America's Red Rock Wilderness Act:

Moving America Closer to 30x30 and Enhancing Wildlife Connectivity

January 2021

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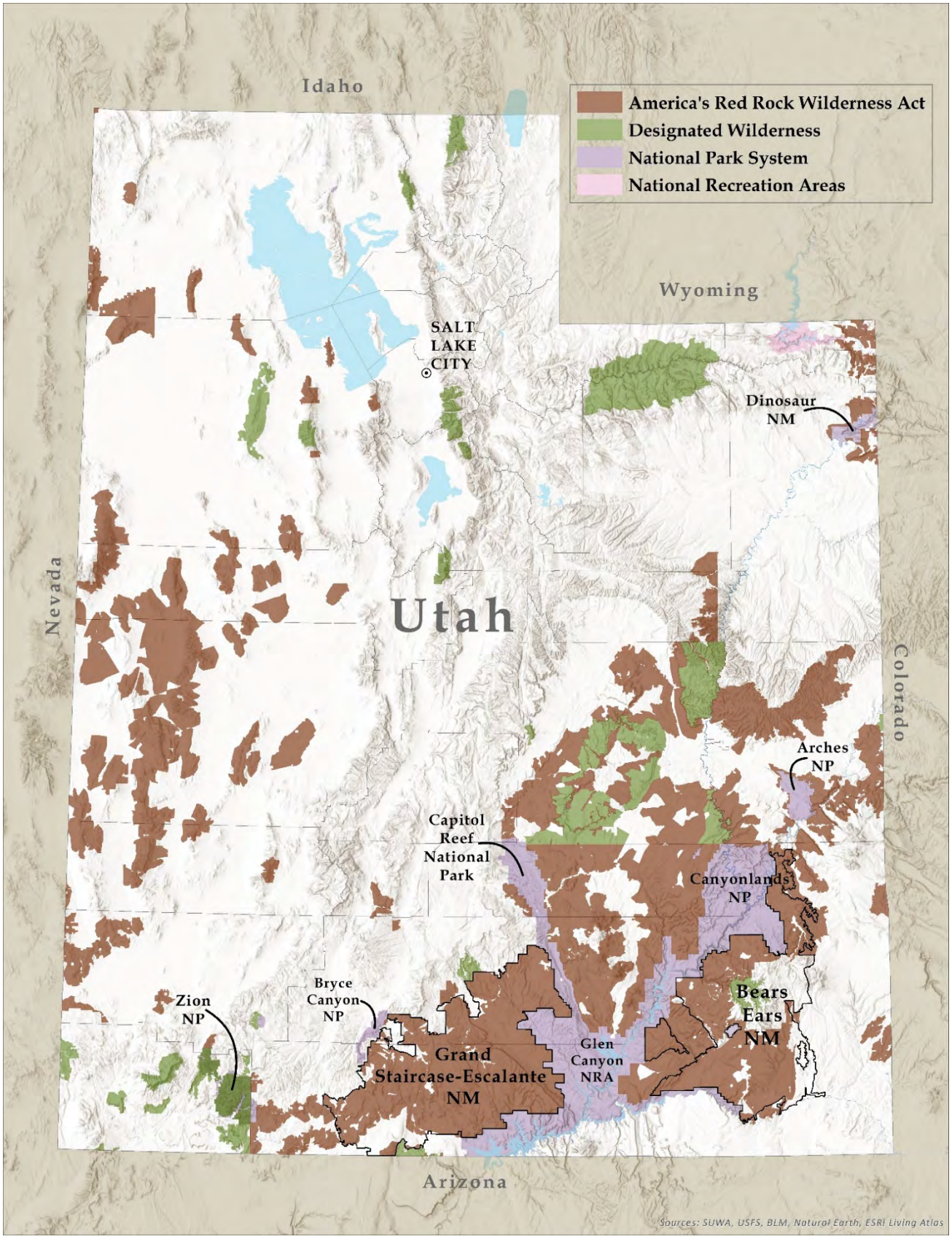
America's Red Rock Wilderness Act
Designated Wilderness
National Park System
National Recreation Areas
Idaho
Wyoming
Nevada
Colorado
Arizona
Utah
SALT LAKE CITY
Dinosaur NM
Arches NP
Capitol Reef National Park
Canyonlands NP
Bryce Canyon NP
Zion NP
Grand Staircase-Escalante NM
Glen Canyon NRA
Bears Ears NM
Sources: SUWA, USFS, BLM, Natural Earth, ESRI Living Atlas

AMERICA'S RED ROCK WILDERNESS ACT: MOVING AMERICA CLOSER TO 30X30 AND ENHANCING WILDLIFE CONNECTIVITY

Passage of America's Red Rock Wilderness Act (ARRWA) would protect approximately 8.4 million acres of unspoiled wild lands and ensure the conservation of 5 regional wildlife corridors critical to the preservation of wildlife species and biodiversity in the West. This would be a significant contribution to the 30x30 conservation goal for which scientists advocate across the globe, which calls for protecting at least 30% of all lands and oceans by 2030—goals deemed necessary to prevent mass extinction of species and to mitigate the impacts of climate change.

INTRODUCTION

Leading scientists and conservationists are calling for a global initiative to protect at least 50% of the earth's lands and oceans by 2050, with an interim step of preserving 30% by 2030, in order to address the climate crisis and prevent the mass extinction of plant and animal species.

Protection of large, undisturbed landscapes, significant core wildlife and plant habitat, and the landscape corridors that connect such habitat are key elements in wildlife conservation and the 30x30 conservation effort. Passage of the 9 million-acre America's Red Rock Wilderness Act (ARRWA) would account for 1.5% of the remaining land that needs to be conserved to reach the goal of protecting 30% of the land in the United States by 2030.[1] [2] It would preserve large unspoiled wild areas in their natural state throughout Utah as well as five regional wildlife corridors that are critical to three wildlife megalinkages within the continental-scale Western Wildway: Grand Canyon to Yellowstone, Grand Canyon to the Bitterroot Wilderness of Central Idaho, and the Green River (Canyonlands to Grand Teton).

AMERICA'S RED ROCK WILDERNESS ACT—MOVING AMERICA CLOSER TO 30X30

The 1964 Wilderness Act is intended to permanently preserve intact, high-quality ecosystems that retain wilderness characteristics, and is the strongest level of conservation protection available within the United States.[3] Protection of the 9 million acres in ARRWA would contribute significantly to the 30x30 campaign by protecting significant acreage of

[1] Hilberg, 2020:5.
[2] State Institutional Trust Land Administration (SITLA) inholdings are included in the 9 million acre figure because it is assumed SITLA lands would be traded out and become federal land if ARRWA is passed.
[3] UWC 1990; Long & Biber 2014; and Belote et al. 2016. Cited in Hilberg, 2020, page 7.

wilderness-quality land in the Colorado Plateau, High Utah Plateaus, and Great Basin ecoregions. In addition, passage of ARRWA would protect important climate refugia critical to wildlife and plants, and as this paper emphasizes, increase landscape connectivity that is essential to species migration/dispersal and range shifts.

Indian Creek. © Tom Till

Only 12% of our country's lands receive some level of significant protection.[4] Scientists tell us that to halt mass extinction and solve the climate crisis, we need to not only preserve existing wild spaces, but to protect more nature—a lot more. In the U.S. we need to protect at least 50% of our undeveloped or restorable lands and oceans by 2050, and at least 30% by 2030.[5] Fortunately, 60% of lands in the continental U.S. are in a largely natural condition or could plausibly be restored to a natural condition.[6] Further, the U.S. ranks as one of the top five countries in the world for remaining wilderness-quality lands.[7] With an ambitious agenda and strong leadership, the U.S. can still conserve a substantial portion of remaining wildlife and natural areas.

Currently, approximately 7.3 million acres of federal land in Utah, or 13.5% of the state, have some significant level of permanent protective status.[8] This includes National Park System units, National Wildlife Refuges, National Recreation Areas, National Monuments administered by the Bureau of Land Management, and designated Wilderness.[9]

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[4] Center for American Progress. 2019. "How Much Nature Should America Keep?" https://www.americanprogress.org/issues/green/reports/2019/08/06/473242/much-nature-america-keep/

[5] E. Dinerstein et al. 2019. "A Global Deal for Nature: Guiding Principles, Milestones, and Targets." *Science Advances* 5 (4) https://advances.sciencemag.org/content/5/4/eaaw2869

[6] Theobald, David M., Ian Leinwand, Jesse J. Anderson, Vincent Landau, Brett G. Dickson, 2019, *Loss and Fragmentation of Natural Lands in the Coterminous U.S. from 2001 to 2017*, Executive Summary, January 18, 2019, Center for American Progress, Executive Summary, https://www.csp-inc.org/public/CSP%20Disappearing%20US%20Exec%20Summary%20011819.pdf. Cited in Lee-Ashley, Matt, 2019, How Much Nature Should America Keep? Center for American Progress, https://www.americanprogress.org/issues/green/reports/2019/08/06/473242/much-nature-america-keep/.

[7] Watson et al., 2018.

[8] Southern Utah Wilderness Alliance

[9] Acreages for BLM national monuments are based on the size of Bears Ears and Grand Staircase-Escalante National Monuments as originally proclaimed by President Obama in 2016 and President Clinton in 1996.

In addition, conservationists have identified 9 million acres of wilderness-quality land managed by the Bureau of Land Management that are deserving of protection. These lands are included in ARRWA, a bill pending before Congress.[10] These lands include expansive, often interconnected landscape areas, many of which have been identified as crucial wildlife habitat and as containing critical wildlife corridors.[11] Passage of ARRWA would increase the amount of protected federal land in Utah from 13.5% to 25%.[12]

Passage of ARRWA would also move America closer to the goal of protecting 30% of our national land base by 2030. Currently, just 12% of the U.S. land area, or 293 million acres, is considered protected.[13] In order to meet the goal of conserving 30% of the U.S. land base, an additional 438 million acres of land must be protected. ARRWA accounts for 1.5% of the remaining land that needs to be protected to reach the 30% goal.[14]

Wilderness designation of ARRWA lands would also result in the permanent protection of important climate change refugia (i.e., areas that are buffered from exposure to rapid changes and climate extremes), which are largely unprotected at low elevations within this region.[15] Climate change refugia facilitate the persistence of sensitive species, preventing the loss of genetic diversity to buy time for adaptation over longer timescales.[16] They can also protect populations from extirpation following extreme events (e.g., severe drought or wildfires), allowing recolonization of the surrounding landscape.[17] This is important because predicted climate disruption changes include reduced habitat suitability and possible species range shifts towards northern latitudes and/or higher elevations,[18] with probable loss of high-elevation montane habitat islands.[19] Effective landscape protection is necessary to counter projected reductions in surface water availability and quality,[20] with significant impacts for riparian vegetation[21] and aquatic communities.[22]

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[10] https://suwa.org/issues/arrwa/
[11] Hilberg, 2020:5.
[12] This calculation is based on protecting all 9 million acres of land in ARRWA, but subtracts those lands in ARRWA that lie within Bears Ears and Grand Staircase-Escalante National Monuments as originally proclaimed (a total of 2,661,207 acres) because they already receive some level of protection.

[13] USGS Gap Analysis Project, "Protected Areas Database of the United States (PAD-US) v1.4: States (US States and Territories) Protection Status Summary Statistics" (U.S. Geological Survey, Reston, VA, 2017). Available at https://www.usgs.gov/core-science-systems/science-analytics-and-synthesis/gap/science/pad-us-statistics-and-reports.
[14] America's Red Rock Wilderness Act includes 9,076,984 million acres of land. However, this includes 2,700,528 acres of Wilderness Study Areas which are considered already protected under the USGS GAP Analysis Project. Thus, passage of ARRWA would add 6,376,454 acres to the total protected land base of the U.S.
[15] Hilberg, 2020:5.
[16] Hilberg, 2020:5.
[17] Hilberg, 2020:5.
[18] Beever et al. 2011; Padgett et al. 2018. Cited in Hilberg, 2020:11.
[19] Yanahan & Moore, 2019; Haight & Hammill, 2020. Cited in Hilberg, 2020:11.
[20] Woodhouse et al., 2016; Pyne & Poff, 2017; Udall & Overpeck, 2017; McCabe et al., 2017; Isaak et al., 2018; Xiao et al., 2018; and Milly & Dunne, 2020. Cited in Hilberg, 2020:11.
[21] Smith & Finch 2016; and Bothwell et al. 2017. Cited in Hilberg, 2020:11.
[22] Isaak et al. 2018. Cited in Hilberg, 2020:11.

Finally, and of utmost importance, passage of ARRWA would increase connectivity between core habitat and climate change refugia within the continental-scale Western Wildway. In western North America, the 6,000-mile Western Wildway, also known as the Spine of the Continent,[23] is an international, coalition-led, proposed and partially implemented network of protected, connected lands from northern Mexico to the Canadian and Alaskan Arctic.[24] Such connectivity is essential to the preservation of wildlife species and biodiversity in the West.

Without connectivity, ecosystems cannot function properly, and without well-functioning ecosystems, biodiversity and other fundamentals of life are at risk.[25] In the face of climate change, connectivity becomes even more important, allowing some species to respond with range shifts and others to migrate into protected areas offering newly suitable habitat.[26]

The Deep Creek Mountains of western Utah are an example of climate refugia. © Scott T. Smith

[23] Hannibal, 2012.
[24] Western Wildway, Wildlands Network, https://wildlandsnetwork.org/wildways/western/.
[25] Hilty et al., 2020:2.
[26] Hilty et al., 2020:7.

