Appendix 10. Potential for Agriculture Conversion

REPORT

Prepared for the Oregon Sage-Grouse Action Plan

Potential Conversion to Agriculture Calculation

The purpose of this project is to identify, quantify and map areas of sage-grouse habitat that could be tilled/converted to agriculture. To accomplish this The Nature Conservancy created a "tillage risk model" (Evans 2014) that uses SSURGO soil, climate and topographic variables to estimate whether a certain piece of untilled ground could be or has the potential to be tilled. It does not look at water availability or current and potential infrastructure and thus does not estimate the *probability* or *likelihood* of tillage. The model was applied to the SageCon project area but restricted to those portions that contain SSURGO (Soil Survey Geographic database) data. The model requires the detailed information contained in SSURGO soil data. See map below labeled ***Spatial Extent of Soils Data (SSURGO)***.

The Model

The "tillage risk model" created by Jeffery Evans (Senior Landscape Ecologist with the Conservancy's North American Science Program) uses a Random Forest modeling approach (Breiman 2001) to identify, among the variables tested, those that have the greatest predictor value for what you are testing for. In this case we tested for tillage risk or agricultural potential and evaluated the following variables:

Topographic Variables

- Wetness Index [Compound Topographic Index which indicates both water availability and soil chemical and depositional characteristics.]
- Slope
- Aspect
- Relative Slope Position
- Elevation
- Topographic Solar-Radiation Index
- Topographic texture [Roughness]

Climate Variables

- Annual Dryness Index
- Number of degree days >5C
- Mean Annual Temperature
- Mean annual Precipitation

SSURGO Soil Variables

- Available Water Storage (4 depths – 0-25 cm, 0-50 cm, 0-100 cm, 0 – 150 cm)
- Bedrock Depth
- Drainage Class (2 characteristics – dominant condition and wettest condition)
- Flooding Frequency (2 characteristics - dominant condition and maximum flooding frequency)
- Hydric Classification Presence
- Hydrologic Group - Dominant Condition
- Irrigated Capability Class (2 Irrigated Capability Class - dominant condition and aggregate percent)
- Non-Irrigated Capability Class (2 Non-Irrigated Capability Class – dominant condition and aggregate percent)
- Ponding Frequency – (Presence)
- Slope Gradient (2 Slope Gradient - Dominant Component and weighted average)
- Water Table Depth (2 Annual – Minimum and April - June – Minimum)

We used NASS Cropland Data Layer (CDL) from 2007 – 2013 (US Department of Agriculture 2012, http://nassgeodata.gmu.edu/CropScape/) to identify existing agricultural land. An area weighted random sample of points was created for each SSURGO polygon within a county. Each sample point is identified as agriculture (based on NASS CDL) or not. Each variable's value is recorded at each sample point. These data are used to build a Random Forests model, and to extrapolate the model results to areas where tilled agriculture does not currently exist. Random Forest also identifies the variables that are most important for predicting where tilled agriculture could occur.

Within the SageCon planning area the variables that the model identified as most important for predicting where tillage could occur included, in order of importance:

1. Mean annual temperature
2. Number of degree days >5C
3. Mean annual precipitation
4. Annual dryness index
5. Surface roughness within a 27x27 pixel (30m) window
6. Available water storage (AWS) 0-50 cm, AWS 0-25 cm, AWS 0-100 cm, AWS 0-150 cm
7. Aspect
8. Slope
9. Relative slope position

Based on these variables **the model assigns to each 30 m pixel the probability of that pixel supporting agricultural development/tillage**.

Results

Again, the intent of the model is to identify risk associated with tillage on private land where tilled agriculture does not currently exist. The results were applied to all of the project area where SSURGO soil data are available (see map on page 4 labeled ***Spatial Extent of Soils Data (SSURGO)***).

A map of tillage potential was developed and summaries prepared that show for various geographies the number of untilled acres on **private land** based on their tillage potential. However, with the data available it is a challenge to identify currently tilled vs. untilled private agricultural land. We defined currently 'tilled' areas using two methods for combining agriculture classes derived by Johnson (2014) from NASS data. Johnson's classification includes:

- tilled crops – *these crops are always tilled*
- alfalfa – *these crops are usually tilled*
- non-alfalfa hay – *this class includes tilled and untilled pastures*
- orchard – *these crops are untilled*
- grassland pasture – *this class is untilled*
- non-agriculture – *all untilled*

These classes are mapped for the project area on the next page.

Our first definition of 'tilled' included the 'tilled crops' and 'alfalfa' classes (hereafter referred to as **Tilled Def. 1**). Our second definition included 'tilled crops', 'alfalfa', and 'non-alfalfa hay' (hereafter referred to as **Tilled Def. 2**).

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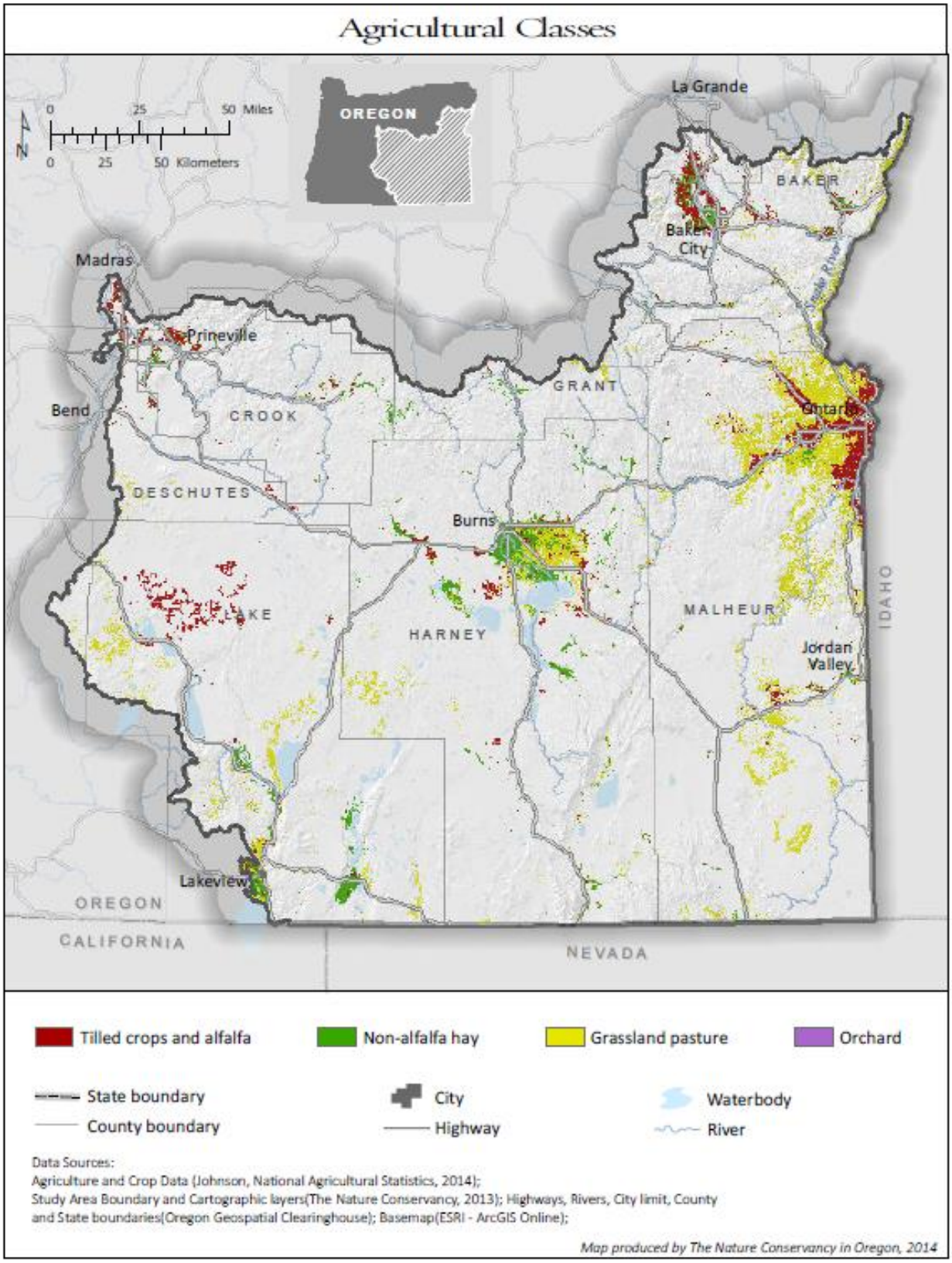

Agricultural Classes
OREGON
0 25 50 Miles
0 25 50 Kilometers
N
La Grande
BAKER
Baker City
Madras
Prineville
Bend
CROOK
GRANT
Ontario
DESCHUTES
Burns
LAKE
HARNEY
MALHEUR
IDAHO
Jordan Valley
Lakeview
OREGON
CALIFORNIA
NEVADA
Tilled crops and alfalfa
Non-alfalfa hay
Grassland pasture
Orchard
State boundary
County boundary
City
Highway
Waterbody
River
Data Sources:
Agriculture and Crop Data (Johnson, National Agricultural Statistics, 2014);
Study Area Boundary and Cartographic layers(The Nature Conservancy, 2013); Highways, Rivers, City limit, County and State boundaries(Oregon Geospatial Clearinghouse); Basemap(ESRI - ArcGIS Online);
Map produced by The Nature Conservancy in Oregon, 2014

Spatial Extent of Soils Data (SSURGO)

Data Sources:
Soil Data (USDA Natural Resources Conservation Service, Gridded Soil Survey Geographic Database for Oregon, 2014); Study Area Boundary and Cartographic layers(The Nature Conservancy, 2013); Highways, Rivers, City limit, County and State boundaries(Oregon Geospatial Clearinghouse);

Map created by The Nature Conservancy, September 2014

Tillage potential is classified into 4 categories (Table 1) based on the probabilities of tillage risk (probability ranges from 0 to 1) as modeled by Jeffrey Evans using topographic, soil, and climate variables (Evans 2014).

