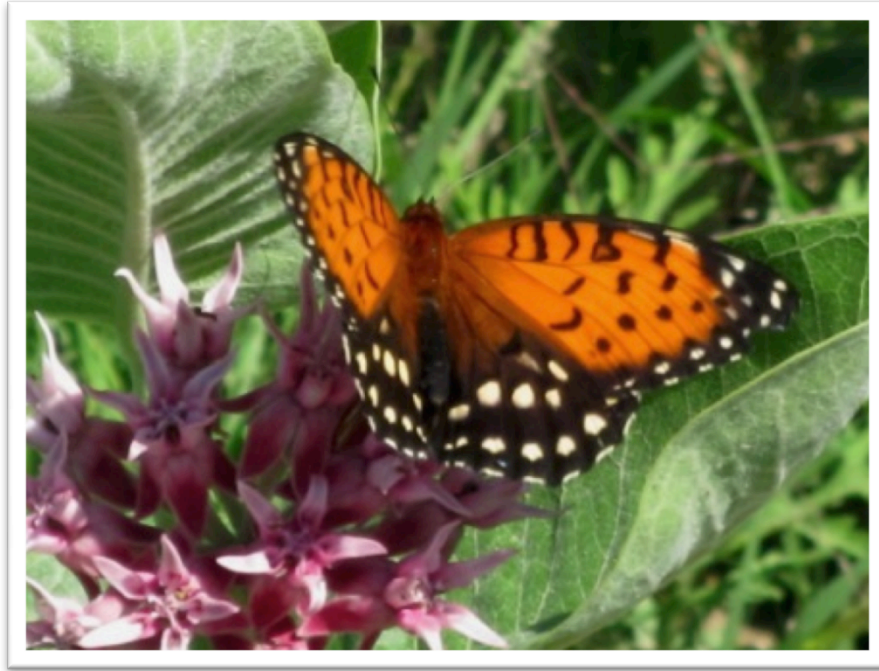


**PETITION TO LIST THE  
Regal Fritillary (*Speyeria idalia*)  
UNDER THE ENDANGERED SPECIES ACT**



Regal fritillary (*Speyeria idalia*) in the Quivira National Wildlife Refuge, Kansas.  
Photo: U.S. Fish & Wildlife Service.

**Petition Submitted to the U.S. Secretary of the Interior, Acting through  
the U.S. Fish and Wildlife Service**

Petitioner:

WildEarth Guardians  
1536 Wynkoop Street, Suite 301  
Denver, Colorado 80202  
303.437.7663

April 19, 2013



## **INTRODUCTION**

WildEarth Guardians requests that the U.S. Secretary of the Interior, acting through the U.S. Fish and Wildlife Service (FWS) list the regal fritillary (*Speyeria idalia*) as “threatened” or “endangered” under the Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544). WildEarth Guardians also requests that FWS designate critical habitat for the species.

The regal fritillary is a brushfooted butterfly characterized by the velvety, blue-black color of its hindwings. The regal fritillary’s habitat and reproductive characteristics make it particularly vulnerable to extirpation. It lives in remnant prairie habitats, has an extended reproductive diapause (extended period of time between mating and laying eggs), and deposits its eggs throughout its habitat on the ground near hostplants rather than on the hostplants.

The regal fritillary is threatened by four factors identified in the ESA. First, the species’ habitat is affected by a range of threats, including crop agriculture, urban and residential development, road construction and maintenance, herbicide and pesticide use, and ill-timed controlled burns. Second, the regal fritillary is particularly threatened by overutilization for commercial or recreational purposes due to its higher potential commercial value than most other prairie-specialist butterflies. It is also likely that females collected for such purposes have not had a chance to reproduce due to the species’ extended period of reproductive diapause. Third, existing regulatory mechanisms are inadequate to protect the regal fritillary and its habitat from increased habitat fragmentation and degradation. Fourth, the regal fritillary is especially vulnerable to the threats it faces due to its reproductive characteristics. Genetic isolation as a result of habitat fragmentation may also increase the regal fritillary’s vulnerability to other threats. Human population growth will only exacerbate current threats to the species.

## **PETITIONER**

WildEarth Guardians is a nonprofit environmental advocacy organization that works to protect wildlife, wild rivers, and wild lands in the American West. The organization has more than 14,000 members and maintains offices in New Mexico, Colorado, and Arizona. WildEarth Guardians has an active endangered species program that works to protect imperiled species and their habitat in the United States and beyond.

## **ENDANGERED SPECIES ACT AND IMPLEMENTING REGULATIONS**

The Endangered Species Act of 1973 protects plants and animals that are listed by the federal government as “endangered” or “threatened” (16 U.S.C. § 1531 et seq.). Any interested person may submit a written petition to the Secretary of Interior requesting him to list a species as “endangered” or “threatened” under the ESA (50 C.F.R. § 424.14(a)). An “endangered species” is “any species that is in danger of extinction throughout all or a significant portion of its range” (16 U.S.C. § 1532(6)). A “threatened species” is defined as “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (16 U.S.C § 1532(20)). “Species” includes subspecies and distinct population segments of sensitive taxa (16 U.S.C § 1532(16)).

The ESA sets forth listing factors under which a species can qualify for protection (16 U.S.C. § 1533(a)(1)):

- A. The present or threatened destruction, modification, or curtailment of 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.

A taxon need only meet one of these listing criteria to qualify for federal listing.

Within 90 days of receiving this petition, the Secretary “shall make a finding as to whether the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted” (*Id.* at § 1533(b)(3)(A)). “Substantial information” is further defined as “that amount of information that would lead a reasonable person to believe that the measure proposed in the petition may be warranted” (50 C.F.R. § 424.14(b)(1)). If the Secretary determines that a species warrants a listing as “endangered” or “threatened” under the ESA, and the species lives within the United States or its waters, he is also obligated to designate critical habitat for that species based on the best scientific data available (16 U.S.C. § 1533(b)(2)).

#### CLASSIFICATION AND NOMENCLATURE

**Common Name.** *Speyeria idalia* is known by the common name “regal fritillary” (Vaughan and Shepherd 2005 at 1; *see also* Tilden and Smith 1986 at 80). This petition refers to the species as “regal fritillary” or “fritillary.”

**Taxonomy.** The petitioned species is *Speyeria idalia* Drury, 1773. The complete taxonomic classification for the fritillary is provided in Table 1.

