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

SCIENTIFIC NAME: Rana luteiventris

COMMON NAME: Columbia spotted frog (Great Basin Distinct Population Segment)

LEAD REGION: California Nevada Operations Office

INFORMATION CURRENT AS OF: April 20, 2007

STATUS/ACTION

___ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status
___ New candidate
_X_ Continuing candidate
 ___ Non-petitioned
 _X_ Petitioned - Date petition received: May 1, 1989
 _X_ 90-day positive - FR date: October 17, 1989 (USFWS 1989)
 _X_ 12-month warranted but precluded - FR date: April 23, 1993 (USFWS 1993)
 ___ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:
a. Is listing warranted (if yes, see summary of threats below)? YES
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? YES
c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. Higher priority actions.

The petition received in May 2004 to list all 225 candidate species, including Rana luteiventris as an endangered species, under the Endangered Species Act (Act) was largely based on the present or threatened destruction, modification, or curtailment of its habitat or range, disease or predation, the inadequacy of existing regulatory mechanisms, and other natural or manmade factors affecting its continued existence (Center for Biological Diversity (CBD) et al. 2004). In addition, the petitioners stated that these species have been on the candidate list for an average of 17 years and such delays have contributed to the extinction of many non-listed species (CBD et al. 2004). We considered the petition in this assessment; however, no new substantive information on R. luteiventris was presented. Two conservation agreements and strategies (Nevada Department of Wildlife (NDOW) 2003a, pp. 1-43; 2003b, pp. 1-51) were signed by Federal, State, County, and university representatives on September 30, 2003, for the Toiyabe Mountains and Northeast (Jarbidge-Independence Range and Ruby Mountains) subpopulations.

We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, since publication of the last CNOR, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs) because most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken, see the discussion of "Progress on Revising the Lists" in the current CNOR, which can be viewed on our Internet website (http://endangered.fws.gov/).

_X_ Listing priority change
Former LP: _3_
New LP: _6_
Date when the species first became a Candidate (as currently defined): April 23, 1993
___ 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.

ANIMAL/PLANT GROUP AND FAMILY: Amphibians, Ranidae (Frogs)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Nevada, Oregon, Idaho

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Nevada (Elko, Eureka, and Nye Counties)
Oregon (Union, Baker, Wallowa, Umatilla, Grant, Harney, and Malheur Counties)
Idaho (Owyhee County)

LAND OWNERSHIP: An estimated 90 percent of all known habitat for Columbia spotted frog occur on lands managed by the Forest Service and the Bureau of Land Management (BLM). National Forests include the Humboldt-Toiyabe in Nevada and the Wallowa-Whitman, Umatilla, and Malheur in Oregon. BLM Districts include Elko and Battle Mountain in Nevada; Lakeview, Burns, Prineville, and Vale in Oregon; and Jarbidge, Bruneau, and Owyhee in Idaho. Columbia spotted frogs are known to occur on the Yomba-Shoshone Reservation in central Nevada and the Duck Valley Reservation straddling the border of Nevada and Idaho. The State of Idaho manages a 680 acre parcel at Sam Noble Springs which Columbia spotted frogs occupy. The remainder of known or suspected sites occurs on private lands.

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LEAD FIELD OFFICE CONTACT: Nevada Fish and Wildlife Office; Chad Mellison, 775-861-6300, chad_mellison@fws.gov

BIOLOGICAL INFORMATION

Species Description
Ranids typically are characterized as slim-waisted, long-legged, smooth-skinned jumpers with webbed hind feet and usually with a pair of dorsolateral folds (glandular folds) that extend from behind the eyes to the lower back. Adult Columbia spotted frogs measure approximately 5.6 centimeters (cm) (2.2 inches (in)) from snout to vent, with females being larger than males (Stebbins 2003, pp. 66, 229-230). Dorsal color and pattern include a light brown, dark brown, or gray, with small spots (Stebbins 2003, pp. 66, 229-230). Ventral coloration can differ among geographic population units and may range from yellow to salmon; however, very young individuals may have very pale, almost white, ventral surfaces (Stebbins 2003, pp. 66, 229-230). The throat and the ventral region are sometimes mottled. The head may have a dark mask with a light stripe on the upper jaw, and the eyes are turned slightly upward. Male frogs have swollen thumbs with darkened bases (Stebbins 2003, pp. 66, 229-230).

Taxonomy
Spotted frogs (Rana pretiosa) were first described by Baird and Girard in 1853 (p. 378-379) and later split into two subspecies R. pretiosa pretiosa and R. pretiosa luteiventris (Thompson 1913, pp. 53-56). The U.S. Fish and Wildlife Service (USFWS) accepts species-specific genetic and geographic differences in Columbia spotted frogs based on Green et al. (1996, pp. 377-388; 1997, pp. 2-7), and Bos and Sites (2001, pp. 1,505-1,511), which define populations in western Washington and Oregon and northeastern California as Oregon spotted frogs (Rana pretiosa) and the remainder of the populations as Columbia spotted frogs (Rana luteiventris). Based on further geographic and genetic characterization, Columbia spotted frogs in Idaho, eastern Oregon, and Nevada are part of the Great Basin population of Columbia spotted frogs (Bos and Sites 2001, p. 1,510). A small population on the eastern border of White Pine County, Nevada and Toole County, Utah, has been determined through phylogenetic data (Bos and Sites 2001, pp. 1,504-1,505, 1,509) to be part of the West Desert population of Columbia spotted frogs. Additional genetics work is currently being conducted by the U.S. Geological Survey (USGS) to further clarify and define the geographic extent of the Great Basin population (USGS 2006, pp.1-3). However, we have carefully reviewed available taxonomic information to reach the conclusion that the species R. luteiventris is a valid taxon.

Habitat
Columbia spotted frogs are found closely associated with clear, slow-moving or ponded surface waters, with little shade, and relatively constant water temperatures (Reaser 1997, pp. 32-33; Reaser and Pilliod 2005, p. 561; Welch and MacMahon 2005, p. 477). Reproducing populations

have been found in habitats characterized by springs, floating vegetation, and larger bodies of pooled water (e.g., oxbows, lakes, stock ponds, beaver-created ponds, seeps in wet meadows, backwaters) (Reaser and Pilliod 2005, p. 560). A deep silt or muck substrate may be required for hibernation and torpor (Bull 2005, p. 12; Reaser and Pilliod 2005, p. 561). In colder portions of their range, Columbia spotted frogs will use areas where water does not freeze, such as spring heads and undercut streambanks with overhanging vegetation (Bull 2005, p. 12; Reaser and Pilliod 2005, p. 561). Females usually lay egg masses in the warmest areas of a pond, typically in shallow water (10-20 cm, 4-8 in), and clutch sizes vary (150-2,400 eggs) (Bull 2005, pp. 8 and 11; Reaser and Pilliod 2005, p. 560; Pearl et al. 2007a). Successful egg production and the viability and metamorphosis of Columbia spotted frogs are susceptible to habitat variables such as temperature, depth, and pH of water, cover, and the presence/absence of predators (e.g., fishes and bullfrogs) (Munger et al. 1996, p. 8; Reaser 1996, pp. 21-22; Bull 2005, p. 7; Reaser and Pilliod 2005, pp. 561-562).

Current and Historical Range/Distribution-Nevada

Columbia spotted frogs in Nevada are found in the central (Nye County) and northeastern (Elko and Eureka Counties) parts of the state, usually at elevations between 1,700 and 2,650 meters (5,600 and 8,700 feet), although they have been recorded historically in a broader range including Lander County in central Nevada and Humboldt County in northwest Nevada (Reaser 2000, p. 1,159). The Great Basin population of Columbia spotted frogs in Nevada is geographically separated into three distinct subpopulations: the Jarbidge-Independence Range, Ruby Mountains, and Toiyabe Mountains.

