

# The Shrinking Sagebrush Sea

Spatial Analyses of Threats to Sagebrush-Steppe and Greater Sage-Grouse



A Report from WILDEARTH GUARDIANS

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## MISSION STATEMENT

WildEarth Guardians protects and restores the  
wildlife, wild places and wild rivers of the American West.

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## Executive Summary

*In the sagebrush lands of the West... the natural landscape is eloquent of the interplay of forces that have created it. It is spread before us like the pages of an open book in which we can read why the land is what it is and why we should preserve its integrity. But the pages lie unread.*

Rachel Carson • *Silent Spring* (1962)

Despite its size, the Sagebrush Sea (scientifically known as “sagebrush steppe”) is one of the most endangered landscapes in North America. **The Sagebrush Sea has been reduced in area by as much as 50 percent since European settlement.** Livestock grazing, natural gas and oil development, agricultural conversion, roads, fences, powerlines and pipelines, off-road vehicle use, urban sprawl, mining, unnatural fire, and invasive weeds are fragmenting or degrading much of what remains.

Greater sage-grouse are a sagebrush obligate species whose range has been significantly reduced with the loss of sagebrush steppe. **Greater sage-grouse distribution has decreased by 56 percent while rangewide abundance has declined by as much as 93 percent from historic levels.** The sage-grouse was chosen as a focal point of this report because, as an indicator and umbrella species, scientists believe that it can act as an effective surrogate for the health of the entire Sagebrush Sea.

Current distribution of sage-grouse is relatively well known, as are the extent of several land uses and related effects in sagebrush steppe. The *Shrinking Sagebrush Sea* presents the results of WildEarth Guardians’ original cartographic analyses of sage-grouse current range and three important threats to the species: natural gas and oil development, livestock grazing, and the spread of cheatgrass in the West. Our analyses has found that these land-uses, both individually and cumulatively, affect millions of acres of sagebrush habitat on public and private lands in the Interior West. We also found that very little of the Sagebrush Sea benefits from some level of federal protection.

### Conservation of Sagebrush Steppe

Only a scant amount of sagebrush steppe is reserved for conservation or related purposes.

- **Only 2.92 percent of the current sage-grouse range is on specially designated federal land.**
- Only 4.35 percent of the 80,775,294 acres of the most important sage-grouse habitat is within current Sagebrush Sea reserves

### Cummulative Threats to Sage-Grouse

Very little sage-grouse current range is spared from individual or combinations of degrading land uses and related effects.

- **More than 81 percent of current sage-grouse range is affected by natural gas and oil development, livestock grazing or probable cheatgrass occurrence.**
- Livestock grazing is permitted and cheatgrass probably occurs on almost 30 percent of sage-grouse current range.
- Livestock grazing and natural gas and oil development affect sage-grouse on almost 9 percent of their current range.

### Roads in the Sagebrush Sea

Roads are everywhere in the Sagebrush Sea. Less than 5 percent of sagebrush-steppe is more than 1.6 miles from a road.

### Natural Gas and Oil Development

Sage-grouse are affected by natural gas and oil development, especially in or proximate to (within 3 km) breeding, nesting and brooding habitat.

- **Approximately 21,400,000 acres, or thirteen percent, of sage-grouse current range is within 3 km of permitted natural gas and oil development.**
- The percentage increases in Montana, Wyoming, Utah and Colorado, where the majority of energy development is occurring in the West: **23 percent of sage-grouse current range is within 3 km of permitted natural gas and oil wells on federal, state and private land in these states.**

### Public Lands Livestock Grazing

Livestock grazing has multiple negative effects on sage-grouse habitat.

- **Livestock grazing is permitted on 91 percent of sage-grouse current range on federal public land, making it the most ubiquitous use of sage-grouse habitat on federal public land.**
- Sage-grouse current range overlaps all or part of 9,517 active federal grazing allotments. Sage-grouse historic range includes all or part of 14,799 active federal grazing allotments.
- **Livestock grazing is also permitted on 72 percent of sage-grouse current range on *all* land ownerships.**

### Cheatgrass Incursion

Cheatgrass is a non-native, flammable weed that destroys native sagebrush steppe.

- **Cheatgrass is probably present in 36 percent of sage-grouse current range.**

### Wildfire

Wildfires in the Sagebrush Sea are larger, hotter and more frequent than in the past. Sage-grouse and other sagebrush wildlife may not use burned sagebrush steppe for decades after a devastating fire.

- More than 6.2 million acres burned in sage-grouse current range between 1997-2007.
- More than 5 million acres, or nine percent, of sage-grouse habitat burned in Idaho, Nevada and Utah between 1997-2007.

Existing threats to sage-grouse and their habitat are enormous. There is an urgent need to protect and restore the Sagebrush Sea. To this end, WildEarth Guardians is using data presented in this report to buttress efforts to list greater sage-grouse and other sagebrush obligate species under the Endangered Species Act; end livestock grazing on federal public land; and designate additional Sagebrush Sea reserves to protect sensitive flora and fauna, and conserve important habitat and watersheds in sagebrush steppe.



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## I. Introduction

An ill wind blows over the great desert of the American West. Energy developers, livestock producers and off-road vehicle users are executing plans to divide and conquer what remains of the Sagebrush Sea, the least known—and consequently the least appreciated—landscape in North America. Unfortunately, too many decisionmakers, members of the media and the public are still unaware of the need to protect and restore the Sagebrush Sea, while industrial users are unmistakably and intensely focused on this region and its most charismatic resident, the greater sage-grouse.

WildEarth Guardians' Sagebrush Sea Campaign seeks to focus public attention and conservation resources on protecting and restoring the vast sagebrush-steppe and its resident fish and wildlife across the West. The Campaign participates in public lands management planning, advocates for natural resource protection, and uses education, research, legislation and litigation to conserve and restore the Sagebrush Sea for present and future generations.

*The Shrinking Sagebrush Sea* provides landscape-level analyses of the effects of some threats to greater sage-grouse and their habitat across the West. The report is intended to improve understanding of the individual effects and cumulative impact of threats on sagebrush-steppe and sage-grouse, and support the need for greater conservation of sagebrush habitat.

## II. The Sagebrush Sea

The Sagebrush Sea is a landscape of dramatic contrasts and subtlety. While to some the dry, rocky hillsides and apparently endless bluffs of sage, juniper, piñon pine, mountain mahogany and bitterbrush appear monotonous and "barren," they teem with wildflowers, aromatic and flowering shrubs, birds and a great variety of other animals. The Sagebrush Sea is expansive country. The horizon extends for 360 degrees and the sky arches high over cedar, mustard-yellow and sea green slopes. Pronghorn race across huge grassy basins and bighorn sheep balance on steep cliffs. The landscape features lakes, rivers, streams, springs and wetlands, hot springs, salt flats, dunes, volcanic rock formations and mountain ranges.<sup>1</sup>

The Sagebrush Sea is estimated to cover more than 100 million acres of the American West,<sup>2</sup> making it one of the most extensive landscapes in North America. **Our spatial analysis of sagebrush steppe (excluding Arizona, New Mexico, North Dakota, and South Dakota) indicates that sagebrush steppe covers at least 106,657,746 acres in the United States (Map 1).** The heart of the Sagebrush Sea is shaped by the Columbia River Basin, the Great Basin, the Wyoming Basin and the Colorado Plateau. The landscape extends from the east side of the Cascade Mountains in Washington and Oregon, across the Snake River Plain in Idaho, to western, central and eastern Wyoming, southwestern and central Montana, and the western edge of the Dakota grasslands. The Sagebrush Sea includes parts of eastern California along the Oregon and Nevada border, northern and central Nevada, and the high plateau country of Utah's West Desert. The landscape also extends south, to western Colorado, northern New Mexico and Arizona.

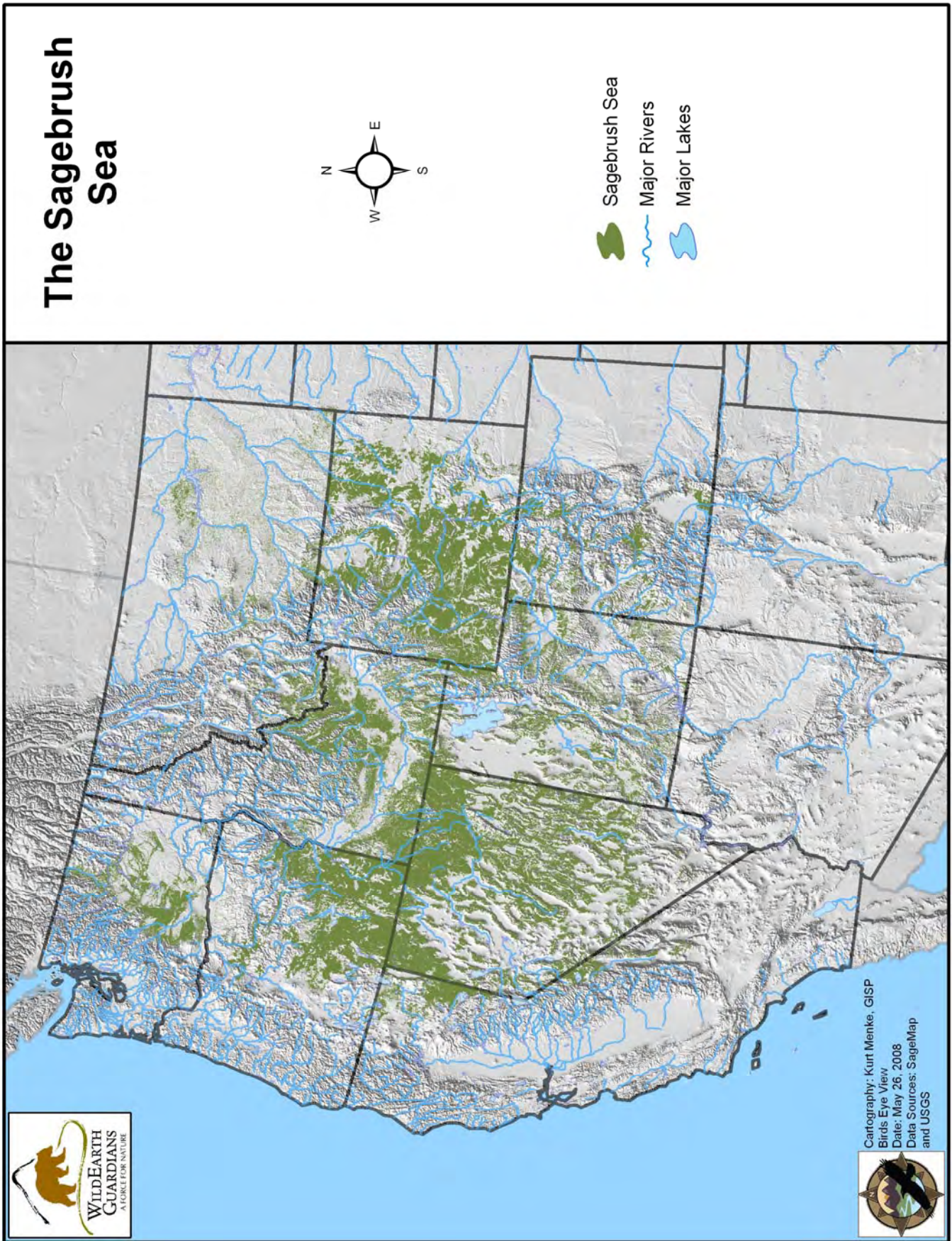
***As far as the eye could reach nothing could be seen but the blue sky and a wilderness of wild sage. The sun was excessively hot and there was not a breath of air in motion. A profound stillness hovered over the landscape and we seemed to travel in a world of sunshine, silence and sage.*** Reuben Shaw, 1896 • *Across the Plains in Forty-Nine* (1948)

Historically, the Sagebrush Sea encompassed more than 150 million acres in western North America,<sup>3</sup> and was perhaps as large as 243 million acres, spanning parts of what became sixteen states and three Canadian provinces.<sup>4</sup> Despite its size, sagebrush steppe “is one of the most endangered [landscapes] in North America.”<sup>5</sup> The Sagebrush Sea has been reduced in area by as much as 50 percent since European settlement.<sup>6</sup> Livestock grazing, natural gas and oil development, agricultural conversion, roads, fences, powerlines and pipelines, off-road vehicle use, urban sprawl, mining, unnatural fire, and invasive weeds are destroying or degrading much of what remains. European inhabitants, in only 150-300 years, “have brought about more profound changes” to sagebrush steppe “than all those of the previous 13,000 years.”<sup>7</sup> Perhaps no sagebrush steppe remains in “pristine” condition.<sup>8</sup>

Most of the Sagebrush Sea that remains is publicly owned in the United States. The Bureau of Land Management (BLM) controls approximately 50 percent of remaining sagebrush-steppe in the United States.<sup>9</sup> The U.S. Forest Service manages eight percent and western states own five percent of the Sagebrush Sea. Remaining sagebrush-steppe exists on private lands (Table 1).

A number of the fastest growing communities in the Interior West – the fastest growing region of the country – are in the Sagebrush Sea, in Colorado, Idaho, Nevada, Oregon, and Utah.<sup>10</sup> Nine of twelve states with large tracts of BLM land are among the fastest growing in the nation;<sup>11</sup> the growth rates in nine western states exceeded 20 percent or more during the past decade.<sup>12</sup> Partly because of this growth, recreational visits to BLM lands have increased 65 percent in the last 15-20 years<sup>13</sup> and are expected to continue to increase 5 percent annually.<sup>14</sup> More than 4,000 communities with a combined population of 22 million people are just a half hour drive from BLM lands.<sup>15</sup> An estimated 4,100 communities rely on watersheds managed by BLM.<sup>16</sup> The BLM recorded 56.3 million recreation visits to BLM lands in 2006.<sup>17</sup> The BLM now collects more revenue from recreational and user fees than public land grazing fees,<sup>18</sup> even though fees are not charged for most recreational activities and at many recreational sites on BLM lands.

Map 1





**Table 1. Ownership of the Sagebrush Sea \***

State, provincial, and national summaries of sagebrush lands (km<sup>2</sup>, acres, % of sagebrush area) by management authority.<sup>§</sup> Specific federal agencies for which data are presented include U.S. Bureau of Land Management (BLM), U.S.D.A. Forest Service (USDA FS), Bureau of Indian Affairs (BIA), U.S. Fish and Wildlife Service (FWS), and U.S. National Park Service (NPS).