The Importance of Connectivity

There are two ways to increase connectivity: *(1) focus on conserving areas that facilitate movement (e.g., ARRWA) and (2) mitigate landscape features that impede movement, such as roads, and identify, designate, and manage such areas to achieve connectivity and other conservation goals.*[27] Both strategies are addressed in this paper with the goal that, together, they produce the most effective results.[28]

Connectivity is defined as "the degree to which the landscape facilitates or impedes movement."[29] Permeability is essentially synonymous with connectivity, referring to the degree to which regional landscapes—encompassing a variety of natural, semi-natural, and developed land cover types—are conducive to wildlife movement and to sustain ecological processes.

Ecologists have long recognized that the loss of core habitat and habitat connectivity poses the greatest threat to species persistence and overall biodiversity.[30] Isolation increases the risk of species extinctions within these areas.[31] If not connected, even the largest protected and ecologically intact areas are spatially inadequate to maintain the full range of native species in natural patterns of abundance and distribution.[32] A review of 25 years of peer-reviewed articles reveals that the most frequently cited recommendation for protecting biodiversity is *ecologically effective connectivity conservation* to ensure species can move and adapt in response to climate-induced changes.[33]

[27] Ament et al. 2014; and Belote et al. 2016.
[28] Soulé and Terborgh 1999.
[29] Taylor et al., 1993.
[30] Soulé and Terborgh 1999; and TWS 2012.
[31] Newmark, 1987, 1995, 2008; Brashares et al., 2001; Parks & Harcourt, 2002; and Prugh et al., 2008.
[32] Newmark 1995; Noss and Cooperrider 1994; and Soule and Terborgh 1999.
[33] Heller and Zavaleta 2009; Mawdsley et al. 2009; Hagerman and Satterfield 2014; IPPC 2014; and Schmitz et al. 2015.

Today's existing protected areas are simply not large enough to encompass the variety of species, processes, and habitats necessary to fully conserve the native diversity of life sustaining the planet's natural unfolding of evolutionary processes essential for the survival, let alone flourishing, of all our planet's living inhabitants, humans included.[34] In addition, many terrestrial protected areas within human-dominated areas are increasingly isolated from one another.[35] The on-the-ground reality is that wildlife species are becoming increasingly isolated in patches of habitat, surrounded by a human-dominated landscape.[36] Even remote wilderness areas with high ecological integrity are impacted by anthropogenic climate change,[37] and proposed wilderness lands are projected to experience rapid shifts in climate conditions and disturbance regimes over the coming century.[38]

As a result, the distribution of many wildlife populations in the U.S. continues to shrink because of habitat loss, degradation, and fragmentation.

Creating more protected areas and ensuring connectivity between protected areas in an effective ecological network is increasingly recognized as a conservation priority to sustain native biodiversity and reduce the risk of extinction, especially in the current era of rapid climate change.[39]

The key elements of an ecological network consist of protected areas such as wilderness, national parks, wildlife refuges, and additional reserves sometimes referred to as Other Effective Area-Based Conservation Measures (OECM). Combined, they are the fundamental core elements of

[34] Wilson, 2016; Newmark 1995; Noss and Cooperrider 1994; and Soulé and Terborgh 1999.
[35] Wittemyer et al., 2008.
[36] Ament et al. 2014:1.
[37] Allan et al., 2020. Cited in Hilberg, 2020:10.
[38] Hilberg, 2020, Table 1.
[39] Belote et al. 2016.

conservation and of any ecological network.[40] By definition, these protected areas must conserve *in situ* biodiversity and may also conserve ecological connectivity.[41] On the other hand, ecological corridors, described below, must conserve connectivity.[42] Depending on their condition and management, ecological corridors may also conserve *in situ* biodiversity.[43]

A long history of ecological and conservation science has addressed questions of ecological network (reserve) design, extinction risks from isolation, and the value of connectivity.[44] The preponderance of relevant, peer-reviewed literature reveals that the most frequently cited recommendation for protecting biodiversity is protection and restoration of connectivity to allow species to move and adapt in response to habitat degradation and climate-induced changes.[45] Conservation scientists emphasize the importance of maintaining a connected network of protected areas to prevent ecosystems and populations from becoming isolated, to reduce the risk of extinction, and ultimately to sustain biodiversity.[46] Climate change further exacerbates the problem of isolation as fragmented landscapes are less resilient to ecological disturbances, to resisting native species loss, and to reducing emerging threats, such as disease. The combined threat of climate change and fragmentation is the most important conservation challenge we face.[47] It follows ***that creating, restoring, and maintaining large, connected networks of protected areas has emerged as one of the highest priorities for conservation in the age of climate change.***[48]

[40] Hilty et al., 2020:17, Table 3.
[41] Hilty et al., 2020:17, Table 3.
[42] Hilty et al., 2020:17, Table 3.
[43] Hilty et al., 2020:17, Table 3.
[44] Newmark 1995; Quammen 1996; and Soulé and Terborgh 1999.
[45] Soulé and Terborgh 1999; Heller and Zavaleta 2009; Mawdsley et al. 2009; Hagerman and Satterfield 2014; IPPC 2014; and Schmitz et al. 2015.
[46] Belote et al. 2016.
[47] Ament et al. 2014:1.
[48] Heller and Zavaleta 2009; Hagerman and Satterfield 2014; IPPC 2014; and Schmitz et al. 2015.

Wildlife Corridors—Lifelines for Animals

Desert bighorn sheep in southern Utah.

An ecological (that is a wildlife, or biological[49]) corridor is a clearly defined geographical space[50] that is governed and managed over the long term to maintain or restore effective ecological connectivity.[51] Maintaining ecological connectivity through corridors is crucial to allow individual animals and ultimately populations of wildlife to move among patchy resources and among populations/subpopulations, and to facilitate seasonal or periodic migrations.[52] Ecological corridors are also important to facilitate dispersal that ensures genetic diversity and permits recolonization in areas where populations have gone extinct.[53]

Researchers have concluded that secure wildlife corridors increase movement between habitat patches by approximately 50%, compared to patches that are not connected by corridors.[54] Linking protected areas, such as national parks and wilderness areas, as well as other crucial habitats, ensures larger, cohesive landscapes of high biological integrity that allow for the migration, movement, and dispersal of wildlife and plants.[55] Improving

[49] The introduced *Northern Rockies Ecosystem Protection Act* (H.R. 1321, 2019, Section 202) describes "Biological Connecting Corridors" as examples of wildlife connectivity relevant to protecting and restoring ecological integrity to the U.S. Northern Rockies Ecosystem.
[50] "Clearly defined" means a spatially defined area with agreed and demarcated borders (Hilty et al., 2020:16).
[51] Hilty et al., 2020:16.
[52] Hilty et al., 2020:21.
[53] Hilty et al., 2020:21.
[54] Gilbert-Norton et al., 2010.
[55] Belote, 2016.

connectivity is a strategically smart and proven method of allowing wildlife to move in response to environmental change.[56] Effective connectivity also facilitates maintenance and restoration of strongly interactive species, which, once ecologically effective populations are achieved, *significantly contribute to sustaining ecologically resilient habitats*.[57]

In addition, conservation areas will likely also gain new species equally in need of conservation.[58] While scientists cannot predict the precise responses of wildlife to climate change, many studies do conclude that the habitat ranges of some species will change, indicating the need for a landscape that wildlife can easily traverse in order to adapt. While species composition changes may lag behind climatic shifts,[59] scientists predict large-scale shifts to higher latitudes and elevations[60] and movements along moisture gradients, and at smaller scales, shifts in preferred microclimates and changes to the nature of the vegetation that constitutes 'habitat.'[61]

In Utah, scientists have stressed that it is crucial to protect large, contiguous blocks of land because many Utah species, especially ecologically essential "keystone" species such as large carnivores, prairie dogs, beavers, as well as rare and imperiled species, require such large areas, not simply to survive but thrive.[62] In addition, large tracts of protected wilderness offer natural ecosystem protection from biological invasions and disease that have devastated many communities, especially plant communities across the state.[63] For example, as early as 1996, researchers proposed that the conservation of Utah's biological diversity depends on (1) ensuring the long-term viability of native plant and animal populations; (2) *maintaining the critical ecological and evolutionary processes upon which these species depend;*[64] and (3) protecting the full range of communities, successional stages, and environmental gradients.[65]

Lands in ARRWA contribute substantially to protecting such large areas, but by themselves, cannot fully satisfy the huge area requirements for maintaining viable populations of all native species. When linked to other public lands, including Utah's national parks and protected areas in adjacent states, however, ARRWA lands provide an absolutely critical component for long-term preservation of regional biological diversity.[66] In other words, the protection of lands in ARRWA provides an essential tool for the conservation and connection of high-quality wildlife and plant habitats, and biodiversity in general.

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[56] Soulé 2010: 350-351; and Ament et al. 2014:1.
[57] Soulé 2010; and Soulé and Noss 1998.
[58] NFWPCAS, 2013:55.
[59] Menendez et al., 2006.
[60] Hickling et al., 2006; Parmesan 2006; and IPCC 2014.
[61] Thomas et al., 2001; and Davies et al. 2006.
[62] Davidson et al., 1996:98.
[63] Davidson et al., 1996:97.
[64] Emphasis added.
[65] Davidson et al., 1996.
[66] Davidson et al., 1996:98.

Wildlife Corridors That Would Benefit from Passage of America's Red Rock Wilderness Act

Passage of ARRWA would protect approximately 9 million acres of wilderness that are integral to five regional wildlife corridors.

Protection of ARRWA lands would increase landscape connectivity in the region, as multiple studies suggest ARRWA lands overlap with large, unprotected areas of the western U.S. that have been identified as critical landscape corridors.[67] Protected area networks that increase landscape connectivity facilitate species movement, enhance gene flow, reduce the risk of extirpation in isolated populations, and increase access to suitable habitat patches that can act as "stepping stones" to support species' range shifts.[68]

1. Grand Canyon to Bitterroot Wilderness Corridor

Connects Grand Canyon region to Idaho's Sawtooth and Bitterroot Ranges. Benefits mule deer, pronghorn antelope, black bear, mountain lion, and potentially wolves

2. Grand Staircase Corridor

Connects Grand Canyon to Yellowstone National Park. Benefits mule deer, elk, bighorn sheep, pronghorn antelope, black bear, mountain lion, and potentially wolves

3. Green River Corridor

Connects Greater Canyonlands Region to Grand Teton National Park. Benefits mule deer, elk, bighorn sheep, pronghorn antelope, black bear, mountain lion, and potentially wolves

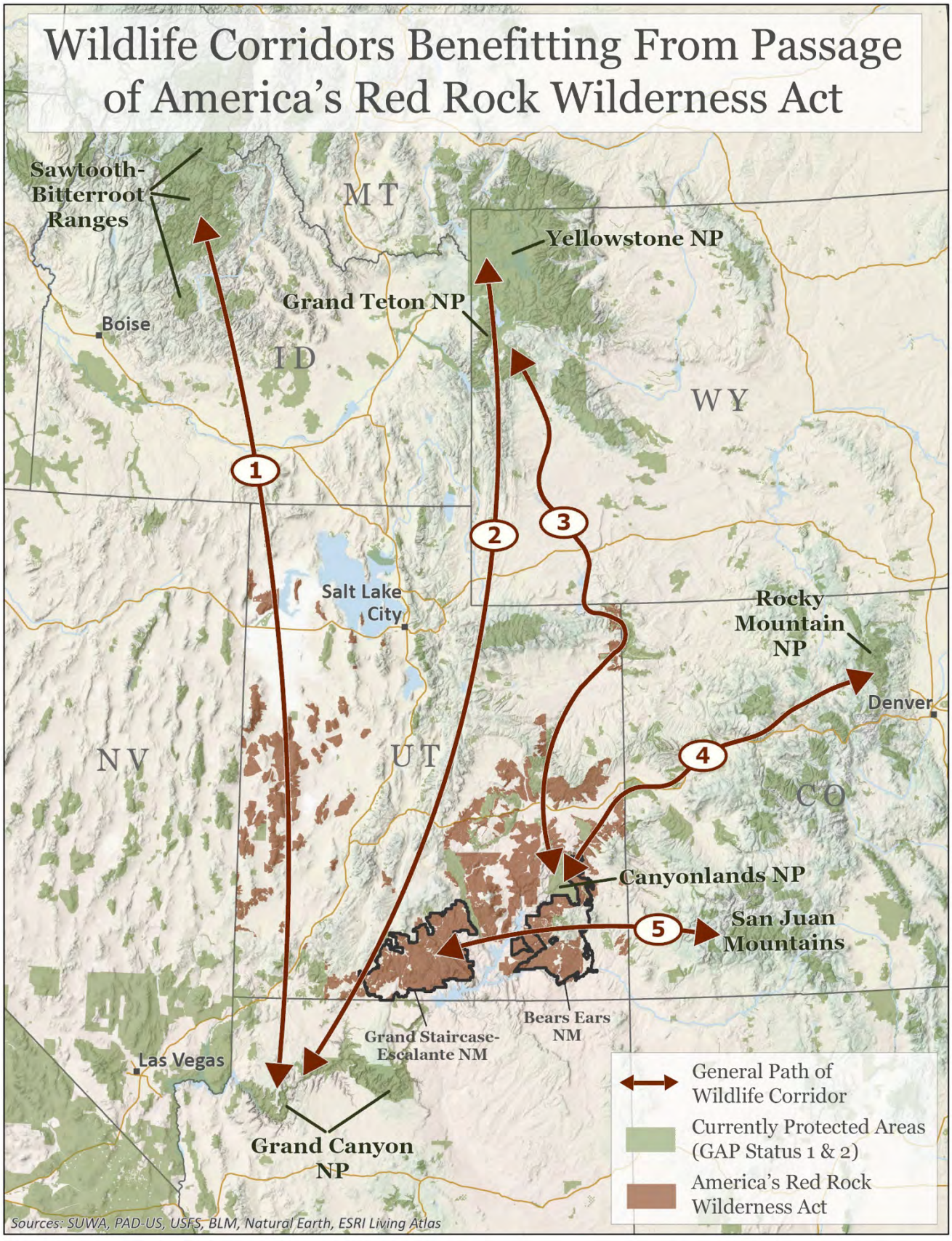
4. Upper Colorado River Corridor

Connects Greater Canyonlands Region to Colorado's Rocky Mountains. Benefits mule deer, elk, bighorn sheep, pronghorn antelope, black bear, mountain lion, and potentially wolves

5. Grand Staircase to San Juan Mountains Corridor

Connects Grand Staircase and Bears Ears Regions to Colorado's San Juan Mountains. Benefits mule deer, elk, bighorn sheep, black bear, mountain lion and potentially wolves

[67] Hilberg, 2020:5.
[68] Hilberg, 2020:5.


