Chelonian Conservation and Biology, 2009, 8(2): 116–149

A Global Analysis of Tortoise and Freshwater Turtle Distributions with Identification of Priority Conservation Areas

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ABSTRACT. – There are currently ca. 317 recognized species of turtles and tortoises in the world. Of those that have been assessed on the IUCN Red List, 63% are considered threatened, and 10% are critically endangered, with ca. 42% of all known turtle species threatened. Without directed strategic conservation planning, a significant portion of turtle diversity could be lost over the next century. Toward that conservation effort, we compiled museum and literature occurrence records for all of the world's tortoises and freshwater turtle species to determine their distributions and identify priority regions for conservation. We constructed projected range maps for each species by selecting geographic information system–defined hydrologic unit compartments (HUCs) with verified locality points, and then added HUCs that connected known point localities in the same watershed or physiographic region and that had similar habitats and elevations as the verified HUCs. We analyzed a total of 305 turtle species and assigned each to 1 of 7 geographic regions of the world. Patterns of global turtle species distributions were determined and regional areas of turtle species richness identified. In only 2 areas of the world did as many as 18 or 19 species occur together in individual HUCs. We then compared species distributions with existing global conservation strategies (GCSs) and established biodiversity priority areas. Presence of a species in a GCS was defined as $\geq$ 5% its range. Of the 34 biodiversity hotspots, 28 collectively contain the projected ranges of 192 turtle species, with 74 endemic; the 5 high-biodiversity wilderness areas contain 72 species, with 17 endemic; and 16 other wilderness areas contain 52 species, with 1 endemic. However, 116 turtle species have either $<$ 50% of their ranges in existing GCSs (57 species) or do not occur in them at all (59 species, 19.3%), thus potentially leaving many tortoises and freshwater turtles without any regional GCS. For each of these 116 species we identify a priority Ecoregion for further conservation consideration, and we identify 3 new global Turtle Priority Areas for conservation based on aggregated Ecoregions. These are the Southeastern United States, Lower Gangetic Plain, and Coastal Australia Turtle Priority Areas.

KEY WORDS. – Reptilia; Testudines; tortoise; turtle; distribution; species richness; endemism; conservation; global conservation strategies; biodiversity hotspots; high-biodiversity wilderness areas; Ecoregions

Turtles have existed on Earth since the rise of the dinosaurs. The first fossil with clear turtle affinities is *Odontochelys semitestacea* from the Triassic of China (Li et al. 2008; Reisz and Head 2008), estimated to be 220 million years old, somewhat older than the earliest fossil turtle with a complete shell, *Proganochelys*, from the late Triassic of Germany (Gaffney and Meeker 1983; Gaffney 1990; Zug 1993). The turtle shell is a unique and successful body plan that has enabled turtles to persist over 200 million years of changing climates and despite the evolution of a diverse array of vertebrate predators. Today, tortoises and freshwater turtles are represented by as many as 460 taxa (species and subspecies) found throughout the tropical and temperate regions of the world (Iverson 1992b; Iverson et al. 2003; Fritz and Havas 2007; TTWG 2007; Rhodin et al. 2008).

Turtles represent one of the most threatened groups of vertebrates, with 10% of the ca. 317 currently recognized species considered critically endangered on the IUCN Red List of Threatened Species (Turtle Conservation Fund 2002; IUCN 2008) and approximately 63% of the assessed species and ca. 42% of all known species considered threatened (IUCN 2008). Exploitation and unregulated trade are the primary causes for sharp declines in many turtle species, especially those from Asia, with habitat loss and degradation also being major factors in widespread declines (van Dijk et al. 2000, Gibbons et al. 2000, Turtle Conservation Fund 2002). The persistence of such an ancient and iconic group is under concerted assault, and turtles have become prominent casualties of the looming global biodiversity crisis (van Dijk et al. 2000). Without directed strategic conservation planning, a significant portion of turtle diversity could be lost over the next century.

In view of their plight, knowledge of current turtle diversity and global distribution patterns could not be more important. Identification of areas of richness, endemism, and threat enable conservation assessments and prioritization of conservation options (Iverson 1992a; Stuart and Thorbjarnarson 2003; Rhodin 2006). Evaluating species by the size of their geographic range on the landscape provides a first estimation of possible threat to the individual species, and analyses of species' range overlaps reveal patterns of richness and endemism.

Diverse approaches to setting priorities in biodiversity conservation have been used by various conservation organizations. Most of these established templates prioritize areas of high irreplaceability, but differ in their emphasis on high or low vulnerability (Brooks et al. 2006). For example, the biodiversity hotspots (BHs) approach (Mittermeier et al. 1998, 2004; Myers et al. 2000) prioritizes areas of concomitant high irreplaceability and high vulnerability, and the high-biodiversity wilderness areas (HBWAs) approach prioritizes areas of high irreplaceability and low vulnerability (Mittermeier et al. 2003); whereas, the megadiversity countries (Mittermeier et al. 1997) and Global 200 (Olson and Dinerstein 1998) templates prioritize only regions of high irreplaceability. Turtles are disproportionately represented among threatened vertebrate species that require conservation action at the landscape scale (Boyd et al. 2008), but often fall outside traditional conservation priority regions.

Although patterns of species richness for freshwater and terrestrial turtles have been evaluated before (Iverson 1992a), these patterns have not been evaluated in the context of global conservation strategies (GCS). Therefore, our primary objectives were to 1) determine global and regional patterns of species richness and endemism in tortoises and freshwater turtles, 2) evaluate the effectiveness of existing biodiversity conservation strategies at incorporating areas of highest conservation importance for turtles, and 3) identify where significant additional conservation effort is needed by defining areas of high turtle richness and endemism that fall outside the currently recognized global biodiversity conservation strategies.

METHODS

We used a taxonomic list of extant tortoises and freshwater turtle species, totaling 305 species, that we compiled from recent reviews (Iverson 1992b; Ernst et al. 1994; van Dijk et al. 2000; Iverson et al. 2003; Thomson et al. 2006) and primary literature (Starkey et al. 2003; Spinks et al. 2004; Stuart and Parham 2004; Spinks and Shaffer 2007). The final list was a consensus among the authors, noting that the number of recognized turtle taxa is a subject of some contention (Lenk et al. 1999; Fritz and Havas 2007; Stuart and Parham 2007; Turtle Taxonomy Working Group [TTWG] 2007), even among the authors. Subsequent taxonomic changes and controversies, which are accumulating rapidly, are identified in TTWG (2007), Fritz and Havas (2007), and Rhodin et al. (2008). A complete analysis of turtle distributions and conservation areas would include the evaluation of all species, subspecies, evolutionarily significant units, and important management units, but for this initial analysis, we address only species.

Point locality data for all freshwater turtles and tortoises, but not marine turtles, were obtained from museum-verified records, published accounts, and databases (Iverson 1992b; Iverson et al. 2003; Kiester and Bock 2007); from the literature published since 1992; and from unpublished records provided by the authors. We did not attempt to reduce ranges to reflect recent extirpations, nor did we enlarge ranges to account for nonnative introductions.

The continents were subdivided into hydrologic unit compartments (HUCs) that delineate watershed boundaries. HUCs were derived from geographic information system (GIS) layers obtained from the Hydro 1K (1:1,000,000 scale; USGS EROS Data Center, Sioux Falls SD, http://edc.usgs.gov), Australian River Basins (Geoscience Australia 2002; and World Wildlife Fund (R. Abell and C. Revenga, *pers. comm.*). We chose these GIS layers as mapping units because delineation methods were fairly uniform across the world; watershed basin HUCs averaged 4000 km^2. Because they reflect topography and drainage patterns, HUCs delineate potential ecological boundaries of species distribution around point localities; although, knowing the exact habitats would require actual distributional survey data. HUCs were imported into ArcView 3.3™ and each HUC that included a turtle point locality for a species was included in the overall distribution for that species.

The integration of turtle point locality data and HUCs provided an initial approach to mapping distributions of turtle species. We then constructed total ''projected range'' maps (hereafter referred to as ''range'') for each species by selecting additional HUCs that connected

Table 1. Tortoise and freshwater turtle species occurrence in 7 defined world geographic regions.

Region[a]	Species richness	Endemic species	Shared species
NA	53	40	13 with CA
CA	51	32	13 with NA 6 with SA
SA	48	42	6 with CA
MD	14	12	2 with AF
AF	48	46	2 with MD
AS	77	77	0
AU	35	35	0

[a] NA, North America; CA, Central America; SA, South America; MD, Mediterranean; AF, Sub-Saharan Africa; AS, Asia; AU, Australasia.

known point localities in the same larger watershed or physiographic region, and contained similar habitats and elevations as the adjacent verified HUCs. Ranges were used to calculate each species distribution in square kilometers in ArcView™. A few HUCs in some species' projected ranges were edited to eliminate areas where no turtles occurred (i.e., HUCs that partially included the high-altitude Himalayas and the central mountains of New Guinea, and nonoccupied portions of unusually large HUCs within the ranges of *Testudo horsfieldii* in Central Asia and *Chelodina steindachneri* in Western Australia).

We used the ArcView Spatial Analyst to overlay these species distributions on the following major biogeographic and continental regions: BHs (Mittermeier et al. 2004), wilderness areas (Mittermeier et al. 2003), and terrestrial Ecoregions (Olson et al. 2001). We considered a species to be endemic to any defined region if $\geq$ 95% of its range was included within that region. A species was considered present if $<$ 95%–5% of its range was included, and in some instances we identify critical range ($\geq$ 50%) and important range ($<$ 50%–5%). To minimize commission errors in our analyses, we discounted (i.e., considered absent) species with $<$ 5% of their range in a given region. However, the exact percentage of occurrence as calculated by our methodology, even if $<$ 5%, is presented in Appendix 1.

RESULTS

Global Distribution of Turtles. — Tortoises and freshwater turtles analyzed in our sample set total 305 species in 12 families and are found in 7 major biogeographic regions of the globe (Table 1): 1) North America (United States and Canada; Nearctic); 2) Central America (Mexico to Panama, including the Caribbean; northern Neotropical); 3) South America (southern Neotropical); 4) Mediterranean (Europe and east to the Caspian Sea, the Middle East, and northern coastal Africa; western Palearctic); 5) Sub-Saharan Africa (African continent south of the Saharan Desert, Madagascar and associated oceanic islands; Afrotropical); 6) Asia (Pakistan to Japan, including Indonesian and Philippine archipelagos; Oriental and eastern Palearctic); and 7) Australasia (Australia, New Guinea, and islands east of Weber's line; Australasian).

Table 2. Turtle families, number of species, and primary global region of occurrence (each species is only counted once). (See Table 1 for definition of region-name abbreviations.)

	Geographic region							
Family	NA	CA	SA	MD	AF	AS	AU	Total
Chelidae			23				32	55
Pelomedusidae					19			19
Podocnemididae			7		1			8
Chelydridae	2	1	1					4
Platysternidae						1		1
Trionychidae	3			1	5	16	2	27
Carettochelyidae							1	1
Dermatemydidae		1						1
Kinosternidae	8	15	2					25
Emydidae	33	16	3	2				54
Geoemydidae		5	4	3		53		65
Testudinidae	2	2	5	6	23	7		45
Total species	48	40	45	12	48	77	35	**305**
Total families	5	6	7	4	4	4	3	—

The use of these biogeographic regions allows for the most parsimonious aggregations of closely related species (i.e., all species in the genus *Testudo* are found in the Mediterranean; most members of Kinosternidae are found in Central America; Australasia and Asia do not share species). Only 21 of 305 species occur in more than 1 of the 7 regions (Table 1). In terms of phylogenetic depth, South America is the most diverse region with 7 families represented, and Australasia is the least (3 families, Table 2). Land tortoises (Testudinidae) comprise only 45 species (14.8% of 305 total) but are represented across 6 of the 7 global regions (Table 2).

In the northern latitudes, turtles reach lat 56°N in Europe (*Emys orbicularis*); whereas, *Testudo horsfieldii* reaches lat 51°N in central Asia. In eastern Asia, *Pelodiscus sinensis* reaches 52°N. In North America, 2 species (*Chrysemys picta* and *Chelydra serpentina*) reach latitudes of 52°N and 53°N, respectively. In the southern latitudes, chelonians reach lat 42°S in South America, represented by *Geochelone chilensis*. The southernmost reaches of the African continent (lat 35°S) harbor turtles, including 6 sympatric tortoises. The snakeneck, *Chelodina longicollis*, is found in southernmost mainland Australia (lat 40°S); however, New Zealand (lat 34°S–47°S) lacks native turtles. Large continental areas devoid of turtles include much of Canada, the Rocky Mountains, southern South America, Russia, Mongolia, the Tibetan Plateau, the Sahara, the Arabian Peninsula, and interior Australia (Fig. 1).

Turtle Richness. — Regions of relatively low turtle richness (1–7 species) occur in western North America and Mexico, eastern South America, the Mediterranean, large regions of Sub-Saharan Africa, eastern Asia, and most of Australia (Fig. 1). However, land tortoises (Testudinidae) have their greatest species richness in the southern portions of Sub-Saharan Africa, which includes

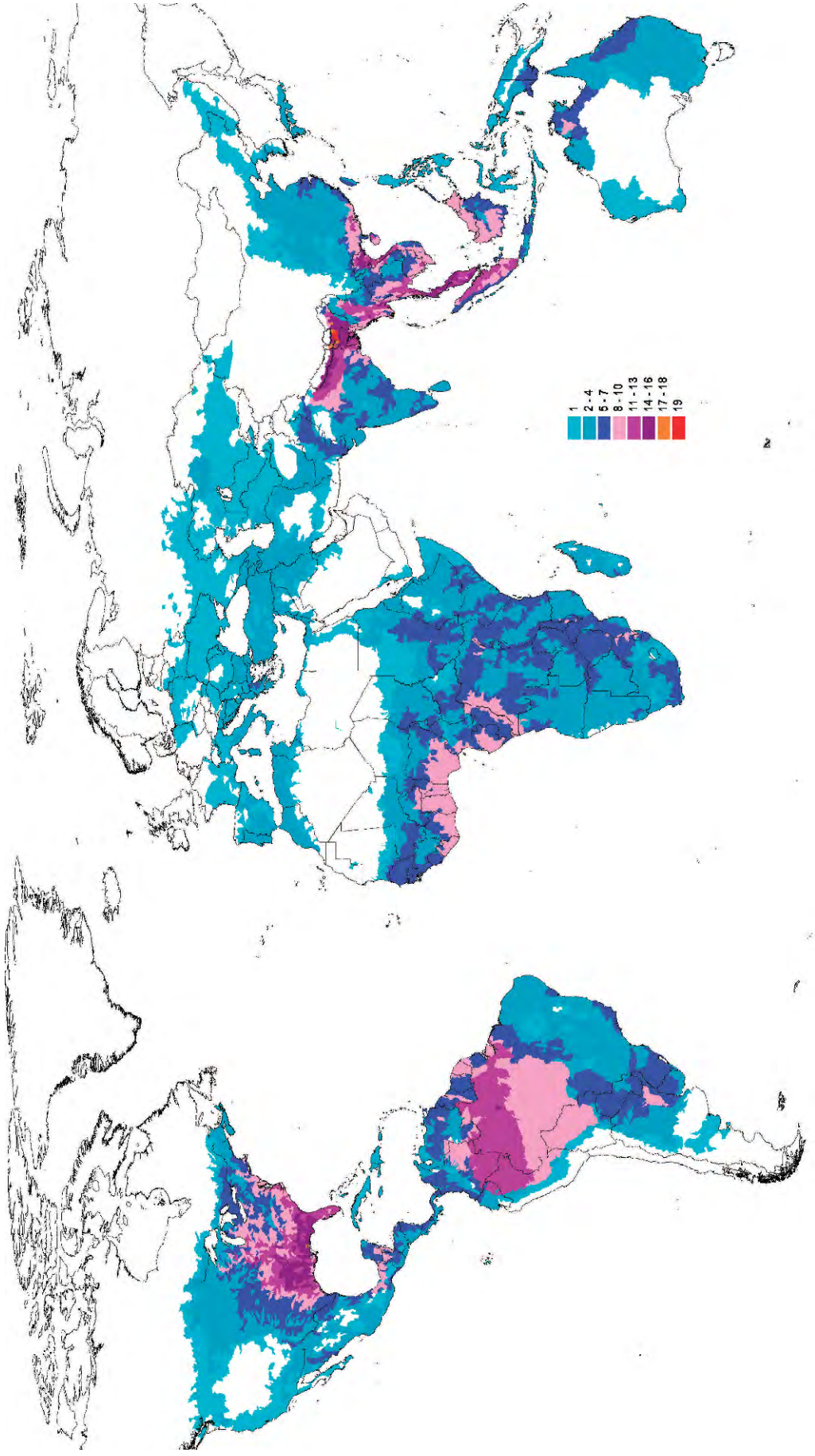

Figure 1. Global patterns of species richness based on projected ranges in hydrologic unit compartments of all 305 species of tortoises (45) and freshwater turtles (260) included in this analysis. Scale of color codes indicates number of species for each area.

