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FINAL REPORT
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For the project entitled:

Predicted Impacts of Utah's Roadless Areas Proposal: Biodiversity Loss, Habitat Fragmentation, and Ecosystem Degradation

Submitted to:

Defenders of Wildlife

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Introduction

The 2001 Roadless Area Conservation Rule (Roadless Rule) currently protects over 58 million acres of United States national forest lands from road construction and logging (USDA Forest Service 2001), including over 4 million acres within the state of Utah. However, Utah has petitioned the Trump administration to issue a state-specific rule that would exempt national forests in Utah from the federal Roadless Rule (State of Utah 2019). Under the state's proposal, a total of 205 inventoried roadless areas (IRA) have been:

a) proposed as Utah Roadless Areas (URA), which would be more open to road construction and logging than federal IRAs;
b) recommended for boundary adjustment, followed by either continued management as an IRA or management as a URA; or
c) recommended for removal from the Roadless Rule (State of Utah 2019) (Fig. 1). We hereafter refer to these areas collectively as 'targeted IRAs'.

Roadless areas are ecologically important because expanding human development continues to fragment natural landscapes (Theobald 2013, Theobald et al. 2016). In addition to direct habitat loss, roads facilitate a multitude of disturbances, including wildlife mortality (from road construction and vehicle collisions), modification of animal behavior (e.g., home range shifts and altered reproductive success), alteration of the physical and chemical environment (e.g., temperature; sedimentation; runoff of heavy metals, salts, and nutrients), spread of invasive species, and increased use of areas by humans that leads to harms such as increased wildfires and increased poaching (Trombulak & Frissell 2000, Daigle 2010). Areas unfragmented by roads are understood to be critical for supporting viable populations of many plants and animals (Loucks et al. 2003, Wang et al. 2014) and, more broadly, the structure and function of ecosystems (Haddad et al. 2015). Ecosystems are fundamentally dependent on biodiversity to function properly (Schulze & Mooney 2012). Ecosystems that retain a full suite of native species and functional processes are expected to better resist and recover from natural and anthropogenic disturbances over time (Parrish et al. 2003, Woodley 2010).

The 2001 Roadless Rule was developed in part for the purposes of protecting plant and animal community diversity, ecosystem integrity, and habitat for threatened, endangered and other at-risk species, consistent with U.S. Forest Service (USFS) planning regulations (USDA Forest Service 2001). Current USFS planning regulations (2012 Planning Rule) emphasize the application of best available science to maintain and restore the integrity[1] of national forest ecosystems and watersheds, maintain plant and animal community diversity, contribute to the recovery of species listed under the federal Endangered Species Act, and maintain viable populations of at-risk species (USDA Forest Service 2012).

Here, we assess the Utah Roadless Rule proposal within the current regulatory framework by examining potential impacts on the degree of ecological integrity and the status of at-risk species currently supported by Utah's national forests. Specifically, we addressed the following questions:

[1] The 2012 Planning Rule defines ecological integrity as "the quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand from most perturbations imposed by natural environmental dynamics or human influence."

- *How might the proposed rule affect the composition, diversity, and viability of species supported by Utah national forests, especially at-risk species?* We determine how many at-risk species are supported by targeted IRAs; evaluate how the composition of at-risk species varies across targeted IRAs; and assess how future road construction and logging in these areas under the proposed rule disproportionately impact the recovery and viability of at-risk species supported by Utah's national forests.

- *How might the proposed rule affect the landscape structure and connectivity of Utah national forests, particularly the overall degree of fragmentation of national forests by roads, if lands currently managed as IRAs are opened to road construction?* We compare the rates of fragmentation by roads in the targeted IRAs to other national forest lands, and evaluate whether future road construction in these areas is likely to reduce the integrity of watersheds and ecosystems within Utah's national forests.

We show that over 100 at-risk species across the state may be harmed by the proposed exemption, because the exemption is likely to lead to increased habitat fragmentation and associated carry-over effects regularly seen outside of IRAs.

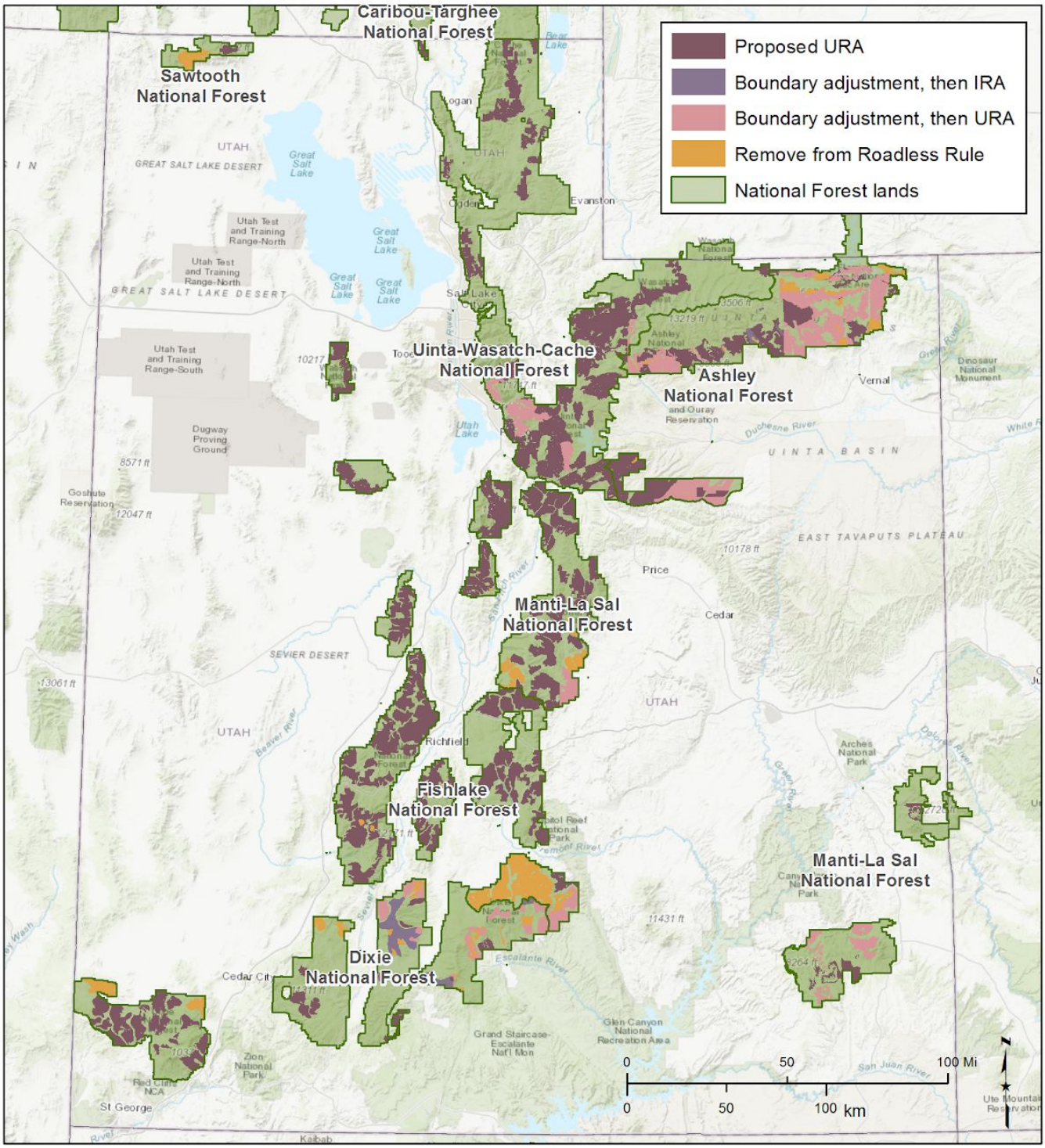


Figure 1. Inventoried Roadless Areas (IRAs) targeted for changes in status by Utah's proposed roadless rule, distributed across Utah's National Forests.

Results

Spatial patterns of species richness across the targeted IRAs are mapped in Figures 2-9. Every targeted IRA is expected to support at least 8 at-risk species, with an average potential species richness of 25 at-risk species per targeted IRA (Fig. 2). All five national forests (NF) located primarily in Utah contain targeted IRAs with potential to support 30 or more at-risk species. The vast majority of targeted IRAs (202 out of 205) include known ranges of or suitable habitat for at least one federally threatened or endangered species, and some units in the Manti-La Sal NF support up to 9 threatened or endangered species (Fig. 3). Targeted IRAs offer suitable habitat for 2-18 at-risk bird species each (mean = 11 species), with the highest potential bird richness found in the Ashley and Uinta-Wasatch-Cache NFs (Fig. 4). At-risk herpetofauna species richness is low in most targeted IRAs (1-3 species), but peaks at 11 potential species in the southwest corner of the state in the Dixie NF (Fig. 5). Every targeted IRA is expected to support at least four at-risk mammal species; some units in the Uinta-Wasatch-Cache NF and one unit of the Manti-La Sal NF contain suitable habitat for 10 at-risk mammals (Fig. 6). An average of three at-risk fish species are expected to occur within any given targeted IRA, and up to seven species may be present in some units of the Manti-La Sal NF (Fig. 7). Due to the highly localized distributions of most at-risk mollusks, few targeted IRAs are expected to host multiple species, but several units in the Fishlake NF may support up to three species (Fig. 8). Similarly, at-risk plants tend to be rare and endemic with limited distributions, but some targeted IRAs in the Fishlake NF are expected to support up to six species (Fig. 9). Among the 101 at-risk species whose estimated ranges overlap Utah's national forest lands, the proportion of a given species' range extent found within targeted IRAs relative to its total range extent on national forest lands was slightly higher (1.11%) than expected (given a null hypothesis that the mean proportion of species' ranges in target IRAs is equal to the proportional area of those IRAs relative to the national forest in which they occur), though the 95% confidence interval on this estimate included zero (1.39% lower to 3.61% higher) (Table 1). However, this figure varied among taxonomic groups and among national forests. The average proportion of at-risk fish, amphibian, reptile, and mammal ranges found in targeted IRAs averaged 3.75% to 5.35% higher than that of birds (which had the lowest proportional range extent in targeted IRAs relative to proportional IRA extent). The average proportion of at-risk plant species ranges in targeted IRAs was 15.34% higher than that of birds. At-risk species that occurred on the Ashley, Caribou-Targhee, and Fishlake NFs had proportional range extents on IRAs that averaged 17.1% to 28.14% higher than those on the Dixie NF, which had the lowest average proportional range extents on targeted IRAs.