**Table 1.** Taxonomy of *Speyeria idalia*. Source: NatureServe 2012 at 1.

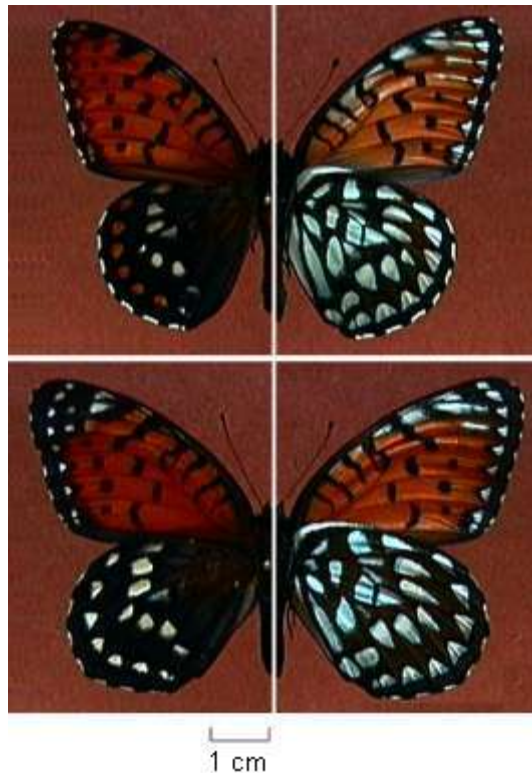
Phylum	Mandibulata
Class	Insecta
Order	Lepidoptera
Family	Nymphalidae
Genus	<i>Speyeria</i>
Species	<i>idalia</i>

“Recent work . . . has indicated that there may be two subspecies, *S. i. occidentalis* in the western part of the range and *S. i. idalia* in the east. However, only a handful of *idalia* specimens are known and the collapse in the eastern populations of regal fritillary may preclude further studies” (Vaughan and Shepherd 2005 at 2).

## SPECIES DESCRIPTION

The regal fritillary is a large, brushfooted butterfly with a wingspan of 67 to 105 mm ( $2\frac{5}{8}$  to  $4\frac{1}{8}$  inches) (Vaughan and Shepherd 2005 at 1). It is similar in size to the monarch butterfly (*Danaus plexippus*) (NatureServe 2012 at 14). Females are slightly larger than males (MDNR 2012 at 2).

The upperside of the forewing is bright red-orange with black markings. On females the forewing is edged with a black marginal band with a postmedian row of white spots. The upperside of the hindwing is black with a postmedian row of white spots. There is also a submarginal row of spots that is orange on males and white on females. The underside of the forewing is orange with a marginal band of white spots and a black fringe. The hindwing is dark greenish brown with elongate white spots. (Vaughan and Shepherd 2005 at 1-2)



**Figure 1.** The regal fritillary.

Source: U.S. Geological Survey, Northern Prairie Wildlife Research Center.<sup>1</sup>

Regal fritillary eggs are initially “white or cream colored” and then darken to a “frost gray.” (Selby 2007 at 14). Larvae can be “ochre-yellow to orangish, yellow on the rear” (Id.) with “yellow lines and black spots” (Vaughan and Shepherd 2005 at 2). “Larvae are about 2.03 mm (0.08 inches) long when they hatch, and they reach a length of 44.45 mm (1.75 inches) when fully developed” (Selby 2007 at 14). Pupae are “light mottled brown tinged with pink, with small

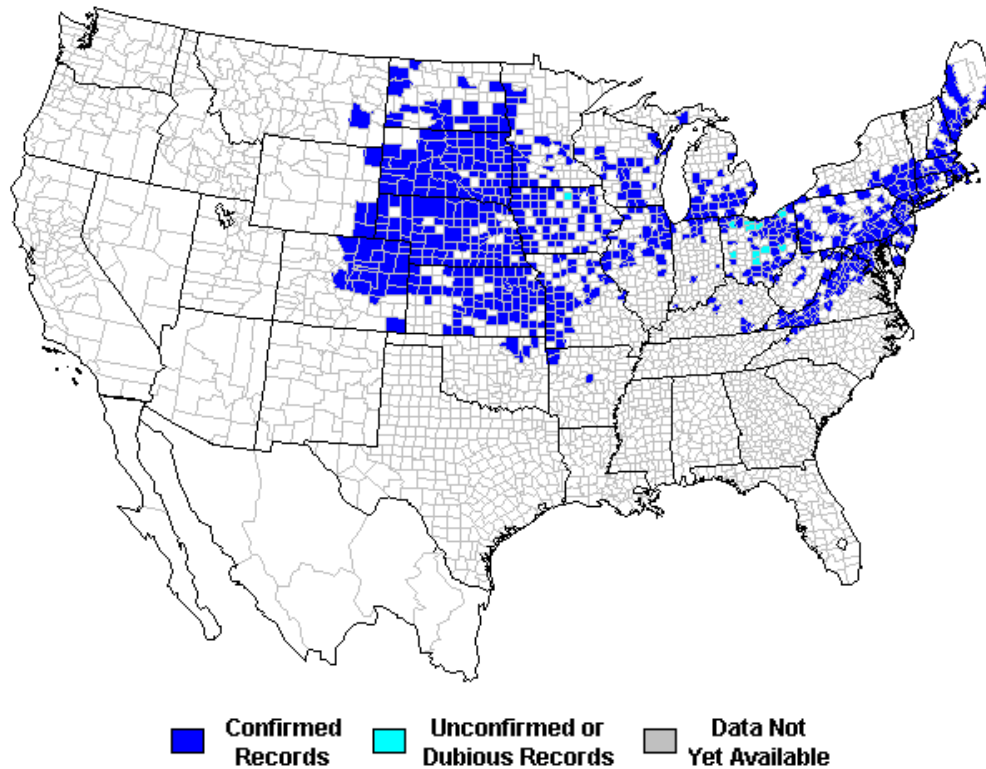
<sup>1</sup>Available at [www.npwrc.usgs.gov/resource/insects/bflynd/nd/98.htm](http://www.npwrc.usgs.gov/resource/insects/bflynd/nd/98.htm).

black spots on the wings and thorax, short dorsal cones, and yellow transverse bands on the abdomen” and reach a size of about 27.94 mm (1.10 inches) in length (Id.).

**Distinctive traits.** According to NatureServe (2012 at 14), “no butterfly anywhere in the world resembles this [the regal fritillary].” The species’ hindwings are unique, being a “velvety, blue-black” with two bands of spots (Selby 2007 at 14). “Because of [their] size, females could be mistaken for a Monarch at great distances” (NatureServe 2012 at 14).

#### **GEOGRAPHIC DISTRIBUTION: HISTORIC AND CURRENT**

Historically the regal fritillary’s range covered more than a million square miles; today the species’ range is less than half that size (NatureServe 2012 at 7). Its historical range extended from Nova Scotia, south to northern Georgia, west to the Dakotas and eastward to the Atlantic coast (Powell *et al.* 2007 at 299; Ferster and Vulinec 2009 at 1; *see* Figure 2).

