



Reference Data

NPS Units: Current NPS administrative boundaries for park units (June 2011)

Park Area of Analysis: 25-mile area of analysis around each park

Solar Energy Zones and Solar PEIS Lands: Solar Energy Development Programmatic EIS (<http://solareis.anl.gov/maps/index.cfm>)

Preliminary PEIS Areas within 25 miles: GIS intersect of Solar PEIS Lands and 25-mile park area of analysis.

Sources:

NPS Land Resource Administrative Boundary layer (June 2011): <https://irma.nps.gov/App/Reference/Search/1>

Park Area of Analysis: NPS Inventory and Monitoring Division

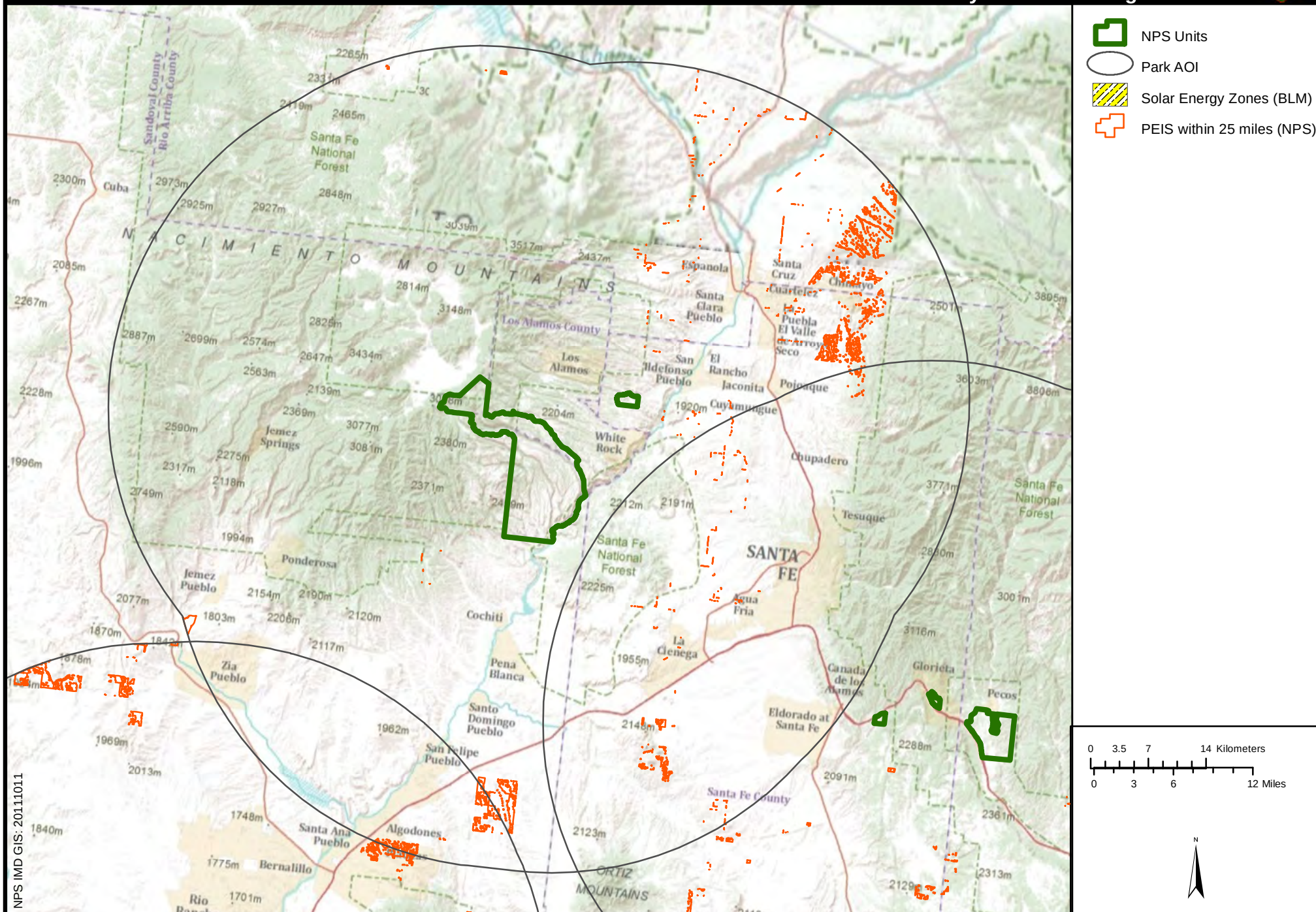
Solar Energy Zones and PEIS Areas: Solar Energy Development Programmatic EIS GIS:

<http://solareis.anl.gov/maps/gis/index.cfm> - download data October 6th, 2011

Bandelier NM - Draft PEIS Resources Map

Reference Data

National Park Service
U.S. Department of the Interior
Inventory and Monitoring Division





Wind Erodibility

Criteria:

NRCS STATSGO Soil Data. Wind Erosion sensitive soil criteria were obtained from BLM Rapid Ecological Assessments for the Mojave Basin and Range.

High wind erosion potential occurs at locations with:

Wind erosion groups (WEG) 1 and 2.

WEG were derived from the whole soil, surface layer and all components.