Spatial patterns in the degree of fragmentation of the targeted IRAs relative to the national forests to which they belong are mapped in Figure 10. We show that the vast majority of targeted IRAs are substantially less fragmented by roads than surrounding national forest lands. Nearly 60% of targeted IRAs are less than 10% as fragmented as the surrounding lands of the national forest to which they belong, with a median of 5.65% relative fragmentation. In other words, targeted IRAs have a median of only 5.65% of the total road length per area found in surrounding national forest lands. Only two of the 205 targeted IRAs are more fragmented than the rest of the National Forest to which they belong.

Table 1. Multiple linear regression model results comparing the proportion of at-risk species range extents on national forests found within target IRAs to the proportional extent of target IRAs within national forests, and assessing how this comparison varies among forests and taxonomic groups.

Term	Coefficient	SE	95% Confidence Interval	
Intercept	25.54	7.417	11.006	40.082
IRA:NF ratio (Reference level = total IRA:NF area)				
Species range extent in IRA:NF	1.11	1.277	-1.394	3.612
Taxon (Reference level = Birds)				
Fish	4.56	1.930	0.777	8.343
Amphibians & Reptiles	5.35	2.339	0.765	9.933
Mammals	3.75	1.719	0.381	7.119
Mollusks	4.99	2.662	-0.228	10.208
Plants	15.34	2.479	10.476	20.194
National Forest (Reference level = Dixie)				
Ashley	28.14	2.432	23.370	32.904
Caribou-Targhee	23.54	2.595	18.449	28.621
Fishlake	17.10	2.335	12.526	21.680
Manti-La Sal	8.95	2.201	4.640	13.268
Sawtooth	4.17	2.879	-1.475	9.811
Uinta-Wasatch-Cache	3.48	2.209	-0.850	7.810

Conclusions

Together, these analyses illustrate that the targeted IRAs support high ecological integrity and are likely to be important for the recovery and viability of at-risk species on Utah's national forest lands. All of the targeted IRAs are expected to host multiple at-risk species and are thus important for maintaining species composition and diversity. Additionally, the majority of the targeted IRAs are expected to be hotspots, or areas of particularly high species richness, for one or more distinct subsets of Utah's at-risk species. This finding indicates that although some targeted IRAs are relatively low in total at-risk species richness, all are expected to be important for one or more taxonomic group, and no reduced subset of the targeted IRAs is adequate to represent the full suite of Utah's at-risk species. In other words, the targeted IRAs host complementary sets of at-risk species, and each IRA is expected to play a critical role in maintaining the species

composition and diversity, and thus ecological integrity, currently supported by Utah's national forests. Furthermore, the targeted IRAs tend to contain a larger proportion of at-risk species range extents on national forest lands than expected given their areal extent. This finding suggests that maintaining these IRAs in their current state may be critical for the continued viability of at-risk species harbored by Utah's national forests, and that future logging and road construction on the targeted IRAs may disproportionately impact recovery and viability of these species. Finally, the extremely low relative road fragmentation of the vast majority of targeted IRAs compared to surrounding lands renders these areas crucial for maintaining the existing structure and connectivity, and thus ecological integrity, of Utah's national forests.

The high ecological integrity of the targeted IRAs and their expected importance for the recovery and viability of at-risk species suggests that any relaxation of restrictions on road construction and logging through replacement of the federal Roadless Rule with a Utah-specific rule would likely bring negative impacts to the integrity of watersheds and ecosystems within Utah's national forests. Road construction on Utah national forests' least-roaded lands would increase overall fragmentation and detract from landscape connectivity, thus diminishing current levels of ecological integrity, contrary to the policy and planning objectives of the 2012 Planning Rule. Likewise, road construction and logging in areas that individually support multiple at-risk species and together support a diverse, complementary suite of at-risk species - often with higher proportional representation of those species than expected based on IRA area alone – would also strongly deviate from Forest Service policy and planning objectives to manage national forest lands for the recovery and viability of at-risk species.

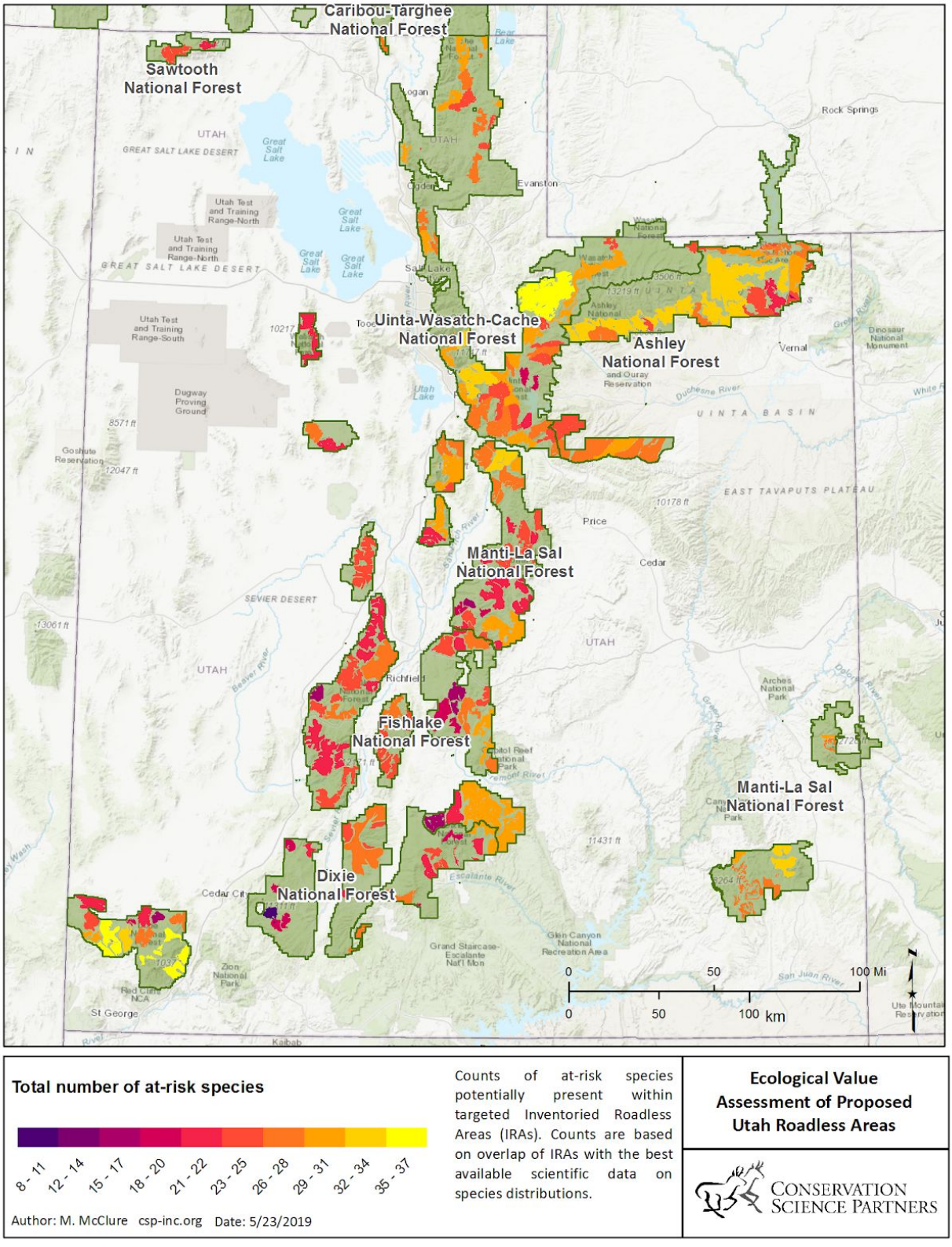
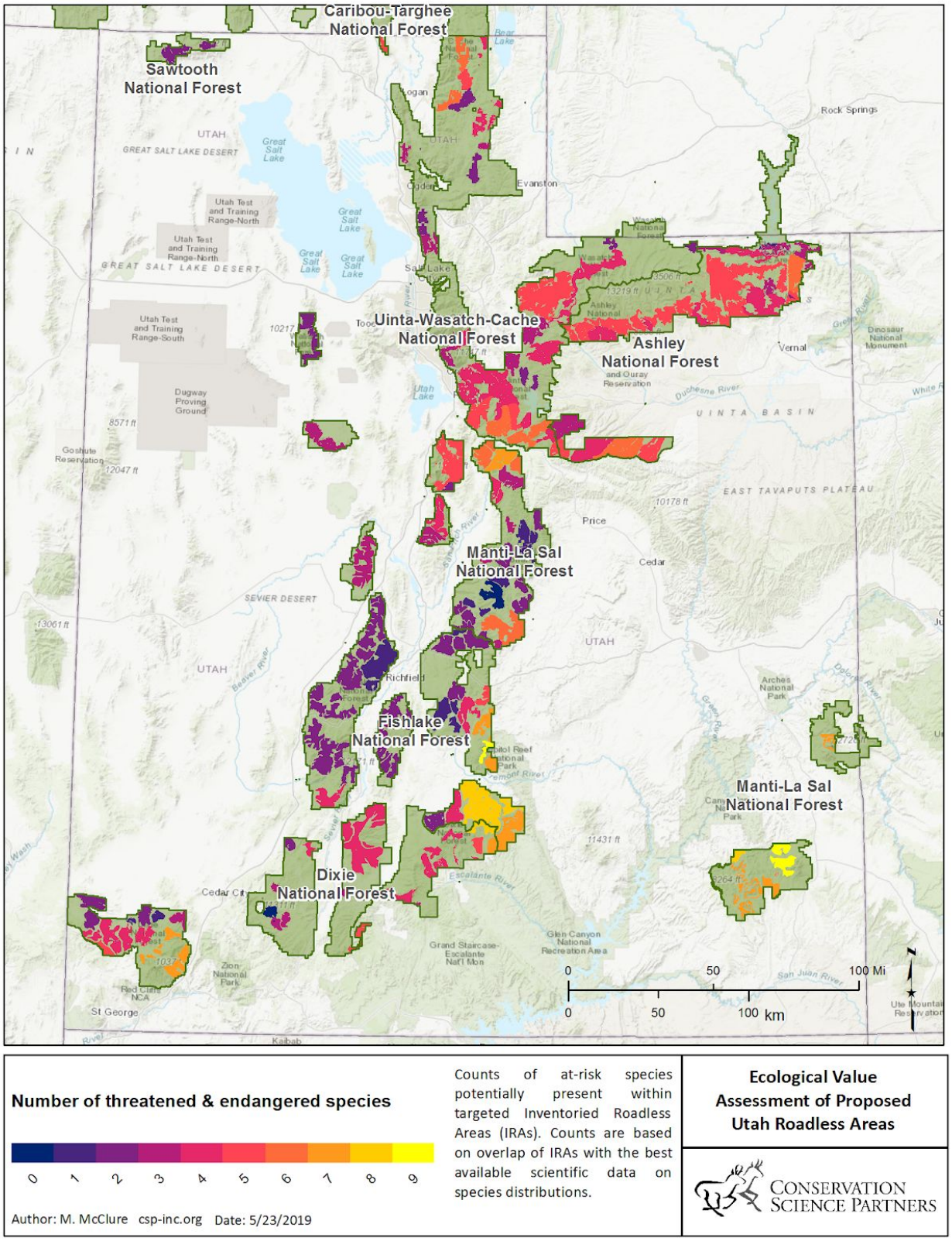


