

# WILDEARTH GUARDIANS

## THE SAGEBRUSH SEA



SAGEBRUSH SEA  
CAMPAIGN

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>

***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 (scientifically known as "sagebrush steppe") encompassed more than 150 million acres in western North America,<sup>2</sup> and was perhaps as large as 243 million acres, spanning parts of sixteen states and three Canadian provinces.<sup>3</sup> Despite its size, sagebrush steppe "is one of the most endangered [landscapes] in North America."<sup>4</sup> The Sagebrush Sea has been reduced in area by as much as 50 percent since European settlement.<sup>5</sup> 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>6</sup> Perhaps no sagebrush steppe remains in "pristine" condition.<sup>7</sup>

### Sagebrush

Sagebrush (*Artemisia* spp.) are among the most widely distributed native plants in the western United States.<sup>8</sup> ("Artemis" was the ancient Greek goddess of wild animals, the hunt, and vegetation, and of chastity and childbirth.<sup>9</sup>) Approximately 21 species and subspecies of sagebrush<sup>10</sup> grow from sea level to nearly 12,000 feet and in areas that receive as little as eight inches of annual precipitation.<sup>11</sup> Many varieties of sagebrush are endemic to North America,<sup>12</sup> including all big sagebrush taxa.<sup>13</sup> Big sagebrush can live as long as a century.<sup>14</sup>

***Imagine a gnarled and venerable live oak-tree reduced to a little shrub two feet high, with its rough bark, its foliage, its twisted boughs, all complete.... It is an imposing monarch of the forest in exquisite miniature.*** Mark Twain, *Roughing It* (1872)

### Denizens of the Sagebrush Sea

The Sagebrush Sea supports an estimated 250 terrestrial vertebrate species,<sup>15</sup> including 100 bird and 70 mammal species.<sup>16</sup> The Snake River Birds of Prey National Conservation Area south of Boise, Idaho, hosts the largest population of nesting raptors in North America<sup>17</sup> (approximately 700 pairs of raptors representing 15 species<sup>18</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>19</sup>

***Of the twenty-seven different orders [of birds] recognized by ornithologists, seventeen are represented by one or more species which regularly occur as residents, migrants or visitants in the Great Basin.*** Fred A. Ryser, Jr., *Birds of the Great Basin* (1985)

Black-tailed jackrabbits are the most abundant large herbivore in the Sagebrush Sea; populations oscillate from approximately 60 to 600 rabbits per square kilometer.<sup>20</sup> Black-tailed jackrabbits have increased and white-tailed jackrabbits have declined in sagebrush steppe as shrubs have increased (due to livestock grazing) relative to grasses and forbs.<sup>21</sup> Coyotes are a top-level predator in the Sagebrush Sea and a very effective predator of jackrabbits.<sup>22</sup>

**Big sagebrush is a nursing mother to a host of organisms ranging from microscopic to large mammals.** Bruce Welch, *Big Sagebrush: A Sea Fragmented into Lakes, Ponds, and Puddles* (2005)

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>23</sup> Bristlecone pines more than 4,000 years old have been found at the highest elevations in the Sagebrush Sea.<sup>24</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>25</sup> Great Basin wetlands support 61 aquatic bugs,<sup>26</sup> 19 endemic plant species and 5 endemic plant varieties, and 4 endemic vole subspecies.<sup>27</sup> Lahontan cutthroat trout and Great Basin cutthroat trout are evolved to survive in relatively warm water in the Great Basin.<sup>28</sup>

More than 1,000 different insects and other invertebrate species may be found in sagebrush steppe<sup>29</sup> (more than 1,240 insects have been identified at the Idaho National Laboratory in eastern Idaho<sup>30</sup>). They have a marked impact on ecosystem dynamics: 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 plant pieces per acre annually.<sup>31</sup>

**In time there were two as perfectly adjusted to their habitat as the sage. One was a mammal, the fleet and graceful pronghorn antelope. The other was a bird, the sage grouse – the ‘cock of the plains’ of Lewis and Clark.** Rachel Carson, *Silent Spring* (1962)