NRCS STATSGO Database May/2011

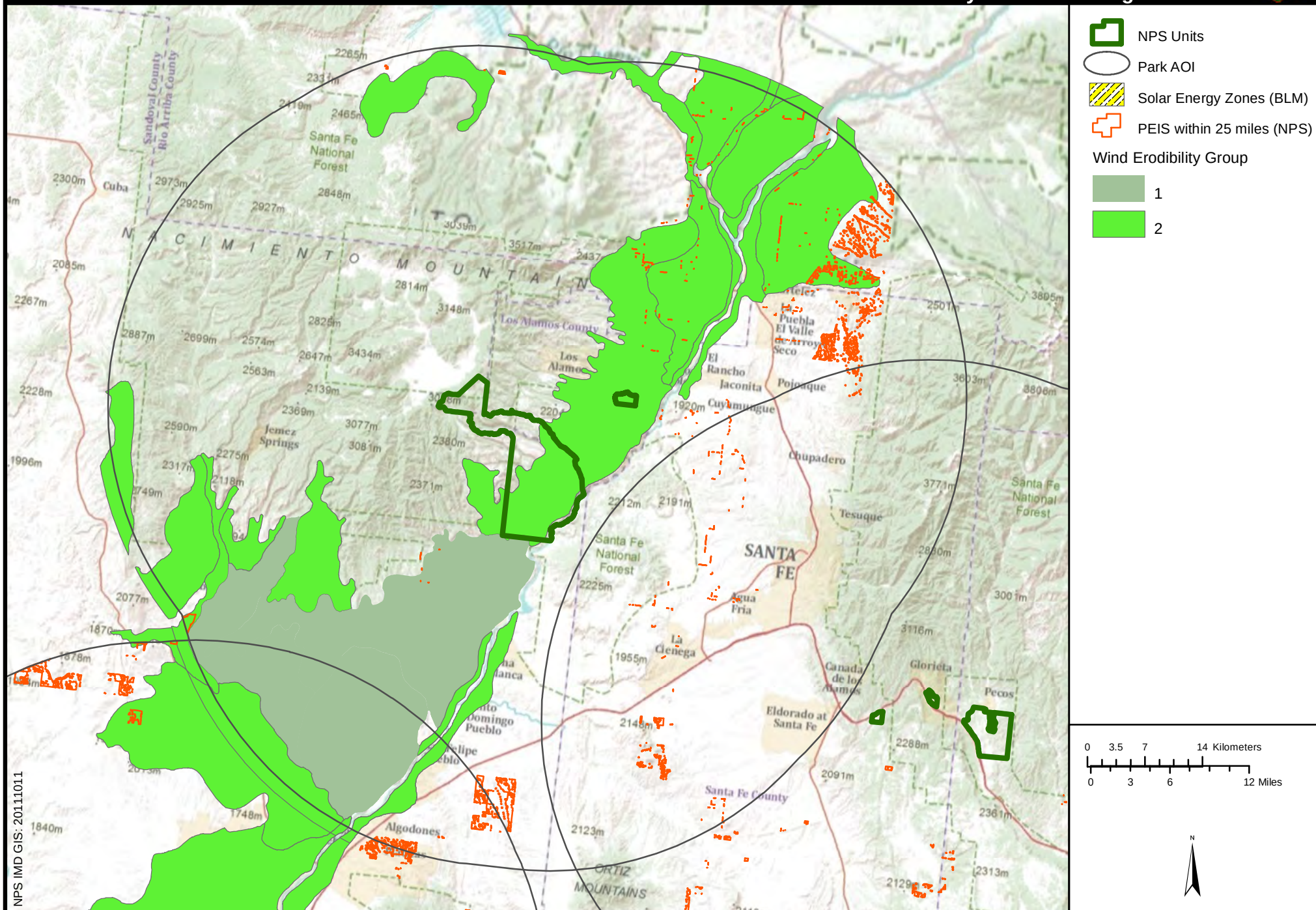
Sources:

Natural Resources Conservation Service, United States Department of Agriculture. U.S. General Soil Map (STATSGO2). Available online at <http://soildatamart.nrcs.usda.gov>. Accessed May/2011

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Soils (Statsgo) Wind Erodibility Group

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Inventory and Monitoring Division





Water Erodibility

Criteria:

NRCS STATSGO K Factor and Slope (DEM) Sensitive Soil (Water Erodibility). Water erosion sensitive soil criteria was obtained from BLM Rapid Ecological Assessments for the Mojave Basin and Range.

High water erosion potential occurs at locations with:

KW<0.20 & Slope > 40 or,

KW 0.20 - 0.36 & Slope > 35 or,

KW > 0.36 & Slope > 25.

K factor has been derived from the whole soil, surface layers and all components.

NRCS STATSGO Database May/2011

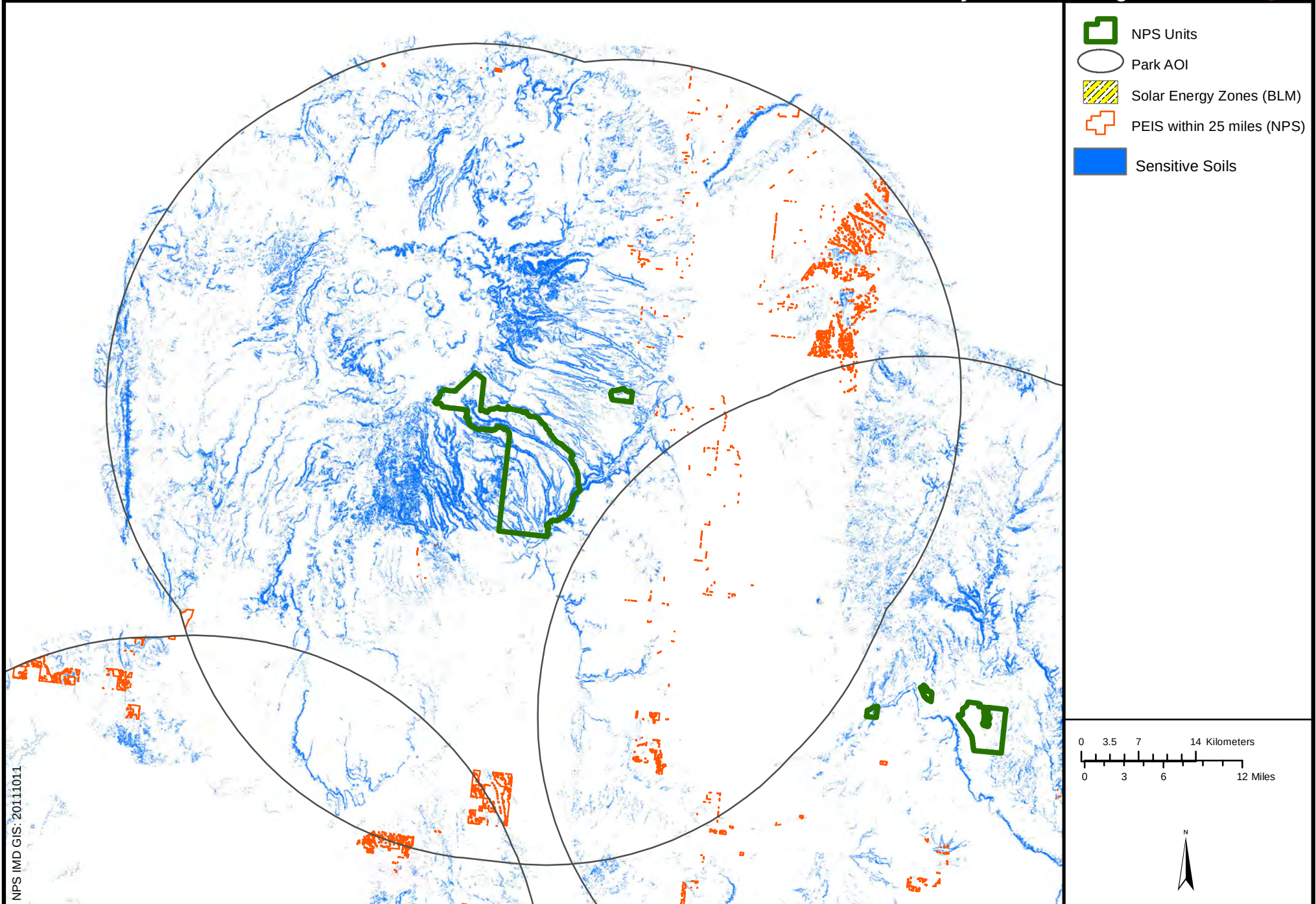
Sources:

Natural Resources Conservation Service, United States Department of Agriculture. U.S. General Soil Map (STATSGO2). Available online at <http://soildatamart.nrcs.usda.gov>. Accessed May/2011

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Soils (Statsgo) K Factor and Slope - Water Erosion

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Inventory and Monitoring Division





Wetlands

U.S. Fish and Wildlife Service National Wetlands Inventory layer for the 6-state Solar PEIS project area.

