U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME:
Anaxyrus boreas boreas

COMMON NAME:
Eastern Population of the boreal toad

LEAD REGION:
Region 6 (Mountain-Prairie Region)

DATE INFORMATION CURRENT AS OF:
May 2017

STATUS/ACTION

X Species assessment - determined either we do not have sufficient information on threats or the information on the threats does not support a proposal to list the species and, therefore, it was not elevated to Candidate status

___ Listed species petitioned for uplisting for which we have made a warranted-but-precluded finding for uplisting (this is part of the annual resubmitted petition finding)

___ Candidate that received funding for a proposed listing determination; assessment not updated

___ New candidate

___ Continuing candidate

___ Listing priority number change
   Former LPN: ___
New LPN: ___

___ Candidate removal: Former LPN: ___
   ___ A – Taxon is more abundant or widespread than previously believed or not subject
to the degree of threats sufficient to warrant issuance of a proposed listing or
continuance of candidate status.
   ___ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a
proposed listing or continuance of candidate status due, in part or totally, to
conservation efforts that remove or reduce the threats to the species.
   ___ F – Range is no longer a U.S. territory.
   ___ I – Insufficient information exists on biological vulnerability and threats to support
listing.
   ___ M – Taxon mistakenly included in past notice of review.
   ___ N – Taxon does not meet the Act’s definition of “species.”
   ___ X – Taxon believed to be extinct.

Date when the species first became a Candidate (as currently defined): n/a

Petition Information:
   ___ Non-petitioned
   X  Petitioned; Date petition received: May 25, 2011
      90-day substantial finding FR publication date: April 12, 2012 (77 FR 21920)
      12-month warranted but precluded finding FR publication date: n/a

   FOR PETITIONED CANDIDATE SPECIES:
   a. Is listing warranted (if yes, see summary of threats below)? No.
   b. To date, has publication of a proposal to list been precluded by other higher priority
listing actions? n/a
   c. Why is listing precluded? n/a

ANIMAL/PLANT GROUP AND FAMILY:

  Amphibians, Bufonidae (True Toads)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE:

  Idaho, Wyoming, Utah, Colorado, and New Mexico, U.S.A.
CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:

Idaho, Wyoming, Utah, Colorado, and New Mexico, U.S.A.

LAND OWNERSHIP:

Land ownership within the current range includes a mix of Federal, Private, State, and other lands (Table 1).

Table 1. Land ownership estimate (percent of total) of occupied boreal toad habitat within the hydrologic unit code-12 (HUC-12). Acreage estimates likely overestimate the actual amount of boreal toad habitat, because not all areas within the HUC-12 are occupied or provide suitable habitats.

<table>
<thead>
<tr>
<th>Land Owner</th>
<th>Percent of Total Area</th>
</tr>
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<tbody>
<tr>
<td>Federal</td>
<td>97%</td>
</tr>
<tr>
<td>Private</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>State</td>
<td>1.5%</td>
</tr>
<tr>
<td>Tribal</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Other</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Total</td>
<td>1,894,038 hectares (4,680,270 acres)</td>
</tr>
</tbody>
</table>

LEAD REGION CONTACT:

Sarah Backsen, 303-236-4388, sarah_backsen@fws.gov

LEAD FIELD OFFICE CONTACT

Kurt Broderdorp, Colorado Ecological Services Field Office, 970-628-7186, kurt_broderdorp@fws.gov

BIOLOGICAL INFORMATION

Species Description
Boreal toads are dark, brown-black, with warty skin and a white to cream-colored dorsal stripe on the back that may sometimes be broken or incomplete (Loeffler 2001, p. 7). Adults are large in size, with males being 60 to 80 millimeters (mm) (2.4 to 3.2 inches (in)) long and females being 75 to 100 mm (3 to 4 in) long from snout to vent. Round black eggs are linearly spaced in two rows within long strings of two-layered jelly. Tadpoles are jet black in color, though sometimes turning brown. Juvenile toads are similar in appearance to adults, but have yellow coloration on the toes and often lack the mid-dorsal stripe, especially when small (Stebbins 2003, pp. 208-209).

Taxonomy

The boreal toad (Anaxyrus boreas boreas) is a subspecies of the Western toad (Anaxyrus boreas, formerly Bufo boreas), which occurs throughout much of the western United States. Our assessment in our 2012 90-day finding (77 FR 21922, April 12, 2012) relied on two studies analyzing mitochondrial DNA (mtDNA) from boreal toads and other closely related species and subspecies. We concluded that boreal toads within southeastern and western Wyoming, Colorado, northern New Mexico, southeastern Idaho, northeastern Nevada, and Utah comprised a population of genetically similar toads identified as the Eastern Major Clade by Goebel et al. (2009, p. 210, fig. 1), and Clade 3–1 by Switzer et al. (2009, p. 8). The combination of Goebel et al.’s Eastern Major Clade and Switzer et al.’s Clade 3–1 formed the Eastern Population of the boreal toad used in that 90-day finding (77 FR 21922, April 12, 2012).

Currently, analyses of mtDNA alone are no longer accepted as definitive, as described further in our Species Status Assessment (SSA) Report (U.S. Fish and Wildlife Service (Service) 2017, p.8). When results of analyses of mtDNA and multiple nuclear genes conflict, the nuclear DNA analyses are accepted and the pattern of mtDNA is interpreted as lineage sorting or gene introgression (Goebel 2017a pers. comm.).

Three types of genetic analyses have been completed or are in progress for the boreal toad, all focusing on the eastern portion of the boreal toad’s distribution. Each used different genetic methods and different numbers of samples, resulting in different strengths and weaknesses. These analyses and their conclusions are described in greater detail in our SSA Report (Service 2017, pp. 8-10), and are summarized here. In one type of analysis, the phylogeography of mtDNA was analyzed (e.g., Goebel 1996, 2000; Goebel et al. 2009; Switzer et al. 2009, entire). In a second type of analysis, three analyses of different nuclear DNA markers were completed or are in progress (Switzer et al. 2009, entire; Goebel 2017, in progress). Finally, in a third type of analysis, Sara Oyler-McCance, PhD, USGS, (Service 2017, Appendix 3 and in progress) is
examining whole-genome single nuclear polymorphisms data to identify the genetic distinctness of the Eastern Population group.

From these analyses, several conclusions are evident. A genetically distinct group of boreal toads exists in the eastern portion of the range and is found within all of Colorado, northern New Mexico, most of Utah, Wyoming, and southeastern Idaho. This is supported by all nuclear DNA analyses and all mtDNA analyses (Switzer et al. 2009, entire; Service 2017, Appendices 2 and 3). In some areas, the geographic boundaries of the eastern group were unclear in several regions based on mtDNA analyses, but nuclear DNA analyses have helped clarify some of these boundaries. Results of mtDNA analyses are slightly different than the combined results of seven-nuclear genes analyzed. We note these differences, but accept the nuclear DNA analyses as more informative of the evolution of the group, for the reasons described above. Results of genomic analysis are largely congruent with the analyses of sequence data by Goebel (Service 2017, Appendix 2).

In summary, current and ongoing genetic analyses suggest the occurrence of an eastern group of boreal toads that are distinct from the rest of the subspecies. Genetic studies have helped clarify the boundaries of this group, which we now understand to include boreal toads in southeastern Idaho, western and south-central Wyoming, most of Utah (except western Box Elder County), Colorado, and north-central New Mexico. In our SSA Report, we refer to this group as the Eastern Population of boreal toads.


**Habitat/Life History**

The boreal toad occurs between 2000 meters (m) (6,550 feet (ft.)) (Hogrefe et al. 2005, p.7) and 3,670 m (12,232 ft.) (Loeffler 2001, p.7; Lambert and Schneider 2013, pp. 10-11; Crockett 2017a, p.5). The distribution of toads is restricted to areas with suitable breeding habitat (described below) within a landscape containing a variety of vegetation types, including pinon-juniper, lodgepole pine, spruce-fir forests, mountain shrubs, and alpine meadows.

Boreal toads occupy three different types of habitat during the course of the year: breeding ponds, summer range, and overwinter refugia. Breeding takes place in shallow, quiet water in lakes, marshes, bogs, ponds, and wet meadows. Breeding has been recorded from large

The availability of moist habitat restricts the movement and distribution of young toads (Livo 1998, p. 130; Loeffler 2001, p. 8). Adults are less dependent on moist habitats than metamorphs, but must rehydrate daily (Campbell 1970a, p. 29-34), and may move several miles and reside in marshes, wet meadows, or forested areas (Goates, et al. 2007, pp. 478-481; Loeffler 2001, p. 8; Muths 2003, p. 163). Toads may use large boulders, small mammal burrows, and beaver lodges and dams as hibernacula (Campbell 1970a, p. 90, Jones and Goettl 1998, pp. 29-30; Loeffler 2001, p. 8).

