Pseudoeurycea naucampatepetl. The Cofre de Perote salamander is endemic to the Sierra Madre Oriental of eastern Mexico. This relatively large salamander (reported to attain a total length of 150 mm) is recorded only from, “a narrow ridge extending east from Cofre de Perote and terminating [on] a small peak (Cerro Volcancillo) at the type locality,” in central Veracruz, at elevations from 2,500 to 3,000 m (Amphibian Species of the World website). *Pseudoeurycea naucampatepetl* has been assigned to the *P. bellii* complex of the *P. bellii* group (Raffaëlli 2007) and is considered most closely related to *P. gigantea*, a species endemic to the La Joya-Jalapa region of Veracruz and adjacent northeastern Hidalgo (Parra-Olea et al. 2001). This salamander is known from only five specimens and has not been seen for 20 years, despite thorough surveys in 2003 and 2004 (EDGE; www.edgeofexistence.org), and thus it might be extinct. The habitat at the type locality (pine-oak forest with abundant bunch grass) lies within Lower Montane Wet Forest (Wilson and Johnson 2010; IUCN Red List website [accessed 21 April 2013]). The known specimens were “found beneath the surface of roadside banks” (www.edgeofexistence.org) along the road to Las Lajas Microwave Station, 15 kilometers (by road) south of Highway 140 from Las Vigas, Veracruz (Amphibian Species of the World website). This species is terrestrial and presumed to reproduce by direct development.

Pseudoeurycea naucampatepetl is placed as number 89 in the top 100 Evolutionarily Distinct and Globally Endangered amphibians (EDGE; www.edgeofexistence.org). We calculated this animal’s EVS as 17, which is in the middle of the high vulnerability category (see text for explanation), and its IUCN status has been assessed as Critically Endangered. Of the 52 species in the genus *Pseudoeurycea*, all but four are endemic to Mexico (see Appendix of this paper and Acevedo et al. 2010). *Photo by James Hanken.*

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A conservation reassessment of the amphibians of Mexico based on the EVS measure

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***Abstract.*—Global amphibian population decline is one of the better documented symptoms of biodiversity loss on our planet, and one of the environmental super-problems humans have created. Most people believe that we should manage nature for our benefit, instead of understanding that we are part of the natural world and depend on it for our survival. As a consequence, humans keep unraveling Earth's life-support systems, and to reverse this trend must begin to develop a sustainable existence. Given this reality, we examine the conservation status of the 378 species of amphibians in Mexico, by using the Environmental Vulnerability Score (EVS) algorithm. We summarize and critique the IUCN Red List Assessments for these creatures, calculate their EVS, and compare the results of both conservation assessments. We also compare the EVS for Mexican amphibians with those recently reported for Mexican reptiles, and conclude that both groups are highly imperiled, especially the salamanders, lizards, and turtles. The response of humans to these global imperatives has been lackluster, even though biological scientists worldwide have called attention to the grave prospects for the survival of life on our planet. As part of the global community, Mexico must realize the effects of these developments and the rapid, comprehensive need to conserve the country's hugely significant herpetofauna. Based on this objective, we provide five broad-based recommendations.**

Key words. EVS, anurans, salamanders, caecilians, IUCN categorizations, survival prospects

***Resumen*.—La disminución global de las poblaciones de anfibios es uno de los síntomas más documentados sobre la pérdida de biodiversidad en nuestro planeta, que a su vez es uno de los superproblemas ambientales creados por los seres humanos. La mayoría de los seres humanos creemos que podemos y debemos manejar la naturaleza para nuestro propio beneficio, en lugar de comprender que somos parte y dependemos de ella misma. Como consecuencia de ello, estamos desarticulando los sistemas biológicos del planeta, y para revertir esta tendencia debemos desarrollar una existencia sostenible. Ante esta realidad, examinamos el estado de conservación de las 378 especies de anfibios mexicanos utilizando el algoritmo de Medida de Vulnerabilidad Ambiental (EVS). Resumimos y criticamos las evaluaciones de la Lista Roja para estos organismos, calculamos su EVS, y comparamos los resultados con los resultados de la categorización de la UICN. También comparamos el EVS de los anfibios mexicanos con los publicados recientemente para los reptiles de México, concluyendo que ambos grupos están en un peligro altamente significativo, principalmente las salamandras, las lagartijas y las tortugas. La respuesta humana a esta crisis global ha sido mediocre, a pesar de que la comunidad mundial de biólogos se une al llamado de atención sobre las perspectivas graves que amenazan la supervivencia de la vida en nuestro planeta. Como parte de la comunidad mundial, el país de México debe de considerar los efectos de estos cambios, y la rápida necesidad de conservar de manera integral la herpetofauna altamente significativa de este país. Basándonos en este objetivo, proporcionamos cinco recomendaciones generalizadas.**

Palabras claves. EVS, anuros, salamandras, cecilios, categorización de UICN, perspectivas de supervivencia

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How will humans react to an increased awareness that Earth's biodiversity is diminishing? What are these losses telling us about our place on the planet, our role in the biosphere? What is our role in conserving biodiversity as we become custodians of a planet that has clear limitations? And how can we pass to future generations the wisdom needed to make sound environmental decisions? The answers to these questions will tell us much about ourselves, and science will take us only part of the way along that journey.

Collins and Crump 2009: 205.

Introduction

Global amphibian population decline is a well-known environmental issue to conservation biologists and herpetologists (Collins and Crump 2009; Stuart et al. 2010). This issue, however, often does not make it onto lists of the world's most significant problems. A survey of European Union citizens conducted in the fall of 2011 identified the following problems of greatest concern: (1) poverty, hunger and lack of drinking water (28% of those surveyed); (2) climate change (20%); (3) the economic situation (16%); (4) international terrorism (11%); (5) the availability of energy (7%); (6) the increasing global population (5%); (7) the spread of infectious disease (4%); (8) armed conflict (4%); the proliferation of nuclear weapons (3%); and (10) don't know (2%).

Such surveys expose several underlying concerns. One is that amphibian population decline is not on the list, but neither is the larger issue of biodiversity decline. Another concern is that this "pick the biggest problem" approach does not acknowledge that all of these issues are intertwined and capable of creating "environmental super-problems," as explained by Bright (2000). Further, with respect to the natural world Bright (2000: 37) indicated that "we will never understand it completely, it will not do our bidding for free, and we cannot put it back the way it was." These features are characteristic of biodiversity and biodiversity decline, and indicative of how little we know about the current status of biodiversity. Mora et al. (2011) provided an estimate of the total amount of biodiversity, which they indicated at approximately 8.7 million (±1.3 million SE), with about 86% of the existing land species and 91% of the oceanic species still awaiting description. The description of new taxa is only the initial step toward understanding how the natural world works. The world will not do our bidding for free, since we cannot obtain an appreciable quantity of anything from nature without sacrificing something in the process. In transforming our planet to fill the needs of our species, we have destroyed the habitats of countless creatures (including amphibians) that also have evolved over time. We cannot reverse this damage, as evidenced by the fact that we have been unable to provide permanent solutions to any of the significant environmental problems. Such is the case with biodiversity decline, since no retreat from species extinction is possible.

Biodiversity decline is an environmental super-problem, as contributing factors include habitat modification, fragmentation, and loss, pollution and disease, over-harvesting, exotic species, and extinction (Vitt and Caldwell 2009). These problems interact to enmesh species into an extinction vortex, defined as "a downward population spiral in which inbreeding and genetic drift combine to cause a small population to shrink and, unless the spiral is reversed, to become extinct" (Campbell et al. 2008: 1251). Theoretically, this effect should significantly impact species with narrower distributions.

The extent of biodiversity decline is unknown, although most estimates indicate that we know very little about this topic. With respect to animals, we know substantially more about the diversity of vertebrates than invertebrates. Among the vertebrates subjected to a global analysis, a greater proportion of amphibians have been documented as threatened than birds or mammals (Stuart et al. 2010). Reptiles and fishes, however, remain unassessed.

The data presented in Stuart et al. (2010) essentially were the same as in Stuart (2004). The number of amphibians known globally now exceeds 7,000 (7,139; www.amphibiaweb.org [accessed 8 June 2013]), which is 24.3% greater than the one cited by Stuart et al. (2010). The description of new species of amphibians obviously is a "growth industry," and the rate of discovery does not appear to be slowing. Thus, we expect that the number of new amphibian taxa from Mexico will continue to increase.

Another major fault with assessing the "world's greatest problems" is that their causes are not identified. As noted by Wilson et al. (2013: 23), "no permanent solution to the problem of biodiversity decline (including herpetofaunal decline) will be found in Mexico (or elsewhere in the world) until humans recognize overpopulation as the major cause of degradation and loss of humankind's fellow organisms." Further, they stated (Pp. 23–24) that, "solutions will not be available until humanity begins to realize the origin, nature, and consequences of the mismatch between human worldviews and how our planet functions." Miller and Spoolman (2012: 20) defined this "planetary management worldview" as maintaining that "we are separate from and in charge of nature, that nature exists mainly to meet our needs and increasing wants, and that we can use our ingenuity and technology to manage the earth's life-support systems, mostly for our benefit, into the distant future."

Unfortunately, over the span of about 10,000 years, humans have dismantled the planet's life-support systems, and today we are living unsustainably (Miller and Spoolman 2012). So, until and unless we develop an environmentally sustainable society, no lasting, workable solutions to environmental problems will be found, including that of biodiversity decline.

Incilius pisinnus. The Michoacán toad, a state endemic, is known only from the Tepalcatepec Depression. This toad's EVS has been assessed as 15, placing it in the lower portion of the high vulnerability category, and its IUCN status as Data Deficient. This individual came from Apatzingán. *Photo by Iván Trinidad Ahumada-Carrillo.*

Craugastor hobartsmithi. The distribution of the endemic Smith's pygmy robber frog is along the southwestern portion of the Mexican Plateau, from Nayarit and Jalisco to Michoacán and the state of México. Its EVS has been determined as 15, placing it in the lower portion of the high vulnerability category, and its IUCN status as Endangered. This individual is from the Sierra de Manantlán in Jalisco. *Photo by Iván Trinidad Ahumada-Carrillo.*

Nonetheless, building a sustainable society requires steps that only a few people appear willing to take. Thus, efforts by conservation biologists to reverse biodiversity decline, including amphibian population decline, must proceed with the realization that we will only be designing short-term solutions that deal with the symptoms of the problems rather than their causes. Within this realization, we undertake the following reassessment of the conservation status of the amphibians of Mexico.

A Revised Environmental Vulnerability Measure

In conducting a conservation reassessment of Mexican reptiles, Wilson et al. (2013) revised the Environmental Vulnerability Score (EVS) from that used in various chapters of Wilson et al. (2010). Similarly, we modified the EVS measure for use with Mexican amphibians, especially by substituting the human persecution scale used for reptiles with a reproductive mode scale, as did Wilson and McCranie (2004) and other authors who used this measure with Central American amphibians (see Wilson et al. 2010).

