liess and Von Der Ohe 2005, entire) that would presumably contain pesticide runoff.

Aside from agricultural runoff, one potential source of herbicides in Platte River caddisfly habitat is chemicals used for the control of exotic vegetation, such as *Phragmites.* Because of the establishment of *Phragmites* along the Platte River, efforts have been taken to control the invasive vegetation using herbicide application. In 2009, the aquatic-safe herbicide Habitat® was sprayed in areas with *Phragmites* in the main channel of the Platte River (The

Nature Conservancy 2011, entire), and it is possible that drift could cause Habitat® to enter sloughs where the caddisfly occurs. Habitat® may result in lower amounts of dissolved oxygen in sloughs as a result of plant decomposition (BASF® 2010, entire). Some spraying for *Phragmites* occurred in 2009, during the early autumn when Platte River caddisfly adults are active (Vivian 2009, pers. obs.). Lower amounts of dissolved oxygen could impact developing caddisfly eggs or reduce the amount of potentially important shade cover in areas where willow (*Salix* spp.) co-occurs with *Phragmites* (Vivian 2010, pers. obs.).

Despite potential adverse impacts to the caddisfly, there is no evidence that population declines or extirpations have occurred as a result of pesticide or herbicide exposure. Following the spraying of *Phragmites* in 2009, the Platte River caddisfly was found again at three of three sites where overlap between spraying and habitat occurred. Most Platte River caddisfly populations are also likely protected from pesticide or herbicide exposure by sufficient buffer strips. For instance, two populations located adjacent to or very near cornfields are likely protected from runoff by a tree and grass buffer of at least 40 meters (131 feet), as the larval densities at these two sites are among the highest of known populations. The 21 populations that occur on protected lands are likely protected from most spray activities typically associated with agriculture. Furthermore, the caddisfly lifecycle likely protects it from some pesticide exposure, because larvae have been observed emigrating from the water as early as mid-April before most crops are in the ground, and the majority of pesticides would enter waterways during the typical farming season in Nebraska of May through October.

Local Conservation Planning

In addition to existing regulatory mechanisms and provisions (discussed under Factor D, below), 60 percent (21 of 35) of Platte River caddisfly populations occur on nongovernmental organization or State lands that are protected for conservation or managed as wilderness areas. These conservation efforts may afford protection of Platte River caddisfly habitat now and into the future. Such examples include Nebraska's Wildlife Management Areas (WMAs) and land owned and managed by the Headwaters Corporation, the group responsible for implementing and overseeing PRRIP. To date, Headwaters has been involved in several discussions with the Service on ways to avoid adverse impacts to the caddisfly with projects in and near Platte River caddisfly habitat. Currently, three Platte River caddisfly populations occur on Headwaters lands, and these sites are likely to be protected from future development by way of a conservation easement. Two other populations occur along roadsides in areas managed by the Nebraska Department of Roads (NDOR), and the Service works with NDOR to avoid and minimize impacts to wetlands on road projects.

The Crane Trust is another entity whose lands provide protection for the Platte River caddisfly. The Trust manages 10,000 acres of land in the central Platte region that have been set aside for wildlife in perpetuity. Four Platte River caddisfly populations are known to occur on land owned by the Crane Trust, and these sites support the largest Platte River caddisfly larval densities currently known. In addition, two Platte River caddisfly populations occur on land owned by The Nature Conservancy (TNC), and the organization is aware of these populations and has taken measures to avoid adverse impacts to the species at these sites.

In areas not protected for conservation, many agencies and organizations have been kept apprised of the Platte River caddisfly and have been engaged with the Service on ways to avoid and minimize impacts to the species and its habitat. For instance, the Federal Highway Administration has coordinated with the Service on ways to avoid and minimize impacts during a bridge reconstruction project near potentially suitable habitat (where the caddisfly was thought to occur) near Fullerton, Nebraska (Vivian 2010, pers. obs.). Also, PFW has noted they are willing to consider the Platte River caddisfly in their wetland restoration work that occurs on public and private lands (Schroeder 2012, pers. comm.). In 2011, PFW and TNC involved the Service in discussions on how to avoid adverse impacts to the caddisfly during restoration work at a site on TNC property. In 2010, the Service's Nebraska Field Office held a workshop for personnel from various local, State, and Federal agencies and organizations on the Platte River caddisfly, its habitat, and survey methodology. This workshop equipped agencies outside the Service with the knowledge to be able to avoid impacts to the caddisfly and its habitat.

PRRIP is a program that affords the Platte River caddisfly protection now and into the future throughout the most degraded portion of its range. Objectives of PRRIP that may benefit the Platte River caddisfly include: (1) Preventing the need to list more basin-associated (Platte River) species under the Act; (2) offsetting through mitigation any adverse impacts of new water-related activities on Service-targeted flows in the Platte River basin (target flows are comprised of species flows and annual pulse flows, which have been identified as flows needed to maintain survival of four target species and wildlife that use the Platte River, and to maintain present channel width and keep islands unvegetated (USDOI 2006, pp. 3–11, 3–12)); (3) using available resources to manage program lands for the benefit of non-listed species of concern, like the Platte River caddisfly; (4) providing sufficient water in the central Platte River (Lexington, Nebraska to Chapman, Nebraska) for the benefit of PRRIP's target species (whooping crane, Interior least tern, piping plover, pallid sturgeon) through water conservation projects; and (5) protecting and restoring 29,000 acres of habitat in the central Platte River for the benefit of the four target species (USDOI 2006, pp., 1–3, 1–17). This agreement was put in place to specifically benefit other endangered and threatened species, but should help maintain the backwaters where the Platte River caddisfly occurs, particularly through PRRIP's goal of maintaining current flows in the central Platte River.