State/Province	Private			BLM			USDA FS			State		
	km <sup>2</sup>	acres	%	km <sup>2</sup>	acres	%	km <sup>2</sup>	acres	%	km <sup>2</sup>	acres	%
Arizona	2,812	694,564	19	3,323	820,781	22	872	215,384	6	1,578	389,766	10
California	2,405	594,035	19	55,768	13,774,696	43	3,902	963,794	30	158	39,026	1
Colorado	9,126	2,254,122	48	6,809	1,681,823	36	1,684	415,948	9	929	229,463	5
Idaho	9,852	2,433,444	17	30,065	7,426,055	53	9,996	2,469,012	18	3,330	822,510	6
Montana †	13,642	3,369,574	56	5,574	1,376,778	23	1,471	363,337	6	2,094	517,218	9
Nevada	13,800	3,408,600	13	77,654	19,180,538	71	10,261	2,534,467	9	21	5,187	0
New Mexico	2,087	515,489	20	1,956	483,132	18	470	116,090	4	455	112,385	4
North Dakota †	2	494	0	16	3,952	0	989	244,283	23	169	41,743	4
Oregon	15,363	3,794,661	27	37,138	9,173,086	65	418	103,246	1	2,051	506,597	4
South Dakota †	222	54,834	46	12	2,964	3	22	5,434	5	0	0	0
Utah	10,825	2,673,775	29	16,721	4,130,087	45	4,402	1,087,294	12	3,351	827,697	9
Washington	10,590	2,615,730	53	1,011	249,717	5	177	43,719	1	2,407	594,529	12
Wyoming	36,004	8,892,988	38	44,952	11,103,144	47	3,633	897,351	4	6,376	1,574,872	7
<b>United States</b>	<b>126,730</b>	<b>31,302,310</b>	<b>27</b>	<b>230,807</b>	<b>57,009,329</b>	<b>50</b>	<b>38,297</b>	<b>9,459,359</b>	<b>8</b>	<b>22,918</b>	<b>5,660,746</b>	<b>5</b>
State/Province	FWS			NPS			BIA			BoRec/DoE/DoD ‡		
	km <sup>2</sup>	acres	%	km <sup>2</sup>	acres	%	km <sup>2</sup>	acres	%	km <sup>2</sup>	acres	%
Arizona	0	0	0	1,652	408,044	0	4,637	1,145,339	31	267	65,949	2
California	70	17,290	1	252	62,244	0	6	1,482	0	556	137,332	4
Colorado	62	15,314	0	116	28,652	0	213	52,611	1	51	12,597	0
Idaho	63	15,561	0	23	5,681	0	1,053	260,091	2	2,139	528,333	4
Montana †	480	118,560	2	79	19,513	0	779	192,413	3	56	13,832	0
Nevada	2,384	588,848	2	135	33,345	0	967	238,849	1	3,441	849,927	3
New Mexico	41	10,127	0	8	1,976	0	5,573	1,376,531	53	3	741	0
North Dakota †	14	3,458	0	61	15,067	0	316	78,052	7	42	10,374	1
Oregon	999	246,753	2	9	2,223	0	230	56,810	0	418	103,246	1
South Dakota †	0	0	0	0	0	0	218	53,846	46	4	988	1
Utah	0	0	0	499	123,253	0	1,179	291,213	3	376	92,872	1
Washington	770	190,190	4	15	3,705	0	2,915	720,005	14	2,160	533,520	11
Wyoming	127	31,369	0	658	162,526	0	3,524	870,428	4	301	74,347	0
<b>United States</b>	<b>5,010</b>	<b>1,237,470</b>	<b>1</b>	<b>3,506</b>	<b>865,982</b>	<b>0</b>	<b>21,610</b>	<b>5,337,670</b>	<b>5</b>	<b>9,814</b>	<b>2,424,058</b>	<b>2</b>
State/Province	Private			Federal								
	km <sup>2</sup>	acres	%	km <sup>2</sup>	acres	%						
Alberta	2,927	722,969	28	7,400	1,827,800	70						
British Columbia	5	1,235	0	9	2,223	1						
Saskatchewan	6,272	1,549,184	90	283	69,901	4						
<b>Canada</b>	<b>9,204</b>	<b>2,273,388</b>	<b>48</b>	<b>7692</b>	<b>1,899,924</b>	<b>40</b>						

\* Data from J. W. Connelly et al. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Assoc. Fish and Wildlife Agencies: 1-27, Table 1.3 (June 2004).

† Total area of sagebrush habitat in the eastern portion of the sagebrush biome was likely underestimated because current maps of equivalent spatial and thematic resolutions were not available when these data were assembled.

‡ U.S. Bureau of Reclamation, U.S. Department of Energy, U.S. Department of Defense.

§ GIS coverages of land ownership and management authority were developed from individual state coverages.

- **Ecological Landscape**

The Sagebrush Sea is a highly varied and complex landscape, filled with a diversity of species that have adapted to the region's variations in elevation, moisture and temperature. While sagebrush dominates visually, there are actually many different varieties of sagebrush, growing in delicate balance with other shrubs, trees, grasses and wildflowers to create a rich mosaic of vegetation that support a host of animal and insect species.

Sagebrush (*Artemisia* spp.) are among the most widely distributed native plants in the western United States.<sup>19</sup> ("Artemis" was the ancient Greek goddess of wild animals, the hunt, and vegetation, and of chastity and childbirth.<sup>20</sup>) Approximately 21 species and subspecies of sagebrush<sup>21</sup> grow from sea level to nearly 12,000 feet and in areas that receive as little as eight inches of annual precipitation.<sup>22</sup> Many varieties of sagebrush are endemic to North America,<sup>23</sup> including all big sagebrush taxa.<sup>24</sup> Big sagebrush can live as long as a century.<sup>25</sup>



Jarbidge Mountains, Jarbidge Wilderness, Nevada  
© Scott Smith Photography [www.ScottSmithPhoto.com](http://www.ScottSmithPhoto.com)

A natural mosaic of sagebrush habitats provides food and shelter for a plethora of birds, large and small mammals, reptiles, amphibians, crustaceans, insects and fish. Hundreds of bird, mammal, fish, reptilian and insect species depend upon sagebrush steppe. The Sagebrush Sea supports an estimated 250 terrestrial vertebrate species,<sup>26</sup> including 100 bird and 70 mammal species. The Snake River Birds of Prey National Conservation Area south of Boise, Idaho, hosts the largest population of nesting raptors in North America (approximately 700 pairs of raptors representing 15 species).<sup>27</sup> Increasingly rare big sagebrush habitat is alive with 94 bird species, 87 mammals, 72 spiders, 58 reptiles, 52 aphids, 32 gall midges, 31 fungi, 24 lichens, 23 ants and 23 beetles.<sup>28</sup>

Pinyon and juniper species occur in the Sagebrush Sea and individual trees may live for hundreds of years. The oldest living tree in Oregon is a western juniper that is over 1,600 years old.<sup>29</sup> Bristlecone pines more than 4,000 years old have been found at the highest elevations in the Sagebrush Sea.<sup>30</sup>

Science has identified at least 163 species and subspecies of aquatic fauna endemic to Great Basin rivers, lakes, streams, and cold and hot springs (67 fishes, 85 mollusks, 9 insects, 2 amphibians, 1 fairy shrimp).<sup>31</sup> Great Basin wetlands support 61 aquatic bugs,<sup>32</sup> 19 endemic plant species and 5 endemic plant varieties, and 4 endemic vole subspecies.<sup>33</sup>

More than 1,000 different insects and invertebrate species may be found in sagebrush steppe<sup>34</sup> (more than 1,240 insects have been identified at the Idaho National Laboratory in eastern Idaho<sup>35</sup>). Their impact on ecosystem dynamics is marked: harvester ants were observed moving vast quantities of

leaves and seeds underground in sagebrush steppe near Reno, Nevada—removing between 63 and 92 million annual plants per acre annually.<sup>36</sup>

Sagebrush obligate species (wildlife that depend on sagebrush habitats during the breeding season or year-round) include greater sage-grouse, Gunnison sage-grouse, sage sparrow, Brewer's sparrow, sage thrasher, pygmy rabbit, sagebrush vole, sagebrush lizard, and pronghorn.<sup>37</sup> As many as 16 million sage-grouse may have occurred in sagebrush steppe prior to European arrival.<sup>38</sup>

The use and abuse of the Sagebrush Sea—the draining and diversion of its streams and wetlands, conversion of sagebrush and native grasses to cropland and exotic forage plants, invasion by weeds and other non-native species, a century or more of intensive livestock grazing, energy development, and unnatural fire—have eliminated and degraded large areas of the landscape. If current land uses continue without modification, the future of many Sagebrush Sea species will be uncertain.

- **Political Landscape**

The Sagebrush Sea includes parts of eleven western states (California, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming) and two Canadian provinces. Since much of the landscape is federal land, the political composition of the congressional delegations representing these states is important. Most, but not all, of the Sagebrush Sea is represented by Republican Senators and Representatives who vote with the anti-environment majority. However, while these westerners represent huge districts, their voters increasingly live in urban, suburban, and exurban communities, rather than rural settings. These changing demographics could have a beneficial effect on Sagebrush Sea politics in the future as urban constituents begin to pressure their elected officials to conserve what remains of the sagebrush-steppe.

- **Conservation Landscape**

The concept of the “Sagebrush Sea” was created to brand a landscape that has historically received little attention from conservationists, media, conservation funders, and the public. Prior to “Sagebrush Sea,” this wonderful landscape was unimaginatively known as “Great Basin” (type) desert, “intermountain grasslands,” “intermountain sagebrush-steppe,” or “Great Basin-Colorado plateau sagebrush semi-desert.” It is also called a “cold” desert, as opposed to the “hot” or true deserts of the Southwest (Mojave, Sonoran, and Chihuahuan).

The term “Sagebrush Sea” is catching on outside the conservation community. Many news stories have used the term, including the *New York Times*, which has called for “preserving the majesty” of the “poetically” dubbed Sagebrush Sea. State and federal agencies, such as the Wyoming Department of Fish and Game, and scientists and academicians have also used the term in public presentations and publications.

### III. Greater Sage-Grouse

- **Greater Sage-Grouse**

The greater sage-grouse (*Centrocercus urophasianus*) is both an indicator and umbrella species for the sagebrush-steppe ecosystem. First described by Lewis and Clark in 1805, nineteenth century travelers and settlers reported huge flocks of sage grouse that darkened the sky as they lifted from valley floors. The historic range of greater sage-grouse closely conformed to the distribution of sagebrush-steppe in what became twelve western states and three Canadian provinces. However, since 1900 sage grouse populations have declined. Greater sage-grouse distribution has decreased by 56 percent while rangewide abundance has been reduced by as much as 93 percent from historic levels.



Male Greater sage-grouse (Photos.com)

- **Natural History**

Greater sage-grouse are a striking and charismatic bird that derives its name, food and shelter from the sagebrush on which it depends. Slightly less than 2 feet in size, both males and females are a mottled, brownish-gray. Males weigh up to six pounds; females half as much. White chest feathers and specialized head feathers distinguish cocks during the spring breeding season. Cocks have long black tail feathers with white tips, while female tail feathers are mottled black, brown, and white.

- **Mating Ritual**

The sage-grouse mating ritual is fascinating to observe, and often described as among the most stirring and colorful natural history pageants in the West. In early spring, at dawn and often at dusk, males congregate on "leks"—ancestral strutting grounds to which the birds return year after year. Leks vary in size from one to forty acres and may be up to fifty miles from winter habitat. To attract a hen, males strut, fan their tail feathers and swell their breasts to reveal bright yellow air sacs. The combination of wing movements and inflating and deflating air sacs make an utterly unique sound: "swish-swish-coo-oo-pink!"

- **Habitat**

Sage-grouse require different seasonal habitats consisting of sagebrush, grasses, forbs, and other desert flora throughout the year and over the course of their life cycle. In the spring, forbs (wildflowers) provide essential nutrition to gravid (carrying eggs) hens. Newly hatched chicks feed on insects found in the grasses along with wildflowers. Sage-grouse summer range is a combination of sagebrush and wildflower-rich areas, including wet meadows and riparian areas. Sage-grouse eat only sagebrush during the winter, so good winter range must provide grouse access to sagebrush under all snow conditions. Sage-grouse and pristine sagebrush habitat are inseparable. Given the species varying habitat requirements, sage-grouse need vast expanses of healthy sagebrush habitat – perhaps hundreds of square miles – with a thriving mosaic of native vegetation and functioning hydrologic systems to survive and flourish.



- **Population/Range**

Greater sage-grouse are a widely distributed but sparsely populated species that occur in Oregon, Idaho, Nevada, Montana, Wyoming, Utah and Colorado, with remnant populations in Washington, California, North Dakota, South Dakota, Alberta and Saskatchewan (Map 2). The U.S. Fish and Wildlife Service has acknowledged that sage-grouse numbers have declined in recent decades. The total sage-grouse population, estimated at 140,000 individuals, represents only about seven percent of historic numbers.

*The sage and the grouse seem made for each other. The original range of the bird coincided with the range of the sage, and as the sagelands have been reduced, so the populations of grouse have dwindled.*

Rachel Carson • *Silent Spring* (1962)

- **Threats**

Sagebrush habitats and wildlife are affected by 26 human-induced threats.<sup>39</sup> An expert panel convened by the U.S. Fish and Wildlife Service ranked threats to sage-grouse. They are, in order: invasive species, infrastructure related to energy (natural gas and oil) development and urbanization, wildfire, agriculture, grazing, energy development, urbanization, strip/coal mining, weather, and pinyon-juniper encroachment.<sup>40</sup> The panel noted that energy development<sup>41</sup> and infrastructure related to energy development<sup>42</sup> are of greater concern in the eastern part of sage-grouse range, and wildfire (fueled by cheatgrass invasion)<sup>43</sup> is more important in the western portion of the range. Disease, predation, hard-rock mining, hunting and environmental contaminants were considered by the expert panel to be of lesser importance to sage-grouse.<sup>44</sup> The individual synergistic and cumulative effects of these threats continue to fragment, degrade and eliminate sage-grouse habitat across the Sagebrush Sea.

- **Legal Status**

Sage-grouse are a game species that are hunted in ten states. Greater sage-grouse were petitioned for listing as a “threatened” or “endangered” species under the Endangered Species Act in 2003, but the petition was rejected by the Fish and Wildlife Service in 2005. Conservation organizations sued to reverse the agency’s 2005 “not warranted” decision and a federal court recently ordered the Fish and Wildlife Service to produce a new decision for the grouse in 2009.