Following are tables summarizing the tillage potential related to sage grouse habitat and core areas in Southeast Oregon. **Tillage potential was defined for areas of private land which are currently untilled**. **All results are based on data only from Oregon, including the core area extents.**

Summaries are provided for:
Tillage potential on private untilled land in the project area (table 1)
Tillage potential on private untilled land within sage grouse cores (tables 2a, b, c),
Tillage potential on private untilled land in habitat[1] types within cores (tables 3a, b, and 4a, b),
Tillage potential on private untilled land in core areas compared to low density areas (tables 5a, b)
Tillage potential on private untilled land by county (within the project area) (tables 6 a, b, c)

Table 1 Tillage potential acres, as defined in the two methods described above, on private non-tilled land within the project area. Tillage potential is classified into 4 categories based on the probabilities of tillage risk (probability ranges from 0 to 1) as modeled by Jeffrey Evans using topographic, soil, and climate variables (Evans 2014).

Tillage potential	Probability of tillage risk	Acres *Tilled Def. 1*	Acres *Tilled Def. 2*	Additional acres when non-alfalfa hay is not included (Def. 1) as tilled area (Acres Def. 1 – Acres Def. 2)
4 - High	0.75 to 1.0	260,014	156,476	103,538
3 - Moderate	0.50 to 0.75	395,602	300,440	95,162
2 - Moderately low	0.25 to 0.50	480,543	413,097	67,445
1 - Low	0 to 0.25	2,453,744	2,397,669	56,075
Total		3,589,903	3,267,683	322,220

[1] Habitat types include areas of sage brush, and areas that have a high potential of being mesic summer habitat. Mesic summer habitat is estimated using areas identified as having an intermediate or high probability of mesic conditions during summer (NRCS Sage Grouse Initiative). Sagebrush habitat is defined using the Sage attribute in the LF_120_EVT (Land Fire Existing Vegetation Type).

See map ***Sage Grouse Core and Low Density Areas*** on page 8 to locate named cores and to see the extent of low density habitat (Tables 5a, b).

Tables 2a, b, c **Core** area summary, acres of each core area by tillage potential class, and percent of acres of each core area by tillage potential class. Areas of already tilled lands are defined using two methods: 1) **Tilled Def. 1:** tilled areas included tilled crops and alfalfa; 2) **Tilled Def. 2**: tilled areas include tilled crops, alfalfa, and not alfalfa hay.

Core Name	Acres in Core[2]	Acres of Core that are on private land that is not tilled		Acres of Core that has Tillage Potential info[3], and are on private land that is not tilled		% of Core that has Tillage Potential info, and are on private land that is not tilled	
		Acre, Tilled Def. 1	Acre, Tilled Def. 2	Acre, Tilled Def. 1	Acre, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2
12 Mile	441,739	252,331	239,766	3,534	3,534	0.8	0.8
Baker	336,406	209,091	202,481	208,506	202,014	62.0	60.1
Beatys	841,387	47,722	47,121	47,524	46,924	5.6	5.6
Brothers/N Wagontire	293,342	74,904	74,882	46,391	46,384	15.8	15.8
Bully Creek	279,718	67,261	66,329				
Burns	35,758	9,358	8,792	9,346	8,780	26.1	24.6
Cow Lakes	249,699	57,647	55,577				
Cow Valley	368,450	266,471	265,391	37,356	37,228	10.1	10.1
Crowley	490,888	79,983	79,675	19,044	18,912	3.9	3.9
Drewsey	368,568	136,600	125,488	128,505	117,690	34.9	31.9
Dry Valley/Jack Mountain	449,413	17,413	17,400	17,399	17,389	3.9	3.9
Folly Farm	165,333	23,126	22,930	18,323	18,128	11.1	11.0
Louse Canyon	672,441	10,536	10,270				
Picture Rock	42,591	4,037	4,033	3,871	3,867	9.1	9.1
Pueblos/S Steens	208,941	39,850	39,795	39,587	39,532	18.9	18.9
Saddle Butte	86,230						
Soldier Creek	295,477	20,587	19,848				
Steens	185,772	26,752	26,373	26,683	26,304	14.4	14.2
Trout Creeks	393,841	29,060	28,482	14,453	14,334	3.7	3.6
Tucker Hill	31,544	14,886	14,339	14,605	14,091	46.3	44.7
Warners	330,247	71,658	71,595	71,601	71,539	21.7	21.7

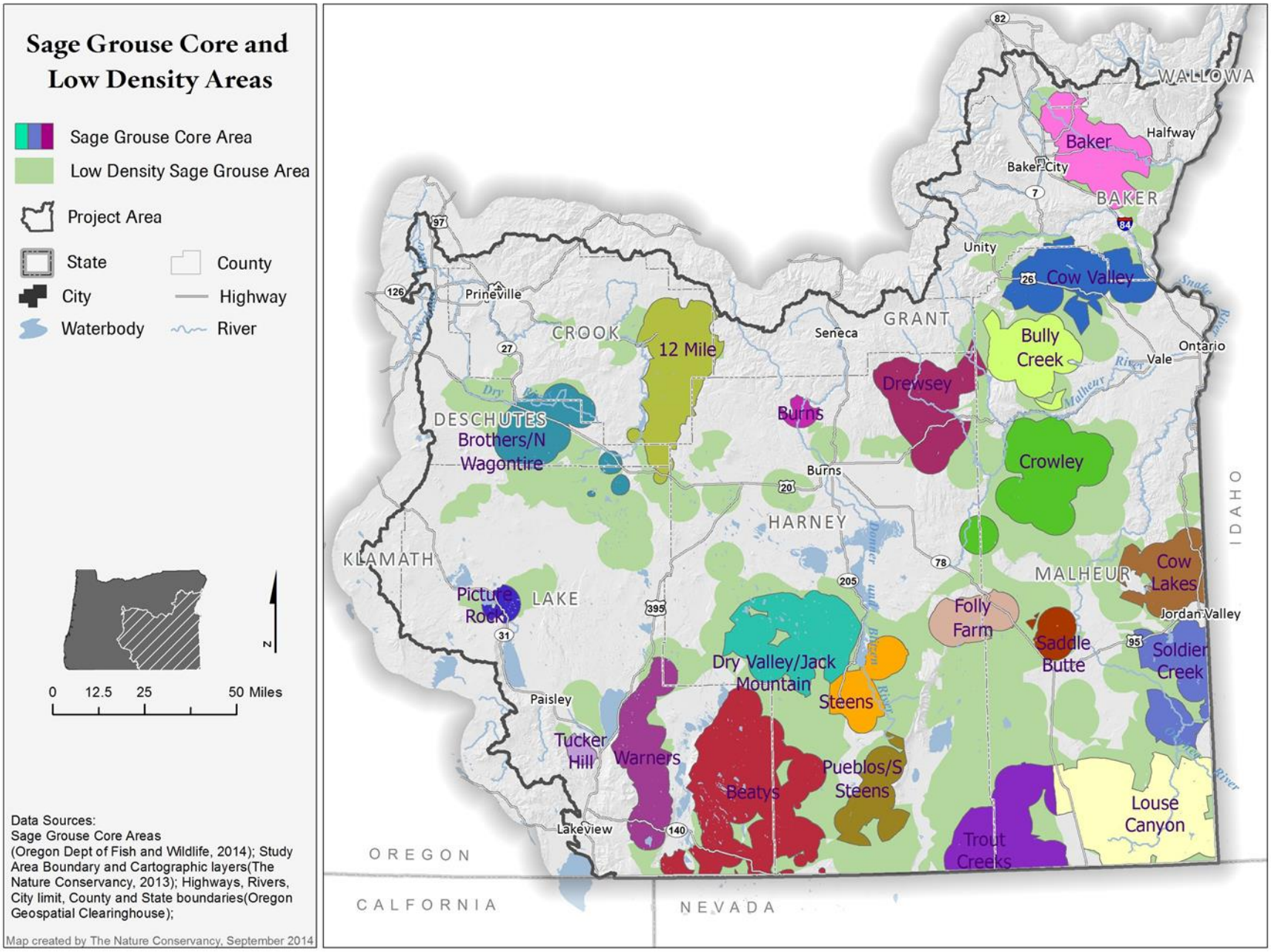
[2] Acres in Core = All acres within the core regardless of ownership and management status (all public land, all private land, all land in agriculture, etc.)
[3] Acres that have SSURG soil data.