Overall, existing programs and organizations that manage land for conservation provide adequate protection for the species and its habitat. Proactive planning efforts with Federal, State, and local agencies, as well as nongovernmental organizations, also help to avoid and minimize impacts to the caddisfly.

Summary of Factor A

Changes in hydrology resulting from water development and its associated effects, including channel degradation and narrowing, invasive species encroachment, urbanization, cropland conversion, groundwater withdrawal, cattle grazing, climate change, pesticides, and floods and droughts, all occur or are likely to occur within the range of the Platte River caddisfly. These environmental stressors will likely continue in the future on each of the river systems where the Platte River caddisfly is known to occur. However, while these stressors are ongoing, when considered individually and collectively, we have determined that they do not pose a threat to the Platte River caddisfly.

The Platte River caddisfly has life-history traits that enable it to survive in an extreme environment, such as the

Great Plains, where climatic extremes are common. These traits are common among species that inhabit temporary (intermittent or ephemeral) wetlands and enable these species to adapt relatively quickly to changing conditions. The Platte River caddisfly can withstand habitat drying, drought, and flooding by burrowing in the soil, aestivating during a time when its habitat is most likely to go dry, inhabiting the hyporheic zone, and possibly laying its eggs in the absence of water (like *Ironoquia punctatissima*). These life history traits likely render the Platte River caddisfly well-suited to withstand future climatic changes.

We also conclude that the aforementioned stressors do not pose a threat to the species, because the Platte River caddisfly occurs in more than one habitat type and on multiple river systems. Surveys have shown that the caddisfly occupies intermittent and permanent sloughs, forested sloughs, and sloughs with an open canopy. While the type locality and intermittent sloughs most likely represent ideal Platte River caddisfly habitat, the species is found in permanent sloughs, and these may be important during times of drought, as they are likely to hold water longer and serve as a refuge during extended dry periods. Forested canopies may offer an additional source of protection against a warmer and drier climate.

Currently, available information does not indicate whether Platte River caddisfly population levels are increasing or decreasing, or if the amount of potential habitat is increasing or decreasing. Overall, we have documented that the species is more common than previously thought and likely is more abundant now than during the drought in the early 2000s. Also, an increase in surveys is likely to result in an increase in the known range of the caddisfly, given the amount of potential habitat that has yet to be surveyed. Additional survey work would likely result in populations being found on more river systems, such as the Cedar, Niobrara, and Republican Rivers in Nebraska.

Currently, the Platte River caddisfly is known from three river systems, and most of the potential threats occur along the Platte River. Historically, the species likely occupied a much greater portion of the Platte River than today. However, despite all of the water development that has occurred on the Platte River system, the caddisfly still occurs along the majority of the reach surveyed between 2009 and 2011. While ongoing degradation poses a threat to the river and the remaining slough habitat available to the caddisfly, several agencies and nongovernmental entities are working to stem future habitat losses. Therefore, conditions are not anticipated to deteriorate on the Platte River, and we consider the majority of caddisfly populations on the river to be secure.

Currently, the Loup and Elkhorn Rivers have less water development and are less degraded than the Platte River, and the best available information indicates that there is sufficient habitat available (including sloughs not yet surveyed) to sustain the Platte River caddisfly on these systems. Future changes to these river systems are anticipated to occur through increasing sodbusting activities and groundwater withdrawal; however, these activities have little overlap with Platte River caddisfly habitat, and current laws and regulations, such as Nebraska State law LB 962, limit the extent to which this can occur.

After a review of the best available information, we have determined that the present or threatened destruction, modification, or curtailment of its habitat or range does not pose a threat to the Platte River caddisfly.

Factor B. Overutilization for Commercial, Recreation, Scientific or Educational Purposes

There is no indication that the Platte River caddisfly is being over collected by hobbyists or researchers, or will be in the future. Collecting of Platte River caddisfly larvae has occurred for scientific purposes (e.g., identification, museum archiving, lab experiments, and genetic analyses), but this has been limited, and largely done at sites supporting the greatest densities of the insect (Alexander and Whiles 2000, p. 1; Vivian 2010, pp. 74–77; Geluso *et al.* 2011, p. 1022; Cavallaro *et al.* 2011, p. 5). The caddisfly is not known to have been collected for educational purposes.

Insect collectors have not been known to take Platte River caddisfly adults for their collections, likely because caddisfly adults are not as showy as other groups of insects, such as butterflies. Also, caddisfly adults are active during a narrow window (i.e., 3 weeks), and the sites where the species occurs are isolated from urban areas and difficult to access.

Summary of Factor B

There is no evidence that overutilization presents a threat to the Platte River caddisfly. Although small, isolated collections of larvae will likely continue for research purposes, we have determined that these collections do not constitute a threat to the species because, to date, these collections have only been conducted at sites with relatively high larval densities. Therefore, we conclude that the best scientific and commercial information available does not indicate that overutilization for commercial, recreational, scientific, or educational purposes is a threat to the Platte River caddisfly.

Factor C. Disease or Predation

Disease and predation play important roles in the natural dynamics of populations and ecosystems. Natural predators of the Platte River caddisfly evolved in conjunction with the caddisfly and do not normally pose a threat to the survival of the species in the absence of other threats. The Platte River caddisfly could be a prey item for predators that are commonly observed in its habitat during its aquatic, terrestrial, and adult stages. Predators of caddisflies in temporary habitats may include large aquatic insects (dragonflies, beetles), amphibians (frogs, salamanders) (Batzer and Wissinger 1996, entire; Wellborn *et al.* 1996, entire), or fish, particularly in more permanent wetlands (Wissinger *et al.* 1999, entire). Aquatic insects, amphibians, and several fish species have all been observed at sites with the Platte River caddisfly, but the sand-grained case of the Platte River caddisfly likely offers it some protection from predators in its environment, as larvae in mineral cases can better withstand crushing than larvae in cases composed of organic material (Otto and Svensson 1980, p. 857).

