PETITION TO LIST THE
Scott riffle beetle (*Optioservus phaeus gilbert*)
UNDER THE ENDANGERED SPECIES ACT

Photograph by Roy Beckemeyer (used with permission).

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

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WILDEARTH GUARDIANS
A FORCE FOR NATURE

INTRODUCTION

WildEarth Guardians ("Guardians") respectfully requests that the Secretary of the Interior, acting through the U.S. Fish and Wildlife Service (FWS) list the Scott riffle beetle (*Optioservus phaeus gilbert*) under the U.S. Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544). WildEarth Guardians also requests that FWS designate critical habitat for this species.

The Scott riffle beetle is a distinct species of insect with only one known population in the world. This population inhabits less than one acre in a short spring run emanating from Big Springs, a natural spring fed by the Ogallala aquifer, located in Lake Scott State Park in Scott County, western Kansas. The species' extreme rarity and single population make the Scott riffle beetle particularly vulnerable to threats to its continued existence. The most serious threat facing the beetle is the loss of its only habitat, most likely to be occasioned by the well-documented dewatering of the Ogallala Aquifer in western Kansas. The aquifer is widely acknowledged to be in overdraft as a result of groundwater pumping for agricultural purposes. Additional threats include degradation of water quality; predation by insectivorous salmonids and common carp that have been introduced into the pool at the base of the beetles' spring run habitat; inadequate regulations to protect the beetle and its habitat; vulnerability to stochastic events as a result of the species' extreme rarity; and the effects of climate change in western Kansas, including a tendency toward more extreme droughts.

PROCEDURAL BACKGROUND

In July 2007, Guardians filed a petition to protect the Scott riffle beetle and 205 other species categorized as imperiled (G2) or critically imperiled (G1) by NatureServe, a source FWS considers "a reputable source of scientific information." 74 Fed. Reg. 6122, 6123 (Feb. 5, 2009). When FWS had not issued a 90-day finding by June 2008, Guardians filed a second, emergency petition, for 32 species in the greatest danger of imminent extinction—including the Scott riffle beetle.[1] In July 2008, FWS denied the emergency petition, and subsequently in February 2009 denied Guardians' original July 2007 petition for 165 of the 206 petitioned species, including the riffle beetle. *Id*. at 6127. Regarding the Scott riffle beetle and two other (plant) species, the 90-day finding stated that Guardians presented

> one or more threats and generally linked them to the species or its habitat. However, we have no documentation to support significant impacts from the threats.

Id. at 6124.

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[1] These 32 species were drawn from WildEarth Guardians' *A Petition to List 206 Critically Imperiled or Imperiled Species in the Mountain-Prairie Region of the United States as Threatened or Endangered Under the Endangered Species Act*, (July 24, 2007), *available at* http://www.wildearthguardians.org/site/DocServer/petition_protection-206-species-r6_7-24- 07.pdf?docID=1522&AddInterest=1103 and *A Petition to List All Critically Imperiled or Imperiled Species in the Southwest United States as Threatened or Endangered Under the Endangered Species Act* (June 18, 2007), *available at* http://www.wildearthguardians.org/site/DocServer/petition_protection-475-species_6-21- 07.pdf?docID=1442&AddInterest=1103.

On January 15, 2010, Guardians challenged the 90-day finding by filing a Petition for Review of Agency Action in federal district court, alleging that FWS' finding that "substantial information was not presented to indicate that the [Scott riffle beetle] is threatened by dewatering [of the Ogallala aquifer]" was arbitrary and capricious and contrary to the ESA. *WildEarth Guardians v. Salazar*, No. 10–cv–00091–WYD, 2011 WL 4102283, at *2, *4. Guardians' legal challenge to FWS's 90-day finding was unsuccessful.

Accordingly, the present petition is submitted to provide the "substantial information" that FWS and the U.S. District Court found lacking in Guardians' 2007 Petition. This Petition provides additional and new information, developed since 2007, including detailed information on dewatering of Ogallala aquifer in western Kansas; threats to the water quality of Big Springs; specific information regarding the predation threat from trout and koi; and additional discussion of how the species' rarity—combined with the threat of stochastic events—imperils the species' survival.

ENDANGERED SPECIES ACT AND IMPLEMENTING REGULATIONS

The ESA, 16 U.S.C. §§ 1531 *et seq.*, was enacted in 1973 "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such endangered species and threatened species." 16 U.S.C. § 1531(b). The protections of the ESA only apply to species that have been listed as endangered or threatened according to the provisions of the statute. The ESA delegates authority to determine whether a species should be listed as endangered or threatened to the Secretary of Interior, who has in turn delegated authority to the Director of the U.S. Fish & Wildlife Service. As defined in the ESA, an "endangered" species is one that is "in danger of extinction throughout all or a significant portion of its range." 16 U.S.C. § 1532(6); see also 16 U.S.C. § 1533(a)(1). A "threatened species" is one that "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). The Service must evaluate whether a species is threatened or endangered as a result of any of the five listing factors set forth in 16 U.S.C. § 1533(a)(1):

> 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 taxon need only meet one of the listing criteria outlined in the ESA to qualify for federal listing. 50 C.F.R. § 424.11.

FWS is required to make these listing determinations "solely on the basis of the best scientific and commercial data available to [it] after conducting a review of the status of the species and after taking into account" existing efforts to protect the species. 16 U.S.C. § 1533(b)(1)(A); *see also* 50 C.F.R. §§ 424.11(b), (f). In making a listing determination, the Secretary must give consideration to species which have been "identified as in danger of extinction, or likely to

become so within the foreseeable future, by any State agency or by any agency of a foreign nation that is responsible for the conservation of fish or wildlife or plants." 16 U.S.C. § 1533(b)(1)(B)(ii). *See also* 50 C.F.R. § 424.11(e) (stating that the fact that a species has been identified by any State agency as being in danger of extinction may constitute evidence that the species is endangered or threatened). Listing may be done at the initiative of the Secretary or in response to a petition. 16 U.S.C. § 1533(b)(3)(A).

After receiving a petition to list a species, the Secretary is required to determine "whether the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted." 16 U.S.C. § 1533(b)(3)(A). Such a finding is termed a "90-day finding." A "positive" 90-day finding leads to a status review and a determination whether the species will be listed, to be completed within twelve months. 16 U.S.C. §1533(b)(3)(B). A "negative" initial finding ends the listing process, and the ESA authorizes judicial review of such a finding. 16 U.S.C. § 1533(b)(3)(C)(ii).