Figure 2. Total potential richness of at-risk species in each targeted IRA, based on the best available scientific data on species distributions.



Number of threatened & endangered species

0 1 2 3 4 5 6 7 8 9

Author: M. McClure csp-inc.org Date: 5/23/2019

Counts of at-risk species potentially present within targeted Inventoried Roadless Areas (IRAs). Counts are based on overlap of IRAs with the best available scientific data on species distributions.

Ecological Value Assessment of Proposed Utah Roadless Areas

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Figure 3. Potential species richness of threatened and endangered species (including proposed and candidate species) in each targeted IRA, based on the best available scientific data on species distributions.

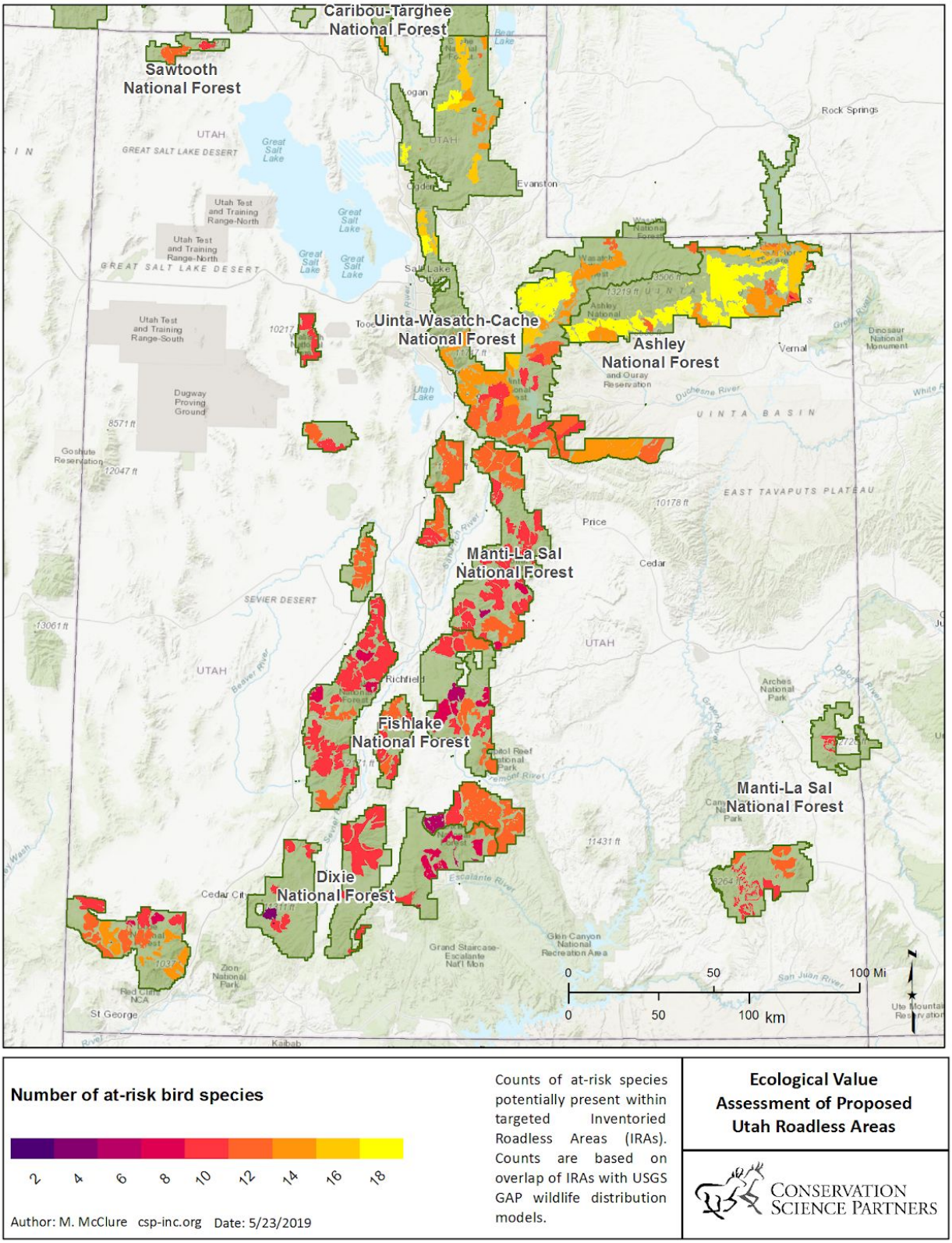

Figure 4. Potential at-risk bird species richness in each targeted IRA, based on USGS Gap Analysis Program species distribution models.