Despite having mineral cases that can withstand crushing, the brook stickleback (*Culaea inconstans*) readily consumed Platte River caddisfly larvae in a laboratory setting, typically after the fish removed the larvae from their cases (Cavallaro 2011, pers. comm). The brook stickleback has been found to reduce macroinvertebrate biomass in wetlands in the Western Boreal Forest (Hornung and Foote 2006, entire), and the brook stickleback has been found at five sites with the Platte River caddisfly, but these sites do not support markedly lower densities of the Platte River caddisfly. Also, the caddisfly is well camouflaged in its environment, and field trials have not been conducted to determine if the brook stickleback consumes the Platte River caddisfly in its natural environment. Furthermore, the brook stickleback has been collected upstream and downstream of the central Platte River since 1942, and from the central Platte River since 1987 and possibly earlier (Chadwick *et al.* 1997, p. 285), and the fish is considered native to

Nebraska (Fischer and Paukert 2008, pp. 372–373). Therefore, the caddisfly and stickleback have likely overlapped in their ranges prior to the discovery of the Platte River caddisfly, and there is no available information to indicate that brook sticklebacks have contributed, or are contributing, to localized extirpations of the caddisfly.

In addition to the brook stickleback, the Platte River caddisfly has been found to occur with other fish predators, including the redear sunfish (*Lepomis microlophus*), fathead minnow (*Pimephales promelas*), common carp (*Cyprinus carpio*), and largemouth bass (*Micropterus salmoides*) (Vivian 2011, p. 14). However, there is no indication that these fish predators are resulting in population declines at these sites or that these sites support lower densities of the Platte River caddisfly compared to sites without these predators. Therefore, we conclude that predation during the aquatic stage does not pose a threat to the Platte River caddisfly.

The Platte River caddisfly is likely impacted by predation in its terrestrial larval and adult stages. Several caddisfly cases have been recovered that show signs of predation possibly by ants or beetles and small mammals, such as shrews. Signs of predation include tears in the cases or holes at the posterior end of the case (Vivian 2009, pers. obs.). However, the sand-grained larval case likely offers some protection to terrestrial larvae through camouflage and defense against crushing (Otto and Svensson 1980, p. 857). Adults are likely eaten by migratory birds and waterfowl (Whiles *et al.* 1999, p. 543). At sites with relatively low numbers of caddisflies, predation on larvae in the terrestrial stage and adults could pose a threat to this species in the future. However, there is no available evidence that the predation of terrestrial larvae or adults is impacting populations of the Platte River caddisfly. Therefore, we do not consider predation during the terrestrial larval and adult life stages to constitute a threat to the species.

Given the small number of individuals at some sites, it is possible that disease could pose a threat to the Platte River caddisfly. However, we have no evidence to suggest that any disease is currently affecting the Platte River caddisfly.

Summary of Factor C

Although the Platte River caddisfly is likely a prey item for various predators (native and non-native), there is no evidence that suggests current levels of predation or disease on the Platte River caddisfly are currently affecting populations or will in the future. Therefore, we conclude that the best scientific and commercial information available indicates that neither disease nor predation poses a threat to the Platte River caddisfly.

Factor D. Inadequacy of Existing Regulatory Mechanisms

Existing Federal, State, and local laws; regulations; and policies that may provide a moderate level of protection for the Platte River caddisfly and its habitat include: The National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*), the Fish and Wildlife Coordination Act (FWCA; 16 U.S.C. 661 *et seq.*), section 404 of the Clean Water Act (CWA; 33 U.S.C. 1251 *et seq.*), and Nebraska State law LB 962.

For all federally funded or authorized projects, Federal actions, or projects occurring on Federal lands, an Environmental Assessment or Environmental Impact Statement is required under NEPA. NEPA is a procedural statute that requires federal agencies to consider the environmental impacts of a proposed project and reasonable alternatives to project actions. It also requires full disclosure of all direct, indirect, and cumulative environmental impacts of the project. However, NEPA does not require protection of a particular species or its habitat, nor does it require the selection of a particular course of action. Therefore, NEPA may only provide a limited amount of protection to the caddisfly in situations where NEPA was applicable.

NEPA does not apply to non-Federal projects on private lands or privately funded projects, and about 34 percent (12 of 35 sites) of the known populations of the Platte River caddisfly occur on private lands or near road ditches. Projects occurring on public hunting grounds or access areas, land under the management of conservation groups, and roadsides often receive Federal dollars, and, therefore, NEPA would apply to 66 percent of sites with the Platte River caddisfly. However, as stated above, NEPA does not provide protection to species. There is no available information regarding any development projects, private or otherwise, occurring within Platte River caddisfly habitat. Overall, we conclude that NEPA would provide some protection to the Platte River caddisfly in the event that development projects and slough habitat overlap in the future.

FWCA requires that proponents of Federal water development projects, including those involving stream diversion, channel deepening, impoundment construction, and/or general modifications to water bodies, consider their impacts to fish and wildlife resources. FWCA also requires that impacts to water bodies be offset through mitigation measures developed in coordination with the Service and the appropriate State wildlife agency. FWCA would provide adequate protection to the Platte River caddisfly in the event that water development projects and Platte River caddisfly habitat overlap. However, there is currently no information regarding any current or planned water development projects within the range of the Platte River caddisfly. Should future water development projects occur within Platte River caddisfly habitat, we have determined that FWCA would adequately protect the caddisfly and its habitat, because the Service would be provided an opportunity to address potential concerns with fish and wildlife resources, including the caddisfly.