From USFWS' Data limitations and uses documentation <http://www.fws.gov/wetlands/Data/Limitations.html>:

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery and/or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Exclusions - Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

By policy, the Service also excludes certain types of "farmed wetlands" as may be defined by the Food Security Act or that do not coincide with the Cowardin et al. definition. Contact the Service's Regional Wetland Coordinator for additional information on what types of farmed wetlands are included on wetland maps.

Precautions - Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Lastly a 500 meter wetlands buffer was applied to the wetlands data.

USFWS National Wetlands Inventory Data.

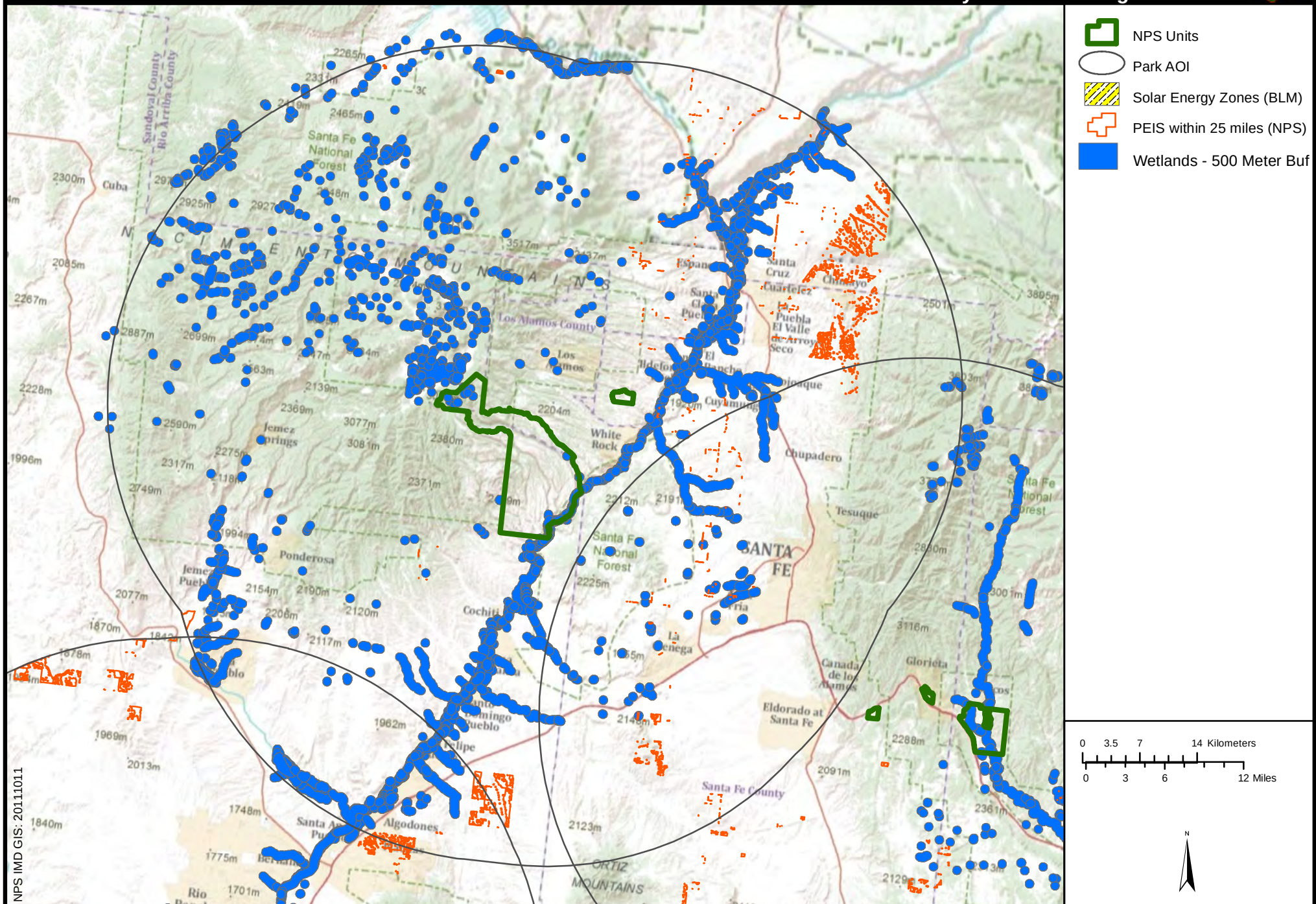
Date varies by location

Sources:

USFWS National Wetlands Inventory (NWI): <http://wetlands.fws.gov>

Wetlands Data (500 Meter Buffer) - U.S. Fish and Wildlife Service

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U.S. Department of the Interior
Inventory and Monitoring Division**





Upstream Watersheds

Upstream watersheds are calculated from 30 meter digital elevation models-derived flow accumulation and flow direction rasters and National Hydrography Dataset flowlines as part of the NPS NPScene landscape dynamics project.

Upstream watersheds are calculated for streams intersecting NPS park boundaries. These pour points are snapped to the NHD flow accumulation raster. Then, watersheds are delineated using the flow direction raster. Watersheds are converted to polygons and are joined to the source park boundary to provide park-level attributes.

In many cases, upstream watersheds may flow outward from the park instead of inward.

For Solar PEIS areas missing NHDPlus flowlines, watersheds were calculated from medium resolution NHD data.

NPS Inventory and Monitoring Division
NHD data varies by location

Sources:

National Hydrography Dataset – NHDPlus: <http://www.horizon-systems.com/nhdplus/data.php>