The largest of Nevada’s three subpopulation areas is the Jarbidge-Independence Range in Elko and Eureka Counties. This subpopulation area is formed by the headwaters of streams in two major hydrographic basins. The South Fork Owyhee River, Owyhee River, Bruneau River, and Salmon Falls Creek drainages flow north into the Snake River basin. Mary’s River, North Fork Humboldt River, and Maggie Creek drain into the interior Humboldt River basin. Columbia spotted frogs occur in the Ruby Mountains in tributaries to the South Fork Humboldt River including Green Mountain, Smith, Corral, and Rattlesnake Creeks on lands in Elko County managed by the Humboldt-Toiyabe National Forest (HTNF). In the Toiyabe Mountains, Columbia spotted frogs are found in seven drainages in Nye County, Nevada--the Reese River (Upper and Lower), Cow and Ledbetter Canyons, and Cloverdale, Stewart, Illinois, and Indian Valley Creeks (NDOW 2003b, p. S-8). The Toiyabe Mountains subpopulation is geographically isolated from the Ruby Mountains and Jarbidge-Independence Range subpopulations by a large gap in suitable habitat and represents R. luteiventris in the southern-most extremity of its range.

Current and Historical Range/Distribution-Idaho and Oregon (Owyhee subpopulation)

Prior to 1995, only six historical sites were known in the Owyhee Mountain range in Idaho (Munger et al. 1996, pp. 2-3, 16) and only 22 sites were known in southeastern Oregon in Malheur County (Munger et al. 1998, pp. 6-7). Currently, Columbia spotted frogs appear to be widely distributed throughout southwestern Idaho (Owyhee County) and eastern Oregon, but local populations within this general area appear to be isolated from each other by either natural or human-induced habitat disruptions (Smyth 2004, pp. 3-7; Bull 2005, pp. 2-3; Engle 2006, p. 20; Moser and Patton 2006, p. 7). In eastern Oregon, the historic and current range of Columbia spotted frogs included the Blue and Wallowa Mountains in Wallowa, Umatilla, Grant, Baker and Union Counties (Bull 2005, pp. 2-3) and the Owyhee and Steens Mountains in Harney and Malheur Counties (Munger et al. 1998, pp. 3-4; Smyth 2004, pp. 3-7).

Population Estimates/Status

Status-Nevada: Declines of Columbia spotted frog populations in Nevada have been recorded since 1962 when it was observed that in many Elko County localities where Columbia spotted frogs were once numerous, the species was nearly extirpated (Turner 1962, pp. 326-327). Extensive loss of habitat was found to have occurred from conversion of wetland habitats to irrigated pasture and from spring and stream dewatering by mining and irrigation practices. In addition, there was evidence of extensive impacts on riparian habitats due to intensive livestock grazing. Researchers in Nevada have documented the loss of historically occupied sites, reduced numbers of individuals within local populations, and declines in the reproduction of those individuals (Turner 1962, pp. 326-327; Hovingh 1990, p. 6; Reaser 1997, pp. 30-33; Hatch et al. 2002, pp. 47-50; Wente et al. 2005, p. 99). Between 1994 and 1996, Reaser (1997, pp. 30-31) resurveyed 41 (45 percent) of 91 previously occupied sites identified between 1912 and 1992. Of the 41 previously occupied sites visited, 14 (34 percent) were still occupied while 27 (66 percent) were unoccupied (Reaser 1997, pp. 30-31).

Between 2002 and 2006, Forest Service crews resurveyed previously surveyed sites that were identified during the 1993-1998 efforts by Reaser (1997, pp. 30- 33) and others (Amy 2003, pp. 1-6). Of the 625 sites visited, Columbia spotted frogs were present at 136 sites (22 percent) and were not detected at the remaining 489 sites (78 percent) (Amy 2003, p. 2; 2004, p. 2; Meneks 2005a, p. 3; 2005b, p. 5; 2006, p. 7). From 2003 to 2006, NDOW also conducted presence/absence surveys at numerous historic sites on BLM and Forest Service lands and found frogs in 10 different watersheds (NDOW 2003c, p. 3; 2004a, p. 3; 2005, p. 3; 2006, p. 3). From 2004 to 2006, Forest Service crews also reported their presence/absence data in terms of watersheds, and found Columbia spotted frogs in 10 different watersheds (Meneks 2005a, p.3; 2005b, p. 5; 2006, p. 7). Four of the 10 watersheds in which Columbia spotted frogs were found by NDOW and the Forest Service were duplicative. Thus, from 2003 to 2006, Columbia spotted frogs were detected at numerous sites within 16 different watersheds on Forest Service managed lands located within the Ruby Mountains and Jarbidge-Independence Range. Additionally, presence/absence surveys were conducted by the USFWS and Tribal members for the first time on the Nevada portion of the Duck Valley Shoshone-Paiute Reservation (Independence Range) during 2004 and 2005, where the species was found in 7 out of 16 locations surveyed (USFWS, unpubl. data).

In 2004, the Forest Service initiated an intensive mark-recapture survey at two sites, Green Mountain Creek (Ruby Mountains) and Tennessee Gulch (Independence Range); a third site was added in 2005, Pole Creek (Jarbidge Range). This was an effort to determine population estimates, mortality, juvenile-to-adult recruitment, movement, and habitat preference (Meneks 2005a, pp. 1-3). Between 2004 and 2006, a total of 1,034 frogs were captured from all three sites, 763 of which were marked using Passive Integrated Transponder (PIT) tags (Meneks 2005a, pp. 2-3; 2005b, pp. 2-5, 2006, pp. 2-6). In 2006, the number of adult frogs captured at the Green Mountain site increased substantially (n=20 in 2005, n=57 in 2006); however, juvenile numbers declined dramatically (n=65 in 2005, n=5 in 2006) (Meneks 2006, pp. 2-3). Adult numbers captured at Tennessee Gulch in 2005 and 2006 were the same (n=139) and were three times greater than the number captured during the 2004 survey (n=41), while juvenile numbers were similar for the 3 years surveyed (n=29, 39, and 24 respectively) (Meneks 2006, pp. 3-4). The number of adult frogs captured at the Pole Creek site increased in 2006 (n=193) compared to 2005 (n=153); however, juvenile numbers decreased significantly (n=5 in 2006, n=72 in 2005) (Meneks 2006, pp. 4-6).

During the summers of 2000 and 2001, mark-recapture surveys of the Toiyabe Mountains subpopulation were conducted by the University of Nevada, Reno. Preliminary estimates of frog numbers in the Indian Valley Creek drainage were approximately 5,000 breeding individuals, which was greater than previously believed (Hatch, et al. 2002, p. 3). However, during the 2000-2001 winter, Hatch et al. (2002, p. 23) noted a large population decrease, ranging between 66 and 86.5 percent at several sites. Survey results suggest poor winter habitat contributed to the winterkill (Hatch et al. 2002, pp. 25-27). A large mark-recapture study using PIT tags was initiated for the Toiyabe Mountains subpopulation in 2004 and has continued annually. Results from the 2006 monitoring are discussed below (NDOW 2007a, pp. 3-5). Total adult frog captures increased moderately at most monitoring sites compared to 2005 and 2004 data. Total recaptures in 2006 were similar to the 2004 and 2005 survey data. Juvenile frogs counts in 2006 (n=271) were up substantially from the 2004 (n=71) and 2005 (n=90) surveys. A cumulative population estimate of 312 adult frogs was generated for the seven Sentinel Site locations combined in 2006, compared to 261 adult frogs in 2005.