Wildlife Corridors Benefitting From Passage of America's Red Rock Wilderness Act
Sawtooth-Bitterroot Ranges
MT
Yellowstone NP
Grand Teton NP
Boise
ID
WY
1
2
3
Salt Lake City
Rocky Mountain NP
Denver
NV
UT
4
CO
Canyonlands NP
San Juan Mountains
5
Bears Ears NM
Grand Staircase-Escalante NM
Las Vegas
Grand Canyon NP
General Path of Wildlife Corridor
Currently Protected Areas (GAP Status 1 & 2)
America's Red Rock Wilderness Act
Sources: SUWA, PAD-US, USFS, BLM, Natural Earth, ESRI Living Atlas

(1) Grand Canyon to Bitterroot Wilderness Wildlife Corridor

- ***Connects Grand Canyon Region to Idaho's Sawtooth-Bitterroot Ranges***
- ***Part of the Grand Canyon to Bitterroot Wilderness Megalinkage***
- ***Approximately 2,559,000 acres in 85 ARRWA units***

This important wildlife corridor is the 900-mile wildlife linkage connecting the Grand Canyon region with central Idaho. The wildlife corridor begins in Grand Canyon and Zion National Parks and Grand Canyon-Parashant National Monument (northwest Arizona), continues across southwestern Utah, then northward along the Utah-Nevada border and into the Sawtooth-Bitterroot Ranges of Idaho.[69]

ARRWA Units Integral to Grand Canyon to Bitterroot Wilderness Wildlife Corridor

Passage of ARRWA would provide protection of 2,559,000 acres in 85 ARRWA units integral to this corridor.[70]

Wildlife benefiting from improved habitat and connectivity include: mule deer,[71] pronghorn antelope,[72] black bear,[73] mountain lion,[74] and wolf.[75]

Existing protected areas in Utah integral to this corridor include Beaver Dam Mountains, Red Mountain, Cottonwood Canyon, Doc's Pass, Slaughter Creek, Cougar Canyon, Tunnel S**p**rings, and Pine Valley.

Asterisk means this unit is listed for more than one corridor.

Zion-Hot Desert (approximately 110,000 acres in 7 units)

- Bunting Point (approximately 12,000 acres)*

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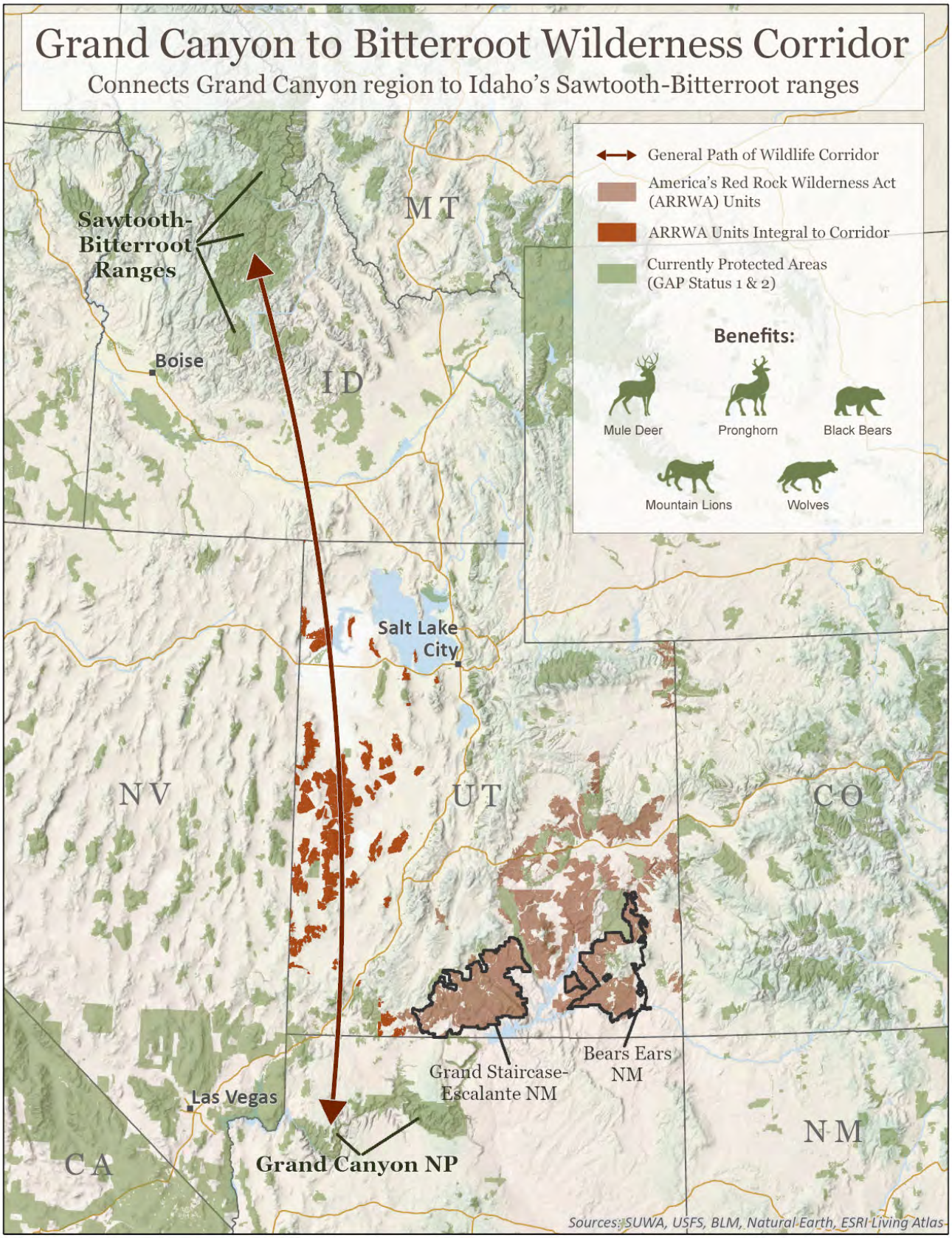
[69] Carroll et al., 2014, Figure 4; see also Belote et al., 2016 which depicts north-south trending linkages in Utah from Beaver Dam Mountain/Red Cliff NCA north to Grouse Creek and Raft River Mountains in Utah's extreme northwest corner along the Idaho and Nevada borders.
[70] Southern Utah Wilderness Alliance. 2020. America's Red Rock Wilderness Geodatabase
[71] National Park Service, Great Basin: List of Mammals, https://www.nps.gov/grba/learn/nature/list-of-mammals.htm, accessed December 10, 2020.
[72] Utah Division of Wildlife Resources, Utah Pronghorn Statewide Management Plan, 2017, Figure 1, https://wildlife.utah.gov/pdf/bg/pronghorn_plan.pdf.
[73] Black bears are common in the northern end of the Grand Canyon-Bitterroot Megalinkage in the Bitterroot Wilderness—see USFWS, 2010, Bitterroot Mountains Bear DNA and Camera Survey, Final Report, https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3847409.pdf, accessed December 10, 2020, but most likely absent in the Utah portion—see Utah Division of Wildlife Resources, Utah Black Bear Management Plan, V.2.0, 2011-2023, Figure 1, https://wildlife.utah.gov/public_meetings/info/2010-12-06.pdf, accessed December 10, 2020. They are rare but historically present in Grand Canyon (Hoffmeister, 1986:484.
[74] UDWR, Utah Cougar Management Plan: Figure 3.
[75] Carroll et al., 2014, Figure 4. Currently, wolves entering Nevada are protected as "endangered" under the federal Endangered Species Act. The gray wolf is protected as "endangered" in most of Utah, with the exception in the northwestern part of the state north of Interstate 80 and east of Interstate 84, including Rich County.

- Canaan Mountain (approximately 16,000 acres)*
- Jolley Gulch (approximately 40 acres)*
- Moquith Mountain (approximately 18,000 acres)*
- Orderville Canyon (approximately 8,000 acres)*
- Parunuweap Canyon (approximately 50,000 acres)*
- Spring Creek Canyon (approximately 7,000 acres)

West Desert (approximately 2,449,000 acres in 78 units)

- Antelope Range (approximately 17,000 acres)
- Bald Eagle Mountain (approximately 10,000 acres)
- Barn Hills (approximately 24,000 acres)
- Big Hollow (approximately 4,000 acres)
- Black Hills (approximately 10,000 acres)
- Broken Ridge (approximately 11,000 acres)
- Bullgrass Knoll (approximately 18,000 acres)
- Burbank Hills (approximately 19,000 acres)
- Burbank Pass (approximately 33,000 acres)
- Cat Canyon (approximately 9,000 acres)
- Wah Wah Mountains (approximately 178,000 acres)
- Chalk Knolls (approximately 18,000 acres)
- Cobb Peak (approximately 8,000 acres)
- Conger Mountain (approximately 25,000 acres)
- Coyote Knolls (approximately 17,000 acres)
- Crater Bench (approximately 40,000 acres)
- Crater Island (approximately 92,000 acres)
- Cricket Mountain (approximately 19,000 acres)
- Crook Creek (approximately 21,000 acres)
- Deep Creek Mountains (approximately 128,000 acres)
- Disappointment Hills (approximately 27,000 acres)
- Drum Mountains (approximately 19,000 acres)
- Dugway Mountains (approximately 27,000 acres)
- Essex Canyon (approximately 1,000 acres)
- Fish Springs Range (approximately 65,000 acres)
- Granite Mountain (approximately 21,000 acres)
- Granite Peak (approximately 20,000 acres)
- Grassy Mountains (approximately 27,000 acres)
- Grouse Creek Mountains (approximately 16,000 acres)
- Hamlin (approximately 15,000 acres)
- Headlight Mountain (approximately 6,000 acres)
- Howell Peak (approximately 29,000 acres)
- Indian Peaks (approximately 17,000 acres)
- Jackson Wash (approximately 21,000 acres)
- Juniper (approximately 19,000 acres)


Grand Canyon to Bitterroot Wilderness Corridor
Connects Grand Canyon region to Idaho's Sawtooth-Bitterroot ranges
General Path of Wildlife Corridor
America's Red Rock Wilderness Act (ARRWA) Units
ARRWA Units Integral to Corridor
Currently Protected Areas (GAP Status 1 & 2)
Benefits:
Mule Deer
Pronghorn
Black Bears
Mountain Lions
Wolves
Sawtooth-Bitterroot Ranges
MT
Boise
ID
Salt Lake City
NV
UT
CO
Grand Staircase-Escalante NM
Bears Ears NM
Las Vegas
NM
CA
Grand Canyon NP
Sources: SUWA, USFS, BLM, Natural Earth, ESRI Living Atlas

- Keg Mountains (approximately 44,000 acres)
- Kern Mountains (approximately 16,000 acres)
- King Top (approximately 114,000 acres)
- Ledger Canyon (approximately 10,000 acres)
- Lion Peak (approximately 30,000 acres)
- Little Drum Mountains (approximately 27,000 acres)
- Little Goose Creek (approximately 1,000 acres)
- Little Sage Valley (approximately 17,000 acres)
- Mahogany Peak (approximately 800 acres)
- Middle Burbank Hills (approximately 8,000 acres)
- Middle Mountains (approximately 43,000 acres)
- Mount Escalante (approximately 21,000 acres)
- Mountain Home Range (approximately 59,000 acres)
- Needle Mountains (approximately 12,000 acres)
- Newfoundland Mountains (approximately 26,000 acres)
- North Peaks (approximately 10,000 acres)
- North Stansbury (approximately 22,000 acres)
- Notch Peak (approximately 72,000 acres)
- Notch View (approximately 9,000 acres)
- Ochre Mountain (approximately 14,000 acres)
- Oquirrh Mountains (approximately 9,000 acres)
- Orr Ridge (approximately 13,000 acres)
- Painted Rock (approximately 30,000 acres)
- Paradise Mountain (approximately 43,000 acres)
- Pilot Mountains (approximately 9,000 acres)
- Pilot Peak (approximately 30,000 acres)
- Red Canyon (approximately 19,000 acres)
- Red Tops (approximately 31,000 acres)
- Rockwell/Little Sahara (approximately 22,000 acres)
- San Francisco Mountain (approximately 45,000 acres)
- Sand Ridge (approximately 80,000 acres)
- Silver Island Mountains (approximately 39,000 acres)
- Snake Valley (approximately 74,000 acres)
- Stansbury Island (approximately 10,000 acres)
- Steamboat Mountain (approximately 43,000 acres)
- Swasey Mountain (approximately 93,000 acres)
- The Toad (approximately 13,000 acres)
- Thomas Range (approximately 45,000 acres)
- Tule Valley (approximately 133,000 acres)
- Tunnel Springs (approximately 26,000 acres)
- Tweedy Wash (approximately 8,000 acres)
- White Rock Range (approximately 6,000 acres)
- Wild Horse Pass (approximately 41,000 acres)

Protected areas in eastern Nevada which are part of this corridor include Great Basin National Park and ten wilderness areas: Tunnel Springs, White Rock Range, Parsnip Peak, Fortification Range, Highland Ridge, High Schells, Ruby Mountains, and Jarbidge Wilderness Areas, along with South Pequop and Bluebell (Goshute Mountains) Wilderness Study Areas.