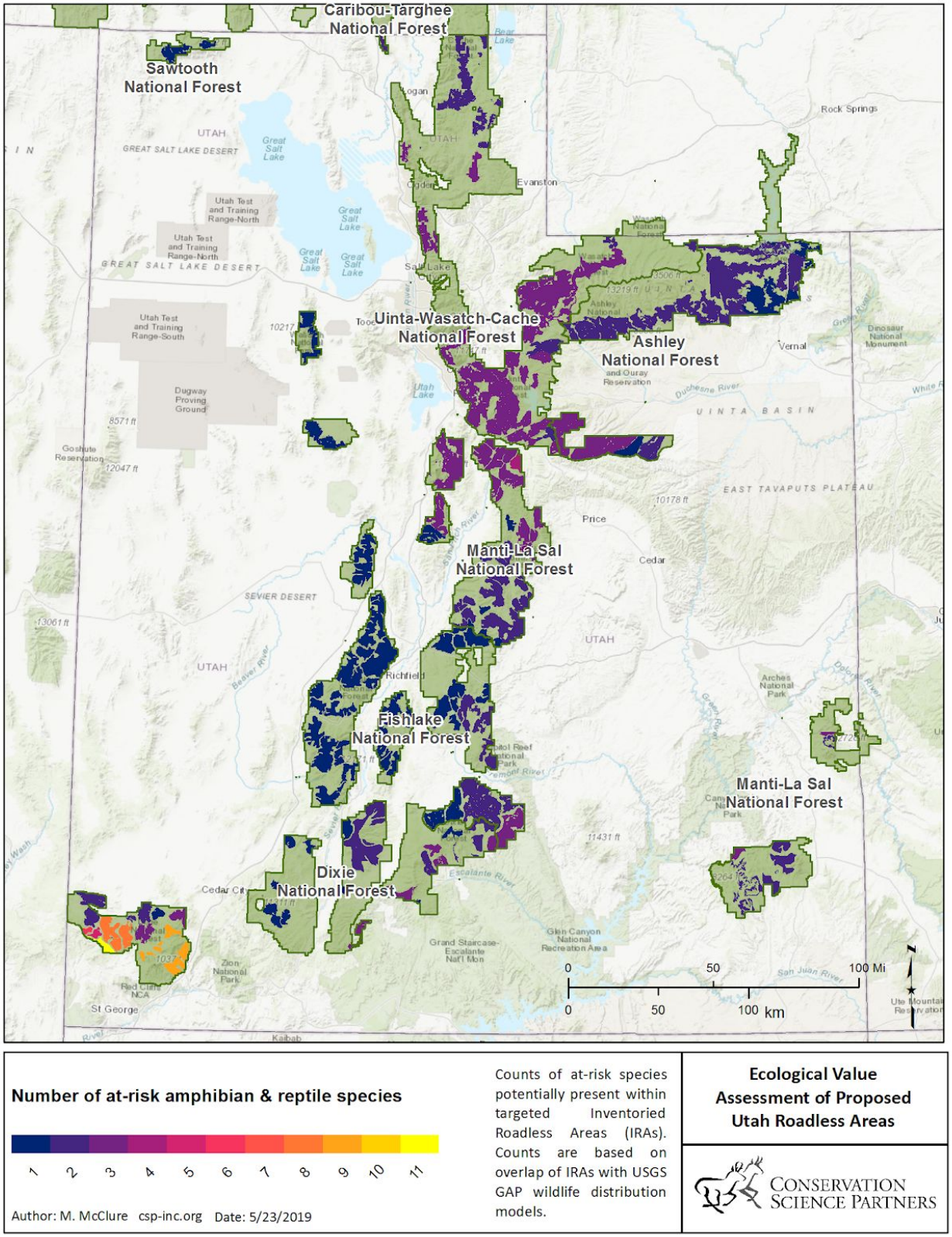

Figure 5. Potential at-risk herpetofauna species richness in each targeted IRA, based on USGS Gap Analysis Program species distribution models.

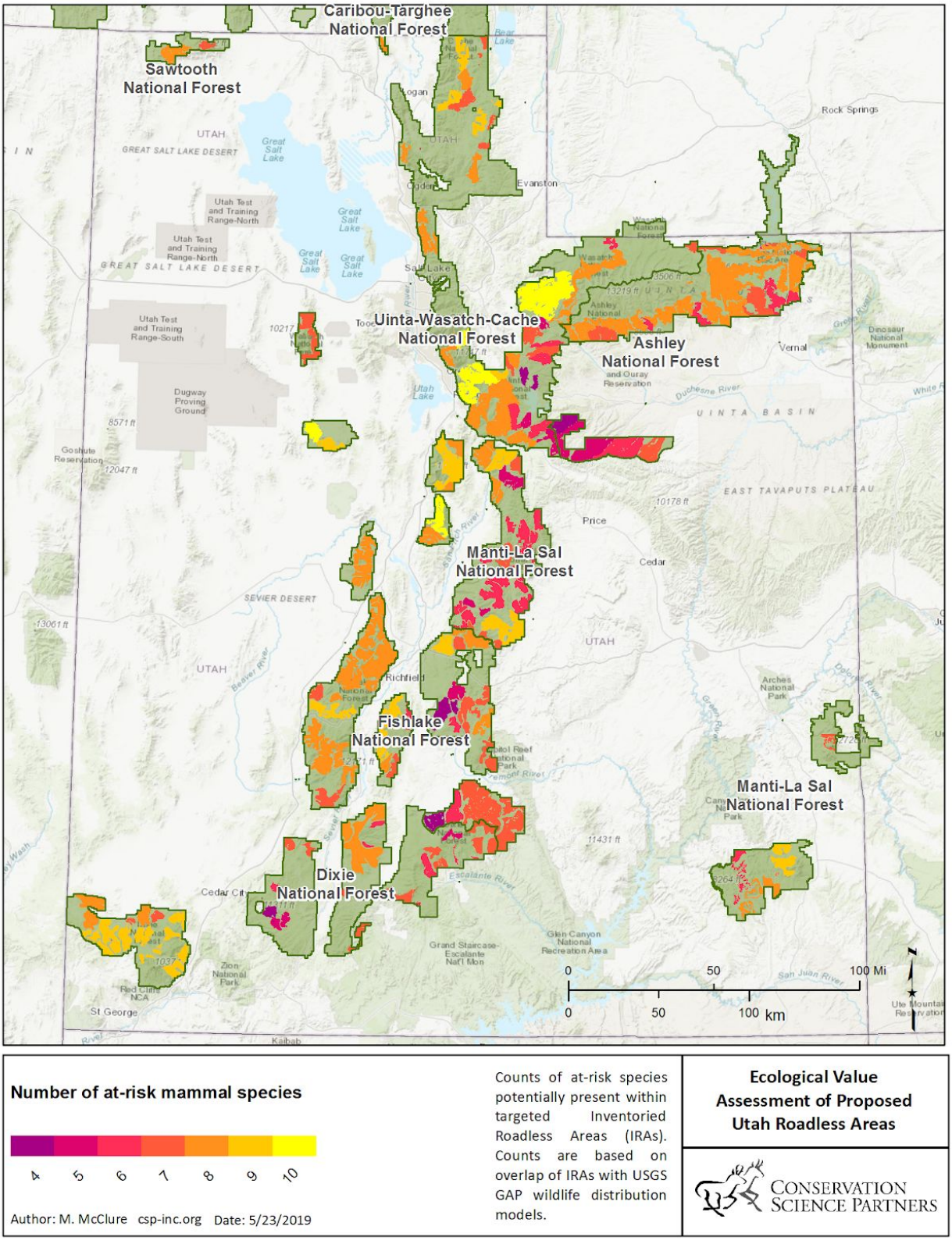

Figure 6. Potential at-risk mammal species richness in each targeted IRA, based on USGS Gap Analysis Program species distribution models.

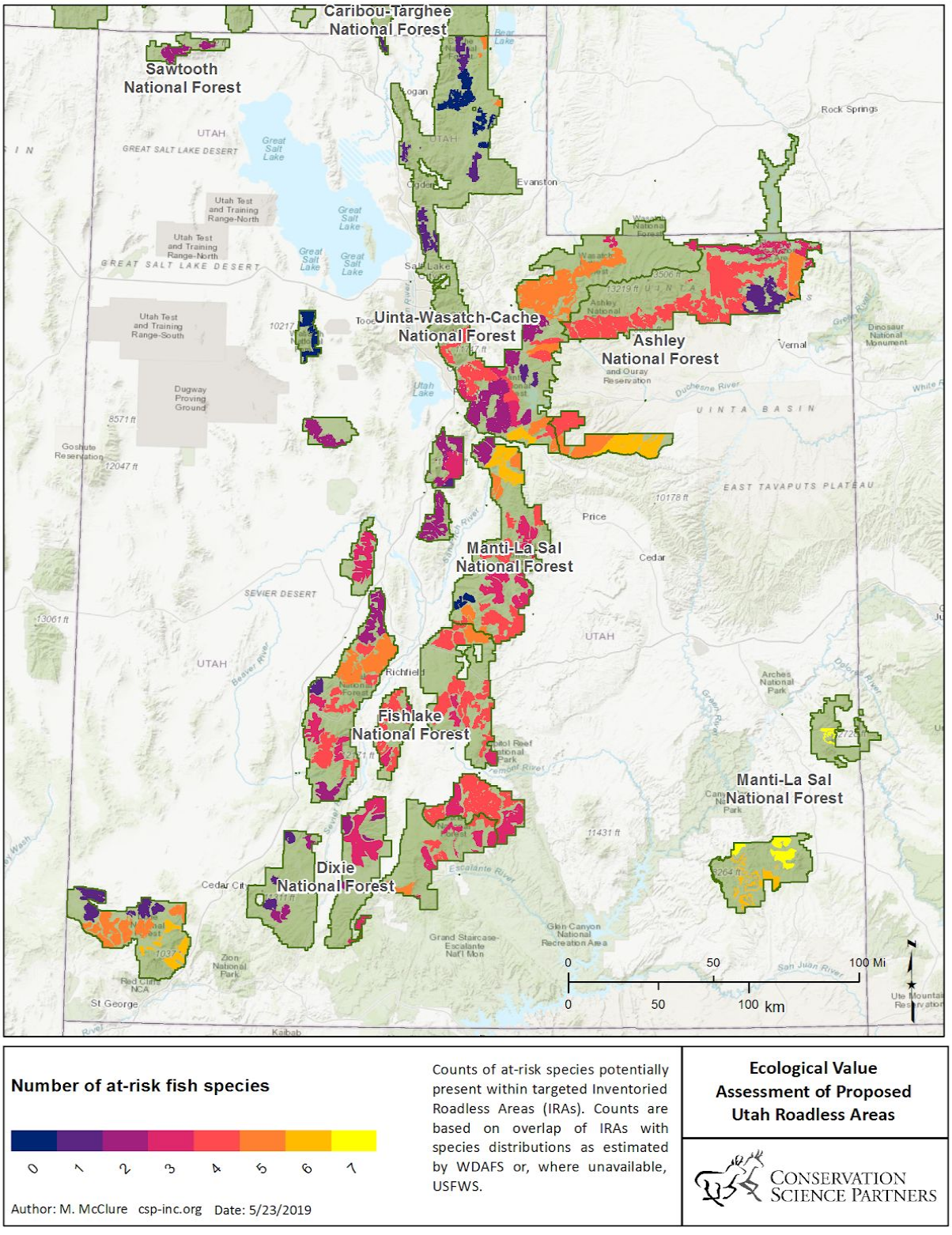

Figure 7. Potential at-risk fish species richness in each targeted IRA, based on species distribution data compiled by the Western Division of the American Fisheries Society at the HUC8 watershed scale where available, or species range estimates provided by the U.S. Fish & Wildlife Service.