The applicable regulations define "substantial information," for purposes of consideration of petitions, 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). The regulations further specify four factors to guide the Service's consideration on whether a particular listing petition provides "substantial" information:

i. Clearly indicates the administrative measure recommended and gives the scientific and any common name of the species involved;
ii. Contains detailed narrative justification for the recommended measure; describing, based on available information, past and present numbers and distribution of the species involved and any threats faced by the species;
iii. Provides information regarding the status of the species over all or significant portion of its range; and
iv. Is accompanied by appropriate supporting documentation in the form of bibliographic references, reprints of pertinent publications, copies of reports or letters from authorities, and maps

50 C.F.R. § 424.14(b)(2)(i)-(iv).

Both the language of the regulation itself (by setting the "reasonable person" standard for substantial information) and the relevant case law underscore the point that the ESA does not require "conclusive evidence of a high probability of species extinction" in order to support a positive 90-day finding. *Ctr. for Biological Diversity v. Morgenweck*, 351 F.Supp.2d 1137, 1140. *See also Moden v. U.S. Fish & Wildlife Serv.*, 281 F.Supp.2d 1193, 1203 (D.Or. 2003) (holding that the substantial information standard is defined in "non-stringent terms"). Rather, the courts have held that the ESA contemplates a "lesser standard by which a petitioner must simply show that the substantial information in the Petition demonstrates that listing of the species *may* be warranted" (emphasis added). *Morgenweck*, 351 F.Supp.2d at 1141 (quoting 16 U.S.C. § 1533(b)(3)(A)). *See also Ctr. for Biological Diversity v. Kempthorne*, No. C 06-04186 WHA, 2007 WL 163244, at *3 (holding that in issuing negative 90-day findings for two species of

salamander, FWS "once again" erroneously applied "a more stringent standard" than that of the reasonable person).

CLASSIFICATION AND NOMENCLATURE

Common Name. *Optioservus phaeus gilbert* is known by the common name "Scott riffle beetle." This petition refers to the species as the "Scott riffle beetle," "riffle beetle," or "beetle."

Taxonomy. The petitioned species is *Optioservus phaeus gilbert.* White 1978.[2] The species' taxonomic classification is shown in Table 1.

Table 1. Taxonomy of *Optioservus phaeus gilbert*

Kingdom	Animalia
Phylum	Mandibulata/Anthropoda
Class	Insecta
Order	Coleoptera
Suborder	Polyphaga
Family	Elmidae
Genus	*Optioservus*
Species	*phaeus*
Subspecies	*gilbert*

SPECIES DESCRIPTION

The Scott riffle beetle is a small, black, aquatic beetle that measures approximately 2.62-2.90 mm in length (White 70). The beetle is adapted for crawling among rock substrates and roots while feeding on diatoms and periphyton along the swift, cobble-laden stream where it lives. The Scott riffle beetle's long legs and well-developed claws enable it to maintain its grip (Ferrington, "Population study" 3). In addition to an ebony shell, the beetle has light coloring at the base of the legs, which is caused by air bubbles on the legs. Scott riffle beetles live under water and breathe through an air bubble trapped beneath the abdomen (Beckemeyer). Like other members of the Elmidae family, due to their unique respiratory adaptation, Scott riffle beetles require oxygen-rich habitat (Ferrington, "Population study" 4).

Population Size and Trend. There is only one known population of Scott riffle beetle, located in a spring run emanating from the Ogallala-aquifer-fed Big Springs in Lake Scott State Park in western Kansas (KDWPT "Optioservus riffle beetle"). Exact data regarding the number of individuals in this single population is difficult to gather, as the beetles have not been adequately preserved or extensively studied. NatureServe reports that there are approximately 1,000-2,500 individual Scott riffle beetles in existence, and that the total population size was estimated at 2,000-4,000 with substantial seasonal fluctuation in numbers (NatureServe). Several searches have been conducted to find other populations of the Scott riffle beetle throughout the High

[2] *See also* U.S. Fish and Wildlife Species Profile, Scott Optioservus riffle beetle, *available at* http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=I0CG.

Plains, but all have been unsuccessful (Ferrington, "Population study" 22; "Status report on Optioservus phaeus," *cited in* Layher 2002).

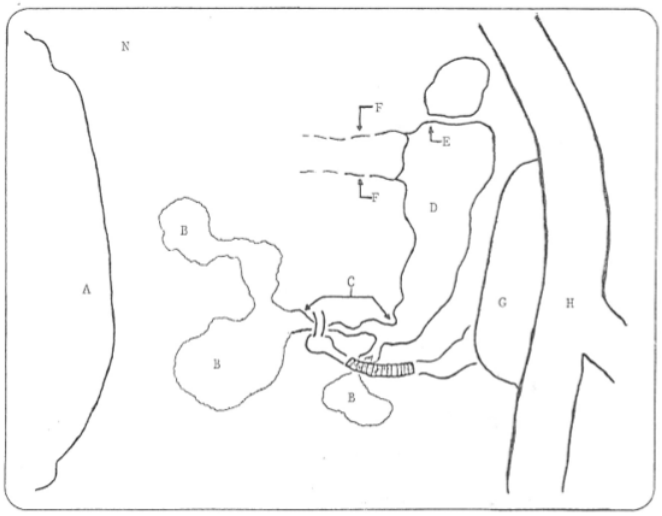
No further population studies of the Scott riffle beetle have been conducted since Ferrington's 1983-1984 study, so the state of the population at this time, 28 years later, is unknown. The highest concentration of adult beetles in 1984 was 1.16 adults per rock in the upper portion of the spring run. Preliminary searches in July 2013 for the beetle in this precise area turned up no evidence of adult beetles, suggesting a possible population decline since 1984.

Life Cycle. Scott riffle beetle larvae possess tracheal gills at the tip of their abdomens, and may remain at this stage for one or two years (Ferrington, "Population study" 3-4). After pupating, the adult beetle is winged and can fly short distances, but soon returns to water and loses the ability to fly ("Population study" 4). Both the adult and larval stages of this small black beetle are aquatic (KDWPT "Optioservus riffle beetle").

Range and Habitat. The Scott riffle beetles' current range is limited to the short spring run emanating from Big Springs in Lake Scott State Park in western Kansas (Figure 1, illustrating Lake Scott State Park, with a red dot encompassing all of the Big Springs Nature Trail, Picnic Area, and the Scott riffle beetles' spring run habitat). Since the species was only discovered in 1978 (White), there is no information regarding its historic distribution, although anthropogenic alternations to the habitat indicate that the beetles' habitat has been curtailed. The stream flowing out of Big Springs is now artificially dammed, which has created what is now the pool connected to the spring run (Figure 2). This supports the assumption that the stream's historic course flowed downhill to join what is now the reservoir, indicating that potential stream habitat was much more abundant in the past than it is now. Sampling conducted in the spring itself and the main pool connected to the run supports this conclusion. Because beetle larvae numbered fewer than 1 in 30 plants in the spring itself, Ferrington did not conduct additional sampling in the spring, focusing his research instead on the spring run as the primary habitat (Figure 2). However, he did find some specimens in Big Springs itself, as well as in the main pool below the spring run and near the water retaining dam at the end of the main pool, indicating that the beetles' habitat was once larger than it is today (Ferrington "Population study" 11).

The requisite Scott riffle beetle habitat is the surface of stones on the substrate of well-oxygenated and constantly flowing water. Other debris and aquatic vegetation is used to a limited extent, particularly by larvae (KDWPT "T&E Guide" 37).

Figure 1. Map of Lake Scott State Park. Recovery Plan 2002.



A. Bluffs to west of Big Springs Area
B. Big Spring
C. Adjoining spring run
D. Pool at base of spring run
E. Water retaining dam
F. Small spring seeps
G. Parking lot
H. Road around lake

Figure 2. Representation of the Big Springs Area. Zone C represents the beetles' primary habitat. Ferrington 1985.

