Shrub Steppe: The Forgotten Ecosystem of Eastern Washington

Doyle McClure

Although decades-long conservation efforts to protect and recover Western forests and wetlands are well known and ongoing, protection of shrub-steppe landscapes, viewed by some as the value-equivalent "old growth" of the arid interior basins and plateaus, has not received comparable attention. This note describes aspects of the shrub-steppe ecosystem, and touches on the questions: what is it?, where has it gone and what is left?, why should we care?, and what are the ongoing threats?

The nature and values of the shrub-steppe ecosystem are elegantly stated by the following citation from Ref 1.

> **Shrubsteppe communities form the iconic, western landscape of open sagebrush plains, rimrock, and tumbleweeds. Described as vegetation communities consisting of one or more layers of perennial grass with a discontinuous overstory layer of shrubs, shrubsteppe historically dominated the landscape in eastern Washington. Some of the many species of wildlife that inhabit shrubsteppe can only be found in these semi-arid communities. Greater sage-grouse, sage sparrows, sage thrashers, and pygmy rabbits are among an elite group of species that depend on sagebrush and are termed "sagebrush obligates". A host of other birds, mammals, reptiles, and insects are found primarily in sagebrush-steppe or other shrubsteppe communities.**

The principal vegetation of the undisturbed shrub-steppe ecosystem consists of big sagebrush (Artemisia tridentate) and bluebunch wheatgrass (Pseudoroegneria spicata), accompanied by smaller amounts of gray and green rabbitbrush, spiny hopsage, three-tip sage, and horsebrush. In addition to large losses in shrub-steppe area, abuse and overuse due to grazing by livestock have resulted in major declines in vegetative health, as marked by shrub size and density, as well as replacement of native grasses by destructive cheatgrass.[(2)]

Historical and Remaining Shrub-steppe Areas

Before colonial settlement, shrub steppe covered nearly 300 million acres in parts of 12 states of the interior West but, by 2004, suffered major decline due both to reduction in area (by 45%-60%) and to widespread degradation of quality in much of the remainder. Conversion to cropland, livestock grazing, recent incursions from oil and gas drilling, as well as placement of wind farms, continue to cause area loss, fragmentation, and degradation of shrub-steppe quality throughout the west[(3)].

The shrub-steppe losses in Washington State, as illustrated by Figure 1 below[(1)] have been most dire.

Figure 1:

Current (left) and historic (right) extents of shrubtsteppe/steppe habitats in eastern Washington. Green=forest; *darkbrown=shrubsteppe/steppe; tan=cropland*

The historic area of shrub steppe in eastern Washington (Figure 1, rightmost inset) comprised more than 12 million acres, about 32% of the total area of the state and about 4% of the total area of shrub steppe in the interior West. Unfortunately, as illustrated by the leftmost inset, the current shrub-steppe area in Washington is only about 4 million acres, 1/3 of its historic value, and is highly fragmented.

Approximately 98% of Washington shrub-steppe loss is attributable to farmland development[(2)], abetted by the massive Columbia Basin Irrigation Project, for which continued expansion is being promoted by the US Bureau of Reclamation. As discussed below, remaining, highly-fragmented areas of shrub steppe, see especially subareas 1, 2, 3, and 6 shown by the left inset of Figure 1, are associated with areas less suitable for crop cultivation.

The largest blocks of remaining shrub-steppe area (see subareas 5) result from protection on federal lands (the Hanford Site and the Yakima Training Center) and on those belonging to the Yakima Indian Nation. These comprise about 2 million acres in extent, half the existing shrub steppe in Washington State. The remaining areas across the central Columbia Basin (subareas 1, 2, and 3) are mainly associated with the coulees, canyons, and so-called scablands resulting from the violent ice-age (Lake Missoula) floods that occurred 12,000 to 15,000 years ago. Fortunately for preservation of shrub steppe habitat, these flood tracks resulted in ubiquitous rocky outcrops and relatively thin soils not conducive to cultivated cropland. Less fortunately, much of the associated area has been severely abused and degraded by excessive livestock grazing.

The close association between major parts of the remaining shrub steppe area and the ice-age flood tracks is illustrated by the one-to-one correlation of the shrub-steppe area 2 shown by Figure 1 above with the shaded areas of Figure 2 below, which denote the extensive channelized scablands of the upper Crab Creek watershed in Lincoln County.