At higher elevations, adult boreal toads emerge from winter refugia when snowmelt has cleared an opening from their burrows and daily temperatures remain above freezing (Campbell 1970a, pp. 22, 99; Campbell 1970b, p. 281). Breeding of Western toads can occur from late January to July, depending on latitude, elevation, and local conditions (Stebbins 2003, p. 209). Boreal toads have been observed to lay up to 16,500 eggs (Campbell 1970a, p. 24). Eggs hatch one to two weeks after being laid. Egg and tadpole development is temperature-dependent. Persistent, shallow bodies of water are vital to breeding success, and if the breeding site dries before metamorphosis is complete, desiccation of the tadpoles or eggs will occur. Tadpoles typically metamorphose by late July to late August, but at higher elevations metamorphosis may not be complete until late September (Loeffler 2001, p. 7).

Recently metamorphosed juveniles may aggregate within a few meters of the water to prevent desiccation, for warmth, or to avoid predation (Black and Black 1969, p. 156; Livo 1998, pp. 128, 130, 134). However, these young toads move into nearby moist habitats later in summer.

After mating, adults often disperse to upland, terrestrial habitats, where they are mostly active during the day in early and late summer (Mullally 1958, entire; Campbell 1970a, pp. 84–86; Carey 1978, pp. 203, 206, 211), foraging primarily on ants, beetles, spiders, and other invertebrates (Schonberger 1945, p. 121; Campbell 1970a, p. 69–71). Late in the summer, adult toads will expand their movements, generally in the direction of wintering habitats (Campbell 1970a, pp. 50, 87; Hammerson 1999, p. 94; Jones and Goettl 1998, p. 29).

Further information on the life history and habitat requirements of the boreal toad can be found in our SSA Report (Service 2017, pp. 13-16).
Historical Range/Distribution

Based on the most up to date genetic information and analyses as described above, the historical range of the Eastern Population of boreal toad considered in our SSA Report includes southeastern Idaho, western and south-central Wyoming, most of Utah (except western Box Elder County), Colorado, and north-central New Mexico.

Current Range/Distribution

For a detailed discussion of how we defined the current range of the Eastern Population of boreal toad, see our SSA Report (Service 2017, pp. 11-13). We lack detailed survey data across the range of the species to precisely map all active discrete breeding sites of boreal toads, because of the variation in survey protocols used and the data collected across the range of the species. Some recent location data collected within last 10 years result from targeted and repetitive site visits to known, or suspected, boreal toad breeding sites. Other data are limited to incidental sightings of individual toads. We recognize that an incidental sighting of an individual adult toad does not necessarily indicate a breeding population, where the presence of eggs, tadpoles, or metamorphs indicates breeding activity. Furthermore, we cannot automatically assume that breeding is not occurring if earlier life stages are not detected where the incidental siting of an adult toad occurred.

Crockett (2017a, p.3), provided occupancy data at the 12-digit hydrologic unit code (HUC-12) level. The term “HUC-12” refers to a watershed delineated in the National Watershed Boundary Dataset, and identified by a unique 12-digit numeric code (USGS 2009). The 12-digit HUC is the finest-grained sub-watershed delineated in the National Watershed Boundary Dataset, representing areas of 10,000-40,000 acres (USGS 2009). Toad encounters at a specific location represent a larger range occupied by the toad and others in the population to which it belongs Crockett 2017a, p. 3). The Service agrees with Crockett (2017a, p. 3) that the use of HUC-12 to up-scale point encounter data is a reasonable approach to identify possible breeding populations. For consistency, we converted all location data submitted to us to the HUC-12 level. This approach allowed us to use consistent units for analysis across the range of the boreal toad.

Since we lack consistent survey data across the range of the boreal toad to indicate breeding activity, we assumed that any observation of an adult toad occurring within the last 10 years, represented an active breeding population, as indicated at the HUC-12 level. We acknowledge that using HUC-12s as a proxy for breeding populations is a coarse-scale approach and that this
approach may either overestimate or underestimate the actual number of breeding populations. As stated above, an individual HUC-12 may include one or more currently active or historical breeding (status unknown) breeding sites. In some cases, an individual breeding site within a HUC-12 may have recently become extirpated, but another breeding site within the HUC may still be active. In such cases, any active breeding site within a HUC-12 results in an occupied status for the entire HUC-12. In some cases the occupancy status is unknown, which represent population areas that have not been surveyed recently.

Based on the information described in our SSA Report (Service 2017, pp. 11-13), we have little reason to believe that the current range has changed substantially from the historical range (Figure 1). The historical range is represented by all of the HUC-12 displayed in Figure 1, including HUC-12s of known occupancy (yellow) and those of unknown occupancy (pink). It is also likely that the range of the species may include additional HUC-12s that contain the appropriate habitat for boreal toads, but have not been surveyed. This analysis is described in greater detail in our SSA Report (Service 2017, pp. 11-13)
Figure 1. Boreal Toad Current and Historical Range. Historical range is represented by the combination of pink and yellow HUC-12s, while yellow HUC-12s represent the known current range based on recent data.
Population Estimates/Status

We are not aware of any total population size estimates for the Eastern Population of the boreal toad. In our analysis of the Eastern Population of the boreal toad, we considered various methods for evaluating the current condition of boreal toad populations. For example, we considered categorizing the health of each population (represented by the HUC-12s) based on demographic factors, such as abundance. However, data are not available to measure abundance or other demographic factors consistently across the range. Therefore, our analysis of the current condition of populations focuses on other factors, such as occupancy of toads and the presence of chytrid fungus (Bd), for which we have information across much of the range as a result of survey efforts by states across the range and input from experts. Out of 439 HUC-12s with evidence of historical occupancy, 111 (25%) are considered currently occupied and potentially Bd negative based on recent survey efforts, 83 (19%) are considered currently occupied and potentially Bd positive based on recent survey efforts, and 245 (56%) have unknown occupancy status (Service 2017 p. 28-34).

PREVIOUS FEDERAL ACTIONS

On September 30, 1993, the Service received a petition from the Biodiversity Legal Foundation and Dr. Peter Hovingh. The petitioners requested that the Service list the Southern Rocky Mountains (SRM) population of the “western boreal toad” (a common name sometimes used in the past for Anaxyrus boreas boreas) as endangered throughout its range in northern New Mexico, Colorado, and southeastern Wyoming (we note that the SRM population is a subset of what we now call the Eastern Population of the boreal toad (Figure 1)). The petitioners also requested that the Service designate critical habitat. We published a notice of a 90–day finding for the petition in the Federal Register on July 22, 1994 (59 FR 37439), indicating that the petition and other readily available scientific and commercial information presented substantial information that the petitioned action may be warranted.

On March 23, 1995, the Service announced a 12–month finding that listing the SRM population of the boreal toad as an endangered Distinct Population Segment (DPS) was warranted but precluded by other higher priority actions (60 FR 15281). At that time, a listing priority number of 3 was assigned. When we find that a species is warranted but precluded for listing, we refer to it as a candidate species. Section 4(b)(3)(B) of the Act directs that when we make a “warranted but precluded” finding on a petition, we are to treat the petition as being one that is resubmitted annually on the date of the finding; thus, the Act requires us to reassess the
petitioned actions and to publish a finding on the resubmitted petition on an annual basis. Several resubmitted candidate assessments for the boreal toad were completed. The most recent of these was published in the Federal Register on May 11, 2005 (70 FR 24870).

On October 7, 2002, as part of an agreement regarding multiple species, the U.S. Department of the Interior reached an out–of–court settlement with several conservation organizations and agreed to make a final determination for listing the SRM population of the boreal toad by no later than September 30, 2005. On September 29, 2005, we reached a determination in a revised 12-month finding that the SRM population of the boreal toad did not warrant listing because it was not a listable entity according to the DPS criteria, and therefore, should be withdrawn from the candidate list (70 FR 56880). When the boreal toad was put on the candidate list in 1995, the DPS policy did not yet exist, so current criteria were not used to determine whether the toad was a listable entity. The combination of using the DPS criteria developed in 1996 and genetic and other information available during development of the 2005 finding led to determinations that the SRM population of the boreal toad was discrete based on DPS discreteness criteria, but was not significant based on DPS significance criteria. Therefore, it was not considered a listable entity.