Wilson et al. (2013) indicated that the EVS measure originally was designed for use in cases where the details of the population status of a species, upon which many of the criteria for IUCN status categorization depend, were not available, as well as to provide an estimate of the susceptibility of amphibians and reptiles to future environmental threats. The advantages for using the EVS measure are indicated below (see EVS for Mexican amphibians).

The EVS algorithm we developed for use with Mexican amphibians consists of three scales, for which the values are added to produce the Environmental Vulnerability Score. The first scale deals with geographic distribution, as follows:

1 = distribution broadly represented both inside and outside Mexico (large portions of range are both inside and outside Mexico)
2 = distribution prevalent inside Mexico, but limited outside Mexico (most of range is inside Mexico)
3 = distribution limited inside Mexico, but prevalent outside Mexico (most of range is outside Mexico)
4 = distribution limited both inside and outside Mexico (most of range is marginal to areas near border of Mexico and the United States or Central America)
5 = distribution within Mexico only, but not restricted to vicinity of type locality
6 = distribution limited to Mexico in the vicinity of type locality

The second scale deals with ecological distribution, as follows:

1 = occurs in eight or more formations
2 = occurs in seven formations
3 = occurs in six formations
4 = occurs in five formations
5 = occurs in four formations
6 = occurs in three formations
7 = occurs in two formations
8 = occurs in one formation

The third scale is concerned with the type of reproductive mode, as follows:

1 = both eggs and tadpoles in large to small bodies of lentic or lotic water
2 = eggs in foam nests, tadpoles in small bodies of lentic or lotic water
3 = tadpoles occur in small bodies of lentic or lotic water, eggs outside of water
4 = eggs laid in moist situation on land or moist arboreal situations, direct development, or viviparous
5 = eggs and tadpoles in water-retaining arboreal bromeliads or water-filled tree cavities

Once these three components are added, their EVS can range from 3 to 19. Wilson and McCranie (2004) allocated the range of scores for Honduran amphibians into three categories of vulnerability to environmental degradation, as follows: low (3–9); medium (10–13); and high (14–19). We use the same categorization.

Recent Changes to the Mexican Amphibian Fauna

Our knowledge of the composition of the Mexican amphibian fauna keeps changing due to discovery of new species and the systematic adjustment of certain known species, which adds or subtracts from the list of taxa that appeared in Wilson et al. (2010). Since that time, the following seven species have been described or resurrected:

Incilius aurarius: Mendelson et al. 2012. *Journal of Herpetology* 46: 473–479. New species.

Incilius mccoyi: Santos-Barrera and Flores Villela. 2011. *Journal of Herpetology* 45: 211–215. New species.

Craugastor saltator: Hedges et al. 2008. *Zootaxa* 1737: 1–182. Resurrected from synonymy of *C. mexicanus*.

Eleutherodactylus modestus. The endemic blunt-toed chirping frog is known from Colima and southwestern Jalisco. Its EVS has been calculated at 16, placing it in the middle portion of the high vulnerability category, and its IUCN status as Vulnerable. This individual is from the Sierra de Manantlán in Jalisco. *Photo by Iván Trinidad Ahumada-Carrillo.*

Dendropsophus sartori. The endemic Taylor's yellow treefrog is distributed along the Pacific slopes from Jalisco to Oaxaca. Its EVS has been determined as 14, at the lower end of the high vulnerability category, and its IUCN status as of Least Concern. This individual came from the Municipality of Minatitlán, Colima. *Photo by Jacobo Reyes-Velasco.*

Charadrahyla tecuani: Campbell et al. 2009. *Copeia* 2009: 287–295. New species.

Gastrophryne mazatlanensis: Streicher et al. 2012. *Molecular Phylogenetics and Evolution* 64: 645–653. Resurrected from synonymy of *G. olivacea.*

Bolitoglossa chinanteca: Rovito et al. 2012. *ZooKeys* 185: 55–71. New species.

Pseudoeurycea cafetalera: Parra-Olea et al. 2010. *Zootaxa* 2725: 57–68. New species.

This represents an increase of 2.0% over the 373 species listed by Wilson and Johnson (2010).

The following species have undergone status changes, and include some taxa discussed in the addendum to Wilson and Johnson (2010):

Diaglena spatulata: Smith et al. 2007. *Evolution* 61: 2075–2085. Transfer from genus *Triprion*.

Hypopachus ustus: Streicher et al. 2012. *Molecular Phylogenetics and Evolution* 64: 645–653. Transfer from genus *Gastrophryne*. Spelling of specific epithet corrected by Frost (2013).

Trachycephalus typhonius: Lavilla et al. 2010. *Zootaxa* 2671: 17–30. New name for *T. venulosus*.

Ixalotriton niger: Wake. 2012. *Zootaxa* 3484: 75–82. Resurrection of genus.

Ixalotriton parva: Wake. 2012. *Zootaxa* 3484: 75–82. Resurrection of genus.

IUCN Red List Assessment of Mexican Amphibians

The IUCN assessment of Mexican amphibians was conducted as part of a Mesoamerican Workshop held in 2002 at the La Selva Biological Station in Costa Rica (see foreword in Köhler 2011). The results of this workshop were incorporated into a general worldwide overview called the Global Amphibian Assessment (Stuart et al. 2004; Stuart et al. 2008; Stuart et al. 2010). This overview uncovered startling conclusions, of which the most important was that nearly one-third (32.3%) of the world's amphibian species are threatened with extinction, i.e., were assessed as Critically Endangered, Endangered, or Vulnerable. This proportion did not include 35 species considered as Extinct or Extinct in the Wild, and by adding them 1,891 of 5,743 species (32.9%) were considered as

Table 1. IUCN Red List categorizations for Mexican amphibian families.

Families	Number of species	IUCN Red List categorizations						
		Critically Endangered	Endangered	Vulnerable	Near Threatened	Least Concern	Data Deficient	Not Evaluated
Bufonidae	35	1	7	2	3	19	1	2
Centrolenidae	1	—	—	—	—	1	—	—
Craugastoridae	39	7	8	7	3	6	6	2
Eleutherodactylidae	23	2	4	7	—	4	5	1
Hylidae	97	29	18	10	4	25	8	3
Leiuperidae	1	—	—	—	—	1	—	—
Leptodactylidae	2	—	—	—	—	2	—	—
Microhylidae	6	—	—	1	—	4	—	1
Ranidae	28	4	2	5	2	12	2	1
Rhinophrynidae	1	—	—	—	—	1	—	—
Scaphiopodidae	4	—	—	—	—	2	—	2
Subtotals	237	43	39	31	12	77	22	12
Ambystomatidae	18	9	2	—	—	2	3	2
Plethodontidae	118	36	37	11	9	10	12	3
Salamandridae	1	—	1	—	—	—	—	—
Sirenidae	2	—	—	—	—	2	—	—
Subtotals	139	45	40	11	9	14	15	5
Dermophiidae	2	—	—	1	—	—	1	—
Subtotals	2	—	—	1	—	—	1	—
Totals	378	88	79	44	21	91	38	17

Smilisca dentata. The endemic upland burrowing treefrog occurs only in southwestern Aguascalientes and adjacent northern Jalisco. Its EVS has been assessed as 14, placing it at the lower end of the high vulnerability category, and its IUCN status as Endangered. This individual was found in the Municipality of Ixtlahuacán del Río, Jalisco. *Photo by Jacobo Reyes-Velasco.*

Lithobates johni. Moore's frog is an endemic anuran whose distribution is limited to southeastern San Luis Potosí, eastern Hidalgo, and northern Puebla. Its EVS has been assessed as 14, placing it at the lower end of the high vulnerability category, and its IUCN status as Endangered. This individual came from Río Claro, Municipality of Molango, Hidalgo. *Photo by Uriel Hernández-Salinas.*

threatened, near extinction, or extinct. Notably, another 1,290 species (22.5%) were evaluated as Data Deficient, i.e., too poorly known to allocate to any of the other IUCN categories. By adding these species to the previous figure of 1,891, an astonishing amount of amphibian species (3,181 [55.4%]) known at that time were considered threatened, near extinction, extinct, or too poorly known to assess. These horrific pronouncements gave rise to a worldwide cottage industry that continues to evaluate the state of amphibian population decline, as registered in a number of websites, most prominently AmphibiaWeb and the Global Amphibian Assessment.

The IUCN Red List website lists the current categorizations for the world's amphibians using the standard IUCN system. We accessed this website in order to summarize the current situation for Mexican amphibians (Table 1). The data in this table are more complete than those for reptiles, as reported by Wilson et al. (2013). All but 17 of the current 378 known Mexican amphibian species have been assigned to an IUCN category, and as for the reptiles (see Wilson et al. 2013) we placed these 17 amphibian taxa (4.5%) in a Not Evaluated (NE) category. The remaining categorizations are: Critically Endangered (CR; 88; 23.2%); Endangered (EN; 79; 20.8%); Vulnerable (VU; 44; 11.6%); Near Threatened (NT; 21; 5.5%); Least Concern (LC; 92; 24.2%); and Data Deficient (DD; 38; 10.0%). Thus, 211 species (55.7%) are placed in one of the three threat categories (CR, EN, or VU), a proportion significantly higher from that reported for these categories on a global scale (CR+EN+VU = 1,856 species, 32.3%; Stuart et al., 2010). If the DD species are added to those in the threat categories, then 249 (65.7%) are either threatened with extinction or too poorly known to allow for assessment, a proportion significantly beyond that for the global situation (CR+EN+VU+DD = 3,146 species; 54.8%; Stuart et al. 2010).

The largest proportion of threatened species are in the anuran families Craugastoridae (22 of 39 species; 56.4%), Eleutherodactylidae (13 of 24 species; 54.2%), and Hylidae (57 of 97 species; 58.8%), and the salamander families Ambystomatidae (11 of 19 species; 57.9%) and Plethodontidae (84 of 118 species; 71.2%). Collectively, the 297 species in these five families make up 78.4% of the amphibian taxa in Mexico, and the 187 threatened species in these families comprise 88.6% of the 211 total.

Table 2. Environmental Vulnerability Scores for Mexican amphibian species, arranged by family. Shaded area to left encompasses low vulnerability scores, and to the right high vulnerability scores.