## Figure 1. Gunnison Sage-Grouse

Gunnison sage-grouse (*Centrocercus minimus*) are distinct from greater sage-grouse, identified by researchers as early as the 1970s and recognized as a new species by the American Ornithologists' Union in 2000. While its historic range may have included parts of Colorado, Utah, New Mexico, Arizona, the species now occurs only in eight small populations in southwestern Colorado and southeastern Utah (Map 2). Gunnison sage-grouse have experienced significant declines from historic numbers and only about 4,000 breeding individuals remain.

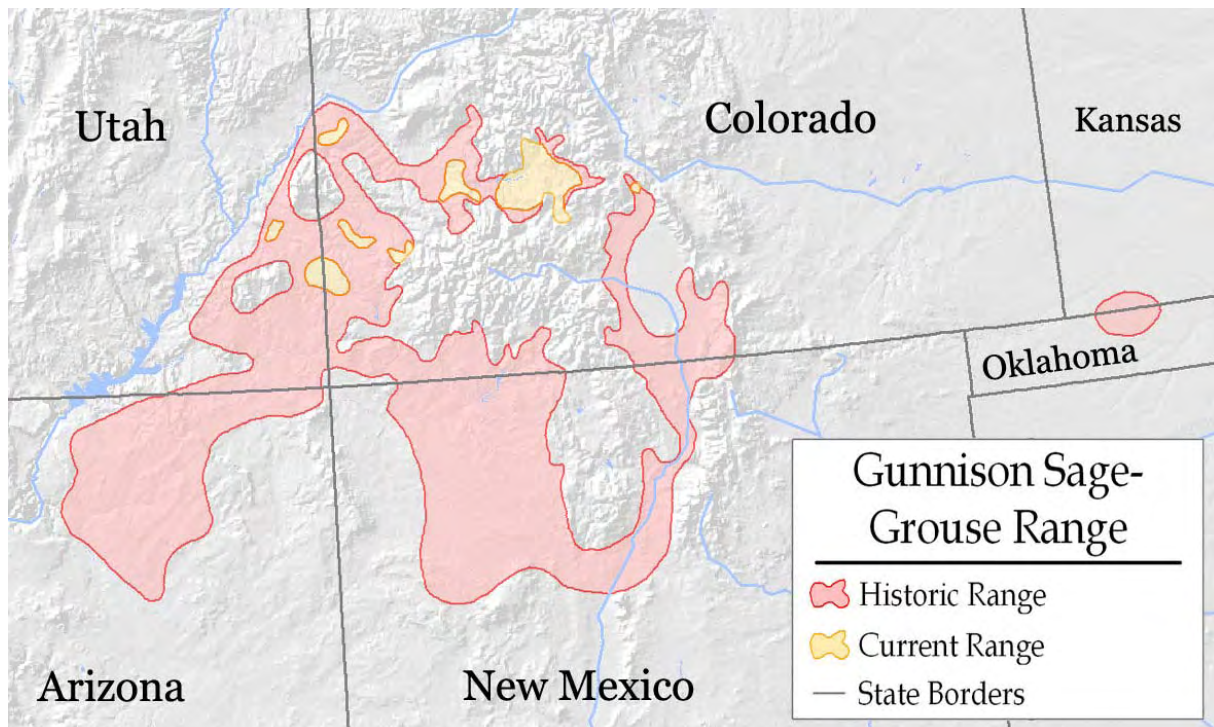
Gunnison sage-grouse are smaller than greater sage-grouse, and have distinct genetic, physical and behavioral differences. Like the greater sage-grouse, the Gunnison sage-grouse is known for its impressive mating ritual, though the mating behavior of the Gunnison sage-grouse differs markedly from that of greater sage-grouse. The Gunnison sage-grouse annual spring display involves unique visual and acoustical characteristics that do not occur in greater sage-grouse. Gunnison males have more noticeable white barring in the sharply pointed tail feathers (retrices), which are longer than are those of greater sage-grouse. Gunnison sage-grouse males also have longer, thicker filoplumes (hairlike feathers extending back from the nape of the neck) than greater sage-grouse males, which they use more conspicuously by tossing them above their heads during the strut.

Gunnison sage-grouse require the same sagebrush habitat types as greater sage-grouse, and are affected by many of the same threats. Livestock grazing, energy development, motorized recreation, and urbanization are fragmenting and degrading Gunnison sage-grouse range. Severe drought in recent years has exacerbated the effects of these human impacts. West Nile virus, a disease that is fatal to greater sage-grouse, has also been discovered in Gunnison sage-grouse range.

WildEarth Guardians' Sagebrush Sea Campaign and partners are working to list Gunnison sage-grouse as "threatened" or "endangered" under the Endangered Species Act.

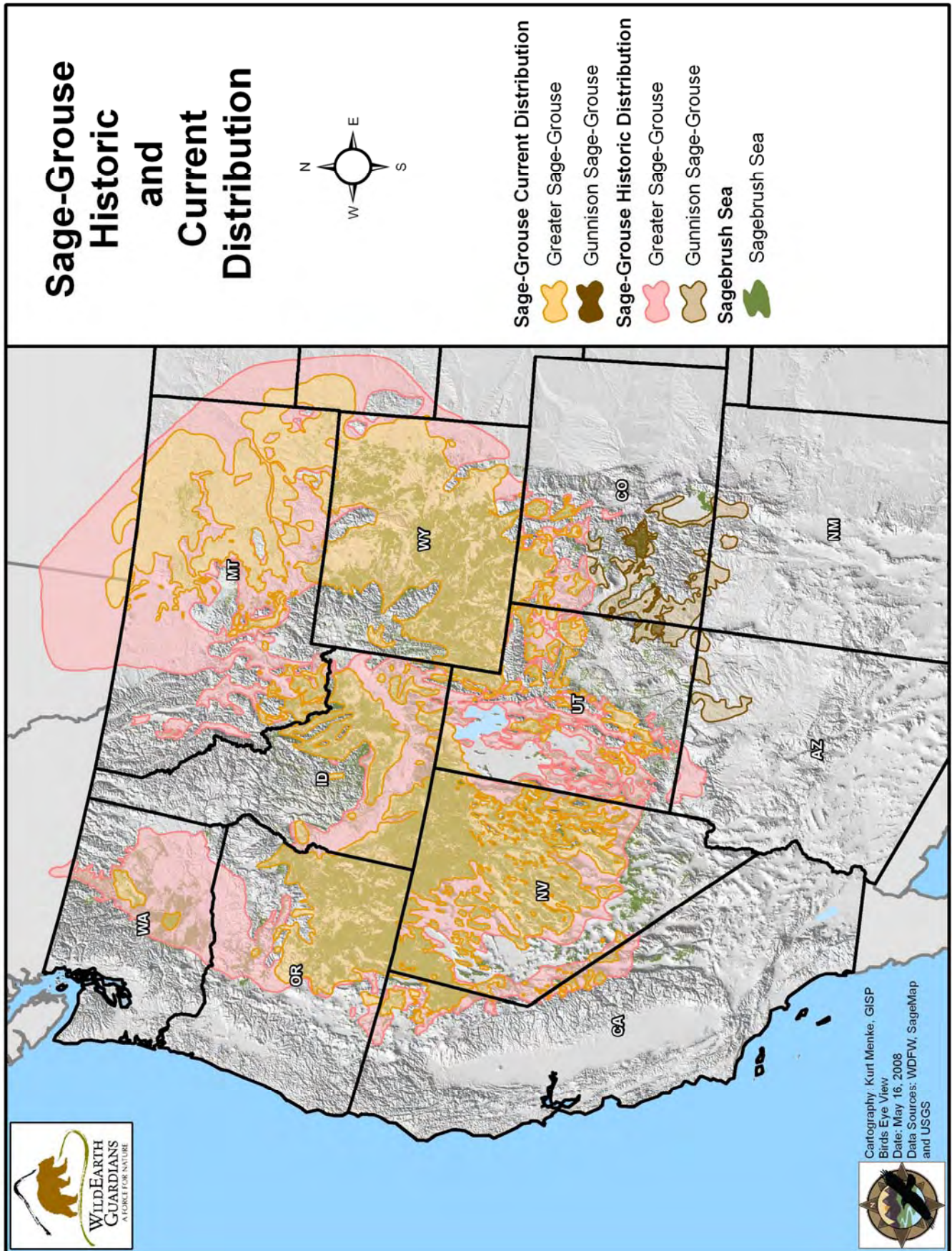


Male Gunnison sage-grouse.  
© Joel Sartore Photography  
[www.joelsartore.com](http://www.joelsartore.com)





Map 2



## IV. Sagebrush Sea Reserves

Very little of the Sagebrush Sea is reserved for conservation (for example, only 2 million acres of sagebrush steppe is federally designated wilderness in the National Wilderness Preservation System). We compiled a list of “Sagebrush Sea reserves” on federal land (Table 2) and created a map of these specially designated areas (Map 3).

Only specially designated areas on federal land were included in our system of reserves. We did not include on our list, depict on Map 3, or consider in our analysis any state or county lands reserved for conservation of sagebrush steppe (or any private land dedicated to conservation).

Some Sagebrush Sea reserves contain more sagebrush habitat than others. Some offer more protection for sagebrush steppe than others. For example, sagebrush-steppe on livestock-free Hart Mountain National Antelope Refuge in southern Oregon is generally better habitat for sagebrush fish and wildlife than grazed wilderness areas nearby in northern Nevada. Some Sagebrush Sea reserves have purposes other than conservation, but also coincidentally protect sagebrush steppe from at least some land uses (e.g., the Idaho National Laboratory in Idaho).

BLM wilderness study areas (“WSAs”) were not considered Sagebrush Sea reserves because they are not “permanently” protected (i.e., Congress can and often does release WSAs from further consideration as wilderness under the Wilderness Act of 1964). Facilities managed by the U.S. Department of Defense (“DOD”) were also not considered Sagebrush Sea reserves. Any conservation benefits derived from a DOD installation are incidental to its purpose and management as a military reservation and could be quickly and permanently lost if/when priorities for that facility change. See Technical Notes, below, for additional areas that were not deemed Sagebrush Sea reserves.

Our analysis found that very little sagebrush habitat is protected in current Sagebrush Sea reserves. **Only 2.92 percent of current sage-grouse range is on specially designated federal land.** Unfortunately, the data do not improve even when considering only the most important sage-grouse habitat. **Only 4.35 percent of 80,775,294 acres of important sage-grouse habitat is on current Sagebrush Sea reserves** (Map 4).



**Table 2. Sagebrush Sea Reserves**

**California**

*National Wildlife Refuges*

- Clear Lake National Wildlife Refuge
- Modoc National Wildlife Refuge

*Wilderness*

- Inyo Mountains Wilderness (BLM, Forest Service)
- Piper Mountain Wilderness (BLM)
- Sylvania Mountains Wilderness (BLM)

**Colorado**

*National Parks*

- Black Canyon of the Gunnison National Park

*National Wildlife Refuges*

- Arapahoe National Wildlife Refuge

*National Monuments*

- Colorado National Monument
- Dinosaur National Monument

*National Conservation/Recreation Areas*

- Curecanti National Recreation Area

*National Conservation/Recreation Areas*

- Gunnison Gorge National Conservation Area (Gunnison Gorge Wilderness [BLM])
- McInnis Canyons National Conservation Area (Black Ridge Canyons Wilderness [BLM])

**Idaho**

*National Wildlife Refuges*

- Camas National Wildlife Refuge
- Grays Lake National Wildlife Refuge
- Minidoka National Wildlife Refuge

*National Monuments*

- Craters of the Moon National Monument (Craters of the Moon Wilderness [NPS])
- Hagerman Fossil Beds National Monument

*National Conservation/Recreation Areas*

- Snake River Birds of Prey National Conservation Area

*Other*

- City of Rocks National Reserve Idaho National Laboratory

**Montana**

*National Wildlife Refuges*

- Charles M. Russell National Wildlife Refuge (UL Bend National Wildlife Refuge, UL Bend Wilderness [FWS])
- Red Rock Lakes National Wildlife Refuge (Red Rock Lakes Wilderness [FWS])

*National Monuments*

- Upper Missouri River Breaks National Monument

**Nevada**

*National Parks*

- Great Basin National Park

*National Wildlife Refuges*

- Fallon National Wildlife Refuge
- Ruby Lake National Wildlife Refuge
- Sheldon National Wildlife Refuge
- Stillwater National Wildlife Refuge

*Wilderness*

- Alta Toquima Wilderness (Forest Service)
- Arc Dome Wilderness (Forest Service)
- Bald Mountain Wilderness (Forest Service)
- Becky Peak Wilderness (BLM)
- Big Rocks Wilderness (BLM)
- Black Rock Desert Wilderness (BLM)
- Bristlecone Wilderness (BLM)
- Currant Mountain Wilderness (Forest Service)
- East Humboldt's Wilderness (Forest Service)
- Far South Egans Wilderness (BLM)
- Fortification Range Wilderness (BLM)
- Goshute Canyon Wilderness (BLM)
- Grant Range Wilderness (Forest Service)
- Highland Ridge Wilderness (BLM)
- Jarbidge Wilderness (Forest Service)
- Mount Grafton Wilderness (BLM)
- Mount Irish Wilderness (BLM)
- North Jackson Mountains Wilderness (BLM)
- Parsnip Peak Wilderness (BLM)
- Quinn Canyon Wilderness (Forest Service)

**Table 2. Sagebrush Sea Reserves, *Cont'd***

**Nevada, *cont'd***

*Wilderness*

- Santa Rosa-Paradise Peak Wilderness (Forest Service)
- Shellback Wilderness (Forest Service)
- South Egan Range Wilderness (BLM)
- South Jackson Mountains Wilderness (BLM)
- South Pahroc Range Wilderness (BLM)
- Table Mountain Wilderness (Forest Service)
- Tunnel Spring Wilderness (BLM)
- Weepah Spring Wilderness (BLM)
- White Pine Range Wilderness (Forest Service)
- White Rock Range Wilderness (BLM)

*National Conservation/Recreation Areas*

- Black Rock Desert-High Rock Canyon Emigrant Trails National Conservation Area (Calico Mountains Wilderness, East Fork High Rock Canyon Wilderness, High Rock Lake Wilderness, Little High Rock Canyon Wilderness, North Black Rock Range Wilderness, Pahute Peak Wilderness [BLM])

**North Dakota**

*National Parks*

- Theodore Roosevelt National Park (Theodore Roosevelt Wilderness [NPS])