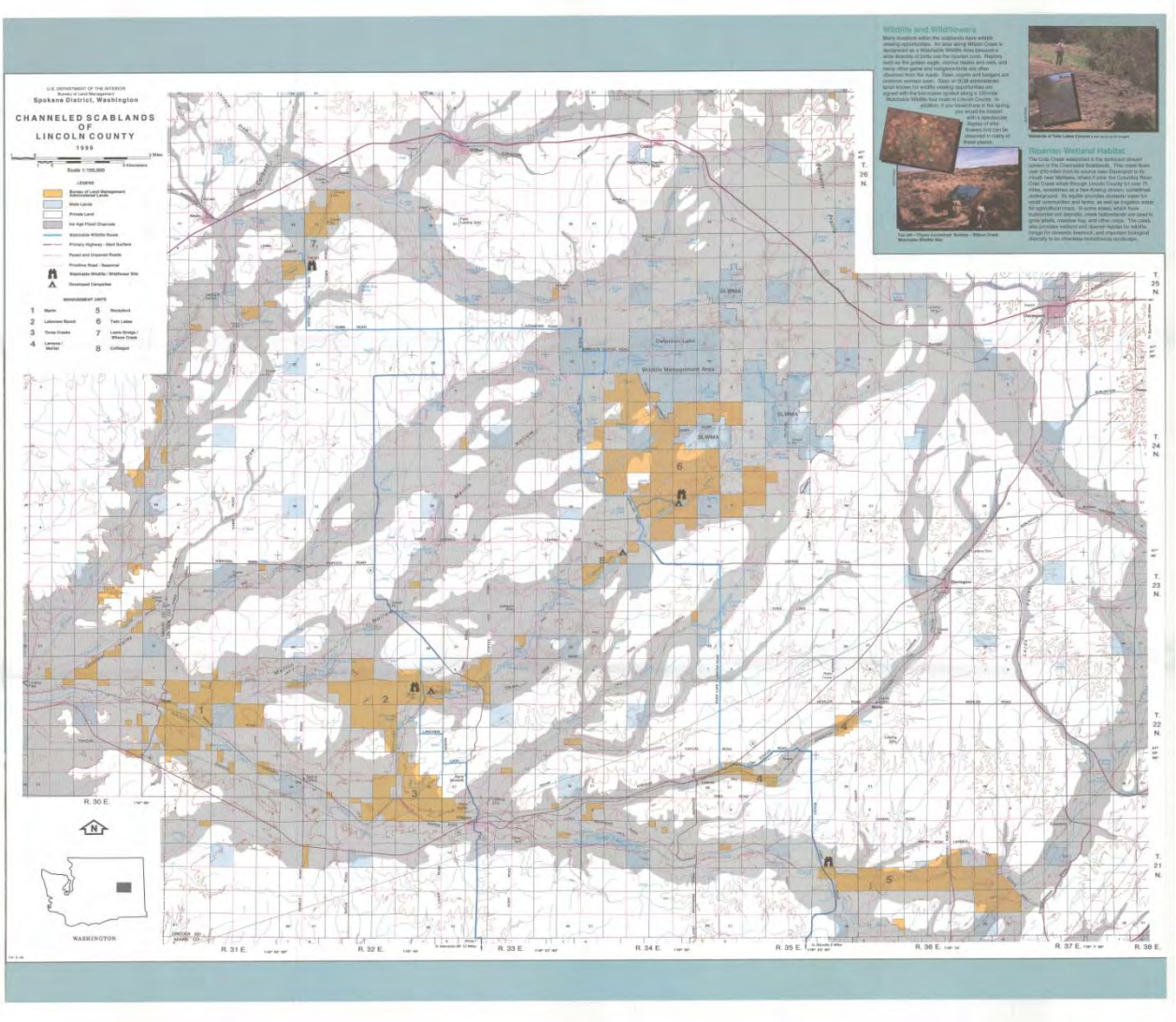

Figure 2 Ice-age Flood Channels in Lincoln County Washington

Ecosystem Values: Intact Shrub Steppe and Associated Wildlife Habitat

Despite the sobering facts recounted above, the remaining 4 million acres of shrub steppe in Washington State continue to have major ecological value. Though small compared to historical values, the individual shrub-steppe areas enumerated in the left inset of Figure 1 and listed below are still quite extensive.

1.	Palouse River Watershed	490,256 acres
2.	Upper Crab Creek Watershed	317,900 acres
3.	Grant-Douglas Counties	405,992 acres
4.	Okanagan-Douglas Counties	624,309 acres
5.	Kittitas-Yakima-Benton Counties	2,010,813 acres

These shrub-steppe areas comprise almost 11% of the total area of Washington State and, although by no means pristine, with appropriate management provide major potential for recovery of their ecological values.