Families	Number of species	Environmental Vulnerability Scores																
		3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Bufonidae	35	1	—	1	2	2	2	3	2	6	4	5	5	2	—	—	—	—
Centrolenidae	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Craugastoridae	39	—	—	—	—	—	1	1	1	1	1	4	4	10	3	5	8	—
Eleutherodactylidae	23	—	—	—	—	—	—	—	—	2	3	—	—	3	4	8	3	—
Hylidae	97	1	2	—	—	4	4	7	5	9	11	16	22	12	1	1	1	1
Leiuperidae	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Leptodactylidae	2	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Microhylidae	6	—	1	—	—	1	2	1	1	—	—	—	—	—	—	—	—	—
Ranidae	28	1	—	1	—	1	2	2	2	2	5	4	5	3	—	—	—	—
Rhinophrynidae	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Scaphiopodidae	4	1	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—
Subtotals	**237**	**4**	**3**	**3**	**4**	**9**	**12**	**14**	**13**	**20**	**25**	**29**	**36**	**30**	**8**	**14**	**12**	**1**
Subtotals %	—	**1.7**	**1.3**	**1.3**	**1.7**	**3.8**	**5.1**	**5.9**	**5.4**	**8.4**	**10.5**	**12.2**	**15.2**	**12.7**	**3.4**	**5.9**	**5.1**	**0.4**
Ambystomatidae	18	—	—	—	—	—	—	—	2	—	—	4	5	7	—	—	—	—
Plethodontidae	118	—	—	—	—	—	—	1	—	2	3	3	8	16	13	36	36	—
Salamandridae	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
Sirenidae	2	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—
Subtotals	**139**	—	—	—	—	—	—	**1**	**2**	**2**	**6**	**7**	**13**	**23**	**13**	**36**	**36**	—
Subtotals %	—	—	—	—	—	—	—	**0.7**	**1.4**	**1.4**	**4.3**	**5.0**	**9.4**	**16.6**	**9.4**	**25.9**	**25.9**	—
Dermophiidae	2	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—
Subtotals	**2**	—	—	—	—	—	—	—	—	**1**	**1**	—	—	—	—	—	—	—
Subtotals %	—	—	—	—	—	—	—	—	—	**50.0**	**50.0**	—	—	—	—	—	—	—
Totals	**378**	**4**	**3**	**3**	**4**	**9**	**12**	**15**	**15**	**23**	**32**	**36**	**49**	**53**	**21**	**50**	**48**	**1**
Totals %	—	**1.1**	**0.8**	**0.8**	**1.1**	**2.3**	**3.2**	**4.0**	**4.0**	**6.1**	**8.4**	**9.5**	**12.9**	**14.0**	**5.6**	**13.2**	**12.7**	**0.3**

Triprion petasatus. The Yucatecan casque-headed treefrog is restricted primarily to the Yucatan Peninsula, occurring in the Mexican states of Yucatán, Campeche, and Quintana Roo, as well as in northern Guatemala and northern Belize. A disjunct population also has been recorded from Santa Elena, Departamento de Cortés, Honduras. Its EVS has been calculated as 10, placing it at the lower end of the medium vulnerability category, and its IUCN status is of Least Concern. Although this treefrog is broadly distributed in the Yucatan Peninsula, it usually is found only during the rainy season when males and females congregate around restricted bodies of water (solution pits, cenotes, and ephemeral ponds) on this flat limestone platform. During the dry season, these frogs retreat into tree holes and rock crevices, and sometimes use their head to plug the opening. This individual is from the state of Yucatán. *Photo by Ed Cassano.*

These data from the IUCN Red List show a frightening picture for the amphibian fauna of Mexico, acknowledged as a major herpetodiversity hotspot in the world on the basis of its diversity and endemism (Wilson and Johnson 2010). Mexico's level of amphibian endemism (66.8%) also has been reported as greater than that for the country's reptiles (57.2%; Wilson and Johnson 2010). Even more frightening is the fact that Mexican salamanders are more threatened than anurans (Table 1). Of the 139 recognized species of salamanders, 96 (69.1%) were assessed into one of the threat categories, as compared to anurans (114 of 236 [48.3%]). In addition, a much smaller proportion of salamander species were judged as Least Concern (14 [10.1%]), as compared to anurans (78 [33.1%]).

Critique of the IUCN Assessment

Although the conservation status of amphibians in Mexico is better understood than that for reptiles (see Wilson et al. 2013), a need for reassessment still is required for several reasons. About 10% of Mexico's amphibians have been judged as Data Deficient, and thus their conservation status remains undetermined. In addition, because certain species have been described recently (see above), 4.5% have not been evaluated (see www.iucnredlist.org; accessed 08 May 2013). Also, by adding the DD and NE species, 55 (14.5%) of Mexico's amphibians presently are not assigned to any of the other IUCN categories. Thus, we consider it worthwhile to subject the Mexican amphibians to the same assessment measure applied by Wilson et al. (2013) for reptiles, to allow for a comparison between these two groups. For these reasons, we will reassess the Mexican amphibian fauna using the Environmental Vulnerability Score (EVS).

EVS for Mexican Amphibians

The EVS provides several advantages for assessing the conservation status of amphibians and reptiles. First, this measure can be applied as soon as a species is named, because the information necessary for its application generally is known at that point. Second, calculating the EVS is economical because it does not require expensive, grant-supported workshops, such as those undertaken for the Global Amphibian Assessment (sponsored by the IUCN). Third, the EVS is predictive, as it measures susceptibility to anthropogenic pressure and can pinpoint taxa with the greatest need of immediate attention and continued scrutiny. Finally, it is simple to calculate and does not "penalize" poorly known species. Thus, given the geometric pace at which environmental threats worsen, since they are commensurate with the rate of human population growth, it is important to use a conservation assessment measure that can be applied simply, quickly, and economically.

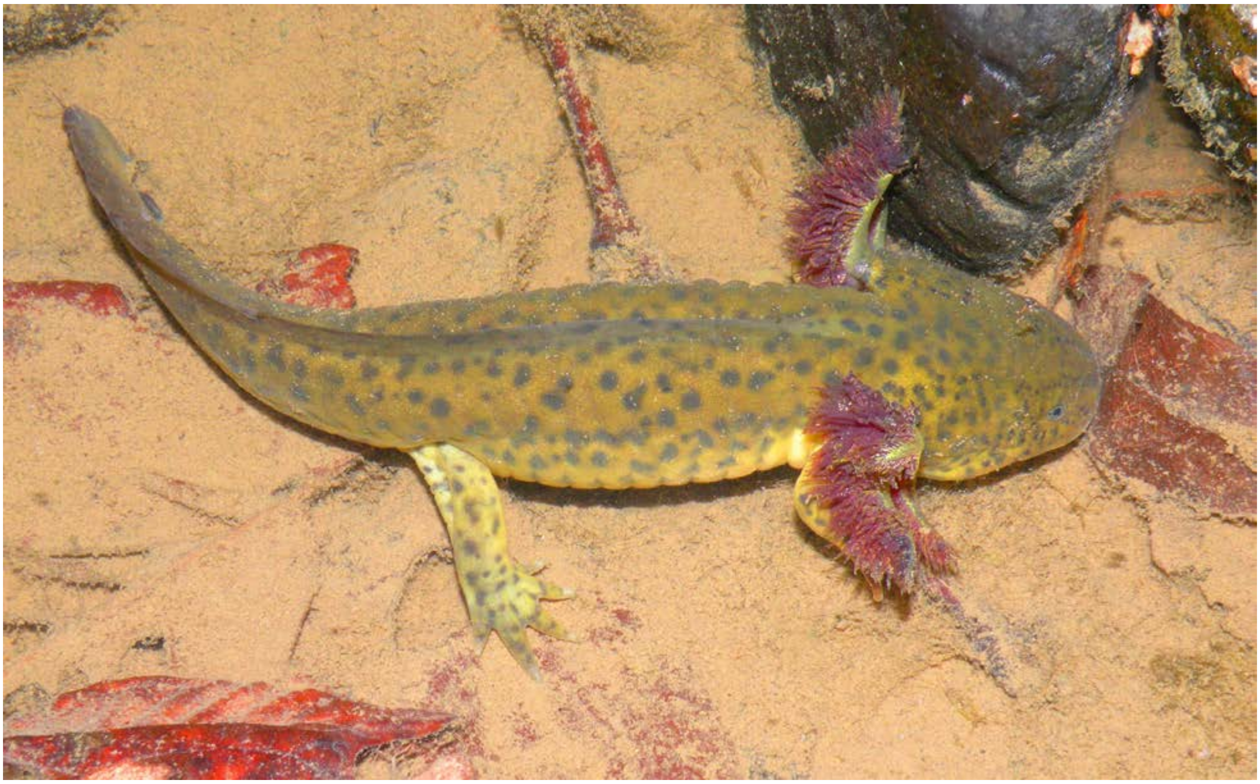
We calculated the EVS using the above-mentioned methodology. This step allowed us to determine the conservation status of all the currently recognized Mexican amphibian species (378), including the 55 species placed in the DD category or not evaluated by the IUCN (www.iucnredlist.org; see Appendix 1, Table 2).

Theoretically, the EVS can range from 3 to 20 (in Mexico, from 3 to 19). A score of 3 is indicative of a species that ranges widely both within and outside of Mexico, occupies eight or more forest formations, and lays its eggs in small to large lentic or lotic bodies of water. Four such species (one each in the families Bufonidae, Hylidae, Ranidae, and Scaphiopodidae) are found in Mexico. At the other extreme, a score of 20 relates to a species that is known only from the vicinity of the type locality, occupies a single forest formation, and its eggs and tadpoles are found in water-retaining arboreal bromeliads or water-filled tree cavities (no such species occur in Mexico). Thus, all the scores fall within the range of 4–19.

In the Introduction, we expressed an interest in attempting to determine the impact of small populations on amphibian species survival in Mexico. The data in Appendix 1 allow us to approximate an answer to this question, inasmuch as one of the components of the EVS assesses the extent of geographic distribution on a sliding scale (1–6), on which higher numbers signify increasingly smaller geographic ranges. Using this range, the distribution of the 378 Mexican species is as follows: 1 = 13 species (3.4%); 2 = 20 (5.3%); 3 = 28 (7.4%); 4 = 64 (16.9%); 5 = 126 (33.3%); and 6 = 127 (33.6%). Obviously, the higher the value of the geographic range, the higher the number and percentage of the taxa involved. These figures indicate that about one-third of the amphibian species in Mexico are known only from the vicinity of their respective type localities. The range of another one-third is somewhat broader, but still limited to the confines of Mexico. As a consequence, the survival prospects of about two-thirds of Mexico's amphibians are tied to changes in their natural environment, as well as to the conservation atmosphere in this nation.

We summarized the EVS for Mexican amphibians by family in Table 2. The EVS range falls into the following three portions: low (3–9), medium (10–13), and high (14–19).

The range and average EVS for the major amphibian groups are as follows: anurans = 3–19 (12.4); salamanders = 9–18 (15.9); and caecilians = 11–12 (11.5). Salamanders generally are significantly more susceptible than anurans to environmental degradation and caecilians somewhat less susceptible than anurans (although only two caecilian species are involved). The average scores either fall in the medium category, in the case of anurans and caecilians, or in the middle portion of the high category, in the case of salamanders. The average EVS for all amphibian species is 13.7, a value near the lower end of the high range of vulnerability.