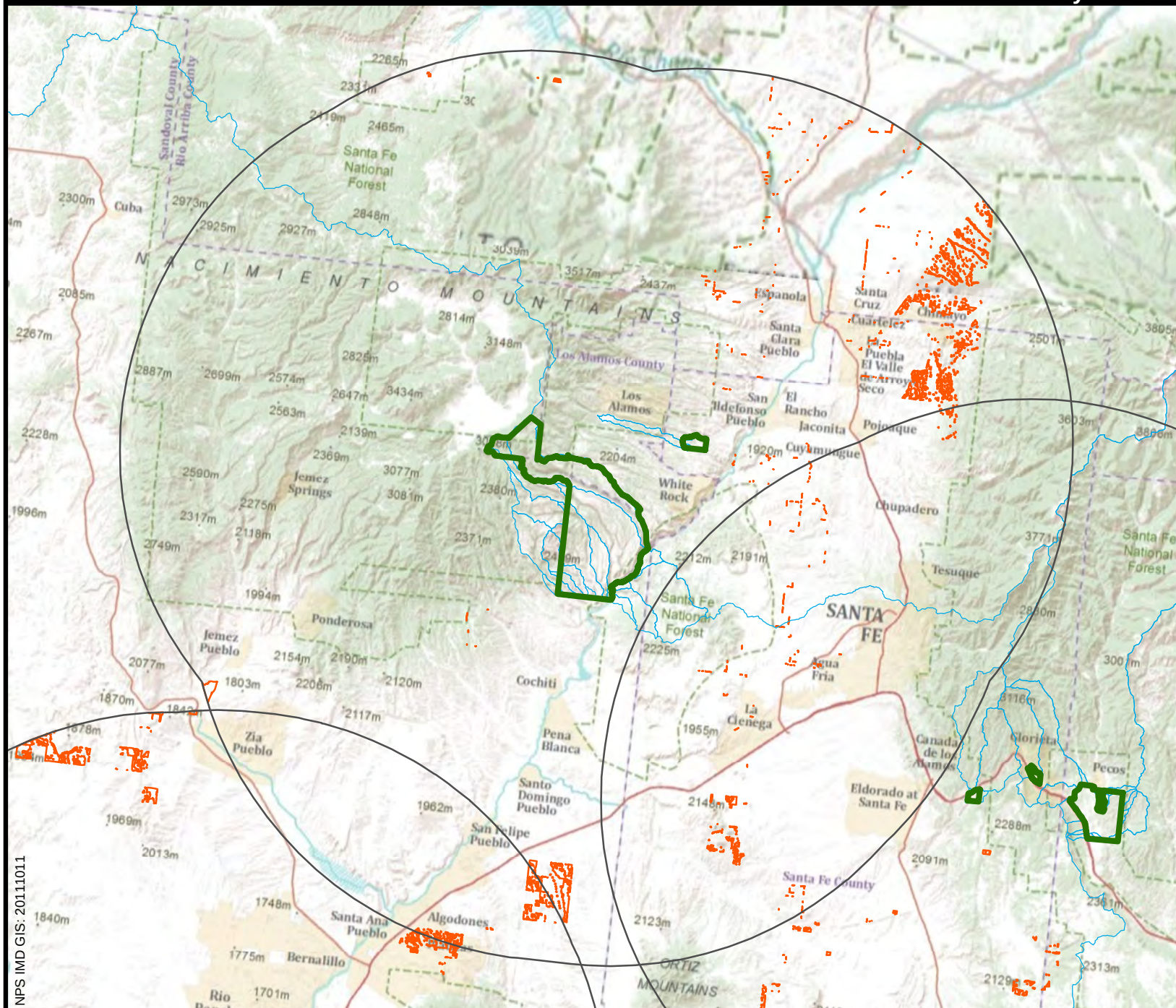
Upstream Watershed SOP for NPScene: <https://irma.nps.gov/Reference.mvc/Profile?Code=2173077>

NPS Administrative Boundaries layer (September 2010): <https://irma.nps.gov/Reference.mvc/Profile?Code=2170522>

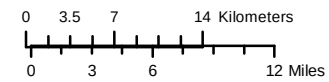
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Upstream Watersheds

National Park Service
U.S. Department of the Interior
Inventory and Monitoring Division



- NPS Units
- Park AOI
- Solar Energy Zones (BLM)
- PEIS within 25 miles (NPS)
- Upstream Watersheds





Protected Areas

Protected areas derived from Protected Areas Database of the United States (PAD-US) version 1.2.

Polygons with one of two status values are displayed:

GAP Status 1: managed for biodiversity – disturbance events proceed or a mimicked

GAP Status 2: managed for biodiversity – disturbance events are mimicked

NPS-sourced polygons were updated from the NPS Land Resource Division in late 2010.

PAD-US Technical Working Group
April 2011

Sources:

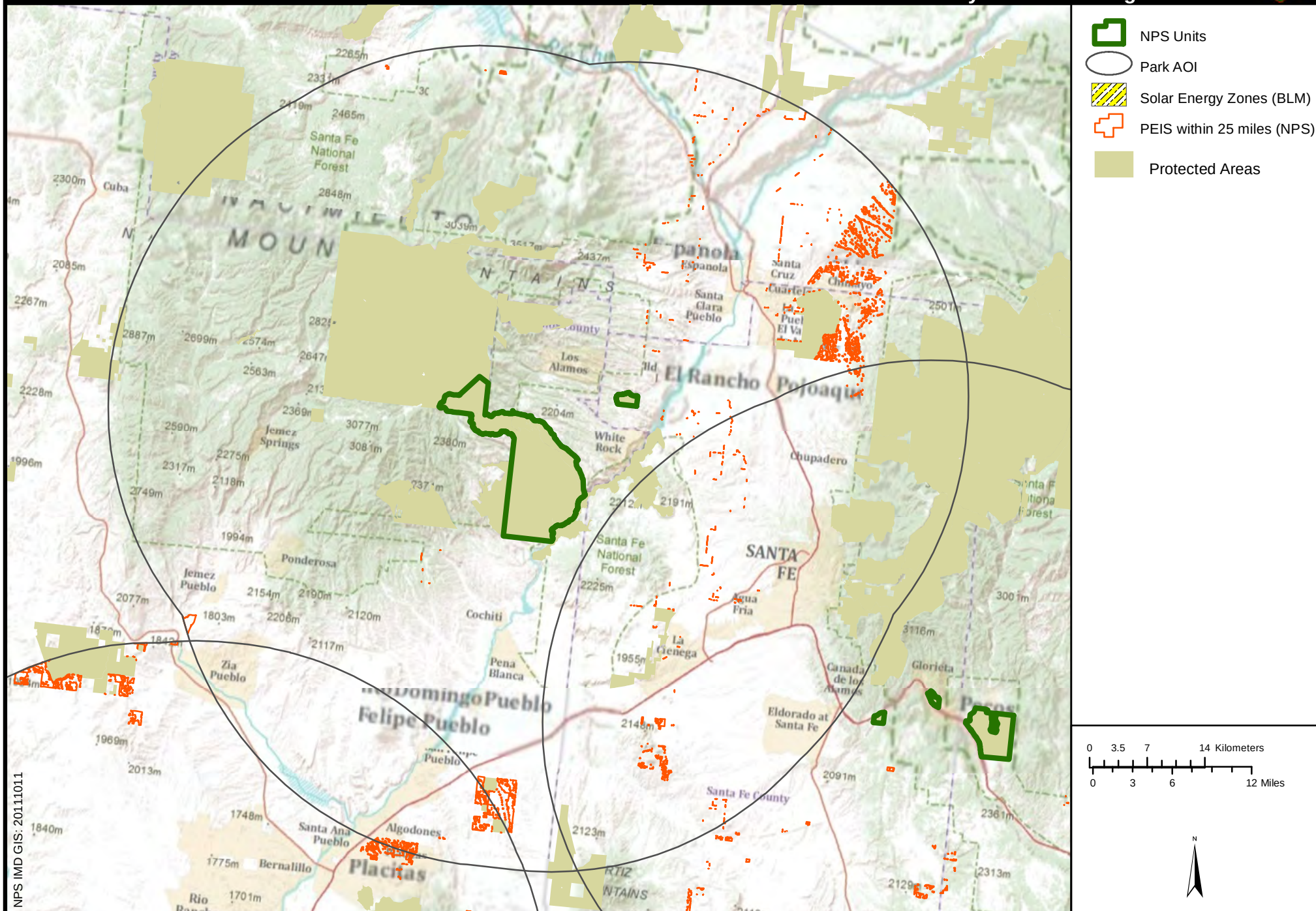
Protected Areas Database of the United States (PAD-US) version 1.2: <http://www.protectedlands.net/padus/>

The Technical Working Group is a consortium of non-government and government researchers including representatives from the Conservation Biology Institute, the Nature Conservancy, NatureServe, the National Geographic Society, Applied Geographics Inc., IUCN, Bureau of Land Management, USDA Forest Service, Virginia Department of Conservation, USGS GAP Analysis Program, and the US Geological Survey

Bandelier NM - Draft PEIS Resources Map

Protected Areas Database (PAD-US 2011)

National Park Service
U.S. Department of the Interior
Inventory and Monitoring Division





Land Ownership

Land ownership derived from the Protected Areas Database of the United States (PAD-US) version 1.2.