Madagascar (Table 2). In the tropical regions, much of Central America, most of the Amazon drainage, western coastal Africa, and the northern coasts of Australia have HUCs containing 8 to 10 species. Greater richness (14–16 species) is found in the Amazon's Rio Negro drainage of Brazil (lat 4°S–5°S), the Malaysian Peninsula (lat 1°N–11°N), northern Vietnam (lat 16°N–22°N), the Ganges–Brahmaputra Basin from Bangladesh to the base of the Himalayas (lat 23°N–29°N), and the North American drainages that enter the Gulf of Mexico (lat 29°N–36°N; Fig. 1). Exceptional richness (18–19 species) occurs in very few individual HUCs: in Asia, part of the lower Ganges–Brahmaputra Basin (lat 26°N–28°N, 19 species; Shrestha 1997; Fig. 2a), and a smaller region in North America in the Mobile Basin, Alabama (lat 30°N–31°N, 18 species; Fig. 2b).

Size of Turtle Ranges. — Ranges for 17 species (5.5% of the total) were calculated at less than 10,000 km^2 each (Appendix 1). These include *Pelusios seychellensis,* which has the smallest range (154 km^2), endemic to the Seychelles Islands, and most likely extinct (Bour and Gerlach 2008; Gerlach 2008), and *Chelodina mccordi*, endemic to Roti Island, Indonesia, 1223 km^2. Thirty-six species (11.8%) occupy an area of less than 25,000 km^2 each (e.g., *Graptemys oculifera*, endemic to the Pearl River basin, southeastern United States, 22,348 km^2; Fig. 3a). Eighty-nine species (29.2%) have an area of between 1 million and 10 million km^2 (e.g., *Chrysemys picta* occupies 5.1 million km^2 in North America). The largest range belongs to *Pelomedusa subrufa* at 16.2 million km^2 in the Sub-Saharan African region (Fig. 3b). The largest percentage of turtle species (44%) have ranges falling between 100,000 and 1 million km^2 (Fig. 4). Mean range size was 1,076,798 km^2, and median range size was 331,919 km^2, represented in rank order by *Gopherus polyphemus*.

Turtles in GCSs. — Twenty-eight of 34 BHs (Mittermeier et al. 2004) collectively contain the ranges for 192 species (Appendix 1; Table 3). Five BHs are known not to contain turtles (Chilean Winter Rainfall–Valdivian Forests, New Caledonia, New Zealand, Polynesia–Micronesia, and East Melanesian Islands) and 1 was discounted in our analyses (mountains of Southwest China) because it contained $< 5\%$ of the ranges of 3 species. Individually, BHs contain as few as 1 and as many as 51 species (e.g., Indo-Burma; Table 3). BHs contain $\geq 50\%$ of the ranges of 120 species, with 74 of those endemic to BHs collectively (53 species are each endemic to a single BH and a further 21 to a combination of more than one BH; see Appendix 1). Only 1 species, *Cuora amboinensis,* occurs in 4 BHs. The Indo-Burma BH contains 15 endemics, Mesoamerica contains 10 endemics, Madagascar and the Indian Ocean Islands contains 7 endemics, and the Caribbean Islands BH contains 4 endemics (all *Trachemys* sp.).

All 5 HBWAs (Mittermeier et al. 2003) contain turtles (Table 3). Individually, HBWAs contain as few as 11 species and as many as 20 (Amazonia; Table 3). Collectively, 72 species are present. Of those, HBWAs contain $\geq 50\%$ of the ranges of 40 species, and 17 are endemic. Only 1 species, *Pelomedusa subrufa,* is present in 2 HBWAs, Miombe–Mopane Woodlands and Congo Forests.

Of the 24 Other Wilderness Areas (OWAs; Mittermeier et al. 2003; Table 3), 5 do not contain turtles (Antarctica, Arctic Tundra, Greenland, Magellanic Forests, and Tasmania), and 3 more were discounted (Patagonia, Pacific Northwest, and Boreal Forests) because they contained $< 5\%$ of the ranges of up to 5 species. The remaining 16 OWAs contain 52 species. Of those, OWAs collectively contain $\geq 50\%$ of the ranges of 12 species. One species is endemic to a single OWA (*Elseya* ''South Alligator''; Arnhem Land Tropical Savanna) and 1 nearly so (93%, *Acanthochelys pallidipectoris*; Chaco). Twenty species have ranges in multiple (up to 3) OWAs (Appendix 1).

In combination, BH, HBWA, and OWA GCSs capture 106 turtle species as endemic ($\geq 95\%$), 34.8% of the world total (305). An additional 140 species are present ($< 95\%$–5%), and these are subdivided into those $< 95\%$–50% present (83 species) and those $< 50\%$ present (57 species). However, 59 species (19.3%) are absent ($< 5\%$) from these GCSs (Table 4), and the number of species either $< 50\%$ present or absent from GCSs is 116 (38.0%).

Turtles and Ecoregion-Focused Conservation. — Of 867 Ecoregions worldwide (Olson and Dinerstein 1998; Olson et al. 2001), 680 include the ranges of turtle species. However, we excluded 330 of these 680, as well as the ''Lake'' Ecoregion (which is not unique to any continent) because of minimal overlap ($< 5\%$) with turtle species ranges. Hence, 349 Ecoregions each contain $\geq 5\%$ of varied numbers of species, ranging from 1 to 29 (Appendix 2). The top 5 Ecoregions of the world for turtles include the Southeastern Mixed Forest (United States, 29 species), the Southeastern Conifer Forest (United States, 25 species), the Northern Indochina Subtropical Forest (Vietnam, Laos, Myanmar, and China; 21 species), the Lower Gangetic Plain Moist Deciduous Forest (India, 18 species), and the Central Forest/Grasslands Transition Zone (United States, 18 species). The Northern Indochina Subtropical Forest is located in the Indo-Burma BH, but it is striking that the remaining top 4 world Ecoregions for turtles are found outside of the GCS schemes that we considered.

For each of the 116 turtle species that have either $< 50\%$ or no GCS coverage we identified a ''first-priority'' Ecoregion based on the species' greatest percent range of occurrence (Appendix 1), and exclusive of GCS. The 45 Ecoregions in this category are counted by global geographic region in Table 4 and listed in Appendix 1. Twelve of the 116 species are endemic to single Ecoregions (Australia, 5 species; China, 4; Congo, 1; United States, 2).

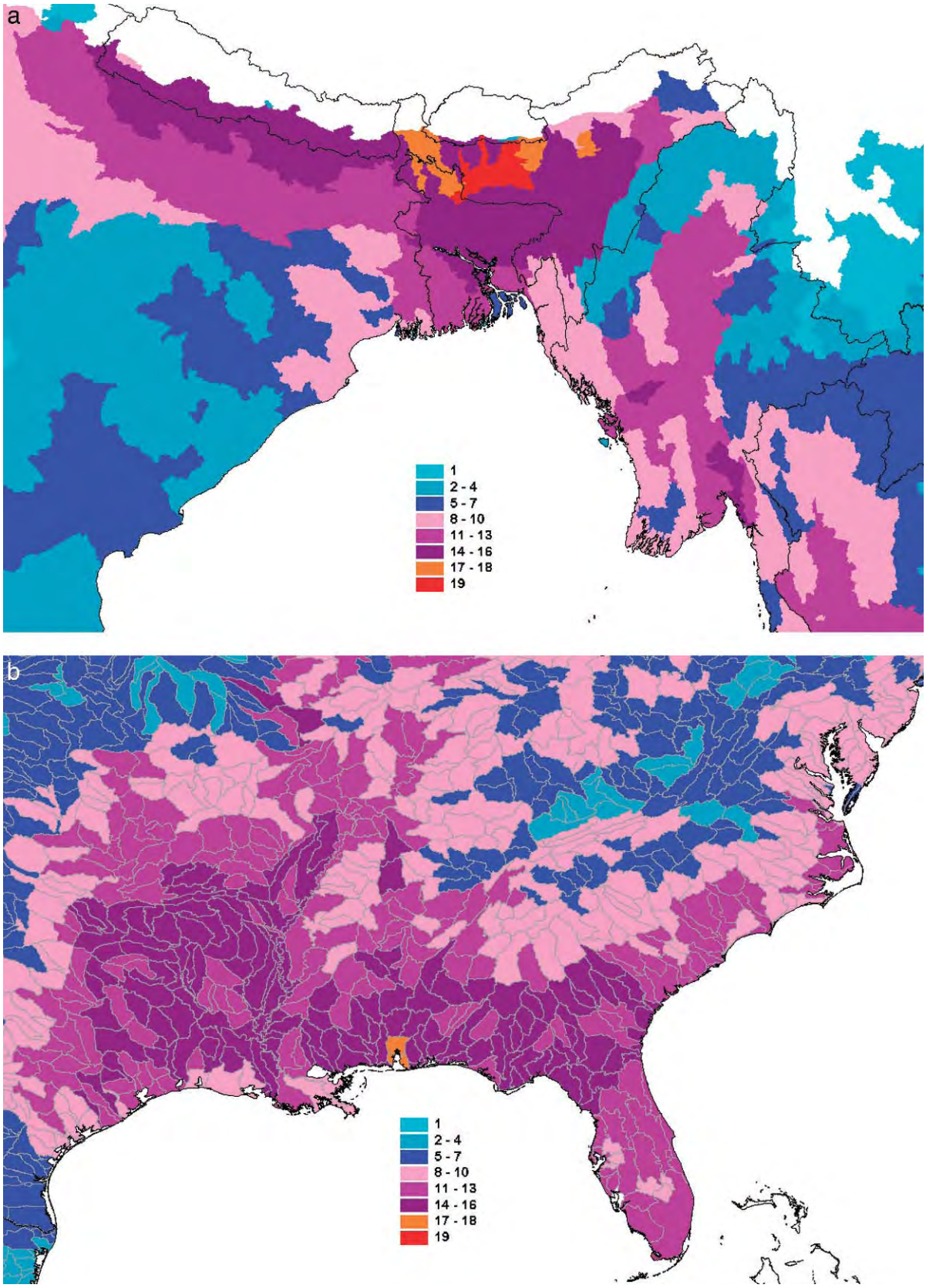

Figure 2. a) The world's greatest turtle species richness area, based on the co-occurrence of species in hydrologic unit compartments in the Ganges–Brahmaputra river basin drainages of India and Bangladesh in South Asia. b) The world's second-greatest turtle richness area, centered on the Mobile River basin in the southeastern United States. Color codes as in Fig. 1.

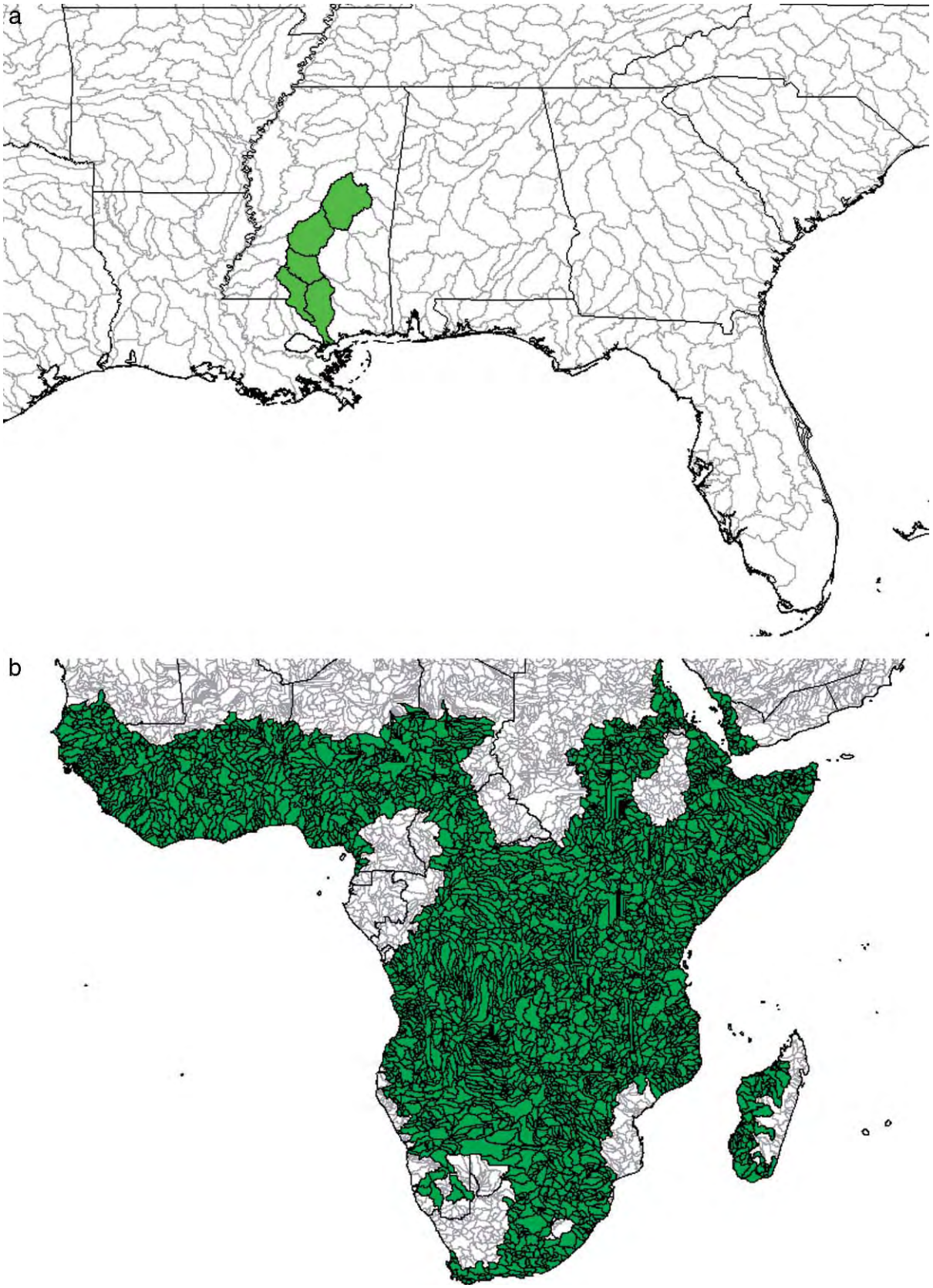

Figure 3. Examples of relative numbers of hydrologic unit compartments that comprise turtle ranges: a) *Graptemys oculifera,* 22,348 km^2, southeastern United States; b) *Pelomedusa subrufa,* 16.2 million km^2, Sub-Saharan Africa. Figs. 3a, b are not at equivalent scales.