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>32</sup> As many as 16 million sage-grouse may have occurred in sagebrush steppe prior to European arrival.<sup>33</sup>

## Imperiled Species in the Sagebrush Sea

More than 350 species<sup>34</sup>—and as many as 630 species<sup>35</sup>—of plants, mammals, birds, reptiles, amphibians and invertebrates in the Sagebrush Sea are of conservation concern. Approximately 20 percent of native flora and fauna in the Sagebrush Sea are considered imperiled.<sup>36</sup>

Despite its size, sagebrush steppe is ranked as the third most imperiled bird habitat in the United States.<sup>37</sup> Across the United States, 63 percent of shrubland and shrub-dependent bird species are declining.<sup>38</sup> In the Intermountain West, more than 50 percent of grassland and shrubland bird species show downward population trends.<sup>39</sup>

Greater sage-grouse range and distribution have decreased by 56 percent<sup>40</sup> while overall abundance has been reduced by as much as 93 percent from historic levels.<sup>41</sup> According to the most recent assessment, “continued loss and degradation of [sage-grouse] habitat and other factors...do not provide causes for optimism.”<sup>42</sup>

**Populations of all of the key [Sagebrush Sea] birds are in decline, and although some of them still exist in fairly large numbers, their prognosis is grim. This is why sagebrush ranks so highly in our top ten threatened habitats—there is no system as vast as this one in such free fall.** American Bird Conservancy, *Top 20 Most Threatened Bird Habitats in the U.S.*

**Legions of leagues (the expression is by no means too strong) are covered with a wild growth of sage, that seems designed by Nature than for nothing else that to feed a certain variety of the feathered family known as “sagecocks.”** Matthew Field, 1843 • *Prairie and Mountain Sketches* (1957)

Among Great Basin aquatic fauna, 58 percent of endemic taxa (78 species/subspecies) have experienced significant declines during the last 140 years due to water diversion, invasive species, livestock grazing and other factors. Sixteen taxa became extinct (12 fishes, 3 mollusks, 1 aquatic insect).<sup>43</sup>

The geographic distribution of Lahontan cutthroat trout and bull trout, among other species, are projected to be reduced as a result of climate change.<sup>44</sup>

## Management of the Sagebrush Sea

Most of the Sagebrush Sea that remains is publicly owned in the United States. The Bureau of Land Management controls approximately 50 percent of remaining sagebrush steppe in the United States.<sup>45</sup> The U.S. Forest Service manages eight percent and western states own five percent of the Sagebrush Sea.<sup>46</sup>

The Bureau of Land Management manages more land than any other federal agency and does so with a budget that amounts to funding at \$3.83 per acre per year.<sup>47</sup> Specially designated “protected” areas receive less funding than other BLM lands. The agency’s 2004 budget only invested an average of \$1.57 per acre in the 26-million acre National Landscape Conservation System.<sup>48</sup>

While the Sagebrush Sea still covers more than 100 million acres,<sup>49</sup> only two million acres are Congressionally designated Wilderness – less than two percent of the region.

## Population Growth and Recreation in the Sagebrush Sea

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>50</sup> Nine of twelve states with large tracts of BLM land are among the fastest growing in the nation;<sup>51</sup> the growth rates in nine western states exceeded 20 percent or more during the past decade.<sup>52</sup> Partly because of this growth, recreational visits to BLM lands have increased 65 percent in the last 15-20 years<sup>53</sup> and are expected to continue to increase 5 percent annually.<sup>54</sup> More than 4,000 communities with a combined population of 22 million people are just a half hour drive from BLM lands.<sup>55</sup> An estimated 4,100 communities rely on watersheds managed by BLM.<sup>56</sup> The BLM recorded 56.3 million recreation visits to BLM lands in 2006.<sup>57</sup> The BLM now collects more revenue from recreational and user fees than public land grazing fees,<sup>58</sup> even though fees are not charged for most recreational activities and at many recreational sites on BLM lands.