The lack of standardized and/or extensive monitoring and routine surveying has prevented dependable determinations of frog population numbers or trends across Nevada. However, since the signing of a conservation agreement and strategy (CAS) in 2003 (NDOW 2003a, b), standardized protocols and consistent monitoring are taking place in both the Northeast (Jarbidge-Independence Range and Ruby Mountains) and Toiyabe Mountains subpopulations.

Status-Idaho: Extensive surveys since 1996 throughout southwestern Idaho have increased the number of known spotted frog sites. However, most of these surveys suggest the sites support small numbers of frogs. Additionally, all known local populations in southwestern Idaho appear to be functionally isolated (Engle 2001, p. 3; Engle and Munger 2003, pp. 3-11). Surveys conducted in 2001 reported of the 49 known local populations in southwestern Idaho, 61 percent had 5 or fewer adult frogs (Engle 2002, p. 3). The largest known local population of Columbia spotted frogs occurs at Sam Noble Springs in the Rock Creek drainage of Owyhee County. Monitoring of the adult frog population has occurred annually since 1998 and no more than 150 adult frogs have been captured in any one year (Moser and Patton 2006, p. 8). Extensive monitoring at sentinel sites between 2000 and 2002 indicated a 36 percent decline in the number of adult Columbia spotted frogs encountered (Lingo and Munger 2003, p. 26). The overall population at one sentinel site, Stoneman Creek, has increased partially due to habitat improvements (Munger and Oelrich 2006, p. 8). Continued annual monitoring at sentinel sites is needed to understand population fluctuations and to document trends. Boise State University has several ongoing research projects related to spotted frogs including the reintroduction of beaver for spotted frog habitat restoration (Munger and Lingo 2003, pp. 1-6), effects of grazing (Howard and Munger 2003, pp. 9-13), spotted frog habitat evaluations (Munger 2003, pp. 4-12), and sentinel site surveys (Lingo and Munger 2003, pp. 1-69; Blankinship and Munger 2005, pp. 1-65; Munger and Oelrich 2006, pp. 1-19).

Status-Oregon: In southeastern Oregon, surveys conducted in 1997 reconfirmed a population of Columbia spotted frogs in the Dry Creek drainage in Malheur County (Munger et al. 1998, pp. 3-4). Detailed population estimates using PIT tags have occurred in Dry Creek since 2001 (Engle 2006, pp. 1-57). Results from these efforts suggest a fairly large reproducing population exists in this area (Engle 2006, p. 20). Presence/absence monitoring is occurring in the Steens Mountains area, Harney County, in which small isolated populations of Columbia spotted frogs are being located (Smyth 2004, pp. 3-7). Monitoring (since 1998) of Columbia spotted frogs in northeastern Oregon indicates relatively stable, small local populations (Pearl 2000, pp. 1-9). Additionally, Bull (2005, p. 3) reported a healthy metapopulation among six populations in northeastern Oregon.

Between 2000 and 2003, the USGS compared current regional distributions of amphibians with occurrence patterns suggested in historical data (Adams et al. 2006, pp. 1-21). Visual encounter surveys were used to determine presence/absence of Columbia spotted frogs on public lands in eastern Oregon and northern Nevada. Based on occupancy models, USGS estimated that Columbia spotted frogs occupied 53 percent of the 30 historical sites in the area surveyed (Wente et al. 2005, p. 99). Six of 16 potential sites were occupied between 2000 and 2003 (Wente et al. 2005, p. 99). Additionally, 187 sites were randomly selected for presence/absence surveys of which only three sites were occupied; however, variability in occupancy between the 3 years was problematic (Wente et al. 2005, pp. 99-106).

In summary, monitoring efforts are being implemented throughout the range of the Columbia spotted frog in Idaho, Nevada, and Oregon; however, lack of consistency in survey protocols and monitoring efforts make it difficult to understand the status of the species across its range. Furthermore, deciphering historical data collected throughout the 1900's and comparing it to current occupancy rates has been problematic. A range-wide effort to determine historical and current occupancy is needed to better track the status of this species.

DISTINCT POPULATION SEGMENT (DPS)

Under the Act, we must consider for listing any species, subspecies, or, for vertebrates, DPSs of these taxa, if information is sufficient to indicate that such action may be warranted. To implement the measures prescribed by the Act and its Congressional guidance, we, along with the National Oceanic and Atmospheric Administration (NOAA) Fisheries, developed policy to clarify our interpretation of the phrase "distinct population segment of any species of vertebrate fish or wildlife" for the purposes of listing, delisting, and reclassifying species under the Act (61 FR 4722; February 7, 1996). The policy allowed us to interpret the requirement of the Act to "…determine whether any species is an endangered species or a threatened species" (section 4(a)(1)) in a clear and consistent fashion for the term "distinct population segment." Under our DPS policy, we consider three elements in a decision regarding the status of a possible DPS as endangered or threatened under the Act. These are applied similarly for addition to the lists of endangered and threatened wildlife and plants, for reclassification, and for removal. The elements are: (1) the population segment=s discreteness from the remainder of the species to which it belongs; (2) the population segment=s significance to the species to which it belongs; and (3) the population segment=s conservation status in relation to the Act=s standards for listing (i.e., when treated as if it were a species, is the population segment endangered or threatened?). Our policy further recognizes it may be appropriate to assign different classifications to different DPSs of the same vertebrate taxon (61 FR 4722).

Discreteness

The DPS policy standard for discreteness allows an entity given DPS status under the Act to be adequately defined and described in some way that distinguishes it from other representatives of its species. A population segment of a vertebrate species may be considered discrete if it satisfies either one of the following two 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); or (2) it is delimited by international governmental boundaries within which significant differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist.

Columbia spotted frogs in the Nevada, southwestern Idaho, and southeastern Oregon portion of the Great Basin are geographically separate from the remainder of the species. Within this portion of the range, there are four subpopulations. The largest of Nevada's three subpopulation areas is the Jarbidge-Independence Range in Elko and Eureka Counties. This subpopulation area is formed by the headwaters of streams in two major hydrographic basins. The South Fork Owyhee River, Owyhee River, Bruneau River, and Salmon Falls Creek drainages flow north into the Snake River basin. Mary's River, North Fork of the Humboldt River, and Maggie Creek drain into the interior Humboldt River basin. A smaller subpopulation of Columbia spotted frogs is located in the Ruby Mountains about 50 miles south of the Jarbidge-Independence Range subpopulation. However, these two subpopulations are isolated by lack of suitable habitat and hydrologic connectivity. The Toiyabe Mountains subpopulation is isolated nearly 200 miles southeast of the Ruby Mountains and Jarbidge-Independence Range subpopulations and represents the southern-most extremity of its range. The Owyhee subpopulation of Columbia spotted frogs appears to be widely distributed throughout southwestern Idaho (mainly in Owyhee County) and southeastern Oregon (Malheur and Harney Counties), but local populations within this general area are small and appear to be isolated from each other and from subpopulations in northeastern Nevada by either natural or human-induced habitat disruptions.