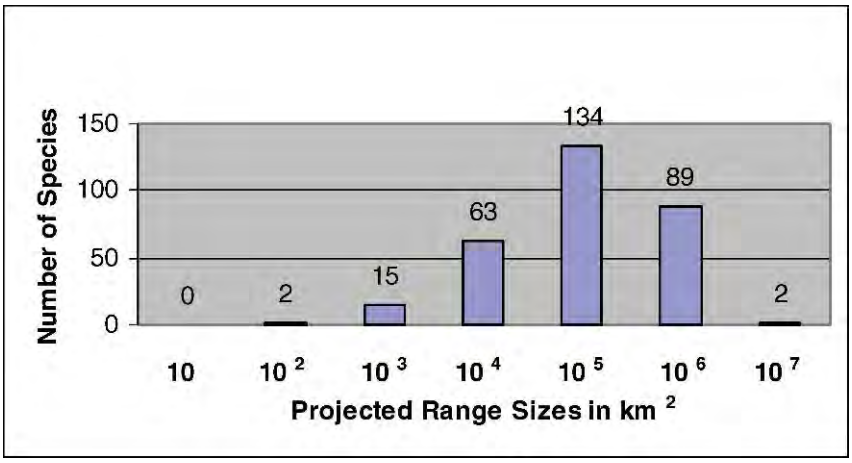

Figure 4. Range distributions (in km^2 of projected hydrologic unit compartments ranges) for 305 turtle species in this analysis.

New Global Turtle Priority Areas (TPAs)

Toward our goal of identifying areas of global turtle species richness that were outside of existing GCSs, we identified 3 new global Turtle Priority Areas (TPAs) that collectively include 72 (62%) of the 116 species without adequate GCS coverage. As previously noted, some of these species have partial ranges in existing GCSs, but the following areas of high species richness lie outside of GCS regions.

Southeastern United States TPA. — North America is the primary region for 48 species (Table 2). Three of these are included in GCSs (*Gopherus agassizii*, *Actinemys marmorata*, and *Kinosternon sonoriense*), and the remaining 45 each have ranges of $< 50\%$ (4 species) in GCSs or are absent (41 species; Appendix 1). Five Ecoregions collectively comprise a Southeastern United States TPA that includes portions or all of the range for 43 of the 45 species; only *Glyptemys insculpta* and *Emydoidea blandingii* are not included (Fig. 5): 1) Southeastern Mixed Forests, 29 species, 2) Southeastern Conifer Forests, 25 species, 3) Mississippi Lowland Forests, 10 species, 4) Piney Woods Forests, 13 species, and 5) Edwards Plateau Savanna, 3 species.

Lower Gangetic Plain TPA. — Asia is the primary region for 77 species (Table 2). Most Asian species are included in GCSs, but 18 have $< 50\%$ of their ranges in GCSs, and 6 are absent (24 species; Table 4, Appendix 1). However, 10 of these 24 are Chinese endemics or nearly so and 14 are found on the Indian subcontinent. The Lower Gangetic Plain Moist Deciduous Forests Ecoregion lies adjacent to the Indo-Burma and Himalaya BHs (Fig. 6) and contains 18 species, which includes 12 of the 14 Indian species in need of conservation coverage; only 2 Indian species, *Geochelone elegans* and *Aspideretes leithii,* occur in other areas.

Coastal Australia TPA. — Australasia is the primary region for 35 species (Table 2). Twenty-five are included in GCSs, but 6 have $< 50\%$ of their ranges in GCSs, and 10 are absent from GCSs. Thus, 16 species in Australia have $> 50\%$ of their range outside of GCSs (Appendix 1). The Coastal Australia TPA complements the existing Kimberly, Arnhem Land, and Cape York Tropical Savanna OWAs and includes the following Ecoregions: 1) Carpentaria Tropical Savanna, 7 species, 2) Brigalow Tropical Savanna, 9 species, 3) Queensland Tropical Rain Forest, 1 endemic species, *Elseya* ''Johnstone'' (A. Georges, unpubl. data), and 4) Eastern Australia Temperate Forests, 9 species (Fig. 7). The Coastal Australia TPA collectively captures 15%–100% of the ranges of all 16 species and contains some portion of the ranges of 22 species (Appendix 1).

DISCUSSION

HUC Methodology. — Knowledge of species distributions in certain global regions is thorough, down to local watershed levels (e.g., North America). For species in these areas, ranges and actual known distributions are effectively the same. In other regions of the world (e.g., Sub-Saharan Africa, Asia), museum and other known distributional data are limited, and therefore, ranges are extrapolations based on expert opinion, similar physiography and habitats, elevation, and drainage connections. At the broadest, most applied scale, the use of HUCs (watersheds) to map turtle distributions is an ecologically valid approach. However, all ranges overestimate the actual habitat available to each species, such as erroneously extending the ranges of turtles to high elevations (i.e., ''Sky Islands'' of the Madrean Pine-Oak Woodlands BH) when the species are restricted to the lowlands of the watershed, or extending turtle ranges into adjacent, but unoccupied, Ecoregions. Only 1 turtle species, *Kinosternon oaxacae*, has a significant portion ($> 50\%$) of its range in the Madrean Pine–Oak Woodlands, but at lower elevations the HUCs clearly delineate the primary watershed conservation boundary for the turtles. Therefore, HUC-derived ranges are representative of landscape-level distributions, especially for many freshwater turtles where identification of

Table 3. Number of turtle species in various Global Conservation Strategies (GCS). A species was counted as occurring in a Biodiversity Hotspot (BH), High Biodiversity Wilderness Area (HBWA), or Other Wilderness Area (OWA) if ≥ 5% of its range occurred within one of those regions. Because true boundaries of species ranges may not match exactly with HUC (watershed) boundaries, species with < 5% of its range in a region were excluded; conversely, species with ≥ 95% of range inside a region were considered endemic. GCS regions were regarded as critical for conservation of a species when ≥ 50% of the species' range occurred within a region. Four-letter codes for BHs, HBWAs, and OWAs are the same as those in Appendix 1.

	Geographic region	GCS region codes	Range < 50%–5%	Range > 50%–95%	Range > 95% (endemic)	Total species
Biodiversity Hotspots (BH)						
Indo-Burma	AS	INBU	21	15	15	51
Mesoamerica	CA	MEAM	11	10	10	31
Madrean Pine–Oak Woodlands	CA	MPOW	23	1		24
Himalaya	AS	HIMA	16	2		18
Sundaland	AS	SUND	7	8	2	17
Cerrado	SA	CERR	13		1	14
Tropical Andes	SA	TRAN	13	1		14
Atlantic Forest	SA	ATLF	8	1	2	11
Mediterranean Basin	MD	MEDB	5	3	2	10
Tumbes–Choco–Magdalena	SA	TUCM	8	2		10
Guinean Forests of West Africa	AF	GFWA	8	1		9
Madagascar and the Indian Ocean Islands	AF	MADG	1		7	8
Succulent Karoo	AF	SUKA	7	1		8
Eastern Afromontane	AF	EAFM	7			7
Cape Floristic Region	AF	CPFP	5	1		6
Maputaland–Pondoland–Albany	AF	MAPA	5	1		6
Western Ghats and Sri Lanka	AS	WGSL	4	2		6
Caribbean Islands	CA	CAIS			4	4
Wallacea	AS,AU	WALL	1		3	4
Horn of Africa	AF	HOAF	4			4
Japan	AS	JAPN	1		2	3
Southwest Australia	AU	SWAU	1		2	3
Caucasus	MD	CAUC	3			3
Coastal Forests of Eastern Africa	AF	CFEA	3			3
Irano-Anatolian	MD	IRAN	3			3
Philippines	AS	PHIL	1		1	2
California Floristic Province	NA	CAFP		1		1
Mountains of Central Asia	MD	MCAS	1			1
High Biodiversity Wilderness Areas (HBWA)						
Amazonia	SA	AMAZ	4	10	6	20
North American Deserts	NA,CA	NAMD	10	7	2	19
Congo Forests	AF	COFO	7	5		12
New Guinea	AU	NEGU	1	1	9	11
Miombo–Mopane Woodlands and Savannas	AF	MMWS	11			11
Other Wilderness Areas (OWA)						
Chaco	SA	CHAC	10	2		12
Arnhem Land Tropical Savanna	AU	ARTS	8		1	9
Kimberly Tropical Savanna	AU	KMTS	5	2		7
Sahel	AF	SAHL	6	1		7
Llanos	SA	LLAN	5	1		6
Banados del Este	SA	BADE	4	1		5
Central Asian Deserts	MD,AS	CASD	4	1		5
Cape York Tropical Savanna	AU	CYTS	4			4
Kalahari Xeric Savanna	AF	KAXS	4			4
Sahara	MD,AF	SAHR	4			4
Arabian Deserts	MD	ARDE	3			3
Australian Deserts	AU	AUDE	3			3
Sundarbans	AS	SBAR	3			3
Pantanal	SA	PANT	2			2
Kalahari–Namib	AF	KANA	1			1
Rocky Mountains	NA	ROMO	1			1

drainage basin catchment boundaries, such as to control pollution inputs, is the first step in drawing accurate conservation boundaries.

The HUC approach to mapping distributions might arguably be less accurate for tortoises (Testudinidae) because these species are less likely to be restricted by drainages and are more capable of crossing drainage divides than some aquatic turtles. Future refinement of individual HUC ranges should be made by removing portions along ecoregional boundaries and elevational contours, when those aspects of a species distribution are well known.

Global Richness Patterns. — Our primary objectives were to determine the global and continental patterns of

Table 4. Number of turtle species by region within the Global Conservation Strategies (GCS) and the number of first-priority Ecoregions (see text) needed to capture all species < 50% present in GCS or absent. (See Appendix 1 for Ecoregion names.)

Region	Endemic to GCS	<95%–50% present in GCS	<50%–5% present in GCS	<5%–0% (absent) from GCS	No. of first-priority Ecoregions
NA	0	3	4	41	14
CA	28	10	2	0	1
SA	18	22	4	1	4
MD	3	8	1	0	1
AF	8	17	22	1	12
AS	36	17	18	6	9
AU	13	6	6	10	4
Totals	106	83	57	59	45

species richness and endemism in tortoises and freshwater turtles, evaluate how well existing biodiversity conservation strategies overlap with the distributions of turtles, and identify areas of high turtle richness and endemism that fall outside the currently recognized GCSs for biodiversity, and on which future efforts should be focused.

The compilation of all ranges for the 305 turtle species using HUCs (Fig. 1) resulted in the identification of many areas of high species richness within the 7 global regions. Areas with up to 10 co-occurring species are found on the northern and northeastern coasts of Australia, the western coastal belt of Sub-Saharan Africa from Liberia southward to Gabon, and much of southeast Asia including southern China, Vietnam, and Cambodia, as well as Borneo. Areas where more than 11 species are likely to co-occur include the Mississippi and Atlantic Coast drainages of southeastern United States, the upper Amazon River drainage of Brazil and Colombia, the Ganges and Brahmaputra drainages of India and Bangladesh, the Irrawaddy drainage of Myanmar, the Salween

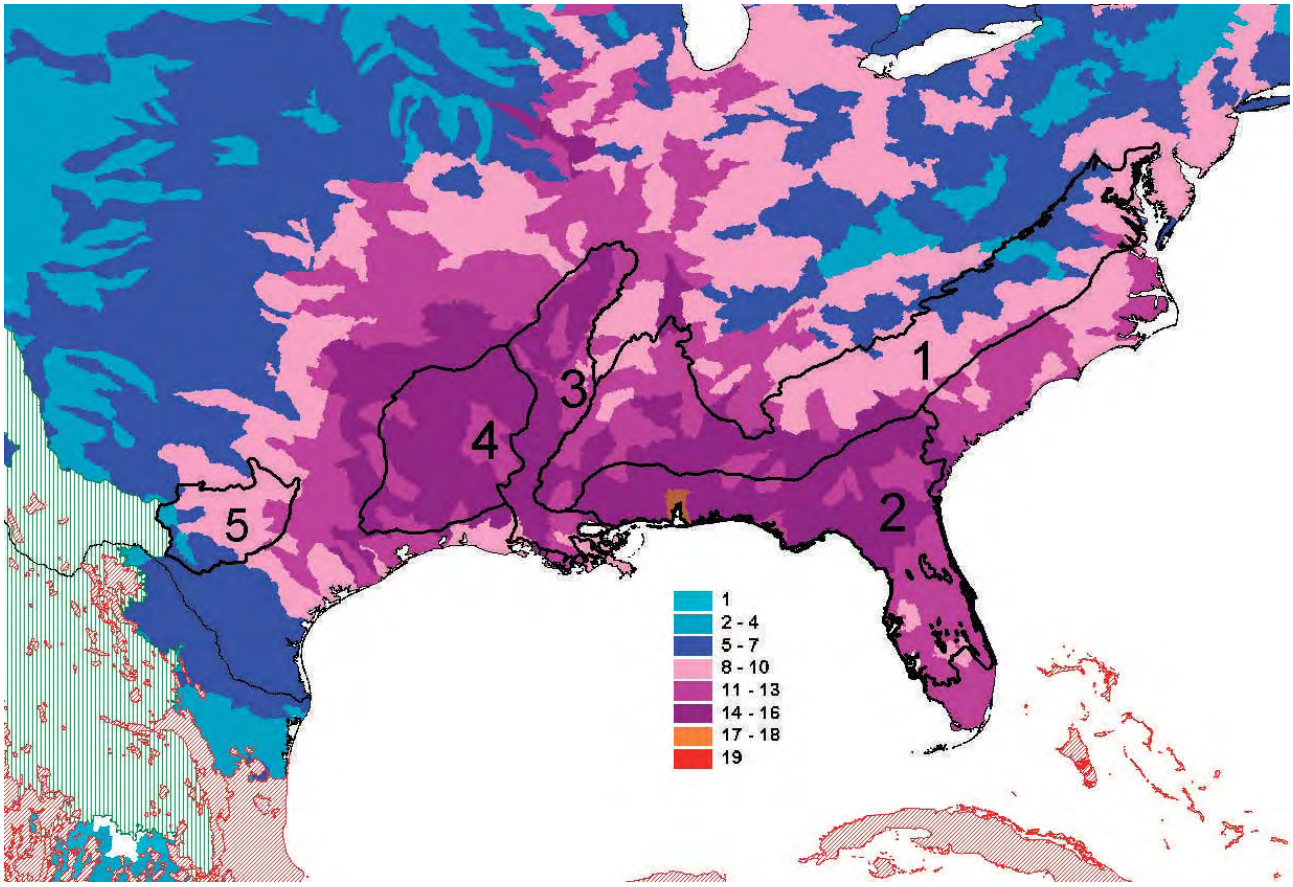

Figure 5. Southeastern United States turtle priority area (TPA) for 43 turtle species not included in existing global conservation strategy areas. Ecoregions comprising the TPA include 1) Southeastern Mixed Forests, 2) Southeastern Conifer Forests, 3) Mississippi Lowland Forests, 4) Piney Woods Forests, and 5) Edwards Plateau Savanna. Vertical green striping indicates an adjacent high-biodiversity wilderness area (North American Deserts); diagonal red striping indicates nearby biodiversity hotspots (Mesoamerica and Caribbean). Color codes as in Fig. 1.