## Habitat Loss and Degradation in the Sagebrush Sea

### Sagebrush Loss

The Sagebrush Sea has been reduced in area by as much as 50 percent since European settlement.<sup>59</sup> Significant areas of sagebrush steppe have been lost to agriculture and development. More than 99 percent of basin big sagebrush in the Snake River Plain of Idaho has been converted to agriculture;<sup>60</sup> fifty-five percent of sagebrush steppe has been lost in Idaho.<sup>61</sup> Approximately 90 percent of the shrub-steppe grassland in the Columbia River basin in Oregon and southwestern Washington has been lost.<sup>62</sup> As much as half of sagebrush habitat has been lost in the Great Basin.<sup>63</sup>

### Degraded Riparian Areas, Water Loss

The BLM manages over 23 million acres classified as riparian or wetland habitat.<sup>64</sup> An estimated 59,000 acres of wetlands and 17,500 stream miles on BLM land lack characteristics necessary for high functioning wetland and riparian habitats.<sup>65</sup>

Potential evapotranspiration exceeds annual precipitation by a factor of over 5 in some parts of the Sagebrush Sea.<sup>66</sup> Wetlands were reduced by 52 percent in Nevada between the 1780s and 1980s.<sup>67</sup> Seeps and springs are destroyed and degraded by grazing, mining, pollution and water diversion in the Great Basin.<sup>68</sup> Most springs—76 percent—observed on BLM land in northern Nevada were highly or moderately disturbed by livestock grazing and water diversion.<sup>69</sup> Climate change will further affect the timing and amount of flow from springs and seeps.<sup>70</sup>

Beavers and their dams, missing from much of the sagebrush steppe, expand and improve habitat for riparian plants, birds and other species.<sup>71</sup>

## Loss of Soil Crust, Soil Erosion

Biological soil crusts are present in all hot, cool, and cold desert and semiarid landscapes. They may constitute up to 70 percent of living cover on a desert landscape. Soil crusts are an important source of fixed carbon and fixed nitrogen.<sup>72</sup> Soil crusts are easily damaged by off-road vehicles and trampling by livestock. Damaged crust exposes soil to erosion by wind and water, and invasion by cheatgrass and other weeds.

## Western Juniper Encroachment

Since 1870, concurrent with the introduction of domestic livestock and the resultant exclusion of periodic fire, the occurrence of western juniper in the sagebrush steppe has increased approximately ten-fold. Sagebrush habitat is being converted to western juniper woodland at a geometric rate. Western juniper is also invading and replacing quaking aspen stands.<sup>73</sup>

## **Threats to the Sagebrush Sea**

Sagebrush habitats and wildlife are affected by 26 human-induced threats.<sup>74</sup>

### Livestock Grazing

The BLM administered approximately 18,000 grazing permits and leases to graze almost 13 million AUMs (animal unit months)\* on 165 million acres of public lands in 2006,<sup>75</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>76</sup> The BLM grazing program is administered by 107 field offices that spend at least \$58 million annually to manage public lands grazing,<sup>77</sup> at a loss of at least \$54.6 million per year to federal taxpayers.<sup>78</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>79</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)

### Invasive Species

At least 46 exotic weeds occur in the Sagebrush Sea.<sup>80</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>81</sup> Invasive species, including weeds and other organisms, are the second leading cause of species endangerment in the United States.<sup>82</sup>

Cheatgrass, an invasive weed perpetuated by livestock grazing and wildfire,<sup>83</sup> is now the dominant species on 100 million acres – 158,000 square miles – in the Intermountain West.<sup>84</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>85</sup> Cheatgrass is spreading at a rate of 14 percent annually in the United States.<sup>86</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)

Fifty nonnative fish taxa have been introduced in the Great Basin where they predate, compete and hybridize with 43 native fish species.<sup>87</sup>

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\* An 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.