The U.S. Army Corps of Engineers (Corps), acting under the authority of section 404 of the CWA, regulates the placement of fill materials into waters under Federal jurisdiction, including the filling of wetlands. Historically, according to a 1977 Corps definition, waters under Federal jurisdiction applied to ''waters of the United States,'' and included intermittent streams, wetlands, sloughs, prairie potholes, and wet meadows. This definition provided protection to nearly all wetlands in the United States (Petrie *et al.* 2001, p. 1). However, two Supreme Court rulings in 2001 and 2006 limited Federal authority under the CWA to regulate certain isolated wetlands (*Solid Waste Agency of Northern Cook County* v. *U.S. Army Corps of Engineers,* 531 U.S. 159, (*SWANCC*) (2001) and *Rapanos* v. *United States,* 547 U.S. 715 (2006)). Following the *SWANCC* and *Rapanos* decisions, it was unknown how the Corps would interpret its jurisdictional lines (Petrie *et al.* 2001, p. 3). According to 2008 guidance documents of the Corps and Environmental Protection Agency, the CWA applies to wetlands adjacent to navigable waters of the United States. This means wetlands must have an unbroken surface or shallow sub-surface connection to jurisdictional waters (even if the connection is intermittent), be physically separated from jurisdictional waters by manmade dikes or barriers or natural river berms, or be in close proximity to navigable waters, supporting the science-based inference that such wetlands have an ecological interconnection with jurisdictional waters.

Currently, most Corps permit applications in central Nebraska are for restoration work along the Platte River by groups such as the PFW, NGPC, and Ducks Unlimited (Moeschen 2011, pers. comm.). Typically, the Service is made aware of these projects and has educated restoration proponents on the Platte River caddisfly and its habitat so as to avoid potential adverse impacts to extant populations. Also, sand and gravel mining operations, if occurring within wetlands along the river, would require a Corps permit. A Corps permit would provide the Service with adequate opportunity to address concerns regarding fish and wildlife resources, and any issued permit would require mitigation (offset impacts, restore area of equal habitat value) at a minimum ratio of 1:1 (Corps 2005, p. 18). Furthermore, the Corps has been kept apprised of all sites where the caddisfly occurs, and two Corps representatives attended a workshop in 2010 that educated various agency personnel on the Platte River caddisfly and its habitat.

Most sloughs that support a Platte River caddisfly population occur in areas directly connected to or adjacent to the main channel of the Platte, Loup, and Elkhorn Rivers. Adjacency under CWA is easily determined for these sloughs. Four of the 35 sites occur in more off-channel areas, and adjacency for these sloughs may not be as easily determined. Despite occurring in more off-channel areas, these four sloughs still likely receive protection from fill. For instance, two sites on the Elkhorn River occur along roadsides, and FHWA and the Nebraska Department of Roads notifies the Service when work within or near wetland areas is scheduled to occur. If these areas become subject to fill activities in the future, the Service would have an opportunity to recommend ways to avoid and minimize impacts to the wetlands. Meanwhile, Wild Rose Slough and the type locality on Crane Trust property are protected from fill activities by way of a conservation easement. Overall, 23 of 35 caddisfly populations occur within WMAs or lands managed for conservation or roadsides and are protected from most fill and development activities in wetlands (with the exception of restoration work). Thus, the CWA adequately protects the Platte River caddisfly and its habitat from fill and development activities now and into the future, because: (1) The CWA would apply to the majority of populations should such activities occur in the future; (2) 66 percent of populations occur in protected areas; and (3) the Service and Corps have engaged in proactive planning efforts so as to avoid impact to the caddisfly and its habitat.

Several governmental and nongovernmental agencies are working to secure water rights for environmental benefits and endangered and threatened species in Nebraska; however, instream flow appropriations do not ensure a stream will always contain water (Czaplewski 2009, entire). Instream appropriations only ensure that the minimum flow needs of species will be met before any future water development projects can occur (Czaplewski 2009, entire). Therefore, in times of drought and low flows, pre-existing water rights will be met before the minimum flow needs of fish and wildlife species are met. However, we previously determined that the Platte River caddisfly can withstand drought to a certain degree even when coupled with existing water development projects.

The Central Platte Natural Resources District (CPNRD) and NGPC each have protected instream flow rights along the Platte River; however, these are not enough to cover ''target flows'' outlined by the PRRIP (NGPC 2008, p. 7). The PRRIP is working to address shortages to target flows by managing an environmental account from reservoirs along the Platte River in Nebraska and leasing water rights from willing landowners. The PRRIP also has a goal of offsetting new depletions to the system that occurred after July 1997 and restoring flows to the river by 130,000 to 150,000 acre-feet per year between 2007 and 2019. Efforts to augment current Platte River flows should provide adequate protection for the Platte River caddisfly populations along the Platte River, possibly with the exception of the type locality and Wild Rose Slough. For instance, as discussed under Factor A, even with more water in the river channel, the type locality and Wild Rose Slough may not become inundated or remain inundated long enough to meet the needs of the Platte River caddisfly (Harner and Whited 2011, entire). Furthermore, the PRRIP seeks to augment sediment inputs to the central Platte River, which should also help prevent future channel degradation from impacting sloughs where the caddisfly occurs.

Passed in 2004, Nebraska State law LB 962 requires the Nebraska Department of Natural Resources to work with each of the 23 Nebraska Natural Resource Districts (NRDs) to address surface water and groundwater appropriations in fully or over-appropriated basins. Basins designated as fully appropriated are required to place a moratorium on any new groundwater wells until an integrated management plan to address depletion issues can be developed (NGPC 2008, p. 18). The law does not prevent new groundwater wells from being drilled outside fully appropriated basins, such as some areas on the Loup River. Future groundwater well construction could contribute to some future loss in slough habitat on the Loup and Elkhorn Rivers as has been observed on the Platte, leading to future caddisfly habitat loss. However, we estimate that the amount of habitat that could be impacted is small, because new development is done on a limited basis, and each NRD monitors groundwater and stream levels annually to ensure water resources are not being depleted.