IDENTIFIED THREATS TO THE PETITIONED SPECIES: CRITERIA FOR LISTING

The Scott riffle beetle meets four of the five criteria for listing identified in ESA § 4 (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.**

<u>The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range (Factor A)</u>

Dewatering of the Ogallala Aquifer in Western Kansas. The primary threat facing the Scott riffle beetle is the destruction of its only known habitat. The beetles' Big Springs habitat is maintained solely by the Ogallala aquifer, which underlies the High Plains of the United States, including all of western Kansas.

The aquifer was created during the Pliocene epoch, approximately 3.8 million years ago, by fluvial deposition from streams that flowed eastward from the Rocky Mountains, creating an enormous alluvial fan (Buchanan "Kansas Springs"). The Ogallala is an unconfined underground

reservoir maintained by stores of water that have been trapped in layers of sediment dating back to the last ice age (EPA "Climate Impacts in the Great Plains"). The aquifer is recharged mainly through precipitation during the spring and summer months (Fryar et al. 534). Due to the High Plains' semi-arid climate, recharge is minimal, averaging less than one inch annually, and is far outweighed by depletion.

The aquifer as a whole is widely acknowledged to be in a state of overdraft, but the crisis is particularly acute in western Kansas. According to the Kansas Geological Survey, the Ogallala aquifer is in decline in most locations, with annual withdrawals "far exceeding" recharge (KGS). David Brauer, Research Agronomist for the U.S. Department of Agriculture's Agricultural Research Service has said, "The Ogallala supply is going to run out and the Plains will become uneconomical to farm. That is beyond reasonable argument. Our goal now is to engineer a soft landing. That's all we can do." (Laurence). Because the Ogallala aquifer is not recharged through rivers or downward flows off mountains, it relies almost exclusively on precipitation falling on the aquifer. Given the low rainfall of semiarid western Kansas, the rate of recharge is very low. Scott County, home of the Scott riffle beetle, receives an annual average of 20.15 inches of precipitation (KSU R&E; Figure 3).

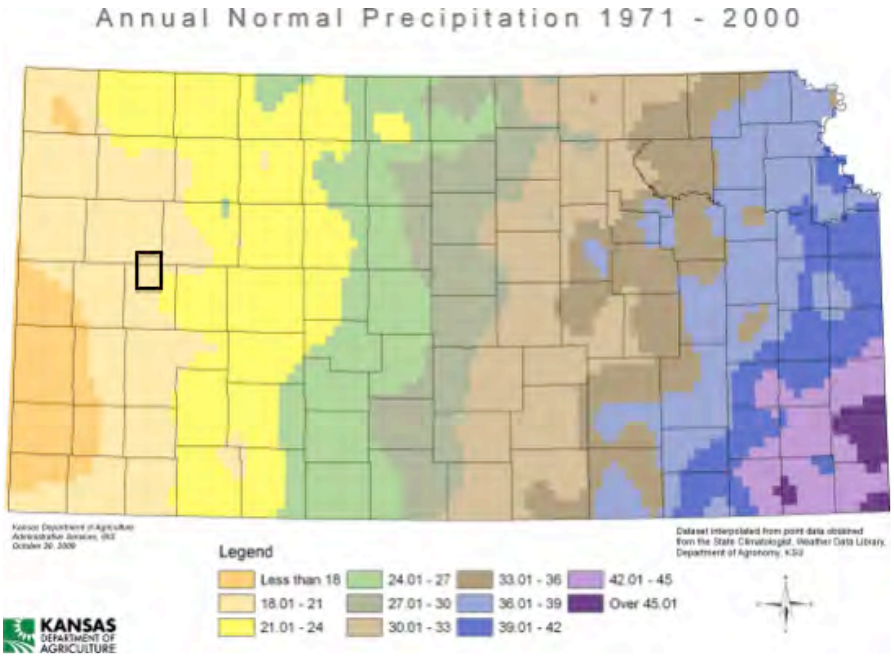


Figure 3. Annual Normal Precipitation 1971-2000.
Location of Lake Scott State Park marked with black box.
Kansas Department of Agriculture 2009.

The average recharge rate in Scott County is approximately 0.53 inches per year (compared to, for example, an average annual recharge rate of 3 inches per year in Marion County in mid-eastern Kansas). In addition to low recharge rates as a result of lack of precipitation, western and central Kansas are home to most of the state's agriculture. In recent years, demand and speculation for biofuels has led farmers in Kansas to increase the acreage of irrigate cornfields by nearly one fifth. This trend toward growing more corn, a highly water-intensive crop, has

exacerbated agricultural demands on the aquifer (Wines). Due to low recharge rates and high withdrawal rates, western Kansas has experienced a dramatic decline in the saturated thickness of the Ogallala aquifer from predevelopment through 2013. In parts of western Kansas, the aquifer has decreased by more than 150 feet. In the area closest to Lake Scott State Park, the aquifer's saturated thickness has declined by up to 50 feet from an estimated 150 to 100 feet prior to development to less than 50 feet today (Figure 4).