## Energy Development

The BLM manages 700 million acres of onshore federal subsurface minerals in the U.S.<sup>88</sup> and presently administers more than 63,000 oil and gas leases<sup>89</sup> and 399 geothermal leases<sup>90</sup> mostly on public lands in the West. Eighty percent of BLM land is available for energy development<sup>91</sup> and more than 36 million acres of minerals are already leased for development in 33 states.<sup>92</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>93</sup> There are also approximately 12,000 abandoned wells on lands under BLM supervision in the West.<sup>94</sup>

BLM's oil and gas permitting activity more than tripled between 1999-2005.<sup>95</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>96</sup> likely resulting in more than 1,000,000 acres being graded, drilled, built upon or otherwise disturbed by energy development.<sup>97</sup> The 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>98</sup>

The very integrity of the Sagebrush Sea in parts of Wyoming, Colorado, Utah, Montana, and the Dakotas is threatened by oil and gas 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>99</sup> Billions of gallons of water have been wasted in the search for coalbed methane.<sup>100</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>101</sup>

Coal, oil, wind power and hydropower are also produced from BLM lands (10.5 percent of the current installed renewable electricity generation capacity in the United States is on BLM lands<sup>102</sup>). The agency is also exploring ways to use solar and biomass resources, oil shale, tar sands, and uranium deposits (nuclear energy) for future energy production.<sup>103</sup>

## Mining

Gold and copper mining are prevalent in the Great Basin region on and adjacent to public lands in the Sagebrush Sea. Nevada is the third largest gold producer in the world, behind South Africa and Australia.<sup>104</sup>

Approximately 25 open pit mines were active in Nevada in 2003.<sup>105</sup> These pits are often flooded by groundwater, which is pumped out (and wasted) at a rate of up to 70,000 gallons per minute.<sup>106</sup> The resultant cone of depression in the water table affects surface and groundwater flows for up to 50 square miles around a mine.<sup>107</sup>

Millions of tons of processed ore from cyanide heap leach mining litter the Great Basin. More than 200 "heaps" of waste rock in Nevada are exposed to the air and precipitation and release tons of toxic metals into the environment. The heaps at the Wind Mountain Mine near Empire, Nevada, contain 29,000 tons of salt, 12,000 tons of chloride, 200 tons of nitrate and 12 tons of selenium. The concentration of 14 metals exceed state standards in mining waste at the Candelaria Mine in Mineral County, Nevada. For example, the concentration of mercury exceeds state standards by 35 times, selenium by 6 times, arsenic by 49 times and cyanide by 350 times.<sup>108</sup>

Mining is the leading source of mercury pollution (from waste rock and air emissions) in the United States.<sup>109</sup> Nevada's gold mines emit 25 percent of all U.S. mercury air pollution west of Texas.<sup>110</sup> The Jerritt Canyon Mine near Elko, Nevada, released 4,700 pounds of mercury into the air in 2002.<sup>111</sup>

Mining companies can profitably process a ton of ore containing as little as 0.015 ounces of gold from heap leach operations.<sup>112</sup> Producing one gold ring (0.33 ounces) can generate 20 tons of mine waste and waste thousands of gallons of groundwater.<sup>113</sup>

Nevada is home to 300,000 abandoned mines; 50,000 mines pose a physical safety hazard;<sup>114</sup> and toxic pollution from 2,000-3,000 mines threaten surface and groundwater.<sup>115</sup>

## 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. Greater sage-grouse population response to energy development and habitat loss. *J. Wildl. Manage.* (in press).

‡ Doherty, K. E., D. E. Naugle, B. L. Walker, and J. M. Graham. Greater sage-grouse winter habitat selection and energy development. *J. Wildl. Manage.* (in press).

## Off-road Vehicles

Off-road vehicles (ORV) damage wildlife habitat and watersheds across the West.<sup>116</sup> Approximately half of publicly owned Bureau of Land Management lands are open to unrestricted ORV use, with another 44 percent designated for limited access and only 6 percent of BLM land closed to ORVs.<sup>117</sup> Of 48 million acres of public land managed by BLM in Nevada, almost 37 million acres are open to ORV use, nine million acres are available for limited access, and only two million acres are closed to ORVs.<sup>118</sup> More than 44 million Americans used off-road vehicles in 2007, up from five million in 1972.<sup>119</sup> More than 5,400 law enforcement incidents on BLM land in 2005 involved off-road vehicle riders (the next highest category of incidents, at 900, involved drug use).<sup>120</sup>

## Unnatural Fire

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>121</sup> depending on sagebrush type, elevation, aspect, etc., although fire may return more frequently to a given watershed during productive periods<sup>122</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.