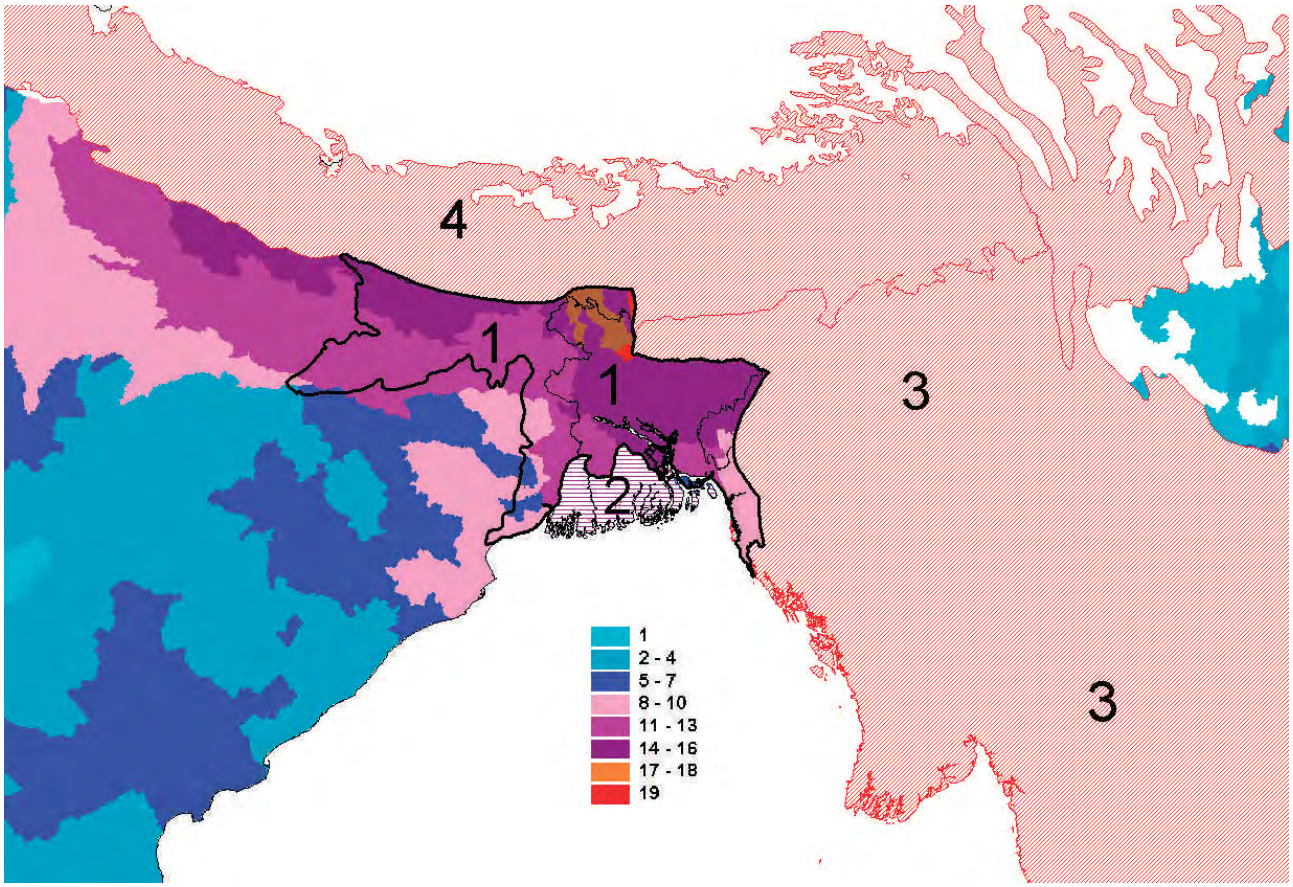

Figure 6. Lower Gangetic Plain turtle priority area (TPA) for 18 species, including 12 species not covered in existing global conservation strategies. A single Ecoregion encompasses the following TPA: 1) Lower Gangetic Plains Moist Deciduous Forests. Diagonal red striping indicates adjacent biodiversity hotspots: 3) Indo-Burma; 4) Himalayas; horizontal purple striping indicates an adjacent OWA: 2) Sundarbans. Color codes as in Fig. 1.

drainage of southern Thailand south throughout Malaysia, and the coastal drainages of Sumatra. The areas of the world where the greatest species density is found include the upper portions of the Ganges and Brahmaputra Basin in India and the lower Mobile Bay drainage along the Gulf Coast of North America (Figs. 1–2).

Our 7 global turtle regions correspond loosely with biogeographic realms (Olson et al. 2001), with the exception that we categorized Central America, including Mexico, as a separate ''northern Neotropical'' realm, as similarly recognized by Bour (2008). Central America represents a wide region of overlap of Nearctic and Neotropical turtles, but also contains a sizeable endemic turtle fauna exemplified by the genera *Dermatemys*, *Claudius,* and *Staurotypus,* and large radiations within the genera *Trachemys*, *Kinosternon*, and *Rhinoclemmys*. Our 7 regions also minimized overlap of species between regions. For example, the turtle faunas on the African continent were assigned to 1 of 2 groups: 1) those species existing south of the Saharan Desert, and 2) those found on the north coast along the Mediterranean Sea, which are biogeographically allied with European and Middle East species (e.g., the genera *Mauremys* and *Testudo*). Only 2 of 48 Sub-Saharan species (*Pelomedusa subrufa* and *Trionyx triunguis*) enter our defined Mediterranean region. Turtles are largely absent from the vast majority of the Palearctic realm, and those that are present in the western Palearctic are derived from the Mediterranean region above; whereas, in the eastern Palearctic (i.e., northeast China and Japan, Korea, and Siberia) the turtle fauna is Indo-Malayan in origin. Also, as with many other faunas (Lomolino et al. 2006), Weber's Line effectively separates Asian from Australasian turtles.

Although turtles have had a successful 200+ million year history, their living diversity is among the lowest of major vertebrate clades (both older and younger). In addition, unlike most groups of organisms (Lomolino et al. 2006), they do not exhibit a pattern of highest diversity in the tropics. Indeed, their greatest diversities are reached at ca. lat 23°N–24°N (Ganges River basin in Asia) and lat 31°N–32° N (Mobile River basin in North America). The combination of their generally low richness, their unusual distribution patterns, and their unusual life history strategies (Heppell 1998) make them especially difficult to conserve.

Existing GCSs. — Our analyses identified turtle and tortoise species that would, in theory, be afforded conservation attention, and possibly protection, under

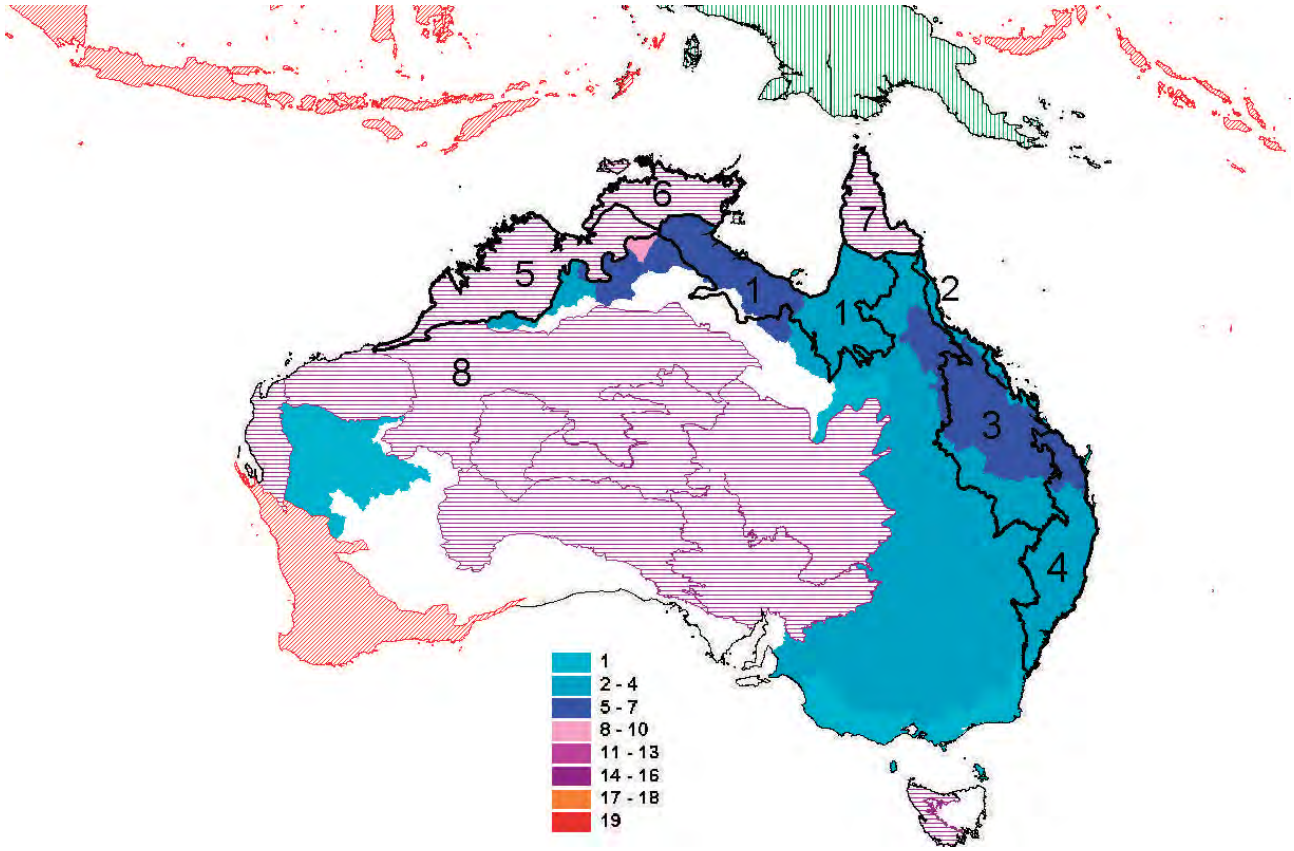

Figure 7. Coastal Australia turtle priority area (TPA) includes for 16 species not covered in existing global conservation strategies. Ecoregions comprising the TPA include the following: 1) Carpentaria Tropical Savanna, 2) Queenland Rainforest, 3) Brigalow Tropical Savanna, and 4) Eastern Australia Temperate Forest. Vertical green striping indicates a nearby high-biodiversity wilderness area (New Guinea), diagonal red striping indicates nearby biodiversity hotspots (Southwest Australia, Wallacea; horizontal purple striping indicates adjacent other wilderness areas: 5) Kimberly Tropical Savanna, 6) Arnhem Land Tropical Savanna, 7) Cape York Tropical Savanna, and 8) Australian Deserts. Color codes as in Fig. 1.

existing GCSs; although, occurrence in these areas certainly carries no guarantee of protection. By identifying these species and also the proportions of their ranges that coincide with GCS regions, we can evaluate the likely importance and effectiveness of particular conservation strategies, as well as the seriousness of landscape-level threats.

BHs are human constructs, ecologically characterized, but defined by disparate levels of human activity (i.e., BHs have lost 70% or more of their original native vegetation; Myers et al. 2000). The 34 BHs hold especially high numbers of endemic species, but their combined area of remaining habitat covers only 2.3% of the earth's land surface; over 50% of the world's plant species and 42% of all terrestrial vertebrate species are endemic to the hotspots (Mittermeier et al. 2004). Clearly, the most important hotspot for turtle conservation is Indo-Burma with 15 endemics and another 15 species with $>$ 50% of their ranges encompassed therein. Similarly, the Mesoamerica BH has 10 species in each of those same 2 categories, and although they contain smaller numbers of species, it must be noted that the entire turtle faunas of Southwest Australia, Madagascar and the Indian Ocean islands, and the Caribbean islands are fully encompassed within their respective BHs.

Our analysis indicated that 74 turtle species (24%) are endemic to BHs, a figure that is significantly lower than the overall endemic terrestrial vertebrate percentage (42%; Mittermeier et al. 2004). However, conservation resources are flowing to BHs (Myers 2003), and the species that are endemic to BHs often receive considerable conservation attention because of the focus on hotspot conservation. Nevertheless, the persistence of these species in the wild depends on conservation success (sensu Brooks et al. 2002) in their respective hotspots of occurrence. Thus, although the identification of BHs has focused attention on their conservation, even if their protection was successful across the globe, only 120 turtle species (39% of the total) have $\geq$ 50% of their ranges within these hotspots. Hence, global turtle conservation must look well beyond the possible protection offered by the conservation of BHs.

Five HBWAs (Amazonia, Congo, New Guinea, North American Deserts, and Miombo–Mopane Woodlands) are large areas of exceptional diversity that remain mostly intact, with greater than 70% of their natural land cover remaining and with relatively low human density and threats (Mittermeier et al. 1998, 2003). Indeed, HBWAs in New Guinea and Amazonia rank below only

the top 2 BHs (Indo-Burma and Mesoamerica) in terms of endemic turtle fauna. In theory, the 17 turtle species endemic to the HBWAs should be some of the most secure because by definition more than 70% of their habitat remains. An assumption, however, is that other threats, including human encroachment, disease, pollution, climate change, and exploitation (sensu Gibbons et al. 2000) are not impacting those turtles at high levels. Unfortunately, they are, as is the case with the exploitation of Amazonian river turtles for food (Ojasti 1996; Moll and Moll 2004; Conway-Gómez 2007) and the extraction for bush meat in the Congo (Luiselli 2003; Maran and Pauwels 2005). These 17 endemic species represent 6% of turtles, which is also lower than the overall endemism in other groups (18% of the world's plants and 10% of all terrestrial vertebrates; Mittermeier et al. 2003).

Of the 24 OWAs analyzed, some are large (i.e., Antarctica, Arctic Tundra), but do not contain turtles. Most of the others are smaller than 1 million km^2. However, several OWAs individually include $> 50\%$ of the ranges of 9 turtle species (e.g., Banados del Este [*Trachemys dorbigni*]; Chaco [*Acanthochelys pallidipectoris* and *Geochelone petersi*]; Llanos [*Podocnemis vogli*]; Sahel [*Geochelone sulcata*]; Central Asian Deserts [*Testudo horsfieldii*]; Kimberly Tropical Savanna [*Emydura victoriae* and *Elseya dentata*]); and Arnhem Land Tropical Savanna [*Elseya* ''South Alligator'']). Collectively, OWAs encompass $\geq 50\%$ of the ranges of 12 species (the 9 above, plus *Phrynops williamsi, Chelodina burrungandjii*, and *Emydura tanybaraga*; Appendix 1).

Ecoregion Approach. — When all the above GCS strategies are combined, 246 of 305 (80.7%) turtle species are addressed at some level. However, additional conservation strategies must be invoked if we are to meet the goal of ''no turtle left behind'' for the other 19.3%. Thus, we prioritized individual or groups of Ecoregions for additional turtle conservation strategies, designating 3 new TPAs. For this paper we did not include priority Ecoregions for every turtle species, but instead presented Ecoregions only for those species that must rely solely on them for conservation (i.e., they fall outside of BHs, HBWAs, and OWAs; Appendix 1). Ecoregions are important in conservation planning at regional levels (e.g., The Nature Conservancy's Ecoregion planning process, Partners for Amphibian and Reptile Conservation (PARC) habitat management guidelines–North America; Bailey et al. 2006) and identifying species at the Ecoregion level allows for maintenance of ecological processes on the local landscape. Ecoregion conservation is clearly important for the 12 turtle species that are endemic to single Ecoregions, including some of the rarest species in the genus *Cuora* in Asia (Appendix 1).

We assigned species to a priority Ecoregion based on the species' greatest percentage of range. This does not mean that we consider that Ecoregion to necessarily be the most important for the conservation of that species; it simply means that because the species has a significant portion of its range there, it would probably be a reasonable area to consider initially for protection. It is also necessary to look at subsequently ranked Ecoregions because, by selecting a first-priority Ecoregion based on greatest range, we may not address the needs for species conservation at the periphery of a species' range. We recognize that field inventory of status and threats, assessment of populations and their sizes, determination of quality of habitat, and the ability to achieve conservation (i.e., political will, local capacity, funding, etc.) will all combine to determine the most effective priority Ecoregion for each species. We also note that future analyses may integrate turtle ranges with recent freshwater Ecoregion delineations (Abell et al. 2008).

In North America, 14 Ecoregions were identified for 45 species. Many species clustered in several adjacent Ecoregions in the southeastern United States (Southeastern United States TPA). The two most turtle-species-rich Ecoregions in the world, Southeastern Mixed Forests and Southeastern Conifer Forests occur here (Fig. 5). However, the Blanding's turtle (*Emydoidea blandingii)* was identified as a focal species in conservation planning for the Great Lakes Ecoregion; whereas, the wood turtle (*Glyptemys insculpta*) was assigned to the New England Acadian Forests because no broader-level strategy previously identified will properly address these species' needs. For 3 wide-ranging North American species (*Apalone spinifera, Chelydra serpentina,* and *Chrysemys picta*), each of their ranges spanned 23–29 Ecoregions with $< 10\%$ of their range in any one; thus, no single Ecoregion was selected for their conservation.