Major highway barriers include Interstate Highways 15 (north-south trending) and 80 (east-west trending), and U.S. 6/50 (east-west trending). Significant obstacles to wildlife movement include state highways 91, 18, 130, 21, 257, 56, and 30.

(2) Grand Staircase Wildlife Corridor

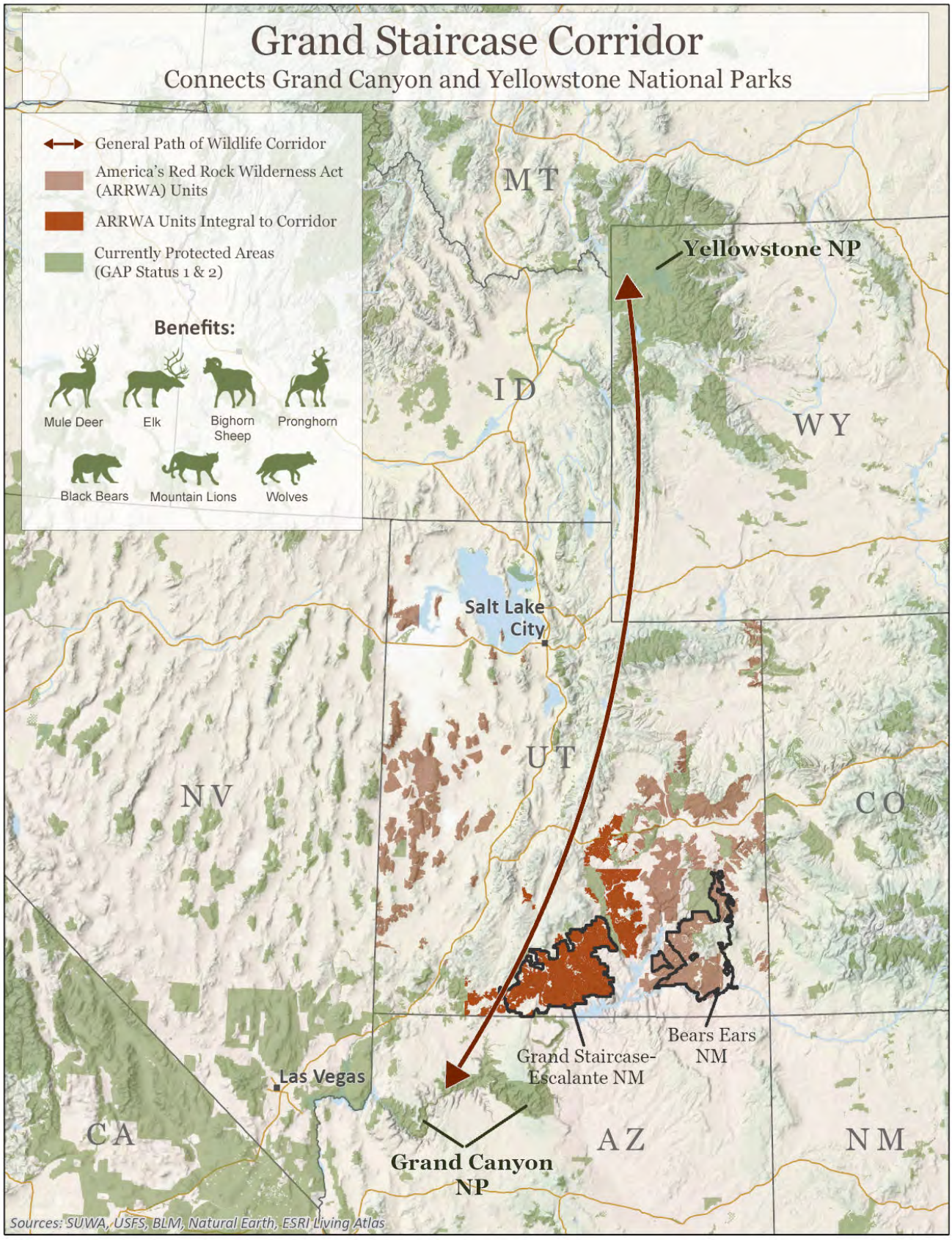
- ***Connects Grand Canyon and Yellowstone National Parks***
- ***A Component of the Grand Canyon to Yellowstone Megalinkage***
- ***Approximately 2,864,000 acres in 84 ARRWA units***

In the 1870s, geologist Clarence Dutton first conceptualized a "Grand Staircase" ascending out of the bottom of the Grand Canyon northward to the high plateaus in southern Utah with the cliff edge of each layer forming giant steps. The Grand Staircase rises more than 6,000 feet in a series of great cliffs and plateaus from the depths of the Grand Canyon to the forested rim of Bryce Canyon,[76] and spans six major life zones, from the lower Sonoran Desert to alpine forest.[77] The landscape-scale Grand Staircase encompasses geologic formations that display 3 billion years of Earth's history.[78]

The Grand Staircase forms a crucial connection in the wildlife linkage between Grand Canyon and Yellowstone National Parks,[79] integral to the 6,000-mile Western Wildway linking northern Mexico with the Alaskan-Canadian Arctic.[80] As such, it comprises a crucial wildlife linkage between Grand Canyon National Park and the adjacent Kaibab National Forest (Kaibab Plateau) leading through Utah's Grand Staircase-Escalante National Monument (GSENM) up to the Paunsagunt Plateau—the Bryce Canyon National Park region and beyond.

In September 1996, President Clinton designated GSENM, emphasizing the remoteness and natural beauty of the area.[81] The President also recognized a crucial role that the monument plays as a wildlife connector, specifically mentioning riparian corridors as an object of conservation under the Antiquities Act. However, in December 2017,

[76] S.3056 (2019), Section 102, (a)(1)(A).
[77] S.3056 (2019), Section 102, (a)(1)(B)(i).
[78] S.3056 (2019), Section 102, (a)(1)(B)(ii).
[79] Carroll et al., 2014; Belote et al., 2016; and Fields et al., 2010.
[80] Wildlands Network, Western Wildway, https://wildlandsnetwork.org/wildways/western/, accessed July 25, 2020.
[81] Clinton, 1996.


Grand Staircase Corridor
Connects Grand Canyon and Yellowstone National Parks
General Path of Wildlife Corridor
America's Red Rock Wilderness Act (ARRWA) Units
ARRWA Units Integral to Corridor
Currently Protected Areas (GAP Status 1 & 2)
Benefits:
Mule Deer
Elk
Bighorn Sheep
Pronghorn
Black Bears
Mountain Lions
Wolves
MT
ID
WY
NV
UT
CO
CA
AZ
NM
Yellowstone NP
Salt Lake City
Las Vegas
Grand Staircase-Escalante NM
Bears Ears NM
Grand Canyon NP
Sources: SUWA, USFS, BLM, Natural Earth, ESRI Living Atlas

President Trump issued an executive order reducing GSENM by 50%.[82]

Conservation organizations and others challenged Trump's order as illegal, and it is under review in the U.S. District Court of Columbia.[83] The Biden-Harris Plan for Tribal Nations says that President Biden will take immediate steps to reverse Trump's attacks on Bears Ears and Grand Staircase-Escalante National Monuments.[84]

The area's corridor function is well documented by Arizona and Utah state wildlife agencies.[85] Additional scientific literature reports that "the connection the Monument [GSENM] provides between Glen Canyon, Canyonlands, Grand Canyon, Capitol Reef, and Bryce Canyon National Park units increases the value of all these areas for protection of viability of plant and animal populations."[86] Additional research and modeling indicate the corridor's ecological significance.[87]

The connectivity value of the original GSENM is increased by the presence of perennial streams that flow through and out of the monument. In any landscape, rivers and streams are often considered the epitome of connectivity critical to a landscape's overall health.[88] Their long, linear shapes and arterial patterns make them unique. By physically and ecologically connecting habitats, riparian areas can significantly influence ecological processes and functions on a landscape level and contribute immensely to the connectivity of western landscapes.[89] Western riparian communities' complex, multi-layered structure supports high species diversity, especially compared to arid uplands. They are anchors for biodiversity in the west.[90]

For example, by 1997, researchers noted, "The Monument contains several perennial streams that connect the high plateaus to the low desert, thus preserving these migration corridors and increasing the Monument's ability to conserve genetic and population diversity of plants and animals."[91] Consequently, "these areas also act as migration corridors for many species, including deer, neotropical [bird] migrants, mountain lions, and bears."

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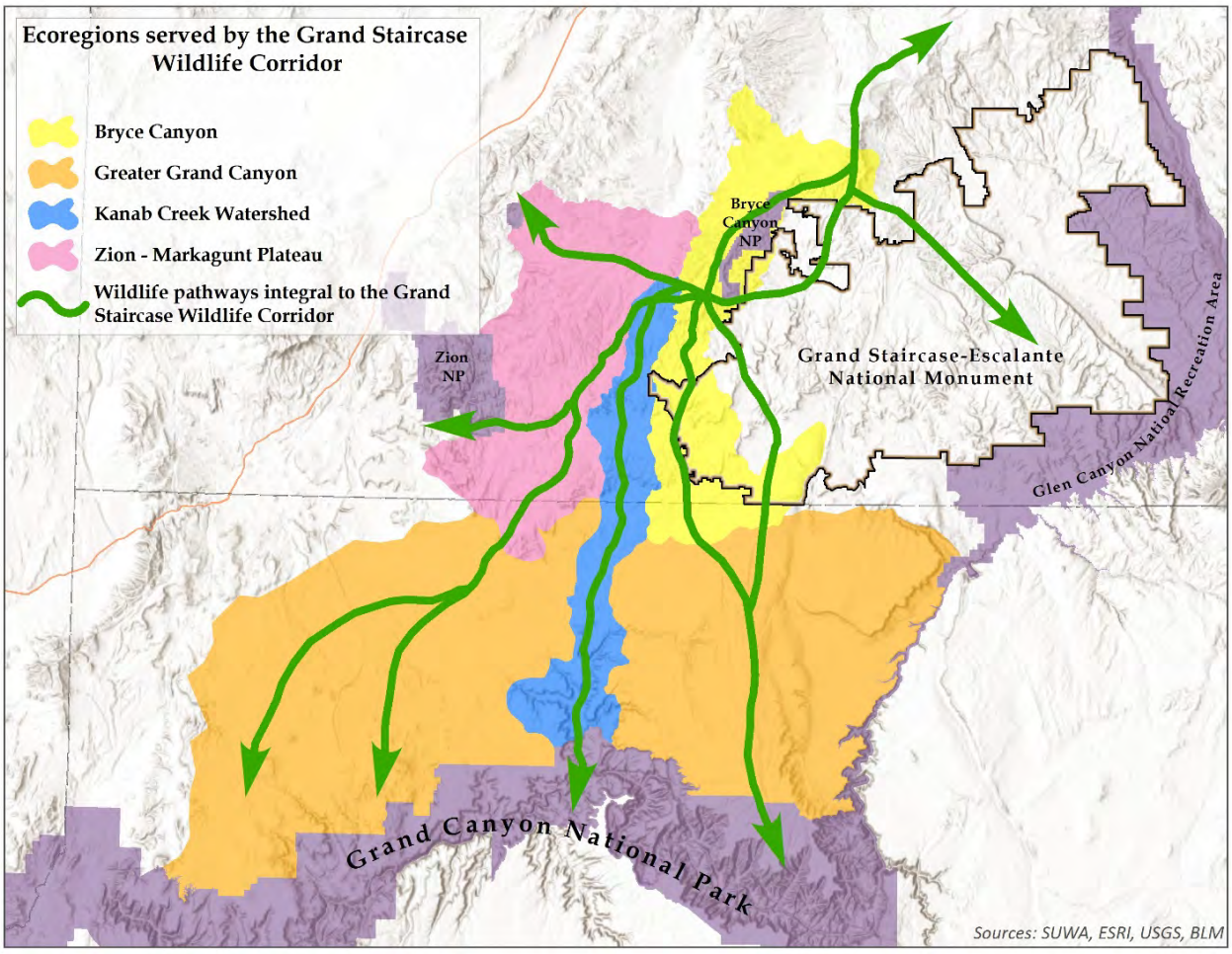
[82] Presidential Proclamation Modifying the Grand Staircase-Escalante National Monument, Proclamation 6920, https://www.whitehouse.gov/presidential-actions/presidential-proclamation-modifying-grand-staircase-escalante-national-monument/, December 4, 2017.
[83] The Wilderness Society et al., v. Donald Trump et al., Case 1:17-cv-02587, Document 1, Filed 12/04/17, 60 pages.
[84] The Biden-Harris Plan for Tribal Nations. https://joebiden.com/tribalnations/
[85] Carrel et al., 1999.
[86] Belnap 1997; cited in Hartly and Aplet 2001:174.
[87] Carroll et al., 2014; Belote et al., 2016; and Fields et al., 2010.
[88] Pringle, 2001; Wiens, 2002; see Barnes 2005:58.
[89] Barnes, 2005.
[90] Barnes, 2005.
[91] Belnap, 1997.