**Oregon**

*National Wildlife Refuges*

- Hart Mountain National Antelope Refuge
- Malheur National Wildlife Refuge

*Other*

- Steens Mountain Cooperative Management and Protection Area (Steens Mountain Wilderness [BLM])

**Utah**

*National Wildlife Refuges*

- Bear River Migratory Bird Refuge
- Fish Springs National Wildlife Refuge
- Ouray National Wildlife Refuge

*Wilderness*

- Cedar Mountain Wilderness (BLM)

*National Monuments*

- Dinosaur National Monument

**Washington**

*National Wildlife Refuges*

- Columbia National Wildlife Refuge

*Wilderness*

- Juniper Dunes Wilderness (BLM)

*National Monuments*

- Hanford Reach National Monument

**Wyoming**

*National Parks*

- Grand Teton National Park

*National Wildlife Refuges*

- Cokeville Meadows National Wildlife Refuge
- Seedskaadee National Wildlife Refuge

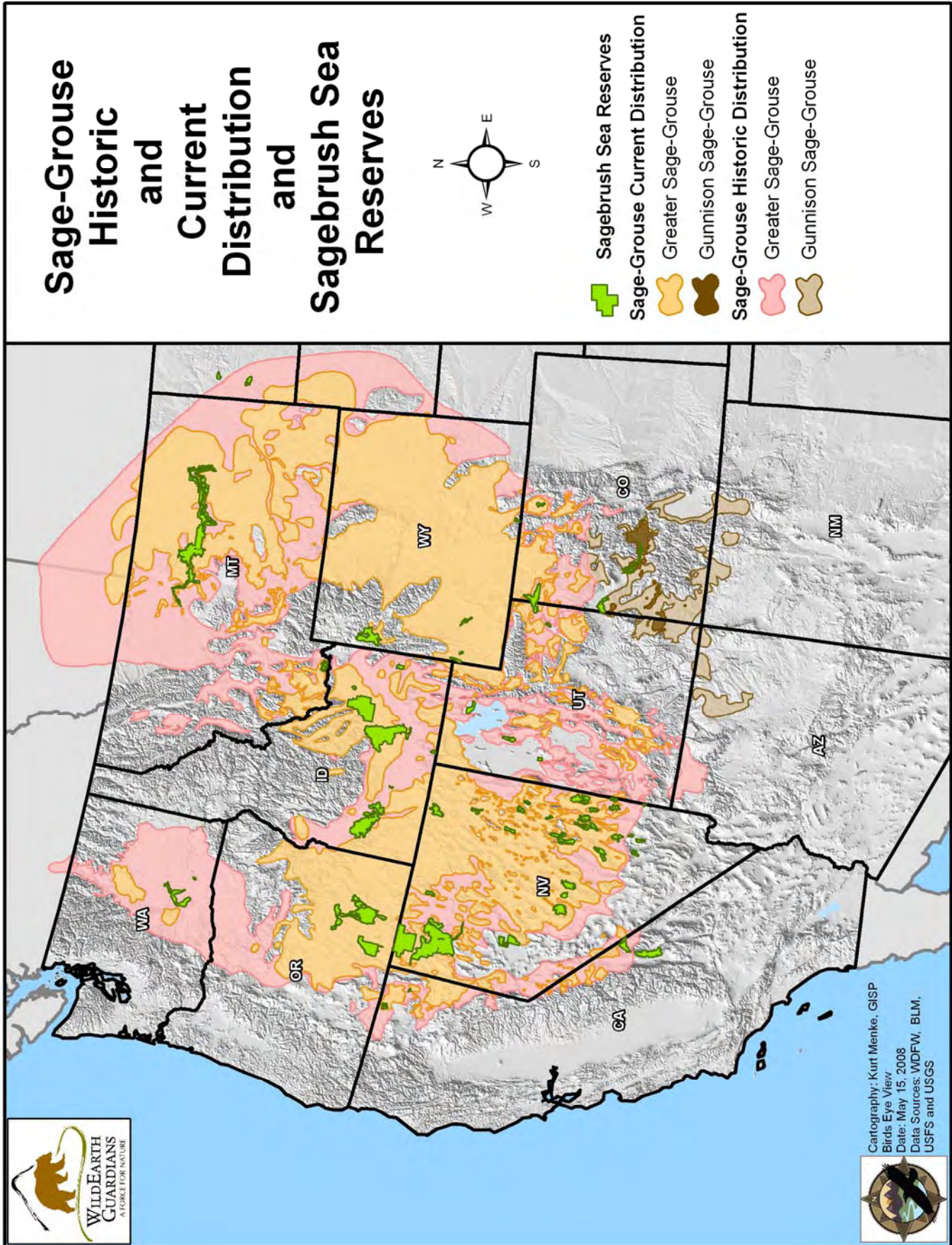
*Wilderness*

- Encampment River Wilderness (Forest Service)

*National Monuments*

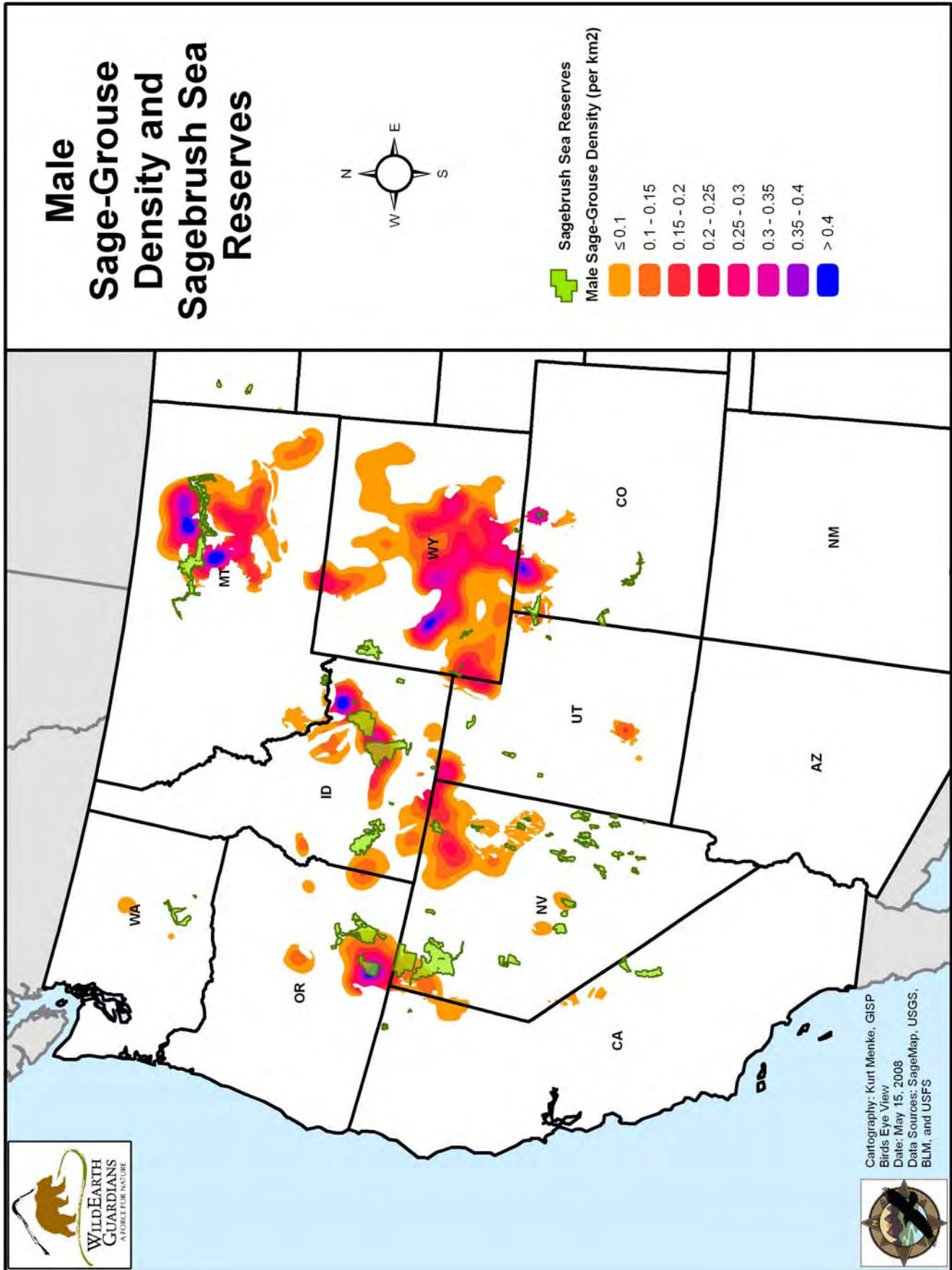
- Fossil Butte National Monument

Map 3





Map 4





## V. Roads in the Sagebrush Sea

Roads are everywhere in the Sagebrush Sea, which is a relatively flat landscape that is easily roaded (Map 5). Less than 5 percent of sagebrush-steppe is more than 1.6 miles, or 2.57 km from a road.<sup>45</sup> Sage-grouse are killed in collisions with vehicles and may be affected by roads up to 6.9 km away.<sup>46</sup>

Researchers have documented the potential for Interstate 80 in Wyoming and associated woven wire fences to fragment wildlife habitat (see Map 6). One study found that only 1 percent of marked pronghorn crossed Interstate 80 during four years of observation and concluded that Interstate 80 effectively blocks north and south movements of pronghorn in the Red Desert in Wyoming.<sup>47</sup>

The Green Mountain common grazing allotment in Wyoming is frequently hailed as one of the largest unfenced areas in the nation (see yellow lined area on Map 6). The allotment is approximately 517,000 acres and contains sections of the historic Oregon Trail and scenic open space valued by hikers, hunters, and equestrians. Fences are negative for sage-grouse. However, as shown on Map 6, while the Green Mountain common allotment may have few fences, it is dissected by roads, which may cancel out any conservation benefit derived from the absence of fences. Further, the allotment is heavily impacted by livestock grazing (35,910 cattle and 11,451 sheep AUMs\*\* are currently authorized on the allotment) and riparian areas, upland habitats and wildlife on the allotment have endured myriad impacts from grazing for decades under BLM management. The BLM is now proposing to construct up to 98 miles of barbed-wire and electrical fences on the allotment—at a cost of \$1 million—to manage grazing on the allotment.<sup>48</sup> An additional \$527,000 has already been spent on “range improvement” projects on the allotment—wells, water pipelines, storage tanks and cattle guards—to facilitate livestock grazing.<sup>49</sup> These developments further destroy and fragment sage-grouse habitat.



**Road-killed sage-grouse** (Carel Brest van Kempen)

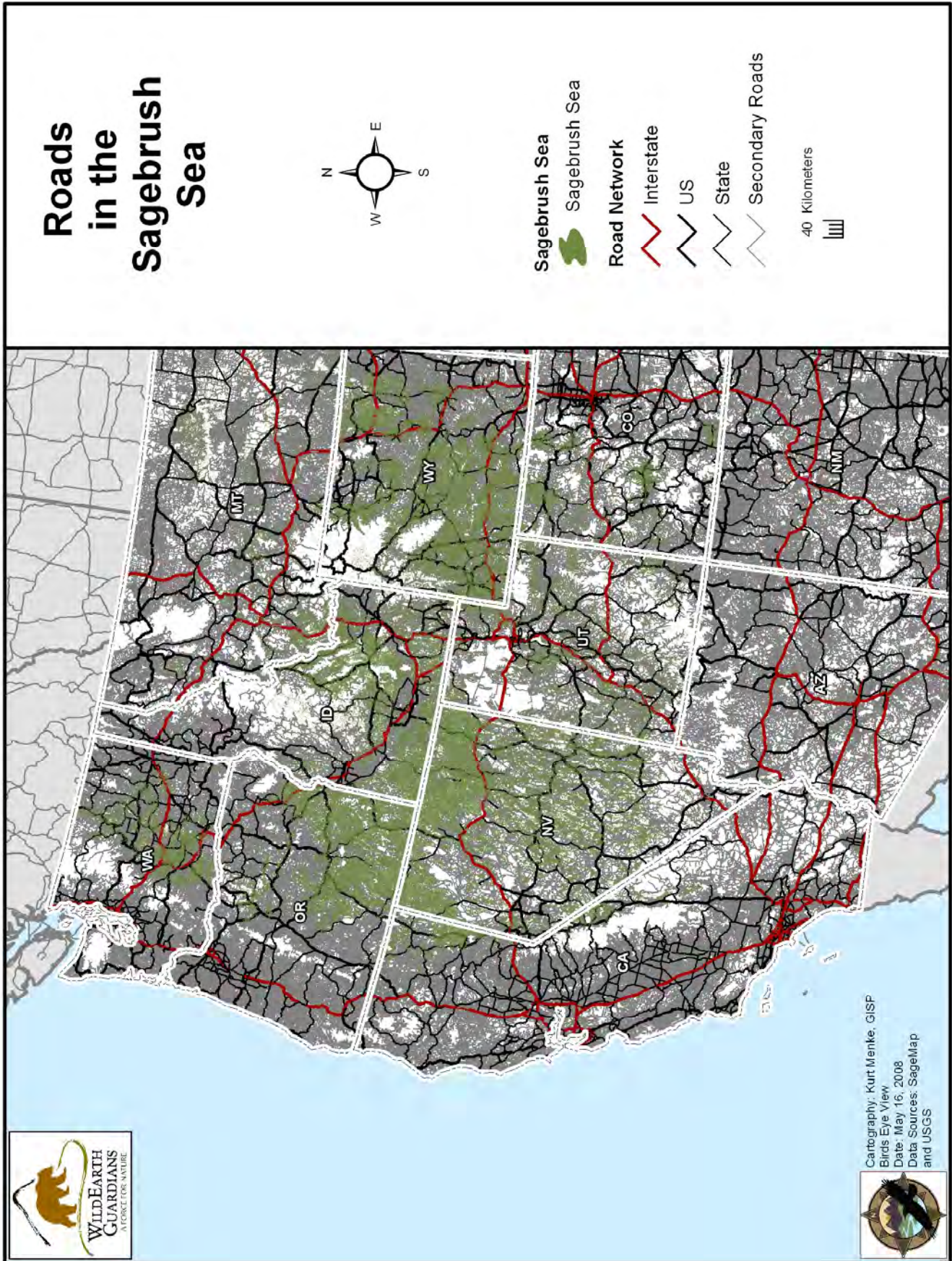


These pronghorn were killed on a road that services a natural gas development field in the species' winter range in Wyoming. The driver, driving a one-ton truck, hit a few of the animals and the rest collided into the side of the moving truck in panic. Wyoming Game and Fish officers were forced to shoot some pronghorn injured in the collision. A total of 21 pronghorn were killed in this incident. Images and information provided by John Amos, SkyTruth, and Linda Baker, Upper Green River Valley Coalition.