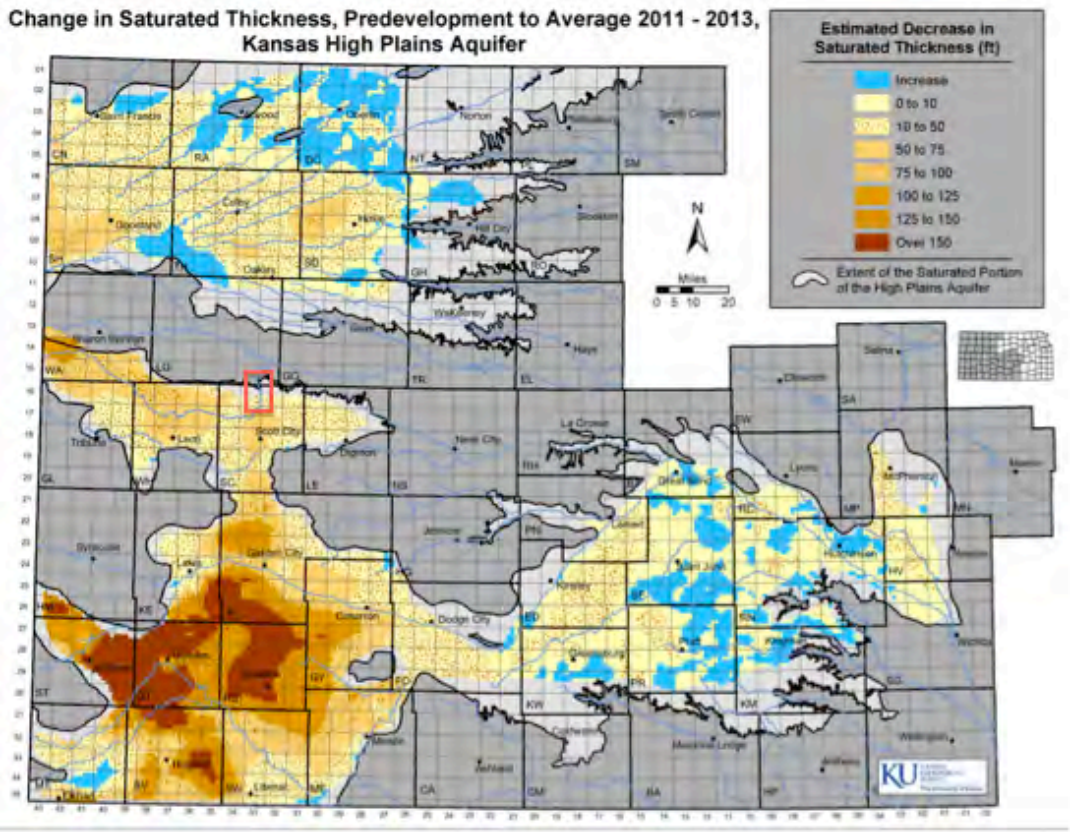


Figure 4. Change in Saturated Thickness, Predevelopment to Average 2011-2013, Kansas High Plains Aquifer. Location of Lake Scott State Park marked with red box.
Kansas Geological Survey 2013.

Since predevelopment saturated thickness levels vary, it is even more illustrative to consider the percent change in saturated thickness from predevelopment through 2012. Most parts of central and southwestern Kansas have experienced declines of between 30 and over 60% in saturated thickness. The area closest to Lake Scott State Park has experienced declines at the high end of that scale (Figure 5).

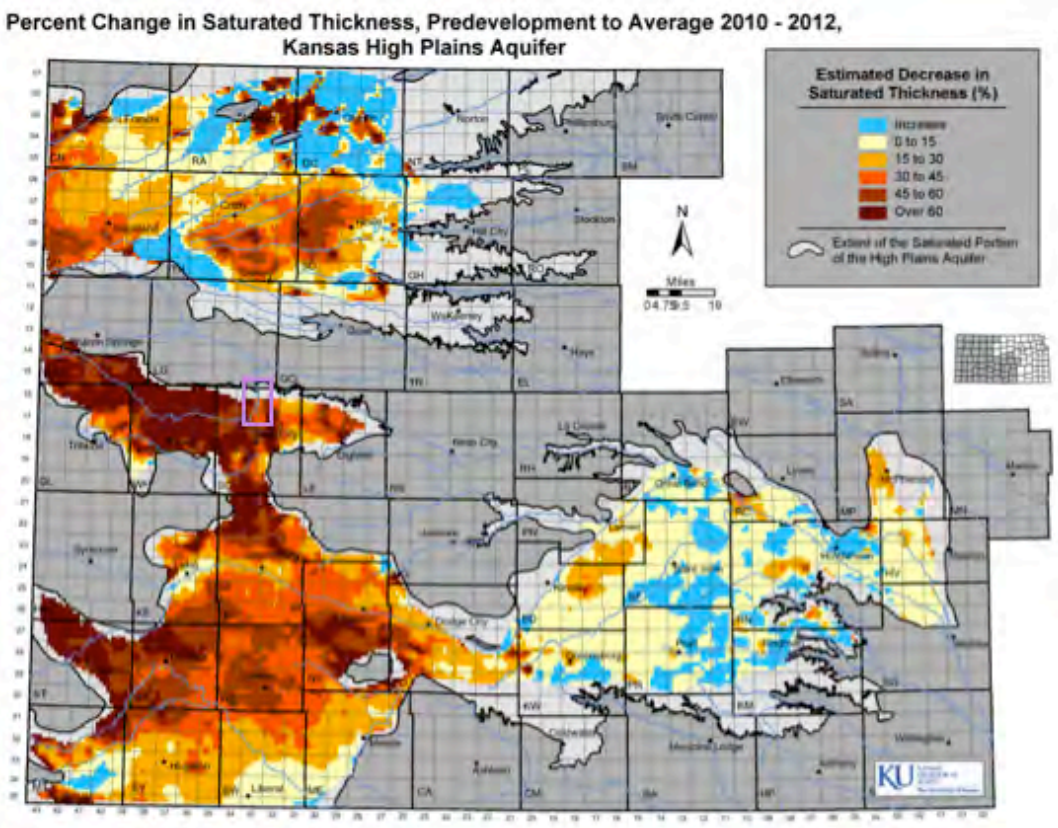


Figure 5. Percent Change in Saturated Thickness, Predevelopment to Average 2010-2012, Kansas High Plains Aquifer. Location of Lake Scott State Park marked with purple box. Kansas Geological Survey 2013.

In response to the water crisis precipitated by the dewatering of the Ogallala aquifer, new technologies have allowed farmers to adapt to declining yields associated with the declining aquifer water table, but despite these changes, the irrigated land area in Kansas will eventually decrease as a result of aquifer dewatering (Rogers and Lamm 13). By the time the aquifer is depleted to the point that agriculture will no longer be viable, the habitat of the Scott riffle beetle and other species that depend on the aquifer will most likely be destroyed. According to projections by the Kansas Geological Survey of the number of years until the saturated thickness reaches minimum thresholds to support large volume water demands, much of western Kansas—including the part of the aquifer underlying Lake Scott State Park and feeding Big Springs—is *already* below that minimum threshold (Figure 6). Despite that, there are no regulations in place to reduce water withdrawal.

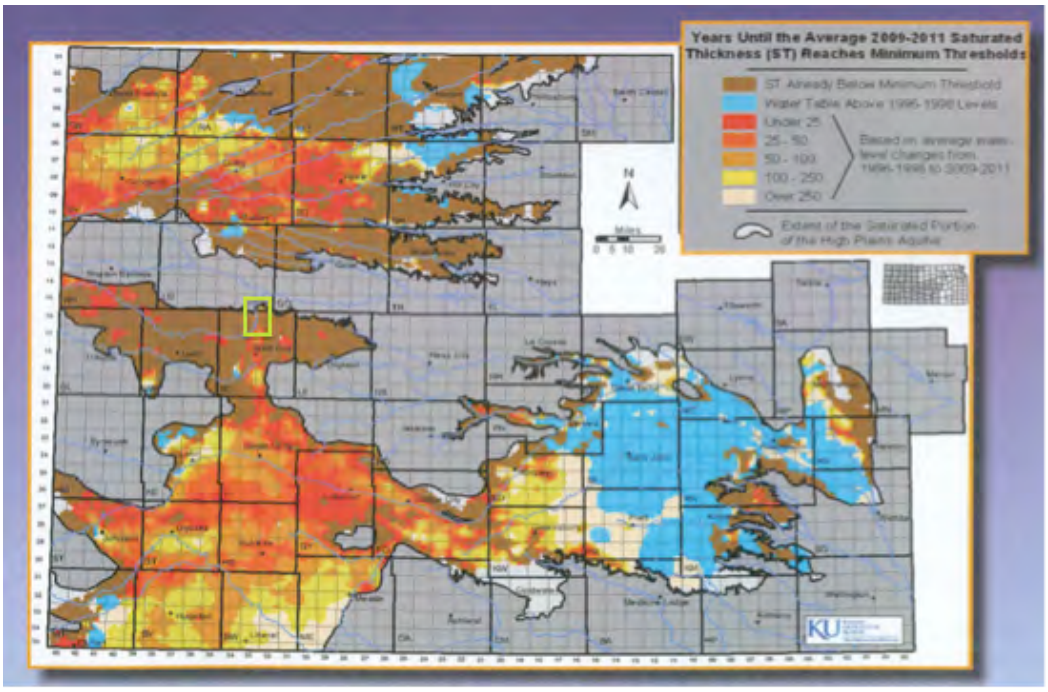


Figure 6. Years Until the Average 2009-2011 Saturated Thickness (ST) Reaches Minimum Thresholds. Location of Lake Scott State Park marked with green box. Kansas Geological Survey 2011.