Figures 3 and 4 show relatively large areas of intact shrub-steppe vegetation in the dramatic Frenchman and Pot Holes Coulees, respectively, which are located above the east side of the Columbia River between Vantage and Quincy (area 3 above). These coulees were formed by torrential overflow-floods into the Columbia River, coming over the ridges bounding the (temporary) 2,000 square-mile Lake Lewis that covered much of central Washington during the ice-age, Lake Missoula floods. The rising waters of Lake Lewis resulted from constriction of the Lake Missoula flood waters by the Wallula Gap, located far downstream on the Columbia River near the Washington-Oregon border. Each of these coulees, located about eight miles apart, is double-lobed in its upper part, then drops 600-700 feet in a series of (dry) cataracts to and across the Babcock Bench to the river below[(4)]. The west-facing view in Figure 3, toward the river and the Cascade foothills beyond, is from the high central rib in the upper Frenchman Coulee. The east-facing view in Figure 4 is from Babcock Bench in the lower Pot Holes Coulee.

Figure 3 Echo Basin from Frenchman Coulee Rib

Figure 4 N Potholes Coulee from Babcock Bench

Figures 5 and 6 also show two other intact areas of shrub-steppe vegetation, both in the Palouse River watershed (area 1 above). The associated Palouse River canyon and terraces of Figure 5, as well as the seven-mile long Rock Lake and the adjacent pothole lake of Figure 6, are all features of the ice-age floods.

Figure 5 Palouse River Canyon (ca 7 mi SE from Washtucna)

Figure 6 Lavista Lake (0.2 mi E from S Rock Lake)

Other examples of intract shrub-steppe vegetation are shown by Figure 7 (in central Adams County, midway between areas 1 and 3 above) and Figure 8 (in Douglas County, western part of area 3). Both coulees were formed by the ice-age floods.

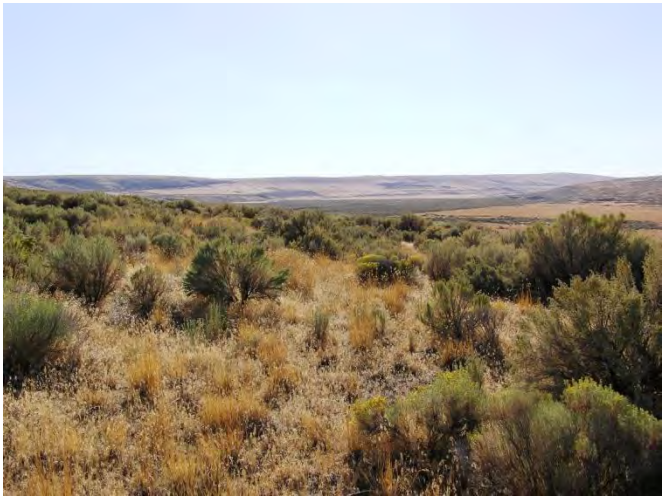

Figure 7 Lind Coulee (ca 10 mi E from Lind)

Figure 8 Moses Coulee (ca 17 mi W from Coulee City and 4.5 mi N from Hwy 2)

In this age of global warming, lessons from the widespread travail throughout the mid-western and western arid lands during the “dustbowl” years of the 1930s, if not forgotten, would show the extreme importance of maintaining healthy shrub-steppe landcover as opposed to excessive areas of cultivated croplands and lands beaten down by abusive livestock grazing[(5)]. The vicious cycle of increased temperatures resulting in decreased rainfall, depletion of ground water, death-dealing dust storms, and pervasive failure of all forms of agriculture could well be repeated in this century.

In addition to their intrinsic value, healthy wildlife populations serve as the proverbial “canary in the goldmine” as regards landscape health essential to human wellbeing. The following citation from Ref. 1 should serve as a clear warning that conservation of the remaining shrub-steppe areas in arid landscapes has been seriously neglected.