All of these Great Basin subpopulations are geographically isolated and separate from the main continuous population of Columbia spotted frogs in the central mountains of Idaho and northeastern Oregon by the Snake River Plain and adjacent lowlands in eastern Oregon. The Owyhee subpopulation is approximately 100 miles from the main continuous population in central Idaho. Occupied habitat in the main population is characterized by conifer forests and high elevation lake environments while habitat for the Great Basin population is characterized by sagebrush with stream and pond environments. Furthermore, the Great Basin population is both hydrologically and geographically separated from isolated populations in Utah. The subpopulation in the Ruby Mountains (Lahontan Basin) is approximately 90 miles from the West Desert population (Bonneville Basin) near Ibapah, Utah. As detailed below, geographic isolation of the Great Basin population is supported by genetic analyses.

The strongest genetic evidence that Great Basin frogs are genetically discrete from other Columbia spotted frogs comes from Bos and Sites (2001, pp. 1,505-1,511) who examined mitochondrial DNA (mtDNA) sequence variation. These data indicate that the frogs sampled in Nevada do not share mtDNA haplotypes (DNA sequences) with the remainder of the frogs sampled. Frogs sampled in Nevada clustered together on phylogenetic trees (which indicate relationships among populations or groups) which were constructed using two different methods (maximum parsimony and maximum likelihood) (Avise 1994, pp. 122-123). The Nevada branch of the phylogenetic tree is strongly supported statistically (with bootstrap probability of 100 percent). Bootstrapping is a method of statistically testing the significance of particular patterns; it involves resampling (with replacement) from the existing data sets and then reassessing the frequency with which particular groups appear in trees generated from the resampled data (Felsenstein 1985, pp. 784-785). This means that 100 percent of the trees generated from the resampled data had the same configuration. A bootstrap probability of 70 percent is the normal criterion for statistical significance in the systematic literature (Hillis and Bull 1993, p. 187). Therefore, the 100 percent bootstrap probability indicates the sampled Nevada frogs are distinct relative to Columbia spotted frogs sampled from other portions of the range. The weakness of this study with respect to evaluation of Great Basin Columbia spotted frogs is that samples were not collected from southwest Idaho or southeast Oregon. These areas are considered to be part of the Great Basin population. Because these areas were not sampled in the study, it is unknown whether or not these areas would cluster with the Nevada samples indicated by mtDNA.

An earlier genetic study using allozymes included samples from one site in southwestern Idaho as well as Nevada. In this study, samples from Nevada and southwestern Idaho were related to samples from Anthony Lake, Oregon (Green et al. 1996, p. 383). Although differences between these samples and others throughout the range were not as striking as the differences indicated by the mtDNA study of Bos and Sites (2001, pp. 1,505-1,511) (i.e., they were primarily differences in frequency of alleles (types) present versus differences in which alleles were present), they suggest that there is some genetic similarity of frogs in southwestern Idaho with those in Nevada. Because the distribution of distinct subpopulations within the Great Basin DPS is still unresolved due to sparse sampling in eastern Oregon and southern Idaho, USGS has initiated a genetic evaluation of the Great Basin DPS (USGS 2006, pp. 1-3). Objectives of the study include: 1) determine the distribution of distinct subpopulations within the Great Basin DPS; 2) determine whether Columbia spotted frog populations from southeastern Oregon and southern Idaho are part of the Great Basin DPS; 3) determine whether Columbia spotted frog populations from northeastern Oregon are part of the Great Basin DPS or instead, part of the large, contiguous portion of the species' range in the northern Rocky Mountains; and 4) examine population genetic structure and status in the Great Basin DPS of Columbia spotted frog. Results are expected in 2008.

Significance

Under our DPS policy, once we have determined that a population segment is discrete, we consider its biological and ecological significance to the larger taxon to which it belongs. This consideration may include, but is not limited to, evidence of the persistence of the discrete population segment in an ecological setting that is unique for the taxon; evidence that loss of the population segment would result in a significant gap in the range of the taxon; evidence that the population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; and evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

We have found substantial evidence that two of these significance factors are met by the Great Basin population of the Columbia spotted frog. The extinction of the Nevada, southwestern Idaho and southeastern Oregon portion of the range of the Columbia spotted frog would likely result in the loss of a significant genetic entity and the curtailment of the range of the species. Particularly, the work of Bos and Sites (2001, pp. 1,505-1,511) indicates that Columbia spotted frogs in Nevada differ genetically from Columbia spotted frogs sampled in other portions of the range to a significant degree. Additionally, loss of Columbia spotted frogs in Nevada, southwestern Idaho and southeastern Oregon would eliminate the southern extent of the species' range.

Conclusion

We evaluated the Great Basin population of Columbia spotted frogs, addressing the two elements which our policy requires us to consider in deciding whether a vertebrate population may be recognized as a DPS and considered for listing under the Act. We conclude that the Great Basin population is discrete, as per our policy, based on its geographic separation and genetic divergence from the isolated populations in Utah and the main continuous populations in central and northern Idaho, northeastern Oregon, eastern Washington, western Montana, northwestern Wyoming, southeast Alaska, and British Columbia and Alberta, Canada. We conclude that the Great Basin population of the Columbia spotted frog is significant because the loss of the species from this area would result in a significant reduction in the species' range and would constitute loss of a genetically divergent portion of the species. Because the population segment meets the discreteness and significance criteria of our DPS policy, the Great Basin population of the Columbia spotted frog constitutes a DPS which qualifies for consideration for listing.

THREATS

A. <u>The present or threatened destruction, modification, or curtailment of its habitat or range</u>.

Habitat modification and/or destruction has been implicated in the majority of amphibian declines (Bishop <u>et al</u>. 2003, pp. 209-210; Young <u>et al</u>. 2004, pp. 31-32; Bradford 2005, pp. 919, 921-922). Isolated populations of amphibians, as seen throughout the range of Columbia spotted frogs in the Great Basin, are particularly susceptible to habitat modification (Noss <u>et al</u>. 2006, p. 230). Columbia spotted frog habitat degradation and fragmentation is a combined result of past and current land use influences from agricultural development, intensive livestock grazing, spring development, urbanization, mining activities, and climate change. Small upland streams and meadows found throughout the central Great Basin are inherently unstable and have been prone to incision for at least the last 400-500 years (Germanoski and Miller 2004, p. 117). Land use activities in these sensitive areas have initiated or accelerated the incision process which has changed the hydrologic function of meadow systems (Jewett et al. 2004, pp. 152-155). These changes in the hydrology of meadows, mainly the lowering of the water table, can cause the vegetation communities to shift from wet meadow communities (Carex sp.) to dry upland plant communities (Artemisia sp.) (Chambers et al. 2004a, p. 201-205). The loss of meadow complexes limits the available habitat for Columbia spotted frogs to the incised channel which may cause a crowding effect (Noss et al. 2006, p. 223). Natural fluctuations in environmental conditions (i.e., drought) tend to magnify the detrimental effects of land use activities, just as the land use activities may compound the detrimental effects of natural environmental events (Boone et al. 2003, p. 138-142).