Ecoregions Served by Grand Staircase Wildlife Corridor

Bryce Canyon Ecoregion

As winter approaches, Utah's mule deer and most likely their main predator, mountain lions, migrate off the high Paunsagunt Plateau south to lower elevation winter range on either the Wygaret Terrace (inside the Monument), the valley east of Kanab (outside the Monument), or along the Buckskin Mountain[92] (removed from the Monument by Trump) bisected by the Utah-Arizona state line.[93] Mule deer movements are likely limited to breaks including Johnson Canyon and Deer Springs Wash in the almost vertical White Cliff that separate the Skutumpah and Wygaret Terraces.[94] Movement likely occurs through limited breaks in the precipitous Vermilion Cliffs, such as Deer Springs Wash, that separate Wygaret Terrance from the valley to the south and the Arizona border.[95] In the spring, the

[92] Carrel et al.,1999:27-29.
[93] Carrel et al.,1999:27-29.
[94] Carrel et al., 1999:16.
[95] Carrel et al., 1999:16.

deer return to the Plateau's higher, cooler summer range along similar routes.[96]

While the recently eviscerated GSENM still protects some of this important winter habitat, a significant portion lies outside any credible conservation area. In addition, the Dixie National Forest land east of Bryce Canyon National Park in the vicinity of Powell Point appears to be an important connector between Bryce Canyon and the Aquarius (to the north) and Kaiparowits (to the east) Plateaus.[97]

Zion-Markagunt Plateau Ecoregion
Researchers identified this wildlife connection east from Zion to the Monument along the East Fork of the Virgin River.[98] This mostly Bureau of Land Management (BLM) land was left out of GSENM, but has been recommended for inclusion in ARRWA because of its outstanding natural character: east of Bryce, the majority of Upper Kanab Creek, Moquith Mountain, Bunting Point, Canaan Mountain, Orderville Canyon, Parunuweap Canyon, and Vermilion Cliffs.[99] In addition, researchers noted a crucial constriction at Mt. Carmel Junction, where roads and development threaten to cut off connection.[100]

The Kanab Creek Watershed Ecoregion
The Kanab Creek watershed encompasses Kanab Creek, which flows south from the Pink Cliffs of the Paunsagunt Plateau to its confluence in Grand Canyon. The Paiute's traditional "entrance" into that vast canyon, Kanab Creek falls within the traditional territory of the Kaibab Band of the Paiute, who farmed along the creek and utilized the various available plant and animal resources. Kanab Creek was also an important north- south trade route and served as a refuge for Paiutes during European-American encroachment.

Greater Grand Canyon Ecoregion
ARRWA would also provide wildlife connectivity for areas outside GSENM,[101] including Arizona's portion of the Greater Grand Canyon region. Conservationists' efforts to create a Greater Grand Canyon Heritage National Monument[102] are intended to further protect essential wildlife connectivity south through Grand Canyon National Park to provide adequate protection of crucial wildlife and rare plant habitat on the Park's adjacent lands.

ARRWA Units Integral to Grand Staircase Wildlife Corridor

Passage of ARRWA would permanently protect approximately 2,864,000 acres in 84 ARRWA units integral to this corridor.[103] Wildlife benefiting from protection and

[96] Carrel et al.,1999:27.
[97] Hartly and Aplet, 2001:181.
[98] Carrel et al.,1999.
[99] S.3056 (2019), Section 102, (a)(1)(D).
[100] Carrel et al.,1999.
[101] S.3056 (2019), Section 102, (a)(1)(D).
[102] https://www.greatergrandcanyon.org/.
[103] Southern Utah Wilderness Alliance. 2020. America's Red Rock Wilderness Geodatabase

restoration of habitat and connectivity include: mule deer,[104] elk,[105] bighorn sheep,[106] pronghorn antelope,[107] black bear,[108] mountain lion,[109] and potentially wolf.[110]

Asterisk means this unit is listed for more than one corridor.

Zion-Hot Desert (approximately 104,000 acres in 6 units)

- Bunting Point (approximately 12,000 acres)*
- Canaan Mountain (approximately 16,000 acres)*
- Jolley Gulch (approximately 40 acres)
- Moquith Mountain (approximately 18,000 acres)*
- Orderville Canyon (approximately 8,000 acres)*
- Parunuweap Canyon (approximately 50,000 acres)*

Grand Staircase (approximately 479,000 acres in 19 units)

- Box Canyon (approximately 3,000 acres)
- Bryce Boot (approximately 3,000 acres)*
- Bryce View (approximately 900 acres)*
- East of Bryce (approximately 800 acres)
- Glass Eye Canyon (approximately 26,000 acres)*
- Kodachrome Headlands (approximately 8,000 acres)*
- Ladder Canyon (approximately 14,000 acres)*
- Nephi Point (approximately 15,000 acres)*
- Paria - Hackberry (approximately 196,000 acres)*
- Paria Canyon Expansion (approximately 4,000 acres)*
- Pine Hollow (approximately 11,000 acres)*
- Slopes of Bryce (approximately 4,000 acres)*
- The Blues (approximately 22,000 acres)*

- The Cockscomb (approximately 12,000 acres)*
- Timber Mountain (approximately 53,000 acres)*
- Upper Kanab Creek (approximately 56,000 acres)
- Vermilion Cliffs (approximately 29,000 acres)
- Willis Creek (approximately 21,000 acres)*
- Willis Creek North (approximately 700 acres)*

[104] Utah Division of Wildlife Resources, Utah Mule Deer Statewide Management Plan: Figure 5, page 31.
[105] Elk are well established throughout Utah, including the aspen-conifer habitats along the state's high plateaus comprising much of the Grand Staircase Wildlife Corridor. See Utah Division of Wildlife Resources, Utah State Elk Management Plan, 2015
https://wildlife.utah.gov/pdf/bg/elk_plan.pdf
[106] UDWR 2018: Figure 2, page 20.
[107] Utah Division of Wildlife Resources, Utah Pronghorn Statewide Management Plan, 2017, Figure 1, https://wildlife.utah.gov/pdf/bg/pronghorn_plan.pdf.
[108] Utah Black Bear Management Plan: Figure 1, page 5.
[109] UDWR, Utah Cougar Management Plan: Figure 3.
[110] Carroll et al., 2014: Habitat Value map, supplemental information.

Kaiparowits Plateau (approximately 863,000 acres in 15 units)

- Andalex Not (approximately 18,000 acres)*
- Burning Hills (approximately 81,000 acres)*
- Canaan Peak Slopes (approximately 2,000 acres)*
- Carcass Canyon (approximately 85,000 acres)*
- Fiftymile Bench (approximately 13,000 acres)*
- Fiftymile Mountain (approximately 207,000 acres)*
- Heaps Canyon (approximately 4,000 acres)*
- Horse Spring Canyon (approximately 32,000 acres)*
- Little Valley Canyon (approximately 5,000 acres)*
- Mud Spring Canyon (approximately 66,000 acres)*
- Nipple Bench (approximately 34,000 acres)*
- Paradise/Wahweap (approximately 266,000 acres)*
- Rock Cove (approximately 17,000 acres)*
- Warm Creek (approximately 24,000 acres)*
- Wide Hollow (approximately 8,000 acres)*

Escalante Canyons (approximately 415,000 acres in 11 units)

- Colt Mesa (approximately 28,000 acres)*
- Death Hollow (approximately 50,000 acres)*
- Forty Mile Gulch (approximately 8,000 acres)*
- Lampstand (approximately 12,000 acres)*
- Muley Twist Flank (approximately 4,000 acres)*
- North Escalante Canyons (approximately 182,000 acres)*
- Pioneer Mesa (approximately 11,000 acres)*
- Scorpion (approximately 61,000 acres)*
- Sooner Bench (approximately 500 acres)*
- Steep Creek (approximately 36,000 acres)*
- Studhorse Peak (approximately 24,000 acres)*

Henry Mountains (approximately 490,000 acres in 11 units)

- Bull Mountain (approximately 17,000 acres)
- Bullfrog Creek (approximately 47,000 acres)*
- Dogwater Creek (approximately 3,000 acres)*
- Long Canyon (approximately 18,000 acres)*
- Mount Ellen (approximately 165,000 acres)
- Mount Hillers (approximately 23,000 acres)*
- Mount Pennell (approximately 174,000 acres)*
- Notom Bench (approximately 8,000 acres)
- Oak Creek (approximately 1,000 acres)*
- Pleasant Creek Bench (approximately 1,000 acres)
- Ragged Mountain (approximately 33,000 acres)*

San Rafael Swell/Capitol Reef (approximately 480,000 acres in 18 units)

- Capitol Reef (approximately 6,000 acres)
- Cedar Mountain (approximately 17,000 acres)
- Devil's Canyon (approximately 16,000 acres)
- Eagle Canyon (approximately 44,000 acres)
- Factory Butte (approximately 25,000 acres)
- Fremont Gorge (approximately 24,000 acres)
- Hondu Country (approximately 3,000 acres)
- Jones Bench (approximately 4,000 acres)
- Limestone Cliffs (approximately 29,000 acres)
- Molen Reef (approximately 37,000 acres)
- Muddy Creek (approximately 92,000 acres)
- Mussentuchit Badlands (approximately 27,000 acres)
- North Blue Flats (approximately 3,000 acres)
- Red Desert (approximately 34,000 acres)
- Rock Canyon (approximately 19,000 acres)
- San Rafael Knob (approximately 17,000 acres)
- Upper Muddy Creek (approximately 21,000 acres)
- Wild Horse Mesa (approximately 63,000 acres)

Wasatch/Sevier Plateaus (approximately 33,000 acres in 4 units)

- Kingston Ridge (approximately 12,000 acres)
- Phonolite Hill (approximately 9,000 acres)
- Pole Canyon (approximately 5,000 acres)
- Rocky Ford (approximately 7,000 acres)

(3) Green River Wildlife Corridor

- ***Connects Greater Canyonlands Region to Grand Teton National Park and Beyond***
- ***Part of the Canyonlands to Grand Teton Megalinkage***
- ***Approximately 800 miles in length[111]***
- ***Approximately 1,785,000 acres in 37 ARRWA units***

Major river networks include the Upper Colorado River, Green River, and Sevier River; smaller streams and springs throughout the region provide critical habitat for plants and animals as well as corridors for wildlife movement.[112] The Green River flows 730 miles from Wyoming's Wind River Mountains to its confluence with the Colorado River in the heart of Canyonlands National Park. It constitutes a vital dispersal corridor linking the Uinta Mountains, Dinosaur National Monument, and Grand Teton National Park to the north, and the Colorado and Arizona portions of the Colorado Plateau to the south.[113]

[111] See Belote et al., 2016; and Fields et al., 2010.
[112] Jones et al. 2011; Olson & Fallon, 2018. Cited in Hilberg, 2020:9.
[113] Davidson et al., 1996:105.

The Green River wildlife corridor already includes two nationally recognized and protected wildlife passages in Wyoming. The first, the Path of the Pronghorn, is a 100-mile long migration corridor beginning 25 miles south of Pinedale and generally following the Green River and continuing another 75 miles along the Gros Ventre River and Wilderness reaching summer range in Grand Teton National Park.[114] The second, the Red Desert to Hobeck Mule Deer Migration wildlife corridor, extends from the Red Desert east of Rock Springs, merging somewhat with the Path of the Pronghorn near Pinedale, and diverging to the southwest slope of the Gros Ventre Range and Wilderness.[115]

Protection of Utah's portion of the Green River, including the Greater Canyonlands, Tavaputs Plateau, and the eastern and western Uinta Mountains, would create a southerly connection for those species.[116]

Protection of the Utah portion of the Green River is also critical for the long-term conservation of the state's biological diversity. This region contains some of the largest remaining federal roadless areas in Utah, and provides important habitat for sensitive species with large area requirements.[117] It includes broad elevational gradients with the potential to protect a wide range of natural communities and to maintain crucial routes for seasonal wildlife migration between high and low elevations.

ARRWA Units Integral to the Green River Wildlife Corridor

Portions of this region were designated as Wilderness in March 2019 under the Emery County Public Land Management Act, which was signed into law as part of the John D. Dingell, Jr. Conservation, Management and Recreation Act. Passage of ARRWA would permanently protect approximately 1,785,000 acres in 37 ARRWA units integral to this corridor.[118]

Wildlife benefiting from protection of habitat and corridors include: mule deer,[119] elk,[120] bighorn sheep,[121] pronghorn antelope,[122] black bear,[123] mountain lion,[124] and potentially wolf.[125]