> **Anthropogenic changes in these unique habitats have caused severe declines in species like the greater sage-grouse and have led to the extirpation of the pygmy rabbit in Washington. Other shrubsteppe-associated species that are likely on the decline include the Washington ground squirrel, Brewer’s sparrow, and burrowing owl. Conversion of shrubsteppe to cropland and other uses is responsible for much of the observed declines in native species; however, the pattern of habitat loss and how remaining habitat is configured on the landscape likely plays a significant role in determining use by wildlife.**

Specific wildlife species of concern that depend on the shrub-steppe areas of central and eastern Washington are as follows:

Species of Concern in Washington State Shrub Steppe Habitat

[http://wdfw.wa.gov/conservation/endangered/lists/search.php?searchby=All&orderby=AnimalType, Common Name ASC]

NOTE: Species listed as State Endangered, State Threatened, State Sensitive, State Candidate, or listed /proposed by the USFWS
Red font: Washington State listings as endangered (SE) or threatened (ST); candidates for State listing (SC)

			Species Status	
Common Name	**Scientific Name**	**Animal Type**	**State**	**Federal**
American white pelican	*Pelecanus erythrorhynchos*	Bird	SE	none
Burrowing owl	*Athene cunicularia*	Bird	SC	FCo
Clark's grebe	*Aechmophorus clarkii*	Bird	SC	none
Columbian Sharp-tailed Grouse	*Tympanuchus phasianellus*	Bird	ST	FCo
Ferruginous hawk	*Buteo regalis*	Bird	ST	FCo
Golden eagle	*Aquila chrysaetos*	Bird	SC	none
Greater Sage-grouse	*Centrocercus urophasianus*	Bird	ST	FC
Loggerhead shrike	*Lanius ludovicianus*	Bird	SC	FCo
Sage sparrow	*Amphispiza belli*	Bird	SC	none
Sage thrasher	*Oreoscoptes montanus*	Bird	SC	none
Sandhill crane	*Grus canadensis*	Bird	SE	none
Western grebe	*Aechmophorus occidentalis*	Bird	SC	none
Yellow-billed cuckoo	*Coccyzus americanus*	Bird	SC	FC
Black-tailed jackrabbit	*Lepus californicus*	Mammal	SC	none
Merriam's shrew	*Sorex merriami*	Mammal	SC	none
Pygmy rabbit	*Brachylagus idahoensis*	Mammal	SE	FE
Townsend's big-eared bat	*Corynorhinus townsendii*	Mammal	SC	FCo
Washington ground squirrel	*Urocitellus washingtoni*	Mammal	SC	FC
White-tailed jackrabbit	*Lepus townsendii*	Mammal	SC	none
Northern leopard frog	*Rana pipiens*	Amphibian	SE	FCo
Sagebrush lizard	*Sceloporus graciosus*	Reptile	SC	FCo
Striped whipsnake	*Masticophis taeniatus*	Reptile	SC	none

The WDFW and numerous other agencies and private organizations formed the Washington Wildlife Habitat Connectivity Working Group to develop a scientific basis for focusing landscape-scale conservation efforts. The WHCWG undertook a major study to quantify and prioritize landscape-scale habitat values throughout Washington State[6]. Large-scale habitat concentration areas and vital intra-area connectivity routes were identified and mapped for selected (focal) species of wildlife representing individual ecosystem types. The group of focal species in Ref 6 that represent the arid, shrub-steppe regions of Eastern Washington include:

Sharp-tailed Grouse, photo by Marc Hallet. (ST)

Greater Sage-Grouse, photo by Rob Bennetts. (ST)

American badger, photo by Sunny Walter.

Black-tailed jackrabbit, photo by Mike Schroeder. (SC)

White-tailed jackrabbit, photo by Doug Backlund. (SC)

Black-tailed deer, photo by Kelly McAllister.

Other species dependent on shrub-steppe habitat in Washington State are[7, 8, 9]:

Pygmy Rabbit (SE)

Northern Leopard Frog (SE)

Washington Ground Squirrel (SC)

As shown by the table and photo captions above, seven of these nine species are listed as state-endangered (2), -threatened (2), or as candidates for listing (3). Although the pygmy-rabbit (SE) was essentially extirpated in Washington, captive breeding and reintroduction continue in the effort to reestablish a viable population[10]. The Northern Leopard Frog (SE) is also on the brink, with the only known population in the state occurring in the Crab Creek drainage north of Moses Lake[8].

Space here does not permit display of maps showing the vital habitat concentration areas and migration corridors for all six focal species above but these critical areas are shown for the Greater Sage Grouse (ST) by Figure 9 and for the Sharp-tailed Grouse (ST) by Figure 10[6].