NPS-sourced polygons were updated from the NPS Land Resource Division in late 2010.

PAD-US Technical Working Group
April 2011

Sources:

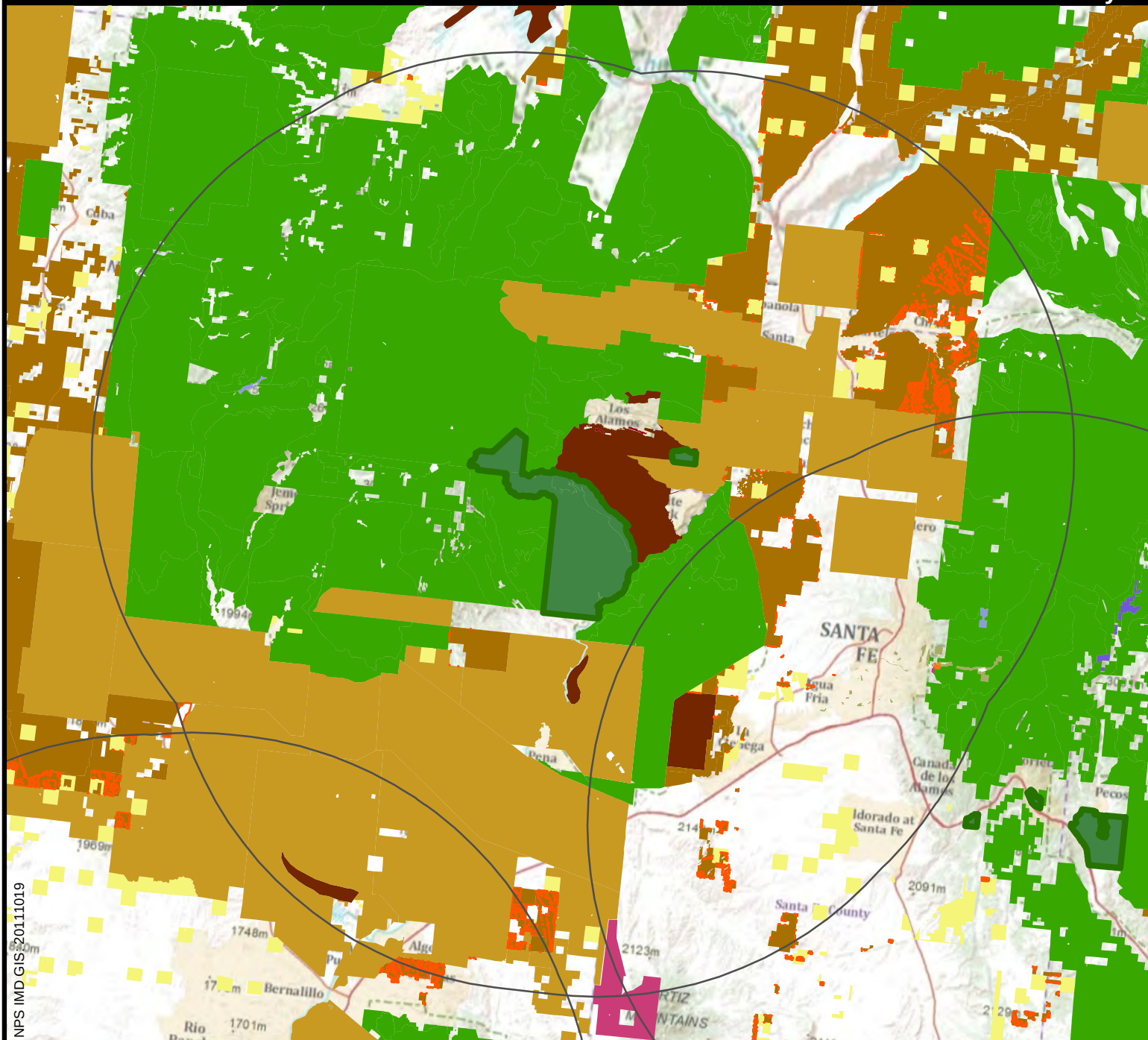
Protected Areas Database of the United States (PAD-US) version 1.2: <http://www.protectedlands.net/padus/>

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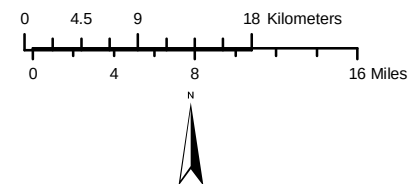
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Land Ownership (PAD-US 2011)

National Park Service
U.S. Department of the Interior
Inventory and Monitoring Division



- NPS Units
 - Park AOI
 - Solar Energy Zones (BLM)
 - PEIS within 25 miles (NPS)
- Owner Name
- Tribal Land
 - Bureau of Land Mgt (BLM)
 - Bureau of Reclamation (BOR)
 - City Land
 - Cty Land \ Regional Agency Land
 - Dept of Defense/Energy (DOD) (DOE)
 - Fish and Wildlife Service (FWS)
 - Forest Service (USFS)
 - National Park Service (NPS)
 - Other Fed (TVA,NRCS,NOAA, etc.)
 - Private Conservation
 - State Trust Land
 - State Fish and Wildlife
 - State Parks and Recreation
 - Other State (NHP,DOT,HS,etc.)
 - The Nature Conservancy (TNC)
 - Territorial Land





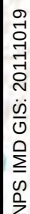
Critical Habitat

U.S. Fish & Wildlife Service Threatened and Endangered Species Final Critical Habitat Designations.

USFWS Endangered Species Division

Sources:

U.S. Fish & Wildlife Service Critical HabitatPortal -<http://criticalhabitat.fws.gov/crithab/> - Download August 3rd, 2011





Roadless Areas

Roadless areas are calculated from road features (minus ferry routes) as a metric of the NPS NPScape landscape dynamics project.

Road features were clipped to the Solar PEIS study area (using Landscape Conservation Cooperative boundaries). A Euclidean distance raster was calculated with a 30 meter cell size snapped to the National Land Cover Database (NLCD) 2006 landcover raster. Cells greater than 500 meters from a road feature were selected and converted to polygons.

The NLCD landcover raster was re-classified into Converted vs. Natural landcover categories. Converted areas are defined as Developed, Pasture/Hay, and Cultivated Crops. Polygons were derived from the Converted cells.