Table 2b. Acres of each Core that are on private land and not tilled, by Tillage Potential class

Core Name	Acres in Core	Acres of each Core that are on private land and not tilled, by Tillage Potential class							
		4 - High		3 - Moderate		2 - Moderately Low		1 - Low	
		Acres Tilled Def. 1	Acres Tilled Def. 2	Acres Tilled Def. 1	Acres Tilled Def. 2	Acres Tilled Def. 1	Acres Tilled Def. 2	Acres Tilled Def. 1	Acres Tilled Def. 2
12 Mile	441,739	365.8	365.8	802.2	802.2	1,320.1	1,320.1	1,046.1	1,046.1
Baker	336,406	3,909.3	672.3	4,742.8	3,267.0	14,696.3	13,727.6	185,158.1	184,347.2
Beatys	841,387			112.3	110.1	4,977.2	4,863.1	42,434.3	41,951.0
Brothers/N Wagontire	293,342	3,877.0	3,877.0	26,323.8	26,317.6	15,099.1	15,098.2	1,090.8	1,090.8
Burns	35,758			8.9	7.8	731.0	565.3	8,606.0	8,207.3
Cow Valley	368,450	135.2	133.4	270.9	232.0	637.8	602.0	36,311.8	36,260.8
Crowley	490,888	6.7	2.2	104.1	69.6	488.4	414.3	18,444.8	18,425.4
Drewsey	368,568	439.5	103.4	4,667.8	1,543.6	9,365.9	4,109.2	114,031.9	111,933.4
Dry Valley/Jack Mountain	449,413			1.3	1.3	48.0	48.0	17,349.7	17,339.2
Folly Farm	165,333	10.5	4.2	304.7	193.7	350.3	292.4	17,657.5	17,637.3
Picture Rock	42,591	89.2	89.2	1,031.7	1,029.5	2,263.1	2,261.8	487.0	487.0
Pueblos/S Steens	208,941	0.9	0.4	22.5	11.3	137.7	130.3	39,425.7	39,389.7
Steens	185,772	5.6	3.6	172.8	120.5	604.0	552.2	25,900.1	25,627.9
Trout Creeks	393,841	0.2	0.2	3.8	2.9	133.4	93.6	14,316.0	14,237.5
Tucker Hill	31,544	19.6	14.5	1,528.3	1,331.9	7,368.8	7,102.6	5,688.0	5,642.4
Warners	330,247	0.4	0.4	176.6	176.6	4,848.0	4,846.2	66,576.2	66,516.1

Table 2c. Percent of Acres of each Core on private land and not tilled, by Tillage Potential class

Core Name	Acres in Core	Percent of Acres of each Core on private land and not tilled, by Tillage Potential class							
		4 - High		3 - Moderate		2 - Moderately Low		1 - Low	
		% Tilled Def. 1	% Tilled Def. 2	% Tilled Def. 1	% Tilled Def. 2	% Tilled Def. 1	% Tilled Def. 2	% Tilled Def. 1	% Tilled Def. 2
12 Mile	441,739	10.4	10.4	22.7	22.7	37.4	37.4	29.6	29.6
Baker	336,406	1.9	0.3	2.3	1.6	7.0	6.8	88.8	91.3
Beatys	841,387			0.2	0.2	10.5	10.4	89.3	89.4
Brothers/N Wagontire	293,342	8.4	8.4	56.7	56.7	32.5	32.6	2.4	2.4
Burns	35,758			0.1	0.1	7.8	6.4	92.1	93.5
Cow Valley	368,450	0.4	0.4	0.7	0.6	1.7	1.6	97.2	97.4
Crowley	490,888	0.0	0.0	0.5	0.4	2.6	2.2	96.9	97.4
Drewsey	368,568	0.3	0.1	3.6	1.3	7.3	3.5	88.7	95.1
Dry Valley/Jack Mountain	449,413			0.0	0.0	0.3	0.3	99.7	99.7
Folly Farm	165,333	0.1	0.0	1.7	1.1	1.9	1.6	96.4	97.3
Picture Rock	42,591	2.3	2.3	26.7	26.6	58.5	58.5	12.6	12.6
Pueblos/S Steens	208,941	0.0	0.0	0.1	0.0	0.3	0.3	99.6	99.6
Steens	185,772	0.0	0.0	0.6	0.5	2.3	2.1	97.1	97.4
Trout Creeks	393,841	0.0	0.0	0.0	0.0	0.9	0.7	99.0	99.3
Tucker Hill	31,544	0.1	0.1	10.5	9.5	50.5	50.4	38.9	40.0
Warners	330,247	0.0	0.0	0.2	0.2	6.8	6.8	93.0	93.0


Sage Grouse Core and Low Density Areas
Sage Grouse Core Area
Low Density Sage Grouse Area
Project Area
State
County
City
Highway
Waterbody
River
0 12.5 25 50 Miles
N
Data Sources:
Sage Grouse Core Areas
(Oregon Dept of Fish and Wildlife, 2014); Study Area Boundary and Cartographic layers(The Nature Conservancy, 2013); Highways, Rivers, City limit, County and State boundaries(Oregon Geospatial Clearinghouse);
Map created by The Nature Conservancy, September 2014
WALLOWA
Baker
Halfway
Baker City
BAKER
Unity
Cow Valley
Prineville
CROOK
12 Mile
Seneca
GRANT
Bully Creek
Ontario
Vale
Drewsey
Burns
DESCHUTES
Brothers/N Wagontire
Crowley
Burns
HARNEY
IDAHO
KLAMATH
MALHEUR
Cow Lakes
Jordan Valley
Picture Rock
LAKE
Folly Farm
Saddle Butte
Soldier Creek
Dry Valley/Jack Mountain
Steens
Paisley
Tucker Hill
Warners
Pueblos/S Steens
Beatys
Louse Canyon
Lakeview
Trout Creeks
OREGON
CALFORNIA
NEVADA