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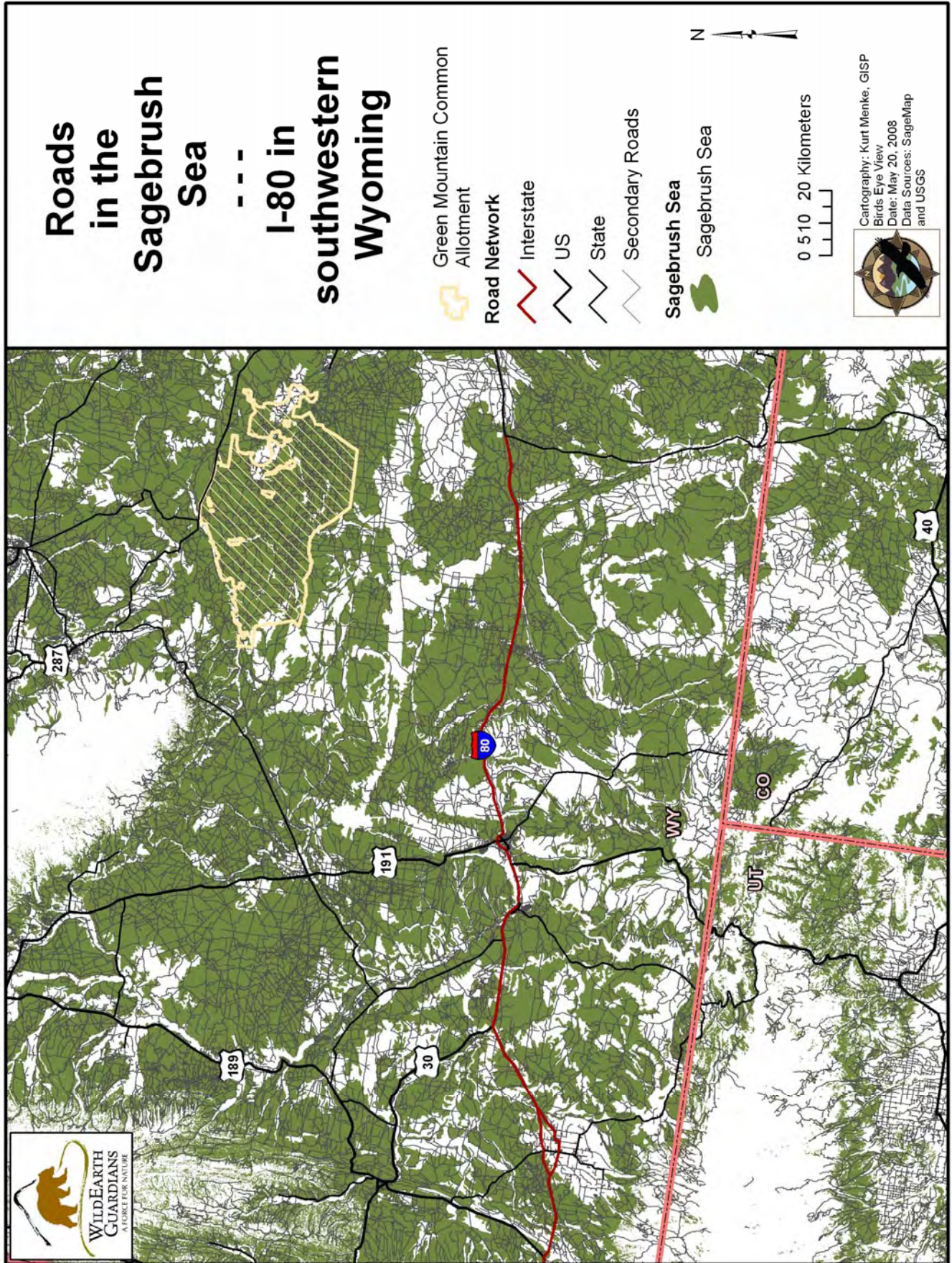
\*\* An AUM (animal unit month) is a measure of the amount of forage necessary to sustain a cow and calf, one horse, or five sheep or goats, for one month.

Map 5





Map 6





## VI. Natural Gas and Oil Development in the Sagebrush Sea

The BLM manages 700 million acres of onshore federal subsurface minerals in the U.S.<sup>50</sup> and presently administers more than 63,000 natural gas and oil leases<sup>51</sup> and 399 geothermal leases<sup>52</sup> mostly on public lands in the West. Eighty percent of BLM land is available for energy development<sup>53</sup> and more than 36 million acres of minerals are already leased for development in 33 states.<sup>54</sup> Of this, about 12.5 million acres are in producing status (oil and natural gas) causing an estimated 400,000 acres of surface disturbance.<sup>55</sup> There are also approximately 12,000 abandoned wells on lands under BLM supervision in the West.<sup>56</sup>

BLM's oil and gas permitting activity more than tripled between 1999-2005.<sup>57</sup> An estimated 115,476 new oil and gas wells will be drilled in Colorado, Montana, Utah and Wyoming in the next 15-20 years,<sup>58</sup> likely resulting in more than 1,000,000 acres being graded, drilled, built upon or otherwise disturbed by energy development.<sup>59</sup> BLM estimates that there are 1.9 million barrels of oil and 57.5 trillion cubic feet of natural gas available for development on public lands just in southwest Wyoming.<sup>60</sup>

The very integrity of the Sagebrush Sea in parts of Wyoming, Colorado, Utah, Montana, and the Dakotas is threatened by natural gas and oil extraction, particularly coalbed methane development. Coalbed methane development has a huge "footprint" on the landscape and the process used to extract coalbed methane depletes local aquifers, causing groundwater levels to drop and wells to run dry. A coalbed methane well produces an average of 12 gallons of water per minute.<sup>61</sup> Billions of gallons of water have been wasted in the search for coalbed methane.<sup>62</sup> Produced water—which is often loaded with salt and other minerals—is either sprayed onto surrounding land, sluiced down a nearby creek, or stored in one of an estimated 23,320 waste pits.<sup>63</sup>

Multiple studies have documented significant impacts to sage-grouse from natural gas and oil development (see e.g., Figure 2). Energy development activities within 3 km of sage-grouse variously affects sage-grouse mating, nesting, brood-rearing, and survival.<sup>64</sup> **Our analysis found that 21,409,547 acres, or 13 percent of sage-grouse current range is within 3 km of permitted natural gas and oil wells on federal, state and private land (Map 7).<sup>††</sup> The percentage increases in Montana, Wyoming, Utah and Colorado, where the majority of energy development is occurring in the West: 23 percent of sage-grouse current range is within 3 km of permitted natural gas and oil wells on federal, state and private land in these states.**

We also mapped areas leased on federal, state and private land for natural gas and oil extraction and sage-grouse current range (Map 8).<sup>††</sup> Trout Unlimited previously analyzed the amount of sage-grouse habitat in areas of potential natural gas and oil development:

- 1,700,000 acres (16.2 percent) of sage-grouse habitat in Montana is within areas of potential natural gas and oil development

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<sup>††</sup> "Permitted" (or "active") oil and gas wells include wells that are permitted (but not yet drilled); in the process of being drilled; drilled, but not currently being used (e.g., shut-in wells); producing; and plugged and abandoned wells.

<sup>††</sup> "Leased" areas are blocks of land where an oil or gas well could be drilled. New wells are authorized through applications for permit to drill filed with the appropriate state oil and gas commission. Many leases already have wells on them and the only limit to how many wells can be developed on a leased area are the well spacing orders, which vary depending on the area.



- 26,000,000 acres (66.7 percent) of sage-grouse habitat in Wyoming is within areas of potential natural gas and oil development
- 3,000,000 acres (43.5 percent) of sage-grouse habitat in Utah is within areas of potential natural gas and oil development
- 9,000,000 acres (28.1 percent) of sage-grouse habitat in Colorado is within areas of natural gas and oil development<sup>65</sup>

### Figure 2. Impacts of Natural Gas Development on Greater Sage-Grouse

An important series of studies has documented the effects of natural gas (coalbed methane) development on greater sage-grouse in Wyoming.

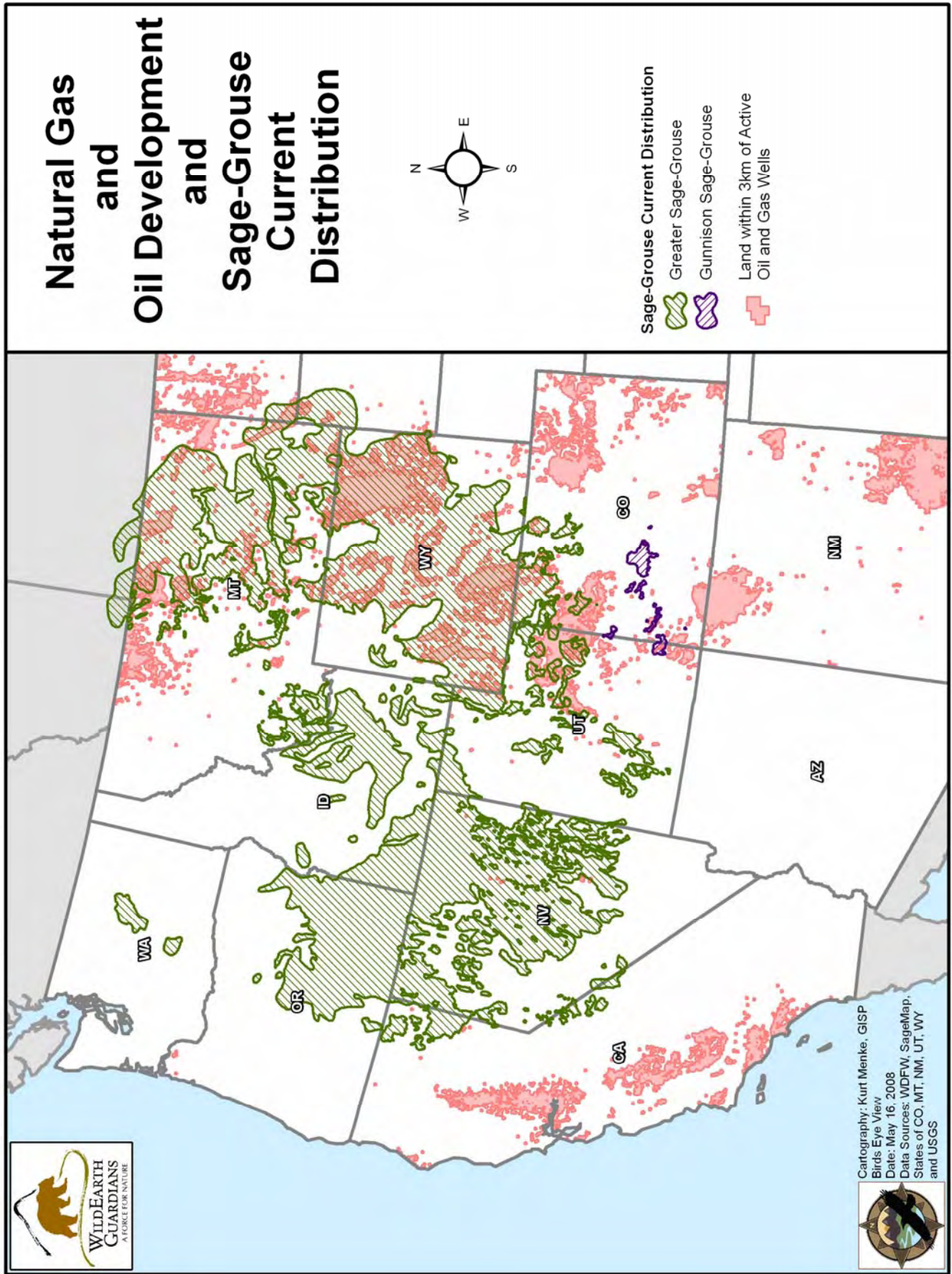
- Populations of breeding males on leks (sage grouse mating sites) in areas subjected to full-field natural gas development in the Pinedale Anticline and Jonah fields declined by an average of 51 percent from the year prior to development (1999-2004) to 2004, compared to only a 3 percent decline at undisturbed leks. ♦
- Active natural gas drilling within 3.1 miles of a sage grouse lek reduced the number of breeding males that used the lek. ♦ From 2001-2005, lek count indices in coalbed methane development fields declined by 82 percent, at a rate of 35 percent per year, whereas leks outside coalbed methane development fields declined by 12 percent, at a rate of 3 percent per year. †
- As road traffic increased, the number of breeding males on affected leks decreased. ♦
- As well density increased, the number of breeding males on affected leks decreased. ♦
- Females strongly avoided nesting in areas of high natural gas well density. ♦
- Nesting females declined 21 percent in areas of natural gas development compared to nesting females in undisturbed areas over 5 years. ♦
- Sage-grouse avoid areas affected by energy development in otherwise suitable—and increasingly rare—winter habitat. ‡
- Of the 313 square miles of the Pinedale Anticline field, only 7.3 square miles (approximately 2 percent) is not leased for oil and gas development. Sage-grouse could be extirpated in the Pinedale Anticline and Jonah development fields within 19 years if current population trends continue. ♦

♦ Holloran, M. J. 2005. Greater sage-grouse (*Centrocercus urophasianus*) population response to natural gas field development in western Wyoming. PhD Dissertation, Univ. of Wyoming. Laramie, WY.

† Walker, B.L., D.E. Naugle, and K.E. Doherty. 2007. Greater sage-grouse population response to energy development and habitat loss. *J. Wildl. Manage.* 71(8): 2644-2654.