Ambystoma velasci. The endemic Plateau tiger salamander, as currently recognized, is distributed widely from northwestern Chihuahua southward along the eastern slopes of the Sierra Madre Oriental, and from southern Nuevo León in the Sierra Madre Oriental, westward to Zacatecas and southward onto the Transverse Volcanic Axis of central Mexico. Its EVS has been determined as 10, placing it at the lower end of the medium vulnerability category, and its IUCN status is of Least Concern. Even though this species does not appear threatened, this is likely an artifact of the composite nature of this taxon. This individual was found at Santa Cantarina, Hidalgo. *Photo by Raciel Cruz-Elizalde.*

Bolitoglossa franklini. Franklin's salamander is distributed along Pacific slopes from southern Chiapas, Mexico, southeastward to south-central Guatemala. Its EVS has been determined as 14, placing it at the lower end of the high vulnerability category, and its IUCN status as Endangered. This individual came from Cerro Mototal, in the Municipality of Motozintla, Chiapas. *Photo by Sean M. Rovito.*

An EVS of 14, at the lower end of the high vulnerability category, was found in the highest percentage (15.2) of anuran species. For salamanders, the respective values are 25.9% for an EVS of both 17 and 18, near the upper end of the range for the high vulnerability category, and for caecilians 50.0% for an EVS of both 11 and 12.

The total EVS scores generally increased from the low end of the scale (3) through most of the high end (14–18), with a single exception (a decrease from 53 to 21 species at scores 15 and 16). An EVS of 15 was found in the peak number of taxa (53), a score that falls within the high range of vulnerability.

Of the 378 total taxa, 50 (13.2%) fall into the low vulnerability category, 106 (28.0%) into the medium category, and 222 (58.7%) into the high category. Thus, six of every 10 Mexican amphibian species were judged as having the highest degree of vulnerability to environmental degradation, and slightly more than one-seventh the lowest degree.

This considerable increase in the absolute and relative numbers from the low portion, through the medium portion, to the high portion differs somewhat from the results published for amphibians and reptiles for several Central American countries in Wilson et al. (2010). Acevedo et al. (2010) reported 89 species (23.2%) with low scores, 179 (46.7%) with medium scores, and 115 (30.0%) with high scores for Guatemala. The same trend was reported for Honduras, where Townsend and Wilson (2010) indicated the corresponding values for amphibians and reptiles as 71 (19.7%), 169 (46.8%), and 121 (33.5%). The comparable data for the Panamanian herpetofauna in Jaramillo et al. (2010) are 143 (33.3%), 165 (38.4%), and 122 (28.4%).

The principal reason that EVS scores are relatively high in Mexico is because of the high level of endemism and the concomitantly narrow range of geographical and ecological occurrence (Appendix 1). Of the 253 endemic amphibian species (139 anurans, 113 salamanders, and one caecilian), 125 (49.4%) were allocated a geographic distribution score of 6, signifying that these creatures are known only from the vicinity of their respective type localities; the remainder of the endemic species (128 [50.6%]) are more broadly distributed within the country (Appendix 1).

Of the 378 Mexican amphibian species, 128 (33.9%) are limited in ecological distribution to one formation (Appendix 1). Therefore, we emphasize that close to one-half of the country's endemic amphibian species are not known to occur outside of the vicinity of their type localities. In addition, essentially one-third are not known to occur outside of a single forest formation. This situation imposes serious challenges in our attempt to conserve the endemic component of the strikingly important Mexican amphibian fauna.

Comparison of IUCN Categorizations and EVS Values

Table 3. Comparison of Environmental Vulnerability Scores (EVS) and IUCN categorizations for Mexican amphibians. Shaded area at the top encompasses low vulnerability category scores, and that at the bottom high vulnerability category scores.

EVS	IUCN categories							
	Critically Endangered	Endangered	Vulnerable	Near Threatened	Least Concern	Data Deficient	Not Evaluated	Totals
3	—	—	—	—	4	—	—	4
4	—	—	—	—	3	—	—	3
5	—	—	—	—	3	—	—	3
6	—	—	—	—	3	—	1	4
7	1	—	—	—	8	—	—	9
8	—	—	2	2	6	—	2	12
9	1	1	1	1	10	—	1	15
10	1	2	1	—	9	—	2	15
11	1	2	7	—	13	—	—	23
12	5	4	3	4	13	2	1	32
13	4	12	5	5	6	3	1	36
14	12	11	7	2	8	6	3	49
15	22	8	5	2	3	10	3	53
16	4	9	4	2	1	1	—	21
17	15	17	6	2	1	7	2	50
18	21	13	3	1	—	9	1	48
19	1	—	—	—	—	—	—	1
Totals	**88**	**79**	**44**	**21**	**91**	**38**	**17**	**378**

Ixalotriton niger. The black jumping salamander is known only from the immediate vicinity of the type locality in northwestern Chiapas. Its EVS has been calculated as 18, placing it in the upper portion of the high vulnerability category, and its IUCN status as Critically Endangered. This individual came from the type locality and was used as part of the type series in the description of the species by Wake and Johnson (1989). The genus *Ixalotriton* is endemic to Mexico, and contains one other species (*I. parvus*). *Photo by David B. Wake.*

Pseudoeurycea longicauda. The endemic long-tailed false brook salamander is distributed in the Transverse Volcanic Axis of eastern Michoacán and adjacent areas in the state of México. Its EVS has been determined as 17, placing it in the middle of the high vulnerability category, and its IUCN status as Endangered. This individual came from Zitácuaro, Michoacán, near the border with the state of México. *Photo by Iván Trinidad Ahumada-Carrillo.*

We noted in Wilson et al. (2013: 18) that, “Since the IUCN categorizations and EVS values both measure the degree of environmental threat impinging on a given species, a certain degree of correlation between the results, using the two measures, is expected.” They further indicated that Townsend and Wilson (2010) demonstrated this to be the case with the Honduran herpetofauna. Wilson et al. (2013: 22) concluded, however, that, “the results of the EVS analysis are nearly the reverse of those obtained from the IUCN categorizations.”

We compared the results of these two conservation measures in Table 3, expecting that our results for the Mexican amphibians would be more consistent with those obtained for the Honduran herpetofauna (Townsend and Wilson 2010) than those garnered for the Mexican reptiles (Wilson et al. 2013).

1. Nature of the IUCN categorizations in Table 3

Like Wilson et al. (2013), we used the “Not Evaluated” category (IUCN 2010), since 17 species (4.5%) have not been evaluated at the IUCN Red List website, and 38 (10.1%) were evaluated as “Data Deficient” (www.iucnredlist.org; accessed 08 May 2013). Thus, the IUCN conservation status of 55 (14.6%) of the total amphibian species remained undetermined. A greater proportion of the Mexican amphibians, however, were assessed based on the IUCN categorizations (323 species [85.4%]) than the Mexican reptiles (Wilson et al. 2013).

2. Pattern of mean EVS vs. IUCN categorizations

In order to more precisely determine the relationship between the IUCN categorizations and the EVS, we calculated the mean EVS for each of the IUCN columns in Table 3, including for the NE species and the total species. The results are as follows: CR (88 spp.) = 15.5 (range 7–19); EN (79 spp.) = 15.1 (9–18); VU (44 spp.) = 13.8 (8–18); NT (21 spp.) = 13.3 (8–18); LC (91 spp.) = 10.0 (3–17); DD (38 spp.) = 15.6 (12–18); NE (17 spp.) = 12.6 (6–18); and total (378 spp.) = 13.7 (3–19). The results of these data show that the mean EVS decreases steadily from the CR category (15.5) through the EN (15.1), VU (13.8), and NT (13.3) categories to the LC category (10.0). This pattern of decreasing values was expected. In addition, the mean value for the DD species (15.6) is closest to that for the CR species. As we stated with regard to Mexican reptiles (Wilson et al. 2013: 22), “this indicates what we generally have suspected about the DD category, i.e., that the species placed in this category likely will fall into the EN or CR categories when (and if) their conservation status is better understood. Placing species in this category is of little benefit to determining their conservation status, however, since once sequestered with this designation their significance tends to be downplayed.” Wilson et al. (2013) demonstrated that this problem was more significant with Mexican reptiles, given that 118 species were evaluated as DD, which provided the impetus to work on the 38 amphibian

Table 4. Comparison of Environmental Vulnerability Scores for Mexican amphibian and reptile species, arranged by major groups. Shaded area to the left encompasses low vulnerability scores, and to the right high vulnerability scores.

Major groups	Number of species	Environmental Vulnerability Scores																	
		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Anurans	237	4	3	3	4	9	12	14	13	20	25	29	36	30	8	14	12	1	—
Percentages	—	**1.7**	**1.3**	**1.3**	**1.7**	**3.8**	**5.1**	**5.9**	**5.4**	**8.4**	**10.5**	**12.2**	**15.2**	**12.7**	**3.4**	**5.9**	**5.1**	**0.4**	—
Salamanders	139	—	—	—	—	—	—	1	2	2	6	7	13	23	13	36	36	—	—
Percentages	—	—	—	—	—	—	—	**0.7**	**1.4**	**1.4**	**4.3**	**5.0**	**9.4**	**16.6**	**9.4**	**25.9**	**25.9**	—	—
Caecilians	2	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—
Percentages	—	—	—	—	—	—	—	—	—	**50.0**	**50.0**	—	—	—	—	—	—	—	—
Amphibian Totals	378	4	3	3	4	9	12	15	15	23	32	36	49	53	21	50	48	1	—
Percentages	—	**1.0**	**0.8**	**0.8**	**1.0**	**2.4**	**3.2**	**4.0**	**4.0**	**6.1**	**8.5**	**9.5**	**13.0**	**14.0**	**5.5**	**13.2**	**12.7**	**0.3**	—
Crocodilians	3	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	—	—	—
Percentages	—	—	—	—	—	—	—	—	—	—	—	**33.3**	**33.3**	—	**33.3**	—	—	—	—
Turtles	42	—	—	—	—	—	1	—	3	1	1	3	8	6	4	3	5	6	1
Percentages	—	—	—	—	—	—	**2.4**	—	**7.1**	**2.4**	**2.4**	**7.1**	**19.0**	**14.3**	**9.5**	**7.1**	**11.9**	**14.3**	**2.4**
Lizards	409	—	—	1	3	6	11	12	15	26	39	49	54	67	77	37	10	2	—
Percentages	—	—	—	**0.2**	**0.7**	**1.5**	**2.7**	**2.9**	**3.7**	**7.1**	**9.5**	**12.0**	**13.2**	**16.4**	**18.8**	**9.0**	**2.4**	**0.5**	—
Snakes	382	1	1	7	10	9	19	17	30	25	31	46	52	50	44	24	9	7	—
Percentages	—	**0.3**	**0.3**	**1.8**	**2.6**	**2.4**	**5.0**	**4.5**	**7.9**	**6.5**	**8.1**	**12.0**	**13.6**	**13.1**	**11.5**	**6.3**	**2.4**	**1.8**	—
Reptile Totals	836	1	1	8	13	15	31	30	46	53	71	99	115	123	126	64	24	15	1
Percentages	—	**0.1**	**0.1**	**1.0**	**1.6**	**1.8**	**3.7**	**3.6**	**5.5**	**6.3**	**8.5**	**11.8**	**13.8**	**14.7**	**15.1**	**7.8**	**2.9**	**1.8**	**0.1**

Dermophis oaxacae. The endemic Oaxacan caecilian is distributed in Colima, Jalisco, Michoacán, Guerrero, Oaxaca, and Chiapas. Its EVS has been calculated as 12, placing it in the middle portion of the medium vulnerability category, and its IUCN status as Data Deficient. This individual was found on the road at Ixtlahuacán, Colima. *Photo by Jacobo Reyes-Velasco.*

species assessed as DD with those occupying the threat categories (CR, EN, and VU) to arrive at a total of 249 species (65.9% of the total amphibian fauna). The EVS range for these DD species (12–18) falls within that for the threat species as a whole (7–19) and the mean for all the four categories becomes 15.1, the same as that for the EN species alone. So, if the DD species can be considered "threat species in disguise," then close to two-thirds of the Mexican amphibian species would be considered under the threat of extinction.