On May 25, 2011, we received a petition of the same date from the Center for Biological Diversity, the Center for Native Ecosystems, and the Biodiversity Conservation Alliance, requesting that either the Eastern or SRM population of the boreal toad be listed as an endangered or threatened DPS, and that critical habitat be designated under the Act. We published a notice of a 90–day finding for the petition in the Federal Register on April 12, 2012 (77 FR 21920). In that finding we concluded that the petition presented substantial scientific or commercial information indicating that listing the Eastern Population of the boreal toad as a DPS may be warranted. The finding announced that we were initiating a review of the status of the Eastern Population to determine if listing it as a DPS is warranted. The 90-day finding further announced that we did not find substantial information that listing the SRM population of the boreal toad as a DPS may be warranted. Although the SRM population appears geographically discrete, we did not find substantial information to suggest that it may be significant according to the criteria in our DPS Policy. We concluded that there is not substantial information in the petition and in our files to suggest that the SRM population of boreal toads may be a valid listable entity (i.e. a DPS) (77 FR 21920, April 12, 2012).

On June 27, 2013, the Center for Biological Diversity filed a complaint (1:13-cv-00975-EGS) to compel the Service to issue 12-month findings as to whether listing under the Act was
warranted for nine species, including the Eastern Population of the boreal toad. On September 23, 2013, the Service and the Center for Biological Diversity filed a stipulated settlement agreement, agreeing that the Service would submit to the Federal Register a 12-month finding for the Eastern DPS of the boreal toad by September 30, 2017 (Center for Biological Diversity v. Jewell 2013, case 1:13-cv-00975-EGS).

SUMMARY OF SPECIES STATUS ASSESSMENT

We completed a Species Status Assessment (SSA) Report for the Eastern Population of the boreal toad (Service 2017, entire), which is available online at http://www.regulations.gov, Docket No. FWS–R6–ES–2017–00XX. This SSA Report contains the results of the comprehensive biological status review by the Service for the Eastern Population of the boreal toad, and provides a thorough account of the species’ overall viability and, therefore, extinction risk. This SSA Report is intended to provide the best available biological information to inform the upcoming 12-month finding and decision on whether or not the Eastern Population of boreal toad is warranted for listing under the Endangered Species Act (Act), and if so, whether and where to propose designating critical habitat. This decision involves the application of standards within the Act, its implementing regulations, and Service policies. The SSA Report contains the scientific analysis on which this finding is based, and the following discussion is a summary of the results and conclusions from the SSA Report.

To evaluate the biological status of the boreal toad both currently and into the future, we assessed a range of conditions to allow us to consider the species’ resiliency, redundancy, and representation (together, the 3Rs). The boreal toad needs multiple resilient populations widely distributed across its range to maintain its persistence into the future and to avoid extinction. A number of factors influence whether boreal toad populations are considered resilient to stochastic events. These factors include (1) sufficient population size (abundance), (2) recruitment of toads into the population, as evidenced by the presence of all life stages at some point during the year, and (3) connectivity between breeding populations. We evaluated a number of potential stressors that could influence the health and resilience of boreal toad populations (Service 2017, p. 22). We found that the main factor influencing the status of populations is the presence of chytrid fungus, Batrachochytrium dendrobatidis (Bd); however, the response of boreal toads to Bd varies across the species’ range. If boreal toads display some resistance to Bd, and recruitment continues within breeding sites despite exposure to Bd, boreal toads should continue to persist with some level of resiliency across their range (Service 2017, p. i).
We have assessed the Eastern Population’s levels of resiliency, redundancy, and representation currently and into the future by evaluating known occupied HUC-12s as a proxy for populations. As explained above under Current Range/Distribution, we lack information to define or precisely map all individual breeding populations of boreal toads, because some recent location data are limited to incidental sightings of individual toads. Therefore, we used HUC-12s to represent historical or active breeding sites, also referred to as populations (Service 2017 pp. 10-11). This allowed us to rely upon consistent units for analysis across the range of the boreal toad. We considered various methods for evaluating the current condition of boreal toad populations. For example, we considered categorizing the health of each population (represented by the HUC-12s) based on demographic factors, such as abundance. However, data are not available to measure abundance or other demographic factors consistently across the range (Service 2017 p. 28). Therefore, our analysis of the current condition of populations focuses on other factors, such as occupancy of toads and the presence of chytrid fungus (Bd), for which we have information across much of the range as a result of survey efforts by states across the range and input from experts. As we consider the future viability of the species, we believe that a greater number of self-sustaining populations that are distributed across the known range of the species would be associated with a higher overall viability of the species. We consider occupied sites where Bd infection is absent to be the most resilient; some populations exist where Bd is present, but are highly resistant to Bd infection, and we also consider these populations highly resilient (Service 2017, p. 29). Other areas display moderate resistance to Bd and are therefore moderately resilient; low resiliency populations are those that have little or no resistance to Bd, and suffer severe population declines or extirpation (Service 2017, p. 33). Therefore, we believe that if suitable habitat parameters continue to be maintained, coupled with some level of resistance to Bd, we anticipate the Eastern Population of the boreal toad would continue to survive into the future.

As noted above (see Population Estimates/Status) the historical range of the Eastern Population of boreal toad includes 439 known HUC-12s across the range of this subspecies. Currently, approximately 194 HUC-12s are considered occupied. Of these, approximately 83 HUC-12s are positive for Bd infection (Service 2017, p. 31-32). Occupancy within the remaining approximately 245 HUC-12s is currently unknown due primarily to the lack of recent survey effort. However, this number includes approximately 62 HUC-12s within in the Southern Rocky Mountains subpopulation area that are considered unoccupied, and may have been extirpated by Bd (Service 2017, p. 31-32). We recognize that the 439 known HUC-12s within the range of the species likely represents a minimum number of possible breeding sites, since every area
that could possibly support boreal toads has not been surveyed (Service 2017, p. 11).

Future Scenarios

Although we evaluated a number of potential stressors, the most significant stressor to boreal toads is Bd. We found that other stressors may have effects on individuals or local areas, but are not population-level impacts (Service 2017, p. 22). Chytrid fungus is distributed across the entire range of the species. However, toads within different parts of the range respond differently to Bd infection. The underlying cause of these differences in response is not well understood, but could possibly be due to genetic differences. However, these differences highlight the broad representation across their range. The variability in the toads’ response to Bd infection informs our understanding of the future of the boreal toad. Toads in the Southern Rocky Mountains subpopulation area appear to respond the most negatively when exposed to Bd, resulting in drastic declines in toad numbers at breeding sites, or the extirpation of toads at some sites. Toads in Utah do not appear to be significantly affected by Bd, and toads in western Wyoming display slow population declines through time.

As part of the Southern Rocky Mountains Recovery Team’s update of its conservation plan, Converse et al. (2016, entire) and Gerber et al. (in review) as cited in Crockett (2017a, p. 2) developed a population persistence model, which provides the most statistically rigorous assessment of viability of toads in the Southern Rocky Mountains (Crockett 2017a, p. 2). The model, based on data on the occupancy of sites by toads and the presence of Bd (the most significant stressor to boreal toads), is described in greater detail in our SSA Report (Service 2017, p. 24, 34-35). This model predicts a greater than 95 percent probability of persistence of toads within the Southern Rocky Mountains over the next 50 years, but with lower population levels, fewer breeding sites, and reduced geographic distribution. Given that boreal toads in other geographic areas display higher levels of resistance to Bd infection (and there is no information to suggest that will change), we believe this model represents a worst-case scenario when considering the future condition of the Eastern Population as a whole (Service 2017, p. 35-36). If we anticipate this high level of persistence (with possible reductions in resilience, representation, or redundancy) to occur within an area most susceptible to Bd infection, toads in other population areas are likely to fare even better, maintaining robust breeding populations into the future, although there is uncertainty regarding how climate change may factor into the future condition of the Eastern Population (Service 2017, p. 36).

Summary: Boreal toad populations are currently experiencing variability in their response to Bd
infection, which we considered to be the primary stressor on boreal toad population resilience for the purposes of our analysis. The most susceptible population to Bd infection experiences high population losses and localized extirpations, but some breeding sites continue to persist despite significant population declines. Some populations within the range show little or no evidence of impacts caused by Bd infection, and remain robust despite the presence of Bd. Other areas show some population decline, but at much lower severity than observed in the Southern Rocky Mountains. Given the prediction for a greater than 95 percent probability of persistence of toads within the Southern Rocky Mountains over the next 50 years, we anticipate that the Eastern Population of boreal toad will likely continue to maintain high levels of resiliency, redundancy, and representation across its range over the next 50 years. This analysis is described in greater detail in our SSA Report (Service 2017, entire).