Fragmentation of habitat may be one of the most significant barriers to Columbia spotted frog recovery and population persistence (Semlitsch 2002, pp. 620-623; Green 2003, pp. 340-341; Funk et al. 2005a, pp. 14-15). Recent studies in Idaho indicate that Columbia spotted frogs exhibit breeding site fidelity (Pilliod et al. 2002, pp. 1,853-1,859; Engle and Munger 2003, pp. 9-10). Movement of frogs from hibernation ponds to breeding ponds may be impeded by zones of unsuitable habitat which can lead to local population extinctions (Engle and Munger 2003, pp. 12-13; Funk et al. 2005a, p. 15; Funk et al. 2005b, p. 494). As movement corridors become more fragmented through loss of flows within riparian or meadow habitats, local populations will become more isolated (Bull and Hayes 2001, pp. 120-122; Pilliod et al. 2002, pp.1853-1859; Munger 2003, pp. 4-9; Engle and Munger 2003, pp. 12-13; Funk et al. 2005a, p. 15; Funk et al. 2005b, p. 494). Vegetation and surface water along movement corridors provide relief from high temperatures and arid environmental conditions, as well as protection from predators. Loss of vegetation and/or lowering of the water table as a result of the above mentioned activities can pose a significant threat to frogs moving from one area to another. Likewise, fragmentation and loss of habitat can prevent frogs from colonizing suitable sites elsewhere (Gibbs 2000, pp. 316-317; Semlitsch 2002, pp. 621-623; Funk et al. 2005b, p. 494; Pringle 2006, pp. 243-246).

Springs provide a stable, permanent source of water for frog breeding, feeding, and winter refugia (Idaho Department of Fish and Game (IDFG) et al. 1995, p. 9). Springs provide deep, protected areas which serve as hibernacula for Columbia spotted frogs in cold climates. Springs also provide protection from predation through underground openings (IDFG et al. 1995, p. 9; Patla and Peterson 1996, pp. 16-17). Most spring developments result in the installation of a pipe or box to fully capture the water source and direct water to another location such as a livestock watering trough. Loss of this permanent source of water in semi-arid ecosystems can also lead to the loss of associated riparian habitats and wetlands used by Columbia spotted frogs. Developed spring pools could be functioning as attractive nuisances for frogs, concentrating them into isolated groups, increasing the risk of disease and predation (Noss et al. 2006, p. 223). Many of the springs in southern Idaho, eastern Oregon, and Nevada have been developed for agricultural use.

According to Minshall et al. (1989, p. 118), riparian and stream ecosystems are the most threatened ecosystems in the Great Basin. Behnke and Zarn (1976, p. 5) identified livestock grazing as the greatest threat to the integrity of stream habitat in the western United States. Grazing occurs throughout the range of Columbia spotted frogs and has been cited as detrimental to Columbia spotted frog habitat (Munger et al. 1996, p. 9; Reaser 1997, pp. 37-38; Engle 2002, pp. 44-55; USFWS 2006, pp. 4-5). Though direct correlation between Columbia spotted frog declines and livestock grazing is limited, the effects of heavy grazing on riparian areas are well documented (Kauffman et al. 1983a, pp. 684-685; 1983b, pp. 686-689; Kauffman and Kreuger 1984, pp. 432-434; Schulz and Leininger 1990, pp. 297-299; Belsky et al. 1999, pp. 425-428).

Bull and Hayes (2000, pp. 292-294) found no impacts of cattle grazing on the reproductive success of Columbia spotted frogs in ponds in northeastern Oregon; however, there was high variability in their results and grazing intensity and timing was not evaluated. In contrast, Howard and Munger (2003, p. 10) found lower survival of Columbia spotted frog larvae in their high livestock waste treatment; however, the high waste treatment larvae had higher growth rates. In a behavioral study, Shovlain et al. (2005, pp. 10-12) found that a closely related species, Oregon spotted frogs (Rana pretiosa), increased their use of grazing exclosures under heavy grazing pressure while no preferences were found under a light grazing regime. Jansen and Healey (2003, pp. 211-218) found that amphibian species diversity declined and habitat condition decreased with increasing grazing intensity along a river in southeastern Australia. A 5-year study of grazing effects on populations of Columbia spotted frogs in the Wallowa Mountains of northeastern Oregon was completed in 2006 (Adams et al. 2006, p. 14); a final report is expected in 2007.

The reduction of beaver populations has been noted as an important feature in the reduction of suitable habitat for Columbia spotted frogs (Reaser 1997, p. 39). Beaver are important in the creation of small pools with slow-moving water that function as habitat for frog reproduction and create wet meadows that provide foraging habitat and protective vegetation cover (Stevens et al. 2007, pp. 6-11). Beaver trapping is still common in Idaho and harvest is unregulated in most areas (IDFG et al. 1995, p. 10). In some areas, beavers are removed because of a perceived threat to water for agriculture. As indicated above, permanent ponded waters are important in maintaining spotted frog habitats during severe drought and winter periods. Removal of beaver in 1992 and the subsequent deterioration of the dam on Stoneman Creek in Idaho is believed to be directly related to the decline of a spotted frog population there (Lingo and Munger 2003, pp. 3-6; Munger and Oelrich 2006, pp. 5-8). Intensive surveying of Stoneman Creek documented only one adult spotted frog in 2000 (Engle 2000, p. 4); however, in 2001, a beaver reintroduction project was started on Stoneman Creek and by 2002 it had one of the highest frog recruitment classes in the Owyhee subpopulation (Lingo and Munger 2003, p. 5).

The effects of mining on Great Basin Columbia spotted frogs have not been specifically studied, but the adverse effects of mining activities on water quality and quantity, other wildlife species, and amphibians in particular have been addressed in professional scientific forums (Ripley et al. 1996, pp. 49-111; Lefcort et al. 1998, p. 449-452; Burkhart et al. 2003, pp. 111-128; Unrine et al. 2004, pp. 2,966-2,969; Bridges and Semlitsch 2005, pp. 89-92). Up until 2001, Nevada had the second highest level of atmospheric mercury releases in the nation (Miller 2004, p. 1). According to Toxic Release Inventory (TRI) data from the Environmental Protection Agency (EPA), major precious metal mining facilities in Nevada released between 12,000 and 13,000 pounds of mercury directly into the atmosphere from 1998 to 2001 (Higgins et al. 2007, p. 3), the majority of which came from the gold mining industry (EPA 2006, pp. 1-4). Additionally, a recent advisory was issued by the Nevada State Health Division that recommends limiting consumption of fish from six northern Nevada waters due to elevated methylmercury levels (Nevada State Health Division 2007, pp. 1-2). Further understanding of how mining activities affects Columbia spotted frogs is needed.

In summary, current land uses continue to negatively alter or destroy important habitat throughout the range of the Columbia spotted frog which further fragments populations making them more susceptible to extinction (Wilcox et al. 2006, pp. 857-862). Recent advisories pertaining to mercury contamination indicate an increasing risk to populations of Columbia spotted frogs downwind of large mining areas in northeastern Nevada. Based on our evaluation of on-going land use activities described above, we conclude there is sufficient information to develop a proposed listing rule for this species due to the present or threatened destruction, modification, or curtailment of its habitat and range.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

We have no information to support that overutilization is a threat to Great Basin Columbia spotted frogs at this time.

C. Disease or predation.

Predation by fishes is likely an important threat to Columbia spotted frogs. The introduction of nonnative salmonid and Centrarchid (e.g., bass) species for recreational fishing have negatively affected frog species throughout the United States, including Columbia spotted frogs (Pilliod and Peterson 2001, pp. 326-331). The negative effects of predation of this kind are difficult to document, particularly in stream systems. However, significant negative effects of predation on frog populations in lentic systems have been documented (Knapp and Matthews 2000, pp. 433-435; Pilliod and Peterson 2001, pp. 326-331; Dunham et al. 2004, pp. 19-20; Bradford 2005, pp. 919-924; Knapp 2005, pp. 270-275). In the western United States, Schade et al. (2005, pp. 1,390-1,393) reported one of every four individual fish in streams are non-native, with brook trout being the most common and abundant non-native fish found in their study. To date, no state fish and game agencies have altered fish stocking rates or locations in order to benefit Columbia spotted frogs.