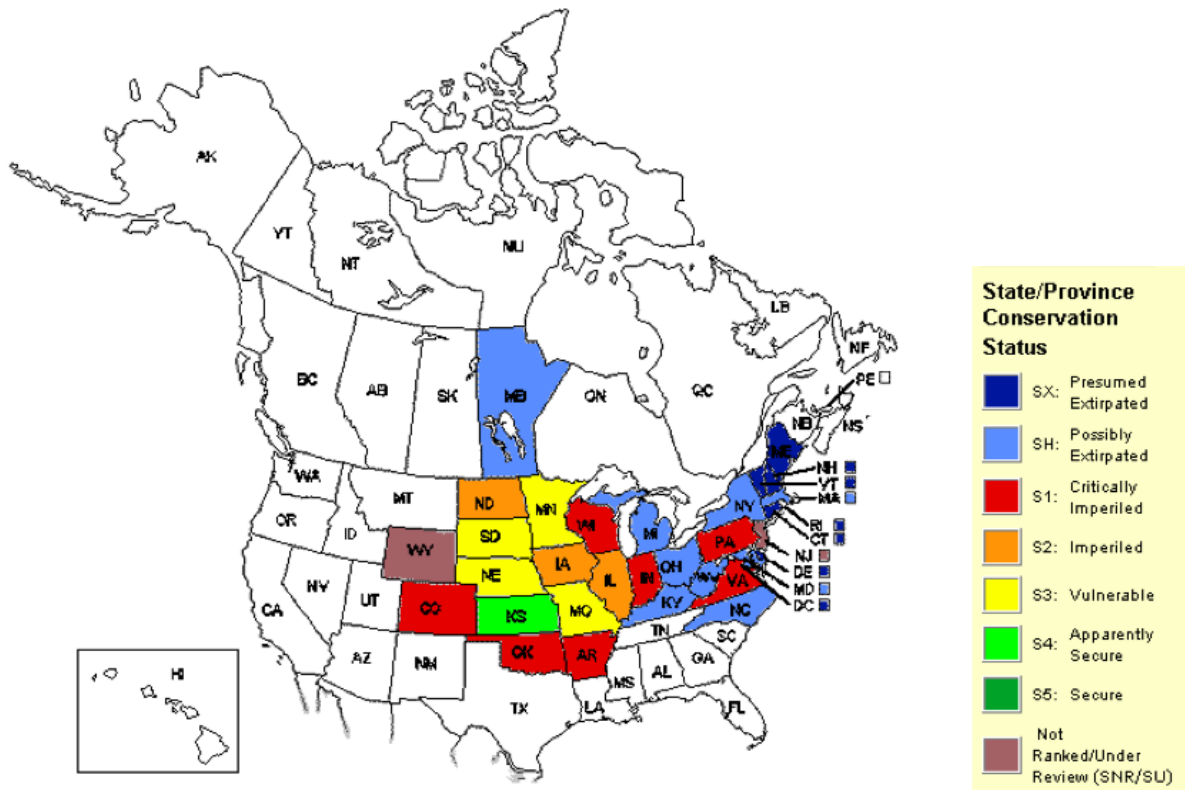


**Figure 2.** Historic distribution of the regal fritillary by county.  
Source: Vaughan and Shepherd 2005 at 5.

The regal fritillary is currently restricted to tall-grass prairie remnants (Vaughan and Shepherd 2005 at 2). Its core range is in Kansas, Missouri, and Nebraska (NatureServe 2012 at 3). It is “very rare or at best locally frequent in its entire range” and “has almost disappeared from its range east of the Mississippi (Vaughan and Shepherd 2005 at 2).

There has been a drastic loss of range since 1980, probably especially since 1987. The southwestern limit still is extreme eastern Colorado, Kansas and extreme northeastern Oklahoma but Royer (1988) says it has disappeared from western North Dakota while persisting in the eastern part. Regals are historic or extirpated in all six New England states; Canada (if ever really established), New York, New Jersey, Maryland, Delaware, probably West Virginia, Ohio, probably Indiana, and Michigan. By the late 1990s, a large population in central Pennsylvania (still extant in 2006) and another in Virginia were the only actually located extant occurrences east of the Illinois-Indiana border region, although there was one apparently reliable observation in western North Carolina in 1994. (NatureServe 2012 at 8, internal citations omitted, *see* Figure 3).

The regal fritillary is “rapidly declining in the prairie states of Illinois, Iowa and Wisconsin” (Ferster and Vulinec 2009 at 9). While it has been recorded in southern Ontario and Manitoba, it probably does not have permanent colonies in Canada (Vaughan and Shepherd 2005 at 2; CBIF 2002 at 1).



**Figure 3.** Current status of the regal fritillary by state. Source: NatureServe 2012 at 9-10

### HABITAT REQUIREMENTS

Regal fritillary butterflies live in tall-grass prairie and other open and sunny locations such as damp meadows, marshes, wet fields, and mountain pastures (Vaughan and Shepherd 2005 at 2; BMNA undated at 1; Selby 2007 at 26). In Michigan, regal fritillaries inhabit “[p]rairie or open environments frequently in sandy regions... Meadows, old fields, and floodplain forest openings

and edges” (MNFI 2012 at 2). Wisconsin has identified regal fritillary habitat in the state as “[l]arge grassland areas with prairie remnants or lightly grazed pasture lands containing prairie vegetation where topography often includes hills and valleys” (WDNR 2012 at 1). The “regal fritillary is strongly associated with native prairie habitat. Adults are encountered in both upland prairies and in wet prairies, although larval development may be restricted to upland prairie” in Minnesota (MDNR 2012 at 2).

Violets are the sole larval hostplant for the fritillary, though the species of violets used varies (Vaughan and Shepherd 2005 at 2; NatureServe 2012 at 15; Selby 2007 at 29). The butterfly might possibly use any species of violet in its habitat, including the birdfoot violet (*Viola pedata*), prairie violet (*Viola pedatifida*) and lance-leaved violet (*Viola lanceolata*) (NatureServe 2012 at 15). “Populations require a large number of violet plants” (Id.).