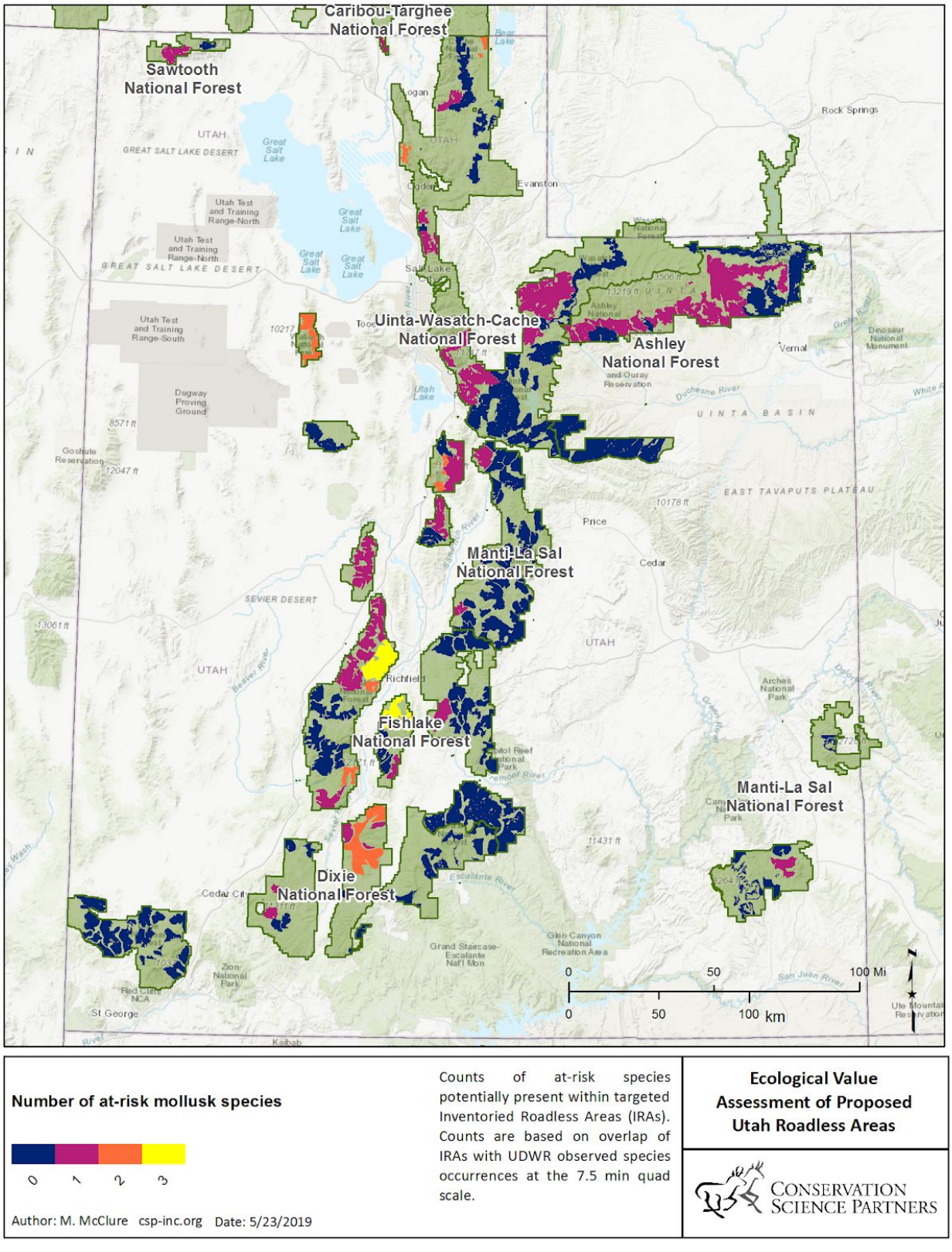

Figure 8. Potential at-risk mollusk species richness in each targeted IRA, based on species observation compiled by the Utah Division of Wildlife Resources at the 7.5-minute quadrangle scale.

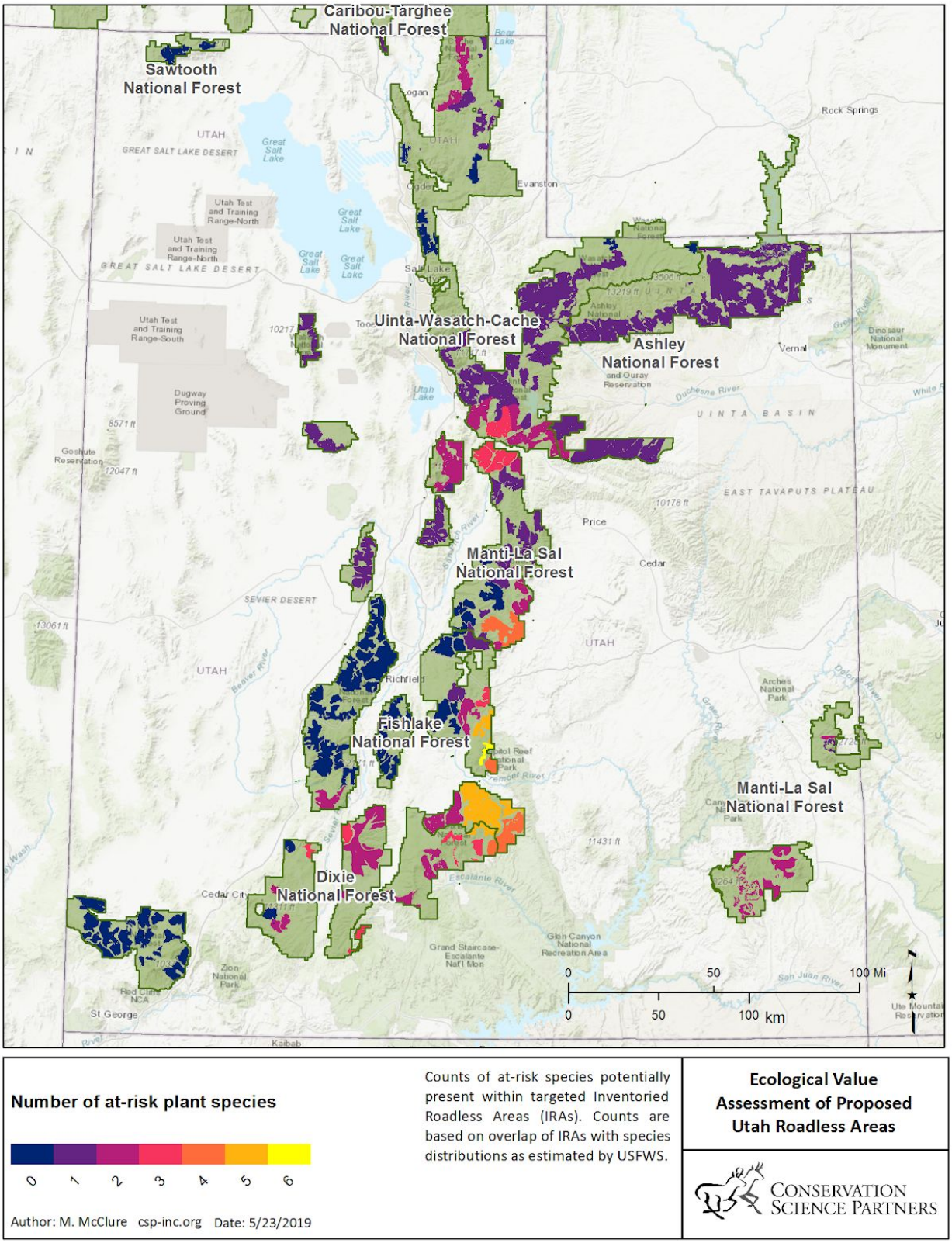

Figure 9. Potential at-risk plant species richness in each targeted IRA, based on species range estimates provided by the U.S. Fish & Wildlife Service.