Final roadless area polygons were derived by erasing converted landcover polygons from the initial 500 meter distance polygon set.

NPS Inventory and Monitoring Division
2005/2006

Sources:

ESRI Streets layer; ESRI Map and Data DVD, dated 2005

Road Metric SOP for NPScape: <https://irma.nps.gov/Reference.mvc/Profile?Code=2166959>

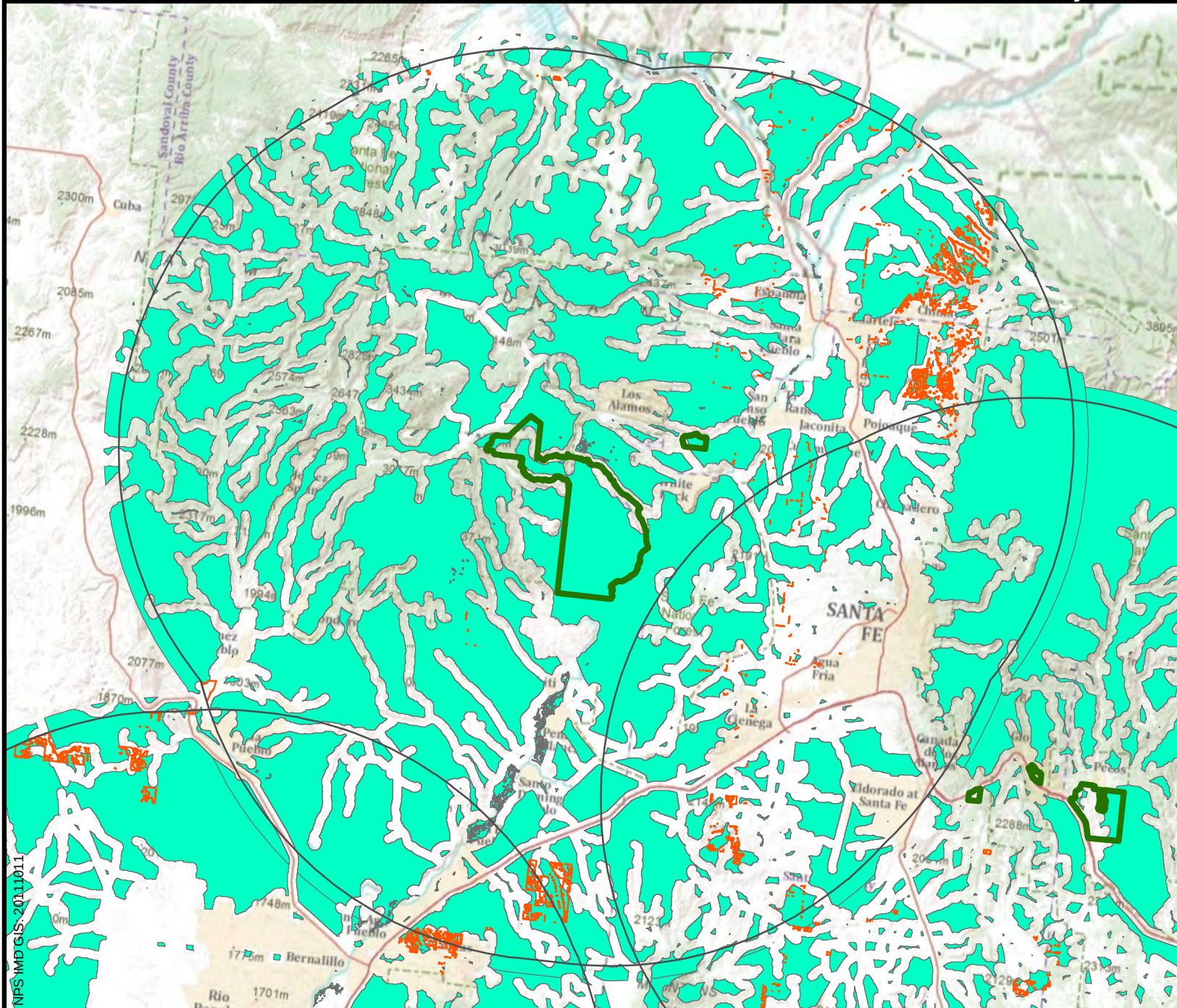
National Land Cover Dataset (2006): <http://www.mrlc.gov/nlcd2006.php>

Landcover Metric SOP for NPScape: <https://irma.nps.gov/Reference.mvc/Profile?Code=2166956>

Bandelier NM - Draft PEIS Resources Map

Roadless Natural Areas

National Park Service
U.S. Department of the Interior
Inventory and Monitoring Division



- NPS Units
- Park AOI
- Solar Energy Zones (BLM)
- PEIS within 25 miles (NPS)
- Roadless Natural Areas

0 3.5 7 14 Kilometers
0 3 6 12 Miles





Naturalness Index

The Naturalness Index is a surrogate for natural landscapes within the continental United States. Land cover data (2001), housing density data, roads data, and highway traffic data are processed into a 270 meter raster representing the degree of naturalness for an area.

The naturalness metric is scaled from 0 to 1, with Darker areas (0) being 'less' natural than lighter areas (1).

David Theobald, Colorado State University

Sources:

Theobald (2010). Estimating natural landscape changes from 1992 to 2030 in the conterminous US. *Landscape Ecology* (25:999-1011).

National Land Cover Dataset (2001 retrofit): <http://www.mrlc.gov/nlcd2001.php>

Housing Density: Theobald, D. 2005. Landscape patterns of exurban growth in the USA from 1980 to 2010. *Ecological and Society* 10(1):32