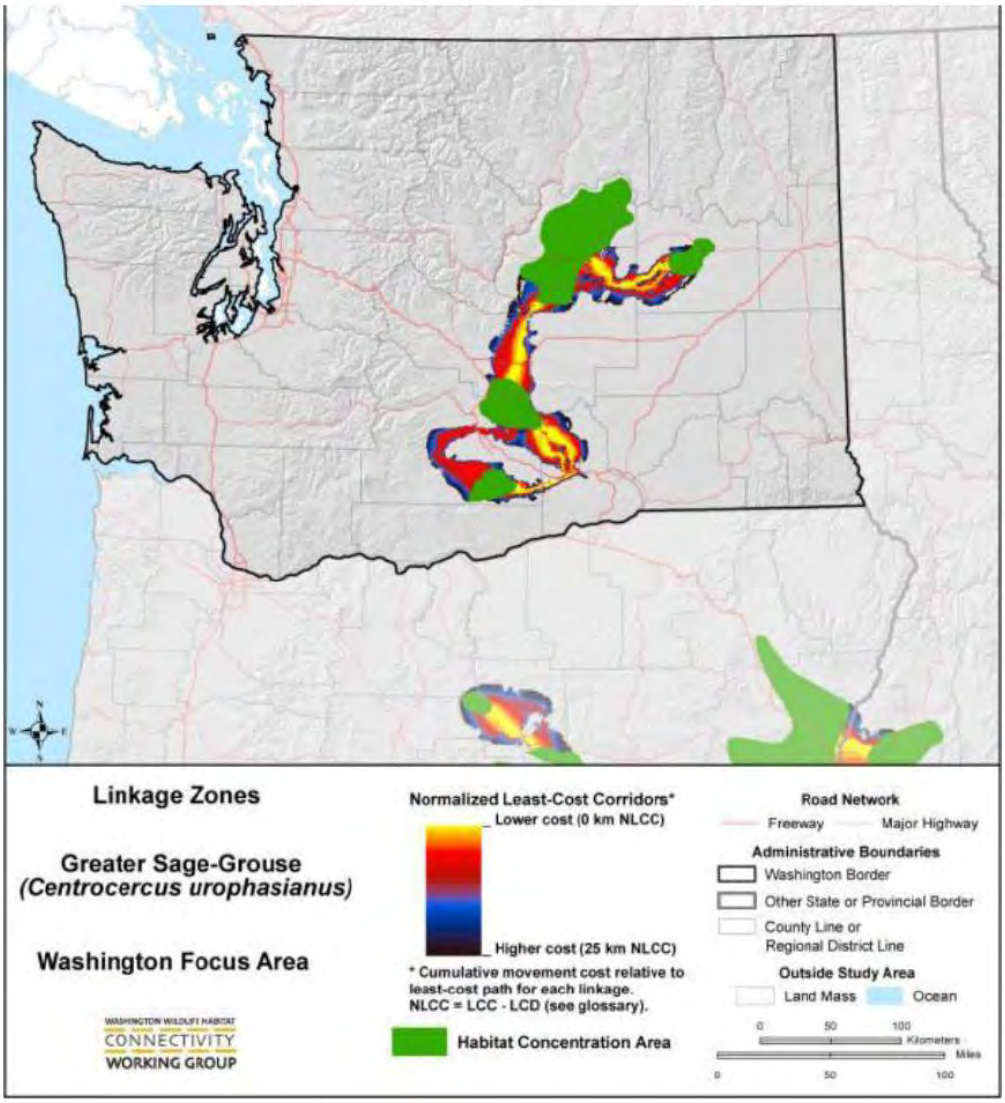

Figure 3.22. Greater Sage-Grouse linkages.

Figure 9 Greater Sage Grouse Habitat and Migration Corridors (Ref. 6)