## **LIFE HISTORY**

**Feeding.** Adult regal fritillaries are nectarivores, while juveniles are herbivores (Id.). Adults feed on nectar from various flowers such as milkweeds, thistles, red clover, and mountain mint (BMNA undated at 1; Selby 2007 at 28). However, “[n]o single nectar genus is crucial and nectar resources nearly always change over the lifetime of at least females” (NatureServe 2012 at 16). If a reliable source of nectar is not available, adult regal fritillaries “will emigrate from an area quickly” (Id. at 15). The regal fritillary has demanding nutritional requirements due to its extended adult lifespan (Selby 2007 at 28). “Most butterflies use nectar resources primarily to meet energy needs, but many long-lived butterflies also use food resources for egg production” (Id.). Adult food limitations may lead to decreased fecundity and fertility.

As noted, violets are the sole larval foodsource (Vaughan and Shepherd 2005 at 2; NatureServe 2012 at 15; Selby 2007 at 29). The violet leaves must be from young or intermediately aged plants (Kopper *et al.* 2001 at 431).

**Reproduction and dispersal.** The regal fritillary’s single flight period takes place between mid-June and mid-September (the timing of the flight period varies across the range and can vary significantly from year to year due to weather) (Selby 2007 at 25). Females emerge one to two weeks after the males and generally mate upon emergence. However, they do not lay eggs until at least three weeks after mating, between late August and early September (NatureServe 2012 at 16; Selby 2007 at 30). This extended period of time between mating and oviposition is known as “reproductive diapause” and is rare in other North American Lepidoptera (Kopper *et al.* 2001 at 427). This appears to be an adaptation to the lifecycle of the larval foodsource—violets. The extended time period between mating and oviposition during the heat of the summer and the overwintering of larvae allow the caterpillars to emerge in the spring when violet hostplants are young (Kopper *et al.* 2001 at 430-31).

The regal fritillary females may lay more than 2,000 eggs (Vaughan and Shepherd 2005 at 2). Females lay single eggs throughout their habitat even if the host violets are not present (Vaughan and Shepherd 2005 at 2, BMNA undated at 1). Eggs are laid on vegetation, dead leaves, and pebbles and hatch in about 3-4 weeks (Vaughan and Shepherd 2005 at 2; NatureServe 2012 at 16). “At least to most observers oviposition seems somewhat haphazard, but given that larvae

seek a hibernation site quickly after hatching... females may cue on factors other than foodplant in selecting the exact site. Based on observations of captive larvae, it appears they prefer to enter rolled over dried grass stems on the ground” (NatureServe 2012 at 14). Once the caterpillars hatch they enter diapause immediately and overwinter unfed (Id.). After becoming active in the spring they eat the leaves of young violets (Vaughan and Shepherd 2005 at 2; Selby 2007 at 30). The pupal stage lasts two and a half to four weeks (Selby 2007 at 25). June is typically the beginning of adult male emergence, although emergence may start as early as late May in the warmest part of the specie’s range (NatureServe 2012 at 16).

Not much is known about the dispersal behavior of the regal fritillary. While some disperse for miles, “[a]dults usually stay in [their] natal area, at least for several weeks” (NatureServe 2012 at 15; *see also* Selby 2007 at 25). The Minnesota Department of Natural Resources (2012 at 3) describes regal fritillaries as “powerful fliers, capable of ranging widely across the landscape,” and further describes dispersal behavior:

Adults are rarely encountered away from native prairie remnants, and they appear to have a strong tendency to remain within the boundaries of these. However, adults are frequently observed in remnants too small to produce self-sustaining populations, suggesting that dispersal among remnants is common. (Id.; *see also* Selby 2007 at 26).

Regals are strong flyers and sometimes disperse over tens of kilometers or more, though it is their tendency to remain within the bounds of their natal prairie, especially if it is surrounded by trees, croplands, or roads (Powell *et al.* 2007 at 304).

**Natural mortality.** Adult regal fritillary males live about a month, dying about 2 weeks after mating (NatureServe 2012 at 16; Kopper *et al.* 2001 at 427). Females probably live approximately two months (NatureServe 2012 at 16).

Mortality for the regal fritillary is particularly high during the larval stage (Selby 2007 at 30). The larva must survive winter and then locate a violet hostplant in spring, which it cannot detect from a distance of more than 1-2 cm. Larvae are also “extremely susceptible to disease, parasitoids, and direct and indirect mortality from fires that consume the vegetation where they are sheltered” (Id.).

## **HISTORIC AND CURRENT POPULATION STATUS AND TRENDS**

The regal fritillary is a “former landscape level species now reduced to scattered, sometimes isolated, remnant colonies. This species was probably about as characteristic of tall grass prairie as bison and far more abundant” (Id.). Populations of regal fritillary began disappearing from the northeastern parts of their range, progressing southward, in the 1950s (Ferster and Vulinec 2009 at 9). There has been a drastic decline in populations since 1980, particularly from 1987 through the early 1990s (Id.; NatureServe 2012 at 3; Powell *et al.* 2007 at 299). The regal fritillary has been assigned a Global Heritage Status Rank of G3 (vulnerable) (NatureServe 2012 at 1; Selby 2007 at 3) as “[t]here is no convincing evidence that the species is stable anywhere” (NatureServe 2012 at 2). “The rank... reflects the very recent large scale decline and range contraction, the causes of which are somewhat uncertain, resulting in a recent (mostly since



1970) loss of approximately 40 [percent] of historic range, and on-going decline in some or possibly all other parts of its range. The decline in numbers and area of occupancy is well over 99 [percent]” (NatureServe 2012 at 2).

It is estimated that there are currently anywhere between 2,500 and 1,000,000 regal fritillary individuals (NatureServe 2012 at 3). These exist in “100-200 viable breeding or metapopulations (educated approximation)... and many more individual colonies” (Id.). The individual colonies are of varying persistence and quality. Most of the northern colonies seem to consist of fewer than 200 adults but there are few mark-release-recapture (MRR) estimates (Id. at 3-4). Powell *et al.* (2007 at 299) estimate that northeastern Kansas supports a population of 12,000, a stronghold for this species. The future of this population is precarious:

The future status of the Regal Fritillary in north-eastern Kansas is tied to the future of prairie, which in this rapidly developing region proximal to greater Kansas City is far from assured; only 6 ha of prairie remain in the two Kansas counties that adjoin our study area and include parts of that metropolitan area, and only a few prairies in our study area are on public lands or are otherwise protected by conservation organizations or easements. In Douglas County, high quality prairie was reduced from 794 ha (110 sites) in 1988 to 565 ha (89 sites) in 2005, a loss of 29 [percent]. Some sites were destroyed by conversion to rowcrops or nonnative pasture, but since many prairies are located on hills that are attractive sites for exurban home building, a disproportionate share have been lost to that use and accompanying yard development. The loss of prairie in our study area has had significant impacts: one of only two prairies with populations of the federally threatened Western Prairie Fringed Orchid (*Platanthera praeclara*) was plowed in 1990, and the last population of Greater Prairie-Chickens (*Tympanuchus cupido*) disappeared in 2003–2004. Currently, neither the small sizes of prairies nor use of prescribed fire limits the occurrence of regals, but if prairies become fewer, their isolation from one another might increase to the point that recolonization of sites no longer keeps pace with local extinctions. Likewise, if use of prescribed fire replaces hay management at more sites, the metapopulation dynamics of the region might be disrupted since high density sites would be fewer and more isolated, the overall population of the region would be reduced, and because burned sites are population sinks to the extent that immigrant females colonize them in the year before a burn. (Powell *et al.* at 307, internal citations omitted).