The bull frog (Rana catesbeiana), a nonnative ranid species, occurs within the range of the spotted frog in the Great Basin. Bullfrogs are known to compete with and prey on other frog species (Moyle 1973, pp. 19-21; Pearl et al. 2004, pp. 16-18; Monello et al. 2006, pp. 406). They rarely co-occur with Columbia spotted frogs (one known site in Nevada), but whether this is an artifact of competitive exclusion or predation is unknown at this time. Bullfrogs are important vectors for spreading many types of diseases and parasites to healthy populations of native amphibians (Johnson and Lunde 2005, p. 130).

Although a diversity of microbial species is naturally associated with amphibians, it is generally accepted that they are rarely pathogenic to amphibians except under stressful environmental conditions. Chytridiomycosis (chytrid) is an emerging panzootic fungal disease in the United States and globally (Blaustein et al. 2005, pp. 1,464-1,465; Briggs et al. 2005, pp. 3,156-3,158; Ouellet et al. 2005, pp. 1,433-1,438; Rachowicz et al. 2006, pp. 1,676-1,682; Pounds et al. 2006, pp. 161-167; Pearl et al. 2007b, pp. 146-148). Clinical signs of amphibian chytrid and diagnosis are described by Daszak et al. (1999, p. 737) which include abnormal posture, lethargy, loss of righting reflexes, skin sloughing, ulcers, and hemorrhaging. Diagnosis is by identification of characteristic intracellular flask-shaped sporangia and septate thalli within the epidermis (Daszak et al. 1999, p. 737). Chytrid can be identified in some species of frogs by examining the oral discs of tadpoles which may be abnormally formed or lacking pigment (Fellers et al. 2001, pp. 946-947).

Chytrid was confirmed in the Circle Pond site, Idaho, where long term monitoring since 1998 has indicated a general decline in the population (Engle 2002, p.15). Sites in both northeast and southeast Oregon have also tested positive for chytrid (Bull 2006, pp. 3-4; Engle 2006, p. 16). Protocols to prevent further spread of the disease by researchers were instituted in 2001. Chytrid has also been found in the Wasatch Columbia spotted frog distinct population segment in Utah (Wilson et al. 2005, pp. 2-3, Semon et al. 2005, pp. 11-12). Chytrid has not been found in Nevada populations of Columbia spotted frogs; however, chytrid has been found in a bullfrog population near Beatty, Nevada (USGS 2005, p. 1). Some evidence suggests that Columbia spotted frogs produce antimicrobial peptides in the skin which may inhibit chytrid infection (Rollins-Smith et al. 2002, pp. 473-476); however, further understanding of how chytrid affects Columbia spotted frogs is needed.

Malformations found in amphibian populations can be caused by several different factors including pesticides, high ultraviolet-B (UV-B) radiation exposure, and parasites and pathogens (Carey et al. 2003, pp. 194-197; Sutherland 2005, pp. 109-123; Johnson and Lunde 2005, pp. 125-138). To date, pesticides have not been implicated in Columbia spotted frog declines; UV-B radiation is discussed further below. Malformed individuals have higher mortality rates than non-malformed individuals. The larvae of the trematode Ribeiroia ondatrae has been associated with higher than normal levels of malformations in populations of several species of amphibians including Columbia spotted frogs (Johnson et al. 2002, pp. 155-162). The life cycle of R. ondatrae includes three hosts, snails of the genus Planorbella, amphibians and/or fish, and finally a bird or mammal (Johnson and Lunde 2005, p. 126). In a recent study covering five different western states, the presence and abundance of Planorbella snails was the only variable related to the presence and abundance of R. ondatrae (Johnson et al. 2002, pp. 160-161). Planorbella snails were more associated with wetlands of human origin and higher orthophosphate levels (Johnson et al. 2002, pp. 160-161; Johnson and Lunde 2005, pp. 133-135). Additionally, two of the four Planorbella snail species were recorded at sites beyond their previously known ranges (Johnson et al. 2002, p. 161), indicating that this could be an expanding threat to amphibians including Columbia spotted frogs.

In summary, nonnative fish (i.e., salmonids or bass) and amphibian (bullfrog) predators occur throughout the range of Columbia spotted frogs. These predators can eliminate or reduce populations or restrict movement of individuals thus, increasing fragmentation and not allowing metapopulation dynamics to occur. Nonnative fish and amphibians can also be vectors for parasites or pathogens (i.e., chytrid fungus) which may increase deformities and can increase mortality rates. Based on our evaluation of predation and disease described above, we conclude there is sufficient information to develop a proposed listing rule for this species.

D. The inadequacy of existing regulatory mechanisms.

Spotted frog occurrence sites and potential habitats occur on public, tribal, State, and private lands. This species is included on the Forest Service sensitive species list; as such, its management must be considered during forest planning processes. The Forest Service must develop and implement management practices to ensure that species on the sensitive species list do not become threatened or endangered because of Forest Service actions. Management objectives must be met in cooperation with the states when projects on National Forest System lands may have a significant effect on sensitive species population numbers or distributions. Furthermore, for Federal candidate species, management objectives must be implemented in cooperation with the USFWS.

BLM policies direct management to consider candidate species on public lands under their jurisdiction. Consistent with existing laws, the BLM shall implement management plans that conserve candidate species and their habitats and shall ensure that actions authorized, funded, or carried out by the BLM do not contribute to the need for the species to become listed. Specifically, BLM policy requires the development, cooperation with, and implementation of range-wide or site-specific management plans, conservation strategies, and assessments for candidate species that include specific habitat and population management objectives designed for conservation, as well as management strategies necessary to meet those objectives. The BLM should request technical assistance from the USFWS, and other qualified sources, on any planned action that may contribute to the need to list a candidate species as threatened or endangered.

Tribal governments within the Great Basin with Columbia spotted frogs do not have regulatory or protective mechanisms in place to protect spotted frogs. The status of local populations of Columbia spotted frogs on Yomba-Shoshone or Duck Valley Shoshone-Paiute Reservation tribal lands is generally unknown.

Columbia spotted frog is classified as a protected amphibian by the State of Nevada under Nevada Administrative Code (NAC) 503.075(3)(a). Per NAC 503.090(1) there is no open season on those species of…amphibian classified as protected. Per NAC 503.093 a person shall not hunt or take any wildlife which is classified as protected, or possess any part thereof, without first obtaining the appropriate license, permit or written authorization from the NDOW. NAC 503.094 authorizes issuance of permits for the take and possession of any species of wildlife for strictly scientific or educational purposes. All Idaho reptiles and amphibians (except bullfrog) are classified as protected nongame species. Protected nongame species status makes it illegal to collect, harm, or otherwise remove from its natural habitat. This designation is held at the State level to help protect populations. Even though amphibians and reptiles are difficult to maintain in captivity, the rule does allow up to four native amphibians and reptiles of a given species to be captured and held in captivity by holders of a valid Idaho hunting license. Columbia spotted frogs are not on the nongame protected wildlife list for the State of Oregon (635-044-0130). As an indication of its status in the State of Oregon, NatureServe (2006) classifies it as imperiled and vulnerable to extirpation and extinction in the state. All three states include Columbia spotted frogs in their State Wildlife Action Plans as a species of conservation concern (IDFG 2005, p. 71; NDOW 2006b, pp. 328-329; Oregon Department of Fish and Wildlife 2006, p.337).