DISTINCT VERTEBRATE POPULATION SEGMENT (DPS)

Under the Service’s Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act (61 FR 4722; February 7, 1996), three elements are considered in the decision concerning the establishment and classification of a possible DPS. These are applied similarly for additions to or removal from the Federal List of Endangered and Threatened Wildlife. These elements include:

1. The discreteness of a population in relation to the remainder of the species to which it belongs;
2. The significance of the population segment to the species to which it belongs; and
3. The population segment’s conservation status in relation to the Act’s standards for listing, delisting, or reclassification (i.e., is the population segment endangered or threatened).

Discreteness

Under the DPS policy, a population segment of a vertebrate taxon may be considered discrete if it satisfies either one of the following conditions:

1. It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.
2. It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory
mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

The Eastern Population of boreal toads has been identified as a separate entity from the rest of the boreal toad subspecies based on multiple lines of genetic evidence over many years, as discussed above under Taxonomy, and described in greater detail in our SSA Report and Appendices (Service 2017). We have no information on known physiological, behavioral, or morphological differences that consistently distinguish boreal toads in the Eastern Population from other populations. There are also no ecological factors that clearly separate the Eastern Population from boreal toads in the rest of their range, as boreal toads occupy a range of habitats that have similar features. The Eastern Population also does not display clear physical or geographic separation from other boreal toads, and the population may in fact overlap and even interbreed with other populations of boreal toads in some areas around the periphery of its range. For this reason, genetic analyses were required to clarify where the precise boundaries of the Eastern Population fall. However, the DPS Policy does not require evidence of complete reproductive isolation as a prerequisite to recognizing a DPS.

Three types of genetic analyses (examining mtDNA, nuclear DNA, and whole-genome single nuclear polymorphisms) in multiple studies over time have consistently identified the Eastern Population as a distinct group from other boreal toads (Service 2017, pp. 8-10). Recent nuclear DNA analyses have helped to clarify the boundaries of the Eastern Population where they were previously unclear (Service 2017, p. 9). Based on genetic evidence, we now understand the Eastern Population to include boreal toads in southeastern Idaho, western and south-central Wyoming, most of Utah (except western Box Elder County), Colorado, and north-central New Mexico (Service 2017, p. 10). Consequently, we conclude that the Eastern Population of the boreal toad is markedly separated from the rest of the boreal toad subspecies, based on the collective results of genetic studies that provide evidence of this discontinuity, and in particular the nuclear DNA evidence clarifying the boundaries of the Eastern Population. Therefore, the Eastern Population meets the first criterion of discreteness under the DPS policy. As a result, the Eastern Population of the boreal toad is considered a discrete population according to the DPS policy. Because the entity meets the first criterion (markedly separated), an evaluation with respect to the second criterion (international boundaries) is not needed, nor is it relevant as there are no international boundaries around this population.

Significance

If a population segment is considered discrete under one or more of the conditions described in
the Service’s DPS policy, its biological and ecological significance will be considered in light of Congressional guidance that the authority to list DPSs be used “sparingly” while encouraging the conservation of genetic diversity. In making this determination, we consider available scientific evidence of the discrete population segment’s importance to the taxon to which it belongs. Since precise circumstances are likely to vary considerably from case to case, the DPS policy does not describe all the classes of information that might be used in determining the biological and ecological importance of a discrete population. However, the DPS policy describes four possible classes of information that provide evidence of a population segment’s biological and ecological importance to the taxon to which it belongs. As specified in the DPS policy (61 FR 4722), this consideration of the population segment’s significance may include, but is not limited to, the following:

1. Persistence of the discrete population segment in an ecological setting unusual or unique to the taxon;
2. Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon;
3. Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range; or
4. Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

A population segment needs to satisfy only one of these conditions to be considered significant. Furthermore, other information may be used as appropriate to provide evidence for significance. Here, we evaluate whether there is evidence that the Eastern Population of the boreal toad differs markedly from other populations of the boreal toad subspecies in its genetic characteristics.

Three types of genetic analyses (examining mtDNA, nuclear DNA, and whole-genome single nuclear polymorphisms) in multiple studies over time demonstrate that the Eastern Population of the boreal toad is genetically different from the rest of the boreal toad subspecies (Service 2017, pp. 8-10). These data, and in particular the nuclear DNA analyses that clarify the boundaries of the Eastern Population, establish the discreteness of the Eastern Population of boreal toads under the DPS policy. Here, we speak to how these data also establish significance.

We believe the differences between the Eastern Population of boreal toads and populations
from the rest of the subspecies range measured using mtDNA, nuclear DNA, and whole-genome single nuclear polymorphisms, as described above under Taxonomy, and described in greater detail in our SSA Report and Appendices (Service 2017) represent “marked genetic differences” in terms of the extent of differentiation and the importance of that genetic legacy to the rest of the taxon. These multiple lines of genetic evidence in multiple studies over time have identified the Eastern Population as a unique genetic lineage differentiated from other populations of boreal toads.

The intent of the DPS policy and the Act is to preserve important elements of biological and genetic diversity, not necessarily to preserve the occurrence of unique alleles in particular populations. In the Eastern Population of boreal toads, the genetic evidence indicates that the group is differentiated from the rest of the subspecies. The extirpation of this group would mean the loss of the genetic variation in this distinct group, and the loss of the future evolutionary potential (i.e. representation) that goes with it. Thus, the genetic data support the conclusion that the Eastern Population of the boreal toad represents a unique and irreplaceable biological resource of the type the Act was intended to preserve. Thus, we conclude that the Eastern Population of the boreal toad differs markedly in its genetic characteristics relative to the rest of the taxon.

The Eastern Population of the boreal toad satisfies the significance criteria outlined in the Service’s DPS policy because it differs markedly in its genetic characteristics relative to other boreal toad populations. Because it meets the criteria for significance based on marked differences in genetic characteristics, there is no need to evaluate whether it meets the other conditions for significance. Therefore, we consider the Eastern Population of the boreal toad significant to the taxon to which it belongs under the Service’s DPS policy.

**Determination of Distinct Population Segment**

We find that a population segment that includes boreal toads in southeastern Idaho, western and south-central Wyoming, most of Utah (except western Box Elder County), Colorado, and north-central New Mexico satisfies the discreteness standard of the DPS policy. Genetic data indicate that the Eastern Population of the boreal toad is clearly differentiated from other populations within the subspecies. Based on the best scientific and commercial information available, as described above, we find that, under the Service’s DPS policy, the Eastern Population of the boreal toad is discrete and significant to the taxon to which it belongs. Because the Eastern Population of the boreal toad is both discrete and significant, it qualifies as
a DPS under the Act. From here on in this document, we refer to this entity as the Eastern DPS of the boreal toad. The remainder of this finding will thus focus on the status of this entity.

DETERMINATION OF SPECIES STATUS

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for determining whether a species is an endangered species or threatened species and should be included on the Federal Lists of Endangered and Threatened Wildlife and Plants (listed). The Act defines an endangered species as any species that is “in danger of extinction throughout all or a significant portion of its range” and a threatened species as any species “that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.” The phrase “significant portion of its range” (SPR) is not defined by the Act, and, since the Service’s policy interpreting the phrase was vacated by the court in Center for Biological Diversity v. Jewel, No. 14-cv-02506-RM (D. Ariz. Mar. 29, 2017), we currently do not have a binding interpretation that addresses: (1) The outcome of a determination that a species is either in danger of extinction or likely to become so in the foreseeable future throughout a significant portion of its range; or (2) what qualifies a portion of a range as “significant.” We have examined the plain language of the Act and court decisions addressing the Service’s application of the SPR phrase in various listing decisions, and for purposes of this finding we are applying the following interpretation for the phrase “significant portion of its range” and its context in determining whether or not a species is an endangered species or a threatened species.

Two district court decisions have evaluated whether the outcomes of the Service’s determinations that a species is in danger of extinction or likely to become so in the foreseeable future in a significant portion of its range were reasonable. Defenders of Wildlife v. Salazar, 729 F. Supp. 2d 1207 (D. Mont. 2010) (appeal dismissed as moot because of public law vacating the listing, 2012 U.S. App. LEXIS 26769 (9th Cir. Nov. 7, 2012)); WildEarth Guardians v. Salazar, No. 09-00574-PHX-FJM, 2010 U.S. Dist. LEXIS 105253 (D. Ariz. Sept. 30, 2010). Both courts found that, once the Service determines that a “species”—which can include a species, subspecies, or DPS under ESA Section 3(16)—meets the definition of an “endangered species” or a “threatened species,” the species must be listed in its entirety and the Act’s protections applied consistently to all members of that species (subject to modification of protections through rules under sections 4(d) and 10(j) of the Act). See Defenders, 729 F. Supp. 2d at 1222 (delisting the Northern Rocky Mountain DPS of gray wolf except in the Wyoming portion of its range (74 FR 15123 (Apr. 2, 2009)) was
unreasonable because the ESA unambiguously prohibits listing or protecting part of a DPS); WildEarth Guardians, 2010 U.S. Dist. LEXIS 105253, at 15-16 (the Service’s finding that listing the Gunnison’s prairie dog in the “montane portion” of its range was warranted (73 FR 6660 (Feb. 5, 2008)) was unreasonable because the Service “cannot determine that anything other than a species, as defined by the ESA, is an endangered or threatened species”). The issue has not been addressed by a Federal Court of Appeals.