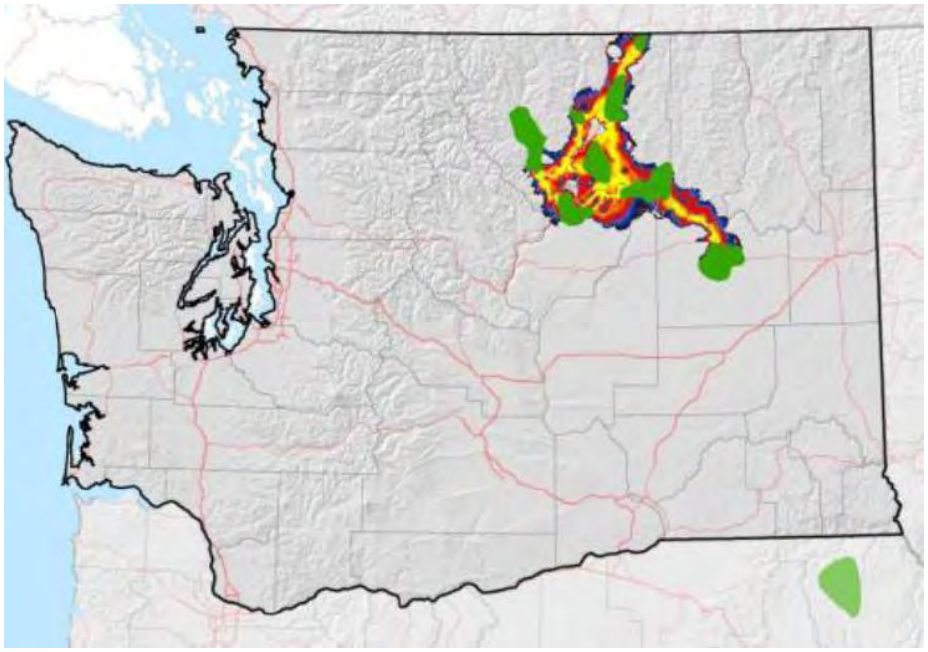

Figure 10 Sharp-tailed Grouse Habitat and Migration Corridors (Ref. 6)

The WDFW is making significant efforts to increase the populations of both Sharp-tailed and Grater Sage Grouse to viable levels[11, 12]. As shown by Figures 9 and 10 above, major habitat concentration areas for these species have significant overlap in Lincoln, Grant, and Douglas Counties (see also areas 2 and 3 of Figure 1, as well as Figure 2). As shown by Figure 9, other important shrub-steppe habitat for the Sage Grouse is located further south in Yakima and Benton Counties (area 5 of Figure 1), whereas from Figure 10 other important habitat areas for the Sharp-tailed Grouse are further north in Okanagan County (area 4 of Figure1).

The composite core habitat and corridor areas for the various focal species described above cover all existing shrub-steppe habitat shown by Figure 1. Continuing agricultural and related activities described in the following continue to impair and reduce the available habitat for these species, most of which are already at risk due primarily to past habitat loss.

Threats to the Remaining Shrub-steppe Ecosystem in Eastern Washington

As noted above, 98% of Washington shrub-steppe loss is attributed to agriculture[2], abetted by the massive Columbia Basin irrigation project. Examples of these threats are shown by the following photos: Figures 11-14 show shrub steppe removal and degradation due to conversion to cropland and to grazing, Figures 15-17 show 100-foot wide irrigation canals that form major wildlife barriers (the USBoR is currently proposing 50-100 miles of additional canals), and Figures 18 show wind farms that are becoming ubiquitous throughout eastern Washington.

Figure 11 Cropland Conversion—Rock Creek

Figure 12 Cropland Conversion and Water Diversion—Wilson Creek

Figure 13 Grazing Abuse—Near Rock Creek

Figure 14 Grazing Abuse—Near Wilson Creek

Figure 15 USBoR East Low Canal—N of Moses Lake

Figure 16 USBoR Main Canal—Pinto Dam at Billy Lake

Figure 17a USBoR—Weber Siphon near I-90

Figure 17b USBoR—Weber Siphon near I-90

Figure 17c USBoR—Weber Siphon at I-90

Figure 17d USBoR—Weber Siphon at I-90

Figure 18a—Wind Farm-near Walla Walla River

Figure 18b—Wind Farm-near Walla Walla River

REFERENCES

1. Shrub-steppe Ecology—Species and Ecosystem Science; WDFW (2010-from webpage)

2. Draft Fish and Wildlife Coordination Act Report For the Odessa Subarea Special Study; USFWS (2010)

3. Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats; Western Association of Fish and Wildlife Agencies (2004)

4. On the Trail of the Ice Age Floods; Bruce Bjornstad (2004)

5. The Worst Hard Time; Timothy Egan (2006)

6. Draft Washington Connected Landscapes Project: Statewide Analysis; WDFW (2010)

7. Draft Recovery Plan for the Columbia Basin Distinct Population Segment of the Pygmy Rabbit; USFWS (2007, 2005, 1995)

8. Washington State Status Report for the Northern Leopard Frog; WDFW (1999)

9. Occupancy Modeling and Detection of Washington Ground Squirrels; WDFW (2009)

10. Endangered pygmy rabbits return home; WDFW News Release (2007)

11. Draft Washington State Recovery Plan for the Columbian Sharp-tailed Grouse; WDFW (2010)

12. Washington State Recovery Plan for the Greater Sage-Grouse; WDFW (2004)