Summary of Factor D

Given that 66 percent of Platte River caddisfly populations occur on protected lands, and current laws and regulations provide adequate protection for slough habitat on private lands should future activities occur within slough habitat, we conclude that the inadequacy of existing regulatory mechanisms does not pose a threat to the Platte River caddisfly.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Small Population Size

Small insect populations may be vulnerable to extirpation as a result of random genetic drift, naturally occurring stochastic events, or demographic stochasticity (Pimm *et al.* 1988, p. 757; Boyce 1992, p. 482; Purvis *et al.* 2000, p. 1949; Melbourne and Hastings 2008, p. 3). Extinction of small populations is also likely to happen more quickly than extinction of larger populations due to inbreeding (Brook *et al.* 2002, pp. 3–4), and this could affect the Platte River caddisfly in the future.

We do not know the true population size of any of the known Platte River caddisfly populations, but we do have information on the numbers of individuals at 18 sites with the caddisfly. We previously discussed that some sites support relatively low densities of the Platte River caddisfly, but determined that finding low numbers of individuals at a site is typical of the *Ironoquia* genus. We also determined that varying population levels across the range of the Platte River caddisfly likely represent the norm for the species, and varying population densities are likely a product of the species occurring in more than one type of habitat. Also, because of various life history traits that enable the caddisfly to survive in temporary habitats, the caddisfly is more able to withstand stochastic events than species less tolerant of extreme weather events. Therefore, we have determined that small population size does not pose a threat to the caddisfly.

Limited Dispersal Ability

The adult stage likely represents the most probable means of dispersal (Williams 1996, p. 644; Petersen *et al.* 2004, p. 934) for the Platte River caddisfly. Poor adult flight capabilities and a short window of adult activity indicate that Platte River caddisfly dispersal to new habitats and between populations is likely a rare event. Observations when adults are active have found individuals underneath vegetation and on or near the ground, particularly when it is windy, and above vegetation or immediately adjacent to standing water in slough habitat during more favorable weather conditions (Vivian 2009, pers. obs.; Vivian 2010, pers. obs.; Geluso *et al.* 2011, p. 1024). When active, the caddisfly has only once been observed to fly more than 10 meters, and wind seemed to greatly influence that individual (Vivian 2009, pers. obs.; Vivian 2010, pers. obs.). Platte River caddisfly adults are also active for a short period of time (i.e., about 2 to 3 weeks) (Whiles *et al.* 1999, p. 539; Goldowitz 2004, p. 6), and this likely limits the species' dispersal ability compared to other caddisflies with longer adult lifespans (Svensson 1972; entire) and could reduce the amount of genetic variability within populations.

Genetics techniques can be used to assess a species' dispersal ability in the absence of direct observations of significant dispersal events (Kelly *et al.* 2002, p. 1642). Amplified Fragment Length Polymorphism has been used to determine the amount of genetic similarity among five caddisfly populations from the Platte, Loup, and Elkhorn Rivers (Cavallaro *et al.* 2011, entire). It was found that one Platte River caddisfly population from near Sutherland, Nebraska, and one near Kearney, Nebraska, had more genetic similarity to each other than the population near Kearney did to a population near Gibbon, Nebraska, despite the closer proximity of Kearney and Gibbon. Also, the population near Gibbon was found to be more closely related to the population near Loup City, Nebraska, even though Loup City is farther from Gibbon than Kearney (~21 km or 13.1 mi) (Bunn and Hughes 1997, p. 341; Cavallaro *et al.* 2011, pp. 12, 15). The Elkhorn River population tested was found to be the most dissimilar from all other populations (Cavallaro *et al.* 2011, p. 7), but this may be more a product of geographic isolation as opposed to habitat fragmentation. It was also established that there is a low amount of gene flow among existing Platte River caddisfly populations and more intra-population variation than inter-population variation (Cavallaro *et al.* 2011, pp. 6–7).

The amount of genetic variability observed in the Platte River caddisfly (Cavallaro *et al.* 2011, p. 7) is similar to what has been observed in the caddisfly *Wormaldia tagananana,* which is identified as having a limited range and presumed limited dispersal ability (Kelly *et al.* 2002, p. 1646). Low gene flow between Platte River caddisfly populations further corroborates that the caddisfly has a limited ability to disperse to new habitats (e.g., restored sloughs, sites that were previously extirpated), and that successful dispersal to new habitats likely depends upon just a few individuals (Schmidt *et al.* 1995, p. 154; Cavallaro *et al.* 2011, pp. 6–7).

Although it has been identified that the Platte River caddisfly is a poor disperser, this is a natural life-history trait. This behavior would be detrimental to the species if the existing populations remained isolated from one another. However, we have not identified that habitat loss is presently occurring to the extent that the fragmentation of Platte River caddisfly populations poses a threat to the species. While sloughs on the different river systems and on both sides of the 155-km (93-mi) distribution gap between Hershey and Elm Creek, Nebraska, are isolated from one another, there is evidence of gamete (male and female reproductive cells) exchange across river systems given the similarity between the sites near Gibbon and Loup City and between Kearney and Sutherland. Furthermore, there have been live individuals or cases found at two restored sites. These observations indicate that there is a limited amount of dispersal occurring within relatively short time periods across short distances.