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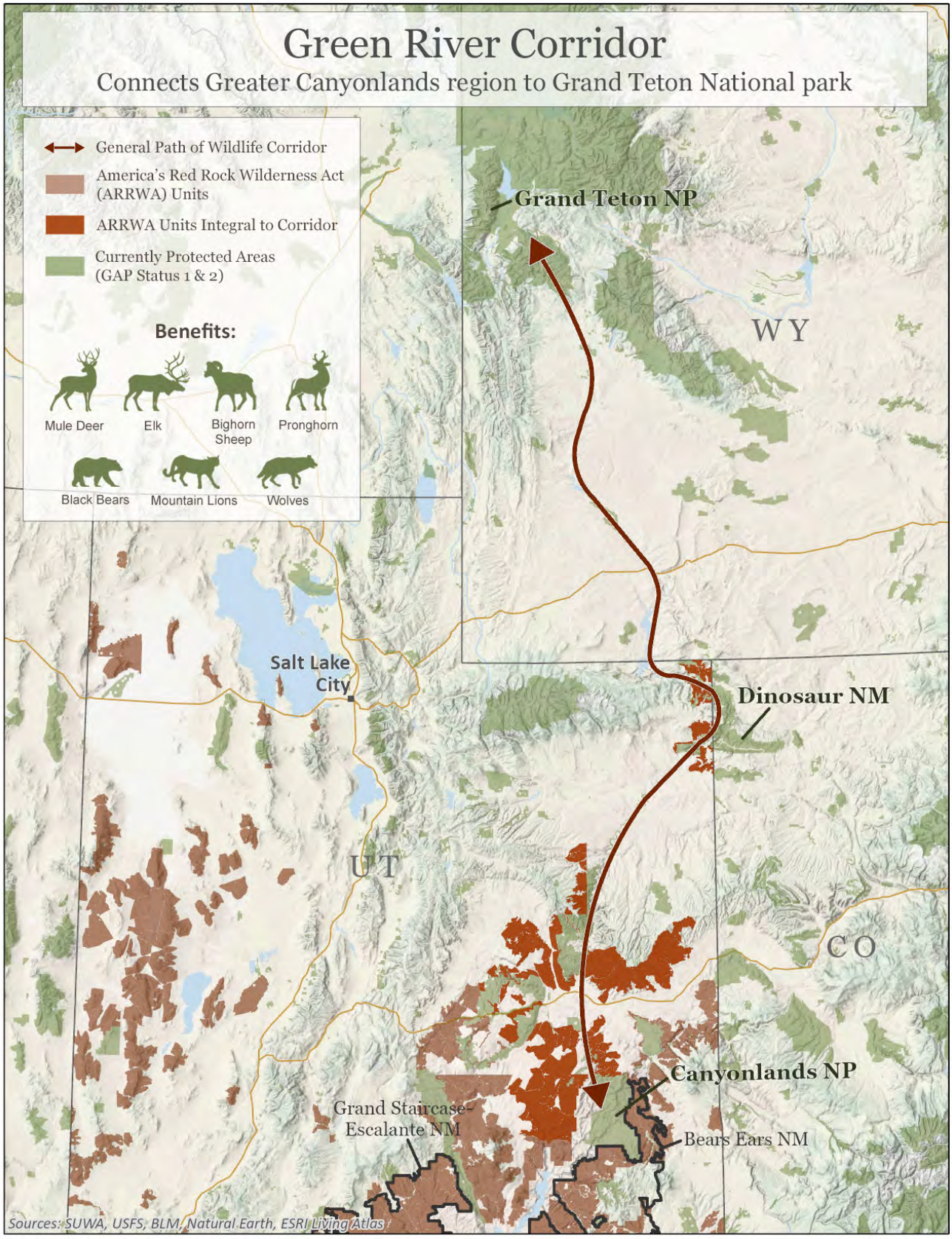
[114] Kauffman et al., 2018:136-137,144.
[115] Kauffman et al., 2018:138-143.
[116] See Belote et al., 2016; Carroll et al., 2014; and Fields et al., 2010.
[117] Davidson et al., Fig. 1.
[118] Southern Utah Wilderness Alliance. 2020. America's Red Rock Wilderness Geodatabase
[119] Utah Division of Wildlife Resources, Utah Mule Deer Statewide Management Plan: Figure 5, page 31.
[120] Elk are well established throughout Utah, including the aspen-conifer habitats along the Green River as it traverses through the Tavaputs Plateaus, a key element of Utah's portion of Green River Wildlife Corridor. See Utah Division of Wildlife Resources, Utah State Elk Management Plan, 2015.
[121] UDWR 2018: Figure 2, page 20.
[122] Utah Division of Wildlife Resources, Utah Pronghorn Statewide Management Plan, 2017, Figure 1, https://wildlife.utah.gov/pdf/bg/pronghorn_plan.pdf.
[123] Utah Black Bear Management Plan, 2011: Figure 1, page 5.
[124] UDWR, Utah Cougar Management Plan: Figure 3.
[125] Carroll et al., 2014: Habitat Value map, supplemental information.


Green River Corridor
Connects Greater Canyonlands region to Grand Teton National park
General Path of Wildlife Corridor
America's Red Rock Wilderness Act (ARRWA) Units
ARRWA Units Integral to Corridor
Currently Protected Areas (GAP Status 1 & 2)
Benefits:
Mule Deer
Elk
Bighorn Sheep
Pronghorn
Black Bears
Mountain Lions
Wolves
Grand Teton NP
WY
Salt Lake City
Dinosaur NM
UT
CO
Canyonlands NP
Grand Staircase-Escalante NM
Bears Ears NM
Sources: SUWA, USFS, BLM, Natural Earth, ESRI Living Atlas

Asterisk means this unit is listed for more than one corridor.

Canyonlands (approximately 714,000 acres in 8 units)

- Dirty Devil (approximately 277,000 acres)
- Duma Point (approximately 17,000 acres)
- Flat Tops (approximately 33,000 acres)
- Horseshoe Canyon (approximately 83,000 acres)
- Horsethief Point (approximately 18,000 acres)
- Labyrinth Canyon (approximately 90,000 acres)
- San Rafael River (approximately 117,000 acres)
- Sweetwater Reef (approximately 78,000 acres)

San Rafael Swell (approximately 318,000 acres in 5 units)

- Lost Spring Wash (approximately 41,000 acres)
- Mexican Mountain (approximately 36,000 acres)
- Price River (approximately 138,000 acres)
- San Rafael Reef (approximately 62,000 acres)
- Sids Mountain (approximately 41,000 acres)

Book Cliffs/Uinta Basin (approximately 754,000 acres in 24 units)

- Bad Land Cliffs (approximately 13,000 acres)
- Beach Draw (approximately 1,000 acres)
- Bourdette Draw (approximately 18,000 acres)
- Bull Canyon (approximately 3,000 acres)
- Dead Horse Pass (approximately 9,000 acres)
- Desbrough Canyon (approximately 16,000 acres)
- Desolation Canyon (approximately 333,000 acres)
- Diamond Breaks (approximately 9,000 acres)
- Diamond Canyon (approximately 189,000 acres)*
- Diamond Mountain (approximately 31,000 acres)
- Goslin Mountain (approximately 4,000 acres)
- Hideout Canyon (approximately 14,000 acres)*
- Lower Flaming Gorge (approximately 22,000 acres)
- Mexico Point (approximately 17,000 acres)*
- Moonshine Draw (approximately 11,000 acres)
- Mountain Home (approximately 9,000 acres)
- O-Wi-Yu-Kuts (approximately 18,000 acres)
- Red Creek Badlands (approximately 5,000 acres)
- Split Mountain Benches (approximately 3,000 acres)
- Stone Bridge Draw (approximately 4,000 acres)
- Stuntz Draw (approximately 2,000 acres)
- Survey Point (approximately 10,000 acres)*

- Turtle Canyon (approximately 12,000 acres)
- Vivas Cake Hill (approximately 300 acres)

(4) Upper Colorado River Corridor

- ***Connects Greater Canyonlands Region to Rocky Mountain National Park***
- ***Approximately 836,000 acres in 28 ARRWA units***

This wildlife passage constitutes a vital dispersal corridor linking the Greater Canyonlands (including the La Sal Mountains, Westwater Canyon, and Uncompahgre Plateau) with Colorado's Rocky Mountains,[126] which comprise a portion of the eastern Western Wildway connecting Mexico with the Canadian and Alaskan arctic.[127]

The Colorado River begins in Rocky Mountain National Park at 10,184 feet above sea level. For the first 250 miles of its course, the Colorado River carves its way through Colorado's mountainous Western Slope. The river continues through spectacular Red Rock country to its confluence with the Green River in Canyonlands National Park. Protection of the Colorado River is critical for the long-term conservation of biological diversity in Utah and western Colorado. This region contains some of the largest remaining federal roadless areas in Utah and provides important habitat for sensitive species with large area requirements.[128] It includes broad elevational gradients with the potential to protect a wide range of natural communities and to maintain crucial routes for seasonal wildlife movement between high and low elevations.

ARRWA Units Integral to the Upper Colorado River Corridor

Passage of ARRWA would provide protection of 836,000 acres in 28 ARRWA units integral to this corridor.[129]

Wildlife benefitting from protection and restoration of habitat and wildlife connectivity include: mule deer,[130] elk,[131] bighorn sheep,[132] pronghorn antelope,[133] black bear,[134] mountain lion,[135] and potentially wolf.[136]

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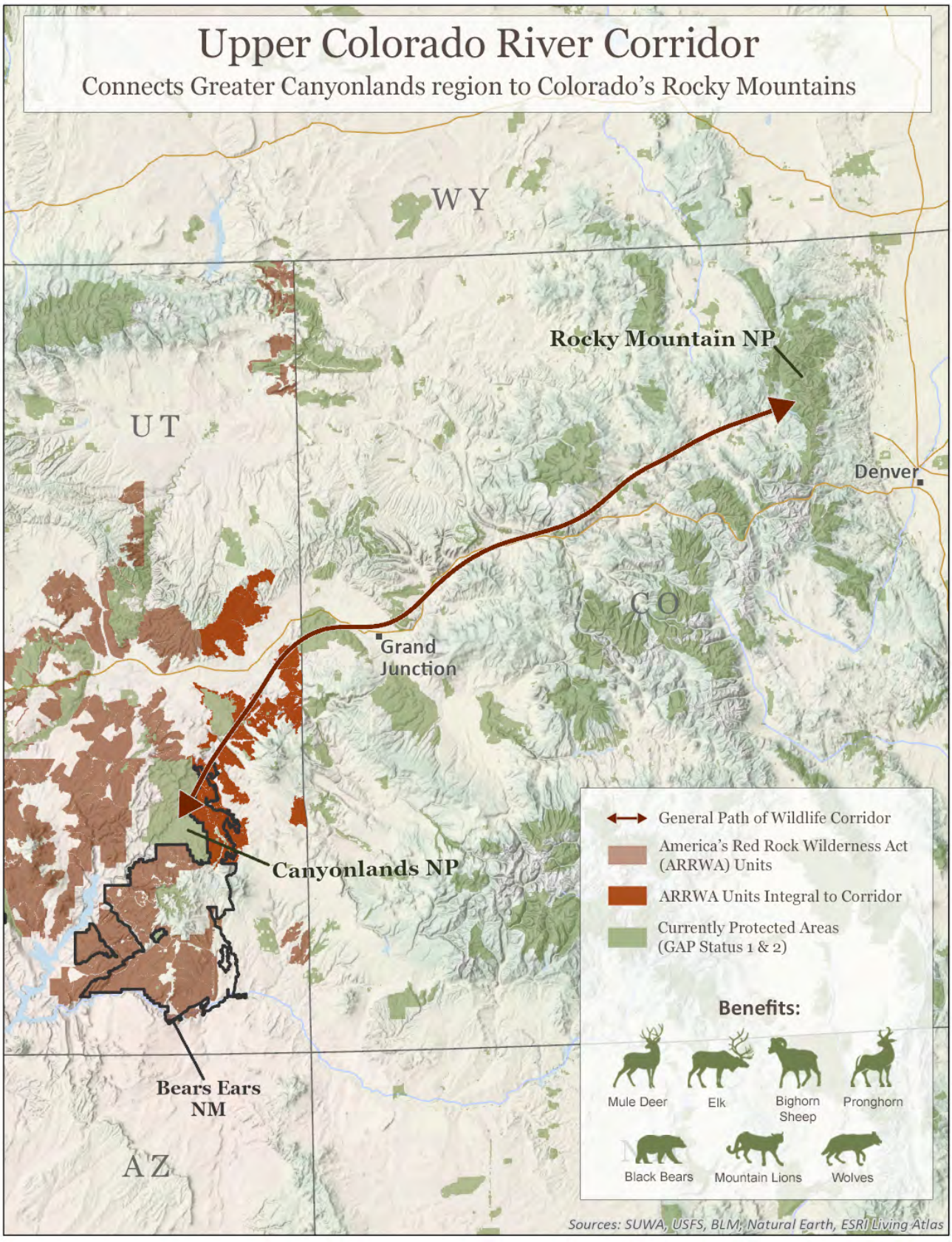
[126] See also Belote, et al., 2016; and Fields et al., 2010.
[127] Western Wildway https://wildlandsnetwork.org/wildways/western/ ; see also Foreman et al., 2003.
[128] Davidson et al., Fig. 1.
[129] Southern Utah Wilderness Alliance. 2020. America's Red Rock Wilderness Geodatabase
[130] Utah Division of Wildlife Resources, Utah Mule Deer Statewide Management Plan: Figure 5, page 31.
[131] Elk are well established throughout Colorado, including habitats on the Uncompahgre Plateau. See "Viewing Wildlife" on Grand Mesa, Uncompahgre, and Gunnison National Forests, No Date Given, https://www.fs.usda.gov/activity/gmug/recreation/natureviewing/?recid=32366&actid=62#:~:text=Contact%20Us-,Viewing%20Wildlife,and%20many%20other%20small%20mammals.
[132] UDWR 2018: Figure 2, page 20.
[133] Utah Division of Wildlife Resources, Utah Pronghorn Statewide Management Plan, 2017, Figure 1, https://wildlife.utah.gov/pdf/bg/pronghorn_plan.pdf.
[134] Utah Black Bear Management Plan: Figure 1, page 5.
[135] UDWR, Utah Cougar Management Plan: Figure 3.
[136] Carroll et al., 2014: Habitat Value map, supplemental information.


Upper Colorado River Corridor
Connects Greater Canyonlands region to Colorado's Rocky Mountains
WY
UT
CO
AZ
Rocky Mountain NP
Denver
Grand Junction
Canyonlands NP
Bears Ears NM
General Path of Wildlife Corridor
America's Red Rock Wilderness Act (ARRWA) Units
ARRWA Units Integral to Corridor
Currently Protected Areas (GAP Status 1 & 2)
Benefits:
Mule Deer
Elk
Bighorn Sheep
Pronghorn
Black Bears
Mountain Lions
Wolves
Sources: SUWA, USFS, BLM, Natural Earth, ESRI Living Atlas

Asterisk means this unit is listed for more than one corridor.