The EVS for the 17 Mexican amphibian species that have not been evaluated by the IUCN range from 6 to 18 (mean = 12.6). These species are of significant conservation interest, inasmuch as the EVS of nine of them falls into the range of high vulnerability.

Based on the pattern of relationships between the LC species and their corresponding EVS, this IUCN category apparently has become a "dumping ground" for a sizable number of Mexican amphibians (91; 24.1% of the amphibian fauna) and like Wilson et al. (2013: 22) concluded for Mexican reptiles, we concur that "A more discerning look at both the LC and NE species might demonstrate that many should be partitioned into other IUCN categories, rather than the LC." The range of EVS values for this category (3–17) is almost as broad as the range of EVS (3–19) for amphibians as a whole; 37 (40.7%) of these 91 species are relegated to the low vulnerability range (3–9), 41 (45.0%) to the medium vulnerability range, and 13 (14.3%) to the high vulnerability range. Again, these results indicate that the LC category likely has been used rather indiscriminately and that the EVS algorithm provides a more useful conservation measure than the IUCN system of categories.

Comparison of EVS Values for Mexican Amphibians and Reptiles

One of our major reasons for writing this paper was to determine the EVS values for Mexican amphibians, so they could be compared to those calculated for Mexican reptiles in Wilson et al. (2013). Thus, we summarized the data in Table 2, and reduced them to the major group level in Table 4. We also reduced the data in Wilson et al. (2013: table 2) and placed them in our Table 4.

The data in this table indicate that the range of EVS values are comparable for amphibians (3–19) and reptiles (3–20). The EVS for the number of amphibian species essentially increases until a score of 15 is reached (53 species), and at 16 drops considerably (21 species) only to spike back up at 17 and 18 (50 and 48 species, respectively). The highest EVS value (19) was assigned to a single species (the fringe-limbed hylid *Ecnomiohyla echinata*). For the reptiles, the numbers and percentages also increase, with the peak (126 [15.1%]) reached at an

EVS of 16, and decreasing rapidly thereafter. As with amphibians, only a single species (the soft-shelled turtle *Apalone atra*) was assigned the highest EVS (20).

When the EVS values are arranged into low, medium, and high categories, the numbers and percentages of species are as follows (amphibians, followed by reptiles): low = 50 (13.2%), 99 (11.8%); medium = 106 (28.0%), 269, (32.2%); and high = 222 (58.8%), 468, (56.0%). The percentages for these two groups are comparable and arranged in the same order. The greatest concern is that in both amphibians and reptiles more than one-half of the species fall into the upper portion of the high vulnerability category, indicating that the Mexican herpetofauna is seriously imperiled.

Of the major groups of amphibians and reptiles, Mexican salamanders were judged the most imperiled. Of the 139 species known from the country, 121 (87.1%) were assessed in the high vulnerability category. The comparable figure for anurans is 101 (42.6%), less than one-half of that for salamanders. Among the reptiles, lizards were judged more threatened than snakes. Of the lizards, 247 (60.4%) fall within the high vulnerability category; the comparable figures for snakes are 186 and 48.7%. Turtles, although fewer in numbers, are more threatened than other reptiles, with 33 species (78.6%) in the high vulnerability category.

In the final analysis, although amphibians are acknowledged widely as threatened on a global basis, a fair accounting of the worldwide conservation status of most reptiles remains unavailable. Our use of the EVS measure for Mexican amphibians and reptiles demonstrates that both groups are in grave peril, and we expect that this situation will worsen exponentially in the coming decades.

Discussion

Global amphibian population decline has occupied the attention of herpetologists since the late 1980s (Gascon et al. 2007). In the years that followed, the Global Amphibian Assessment (GAA) was undertaken (Stuart et al. 2004), which uncovered the startling conclusions discussed in the Introduction. As noted in the foreword to Gascon et al. (2007: 2), "the first GAA documented the breadth of amphibian losses worldwide and made it clear that business as usual—the customary conservation approaches and practices—were not working." As a result, an Amphibian Conservation Summit was convened in September 2005, which resulted in a putatively comprehensive Amphibian Conservation Action Plan (ACAP; Gascon et al. 2007). The ACAP declaration proposed (p. 59) that, "Four kinds of intervention are needed to conserve amphibians, all of which need to be started immediately:

1. Expanded understanding of the causes of declines and extinctions
2. Ongoing documentation of amphibian diversity, and how it is changing
3. Development and implementation of long-term conservation programmes
4. Emergency responses to immediate crises."

We maintain that the ACAP does an admirable job of examining many of the issues directly related to amphibian decline, but this examination essentially stops after considering the proximate symptoms of the problem. Nonetheless, as noted by Wilson and Townsend (2010: 774), "problems created by humans, i.e., overpopulation and its sequelae, are not solved by treating only their symptoms, e.g., organismic endangerment." Consequently, trying to deal with a symptom of overpopulation and resource overuse and abuse, such as amphibian decline, will create only limited short-term responses, instead of lasting solutions to the fundamental problems tied to the impact of humans. Thus, ultimately, amphibian decline will not be successfully addressed.

The fundamental problem is that humans have not created a sustainable existence for themselves. Understanding why not is simple through examination of the principles of sustainability elaborated by Miller and Spoolman (2012: 6), as follows:

- "Nature has sustained itself for billions of years by relying on solar energy, biodiversity, and nutrient cycling.
- Our lives and economies depend on energy from the sun and on natural resources and natural services (*natural capital*) provided by the earth.
- As our ecological footprints grow, we are depleting and degrading more of the earth's natural capital.
- Major causes of environmental problems are population growth, wasteful and unsustainable resource use, poverty, and not including the harmful environmental costs of resource use in the market prices of goods and services.
- Our environmental worldview plays a key role in determining whether we live unsustainably or more sustainably.
- Living sustainably means living off the earth's natural income without depleting or degrading the natural capital that supplies it."

Living unsustainably is a consequence of unregulated human population growth that generates the overuse and abuse of renewable and non-renewable resources, and dependence on a cost-accounting system that ignores factoring in clean up expenses in determining how goods and services are priced. Life-sustaining resources are not distributed equitably among people, but along a scale ranging from very high to very low. Poverty is the consequence of existing at the low end of the scale, where people are unable to meet their basic needs for adequate food and water, clothing, or shelter (Raven and Berg 2004).

Environmental scientists use the concept of *ecological footprint* to express "the average amount of land and ocean needed to supply an individual with food, energy, water, housing, transportation, and waste disposal" (Raven and Berg 2004: G-5). The global ecological footprint has increased over the years to the point that the Global Footprint Network calculated it would take "1.5 years to generate the renewable resources used in 2008" (WWF Living Planet Report 2012: 40). "Humanity's annual demand on the natural world has exceeded what the Earth can renew in a year since the 1970s," which has created a so-called "ecological overshoot" (WWF Living Planet Report 2012: 40). Thus, Earth's capital (its biocapacity) is being depleted on a continually growing basis, and the planet is becoming less capable of supporting life in general, and human life in particular. Estimates indicate that by the year 2050, under a "business as usual" scenario, it would require an equivalent of 2.9 planets to support the amount of humanity expected to exist at that time (WWF Living Planet Report 2012: 101).

The World Wildlife Fund promulgated its "One Planet perspective," which "explicitly proposes to manage, govern and share natural capital within the Earth's ecological boundaries. In addition to safeguarding and restoring this natural capital, WWF seeks better choices along the entire system of production and consumption, supported by redirected financial flows and more equitable resource governance. All of this, and more, is required to decouple human development from unsustainable consumption (moving away from material and energy-intensive commodities), to avoid greenhouse gas emissions, to maintain ecosystem integrity, and to promote pro-poor growth and development" (WWF Living Planet Report 2012: 106).

Only within this context will the provisions of ACAP have the desired effects, i.e., to preserve the portion of natural capital represented by amphibians. Thus, in writing about the conservation status of the amphibians of Mexico, we are constructing our conclusions and recommendations in light of these global imperatives.

Conclusions and Recommendations

We structured our conclusions and recommendations after those of Wilson and Townsend (2010) for the entire Mesoamerican herpetofauna, refining them specifically for the Mexican amphibian fauna, as follows:

1. Given that Mexico contains the highest level of amphibian diversity and endemicity in the Mesoamerican biodiversity hotspot, our most fundamental recommendation is that protection of this aspect of the Mexican patrimony should be made a major component of the management strategy of the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT). In turn, that strategy needs to be incorporated into an overall plan for a sustainable future for Mexico, of which the most critical component is to "explicitly integrate population dynamics (size, growth rate, composition, location and migration) and per capita consumption trends into national planning policies to support a better balance between population and available resources" (WWF Living Planet Report 2012: 121).

2. All organisms have intrinsic and extrinsic value, especially as components of healthily functioning ecosystems, but we believe that although conservation efforts should extend to all species in a given area, most interest should be focused on species with a limited distribution (i.e., endemic species). The rationale for this position is that funds to support conservation initiatives have remained scarce, although this situation will have to change in the near future. The principal regions of Mexican amphibian endemism are the Sierra Madre Oriental, the Sierra Madre del Sur, and the Mesa Central, in the order listed. Unfortunately, about 39% of Mexico's population occupies the Mesa Central (Flores-Villela et al. 2010). Inasmuch as this concentrated population will continue to grow into the foreseeable future, not only as a consequence of the rate of natural increase (1.4% in Mexico), but also because of the increase in the percentage of the population attracted to the large cities of the Mesa Central (Guadalajara, León, México, Morelia, Salamanca, and others; Flores-Villela et al. 2010), it is critically important to make the amphibian fauna of the Mesa Central a fundamental component of the national plan for biodiversity protection by SEMARNAT.