For the purposes of this finding, we interpret the phrase “significant portion of its range” (SPR) in the Act’s definitions of “endangered species” and “threatened species” to provide an independent basis for listing a species in its entirety; thus two situations (or factual bases) would qualify a species for listing: A species may be in danger of extinction or likely to become so in the foreseeable future throughout all of its range; or a species may be in danger of extinction or likely to become so throughout a significant portion of its range. If a species is in danger of extinction throughout an SPR, it, the species, is an “endangered species.” The same analysis applies to “threatened species.” Therefore, the consequence of finding that a species is in danger of extinction or likely to become so throughout a significant portion of its range is that the entire species will be listed as an endangered species or threatened species, respectively, and the Act’s protections will be applied to all individuals of the species wherever found.

Although there are potentially many ways to determine whether a portion of a species’ range is “significant,” we conclude, for the purposes of this finding, that the significance of the portion of the range should be determined based on its biological contribution to the conservation of the species. For this reason, we describe the threshold for “significant” in terms of an increase in the risk of extinction for the species. We conclude that such a biologically based definition of “significant” best conforms to the purposes of the Act, is consistent with judicial interpretations, and best ensures species’ conservation.

For the purposes of this finding, we determine if a portion’s biological contribution is so important that the portion qualifies as “significant” by asking whether, without that portion, the species in the remainder of its range warrants listing. Conversely, we would not consider the portion of the range at issue to be “significant” if the species would not warrant listing even if the population in that portion of the range in question became extirpated (extinct locally).

We interpret the term “range” to be the general geographical area within which the species is currently found, including those areas used throughout all or part of the species’ life cycle, even
if not used on a regular basis. We consider the “current” range of the species to be the range occupied by the species at the time the Service makes a determination under section 4 of the Act. The phrase “is in danger” in the definition of “endangered species” denotes a present-tense condition of being at risk of a current or future undesired event. Hence, to say a species “is in danger” in an area where it no longer exists—i.e., in its historical range where it has been extirpated—is inconsistent with common usage. Thus, “range” must mean “current range,” not “historical range.” A corollary of this logic is that lost historical range cannot constitute a significant portion of a species’ range where a species is in danger of extinction or likely to become so within the foreseeable future. While we conclude that a species cannot be in danger of extinction in its lost historical range, taking into account the effects of loss of historical range on a species is an important component of determining a species’ current and future status.

In implementing these independent bases for listing a species, as discussed above, we list any species in its entirety either because it is in danger of extinction now or likely to become so in the foreseeable future throughout all of its range or because it is in danger of extinction or likely to become so in the foreseeable future throughout a significant portion of its range. With regard to the text of the Act, we note that Congress placed the “all” language before the SPR phrase in the definitions of “endangered species” and “threatened species.” This suggests that Congress intended that an analysis based on consideration of the entire range should receive primary focus. Thus, the first step in our assessment of the status of a species is to determine its status throughout all of its range. Depending on the status throughout all of its range, we will subsequently examine whether it is necessary to determine its status throughout a significant portion of its range.

We recognize the definition of “species” allows, for vertebrates, consideration of the status of a taxonomic species or subspecies over less than its entire range (i.e., distinct population segment). The Act’s definition of “species” includes “any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish and wildlife which interbreeds when mature (16 U.S.C. 1532(16)).” Under the DPS authority, the Service can evaluate and list members of a species in less than the entire range of the species if the segment is determined to be both discrete and significant (61 FR 4722, February 7, 1996). Because the DPS authority and the SPR language both allow the Service to evaluate the status of a taxonomic species or subspecies over less than its entire range, we must explain their relationship.
The definition of “significant” for the purpose of SPR analysis differs from the definition of “significant” as defined in our DPS policy and used for DPS analysis. We expect – based on our experience and knowledge of already listed DPSs, the differences between the two standards, the specific circumstance described by the definition of “significant portion of its range,” and the high bar it sets – that there will seldom be situations in which the population within a SPR for a taxonomic species or subspecies might also constitute a DPS. The DPS authority affords the Service flexibility to apply differing statuses (and thus differing management) across the range of vertebrate species and allows to us to consider and recognize efforts made by States or foreign nations in our application of protections of the Act. Therefore, in the rare circumstance when there is an SPR that also meets the definition of a DPS, we would consider the DPS to be the proper entity for listing.

Under section 4(a)(1) of the Act, we determine whether a species is an endangered species or threatened species because of any of the following: (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. These five factors apply whether we are analyzing the species’ status throughout all of its range or throughout a significant portion of its range.

Until recently, the Service has presented its evaluation of information under the five listing factors in an outline format, discussing all of the information relevant to any given factor and providing a factor-specific conclusion before moving to the next factor. However, the Act does not require findings under each of the factors, only that we examine information related to each of the factors and make an overall determination as to the species’ status (for example, endangered species, threatened species, or not warranted). Ongoing efforts to improve the efficiency and efficacy of the Service’s implementation of the Act have led us to present this information in a different format that we find leads to greater clarity in our understanding of the science, its uncertainties, and our application of our statutory framework to that science. Therefore, while the presentation of information in this document differs from past practice, it differs in format only. We have evaluated the same body of information that, in the past, we have discussed under an outline of the five listing factors. In this analysis, we are applying the same information standard, and we are applying the same statutory framework in reaching our conclusions and ultimate determination of the status of the species under the Act.
Summary of Analysis

The biological information we reviewed and analyzed as the basis for our findings is documented in the SSA Report (Service 2017, entire), a summary of which is provided above. The projections for the future condition of the species are based on our expectations of the potential stressors affecting the species. The potential stressors we evaluated in detail in our SSA Report (Service 2017, Appendix A) that fall under Factors A, B, C, and E of Act section 4(a)(1) are water management (Factor E), roads and driving (Factors A and E), livestock grazing (Factors A and E), recreation (Factors A and E), timber harvest (Factors A and E), urbanization (Factor A), pollutants (Factor E), energy development (Factors A and E), collection (Factor B), chytrid fungus (Factor C), other diseases (Factor C), predation (Factor C), isolation (Factor E), ultraviolet radiation (Factor E), and climate change and drought (Factor E). Based on that analysis, we concluded that only chytridiomycosis resulting from Bd infection (Factor C) has the potential to cause population-level effects to boreal toads. The other stressors may affect individuals or individual breeding sites, but are not expected to impact the species as a whole (Service 2017, Appendix A), and therefore were not evaluated further in the SSA report. Other factors that could also influence the viability of the boreal toad are climate change (Factor E) and management actions.

Considerations under Factor D and Conservation Efforts: Since we did not find any of the stressors evaluated above to be threats that are impacting the viability of the Eastern DPS of the boreal toad, an evaluation of the adequacy of regulatory mechanisms to address those threats would not be required. However, to provide background and context to our evaluation of the stressors mentioned above, here we briefly describe regulatory mechanisms that are relevant to the DPS.

The boreal toad has different legal statuses in different states. Boreal toads are state listed as endangered in Colorado, a state sensitive species in Utah, a protected nongame species and a Species of Greatest Conservation Need in Idaho, state listed as endangered in New Mexico, and a native species status one in Wyoming. Generally, these regulations either prohibit or restrict collection of boreal toads.

At the Federal level, the U.S. Forest Service and the Bureau of Land Management consider boreal toad to be a sensitive species. Both agencies include policy guidance to avoid, minimize, or eliminate potential adverse effects caused by management actions to sensitive species. At this time, we have no information to quantify the impacts to boreal toads or the level of
conservation imparted by the policies of these agencies.

While non-regulatory, we also note that two conservation plans have been developed, by the Utah Boreal Toad Conservation Team (Hogrefe et al. 2005, entire), and the Southern Rocky Mountains Boreal Toad Recovery Team and Technical Advisory Group (Loeffler, C. [ed.] 2001, entire). Because these are non-regulatory, they are not considered under Factor D, but are evaluated in our SSA Report in terms of what protections they may provide to the toad in the face of other stressors. Both plans contain a number of conservation actions that have been implemented to minimize stressors and maintain or improve the status of the Eastern Population of the boreal toad.