The Kansas Geological Survey has estimated that, in order to meet sustainable yield, authorized groundwater use in most of Groundwater Management District 1 (GMD1), which includes the area closest to Lake Scott State Park, would need to be reduced by more than 75% (Figure 7). The likelihood of agricultural groundwater users voluntarily implementing such a drastic reduction in groundwater use, particularly in the face of increasingly extreme drought conditions and continued demand for water-intensive crops such as corn, is extremely low.

Declining groundwater leads inexorably to diminished flows in springs fed exclusively by the aquifer, such as Big Springs. Many springs in western Kansas have already stopped flowing as a result of over-pumping of the Ogallala aquifer, and should overuse continue unabated, Big Springs will prove no exception (Buchanan, "Kansas Springs"). In 1974, the yield of Big Springs was measured at 400 gallons per minute. By 1998, that yield was reduced to 350 gallons per minute (Layher 16). In his 1985 study, Ferrington noted that a relationship exists between the abundance of larvae and the velocity of the water: "Averaged across all sample dates, larvae exhibited a steady increase in abundance versus increasing current velocity." He also noted that while proportionately smaller densities of larvae occurred on rocks in slower velocity conditions, the larvae clearly preferred those in areas of faster current velocity (Ferrington "Population study"). Given the documented preference for faster-moving water, a decrease in yield is likely to be detrimental to the population. Despite Ferrington's recommendation for continued yield monitoring ("Population study"), there is no evidence that such monitoring has been implemented; therefore, the current yield of the spring is unknown. However, the decrease in saturated thickness in the area (discussed above) may indicate that yields in Big Springs have fallen below 350 gallons per minute.

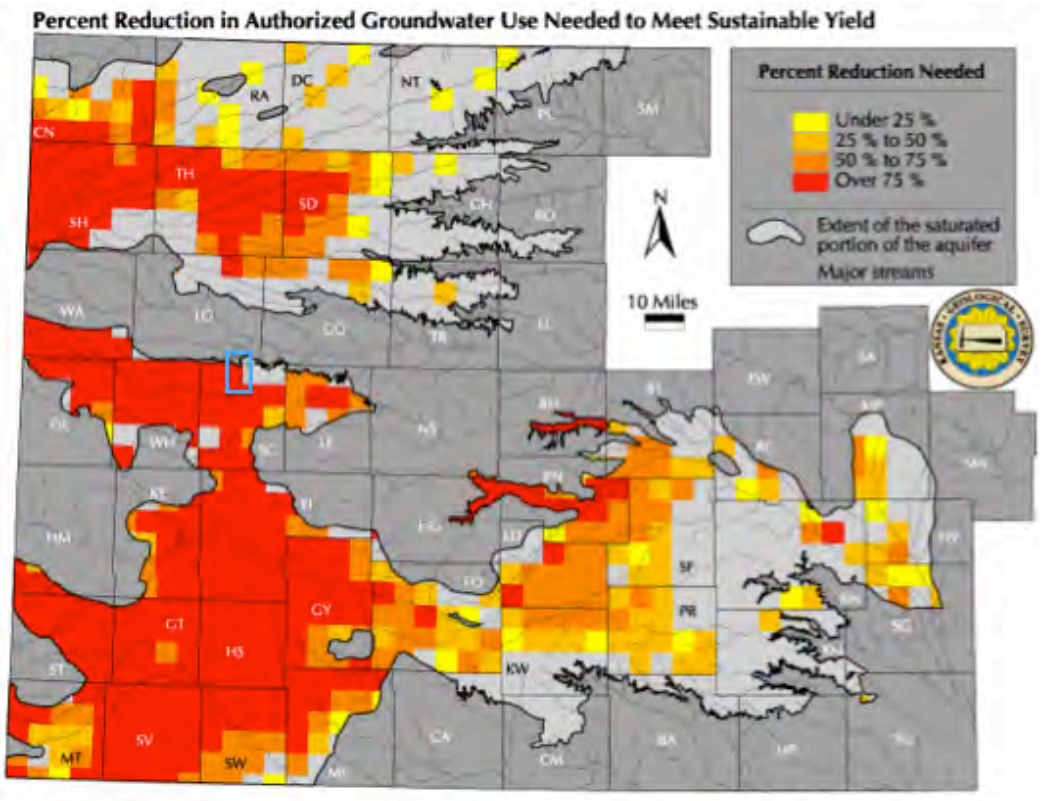


Figure 7. Percent Reduction in Authorized Groundwater Use Needed to Meet Sustainable Yield. Location of Lake Scott State Park marked with blue box. Kansas Geological Survey.

Decreased Water Quality in Big Springs. Both poison ivy and poison oak grow in the area surrounding Big Springs. The Big Springs Nature Trail, a short hiking trail, begins next to the spring run and continues around the adjacent pool. During the summer of 2013, the sides of the trail had clearly been sprayed with herbicide, presumably to eliminate poison ivy and oak. As a result, all vegetation along the side of the trail is dead, while the vegetation just behind the clear herbicide spray line is thriving. The trail is elevated above the spring run, creating a high risk of water contamination by runoff containing herbicides. Figure 8 illustrates the clear use of herbicides along the side of the trail, as evidenced by the fact that the plants closest to the trail are dead, while those immediately beyond that are thriving.

In addition to the localized water quality threat posed by the use of herbicides, the spring is also susceptible to negative changes in groundwater quality in the surrounding area. In Kansas, highly saline water is fairly common, reflected in locations such as Salt Springs, and ground-water dissolution of gypsum can lead to water that is high in sulfates. At least one spring associated with the Arkansas River in western Kansas is now high in sulfates from reuse of the water, mostly for irrigation. Another spring in eastern Kansas shows elevated levels of contamination from hazardous-waste sites more than a mile away. Several springs in the rest of the state show elevated levels of nitrates, most likely related to agricultural activity (Buchanan, “Kansas Springs”). The area around Lake Scott State Park is dominated by large-scale agriculture and livestock operations, both of which contribute to groundwater pollution (Figure 9).

Figure 8. Big Springs Nature Trail with evidence of herbicide use, July 2013. Photographs taken by Charmayne Palomba. Used with permission.

Figure 9. Satellite image of agricultural activity surrounding Lake Scott State Park. Google Maps 2013.