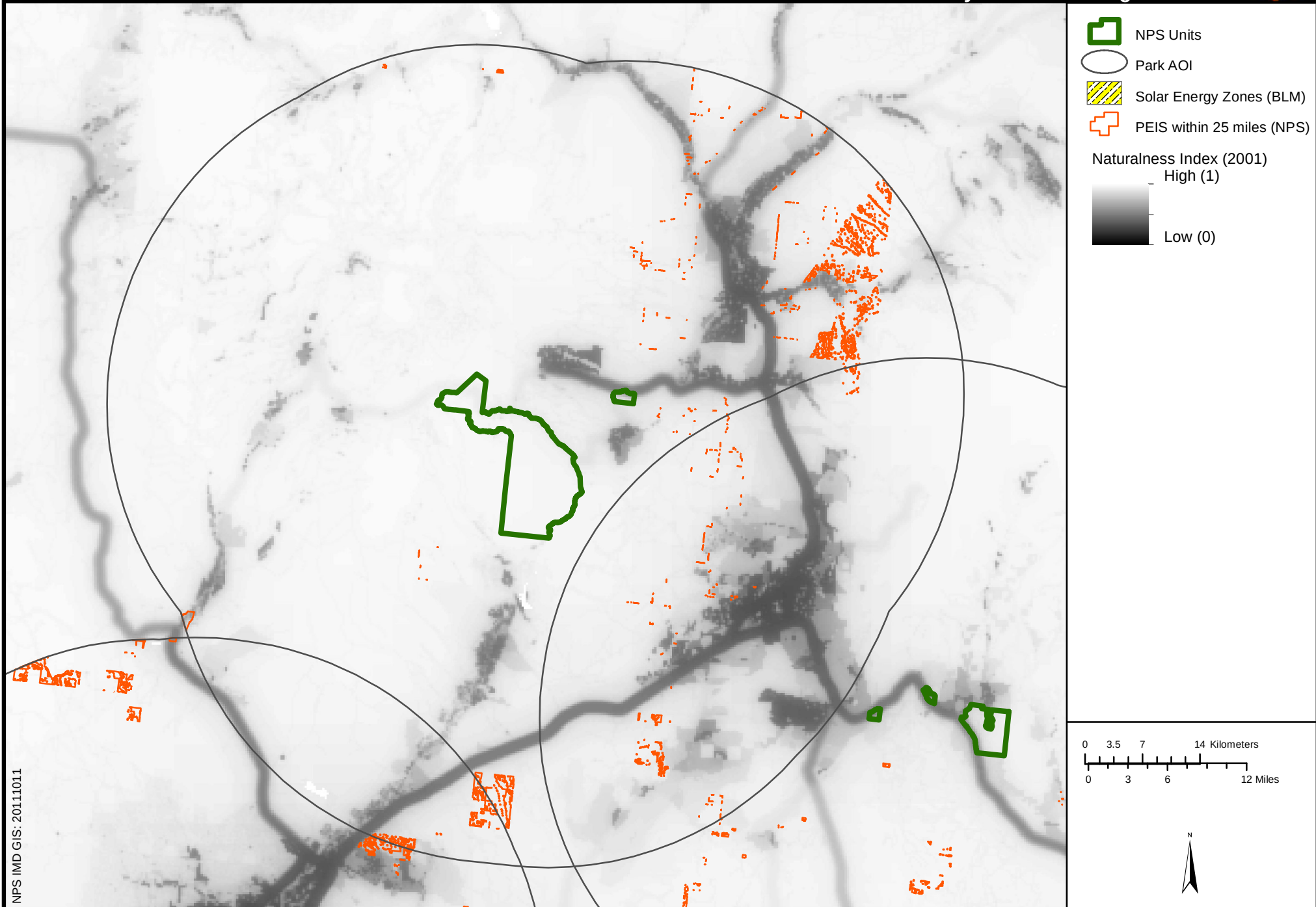
Roads: ESRI Streets, 2006, ESRI Maps and Data DVD.

Highway Traffic Volume: USDOT National Transportation Database 2007 CD.

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Naturalness Index - Theobald (2010)

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Inventory and Monitoring Division





Landscape permeability

Landscape Permeability - Theobald et al. (in press). Landscape permeability is derived using the inverse of a naturalness landscape metric, where naturalness is derived from landcover, housing density, presence of roads and railways, effects of highway traffic, and minimally adjusted for canopy cover and slope (Theobald 2010). Using the naturalness metric to define permeability resistance, a gradient based modeling approach using percolation theory and least-cost distance methods is performed over thirty iterations originating from random start locations. From these iterations an averaged network centrality (i.e. landscape permeability/connectivity) metric is derived.

Landscape permeability measures both local park unit and national level connectivity corridors which are spatially coincident with the 25 mile park radius study area. Higher permeability values signify greater connectivity.

Raw landscape permeability average flow accumulation values across the 30 model iterations were: 1) Filtered using a three cell radius, 2) Normalized using a $\log_2$ transformation 3) Converted to integer, and 4) All values less than seven were reclassified to -9999. Post processing resulted in landscape permeability values across the contiguous US ranging from low to high permeability (connectivity) values between 7 and 22.

David Theobald et al - Fall 2011

Sources:

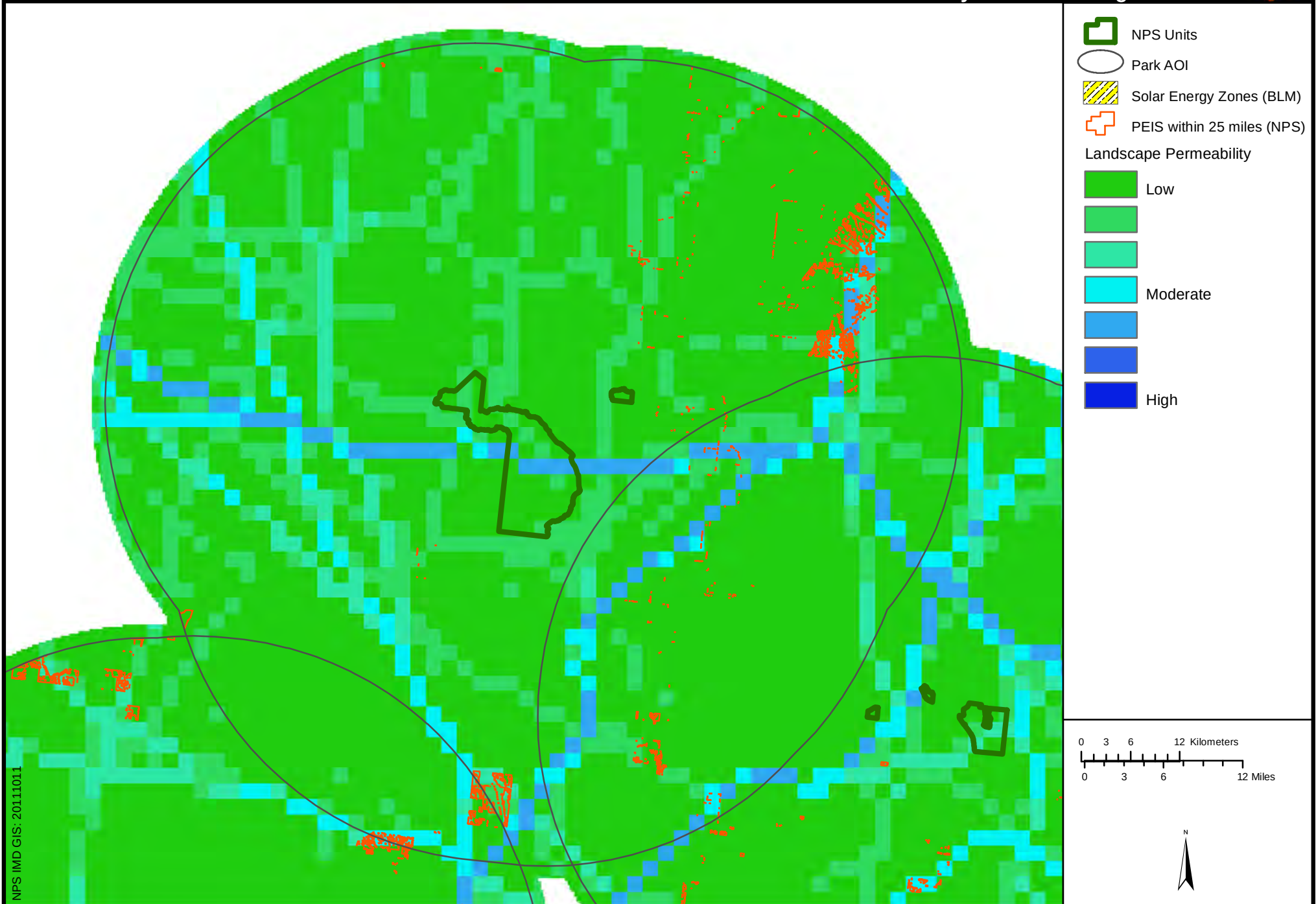
Theobald D., Reed S., Fields, K., and Soule, M. (in press). Connecting natural landscapes using a landscape permeability model to prioritize conservation activities in the US. Conservation Letters.