In Central America, the occurrence of BHs and HBWAs resulted in the inclusion of many turtle species, but some Ecoregions were outside the GCS, including the Tamaulipan Mezquital, important for *Gopherus berlandieri* and *Pseudemys gorzugi*. For future analyses, some species (i.e., *Trachemys yaquia* and *Kinosternon alamosae*) marginally missed our cutoff for needing Ecoregion-focused attention, but would likely benefit from protection in the Sonoran–Sinaloan transition Ecoregion. Likewise, the Caatinga and the Argentine Monte Ecoregions lie outside of GCSs in South America but are important for *Batrachemys tuberculata* and *Geochelone chilensis*, respectively. Overall, 5 South American species would benefit from conservation focused on these Ecoregions.

Most Mediterranean species had substantial overlap with the Mediterranean Basin BH, but *Emys orbicularis* would likely benefit from additional conservation attention in the Central European Mixed Forests Ecoregion.

The distributions of turtles in Sub-Saharan Africa are poorly known (Bour 1983), and ranges were difficult to construct because museum data were sparser than for other regions (Iverson 1992b). The percentages of some species' ranges falling in or out of GCSs were difficult to determine with certainty because HUC layers for Africa do not always align well with the boundaries of

Ecoregions and GCSs. Nevertheless, at least 23 species have > 50% of their ranges outside of GCSs, and several Ecoregions emerged as priorities for turtle conservation, including the West Sudanian Savanna as a priority area for at least 5 species and the Nama Karoo for 3 species (see Appendix 1). *Pelusios broadleyi* would benefit from focus on the Masai Xeric Grasslands and Shrublands Ecoregion. Further detailed analysis of the distributions of individual African species is needed for conservation planning (Burgess et al. 2005, Luiselli 2008).

Asia could be treated as 2 separate regions because it contains the fauna of the Indian subcontinent and that of Southeast Asia. The Indo-Burma BH contains species from both India and Southeast Asia but contains the greatest percentage range for the latter. The Ganges–Brahmaputra region of India and Bangladesh exhibits the greatest range overlap for turtles in a single area in the world, with 19 species known from each of 4 connected HUCs (Figs. 2a, 6; Lower Gangetic Plain TPA; see also Iverson 1992a, 1992c). The richness of turtles in the Ganges–Brahmaputra Basin is in part because of the overlap in the 2 faunas. The Lower Gangetic Plains Moist Deciduous Forest Ecoregion, representing the third-most species-rich turtle Ecoregion in the world (18 species), accounted for 12 species that were not previously covered by GCSs (Appendix 1). The Upper Gangetic Plains Moist Deciduous Forests Ecoregion, although clearly needed for conservation of the Ganges River system and its fauna, does not gain any more turtle species, just more range of the same species. Other Ecoregions that include the same high turtle species richness (but are within the Indo-Burma and Himalaya BHs) include Meghalaya Subtropical Forests, Brahmaputra Valley Evergreen Forests, Mizoram–Manipur–Kachin Rainforests, and Terai–Duar Savannas and Grasslands. Both the Deccan Thorn Scrub and the Eastern Highlands Moist Deciduous Forests are important Ecoregions for 3 species (*Lissemys punctata*, *Geochelone elegans*, and *Aspideretes leithii*) because these species are 84%–92% outside of GCSs. India has one of the most diverse turtle faunas with 28 species, and ranks among the top 5 countries in terms of importance for turtle conservation in Asia (Stuart and Thorjarnarson 2003) and the world (Rhodin 2006). In addition, climate change studies suggest that glacial melt in the Himalaya will affect water flow in the Ganges Basin (Xu et al. 2009), thus adding another conservation concern to this priority area.

There are 12 Southeast Asian species that are not accounted for in the Indo-Burma BH, and the Ecoregions needed for their conservation include the Jian Nan Subtropical Evergreen Forest (5 species), Chiangjiang Plain Evergreen Forest (3 species), the Yunnan Plateau Subtropical Evergreen Forest (3 species, all presumably endemic: *Cuora mccordi*, *Cuora yunnanensis*, *Cuora zhoui*), and the Qin Lin Mountains or Daba Mountains (1 species, *Cuora pani*).

For Australasia, those species that occur in Ecoregions in New Guinea (Southern New Guinea Freshwater Swamps and Lowland Rain Forests, and Trans-Fly Savanna Grasslands) are accounted for in the New Guinea HBWA. However, there are 16 species in Australia that were not adequately addressed by GCSs, for which we identified the Coastal Australian TPA. Three OWAs in northern coastal Australia correspond with the boundaries of Ecoregions of the same name (Kimberly, Arnhem Land, and Cape York Tropical Savannas). Additional Ecoregions for Australian turtle conservation include the Carpentaria Tropical Savanna, Brigalow Tropical Savanna, Queensland Tropical Rain Forest, and Eastern Australia Temperate Forests. Other Ecoregions that are important for some of the same turtles include the Victoria Plains Tropical Savanna, the Western Australia Mugla Shrublands, and the Einasleigh Upland Savanna.

Our analysis demonstrates that even if we assume that conservation actions will be effective under current GCSs and cover all turtle species within these geographic areas, at least 59 species fall completely outside that potential protection. We hope our classification of 3 new TPAs will create awareness of landscape-level protection opportunities for conservation of additional species in North America, Asia, and Australia. By our calculations, with the addition of our 3 TPAs to the existing GCSs discussed in this paper, only 10 species would not have been addressed. These include *Emydoidea blandingii* and *Glyptemys insculpta* (North America), *Geochelone chilensis* (South America), *Pelusios broadleyi* (Sub-Saharan Africa), and 6 *Cuora* species (*Cuora aurocapitata, Cuora flavomarginata, C. mccordi, C. pani, C. yunnanensis, C. zhoui*; Asia); however, we list Ecoregions for these species for future focus in Appendix 1.

Clearly, conservation strategies that target species-specific action (Buhlmann and Gibbons 1997; Rodrigues 2006), improve coverage of protected areas worldwide (Rodrigues et al. 2004), and address threats to turtles specifically (Turtle Conservation Fund 2002) and in the larger landscape (Boyd et al. 2008) must be employed collectively and synergistically in order to include and hopefully protect every species effectively under a conservation umbrella strategy. Our goal with this analysis was to develop an improved strategy to ''leave no turtle behind'' in the global race to conserve this unique and imperiled group of vertebrates.

ACKNOWLEDGMENTS

We wish to thank staff at the GIS Labs of the Center for Applied Biodiversity Science at Conservation International (Rob Waller, Mark Denil) and the Savannah River Laboratory (Jeff Harris, Bess Harris) for assistance at various stages of mapping the distributions of turtles. Ross Kiester provided most of the digitized point localities for this project from the Web site www.emys.geo.orst.edu. Carmen Revenga (The Nature Conservan-

cy), Robin Abell and Michelle Thieme (World Wildlife Fund) provided their new HUC layers for South America. We greatly appreciate critical and helpful peer review by Mike Hoffmann, Jeff Seminoff, Ross Kiester, Bryan Wallace, and Roger Bour. Support for this project was provided by Conservation International, Washington, DC/ Arlington, Virginia; the National Science Foundation (DBI-9807898; to JBI), and Earlham College. This material is based upon work supported by the Department of Energy under Award Number DE-FC-09-075R22506 to the Savannah River Ecology Laboratory. Projected range maps for each turtle species are available from the authors.

TURTLE TAXONOMY NOTE

We began our project with a taxonomy acceptable to all authors, and we have retained that taxonomy in this paper. However, a number of names have changed since we began (e.g., see Fritz and Havas 2007, Rhodin et al. 2008). They are listed here, with the more recently proposed name in brackets: *Batrachemys [Mesoclemmys] zuliae, Batrachemys [Mesoclemmys] dahli, Bufocephala [Mesoclemmys] vanderhaegei, Chinemys [Mauremys] nigricans, Chinemys [Mauremys] reevesii, Pyxidea [Cuora] mouhotii, Elseya "*Burnett*" [albagula], Geochelone [Chelonoidis] carbonaria, Geochelone [Chelonoidis] chilensis, Geochelone [Chelonoidis] denticulata, Geochelone [Chelonoidis] nigra, Geochelone [Chelonoidis] petersi, Geochelone [Stigmochelys] pardalis, Geochelone [Astrochelys] radiata, Geochelone [Astrochelys] yniphora, Geoemyda [Vijayachelys] silvatica, Heosemys [Siebenrockiella] leytensis, Hieremys [Heosemys] annandalii, Homopus* sp. *[solus], Ocadia [Mauremys] sinensis, Ranacephala [Phrynops] hogei, Rhinemys [Phrynops] rufipes*, *Dipsochelys [Aldabrachelys] dussumieri [gigantea], Aspideretes [Nilssonia] gangeticus, hurum, leithii,* and *nigricans*; *Batagur affinis; Callagur [Batagur] borneoensis;* and *Kachuga [Batagur] dhongoka, kachuga,* and *trivittata*.

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Appendix 1. The 305 turtle species addressed in this analysis and their primary region of occurrence, range in sq. km., and their percentage of occurrence in 3 existing Global Conservation Strategies (GCS): Biodiversity Hotspots (BH), High Biodiversity Wilderness Areas (HBWA), and Other Wilderness Areas (OWA). These GCS are identified specifically by name (see Table 3 for acronyms) if > 5% of a species' range occurs within. When a species occurs in multiple GCS, those areas are presented in order of greatest range encompassed. Species whose ranges occur > 50% outside of these existing GCS (n = 116) are assigned to a first-priority Ecoregion based on their greatest percentage of occurrence.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Carettochelyidae	Carettochelys insculpta	488,050	AU			56.8	NEGU	31.0	ARTS,KMTS	12		
Chelidae	Acanthochelys macrocephala	949,088	SA	27.7	CERR,TRAN	3.7		49.0	CHAC,PANT	20		
Chelidae	Acanthochelys pallidipectoris	467,431	SA	0.6				93.0	CHAC	6		
Chelidae	Acanthochelys radiolata	319,393	SA	67.5	ATLF					33		
Chelidae	Acanthochelys spixii	1,349,035	SA	56.8	ATLF,CERR			31.0	BADE,CHAC	12		
Chelidae	Batrachemys dahli	19,741	SA	87.9	TUCM,TRAN					12		
Chelidae	Batrachemys heliostemma	551,361	SA	0.1		99.9	AMAZ			0		
Chelidae	Batrachemys nasuta	386,816	SA			100.0	AMAZ			0		
Chelidae	Batrachemys raniceps	5,261,453	SA	4.5		91.4	AMAZ	1.0		3		
Chelidae	Batrachemys tuberculata	653,780	SA	24.5	CERR,ATLF					76	Caatinga	75.5%
Chelidae	Batrachemys zuliae	23,973	SA	31.3	TRAN					69	Catatumbo moist forests	54.6%
Chelidae	Bufocephala vanderhaegei	1,847,789	SA	49.8	CERR,ATLF	1.0		41.0	CHAC,PANT	8		
Chelidae	Chelodina burrungandjii	429,074	AU					62.0	KMTS,ARTS	38		
Chelidae	Chelodina canni	983,683	AU					13.0	CYTS	87	Carpentaria tropical savanna	34.5%
Chelidae	Chelodina expansa	1,151,074	AU					4.0		96	Brigalow tropical savanna	21.8%
Chelidae	Chelodina longicollis	2,093,499	AU					12.0	AUDE	88	Brigalow tropical savanna	15.8%
Chelidae	Chelodina mccordi	1,223	AU	100.0	WALL					0		
Chelidae	Chelodina novaeguineae	102,628	AU			100.0	NEGU			0		
Chelidae	Chelodina oblonga	113,918	AU	100.0	SWAU					0		
Chelidae	Chelodina parkeri	64,621	AU			100.0	NEGU			0		
Chelidae	Chelodina pritchardi	2,962	AU			100.0	NEGU			0		
Chelidae	Chelodina reimanni	51,401	AU			100.0	NEGU			0		
Chelidae	Chelodina rugosa	998,578	AU			5.9	NEGU	34.0	ARTS,CYTS, KMTS	60	Carpentaria tropical savanna	34.2%
Chelidae	Chelodina steindachneri	636,658	AU	16.8	SWAU			43.0	AUDE	40		
Chelidae	Chelus fimbriata	6,735,937	SA	6.1		83.7	AMAZ	7.0	LLAN	3		
Chelidae	Elseya ''Johnstone''	2,305	AU							100	Queensland tropical rain forests	100.0%
Chelidae	Elseya ''South Alligator''	73,865	AU					100.0	ARTS	0		

Appendix 1. Continued.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Chelidae	Elseya albagula	203,463	AU							100	Brigalow tropical savanna	78.0%
Chelidae	Elseya bellii	116,626	AU							100	Eastern Australian temperate forests	36.7%
Chelidae	Elseya branderhorsti	241,096	AU			100.0	NEGU			0		
Chelidae	Elseya dentata	446,827	AU					75.0	KMTS,ARTS	25		
Chelidae	Elseya georgesi	3,446	AU							100	Eastern Australian temperate forests	99.7%
Chelidae	Elseya irwini	130,088	AU							100	Brigalow tropical savanna	45.1%
Chelidae	Elseya latisternum	1,226,203	AU					22.0	ARTS,CYTS	78	Carpentaria tropical savanna	27.7%
Chelidae	Elseya lavarackorum	215,337	AU					5.0	ARTS	95	Carpentaria tropical savanna	71.6%
Chelidae	Elseya novaeguineae	385,719	AU			100.0	NEGU			0		
Chelidae	Elseya purvisi	8,180	AU							100	Eastern Australian temperate forests	100.0%
Chelidae	Elusor macrurus	9,405	AU							100	Eastern Australian temperate forests	100.0%
Chelidae	Emydura macquarii	2,134,494	AU							100	Brigalow tropical savanna	16.0%
Chelidae	Emydura subglobosa	290,059	AU			98.9	NEGU	1.0		0		
Chelidae	Emydura tanybaraga	210,313	AU					66.0	CYTS,KMTS, ARTS	34		
Chelidae	Emydura victoriae	430,109	AU					74.0	KMTS	26		
Chelidae	Emydura worrelli	384,478	AU					44.0	ARTS,KMTS	56	Carpentaria tropical savanna	40.2%
Chelidae	Hydromedusa maximiliani	165,387	SA	100.0	ATLF					0		
Chelidae	Hydromedusa tectifera	1,806,741	SA	53.5	ATLF,CERR			30.0	BADE,CHAC	16		
Chelidae	Mesoclemmys gibba	3,695,371	SA	1.2		93.9	AMAZ	4.6		0		
Chelidae	Mesoclemmys perplexa	9,534	SA	95.8	CERR					4		
Chelidae	Phrynops geoffroanus	9,139,939	SA	31.4	CERR,ATLF	51.7	AMAZ	13.0	CHAC	4		
Chelidae	Phrynops hilarii	2,045,840	SA	33.9	ATLF,CERR			46.0	CHAC,BADE	20		
Chelidae	Phrynops tuberosus	1,299,726	SA	12.5	CERR,ATLF	44.5	AMAZ			43		
Chelidae	Phrynops williamsi	835,127	SA	28.2	ATLF			52.0	BADE,CHAC	20		
Chelidae	Platemys platycephala	7,264,077	SA	10.3	TRAN	86.1	AMAZ	1.0		3		
Chelidae	Pseudemydura umbrina	8,218	AU	100.0	SWAU					0		
Chelidae	Ranacephala hogei	93,714	SA	100.0	ATLF					0		
Chelidae	Rheodytes leukops	142,525	AU							100	Brigalow tropical savanna	96.7%
Chelidae	Rhinemys rufipes	1,317,335	SA			100.0	AMAZ			0		