Other Potential Threats to Habitat. As noted above, it is likely that anthropogenic alternations to the habitat, such as damming the stream flowing out of Brig Springs, have already led to a curtailment of a habitat that was once likely much more abundant than it is today. In addition, a new wooden footbridge was recently constructed to replace the original stone footbridge (Figure 10), which had been closed by the Kansas Department of Transportation due to potential safety issues. The purpose of building the new bridge was to increase accessibility to Big Springs, a landmark within the park (Haxton). Before the new footbridge was installed, it was very difficult

to reach the beetle's habitat due to thick vegetation. Now, the footbridge leads directly to and across the habitat (Figure 11), and it is very easy to climb off the footbridge directly onto the rocks in the spring run that constitute the beetle's habitat. Such increased accessibility constitutes a potential threat to the Scott riffle beetle, whose small habitat will almost certainly be disturbed by visitors climbing down off the bridge into the beetle's spring run habitat. In addition, there are no signs prohibiting visitors from climbing down off the bridge into the run.

Figure 10. Scott riffle beetle spring run habitat with original stone footbridge, July 2010. Photograph taken by Jay Tutchton. Used with permission.

Figure 11. Scott riffle beetle spring run habitat with new wood footbridge, July 2013. Photograph taken by Stuart Wilcox. Used with permission.

Disease or Predation (Factor C)

Non-native and Insectivorous Species. Kansas Department of Wildlife, Parks and Tourism's (KDWPT) 2002 Recovery Plan for the Scott riffle beetled noted that "the introduction of an insectivorous species of fish to the spring or the run and pool below it could greatly reduce or eliminate the population of Scott riffle beetles" (Layher 15). At the time, such introduction was only hypothetical; however, since 2002 the Big Springs pool, which is fed by the spring run where the Scott riffle beetles live, has been stocked with rainbow trout (*Oncorhynchus mykiss*), a salmonid (Personal correspondence with Lake Scott State Park Manager Greg Mills 2013). Like other salmonids, rainbow trout are insectivorous, feeding on both terrestrial and aquatic insects. Therefore, their presence in Big Springs presents a threat to the beetles. The current in the spring run is not very strong, and would not present an obstacle to rainbow trout, which are capable of swimming upstream.

In addition to the presence of rainbow trout, non-native common carp (*Cyprinus carpio*), including ornamental domesticated koi, have been introduced to the Big Spring pool (Figure 12). All varieties of common carp are insectivorous, and as water levels change, the carp are able to consume the Scott riffle beetles, further depleting their population. In addition to directly preying on the beetles, koi also present a threat to the water quality of Big Springs. When introduced into the wild, koi are widely regarded as pest fish. By destroying vegetation and increasing water turbidity during feeding, they cause a deterioration of habitat for species requiring clean water (Nico et al.).

Figure 12. Common carp in Big Springs pool, July 2010.
Photographs taken by Jay Tutchton. Used with permission.

The Inadequacy of Existing Regulatory Mechanisms (Factor D)

State Protection. Kansas designated the Scott riffle beetle as a state-threatened species in 1980, but upgraded the beetle to endangered status in 1993 (Kan. Admin. Regs. §115-15-1(a)(1)) due to the recognition that further surveys did not find additional populations (Personal correspondence with KDWPT Threatened & Endangered Coordinator Ed Miller 2013). Currently, Scott riffle beetles are protected by the Kansas Nongame and Endangered Species Conservation Act (NESCA) and administrative regulations applicable thereto.

As defined by Kansas Administrative Regulations, critical habitats include those areas documented as currently supporting self-sustaining population(s) of any threatened or endangered species of wildlife as well as those areas determined by KDWPT to be essential for the conservation of any threatened or endangered species of wildlife. Kan. Admin. Regs. § 115-15-3(a)(2)(A-B). Currently, "all springs and spring-fed streams that lie within Section 13, T16S, R33W, Scott County" are designated critical habitat for Scott riffle beetles. The habitat lies entirely within the boundaries of Lake Scott State Park (KDWPT "Optioservus riffle beetle).

While the Scott riffle beetle is listed and provided with critical habitat protection under the state NESCA, the protections afforded the beetle by that statute are inadequate to ensure the species' continued existence. Unlike the federal ESA, the state NESCA includes no explicit provision against taking a threatened or endangered species. Rather, the statute delegates authority to the secretary to "adopt such rules and regulations… which establish limitations relating to taking… as are deemed necessary by the secretary to conserve such nongame species." Kan. Stat. Ann. § 32-959 (West 1975). The corresponding regulation requires "any person sponsoring or responsible for a publicly funded action, a state or federally assisted action, or an action requiring a permit from another state or federal government agency" to apply for a permit (defining "action" as "an activity resulting in physical alteration of a listed species' habitat, physical disturbance of listed species, or destruction of individuals of a listed species"). However, the following actions are exempt from permitting requirements: 1) "normal farming and ranching practices"; 2) "development of residential and commercial property on privately owned property financed with private, nonpublic funds"; and 3) "activities for which a person has obtained a scientific, educational, or exhibition permit." K.S. A.D.C. 115-15-3(b)(1-3). Therefore, although the Scott riffle beetles' habitat is located within a State Park, the park service is unable to address some of the most serious threats to the species—namely aquifer depletion and contamination as a result of intensive agricultural activity, vulnerability to stochastic events, and climate change.

Under Kansas state law, the Scott riffle beetle's immediate habitat is purportedly protected from direct development projects thereon. However, the construction of the footbridge providing easier access to the beetles' habitat, the use of herbicide in the direct vicinity of the stream run, and the introduction of predatory koi and trout indicate that such protections are insufficient. In addition, state law does not protect the beetle against the most pressing threat, the destruction of habitat by dewatering of the Ogallala aquifer. The Kansas State recovery plan recognizes that it cannot manage threats such as aquifer depletion (Layher 30). As a result, state regulatory mechanisms are inadequate in addressing the multitude of environmental dangers facing the

Scott riffle beetle. Without federal protection, the Scott riffle beetle and its habitat remain in critical danger.

Federal Protection. There is no current federal protection for the Scott riffle beetle. The species was previously placed on the Endangered Species Act candidate list as a category 2 species in 1989, 1991, and 1994, but was removed in 1996. 54 Fed. Reg. 554 (Jan. 6, 1989); 56 Fed. Reg. 58804 (November 21, 1991); 59 Fed. Reg., 58982 (Nov. 15, 1994).[3] The beetle was removed as a candidate in 1996 when FWS eliminated the entire category 2 candidate species list. Species formerly listed as category 2 species were those "for which information now in the possession of the FWS indicates that proposing to list as endangered or threatened is possibly appropriate, but for which persuasive evidence on biological vulnerability and threat are not currently available to support proposed rules" (59 Fed. Reg. 58,982, 58,983 (1994)). In other words, category 2 species—including the Scott riffle beetle—were those for which FWS had substantial information to determine that listing *may* be warranted, which suggests that a positive 90-day finding is warranted.

The five criteria for listing under Kansas' NESCA are the same as those of the federal ESA (*infra* Part IV). As is the case for the federal statute, listing determinations are to be made "on the basis of the best scientific, commercial and other data available." K.S.A. 32-960(b)(1). The state designation of the Scott riffle beetle as "endangered" based on the same criteria set forth in the federal statute underscore the importance of giving consideration to species that have been "identified as in danger of extinction, or likely to become so within the foreseeable future, by any State agency…" 16 U.S.C. § 1533(b)(1)(B)(ii).