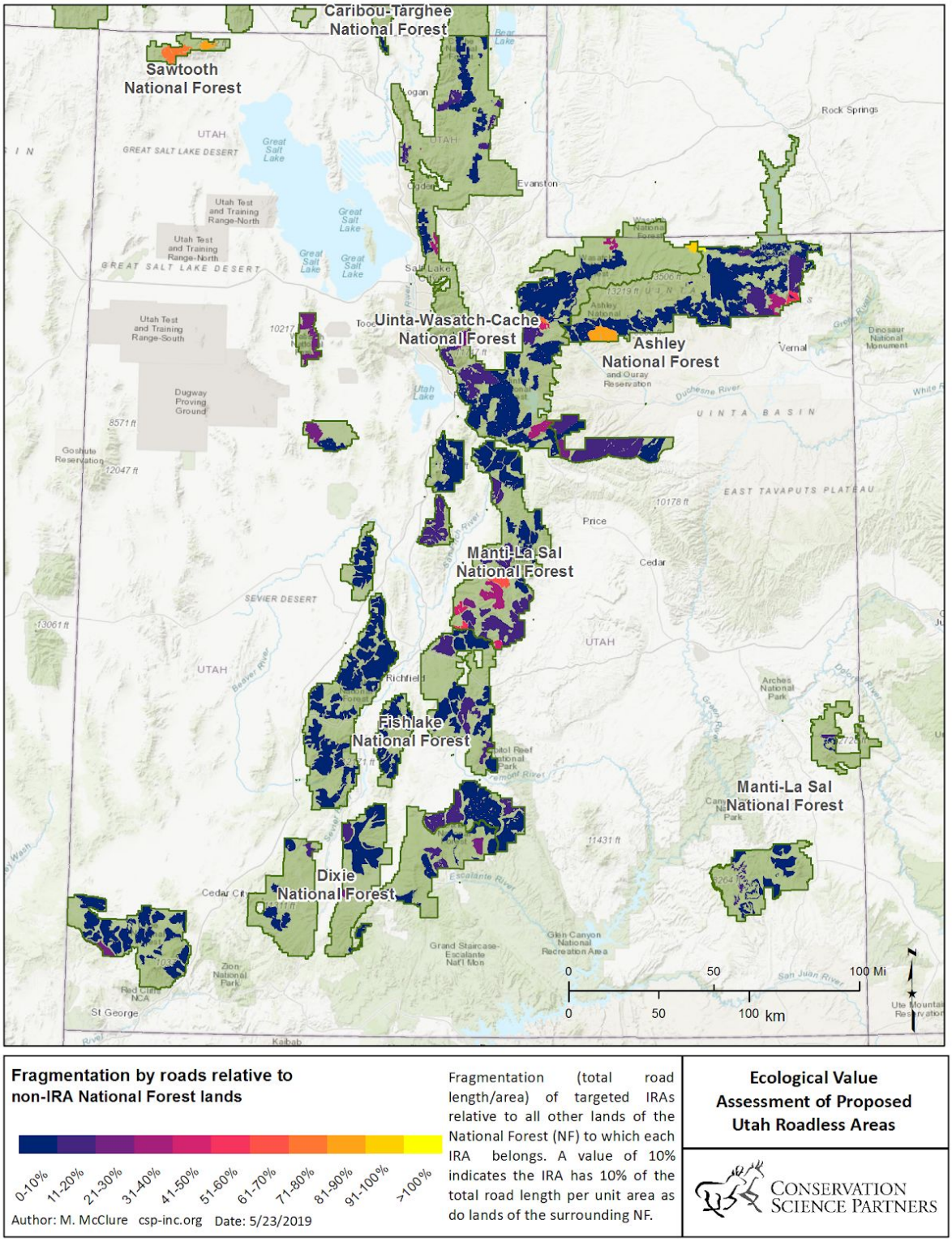

Figure 10. Degree of fragmentation by roads of the targeted IRAs relative to the National Forests to which they belong. For example, a value of 10% indicates that the degree of fragmentation (i.e., total road length per unit area) in the targeted IRA is 10% of that in the rest of the National Forest to which it belongs.

Methods

At-risk species composition, diversity, and viability

We assessed the potential for Utah's proposed roadless rule to impact at-risk species composition and diversity by estimating at-risk species richness (i.e., number of species) supported by each of the targeted IRAs. At-risk species were defined to include federally threatened and endangered species (including candidate and proposed species; UDWR 2017), species listed as sensitive by the USFS (USDA Forest Service 2016), and additional wildlife identified as species of concern by the Utah Division of Wildlife Resources (UDWR; UDWR 2017), representing a total of 152 species (Appendix A).

We estimated the distribution of at-risk species across Utah based on the best available scientific datasets, with an aim toward the greatest possible consistency in data sources and methodology across species. For terrestrial vertebrates (amphibians, birds, mammals, reptiles), we used wildlife distribution models created and distributed by the U.S. Geological Survey (USGS) Gap Analysis Program (GAP; USGS 2013) to estimate the potential distribution of each species. These models represent areas where species are predicted to occur based on habitat associations within the coarse geographic limits where a species may be found. Predictions of potential species occurrence are deduced from published literature reporting species associations with land cover, elevation, hydrologic characteristics, human avoidance, and preference for or avoidance of ecotones (i.e., transitions between vegetation types). This compiled habitat information and associated spatial data layers are used by biologists to determine species associations with the ecological systems and land use classes represented in the National GAP Land Cover Map (V1; USGS 2001), which are then further restricted by e.g., elevation range and proximity to hydrologic features. For some species, models are season-specific and account for variable habitat selection among regions; in these cases we considered potential occurrence in any season. These models offer broad representations of key aspects of potential habitat for a given species, and should not be interpreted as known occurrence of the species[2]. However, aggregated GAP distribution models are expected to effectively identify areas of the landscape that offer potential habitat for multiple at-risk wildlife species and that are therefore expected to be critical for maintaining species diversity of Utah's national forests. This application is well within the range of appropriate uses identified for these data (USGS 2013).

We estimated distribution for other taxonomic groups using several data sources. The distributions of most at-risk fish species were based on range estimates provided by the Western Division of the American Fisheries Society (WDAFS; WNFC 2012), which have been compiled across state fish agencies at the watershed scale (8-digit hydrologic units, or HUC8; Seaber et al. 1987). Range estimates for fish species with no WDAFS data available (n = 5), as well as range estimates for at-risk plants, were based on data provided by the U.S. Fish & Wildlife Service (USFWS; USFWS 2019). At-risk mollusk distributions were estimated primarily from observed species occurrence data compiled by UDWR at the 7.5-minute quadrangle scale (UDWR 2019). Where these data were not available (3 species), we filled gaps with species range estimates provided by USFWS (USFWS 2019).

To estimate the diversity of at-risk species in each targeted IRA, we summed the number of species with distribution data (86.2% of 152 species; Fig. 11, Appendix A) whose estimated ranges intersected each IRA. We compiled species

[2] For further information regarding methodology and appropriate use, see: https://www.usgs.gov/core-science-systems/science-analytics-and-synthesis/gap/science/species-data-overview

richness estimates across all at-risk species, threatened and endangered species, as well as taxonomic subsets. Reptiles and amphibians were grouped as herpetofauna due to the limited number of at-risk amphibian species assessed (data available for 4 of 5 at-risk species). We then assessed the diversity and taxonomic composition of at-risk species expected to be supported by the targeted IRAs, both in terms of total species richness and spatial distribution patterns.

Lastly, we assessed the relative contribution of the targeted IRAs to supporting at-risk species on Utah's national forest lands to anticipate whether future road construction and logging in these areas under the proposed rule might disproportionately impact at-risk species recovery and viability. We first calculated the total area of each at-risk species' range found within each national forest (restricted to lands within the state of Utah) as well as the total area of each species' range found within targeted IRAs within each national forest. Using these values, we calculated the proportion of each species' national forest range extent that lies within the targeted IRAs. We then determined whether the targeted IRAs account for a greater proportion of at-risk species ranges on national forest lands than expected given the areal extent of the targeted IRAs. For example, we asked the question: if targeted IRAs represent 20% of the total area of a national forest, do the target IRAs tend to contain more than 20% of the range extents of at-risk species that occur in that national forest? We addressed this question using a multiple linear regression model that accounted for variation in this relationship among national forest units and taxonomic groups.

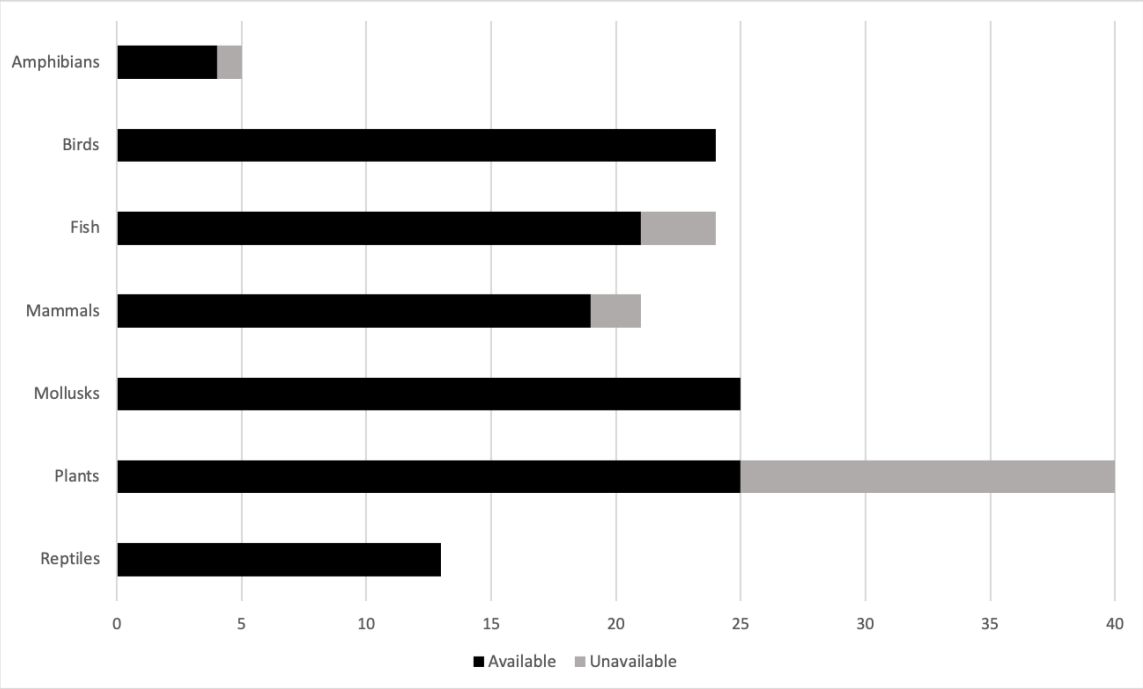

Figure 11. Number of Utah at-risk species and availability of species distribution data by taxonomic group.