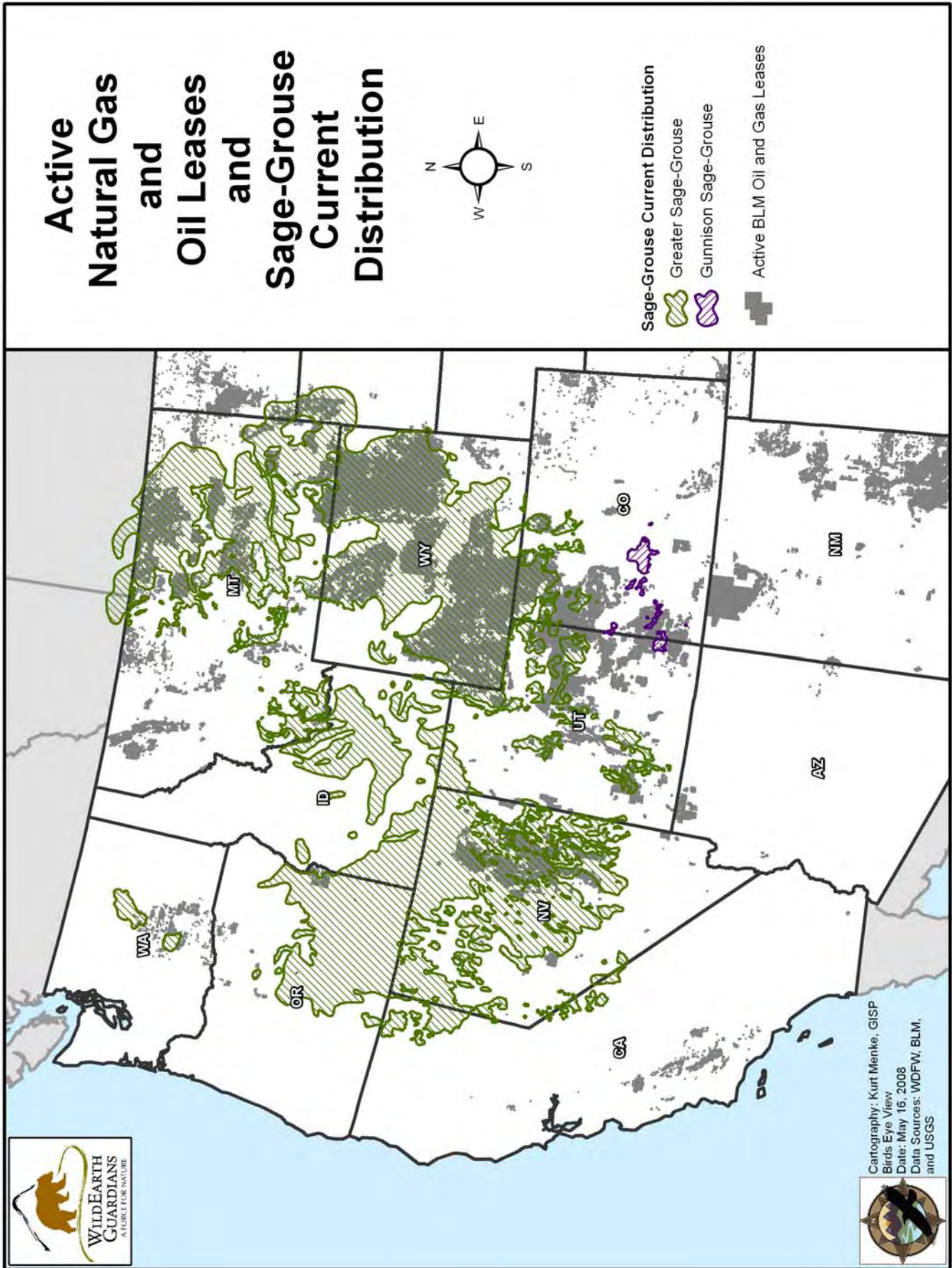
‡ Doherty, K. E., D. E. Naugle, B. L. Walker, and J. M. Graham. 2008. Greater sage-grouse winter habitat selection and energy development. *J. Wildl. Manage.* 72(1): 187-195.

Map 7





Map 8



## VII. Federal Public Land Livestock Grazing in the Sagebrush Sea

The BLM administered approximately 18,000 grazing permits and leases to graze almost 13 million AUMs on 165 million acres of public lands in 2006,<sup>66</sup> primarily in the Sagebrush Sea. More than 99 percent of remaining sagebrush steppe has been affected by livestock and approximately 30 percent has been heavily grazed.<sup>67</sup> The BLM grazing program is administered by 107 field offices that spend at least \$58 million annually to manage public lands grazing,<sup>68</sup> at a loss of at least \$54.6 million per year to federal taxpayers.<sup>69</sup> Archeological and palynological (pollen, spores) evidence indicates that the introduction of domestic livestock had more effect on the Great Basin than any event in the previous 1,000 years.<sup>70</sup>

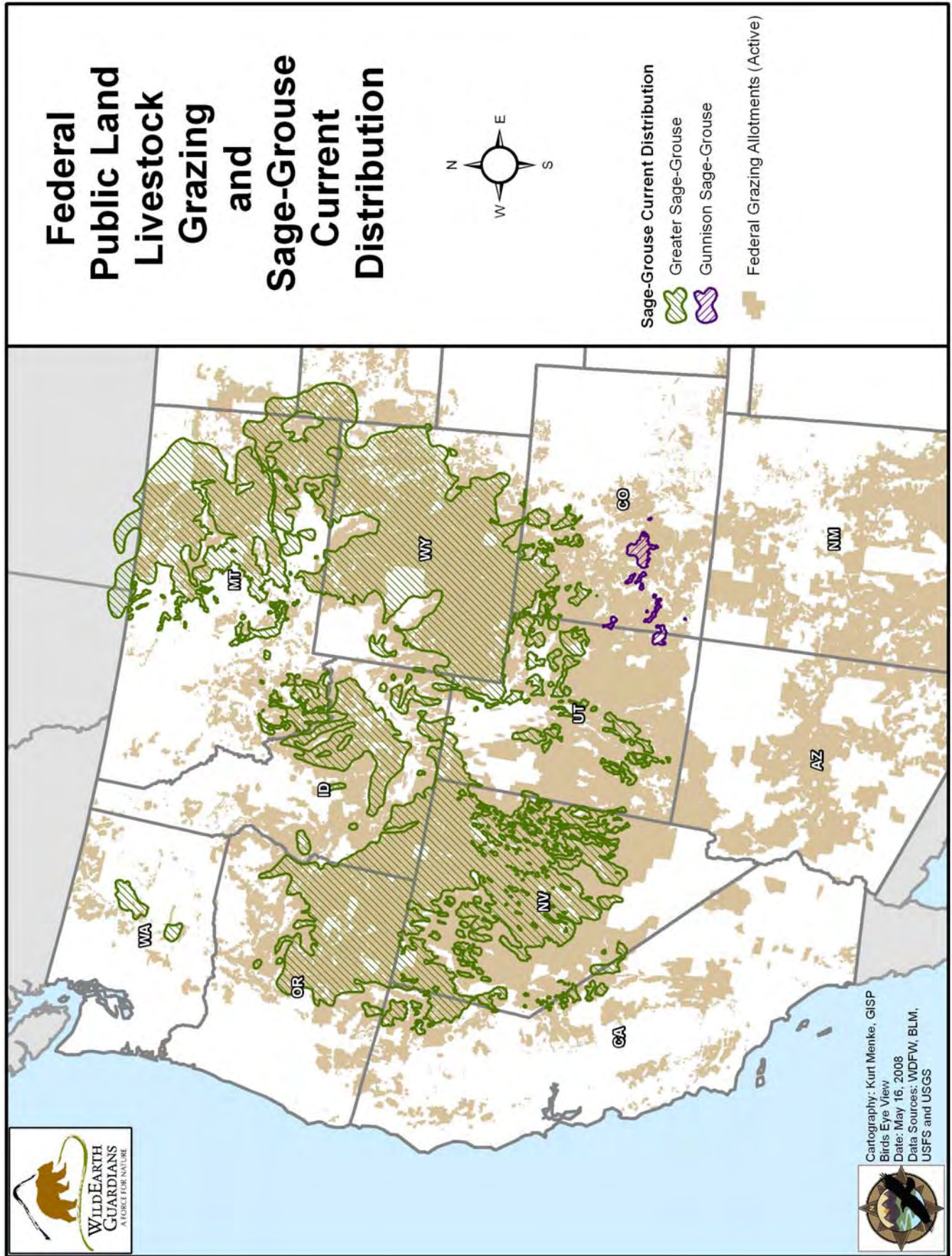
***Although cattle grazing in the West has polluted more water, eroded more topsoil, killed more fish, displaced more wildlife, and destroyed more vegetation than any other kind of land use, the American public pays ranchers to do it.***

Ted Williams, "He's Going to Have an Accident," *Audubon* (1991)

The multiple effects of livestock grazing on sagebrush-steppe are associated with the widespread decline of sage grouse across their range.<sup>71</sup> Livestock grazing continues throughout sage-grouse range, including on federal lands. Our analysis found that livestock grazing is permitted on 91 percent of sage-grouse current range on federal public land (Map 9). We also found that 72 percent of sage-grouse current range on all land ownerships is grazed. Sage-grouse current range overlaps all or part of 9,517 active federal grazing allotments. Sage-grouse historic range includes all or part of 14,799 active federal grazing allotments.



Map 9



## VIII. Cheatgrass in the Sagebrush Sea

At least 46 exotic weeds occur in the Sagebrush Sea.<sup>72</sup> Estimates of the rapid spread of weeds in the West include 2,300 acres per day on BLM lands and 4,600 acres per day on all western public lands.<sup>73</sup> Invasive species, including weeds and other organisms, are the second leading cause of species endangerment in the United States.<sup>74</sup>

Cheatgrass, an invasive weed perpetuated by livestock grazing and wildfire,<sup>75</sup> is now the dominant species on 100 million acres – 158,000 square miles – in the Intermountain West.<sup>76</sup> More than fifty percent of sagebrush steppe may be invaded to some extent by cheatgrass, with losses projected to accelerate in the future.<sup>77</sup> Cheatgrass is spreading at a rate of 14 percent annually in the United States.<sup>78</sup>

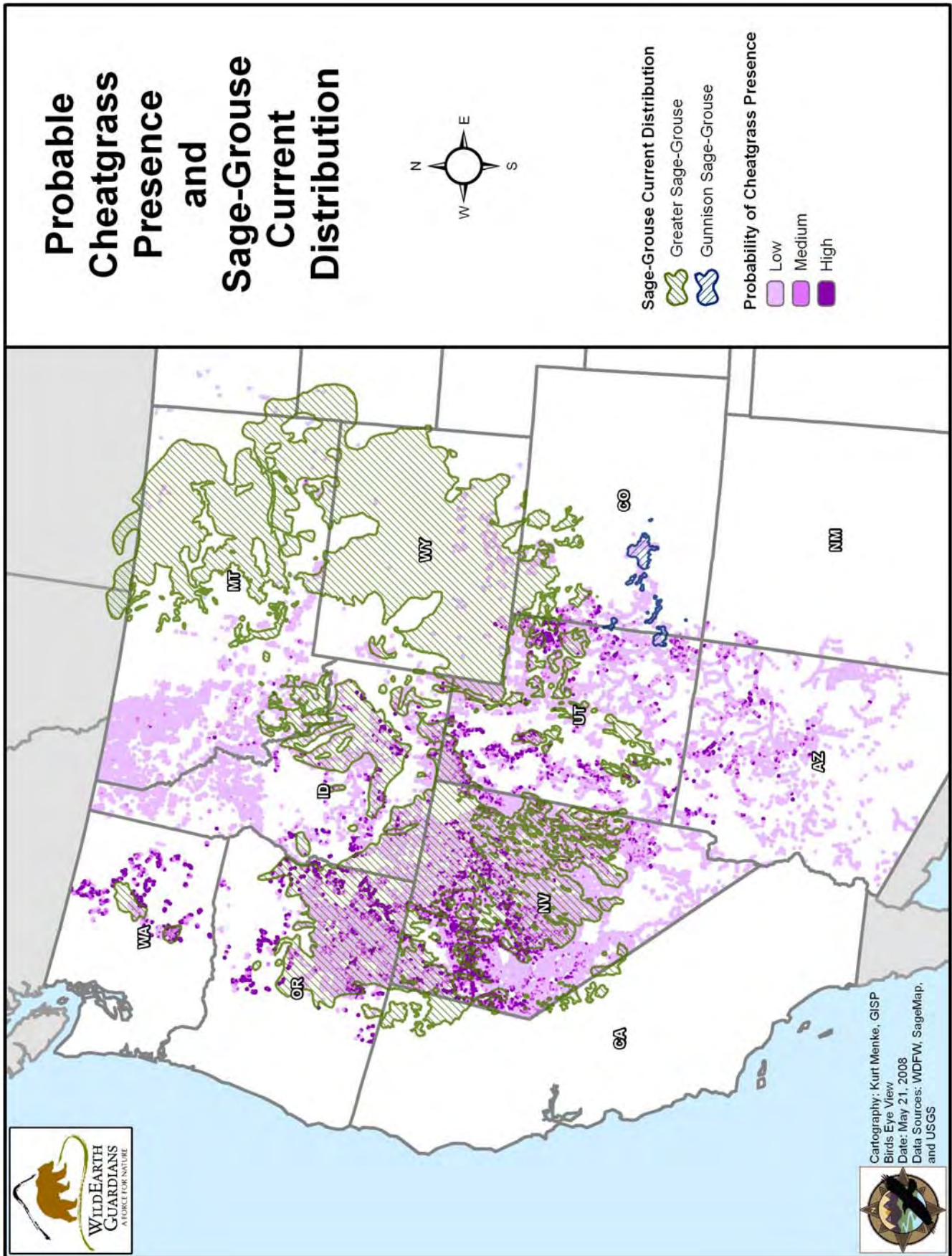
***I listened carefully for clues whether the West has accepted cheat as a necessary evil, to be lived with until kingdom come, or whether it regards cheat as a challenge to rectify its past errors in land-use. I found the hopeless attitude almost universal.***

Aldo Leopold • A Sand County Almanac (1949)

Cheatgrass incursion is negative for sage-grouse, particularly in the western portion of the species' range (Great Basin). We mapped the probability of cheatgrass presence and sage-grouse current distribution (Map 10). **Our analysis found that cheatgrass is probably present in 36 percent of sage-grouse current range.**



Map 10





## IX. Wildfire in the Sagebrush Sea

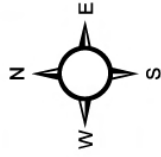
The Sagebrush Sea is a fire-adapted landscape that benefits from infrequent, low intensity fires that renew the ecosystem. (Natural fire intervals in sagebrush steppe range from 35-450 years,<sup>79</sup> depending on sagebrush type, elevation, aspect, etc., although fire may return more frequently to a given watershed during productive periods<sup>80</sup>). However, a combination of fire suppression, livestock grazing and the spread of highly flammable nonnative plants has drastically altered the natural fire regime. Wildfires now burn larger, hotter, and more frequently in lower elevation basin and Wyoming big sagebrush habitats. Little remains in the wake of these fires, and burned areas are often vulnerable to re-invasion by cheatgrass, which can completely occupy a burned site. Paradoxically, the removal of fine fuels (e.g., by livestock) in higher elevation mountain sagebrush habitats may deprive those sites of natural fire for many years.