Other. The Scott riffle beetle is recognized as a Species of Greatest Conservation Need by the Kansas Department of Wildlife, Parks & Tourism (2005), and Globally Imperiled (G1) by NatureServe (2009), but these designations do not provide any protection for the species or its habitat. The system used by KDWPT to rank species of greatest concern gives the Scott riffle beetle 16 out of a maximum possible 18 points, based on six criteria. Of 286 species ranked, only one other species, the Neosho mucket[4] (*Lampsilis rafinesqueana*), received such a high rating. In other words, the state of Kansas considers the Scott riffle beetle to be one of the two species of greatest conservation concern in the state (Wasson 2005).

In 1972, Kansas Groundwater Management District Act established five groundwater management districts (GMDs), local government units created "for the proper management of the groundwater resources of the state; for the conservation of groundwater resources; for the prevention of economic deterioration; for associated endeavors within the state of Kansas through the stabilization of agriculture; and to secure for Kansas the benefit of its fertile soils and favorable location with respect to national and world markets." Kan. Stat. Ann. § 82a-1020. GMD 1, which underlies Lake Scott County Park, has recently adopted a "safe yield" program, which limits future appropriations in areas with minimal saturated thickness or significant

[3] *See also* U.S. Fish and Wildlife Service, Species Profile: Scott Optioservus riffle beetle, available at http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=I0CG.

[4] In October 2012, FWS published a proposed rule to list the Neosho mucket as a "threatened" species in Kansas under the ESA. 77 Fed. Reg. 200, 63440. The comment period for a revised version of the proposed rule closed on June 9, 2013.

depletion since 1950. GMD 1 Management Plan. However, while the adoption of safe yield policies has slowed the rate of water-table declines in other GMDs, "declines have continued throughout most of the High Plains aquifers and in all the [Kansas] GMDs… As a result, streamflows and associated riparian and aquatic ecosystems in western and central Kansas have been steadily decreasing and deteriorating" (Sophocleous 553).

Other Natural or Manmade Factors Affecting Continued Existence (Factor E)

Rarity. The Scott riffle beetle's extreme rarity presents a great threat to the species' continued existence. While there is evidence that the population may be in decline, the most relevant fact is not the number of individuals in the population, but the fact that the Big Springs population is the *only* known population of this species. Given its single population in a very small habitat, the Scott riffle beetle is extremely vulnerable to stochastic events (e.g., flooding, habitat reduction/modification or resource competition by invasive species, severe drought as has been recently experienced in western Kansas, and water contamination). FWS has repeatedly recognized that rarity is a threat to the continued existence of a species.[5] For example, in reference to the Sisi snail (*Ostodes strigatus*), FWS noted that "[e]ven if the threats responsible for the decline of this species were controlled, the persistence of existing populations is hampered by the small number of extant populations and the small geographic range of the known populations."

It is important to note that even if the beetles' population were determined to be stable as it is currently listed on NatureServe (an uncertain conclusion given the lack of recent data), it is the *number* of populations, not the number of individuals in a given population, nor the stability of that population, that presents the greatest threat when it comes to stochastic events. If, for example, one incident of water contamination or a wildfire in the area were sufficient to extirpate the population at time *x*, it is wholly irrelevant whether the population was stable at time *x* or decreasing; the result is the same. Because there is only one known population of Scott riffle beetles, the threat presented by stochastic events is precisely the same regardless of the size or stability of the population.

In its August 2013 proposed listing of the smalleye shiner (*Notropis buccula*), FWS supported its proposed listing with a discussion of the threats posed to the shiner as a result of the fact that only one extant population of the species remains. FWS noted that even though the single extant population of the smalleye shiner "is generally considered resilient to local or short-term environmental changes… with only one location, the species lack[s] any redundancy, and it is presumed th[e] species lack[s] the genetic and ecological representation to adapt to ongoing threats." 78 Fed. Reg. 47582. The shiner is threatened by some of the same key threats facing the Scott riffle beetle, including adequate water flows due to drought, groundwater withdrawal and depletion, and climate change. In its proposed rule, FWS goes on to say that the condition of the shiner is already at a "low viability (low probability of persistence)," a state of affairs that is

[5] *See, e.g.*, FWS candidate assessment forms for *Doryopteris takeuchii*, *Huperzia stemmermanniae*, *Melicope hiiakae*, *Ostodes strigatus*, *Partula langfordi*, *Peperomia subpetiolata*, *Phyllostegia bracteata*, and *Tryonia circumstriata*, *available at* http://www.fws.gov/endangered.

"only expected to decline into the future." Given the single extant population of Scott riffle beetles and the multitude of threats facing that population, the Scott riffle beetle should clearly be afforded the same consideration that the smalleye shiner has received.

In addition to the fact that the Big Springs population is the only known population, there is evidence that the population may be in decline. Because the last study was conducted 28 years ago, there is no recent data on population numbers. Since the species has likely been adversely affected as a result of water contamination from herbicides, increased accessibility to the beetles' spring run habitat, and predation by non-native insectivorous species, it is likely that the population is smaller than it was in 1985. Even if the dewatering of the Ogallala aquifer has not yet reduced the stream yield to the point that it is *currently* adversely affecting the beetle, these other factors make a decline in population not only foreseeable, but also likely currently happening. Heightened risk of extinction is "inherent in low numbers," a basic tenet that has been a cornerstone of conservation biology (Caughley 216). Like other species with very small populations, the Scott riffle beetle's risk of extinction is greatly heightened by the fact that it consists of a single population. Small, isolated populations such as that of the Scott riffle beetle are particularly vulnerable to: 1) demographic fluctuations, 2) environmental fluctuation in resource or habitat availability, predation, competitive interactions and catastrophes, 3) reduction in cooperative interactions and subsequent decline in fertility and survival, 4) inbreeding depression reducing reproductive fitness, and 5) loss of genetic diversity reducing the ability to evolve and cope with environmental change (Traill et al. 29).

Climate Change. The EPA (1998) and the IPCC (2001) predict that, due to anthropogenic climate change, the average temperature in the Southwest will increase by 3° to 5° C by 2100, and that both temperature and precipitation will be more variable. The western United States will likely suffer a decrease in water resources due to climate change. "Warming in western mountains is projected to cause decreased snowpack, more winter flooding and reduced summer flows, exacerbating competition for over-allocated water resources" (IPCC, "Climate Change 2007" 11).

As a result of climate change, western Kansas will become warmer and drier. If temperature increase continues as projected by the IPCC "middle of the road" scenario, by 2100, "[t]emperatures in Kansas will rise in all seasons, in all parts of the state, by an average of 2-4°F. Southwest Kansas could see a rise as steep as 8°F" (Brunsell et al. 2). Warmer temperatures will lead to more evaporation and transpiration. Consequently, agricultural demand on irrigation will increase, thus exacerbating the existing threat of dewatering of the Ogallala aquifer. Parts of western Kansas may see water deficits (the measure of water need which must be made up by irrigation, assuming continuing agricultural demand) of up to eight inches by the end of the century (Brunsell et al. 6) (Figure 13).