Available information suggests that the abundance of the regal fritillary in other areas is lower than that in Kansas (NatureServe 2012 at 4). It is difficult to determine population without MRR, partially because unseen individuals, which are mostly females, will not be effectively accounted for (Id.). “This species probably has over 50,000 adults most years but could occasionally go lower if fluctuations tend to be synchronized along the Missouri-Kansas border - e.g. perhaps during droughts” (Id.). “This landscape level species has been reduced to remnant colonies in most places mostly of 100 or so adults or less, and is prone to year to year fluctuations, meaning small colonies may die out. In addition it is vulnerable to fire, drought, ill-timed mowing and probably other disturbances” (Id. at 6).

## IDENTIFIED THREATS TO THE PETITIONED SPECIES: CRITERIA FOR LISTING

The regal fritillary meets at least four of the criteria for listing identified in the ESA (16 U.S.C. §1533(a)(1)) (in bold):

- 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.**

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

The greatest threat to the regal fritillary is habitat destruction, fragmentation, and degradation of prairies and the loss of larval hostplants (Selby 2007 at 3, 20, 33; Ferster and Vulinec 2009 at 1-2). This was noted as long ago as 1993, when the butterfly was still on the federal candidate list and over 95 percent of prairie habitat had already been eliminated from states east of the Great Plains (Moffat and McPhillips 1993 at 2).

In the 1980s, substantial populations of this species were limited to offshore islands of New England and New York. Due to substantial habitat reduction, followed by adverse weather... the species is now considered extirpated in those states. At about the same time, it disappeared from the rest of the U.S. Fish and Wildlife Service's Region 5 and Ohio, Michigan, and much of Indiana in Region 3. (*Id.*)

The decreasing *quality* of prairie habitat is also a concern, as nectar plants and larval food sources are affected by the use of herbicides and pesticides, invasive exotic species, and encroachment by woody vegetation (Selby 2007 at 3; USGS 1995 at 3; Ferster and Vulinec 2009 at 3).

The fritillary butterflies of the genus *Speyeria* and their larval foodplants, violets (*Viola*), are among the most sensitive organisms in native ecosystems, and are among the first to be exterminated as a result of widespread human disturbance. Illustrative of this is the Regal Fritillary (*S. idalia*) and its larval foodplant, the Blue Prairie Violet (*V. pedatifida*). These organisms are two of the most characteristic indicator species of virgin tall-grass prairie in the central United States. Like the American Bison, it is quite evident that millions of *S. idalia* must have swarmed across the vast expanses of original tall-grass prairie in Illinois, Iowa, Missouri, Kansas, Nebraska, South Dakota and North Dakota before Europeans eliminated this native ecosystem with agriculture. Today, the violet and butterfly are mainly confined to the few small patches of virgin prairie that still survive in these prairie states, and are being preserved by state and private agencies. (Hammond and McCorkle 1983 at 218-219, internal citations omitted)

**Development.** “Changes in land use practices across the historic range of [regal fritillaries] likely reduced plant diversity resulting in local butterfly extinctions” (Ferster and Vulinec 2009 at 10).

[A]ctivities that continue to eliminate remnant prairie habitats include row crop agriculture, urban development and housing construction, road construction and maintenance, gravel mining, and wind generators. In the absence of fire and grazing, some prairies will eventually be lost to encroachment by woody vegetation. While this can include native woody species, it has been exacerbated by the introduction of many aggressive exotic woody species that are very difficult to control. (Selby 2007 at 33).

### **Biocides.**

Indiscriminant use of insecticides for pest control on rangeland or adjacent cropland can be a major direct threat to regal fritillaries and other prairie-specialist butterflies. Royer and Marrone (1992) cite the combination of drought and grasshopper control programs along the Red River Valley in North Dakota as having serious impacts on Poweshiek skipperling populations. Broadcast spraying of herbicides, which usually targets dicots, can also affect regal fritillary populations indirectly by eliminating larval food plants and important nectar sources. (Selby 2007 at 36).

### **Livestock grazing.**

While light to moderate grazing appears to benefit regal fritillary populations, especially if there is some contiguous ungrazed habitat, heavy grazing is a threat. In a study at Rowe Sanctuary in Nebraska, regal fritillaries were abundant on the 73-ha (180-acre) prairie, but none were found on adjacent overgrazed pastures. Reduced availability of nectar resources is likely the primary factor, but changes to vegetative structure, removal of larval host plants, and trampling eggs and larvae may also be factors. (*Id.* at 35, internal citations omitted).

Rangeland management can be detrimental to regal fritillary populations. “Historically, the Flint Hills [of Kansas] must have had a regal population of unimaginably large proportions, and probably still would except that nearly all its prairie is rangeland, most of which is burned annually or biannually to maximize beef yields” (Powell et al. 2007 at 307).

**Exotic/encroaching species.** “Host plants that *S. idalia* and other rare butterflies require as food sources often compete poorly with other plants (especially woody species)” (Ferster and Vulinec 2009 at 2).

[Prairie remnants] are often surrounded by row crop agriculture and face a constant influx of eroded soil complete with annual weed seeds. Cool season exotics (e.g., smooth brome [*Bromus inermis*], Kentucky bluegrass [*Poa pratensis*]) have been introduced into many prairie pastures, and grazing practices often favor these species. Other threats include aggressive perennial species (e.g., leafy spurge [*Euphorbia esula*]) that can replace the

diverse native communities with dense monocultures. Aggressive non-native woody species have exacerbated the tendency of native grasslands to be lost to encroachment by woody vegetation. (Selby 2007 at 35-36).

**Unnatural disturbance regimes.** Without natural disturbance regimes – examples include physical soil disturbances caused by large mammals now extinct, and intermittent fire – the natural habitat that the regal fritillary needs disappears (Ferster and Vulinec 2009 at 2). Many remaining prairie fragments are inappropriately managed for the butterfly:

Higher rates of disturbance, such as yearly mowing, tilling, or the frequent use of herbicides may act to reduce plant diversity, discouraging perennial plants (like many nectar plant species) that take longer to establish. Where disturbance is lacking, woody plants eventually dominate and replace or suppress growth of herbaceous species that require full sun. Grassland conservation efforts in the northeastern US must include some form of disturbance, but the mechanisms of disturbance (mowing, burning, plowing) used may have dramatically different effects on biodiversity. (Id.).