In 1999 range fires burned 1.7 million acres in the Great Basin as flames raced across the landscape at over 40 miles per hour.<sup>123</sup> More than 850,000 acres (1,320 square miles) burned in western Elko County, Nevada, in 2006, eliminating habitat for over 10,000 sage-grouse.<sup>124</sup> An estimated 76 sage-grouse leks were lost to fire in northern Nevada in 2005-2006.<sup>125</sup> An additional 75 leks were lost in the Murphy Complex Fire in Idaho and Nevada in 2007.<sup>126</sup> Approximately 60 percent of winter range for one of Nevada's largest and most productive antelope herds was burned in 2006. More than six million acres of sagebrush habitat has been lost to 8,233 wildfires in Nevada between 1999 and 2006.<sup>127</sup> Fires scorched 70 percent of sage-grouse habitat in Idaho's Big Desert in just three years.<sup>128</sup> Approximately 25 percent of the Idaho National Laboratory site has burned since 1994.<sup>129</sup> Almost half (250,000 acres) of the public lands in the Snake River Birds of Prey National Conservation Area burned between 1980 and 1994,<sup>130</sup> which appears to have reduced prey populations for raptors in the NCA.<sup>131</sup> An average of 235,000 acres managed by the BLM in Idaho have burned annually over the last 10 years.<sup>132</sup> More than 3.6 million acres of public lands were burned in 2004, one of the worst fire seasons on record.<sup>133</sup> More than 2.4 million acres of primarily sagebrush steppe and associated habitats were burned by wildfires in Idaho, Utah and Nevada in 2007.<sup>134</sup>

### Climate Change

As much as 80 percent of remaining sagebrush steppe could be lost to the direct or indirect effects of global warming.<sup>135</sup> Atmospheric CO<sub>2</sub> has increased approximately 20 percent during the past century.<sup>136</sup> Average temperature has increased 0.6 - 1.1° F in the last 100 years in the Great Basin.<sup>137</sup> Climate change is projected to cause temperatures to continue to increase in the Great Basin by 3 - 4° F in spring and autumn, and by 5 - 6° F in winter and summer, by 2100.<sup>138</sup>

### Roads, Pipelines, Communications and Utility Corridors

Roads promote the invasion of exotic species, serve as travel routes for predators, facilitate human access into sagebrush habitats and increase fire risk. Less than 5 percent of existing sagebrush habitat is more than 1.6 miles from a mapped road.<sup>139</sup>

BLM has granted 93,000 rights-of-way on public land, including for more than 112,000 miles of electrical transmission lines, oil and gas pipelines, and telephone lines,<sup>140</sup> and 3,500 communications sites.<sup>141</sup> The total area of these and other rights of way on BLM lands is more than 6.6 million acres.<sup>142</sup>

***The prowler of the night,  
The lean coyote,  
Slips to his rocky fastnesses,  
And noiselessly, through the gray sage,  
Jack-rabbits shuttle.  
Now, from the castellated cliffs,  
Rock-ravens launch their proud black sails.  
Wild horses neigh and toss their manes,  
Trooping back to pasture;  
Orioles begin to twitter.  
All shy things, breathless, watch  
The thin, white skirts of Dawn,  
The dancer of the sky,  
Tripping daintily down the roseate mountain,  
Emptying a golden basin.  
A red-bird, dipped in sunrise,  
Cracks from a poplar top  
His exultant whip above a silver world.***

Charles Erskine Scott Wood, *The Poet in the Desert*  
(1929/1949)