Appendix 1. Continued.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Chelydridae	Chelydra acutirostris	317,342	SA,CA	86.1	TUCM,TRAN, MEAM					14		
Chelydridae	Chelydra rossignoni	244,801	CA	100.0	MEAM					0		
Chelydridae	Chelydra serpentina	5,681,234	NA	0.0		1.9		1.0		97	29 Ecoregions with range between 1% and 7%	97.0%
Chelydridae	Macrochelys temminckii	1,004,326	NA							100	Southeastern mixed forests	16.1%
Dermatemydidae	Dermatemys mawii	167,143	CA	100.0	MEAM					0		
Emydidae	Actinemys marmorata	428,757	NA,CA	66.6	CAFP	7.1	NAMD	3.0		23		
Emydidae	Chrysemys dorsalis	397,030	NA							100	Mississippi lowland forests	26.9%
Emydidae	Chrysemys picta	5,046,148	NA,CA	0.0		2.1		9.0	ROMO	89	Northern short grasslands	11.9%
Emydidae	Clemmys guttata	881,788	NA							100	Southern Great Lakes forests	21.4%
Emydidae	Deirochelys reticularia	912,704	NA							100	Southeastern conifer forests	25.7%
Emydidae	Emydoidea blandingii	890,717	NA							100	Southern Great Lakes forests	17.5%
Emydidae	Emys orbicularis	4,998,172	MD	31.1	MEDB,CAUC			6.0	CASD	63	Central European mixed forests	11.3%
Emydidae	Emys trinacris	25,514	MD	100.0	MEDB					0		
Emydidae	Glyptemys insculpta	1,012,873	NA					2.0		98	New England/Acadian forests	20.4%
Emydidae	Glyptemys muhlenbergii	179,525	NA							100	Appalachian/Blue Ridge forests	33.4%
Emydidae	Graptemys barbouri	51,954	NA							100	Southeastern conifer forests	56.4%
Emydidae	Graptemys caglei	15,539	NA							100	Edwards Plateau savanna	34.6%
Emydidae	Graptemys ernsti	27,221	NA							100	Southeastern conifer forests	72.4%
Emydidae	Graptemys flavimaculata	19,590	NA							100	Southeastern conifer forests	67.6%
Emydidae	Graptemys geographica	1,285,698	NA							100	Central U.S. hardwood forests	19.8%
Emydidae	Graptemys gibbonsi	48,139	NA							100	Southeastern mixed forests	50.1%
Emydidae	Graptemys nigrinoda	79,032	NA							100	Southeastern mixed forests	76.1%
Emydidae	Graptemys oculifera	22,348	NA							100	Southeastern mixed forests	64.7%
Emydidae	Graptemys ouachitensis	689,461	NA							100	Central U.S. hardwood forests	23.7%
Emydidae	Graptemys pseudo-geographica	882,121	NA							100	Central forest/grasslands transition zone	21.6%

Appendix 1. Continued.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Emydidae	Graptemys pulchra	87,722	NA							100	Southeastern mixed forests	54.1%
Emydidae	Graptemys sabinensis	53,042	NA							100	Piney Woods forests	81.9%
Emydidae	Graptemys versa	73,928	NA							100	Edwards Plateau savanna	38.4%
Emydidae	Malaclemys terrapin	262,846	NA							100	Southeastern conifer forests	26.0%
Emydidae	Pseudemys alabamensis	12,712	NA							100	Southeastern conifer forests	96.7%
Emydidae	Pseudemys concinna	1,302,209	NA							100	Southeastern mixed forests	24.1%
Emydidae	Pseudemys floridana	263,047	NA							100	Southeastern conifer forests	47.1%
Emydidae	Pseudemys gorzugi	139,261	CA,NA	5.9	MPOW	28.4	NAMD			66	Tamaulipan mezquital	56.3%
Emydidae	Pseudemys nelsoni	138,078	NA							100	Southeastern conifer forests	78.8%
Emydidae	Pseudemys peninsularis	110,859	NA							100	Southeastern conifer forests	75.1%
Emydidae	Pseudemys rubriventris	117,634	NA							100	Middle Atlantic coastal forests	27.6%
Emydidae	Pseudemys suwanniensis	38,782	NA							100	Southeastern conifer forests	97.7%
Emydidae	Pseudemys texana	232,997	NA							100	Edwards Plateau savanna	21.3%
Emydidae	Terrapene carolina	2,383,788	NA							100	Southeastern mixed forests	14.6%
Emydidae	Terrapene coahuila	15,159	CA	15.3	MPOW	84.7	NAMD			0		
Emydidae	Terrapene mexicana	94,690	CA	92.6	MEAM,MPOW	4.5				3		
Emydidae	Terrapene nelsoni	155,018	CA	69.2	MEAM,MPOW	6.9	NAMD			24		
Emydidae	Terrapene ornata	2,226,508	NA,CA	2.2		16.8	NAMD			81	Western short grasslands	17.8%
Emydidae	Terrapene yucatana	111,536	CA	100.0	MEAM					0		
Emydidae	Trachemys adiutrix	4,333	SA			24.2	AMAZ			76	Northeastern Brazil restingas	75.8%
Emydidae	Trachemys callirostris	248,536	SA	66.6	TRAN,TUCM					33		
Emydidae	Trachemys decorata	34,344	CA	100.0	CAIS					0		
Emydidae	Trachemys decussata	108,980	CA	100.0	CAIS					0		
Emydidae	Trachemys dorbigni	561,063	SA	2.4				64.0	BADE,CHAC	34		
Emydidae	Trachemys emolli	37,460	CA	100.0	MEAM					0		
Emydidae	Trachemys gaigeae	118,267	CA,NA	5.5	MPOW	90.2	NAMD			4		
Emydidae	Trachemys nebulosa	76,803	CA	16.9	MEAM,MPOW	69.3	NAMD			14		
Emydidae	Trachemys ornata	53,123	CA	95.4	MEAM,MPOW					5		
Emydidae	Trachemys scripta	2,668,001	NA,CA	0.5		4.0				96	Central forest/grasslands transition zone	14.6%
Emydidae	Trachemys stejnegeri	49,808	CA	100.0	CAIS					0		

Appendix 1. Continued.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Emydidae	Trachemys taylori	15,159	CA	15.3	MPOW	84.7	NAMD			0		
Emydidae	Trachemys terrapen	10,857	CA	100.0	CAIS					0		
Emydidae	Trachemys venusta	815,487	CA,SA	95.2	MEAM,MPOW	2.4				2		
Emydidae	Trachemys yaquia	81,958	CA	24.6	MPOW,MEAM	30.4	NAMD			45		
Geoemydidae	Batagur baska	608,286	AS	89.8	SUND,INBU			5.0	SBAR	5		
Geoemydidae	Callagur borneoensis	381,093	AS	100.0	SUND					0		
Geoemydidae	Chinemys nigricans	184,562	AS	38.9	INBU					61	Jian Nan subtropical evergreen forests	61.1%
Geoemydidae	Chinemys reevesii	2,165,214	AS	9.3	JAPN					91	Changjiang Plain evergreen forests	20.2%
Geoemydidae	Cuora amboinensis	3,136,203	AS	98.0	SUND,INBU, PHIL,WALL			1.0		1		
Geoemydidae	Cuora aurocapitata	7,766	AS							100	Changjiang Plain evergreen forests	100.0%
Geoemydidae	Cuora bourreti	95,220	AS	100.0	INBU					0		
Geoemydidae	Cuora flavomarginata	646,032	AS	0.1						100	Changjiang Plain evergreen forests	57.6%
Geoemydidae	Cuora galbinfrons	211,853	AS	96.0	INBU					4		
Geoemydidae	Cuora mccordi	5,745	AS							100	Yunnan Plateau subtropical evergr forests	100.0%
Geoemydidae	Cuora mouhotii	1,159,002	AS	95.5	INBU			1.0		4		
Geoemydidae	Cuora pani	63,919	AS							100	Qin Ling Mountains deciduous forests	55.8%
Geoemydidae	Cuora picturata	71,524	AS	100.0	INBU					0		
Geoemydidae	Cuora trifasciata	478,419	AS	76.5	INBU					24		
Geoemydidae	Cuora yunnanensis	18,679	AS							100	Yunnan Plateau subtropical evergr forests	100.0%
Geoemydidae	Cuora zhoui	12,870	AS							100	Yunnan Plateau subtropical evergr forests	100.0%
Geoemydidae	Cyclemys atripons	261,095	AS	100.0	INBU					0		
Geoemydidae	Cyclemys dentata	1,497,244	AS	100.0	SUND					0		
Geoemydidae	Cyclemys oldhami	1,375,603	AS	90.4	INBU,HIMA			1.0		9		
Geoemydidae	Cyclemys tcheponensis	230,726	AS	100.0	INBU					0		
Geoemydidae	Geoclemys hamiltonii	1,407,332	AS	20.8	HIMA,INBU			1.0		78	Northwestern thorn scrub forests	21.3%
Geoemydidae	Geoemyda japonica	2,278	AS	100.0	JAPN					0		
Geoemydidae	Geoemyda silvatica	69,099	AS	59.7	WGSL					40		
Geoemydidae	Geoemyda spengleri	452,934	AS	80.5	INBU					19		
Geoemydidae	Hardella thurjii	1,037,126	AS	25.2	HIMA,INBU			2.0		73	Upper Gangetic Plains moist decid forests	24.7%

Appendix 1. Continued.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Geoemydidae	Heosemys annandalii	430,654	AS	100.0	INBU,SUND					0		
Geoemydidae	Heosemys depressa	41,037	AS	100.0	INBU					0		
Geoemydidae	Heosemys grandis	916,619	AS	100.0	INBU,SUND					0		
Geoemydidae	Heosemys leytensis	11,298	AS	100.0	PHIL					0		
Geoemydidae	Heosemys spinosa	1,075,973	AS	100.0	SUND,INBU					0		
Geoemydidae	Kachuga dhongoka	731,078	AS	18.8	HIMA			4.0		77	Upper Gangetic Plains moist decid forests	35.5%
Geoemydidae	Kachuga kachuga	746,584	AS	15.9	HIMA			4.0		80	Upper Gangetic Plains moist decid forests	34.8%
Geoemydidae	Kachuga trivittata	327,791	AS	100.0	INBU					0		
Geoemydidae	Leucocephalon yuwonoi	45,039	AS	100.0	WALL					0		
Geoemydidae	Malayemys macrocephala	279,330	AS	100.0	INBU,SUND					0		
Geoemydidae	Malayemys subtrijuga	487,094	AS	100.0	INBU					0		
Geoemydidae	Mauremys annamensis	21,335	AS	100.0	INBU					0		
Geoemydidae	Mauremys caspica	1,819,436	MD	53.1	IRAN,CAUC			22.0	ARDE,CASD	25		
Geoemydidae	Mauremys japonica	159,963	AS	100.0	JAPN					0		
Geoemydidae	Mauremys leprosa	1,352,526	MD	83.1	MEDB			13.0	SAHR	4		
Geoemydidae	Mauremys mutica	629,324	AS	55.2	INBU					45		
Geoemydidae	Mauremys rivulata	682,035	MD	58.6	MEDB			1.0		40		
Geoemydidae	Melanochelys tricarinata	307,495	AS	65.4	HIMA,INBU					35		
Geoemydidae	Melanochelys trijuga	1,909,471	AS	39.9	INBU,WGSL, HIMA			1.0		59	Deccan thorn scrub forests	17.7%
Geoemydidae	Morenia ocellata	402,086	AS	96.8	INBU					3		
Geoemydidae	Morenia petersi	306,789	AS	47.8	HIMA			10.0	SBAR	42		
Geoemydidae	Notochelys platynota	1,179,228	AS	100.0	SUND,INBU					0		
Geoemydidae	Ocadia sinensis	559,352	AS	52.9	INBU					47		
Geoemydidae	Orlitia borneensis	843,392	AS	100.0	SUND					0		
Geoemydidae	Pangshura smithii	1,151,781	AS	29.5	HIMA,INBU			1.0		69	Northwestern thorn scrub forests	23.2%
Geoemydidae	Pangshura sylhetensis	288,548	AS	72.4	HIMA,INBU			1.0		27		
Geoemydidae	Pangshura tecta	1,775,971	AS	12.1	HIMA			2.0		86	Upper Gangetic Plains moist decid forests	14.7%
Geoemydidae	Pangshura tentoria	1,288,375	AS	22.7	HIMA,INBU			1.0		76	Upper Gangetic Plains moist decid forests	20.3%
Geoemydidae	Rhinoclemmys annulata	389,930	CA,SA	88.5	MEAM,TUCM, TRAN					11		
Geoemydidae	Rhinoclemmys areolata	320,697	CA	100.0	MEAM					0		

Appendix 1. Continued.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Geoemydidae	Rhinoclemmys diademata	68,468	SA	28.5	TRAN					72	Catatumbo moist forests	24.7%
Geoemydidae	Rhinoclemmys funerea	97,668	CA	100.0	MEAM					0		
Geoemydidae	Rhinoclemmys melanosterna	338,929	SA,CA	78.1	TRAN,TUCM					22		
Geoemydidae	Rhinoclemmys nasuta	133,849	SA	76.3	TRAN,TUCM					24		
Geoemydidae	Rhinoclemmys pulcherrima	405,349	CA	94.9	MEAM,MPOW					5		
Geoemydidae	Rhinoclemmys punctularia	1,846,615	SA	0.4		97.3	AMAZ	2.0		0		
Geoemydidae	Rhinoclemmys rubida	151,597	CA	100.0	MEAM,MPOW					0		
Geoemydidae	Sacalia bealei	368,797	AS	22.3	INBU					78	Jian Nan subtropical evergreen forests	77.1%
Geoemydidae	Sacalia quadriocellata	283,563	AS	97.6	INBU					2		
Geoemydidae	Siebenrockiella crassicollis	1,198,586	AS	100.0	SUND,INBU					0		
Kinosternidae	Claudius angustatus	230,989	CA	99.9	MEAM					0		
Kinosternidae	Kinosternon acutum	211,831	CA	99.8	MEAM,MPOW					0		
Kinosternidae	Kinosternon alamosae	109,109	CA	37.0	MEAM,MPOW	26.5	NAMD			37		
Kinosternidae	Kinosternon angustipons	32,407	CA	100.0	MEAM					0		
Kinosternidae	Kinosternon arizonense	83,131	CA,NA	9.1	MPOW	76.6	NAMD			14		
Kinosternidae	Kinosternon baurii	305,069	NA							100	Southeastern conifer forests	51.9%
Kinosternidae	Kinosternon chimalhuaca	14,598	CA	100.0	MEAM,MPOW					0		
Kinosternidae	Kinosternon creaseri	116,497	CA	100.0	MEAM					0		
Kinosternidae	Kinosternon dunni	24,522	SA	52.4	TRAN,TUCM					48		
Kinosternidae	Kinosternon durangoense	52,536	CA	3.5		96.5	NAMD			0		
Kinosternidae	Kinosternon flavescens	1,559,918	NA,CA	6.1		21.8	NAMD			72	Western short grasslands	20.9%
Kinosternidae	Kinosternon herrerai	88,926	CA	99.4	MEAM,MPOW					1		
Kinosternidae	Kinosternon hirtipes	286,249	CA,NA	47.4	MPOW,MEAM	42.4	NAMD			10		
Kinosternidae	Kinosternon integrum	573,094	CA	75.4	MEAM	7.6	NAMD			17		
Kinosternidae	Kinosternon leucostomum	1,059,880	CA,SA	94.1	MEAM,TRAN, TUCM					6		
Kinosternidae	Kinosternon oaxacae	38,315	CA	100.0	MPOW,MEAM					0		