Summary of Factor E

In summary, although small population size and limited dispersal ability have the potential to adversely impact the Platte River caddisfly, there is no evidence that this is occurring or is likely to occur in the near future. For instance, there are no known caddisfly population extirpations that have occurred as a result of small population size. We previously established that the Platte River caddisfly has the ability to recolonize sloughs following stochastic events and is well adapted to the environmental extremes found in the Great Plains. Therefore, we conclude that other natural or manmade factors do not pose a threat to the species.

Cumulative Impacts

Some of the threats discussed in this finding can work in concert with one another to cumulatively create situations that will impact the Platte River caddisfly beyond the scope of each individual threat. For example, as mentioned under Factor A, the impacts of water development on Platte River caddisfly habitat could be exacerbated by the effects of drought and the projected increases in drought resulting from climate change. In the absence of water development projects across the landscape, the Platte River caddisfly is naturally tolerant of drought because of its semi-terrestrial lifecycle and ability to recolonize sloughs once they become inundated again following extended dry periods. However, in the presence of water development, projects that remove water from the Platte, Loup, and Elkhorn Rivers have the potential to reduce the amount of available habitat across the landscape to the point that, during drought, enough refugia may not be available to sustain existing populations. Also, because of climate change, the frequency of droughts is expected to increase, and this will likely be exacerbated by ongoing water development. Water development has the ability to exacerbate the effects of drought (climate change-related or otherwise), because less water is flowing through the system than what there would be in the absence of water development. Future, extreme droughts and climate change are also expected to facilitate the spread of non-native vegetation, and this could result in a loss in habitat due to the encroachment of exotic vegetation in sloughs. Because of these relationships, we will analyze the cumulative impact of drought (as a result of climate change), water development (human-caused water reduction), and invasive species.

Water Development, Drought, and Invasive Species

As mentioned previously, under normal conditions and otherwise, the Platte River caddisfly has the ability to withstand drought, because it enters into a dormant phase during the typical summer dry period. However, extreme drought can adversely impact the caddisfly to the point that it results in localized extirpations. For instance, extreme drought resulted in the extirpation of the type locality and one site near Shelton, Nebraska, in the early 2000s. The species has since recolonized the type locality. The Shelton site has not been surveyed since 2009, but it is possible the Platte River caddisfly has recolonized this area. This indicates that there was likely sufficient habitat available near the type locality during the drought to serve as refugia for the caddisfly, and that within a short period of time following disturbance, the species founded new populations in previously occupied habitat.

The drought in the early 2000s occurred during a time when water development projects, such as dams and diversions, were prevalent across the landscape, particularly along the Platte River. The Platte River is considered to be the most degraded portion of the range of the caddisfly, but no new, large water projects have been implemented since 1956. Under current laws and regulations, we anticipate that current conditions with respect to water development are not anticipated to deteriorate along the Platte River or appreciably diminish on the Loup and Elkhorn Rivers.

The caddisfly has already been shown to withstand the combined effects of extreme drought and water-related impacts to its habitat. The species is also still present following the proliferation of invasive species along the Platte River during the drought in the early 2000s. Meanwhile, there are no new, large-scale water development projects planned within the range of the caddisfly. Therefore, the amount of habitat available to the caddisfly is not anticipated to greatly diminish because of water development now or into the future. While future, extreme droughts could result in extirpations of the caddisfly at a local scale, from examining satellite imagery to identify slough habitat, we find there is sufficient habitat available surrounding current populations to serve as refugia for the species during drought. Thus, there is no information to suggest that future, extreme droughts resulting from climate change and current water development projects will reduce the ability of existing caddisfly populations to sustain themselves under a warmer and drier climate.

We previously identified that at three Platte River caddisfly sites along the Platte River, *Phalaris arundinacea* (reed canarygrass) may encroach enough in the future to contribute to the extirpation of the caddisfly at these locations. There is no evidence that suggests *Phalaris arundinacea* is resulting in habitat loss at the remaining 32 sites where the species occurs. Because of the current small number of sites affected by invasive species (3 of 35), and our inability to predict the future effects of invasive species on other caddisfly sites, we do not find that invasive species pose a threat to the species now or in the future.

Finding

As required by the Act, we considered the five factors in assessing whether the Platte River caddisfly is endangered or threatened throughout all of its range. We examined the best scientific and commercial information available regarding the past, present, and future threats faced by the Platte River caddisfly. We reviewed the petition, information available in our files, other available published and unpublished information, and we consulted with recognized caddisfly, slough, and hydrology experts and other Federal, State, and nongovernmental entities. On the basis of the best scientific and commercial information available, we find that the Platte River caddisfly is not in danger of extinction (endangered species) now or likely to become an endangered species within the foreseeable future (threatened species), throughout all or a significant portion of its range. Therefore, we find that listing the Platte River caddisfly as an endangered or threatened species is not warranted throughout its range at this time.

The Platte River caddisfly is currently known from 35 locations across three river systems, and the number of populations would most likely increase with additional survey efforts, because potentially suitable habitat has been identified but has not been surveyed. Meanwhile, with the exception of the type locality, there is a lack of information on population trends. It appears that the caddisfly naturally occurs at varying densities depending on habitat type and may even be classified as a habitat generalist. Because the species occurs in more than one habitat type on three different river systems, the caddisfly is well-represented across the landscape and is resilient to the various stressors present throughout its range.

In this finding, we identified a number of potential stressors under Factor A. The stressor most likely to constitute a threat to the Platte River caddisfly and its habitat in the future is landscape-level changes in hydrology. The Platte River is one of the most managed river systems in the United States and contains several impoundments, diversions, and groundwater withdrawals that have resulted in hydrological and morphological changes to the floodplain. The dewatering of the Platte River likely resulted in historical losses of Platte River caddisfly habitat. Nonetheless, we have established that most remaining populations are likely to remain adequately protected across this portion of the species' range because of programs, such as PRRIP and PFW, and the existence of protected areas where many Platte River caddisfly populations occur. Although ongoing and future Platte River channel degradation could potentially affect the Platte River caddisfly and its habitat in the future, particularly at the Crane Trust, restoration efforts are ongoing along the central Platte River to stem this trend. These efforts should protect caddisfly populations along the Platte River, where most stressors are concentrated, now and into the future.