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- <sup>1</sup> Adapted from America Lands Alliance. 2001. *The Sagebrush Sea*. American Lands Alliance. Washington, DC (available at [www.sagebrushsea.org/booklet.htm](http://www.sagebrushsea.org/booklet.htm)).
- <sup>2</sup> Wisdom, M. J., M. M. Rowland, R. J. Tausch. 2005. Effective management strategies for sage-grouse and sagebrush: a question of triage? *Trans. N. Amer. Wildl. & Nat. Res. Conf.* 70: 206 (citing Barbour, M. G. and W. D. Billings. 1988. *NORTH AMERICAN TERRESTRIAL VEGETATION*. Cambridge University Press. Cambridge, United Kingdom). *But see* J. Borland. 1998. True grit: cold-hardy sagebrush. *Hortus West* 9(2): 1 (*Artemisia* spp. may have historically occurred on as much as 270 million acres in the western United States).
- <sup>3</sup> Braun, C. E., O. O. Oedekoven, C.L. Aldridge. 2002. Oil and gas development in western North America: effects on sagebrush steppe avifauna with particular emphasis on sage grouse. *Trans. N. Amer. Wildl. & Nat. Res. Conf.* 67: 337 (citing A. A. Beetle. 1960. A study of sagebrush. The Section Tridentatae of *Artemisia*. Univ. Wyoming Agric. Exp. Stn. Bull. 368. Univ. Wyoming. Laramie, WY and T. R. Vale. 1975. Presettlement vegetation in the sagebrush-grass area of the Intermountain West. *J. Range Manage.* 28: 32-36).
- <sup>4</sup> USGS. "State and Federal Partnership Forms to Restore Great Basin Rangelands" (news release). U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center, Corvallis Research Group. Corvallis, OR. (Nov. 8, 2005); R. F. Noss, E. T. LaRoe, J. M. Scott. 1995. Endangered ecosystems of the United States: a preliminary assessment of loss and degradation. Biological Report 28. National Biological Service. Washington, DC.
- <sup>5</sup> Wisdom, M. J., M. M. Rowland, R. J. Tausch. 2005. Effective management strategies for sage-grouse and sagebrush: a question of triage? *Trans. N. Amer. Wildl. & Nat. Res. Conf.* 70: 206 (citing J. W. Connelly et al. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Assoc. Fish and Wildlife Agencies. [June 2004]).
- <sup>6</sup> West, N. E. and J. A. Young. 1999. Intermountain valleys and lower mountain slopes. Pages 256-284 in M. G. Barbour and W. D. Billings (eds.). *NORTH AMERICAN TERRESTRIAL VEGETATION*. 2nd edition. Cambridge University Press. New York, NY: 259 (citing multiple sources).
- <sup>7</sup> West, N. E. 1999. Managing for biodiversity of rangelands. Pages 101-126 in W. W. Collins and C. O. Qualset (eds.). *BIODIVERSITY IN AGROECOSYSTEMS*. CRC Press. Boca Raton, FL: 109.
- <sup>8</sup> McArthur, E. D. 2000. Sagebrush systematics and distribution. Pages 9-14 in P. G. Entwistle, A. M. Debolt, J. H. Kaltenecker, K. Steenhof (compilers). *Proc. Sagebrush Steppe Ecosystems Symposium*; June 21-23, 1999; Boise State University, Boise, ID. Publ. no. BLM/ID/PT-0001001+1150. Bureau of Land Management. Boise, ID.
- <sup>9</sup> McArthur, E. D. 2000. Sagebrush systematics and distribution. Pages 9-14 in P. G. Entwistle, A. M. Debolt, J. H. Kaltenecker, K. Steenhof (compilers). *Proc. Sagebrush Steppe Ecosystems Symposium*; June 21-23, 1999; Boise State University, Boise, ID. Publ. no. BLM/ID/PT-0001001+1150. Bureau of Land Management. Boise, ID: 9 (citing E. D. McArthur. 1979. Sagebrush systematics and evolution. Pages 14-22 in *The Sagebrush Ecosystem: A Symposium*. Utah State Univ. Logan, UT).
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