Protection of wetland habitat from loss of water to irrigation or spring development is difficult because most water in the Great Basin has been allocated to water right applicants based on historical use and spring development has already occurred within much of the known habitat of Columbia spotted frogs. Federal lands may have water rights that are approved for wildlife use, but these rights are often superseded by historic rights upstream or downstream that do not provide for minimum flows. Also, most public lands are managed for multiple use and are subject to livestock grazing, silviculture activities, and recreation uses that may be incompatible with spotted frog conservation without adequate mitigation measures.

The threatened Lahontan cutthroat trout (Oncorhynchus clarkii henshawi) (LCT) historically occurred throughout the Nevada portion of Columbia spotted frog's range and their distribution still overlaps in some watersheds. The distribution of threatened bull trout (Salvelinus confluentus) (Jarbidge River DPS) in northeastern Nevada and southwestern Idaho and the Columbia River DPS in northeastern Oregon overlap Columbia spotted frog habitat. Additionally, threatened anadromous fish species including, steelhead (O. mykiss) (Middle Columbia River Evolutionary Significant Unit (ESU) and Snake River ESU) and Chinook salmon (O. tshawytscha) (spring/summer Snake River ESU) occur in northeastern Oregon with spotted frogs. Some recovery efforts and regulatory protection measures for these threatened salmonid species should benefit Columbia spotted frogs in some riverine environments where their habitats overlap.

Lands administered by the Forest Service and BLM are interspersed and surrounded by private parcels on which intensive grazing management, irrigation (diversions), agriculture, and mining activities likely typify the land-use practices. There are generally fewer regulatory mechanisms to address activities on private lands. Grazing of interspersed and surrounding private lands could exacerbate the adverse effects of actions on public lands to Columbia spotted frogs, as described previously. Irrigation, agriculture, and mining practices could dewater streams, create migration barriers, or negatively affect water quality. Ongoing or reasonably foreseeable future activities on private lands within the range of Columbia spotted frogs will continue to affect Columbia spotted frogs and their habitat but the extent of that impact is unknown at this time.

In summary, regulatory mechanisms exist for the Columbia spotted frog; however, consistency in applying these mechanisms is unclear. Although all three states include Columbia spotted frog in their State Action Plans as a species of conservation concern, Idaho and Oregon still allow some level of take. Nevada does not allow take of the species without a permit; however, enforcement is lacking. Federal agency policy requires that management activities do not lead to a trend to list candidate species as threatened or endangered. While policies exist to protect Columbia spotted frogs and their habitat on public lands, there is no mechanism to show the effectiveness of these policies. Other federally listed species occur within the range of Columbia spotted frogs; however, the extent of this overlap and its effectiveness in protecting Columbia spotted frogs and their habitat is unknown. Private lands could be very important to the conservation of Columbia spotted frogs due to their frequent locations on or near waterways, but protective measures for the species in these areas are generally lacking. Based on our evaluation of the inadequacy of existing regulatory mechanisms described above, we conclude there is sufficient information to develop a proposed listing rule for this species.

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

Increases in ultraviolet-B (UV-B) radiation from depletion of stratospheric ozone have been suggested as a possible threat to amphibian populations (Blaustein et al. 1997, pp. 13,735-13,736; Adams et al. 2005, pp. 493-498; Blaustein and Belden 2005, pp. 87-88). UV-B mainly decreases egg survivorship and increases deformities in developing metamorphs (Blaustein et al. 1997, pp. 13,735-13,736). Columbia spotted frogs are a species that could be susceptible to increases in UV-B radiation because they are a basking species and lay their eggs in shallow water. However, Blaustein et al. (1999, pp. 1,102-1,104) found that Columbia spotted frogs in the embryonic stage were resistant to UV-B because of high levels of photolyase. Additionally, Adams et al. (2005, p. 497) found ambiguous results on the effects of UV-B on Columbia spotted frogs and suggested that the relationship between UV-B and Columbia spotted frogs be investigated further.

Past climate scenarios have shaped Great Basin ecosystems (Tausch et al. 2004, pp. 24-40). Great Basin ecosystems and their associated riparian areas are expected to be highly sensitive to any future changes in climate (Sala et al. 2000, pp. 1,772-1,773; Fleishman et al. 2004, pp. 248-251). Ecological consequences of climate change may include changes in population dynamics, timing of reproduction, changing geographic range, and more broad community and ecosystem level changes (Hansen et al. 2001, pp. 766-773; McCarty 2001, pp. 321-325). Amphibians are sensitive to changes in precipitation and temperature which may increase the risk of extinction for this group of organisms (Boone et al. 2003, pp. 131-136; Corn 2005, pp. 59-64; Noss et al. 2006, p. 236).

The frequency, duration, and magnitude of extreme weather events such as drought are also expected to occur which increases the risk of extinction (Tausch et al. 2004, p. 25; Corn 2005, p. 64; Wilcox et al. 2006, pp. 857-862). In addition, changing climate has affected summer temperatures and the timing of spring snowmelt which has contributed to increasing the length of the wildfire season, wildfire frequency, and the size of wildfires (McKenzie et al. 2004, pp. 893-899; Westerling et al. 2006, pp. 941-942). Direct mortality of amphibians due to fire is thought to be rare and of minor importance to most populations (Russell et al. 1999, pp. 374-379; Smith 2000, pp. 20, 29-30; Pilliod et al. 2003, pp. 165-175), however, few studies have documented fire effects to aquatic amphibians in the western United States (Bury 2004, pp. 970-973). Most negative effects to aquatic species after wildfire are due to the immediate loss or alteration of habitat and indirect effects such as post-fire hydrologic events (Gresswell 1999, pp. 199-211).

Many of the threats discussed above do not act alone. Multiple stressors can alter the effects of other stressors or act synergistically to affect individuals and populations (Boone et al. 2003, pp. 138-143; Westerman et al. 2003, pp. 90-91; Blaustein and Bancroft, p. 441). For example, Kiesecker and Blaustein (1995, pp. 11,050-11,051) describe how UV-B acts with a pathogen to increase embryonic mortality above levels shown with either factor alone. Interactions between current land uses and changing climate conditions are expected to cause shifts in populations, communities, and ecosystems (Hansen et al. 2001, p. 767). Additionally, chemicals may exist in the environment at sub-lethal levels; however, UV light may increase the toxicity of these chemicals or may increase an individual’s susceptibility to disease or predation (Boone et al. 2003, pp. 138-142; Burkhart et al. 2003, pp. 116-120).

In summary, climate change has and is expected to continue to affect Great Basin ecosystems; however, predictions are difficult to make (Fleishman et al. 2004, pp. 248-251; Botkin et al. 2007, pp. 227-234). Corn (2005, pp. 59-64) describes many consequences of a changing climate to amphibian species. The effects of multiple stressors such as climate change, habitat destruction, and disease needs further research. The current state of small fragmented populations of Columbia spotted frogs in the Great Basin indicates a high probability of populations disappearing (Wilcox et al. 2006, pp. 857-862). Protecting or improving Columbia spotted frog populations and their habitat so that they can adapt to expected changes in climate may be the most important conservation action (Chambers et al. 2004b, pp. 266-268). Based on our evaluation of other natural or manmade factors affecting its continued existence described above, we conclude there is sufficient information to develop a proposed listing rule for this species.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

A 10-year CAS was signed in September 2003 (NDOW 2003a, pp. 1-43; 2003b, pp. 1-55) for both the Northeast (Jarbidge-Independence Range and Ruby Mountains) and the Toiyabe Mountains subpopulations in Nevada. Additionally, a Candidate Conservation Agreement with Assurances was completed in 2006 for the Owyhee subpopulation at Sam Noble Springs, Idaho (USFWS 2006, pp. 1-45). At the end of 2006, 14 percent of the identified tasks listed in the Northeast CAS have been completed and an additional 57 percent of the tasks have been initiated at some level (NDOW 2007b, p. 7). At the end of 2006, 22 percent of the identified tasks listed in the Toiyabe Mountains CAS have been completed and an additional 66 percent of the tasks have been initiated at some level (NDOW 2007a, p. 6). Implementing the CASs is formulating future conservation actions aimed at alleviating threats to the species. For example, adequate habitat was identified as a limiting factor in the Toiyabe Mountains subpopulation. A habitat enhancement project was completed in the fall of 2004 which included the construction or augmentation of 22 ponds in Indian Valley Creek (NDOW 2004b, pp. 4-6). Effectiveness monitoring of this habitat enhancement project as well as the effectiveness of the conservation agreements as a conservation tool is ongoing.