In the absence of fire and grazing, some prairies will eventually be lost to encroachment by woody vegetation. While this can include native woody species, it has been exacerbated by the introduction of many aggressive exotic woody species that are very difficult to control. Other invasive exotic species can also threaten to degrade and eventually eliminate prairie habitat. (Selby 2007 at 33).

Prescribed fire, grazing, and haying can play important roles in maintaining prairie ecosystems, but can also pose threats to the regal fritillary depending on timing and intensity (Selby 2007 at 3, 34-35). Improper timing of these activities can impact the availability of nectar and larval food sources. Ill-timed prescribed burns are especially a threat (Vaughan and Shepherd 2005 at 2). Larvae on the prairie floor face the danger of direct mortality from fires and indirect mortality from increased exposure after the fires remove the protective litter layer (Selby 2007 at 3, 34). “The principal need is for its prairie habitat to be protected and appropriately managed... A better understanding of the impact of fire (prescribed burning) on butterfly populations is necessary” (Vaughan and Shepherd 2005 at 3).

**Habitat fragmentation.** Fragmentation of regal fritillary habitat makes the butterfly more vulnerable to the other threats, as isolated populations may not be able to recover from catastrophic events, whether natural (such as an extreme weather event) or anthropogenic (such as an ill-timed prescribed burn) (Selby 2007 at 3). Fragmentation (and degraded habitat) may also prevent colonization or recolonization of suitable habitat. “*S. idalia* is a very strong flier, and in highly fragmented habitats there could be a strong selection pressure against individuals that disperse (one could view this as dispersal suicide in highly agricultural landscapes)” (Kelly and Debinski 1998 at 273). For example, “[t]he extent of *S. idalia*’s decline and population in Iowa has reached a point where distance from existing populations could be excluding the insect from otherwise suitable habitat. Sites that may have served as stepping stones in the past may be less effective now because of marginal hostplant and adult nectar resources” (Id. at 272). Minnesota has noted a similar issue:

Movement of adults among sites is probably important for the persistence of the regal fritillary in most prairie remnants in Minnesota. Many of the smaller remnants are unprotected and are likely to eventually vanish. This could lead to the disappearance of the regal fritillary from many of the surviving prairies. The decreasing likelihood of dispersers finding suitable opportunities for reproduction could exacerbate gene selection against dispersal. Even the largest prairies in Minnesota cannot support populations of this butterfly that are large enough to be secure against possible catastrophic events. (MDNR 2012 at 4-5).

The facts that regal fritillaries do not migrate and are unable to survive in the altered landscapes that surround the fragmented prairie remnants have important conservation implications. Although they have greater dispersal capability than most other prairie butterflies, the odds of successfully repopulating distant prairie fragments are low. If an isolated population in the highly fragmented prairie landscape is extirpated, it is unlikely that it will be repopulated. Therefore, the entire life cycle must be completed successfully each year at each site for local populations to persist through time at those sites. (Selby 2007 at 31-32).

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

Selby (2007 at 36) notes that populations of insects which are already “depressed or concentrated in small habitat fragments can be more sensitive to overcollecting.” This may be a particular threat to the regal fritillary if collectors are capturing females that have not had a chance to reproduce due to the species’ extended period of reproductive diapause (*Id.*). At least one population has disappeared after collection of adult fritillaries. “Regal fritillaries are also more attractive to collectors and have more potential commercial value than most prairie-specialist butterflies. In Colorado, overcollecting is listed as a possible threat due to the species’ attractiveness to collectors and their colonial habitat” (*Id.*). The Missouri Department of Conservation (2012) admonishes owners of prairie habitat not to let collectors capture regal fritillaries.

#### **(D) The inadequacy of existing regulatory mechanisms**

**United States.** The regal fritillary was a candidate for listing under the ESA until 1996, when it was removed from candidacy by FWS (Kelly and Debinski 1998 at 262). The U.S. Forest Service recognizes the regal fritillary as a sensitive species in Regions 1, 2, 8, and 9. This designation “does not confer legal protection, but it does help to ensure that appropriate conservation/ management objectives and practices are implemented on those National Forest System lands where it occurs” (Selby 2007 at 12). Missouri has placed the fritillary on the Missouri Department of Conservation’s Watch List (MDC 2012). It is also a species of special concern in Oklahoma (ONHI 2003 at 4).

Though state rankings and listings may provide a measure of protection, they are insufficient to preserve such a wide-ranging species across the landscape. Of particular note is the lack of state protection in Kansas, home to one of the most stable remaining populations. The patchwork of

regulations that currently exists cannot present a landscape-level vision for conservation of this landscape-level species.

	State Rank	Protection Status	
<b>Global</b>	G3	—	
<b>USA (National)</b>	N3	—	
<b>USA (State)</b>			<b>Status Rank Definitions</b>
			G1/N1/S1 – Critically imperiled
Connecticut	SX	SC	G2/N2/S2 – Imperiled
Delaware	SX	—	G3/N3/S3 – Vulnerable
District of Columbia	SX	—	G4/N4/S4 – Apparently Secure
Maine	SX	—	GX/NX/SX – Presumed extirpated
New Hampshire	SX	—	GH/NH/SH – Possibly extirpated
Rhode Island	SX	—	SNR – Not ranked
Vermont	SX	SC	
Kentucky	SH	H	<b>Protection Status Definitions</b>
Maryland	SH	X	E – Endangered
Massachusetts	SH	—	T – Threatened
Michigan	SH	E	SC – Special Concern
New Jersey	SH	—	
New York	SH	E	<b>State Specific Status Definitions</b>
North Carolina	SH	SR	H – Historic
Ohio	SH	E	SR – Significantly rare
Oklahoma	SH	SS2	SS2 – Possibly threatened
West Virginia	SH	—	X – Endangered extirpated
Arkansas	S1	—	
<b>Colorado*</b>	<b>S1</b>	—	— No Status Rank/Protection Status
Indiana	S1	E	
Pennsylvania	S1	—	<b>*USFS Region 2 States</b>
Virginia	S1	—	
Wisconsin	S1	E	
Illinois	S2	T	
Iowa	S2	SC	
North Dakota	S2	—	
Minnesota	S3	SC	
Missouri	S3	—	
<b>Nebraska*</b>	<b>S3</b>	—	
<b>South Dakota*</b>	<b>S3</b>	—	
<b>Kansas*</b>	<b>S4</b>	—	
<b>Wyoming*</b>	<b>SNR</b>	—	
Montana	—	—	
<b>Canada (National)</b>	NH	—	
<b>Canada (Province)</b>			
Manitoba	SHB	—	

**Figure 4.** Natural Heritage Program Global, National, and State/Province Status Ranks, and legal protection status for the regal fritillary as of 2007. Source: Selby *et al.* 2007 at 11 (*see also* ODNR 2012 at 4; WDNR 2012 at 2; MSUE 2012 at 12; Vaughan and Shepherd 2005 at 3; MDNR 2012 at 2).