Canyonlands (approximately 277,000 acres in 7 units)

- Bridger Jack Mesa (approximately 37,000 acres)
- Dead Horse Cliffs (approximately 6,000 acres)
- Demons Playground (approximately 4,000 acres)
- Gooseneck (approximately 10,000 acres)
- Hatch/Lockhart/Hart (approximately 172,000 acres)
- Indian Creek (approximately 33,000 acres)
- Shay Mountain (approximately 17,000 acres)

Moab (approximately 329,000 acres in 17 units)

- Arches Adjacent (approximately 11,000 acres)
- Beaver Creek (approximately 46,000 acres)
- Behind the Rocks (approximately 20,000 acres)
- Big Triangle (approximately 24,000 acres)
- Coyote Wash (approximately 29,000 acres)
- Dome Plateau (approximately 39,000 acres)
- Fisher Towers (approximately 20,000 acres)
- Goldbar Canyon (approximately 11,000 acres)
- Granite Creek (approximately 5,000 acres)
- Hunters Canyon (approximately 7,000 acres)
- Mary Jane Canyon (approximately 29,000 acres)
- Mill Creek (approximately 17,000 acres)
- Morning Glory (approximately 11,000 acres)
- Porcupine Rim (approximately 10,000 acres)
- Renegade Point (approximately 6,000 acres)
- Westwater Canyon (approximately 39,000 acres)
- Yellow Bird (approximately 5,000 acres)

Book Cliffs (approximately 230,000 acres in 4 units)

- Diamond Canyon (approximately 189,000 acres)*
- Hideout Canyon (approximately 14,000 acres)*
- Mexico Point (approximately 17,000 acres)*
- Survey Point (approximately 10,000 acres)*

(5) Grand Staircase to San Juan Mountains Wildlife Corridor

- ***Connects Grand Staircase-Escalante and Bears Ears Regions with Colorado's San Juan Mountains***
- ***Approximately 3,271,000 acres in 74 ARRWA units***

This wildlife passage connects Grand Staircase-Escalante and Bears Ears regions with Colorado's San Juan Mountains.[137] This portion of the eastern Western Wildway links Mexico with the Canadian and Alaskan Arctic.[138]

ARRWA Units Integral to Grand Staircase to San Juan Mountains Wildlife Corridor

Passage of ARRWA would permanently protect approximately 3,271,000 acres in 74 ARRWA units integral to this corridor. [139]

Regional wildlife directly benefiting from protection of habitat and movement corridors include: mule deer,[140] elk,[141] bighorn sheep,[142] black bear,[143] mountain lion,[144] and potentially wolf.[145]

Asterisk means this unit is listed for more than one corridor.

Grand Staircase (approximately 393,000 acres in 16 units)

- Box Canyon (approximately 3,000 acres)*
- Bryce Boot (approximately 3,000 acres)*
- Bryce View (approximately 900 acres)*
- Glass Eye Canyon (approximately 26,000 acres)*
- Kodachrome Headlands (approximately 8,000 acres)*
- Ladder Canyon (approximately 14,000 acres)*
- Nephi Point (approximately 15,000 acres)*
- Paria - Hackberry (approximately 196,000 acres)*
- Paria Canyon Expansion (approximately 4,000 acres)*
- Pine Hollow (approximately 11,000 acres)*
- Slopes of Bryce (approximately 4,000 acres)*
- The Blues (approximately 22,000 acres)*
- The Cockscomb (approximately 12,000 acres)*
- Timber Mountain (approximately 53,000 acres)*

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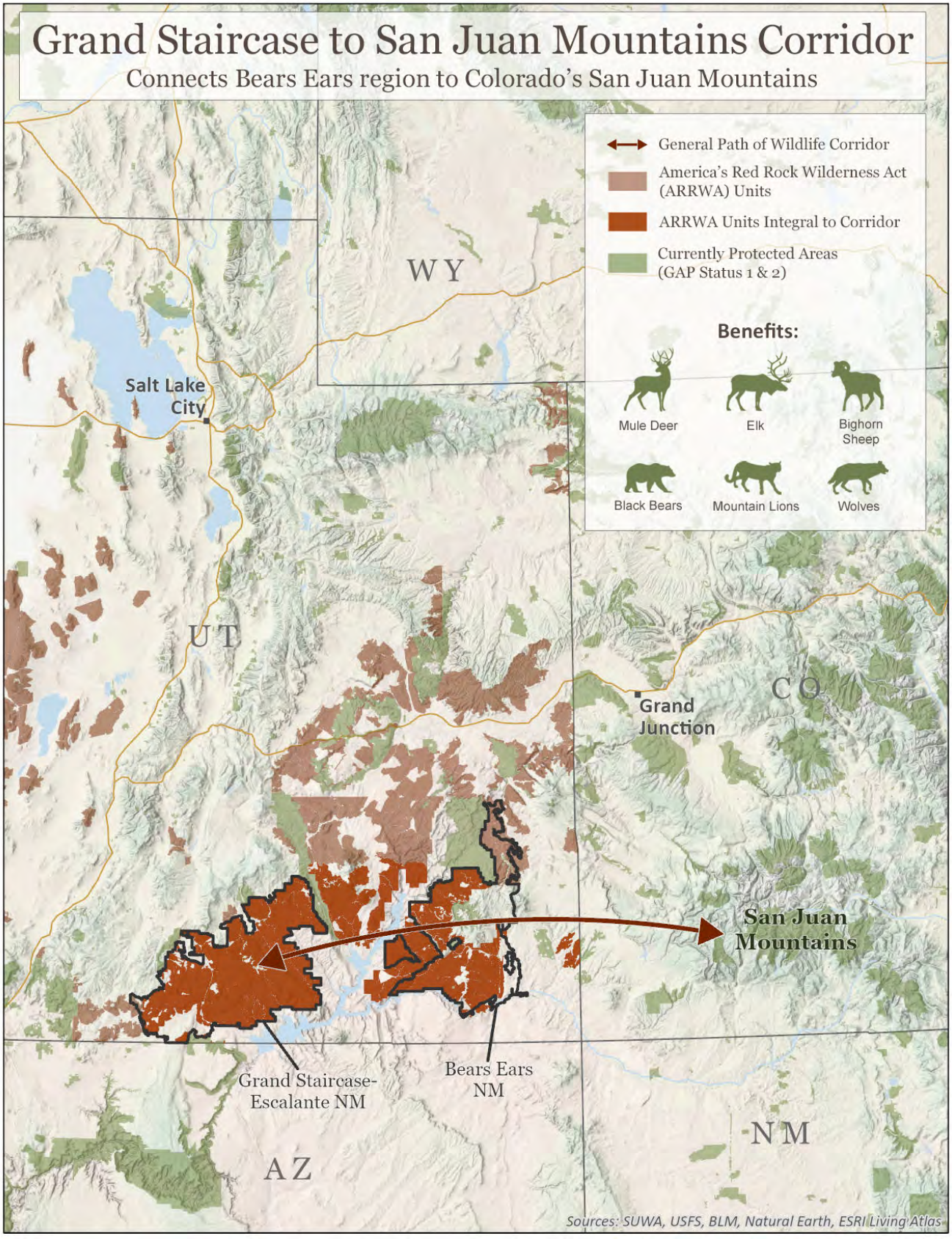
[137] Carroll et al., 2014; see also Belote, et al., 2016; and Fields et al., 2010.
[138] Western Wildway https://wildlandsnetwork.org/wildways/western/ ; see also Foreman et al., 2003.
[139] Southern Utah Wilderness Alliance. 2020. America's Red Rock Wilderness Geodatabase
[140] Utah Division of Wildlife Resources, Utah Mule Deer Statewide Management Plan: Figure 5, page 31.
[141] Elk are well established throughout Utah, including the aspen-conifer habitats on the Abajo and San Juan Mountains. See Utah Division of Wildlife Resources Utah State Elk Management Plan, 2015.
[142] UDWR 2018: Figure 2, page 20.
[143] Utah Black Bear Management Plan, 2011: Figure 1, page 5.
[144] UDWR, Utah Cougar Management Plan: Figure 3.
[145] Carroll et al., 2014: Habitat Value map, supplemental information.


Grand Staircase to San Juan Mountains Corridor
Connects Bears Ears region to Colorado's San Juan Mountains
General Path of Wildlife Corridor
America's Red Rock Wilderness Act (ARRWA) Units
ARRWA Units Integral to Corridor
Currently Protected Areas (GAP Status 1 & 2)
Benefits:
Mule Deer
Elk
Bighorn Sheep
Black Bears
Mountain Lions
Wolves
WY
Salt Lake City
UT
CO
Grand Junction
San Juan Mountains
Grand Staircase-Escalante NM
Bears Ears NM
AZ
NM
Sources: SUWA, USFS, BLM, Natural Earth, ESRI Living Atlas

- Willis Creek (approximately 21,000 acres)*
- Willis Creek North (approximately 700 acres)*

Kaiparowits Plateau (approximately 846,000 in 12 units)

- Andalex Not (approximately 18,000 acres)*
- Burning Hills (approximately 81,000 acres)*
- Canaan Peak Slopes (approximately 2,000 acres)*
- Carcass Canyon (approximately 85,000 acres)*
- Fiftymile Bench (approximately 13,000 acres)*
- Fiftymile Mountain (approximately 207,000 acres)*
- Horse Spring Canyon (approximately 32,000 acres)*
- Mud Spring Canyon (approximately 66,000 acres)*
- Nipple Bench (approximately 34,000 acres)*
- Paradise/Wahweap (approximately 266,000 acres)*
- Warm Creek (approximately 24,000 acres)*
- Rock Cove (approximately 17,000 acres)*

Escalante Canyons (approximately 415,000 acres in 11 units)

- Colt Mesa (approximately 28,000 acres)*
- Death Hollow (approximately 50,000 acres)*
- Forty Mile Gulch (approximately 8,000 acres)*
- Lampstand (approximately 12,000 acres)*
- Muley Twist Flank (approximately 4,000 acres)*
- North Escalante Canyons (approximately 182,000 acres)*
- Pioneer Mesa (approximately 11,000 acres)*
- Scorpion (approximately 61,000 acres)*
- Sooner Bench (approximately 500 acres)*
- Steep Creek (approximately 36,000 acres)*
- Studhorse Peak (approximately 24,000 acres)*

Henry Mountains (approximately 300,,000 acres in 7 units)

- Bullfrog Creek (approximately 47,000 acres)*
- Dogwater Creek (approximately 3,000 acres)*
- Long Canyon (approximately 18,000 acres)*
- Mount Hillers (approximately 23,000 acres)*
- Mount Pennell (approximately 174,000 acres)*
- Oak Creek (approximately 1,000 acres)*
- Ragged Mountain (approximately 33,000 acres)*

Glen Canyon (approximately 690,000 acres in 11 units)

- Caine Spring Desert Adjacent (approximately 400 acres)
- Cane Spring Desert (approximately 19,000 acres)
- Copper Point (approximately 5,000 acres)

- Dark Canyon (approximately 145,000 acres)
- Fiddler Butte (approximately 100,000 acres)
- Fort Knocker (approximately 13,000 acres)
- Little Rockies (approximately 73,000 acres)
- Red Rock Plateau (approximately 207,000 acres)
- The Needle (approximately 12,000 acres)
- Upper Red Canyon (approximately 28,000 acres)
- White Canyon (approximately 88,000 acres)

San Juan-Anasazi (approximately 600,000 acres in 16 units)

- Allen Canyon (approximately 7,000 acres)
- Arch Canyon (approximately 33,000 acres)
- Comb Ridge (approximately 17,000 acres)
- Cross Canyon (approximately 3,000 acres)
- Fish/Owl Creek Canyons (approximately 83,000 acres)
- Grand Gulch (approximately 173,000 acres)
- Hammond Canyon (approximately 5,000 acres)
- Lime Creek (approximately 6,000 acres)
- Monument Canyon (approximately 20,000 acres)
- Nokai Dome (approximately 102,000 acres)
- Road Canyon (approximately 71,000 acres)
- San Juan River (approximately 15,000 acres)
- The Tabernacle (approximately 8,000 acres)
- Tin Cup Mesa (approximately 29,000 acres)
- Tuwa Canyon (approximately 10,000 acres)
- Valley of the Gods (approximately 16,000 acres)

Canyonlands (approximately 31,000 acres in 1 unit)

- Butler Wash (approximately 31,000 acres)

APPENDIX A

RECOMMENDED WILDLIFE CORRIDOR GOALS AND OBJECTIVES

Utah pronghorn herd.

Ecological connectivity is the unimpeded movement of species and the flow of natural processes that sustain life on Earth.[146] This definition has been endorsed by the Convention on Migratory Species[147] and underlines the urgency of protecting connectivity and its various elements, including dispersal, seasonal migration, fluvial processes, and the connectivity that is inherently present in large wild areas.[148] An ecological or wildlife corridor is a clearly defined geographical space that is governed and managed over the long term to maintain or restore effective ecological connectivity.[149] The following terms are often used similarly: 'linkages,' 'wildways,' 'safe passages,' 'ecological connectivity areas,' 'ecological connectivity zones,' and 'permeability areas.'