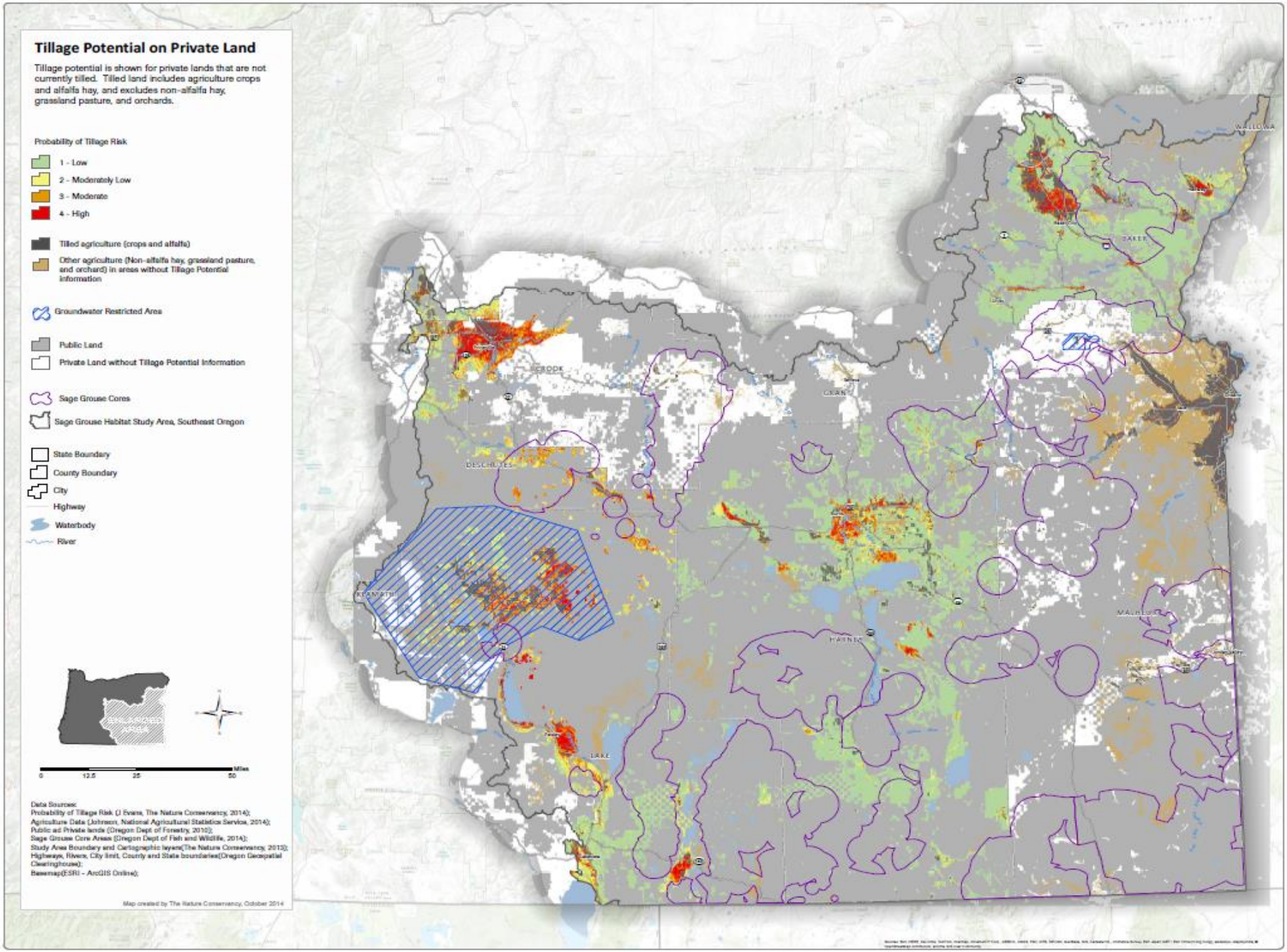

Tillage Potential on Private Land
Tillage potential is shown for private lands that are not currently tilled. Tilled land includes agriculture crops and alfalfa hay, and excludes non-alfalfa hay, grassland pasture, and orchards.
Probability of Tillage Risk
1 - Low
2 - Moderately Low
3 - Moderate
4 - High
Tilled agriculture (crops and alfalfa)
Other agriculture (Non-alfalfa hay, grassland pasture, and orchard) in areas without Tillage Potential information
Groundwater Restricted Area
Public Land
Private Land without Tillage Potential Information
Sage Grouse Cores
Sage Grouse Habitat Study Area, Southeast Oregon
State Boundary
County Boundary
City
Highway
Waterbody
River
0
12.5
25
50
Miles
Data Sources:
Probability of Tillage Risk (J Evans, The Nature Conservancy, 2014);
Agriculture Data (Johnson, National Agricultural Statistics Service, 2014);
Public ad Private lands (Oregon Dept of Forestry, 2010);
Sage Grouse Core Areas (Oregon Dept of Fish and Wildlife, 2014);
Study Area Boundary and Cartographic layers(The Nature Conservancy, 2013);
Highways, Rivers, City limit, County and State boundaries(Oregon Geospatial Clearinghouse);
Basemap(ESRI - ArcGIS Online);
Map created by The Nature Conservancy, October 2014
WALLOWA
BAKER
CROOK
GRANT
DESCHUTES
KLAMATH
HARNEY
MALHEUR
LAKE

Table 3a & b Summary of **habitat** (sage and mesic summer habitat combined) and **habitat type** summaries. Areas of already tilled lands are defined using two methods: 1) **Tilled Def. 1:** tilled areas included tilled crops and alfalfa; 2) **Tilled Def. 2**: tilled areas include tilled crops, alfalfa, and not alfalfa hay.

Core Name	Acres of Core	Acres of habitat (combined) in the Core	Habitat Type	Acres of habitat type in the Core	Acres of habitat (combined) in the core, on private non-tilled land		Acres of habitat type in the Core, on private non-tilled land	
					Acre, Tilled Defn 1	Acre, Tilled Defn 2	Acre, Tilled Defn 1	Acre, Tilled Defn 2
12 Mile	441,739	356,523	1 - Sagebrush	346,248	2,886	2,886	2,879	2,879
			2 - Mesic	10,049			7	7
			3 - Both	226				
Baker	336,406	199,981	1 - Sagebrush	177,547	113,726	107,650	102,936	102,878
			2 - Mesic	21,568			10,228	4,249
			3 - Both	866			562	523
Beatys	841,387	766,122	1 - Sagebrush	756,896	721,936	722,424	714,147	714,190
			2 - Mesic	6,638			5,445	5,866
			3 - Both	2,589			2,344	2,367
Brothers/N Wagontire	293,342	265,482	1 - Sagebrush	265,415	44,485	44,479	44,479	44,478
			2 - Mesic	63			41	46
			3 - Both	4			0	0
Bully Creek	279,718	190,305	1 - Sagebrush	184,588				
			2 - Mesic	5,392				
			3 - Both	325				
Burns	35,758	20,337	1 - Sagebrush	18,606	5,569	5,023	4,226	4,218
			2 - Mesic	1,434			322	829
			3 - Both	297			231	200
Cow Lakes	249,699	172,737	1 - Sagebrush	170,472				
			2 - Mesic	2,254				
			3 - Both	11				
Cow Valley	368,450	242,773	1 - Sagebrush	232,085	18,791	18,700	18,391	18,372
			2 - Mesic	10,168			390	318
			3 - Both	520			10	10
Crowley	490,888	374,115	1 - Sagebrush	370,904	15,857	15,727	14,928	14,926
			2 - Mesic	2,832			805	678
			3 - Both	379			124	123
Drewsey	368,568	209,775	1 - Sagebrush	193,231	82,630	72,854	68,652	68,403
			2 - Mesic	14,719			12,423	10,684
			3 - Both	1,825			1,555	1,047
Dry Valley/Jack Mountain	449,413	401,799	1 - Sagebrush	401,470	388,624	388,625	388,455	388,456

Core Name	Acres of Core	Acres of habitat (combined)	Habitat Type	Acres of habitat type in the Core	Acres of habitat (combined) in the core, on private non-tilled land		Acres of habitat type in the Core, on private non-tilled land	
			2 - Mesic	329			169	169
Folly Farm	165,333	73,881	1 - Sagebrush	69,726	43,656	43,824	41,341	41,350
			2 - Mesic	3,736			2,131	2,291
			3 - Both	419			183	183
Louse Canyon	672,441	622,738	1 - Sagebrush	622,642				
			2 - Mesic	94				
			3 - Both	2				
Picture Rock	42,591	28,325	1 - Sagebrush	27,898	2,241	2,239	1,867	1,866
			2 - Mesic	427			374	373
			3 - Both	0			0	0
Pueblos/S Steens	208,941	118,234	1 - Sagebrush	114,984	97,318	97,366	96,529	96,533
			2 - Mesic	2,468			1,734	1,696
			3 - Both	781			599	592
Saddle Butte	86,230	38,800	1 - Sagebrush	38,800				
Soldier Creek	295,477	224,403	1 - Sagebrush	224,245				
			2 - Mesic	159				
Steens	185,772	95,958	1 - Sagebrush	91,018	82,148	82,480	79,612	79,640
			2 - Mesic	4,213			2,385	2,657
			3 - Both	728			151	182
Trout Creeks	393,841	304,633	1 - Sagebrush	302,404	8,463	8,348	7,803	7,801
			2 - Mesic	1,855			485	381
			3 - Both	374			175	166
Tucker Hill	31,544	22,576	1 - Sagebrush	21,613	9,912	9,540	9,134	9,108
			2 - Mesic	885			715	376
			3 - Both	78			63	56
Warners	330,247	278,686	1 - Sagebrush	271,663	223,868	223,923	222,124	222,126
			2 - Mesic	5,928			1,451	1,501
			3 - Both	1,096			292	295

Table 3b. Percent of Habitat and Habitat Types on private land in Cores with tillage potential data.

		Habitat (Combined)			Habitat Type		
Core Name	Habitat Type	% of Core that is Habitat (combined)	% of Habitat in Core that has Tillage Potential Info and that is on private non-tilled land, that is Habitat Type. Tilled Defn 1	% of Habitat in Core that has Tillage Potential Info and that is on private non-tilled land that is Habitat Type. Tilled Defn 2	% of Habitat (combined) in Core that is Habitat Type	% of Habitat in Core that has Tillage Potential Info and that is on private non-tilled land, that is Habitat Type. Tilled Defn 1	% of Habitat in Core that has Tillage Potential Info and that is on private non-tilled land that is Habitat Type. Tilled Defn 2
12 Mile	1 - Sagebrush	80.7	0.8	0.8	97.1	99.8	99.8
	2 - Mesic				2.8	0.2	0.2
	3 - Both				0.1		
Baker	1 - Sagebrush	59.4	56.9	51.4	88.8	90.5	95.6
	2 - Mesic				10.8	9.0	3.9
	3 - Both				0.4	0.5	0.5
Beatys	1 - Sagebrush	91.1	94.2	93.2	98.8	98.9	98.9
	2 - Mesic				0.9	0.8	0.8
	3 - Both				0.3	0.3	0.3
Brothers/N Wagontire	1 - Sagebrush	90.5	16.8	16.8	100.0	100.0	100.0
	2 - Mesic				0.0	0.1	0.1
	3 - Both				0.0	0.0	0.0
Bully Creek	1 - Sagebrush	68.0			97.0		
	2 - Mesic				2.8		
	3 - Both				0.2		
Burns	1 - Sagebrush	56.9	27.4	20.7	91.5	75.9	84.0
	2 - Mesic				7.1	5.8	16.5
	3 - Both				1.5	4.2	4.0
Cow Lakes	1 - Sagebrush	69.2			98.7		
	2 - Mesic				1.3		
	3 - Both				0.0		
Cow Valley	1 - Sagebrush	65.9	7.7	7.6	95.6	97.9	98.2
	2 - Mesic				4.2	2.1	1.7
	3 - Both				0.2	0.1	0.1
Crowley	1 - Sagebrush	76.2	4.2	4.0	99.1	94.1	94.9
	2 - Mesic				0.8	5.1	4.3
	3 - Both				0.1	0.8	0.8
Drewsey	1 - Sagebrush	56.9	39.4	32.6	92.1	83.1	93.9
	2 - Mesic				7.0	15.0	14.7
	3 - Both				0.9	1.9	1.4
Dry Valley/Jack	1 - Sagebrush	89.4	96.7	96.7	99.9	100.0	100.0