The amount of sagebrush steppe burned by wildfire has increased dramatically in the past decade. **More than 6.2 million acres burned in sage-grouse current range between 1997-2007.** Most of these fires have occurred in the Great Basin, where cheatgrass has invaded millions of acres of sagebrush habitat. **More than 5 million acres, or nine percent, of sage-grouse habitat burned in Idaho, Nevada and Utah between 1997-2007.**

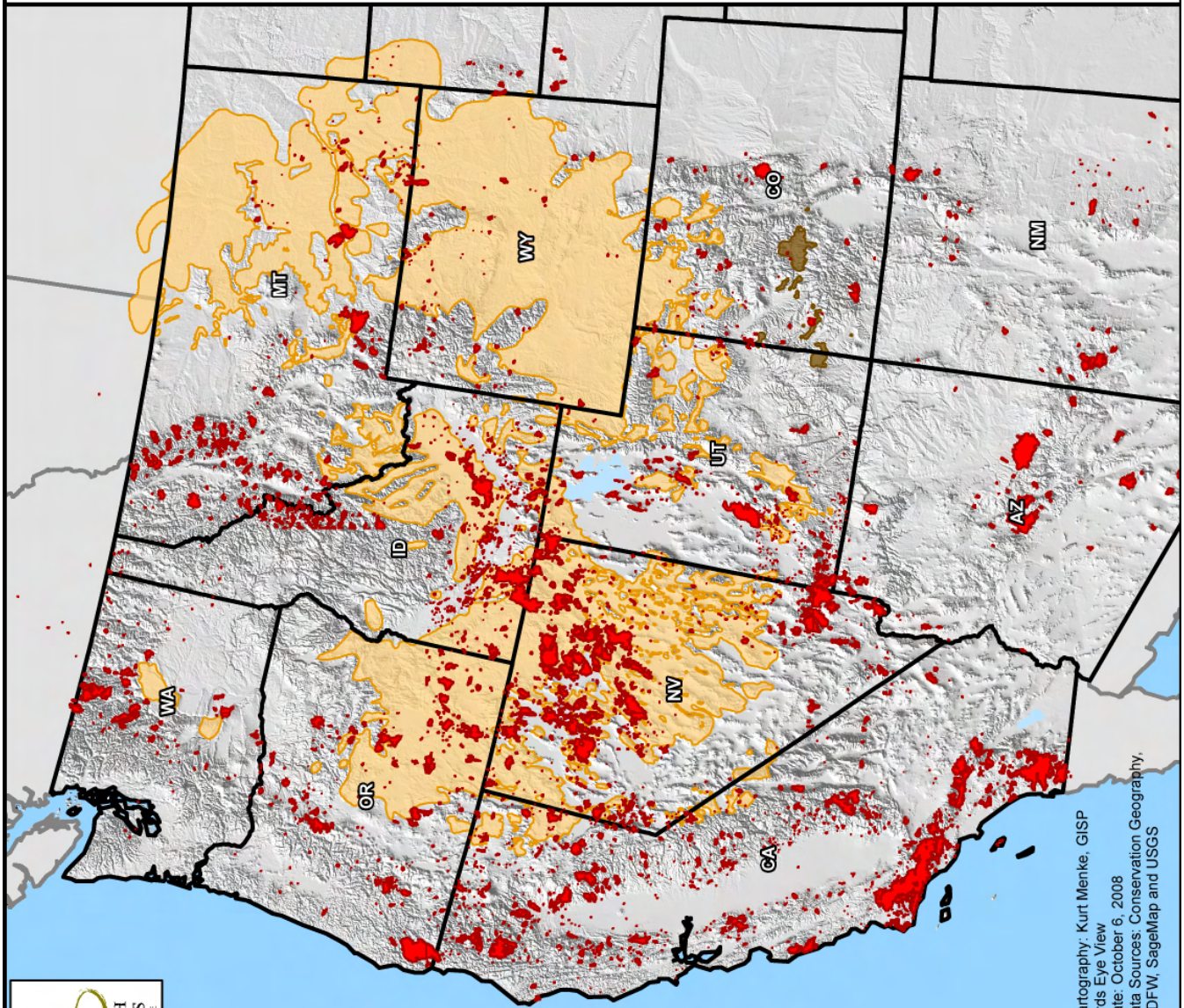
Sage-grouse may not use burned habitat for decades following fire. Sagebrush may return to preburn occurrence within 15 to 20 years after fire if conditions are favorable (e.g., proximate seed sources, quick seedling establishment, conducive weather, etc.). If not, various sagebrush varieties may require between 30 to 50 years to re-occupy a burned site.<sup>81</sup> Ecological modelling indicates that frequent, large fires in sagebrush steppe may lead to extirpation of sage-grouse.<sup>82</sup>

Map 11

# Wildfires and Sage-Grouse Current Distribution 1997 - 07



- Wildfires (1997-07)
- Sage-Grouse Current Distribution
  - Greater Sage-Grouse
  - Gunnison Sage-Grouse



Cartography: Kurt Menke, GISP  
Birds Eye View  
Date: October 6, 2008  
Data Sources: Conservation Geography,  
WDFW, Segalmap and USGS

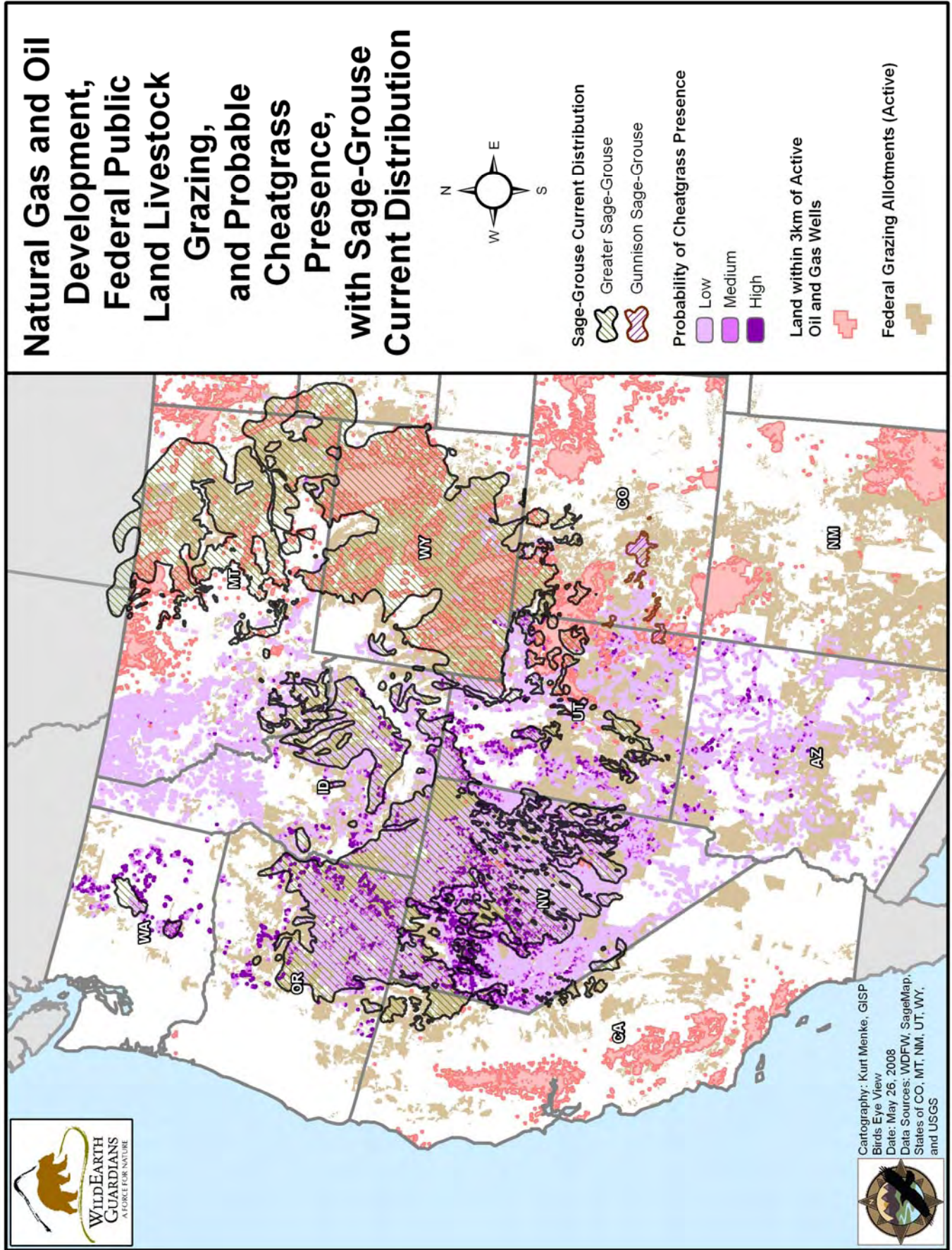


## **X. Triple Threat: Natural Gas and Oil Development, Federal Public Land Livestock Grazing, and Probable Cheatgrass Presence in Sage-Grouse Current Range**

As described in this report, natural gas and oil development, public land grazing and cheatgrass have deleterious effects on sage-grouse. The impacts are compounded where two or more of these threats affect sage-grouse (Map 11). Our analysis found that grazing is permitted and cheatgrass probably occurs on almost **30 percent** of sage-grouse current range. We also found that grazing and natural gas and oil development affect sage-grouse on almost **9 percent** of current range. While less than one percent of current sage-grouse habitat is affected by all three threats depicted on this map, more than **81 percent** of current sage-grouse range is affected by at least one of these threats.

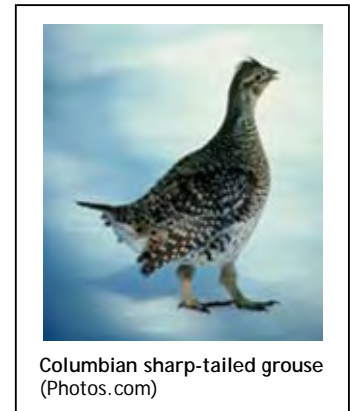


Map 12



### Figure 3. Columbian Sharp-Tailed Grouse

The Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) are the smallest and rarest of six subspecies of sharp-tailed grouse in North America. First described by Lewis and Clark in 1805, the Columbian sharp-tailed grouse was once considered the most abundant grouse in the Intermountain West. The historic range of Columbian sharp-tailed grouse included parts of what became ten western states and one Canadian province. However, by 1900 Columbian sharp-tailed grouse distribution had declined. The subspecies now occurs in less than ten percent of its historic range (Map 12).



#### *Natural History*

Sharp-tailed grouse are medium-sized (16"-19" long) brown-gray grouse that are endemic to a variety of habitats in North America. The Columbian subspecies have darker gray plumage, more pronounced spotting on the throat, and narrower markings on the on its underside than other sharp-tailed grouse. Males have a pink or pale violet air sac on each side of the neck, as well as yellow superciliary combs, both of which enlarge during display. Columbian sharp-tailed grouse average life-span is approximately three years.

#### *Mating Ritual*

The Columbian sharp-tailed grouse mating ritual is amazing to observe. Each spring, and occasionally in autumn, male grouse congregate on "leks" – communal strutting grounds to which the birds return year after year. The males arrive 30-60 minutes before sunrise and may remain on the lek for 2-3 hours. The males' courtship display consists of animated dancing and "freezing" phases. They strut, push their tails upward, inflate their air sacs, and rush forward or circle while stamping their feet, clicking their central tail feathers, and emitting hooting, clucking, cackling and gobbling sounds. Dancing bouts last 30-50 seconds. Males will often dance in synchrony, appearing to start and stop on cue. The most central, dominant males on the lek do most of the mating.

#### *Population/Range*

Columbian sharp-tailed grouse historically occurred in steppe, shrub-steppe and associated scrub forests and riparian habitats throughout western North America. Columbian sharp-tailed grouse now mostly occur in three metapopulations in central British Columbia, southeastern Idaho/northern Utah, and northwestern Colorado/south-central Wyoming (Map 12). **Greater sage-grouse and Columbian sharp-tailed grouse share approximately 4.8 million acres of current range** (Map 13). Although millions of Columbian sharp-tailed grouse probably occurred in the West historically, only 18,000 – 25,000 breeding individuals currently remain in the United States.