Ecosystem structure and connectivity

We assessed the potential for Utah's proposed roadless rule to impact landscape structure and connectivity by quantifying the degree of fragmentation of each targeted IRA by roads relative to the degree of fragmentation of all other lands in the national forest to which each targeted IRA belongs. Fragmentation is defined as the transformation of large expanses of habitat into a number of smaller, more isolated patches (Fahrig 2003). Fragmentation alters landscape

structure by reducing the total area of the original habitat type and by increasing the ratio of habitat edges to core habitat area (Fahrig 2003). It alters *connectivity* by increasing isolation among core habitat areas, whether through structural discontinuity between habitat cores, increased distance between cores, and/or functional reduction in movement of organisms or ecological processes between cores (Tischendorf & Fahrig 2000). It is important to note here that despite their designation as 'roadless', some IRAs do contain some roads (e.g., due to exemption of historic roads when establishing IRAs). We specifically sought to quantify the degree of road fragmentation in the targeted IRAs relative to other national forest lands in order to address comments in Utah's petition to the USFS indicating that many of the targeted IRAs were selected for boundary revision and/or changes in management because they contain roads or, in some cases, are 'heavily roaded' (State of Utah 2019).

We assembled all available roads and motorized trails datasets from the FSGeodata Clearinghouse (USDA Forest Service 2019), which represent all roads and trails included in Motorized Vehicle Use Maps (USDA Forest Service 2018) and all existing National Forest System roads. We then merged these datasets and dissolved redundant features based on unique feature IDs and spatial overlap. We produced two versions of the compiled roads dataset: one that included all roads and motorized trails, and one that excluded roads and trails classified as impassable to vehicle traffic. We quantified fragmentation of targeted IRAs as the total length of roads contained within a given unit divided by the unit's area. Similarly, fragmentation of other national forest lands was quantified as the total length of roads contained within non-IRA lands of each national forest divided by their total area. We then calculated relative fragmentation of the targeted IRAs as a percentage of the degree of fragmentation of surrounding national forest lands, such that IRAs that are less fragmented than other lands in the same national forest have values <100% and those that are more fragmented have values >100%. Although this approach results in some homogenization of road density estimates across sometimes large, heterogeneous areas, we maintain that it offers a reasonable and defensible means of quantifying fragmentation by roads at the level of IRA units relative to other national forest lands. In particular, unlike other standard fragmentation metrics, this method does not penalize IRAs for their proximity to roads that lie immediately outside their boundaries and which, in many cases, their boundaries were drawn specifically to exclude. It is therefore expected to more meaningfully capture the contribution of IRAs to limiting further fragmentation and maintaining landscape structure and connectivity of national forests.

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Appendix A

Table A1. At-risk species considered included federally threatened and endangered species, USFS-designated sensitive species, and species identified by Utah Department of Wildlife Resources as species of concern. Species denoted with an asterisk (*) did not have distribution data available and were not included in analyses.

Common Name	Scientific Name	Taxon	Status	Source
Boreal toad	*Anaxyrus boreas*	Amphibian	USFS Sensitive	*
Western toad	*Anaxyrus boreas*	Amphibian	Wildlife SOC	USGS
Great Plains toad	*Anaxyrus cognatus*	Amphibian	Wildlife SOC	USGS
Arizona toad	*Anaxyrus microscaphus*	Amphibian	Wildlife SOC	USGS
Columbia spotted frog	*Rana luteiventris*	Amphibian	USFS Sensitive, Conservation Agreement	USGS
Northern goshawk	*Accipiter gentilis*	Bird	USFS Sensitive, Conservation Agreement	USGS
Boreal owl	*Aegolius funereus*	Bird	USFS Sensitive	USGS
Grasshopper sparrow	*Ammodramus savannarum*	Bird	Wildlife SOC	USGS
Short-eared owl	*Asio flammeus*	Bird	Wildlife SOC	USGS
Burrowing owl	*Athene cunicularia*	Bird	Wildlife SOC	USGS
Ferruginous hawk	*Buteo regalis*	Bird	Wildlife SOC	USGS
Gunnison sage grouse	*Centrocercus minimus*	Bird	Threatened	USGS
Greater sage grouse	*Centrocercus urophasianus*	Bird	USFS Sensitive, Wildlife SOC	USGS
Mountain plover	*Charadrius montanus*	Bird	Wildlife SOC	USGS
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	Bird	Threatened	USGS
Black swift	*Cypseloides niger*	Bird	Wildlife SOC	USGS
Bobolink	*Dolichonyx oryzivorus*	Bird	Wildlife SOC	USGS
Southwestern willow flycatcher	*Empidonax traillii extimus*	Bird	Endangered	USGS
Peregrine falcon	*Falco peregrinus*	Bird	USFS Sensitive, Wildlife SOC	USGS
Bald eagle	*Haliaeetus leucocephalus*	Bird	USFS Sensitive, Wildlife SOC	USGS

Lewis' woodpecker	*Melanerpes lewis*	Bird	Wildlife SOC	USGS
Long-billed curlew	*Numenius americanus*	Bird	Wildlife SOC	USGS
Mountain quail	*Oreortyx pictus*	Bird	USFS Sensitive	USGS
American white pelican	*Pelecanus erythrorhynchos*	Bird	Wildlife SOC	USGS
American three-toed woodpecker	*Picoides dorsalis*	Bird	USFS Sensitive, Wildlife SOC	USGS
Flammulated owl	*Psiloscops flammeolus*	Bird	USFS Sensitive	USGS
Great gray owl	*Strix nebulosa*	Bird	USFS Sensitive	USGS
Mexican spotted owl	*Strix occidentalis lucida*	Bird	Threatened	USGS
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	Bird	USFS Sensitive, Wildlife SOC	USGS
Desert sucker	*Catostomus clarkii*	Fish	Wildlife SOC	WDAFS
Bluehead sucker	*Catostomus discobolus*	Fish	Conservation Agreement	WDAFS
Flannelmouth sucker	*Catostomus latipinnis*	Fish	Conservation Agreement	WDAFS
June sucker	*Chasmistes liorus*	Fish	Endangered	USFWS
Bear Lake sculpin	*Cottus extensus*	Fish	Wildlife SOC	WDAFS
Humpback chub	*Gila cypha*	Fish	Endangered	WDAFS
Bonytail chub	*Gila elegans*	Fish	Endangered	USFWS
Roundtail chub	*Gila robusta*	Fish	Conservation Agreement	WDAFS
Virgin River Chub	*Gila seminuda*	Fish	Endangered	WDAFS
Least chub	*Iotichthys phlegethontis*	Fish	Conservation Agreement	WDAFS
Southern leatherside chub	*Lepidomeda aliciae*	Fish	USFS Sensitive, Wildlife SOC	WDAFS
Northern leatherside chub	*Lepidomeda copei*	Fish	USFS Sensitive, Wildlife SOC	WDAFS
Virgin spinedace	*Lepidomeda mollispinus*	Fish	Conservation Agreement	WDAFS
Yellowstone cutthroat trout	*Oncorhynchus clarkii bouvieri*	Fish	USFS Sensitive, Wildlife SOC	*
Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*	Fish	Threatened	WDAFS

Colorado River cutthroat trout	*Oncorhynchus clarkii pleuriticus*	Fish	USFS Sensitive, Conservation Agreement	*
Greenback cutthroat trout	*Oncorhynchus clarkii stomias*	Fish	Threatened	USFWS
Bonneville cutthroat trout	*Oncorhynchus clarkii utah*	Fish	USFS Sensitive, Conservation Agreement	WDAFS
Woundfin	*Plagopterus argentissimus*	Fish	Endangered	WDAFS
Bear Lake whitefish	*Prosopium abyssicola*	Fish	Wildlife SOC	WDAFS
Bonneville cisco	*Prosopium gemmifer*	Fish	Wildlife SOC	WDAFS
Bonneville whitefish	*Prosopium spilonotus*	Fish	Wildlife SOC	WDAFS
Colorado pikeminnow	*Ptychocheilus lucius*	Fish	Endangered	WDAFS
Razorback sucker	*Xyrauchen texanus*	Fish	Endangered	WDAFS
California floater	*Anodonta californiensis*	Mollusk	Wildlife SOC	UDWR
Western pearlshell	*Margaritifera falcata*	Mollusk	Wildlife SOC	UDWR
Southern tightcoil	*Ogaridiscus subrupicola*	Mollusk	Wildlife SOC	UDWR
Eureka mountainsnail	*Oreohelix eurekensis*	Mollusk	Wildlife SOC	UDWR
Lyrate mountainsnail	*Oreohelix haydeni*	Mollusk	Wildlife SOC	UDWR
Brian Head mountainsnail	*Oreohelix parawanensis*	Mollusk	Wildlife SOC	UDWR
Deseret mountainsnail	*Oreohelix peripherica*	Mollusk	Wildlife SOC	UDWR
Yavapai mountainsnail	*Oreohelix yavapai*	Mollusk	Wildlife SOC	UDWR
Kanab Ambersnail	*Oxyloma kanabense*	Mollusk	Endangered	USFWS
Cloaked physa	*Physa megalochlamys*	Mollusk	Wildlife SOC	UDWR
Utah physa	*Physella utahensis*	Mollusk	Wildlife SOC	UDWR
Wet-rock physa	*Physella zionis*	Mollusk	Wildlife SOC	UDWR
Longitudinal gland pyrg	*Pyrgulopsis anguina*	Mollusk	Wildlife SOC	UDWR
Smooth glenwood pyrg	*Pyrgulopsis chamberlini*	Mollusk	Wildlife SOC	UDWR
Desert springsnail	*Pyrgulopsis deserta*	Mollusk	Wildlife SOC	UDWR