Climate change is a concern and is likely to render the range of the Platte River caddisfly hotter and drier. Nonetheless, we have determined that the species should withstand future climatic changes because of various life-history traits that are common among semi-terrestrial caddisflies and because of the distribution of its habitat across the landscape. We have determined that the present or threatened destruction, modification, or curtailment of its habitat or range (Factor A) is not a threat to the Platte River caddisfly at this time.

We have determined that overutilization for commercial, recreational, or scientific use (Factor B) is not a threat to the species at this time. Neither disease nor predation (Factor C) is known or expected to be a threat to the species. We have determined that the inadequacy of existing regulatory mechanisms (Factor D) is not a threat to the Platte River caddisfly, and that regulatory mechanisms currently in place provide protection to the species. Regarding other natural or manmade factors affecting its continued existence (Factor E), we do not consider small population size or limited dispersal ability to constitute a threat to the species. The available information does not indicate that the caddisfly is being impacted genetically, or in any other way, as a result of small population size or limited dispersal ability, or that it will become an endangered or threatened species in the foreseeable future due to stochastic events. We have also examined the cumulative impact of various stressors acting together and whether those pose a threat to the caddisfly. We have determined that, when examined together, the cumulative impact of various stressors does not pose a threat to the caddisfly.

Significant Portion of the Range

Having determined that the Platte River caddisfly is not an endangered or threatened species throughout its range, we must next consider whether there are any significant portions of its range where the species is in danger of extinction or is likely to become an endangered species in the foreseeable future. The Act defines ''endangered species'' as any species which is ''in danger of extinction throughout all or a significant portion of its range,'' and ''threatened species'' as any species which is ''likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' The phrase ''significant portion of its range'' (SPR) is not defined by the statute, and we have no regulation governing SPR.

We interpret the phrase ''significant portion of its range'' in the Act's definitions of ''endangered species'' and ''threatened species'' to provide an independent basis for listing; thus, there are two situations (or factual bases) under which a species would qualify for listing: A species may be an endangered or threatened species throughout all of its range; or a species may be an endangered or threatened species in only a significant portion of its range. If a species is in danger of extinction throughout an SPR, the species is an ''endangered species.'' The same analysis applies to ''threatened species.'' Based on this interpretation and supported by existing case law, the consequence of finding that a species is an endangered or threatened species in only a significant portion of its range is that the entire species will be listed as an endangered or threatened species, respectively, and the Act's protections will be applied across the species' entire range. Because ''significant portion of its range'' provides an independent basis for listing and protecting the entire species, we next turn to the meaning of ''significant'' to determine the threshold for when such an independent basis for listing exists.

Although there are potentially many ways to determine whether a portion of a species' range is ''significant,'' the significance of the portion of the range should be determined based on its biological contribution to the conservation of the species. For this reason, we describe the threshold for ''significant'' in terms of an increase in the risk of extinction for the species. We conclude that a biologically based definition of ''significant'' best conforms to the purposes of the Act, is consistent with judicial interpretations, and best ensures species' conservation. Thus, as explained further below, a portion of the range of a species is ''significant'' if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction.

We evaluate biological significance based on the principles of conservation biology using the concepts of redundancy, resiliency, and representation. *Resiliency* describes the characteristics of a species and its habitat that allow it to recover from periodic disturbance. *Redundancy* (having multiple populations distributed across the landscape) may be needed to provide a margin of safety for the species to withstand catastrophic events. *Representation* (the range of variation found in a species) ensures that the species' adaptive capabilities are conserved. Redundancy, resiliency, and representation are not independent of each other, and some characteristic of a species or area may contribute to all three. For example, distribution across a wide variety of habitat types is an indicator of representation, but it may also may indicate a broad geographic distribution contributing to redundancy (decreasing the chance that any one event affects the entire species), and the likelihood that some habitat types are less susceptible to certain threats, contributing to resiliency (the ability of the species to recover from disturbance). None of these concepts is intended to be mutually exclusive, and a portion of a species' range may be determined to be ''significant'' due to its contributions under any one or more of these concepts.

We determine if a portion's biological contribution is so important that the portion qualifies as ''significant'' by asking whether *without that portion,* the representation, redundancy, or resiliency of the species would be so impaired that the species would have an increased vulnerability to threats to the point that the overall species would be in danger of extinction (i.e., would be ''an endangered species''). Conversely, we would not consider the portion of the range at issue to be ''significant'' if there is sufficient resiliency, redundancy, and representation elsewhere in the species' range that the species would not be in danger of extinction throughout its range if the population in that portion of the range in question became extirpated (extinct locally).

We recognize that this definition of ''significant'' (a portion of the range of a species is ''significant'' if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction) establishes a threshold that is relatively high. On the one hand, given that the consequences of finding a species to be an endangered or threatened species in an SPR would be listing the species throughout its entire range, it is important to use a threshold for ''significant'' that is robust. It would not be meaningful or appropriate to establish a very low threshold whereby a portion of the range can be considered ''significant'' even if only a negligible increase in extinction risk would result from its loss. Because nearly any portion of a species' range can be said to contribute some increment to a species' viability, use of such a low threshold would require us to impose restrictions and expend conservation resources disproportionately to achieve conservation benefits. This would result in the listing being rangewide, even if only a portion of the range of minor conservation importance to the species is imperiled. On the other hand, it would be inappropriate to establish a threshold for ''significant'' that is too high. This would be the case if the standard were, for example, that a portion of the range can be considered ''significant'' only if threats in that portion result in the entire species' being currently endangered or threatened. Such a high bar would not give the SPR phrase independent meaning, as the Ninth Circuit held in *Defenders of Wildlife* v. *Norton,* 258 F.3d 1136 (9th Cir. 2001).