A wildlife (ecological) corridor should be clearly delineated,[150] have specific ecological objectives, and be governed and managed to achieve connectivity outcomes.[151] A wildlife

[146] CMS, 2020, cited in Hilty et al., 2020:2.
[147] CMS, 2020.
[148] Hilty et al., 2020:xii.
[149] Hilty et al., 2020:4, Box 1.
[150] Hilty et al., 2020:27.
[151] Hilty et al., 2020:24.

corridor's purpose is to maintain connectivity, especially in regions where natural habitat has been badly fragmented and yet extensive connectivity is required to retain that region's elements and processes.[152]

The most critical step in documenting a wildlife corridor is defining its objectives for ecological connectivity.[153] Connectivity can be established or maintained for any one or a combination of the following purposes, all of which depend on movements between habitat patches: (1) genetic exchange; (2) movement of individuals to meet life-cycle needs, including migration; (3) provision of habitat for daily to multi-generational movement; (4) maintenance of ecological processes; (5) movement and adaptation responses to global change, including climate change; (6) or recovery and recolonization after disturbance. A wildlife corridor should have clear and measurable ecological objectives meeting at least one of the above purposes.[154]

General

- Make wildlife corridors—also known as ecological corridors, wildways, or habitat links—as wide and wild as possible. Although the size of a wildlife corridor will vary, it should be large enough to achieve its specific ecological connectivity objectives over the long term.[155] Wildlife corridors should be designated so they contain sufficient ecologically effective habitat to facilitate wildlife movement for daily, seasonal, and long-term needs in a safe manner.[156]
- Allow for latitudinal and elevational range shifts in response to climate change.[157]
- Maintain ecological integrity of all wildlife habitat types and migration routes.[158]
- Evaluate proposed activities, including recreational use, for their potential to adversely affect relevant wildlife values in the corridor. Do not permit any activities that interfere with adequate protection of those values.[159] Eliminate or minimize mechanical intrusions within the corridor.
- Close the area to renewable and other energy developments, including ostensibly renewable forms. For example, flyway corridors require consideration of their vertical dimension with an emphasis on threats such as the placement of wind turbines that intercept and kill migrating avifauna.[160]
- Manage area to protect migration and movement routes for mule deer and other wide-ranging wildlife, and especially keystone species[161] such as wolves, cougars,

[152] Hilty et al., 2020:24.
[153] Examples of the seven ecological connectivity objectives are provided in Hilty et al., 2020:25, Box 2.
[154] Hilty et al., 2020:25.
[155] Hilty et al., 2020:27.
[156] Modified from BLM 2012:2-55. See also Dobson et al. 1999, and Groom et al., 1999, both articles cited in Foreman et al., 2003:148.
[157]Dobson et al. 1999, cited in Foreman et al., 2003:148.
[158] Groom et al., 1999, cited in Foreman et al., 2003: 148.
[159] Modified from BLM 2006:21; and BLM 2015:882; Section 4-49.2.1.
[160] Hilty et al., 2020:28.
[161] A "keystone, or strongly interactive" species is one whose absence or unusual rarity causes cascading, dissipative transformations in ecosystems, including alterations or simplifications in ecological structure, function, or composition (Soulé et al. 2005:170).

Mountain lion in southern Utah.

and other carnivores.[162] This includes identification and mitigation of barriers such as highways, canals, fencing, and man-made dams.[163]

- Protect riparian habitat for aquatic species (native fish, beaver, river otter, mink, invertebrates, etc.).[164]
- Activities currently authorized by the agency in any corridor shall be consistent with wildlife movement, migration, and dispersal requirements.
- Disallow hunting or trapping of large carnivores and other sensitive species within wildlife corridors.
- For private lands within wildlife corridors, provide strong economic incentives for wildlife-friendly practices; have funds ready for conservation acquisition by land trust or government agency, should the owners decide to sell.

Retain Public Ownership

- Retain public land in federal ownership allowing for the protective management of crucial habitat and movement corridors for mule deer, elk, pronghorn antelopes,

[162] Modified from BLM 2015d:881; Section 4-49.2; and BLM 2008:2-45,47.
[163] Beier et al., 2008.
[164] Dobson et al. 1999, cited in Foreman et al., 2003:148.

other wide-ranging wildlife and especially top carnivores, like wolves and cougars, and ecosystem enhancers, like beavers and prairie dogs.

- Encourage the acquisition of non-federal lands within the corridor through purchase from willing sellers, exchange (but never trading away other ecologically critical lands), transfer, or donation. Acquired lands should be managed consistent with the corridor's standards and guidelines.
- Again, where possible, augment wildlife values through purchase from willing sellers, exchange, transfer or donation of additional acreage of crucial wildlife habitat for their migration, movement, and dispersal.[165]
- Establish and implement in a timely manner mitigation measures for roads, fencing, and other fragmenting structures to allow the safe movement of wildlife. Busy roads should have safe wildlife overpasses and underpasses where wildlife want to cross.

Prohibit Mining

- Subject to valid existing rights, mining as well as oil and gas exploration and development is prohibited within corridor management areas.[166]
- Close the corridor to fluid mineral leasing and to mineral materials sales.[167]
- Close the corridor to all locatable and leasable minerals exploration and development (including geothermal and sodium), and mineral material disposals.
- Withdraw the corridor from location and entry under the Mining Law, subject to valid existing rights.
- Close the corridor to recreational placer mining outside of active mining claims.
- Prohibit surface occupancy and surface-disturbing activities.

Minimize and Mitigate Roads

- Manage motorized vehicular use as "Limited to Designated Roads and Trails."
- Establish road and motorized trail density standards within the management area to conform to the best scientific recommendations, *generally less than one-half mile per square mile*.[168] Ensure that there will be no net increases in road densities above a scientifically credible threshold to maintain the security of core habitat areas.[169]

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[165] Modified from BLM 2015 2015d:882; Section 4-49.2.1; BLM 2006:21.
[166] H.R. 1321-Northern Rockies Ecosystem Protection Act, 02/22/2019, Sec. 203(b)(2), https://www.congress.gov/bill/116th-congress/house-bill/1321/text?q=%7B%22search%22%3A%5B%22Northern+Rockies+Ecosystem+Protection+Act%22%5D%7D&r=2&s=3;
[167] BLM 2015d:882,883; Section 4-49.2.2.
[168] H.R. 1321-Northern Rockies Ecosystem Protection Act, 02/22/2019, Sec. 203(b)(3)(B), https://www.congress.gov/bill/116th-congress/house-bill/1321/text?q=%7B%22search%22%3A%5B%22Northern+Rockies+Ecosystem+Protection+Act%22%5D%7D&r=2&s=3; Lyon 1979; Van Dyke et al. 1986a,b; Fox 1989. Trombulak and Frissell 2000; Reed et al. 1996; Strittholt and DellaSala 2001; and Davidson et al. 1996. See Groom et al., 1999, cited in Forman et al., 2003: 148. Dobson et al. 1999 (cited in Foreman et al., 2003:148) recommends a road density in wildlife corridors of no more than 0.25 miles per square mile.
[169] Forest Service 2012: unpaginated, Tables 16b-9 and 16b-10.

- Close existing designated roads or trails if conflicts with wildlife cannot be mitigated.[170]
- Establish and implement in a timely manner safe wildlife crossings and mitigation standards for existing roads and primitive roads or highways crossing public land to facilitate movement of wildlife and reduce mortality of wildlife from vehicle collisions.[171]
- Ban new permanent roads within the corridor in order to maintain unfragmented habitat for wildlife migration and dispersal.[172]

Phase Out Livestock Grazing

- Mitigate ecological impacts due to livestock grazing. Grazing of domestic cattle and sheep has been the leading cause of watershed, stream, and grassland degradation.[173] Wildlife corridors should incorporate grazing guidelines that state that livestock grazing may be permitted only where, and in such a manner, that it serves positive ecological roles.[174] Permanent voluntary retirement of grazing permits offers an effective resolution of habitat integrity-livestock conflicts and ends gratuitous lethal control of carnivores.[175]
- Evaluate any proposed changes in grazing fencing guidelines for wildlife, e.g., timing and intensity of use, for impacts on relevant wildlife values. Implement those changes that benefit wildlife.[176]
- Minimize fencing for livestock and make all fences wildlife friendly.[177]

Vegetation Treatments

- Only allow vegetation treatments determined beneficial by the best available science relevant to ecosystem values.
- Minimize homogenous forests where diverse, mixed-age forests would be more natural. Consider prohibiting the practice of even-aged silvicultural management and timber harvesting within the special corridor management areas.[178]
- Discourage the spread of invasive species by removing unneeded roads and power-lines, and allowing natural wildfires to burn where safe.

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[170] BLM 2012:2-55.
[171] BLM 2012:2-55.
[172] BLM 2006:21.
[173] Belsky et al., 1999, Fleischner 1994, Donahue 1999; and Noss and Cooperrider, 1994.
[174] Fleischner et al., 1994.
[175] Stone et al., 2016.
[176] Modified from BLM, 2006:21.
[177] MFWP 2012; Jakes et al., 2018; and Paige 2012.
[178] H.R. 1321-Northern Rockies Ecosystem Protection Act, 02/22/2019, Sec. 203(b)(1), https://www.congress.gov/bill/116th-congress/house-bill/1321/text?q=%7B%22search%22%3A%5B%22Northern+Rockies+Ecosystem+Protection+Act%22%5D%7D&r=2&s=3.

APPENDIX B
UTAH FLYWAYS

Utah and most of the Western Wildway is considered a component of what is known as the Pacific Flyway, a major north-south ecological corridor for migratory birds in America that extends from Alaska to Patagonia. In the U.S., the Pacific Flyway includes Alaska, Arizona, California, Idaho, Nevada, Oregon, Utah, Washington, and those portions of Colorado, Montana, New Mexico, and Wyoming west of the Continental Divide.[179]

Stepping Stones

An ecological corridor can be discontinuous provided that the objectives, governance and management are the same across its segments. Such wildlife linkages are referred to as "stepping stone" components of the larger wildlife passage.[180] In order to provide connectivity, stepping stones must be of an appropriate habitat type, align with mechanisms of dispersal requirements (e.g., the Pacific Flyway), and be of a minimum threshold size.[181] In cases where there is more than one management entity involved, management actions should be coordinated.[182]

Utah's three National Wildlife Refuges (NWR)—Ouray NWR,[183] Fish Springs NWR,[184] and Bear River Migratory Bird Refuge[185]—comprise significant stepping stone components of the Western Wildway through the state.

Ouray National Wildlife Refuge is one link in the chain of sparsely distributed wetlands along the Green River that provides much needed habitat for migrating birds, sandhill cranes, bald eagles, and waterfowl.[186] Fish Springs National Wildlife Refuge provides habitat for nearly 280 species of birds including migratory species.[187] Migratory birds at Bear River Migratory Bird Refuge include American avocet, cinnamon teal, black-necked stilt, American white pelican, black tern, and Franklin's gull.[188]

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[179] The Pacific Flyway Council, August 2020. http://www.pacificflyway.gov/.
[180] Hilty et al., 2020:27.
[181] Hilty et al., 2020:27; See Hilty et al. 2020:113-116, Annex, Case Studies 24—Marine Connectivity, Australia, The Great Barrier Reef: Systematically Protecting Connectivity Without Data; and Hilty et al., 2020:116-117, Annex, Case Study 25, Marine Connectivity: North America.
[182] Hilty et al., 2020:27.
[183] 11,987 acres, Canyonlands to Tetons (Green River) Wildlife Megalinkage, IUCN Category IV (habitat/species management area).
[184] 17,992 acres, Grand Canyon-Bitterroot Wildlife Megalinkage, IUCN Category IV (habitat/species management area).
[185] 74,000 acres, Grand Canyon-Yellowstone Megalinkage, IUCN Category IV (habitat/species management area).
[186] USFWS, Ouray National Wildlife Refuge, https://www.fws.gov/refuge/wildlife_and_habitat/wildlife_and_habitat.html.
[187] Fish Springs National Wildlife Refuge, Utah State Parks, https://www.stateparks.com/fish_springs_national_wildlife_refuge_in_utah.html.
[188] Table 3. Priority Species, Bear River Migratory Bird Refuge https://www.fws.gov/uploadedFiles/BRPrioritySpeciesList.pdf.

Flyways require consideration of their vertical dimension with an emphasis on threats such as the placement of wind turbines that intercept and kill migrating avifauna.[189] In addition, effective conservation requires that managing agencies recognize and address potentially adverse activities at the surface such as subterranean freshwater systems that are relatively remote from them.[190] For example, the source of Fish Springs is thought to be the end of a long groundwater flowpath starting in Nevada's Schell Creek and Snake Ranges and flowing along permeable bedrock or faults toward the NWR.[191] In any event, effective protection of any ecological corridor requires addressing its height and depth dimensions to achieve its connectivity objectives.[192]

[189] Hilty et al., 2020:28.
[190] Hilty et al., 2020:28.
[191] Fish Springs National Wildlife Refuge, Wikipedia, https://en.wikipedia.org/wiki/Fish_Springs_National_Wildlife_Refuge.
[192] Hilty et al., 2020:28.

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About the Author

As the wildlands coordinator for The Rewilding Institute, **Kim Crumbo** continues a 40-year career in conservation beginning with Colorado River protection in the early 1970s. Throughout his career, he has assisted a wide array of conservation partners in development and implementation of the Western Wildway, including work on wilderness and national monument designations, and recovery of the Mexican wolf and other keystone species. Kim served 20 years with the National Park Service in Grand Canyon as a river ranger and later as wilderness coordinator. He also worked as a professional river guide for ten years and for two years as the Sierra Club's Utah wilderness coordinator.

Prior to his river ranger and wilderness conservation careers, he spent four years with the Navy's SEAL Team One completing two combat deployments to Vietnam. His combat exploits earned him the Bronze Star along with other decorations.

Kim received a B.S. in Environmental Studies from Utah State University, with postgraduate work in outdoor recreation. In 1999 he received the National Park Service's Director's Wilderness Management and Stewardship Award. In the same year, The Wilderness Society presented Kim with the Environmental Heroes Award. In 2009, the Grand Canyon Chapter of the Sierra Club named him "Conservationist of the Year" for his efforts to protect Arizona's wildlife and wild places. He received the Wilburforce Foundation's 2016 Conservation Leadership Award.

His publications include numerous conservation articles and a book, *A River Runners Guide to the History of Grand Canyon*.