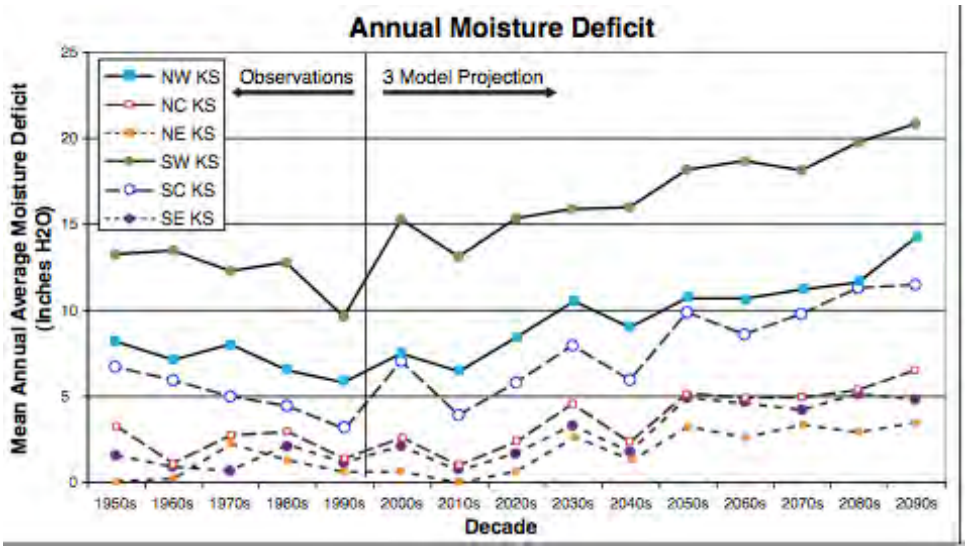


Figure 13. Annual moisture deficit in all regions of Kansas. Brunsell et al. 2008.

While there is still considerable uncertainty regarding the effects of climate change on droughts, a 2010 Massachusetts Institute of Technology study predicts an increase in both the severity and the frequency of hydrological droughts in all sub-basins in the most drought-prone parts of the country, including western Kansas (Strzepek et al.8) (Figure 14). An increase in droughts will place even greater pressure on irrigation and further strain the limited resources of the Ogallala aquifer. “Drought patterns are already intensifying across [Kansas]. The greatest decrease in winter moisture is taking place in western Kansas. The greatest increase in spring moisture is occurring in eastern Kansas” (Brunsell et al. 3).

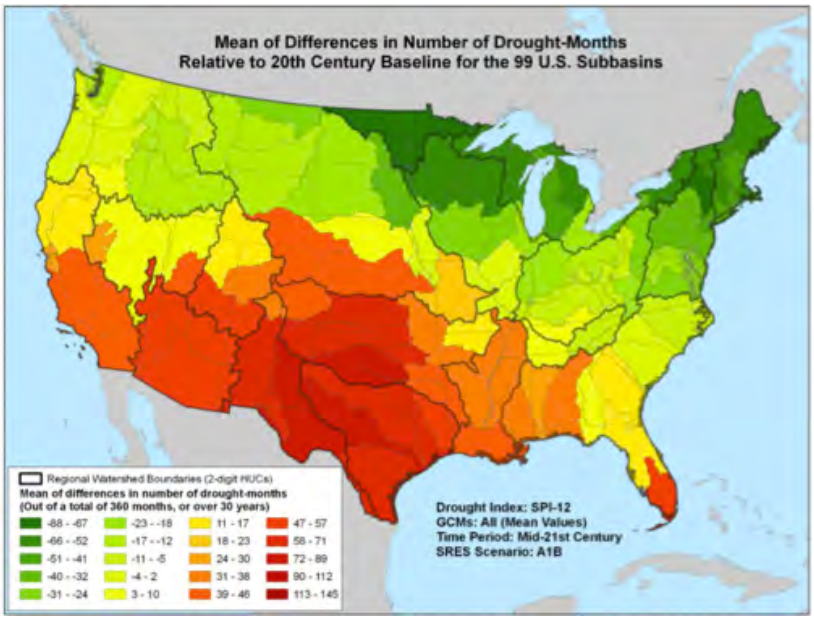


Figure 14. Mean of differences in number of drought-months relative to 20th century baseline for the 99 U.S. sub-basins. Strzepek 2010.

In addition to threats related to greater demand on water and consequent further dewatering of the Ogallala aquifer, climate change has also been linked to an increase in the pervasiveness of invasive species. Climate change will likely lead to an increase in the extent, frequency, and severity of invasive species, and may also facilitate a shift toward invasion in species that have not historically been invasive ("Climate Change & Invasive Species"). In the event that a common western invasive species (e.g., the New Zealand mudsnail or any number of invasive aquatic plants such as Eurasian watermilfoil) were to become established in Big Springs, the entire population of Scott riffle beetles could easily be extirpated.

Finally, warming temperatures in western Kansas may cause the water temperature of the spring run to rise, which could be detrimental to the beetle population. In his 1985 study, Ferrington noted that "while lower water temperature values should have little or no influence on the occurrence of larvae and adults of *O. phaeus*, the upper temperature tolerance of this species may highly influence its distribution" ("Population study" 24). Research suggests that species and ecosystems will need to shift (northward, away from the equator) an average of .42 km per year to survive the deleterious effects of increasing temperatures associated with climate change (Loarie et al. 1053). Distances may be greater, more than 1 km per year, for species in deserts, where climate change is predicted to have greater effect (Loarie et al. 1053). It is unlikely that small, isolated populations, already dependent on diminished and likely immovable habitats, will be able to shift to other habitats to adapt to the effects of climate change. This is particularly true for species dependent on a single pool or spring, such as the Scott riffle beetle.

CONCLUSION AND REQUESTED DESIGNATION

For the reasons explained above, WildEarth Guardians requests that the FWS list the Scott riffle beetle as an "endangered" or "threatened" species under the ESA. As the riffle beetle is threatened by four of the five statutory listing factors, this action is clearly warranted. The primary threat facing the beetle, which is not adequately addressed by existing state protection, is the dewatering of the Ogallala aquifer in western Kansas. The extreme rarity of this unique species renders it particularly vulnerable to this and other threats. The fact that this species has been recognized as endangered by KDWPT, the State agency responsible for the conservation of wildlife, and by the peer-reviewed scientific database NatureServe, lends additional weight to the substantial information presented in this petition and should be considered in support of a positive 90-day finding.

Since habitat destruction and modification are primary threats to the Scott riffle beetle's continued existence, WildEarth Guardians also requests that critical habitat be designated for the species in its U.S. range concurrent with final ESA listing. In order to avoid extinction, critical habitat should, at a minimum, be designated for all springs and spring-fed streams that lie within Section 13, T16S, R33W, Scott County. These lands and waters are currently within the boundaries of Lake Scott State Park, and constitute the Scott riffle beetles' sole habitat.

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