Otter Creek pyrg	*Pyrgulopsis fusca*	Mollusk	Wildlife SOC	UDWR
Hamlin Valley pyrg	*Pyrgulopsis hamlinensis*	Mollusk	Wildlife SOC	UDWR
Carinate Glenwood pyrg	*Pyrgulopsis inopinata*	Mollusk	Wildlife SOC	UDWR
Ninemile pyrg	*Pyrgulopsis nonaria*	Mollusk	Wildlife SOC	UDWR
Bifid duct pyrg	*Pyrgulopsis peculiaris*	Mollusk	Wildlife SOC	USFWS
Bear Lake springsnail	*Pyrgulopsis pilsbryana*	Mollusk	Wildlife SOC	UDWR
Black Canyon pyrg	*Pyrgulopsis plicata*	Mollusk	Wildlife SOC	UDWR
Sub-globose snake pyrg	*Pyrgulopsis saxatilis*	Mollusk	Wildlife SOC	USFWS
Southern Bonneville pyrg	*Pyrgulopsis transversa*	Mollusk	Wildlife SOC	UDWR
Northwest Bonneville pyrg	*Pyrgulopsis variegata*	Mollusk	Wildlife SOC	UDWR
Pygmy rabbit	*Brachylagus idahoensis*	Mammal	USFS Sensitive, Wildlife SOC	USGS
Gray wolf	*Canis lupus*	Mammal	Endangered	USGS
Townsend's big-eared bat	*Corynorhinus townsendii*	Mammal	USFS Sensitive, Wildlife SOC	USGS
Gunnison's prairie dog	*Cynomys gunnisoni*	Mammal	Wildlife SOC	USGS
White-tailed prairie dog	*Cynomys leucurus*	Mammal	Wildlife SOC	USGS
Utah prairie dog	*Cynomys parvidens*	Mammal	Threatened	USGS
Spotted bat	*Euderma maculatum*	Mammal	USFS Sensitive, Wildlife SOC	USGS
North American wolverine	*Gulo gulo*	Mammal	Proposed	USGS
Allen's big-eared bat	*Idionycteris phyllotis*	Mammal	Wildlife SOC	UDWR
Western red bat	*Lasiurus blossevillii*	Mammal	Wildlife SOC	USGS
Canada lynx	*Lynx canadensis*	Mammal	Threatened	USGS
Fisher	*Martes pennanti*	Mammal	USFS Sensitive	USGS
Dark kangaroo mouse	*Microdipodops megacephalus*	Mammal	Wildlife SOC	USGS
Mexican vole	*Microtus mexicanus*	Mammal	Wildlife SOC	*
Fringed myotis	*Myotis thysanodes*	Mammal	Wildlife SOC	USGS

Big free-tailed bat	*Nyctinomops macrotis*	Mammal	Wildlife SOC	USGS
Bighorn sheep	*Ovis canadensis*	Mammal	USFS Sensitive	USGS
Silky pocket mouse	*Perognathus flavus*	Mammal	Wildlife SOC	USGS
Preble's shrew	*Sorex preblei*	Mammal	Wildlife SOC	USGS
Southern Idaho ground squirrel	*Urocitellus endemicus*	Mammal	USFS Sensitive	USGS
Kit fox	*Vulpes macrotis*	Mammal	Wildlife SOC	USGS
Wonderland Alice flower	*Aliciella caespitosa*	Plant	USFS Sensitive	*
Chatterley onion	*Allium geyeri var chatterleyi*	Plant	USFS Sensitive	*
Sweet-flowered rock jasmine	*Androsace chamaejasme ssp. carinata*	Plant	USFS Sensitive	*
Wheeler's angelica	*Angelica wheeleri*	Plant	USFS Sensitive	*
Link Trail columbine	*Aquilegia flavescens var. rubicunda*	Plant	USFS Sensitive	*
Graham columbine	*Aquilegia grahamii*	Plant	USFS Sensitive	*
Dwarf bear-poppy	*Arctomecon humilis*	Plant	Endangered	USFWS
Petiolate wormwood	*Artemesia campestris*	Plant	USFS Sensitive	*
Welsh's milkweed	*Asclepias welshii*	Plant	Threatened	USFWS
Shivwits milkvetch	*Astragalus ampullarioides*	Plant	Endangered	USFWS
Bicknell milkvetch	*Astragalus consobrinus*	Plant	USFS Sensitive	*
Deseret milkvetch	*Astragalus desereticus*	Plant	Threatened	USFWS
Dana milkvetch	*Astragalus henrimontanensis*	Plant	USFS Sensitive	*
Holmgren milkvetch	*Astragalus holmgreniorum*	Plant	Endangered	USFWS
Isely's milkvetch	*Astragalus isleyi*	Plant	USFS Sensitive	*
Navajo Lake milkvetch	*Astragalus limnocharis var. limnocharis*	Plant	USFS Sensitive	*
Table Cliff milkvetch	*Astragalus limnocharis var. tabulaeus*	Plant	USFS Sensitive	*

Heliotrope milkvetch	*Astragalus montii*	Plant	Threatened	USFWS
Guard milkvetch	*Astragalus zionis var. vigulus*	Plant	USFS Sensitive	*
Dainty moonwort	*Botrychium crenulatum*	Plant	USFS Sensitive	*
Slender moonwort	*Botrychium lineare*	Plant	USFS Sensitive	*
Navajo sedge	*Carex specuicola*	Plant	Threatened	USFWS
Jones cycladenia	*Cycladenia humilis var. jonesii*	Plant	Threatened	USFWS
Shrubby reed-mustard	*Glaucocarpum suffrutescens*	Plant	Endangered	USFWS
Barneby ridge-cress	*Lepidium barnebyanum*	Plant	Endangered	USFWS
Kodachrome bladderpod	*Lesquerella tumulosa*	Plant	Endangered	USFWS
San Rafael cactus/Despain pincushion cactus	*Pediocactus despainii*	Plant	Endangered	USFWS
Siler pincushion cactus	*Pediocactus sileri*	Plant	Threatened	USFWS
Winkler cactus	*Pediocactus winkleri*	Plant	Threatened	USFWS
Clay phacelia	*Phacelia argillacea*	Plant	Endangered	USFWS
Maguire primrose	*Primula maguirei*	Plant	Threatened	USFWS
Autumn buttercup	*Ranunculus aestivalis*	Plant	Endangered	USFWS
Clay reed-mustard	*Schoenocrambe argillacea*	Plant	Threatened	USFWS
Barneby reed-mustard	*Schoenocrambe barnebyi*	Plant	Endangered	USFWS
Pariette cactus	*Sclerocactus brevispinus*	Plant	Threatened	USFWS
Uinta Basin hookless cactus	*Sclerocactus wetlandicus*	Plant	Threatened	USFWS
Wright fishhook cactus	*Sclerocactus wrightiae*	Plant	Endangered	USFWS
Gierisch mallow	*Sphaeralcea gierischii*	Plant	Endangered	USFWS
Ute ladies'-tresses	*Spiranthes diluvialis*	Plant	Threatened	USFWS
Last Chance townsendia	*Townsendia aprica*	Plant	Threatened	USFWS
Zebra-tailed lizard	*Callisaurus draconoides*	Reptile	Wildlife SOC	USGS
Western banded gecko	*Coleonyx variegatus*	Reptile	Wildlife SOC	USGS

Sidewinder	*Crotalus cerastes*	Reptile	Wildlife SOC	USGS
Speckled rattlesnake	*Crotalus mitchellii*	Reptile	Wildlife SOC	USGS
Mohave rattlesnake	*Crotalus scutulatus*	Reptile	Wildlife SOC	USGS
Desert iguana	*Dipsosaurus dorsalis*	Reptile	Wildlife SOC	USGS
Cornsnake (red)	*Elaphe emoryi*	Reptile	Wildlife SOC	USGS
Mojave desert tortoise	*Gopherus agassizii*	Reptile	Threatened	USGS
Gila monster	*Heloderma suspectum*	Reptile	Wildlife SOC	USGS
Western threadsnake	*Leptotyphlops humilis*	Reptile	Wildlife SOC	USGS
Smooth greensnake	*Opheodrys vernalis*	Reptile	Wildlife SOC	USGS
Common chuckwalla	*Sauromalus ater*	Reptile	Wildlife SOC	USGS
Desert night lizard	*Xantusia vigilis*	Reptile	Wildlife SOC	USGS

[1]Species of Concern; [2]USGS Gap Analysis Program; [3]Western Division of the American Fisheries Society; [4]U.S. Fish & Wildlife Service; [5]Utah Division of Wildlife Resources.