Collectively, while these legal statuses and plans likely have some positive influence on boreal toad viability, we do not have information to indicate that they have been major drivers of the toad’s current status. Furthermore, since our analysis did not identify any of the stressors we evaluated as threats to the species’ viability such that listing is warranted, as described further below, regulatory mechanisms would not be required to address them.

The purpose of the SSA was to characterize the current and future viability of the Eastern DPS of boreal toads in the face of potential stressors. In the SSA Report, we described the viability of the Eastern DPS of boreal toads in terms of redundancy, representation, and resiliency (Service 2017, entire). We consider occupied sites where Bd infection is absent to be the most resilient; some populations exist where Bd is present, but are highly resistant to Bd infection, and we also consider these populations highly resilient. Other areas display moderate resistance to Bd and are therefore moderately resilient; low resiliency populations are those that have little or no resistance to Bd, and suffer severe population declines or extirpation. The overall results of the status assessment found that the best available information indicates that the Eastern DPS of boreal toads currently has approximately 194 HUC-12s that are estimated to be occupied. Of these, approximately 83 HUC-12s are positive for Bd infection. Occupancy within the remaining approximately 245 HUC-12s is currently unknown due primarily to the lack of recent survey effort. However, this number includes approximately 62 HUC-12s within in the Southern Rocky Mountains subpopulation area that are considered unoccupied, and may have been extirpated by Bd.

In our evaluation of future viability, a model of population persistence predicted a greater than 95 percent probability of persistence of boreal toads within the Southern Rocky Mountains over the next 50 years, but with lower population levels, fewer breeding sites, and reduced
geographic distribution, potentially indicating lower levels of resilience, redundancy, and representation. Given that boreal toads in other geographic areas display higher levels of resistance to Bd infection, we believe this model represents a worst-case scenario when considering the future condition of the Eastern DPS as a whole. No information suggests that boreal toads in other geographic areas would respond as negatively in the future as boreal toads in the SRM to the presence of Bd, given the higher levels of resistance they currently display. Therefore, if we anticipate this high level of persistence to occur within an area most susceptible to Bd infection, despite reductions in population levels and sites, toads in other population areas are likely to fare even better, maintain robust breeding populations into the future, although there is uncertainty regarding how climate change may factor into the future condition of the Eastern DPS.

Application of Analysis to Determinations
Our SSA characterized the current viability of the Eastern DPS of boreal toad in terms of resiliency, redundancy, and representation, and characterized future viability in terms of the predicted probability of population persistence. This forms the basis for our determinations under the Act. Because of uncertainties regarding the impacts of chytrid fungus infection as a future stressor to the species, and the variability in response to chytrid fungus across the range of the DPS, we evaluated a population persistence model for boreal toads in the Southern Rocky Mountains, as described above. Given that boreal toads in other geographic areas display higher levels of resistance to Bd infection, we believe this model represents a worst-case scenario when considering the future condition of the Eastern Population as a whole. The fundamental question before the Service is whether the projection of extinction risk, described in the SSA Report in terms of the 3 Rs and the probability of persistence in 50 years under a worst case scenario (taking into account chytrid fungus infection and its variable effects on the species, and considering the uncertainty regarding the effects of climate change into the future), indicate that the DPS warrants protection as an endangered or threatened species under the Act. Theoretically, if population condition declines and distribution shrinks, the species’ extinction risk would increase and overall viability would decline.

In using the SSA framework to analyze the scientific information, as documented in the SSA Report, we assess not only individual effects on the species but also their potential cumulative effects. Specifically, we incorporate cumulative effects into our analysis when we characterize the current and future conditions for each population, which we do both individually and cumulatively (Service 2017, Chapters 3-4). Our conceptual model first described the ways in which anthropogenic and natural factors singly and collectively affect the habitat and/or
demographics needed by individuals and populations (Service 2017, p. 17). We then assessed the current and future condition of each population, which incorporates the cumulative effects of these factors on each populations. The conceptual model captures the most current and plausible hypotheses about the ways in which factors singly and collectively affect habitat and/or demographics and populations/species. In addition, the conceptual model helps identify potential conservation actions by identifying important pathways those conservation actions could interrupt; quantifying the cumulative, synergistic and antagonistic relationships among these factors by identifying the effect on population size and growth rate; setting the stage for the ranking of each factor’s relative influence on habitat and/or population demographics; and thereby help identify necessary conservation actions and their priority in application, respectively. Our current and future condition assessment is iterative because it assesses the effects of all the factors that may influence the species, both detrimental and beneficial. Because the SSA framework considers not just the presence of the factors but also the degree to which they collectively influence a species risk, our assessment integrates the cumulative effects of the factors, thereby replacing the standalone cumulative effects analysis.

As described in the determinations below, we first evaluated whether the Eastern DPS of boreal toads is in danger of extinction throughout its range now (an endangered species). We then evaluated whether the DPS is likely to become in danger of extinction throughout its range in the foreseeable future (a threatened species). We finally considered whether the Eastern DPS of boreal toads is an endangered or threatened species in a significant portion of its range (SPR).

**Determination of Status Throughout All of its Range**

**Standard: In Danger of Extinction Throughout Range**

Under the Act, an endangered species is any species that is “in danger of extinction throughout all or a significant portion of its range.” In this finding, we evaluate the best available scientific and commercial information about the boreal toad’s current distribution, occupancy of HUC-12s, presence of Bd, and the predicted future probability of persistence across the range (these are described in the SSA Report in terms of resiliency, redundancy, and representation) to describe the viability of the species, and how it may change over time (using a model of population persistence as a worst case scenario). Ultimately, we compare our evaluation of the species’ risk of extinction against the definition of an endangered species.

**Evaluation and Finding: In Danger of Extinction Throughout Range**
Our review found that overall, the Eastern DPS of the boreal toad likely occupies the majority of its known historical range within Colorado, Wyoming, Utah, northern New Mexico, and southeastern Idaho, although many HUC-12s lack recent survey data to confirm boreal toad occupancy. Based on recent survey data, the Eastern DPS of boreal toads includes at least 111 populations that are considered to be relatively healthy due to the absence of Bd, and are considered the most resilient. These populations are distributed across the range of the species. In other populations, Bd is present, but some of these populations display some tolerance of Bd infection; however this is variable across the range. Toad populations in Utah that are infected by Bd may be as resilient as toad populations that are not infected by Bd elsewhere. Based on evidence of gradual population declines likely attributed to Bd, boreal toads in western Wyoming and southeastern Idaho appear to be somewhat less tolerant of Bd compared to toads in Utah, and therefore infected populations in these areas are considered moderately resilient. Boreal toad populations in the Southern Rocky Mountains that are infected with Bd display no tolerance to Bd, and are considered to be of low resilience. Therefore, there is a gradation of resiliency within the Eastern DPS.

Based on recent survey data across the range, at least 37 percent of boreal toad populations in the Eastern DPS are considered resilient, or have moderate resiliency, and 7 percent of the toad populations (e.g. toads in the Southern Rocky Mountains) display low resilience. We are uncertain about the status of 183 populations that occur outside of the Southern Rocky Mountains, because there is no recent survey data for these populations, and therefore the occupancy of these populations is currently unknown. However, these populations occur in areas that show some level of tolerance to Bd, likely placing them in the moderately resilient category. These differences in tolerance to Bd demonstrate representation across the range of the Eastern DPS, and approximately 347 of 439 (79%) boreal toad populations are currently in a moderate to high resiliency category, providing a high degree of redundancy across the range of the Eastern DPS of the boreal toad.

Because boreal toads in the DPS are distributed across the majority of their historical range, with a large percentage of populations in a moderate or high resiliency category in the face of Bd, which is the primary stressor influencing the species, we find that the species has a very low risk of extirpation due to stochastic or catastrophic events that could plausibly occur in the future, and that due to these conditions, the species retains adaptive capacity. Therefore, we conclude that the current risk of extinction is low, such that the Eastern DPS of boreal toads is not in danger of extinction throughout all of its range.
Having found that the Eastern DPS of the boreal toad is not an endangered species throughout its range, we next evaluated whether the DPS is a threatened species throughout its range.

Standard: Likely to Become Endangered Threatened Species Throughout Range

Under the Act, a threatened species is any species that is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” The foreseeable future refers to the extent to which the Secretary can reasonably rely on predictions about the future in making determinations about the future conservation status of the species (U.S. Department of Interior, Solicitor’s Memorandum, M-37021, January 16, 2009). The key statutory difference between a threatened species and an endangered species is the timing of when a species may be in danger of extinction, either now (endangered species) or in the foreseeable future (threatened species).