Appendix 1. Continued.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Kinosternidae	Kinosternon scorpioides	7,683,067	SA,CA	19.2	MEAM,CERR	63.0	AMAZ	10.0	CHAC, LLAN	8		
Kinosternidae	Kinosternon sonoriense	287,428	NA,CA	17.0	MPOW	57.4	NAMD			26		
Kinosternidae	Kinosternon subrubrum	1,538,555	NA							100	Southeastern mixed forests	21.4%
Kinosternidae	Staurotypus salvinii	57,418	CA	100.0	MEAM,MPOW					0		
Kinosternidae	Staurotypus triporcatus	239,995	CA	100.0	MEAM					0		
Kinosternidae	Sternotherus carinatus	396,605	NA							100	Piney Woods forests	35.2%
Kinosternidae	Sternotherus depressus	12,528	NA							100	Appalachian mixed mesophytic forests	87.4%
Kinosternidae	Sternotherus minor	461,517	NA							100	Southeastern conifer forests	41.9%
Kinosternidae	Sternotherus odoratus	2,562,525	NA							100	Southeastern mixed forests	12.6%
Pelomedusidae	Pelomedusa subrufa	16,215,097	AF,MD	21.5	HOAF	13.8	COFO, MMWS	11.0	SAHL	54	27 Ecoregions with range between 1 and 10%	80.2%
Pelomedusidae	Pelusios adansonii	4,539,352	AF	3.2				41.0	SAHL	56	West Sudanian savanna	24.9%
Pelomedusidae	Pelusios bechuanicus	582,688	AF			33.1	MMWS			67	Zambezian Baikiaea woodlands	27.9%
Pelomedusidae	Pelusios broadleyi	8,210	AF	1.4						99	Masai xeric grasslands and shrublands	68.8%
Pelomedusidae	Pelusios carinatus	996,559	AF			69.6	COFO			30		
Pelomedusidae	Pelusios castaneus	2,154,075	AF	26.4	GFWA	11.3	COFO	4.0		58	West Sudanian savanna	24.5%
Pelomedusidae	Pelusios castanoides	1,324,419	AF	63.2	MADG,CFEA	9.0	MMWS			28		
Pelomedusidae	Pelusios chapini	1,103,008	AF	2.8		61.5	COFO			36		
Pelomedusidae	Pelusios cupulatta	303,346	AF	90.7	GFWA					9		
Pelomedusidae	Pelusios gabonensis	2,917,745	AF	5.2		61.3	COFO			34		
Pelomedusidae	Pelusios marani	230,937	AF			83.4	COFO			17		
Pelomedusidae	Pelusios nanus	1,220,988	AF	6.1	EAFM	45.3	MMWS			49		
Pelomedusidae	Pelusios niger	1,163,968	AF	44.3	GFWA	23.3	COFO			32		
Pelomedusidae	Pelusios rhodesianus	4,342,380	AF	8.3		26.0	MMWS	1.0		65	Central Zambezian Miombo woodlands	25.2%
Pelomedusidae	Pelusios seychellensis	154	AF	100.0	MADG					0		
Pelomedusidae	Pelusios sinuatus	3,033,006	AF	32.7	HOAF,CFEA, EAFM	8.8	MMWS	1.0		58	Somali Acacia-Commiphora bushland thicket	14.4%
Pelomedusidae	Pelusios subniger	1,933,524	AF	12.9		16.9	MMWS			70	Central Zambezian Miombo woodlands	28.2%
Pelomedusidae	Pelusios upembae	13,893	AF			29.0	MMWS			71	Central Zambezian Miombo woodlands	100.0%
Pelomedusidae	Pelusios williamsi	294,549	AF	26.0	EAFM	0.0				74	Victoria Basin forest-savanna mosaic	29.7%

Appendix 1. Continued.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Platysternidae	Platysternon megacephalum	1,459,739	AS	65.3	INBU					35		
Podocnemididae	Erymnochelys madagascariensis	272,704	AF	100.0	MADG					0		
Podocnemididae	Peltocephalus tracaxa	3,252,167	SA	1.0		92.2	AMAZ	7.0	LLAN	0		
Podocnemididae	Podocnemis erythrocephala	847,730	SA			100.0	AMAZ			0		
Podocnemididae	Podocnemis expansa	6,117,277	SA	6.4	CERR	86.2	AMAZ	4.6		3		
Podocnemididae	Podocnemis lewyana	164,577	SA	92.3	TRAN,TUCM					8		
Podocnemididae	Podocnemis sextuberculata	2,927,904	SA	0.5		99.5	AMAZ			0		
Podocnemididae	Podocnemis unifilis	7,184,705	SA	12.0	CERR	79.0	AMAZ	6.0	LLAN	3		
Podocnemididae	Podocnemis vogli	628,389	SA	8.9	TRAN	17.8	AMAZ	68.0	LLAN	5		
Testudinidae	Chersina angulata	364,418	AF	68.8	SUKA,MAPA, CPFP			1.0		30		
Testudinidae	Dipsochelys dussumieri	159	AF	100.0	MADG					0		
Testudinidae	Geochelone carbonaria	6,232,342	SA	26.0	CERR	40.2	AMAZ	18.0	CHAC, LLAN	16		
Testudinidae	Geochelone chilensis	266,143	SA					4.0		96	Argentine Monte	60.6%
Testudinidae	Geochelone denticulata	7,967,932	SA	12.6	CERR	78.1	AMAZ	5.3		4		
Testudinidae	Geochelone elegans	968,569	AS	9.9	WGSL					90	Deccan thorn scrub forests	16.7%
Testudinidae	Geochelone nigra	7,421	SA	52.0	TUCM					48		
Testudinidae	Geochelone pardalis	5,725,982	AF	26.1	HOAF,EAFM	3.8		11.0	KAXS	59	Somali Acacia-Commiphora bushland thicket	12.7%
Testudinidae	Geochelone petersi	1,291,373	SA	8.4				67.0	CHAC	25		
Testudinidae	Geochelone platynota	141,908	AS	100.0	INBU					0		
Testudinidae	Geochelone radiata	56,010	AF	100.0	MADG					0		
Testudinidae	Geochelone sulcata	4,980,407	AF	5.9				73.0	SAHL,SAHR	21		
Testudinidae	Geochelone yniphora	9,756	AF	100.0	MADG					0		
Testudinidae	Gopherus agassizii	452,432	NA,CA	10.4	MPOW	73.2	NAMD			16		
Testudinidae	Gopherus berlandieri	323,496	CA,NA	20.7	MEAM,MPOW	9.8	NAMD			70	Tamaulipan mezquital	42.5%
Testudinidae	Gopherus flavomarginatus	48,727	CA	3.4		96.6	NAMD			0		
Testudinidae	Gopherus polyphemus	331,919	NA							100	Southeastern conifer forests	68.7%

Appendix 1. Continued.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Testudinidae	Homopus areolatus	198,324	AF	79.6	CPFP,MAPA, SUKA					20		
Testudinidae	Homopus boulengeri	170,564	AF	37.4	MAPA,SUKA, CPFP					63	Nama Karoo	69.3%
Testudinidae	Homopus femoralis	295,505	AF	29.1	MAPA,SUKA			10.0	KAXS	61	Nama Karoo	39.0%
Testudinidae	Homopus signatus	102,089	AF	82.7	SUKA,CPFP					17		
Testudinidae	Homopus solus	47,810	AF	31.3	SUKA			26.0	KANA	43		
Testudinidae	Indotestudo elongata	1,605,629	AS	83.1	INBU,HIMA			1.0		16		
Testudinidae	Indotestudo forstenii	34,986	AS	100.0	WALL					0		
Testudinidae	Indotestudo travancorica	73,465	AS	63.6	WGSL					36		
Testudinidae	Kinixys belliana	10,778,154	AF	22.1	GFWA,HOAF	16.1	COFO	5.0	SAHL	57	West Sudanian savanna	12.5%
Testudinidae	Kinixys erosa	4,640,514	AF	15.5	GFWA	38.6	COFO			46		
Testudinidae	Kinixys homeana	1,825,142	AF	32.4	GFWA	15.7	COFO			52	Guinean forest-savanna mosaic	24.2%
Testudinidae	Kinixys lobatsiana	152,779	AF	0.4		5.3	MMWS	2.0		92	Southern Africa bushveld	53.0%
Testudinidae	Kinixys natalensis	150,872	AF	69.3	MAPA	3.2				28		
Testudinidae	Kinixys spekii	2,517,338	AF	10.6	EAFM	16.7	MMWS	1.0		72	Central Zambezian Miombo woodlands	33.0%
Testudinidae	Malacochersus tornieri	476,919	AF	8.9	EAFM	0.9				90	So. Acacia-Commiphora bushland thicket	35.0%
Testudinidae	Manouria emys	1,417,375	AS	96.5	SUND,INBU			1.0		2		
Testudinidae	Manouria impressa	1,123,021	AS	99.2	INBU,SUND					1		
Testudinidae	Psammobates geometricus	34,175	AF	100.0	CPFP,SUKA					0		
Testudinidae	Psammobates oculiferus	1,447,545	AF	0.4		1.3		42.0	KAXS	56	Kalahari Acacia-Baikiaea woodlands	20.0%
Testudinidae	Psammobates tentorius	812,949	AF	26.1	SUKA,MAPA, CPFP			18.0	KAXS	56	Nama Karoo	43.0%
Testudinidae	Pyxis arachnoides	68,906	AF	100.0	MADG					0		
Testudinidae	Pyxis planicauda	17,494	AF	100.0	MADG					0		
Testudinidae	Testudo graeca	3,222,988	MD	59.1	MEDB,IRAN, CAUC			22.0	CASD	19		
Testudinidae	Testudo hermanni	607,067	MD	56.6	MEDB					43		
Testudinidae	Testudo horsfieldii	3,362,935	MD	9.4	MCAS			73.0	CASD	18		
Testudinidae	Testudo kleinmanni	78,745	MD	21.2	MEDB			45.0	SAHR	34		
Testudinidae	Testudo marginata	89,980	MD	96.9	MEDB					3		
Testudinidae	Testudo werneri	19,389	MD	40.3	MEDB			15.0	ARDE	45		
Trionychidae	Amyda cartilaginea	2,999,920	AS	100.0	INBU,SUND					0		
Trionychidae	Apalone ferox	253,627	NA							100	Southeastern conifer forests	75.0%
Trionychidae	Apalone mutica	1,452,504	NA			0.0				100	Central forest/grasslands transition zone	19.5%
Trionychidae	Apalone spinifera	3,597,348	NA,CA	0.7		4.6		1.0		94	Central forest/grasslands transition zone	11.3%

Appendix 1. Continued.

Family	Species	Range (sq km)	Geogr. Reg.	% BH	BH identification	% HBWA	HBWA identification	% OWA	OWA identification	% Other	First-priority Ecoregion	% First-priority Ecoregion
Trionychidae	Aspideretes gangeticus	1,479,884	AS	12.6	HIMA			2.0		85	Upper Gangetic Plains moist decid forests	17.2%
Trionychidae	Aspideretes hurum	969,597	AS	30.8	HIMA,INBU			3.0		66	Lower Gangetic Plains moist decid forests	25.6%
Trionychidae	Aspideretes leithii	505,942	AS	8.2	WGSL					92	Deccan thorn scrub forests	28.0%
Trionychidae	Aspideretes nigricans	99,459	AS	92.2	HIMA,INBU			1.0		7		
Trionychidae	Chitra chitra	472,160	AS	100.0	SUND,INBU, HIMA					0		
Trionychidae	Chitra indica	2,405,078	AS	13.3	HIMA			1.0		86	Eastern highlands moist deciduous forests	12.1%
Trionychidae	Chitra vandijki	232,356	AS	100.0	INBU					0		
Trionychidae	Cyclanorbis elegans	2,364,420	AF	6.5	GFWA			23.0	SAHL	70	West Sudanian savanna	24.5%
Trionychidae	Cyclanorbis senegalensis	4,114,803	AF	7.8	GFWA			24.0	SAHL	68	West Sudanian savanna	31.9%
Trionychidae	Cycloderma aubryi	2,133,976	AF	0.7		69.9	COFO			29		
Trionychidae	Cycloderma frenatum	458,122	AF	18.0	CFEA,EAFM	22.5	MMWS			60	Eastern Miombo woodlands	27.1%
Trionychidae	Dogania subplana	1,490,113	AS	100.0	SUND,INBU					0		
Trionychidae	Lissemys punctata	3,290,199	AS	14.6	HIMA,WGSL			1.0		84	Northwestern thorn scrub forests	12.3%
Trionychidae	Lissemys scutata	267,136	AS	100.0	INBU					0		
Trionychidae	Nilssonia formosa	279,431	AS	100.0	INBU					0		
Trionychidae	Palea steindachneri	530,021	AS	67.4	INBU					33		
Trionychidae	Pelochelys bibroni	319,816	AU			100.0	NEGU			0		
Trionychidae	Pelochelys cantorii	1,785,699	AS	82.8	SUND,INBU			2.0		15		
Trionychidae	Pelochelys signifera	175,138	AU			100.0	NEGU			0		
Trionychidae	Pelodiscus sinensis	4,303,000	AS	14.5	INBU			2.0		84	Jian Nan subtropical evergreen forests	15.4%
Trionychidae	Rafetus euphraticus	563,724	MD	35.6	IRAN,MEDB			27.0	ARDE,CASD	37		
Trionychidae	Rafetus swinhoei	161,950	AS	68.0	INBU					32		
Trionychidae	Trionyx triunguis	4,931,039	AF,MD	21.4	GFWA	15.9	COFO	18.0	SAHL,SAHR	45		

Appendix 2. Ecoregions of the world (349) that encompass > 5% of a turtle species' range, ranked by number of species per Ecoregion. (See Table 1 for definition of abbreviations.)

Region	Ecoregion name	Total species, 5% or more	Species with 50–94.9%	Species endemic (95% or more)
NA	Southeastern Mixed Forests	29	4	
NA	Southeastern Conifer Forests	25	8	2
AS	Northern Indochina Subtropical Forests	21		
AS	Lower Gangetic Plains Moist Deciduous Forests	18		
NA	Central Forest/Grasslands Transition Zone	18		
AS	South China–Vietnam Subtropical Evergreen Forests	15		
SA	Cerrado	14	1	
AS	Central Indochina Dry Forests	14		
AS	Peninsular Malaysian Rain Forests	14		
NA	Central US Hardwood Forests	14		
CA	Chihuahuan Desert	13	4	1
NA	Piney Woods Forests	13	1	
AS	Upper Gangetic Plains Moist Deciduous Forests	13		
AS	Sumatran Lowland Rain Forests	13		
SA	Southwest Amazon Moist Forests	13		
AS	Jian Nan Subtropical Evergreen Forests	12	2	
AS	Mizoram–Manipur–Kachin Rain Forests	12		
AS	Tenasserim-South Thailand Semi-Evergreen Rain Forests	12		
SA	Uatuma-Trombetas Moist Forests	12		
AF	Central Zambezian Miombo Woodlands	11		1
AF	West Sudanian Savanna	11		
AS	Borneo Lowland Rain Forests	11		
AS	Irrawaddy Moist Deciduous Forests	10	1	
AF	Zambezian and Mopane Woodlands	10		
AF	Guinean Forest-Savanna Mosaic	10		
CA	Sierra Madre Occidental Pine–Oak Forests	10		
NA	Middle Atlantic Coastal Forests	10		
NA	Mississippi Lowland Forests	10		
AU	Eastern Australian Temperate Forests	9		3
AU	Brigalow Tropical Savanna	9	1	1
AU	Arnhem Land Tropical Savanna	9		1
CA	Petén-Veracruz Moist Forests	9	4	
AF	Northwestern Congolian Lowland Forests	9		
CA	Yucatán Moist Forests	9		
SA	Madeira–Tapajós Moist Forests	9		
AF	Nama Karoo	8	1	
AF	Succulent Karoo	8	1	
AF	Western Congolian Forest–Savanna Mosaic	8		
AS	Sumatran Peat Swamp Forests	8		
AS	Northwestern Thorn Scrub Forests	8		
AU	Mitchell Grass Downs	8		
AU	Victoria Plains Tropical Savanna	8		
AU	Southern New Guinea Freshwater Swamp Forests	8		
AU	Southern New Guinea Lowland Rain Forests	8		
NA	Appalachian/Blue Ridge Forests	8		
NA	Central and Southern Mixed Grasslands	8		
NA	Southern Great Lakes Forests	8		
SA	Alta Paraná Atlantic Forests	8		
SA	Humid Chaco	8		
AS	Changjiang Plain Evergreen Forests	7	1	1
AU	Kimberly Tropical Savanna	7	2	
AU	Carpentaria Tropical Savanna	7	1	
CA	Isthmian–Atlantic Moist Forests	7	1	
AF	Southern Miombo Woodlands	7		
AS	Khathiar–Gir Dry Deciduous Forests	7		
AS	Kayah–Karen Montane Rain Forests	7		
AS	Southeastern Indochina Dry Evergreen Forests	7		
AU	Central Range Montane Rain Forests	7		
CA	Sierra Madre Oriental Pine–Oak Forests	7		
CA	Sinaloan Dry Forests	7		
CA	Sonoran-Sinaloan Transition Subtropical Dry Forest	7		
NA	Western Short Grasslands	7		
SA	Northwestern Andean Montane Forests	7		
AF	Sahelian Acacia Savanna	6	1	
CA	Chocó–Darién Moist Forests	6	1	
CA	Sonoran Desert	6	1	

Appendix 2. Continued.