**Canada.** The National Heritage Status Rank for regal fritillary in Canada is NH (possibly extirpated). “The scattered regal fritillary records from Canada are not thought to represent

permanent populations” (Selby *et al.* 2007 at 10). Canada does not list the regal fritillary as a species at risk (Vaughan and Shepherd 2005 at 1).

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

**Biological vulnerability.** The regal fritillary’s reproductive characteristics render it particularly vulnerable to extirpation. The regal fritillary has only a single flight period (Vaughan and Shepherd 2005 at 2; Selby 2007 at 25). Females lay their eggs singly in a seemingly haphazard manner, not necessarily on the larval food source (NatureServe 2012 at 14). “Based on observations of captive larvae, it appears they prefer to enter rolled over dried grass stems on the ground” (NatureServe 2012 at 14). This behavior, however, can increase the risk that larvae will be destroyed while on the ground and that those which survive will not find a food source.

**Genetic isolation.** Because the regal fritillary generally does not migrate and populations are fragmented, genetic isolation may pose a long-term threat to the species (Selby 2007 at 3).

Genetic isolation resulting from habitat fragmentation can lead to reduced fitness due to genetic drift, which can in turn lead to decreases in heterozygosity and elevated inbreeding coefficients. Until recently, regal fritillaries were one of only three *Speyeria* species for which there were no recognized subspecies. Regal fritillaries are strong flyers, capable of moving between fragmented populations, and the resulting gene flow could account for their apparent lack of genetic variability. However, as regal fritillary populations become more isolated because of increasing habitat fragmentation, their ability to move between populations may be significantly reduced. . . . Fragmented Midwestern populations showed increased differentiation and decreased genetic diversity when compared to unfragmented Great Plains populations (*Id.* at 31, internal citations omitted).

**Environmental threats.** The regal fritillary can be affected by extreme weather such as harsh winters, late frosts, unusually cool and wet growing seasons, flood, drought, and severe storms (Selby 2007 at 3, 36; NatureServe 2012 at 5-6).

**Climate change.** “[T]he rapidity and severity of the [regal fritillary’s] decline strongly suggests that the species is susceptible to subtle environmental change” (MDNR 2012 at 1). Climate change is affecting temperatures and water resources in the Great Plains.

Significant trends in regional climate are apparent over the last few decades. Average temperatures have increased throughout the region, with the largest changes occurring in winter months and over the northern states. Relatively cold days are becoming less frequent and relatively hot days more frequent. Precipitation has also increased over most of the area. . . . Projected changes in long-term climate and more frequent extreme events such as heat waves, droughts, and heavy rainfall will affect many aspects of life in the Great Plains. These include the region’s already threatened water resources, essential agricultural and ranching activities, unique natural and protected areas, and the health and prosperity of its inhabitants. (USGCRP 2009 at 123).

FWS should investigate the possible impacts of climate change on the regal fritillary and its habitat.

**Synergistic effects.** Brook *et al.* (2008 at 453) note that “[i]f habitat destruction or overexploitation of populations is severe, species loss can occur directly and abruptly. Yet the final descent to extinction is often driven by synergistic processes (amplifying feedbacks) that can be disconnected from the original cause of decline.”

The threats to the regal fritillary described in this petition could work synergistically to cause the extinction of the species. “Ongoing habitat destruction and fragmentation are the primary drivers of contemporary extinctions... synergistic interactions with hunting, fire, invasive species and climate change are being revealed with increasing frequency” (Brook *et al.* 2008 at 457). In this context, “synergistic” describes the “simultaneous action of separate processes (extrinsic threats or intrinsic biological traits) that have a greater total effect than the sum of individual effects alone... For instance, habitat loss can cause some extinctions directly by removing all individuals over a short period of time, but it can also be indirectly responsible for lagged extinctions by facilitating invasions, improving hunter access, eliminating prey, altering biophysical conditions and increasing inbreeding depression” (Brook *et al.* 2008 at 453).

The regal fritillary is already at risk due to habitat loss and fragmentation, collecting, biological vulnerabilities, and lack of protective regulation. The risk of extirpation is increased due to the synergistic interaction of these threats. Existing regulatory measures are insufficient to protect the regal fritillary population from further decline. Listing the regal fritillary as “threatened” or “endangered” under the ESA would provide needed regulation to address threats individually and collectively to the species. Listing the regal fritillary under the ESA would also ensure protection of sufficient habitat, restrict take, and require recovery planning for the species (*see* 16 U.S.C. § 1538(a)(1)(B)).

## CONCLUSION AND REQUESTED DESIGNATION

The regal fritillary (*Speyeria idalia*) merits listing as an “endangered” or “threatened” species under the ESA. The species is extirpated from much of its historical range and continues to face overwhelming threats from habitat destruction leading to fragmentation and degradation of the prairie landscape.

WildEarth Guardians hereby petitions the U.S. Secretary of the Interior, acting through the U.S. Fish and Wildlife Service to list the regal fritillary (*Speyeria idalia*) as “threatened” or “endangered” under the ESA. This listing action is warranted because the regal fritillary is threatened by four of the five listing factors delineated in the Act: present and threatened destruction, modification and curtailment of habitat and range; overutilization; the inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting the species’ continued existence.

Since threats to native prairie habitat are a significant cause of imperilment for the regal fritillary, WildEarth Guardians also requests that FWS designate critical habitat for this species in the U.S. concurrent with final ESA listing.