3. Oscar Flores-Villela and his colleagues produced highly significant conservation analyses (Flores-Villela 1993; Flores-Villela and Gerez 1994; Ochoa-Ochoa and Flores-Villela 2006; Flores-Villela et al. 2010) that have documented the centers of diversity and endemism of the Mexican herpetofauna. Given the large disparity between these centers and the placement of protected areas in the country, we can only echo the conclusions of Flores-Villela et al. (2010: 313) that, "Given the great importance of the herpetofauna of the Central Highlands of Mexico, both in terms of its diversity and endemicity, appropriate steps need to be taken quickly to establish protected areas around the center of herpetofaunal endemism in the Sierra Madre del Sur, and to reassess the ability of the protected areas already established in the Mesa Central to encompass their centers of endemism." A similar recommendation can be made with respect to the other centers, e.g., the Sierra Madre Oriental, which has been even more ignored than areas in the Central Highlands (Lavín et al. 2010).

4. Finding ways to use biodiversity sustainably must become a fundamental goal for all humanity. The steps necessary to achieve this end are not difficult to envision; the problem lies in marshaling the paradigm shift necessary to make the transition. The major steps involve: (a) creating a reality-based educational system that will prepare people for the world as it is and will come to be, instead of the way people wish it were; (b) integrating educational reform into a broad-based plan for governmental and economic reform founded on principles of equality, shared responsibility, and commitment to a sustainable future for humanity and the natural world; (c) using governmental and economic reform to design a global society structured to exist within the limits of nature; and (d) basing a society on the notion that everyone must work toward this end. Within such overarching goals, the task of learning the best way to catalogue, protect, and make sustainable use of the world's organisms is a huge undertaking. New molecular-based technology, however, is allowing for a better understanding of biological diversity, which is much greater than we previously envisioned. Because of the accelerating rate at which we are losing biological diversity, biologists are faced with helping humanity adopt a worldview in which all species matter, and that the sustainability of humans will depend on reforming our society based on the framework for survival tested by the process of natural selection over the last 3.5 billion years life has occupied our planet (Beattie and Ehrlich 2004).

5. In 2012, the United Nations Secretary-General's High-level Panel on Global Sustainability produced a seminal report entitled "Resilient People, Resilient Planet: A Future Worth Choosing." In a vision statement (p. 13), the panel introduced the concept of "tipping points," as follows: "The current global development model is unsustainable. We can no longer assume that our collective actions will not trigger tipping points as environmental thresholds are breached, risking irreversible damage to both ecosystems and human communities. At the same time, such thresholds should not be used to impose arbitrary growth ceilings on developing countries seeking to lift their people out of poverty. Indeed, if we fail to resolve the sustainable development dilemma, we run the risk of condemning up to 3 billion members of our human family to a life of endemic poverty. Neither of these outcomes is acceptable, and we must find a new way forward." The panel also pointed out (p. 14) that "it is time for bold global efforts, including launching a major global scientific initiative, to strengthen the interface between science and policy. We must define, through science, what scientists refer to as 'planetary boundaries,' 'environmental thresholds,' and 'tipping points." On p. 23, they emphasize that, "awareness is growing of the potential for passing 'tipping points' beyond which environmental change accelerates, has the potential to become self-perpetuating, and may be difficult or even impossible to reverse." Environmental scientists have warned of this eventuality for decades; most of the world's people just have not listened. The Stockholm Resilience Centre (www.stockholmresilience.org), however, has exposed a number of "planetary boundaries," defined as certain thresholds or tipping points beyond which there is the "risk of irreversible and abrupt environmental change" (Box 2 on p. 24 of the UN panel report). The Stockholm Resilience Centre sponsored a group of scientists (Rockström et al. 2009) that identified nine planetary boundaries, including: "climate change, rate of biodiversity loss, biogeochemical flows (both nitrogen and phosphorus), stratospheric ozone depletion, ocean acidification, global freshwater use, change in land use, atmospheric aerosol loading and chemical pollution." The scientists estimated that "human activity appears to have already transgressed the [planetary] boundaries associated with climate change, rate of biodiversity loss and changes to the global nitrogen cycle." Furthermore, "humanity may soon be approaching the boundaries for interference with the global phosphorous cycle, global freshwater use, ocean acidification and global change in land use." Finally, they concluded that, "the boundaries are strongly interlinked, so that crossing one may shift others and even cause them to be overstepped." As a consequence of these realities, governments across the globe are faced with the choice of continuing to do "business as usual," ultimately spilling over all the planetary boundaries and ending up in a world in which all of our options have been exhausted except for the last one…the option to fail, or to pull together to develop a human existence lying within planetary boundaries in order to define a "safe operating space for humanity." Our chances to avoid the one and succeed with the other will depend on how well humanity is able to embrace new ways of thinking about our problems and enlist the help of groups of people who traditionally have been marginalized—especially women and the young. These words apply to Mexico, as they do to all other countries in the world.

The three authors of this work are herpetologists who specialize in research on amphibians and reptiles in Mesoamerica. This paper focuses on the conservation status of the amphibians of Mexico, and follows a similar effort on the reptiles (Wilson et al. 2013). We demonstrated by using both the IUCN categorizations and EVS measure that the Mexican amphibian fauna is one of the most seriously threatened of any existing in the world. All indications suggest that humans have transgressed the planetary boundaries associated with biodiversity loss, and there is no time to lose to reverse this dismantling trend or our descendants will be left to conclude that our generation condemned them to an environmentally impoverished world by our inaction. In the final analysis, life on Earth has survived five prior mass extinction events; humanity's job now is to survive the one of its own making.

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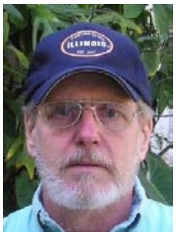

Larry David Wilson is a herpetologist with lengthy experience in Mesoamerica, totaling six collective years (combined over the past 47). Larry is the senior editor of the recently published *Conservation of Mesoamerican Amphibians and Reptiles* and a co-author of seven of its chapters. He retired after 35 years of service as Professor of Biology at Miami-Dade College in Miami, Florida. Larry is the author or co-author of more than 290 peer-reviewed papers and books on herpetology, including the 2004 Amphibian & Reptile Conservation paper entitled "The conservation status of the herpetofauna of Honduras." His other books include *The Snakes of Honduras*, *Middle American Herpetology*, *The Amphibians of Honduras*, *Amphibians & Reptiles of the Bay Islands and Cayos Cochinos, Honduras*, *The Amphibians and Reptiles of the Honduran Mosquitia*, and *Guide to the Amphibians & Reptiles of Cusuco National Park, Honduras*. He also served as the Snake Section Editor for the Catalogue of American Amphibians and Reptiles for 33 years. Over his career, Larry has authored or co-authored the descriptions of 69 currently recognized herpetofaunal species and six species have been named in his honor, including the anuran *Craugastor lauraster* and the snakes *Cerrophidion wilsoni*, *Myriopholis wilsoni*, and *Oxybelis wilsoni*.

Jerry D. Johnson is Professor of Biological Sciences at The University of Texas at El Paso, and has extensive experience studying the herpetofauna of Mesoamerica. He is the Director of the 40,000 acre "Indio Mountains Research Station," was a co-editor on the recently published *Conservation of Mesoamerican Amphibians and Reptiles*, and is Mesoamerica/Caribbean editor for the Geographic Distribution section of *Herpetological Review*. Johnson has authored or co-authored over 80 peer-reviewed papers, including two 2010 articles, "Geographic distribution and conservation of the herpetofauna of southeastern Mexico" and "Distributional patterns of the herpetofauna of Mesoamerica, a biodiversity hotspot."

Vicente Mata-Silva is a herpetologist interested in ecology, conservation, and the monitoring of amphibians and reptiles in Mexico and the southwestern United States. His bachelor's thesis compared herpetofaunal richness in Puebla, México, in habitats with different degrees of human related disturbance. Vicente's master's thesis focused primarily on the diet of two syntopic whiptail species of lizards, one unisexual and the other bisexual, in the Trans-Pecos region of the Chihuahuan Desert. Currently, he is a postdoctoral research fellow at the University of Texas at El Paso, where his work focuses on rattlesnake populations in their natural habitat. His dissertation was on the ecology of the rock rattlesnake, *Crotalus lepidus*, in the northern Chihuahuan Desert. To date, Vicente has authored or co-authored 34 peer-reviewed scientific publications.

Appendix 1. Comparison of the IUCN Ratings from the Red List Website (updated to 08 May 2013) and Environmental Vulnerability Scores for 378 Mexican Amphibians. See text for explanations of the IUCN and EVS rating systems. * = species endemic to Mexico.

Species	IUCN rating	Environmental Vulnerability Score			
		Geographic Distribution	Ecological Distribution	Reproductive Mode	Total Score
Order Anura (237 species)					
Family Bufonidae (35 species)					
Anaxyrus boreus	NT	3	4	1	8
Anaxyrus californicus	EN	4	7	1	12
Anaxyrus cognatus	LC	3	5	1	9
*Anaxyrus compactilis**	LC	5	8	1	14
Anaxyrus debilis	LC	1	5	1	7
*Anaxyrus kelloggi**	LC	5	8	1	14
*Anaxyrus mexicanus**	NT	5	7	1	13
Anaxyrus punctatus	LC	1	3	1	5
Anaxyrus retiformis	LC	4	7	1	12
Anaxyrus speciosus	LC	4	7	1	12
Anaxyrus woodhousii	LC	3	6	1	10
Incilius alvarius	LC	4	6	1	11
Incilius aurarius	NE	4	8	1	13
Incilius bocourti	LC	4	6	1	11
Incilius campbelli	NT	4	8	1	13
Incilius canaliferus	LC	4	3	1	8
*Incilius cavifrons**	EN	5	7	1	13
Incilius coccifer	LC	3	5	1	9
*Incilius cristatus**	CR	5	8	1	14
*Incilius cycladen**	VU	5	8	1	14
*Incilius gemmifer**	EN	6	8	1	15
Incilius luetkenii	LC	3	3	1	7
Incilius macrocristatus	VU	4	6	1	11
*Incilius marmoreus**	LC	5	5	1	11
*Incilius mazatlanensis**	LC	5	6	1	12
*Incilius mccoyi**	NE	5	8	1	14
Incilius nebulifer	LC	1	4	1	6
*Incilius occidentalis**	LC	5	5	1	11
*Incilius perplexus**	EN	5	5	1	11
*Incilius pisinnus**	DD	6	8	1	15
*Incilius spiculatus**	EN	5	7	1	13
Incilius tacanensis	EN	4	4	1	9
Incilius tutelarius	EN	4	5	1	10
Incilius valliceps	LC	3	2	1	6
Rhinella marina	LC	1	1	1	3
Family Centrolenidae (1 species)					
Hyalinobatrachium fleischmanni	LC	3	4	3	10
Family Craugastoridae (39 species)					
Craugastor alfredi	VU	2	5	4	11
Craugastor amniscola	DD	4	6	4	14
Craugastor augusti	LC	2	2	4	8
*Craugastor batrachylus**	DD	6	8	4	18