Evaluation and Finding: Likely to Become Endangered Threatened Species Throughout Range

In considering the foreseeable future, we forecasted the status of the Eastern DPS of the boreal toad as measured by the predicted probability of persistence of the species (and described in the SSA Report in terms of resiliency, redundancy, and representation) across the range. For the purpose of this assessment, we generally define viability as the ability of the species to sustain populations in a natural ecosystem beyond a biologically meaningful timeframe, in this case, approximately 50 years (i.e. the year 2067). We chose this timeframe because it corresponds to the time period that has been evaluated by the Southern Rocky Mountains Conservation Team as part of a model of boreal toad population persistence in the Southern Rocky Mountains (Boreal Toad Meta-population Viability Model 2016). The predictions of this model represent the best available information on the potential future condition of boreal toads within the Southern Rocky Mountains. We are not aware of any additional efforts to predict future population conditions for boreal toads in any other part of the Eastern DPS; however we believe the model described above is still informative when considering the rest of the species’ range, as explained above.

The primary factor that may affect the future viability of the Eastern DPS of boreal toads is Bd infection, although climate change and management actions may also play a role (Service 2017, Chapter 3). There is uncertainty regarding whether and how rates of Bd infection may change, and what management actions may be implemented in the future. Therefore, to assist us in evaluating the status of the DPS in the foreseeable future, we considered the predictive model developed by the Southern Rocky Mountains Conservation Team, which we considered to
represent a worst case scenario compared to the rest of the range of the Eastern DPS, since the model assumed no resistance to Bd. We then evaluated the viability of the Eastern DPS of boreal toads in the foreseeable future, described in terms of resiliency, redundancy, and representation and predicted probability of persistence.

Looking into the foreseeable future in 50 years, the model predicts that even without management actions, the probability of persistence of boreal toads within the Southern Rocky Mountains will be quite high (greater than 0.95). However, under this worst case scenario, the model predicts that the number of active breeding sites and occupied mountain ranges would both be lower than they are today. Despite these reductions in breeding sites and occupancy in the Southern Rocky Mountains, the 0.95 probability of persistence indicates a low risk of extinction for boreal toads in this area. Boreal toads in the remainder of the Eastern DPS appear to fare better, and possibly exhibit some tolerance to Bd infection. Therefore, if we were to apply this model to similar data from the other geographic areas within the species’ range, we would expect a higher probability of persistence in those areas compared to the projected outcome for the Southern Rocky Mountains. However, we note that there is uncertainty regarding how climate change will factor into the future viability of the species across its range, as it may have both positive and negative effects (Service 2017, Appendix A).

Overall, even under a worst case scenario (represented by boreal toads in the SRM), where no management actions are directed toward conservation of the species, and where there is no resistance to Bd, the predictive model anticipates a high probability (0.95) of persistence of toads in 50 years within the Southern Rocky Mountains. The predicted reduction in the number of active breeding sites and occupied mountain ranges in the Southern Rocky Mountains could put boreal toads in the Southern Rocky Mountains at increased risk from catastrophic events or reduce their adaptive capacity (i.e. lower levels of redundancy and representation). Although we anticipate increased risk in the Southern Rocky Mountains in the future in this scenario, it appears that boreal toads in this area will have sufficient healthy populations distributed geographically to ensure a high probability of persistence. Given the apparent higher tolerance of Bd displayed by boreal toads across the rest of the range, we have high confidence that these populations will retain higher numbers of healthy populations, distributed widely across the range (resiliency, representation, and redundancy) than toads in the Southern Rocky Mountains, and will have a higher probability of persistence. Because we project a high probability of persistence in the face of Bd across the majority of the range of the Eastern DPS in 50 years, even under a worst-case scenario, we find that the species has a low future risk of extirpation due to stochastic or catastrophic events that could plausibly occur in the future, and that due to these conditions, the species is expected to retain most of its adaptive capacity.
Therefore, we conclude that the risk of extinction in the foreseeable future is low, such that the Eastern DPS of boreal toad is not likely to become an endangered species within the foreseeable future throughout all of its range.

Thus, after assessing the best available information, we conclude that the Eastern DPS of boreal toad is not in danger of extinction throughout all of its range nor is it likely to become so in the foreseeable future.

**Determination of Status Throughout a Significant Portion of its Range**

Consistent with our interpretation that there are two independent bases for listing species as described above, after examining the species’ status throughout all of its range, we now examine whether it is necessary to determine its status throughout a significant portion of its range. We must give operational effect to both the “throughout all” of its range language and the SPR phrase in the definitions of “endangered species” and “threatened species.” The Act, however, does not specify the relationship between the two bases for listing. As discussed above, to give operational effect to the “throughout all” language and that it is referenced first in the definition, consideration of the species’ status throughout the entire range should receive primary focus and we should undertake that analysis first. In order to give operational effect to the SPR language, the Service should undertake an SPR analysis if the species is neither in danger of extinction nor likely to become so in the foreseeable future throughout all of its range, to determine if the species should nonetheless be listed because of its status in an SPR. Thus, we conclude that to give operational effect to both the “throughout all” language and the SPR phrase, the Service should conduct an SPR analysis if (and only if) a species does not warrant listing according to the “throughout all” language.

Because we determined that the Eastern DPS of boreal toad is not in danger of extinction or likely to become so in the foreseeable future throughout all of its range, we will consider whether there are any significant portions of its range in which the Eastern DPS of boreal toad is in danger of extinction or likely to become so.

Although there are potentially many ways to determine whether a portion of a species’ range is “significant,” we conclude, as noted above, for the purposes of this finding, that the significance of the portion of the range should be determined based on its biological contribution to the conservation of the species. For this reason, we describe the threshold for “significant” in terms of an increase in the risk of extinction for the species. We conclude that such a
biologically based definition of “significant” best conforms to the purposes of the Act, is consistent with judicial interpretations, and best ensures species’ conservation.

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

For the purposes of this finding, we determine if a portion’s biological contribution qualifies as “significant” by asking whether, **without that portion**, the representation, redundancy, or resiliency of the species would be so impaired that the species would be in danger of extinction or likely to become so in the foreseeable future (i.e., would be an “endangered species” or a “threatened species”). Conversely, we would not consider a portion to be “significant” if there is sufficient resiliency, redundancy, and representation elsewhere in the species’ range that the species would not be in danger of extinction or likely to become so throughout its range even if the population in that portion of the range in question became extirpated.

We recognize that this definition of “significant” establishes a threshold that is relatively high. Given that the outcome of finding a species to be in danger of extinction or likely to become so in an SPR would be to list the species and apply protections of the Act to all individuals of the species wherever found, we concluded it is important to use a threshold for “significant” that is robust. It would not be meaningful or appropriate to establish a low threshold whereby a portion of the range can be considered “significant” even if only a negligible increase in
extinction risk would result from its loss. Because nearly any portion of a species’ range can be said to contribute some increment to a species’ viability, use of such a low threshold would require us to impose restrictions and expend conservation resources disproportionately to conservation benefit: Listing would be rangewide, even if only a portion of the range with minor conservation importance to the species is imperiled. On the other hand, it would be inappropriate to establish a threshold for “significant” that is too high. This would be the case if the standard were, for example, that a portion of the range can be considered “significant” only if threats in that portion result in the entire species’ being currently in danger of extinction or likely to become so. Such a high bar would not give the SPR phrase independent meaning, as the Ninth Circuit held in *Defenders of Wildlife v. Norton*, 258 F.3d 1136 (9th Cir. 2001).

The definition of “significant” used in this finding carefully balances these concerns. By setting a relatively high threshold, we minimize the degree to which restrictions would be imposed or resources expended that do not contribute substantially to species conservation. But we have not set the threshold so high that the phrase “throughout a significant portion of its range” loses independent meaning. Specifically, we have not set the threshold as high as it was under the interpretation presented by the Service in the *Defenders* litigation. Under that interpretation, the portion of the range would have to be so important that the species’ current level of imperilment in the portion results in the species currently being in danger of extinction or likely to becomes throughout all of its range. Under the definition of “significant” used in this finding, the portion of the range need not rise to such an exceptionally high level of biological significance.

We are aware that the court in *Center for Biological Diversity v. Jewel* found that this definition of “significant” does not give sufficient independent meaning to the SPR phrase. However, that decision was based on two misunderstandings about the interpretation of “significant.” First, the court’s decision was based on its finding that, as with the interpretation that the court rejected in *Defenders*, the definition of “significant” does not allow for an independent basis for listing. However, this definition of “significant” is not the same as the definition applied in *Defenders*, which looked at the current status within the portion and asked what the current effect on the entire range of the species is. By contrast, this definition of “significant” looks at a future hypothetical loss of all members within the portion and evaluates the effect on the remainder of the species. The current status of the species in that portion is relevant only for determining the listing status if the portion has been determined to be significant. This definition of “significant” establishes a lower threshold than requiring that the species’ current status in that portion of its range is already causing the species to be in danger of extinction.
throughout all of its range or likely to become so in the foreseeable future. In other words, this definition of “significant” captures circumstances that would not be captured by the definition used in *Defenders*, or by analyzing whether a species is in danger of extinction or likely to become so throughout all of its range: a species that is *not* currently even likely to become an endangered species in the foreseeable future, but would be if a particular important portion of its range is completely lost, can nonetheless be listed now if the species in that portion is threatened or endangered (as opposed to only after the portion is in fact lost, as would be the case if the SPR language did not exist).