## REFERENCES

- Butterflies and Moths of North America [BMNA]. Undated. Attributes of *Speyeria idalia*. Available at [www.butterfliesandmoths.org/species/Speyeria-idalia](http://www.butterfliesandmoths.org/species/Speyeria-idalia) [viewed October 2012].
- Brook, B. W., N. S. Sodhi, and C. J. A. Bradshaw. 2008. Synergies among extinction drivers under global change. *Trends in Ecology and Evolution* 23: 453- 460. Available at [www.dbs.nus.edu.sg/lab/cons-lab/documents/Brook\\_etal\\_TREE\\_2008.pdf](http://www.dbs.nus.edu.sg/lab/cons-lab/documents/Brook_etal_TREE_2008.pdf) [viewed July 2012].
- Canadian Biodiversity Information Facility [CBIF]. 2002. Regal Fritillary. Available at [www.cbif.gc.ca/spp\\_pages/butterflies/species/RegalFritillary\\_e.php](http://www.cbif.gc.ca/spp_pages/butterflies/species/RegalFritillary_e.php) [last modified May 31, 2010; viewed October 2012].
- Ferster, B., and K. Vulinec. 2009. Population size and conservation of the last eastern remnants of the regal fritillary, *Speyeria idalia* (Drury) [Lepidoptera, Nymphalidae]; implications for temperate grassland restoration. (Online). *Journal of Insect Conservation*. Available at [cars.desu.edu/faculty/kvulinec/Curriculum\\_Vitae\\_files/Ferster%20%26%20Vulinec%20Regal%20Fritillary%202009.pdf](http://cars.desu.edu/faculty/kvulinec/Curriculum_Vitae_files/Ferster%20%26%20Vulinec%20Regal%20Fritillary%202009.pdf) [viewed July 2012].
- Hammond, P. C. and D. V. McCorkle. 1983(84). The decline and extinction of *Speyeria* populations resulting from human environmental disturbances (Nymphalidae: Argynninae). *Journal of Research on the Lepidoptera* 22: 217-224.
- Kelly, L., and D. M. Debinski. 1998. Relationship of host plant density to size and abundance of the Regal Fritillary *Speyeria idalia* Drury (Nymphalidae). *Journal of the Lepidopterists' Society* 52: 262-276. Available at [peabody.research.yale.edu/jls/pdfs/1990s/1998/1998-52%283%29262-Kelly.pdf](http://peabody.research.yale.edu/jls/pdfs/1990s/1998/1998-52%283%29262-Kelly.pdf) [viewed July 2012].
- Kopper, B. J., S. Shengqiang, R. E. Charlton, and S. B. Ramaswamy. 2001. Evidence for reproductive diapause in the fritillary *Speyeria idalia* (Lepidoptera: Nymphalidae). *Annals of the Entomological Society of America* 94(3): 427-432.
- Missouri Department of Conservation [MDC]. 2012. Regal Fritillary. Available at [mdc.mo.gov/discover-nature/field-guide/regal-fritillary](http://mdc.mo.gov/discover-nature/field-guide/regal-fritillary) [viewed October 2012].
- Minnesota Department of Natural Resources [MDNR]. 2012. *Speyeria idalia*. Available at [www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=IIIEPJ6040](http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=IIIEPJ6040) [viewed October 2012].
- Michigan State University Extension [MSUE]. Michigan Natural Features Inventory. Michigan's Special Animals. Available at [mnfi.anr.msu.edu/data/specialanimals.cfm](http://mnfi.anr.msu.edu/data/specialanimals.cfm) [viewed July 2012].
- Michigan Natural Features Inventory [MNFI]. 2007. Rare Species Explorer (Web Application). Available at [mnfi.anr.msu.edu/explorer](http://mnfi.anr.msu.edu/explorer) [viewed October 2012].

Moffat, M., and N. McPhillips. 1993. Management for butterflies in the northern Great Plains: A literature review and guidebook for land managers. USDI Fish and Wildlife Service, Pierre, SD.

NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, VA. Available at [www.natureserve.org/explorer](http://www.natureserve.org/explorer) [viewed October 2012].

Ohio Department of Natural Resources [ODNR]. 2012. Ohio's Endangered Species. Available at [www.dnr.state.oh.us/tabid/6005/default.aspx](http://www.dnr.state.oh.us/tabid/6005/default.aspx) [viewed October 2012].

Oklahoma Natural Heritage Inventory [ONHI]. 2003. Working List of Rare Oklahoma Invertebrates. Available at [www.biosurvey.ou.edu/download/heritage/inverts0503.pdf](http://www.biosurvey.ou.edu/download/heritage/inverts0503.pdf) [viewed November 2012].

Powell, A. F. L. A., W. H. Busby, and K. Kindscher. 2007. Status of the regal fritillary (*Speyeria idalia*) and effects of fire management on its abundance in northeastern Kansas, USA. *Journal of Insect Conservation* 11: 299-308. Available at [kbs.ku.edu/media/uploads/work/Kindscher\\_2007\\_Status\\_of\\_the\\_regal\\_fritillary.pdf](http://kbs.ku.edu/media/uploads/work/Kindscher_2007_Status_of_the_regal_fritillary.pdf) [viewed July 2012].

Selby, G. 2007. Regal fritillary (*Speyeria idalia* Drury): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available at [www.fs.fed.us/r2/projects/scp/assessments/regalfritillary.pdf](http://www.fs.fed.us/r2/projects/scp/assessments/regalfritillary.pdf) [viewed July 2012].

Tilden, J. W., and A. C. Smith. 1986. A field guide to western butterflies. Houghton-Mifflin Co., Boston, MA.

U.S. Geological Survey [USGS]. 1995. Northern Prairie Wildlife Research Center. North Dakota's Federally Listed Endangered, Threatened, and Candidate Species – 1995: Regal Fritillary Butterfly (*Speyeria idalia*). Available at [www.npwrc.usgs.gov/resource/wildlife/nddanger/species/speyidal.htm](http://www.npwrc.usgs.gov/resource/wildlife/nddanger/species/speyidal.htm) [last modified August 03, 2006; viewed July 2012].

U.S. Global Change Research Program [USGCRP]. 2009. Global Climate Change Impacts in the U.S.: Great Plains. Available at [www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/regional-climate-change-impacts/great-plains](http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/regional-climate-change-impacts/great-plains) [viewed October 2012].

Vaughan, D. M., and M. D. Shepherd. 2005. Species Profile: *Speyeria idalia*. In Shepherd, M.D., D.M. Vaughan, and S.H. Black (eds). Red List of Pollinator Insects of North America. CD-ROM Version 1 (May 2005). The Xerces Society for Invertebrate Conservation. Portland, OR. Available at [www.xerces.org/regal-fritillary/](http://www.xerces.org/regal-fritillary/) [viewed June 2012].

Wisconsin Department of Natural Resources [WDNR]. 2012. Regal Fritillary. Available at [dnr.wi.gov/topic/EndangeredResources/Animals.asp?mode=detail&SpecCode=IILEPJ6040](http://dnr.wi.gov/topic/EndangeredResources/Animals.asp?mode=detail&SpecCode=IILEPJ6040) [last modified October 15, 2012; viewed October 2012].