		Habitat (Combined)			Habitat Type		
Core Name	Habitat Type	% of Core that is Habitat (combined)	% of Habitat in Core that has Tillage Potential Info and that is on private non-tilled land, that is Habitat Type. Tilled Defn 1	% of Habitat in Core that has Tillage Potential Info and that is on private non-tilled land that is Habitat Type. Tilled Defn 2	% of Habitat (combined) in Core that is Habitat Type	% of Habitat in Core that has Tillage Potential Info and that is on private non-tilled land, that is Habitat Type. Tilled Defn 1	% of Habitat in Core that has Tillage Potential Info and that is on private non-tilled land that is Habitat Type. Tilled Defn 2
Mountain	2 - Mesic				0.1	0.0	0.0
Folly Farm	1 - Sagebrush	44.7	59.1	56.0	94.4	94.7	94.4
	2 - Mesic				5.1	4.9	5.2
	3 - Both				0.6	0.4	0.4
Louse Canyon	1 - Sagebrush	92.6			100.0		
	2 - Mesic				0.0		
	3 - Both				0.0		
Picture Rock	1 - Sagebrush	66.5	7.9	6.6	98.5	83.3	83.3
	2 - Mesic				1.5	16.7	16.6
	3 - Both				0.0	0.0	0.0
Pueblos/S Steens	1 - Sagebrush	56.6	82.3	81.6	97.3	99.2	99.1
	2 - Mesic				2.1	1.8	1.7
	3 - Both				0.7	0.6	0.6
Saddle Butte	1 - Sagebrush	45.0			100.0		
Soldier Creek	1 - Sagebrush	75.9			99.9		
	2 - Mesic				0.1		
Steens	1 - Sagebrush	51.7	85.6	83.0	94.9	96.9	96.6
	2 - Mesic				4.4	2.9	3.2
	3 - Both				0.8	0.2	0.2
Trout Creeks	1 - Sagebrush	77.3	2.8	2.6	99.3	92.2	93.4
	2 - Mesic				0.6	5.7	4.6
	3 - Both				0.1	2.1	2.0
Tucker Hill	1 - Sagebrush	71.6	43.9	40.3	95.7	92.2	95.5
	2 - Mesic				3.9	7.2	3.9
	3 - Both				0.3	0.6	0.6
Warners	1 - Sagebrush	84.4	80.3	79.7	97.5	99.2	99.2
	2 - Mesic				2.1	0.6	0.7
	3 - Both				0.4	0.1	0.1

Table 4a & b Summary of **habitat** (sage and mesic summer habitat combined) and **habitat type** by tillage potential. Areas of already tilled lands are defined using two methods: 1) **Tilled Def. 1:** tilled areas included tilled crops and alfalfa; 2) **Tilled Def. 2**: tilled areas include tilled crops, alfalfa, and not alfalfa hay.

Core Name	Habitat Type	Acres by Tillage Potential, by Habitat Type in Core on private untilled land								Total Acres, all Tillage Potential class combined	
		4 - High		3 - Moderate		2 - Moderately Low		1 - Low			
		Acre, Tilled Def. 1	Acre, Tilled Def. 2	Acre, Tilled Def. 1	Acre, Tilled Def. 2	Acre, Tilled Def. 1	Acre, Tilled Def. 2	Acre, Tilled Def. 1	Acre, Tilled Def. 2	Acre, Tilled Def. 1	Acre, Tilled Def. 2
12 Mile	1 - Sagebrush	314	314	647	647	1,161	1,161	757	757	2,879	2,879
	2 - Mesic							7	7	7	7
12 Mile Total		314	314	647	647	1,161	1,161	764	764	2,886	2,886
Baker	1 - Sagebrush	103	102	1,325	1,323	6,618	6,605	94,891	94,849	102,936	102,878
	2 - Mesic	3,605	397	2,039	623	1,883	1,051	2,701	2,178	10,228	4,249
	3 - Both	7	4	47	41	153	141	355	336	562	523
Baker Total		3,715	503	3,412	1,987	8,653	7,798	97,947	97,363	113,726	107,650
Beatys	1 - Sagebrush			44	44	4,262	4,260	37,492	37,451	41,798	41,754
	2 - Mesic			6	4	126	34	953	627	1,085	665
	3 - Both			1	1	15	11	225	207	242	218
Beatys Total				50	48	4,404	4,304	38,670	38,285	43,124	42,637
Brothers/N Wagontire	1 - Sagebrush	3,782	3,782	25,405	25,404	14,227	14,227	1,065	1,065	44,479	44,478
	2 - Mesic			5	0	1	0	0	0	6	1
	3 - Both					0	0			0	0
Brothers/N Wagontire Total		3,782	3,782	25,410	25,405	14,228	14,228	1,065	1,065	44,485	44,479
Burns	1 - Sagebrush					95	92	4,131	4,126	4,226	4,218
	2 - Mesic			7	6	461	317	644	283	1,112	605
	3 - Both			0	0	70	57	161	143	231	200
Burns Total				7	6	626	465	4,936	4,552	5,569	5,023
Cow Valley	1 - Sagebrush	18	18	47	47	169	169	18,156	18,137	18,391	18,372
	2 - Mesic	46	45	87	51	111	84	146	138	390	318
	3 - Both	2	2	3	3	3	3	2	2	10	10
Cow Valley Total		66	64	137	102	284	256	18,304	18,278	18,791	18,700
Crowley	1 - Sagebrush			15	15	113	113	14,799	14,798	14,928	14,926
	2 - Mesic	7	2	76	42	306	233	417	401	805	678
	3 - Both			6	6	32	32	85	85	124	123
Crowley Total		7	2	97	63	451	379	15,302	15,284	15,857	15,727
Drewsey	1 - Sagebrush	34	33	572	556	1,830	1,751	66,215	66,063	68,652	68,403
	2 - Mesic	330	32	3,288	377	5,813	1,083	2,993	1,912	12,423	3,404
	3 - Both	15	2	153	59	576	342	811	644	1,555	1,047
Drewsey Total		380	67	4,012	992	8,219	3,176	70,019	68,619	82,630	72,854

Core Name	Habitat Type	Acres by Tillage Potential, by Habitat Type in Core on private untilled land								Total Acres, all Tillage Potential class combined	
		4 - High		3 - Moderate		2 - Moderately Low		1 - Low			
		Acre, Tilled Def. 1	Acre, Tilled Def. 2	Acre, Tilled Def. 1	Acre, Tilled Def. 2	Acre, Tilled Def. 1	Acre, Tilled Def. 2	Acre, Tilled Def. 1	Acre, Tilled Def. 2	Acre, Tilled Def. 1	Acre, Tilled Def. 2
Dry Valley/Jack Mountain	1 - Sagebrush					21	21	12,719	12,718	12,740	12,739
	2 - Mesic			1	1	4	4	144	144	150	150
Dry Valley/Jack Mountain Total				1	1	25	25	12,864	12,862	12,890	12,889
Folly Farm	1 - Sagebrush			5	5	37	30	4,562	4,560	4,604	4,595
	2 - Mesic	10	4	288	179	218	180	935	928	1,451	1,292
	3 - Both			4	4	18	18	188	188	210	210
Folly Farm Total		10	4	297	188	272	229	5,685	5,676	6,265	6,097
Picture Rock	1 - Sagebrush	53	53	615	614	1,099	1,099	101	101	1,867	1,866
	2 - Mesic	2	2	7	7	216	215	149	149	374	373
	3 - Both					0	0			0	0
Picture Rock Total		54	54	622	622	1,315	1,313	250	250	2,241	2,239
Pueblos/S Steens	1 - Sagebrush			0	0	22	22	18,326	18,323	18,348	18,345
	2 - Mesic	1	0	22	11	95	88	1,616	1,596	1,734	1,696
	3 - Both					6	6	593	587	599	592
Pueblos/S Steens Total		1	0	22	11	123	116	20,535	20,506	20,682	20,634
Steens	1 - Sagebrush			2	2	255	254	10,917	10,890	11,174	11,146
	2 - Mesic	6	4	158	107	234	191	1,425	1,249	1,823	1,551
	3 - Both			9	8	24	21	544	517	577	545
Steens Total		6	4	169	117	514	466	12,886	12,656	13,574	13,243
Trout Creeks	1 - Sagebrush			1	1	12	12	7,790	7,788	7,803	7,801
	2 - Mesic	0	0	3	2	88	50	394	329	485	381
	3 - Both			0	0	18	16	157	149	175	166
Trout Creeks Total		0	0	4	3	118	79	8,341	8,267	8,463	8,348
Tucker Hill	1 - Sagebrush	7	7	837	830	4,558	4,549	3,732	3,721	9,134	9,108
	2 - Mesic	7	3	265	113	362	193	80	68	715	376
	3 - Both	0	0	6	4	28	23	29	28	63	56
Tucker Hill Total		15	10	1,107	947	4,949	4,765	3,841	3,817	9,912	9,540
Warners	1 - Sagebrush	0	0	120	120	3,640	3,639	45,735	45,734	49,496	49,494
	2 - Mesic			8	8	251	251	4,213	4,163	4,472	4,422
	3 - Both			2	2	28	28	774	771	804	801
Warners Total		0	0	129	129	3,919	3,918	50,723	50,669	54,771	54,717

4 b. % Tillage Potential, for Habitat Type in Core on Private Untilled Land

Core Name	Habitat Type	% Tillage Potential, by Habitat Type in Core on private untilled land							
		4 - High		3 - Moderate		2 - Moderately Low		1 - Low	
		%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2
12 Mile	1 - Sagebrush	10.9	10.9	22.5	22.5	40.3	40.3	26.3	26.3
	2 - Mesic							100.0	100.0
12 Mile Total		10.9	10.9	22.4	22.4	40.2	40.2	26.5	26.5
Baker	1 - Sagebrush	0.1	0.1	1.3	1.3	6.4	6.4	92.2	92.1
	2 - Mesic	35.3	3.9	19.9	6.1	18.4	10.3	26.4	21.3
	3 - Both	1.2	0.8	8.4	7.3	27.1	25.1	63.2	59.8
Baker Total		3.3	0.4	3.0	1.7	7.6	6.9	86.1	85.6
Beatys	1 - Sagebrush			0.1	0.1	10.2	10.2	89.7	89.6
	2 - Mesic			0.5	0.3	11.6	3.1	87.8	57.8
	3 - Both			0.5	0.5	6.3	4.4	93.3	85.5
Beatys Total				0.1	0.1	10.2	10.0	89.7	88.8
Brothers/N Wagontire	1 - Sagebrush	8.5	8.5	57.1	57.1	32.0	32.0	2.4	2.4
	2 - Mesic			80.8	7.7	15.4	3.8	3.8	3.8
	3 - Both					100.0	100.0		
Brothers/N Wagontire Total		8.5	8.5	57.1	57.1	32.0	32.0	2.4	2.4
Burns	1 - Sagebrush					2.2	2.2	97.8	97.6
	2 - Mesic			0.6	0.5	41.5	28.5	57.9	25.4
	3 - Both			0.1	0.1	30.5	24.6	69.4	61.7
Burns Total				0.1	0.1	11.2	8.4	88.6	81.7
Cow Valley	1 - Sagebrush	0.1	0.1	0.3	0.3	0.9	0.9	98.7	98.6
	2 - Mesic	11.9	11.5	22.2	13.2	28.5	21.4	37.4	35.4
	3 - Both	15.6	15.6	28.9	28.9	31.1	31.1	24.4	24.4
Cow Valley Total		0.4	0.3	0.7	0.5	1.5	1.4	97.4	97.3

Core Name	Habitat Type	% Tillage Potential, by Habitat Type in Core on private untilled land							
		4 - High		3 - Moderate		2 - Moderately Low		1 - Low	
		%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2
Crowley	1 - Sagebrush			0.1	0.1	0.8	0.8	99.1	99.1
	2 - Mesic	0.8	0.3	9.4	5.2	38.0	29.0	51.8	49.8
	3 - Both			5.2	4.8	26.0	25.7	68.8	68.4
Crowley Total		0.0	0.0	0.6	0.4	2.8	2.4	96.5	96.4
Drewsey	1 - Sagebrush	0.1	0.0	0.8	0.8	2.7	2.6	96.5	96.2
	2 - Mesic	2.7	0.3	26.5	3.0	46.8	8.7	24.1	15.4
	3 - Both	1.0	0.1	9.8	3.8	37.0	22.0	52.2	41.4
Drewsey Total		0.5	0.1	4.9	1.2	9.9	3.8	84.7	83.0
Dry Valley/Jack Mountain	1 - Sagebrush					0.2	0.2	99.8	99.8
	2 - Mesic			0.9	0.9	2.8	2.8	96.3	96.1
Dry Valley/Jack Mountain Total				0.0	0.0	0.2	0.2	99.8	99.8
Folly Farm	1 - Sagebrush			0.1	0.1	0.8	0.7	99.1	99.0
	2 - Mesic	0.7	0.3	19.8	12.3	15.0	12.4	64.4	64.0
	3 - Both			2.0	2.0	8.6	8.6	89.4	89.3
Folly Farm Total		0.2	0.1	4.7	3.0	4.3	3.6	90.7	90.6
Picture Rock	1 - Sagebrush	2.8	2.8	32.9	32.9	58.9	58.9	5.4	5.4
	2 - Mesic	0.5	0.5	2.0	1.9	57.7	57.4	39.9	39.9
	3 - Both					100.0	100.0		
Picture Rock Total		2.4	2.4	27.8	27.7	58.7	58.6	11.1	11.1
Pueblos/S Steens	1 - Sagebrush			0.0	0.0	0.1	0.1	99.9	99.9
	2 - Mesic	0.1	0.0	1.3	0.6	5.5	5.1	93.2	92.0
	3 - Both					1.0	0.9	99.0	98.0
Pueblos/S Steens Total		0.0	0.0	0.1	0.1	0.6	0.6	99.3	99.2

Core Name	Habitat Type	% Tillage Potential, by Habitat Type in Core on private untilled land							
		4 - High		3 - Moderate		2 - Moderately Low		1 - Low	
		%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2
Steens	1 - Sagebrush			0.0	0.0	2.3	2.3	97.7	97.5
	2 - Mesic	0.3	0.2	8.7	5.9	12.8	10.5	78.2	68.6
	3 - Both			1.5	1.3	4.2	3.6	94.3	89.6
Steens Total		0.0	0.0	1.2	0.9	3.8	3.4	94.9	93.2
Trout Creeks	1 - Sagebrush			0.0	0.0	0.2	0.2	99.8	99.8
	2 - Mesic	0.0	0.0	0.6	0.4	18.1	10.4	81.3	67.9
	3 - Both			0.1	0.1	10.0	9.1	89.8	85.4
Trout Creeks Total		0.0	0.0	0.0	0.0	1.4	0.9	98.6	97.7
Tucker Hill	1 - Sagebrush	0.1	0.1	9.2	9.1	49.9	49.8	40.9	40.7
	2 - Mesic	1.0	0.4	37.1	15.8	50.7	27.0	11.2	9.5
	3 - Both	0.4	0.4	8.8	6.3	44.9	36.8	46.0	44.6
Tucker Hill Total		0.2	0.1	11.2	9.6	49.9	48.1	38.8	38.5
Warners	1 - Sagebrush	0.0	0.0	0.2	0.2	7.4	7.4	92.4	92.4
	2 - Mesic			0.2	0.2	5.6	5.6	94.2	93.1
	3 - Both			0.2	0.2	3.5	3.5	96.3	95.9
Warners Total		0.0	0.0	0.2	0.2	7.2	7.2	92.6	92.5

Table 5a & b Acres and Percentage of all **core area, and all low density area**, for the project area and by tillage potential class. Areas of already tilled lands are defined using two methods: 1) **Tilled Def. 1:** tilled areas included tilled crops and alfalfa; 2) **Tilled Def. 2**: tilled areas include tilled crops, alfalfa, and not alfalfa hay.

Area Type	Acre	Acres of Area Type which is on private land and not tilled		Acres of Area Type with Tillage Potential information that is on private land that is not tilled		Percent of Area Type with Tillage Potential information that is on private land that is not tilled	
		Acres, Tilled Def. 1	Acres, Tilled Def. 2	Acres, Tilled Def. 1	Acres, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2
Core Area	7,297	1,459,273	1,420,566	706,727	686,651	48.4	48.3
Low Density	5,825	998,271	977,152	626,433	610,259	62.8	62.5

Table 5b.

Area Type	Acres of Core and Low Density Habitat on Private Land and not Tilled, by Tillage Potential class									
	4 - High		3 - Moderate		2 - Moderately Low		1 - Low		All Classes	All Classes
	Acres, Tilled Def. 1	Acres, Tilled Def. 2	Acres, Tilled Def. 1	Acres, Tilled Def. 2	Acres, Tilled Def. 1	Acres, Tilled Def. 2	Acres, Tilled Def. 1	Acres, Tilled Def. 2	Acres, Tilled Def. 1	Acres, Tilled Def. 2
Core Area	8,860	5,267	40,274	35,218	63,069	56,027	594,524	590,139	706,727	686,651
Low Density	9,250	6,197	37,590	32,919	55,401	51,655	524,191	519,489	626,433	610,259
Total Acres	18,110	11,464	77,865	68,136	118,471	107,682	1,118,715	1,109,628	1,333,161	1,296,910
%Core Area	0.49	0.46	0.52	0.52	0.53	0.52	0.53	0.53	0.53	0.53
% Low Density	0.51	0.54	0.48	0.48	0.47	0.48	0.47	0.47	0.47	0.47

Table 6a, b, and c **County** summary, acres of each county by tillage potential class, and percent of acres of each county by tillage potential class. Areas of already tilled lands are defined using two methods: 1) **Tilled Def. 1:** tilled areas included tilled crops and alfalfa; 2) **Tilled Def. 2**: tilled areas include tilled crops, alfalfa, and not alfalfa hay.

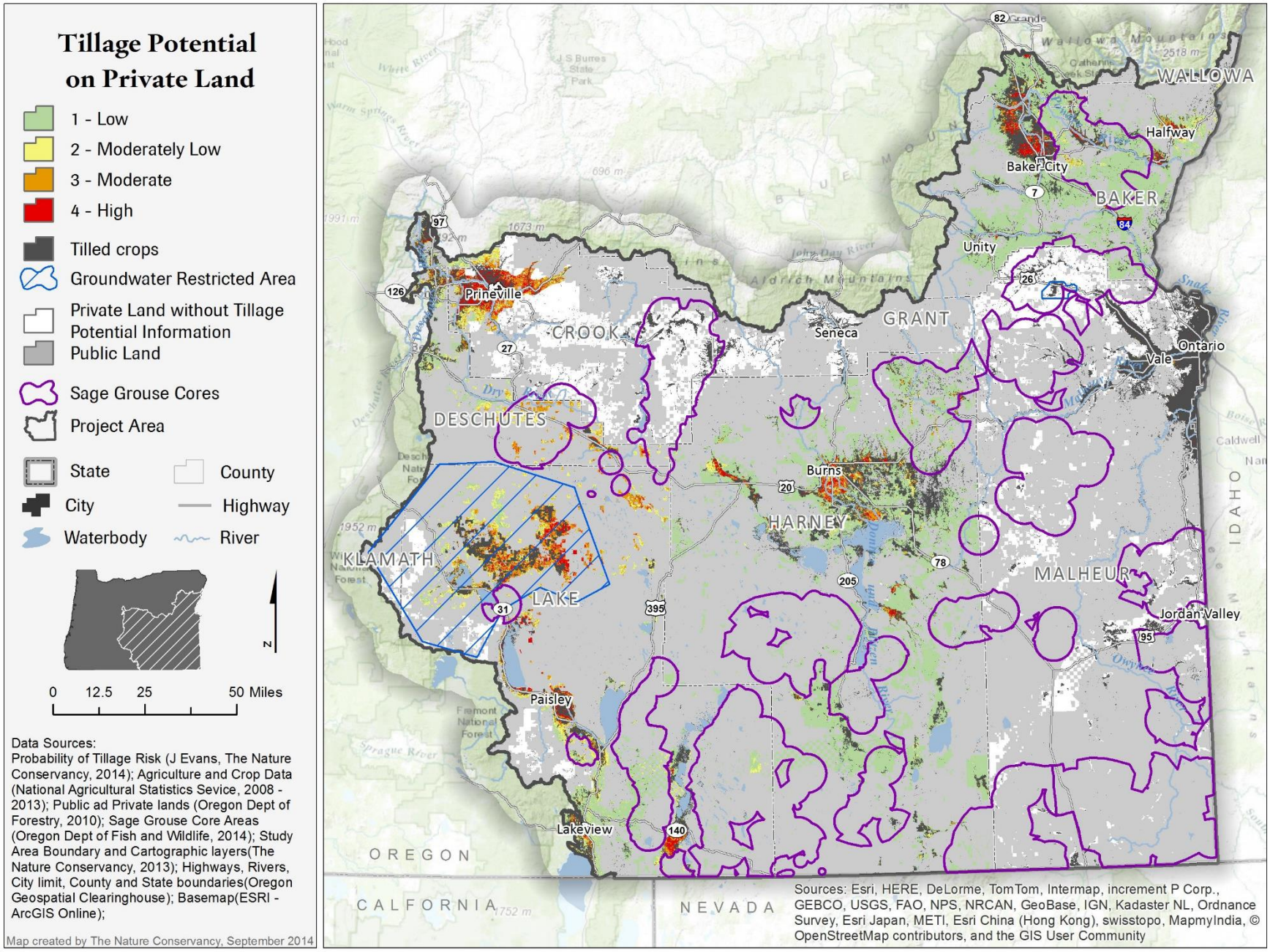
County	Acre	Acres of the county that is private land that is not tilled		Acres of County with Tillage Potential Information	Acres of County with Tillage Potential information that is on private land that is not tilled		% of the county that is private land that is not tilled		% of County with Tillage Potential Information	% of County with Tillage Potential information that is on private land that is not tilled	
		Acres, Tilled Def. 1	Acres, Tilled Def. 2		Acres, Tilled Def. 1	Acres, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2		%, Tilled Def. 1	%, Tilled Def. 2
Baker	1,967,133	879,233	813,715	1,894,957	870,370	805,078	44.7	41.4	96.3	45.9	42.5
Crook	1,854,245	893,544	859,619	231,258	162,807	146,620	48.2	46.4	12.5	70.4	63.4
Deschutes	861,065	162,181	157,239	633,043	161,240	156,307	18.8	18.3	73.5	25.5	24.7
Grant	746,022	223,262	207,240	56	8	8	29.9	27.8	0.0	13.5	13.5
Harney	6,545,177	1,497,011	1,339,464	5,905,262	1,466,003	1,309,851	22.9	20.5	90.2	24.8	22.2
Jefferson	72,649	28,330	26,983	70,320	28,102	26,755	39.0	37.1	96.8	40.0	38.0
Klamath	111,469	26,978	26,978	141			24.2	24.2	0.1		
Lake	4,677,467	933,128	862,572	4,025,921	748,399	678,346	19.9	18.4	86.1	18.6	16.8
Malheur	6,348,253	1,129,455	1,106,396	219,423	32,900	32,613	17.8	17.4	3.5	15.0	14.9
Union	204,627	120,721	112,731	190,746	119,852	111,881	59.0	55.1	93.2	62.8	58.7
Wallowa	35,023	719	719	26,033	209	209	2.1	2.1	74.3	0.8	0.8
Wheeler	56,728	522	522				0.9	0.9			
Total	23,479,858	5,895,084	5,514,177	13,197,160	3,589,889	3,267,669	25.1	23.5	56.2	27.2	24.8

Table 6b. Acres of Each County on Private Untilled Land, by Tillage Potential Class

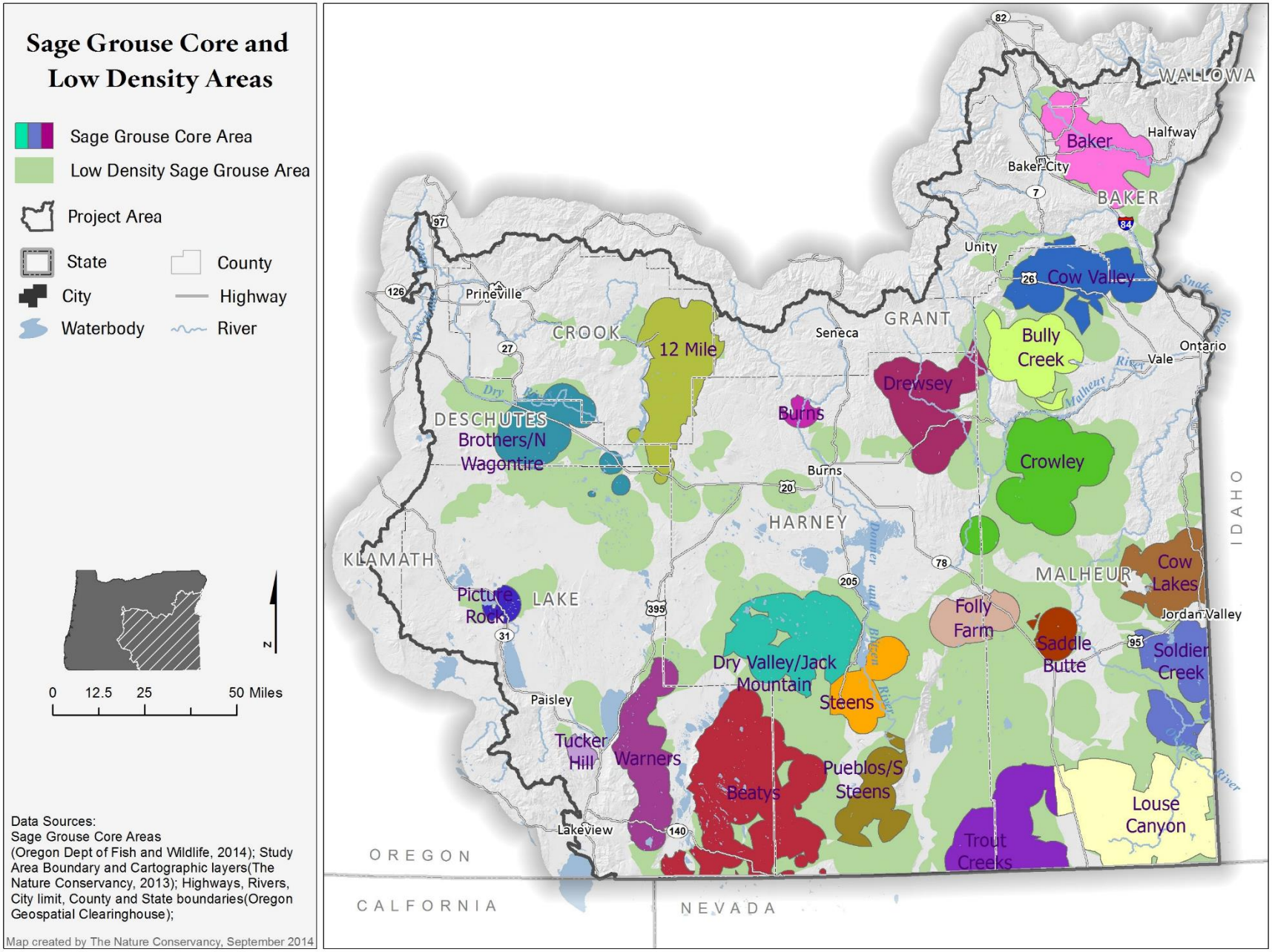
County	Acres of each County on Private Untilled Land, by Tillage Potential class									
	4 - High		3 - Moderate		2 - Moderately Low		1 - Low		All Classes	All Classes
	Acres, Tilled Def. 1	Acres, Tilled Def. 2	Acres, Tilled Def. 1	Acres, Tilled Def. 2	Acres, Tilled Def. 1	Acres, Tilled Def. 2	Acres, Tilled Def. 1	Acres, Tilled Def. 2	Acres, Tilled Def. 1	Acres, Tilled Def. 2
Baker	46,453	12,557	38,834	20,287	57,194	49,741	727,890	722,493	870,370	805,278
Crook	65,640	51,879	57,579	55,715	31,887	31,428	7,700	7,598	162,807	146,620
Deschutes	8,476	7,930	49,507	47,212	57,652	56,029	45,605	45,136	161,240	156,307
Grant							8	8	8	8
Harney	33,280	4,011	68,129	18,346	98,300	59,853	1,266,294	1,227,642	1,466,003	1,309,852
Jefferson	1,167	774	3,539	2,937	9,015	8,759	14,380	14,285	28,102	26,755
Lake	85,354	63,240	161,705	141,877	209,611	192,195	291,729	281,034	748,399	678,346
Malheur	14,848	14,666	10,885	10,798	5,379	5,362	1,789	1,787	32,900	32,613
Union	4,728	1,351	5,303	3,148	11,473	9,698	98,347	97,684	119,852	111,881
Wallowa	57	57	120	120	32	32	1	1	209	209
Klamath							-	-	-	-

Table 6c. Percent of Acres of Each County on Private Untilled Land, by Tillage Potential Class

County	Percent of acres of each County that is on private land and not tilled, by Tillage Potential class							
	4 - High		3 - Moderate		2 - Moderately Low		1 - Low	
	%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2	%, Tilled Def. 1	%, Tilled Def. 2
Baker	15.76	58.29	30.93	59.21	46.67	53.67	43.97	44.30
Crook	56.03	70.90	72.95	75.39	62.92	63.84	61.52	62.34
Deschutes	22.48	24.03	22.60	23.69	24.82	25.54	27.67	27.96
Grant							13.55	13.55
Harney	9.82	81.44	19.79	73.51	38.58	63.37	21.86	22.55
Jefferson	13.31	20.06	23.00	27.71	44.91	46.23	44.32	44.62
Lake	29.38	39.65	22.64	25.80	15.34	16.73	14.56	15.11
Malheur	8.69	8.80	30.23	30.48	57.81	57.98	31.61	31.64
Union	10.83	37.88	23.77	40.05	49.55	58.61	67.16	67.62
Wallowa	1.58	1.58	1.55	1.55	0.39	0.39	0.01	0.01
Klamath								


Tillage Potential on Private Land
1 - Low
2 - Moderately Low
3 - Moderate
4 - High
Tilled crops
Groundwater Restricted Area
Private Land without Tillage Potential Information
Public Land
Sage Grouse Cores
Project Area
State
County
City
Highway
Waterbody
River
N
0 12.5 25 50 Miles
Data Sources:
Probability of Tillage Risk (J Evans, The Nature Conservancy, 2014); Agriculture and Crop Data (National Agricultural Statistics Sevice, 2008 - 2013); Public ad Private lands (Oregon Dept of Forestry, 2010); Sage Grouse Core Areas (Oregon Dept of Fish and Wildlife, 2014); Study Area Boundary and Cartographic layers(The Nature Conservancy, 2013); Highways, Rivers, City limit, County and State boundaries(Oregon Geospatial Clearinghouse); Basemap(ESRI - ArcGIS Online);
Map created by The Nature Conservancy, September 2014
WALLOWA
BAKER
GRANT
CROOK
DESCHUTES
HARNEY
MALHEUR
KLAMATH
LAKE
IDAHO
OREGON
CALFORNIA
NEVADA
Halfway
Baker City
Unity
Prineville
Seneca
Ontario
Vale
Burns
Jordan Valley
Paisley
Lakeview
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

See map ***Sage Grouse Core and Low Density Areas*** on page 8 to locate named cores and to see the extent of low density habitat (Table 5).



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APPENDIX

Data Sets Used for Mapping and Modeling

Data Type	Data Source	Associated Variables	Description	Publication Year(s)
Agriculture	NASS CLD (National Agricultural Statistics Service – Crop Data Layer)	Acres in agricultural production	All agricultural crops	2007 - 2013
		Acres in agricultural production but largely untilled	Other Hay/Non Alfalfa agricultural crop type	2013
Climate	PRISM (Parameter-elevation Regressions on Independent Slopes Model) - PRISM Climate Group, Oregon State University	Number of degree days>5C	Degree-days are determined by subtracting the mean temperature (max+min/2). Each degree that a day's mean temperature is below or above a reference temperature is counted a one degree-day.	2014
		Annual Dryness Index	Square root of the number of degree days >5C divided by mean annual precipitation	
		Mean Annual Temperature		
		Mean Annual Precipitation		
Topography	Digital Elevation Model	Compound Topographic Index	Wetness Index which indicates both water availability and soil chemical and depositional characteristics	2012
		Slope		
		Aspect		
		Relative Slope Position	The relative landform position of a given pixel within a hillslope landform.	
		Elevation		

Data Type	Data Source	Associated Variables	Description	Publication Year(s)
		Topographic Solar-Radiation Index	This transformation assigns a value of zero to land oriented in a north-northeast direction, (typically the coolest and wettest orientation), and a value of one on the hotter, dryer south-westerly slopes. The result is a continuous variable between 0 - 1	
		Topographic texture [Roughness]	A metric that indicates complexity of an elevations surface within a 3x3 and 27x27 window.	
Soils	Soil Survey Geographic database	Available Water Storage at four depths (0-25cm, 0-50cm, 0-100cm, 0-150cm)	The volume of water that the soil, to a depth of 25, 50, 100, and 150 cm, can store that is available to plants.	2014
		Bedrock Depth		
		Drainage Class: a) dominant condition, b) wettest condition	The natural drainage condition of the soil refers to the frequency and duration of wet periods. A) the dominant drainage class for the unit is based on composition percentage of each map unit component. B) the wettest drainage class is assigned to an individual component of the map unit whose composition in the map unit is equal to or exceeds 15%	
		Flooding Frequency	A) The dominant flood frequency class for the map unit and B) the highest probability class assigned to an individual component of the map unit.	
		Hydric Classification Presence	An indication of the proportion of the map unit that is in the “hydric” class.	
		Irrigated Capability Class: Dominant Condition, and Aggregate Percent.	The broadest category in the land capability classification system for soils. This attribute displays the dominant capability class, under irrigated conditions, for the map unit based on	

Data Type	Data Source	Associated Variables	Description	Publication Year(s)
			composition percentage of all components in the map unit.	
		Non-Irrigated Capability Class: Dominant Condition, and Aggregate Percent	Same as above except under non-irrigated conditions.	
		Ponding Frequency	Percentage of the map unit that is subject to water being ponded on the soil surface.	
		Slope Gradient	Elevation between two points, expressed as a percentage of the distance between those points.	
		Water Table Depth	Annual minimum and April – June minimum	
Sage-grouse habitat	LANDFIRE 2010	Sage brush habitat	Sage brush mapped as present or absent in a 30 meter grid.	2010
	Donnelly (in review), Sage Grouse Initiative	Mesic habitat	Data estimates annual probability of mesic condition (i.e. likelihood of site to provide food resources to sage-grouse during late brood rearing, August-September) within delineated summer habitat sites. Low probability sites are more sensitive to climate variability, productive during periods of higher soil moister (wet years). Conversely, high probability wetlands indicate increased resiliency during dryer years. Probabilities are assigned to classes as follows: low <5/10 years productive; intermediate = ≥5 to <8/10 years productive; high = ≥8/10 years productive." TNC included the high and intermediate probability classes in our habitat mapping.	2014