*Craugastor berkenbuschii**	NT	5	5	4	14
Craugastor brocchi	VU	4	6	4	14
*Craugastor decoratus**	VU	5	6	4	15
*Craugastor galacticorhinis**	NE	6	8	4	15
*Craugastor glaucus**	CR	6	8	4	18
Craugastor greggi	CR	4	7	4	15
*Craugastor guerreroensis**	CR	6	8	4	18
*Craugastor hobartsmithi**	EN	5	6	4	15
Craugastor laticeps	NT	4	4	4	12
Craugastor lineatus	CR	4	7	4	15
Craugastor loki	LC	2	4	4	10
Craugastor matudai	VU	4	7	4	15
*Craugastor megalotympanum**	CR	6	8	4	18
*Craugastor mexicanus**	LC	5	7	4	16
*Craugastor montanus**	EN	6	8	4	18
*Craugastor occidentalis**	DD	5	4	4	13
*Craugastor omiltemanus**	EN	5	7	4	16
Craugastor palenque	DD	4	7	4	15
*Craugastor pelorus**	DD	5	6	4	15
*Craugastor polymniae**	CR	6	8	4	18
*Craugastor pozo**	CR	6	7	4	17
Craugastor pygmaeus	VU	2	3	4	9
*Craugastor rhodopis**	VU	5	5	4	14
*Craugastor rugulosus**	LC	5	4	4	13
Craugastor rupinius	LC	4	5	4	13
*Craugastor saltator**	NE	5	6	4	15
*Craugastor silvicola**	EN	6	8	4	18
*Craugastor spatulatus**	EN	5	7	4	16
Craugastor stuarti	EN	4	7	4	15
*Craugastor tarahumaraensis**	VU	5	8	4	17
*Craugastor taylori**	DD	6	8	4	18
*Craugastor uno**	EN	5	8	4	17
*Craugastor vocalis**	LC	5	4	4	13
*Craugastor vulcani**	EN	6	7	4	17
*Craugastor yucatanensis**	NT	5	8	4	17
Family Eleutherodactylidae (23 species)					
*Eleutherodactylus albolabris**	NE	6	7	4	17
*Eleutherodactylus angustidigitorum**	VU	5	8	4	17
Eleutherodactylus cystignathoides	LC	2	6	4	12
*Eleutherodactylus dennisi**	EN	6	8	4	18
*Eleutherodactylus dilatus**	EN	5	8	4	17
*Eleutherodactylus grandis**	CR	6	8	4	18
Eleutherodactylus guttilatus	LC	2	5	4	11
*Eleutherodactylus interorbitalis**	DD	5	6	4	15
Eleutherodactylus leprus	VU	2	6	4	12
*Eleutherodactylus longipes**	VU	5	6	4	15
*Eleutherodactylus maurus**	DD	5	8	4	17
*Eleutherodactylus modestus**	VU	5	7	4	16
*Eleutherodactylus nitidus**	LC	5	3	4	12

*Eleutherodactylus nivicolimae**	VU	6	7	4	17
*Eleutherodactylus pallidus**	DD	5	8	4	17
Eleutherodactylus pipilans	LC	2	5	4	11
Eleutherodactylus rubrimaculatus	VU	4	7	4	15
*Eleutherodactylus rufescens**	CR	6	7	4	17
*Eleutherodactylus saxatilis**	EN	5	8	4	17
*Eleutherodactylus syristes**	EN	5	7	4	16
*Eleutherodactylus teretistes**	DD	5	7	4	16
*Eleutherodactylus verrucipes**	VU	5	7	4	16
*Eleutherodactylus verruculatus**	DD	6	8	4	18
Family Hylidae (97 species)					
Acris blanchardi	NE	3	8	1	12
Agalychnis callidryas	LC	3	5	3	11
*Agalychnis dacnicolor**	LC	5	5	3	13
Agalychnis moreletii	CR	1	3	3	7
Anotheca spinosa	LC	3	6	5	14
Bromeliohyla bromeliacia	EN	4	7	5	16
*Bromeliohyla dendroscarta**	CR	5	7	5	17
*Charadrahyla altipotens**	CR	5	6	1	12
*Charadrahyla chaneque**	EN	5	7	1	13
*Charadrahyla nephila**	VU	5	7	1	13
*Charadrahyla taeniopus**	VU	5	7	1	13
*Charadrahyla tecuani**	NE	6	8	1	15
*Charadrahyla trux**	CR	6	7	1	14
Dendropsophus ebraccatus	LC	3	6	3	10
Dendropsophus microcephalus	LC	3	3	1	7
Dendropsophus robertmertensi	LC	4	4	1	9
*Dendropsophus sartori**	LC	5	8	1	14
*Diaglena spatulata**	LC	5	7	1	13
*Duellmanohyla chamulae**	EN	6	7	1	13
*Duellmanohyla ignicolor**	EN	6	7	1	14
Duellmanohyla schmidtorum	VU	4	3	1	8
*Ecnomiohyla echinata**	CR	6	8	5	19
*Ecnomiohyla miotympanum**	NT	5	3	1	9
*Ecnomiohyla valancifer**	CR	6	7	5	18
*Exerodonta abdivita**	DD	6	8	1	15
*Exerodonta bivocata**	DD	6	8	1	15
*Exerodonta chimalapa**	EN	6	5	1	12
*Exerodonta juanitae**	VU	5	8	1	14
*Exerodonta melanomma**	VU	5	5	1	11
*Exerodonta pinorum**	VU	5	7	1	13
*Exerodonta smaragdina**	LC	5	6	1	12
*Exerodonta sumichrasti**	LC	5	3	1	9
*Exerodonta xera**	VU	5	8	1	14
*Hyla arboricola**	DD	5	6	1	12
Hyla arenicolor	LC	2	4	1	7
*Hyla euphorbiacea**	NT	5	7	1	13
*Hyla eximia**	LC	5	4	1	10
*Hyla plicata**	LC	5	5	1	11

Hyla walkeri	VU	4	6	1	11
Hyla wrightorum	LC	2	6	1	9
*Megastomatohyla mixe**	CR	6	8	1	15
*Megastomatohyla mixomaculata**	EN	5	8	1	14
*Megastomatohyla nubicola**	EN	5	8	1	14
*Megastomatohyla pellita**	CR	6	7	1	14
Plectrohyla acanthodes	CR	4	7	1	12
*Plectrohyla ameibothalame**	DD	6	8	1	15
*Plectrohyla arborescandens**	EN	5	5	1	11
Plectrohyla avia	CR	4	8	1	13
*Plectrohyla bistincta**	LC	5	3	1	9
*Plectrohyla calthula**	CR	5	8	1	14
*Plectrohyla calvicollina**	CR	6	7	1	14
*Plectrohyla celata**	CR	6	7	1	14
*Plectrohyla cembra**	CR	5	8	1	14
*Plectrohyla charadricola**	EN	5	8	1	14
*Plectrohyla chryses**	CR	6	7	1	14
*Plectrohyla crassa**	CR	5	8	1	14
*Plectrohyla cyanomma**	CR	5	8	1	14
*Plectrohyla cyclada**	EN	5	8	1	14
*Plectrohyla ephemera**	CR	6	8	1	15
Plectrohyla guatemalensis	CR	4	4	1	9
Plectrohyla hartwegi	CR	4	5	1	10
*Plectrohyla hazelae**	CR	5	6	1	12
Plectrohyla ixil	CR	4	7	1	12
*Plectrohyla labedactyla**	DD	6	8	1	15
*Plectrohyla lacertosa**	EN	5	8	1	14
Plectrohyla matudai	VU	4	6	1	11
*Plectrohyla miahuatlanensis**	DD	6	8	1	15
*Plectrohyla mykter**	EN	5	7	1	13
*Plectrohyla pachyderma**	CR	6	8	1	15
*Plectrohyla pentheter**	EN	5	7	1	13
*Plectrohyla psarosema**	CR	6	8	1	15
*Plectrohyla pychnochila**	CR	6	8	1	15
*Plectrohyla robertsorum**	EN	5	7	1	13
*Plectrohyla sabrina**	CR	5	8	1	14
Plectrohyla sagorum	EN	4	5	1	10
*Plectrohyla siopela**	CR	6	8	1	15
*Plectrohyla thorectes**	CR	5	7	1	13
Pseudacris cadaverina	LC	4	6	1	11
Pseudacris clarki	LC	3	8	1	12
Pseudacris hypochondriaca	NE	4	4	1	9
*Ptychohyla acrochorda**	DD	6	7	1	14
*Ptychohyla erythromma**	EN	5	7	1	13
Ptychohyla euthysanota	NT	4	3	1	8
*Ptychohyla leonhardschultzei**	EN	5	6	1	12
Ptychohyla macrotympanum	CR	4	6	1	11
*Ptychohyla zophodes**	DD	5	7	1	13
Scinax staufferi	LC	2	1	1	4