Region	Ecoregion name	Total species, 5% or more	Species with 50–94.9%	Species endemic (95% or more)
NA	Appalachian Mixed Mesophytic Forests	6	1	
SA	Guianan Moist Forests	6	1	
SA	Magdalena-Urabá Moist Forests	6	1	
AF	Atlantic Equatorial Coastal Forests	6		
AF	East Sudanian Savanna	6		
AF	Northern Congolian Forest–Savanna Mosaic	6		
AS	Central Deccan Plateau Dry Deciduous Forests	6		
AS	Deccan Thorn Scrub Forests	6		
AS	Eastern Highlands Moist Deciduous Forests	6		
AS	Irrawaddy Dry Forests	6		
AS	Northern Annamites Rain Forests	6		
AS	Myanmar Coastal Rain Forests	6		
AU	Trans Fly Savanna and Grasslands	6		
CA	Central American Atlantic Moist Forests	6		
CA	Pantanos De Centla	6		
NA	Everglades	6		
SA	Chaco	6		
SA	Japurá–Solimoes–Negro Moist Forests	6		
AS	Yunnan Plateau Subtropical Evergreen Forests	5		3
AF	Southern Africa Bushveld	5	1	
SA	Uruguayan Savanna	5	1	
AF	Drakensberg Montane Grasslands	5		
AF	Montane Fynbos and Renosterveld	5		
AF	Madagascar Succulent Woodlands	5		
AF	Central Congolian Lowland Forests	5		
AF	Northeastern Congolian Lowland Forests	5		
AF	Northern Acacia–Commiphora Bushlands and Thickets	5		
AF	Southern Congolian Forest-Savanna Mosaic	5		
AS	Brahmaputra Valley Semi-Evergreen Forests	5		
AS	Chhota–Nagpur Dry Deciduous Forests	5		
AS	Southern Annamites Montane Rain Forests	5		
AU	Einasleigh Upland Savanna	5		
CA	Central American Pine–Oak Forests	5		
CA	Trans-Mexican Volcanic Belt Pine–Oak Forests	5		
NA	Northeastern Coastal Forests	5		
NA	Western Gulf Coastal Grasslands	5		
SA	Mato Grosso Seasonal Forests	5		
SA	Serra Do Mar Coastal Forests	5		
AU	Southeastern Papuan Rain Forests	4		1
AF	Madagascar Dry Deciduous Forests	4	2	
CA	Veracruz Moist Forests	4	2	
AF	Eastern Guinean Forests	4	1	
AU	Southeast Australia Temperate Savanna	4	1	
CA	Sierra Madre del Sur Pine–Oak Forests	4	1	
SA	Caatinga	4	1	
SA	Llanos	4	1	
AF	Kalahari Acacia-Baikiaea Woodlands	4		
AF	Kalahari Xeric Savanna	4		
AF	Lowland Fynbos and Renosterveld	4		
AF	Somali Acacia-–Commiphora Bushlands and Thickets	4		
AF	Western Guinean Lowland Forests	4		
AS	Eastern Himalayan Broadleaf Forests	4		
AS	Narmada Valley Dry Deciduous Forests	4		
AS	South Deccan Plateau Dry Deciduous Forests	4		
AS	Northern Vietnam Lowland Rain Forests	4		
AS	Southern Vietnam Lowland Dry Forests	4		
AS	Luang Prabang Montane Rain Forests	4		
AU	Cape York Tropical Savanna	4		
CA	Southern Pacific Dry Forests	4		
CA	Yucatán Dry Forests	4		
MD	Arabian Desert and East Sahero-Arabian Xeric Shrublands	4		
NA	Eastern Great Lakes Lowland Forests	4		
NA	East Central Texas Forests	4		
NA	Ozark Mountain Forests	4		
NA	Texas Blackland Prairies	4		
SA	Napo Moist Forests	4		
SA	Solimoes–Japurá Moist Forest	4		

Appendix 2. Continued.

Region	Ecoregion name	Total species, 5% or more	Species with 50–94.9%	Species endemic (95% or more)
SA	Negro–Branco Moist Forests	4		
SA	Magdalena Valley Montane Forests	4		
SA	Araucaria Moist Forests	4		
CA	Tamaulipan Mezquital	3	1	
MD	Aegean & Western Turkey Sclerophyllous and Mixed Forests	3	1	
AF	Eastern Miombo Woodlands	3		
AF	Southern Acacia–Commiphora Bushlands and Thickets	3		
AF	Highveld Grasslands	3		
AF	Madagascar Lowland Forests	3		
AF	Angolan Miombo Woodlands	3		
AF	Namibian Savanna Woodlands	3		
AF	Western Congolian Swamp Forests	3		
AS	Irrawaddy Freshwater Swamp Forests	3		
AS	Huang He Plain Mixed Forests	3		
AS	Borneo Peat Swamp Forests	3		
AS	Tonle Sap-Mekong Peat Swamp Forests	3		
AU	Eastern Australia Mulga Shrublands	3		
AU	Murray-Darling Woodlands and Mallee	3		
AU	Southeast Australia Temperate Forests	3		
CA	Western Ecuador Moist Forests	3		
CA	Central American Dry Forests	3		
CA	Meseta Central Matorral	3		
MD	Zagros Mountains Forest Steppe	3		
MD	Mediterranean Woodlands and Forests	3		
MD	Illyrian Deciduous Forests	3		
MD	Eastern Mediterranean Conifer–Sclerophyllous–Broadleaf Forests	3		
MD	Mediterranean Dry Woodlands and Steppe	3		
MD	Mesopotamian Shrub Desert	3		
NA	Eastern Forest/Boreal Transition	3		
NA	Allegheny Highlands Forests	3		
NA	Western Great Lakes Forests	3		
NA	Central Tall Grasslands	3		
NA	Edwards Plateau Savanna	3		
NA	Upper Midwest Forest/Savanna Transition Zone	3		
SA	Bahia Interior Forests	3		
SA	Caqueta Moist Forests	3		
SA	Juruá-Purus Moist Forests	3		
SA	Tapajós-Xingu Moist Forests	3		
SA	Guajira-Barranquilla Xeric Scrub	3		
SA	Sinú Valley Dry Forests	3		
SA	Humid Pampas	3		
SA	Southern Cone Mesopotamian Savanna	3		
SA	Cauca Valley Montane Forests	3		
AF	Madagascar Spiny Thickets	2	2	
AS	Sulawesi Lowland Rain Forests	2	2	
AU	Northern New Guinea Lowland Rain and Freshwater Swamp Forests	2	1	
AU	Southwest Australia Woodlands	2	1	
CA	Jalisco Dry Forests	2	1	
CA	Hispaniolan Moist Forests	2	1	
MD	Tyrrhenian–Adriatic Sclerophyllous and Mixed Forests	2	1	
SA	Argentine Monte	2	1	
SA	Catatumbo Moist Forests	2	1	
AF	Southern Zanzibar–Inhambane Coastal Forest Mosaic	2		
AF	Albany Thickets	2		
AF	Madagascar Subhumid Forests	2		
AF	East African Montane Forests	2		
AS	Sulawesi Montane Rain Forests	2		
AS	Himalayan Subtropical Broadleaf Forests	2		
AS	Meghalaya Subtropical Forests	2		
AS	North Western Ghats Moist Deciduous Forests	2		
AS	North Western Ghats Montane Rain Forests	2		
AS	Terai-Duar Savanna and Grasslands	2		
AS	Chin Hills-Arakan Yoma Montane Forests	2		
AS	Malabar Coast Moist Forests	2		
AS	South Western Ghats Moist Deciduous Forests	2		

Appendix 2. Continued.

Region	Ecoregion name	Total species, 5% or more	Species with 50–94.9%	Species endemic (95% or more)
AS	South Western Ghats Montane Rain Forests	2		
AS	Daba Mountains Evergreen Forests	2		
AS	Gizhou Plateau Broadleaf and Mixed Forests	2		
AS	Hainan Island Monsoon Rain Forests	2		
AS	Borneo Montane Rain Forests	2		
AS	Cardamom Mountains Rain Forests	2		
AS	Chao Phraya Freshwater Swamp Forests	2		
AS	Sumatran Montane Rain Forests	2		
AS	Tonle Sap Freshwater Swamp Forests	2		
AU	Southwest Australia Savanna	2		
AU	Simpson Desert	2		
AU	New Guinea Mangroves	2		
AU	Kwongan Heathlands	2		
CA	Ecuadorian Dry Forests	2		
CA	Bajío Dry Forests	2		
CA	Hispaniolan Dry Forests	2		
CA	Hispaniolan Pine Forests	2		
CA	Balsas Dry Forests	2		
CA	Central Mexican Matorral	2		
CA	Costa Rican Seasonal Moist Forests	2		
CA	Talamancan Montane Forests	2		
MD	Eastern Anatolian Montane Steppe	2		
MD	Middle East Steppe	2		
MD	Central Persian Desert Basins	2		
MD	Registan–North Pakistan Sandy Desert	2		
MD	Balkan Mixed Forests	2		
MD	Pindus Mountains Mixed Forests	2		
MD	North Saharan Steppe and Woodlands	2		
NA	Northern Short Grasslands	2		
SA	Atlantic Dry Forests	2		
SA	Pantanal	2		
SA	Bahia Coastal Forests	2		
SA	Purus Varzeá	2		
SA	Venezuelan Andes Montane Forests	2		
SA	Guayanan Highlands Moist Forests	2		
SA	Tocantins/Pindare Moist Forests	2		
SA	Maranhao Babaçu Forests	2		
SA	Cordillera Oriental Montane Forests	2		
SA	Maracaibo Dry Forests	2		
AF	Aldabra Island Xeric Scrub	1		1
AF	Granitic Seychelles Forests	1		1
AS	Timor and Wetar Deciduous Forests	1		1
AS	Palawan Rain Forests	1		1
AU	Queensland Tropical Rain Forests	1		1
SA	Galapagos Islands Xeric Scrub	1		1
AF	Masai Xeric Grasslands and Shrublands	1	1	
AS	Nansei Islands Subtropical Evergreen Forests	1	1	
AS	Qin Ling Mountains Deciduous Forests	1	1	
AS	Taiheiyo Evergreen Forests	1	1	
CA	Cuban Dry Forests	1	1	
CA	Jamaican Moist Forests	1	1	
SA	Northeastern Brazil Restingas	1	1	
AF	Maputaland Coastal Forest Mosaic	1		
AF	Angolan Mopane Woodlands	1		
AF	Zambezian Baikiaea Woodlands	1		
AF	Zambezian Flooded Grasslands	1		
AF	Namib Desert	1		
AF	Madagascar Mangroves	1		
AF	Albertine Rift Montane Forests	1		
AF	Eastern Congolian Swamp Forests	1		
AF	Nigerian Lowland Forests	1		
AF	Saharan Flooded Grasslands	1		
AF	South Saharan Steppe and Woodlands	1		
AF	Victoria Basin Forest-Savanna Mosaic	1		
AS	Eastern Java–Bali Rain Forests	1		
AS	Thar Desert	1		
AS	Himalayan Subtropical Pine Forests	1		

Appendix 2. Continued.

Region	Ecoregion name	Total species, 5% or more	Species with 50–94.9%	Species endemic (95% or more)
AS	Sundarbans Mangroves	1		
AS	Central China Loess Plateau Mixed Forests	1		
AS	Nihonkai Evergreen Forests	1		
AS	Taiheiyo Montane Deciduous Forests	1		
AS	Taiwan Subtropical Evergreen Forests	1		
AS	Red River Freshwater Swamp Forests	1		
AS	Chao Phraya Lowland Moist Deciduous Forests	1		
AS	Indochina Mangroves	1		
AS	Myanamar Coast Mangroves	1		
AS	Sundaland Heath Forests	1		
AU	Carnarvon Xeric Shrublands	1		
AU	Pilbara Shrublands	1		
AU	Western Australian Mulga Shrublands	1		
AU	Esperance Mallee	1		
AU	Jarrah-Karri Forest and Shrublands	1		
AU	Northern New Guinea Montane Rain Forests	1		
AU	Vogelkop Montane Rain Forests	1		
AU	Vogelkop-Aru Lowland Rain Forests	1		
CA	Esmeraldes/Chocó Mangroves	1		
CA	Cuban Moist Forests	1		
CA	Cuban Pine Forests	1		
CA	Cuban Wetlands	1		
CA	Baja California Desert	1		
CA	Gulf Of California Xeric Scrub	1		
CA	Sierra De La Laguna Dry Forests	1		
CA	Puerto Rican Moist Forests	1		
CA	Greater Antilles Mangroves	1		
CA	Jamaican Dry Forests	1		
CA	Central American Montane Forests	1		
CA	Miskito Pine Forests	1		
CA	Sierra Madre De Chiapas Moist Forest	1		
CA	Sierra Madre De Oaxaca Pine-Oak Forests	1		
CA	Tamaulipan Matorral	1		
CA	Veracruz Dry Forests	1		
CA	Veracruz Montane Forests	1		
MD	Tigris–Euphrates Alluvial Salt Marsh	1		
MD	Caucasus Mixed Forests	1		
MD	Iberian Sclerophyllous and Semi-Deciduous Forests	1		
MD	Mediterranean Acacia-Argania Dry Woodlands/Succulent Thickets	1		
MD	Southwest Iberian Mediterranean Sclerophyllous/Mixed Forests	1		
MD	Central European Mixed Forests	1		
MD	Dinaric Mountains Mixed Forests	1		
MD	East European Forest Steppe	1		
MD	Italian Sclerophyllous and Semi-Deciduous Forests	1		
MD	Pannonian Mixed Forests	1		
MD	Rodope Montane Mixed Forests	1		
MD	South Appenine Mixed Montane Forests	1		
MD	Baluchistan Xeric Woodlands	1		
MD	Central Asian Northern Desert	1		
MD	Central Asian Southern Desert	1		
MD	Kazakh Semi-Desert	1		
MD	Pontic Steppe	1		
MD	South Iran Nubo-Sindian Desert and Semi-Desert	1		
MD	Anatolian Conifer and Deciduous Mixed Forests	1		
MD	Eastern Anatolian Deciduous Forests	1		
MD	Nile Delta Flooded Savanna	1		
MD	Sahara Desert	1		
MD	Southern Anatolian Montane Conifer and Deciduous Forests	1		
NA	California Central Valley Grasslands	1		
NA	California Interior Chaparral and Woodlands	1		
NA	Klamath-Siskiyou Forests	1		
NA	Central and Southern Cascades Forests	1		
NA	Eastern Cascades Forests	1		
NA	California Coastal Sage and Chaparral	1		
NA	Sierra Nevada Forests	1		

Appendix 2. Continued.

Region	Ecoregion name	Total species, 5% or more	Species with 50–94.9%	Species endemic (95% or more)
NA	Mojave Desert	1		
NA	Atlantic Coastal Pine Barrens	1		
NA	New England/Acadian Forests	1		
NA	Arizona Mountains Forests	1		
NA	Colorado Plateau Shrublands	1		
SA	Arid Chaco	1		
SA	Semiarid Pampas	1		
SA	Chiquitano Dry Forests	1		
SA	Ucayali Moist Forests	1		
SA	Apure–Villavicencio Dry Forests	1		
SA	Iquitos Varzeá	1		
SA	Marajó Varzeá Forests	1		
SA	Monte Alegre Varzeá	1		
SA	Rio Negro Campinarana	1		
SA	Xingu–Tocantins–Araguaia Moist Forests	1		
SA	Maranhao Mangroves	1		
SA	La Costa Xeric Shrublands	1		
SA	Argentine Espinal	1		
SA	Paraná Flooded Savanna	1		

Received: 29 March 2009
Revised and Accepted: 26 September 2009