The definition of ''significant'' used in this finding carefully balances these concerns. By setting a relatively high threshold, we minimize the degree to which restrictions will be imposed or resources expended that do not contribute substantially to species conservation. But we have not set the threshold so high that the phrase ''in a significant portion of its range'' loses independent meaning. Specifically, we have not set the threshold as high as it was under the interpretation presented by the Service in the *Defenders* litigation. Under that interpretation, the portion of the range would have to be so important that current imperilment there would mean that the species would be *currently* imperiled everywhere. Under the definition of ''significant,'' the portion of the range need not rise to such an exceptionally high level of biological significance. (We recognize that if the species is imperiled in a portion that rises to that level of biological significance, then we should conclude that the species is in fact imperiled throughout all of its range, and that we would not need to rely on the SPR language for such a listing.)

Rather, under this interpretation we ask whether the species would be an endangered species everywhere without that portion, i.e., if that portion were completely extirpated. In other words, the portion of the range need not be so important that even the species being in danger of extinction in that portion would be sufficient to cause the species in the remainder of the range to be an endangered species; rather, the *complete extirpation* (in a hypothetical future) of the species in that portion would be required to cause the species in the remainder of the range to be an endangered species.

The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose to analyzing portions of the range that have no reasonable potential to be significant or to analyzing portions of the range in which there is no reasonable potential for the species to be an endangered or threatened species. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that: (1) The portions may be ''significant,'' *and* (2) the species may be in danger of extinction there or likely to become so within the foreseeable future. Depending on the biology of the species, its range, and the threats it faces, it might be more efficient for us to address the significance question first or the status question first. Thus, if we determine that a portion of the range is not ''significant,'' we do not need to determine whether the species is an endangered or threatened species there; if we determine that the species is not endangered or threatened in a portion of its range, we do not need to determine if that portion is ''significant.'' In practice, a key part of the determination that a species is in danger of extinction in a significant portion of its range is whether the threats are geographically concentrated in some way. If the threats to the species are essentially uniform throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats to the species occurs only in portions of the species' range that clearly would not meet the biologically based definition of ''significant,'' such portions will not warrant further consideration.

To determine whether the Platte River caddisfly could be considered an endangered or threatened species in a ''significant portion of its range'', we reviewed the best scientific information with respect to the geographic concentration of threats and the significance of portions of the range to the conservation of the species. We first evaluated whether substantial information indicated (i) the threats are so concentrated in any portion of the species' range that the species may be currently in danger of extinction in that portion; and (ii) if so, whether those portions may be significant to the conservation of the species. Our rangewide review of the species concluded that the Platte River caddisfly is not an endangered or threatened species. As described above, to establish whether any areas may warrant further consideration, we reviewed our analysis of the five listing factors to determine whether any of the potential threats identified were so concentrated among the 35 populations that some portion of the range of the Platte River caddisfly may be in danger of extinction now or in the foreseeable future.

We found that most potential threats evaluated in this rule were concentrated on the Platte River, and we have determined that these potential threats, including but not limited to: landscape level changes in hydrology, invasive species, climate change, drought, flooding, grazing, inadequacy of existing regulatory mechanisms, and poor dispersal ability, are not resulting in current losses of slough habitat or losses of any of the 28 populations of the Platte River caddisfly along the Platte River, nor are they likely to do so in the foreseeable future. In addition, we find that the Platte River portion of the range of the caddisfly is not endangered or threatened because of existing programs and entities that are striving to protect current channel conditions. There is also no information to indicate that the potential threats analyzed under the five factors are contributing to a decline in the number of Platte River caddisfly populations or amount of slough habitat available along the central Platte River. For instance, we analyzed projected increases in the frequency of droughts in central Nebraska and how this could impact the Platte River caddisfly and its habitat. We also considered how the effects of climate change may be compounded by current levels of water development and have determined that these threats are not likely to pose a threat to the Platte River caddisfly across its range. Therefore, based on our review, the available information does not indicate that any of the potential threats we evaluated in all the factors under the Act were so concentrated in any portion of the species' range as to find that the Platte River caddisfly may currently be in danger of extinction in that portion of its range. Because we find that the Platte River caddisfly is not an endangered species in any portion of its range now or in the foreseeable future, we need not address the question of whether any portion may be significant.

Conclusion

Our review of the information pertaining to the five factors does not support the assertion that there are threats acting on the species or its habitat that have rendered the Platte River caddisfly to be in danger of extinction or likely to become so in the foreseeable future, throughout all or a significant portion of its range. Therefore, listing the Platte River caddisfly as an endangered or threatened species under the Act is not warranted at this time.

We request that you submit any new information concerning the status of, or threats to, the Platte River caddisfly to our Nebraska Field Office (see **ADDRESSES**) whenever it becomes available. New information will help us monitor the Platte River caddisfly and encourage its conservation. If an emergency situation develops for the Platte River caddisfly or any other species, we will act to provide immediate protection.

References Cited

A complete list of references cited is available on the Internet at *http://www.regulations.gov* and upon request from the Nebraska Field Office (see **ADDRESSES**).

Authors

The primary authors of this notice are the staff members of the Nebraska Field Office.

Authority

The authority for this action is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: August 20, 2012.

Benjamin N. Tuggle,

Acting Director, U.S. Fish and Wildlife Service.

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