Smilisca baudinii	LC	1	1	1	3
Smilisca cyanosticta	NT	4	7	1	12
*Smilisca dentata**	EN	5	8	1	14
Smilisca fodiens	LC	2	5	1	8
*Tlalocohyla godmani**	VU	5	7	1	13
Tlalocohyla loquax	LC	3	3	1	7
Tlalocohyla picta	LC	2	5	1	8
*Tlalocohyla smithii**	LC	5	5	1	11
Trachycephalus typhonius	LC	1	2	1	4
Triprion petasatus	LC	4	5	1	10
Family Leiuperidae (1 species)					
Engystomops pustulosus	LC	3	2	2	7
Family Leptodactylidae (2 species)					
Leptodactylus fragilis	LC	1	2	2	5
Leptodactylus melanonotus	LC	1	3	2	6
Family Microhylidae (6 species)					
Gastrophryne elegans	LC	2	5	1	8
Gastrophryne mazatlanensis	NE	2	5	1	8
Gastrophryne olivacea	LC	3	5	1	9
Hypopachus barberi	VU	4	5	1	10
Hypopachus ustus	LC	2	4	1	7
Hypopachus variolosus	LC	2	1	1	4
Family Ranidae (28 species)					
Lithobates berlandieri	LC	4	2	1	7
Lithobates brownorum	NE	4	3	1	8
Lithobates catesbeianus	LC	3	6	1	10
*Lithobates chichicuahutla**	CR	6	8	1	15
Lithobates chiricahuensis	VU	4	6	1	11
*Lithobates dunni**	EN	5	8	1	14
Lithobates forreri	LC	1	1	1	3
*Lithobates johni**	EN	5	8	1	14
*Lithobates lemosespinali**	DD	5	8	1	14
Lithobates macroglossa	VU	4	7	1	12
Lithobates maculatus	LC	3	1	1	5
*Lithobates magnaocularis**	LC	5	6	1	12
*Lithobates megapoda**	VU	5	8	1	14
*Lithobates montezumae**	LC	5	7	1	13
*Lithobates neovolcanicus**	NT	5	7	1	13
*Lithobates omiltemanus**	CR	5	7	1	13
*Lithobates psilonota**	DD	5	8	1	14
*Lithobates pueblae**	CR	6	8	1	15
*Lithobates pustulosus**	LC	5	3	1	9
*Lithobates sierramadrensis**	VU	5	7	1	13
*Lithobates spectabilis**	LC	5	6	1	12
Lithobates tarahumarae	VU	2	5	1	8
*Lithobates tlaloci**	CR	6	8	1	15
Lithobates vaillanti	LC	3	5	1	9
Lithobates yavapaiensis	LC	4	7	1	12
*Lithobates zweifeli**	LC	5	5	1	11

Rana boylii	NT	3	8	1	12
Rana draytonii	LC	3	6	1	10
Family Rhinophrynidae (1 species)					
Rhinophrynus dorsalis	LC	2	5	1	8
Family Scaphiopodidae (4 species)					
Scaphiopus couchii	LC	1	1	1	3
Spea bombifrons	NE	3	6	1	10
Spea hammondii	LC	3	8	1	12
Spea multiplicata	NE	1	4	1	6
Order Caudata (139 species)					
Family Ambystomatidae (18 species)					
*Ambystoma altamirani**	EN	5	7	1	13
*Ambystoma amblycephalum**	CR	6	6	1	13
*Ambystoma andersoni**	CR	6	8	1	15
*Ambystoma bombypellum**	CR	6	8	1	15
*Ambystoma dumerilii**	CR	6	8	1	15
*Ambystoma flavipiperatum**	DD	6	7	1	14
*Ambystoma granulosum**	CR	6	7	1	14
*Ambystoma leorae**	CR	6	8	1	15
*Ambystoma lermaense**	CR	6	8	1	15
Ambystoma mavortium	NE	3	6	1	10
*Ambystoma mexicanum**	CR	6	8	1	15
*Ambystoma ordinarium**	EN	5	7	1	13
*Ambystoma rivulare**	DD	5	7	1	13
*Ambystoma rosaceum**	LC	5	8	1	14
*Ambystoma silvense**	DD	5	8	1	14
*Ambystoma subsalsum**	NE	5	8	1	14
*Ambystoma taylori**	CR	6	8	1	15
*Ambystoma velasci**	LC	5	4	1	10
Family Plethodontidae (118 species)					
Aneides lugubris	LC	3	7	4	14
Batrachoseps major	LC	4	6	4	14
*Bolitoglossa alberchi**	LC	6	5	4	15
Bolitoglossa chinanteca	NE	6	8	4	18
Bolitoglossa engelhardti	EN	4	7	4	15
Bolitoglossa flavimembris	EN	4	7	4	15
Bolitoglossa flaviventris	EN	4	5	4	13
Bolitoglossa franklini	EN	4	6	4	14
Bolitoglossa hartwegi	NT	4	4	4	12
*Bolitoglossa hermosa**	NT	5	7	4	16
Bolitoglossa lincolni	NT	4	5	4	13
*Bolitoglossa macrinii**	NT	5	6	4	15
Bolitoglossa mexicana	LC	4	3	4	11
Bolitoglossa mulleri	VU	4	7	4	15
*Bolitoglossa oaxacensis**	DD	5	8	4	17
Bolitoglossa occidentalis	LC	4	3	4	11
*Bolitoglossa platydactyla**	NT	5	6	4	15
*Bolitoglossa riletti**	EN	6	6	4	16
Bolitoglossa rostrata	VU	4	6	4	14

Bolitoglossa rufescens	LC	1	4	4	9
Bolitoglossa stuarti	DD	4	7	4	15
*Bolitoglossa veracrucis**	EN	6	7	4	17
Bolitoglossa yucatana	LC	4	7	4	15
*Bolitoglossa zapoteca**	DD	6	8	4	18
*Chiropterotriton arboreus**	CR	6	8	4	18
*Chiropterotriton chiropterus**	CR	6	6	4	16
*Chiropterotriton chondrostega**	EN	5	8	4	17
*Chiropterotriton cracens**	EN	6	7	4	17
*Chiropterotriton dimidiatus**	EN	6	7	4	17
*Chiropterotriton lavae**	CR	6	8	4	18
*Chiropterotriton magnipes**	CR	6	6	4	16
*Chiropterotriton mosaueri**	DD	6	8	4	18
*Chiropterotriton multidentatus**	EN	5	6	4	15
*Chiropterotriton orculus**	VU	6	8	4	18
*Chiropterotriton priscus**	NT	6	6	4	16
*Chiropterotriton terrestris**	CR	6	8	4	18
*Cryptotriton alvarezdeltoroi**	EN	6	8	4	18
*Dendrotriton megarhinus**	VU	6	7	4	17
*Dendrotriton xolocalcae**	VU	6	8	4	18
Ensatina eschscholtzii	LC	3	7	4	14
Ensatina klauberi	NE	4	6	4	14
*Ixalotriton niger**	CR	6	8	4	18
*Ixalotriton parvus**	CR	6	8	4	18
Nyctanolis pernix	EN	4	7	4	15
Oedipina elongata	LC	4	7	4	15
*Parvimolge townsendi**	CR	5	7	4	16
*Pseudoeurycea ahuitzotl**	CR	6	8	4	18
*Pseudoeurycea altamontana**	EN	5	8	4	17
*Pseudoeurycea amuzga**	DD	6	8	4	18
*Pseudoeurycea anitae**	CR	6	8	4	18
*Pseudoeurycea aquatica**	CR	6	8	4	18
*Pseudoeurycea aurantia**	VU	6	8	4	18
*Pseudoeurycea bellii**	VU	5	3	4	12
*Pseudoeurycea boneti**	VU	6	7	4	17
Pseudoeurycea brunnata	CR	4	7	4	15
Pseudoeurycea cafetalera	NE	6	7	4	17
*Pseudoeurycea cephalica**	NT	5	5	4	14
*Pseudoeurycea cochranae**	EN	6	7	4	17
*Pseudoeurycea conanti**	EN	5	7	4	16
*Pseudoeurycea firscheini**	EN	6	8	4	18
*Pseudoeurycea gadovii**	EN	5	4	4	13
*Pseudoeurycea galaenae**	NT	6	8	4	18
*Pseudoeurycea gigantea**	CR	5	7	4	16
Pseudoeurycea goebeli	CR	4	7	4	15
*Pseudoeurycea juarezi**	CR	6	7	4	17
*Pseudoeurycea leprosa**	VU	5	7	4	16
*Pseudoeurycea lineola**	EN	5	5	4	14
*Pseudoeurycea longicauda**	EN	5	8	4	17

*Pseudoeurycea lynchi**	CR	5	8	4	17
*Pseudoeurycea maxima**	DD	5	8	4	17
*Pseudoeurycea melanomolga**	EN	6	6	4	16
*Pseudoeurycea mixcoatl**	DD	6	8	4	17
*Pseudoeurycea mixteca**	LC	5	8	4	17
*Pseudoeurycea mystax**	EN	6	8	4	18
*Pseudoeurycea naucampatepetl**	CR	6	7	4	17
*Pseudoeurycea nigromaculata**	CR	5	8	4	17
*Pseudoeurycea obesa**	DD	6	8	4	18
*Pseudoeurycea orchileucos**	EN	6	8	4	18
*Pseudoeurycea orchimelas**	EN	6	7	4	17
*Pseudoeurycea papenfussi**	NT	6	7	4	17
*Pseudoeurycea praecellens**	CR	6	8	4	18
*Pseudoeurycea quetzalanensis**	DD	6	7	4	17
Pseudoeurycea rex	CR	4	4	4	12
*Pseudoeurycea robertsi**	CR	6	8	4	18
*Pseudoeurycea ruficauda**	DD	6	8	4	18
*Pseudoeurycea saltator**	CR	6	8	4	18
*Pseudoeurycea scandens**	VU	6	7	4	17
*Pseudoeurycea smithi**	CR	5	6	4	15
*Pseudoeurycea tenchalli**	EN	6	7	4	17
*Pseudoeurycea teotepec**	EN	6	8	4	18
*Pseudoeurycea tlahcuiloh**	CR	6	7	4	17
*Pseudoeurycea tlilicxitl**	DD	5	8	4	17
*Pseudoeurycea unguidentis**	CR	6	7	4	17
*Pseudoeurycea werleri**	EN	6	7	4	17
*Thorius adelos**	EN	6	8	4	18
*Thorius arboreus**	EN	6	8	4	18
*Thorius aureus**	CR	6	7	4	17
*Thorius boreas**	EN	6	8	4	18
*Thorius dubitus**	EN	5	7	4	16
*Thorius grandis**	EN	6	5	4	15
*Thorius infernalis**	CR	6	8	4	18
*Thorius insperatus**	DD	6	8	4	18
*Thorius lunaris**	EN	6	8	4	18
*Thorius macdougalli**	VU	6	6	4	16
*Thorius magnipes**	CR	6	7	4	17
*Thorius minutissimus**	CR	6	7	4	17
*Thorius minydemus**	CR	6	8	4	18
*Thorius munificus**	CR	6	8	4	18
*Thorius narismagnus**	CR	6	8	4	18
*Thorius narisovalis**	CR	6	7	4	17
*Thorius omiltemi**	EN	6	8	4	18
*Thorius papaloae**	EN	6	7	4	17
*Thorius pennatulus**	CR	5	6	4	15
*Thorius pulmonaris**	EN	6	7	4	17
*Thorius schmidti**	EN	6	7	4	17
*Thorius smithi**	CR	6	7	4	17
*Thorius spilogaster**	CR	6	7	4	17

*Thorius troglodytes**	EN	6	6	4	16
Family Salamandridae (1 species)					
Notophthalmus meridionalis	EN	2	8	1	12
Family Sirenidae (2 species)					
Siren intermedia	LC	3	8	1	12
Siren lacertina	LC	3	8	1	12
Order Gymnophiona (2 species)					
Family Dermophiidae (2 species)					
Dermophis mexicanus	VU	4	3	4	11
*Dermophis oaxacae**	DD	5	3	4	12