To minimize the effects of grazing on Columbia spotted frog habitat, many grazing allotment closures and grazing exclosure projects have been implemented throughout the frog’s range including Cloverdale Creek (Toiyabe Mountains subpopulation), Indian Valley Creek (Toiyabe Mountains subpopulation), Dry Creek (Owyhee subpopulation), and Sam Noble Springs (Owyhee subpopulation), as well as study sites in northeastern Oregon (Bull 2005, pp. 2, 35-36). Effectiveness monitoring of these projects is vital in determining the impacts of grazing on Columbia spotted frogs in these areas and the validity of these management actions in protecting and enhancing Columbia spotted frog habitat. Because the distribution of distinct subpopulations within the Great Basin DPS is still unresolved due to sparse sampling in eastern Oregon and southwest Idaho, USGS has initiated a genetic evaluation of the Great Basin DPS. This genetic information will provide insight on the distribution, management needs, and conservation activities for this species. Active monitoring, research, and habitat improvement projects are occurring or are being planned throughout the range of the Great Basin DPS of Columbia spotted frogs which is increasing our knowledge of life history characteristics, population fluctuations, genetics, and threats to the species.

SUMMARY OF THREATS

Small highly fragmented populations, characteristic of the majority of existing populations of Columbia spotted frogs in the Great Basin, are highly susceptible to extinction processes. Poor management of Columbia spotted frog habitat including water development, improper grazing, mining activities and non-native species have and continue to contribute to the degradation and fragmentation of habitat. Emerging fungal diseases such as chytridiomycosis and the spread of parasites are contributing factors to Columbia spotted frog population declines throughout portions of its range. Effects of climate change such as drought and stochastic events such as fire often have detrimental effects to small isolated populations and can often exacerbate existing threats. Based on our evaluation of the five listing factors affecting the continued existence of Columbia spotted frogs in the Great Basin described above, we conclude there is sufficient information to develop a proposed listing rule for this species. We find that this DPS is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

RECOMMENDED CONSERVATION MEASURES:

- Reduce threats to Columbia spotted frogs and their habitat
- Maintain, enhance, and restore populations of Columbia spotted frogs and their habitat throughout their current and historic range
- Determine genetic status of all existing populations
- Assess the abundance of Columbia spotted frogs, trends, habitat conditions, and existing and potential threats in a consistent manner throughout their range
- Conduct research that directly supports conservation and management of Columbia spotted frogs and their habitats (i.e., UV-B, chytridiomycosis, parasites, global climate change, synergistic threats, habitat enhancement)

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	**Imminent**	Monotypic genus	7
		Species	8
		Subspecies/population	**9***
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for Listing Priority Number:

<u>Magnitude:</u>
Threats to the species and its habitat such as habitat modification and fragmentation, nonnative species, inadequate regulatory mechanisms, and climate occur rangewide but at various intensities. Other threats such as disease and mining-related activities impact local populations. Thus, the overall magnitude of threats is moderate (Appendix A).

<u>Imminence:</u>
Threats to the species' habitat have occurred for over 100 years and continue to threaten the species today indicating the threats to the species are imminent (Appendix A). Climate change and its associated extreme weather conditions are occurring now and are expected in the future. Risks from mercury are continuing and may be increasing in northeast Nevada. Chytrid fungus is documented in Idaho and Oregon; however its impact to those populations is unknown. Above natural levels of malformations due to parasites have been documented in other parts of its range and may be a threat to Columbia spotted frogs in the Great Basin DPS in the future.

Rationale for Change in Listing Priority Number:

Many threats to the species occur rangewide at various intensities; however, others only occur locally indicating a moderate magnitude of threats (Appendix A). This change from high to moderate magnitude is due in part to monitoring efforts identifying and verifying the scope and intensity of threats. The majority of threats occurring in the past still continue to occur today indicating the threats are imminent. Various conservation efforts are being implemented to protect Columbia spotted frogs from the threats described previously; however, the effectiveness of these efforts has yet to be evaluated. Existing and future conservation efforts should continue and evaluation of their effectiveness should be a priority. Trends in the status of the species are difficult to analyze from a rangewide standpoint. Methods to ascertain the status rangewide should be researched and implemented.

____ Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? Yes

Is Emergency Listing Warranted? No. While most threats to the species are imminent, the threats are affecting the species at varying magnitudes and intensities. The two CASs and the development of candidate conservation agreements with assurances should provide a roadmap towards recovery. Monitoring the effectiveness of these agreements and willingness of the participants to continue implementation will remain a priority. As a candidate species, Columbia spotted frogs are afforded higher protection from Federal land management agencies.

DESCRIPTION OF MONITORING

Numerous mark-recapture and presence-absence surveys are occurring throughout the range of the Great Basin DPS of Columbia spotted frogs. Monitoring and/or research is being conducted by Brigham Young University and Boise State University, USGS, BLM, Forest Service, USFWS, IDFG, NDOW, and the Nevada Natural Heritage Program. Annual reports and research papers are obtained by the Nevada Fish and Wildlife Office and summarized for the CNOR. A rangewide Columbia spotted frog meeting (initiated in 2002) is held every 2 years to discuss various research, monitoring, and conservation activities occurring throughout the entire range of the species. The next meeting is being held in the spring of 2008 in Boise, Idaho.

Substantial effort is needed to conserve this species because it is a wide ranging species and occupies diverse habitat. Because of this, there is a need to conduct a mid-level type of monitoring effort as described in the *Amphibian Research and Monitoring Initiative* (Muths et al. 2006, pp. 1-77). Mid-level monitoring documents trends in site occupancy that may be the most useful metric for assessing changes in amphibian status (Muths et al. 2006, pp. 5-6). Mid-level monitoring was conducted by USGS in southeast Oregon from 2000 to 2003 (Wente et al. 2005, pp. 99-106; Adams et al. 2006, p. 10). This effort should be reinstituted and expanded to the entire range of Columbia spotted frogs within the Great Basin DPS. In addition to mid-level monitoring, intensive surveys being conducted in eastern Oregon, southwestern Idaho, northeast and central Nevada must continue. Like most aquatic species, amphibian populations fluctuate yearly due to climate (Corn 2005, p. 60). It is important to track population changes annually and for significant time periods to distinguish between anthropogenic effects to the species and its habitat and natural population fluctuations.

COORDINATION WITH STATES

Various Federal, State, and local agencies, and universities from all three States provided information.

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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: ______________________________________ 8/16/2007
Regional Director, Fish and Wildlife Service Date

Concur: Kenneth Stansell November 27, 2007
Acting Director, U.S. Fish and Wildlife Service Date

Do not concur: ______________________________ ___________
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review:
Conducted by: