

# West-Wide Wind Mapping Project

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*Project Report*

**Environmental Science Division**



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Robert Sullivan

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## *Project Report*

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## NOTATION

The following is a list of the acronyms, abbreviations, and units of measure used in this report. Some acronyms used only in tables may be defined only in those tables.

### ACRONYMS AND ABBREVIATIONS

ACEC	Area of Critical Environmental Concern
Argonne	Argonne National Laboratory
BLM	Bureau of Land Management
CDCA	California Desert Conservation Area
CHAT	Crucial Habitat Assessment Tool (Western Governors' Association)
DFA	Development Focus Area
DoD	U.S. Department of Defense
DRECP	Desert Renewable Energy Conservation Plan
ESA	Endangered Species Act
GHMA	General Habitat Management Area
GIS	geographic information system
HLSC	high level of siting considerations
ID	identification
MLSC	moderate level of siting considerations
NGO	non-governmental organization
NLCS	National Landscape Conservation System
NPS	National Park Service
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NSBP	National Scenic Byways Program
PEIS	Programmatic Environmental Impact Statement
PHMA	Priority Habitat Management Area
Project	West-Wide Wind Mapping Project
RETI	Renewable Energy Transmission Initiative (California)
RMBO	Rocky Mountain Bird Observatory
RMP	Resource Management Plan



ROD	Record of Decision
ROW	right-of-way
SFA	Sagebrush Focal Area
SRMA	Special Recreation Management Area
TWS	The Wilderness Society
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRM	Visual Resources Management
WGA	Western Governors' Association
Wind Mapper	Wind Energy Environmental Mapper

#### **UNITS OF MEASURE**

km <sup>2</sup>	square kilometer(s)
m	meter(s)
mi	mile(s)
s	second(s)

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## EXECUTIVE SUMMARY

The U.S. Department of the Interior's Bureau of Land Management (BLM) is evaluating the potential for wind energy development on public lands across 11 western states (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming), including an assessment of potential resource sensitivities. The BLM Wind Energy Program specifies which BLM-administered lands are potentially available for wind energy development and which are excluded from wind energy development for various reasons.

BLM's 2005 *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States* (Wind PEIS) and the associated Record of Decision (ROD) identified BLM-administered lands in the same 11 western states that would be excluded from wind development. Since 2005, numerous land use plan revisions and amendments (most notably the land use planning effort for the greater sage grouse and the *Desert Renewable Energy Conservation Plan*) have changed the boundaries of the excluded lands. BLM policy has also changed with respect to certain exclusions. As a result, maps of wind energy development exclusions prepared as part of the Wind PEIS are no longer accurate.

Through subsequent state-level efforts, the BLM has identified additional BLM-administered lands that may be suitable for wind energy development. However, because of environmental and other sensitivities, proposed wind energy development projects on these lands are anticipated to have more extensive siting considerations. These evaluations have not been incorporated into any national-level maps, nor have they been assessed at the national level for consistency in approach.

The West-Wide Wind Mapping Project (Project) identified and mapped BLM-administered lands in the 11 western states that currently would be excluded from wind development on the basis of decisions made in the Wind PEIS ROD, subsequent policy and land use plan amendments, and potential policy changes. Wind energy development exclusions on BLM-administered lands as mapped in this Project include lands in the National Landscape Conservation System; lands inventoried and managed for wilderness characteristics; Areas of Critical Environmental Concern; selected ecological, cultural, recreational, and visual resource areas; and areas with potentially incompatible land uses, such as BLM-designated wind exclusion areas. The Project was conducted by the BLM National Renewable Energy Coordination Office with assistance from Argonne National Laboratory.

The Project further identified additional BLM-administered lands with potentially developable wind resources<sup>1</sup> where the presence of certain environmental resources or land use restrictions may require more extensive consideration of proposed wind energy projects. These lands are described and mapped as lands having a high level of siting considerations (HLSC) and as lands having a moderate level of siting considerations (MLSC).

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<sup>1</sup> In this Project, lands with wind speeds greater than 5 m/s at a hub height of 80 m are considered to be potentially developable.

HLSC lands are BLM-administered lands where the presence of certain environmental resources or land use restrictions is likely to require greater consideration of potential impacts to resources and existing uses when the BLM, other federal or state agencies, or stakeholders conduct siting reviews. MLSC lands are BLM-administered lands where the presence of certain environmental resources or land use restrictions is likely to require a moderate consideration of potential impacts to resources and existing uses in siting reviews. Other BLM-administered lands with potentially developable wind resources do not have known environmental resources or land use restrictions that are likely to require more extensive consideration in siting reviews. The degree of consideration of the potential impacts to resources and existing uses for lands identified as HLSC/MLSC is related to the sensitivity of those lands' associated resources and existing uses to wind energy development.

This Project shares information about potential issues that may be associated with developing wind energy on BLM-administered lands. This information may be used to evaluate future development opportunities and challenges; however, it should not be used to replace or predict specific outcomes of project-specific reviews.

# 1 INTRODUCTION

## 1.1 NEED AND PURPOSE FOR STUDY

The U.S. Department of the Interior's Bureau of Land Management (BLM) has an active Wind Energy Development Program that specifies which BLM-administered lands are potentially available for wind energy development and which are excluded from wind energy development for various reasons, including environmental constraints. The *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States* (Wind PEIS) identified BLM-administered lands in 11 western states that would be excluded from wind development and evaluated associated land use plan amendments (BLM 2005a). The Record of Decision (ROD) for the Wind PEIS amended 52 land use plans in 9 western states to implement BLM's wind energy development program (BLM 2005b).

In the almost 11 years since the issuance of the Wind PEIS ROD in 2005, numerous land use plan revisions and amendments have changed the boundaries of the excluded lands. BLM policy has also changed with respect to certain exclusions. As a result, maps of wind energy development exclusions prepared as part the Wind PEIS are no longer accurate.

Updated maps of wind energy development exclusions and environmental sensitivities are needed to inform BLM land use planning activities. The West-Wide Wind Mapping Project (Project) was undertaken to identify and map BLM-administered lands in the 11 western states that would currently be excluded from wind development on the basis of decisions made in the Wind PEIS and subsequent policy and land use plan amendments and potential policy changes, and, further, to identify additional BLM-administered lands that might have more extensive siting considerations resulting from the presence of sensitive resources or potentially incompatible land uses. This Project shares information about potential issues that may be associated with developing wind energy on BLM-administered lands. This information may be used to evaluate future development opportunities and challenges; however, it should not be used to replace or predict specific outcomes of project-specific reviews.

The Project was conducted by the BLM National Renewable Energy Coordination Office with assistance from Argonne National Laboratory (Argonne).

## 1.2 BACKGROUND

The Wind PEIS ROD specified that the BLM would not issue right-of-way (ROW) authorizations for wind energy development on lands on which wind energy development is incompatible with specific resource values. Lands excluded from wind energy development include designated areas that are part of the National Landscape Conservation System (NLCS) (e.g., Wilderness Areas, Wilderness Study Areas, National Monuments, National Conservation Areas, Wild and Scenic Rivers, and National Historic and Scenic Trails) and Areas of Critical Environmental Concern (ACECs). In addition to these blanket exclusions, certain areas were

excluded within individual field offices in order to protect specific resources or uses (e.g., specific viewsheds, military training areas, and special management areas). The ROD also stated that additional areas of land might be excluded from wind energy development on the basis of findings of resource impacts that cannot be mitigated and/or conflicts with existing and planned multiple-use activities or land use plans. Subsequent to issuance of the ROD, in 2008, the BLM issued a Wind Energy Development Policy (Instruction Memorandum 2009-043) (BLM 2008) that updated decisions issued in the ROD to ensure BLM-wide consistency in the processing and management of wind energy ROWs. Among other things, this policy reversed the blanket exclusion for ACECs.

Lands excluded from wind energy development in the ROD were identified in maps issued as part of the Wind PEIS. Since 2005, state-specific land use plan revisions and amendments (most notably the land use planning effort for the greater sage-grouse [BLM 2015a, 2015b] and the *Desert Renewable Energy Conservation Plan* [BLM 2015c, 2016]) have resulted in new land use designations and adjustments to existing land use designations, thus changing the boundaries of lands excluded from wind energy development as described in the Wind PEIS. As a result, the maps of wind energy development exclusion areas prepared as part of the Wind PEIS (found in Appendix B of the PEIS) are no longer accurate.

Through separate state-level efforts, the BLM has also identified additional lands that may be suitable for wind energy development, given the presence of potentially developable wind resources. However, because of environmental and other concerns, they should be considered sensitive in terms of wind energy development. These evaluations have not been incorporated into any national-level maps, nor have they been assessed at the national level for consistency in approach.

The Project provides updated maps of wind energy development exclusion and environmentally sensitive areas. The maps and associated geospatial datasets will be updated periodically to maintain accuracy in the future (see Section 5 for a discussion of updates).

### 1.3 SCOPE

The geographic scope of the Project was limited to BLM-administered lands in the following 11 western states:

- Arizona
- California
- Colorado
- Idaho
- Montana
- Nevada
- New Mexico
- Oregon
- Utah

- Washington
- Wyoming

BLM-administered lands in Alaska and the eastern United States were not included in the Project, nor were lands owned or administered by agencies or parties other than the BLM. Because wind energy development is not feasible without sufficient wind energy resources, the maps and associated geospatial data are further limited to BLM-administered lands with an average annual wind speed of 5 m/s or greater at a hub height of 80 m.

#### **1.4 INTENDED USE AND USERS**

The Project maps, report, and selected geospatial data are publicly available through the Project website at <http://wwmp.anl.gov>. In addition, the geospatial data are available for viewing on the *Wind Energy Environmental Mapper (Wind Mapper)* website at <http://windmapper.anl.gov>. The maps and data may be useful to BLM and other federal agency staff, the wind energy industry, environmental organizations, Native American tribes, and other stakeholders interested in wind energy development on BLM-administered public lands. The information is anticipated to be useful for broad-scale wind energy development planning. It may be useful for other purposes but is subject to important limitations that may affect its suitability for various uses (see Section 2.3, Data Limitations).

#### **1.5 DOCUMENT ORGANIZATION**

The remainder of this document is divided into four sections followed by three appendices. Section 2 presents the main tasks undertaken for the Project and the analytical methods used. Section 3 presents the study results, including current regional and state wind energy exclusion and sensitivity maps and acreages estimates. Section 4 discusses the content and capabilities of *Wind Mapper*, an online interactive geospatial data viewer for the Project, as well as the Project website; and Section 5 discusses future updates to Project maps and data. Appendix A lists the energy facility siting studies consulted in a literature review. Appendix B lists all of the geospatial data sources used in the Project, and Appendix C is the Public Comment Summary Document that summarizes the public comments on the project provided by stakeholders.

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## 2 TASKS AND METHODS

### 2.1 LITERATURE AND DATA REVIEW

The West-Wide Wind Mapping Project included an initial literature review of 17 existing studies conducted by federal agencies (including the BLM), state agencies, nongovernmental organizations (NGOs), or multi-state collaborative groups (as of April 2014) that identified potential renewable energy and electric transmission development constraints within a geographic scope primarily confined to the 11 conterminous western states in which the BLM administers a significant amount of land (see Appendix A). The studies were used to develop a list of potentially sensitive environmental resources and conflicting land uses to consider in the Project. A summary of the results of the literature review is presented in Section 3.1 of this report.

### 2.2 DATA GATHERING, PROCESSING, AND ANALYSIS

The Project included the (1) identification of classes of excluded and potentially sensitive resources, (2) acquisition of geospatial data representing those classes, and (3) compilation of the acquired data into uniform layers of information covering the 11 western states. The BLM and a number of other federal agencies and NGOs contributed geospatial data for the Project.

Data acquisition and processing tasks included the following:

1. *Data acquisition and inventory.* The BLM Washington Office acted as point of contact to initiate data calls and upload the data collected from the 11 BLM state offices to a cloud-based data storage system. The data were then downloaded by Argonne and entered into the Project data inventory, where each individual dataset was classified according to its sensitivity class and given a source identification (ID) generated by the inventory system. Questions from Argonne regarding proper classification of the data were reconciled by the BLM Washington Office in coordination with the respective state office(s).
2. *Evaluation of data geometry and attributes.* Data geometry and data type were evaluated for quality and usability by Argonne geographic information system (GIS) analysts. Point data or line data (which contain no area) were rejected for use or were used to develop polygons based on setback distances recommended by the BLM Washington Office. Attributes of the data were also checked to ensure that all features were classified correctly.
3. *Combining of data of the same sensitivity class into one layer.* Based on data type and attributes, Argonne GIS analysts used the appropriate GIS tools to combine the individual datasets into single layers representing individual sensitivity classes (e.g., Designated Critical Habitat for Endangered Species

Act [ESA]-Listed Species). Where possible, standard attributes were maintained and source IDs from the Argonne inventory were carried through as attributes of each feature in the final compiled layer.

4. *Reconciling topological errors.* The topology of each final compiled layer was checked, and errors (where features which should be mutually exclusive overlap) were fixed.
5. *Writing metadata for compiled layers.* Metadata were written for each compiled layer with a focus on identifying the individual sources used in the compilation.
6. *Map production.* Regional and individual state maps of wind energy development exclusion and sensitive areas were developed in various formats, including Adobe Acrobat PDF files.
7. *Acreage calculation.* Estimates of the amount of BLM-administered lands as mapped with respect to potentially developable wind resources, exclusions, and expected level of siting considerations were calculated by state using the GIS.

In addition to excluded or sensitive resource areas, other important data layers used in the Project included average annual wind speed and surface management agency. These layers were used to define the geographic scope of the Project based on the suitability of the wind resource and to limit the study to BLM-administered lands. The wind speed data were purchased from AWS Truepower, LLC; wind speeds at 80 m above ground level were used in the analyses.

Additional geospatial data, such as hydrography and state and field office boundaries, were used for reference purposes and were obtained from a variety of sources. Appendix B provides a complete listing of data types used in the Project and the sources of these data.

## 2.3 DATA LIMITATIONS

Several important limitations and assumptions apply to the Project that must be carefully considered when interpreting the classes of exclusions and potentially sensitive resources that have been mapped:

- *Incomplete coverage.* The Project has attempted to assemble all geospatial data pertaining to potentially sensitive resources across all 11 western states. Certain classes of data may be incomplete in some areas. Data will be added to complete Project coverage as it is received or created.
- *Differences in data resolution.* The Project is intended for use in broad-scale wind energy development planning and is not suitable for siting individual projects. Some of the data included have a resolution as low as 1 km<sup>2</sup>.

- *Technical and other constraints.* Wind energy project siting involves other considerations beyond wind energy resources and compatible land uses. For example, proximity to suitable electric transmission is an important wind energy siting criterion. Generally, available transmission is limited, and while several transmission projects that might provide suitable transmission capacity for new wind projects are planned, whether or not they will actually be constructed is unknown. A predictive analysis for electric transmission is beyond the scope of the Project. Other considerations not examined in the Project include, but are not limited to, access to suitable roads and slope. Similarly, there are economic factors that dictate wind energy project planning and siting strategies, and these factors are also not included.
- *Lack of cultural and tribal data.* Inherently, some cultural resources data and data regarding tribal concerns for specific locations are either unavailable in geospatial format, are sensitive and cannot be publicly released, or both. Currently, the displayable cultural resources data include properties listed on the National Register of Historic Places (NRHP) (publicly available locations only); National Historic Landmarks; National Historic Parks, National Historic Sites, National Historic Trails; and ACECs, some of which may have been designated for cultural values.
- *Project-specific factors.* When a specific project is proposed for a specific location on public lands, it triggers surveys and impact assessments that may uncover previously unidentified resources that lead to more extensive siting reviews (e.g., a cultural or ecological resources survey) and, in some cases, exclusion of the project location from development. In the case of ecological resources, many areas on BLM-administered lands have not been surveyed for these resources or have not been surveyed recently or to current standards. Because the Project is not examining issues of siting individual wind projects, it is not possible to account for significant resources that may be present on these lands.

## 2.4 STAKEHOLDER INPUT

On September 16, 2014, the BLM hosted a stakeholder outreach meeting to present information on the West-Wide Wind Mapping Project and to solicit feedback. The information presented in this meeting was made available to the general public for comment and review. Many stakeholders provided valuable comments during the meeting; written comments were received from seven stakeholder groups:

- American Wind Energy Association;
- Clark County, Nevada, Department of Aviation;
- Southern Nevada Water Authority;
- South-West Department of Defense Regional Coordination Team;

- The Nature Conservancy;
- The Wilderness Society on behalf of itself and 15 other NGOs; and
- World Wildlife Fund.

Most commenters supported the idea of renewable energy development on public land and made additional comments and recommendations on the Project that fell into eight main topics: (1) comments on the Project purpose and objective, (2) comments on potential exclusions, (3) consideration of additional resource sensitivities and/or exclusion categories, (4) mapping suggestions, (5) use of appropriate data sources, (6) siting, (7) public involvement, and (8) Project implementation and maintenance. A summary of these comments is provided in Appendix C. A number of changes to the project methods and data sources were made in response to the comments received; however, no written responses to comments have been provided.

### 3 ANALYSIS AND MAPPING RESULTS

#### 3.1 WIND ENERGY DEVELOPMENT EXCLUSION AND SENSITIVITY IDENTIFICATION

As noted in Section 2.1, the West-Wide Wind Mapping Project included an initial literature review of existing studies as of April 2014 that identified potential development sensitivities for utility-scale renewable energy development and/or electric transmission. The 17 reviewed studies identified approximately 250 different types of potential sensitivities for wind, solar, geothermal, biomass, and hydroelectric energy development, as well as electric transmission. A list of the studies included in the literature review is to be found in Appendix A.

Many of the sensitivities identified in these studies were not relevant or useable for the Project for various reasons, including being overly vague or lacking any spatial reference; applying only to non-BLM-administered lands; there being physical constraints (e.g., topography, soil stability, slope restrictions, and therefore being applicable primarily at a site- and project-specific scale); or there being land use-related restrictions that also would be applicable primarily at a site- and project-specific scale (e.g., no development on roads or at airports). The remaining sensitivities related primarily to special area designations, environmental concerns, or land use incompatibility that were determined to be potentially applicable to BLM-administered lands. Of the sensitivities that were potentially applicable, many were based on environmental concerns about ecological resources that are focused on a variety of animal habitats. Sensitivities were also identified concerning visual, recreation, historical, cultural, and paleontological resources. No definitive assessment of applicability to BLM-administered lands could be made for a small number of constraints identified in the existing studies.

From this list of constraints, along with the exclusions and sensitivities previously identified, the BLM selected an initial list of exclusions and sensitivities to be included in the Project. The list was eventually modified based on comments received from stakeholders (see Section 2.4 and Appendix C) and further BLM internal review.

Wind energy development exclusions and sensitivities analyzed and mapped in the Project include special land resource areas (e.g., NLCS lands, ACECs), ecological resources, cultural resources, visual resources, recreation resources, and potentially incompatible land uses, based on BLM policy or decisions made in individual Resource Management Plans (RMPs). There was some overlap among these categories because RMP decisions are often made based in part on environmental concerns; however, for Project analysis, it was useful to classify the exclusions and sensitivities into these major types.

Wind energy development exclusions as mapped in this Project include lands in the NLCS; lands inventoried and managed for wilderness characteristics; ACECs; Desert Renewable Energy Conservation Plan (DRECP) California Desert National Conservation Lands; selected ecological, cultural, and visual resource areas; and areas with potentially incompatible land uses, such as BLM-designated wind exclusion areas.

Table 1 lists wind energy development exclusions and sensitivities that the BLM identified for inclusion in the Project. Exclusions were identified on the basis of decisions made in the Wind PEIS and subsequent policy and land use plan amendments and potential policy changes. Sensitivities included BLM-administered lands with potentially developable wind resources where the presence of certain environmental resources or land use restrictions may result in more extensive siting considerations for proposed wind energy projects. These lands are described and mapped as lands having a high level of siting considerations (HLSC) and lands having a moderate level of siting considerations (MLSC). HLSC lands are BLM-administered lands where the presence of certain environmental resources or land use restrictions is likely to require greater consideration of potential impacts to resources and existing uses when the BLM, other federal or state agencies, or stakeholders conduct siting reviews. MLSC lands are BLM-administered lands where the presence of certain environmental resources or land use restrictions is likely to require a moderate consideration of potential impacts to resources and existing uses in siting reviews. The degree of consideration of the potential impacts to resources and existing uses for lands identified as HLSC/MLSC is related to the sensitivity of those lands' associated resources and existing uses to wind energy development. Other BLM-administered lands with potentially developable wind resources do not have known environmental resources or land use restrictions that are likely to require more extensive consideration in siting reviews. Table 1 also indicates whether each excluded/sensitive area is designated by the BLM and identifies the source of the geospatial data for each resource area type.

The exclusions and sensitivities identified in Table 1 were included in the data call to the BLM state offices as discussed in Section 2.2, and the data received from the state offices were then combined with average annual wind speed data and BLM land management data to develop the exclusion and sensitivity maps that constitute the main products of the West-Wide Wind Mapping Project. It is possible that other sensitive resources and designations, not included in the Project at this time, may be identified during a project-specific review that could trigger additional siting review. Not all resources identified in Table 1 have been included as data layers in the *Wind Mapper* data viewer tool or integrated into Project maps; it is expected that these resources will be integrated in the future as data become available.

**TABLE 1 Exclusions and Other Resource Sensitivities Related to Wind Energy Development on BLM-Administered Lands<sup>a</sup>**

Exclusions and Sensitivities	BLM Designation <sup>b</sup>	Exclusion	Other Sensitive Resource <sup>c</sup>	Data Source <sup>d</sup>
<i>Special Land Resource Areas</i>				
Areas of Critical Environmental Concern	√	<b>X</b>		BLM
DRECP California Desert National Conservation Lands	√	<b>X</b>		BLM
Lands inventoried and managed for wilderness characteristics	√	<b>X</b>		BLM
National Conservation Areas (except CDCA)	√	<b>X</b>		BLM
National Monuments	√	<b>X</b>		BLM
National Natural Landmarks on BLM-administered lands		<b>X</b>		NPS
Other designated NLCS lands <sup>e</sup>	√	<b>X</b>		BLM
Wild and Scenic Rivers	√	<b>X</b>		BLM
Wilderness Areas	√	<b>X</b>		BLM
Wilderness Study Areas	√	<b>X</b>		BLM
<i>Ecological Resources</i>				
Desert tortoise				
Designated critical habitat			High	BLM
USFWS-identified priority tortoise connectivity areas			Moderate	USFWS
Desert Wildlife Management Areas	√		Moderate	BLM
Designated critical habitat for ESA-listed species			High	USFWS
Designated special status species management areas	√		Moderate	BLM
DRECP Wildlife Allocations	√	<b>X</b>		BLM
Important Bird Areas			Moderate	National Audubon Society
Raptor habitat/distribution				
Bald eagle, Golden eagle, and Aplomado falcon potentially suitable habitat distribution <sup>f</sup>			Moderate	USGS
California condor, Mexican spotted owl, and Northern spotted owl designated critical habitat			High	USFWS

**TABLE 1 (Cont.)**

Exclusions and Sensitivities	BLM Designation <sup>b</sup>	Exclusion	Other Sensitive Resource <sup>c</sup>	Data Source <sup>d</sup>
<i>Ecological Resources (cont.)</i>				
Sage-grouse (includes greater and Gunnison)				
GHMA, except in Idaho, Utah, and Wyoming	√		High	BLM
GHMA in Idaho, Utah, and Wyoming	√		Moderate	BLM
PHMA, except in Wyoming and Lake, Malheur, and Harney Counties in Oregon	√	<b>X</b>		BLM
PHMA in Wyoming and Lake, Malheur, and Harney Counties in Oregon	√		High	BLM
SFA, except in Wyoming	√	<b>X</b>		BLM
SFA in Wyoming	√		High	BLM
Sharp-tailed grouse habitat			Moderate	BLM
Wildlife Management Areas, except in California	√		Moderate	BLM
WGA CHAT crucial habitat			Moderate	WGA
<i>Potentially Incompatible Land Uses</i>				
Designated BLM utility corridors	√		High	BLM
DoD-designated areas of high risk of adverse impact			High	DoD
DoD restricted airspace and military training routes			Moderate	BLM NOC
DRECP DFAs restricted to solar and/or geothermal energy	√	<b>X</b>		BLM
DRECP Variance Lands	√		Moderate	BLM
Lands acquired with federal funds for conservation purposes	√	<b>X</b>		BLM
Lands purchased by private funds and donated to the BLM	√		Moderate	BLM
No surface occupancy restriction areas	√		High	BLM
NPS-identified high potential conflict areas			Moderate	NPS



**TABLE 1 (Cont.)**

Exclusions and Sensitivities	BLM Designation <sup>b</sup>	Exclusion	Other Sensitive Resource <sup>c</sup>	Data Source <sup>d</sup>
<i>Potentially Incompatible Land Uses (cont.)</i>				
RMP Wind Avoidance Areas	√		High	BLM
RMP Wind Exclusion Areas	√	<b>X</b>		BLM
ROW Avoidance Areas	√		High	BLM
ROW Exclusion Areas	√	<b>X</b>		BLM
Utah Test and Training Range			High	BLM
<i>Visual Resources</i>				
BLM Back-Country Byways	√		Moderate	BLM
DRECP National Scenic Cooperative Management Areas	√	<b>X</b>		BLM
National Scenic Highways/All-American Roads			Moderate	NSBP
National Scenic Trails		<b>X</b>		NPS
State Scenic Highways			Moderate	NSBP
VRM Class I	√	<b>X</b>		BLM
VRM Class II	√		High	BLM
VRM Class III	√		Moderate	BLM
<i>Cultural Resources</i>				
Areas of Tribal Concern			Moderate	BLM
National Historic Landmarks		<b>X</b>		NPS
National Historic Parks and National Historic Sites		<b>X</b>		NPS
National Historic Trails		<b>X</b>		NPS
Properties listed on the NRHP or comparable state register		<b>X</b>		NPS, state agencies
Sites identified by the BLM as eligible for listing on the NRHP	√		Moderate	BLM
State Historic Trails			High	State agencies

**TABLE 1 (Cont.)**

Exclusions and Sensitivities	BLM Designation <sup>b</sup>	Exclusion	Other Sensitive Resource <sup>c</sup>	Data Source <sup>d</sup>
<i>Recreational Resources</i>				
Long-term visitor use areas	√		Moderate	BLM
Off-highway vehicle areas				
DRECP Open Off Highway Vehicle Areas	√	<b>X</b>		BLM
Off-highway vehicle open areas, except in DRECP	√		Moderate	BLM
Recreation management areas				
DRECP Extensive Recreation Management Areas	√		High	BLM
DRECP SRMAs	√	<b>X</b>		BLM
SRMAs, except in California	√		Moderate	BLM
SRMAs in California, not in the DRECP	√	<b>X</b>		BLM

<sup>a</sup> Abbreviations: BLM = Bureau of Land Management; CDCA = California Desert Conservation Area; CHAT = Crucial Habitat Assessment Tool; DoD = U.S. Department of Defense; DRECP = Desert Renewable Energy Conservation Plan; DFA = Development Focus Area; ESA = Endangered Species Act; GHMA = General Habitat Management Area; NLCS = National Landscape Conservation System; NOC = National Operations Center; NPS = National Park Service; NRHP = National Register of Historic Places; NSBP = National Scenic Byways Program; PHMA = Priority Habitat Management Area; RMP = Resource Management Plan; ROW = right-of-way; SFA = Sagebrush Focal Area; SRMA = Special Recreation Management Area; USFWS = U.S. Fish and Wildlife Service; USGS = U.S. Geological Survey; VRM = Visual Resource Management; WGA = Western Governors’ Association.

<sup>b</sup> Land use designation or characterization established by the BLM.

<sup>c</sup> Other sensitive resources are characterized by whether they are expected to have a “high” level of siting considerations (HLSC) versus a “moderate” level of siting considerations (MLSC). Other resources and designations (e.g., National Recreational Trails, Watchable Wildlife Viewing Sites, Wild Horse and Burro Ranges) may trigger additional siting reviews. Although they are not included in this table, they may be identified during project-specific reviews.

<sup>d</sup> All BLM data will be obtained from BLM state and/or field offices, unless otherwise indicated.

<sup>e</sup> Other designated NLCS lands include Cooperative Management and Protection Areas, National Forest Reserves, and Outstanding Natural Areas.

<sup>f</sup> Potentially suitable habitat distribution is determined on the basis of distribution models that represent areas where species are predicted to occur based on habitat associations. These distribution models are developed as part of the USGS Southwest Regional Gap Analysis Project.

### **3.2 UPDATED BLM WIND PEIS WIND ENERGY DEVELOPMENT EXCLUSIONS AND SITING CONSIDERATIONS MAP PRODUCTS**

Mapping products for the West-Wide Wind Mapping Project include individual state maps and an 11-state map of both wind energy development exclusions and sensitivities for BLM-administered lands with average annual wind speeds of 5 m/s or greater. Small-scale versions of these maps are shown in Figures 1 through 12. Important limitations of the data, copyright information, and other map notes are provided in the text box on the next page. The maps show excluded HLSC, MLSC, and other potentially developable lands in four different hues, shaded by the average annual wind speed, with darker shades of each color representing lands with higher average annual wind speeds. The maps also show BLM-administered lands without developable wind resources (those lands with annual average wind speeds of less than 5 m/s) in gray. More detailed, poster-size maps are available through the Project website at <http://wwmp.anl.gov>.

The geospatial data for the exclusion and sensitive areas are also available for interactive viewing through the *Wind Mapper* geospatial data viewer and for downloading through the Project website.

### **3.3 ACREAGES FOR WIND ENERGY DEVELOPMENT EXCLUSIONS, HLSC, MLSC, AND OTHER BLM-ADMINISTERED LANDS**

Figures 1 through 12 show the locations of BLM-administered lands, lands where wind energy development would be excluded, HLSC and MLSC lands, and other potentially developable lands. Table 2 gives the acreages for each of these categories.

## MAP NOTES

### **Data Limitations**

These maps were constructed using the best available geospatial data but may contain errors. Geospatial data are not complete across the mapped area for some resources. Acreage estimates are based on BLM state office boundaries, which in some cases differ slightly from state boundaries. Mapping is intended for use in large-scale wind energy planning and is not suitable for individual project siting or review. Topography, roadway accessibility, economic factors, and other resources were not considered in this mapping effort. Appendix B of this report identifies the geospatial data layers used in this effort.

### **Copyright Information**

Wind speed data source: Platts. Copyright© 2014 by McGraw Financial.

### **Wind Speed Data**

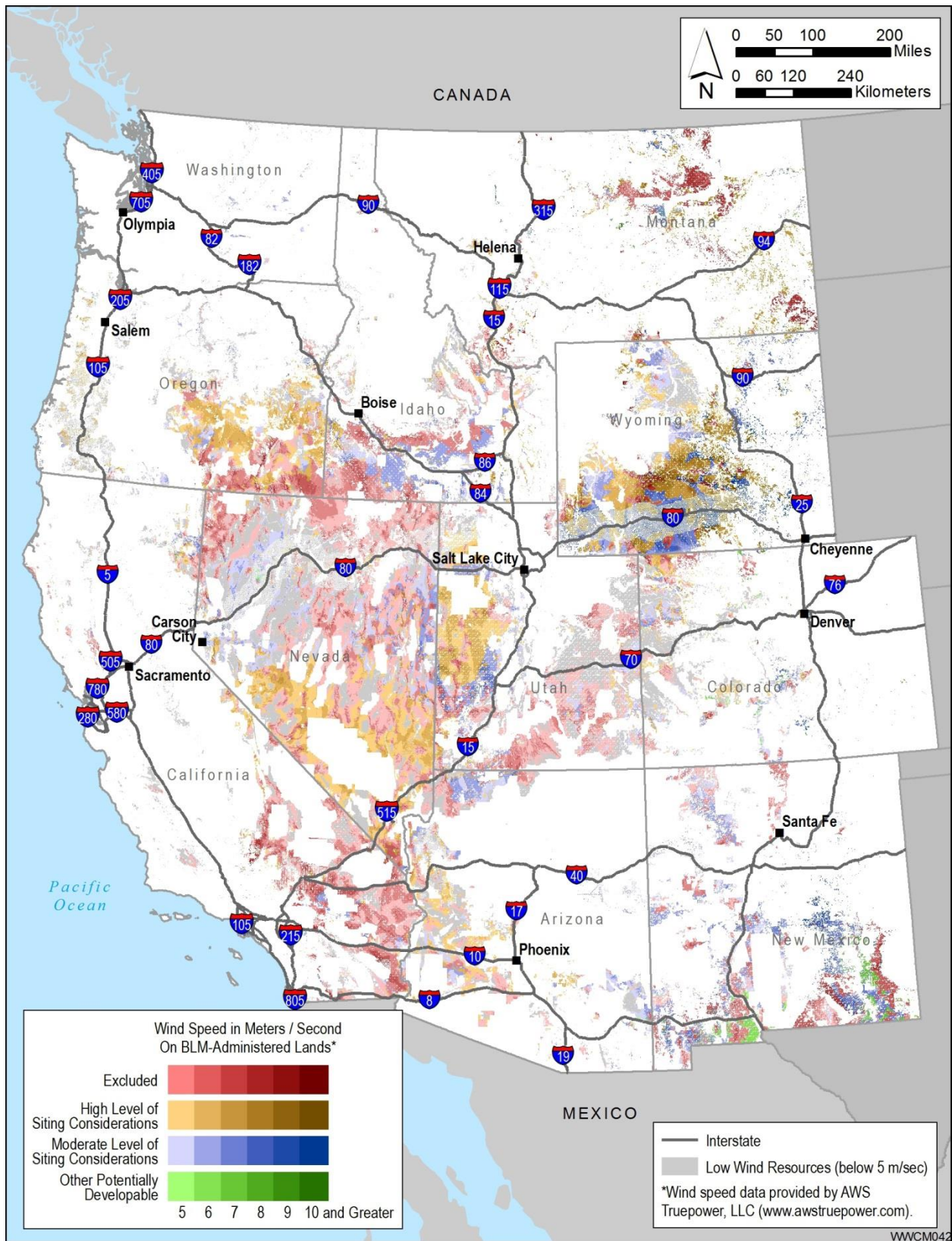
Wind speed shown on BLM-administered land is for a hub height of 80 m using data provided by AWS Truepower, LLC ([www.awstruepower.com](http://www.awstruepower.com)).

### **Excluded Lands**

Excluded lands include those lands that are excluded from wind development on the basis of existing land use plan decisions and potential policy changes. Wind projects proposed on BLM-administered lands that are not excluded will have varying levels of siting considerations due to the presence of certain environmental resources or land use restrictions. HLSC lands are BLM-administered lands where the presence of certain environmental resources or land use restrictions is likely to require greater consideration of potential impacts to resources and existing uses when the BLM, other federal or state agencies, or stakeholders conduct siting reviews. MLSC lands are BLM-administered lands where the presence of certain environmental resources or land use restrictions is likely to require a moderate consideration of potential impacts to resources and existing uses in siting reviews. Other BLM-administered lands with potentially developable wind resources do not have known environmental resources or land use restrictions that are likely to require more extensive consideration in siting reviews.

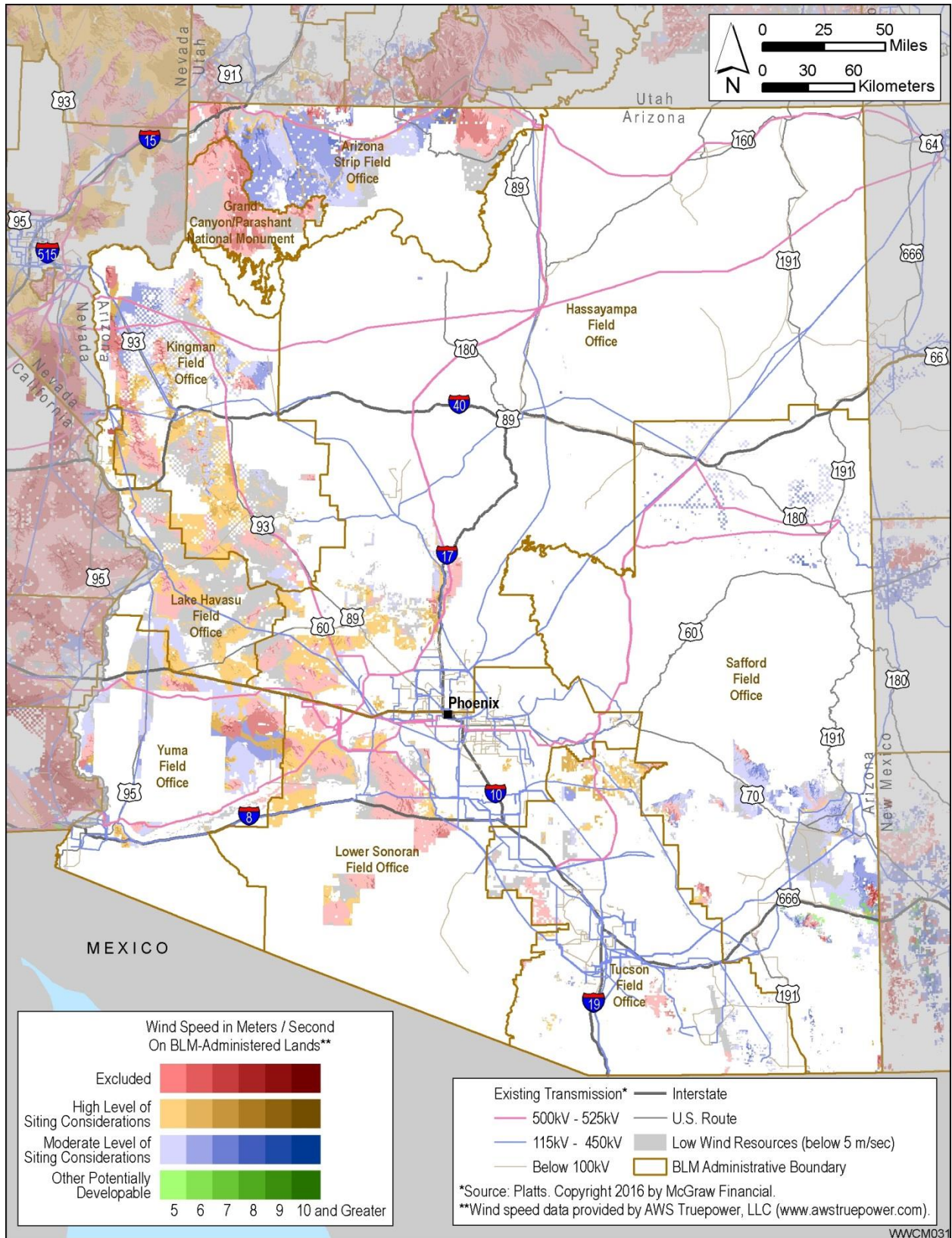
### **BLM-Administered Lands without Potentially Developable Wind Resources**

Lands with wind speeds below 5 m/s are not considered to be developable. BLM-administered lands with speeds below 5 m/s have not been mapped with respect to exclusions or expected level of siting considerations.



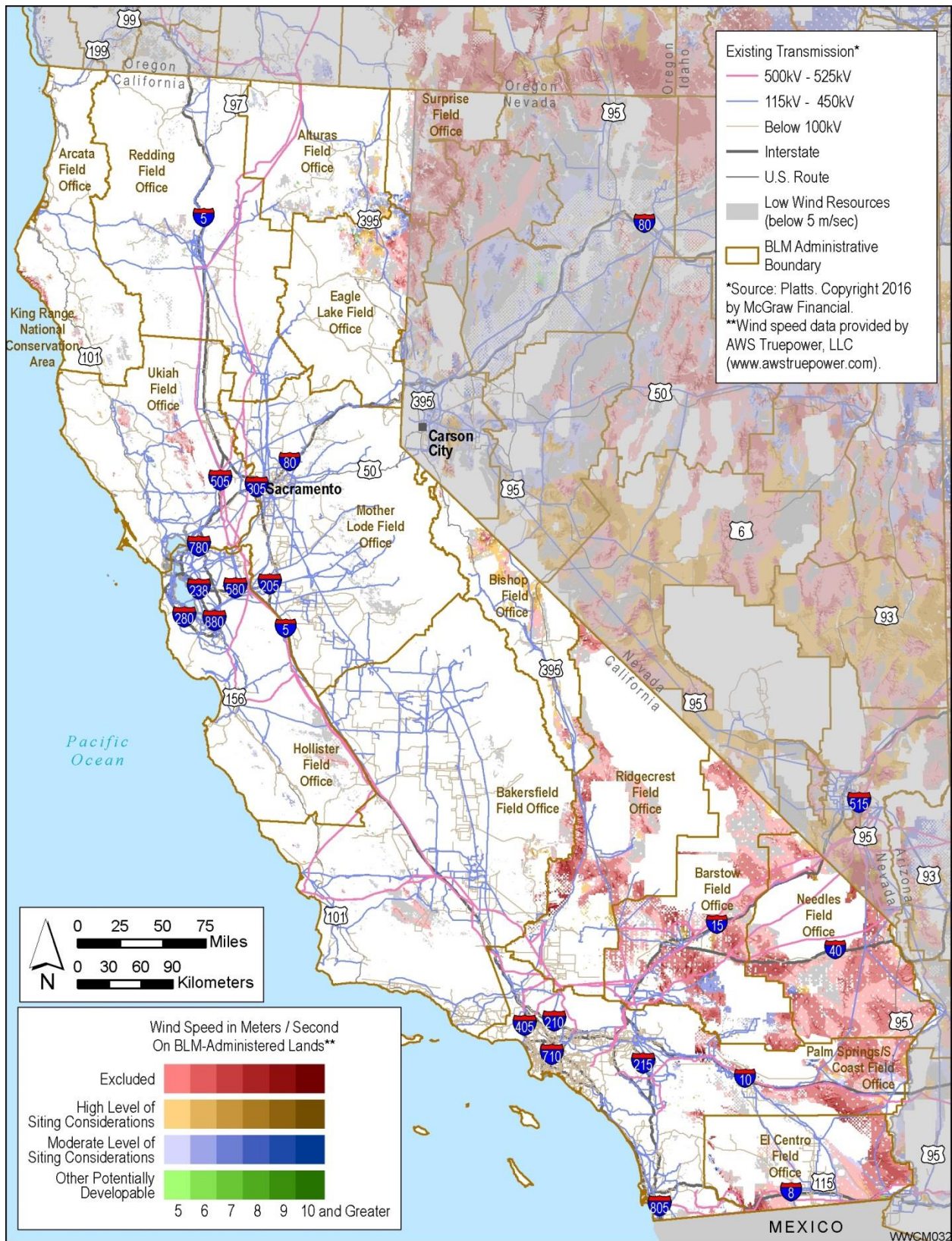
**FIGURE 1 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in the 11 Western States**





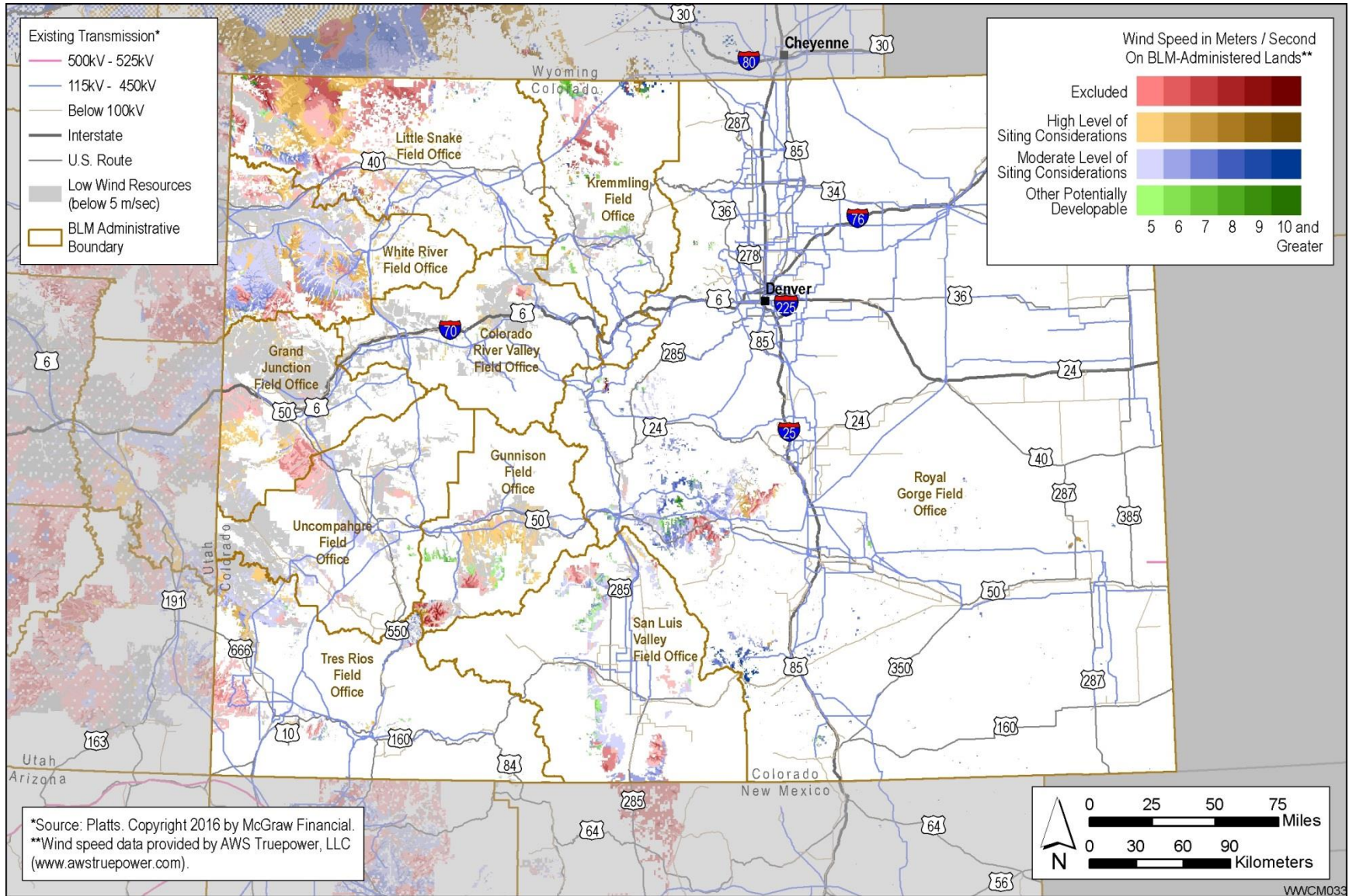
**FIGURE 2 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in Arizona**





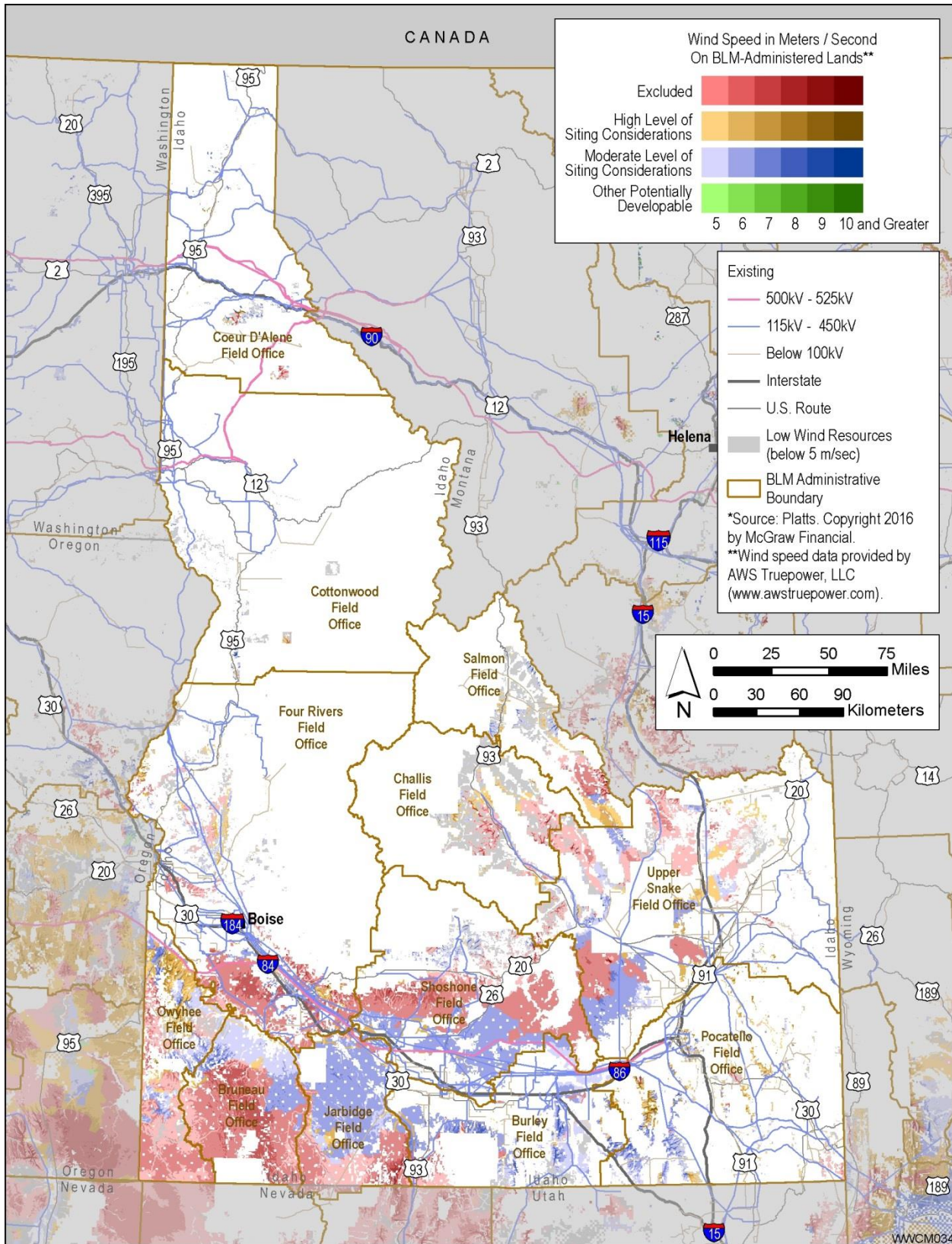
**FIGURE 3 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in California**





**FIGURE 4 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in Colorado**





**FIGURE 5 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in Idaho**



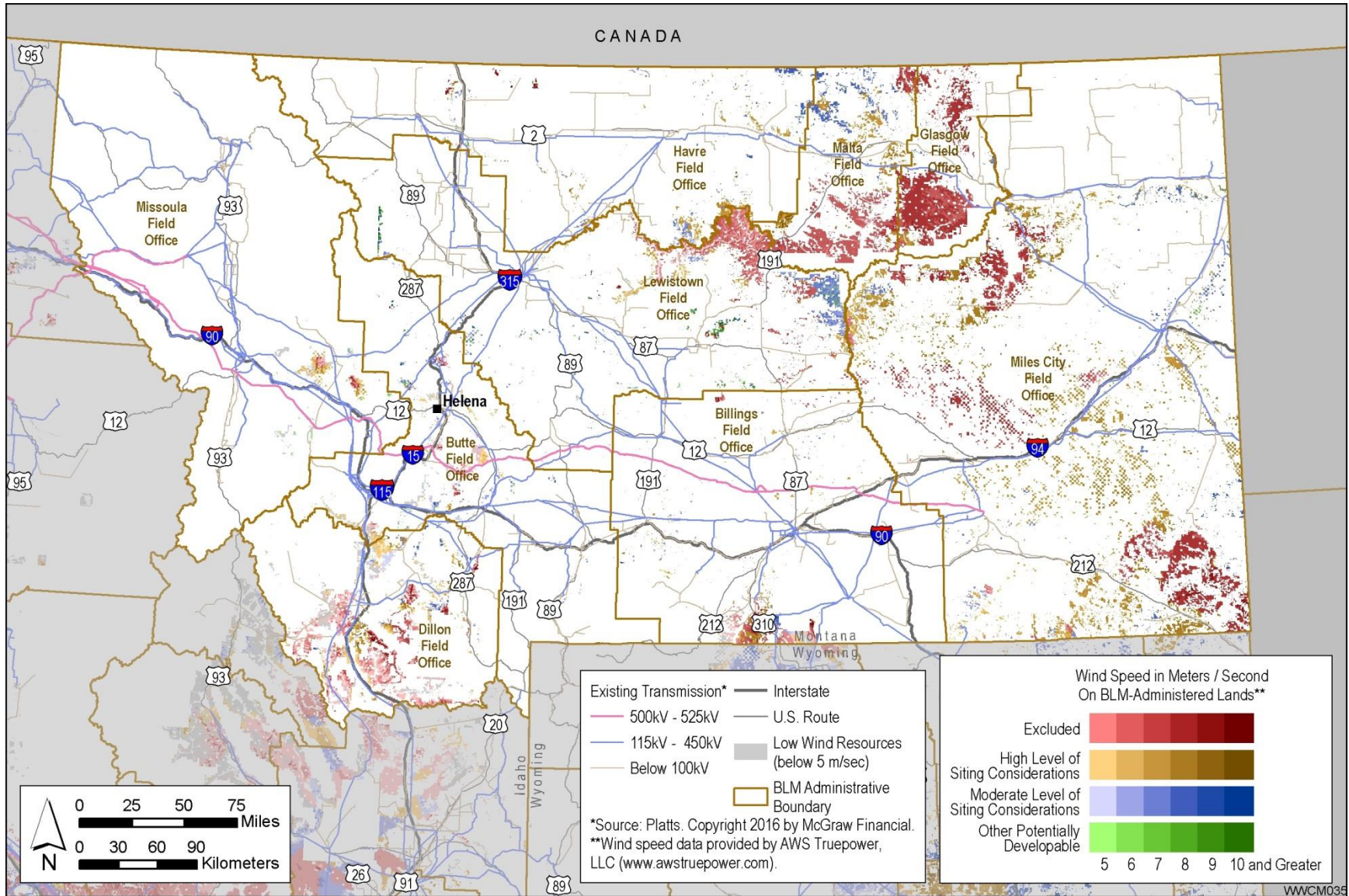
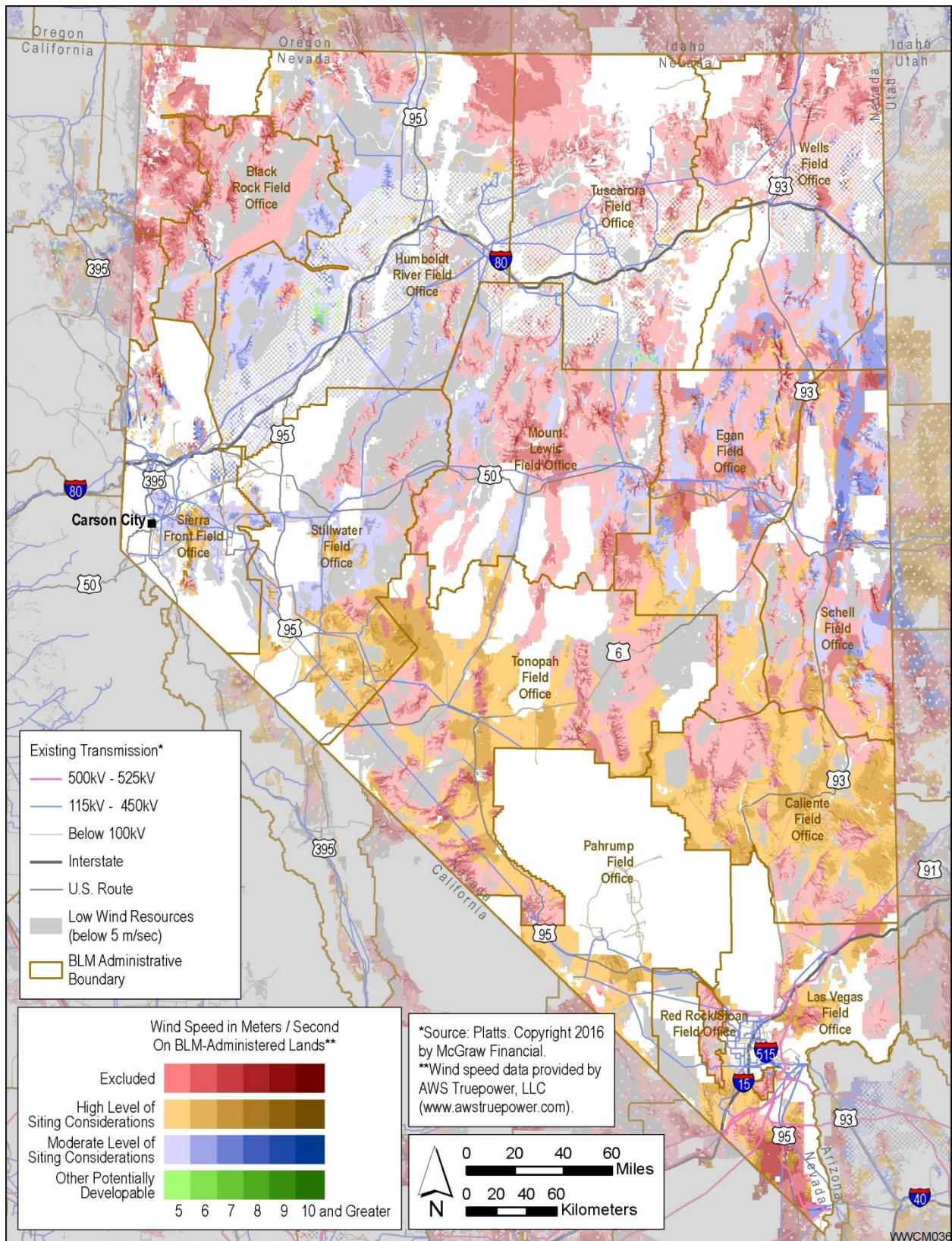


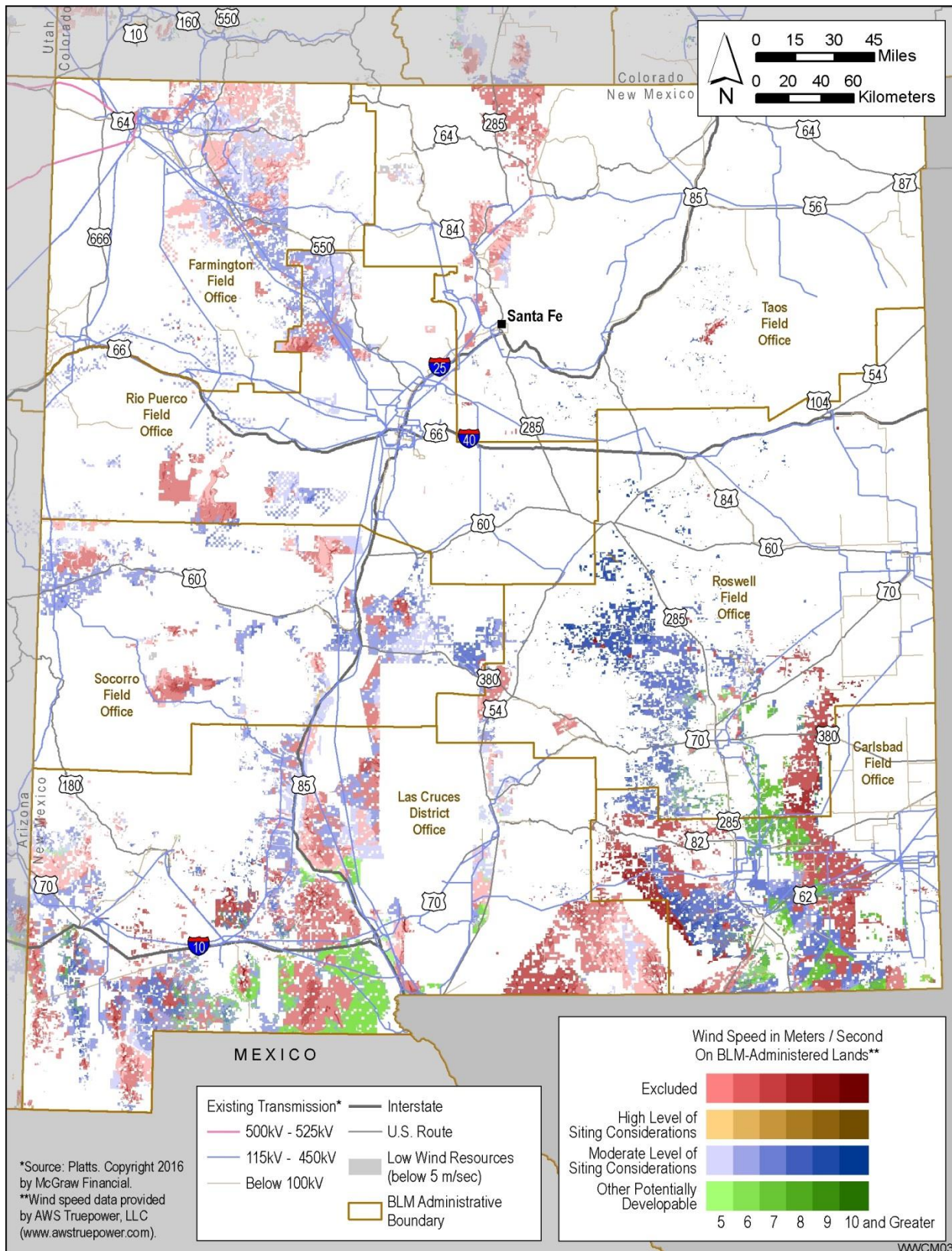
FIGURE 6 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in Montana





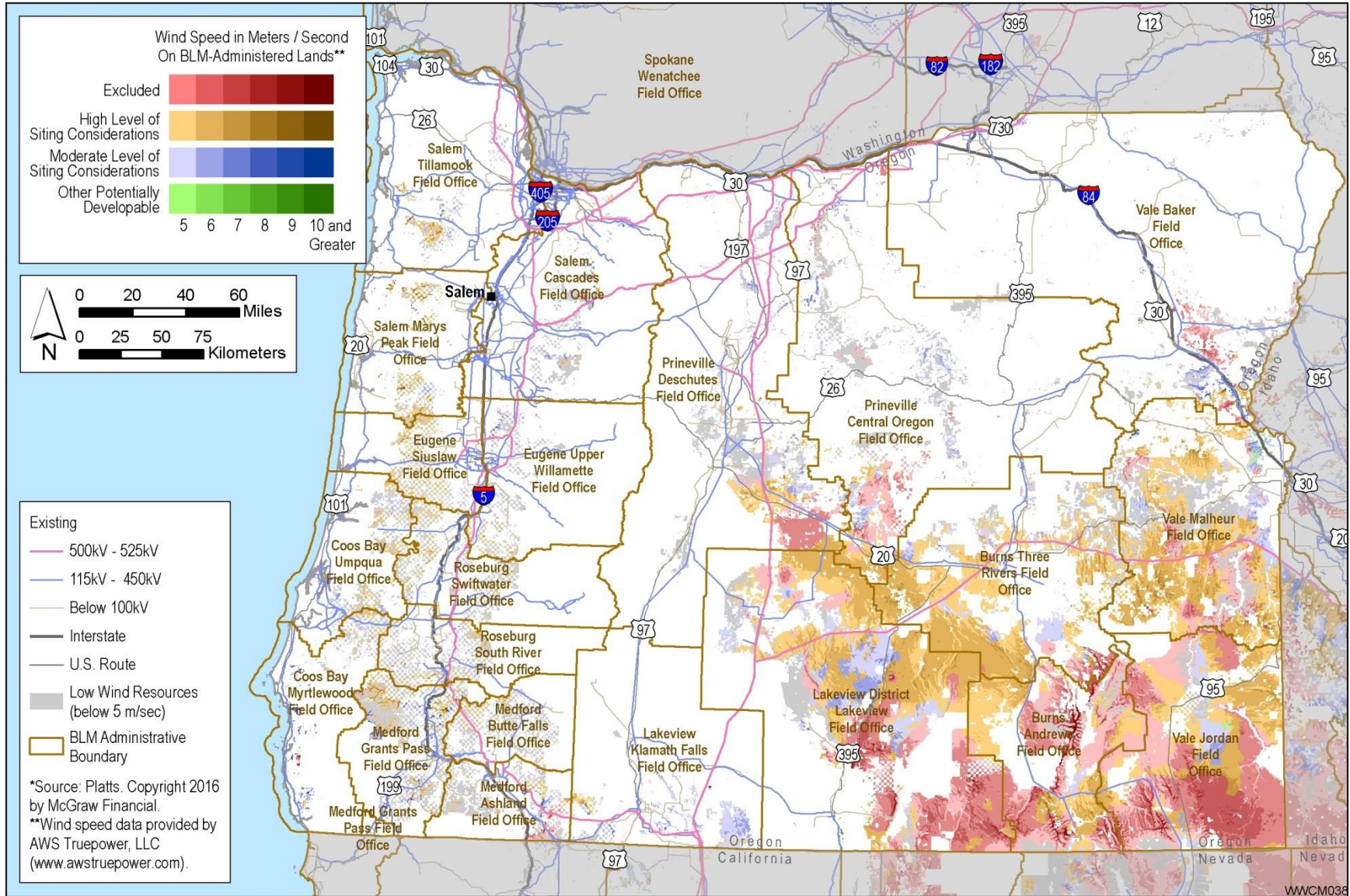
**FIGURE 7 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in Nevada**





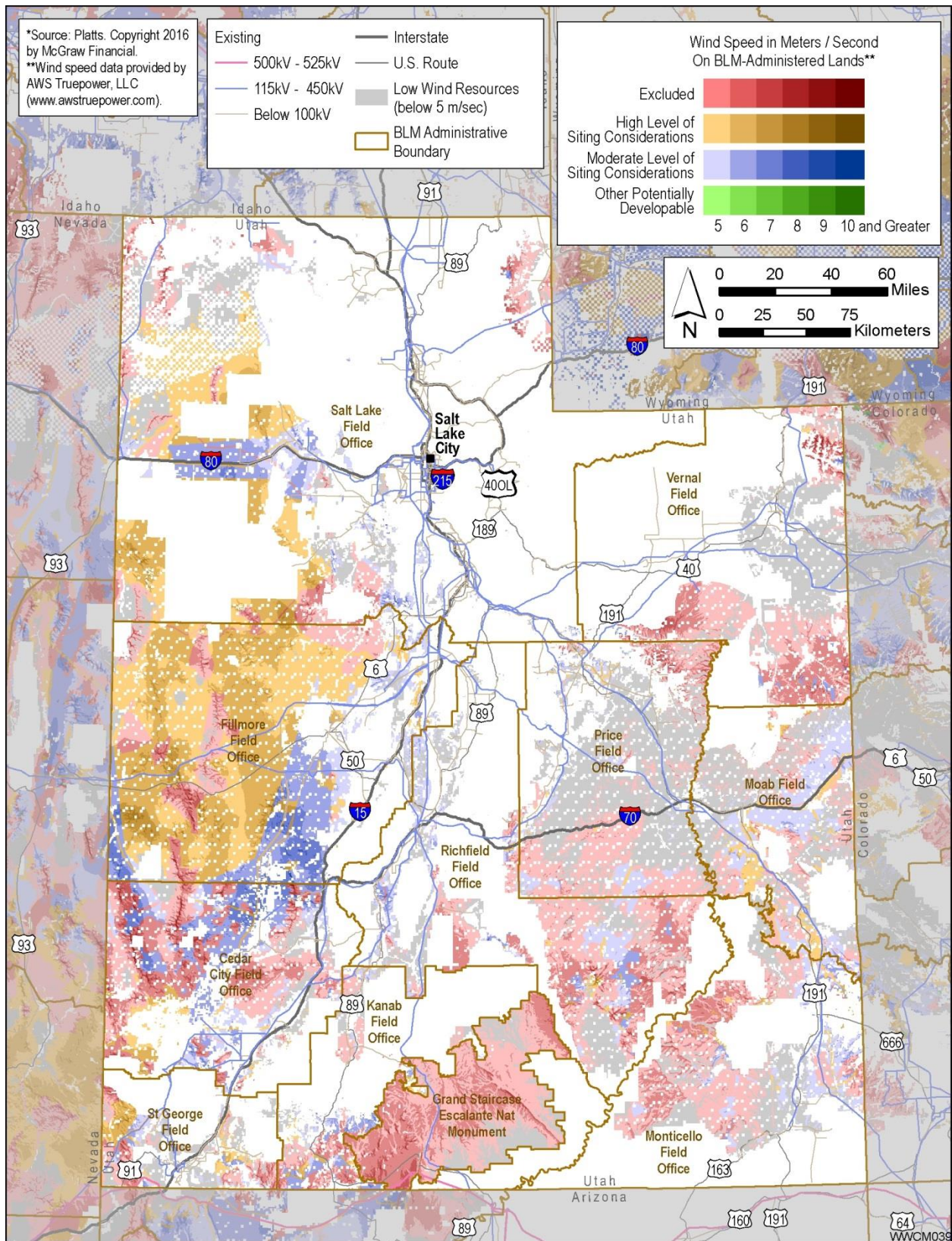
**FIGURE 8 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in New Mexico**





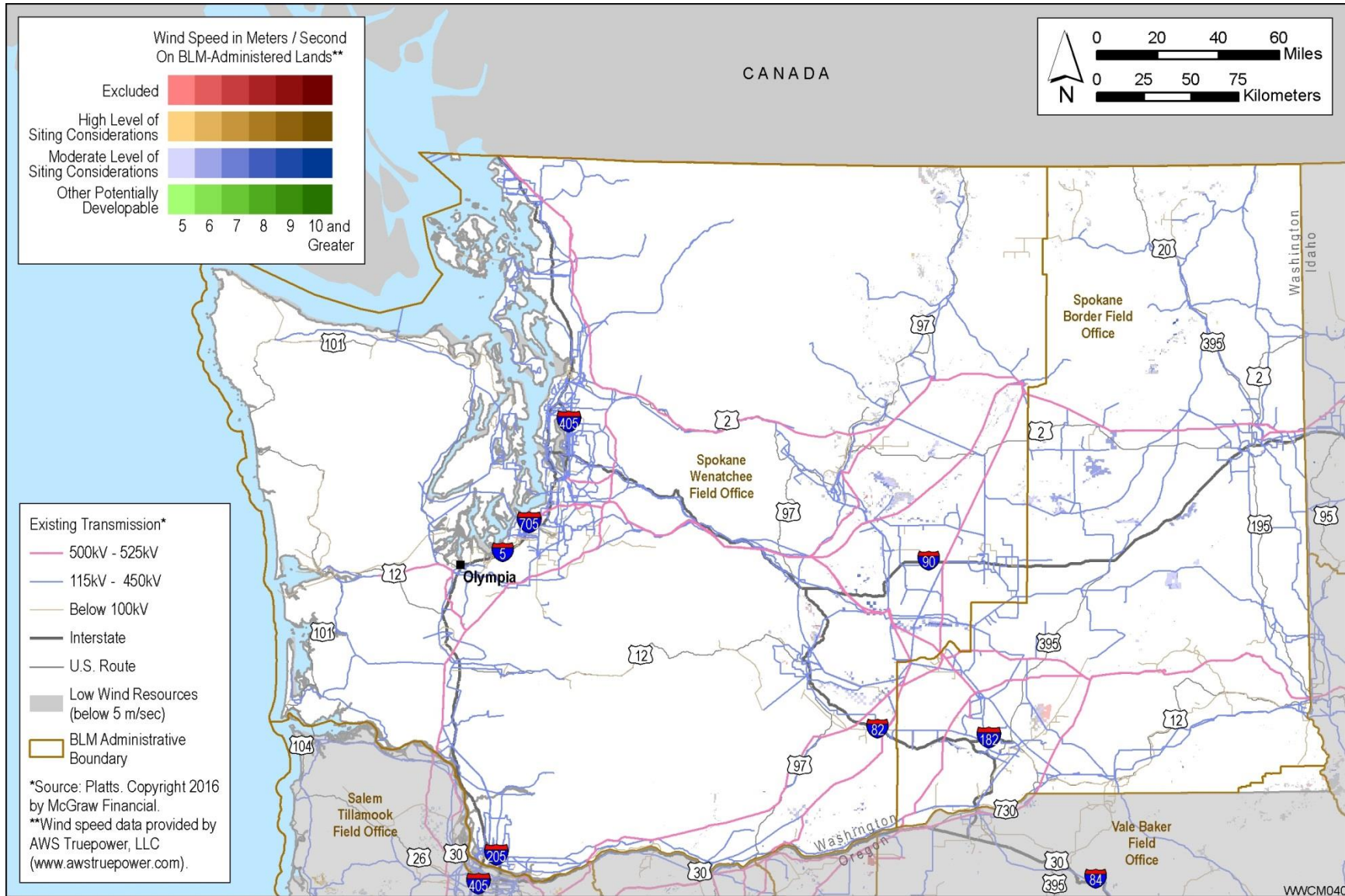
**FIGURE 9 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in Oregon**





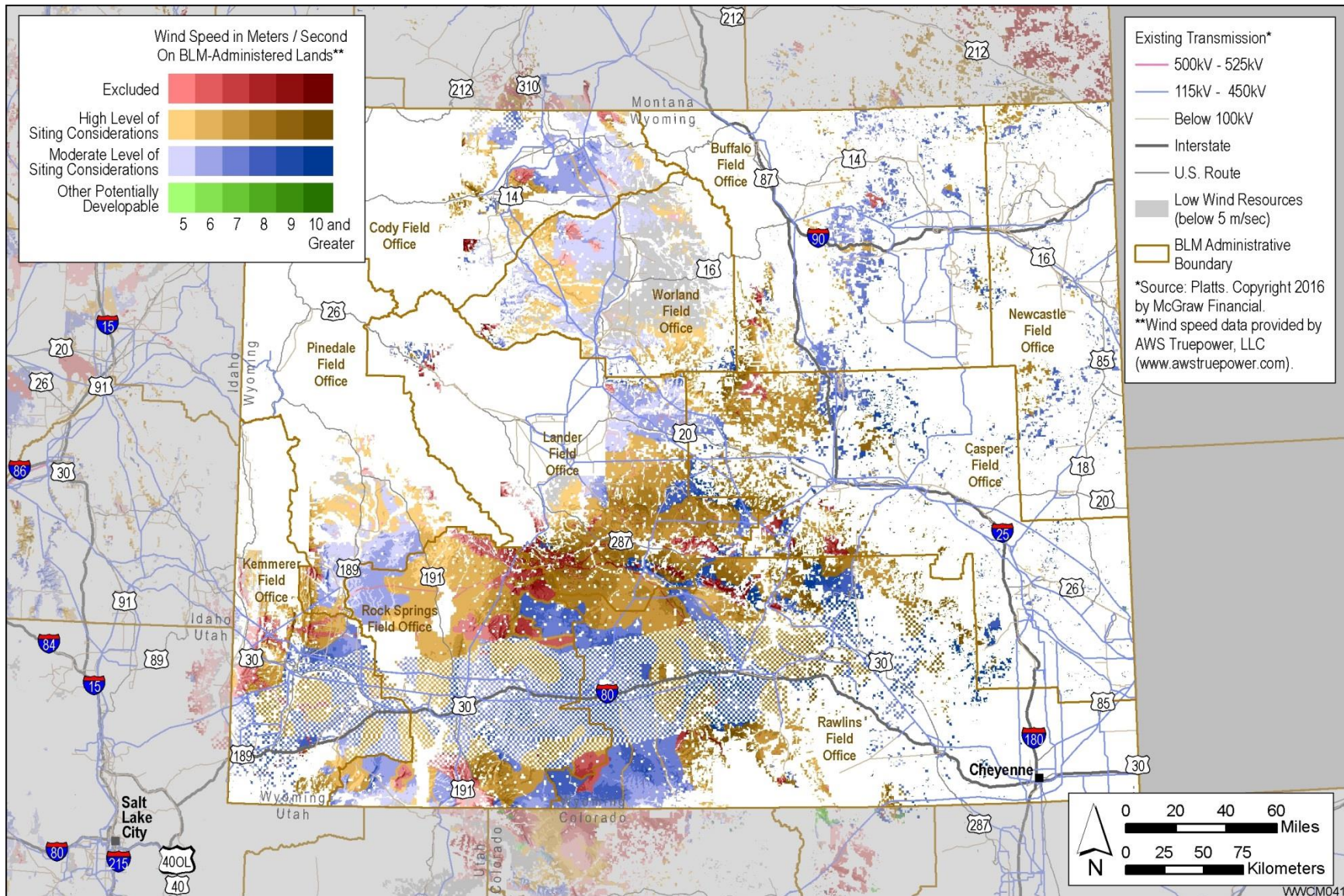
**FIGURE 10 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in Utah**





**FIGURE 11 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in Washington**





**FIGURE 12 Wind Resources, Exclusions, and Resource Sensitivities on BLM-Administered Lands in Wyoming**



**TABLE 2 Summary of BLM-Administered Lands in Each State as Mapped with Respect to Potentially Developable Wind Resources, Exclusions, and Expected Level of Siting Considerations<sup>a,b</sup>**

State	Total BLM-Administered Lands (acres)	Total Lands with Existing or Potential Exclusions (acres) <sup>c</sup>	Lands with Potentially Developable Wind Resources (acres) <sup>d,e,f</sup>				
			Total	Lands Having High Level of Siting Considerations	Lands Having Moderate Level of Siting Considerations	Other Lands with Average Annual Wind Speed > 5 m/s	Lands with Average Annual Wind Speed < 5 m/s
Arizona	12,026,719	2,921,389	5,971,987	2,629,320	3,304,215	38,451	3,133,343
California	14,958,398	9,677,937	1,993,198	1,004,645	944,053	44,501	3,287,263
Colorado	8,284,340	1,822,224	3,338,334	1,230,759	1,900,657	206,918	3,123,782
Idaho	11,671,130	5,171,228	4,699,736	1,072,370	3,625,480	1,886	1,800,166
Montana	6,222,368	3,150,204	2,739,451	1,917,477	734,068	87,906	332,714
Nevada	47,268,438	19,158,085	16,854,005	9,997,791	6,788,674	67,540	11,256,348
New Mexico	12,793,991	5,911,170	6,735,608	67,037	5,620,599	1,047,972	147,213
Oregon	15,695,673	4,454,884	7,642,356	5,888,380	1,723,840	30,137	3,598,428
Utah	22,626,085	8,689,488	8,100,658	4,565,312	3,533,106	2,241	5,835,938
Washington	424,970	17,628	262,926	359	260,980	1,587	144,416
Wyoming	17,309,485	1,520,739	14,589,323	7,705,414	6,880,196	3,713	1,199,423
<b>Total</b>	<b>169,281,596</b>	<b>62,494,976</b>	<b>72,927,582</b>	<b>36,078,863</b>	<b>35,315,868</b>	<b>1,532,852</b>	<b>33,859,034</b>

<sup>a</sup> To convert acres to km<sup>2</sup>, multiply by 0.004047.

<sup>b</sup> The acreage estimates were calculated on the basis of the best available GIS data. GIS data are not complete across the mapped area for some resources. Acreage estimates are based on BLM state office boundaries, which may differ slightly from state boundaries.

<sup>c</sup> Excluded lands include those that are excluded from wind development on the basis of existing land use plan decisions and potential policy changes.

<sup>d</sup> Potentially developable wind resources include average annual wind speeds of 5 m/sec or greater, measured at hub heights of 80 m as mapped by AWS Truepower, LLC.

<sup>e</sup> Wind projects proposed on BLM-administered lands that are not excluded will have varying levels of siting considerations owing to the presence of certain environmental resources or land use restrictions. Lands having a high level of siting considerations are lands where the presence of certain environmental resources or land use restrictions is likely to require greater consideration of potential impacts to resources and existing uses when the BLM, other federal or state agencies, or stakeholders conduct siting reviews. Lands having a moderate level of siting considerations are likely to require a moderate consideration of potential impacts in siting reviews. Other BLM-administered lands with potentially developable wind resources do not have known environmental resources or land use restrictions that are likely to require more extensive consideration in siting reviews.

<sup>f</sup> BLM-administered lands with average annual wind speeds of less than 5 m/sec are considered not to have potentially developable wind resources. These lands have not been mapped for excluded areas or high or moderate levels of siting considerations.

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## 4 WIND ENERGY ENVIRONMENTAL MAPPER GEOSPATIAL DATA VIEWER AND PROJECT WEBSITE

*Wind Mapper* is an interactive Web-based mapping tool that displays wind energy resources and relevant environmental data for the western United States. Users can view map layers that were used to create the map products for the West-Wide Wind Mapping Project. The tool provides the ability to zoom and pan to areas of interest, query the data, and print maps. *Wind Mapper* also allows users to draw an area of interest on screen, and then generate reports that specify the types and acreages of environmental resources within the area identified as wind energy development exclusion areas, HLSC lands, or MLSC lands.

*Wind Mapper* provides users with fast, easy access to a wide variety of spatial data through a Web browser, requiring only limited and generally quick data and software downloads. *Wind Mapper* data layers will be updated over time, thus providing the best access to updated, comprehensive data in an easy-to-use format.

*Wind Mapper* requires an active Internet connection while in use. It is compatible with leading, current Web browsers. *Wind Mapper* is available at <http://windmapper.anl.gov>. Geospatial data used for the Project are available for download through the Project website at <http://wwmp.anl.gov>. Files are available in Esri File Geodatabase format and in Esri Shapefile format for use with GIS software. The project website also provides a summary of the Project and links to Project exclusion and sensitivity maps and this Project report, as well as news and updates about the Project.

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## 5 FUTURE UPDATES

As noted in the Introduction to this report, land use plan revisions and amendments, changes in BLM policy, and state-level efforts may result in changes in the locations and amounts of BLM-administered lands that may be suitable for wind energy development. In addition, data for exclusions and sensitivities not currently available for inclusion in the West-Wide Wind Mapping Project may become available in the future. As a result, the BLM intends to periodically update the Project maps and geospatial data, as well as the *Wind Mapper* data layers, in order to provide the best and most current data available. Information about these updates will be posted on the Project website at <http://wwmp.anl.gov>, and users who have signed up for Project e-mails through the website will be notified via e-mail.

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## 6 REFERENCES

BLM (Bureau of Land Management), 2005a, *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States, Including Proposed Amendments to Selected Land Use Plans*, U.S. Department of the Interior, FES-05-11, Final, June. Available at <http://windeis.anl.gov/documents/fpeis/Index.cfm>, accessed October 25, 2016.

BLM, 2005b, *Record of Decision: Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments*, U.S. Department of the Interior, December. Available at <http://windeis.anl.gov/documents/docs/windpeisrod.pdf>, accessed October 25, 2016.

BLM, 2008, *Instruction Memorandum 2009-043, Wind Energy Development Policy*, U.S. Department of the Interior, Bureau of Land Management, Washington, D.C., Dec. 19.

BLM, 2015a, *Record of Decision and Approved Resource Management Plan Amendments for the Great Basin Region, Including the Greater Sage-Grouse Sub-Regions of Idaho and Southwestern Montana, Nevada and Northeastern California, Oregon, Utah*, U.S. Department of the Interior, Bureau of Land Management, Washington, D.C., September.

BLM, 2015b, *Record of Decision and Approved Resource Management Plan Amendments for the Rocky Mountain Region, Including the Greater Sage-Grouse Sub-Regions of Lewistown, North Dakota, Northwest Colorado, Wyoming, and the Approved Resource Management Plans for Billings, Buffalo, Cody, HiLine, Miles City, Pompeys Pillar National Monument, South Dakota, Worland*, U.S. Department of the Interior, Bureau of Land Management, Washington, D.C., September.

BLM, 2015c, *Desert Renewable Energy Conservation Plan Proposed Land Use Plan Amendment and Final Environmental Impact Statement*, U.S. Department of the Interior, BLM/CA/PL-2016/03+1793+8321, October.

BLM, 2016, *Desert Renewable Energy Conservation Plan Record of Decision for the Land Use Plan Amendment to the California Desert Conservation Area Plan, Bishop Resource Management Plan, and Bakersfield Resource Management Plan*, U.S. Department of the Interior, BLM/CA/PL-2016/03+1793+8321, September.

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**APPENDIX A:**  
**RELEVANT ENERGY GENERATION AND ELECTRIC TRANSMISSION**  
**SUITABILITY STUDIES**

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**APPENDIX A:  
RELEVANT ENERGY GENERATION AND ELECTRIC TRANSMISSION  
SUITABILITY STUDIES**

Table A-1 lists the studies, projects, and systems as of 2014 that were reviewed as part of the West-Wide Wind Mapping Project (Project). As discussed in Section 3.1, environmental resources and conflicting land uses included in these efforts were considered for evaluation in the Project.

**TABLE A-1 Studies, Projects, and Systems Reviewed as Part of the West-Wide Wind Mapping Project (alphabetical by organization)**

Study/Project/ System Name	Organization	Development Type	Data Layers Included/Resources Considered	Constraint Types Identified	Geographic Scope
<i>Arizona Renewable Resource and Transmission Identification Subcommittee</i>	Arizona Renewable Resource and Transmission Identification Subcommittee	Solar, wind	Specially designated lands, visual resources, wildlife resources, water resources, historical/cultural resources, slope, military areas, other	<ul style="list-style-type: none"> <li>• Exclusion</li> <li>• High sensitivity</li> <li>• Moderate sensitivity</li> <li>• Low sensitivity</li> </ul>	Statewide
<i>Wind Power in Wyoming: Doing it Smart from the Start</i>	Biodiversity Conservation Alliance	Wind	Specially designated lands, visual resources, wildlife resources, other	<ul style="list-style-type: none"> <li>• Exclusion areas</li> <li>• Caution areas</li> <li>• Promotion areas</li> </ul>	Statewide
<i>Arizona Restoration Design Energy Project</i>	BLM Arizona	Solar, wind	Specially designated lands, visual resources, wildlife resources, water resources, historical/cultural resources, slope, military areas, other	<ul style="list-style-type: none"> <li>• Known sensitive resources eliminated from consideration</li> <li>• Water Protection Zones</li> </ul>	Statewide

**TABLE A-1 (Cont.)**

Study/Project/ System Name	Organization	Development Type	Data Layers Included/Resources Considered	Constraint Types Identified	Geographic Scope
<i>BLM Southern Idaho Infrastructure Development Conflict Map</i>	BLM Idaho  -----	Power transmission lines; communication facilities/towers; airports; paved roads; railroads; energy development such as wind, geothermal, coal, nuclear, solar	Specially designated lands, visual resources, wildlife resources, historical/cultural resources, military areas, other	<ul style="list-style-type: none"> <li>• Development precluded</li> <li>• High conflict</li> <li>• Moderate conflict</li> <li>• Low conflict</li> </ul>	Southern Idaho
<i>Renewable Energy Development Challenges and Opportunities</i>	BLM Oregon	Wind	Specially designated lands, visual resources, wildlife resources, military areas	<ul style="list-style-type: none"> <li>• BLM Special Emphasis Area</li> <li>• Conservation Opportunity Area</li> <li>• BLM Preliminary Primary Habitat</li> <li>• BLM Preliminary General Habitat</li> <li>• DoD Consultation Area</li> </ul>	Statewide
<i>Colorado Renewable Energy Development Infrastructure</i>	Colorado Governor's Energy Office	Solar, wind	Specially designated lands, wildlife resources, water resources, military areas, other	<ul style="list-style-type: none"> <li>• Sensitive resources conservation (with five classifications that vary from low to high)</li> <li>• Environmental considerations</li> </ul>	Statewide
<i>High Plains Express Routing/Permitting Study Committee Update</i>	High Plains Express Routing/Permitting Study Committee	Extra-high voltage transmission line facilities	Specially designated lands, wildlife resources, historical/cultural resources, slopes, military areas, other	<ul style="list-style-type: none"> <li>• Exclusion areas</li> <li>• Sensitivity areas</li> <li>• Opportunity areas</li> </ul>	Arizona, Colorado, New Mexico, Wyoming

**TABLE A-1 (Cont.)**

Study/Project/ System Name	Organization	Development Type	Data Layers Included/Resources Considered	Constraint Types Identified	Geographic Scope
<i>Nevada Renewable Energy Transmission Access Advisory Committee</i>	Nevada Renewable Energy Transmission Access Advisory Committee	Solar, wind, biomass, geothermal	Specially designated lands, wildlife resources, slope, military areas, other	<ul style="list-style-type: none"> <li>• Level 1 (fatal flaw, highest constraint)</li> <li>• Level 2 (high constraint)</li> <li>• Level 3 (moderate constraint)</li> <li>• Level 4 (low constraint)</li> <li>• Level 5 (unresolved)</li> </ul>	Statewide
<i>California Renewable Energy Transmission Initiative (RETI)</i>	RETI Stakeholder Steering Committee	Solar, wind, biomass, geothermal, biogas, hydro, and wave and marine currents	Specially designated lands, wildlife resources, water resources, historical/cultural resources, slope, and other	<ul style="list-style-type: none"> <li>• Category 1 lands (exclusion zones)</li> <li>• Category 2 lands</li> </ul>	California, Arizona, Nevada, Oregon, Washington, British Columbia, and the northern part of Baja California
<i>USFWS Land- Based Wind Energy Guidelines</i>	U.S. Fish and Wildlife Service (USFWS)	Wind	Specially designated lands, wildlife resources	<ul style="list-style-type: none"> <li>• Precluded areas</li> <li>• Protected areas</li> <li>• Inappropriate areas</li> <li>• Avoidance areas</li> </ul>	United States
<i>Utah Renewable Energy Zone</i>	Utah Renewable Energy Zones Task Force	Solar, wind, geothermal	Military areas, other	Exclusion areas	Statewide

**TABLE A-1 (Cont.)**

Study/Project/ System Name	Organization	Development Type	Data Layers Included/Resources Considered	Constraint Types Identified	Geographic Scope
<i>Western Governors' Association Western Renewable Energy Zone</i>	Western Governors' Association	Solar, wind, biomass, hydro, geothermal	Specially designated lands, visual resources, wildlife resources, water resources, slope, military areas, other	<ul style="list-style-type: none"> <li>• Exclusion areas</li> <li>• Avoidance areas</li> <li>• Wildlife avoidance areas</li> </ul>	Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, Wyoming; Alberta and British Columbia
<i>Wyoming Wind Collector System and Integration Study</i>	Wyoming Business Council, Business and Industry Division, State Energy Office, and Wyoming Infrastructure Authority	Wind	Specially designated lands, visual resources, wildlife resources, water resources, historical/cultural resources, military areas, other	<ul style="list-style-type: none"> <li>• Very high constraint</li> <li>• High constraint</li> <li>• Moderate constraint</li> <li>• Low constraint</li> </ul>	Southeast Wyoming
<i>Wind Development Environmental Conflicts Map, December 2008</i>	Wyoming Infrastructure Authority	Wind	Specially designated lands, visual resources, wildlife resources	<ul style="list-style-type: none"> <li>• Likely precluded</li> <li>• Significant environmental conflicts</li> <li>• No significant environmental conflicts identified</li> </ul>	Statewide
<i>Wind Development Environmental Conflicts Map, October 2010</i>	Wyoming Governor's Office	Wind	Specially designated lands, visual resources, wildlife resources	<ul style="list-style-type: none"> <li>• Excluded</li> <li>• High sensitivity</li> <li>• Sensitive</li> <li>• Minimal environmental conflicts</li> </ul>	Statewide

**TABLE A-1 (Cont.)**

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Study/Project/ System Name	Organization	Development Type	Data Layers Included/Resources Considered	Constraint Types Identified	Geographic Scope
<i>Wind Energy: Doing it Right in Wyoming</i>	Wyoming Outdoor Council	Wind	Specially designated lands, visual resources, wildlife resources, other	<ul style="list-style-type: none"><li>• Exclusion areas</li><li>• Avoidance areas</li></ul>	Statewide

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**APPENDIX B:**  
**GEOSPATIAL DATA LAYERS USED IN THE ANALYSIS**  
**FOR THE WEST-WIDE WIND MAPPING PROJECT**

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**APPENDIX B:**

**GEOSPATIAL DATA LAYERS USED IN THE ANALYSIS FOR THE WEST-WIDE WIND MAPPING PROJECT**

Table B-1 lists the geospatial data sources used in the West-Wide Wind Mapping Project.

**TABLE B-1 West-Wide Wind Mapping Project Geospatial Data Classes and Sources<sup>a</sup>**

Resource Type/Feature Class Name	Source	Source Date
<i>Special Land Resource Areas</i>		
Areas of Critical Environmental Concern	BLM Arizona State Office	2014
	BLM California State Office	2014
	BLM Colorado State Office	2014
	BLM Idaho State Office	2012
	BLM Montana State Office	2012
	BLM Nevada State Office	2014
	BLM Utah State Office	2014
	Various sources compiled at Argonne National Laboratory	2014
DRECP California Desert National Conservation Lands	BLM California State Office	2016
Lands inventoried and managed for wilderness characteristics	BLM Arizona State Office	2014
National Conservation Areas (except CDCA)	BLM California State Office	2000
National Monuments	BLM California State Office	2012, 2014
	BLM Colorado State Office	2014
	BLM Idaho State Office	2012
	BLM Montana State Office	2014
	BLM Utah State Office	2014
	BLM Washington Office	2009
	Various sources compiled at Argonne National Laboratory	2014
National Natural Landmarks on BLM-administered lands	NPS	2013
Other designated NLCS lands	BLM California State Office	2007
	BLM Washington Office	2009

**TABLE B-1 (Cont.)**

Resource Type/Feature Class Name	Source	Source Date	
<i>Special Land Resource Areas (cont.)</i>			
Wild and Scenic Rivers	BLM California State Office	2014	
	BLM Colorado State Office	2014	
	BLM Idaho State Office	2012	
	BLM Montana State Office	Unknown	
Wilderness Areas	BLM Arizona State Office	2014	
	BLM California State Office	2014	
	BLM Colorado State Office	2013	
	BLM Idaho State Office	2013	
	BLM Montana State Office	Unknown	
	BLM Nevada State Office	2014	
	BLM Utah State Office	2014	
	BLM Washington Office	2009	
	Various sources compiled at Argonne National Laboratory	2014	
	Wilderness.net	2014	
	Wilderness Study Areas	BLM	2014
		BLM Arizona State Office	2014
BLM California State Office		2014	
BLM Colorado State Office		2013	
BLM Idaho State Office		2011	
BLM Montana State Office		2014	
BLM Nevada State Office		2014	
BLM Utah State Office		2014	
BLM Washington Office		1982–2009	
Various sources compiled at Argonne National Laboratory	2014		

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**TABLE B-1 (Cont.)**

Resource Type/Feature Class Name	Source	Source Date
<i>Ecological Resources</i>		
Desert tortoise		
Designated critical habitat	BLM Arizona State Office	2011
USFWS-identified priority tortoise connectivity areas	USFWS	2011
Desert Wildlife Management Areas	BLM California State Office	2014
Designated critical habitat for ESA-listed species	USFWS	1967–2015
Designated special status species management areas	BLM Arizona State Office	2012
	BLM Oregon/Washington State Office	2014
DRECP Wildlife Allocations	BLM California State Office	2016
Important Bird Areas	National Audubon Society	2015
Raptor habitat/distribution		
Aplomado falcon distribution	USGS	2015
Bald eagle distribution	USGS	2015
California condor critical habitat	USFWS	2015
California condor distribution	USGS	2015
Golden eagle distribution	USGS	2015
Mexican spotted owl critical habitat	USFWS	2015
Mexican spotted owl distribution	USGS	2015
Northern spotted owl critical habitat	USFWS	2015
Northern spotted owl distribution	USGS	2015
Sage-grouse (includes greater and Gunnison)		
GHMA	BLM Washington Office	2016
PHMA	BLM Washington Office	2016
SFA	BLM Washington Office	2016
Sharp-tailed grouse habitat	BLM Wyoming State Office	2004
Wildlife Management Areas, except in California	BLM Arizona State Office	2014
	BLM Idaho State Office	2014
	BLM Utah State Office	2014

**TABLE B-1 (Cont.)**

Resource Type/Feature Class Name	Source	Source Date
<i>Potentially Incompatible Land Uses</i>		
Designated BLM utility corridors	BLM Arizona State Office	2014
	BLM Montana State Office	Unknown
	BLM Nevada State Office	2014
	BLM Utah State Office	2014
	Various sources compiled at Argonne National Laboratory	2008
DoD-designated areas of high risk of adverse impact	DoD	2011, 2013
DoD restricted airspace and military training routes	Mantech, Inc. (DoD contractor)	2009
DRECP DFAs restricted to solar and/or geothermal energy	BLM California State Office	2016
DRECP Variance Lands	BLM California State Office	2016
Lands acquired with federal funds for conservation purposes	BLM California State Office	2014
Lands purchased by private funds and donated to the BLM	BLM California State Office	Unknown
No surface occupancy restriction areas	BLM Colorado State Office	2014
	BLM Idaho State Office	2014
	BLM Montana State Office	Unknown
NPS-identified high potential conflict areas	NPS	2012
RMP Wind Avoidance Areas	BLM Arizona State Office	2012
	BLM Montana State Office	2014
	BLM Utah State Office	2014
RMP Wind Exclusion Areas	BLM Arizona State Office	2012
	BLM California State Office	2010
	BLM Montana State Office	2014
	BLM New Mexico State Office	2014
	BLM Wyoming State Office	2014

**TABLE B-1 (Cont.)**

Resource Type/Feature Class Name	Source	Source Date
<i>Potentially Incompatible Land Uses (cont.)</i>		
ROW Avoidance Areas	BLM Montana State Office	Unknown
	BLM Nevada State Office	2014
ROW Exclusion Areas	BLM Idaho State Office	2014
	BLM Montana State Office	2009, 2014
	BLM Nevada State Office	2014
	BLM New Mexico State Office	2009
	BLM Oregon/Washington State Office	2014
	BLM Utah State Office	2014
	BLM Washington Office	2013
Utah Test and Training Range	BLM Utah State Office	2010
<i>Visual Resources</i>		
BLM Back-Country Byways	BLM Idaho State Office	2014
	BLM Montana State Office	Unknown
DRECP National Scenic Cooperative Management Areas	BLM California State Office	2016
National Scenic Highways/All-American Roads	BLM Idaho State Office	2010
National Scenic Trails	BLM California State Office	2009
	BLM Montana State Office	2014
	BLM Washington Office	2009
National Scenic and Historic Trails	BLM Colorado State Office	2014
	BLM Idaho State Office	2012
	BLM Nevada State Office	2014
	BLM Utah State Office	Unknown
	Various sources compiled at Argonne National Laboratory	2014
State Scenic Highways	BLM Idaho State Office	2010
	Federal Highway Administration	2013

**TABLE B-1 (Cont.)**

Resource Type/Feature Class Name	Source	Source Date
<i>Visual Resources (cont.)</i>		
VRM Class I	BLM Arizona State Office	2014
	BLM Idaho State Office	2012
	BLM Montana State Office	2008, 2014
	BLM Oregon/Washington State Office	2014
	BLM Utah State Office	2014
VRM Class II	BLM Arizona State Office	2014
	BLM California State Office	2012
	BLM Montana State Office	2008, 2014
VRM Class III	BLM Arizona State Office	2014
	BLM California State Office	2012
	BLM Montana State Office	2008, 2014
<i>Cultural Resources</i>		
National Historic Landmarks	National Park Service	2014
National Historic Parks and National Historic Sites	BLM Washington Office	2009
National Historic Trails	BLM California State Office	2003, 2004
	BLM Montana State Office	2014
	BLM Washington Office	2009
Properties listed on the NRHP or comparable state register	NPS National Register Information System	2013
<i>Recreation Resources</i>		
Long-term visitor use areas	BLM Arizona State Office	2014
Off-highway vehicle areas		
DRECP Open Off Highway Vehicle Areas	BLM California State Office	2016
Off-highway vehicle open areas, except in DRECP	BLM Arizona State Office	2014
	BLM California State Office	2012
	BLM Idaho State Office	2013
	BLM Montana State Office	Unknown



**TABLE B-1 (Cont.)**

Resource Type/Feature Class Name	Source	Source Date
<i>Recreation Resources (cont.)</i>		
	BLM Oregon/Washington State Office	2014
	BLM Utah State Office	2014
Recreation management areas		
DRECP Extensive Recreation Management Areas	BLM California State Office	2016
DRECP SRMAs	BLM California State Office	2016
SRMAs, except in California	BLM Arizona State Office	2014
	BLM Colorado State Office	2013
	BLM Idaho State Office	2013
	BLM Montana State Office	2010, 2014
	BLM New Mexico State Office	Unknown
	BLM Oregon/Washington State Office	2014
	BLM Utah State Office	2014
SRMAs in California, not in the DRECP	BLM California State Office	2013
<i>Reference</i>		
BLM Field Office boundaries	BLM Washington Office	2011
NPS boundaries	NPS	Unknown
Roads	National Transportation Atlas Data	2011
Surface Management Agency	BLM National Operations Center	2009
Wind Speed	AWS Truepower, LLC	2014

<sup>a</sup> Abbreviations: BLM = Bureau of Land Management; CDCA = California Desert Conservation Area; DoD = U.S. Department of Defense; DRECP = Desert Renewable Energy Conservation Plan; DFA = Development Focus Area; ESA = Endangered Species Act; GHMA = General Habitat Management Area; NLCS = National Landscape Conservation System; NPS = National Park Service; NRHP = *National Register of Historic Places*; PHMA = Priority Habitat Management Area; RMP = Resource Management Plan; ROW = right-of-way; SFA = Sagebrush Focal Area; SRMA = Special Recreation Management Area; USFWS = U.S. Fish and Wildlife Service; USGS = U.S. Geological Survey; VRM = Visual Resource Management.

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**APPENDIX C:**  
**PUBLIC COMMENT SUMMARY DOCUMENT**

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**APPENDIX C:  
PUBLIC COMMENT SUMMARY DOCUMENT**

**SUMMARY OF STAKEHOLDER COMMENTS FROM  
SEPTEMBER 2014 PUBLIC MEETING**

On September 16, 2014, the U.S. Department of the Interior’s Bureau of Land Management (BLM) hosted a stakeholder outreach meeting to present information on the West-Wide Wind Mapping Project (Project) and to solicit feedback. There were 44 attendees. The information presented at this meeting was made available to the general public for comment and review. Comment documents were received from seven stakeholder groups:

- American Wind Energy Association;
- Clark County, Nevada, Department of Aviation;
- Southern Nevada Water Authority;
- South-West Department of Defense Regional Coordination Team;
- The Nature Conservancy;
- The Wilderness Society on behalf of itself and 15 other nongovernmental organizations (NGOs); and
- World Wildlife Fund.

Most commenters supported the idea of renewable energy development on public land and made additional comments and recommendations regarding the Project that can be organized into eight main topics: (1) comments on the Project purpose and objective, (2) comments on potential exclusions, (3) consideration of additional resource sensitivities and/or exclusion categories, (4) mapping suggestions, (5) use of appropriate data sources, (6) siting, (7) public involvement, and (8) Project implementation and maintenance.<sup>2</sup> A summary of these comments is provided below.

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<sup>2</sup> During the public meeting, the BLM referred to wind energy exclusions and constraints presented by various resources and land uses. Many of the stakeholders found the term “constraints” to be unclear and potentially misleading with respect to actual limitations they might constitute. Subsequent to the meeting, the BLM dropped the term “constraints” and instead referred to “other sensitive resources.” Meeting materials posted for public review were modified to use the new terminology. As a result, both terms, “constraints” and “other sensitive resources,” appear in the stakeholder comments.

## PROJECT PURPOSE AND OBJECTIVE

- The purpose and value of the Project are unclear. The BLM needs to further explain the purpose of the Project and how the maps will be utilized.
- Maps developed under the Project should not be used to determine where development may or may not occur and should only be used for informational purposes.
- Wind development should be allowed to proceed through the use of risk-based and site-specific approaches rather than through creating development/no-development zones.
- The Project should be closely coordinated with the Wyoming Wind and Transmission Study (WWATS), and both should be a priority.

## POTENTIAL EXCLUSIONS

- It is unclear how and why the potential exclusion and constraints categories were chosen. The BLM should clarify which exclusions and constraints will be included in the Project and provide a rationale for why these areas should be excluded or are considered sensitive to wind development.
- With regard to the Preliminary Exclusions and Other Resource Sensitivities Related to Wind Energy on BLM-Administered Lands Table:
  - *Lands Purchased by Private Funds and Donated to BLM* should be considered an exclusion, not just a BLM Designation and Other Sensitive Resource.
  - It is not clear why *No Surface Occupancy Restriction Areas*, *Resource Management Plan (RMP) Wind Avoidance Areas*, and *Right-of-Way (ROW) Avoidance Areas* are not considered areas of exclusion.
- Commenters suggested that the BLM consider adding the following categories as exclusions:
  - Airport-Related Lands—specifically lands that are so close to an existing or proposed airport that construction of tall structures could create hazards to air navigation.
  - All designated Critical Habitat for threatened and endangered species.
  - All Priority Areas for Conservation and all areas identified as core or priority habitat (or similar designation) for greater sage-grouse.

- Habitat for raptors and Key Raptor Areas.
- Inventoried and non-inventoried roadless areas that could qualify as wilderness.
- Lands Acquired or Designated via Compensatory Mitigation.
- High-use areas for bat species.

### **ADDITIONAL SENSITIVE RESOURCE CATEGORIES**

- Commenters suggested that the BLM consider adding the following categories as land sensitivities:
  - General sage-grouse areas.
  - The Nature Conservancy’s biodiversity portfolio.
  - Lands more than 15 mi away from existing high-voltage transmission lines.
- Commenters suggested that if the following categories were not considered as exclusions that they at least be considered as sensitive resources:
  - Habitat for raptors and Key Raptor Areas (if not considered as an exclusion) or sensitive areas incorporated into the model.
  - Inventoried and non-inventoried roadless areas that could qualify as wilderness; at a minimum, these should be considered as sensitive areas.

### **MAPPING SUGGESTIONS**

- The Project should identify areas excluded from wind development and areas with low, moderate, and high levels of sensitivity to inform future land use planning, conservation, and energy development.
- The Project should include proposed high-voltage transmission lines.

### **APPROPRIATE DATA SOURCES**

Most commenters suggested that the BLM should use the best available data to develop the Project. All of the commenters suggested a variety of sources, including papers, guides,

websites, and landscape-level planning tools already available for use, to be used in the development of the Project.

- The U.S. Department of Defense (DoD) would like to have a discussion regarding adding data layers to the Project that would better articulate DoD interests.
- The BLM should coordinate with other agencies and other landscape-level planning efforts to ensure that the public has access to consistent and transparent data.
- The BLM should avoid the creation of redundant planning tools. A variety of landscape-level planning tools and geospatial databases are available to help developers implement wind energy at a landscape-level basis. These include the following:
  - American Wind Wildlife Institute’s (AWWI) *Landscape Assessment Tool (LAT)*
  - Argonne National Laboratory’s (Argonne’s) *Eastern Interconnection States’ Planning Council (EISPC) Energy Zones Mapping Tool*
  - The Audubon Society’s *Important Bird Areas*
  - BLM’s Rapid Ecological Assessments
  - DoD’s *Preliminary Screening Tool*
  - DoD’s *Siting Clearinghouse*
  - National Renewable Energy Laboratory’s (NREL’s) *Regional Energy Deployment System (ReED Model)*
  - NREL’s *Wind Prospector*
  - New York State Energy Research and Development Administration’s (NYSERDA’s) *Wind Energy Siting and Biodiversity Tool*
  - Rocky Mountain Bird Observatory’s (RMBO’s) *Rocky Mountain Avian Data Center*
  - RMBO’s *Partners in Flight Database*
  - State of Montana’s *Crucial Areas Assessment Tool*
  - The Nature Conservancy’s *Low Impact Wind Planning Tool*



- The Western Governors’ Association’s *Crucial Habitat Assessment Tool* (CHAT)
- The Wilderness Society’s (TWS’s) *Citizens’ Wilderness Proposal Areas*
- TWS’s *Citizen-Inventoried Lands with Wilderness Characteristics*
- Western Electricity Coordinating Council’s (WECC’s) Environmental Data Task Force’s *Geospatial Data Viewer*
- U.S. Fish and Wildlife Service’s (USFWS’s) *Land-Based Wind Energy Guidelines* (WEGs)
- USFWS’s *Landscape Energy Action Plan* (LEAP)
- USFWS’s *Information, Planning, and Conservation System* (IPaC)

## **SITING**

- Renewable energy development should be steered toward already disturbed lands and/or lands where there will be the least conflict with resources of concern.
- The BLM should consider transmission needs when considering areas suitable for wind development.
- Existing and pending rights-of-way (ROWs) throughout portions of the Project area. The following information should be clarified in any further National Environmental Policy Act (NEPA) documents:
  - Existing ROWs would not be affected by the designation of wind energy project developable and undevelopable lands.
  - If a wind energy project is developed within the vicinity of the ROW, the project will not block the existing ROW.
  - The designation of wind energy developable and undevelopable lands would not prevent the issuance of non-wind-energy project ROWs within these lands.

## **PUBLIC INVOLVEMENT**

- The BLM should continue to provide meaningful opportunities for public involvement in the Project.

- The BLM should create a Project website.
- The BLM should create a Project e-newsletter.
- The BLM should publish a Request for Information in the *Federal Register*.
- The BLM should host additional public meetings and/or webinars.
- The BLM should provide a follow-up opportunity to demonstrate the Project.
- Preliminary draft Project shapefiles and associated metadata should be made available to the public via the public website.
- The BLM should coordinate closely with grazing permittees when designating wind energy developable and undevelopable lands.

#### **IMPLEMENTATION AND MAINTENANCE OF THE PROJECT**

- The BLM should commit to using the Project to inform future land use planning decisions.
- The BLM should commit to providing regular training for staff members on the use of Project resources.





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