Theobald (2010). Estimating natural landscape changes from 1992 to 2030 in the conterminous US. Landscape Ecology (25:999-1011).

Bandelier NM - Draft PEIS Resources Map

Landscape Permeability - Connectivity (Theobald In Press)

National Park Service
U.S. Department of the Interior
Inventory and Monitoring Division





Nighttime Lights

The DMSP-OLS Nighttime Lights Time Series (version 4) represents global cloud-free composite images at 1-arc second resolution. The digital number values represent cleaned up average visibility values for cities, towns, and other sites including gas flares. The dataset does not include fires or other ephemeral events. Background noise areas are replaced with zero values.

Darker areas have less nighttime lights than lighter areas.

Defense Meteorological Satellite Program
2009

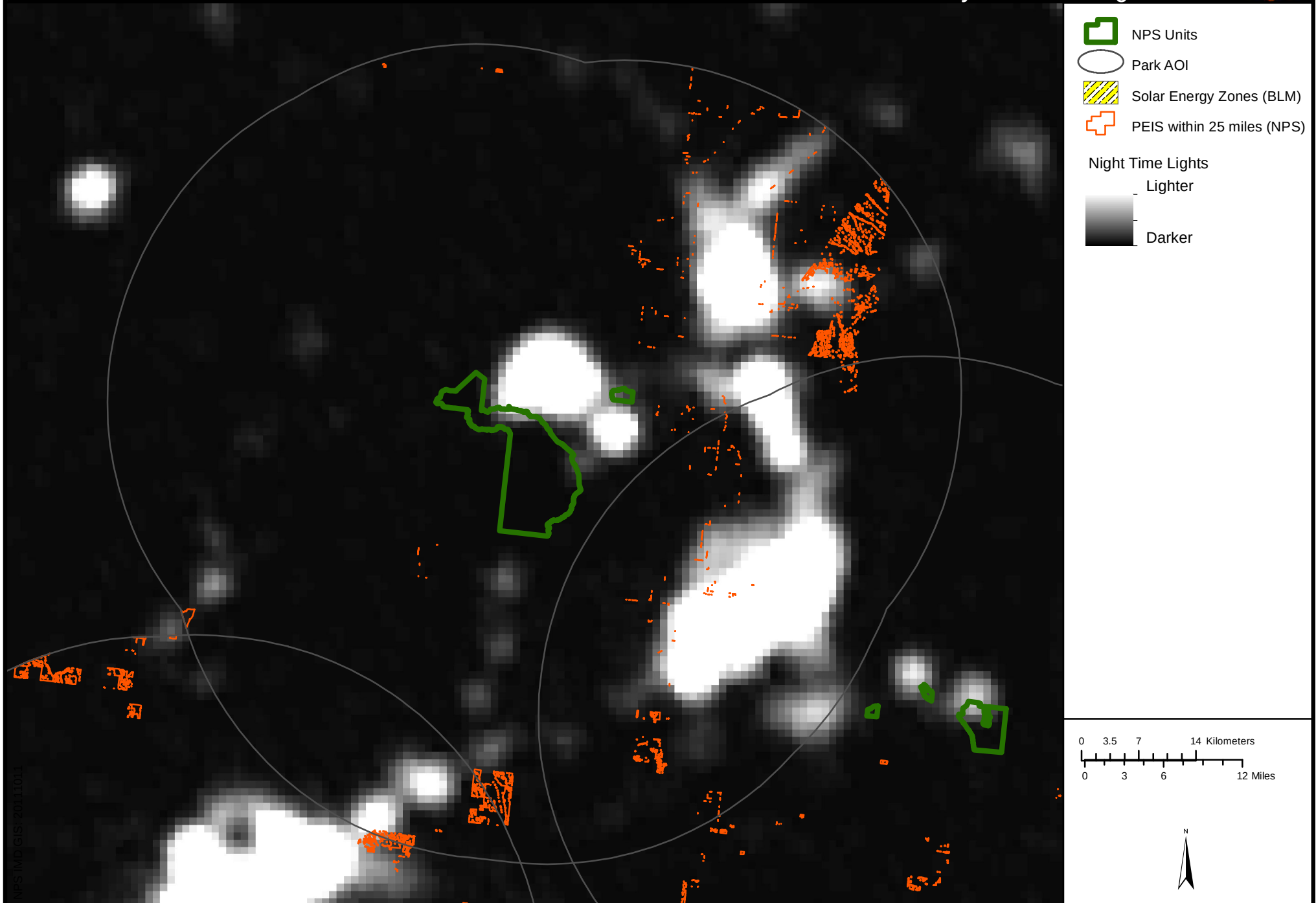
Sources:

Defense Meteorological Satellite Program: <http://www.ngdc.noaa.gov/dmsp/dmsp.html>

Bandelier NM - Draft PEIS Resources Map

Nighttime Lights - Defense Meteorological Satellite Program

National Park Service
U.S. Department of the Interior
Inventory and Monitoring Division





Viewshed

Traditional viewshed analysis evaluates the visibility of locations in a binary manner (i.e. Visible/Not Visible) across a defined study area of interest (Park Unit, Area of Analysis, etc.) from a single defined observation point. A *study area of interest* is the area for which the viewshed analysis is being performed. A *sample point* is the location from which the viewshed analysis is being performed, and in this context should be considered as the location of development such as a solar tower, wind turbine, etc. Ideally, observer points will be NPS-identified 'known observation points' (KOPs). Many options exist for subsequent viewshed analysis.

A *composite viewshed* is the visibility of multiple viewsheds combined into one viewshed. A visible value in a composite viewshed implies that across all the combined viewsheds and corresponding sample points at a minimum at least one of the sample points is visible. On a cell by cell basis across the study area of interest the numbers of visible sample points are recorded in the composite viewshed. Composite viewsheds are a quick way to synthesize multiple viewsheds into one singular viewshed, thus giving a cursory overview of potential visual resource effects.

NPS Inventory and Monitoring Division - 2011

Sources:

National Elevation Dataset 30 meter digital elevation model

Observer Points:

Spatially Balanced Sample Points - "Out - In" (ArcGIS - Theobald et al. 2007)– <https://irma.nps.gov/App/Reference/Profile/2176278>

Bandelier NM - Draft PEIS Resources Map

Viewshed Analysis - Spatial Balanced Sample Points Out - In

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