#### *Threats*

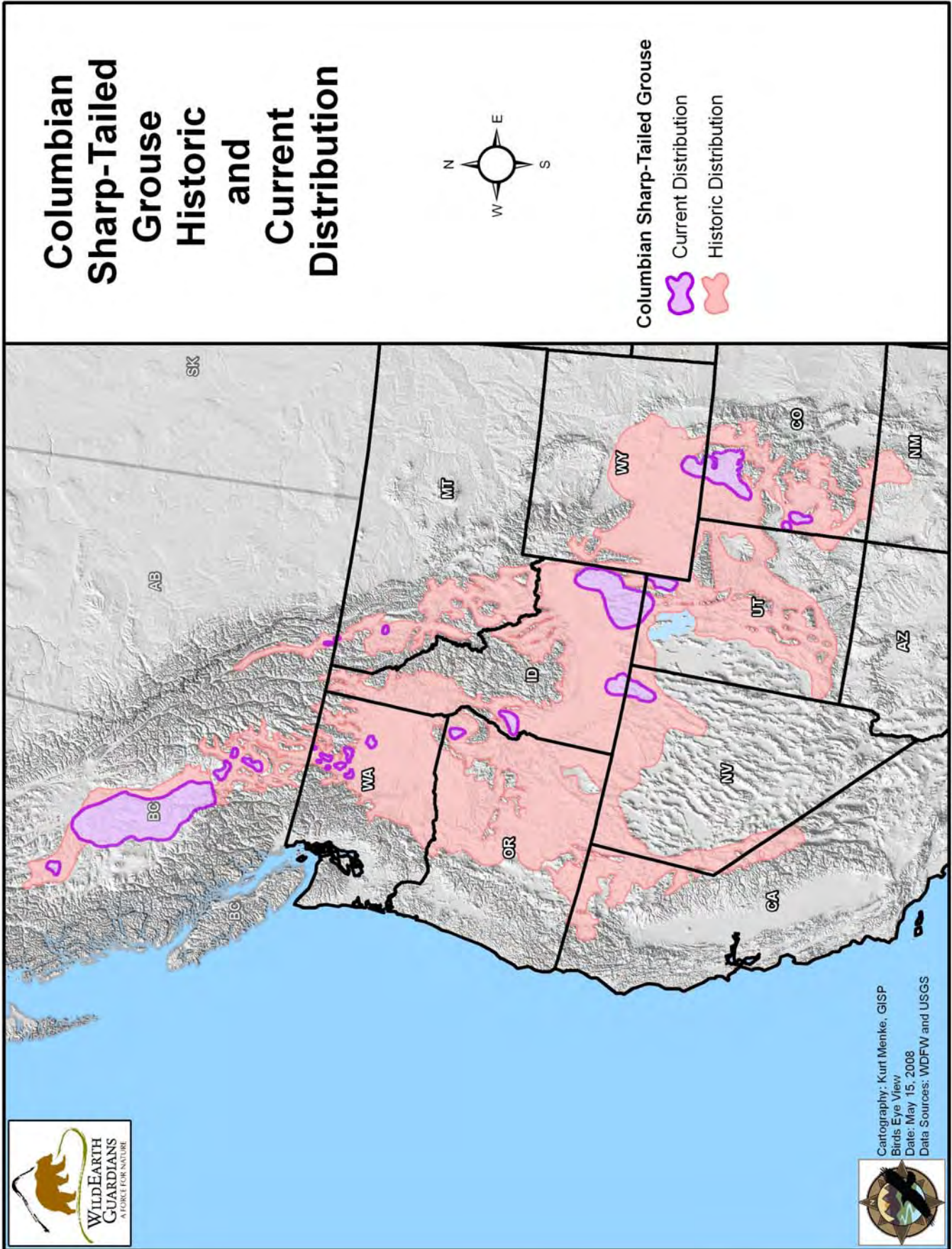
Human activities in the West have degraded and eliminated Columbian sharp-tailed habitat, including livestock grazing, agricultural conversion, application of herbicides and pesticides, unnatural fire, natural gas and oil, urban sprawl, and mining. The potential loss of habitat on private land enrolled in the Conservation Reserve Program may also threaten Columbian sharp-tailed grouse.

#### *Conservation Status*

Federal and state agencies have identified Columbian sharp-tailed grouse as a sensitive (sub)species (paradoxically, the grouse are also a game species that are hunted in several states). WildEarth Guardians has petitioned the U.S. Fish and Wildlife Service to protect the Columbian sharp-tailed grouse under the Endangered Species Act.

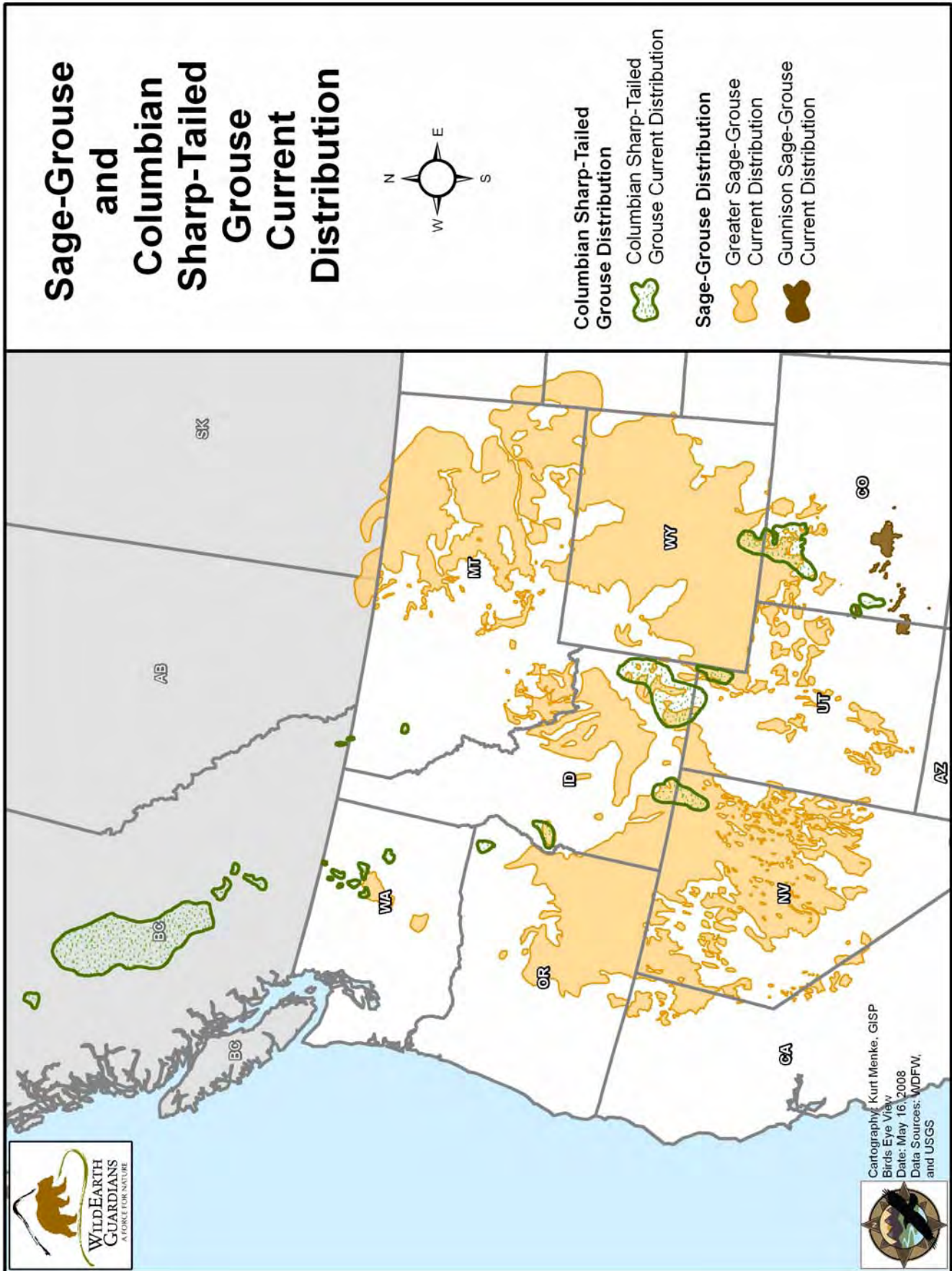


Map 13





Map 14



## **XI. Conclusion**

New research predicts further loss of sagebrush steppe and sage-grouse range.<sup>83</sup> Livestock grazing, natural gas and oil development, the spread of cheatgrass and resultant wildfire will continue to threaten sensitive species. WildEarth Guardians seeks to list greater sage-grouse, Gunnison sage-grouse, and Columbian sharp-tailed grouse as threatened or endangered under the Endangered Species Act to protect these species from extinction and compel better management of sagebrush steppe.

Livestock grazing is among the most harmful and pervasive uses of publicly owned sagebrush steppe. Livestock stocking rates and timing of grazing on public land allotments are too excessive to allow habitats to recover from annual grazing use. Greater sage-grouse and other species have benefited where livestock grazing has been reduced or eliminated on the landscape. WildEarth Guardians seeks to permanently end public lands livestock grazing in sage-grouse range by proposing that the federal government pay grazing permittees generous compensation to relinquish their grazing permits so that grazing allotments can be permanently retired from grazing use.

Despite its size, the Sagebrush Sea is among the most under-represented landscapes in the federal land conservation systems.<sup>85</sup> Additional Sagebrush Sea reserves are needed to protect critical habitat cores and corridors and sustain Sagebrush Sea species until the current energy development boom in sagebrush steppe has subsided, livestock have been removed from federal public land, and sagebrush steppe can be restored from cheatgrass invasion and wildfire. WildEarth Guardians is developing additional maps and analyses, and related public information and legislative campaigns to create new reserves in sagebrush steppe.

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<sup>85</sup> National Wilderness Preservation System, National Park System, National Wildlife Refuge System, National Landscape Conservation System.

## XII. Technical Notes

### 1. Map 1. The Sagebrush Sea.

GIS data used to depict sagebrush steppe is from P. Comer, J. Kagan, M. Heiner, C. Tobalske. 2002. Current distribution of sagebrush and associated vegetation in the western United States (excluding AZ and NM) (map). Interagency Sagebrush Working Group. U.S. Geol. Surv., Forest and Rangeland Ecosystems Science Center. Boise, ID; The Nature Conservancy. Boulder, CO. The data was acquired from the U.S. Geological Survey "SageMAP" website (<http://sagemap.wr.usgs.gov>). It includes current distribution of 10 sagebrush vegetation types in Washington, Oregon, California, Colorado, Wyoming and Montana. The data and map are missing sagebrush occurrence in Arizona, New Mexico, North Dakota and South Dakota. This map was also published in Wisdom, M. J., M. M. Rowland, L. H. Suring, L. Schueck, C. W. Meinke, S. T. Knick. 2005. Evaluating species of conservation concern at regional scales. Chap. 1 in part I: Methods of regional assessment for sagebrush-associated species of conservation concern. Pages 5-74 in M. J. Wisdom, M. M. Rowland, L. H. Suring (eds.). HABITAT THREATS IN THE SAGEBRUSH ECOSYSTEM: METHODS OF REGIONAL ASSESSMENT AND APPLICATIONS IN THE GREAT BASIN. Alliance Communications Group. Lawrence, KS: 7.

### 2. Map 2. Sage-Grouse Historic and Current Distribution.

Sage-grouse historic and current range depicted on maps in this report were reviewed in M. A. Schroeder, C. L. Aldridge, A. D. Apa, J. R. Bohne, et al. 2004. Distribution of sage-grouse in North America. *Condor* 106: 363-376. The GIS data were acquired from the U.S. Geological Survey "SageMAP" website (<http://sagemap.wr.usgs.gov>).

### 3. Map 3. Sage-Grouse Historic and Current Distribution and Sagebrush Sea Reserves.

*Badlands National Park, ND* • This national park is not a Sagebrush Sea reserve.

*Hanford Reach National Monument, WA* • The upside-down "U"-shaped Hanford Reach National Monument (which includes the former Saddle Mountain National Wildlife Refuge) depicted on the map excludes an area managed by the Department of Energy. This area does not support conservation; it is fragmented by facilities and roads; and there is significant disturbance to wildlife from human activity.

*Idaho National Laboratory, ID* • Although managed by the Department of Energy, this facility includes important sagebrush habitat and continuously monitors sagebrush health and recovery on the reserve.

*Medicine Lake National Wildlife Refuge, MT* • This refuge (and Medicine Lake Wilderness [FWS]) are in the mixed grass/short grass prairie ecosystem and are not a Sagebrush Sea reserve.

*Modoc National Wildlife Refuge, CA* • Although not located within sage-grouse range or the Sagebrush Sea as depicted in this map, the refuge includes "sagebrush uplands" and habitat for some Sagebrush Sea species.

*Steens Mountain Cooperative Management and Protection Area, OR* • The aggregate of wilderness, Wild and Scenic Rivers and other Congressionally designated land that comprise the Steens Mountain Cooperative Management and Protection Area depicted on the map is missing the 652,023 acres from the mineral withdrawal area.

*Stillwater National Wildlife Refuge, NV* • The refuge depicted on the map is missing the Stillwater Wildlife Management Area. The refuge is primarily wetlands (with some sagebrush uplands) that are important to sagebrush obligate species.

*Wind Cave National Park, ND* • This national park is not a Sagebrush Sea reserve.



**4. Map 4. Male Sage-Grouse Density and Sagebrush Sea Reserves.**

The GIS data for male sage-grouse density were acquired from the U.S. Geological Survey "SageMAP" website (<http://sagemap.wr.usgs.gov>). The same GIS data was previously used to create a map in J. W. Connelly et al. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Assoc. Fish and Wildlife Agencies: 13-2 (June 2004).

**5. Map 5. Roads in the Sagebrush Sea.**

The GIS data for interstate highways, state highways, roads and secondary roads were acquired from the U.S. Geological Survey "SageMAP" website (<http://sagemap.wr.usgs.gov>). Secondary roads depicted on Map 5 are not buffered by any distance, but the line thickness of roads shown on the map would be approximately 2 km wide on the ground. State boundaries represent a 16 km swath on the ground. These widths are simply symptoms of scale in mapmaking.

**6. Map 7. Natural Gas and Oil Development and Sage-Grouse Current Distribution.**

GIS data for natural gas and oil development in the Rocky Mountain west were acquired from Colorado Oil and Gas Commission; Montana Department of Natural Resources and Conservation, Board of Oil and Gas; Petroleum Recovery Research Center (New Mexico) and/or New Mexico Energy, Minerals and Natural Resources Department; Utah Department of Natural Resources, Division of Oil, Gas and Mining; Wyoming Oil and Gas Conservation Commission. Sara Watterson, EarthJustice, Denver, Colorado, advised which categories of wells identified in these databases (e.g., "new," "APD," "drilling," "producing," "shut in," "temporarily abandoned," etc.) should be mapped as existing gas and oil development on Maps 7 and 11.

**7. Map 8. Active Natural Gas and Oil Leases and Sage-Grouse Current Distribution.**

GIS data for active natural gas and oil leases received from Bureau of Land Management, National Integrated Land System GeoCommunicator. The lease data range from 2005 to May 2008.

**8. Map 9. Federal Public Land Livestock Grazing and Sage-Grouse Current Distribution.**

GIS data used to depict (active) federal public lands livestock grazing allotments were assembled from a variety of sources, including BLM national and state offices, and Forest Service national and regional offices.

**9. Map 10. Probable Cheatgrass Presence and Sage-Grouse Current Distribution.**

The GIS data for probable cheatgrass occurrence was acquired from the U.S. Geological Survey "SageMAP" website (<http://sagemap.wr.usgs.gov>). The GIS data was previously used to create a map in J. W. Connelly et al. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Assoc. Fish and Wildlife Agencies: 5-32 (June 2004). The map published in Connelly et al. (2004) also separately depicted probable cheatgrass occurrence using kernel estimators.

**10. Map 13. Columbian Sharp-Tailed Grouse Historic and Current Distribution.**

GIS data used to depict Columbian sharp-tailed grouse historic and current distribution was developed by M. Schroeder, Washington Department of Fish and Wildlife. The map is a coarse representation of historic and current range.

### XIII. Endnotes

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