The second misunderstanding was the court’s characterization of the listing determination for the African coelacanth as an indication of our difficulty applying this definition of “significant.” However, in that listing determination, the conclusion was that the species was not in danger of extinction throughout all of its range or likely to become so in the foreseeable future but it did warrant listing because of its status in a significant portion of its range. The only reason for not listing the entire species was that the population in that portion of the range met the definition of a distinct population segment (DPS). Therefore, the agency listed the DPS instead of the entire species. The population in an SPR is not automatically a DPS so, contrary to the court’s reasoning, the definition of “significant” can be applied and result in listing a species that would not otherwise be listed. We also note another instance in which this definition has resulted in a finding that an entity did was not in danger of extinction in the foreseeable future through all of its range, but was in a significant portion. In a proposed rule (82 FR 3694; January 12, 2017), NMFS found that the giant manta ray was not currently in danger of extinction or likely to become so in the foreseeable future throughout all of its range because the Atlantic populations were not experiencing the same risks as the Pacific populations. However, they did find that the Pacific populations constituted an SPR, because without that portion, the smaller and more sparsely distributed populations in the Atlantic would become vulnerable to demographic risks and would be likely to become in danger of extinction in the foreseeable future. Accordingly, the giant manta ray is proposed to be listed as a threatened species. In light of these two misunderstandings, we are currently seeking reconsideration of the district court’s decision.

To undertake this analysis, we first identify any portions of the species’ range that warrant further consideration. The range of a species can theoretically be divided into portions in an infinite number of ways. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that there are any portions of the species’ range: (1) that may be “significant,” and (2) where the species may be in danger of...
extinction or likely to become so in the foreseeable future. We emphasize that answering these questions in the affirmative is not equivalent to a determination that the species should be listed—rather, it is a step in determining whether a more-detailed analysis of the issue is required.

A key part of identifying portions appropriate for further analysis is whether the threats are geographically concentrated. If a species is not in danger of extinction or likely to become so in the foreseeable future throughout all of its range and the threats to the species are essentially uniform throughout its range, then the species is not likely to be in danger of extinction or likely to become so in the foreseeable future in any portion of its range. Moreover, if any concentration of threats applies only to portions of the species’ range that are not “significant,” such portions will not warrant further consideration.

If we identify any portions (1) that may be significant and (2) where the species may be in danger of extinction or likely to become so in the foreseeable future, we conduct a more thorough analysis to determine whether both of these standards are indeed met. The identification of a geographic area that meets our definition of significant does not create a presumption, prejudgment, or other determination as to whether the species is in danger of extinction or likely to become so in the foreseeable future in that identified SPR. We must then analyze whether the species is in danger of extinction or likely to become so in the SPR. To make that determination, we use the same standards and methodology that we use to determine if a species is in danger of extinction or likely to become so in the foreseeable future throughout all of its range.

Depending on the biology of the species, its range, and the threats it faces, it might be more efficient for us to address the significance question first or the status question first. If we address significance first and determine that a portion of the range is not “significant,” we do not need to determine whether the species is in danger of extinction or likely to become so in the foreseeable future there; if we address the status of the species in portions of its range first and determine that the species is not in danger of extinction or likely to become so in a portion of its range, we do not need to determine if that portion is “significant.”

Eastern DPS of the Boreal Toad Determination of Significant Portion of its Range

Applying the process described above, to identify whether any portions warrant further consideration, we determine whether there is substantial information indicating that (1)
particular portions may be significant and (2) the species may be in danger of extinction in those portions or likely to become so within the foreseeable future.

To identify portions where the species may be in danger of extinction or likely to become so in the foreseeable future, we consider whether the threats are geographically concentrated in any portion of the species’ range. We evaluated the current range of the Eastern DPS of boreal toads to determine if there is any apparent geographic concentration of threats to the species. Our SSA concluded that the primary stressor that could potentially impact the Eastern DPS of boreal toads at a population level was Bd infection (Service 2017, p. 22). However, the response of boreal toads to Bd infection is variable across the range. The portion of the range that experiences the most severe impacts from Bd is the Southern Rocky Mountains (including Colorado, northern New Mexico, and southern Wyoming), where boreal toads have experienced rapid, precipitous declines in breeding populations, or extirpations possibly caused by to Bd (Service 2017, pp. 24-25). Compared to other geographic areas, this portion of the range appears to have the lowest tolerance for Bd infection. Therefore, the Southern Rocky Mountains is the most logical portion of the range to consider further in this evaluation.

Given the apparent greater vulnerability to Bd of boreal toads in the Southern Rocky Mountains, we evaluated whether this portion of the range could be considered endangered or threatened. In the Southern Rocky Mountains, 34 HUC-12s are occupied and Bd negative, and considered to have high resilience. 30 HUC-12s are occupied and Bd positive, and considered to have moderate resilience. Another 62 HUC-12s have likely been extirpated, possibly due to Bd infection (Service 2017, p. 31-32). The 51% of HUC-12s that are in the high or moderate resilience category are spread throughout the Southern Rocky Mountains, providing adaptive capacity (representation) and redundancy in the face of catastrophic events (Service 2017, p. 30). Looking into the foreseeable future, a model of population persistence focused on the Southern Rocky Mountains predicted a 95% probability of persistence for toads in this geographic area in 50 years, assuming no resistance to Bd, and without any management actions (Service 2017, p. 35). The model also predicted that there would be fewer breeding sites and occupied mountain ranges than there are today; indicating that levels of redundancy and representation could be reduced (Service 2017, p. 36). Despite the possible reductions in breeding sites and occupied mountain ranges in the foreseeable future, the current and projected future conditions indicate a low risk of extinction for boreal toads in the Southern Rocky Mountains. Therefore, boreal toads in the Southern Rocky Mountains are not in danger of extinction or likely to become so in the foreseeable future. Because we have determined that boreal toads are not in danger of extinction or likely to become so in the foreseeable
future in the Southern Rocky Mountains portion of the range, we do not need to determine if that portion is “significant.” We did not identify any portions where the species may be in danger of extinction or likely to become so in the foreseeable future. Therefore, no portions warrant further consideration to determine whether the species may be in danger of extinction or likely to become so in the foreseeable future in a significant portion of its range.

EASTERN DPS OF THE BOREAL TOAD DETERMINATION OF STATUS

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Eastern DPS of boreal toad. Because the species is neither in danger of extinction now nor likely to become so in the foreseeable future throughout all or any significant portion of its range, the species does not meet the definition of an endangered species or threatened species.

We request that you submit any new information concerning the status of, or threats to, the Eastern DPS of the boreal toad to our Colorado Ecological Services Field Office (see LEAD FIELD OFFICE CONTACT) whenever it becomes available. New information will help us monitor this species and encourage its conservation. If an emergency situation develops for the Eastern DPS of the boreal toad we will act to provide immediate protection.

For species that are being removed from candidate status:
Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)? n/a

RECOMMENDED CONSERVATION MEASURES
n/a

DESCRIPTION OF MONITORING
Monitoring efforts for boreal toads have varied across the Eastern DPS. Conservation plans developed by the Utah Boreal Toad Conservation Team and the Southern Rocky Mountains Boreal Toad Recovery Team and Technical Advisory Group both plans contain a number of conservation actions that have been implemented to minimize stressors and maintain or improve the status of the Eastern Population of the boreal toad, including species and disease monitoring. However, across the range as a whole, up to 245 HUC-12s are considered to have unknown status, due to lack of recent surveys. We recognize that the 439 known HUC-12s within the range of the species likely represents a minimum number of possible breeding sites,
since every area that could possibly support boreal toads has not been surveyed.

COORDINATION WITH STATES
Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: Idaho, Wyoming, Colorado, New Mexico, and Utah

Indicate which State(s) did not provide any information or comments: none

LITERATURE CITED


APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: 
N. E. Wells
Regional Director, Fish and Wildlife Service

Date: 7/27/17

Concur: 
James W. Kruith
Acting Director, Fish and Wildlife Service

Date: SEP 15 2017

Do not concur: 
______________________________
Director, Fish and Wildlife Service

Date

Director’s Remarks: