National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science

NPS Identified Areas of High Potential for Resource Conflict

Area Specific

ON THE COVER

Upper Left - Panorama, Death Valley Wilderness, Death Valley National Park. Credit P. Landress, NRSS Office of Outreach and Education
Upper Right - Desert Big Hron. Credit NPS Photo
Middle Left - Hikers in a field of flowers, Death Valley National Park. Credit Alan Van Valkenburg
Middle Right - Salt Creek pools, Death Valley National Park. Credit NPS Photo
Lower Left - Milky Way over Great Basin National Park. Credit NPS Photo
Lower Right - Overlook, Salinas Pueblo Missions National Monument. Credit NPS Photo

NPS Identified Areas of High Potential for Resource Conflict

Area Specific

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August 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

NPS-Identified Areas of High Potential for Resource Conflict: Site-Specific Maps and Narratives

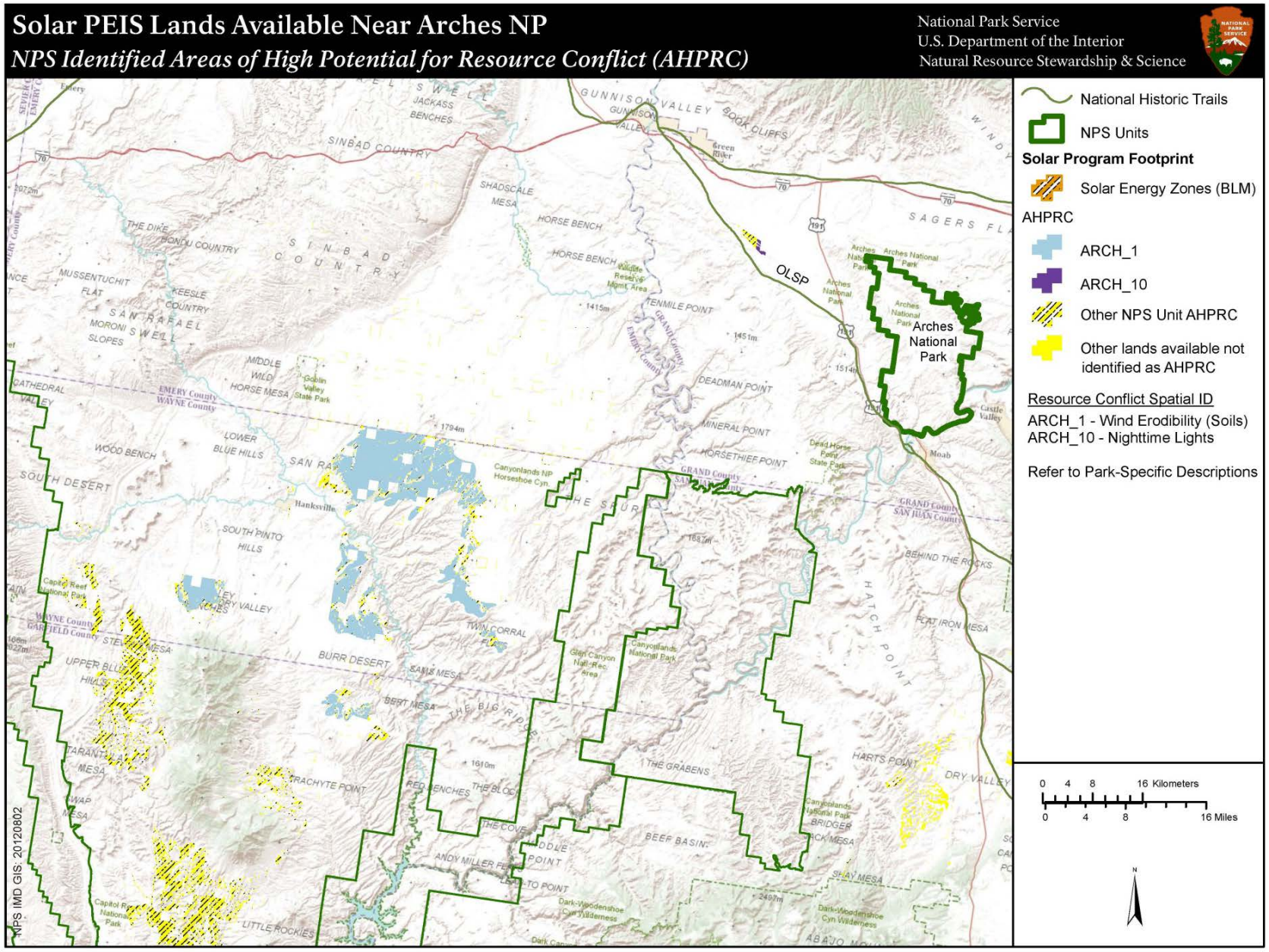
This document provides maps showing locations of Areas of High Potential for Resource Conflict (AHPRC). With each site-specific map is a narrative describing the potential resource conflict associated with lands available for utility-scale solar energy development. A brief explanation of the methodology is described in Explanation of Map of NPS Identified Areas of High Potential for Resource Conflict and the AHPRC *GIS data* are available for download. Resource condition maps with spatial respresentation of the GIS data used to determine AHPRC by park are shown in the NPS Identified Areas of High Potential for Resource Conflict - Resource Conidition Maps document. Park codes and unit names are listed in List of NPS Unit Codes with Full Names. Future updates of this document will be provided as necessary and when additional AHPRC information becomes available.

Updated: August 3, 2012

Table of Contents:

Arches National Park

ARCH AHPRC Locations

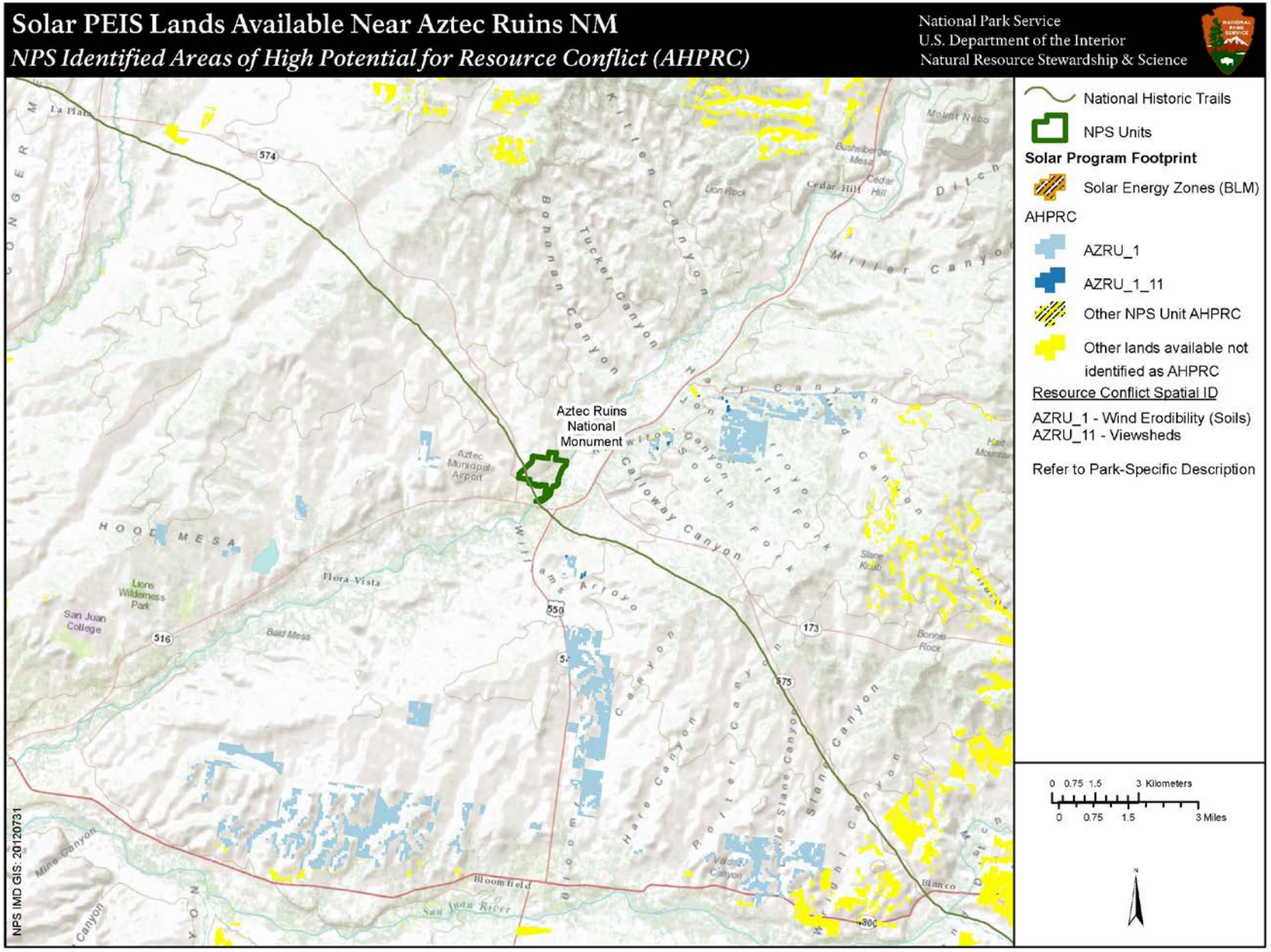


Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**ARCH_1**	Lands available for solar energy development occur upwind of the park in areas where soils are classified in Wind Erodibility Groups 1 and 2 and are susceptible to wind erosion. These include lands located west and southwest, and upwind of both Canyonlands NP and the park. These soils are susceptible to wind erosion. The park is a Class 1 air quality area under the Clean Air Act and managed as such (see References). Disturbance of these lands from the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. Such disturbance would exacerbate generation of dust and diminish visibility and other downwind resources. Effects of fugitive dust on visibility are demonstrated in monitoring data (see http://moab.colorado.edu/TSP.html) at the Island in the Sky district in Canyonlands NP. Numerous recent publications (see References) describe the downwind significance of dust emissions from low-elevation drylands. The park is concerned that soil disturbances due to the construction and operation of solar energy facilities could degrade air quality in the park and cause violation of the National Ambient Air Quality Standards (NAAQS). The increase in dust emissions and deposition of particulates and soil in the park could potentially degrade air quality (including visibility), vegetation and wildlife habitats. The park identifies AHPRC to protect air quality and resources that are vulnerable to the effects of wind erosion. [See additional GIS shapefile derived from intersection of BLM Solar PEIS with Henry Mtns soil survey, Utah soil survey area UT631, blm_development_alternative_clip_soil.shp in the CANY_ARCH folder in the park specific zip file download]. References: Field, J. P., J. Belnap, D. D. Breshears, J. C. Neff, G. S. Okin, J. J. Whicker, T. H. Painter, S. Ravi, M. C. Reheis, and R. L. Reynolds. 2010. The ecology of dust. Frontiers in Ecology and the Environment 8:423–430 Neff, J. C., A. P. Ballantyne, G. L. Farmer, N. M. Mahowald, J. L. Conroy, C. C. Landry, J. T. Overpeck, T. H. Painter, C. R. Lawrence, and R. L. Reynolds. 2008. Increasing aeolian dust deposition in the western United States linked to human activity. Nature Geoscience 1:189-195 Okin, G. S., J. E. Bullard, R. L. Reynolds, J.-A. C. Ballantine, K. Schepanski, M. C. Todd, J. Belnap, M. C. Baddock, T. E. Gill, and M. E. Miller. 2011. Dust: Small-scale processes with global consequences. EOS, Transactions, American Geophysical Union 92:241-248 Painter, T. H., J. S. Deems, J. Belnap, A. F. Hamlet, C. C. Landry, and B. Udall. 2010. Response of Colorado River runoff to dust radiative forcing in snow. Proceedings of the National Academy

		of Sciences 107:17125-17130 Air Quality in National Parks 2008 Annual Performance & Progress Report Natural Resource Report NPS/NRPC/ARD/NRR—2009/151
Nighttime Lights	**ARCH_10**	The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment. Dark night sky is an important element of the park's scenic qualities, as well. Lands west-northwest of the park contribute to the park's dark night sky. The park is concerned that solar energy development in areas that have high dark night sky value could degrade the park's dark sky resource. The park identifies as AHPRC to protect dark night sky. Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93

Aztec Ruins National Monument

AZRU AHPRC Locations

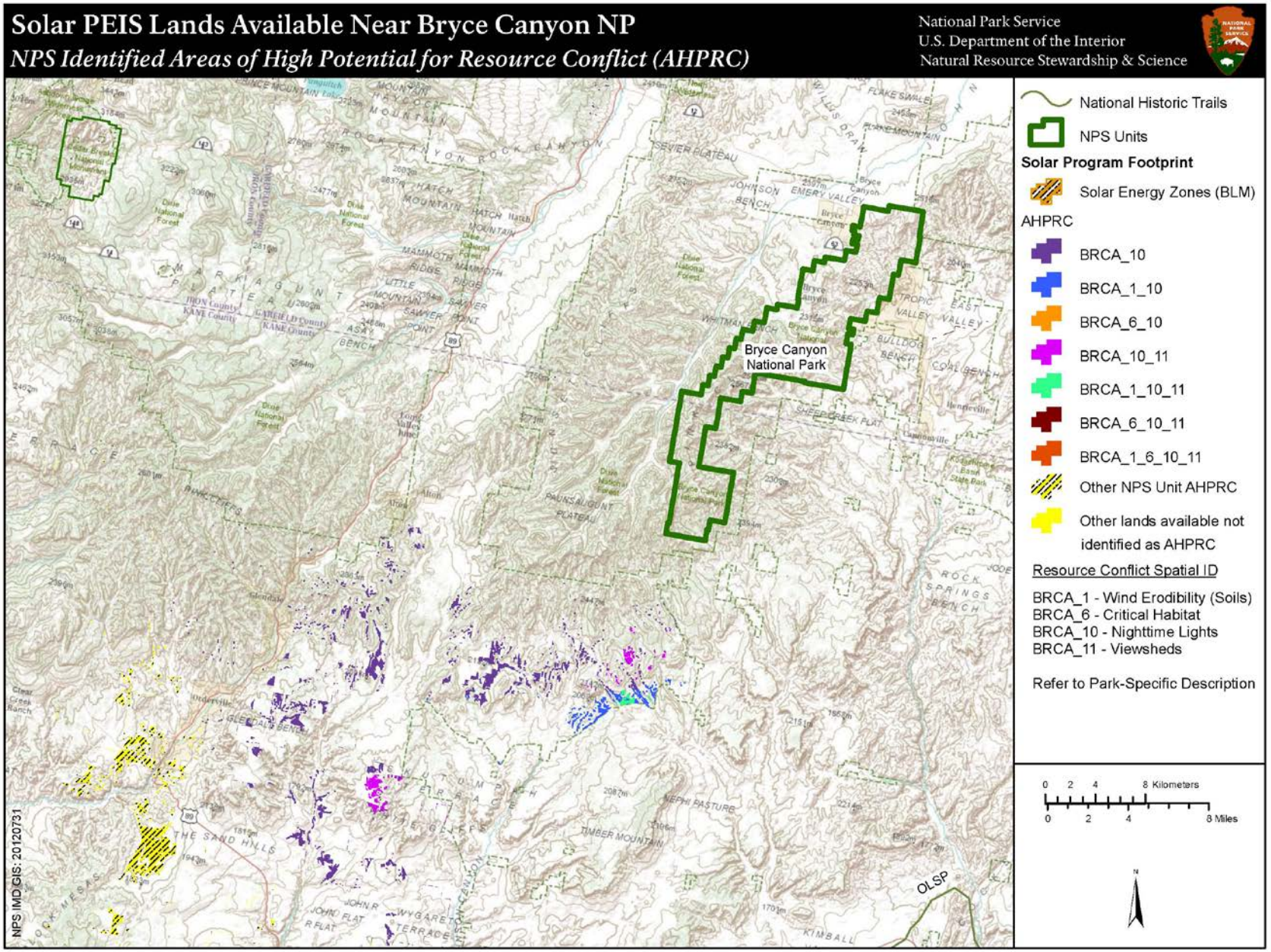


AZRU AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**AZRU_1**	Lands available for solar energy development occur in areas where soils have high wind erosion potential. Construction and post-construction activities, service road maintenance and use, loss of vegetation, and disturbance of soil crusts caused by development on soils classified in Wind Erodibility Group 2 could generate significant dust emissions. Most of these lands are located south and southeast of the park. The park is concerned that prevailing winds would carry soils and fine particulates generated from solar development construction and operations into the park and surrounding area, degrade visitor experience and deposit in and around the historic ruins. The park identifies AHPRC to protect air quality and historic resources. References: Field, J. P., J. Belnap, D. D. Breshears, J. C. Neff, G. S. Okin, J. J. Whicker, T. H. Painter, S. Ravi, M. C. Reheis, and R. L. Reynolds. 2010. The ecology of dust. Frontiers in Ecology and the Environment 8:423–430 Neff, J. C., A. P. Ballantyne, G. L. Farmer, N. M. Mahowald, J. L. Conroy, C. C. Landry, J. T. Overpeck, T. H. Painter, C. R. Lawrence, and R. L. Reynolds. 2008. Increasing aeolian dust deposition in the western United States linked to human activity. Nature Geoscience 1:189-195 Okin, G. S., J. E. Bullard, R. L. Reynolds, J.-A. C. Ballantine, K. Schepanski, M. C. Todd, J. Belnap, M. C. Baddock, T. E. Gill, and M. E. Miller. 2011. Dust: Small-scale processes with global consequences. EOS, Transactions, American Geophysical Union 92:241-248
Viewshed	**AZRU_11**	Scenic vistas from archeological sites are relatively unimpaired in many areas. The vistas provide visitors a historical reference for the landscape that existed when the ancestral Pueblo people occupied the area. Lands available for solar energy development occur within park viewsheds in areas east and northeast, south and southeast, and west and southwest of the park. The park is concerned that solar energy facilities located in line of sight from key observation points within the park could adversely affect the historical scene and visitor experience. The park identifies AHPRC to protect visual resources.

Bryce Canyon National Park

BRCA AHPRC Locations



BRCA AHPRC Locations

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**BRCA_1**	Lands available for solar energy development are located southwest of the park in areas where soils are classified Wind Erodibility Group 1 and are susceptible to wind erosion. The park, and nearby Zion and Capitol Reef National Parks, is a Class 1 air quality area under the Clean Air Act, (see References), indicating that no significant degradation of air quality should be permitted under federally proposed actions. Numerous recent publications (see References) describe the downwind significance of dust emissions from low-elevation drylands. Disturbance of these lands from the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. Such disturbance would exacerbate generation of dust and diminish visibility and other downwind resources. The park is concerned that soil disturbances due to the construction and operation of solar energy facilities could degrade air quality in the park and cause violation of the National Ambient Air Quality Standards (NAAQS). The increase in dust emissions and deposition of particulates and soil in the park could also degrade vegetation and wildlife habitats. The park identifies AHPRC to protect air quality. References: Field, J. P., J. Belnap, D. D. Breshears, J. C. Neff, G. S. Okin, J. J. Whicker, T. H. Painter, S. Ravi, M. C. Reheis, and R. L. Reynolds. 2010. The ecology of dust. Frontiers in Ecology and the Environment 8:423–430 Neff, J. C., A. P. Ballantyne, G. L. Farmer, N. M. Mahowald, J. L. Conroy, C. C. Landry, J. T. Overpeck, T. H. Painter, C. R. Lawrence, and R. L. Reynolds. 2008. Increasing aeolian dust deposition in the western United States linked to human activity. Nature Geoscience 1:189-195 Okin, G. S., J. E. Bullard, R. L. Reynolds, J.-A. C. Ballantine, K. Schepanski, M. C. Todd, J. Belnap, M. C. Baddock, T. E. Gill, and M. E. Miller. 2011. Dust: Small-scale processes with global consequences. EOS, Transactions, American Geophysical Union 92:241-248 Painter, T. H., J. S. Deems, J. Belnap, A. F. Hamlet, C. C. Landry, and B. Udall. 2010. Response of Colorado River runoff to dust radiative forcing in snow. Proceedings of the National Academy of Sciences 107:17125-17130 Air Quality in National Parks 2008 Annual Performance & Progress Report Natural Resource Report NPS/NRPC/ARD/NRR—2009/151

Critical Habitat	**BRCA_6**	Lands available for solar energy development approximately 4 miles east of the park are associated with critical habitat for the Mexican spotted owl. The park is concerned that, although the critical habitat only adjoins the park in one location (at northern end), the construction and operation of solar energy facilities adjacent to this habitat could also adversely affect wildlife within the park. The park identifies AHPRC to protect critical habitat.
Nighttime Lights	**BRCA_10**	The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment. The night sky is an attribute sought by thousands of park visitors each year. The park is nationally recognized for its ranger-led stargazing programs. Lands available for solar energy development located south and southwest of the park contribute to the park's dark night sky. The park is concerned that solar energy development on lands within the area of analysis could degrade the park's dark sky resource. The park identifies as AHPRC to protect dark night sky. Additional Resource Conflict Comments Ecological effects. Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93 Park night sky quality. The park lies on the western edge of the Colorado Plateau and is one of the few areas of natural night sky one can view in the contiguous United States. In a survey of 45 park units, Bryce Canyon NP ranks in the top five in night sky quality. Night sky quality is principally degraded by light pollution — emissions from outdoor lights that cause direct glare and reduce the contrast of the night sky — but atmospheric clarity also plays a role. The

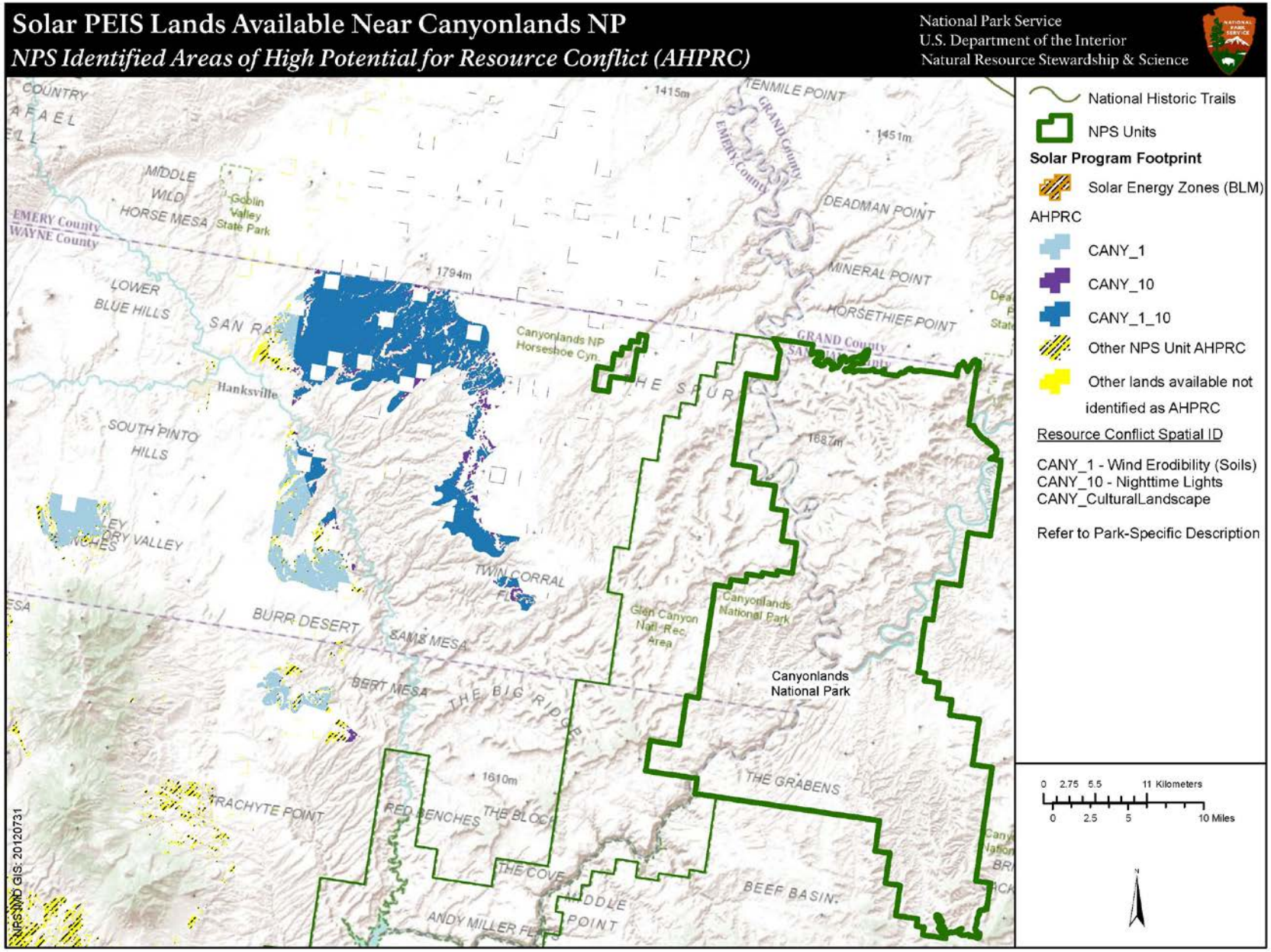
		combination of air that is free of aerosols and water vapor that reduce visibility, high viewing elevations, and a sparse human population in the immediate vicinity of the park results in a view of the night sky that is near pristine. Photometric measurements taken within the park show that zenith sky condition is virtually unaltered, attaining the theoretical natural darkness of 21.95 magnitudes per square arc-second at Yovimpa Point (the darkest location in the park). The park has collected precise data on night sky brightness and existing light pollution from Yovimpa Point in the south portion of the park, as well as Bryce Point and Inspiration Point in the northern portion. Data collected at Cedar Breaks NM and Zion NP compliment the Bryce Canyon data. Additionally, the National Park Service has recently put forth a "Call to Action" as a guidance document to prepare the NPS for a second century of stewardship and engagement in anticipation of the upcoming Centennial celebration in 2016. One of these actions, "Starry, Starry Night", directs the NPS to "lead the way in protecting natural darkness as a precious resource and create a model for dark sky protection by establishing America's first Dark Sky Cooperative on the Colorado Plateau in collaboration with other federal agencies, partners, and local communities." The protection of night sky quality in the area surrounding the park is integral to this effort and is a priority conservation item for the park. Light intrusion of any form is a detriment to dark sky preservation. Specific visual impacts of solar facilities would include high contrast with surrounding, undeveloped areas, glint and glare, plumes of dust or steam, and presence of night lighting (Draft Solar PEIS, 5-9). Night lighting could also disturb wildlife in the solar energy project area. Lights directly attract migratory birds (particularly in inclement weather and during low-visibility conditions), and can indirectly attract birds and bats by attracting flying insects. Attraction to lights can result in birds colliding with structures (Draft Solar PEIS, 5-82). Depending on mitigation proposed in site-specific Lighting Plans, light intrusions may be reduced to some degree on utility-scale solar development; however, lighting levels would be determined based on "safety and security" of the facility and its workers and any level of light pollution for large-acreage development in combination with reflective surfaces and hazard navigation lighting would degrade the dark sky condition at and surrounding the park. Similarly, small scale photovoltaic systems could degrade the dark sky surrounding the park and any solar energy applications for smaller parcel developments in the region of Bryce Canyon National Park should be carefully analyzed for impacts to viewshed and night sky. Concerns over night sky preservation extend to the protection of wilderness character, the "naturalness index" (Theobald, 2010), landscape permeability and nocturnal wildlife protection for the park and the surrounding region. Reference:

		Theobald. 2010. Estimating natural landscape changes from 1992 to 2030 in the conterminous US. Landscape Ecology (25:999-1011).
Viewshed	**BRCA_11**	Lands available for solar energy development are located south and southwest of the park and in viewsheds of the southern portion of the park. The park, and nearby Zion and Capitol Reef National Parks, is a Class 1 air quality area under the Clean Air Act, indicating that no significant degradation of air quality should be permitted under federally proposed actions. The park is concerned that solar energy facilities in line of sight from key observations points could adversely affect scenic vistas at Yovimpa and Rainbow Points. The combined development of solar energy and coal mining in the area of analysis could also degrade air quality. The park identifies AHPRC to protect visual resources and air quality. Additional Resource Conflict Concerns 1. Migration corridors. Protection of wildlife migration corridors (especially large mammals moving onto and off of the Colorado Plateau during the spring and fall using corridors to the south of the park). 2. Invasive species. Degradation of habitat through the introduction and spread of non-native plant species. 3. Listed species. Protection of sensitive and listed species (greater sage grouse leks and Utah prairie dog colonies are located in parcels to the southwest of the park on private and federal land and may occur on lands available for solar energy development). 4. Transmission. Lack of infrastructure required to construct and sustain solar energy facilities roads and transmission lines (e.g., in the area surrounding Bryce Canyon, transmission with existing capacity and substations are not currently available or may require upgrades that could outweigh the economic benefit of utility scale solar development). The impact on landscapes due to transmission upgrades or new line construction may be greater than development of utility-scale solar energy sites and would need to be analyzed on a case-by-case basis. 5. Viability. Economic viability of additional energy capacity (generation and transmission) in the region. Current transmission lines in the region are at capacity (refer to Tropic to Hatch 138 KV Transmission Line Project, Final EIS). 6. Compatibility. Compatibility of land uses (for example, solar energy development located next to large-scale coal mining near the town of Alton). 7. Cumulative effects. Cumulative land-use impact on the park from other development including logging, oil and gas leasing, coal mining, and residential expansion, prevalent, throughout the region. Singularly, each land use may not substantially degrade park resources. Taken together, the cumulative land-use impacts on the park and landscapes connected to the park are potentially significant.

		8. Future SEZs. Creation of additional SEZs near the park. The lands available for solar energy development surrounding the park would likely not meet the criteria to be considered for future inclusion as a SEZ, because there(1) lack of demand in the area, and (2) technical and economic challenge of constructing a SEZ in this remote and generally inaccessible region. The park understands that smaller scale solar development in those parcels remains possible and resource impact concerns, even for small scale solar development, are summarized above.

Canyonlands National Park

CANY AHPRC Locations



Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**CANY_1**	Lands available for solar energy development are located west and southwest and upwind of the park and Arches NP in areas where soils are classified in Wind Erodibility Groups 1 and 2. These soils are susceptible to wind erosion. The park, and nearby Arches and Capitol Reef National Parks, is a Class 1 air quality area under the Clean Air Act (see References), indicating that no significant degradation of air quality should be permitted under federally proposed actions. Effects of fugitive dust on visibility are demonstrated in monitoring data collected by NPS (see http://moab.colorado.edu/TSP.html) at the Island in the Sky district in the park. Numerous recent publications (see References) describe the downwind significance of dust emissions from low-elevation drylands. Disturbance of these lands from the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. Such disturbance would exacerbate generation of dust and diminish visibility and other downwind resources. The park is concerned that soil disturbances due to the construction and operation of solar energy facilities could degrade air quality in the park and cause violation of the National Ambient Air Quality Standards (NAAQS). The increase in dust emissions and deposition of particulates and soil in the park could also degrade vegetation and wildlife habitats. The park identifies AHPRC to protect air quality. [See additional GIS shapefile derived from intersection of BLM Solar PEIS with Henry Mtns soil survey, Utah soil survey area UT631, blm_development_alternative_clip_soil.shp in the CANY_ARCH folder in the park specific zip file download]. References: Field, J. P., J. Belnap, D. D. Breshears, J. C. Neff, G. S. Okin, J. J. Whicker, T. H. Painter, S. Ravi, M. C. Reheis, and R. L. Reynolds. 2010. The ecology of dust. Frontiers in Ecology and the Environment 8:423–430 Neff, J. C., A. P. Ballantyne, G. L. Farmer, N. M. Mahowald, J. L. Conroy, C. C. Landry, J. T. Overpeck, T. H. Painter, C. R. Lawrence, and R. L. Reynolds. 2008. Increasing aeolian dust deposition in the western United States linked to human activity. Nature Geoscience 1:189-195 Okin, G. S., J. E. Bullard, R. L. Reynolds, J.-A. C. Ballantine, K. Schepanski, M. C. Todd, J. Belnap, M. C. Baddock, T. E. Gill, and M. E. Miller. 2011. Dust: Small-scale processes with global consequences. EOS, Transactions, American Geophysical Union 92:241-248 Painter, T. H., J. S. Deems, J. Belnap, A. F. Hamlet, C. C. Landry, and B. Udall. 2010. Response

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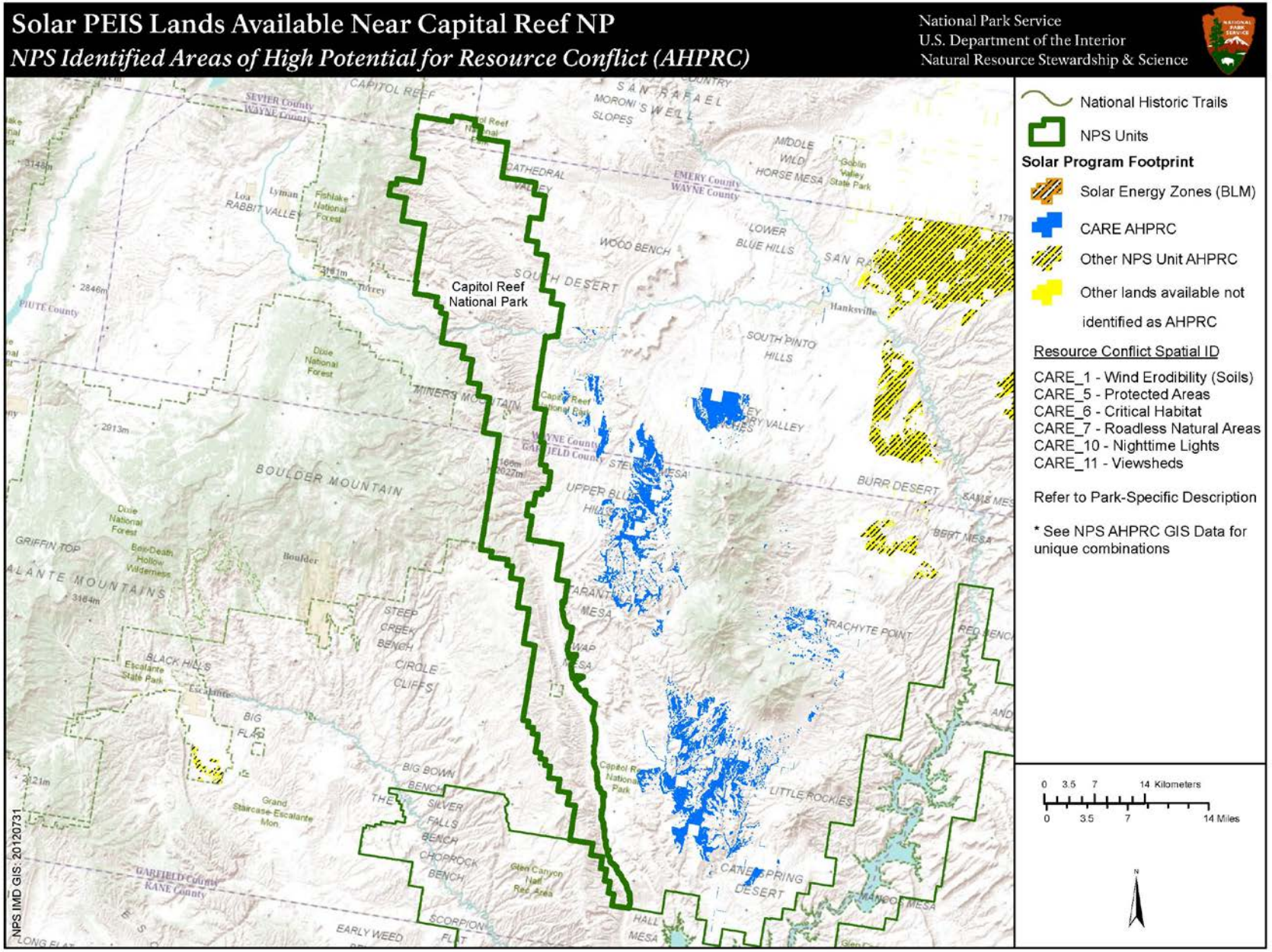
Nighttime Lights	**CANY_10**	The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment. Dark night sky is an important element of the park's scenic qualities, as well. Lands west of the park contribute to the park's dark night sky. The park is concerned that there are no other light sources in the area west of the park and solar energy development on lands within the area of analysis could degrade the park's dark sky resource. The park identifies as AHPRC to protect dark night sky. Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Cultural Resources	**CANY_Cultural Landscape**	Lands available for solar energy development are located in areas possessing significant cultural landscape values. The park is concerned that solar energy development could diminish the historical and scenic landscape, and degrade interpretive value of the cultural and historical resources. The park identifies AHPRC to protect the cultural landscape.

		Additional Resource Conflict Concerns A cultural landscape map showing boundaries of Robbers Roost/Under the Ledge Ranches Cultural Landscape Inventory (CLI) reveals a large, historic landscape that encompasses over 900 square miles in southeast Utah and coincides with some lands available for solar energy development. This landscape includes deep canyons, wide open flats, juniper and pinion forest, sand dunes, and desert scrub country, between 5000-7000 feet of elevation and it represents a hardscrabble ranchland for four historic ranching families, spanning about 100 years. The landscape features numerous brush corrals (corrals created using stacked juniper and pinion trees), springs, trails, and remnants of family ranching camps. According to the CLI, the landscape resources are classified significant for subsistence ranching, and exploration/settlement (Criterion A), vernacular architecture (Criterion C), and archeological resources (Criterion D). The integrity of many of the landscape features remain, though time and the elements have taken their toll on a number of sites, leaving them in a ruinous state. Today, the area is essentially an archeological district. A Determination of Eligibility has been drafted as part of the CLI. The CLI project has been a successful partnership between the NPS and BLM to identify and document hard-scrabble, subsistence ranching features unique to Utah. The State Historic Preservation Office (SHPO) has confirmed that these resources are one-of-a-kind and should also be nominated to the National Register. The CLI and Determination of Eligibility is the first step toward drafting a Multiple Property Nomination to list the landscape and its resources on the National Register of Historic Places. As of December 2011, the CLI was in the process of being finalized. The document and Determination of Eligibility will be put forth for SHPO concurrence in early 2012. [See Cultural_Landscapes folder in the CANY_GLCA directory in the park specific zip file download].

Capital Reef National Park

CARE AHPRC Locations



Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**CARE_1**	Lands available for solar energy development are located east of the southern end of the park where soils are classified in Wind Erodibility Groups 1 and 2. These soils are susceptible to wind erosion. While the predominant wind direction in these areas is away from the park towards Glen Canyon NRA, the does experience periods of wind from the east. The park, and nearby Arches and Canyonlands National Parks, is a Class 1 air quality area under the Clean Air Act (see References), indicating that no significant degradation of air quality should be permitted under federally proposed actions. Numerous recent publications (see References) describe the downwind significance of dust emissions from low-elevation drylands. Current monitoring data support the park's concern that disturbance of soils in this area from solar development would increase particulate deposition decrease visibility in the park. Deposition of wind eroded soils can affect plant and animal communities as well as eventually be eroded by water and affect riparian and watercourses in the park. Disturbance of these lands from the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. Such disturbance would exacerbate generation of dust and diminish visibility and other downwind resources. The park is concerned that soil disturbances due to the construction and operation of solar energy facilities could degrade air quality in the park and cause violation of the National Ambient Air Quality Standards (NAAQS). The increase in dust emissions and deposition of particulates and soil in the park could also degrade vegetation and wildlife habitats. The park identifies AHPRC to protect air quality. References: Field, J. P., J. Belnap, D. D. Breshears, J. C. Neff, G. S. Okin, J. J. Whicker, T. H. Painter, S. Ravi, M. C. Reheis, and R. L. Reynolds. 2010. The ecology of dust. Frontiers in Ecology and the Environment 8:423–430 Neff, J. C., A. P. Ballantyne, G. L. Farmer, N. M. Mahowald, J. L. Conroy, C. C. Landry, J. T. Overpeck, T. H. Painter, C. R. Lawrence, and R. L. Reynolds. 2008. Increasing aeolian dust deposition in the western United States linked to human activity. Nature Geoscience 1:189-195 Okin, G. S., J. E. Bullard, R. L. Reynolds, J.-A. C. Ballantine, K. Schepanski, M. C. Todd, J. Belnap, M. C. Baddock, T. E. Gill, and M. E. Miller. 2011. Dust: Small-scale processes with global consequences. EOS, Transactions, American Geophysical Union 92:241-248 Painter, T. H., J. S. Deems, J. Belnap, A. F. Hamlet, C. C. Landry, and B. Udall. 2010. Response of Colorado River runoff to dust radiative forcing in snow. Proceedings of the National Academy

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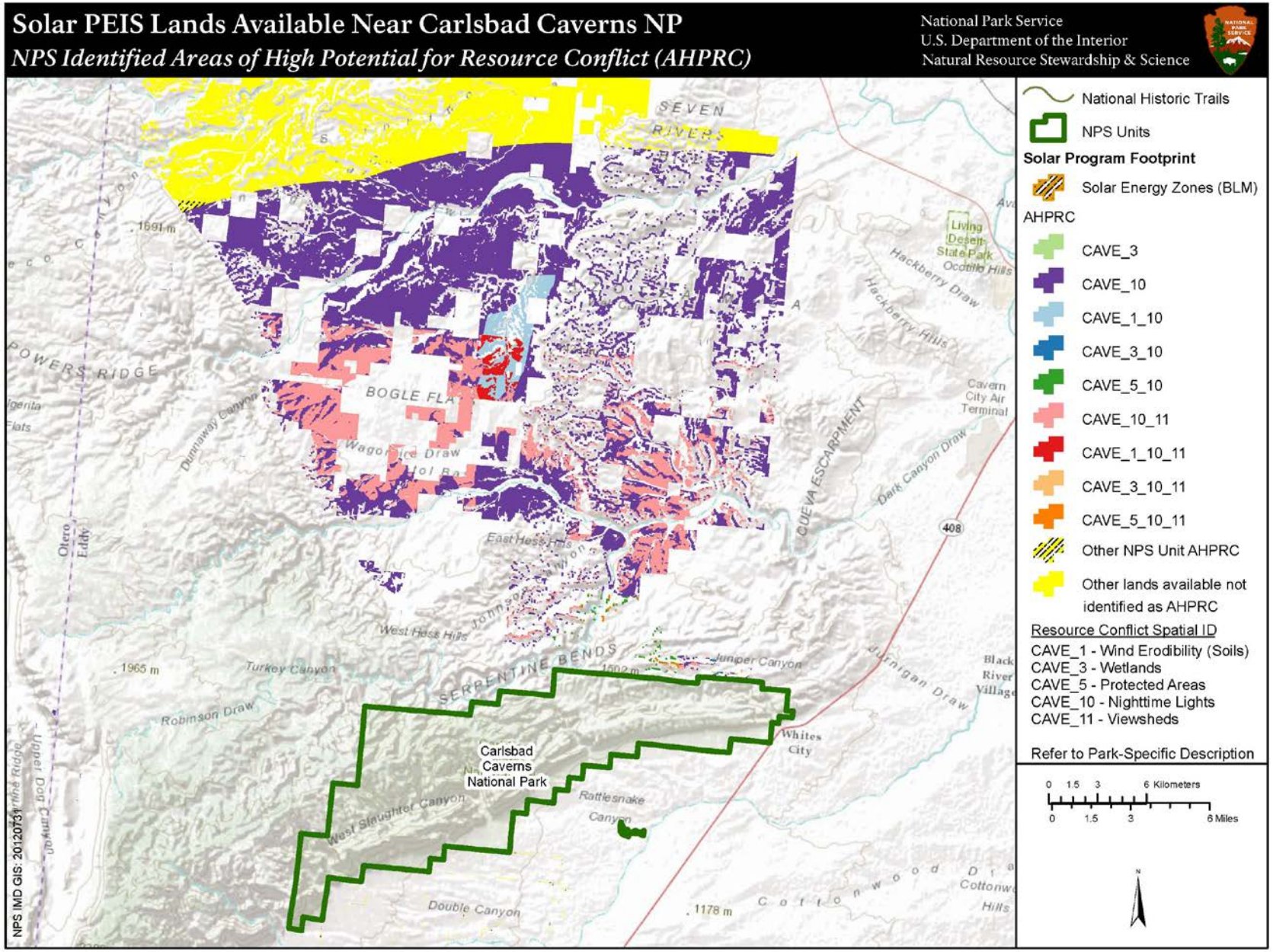
Protected Areas	**CARE_5**	Lands available for solar energy development located east of the park either border or lie in close proximity to protected areas. The park is concerned that solar energy development near the protected areas could interrupt the linkage of these areas to park resources. The park identifies AHPRC to protect these areas and resource connectivity with the park. Reference: National Park Service. 2001. Capitol Reef National Park General Management Plan and Environmental Impact Statement, Record of Decision
Critical Habitat	**CARE_6**	Critical habitat designated for the Mexican Spotted Owl is located near the east boundary of the park. Lands available for solar energy development occur adjacent to, or border, the designated habitat. The park is concerned that solar energy development near the critical habitat could adversely affect the species use of the park. The park identifies AHPRC to protect critical habitat. Reference: National Park Service. 2001. Capitol Reef National Park General Management Plan and Environmental Impact Statement, Record of Decision
Roadless Areas	**CARE_7**	The protection of intact landscapes and their inherent scenic and biological values is a primary management goal of the park because these landscapes are important for maintaining biological (genetic) diversity of resident park wildlife populations. Lands available for solar energy development located on the east side of the park occur in largely roadless natural areas. The park is concerned that solar energy development in these undisturbed areas could increase disturbances to critical habitats, erosion of sensitive soils and invasion by non-native plants. The park identifies AHPRC to protect landscape integrity, and visual and wildlife resources.
Nighttime Lights	**CARE_10**	The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment and possesses some of the best night sky viewing areas in North America. Lands available for solar energy development located east of the park occur in areas with high quality dark sky conditions. The park is concerned that nighttime operations and security lights on energy installations could adversely affect this resource undermining efforts to preserve dark sky.

		The park is concerned that solar energy development on lands east of the park in the area of analysis could degrade the park's dark sky because there are no other light sources. The park identifies as AHPRC to protect dark night sky. Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewshed	**CARE_11**	Lands available for solar energy development located east of the park occur in areas possessing scenic landscape qualities, where there is little evidence of development and a high visual sensitivity. The park is a Class 1 air quality area under the Clean Air Act, indicating that no significant degradation of air quality should be permitted under federally proposed actions. The park is concerned that solar energy facilities could be developed within line of sight from key observation points and adversely affect the pastoral panoramas. The park identifies AHPRC to protect these scenic landscapes and visual resources.

Carlsbad Caverns National Park

CAVE AHPRC Locations



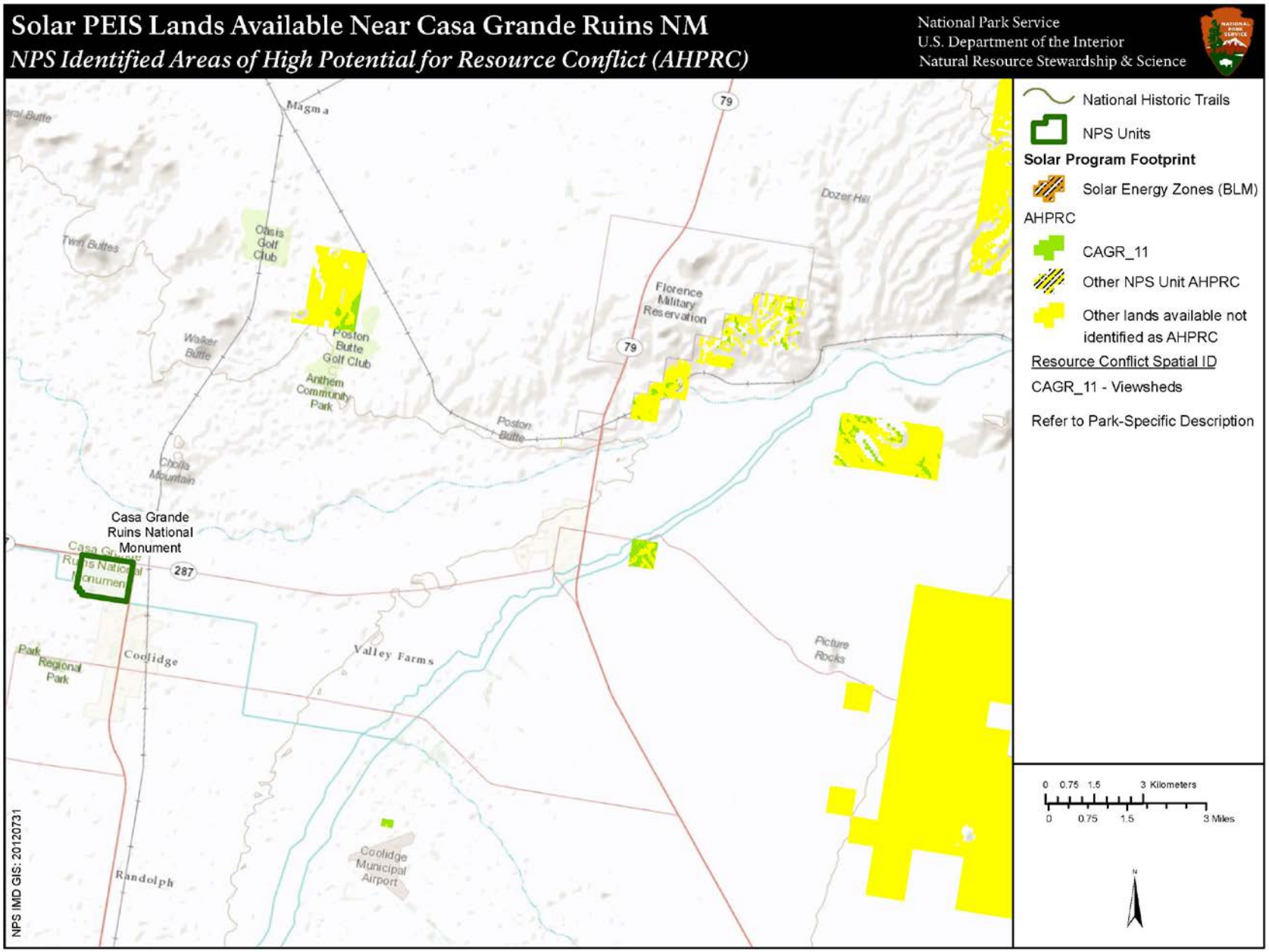
CAVE AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Justification
Wind Erodibility	**CAVE_1**	Lands available for solar energy development located north of the park occur where soils are classified in Wind Erodibility Group 1 and have a high potential for dust generation. The park is a Class 1 air quality area which is afforded the highest protection under the Clean Air Act. Construction and post-construction activities, service road maintenance and use, loss of vegetation, and disturbance of soil crusts soils in Wind Erodibility Groups 1 could produce significant quantities of fugitive dust. The park is concerned that these disturbances could increase dust emissions and adversely affect air quality and visibility. The park identifies AHPRC to protect air quality and visual resources. Reference: Air Quality in National Parks 2008 Annual Performance & Progress Report Natural Resource Report NPS/NRPC/ARD/NRR—2009/151 Additional Resource Conflict Concerns A methodology for determining visibility impacts (VISCREEN) is the method required under the FLAG workgroup or (CALPUFF) to model such occurrences. http://nature.nps.gov/air/permits/flag Generation of windborne particulates that exceed the National Ambient Air Quality Standards (NAAQS) from potential solar developments requires a quantitative measure of the impact through the computation of the consumption of Class I and II increments. Dust generated from large-scale land clearing, construction, and operation, and development of access roads, could produce cross-boundary effects on park resources including air quality, vegetation, and wildlife habitat, and water quality (sediment).
Wetlands	**CAVE_5**	Wetlands support important vegetation and wildlife species, and provide habitat for migratory birds. Wetlands also contain species that are uniquely adapted to the local environment and provide important linkage in wildlife migration corridors to the park. Lands available for solar energy development occur near wetlands in the area of analysis. The park is concerned that water development to support solar energy facilities may adversely affect wetlands, disrupt wildlife habitat and migration and alter water quantity (runoff) and quality (sedimentation). The park identifies AHPRC to protect wetlands and dependent wildlife resources.

Protected Areas	**CAVE_5**	Lands available for solar energy development located near the park's northern boundary are adjacent to the Mudgetts Wilderness Study Area. The park is concerned that solar energy development on these lands could disrupt wildlife migration between the study area and the park. The park AHRPC to protect the habitat connectivity and wildlife resources.
Nighttime Lights	**CAVE_10**	The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment. Lands available for solar energy development occur in areas having dark night sky. The park is concerned that solar energy development in these areas could adversely affect the dark night sky. The park identifies AHPRC to protect dark night sky. Additional Resource Conflict Comments Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewshed	**CAVE_11**	Lands available for solar energy development occur in scenic landscapes to the north of the park. These scenic vistas extend beyond 25 miles in some places. The park is concerned that solar energy development in line of sight from key observation points could adversely affect the opportunity for visitors to experience views of broad, undeveloped landscapes. The park identifies AHPRC to protect the visual resources. [See Viewshed folder in the CAVE directory in the park specific zip file download].

Casa Grande Ruins National Monument

CAGR AHPRC Locations

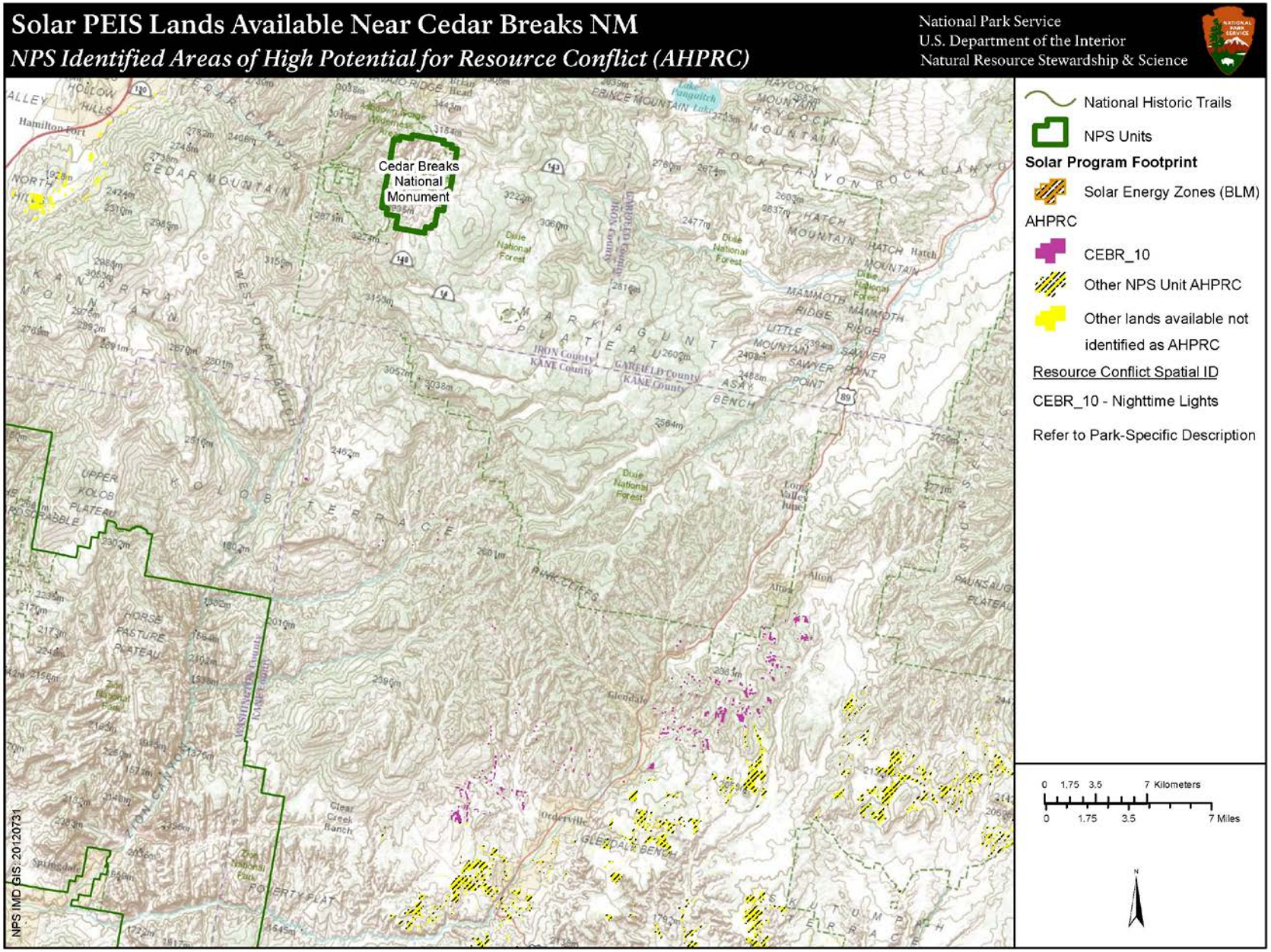


CAGR AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Viewsheds	**CAGR_11**	Of principle concern to the park is the visual importance of the park's historic setting. The park is the first national monument established as part of the National Park System, and represents a significant step in the history of the national preservation movement in the United States. The park is eligible for the National Register as an NHL under all eligibility criteria, exhibiting exceptional integrity. A Cultural Landscape Inventory identifies the "views and vistas" as important to the integrity of the monument's cultural landscape. Solar energy facilities on this landscape could introduce visual elements that are out of character with the property's historic setting and could subsequently result in significant visual impacts. Relatively lower profile photovoltaic (PV) solar systems could also pose some visual impact to park visitors with the area of analysis. Parabolic trough, Sterling Engines, or power tower systems would have an even larger visual profile, greatly increasing the potential for impacts beyond the impacts associated with equivalent power generation PV systems. The park identifies AHPRC to protect visual resources and cultural landscape.

Cedar Breaks National Monument

CEBR AHPRC Locations

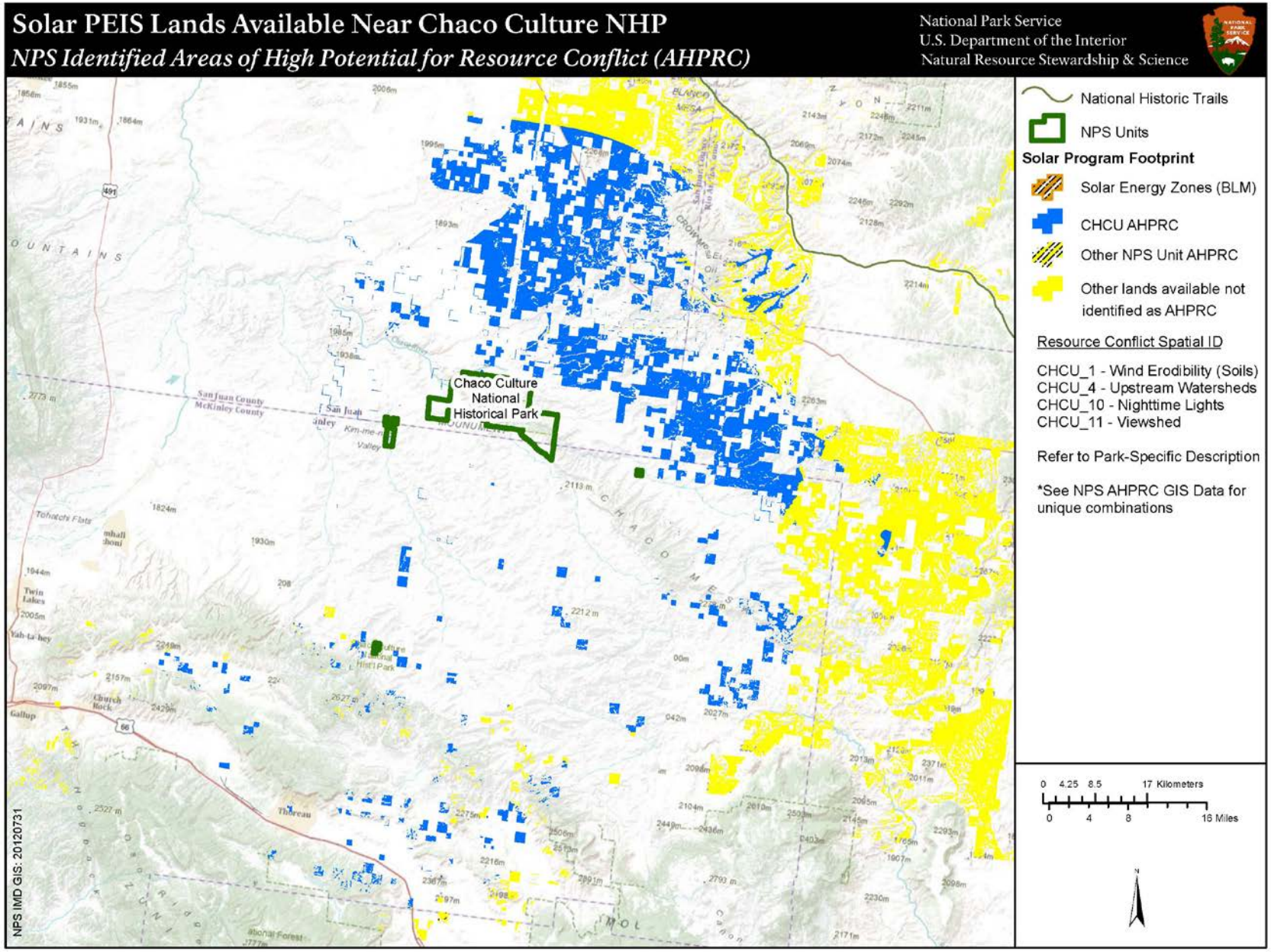


CEBR AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Nighttime Lights	**CEBR_10**	Dark night sky is a wilderness character that the park is trying to preserve for visitors. Nighttime operations and security lights on energy installations would have a potential impact on dark night sky and aesthetic values at the park and would undermine efforts to preserve dark night sky. Lands available for solar energy development occur south and southeast of the park in an area of high quality dark night sky. Nighttime operations and security lights at solar energy facilities could adversely affect this resource undermining efforts to preserve dark sky. The park is concerned that solar energy development on lands south and southeast of the park in the area of analysis could degrade the park's dark sky because there are no other light sources. These lands coincide with the area of analyses for Bryce Canyon and Zion National Parks. The park identifies AHPRC to protect dark night sky.

Chaco Culture National Historical Park

CHCU AHPRC Locations



CHCU AHPRC Descriptions

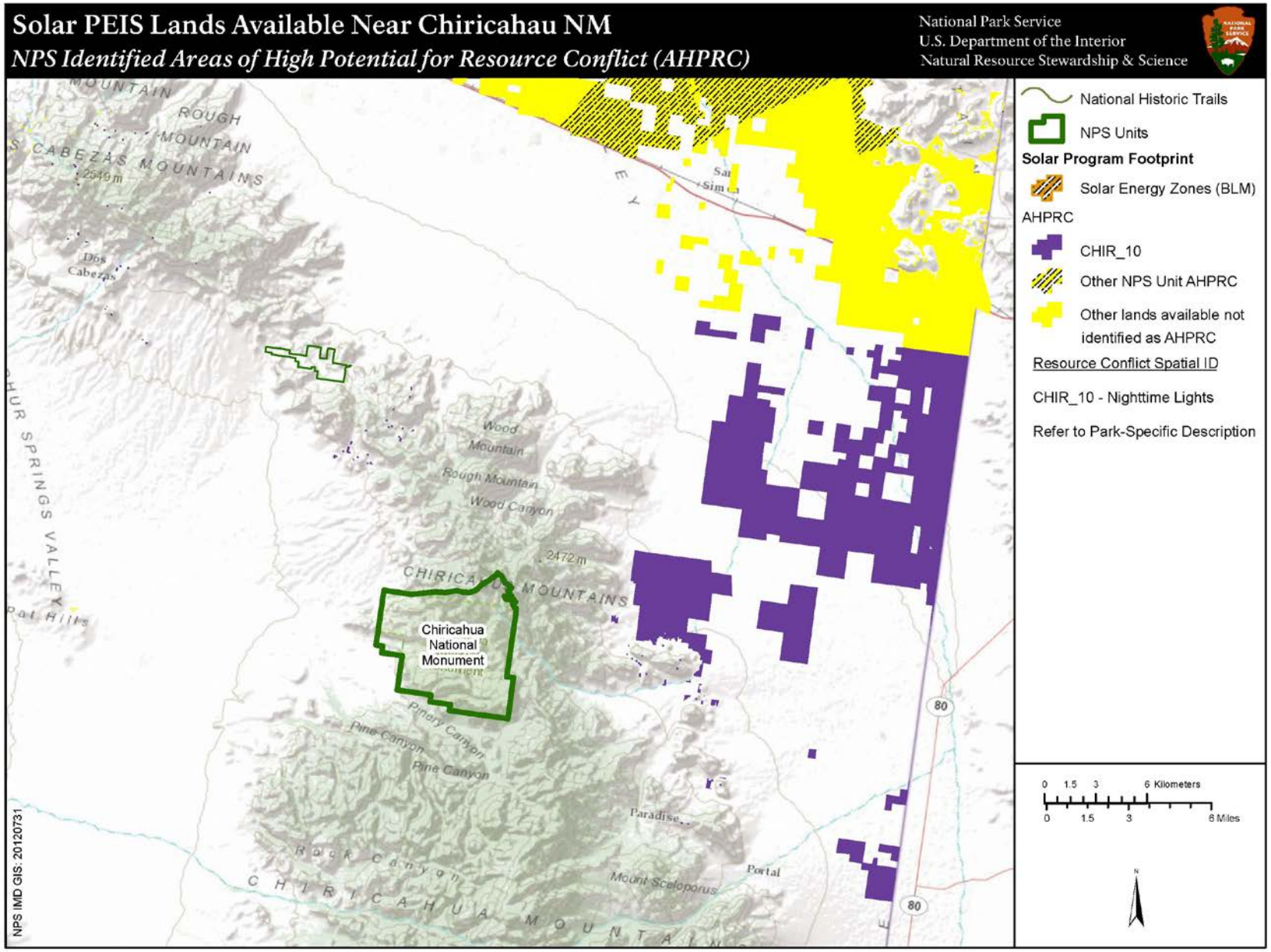
Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**CHCU_1**	Lands available for solar energy development in the area of analysis are located where soils are classified in Wind Erodibility Groups 1 and 2 and have a high potential for dust generation. Pervasive during the spring, prevailing winds carry dust into the park. While aeolian processes are a natural condition, an excess of fugitive dust can exacerbate health problems for humans and wildlife, reduce visibility, and reduce the enjoyment of park visitors. Construction and post-construction activities, service road maintenance and use, loss of vegetation, and disturbance of soil crusts caused by development on these soils could generate significant dust emissions. The park is concerned about the generation of excess dust and the potential impact park resources. The park identifies AHPRC to protect air quality. References: Field, J. P., J. Belnap, D. D. Breshears, J. C. Neff, G. S. Okin, J. J. Whicker, T. H. Painter, S. Ravi, M. C. Reheis, and R. L. Reynolds. 2010. The ecology of dust. Frontiers in Ecology and the Environment 8:423–430 Neff, J. C., A. P. Ballantyne, G. L. Farmer, N. M. Mahowald, J. L. Conroy, C. C. Landry, J. T. Overpeck, T. H. Painter, C. R. Lawrence, and R. L. Reynolds. 2008. Increasing aeolian dust deposition in the western United States linked to human activity. Nature Geoscience 1:189-195 Okin, G. S., J. E. Bullard, R. L. Reynolds, J.-A. C. Ballantine, K. Schepanski, M. C. Todd, J. Belnap, M. C. Baddock, T. E. Gill, and M. E. Miller. 2011. Dust: Small-scale processes with global consequences. EOS, Transactions, American Geophysical Union 92:241-248
Upstream Watersheds	**CHCU_4**	There are three ephemeral streams within the park and numerous tributary streams that are important to the ecological health of the park. Chaco Wash is prone to floods that damage cultural and historic resources. Lands available for solar energy development are located in upstream watersheds. The development of solar energy facilities in this area could disturb soils, and alter rates of erosion, sedimentation and runoff. The park is concerned that these effects may alter water quantity (runoff) and quality (sedimentation). The park is also concerned that extractions of groundwater for solar energy development could deplete limited groundwater sources, impact culturally important springs and seeps, and alter the availability of water for park operations. The park identifies AHPRC to protect upstream watersheds. Additional Resource Conflict Concerns Naturalness. The upstream watersheds possess a high naturalness value. Grazing and isolated

		residential development dominate the near-park landscape. This low level of development helps protect the park's cultural and natural resources, roads and other infrastructure, water quality, habitat , natural acoustic environment , archaeological, and paleontological resources.
Nighttime Lights	**CHCU_10**	The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment. Dark night sky is an important element of the park's scenic qualities, as well. The park's Night Sky Program is among the most popular visitor activities, as well as "stargazing" through our observatory's 25-inch telescope which was installed here specifically because of the park's low levels of light pollution. The park has an active Night sky program for visitor and University sources astronomers. Dark night sky is also important for species that rely on the cover of night to evade predators. The park identifies AHPRC to protect dark night sky. Additional Resource Conflict Comments Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewshed	**CHCU_11**	Scenic vistas from archeological sites are relatively unimpaired in many areas. The vistas provide visitors a historical reference for the landscape that existed when the ancestral Pueblo people occupied the area. Views from the park's higher elevations encompass broad landscapes and numerous archaeological sites, some of which are 1000-or-more-years old. On a clear day, the view from Tsin Kletsin great house on South Mesa captures the top half of Shiprock, the remnant of a volcanic intrusion approximately 65 miles away. These views are integral to the park visitor experience. Lands available for solar energy development in the area of analysis are located in

		these scenic and historical landscapes. Solar energy facilities in line of sight from key observation points within the park could adversely affect the scenic and historical character of landscapes and visitor experience. The park identifies AHPRC to protect visual and cultural landscapes. Additional Resource Conflict Concerns Protecting the scenic vista is an important element of the cultural landscape and the cultural landscape is core to the management of the park. Chaco Culture National Historical Park (CHCU) was established by Congress in 1980 to recognize, preserve, and interpret the unique archaeological resources associated with the prehistoric Chacoan culture in the San Juan Basin and to promote research of its nationally significant resources. Its approximately 34,000 acres incorporate the former Chaco Canyon National Monument, established in 1907, and additional lands. The 1980 CHCU enabling legislation further designated a number of "Chaco Culture Archaeological Protection Sites" that NPS helps to protect, preserve, maintain, and administer through cooperative agreements with landowners. With some later additions, approximately 40 Chacoan greathouse sites are now so designated. Some of these designated protection sites are on federal lands managed by BLM. The park was named a UNESCO World Heritage Site in 1987, making it one of only a small number of sites in the country to carry this special designation. The Chaco Culture World Heritage Site designation also named another NPS unit, Aztec Ruins National Monument (AZRU), as an associated site, as well as the BLM-managed ruins of Casamero, Kin Nizhoni, Pierre's Site, Twin Angels, and Halfway House. Approximately 4000 distinct archaeological sites are known to exist within the boundaries of Chaco Culture NHP, and countless other related archaeological sites are found throughout the surrounding region. There is a high potential for solar energy development to degrade or otherwise adversely affect many of these resources, and thus adversely affect important cultural landscapes and our understanding of the Chacoan culture as a whole.

Chiricahua National Monument

CHIR AHPRC Locations

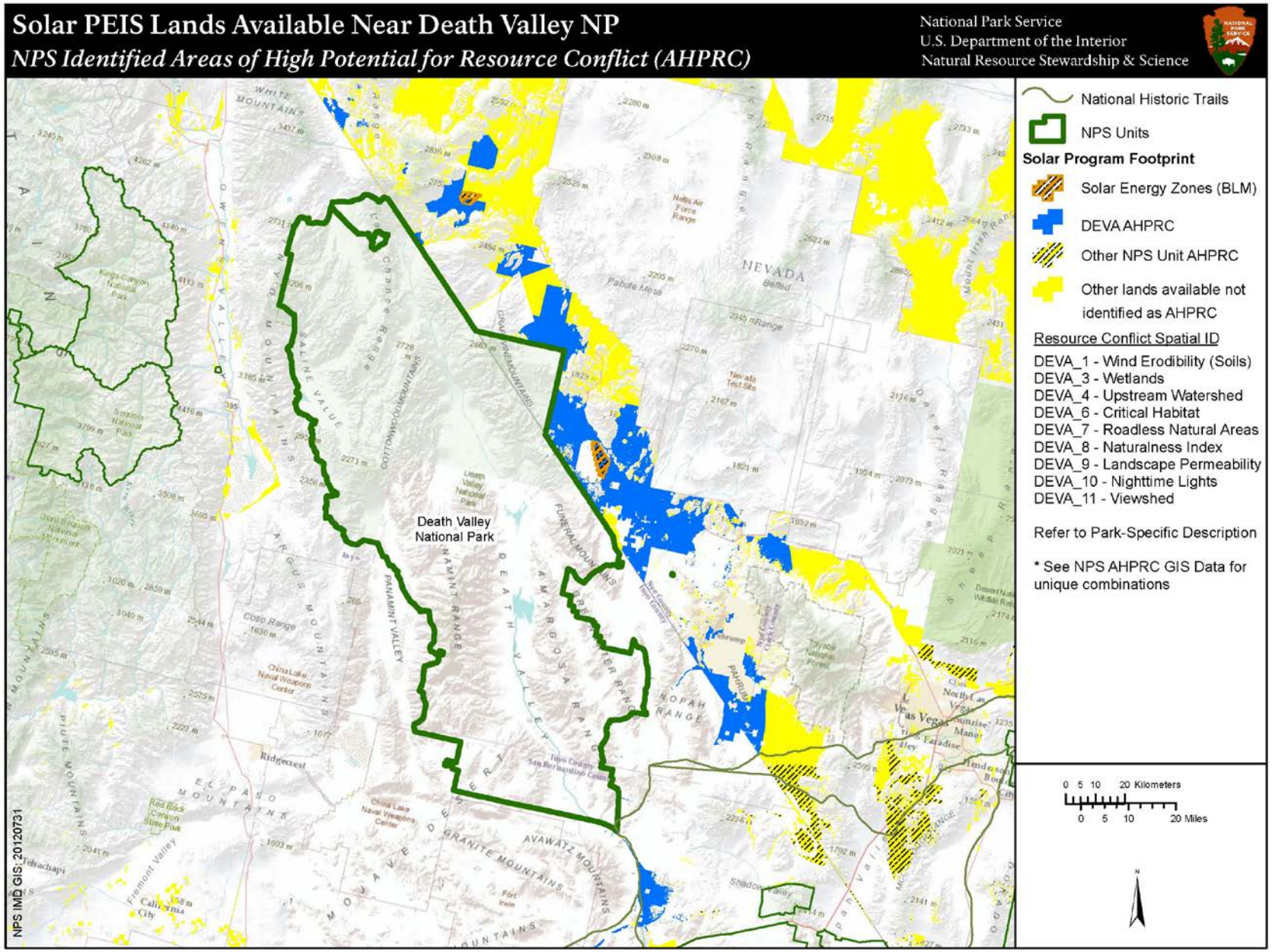


CHIR AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Nighttime Lights	**CHIR_10**	The park has remarkable night sky resources with very few intrusions other than distant light sources far to the west. Lands available for solar energy development occur northwest of the park in small scattered tracts, and east to northeast of the park in area of high quality dark night sky. Nighttime operations and security lights at solar energy facilities could adversely affect this resource, and undermine efforts to preserve dark sky. While the majority of these lands are in not located within line of sight of key observations points and, therefore, not within most park viewsheds, the park is concerned that solar energy development on these lands could adversely affect the park's dark sky because there are no other light sources. This change could be significant to park visitors, including astronomers. The park identifies AHPRC to protect dark night sky.

Death Valley National Park

DEVA AHPRC Locations



DEVA AHPRC Descriptions

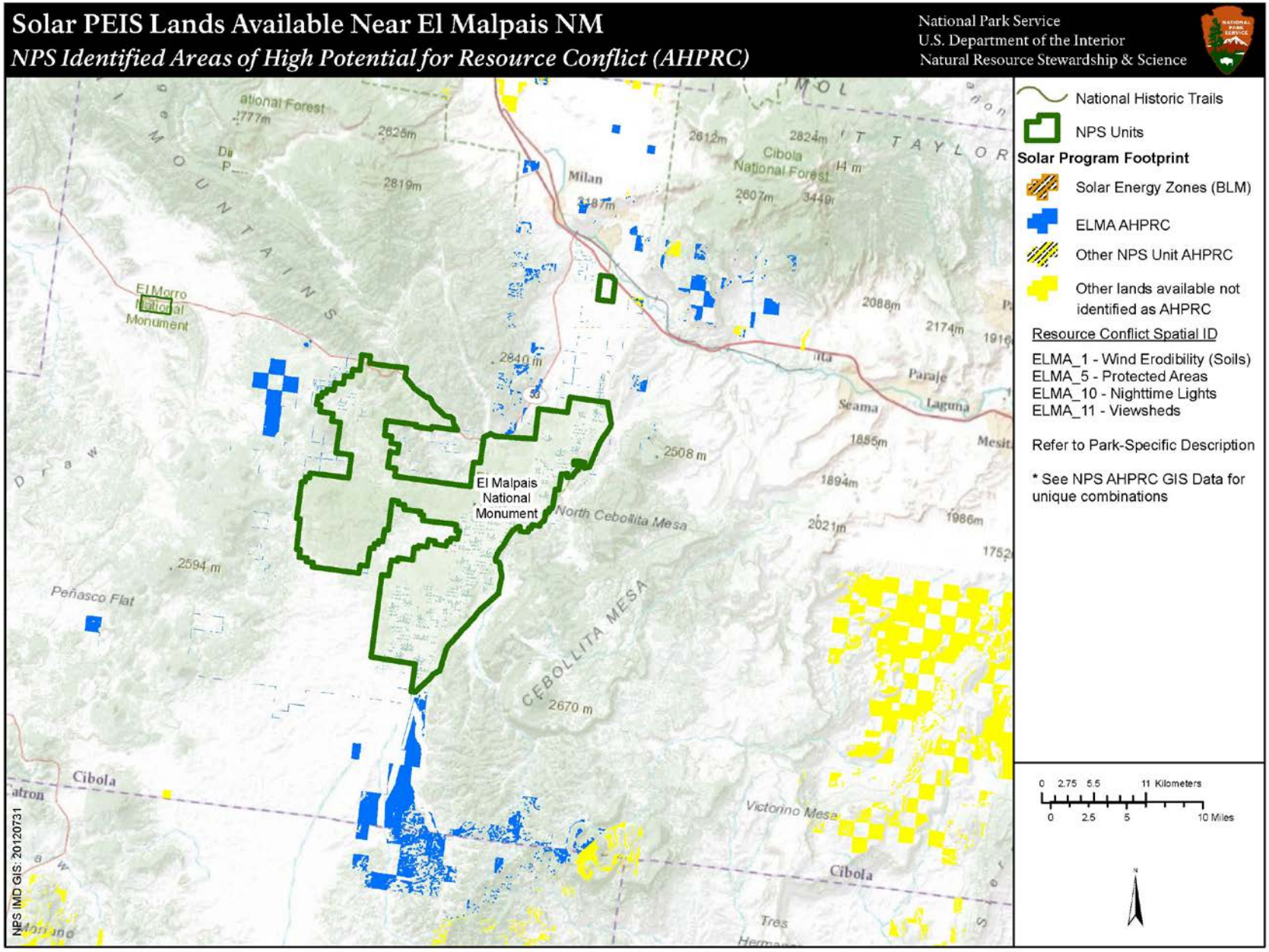
Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**DEVA_1**	Soils susceptible to wind erosion occur around much of the park. Dust is the number one source of PM-10 (particulate matter 10 microns or smaller) air pollution in the area surrounding the park. Lands available for solar energy development are located in areas where soils are classified in Wind Erodibility Groups 1 and 2. Solar energy development, including construction and post-construction activities, service road maintenance and use, loss of vegetation, and disturbance of soil crusts on soils could produce significant quantities of fugitive dust. The park is concerned that these disturbances could increase dust emissions and adversely affect air quality and visibility, and disrupt sensitive desert ecosystems. The park identifies AHPRC to protect air quality and ecological resources.
Wetlands	**DEVA_3**	In an environment where water is scarce, the presence of springs, palm oases, and wetlands is critical for species relying on these sites. Wetlands contain species that are uniquely adapted to the harsh desert environment. Lands available for solar energy development east of the park are located where water resource development in support of solar energy facilities could alter the direction and movement of surface and/or groundwater. The park is concerned about the effects of water development on water-dependent resources. The park identifies AHPRC to protect sensitive, surface- and groundwater-dependent resources. Additional Resource Conflict Concern Devils Hole was added to Death Valley National Park in 1952 by Presidential Proclamation 2961, for the purpose of protecting the Devils Hole pupfish and the water resources connected to the unit, stating in part "…the pool is of such outstanding scientific importance that it should be given special protection." The National Park Service's reserved water right at Devils Hole established by this proclamation has been upheld by decision of the Supreme Court (Cappaert v. United States, 426 U.S. 128, 1976).
Upstream Watersheds	**DEVA_4**	Lands available for solar energy development located northeast of the park lie in an upstream watershed. The development of solar energy facilities in this area has potential to disturb soils, and increase rates of erosion, sedimentation and runoff. Increased land disturbance also promotes invasion of non-native and invasive plants, particularly along road corridors. These impacts may affect water quality and quantity and ecological conditions in the park. The park identifies AHPRC to protect water resources and ecological conditions.
Critical Habitat	**DEVA_6**	Lands available for solar energy development occur near critical habitats for plant and animal species and in corridors connecting these habitats. Habitat connectivity and plant and wildlife migration corridors are important landscape features for maintaining viable populations of

		protected species in the park. The park identifies AHPRC to protect critical habitats.
Roadless Areas, Naturalness Index and Landscape Permeability	**DEVA_7 DEVA_8 DEVA_9**	Lands available for solar energy development surrounding the park have high roadless, naturalness, and landscape permeability values and represent intact, high integrity landscapes. The protection of intact landscapes and their inherent scenic values is a primary management goal of the park because these landscapes are important for maintaining biological (genetic) diversity of resident park wildlife populations. The park is concerned about the protection of intact landscapes and their inherent scenic, hydrologic, and ecological values from the effects of solar energy development. The park identifies AHPRC to protect roadless areas, visual resources and landscape integrity.
Nighttime Lights	**DEVA_10**	The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment. The park is concerned that the siting of multiple solar energy facilities could decrease the quality of nighttime sky in the park and could produce noticeable effects to ecosystem function. The park is concerned that solar energy development on lands within the area of analysis that possess dark night sky could degrade the park's night sky resource. The park is also concerned that solar facilities within 50 miles of the park be required to install only down-shielded, dark night sky appropriate lighting approved by the NPS and the International Dark Sky Association. The park identifies AHPRC to protect dark night sky. Additional Resource Conflict Concerns Research indicates dark sky importance to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. Examples specific to desert ecology of the Death Valley region are numerous. Coyotes (Canis latrans) group howl and group yip-howl more during the new moon, when it is darkest. Communication is necessary either to reduce trespassing from other packs, or to assemble packs to hunt prey during dark conditions (Bender et al., 1996). Depending on intensity of light pollution, ambient illumination could alter or eliminate this pattern in affected areas (Longcore and Rich, 2004). Desert rodents reduce their foraging activity when exposed to ambient light (Kotler, 1984). A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities

		could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Bender DJ, Bayne EM, and Brigham RM. 1996. Lunar condition influences coyote (Canis latrans) howling. American Midland Naturalist Journal 136: 413–17 Kotler BP. 1984. Risk of predation and the structure of desert rodent communities. Ecology 65: 689–701 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewshed	**DEVA_11**	Protecting scenic values is recognized in the park's enabling legislation (California Desert Protection Act of 1994, 16 U.S.C. §§ 410aaa through 410aaa-83, October 31, 1994). Lands available for solar energy development occur in viewsheds that possess high scenic quality for visitors. The park has identified key viewsheds that represent a range of visitation and viewing opportunities. The park is concerned that the development of solar energy facilities in line of sight from key observation points could affect the park's viewsheds. The park identifies AHPRC to protect visual resources. Additional Resource Conflict Concerns Death Valley National Park was recognized in its enabling legislation (California Desert Protection Act of 1994, 16 U.S.C. §§ 410aaa through 410aaa-83, October 31, 1994) as being nationally significant for a wide array of values, including "scenic values." The park contains many iconic desert and mountain observation points where scenic views are critical component of the park's legislated protection. The park concurs with any DOD-requested height restrictions for structures located within or adjacent to the Gold Point SEZ. Height restrictions of 50 feet (15 meters) above ground could somewhat mitigate potential visual resource impacts near the northern portion of the park.

El Malpais National Monument

ELMA AHPRC Locations

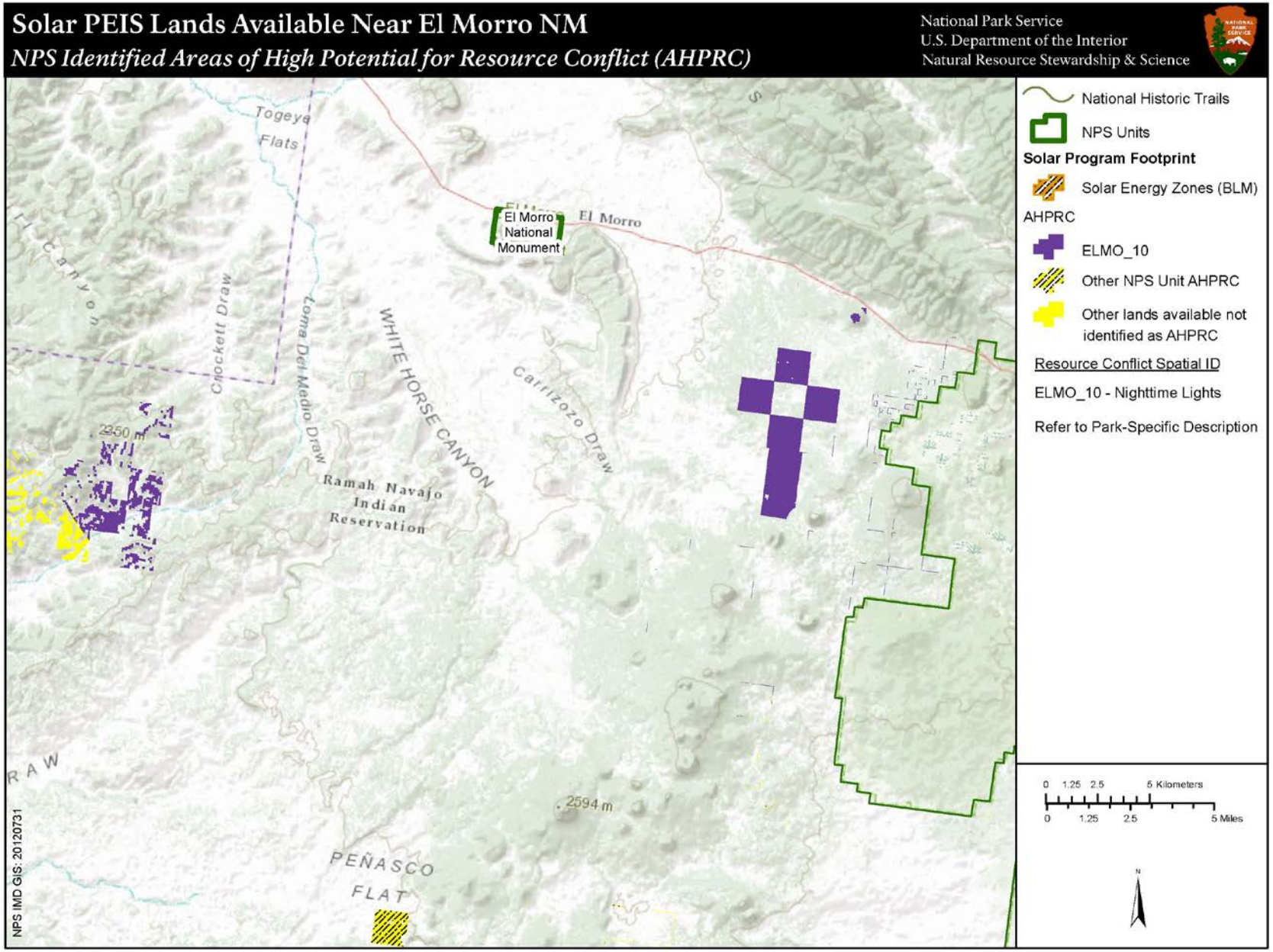


ELMA AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**ELMA_1**	Soils susceptible to wind erosion occur around much of the park. Lands available for solar energy development in the area of analysis are located to the south and north of the park where soils are classified in Wind Erodibility Groups 1 and 2 and have a high potential for dust generation. The disturbance of these wind erodible soils associated with the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. The park is concerned that disturbance of these soils poses a threat to air quality and visitor experience at the park. The park identifies AHPRC to protect air quality.
Protected Areas	**ELMA_5**	There are two BLM-administered wilderness areas located adjacent to the park. In addition, 97,428 acres within the park is proposed wilderness. Lands available for solar energy development located to the south of the park are located within park's viewshed. The park is concerned that development of solar energy facilities near proposed and existing wilderness areas could diminish wilderness resources. The park identifies AHPRC to protect wilderness.
Nighttime Lights	**ELMA_10**	Both El Malpais NM and El Morro NM are eligible for inclusion in the NPS Dark Night Sky program. The dark night sky is a natural resource for these parks, with nearly pristine night sky conditions at each. Lands available for solar energy development occur in areas that possess dark night sky. The parks are concerned that solar energy development in the area of analysis could increase artificial lighting and light pollution. The park identifies AHPRC to protect dark night sky.
Viewshed	**ELMA_11**	Scenic views of the natural, historic and cultural landscape occur in all directions from the park and are of high value to park visitors. Lands available for solar energy development in the area of analysis are located within the park's viewshed. The park is concerned that solar energy development located in line of sight from key observation could adversely affect these natural, historic and cultural landscapes. The park identifies this AHPRC to protect visual resources.

El Morro National Monument

ELMO AHPRC Locations

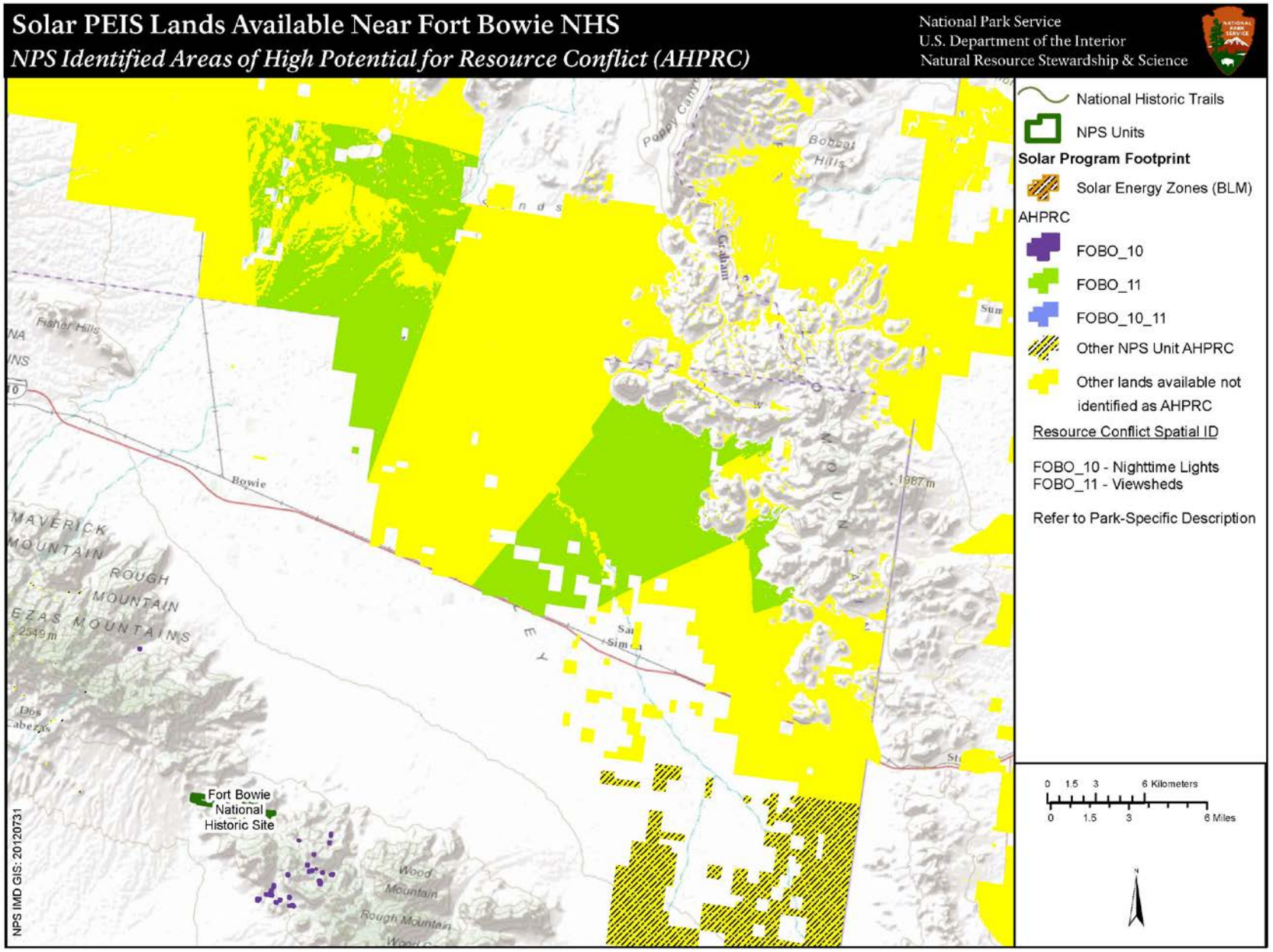


ELMO AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Nighttime Lights	**ELMO_10**	Both El Malpais NM and El Morro NM are eligible for inclusion in the NPS Dark Night Sky program. The dark night sky is a natural resource for these parks, with nearly pristine night sky conditions at each. Lands available for solar energy development occur in areas that possess dark night sky. The parks are concerned that solar energy development in the area of analysis could increase artificial lighting and light pollution. The park identifies AHPRC to protect dark night sky. Additional Background Comments Lands available for solar energy development occur southwest of the park in areas where soils are classified in Wind Erodibility Group 2. The park is concerned that disturbance of these soils poses a threat to air quality and visitor experience.

Fort Bowie National Historic Site

FOBO AHPRC Locations

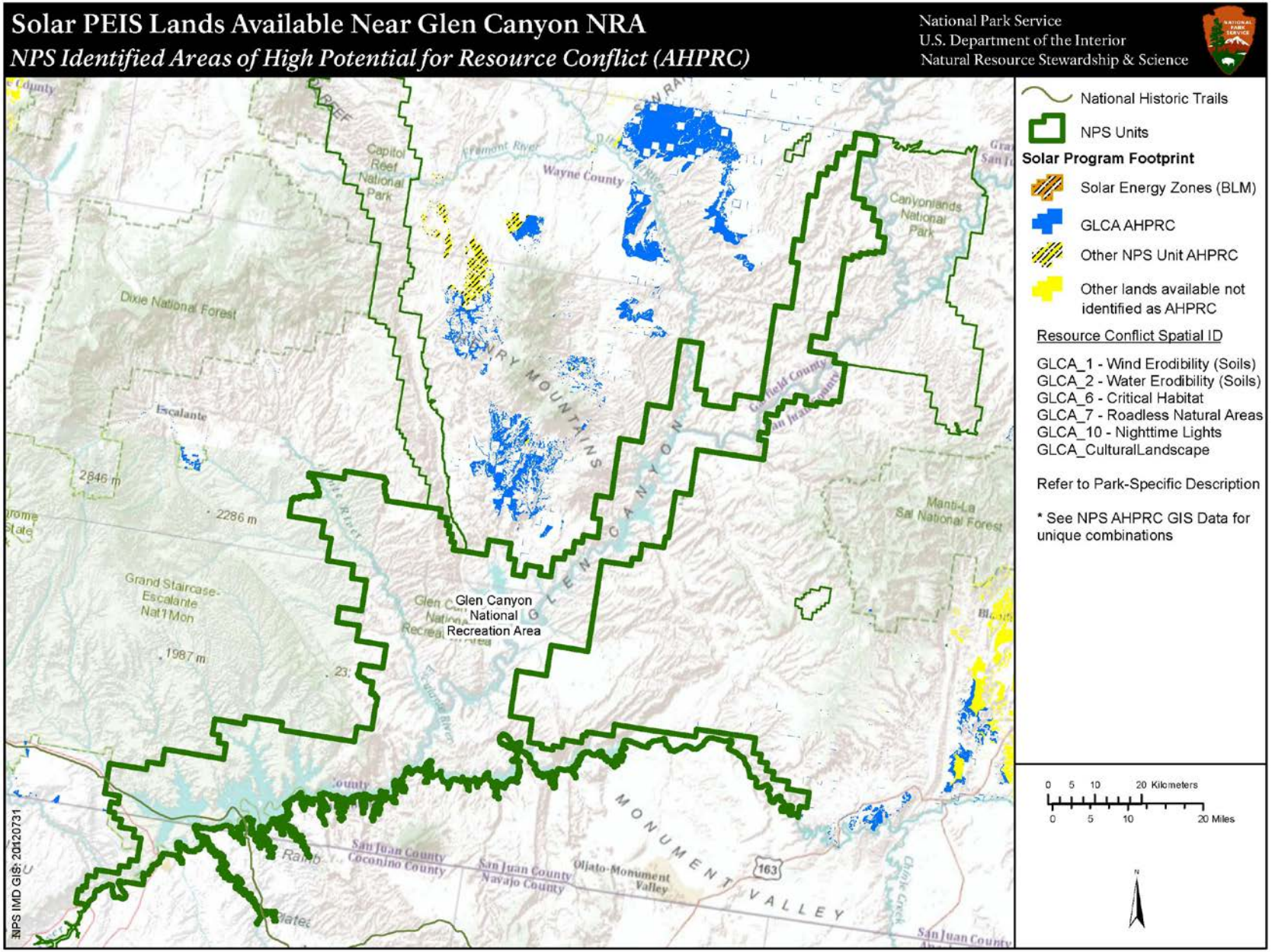


FOBO AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Nighttime Lights	**FOBO_10**	Lands available for solar energy development occur southeast and northwest of the park in small scattered tracts, and east to northeast of the park in area of high quality dark night sky. Nighttime operations and security lights at solar energy facilities could adversely affect this resource, and undermine efforts to preserve dark sky. While most of these lands are not located within line of sight of key observations points and, therefore, not within most park viewsheds, the park is concerned that solar energy development on these lands could adversely affect the park's dark sky because there are no other light sources. The park identifies AHPRC to protect dark night sky.
Viewshed	**FOBO_11**	Lands available for solar energy occur within park viewsheds to the north-northeast. The park is concerned about preserving scenic views, and dark night sky in these areas. The park identifies AHPRC to protect visual resources.

Glen Canyon National Recreation Area

GLCA AHPRC Locations



Resource of Concern	Spatial Reference ID #	Resource Conflict Justification
Wind Erodibility	**GLCA_1**	Lands available for solar energy development located west and north of the middle section of the park (park lands longitudinal along the Colorado River) occur in areas upwind of the park and Canyonlands NP, in areas where soils are classified in Wind Erodibility Groups 1 and 2. These soils are susceptible to wind erosion. The predominant wind direction in these areas is toward the park and Canyonlands NP. The nearby Arches and Canyonlands National Parks are Class 1 air quality area under the Clean Air Act, indicating that no significant degradation of air quality should be permitted under federally proposed actions. Numerous recent publications (see References) describe the downwind significance of dust emissions from low-elevation drylands. Current monitoring data support the park's concern that disturbance of soils in this area from solar development would increase particulate deposition decrease visibility in the park. Deposition of wind eroded soils can affect plant and animal communities as well as eventually be eroded by water and affect riparian and watercourses in the park. Disturbance of these lands from the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. High winds frequently experienced on the Colorado Plateau (especially during the spring season), and disturbance of these soils, would exacerbate generation of dust and diminish visibility and other downwind resources. The park is concerned that soil disturbances due to the construction and operation of solar energy facilities could degrade air quality in the park. The increase in dust emissions and deposition of particulates and soil in the park could also degrade vegetation and wildlife habitats. The park identifies AHPRC to protect air quality. References: Field, J. P., J. Belnap, D. D. Breshears, J. C. Neff, G. S. Okin, J. J. Whicker, T. H. Painter, S. Ravi, M. C. Reheis, and R. L. Reynolds. 2010. The ecology of dust. Frontiers in Ecology and the Environment 8:423–430 Neff, J. C., A. P. Ballantyne, G. L. Farmer, N. M. Mahowald, J. L. Conroy, C. C. Landry, J. T. Overpeck, T. H. Painter, C. R. Lawrence, and R. L. Reynolds. 2008. Increasing aeolian dust deposition in the western United States linked to human activity. Nature Geoscience 1:189-195 Okin, G. S., J. E. Bullard, R. L. Reynolds, J.-A. C. Ballantine, K. Schepanski, M. C. Todd, J. Belnap, M. C. Baddock, T. E. Gill, and M. E. Miller. 2011. Dust: Small-scale processes with global consequences. EOS, Transactions, American Geophysical Union 92:241-248 Painter, T. H., J. S. Deems, J. Belnap, A. F. Hamlet, C. C. Landry, and B. Udall. 2010. Response of Colorado River runoff to dust radiative forcing in snow. Proceedings of the National Academy

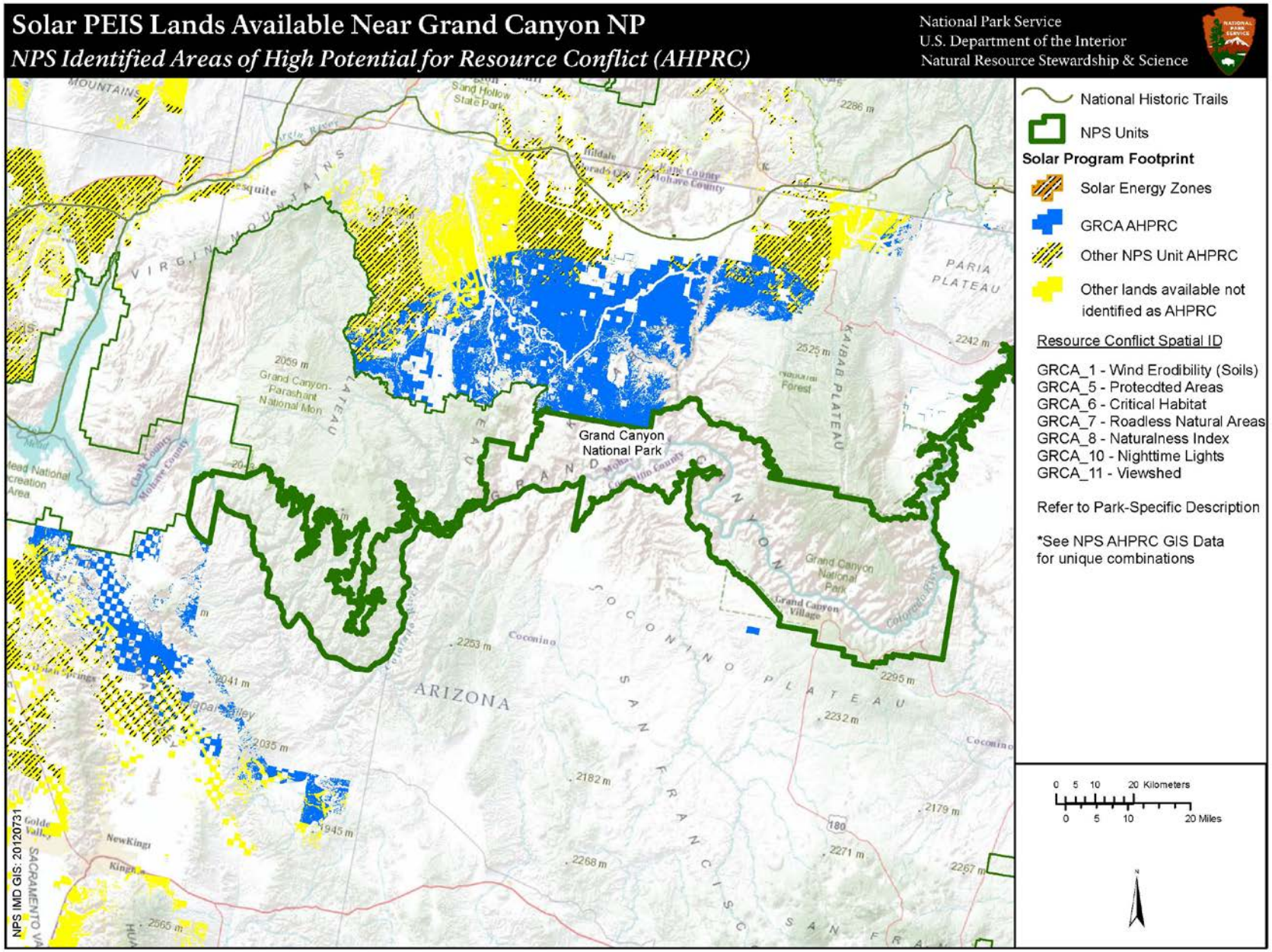
		of Sciences 107:17125-17130
Water Erodibility	**GLCA_2**	Lands available for solar energy development west and north of the middle section of the park (park lands longitudinal along the Colorado River) occur in areas where soils are classified as having High Water Erosion Potential. The park is concerned that solar energy development in these areas could disturb soils, alter rates of erosion, sedimentation and runoff and increase invasion of non-native species in the park. The park identifies AHPRC to protect water resources and native species.
Critical Habitat	**GLCA_6**	Critical habitat designated for the Mexican Spotted Owl is located in several areas near the park. In addition, there are extensive riparian and river miles of designated critical habitat located along the upper portions of the park (the Colorado River and portions of the San Juan River) for the endangered Colorado pikeminnow, boneytail chub, humpback chub, razorback sucker, and the Navajo sedge. Lands available for solar energy development in the area of analysis are located adjacent or upstream of these critical habitats. The park is concerned that solar energy development adjacent and/or upstream of these critical habitats could exacerbate difficult challenges for managing these habitats and protecting species. The park identifies AHPRC to protect listed species.
Roadless Areas	**GLCA_7**	The park is surrounded largely by roadless natural areas. The protection of intact landscapes and their inherent scenic value and biological values is a primary management goal of the park because these landscapes are important for maintaining biological (genetic) diversity of resident park wildlife populations. Lands available for solar energy development located to the west and north of the middle section of the park (park lands longitudinal along the Colorado River) occur in largely roadless natural areas. These lands also coincide, in some places, with lands managed as suitable and recommended for wilderness in 1980. The park is concerned that solar energy development in these largely intact, undisturbed landscapes could increase disturbances to critical habitats, erosion of sensitive soils and invasion by non-native plants. The park identified AHPRC to protect landscape integrity. [See the Wilderness folder in the GLCA directory in the park specific zip file download]. Reference: National Park Service. 1979. Glen Canyon National Recreation Area General Management Plan.
Nighttime Lights	**GLCA_10**	The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment. Lands available for solar energy development located to the west and north of the middle section of the park (park lands longitudinal along the Colorado River) occur in areas with high quality dark sky conditions. Lands available for solar energy development in remote areas to the east of the Waterpocket Fold (northern portions of the fold) in and adjacent to Capitol Reef

		NP are also visible from the park. Because there are no other light resources in the area, the park is concerned that nighttime operations and security lights on energy installations could adversely affect this resource undermining efforts to preserve dark sky. The park identifies as AHPRC to protect dark night sky. Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Cultural Landscapes	**GLCA_Cultural Landscape**	Lands available for solar energy development are located in areas possessing significant cultural landscape values. The park is concerned that solar energy development could diminish the historical and scenic landscape, and degrade interpretive value of the cultural and historical resources. The park identifies AHPRC to protect the cultural landscape. Additional Resource Conflict Concerns A cultural landscape map showing boundaries of Robbers Roost/Under the Ledge Ranches Cultural Landscape Inventory (CLI) reveals a large, historic landscape that encompasses over 900 square miles in southeast Utah and coincides with some lands available for solar energy development. This landscape includes deep canyons, wide open flats, juniper and pinion forest, sand dunes, and desert scrub country, between 5000-7000 feet of elevation and it represents a hardscrabble ranchland for four historic ranching families, spanning about 100 years. The landscape features numerous brush corrals (corrals created using stacked juniper and pinion trees), springs, trails, and remnants of family ranching camps. According to the CLI, the

		landscape resources are classified significant for subsistence ranching, and exploration/settlement (Criterion A), vernacular architecture (Criterion C), and archeological resources (Criterion D). The integrity of many of the landscape features remain, though time and the elements have taken their toll on a number of sites, leaving them in a ruinous state. Today, the area is essentially an archeological district. A Determination of Eligibility has been drafted as part of the CLI. The CLI project has been a successful partnership between the NPS and BLM to identify and document hard-scrabble, subsistence ranching features unique to Utah. The State Historic Preservation Office (SHPO) has confirmed that these resources are one-of-a-kind and should also be nominated to the National Register. The CLI and Determination of Eligibility is the first step toward drafting a Multiple Property Nomination to list the landscape and its resources on the National Register of Historic Places. As of December 2011, the CLI was in the process of being finalized. The document and Determination of Eligibility will be put forth for SHPO concurrence in early 2012. [See Cultural_Landscapes folder in the CANY_GLCA directory of the park specific zip file download].

Grand Canyon National Park

GRCA AHPRC Locations



GRCA AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**GRCA_1**	Lands available for solar energy development north of the central portion of the park are in areas where soils are classified in Wind Erodibility Groups 1 and 2. These soils are susceptible to wind erosion. The park is a Class 1 air quality area under the Clean Air Act which is afforded the highest protection under the Clean Air Act. http://nature.nps.gov/air/permits/flag Disturbance of soils classified in wind-erodible soils related to the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. The park is concerned that soil disturbances due to the construction and operation of solar energy facilities could degrade air quality in the park and cause violation of the National Ambient Air Quality Standards (NAAQS). Air quality impacts are through the computation of the consumption of Class I and II increments. The increase in dust emissions and deposition of particulates and soil due to ground disturbances in the park could potentially degrade air quality (including visibility), vegetation and wildlife habitats. The park identifies areas of high wind erodibility as AHPRC to protect air quality. References: National Park Service. 2007. 2006 annual performance and progress report: air quality in national parks. Dated October 2007. Available at: <http://www.nature.nps.gov/air/Pubs/pdf/gpra/GPRA_AQ_ConditionsTrendReport2006.pdf>. Accessed February 2010 Bureau of Land Management. 2011. Northern Arizona Proposed Withdrawal Draft Environmental Impact Statement Arizona Strip District Office, AZA-035138. Available at: http://www.blm.gov/az/st/en/prog/mining/timeout/deis.html Air Quality in National Parks 2008 Annual Performance & Progress Report Natural Resource Report NPS/NRPC/ARD/NRR—2009/151 Additional Resource Conflict Concerns

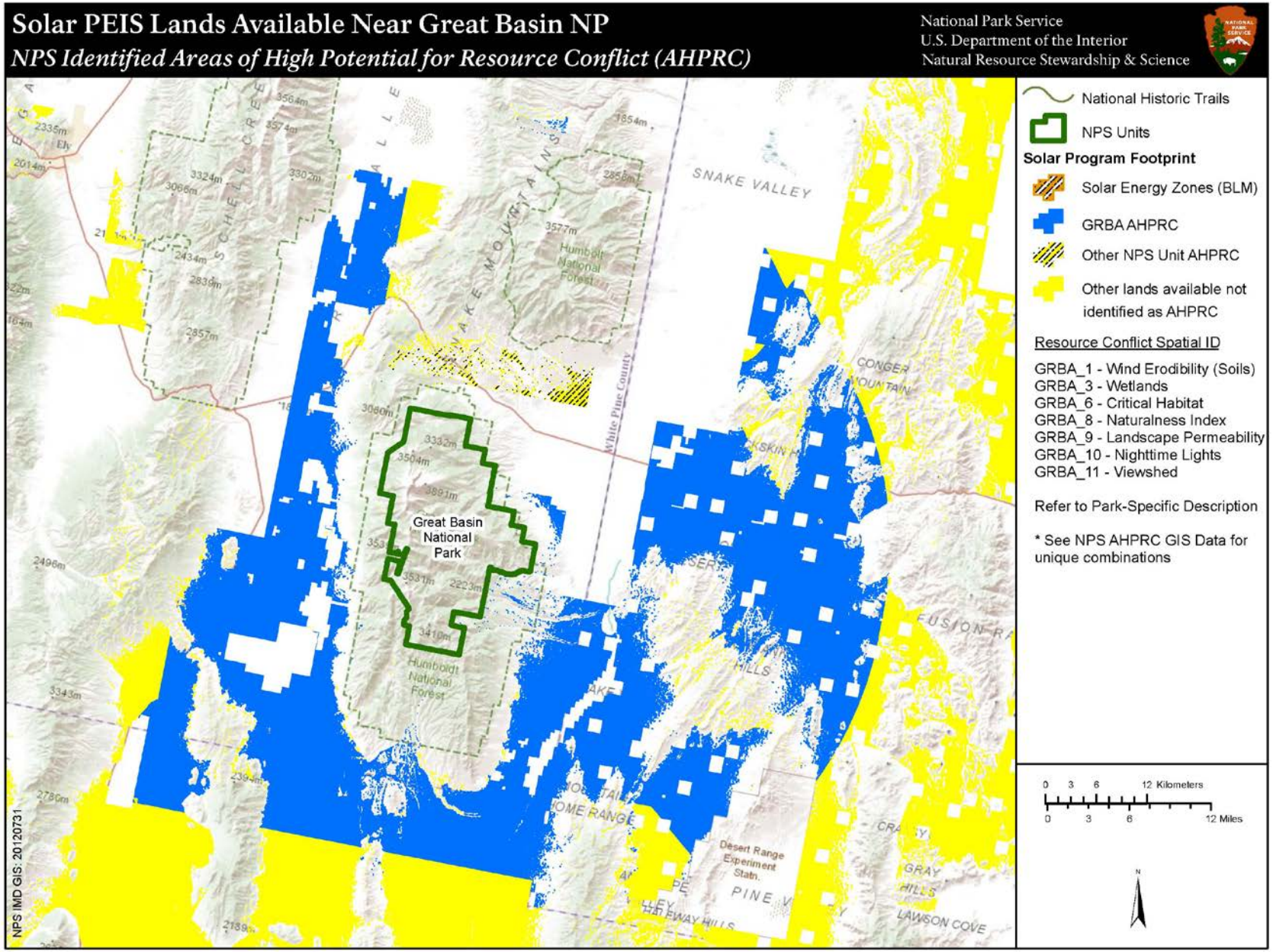
		Water Erodibility. Potential indirect effects on vegetation in riparian areas, seeps and spring due to the higher rates of erosion and sedimentation in drainages. Potential downstream impacts from road and infrastructure development sediment, particularly in Tuckup and 150-Mile Canyon watersheds. Upstream Watersheds. Potential effects of land disturbance due to solar energy development (including road construction) on sedimentation processes and the introduction of non-native, invasive species, particularly in Tuckup and 150-Mile Canyon watersheds. Water Resources. Potential effects of solar energy development on water supplies. Groundwater resources are limited in the Colorado Plateau, particularly near the park. Water use for solar energy development, even for lower-use technologies such photovoltaic systems could affect water quantity and/or quality available for park resources.
Protected Areas	**GRCA_5**	There are a substantial number of protected areas within 50 miles of the park. Lands available for solar energy development are located adjacent to these protected areas, including the following areas: northeast near the Paria Plateau; northwest and southwest of the downriver section; and immediately north of the central section. The park identifies AHPRC to protect specially-designated areas. References: National Park Service. 1995. General Management Plan: Grand Canyon National Park. ———. 1988. Grand Canyon National Park Backcountry Management Plan
Critical Habitat	**GRCA_6**	The park is concerned that lands available for solar energy development are located near critical habitat for the Mexican Spotted Owl, and upstream of extensive riparian resources and critical habitat (Colorado River) for the endangered humpback chub in the central section. Lands available for solar energy development along portions of the North Rim lie adjacent to or border these critical habitat areas. The park is concerned that these habitats are protected from the effects of solar energy development in upstream areas. The park identifies AHPRC to protect critical habitat.
Roadless Areas	**GRCA_7**	The park is concerned that development in largely intact, undeveloped areas near the park could increase unauthorized access to archeological sites and intensify illegal hunting, ORV use, or other unauthorized activities in the park. Roadless areas help maintain the integrity of wildlife migration corridors and flyways. The park identifies AHPRC to protect roadless natural areas.
Naturalness Index	**GRCA_8**	The region north of the Grand Canyon contains nearly pristine lands, unaffected by man's intrusion. Lands available for solar energy development north of the park possess high quality natural value. The park is concerned that solar energy development on these relatively intact landscapes could adversely affect these intact landscapes.

		The park manages areas on the Kanab Plateau and Marble Platform to maintain an undeveloped character (see References). The park's backcountry zoning system classifies the Kanab Plateau and canyons adjacent to Marble Platform as primitive and heavily restricted from development. The park manages these areas to provide high quality recreation opportunities to the public, including the preservation of natural sounds. Increased development near the backcountry recreation areas could adversely affect primitive recreational character in this area. The park identifies AHPRC to protect the integrity of landscapes and recreation resources. References: Ambrose, S. 2008. Sound Levels and Audibility of Common Sounds in Frontcountry and Transitional Areas in Grand Canyon National Park, 2007–2008 ———. 2010b. Sound Levels of Equipment and Operations at the Arizona 1 Uranium Mine in Northern Arizona, March 20, 2010 to April 8, 2010 National Park Service. 1995. General Management Plan: Grand Canyon National Park. Denver Service Center ———. 1988. Grand Canyon National Park Backcountry Management Plan ———. 2009a. Aquatic Biology Inventory of Springs and Seeps: Uranium Mining Withdrawal EIS. Draft Final Report. Colorado Plateau Cooperative Ecosystem Studies Unit
Nighttime Lights	**GRCA_10**	Dark night sky is a wilderness character that the park manages as a natural resource. Lands available for solar energy development north of the park possess high quality dark night sky. The park is concerned that nighttime operations and security lights on energy installations could adversely affect this resource undermining efforts to preserve dark sky. The park identifies as AHPRC to protect dark night sky. References: 2006a. Night Sky Quality Monitoring Report, Parashant National Monument, Arizona, McDonald Flat, February 24, 2006. Available at: <http://nature.nps.gov/air/lightscapes/monitorData/para/mF20060224.cfm>. Accessed August 30, 2010. National Park Service. 1995. General Management Plan: Grand Canyon National Park. Denver Service Center Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple

		adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewsheds	**GRCA_11**	The entire Kanab Plateau is covered in visible mining claims including claims at, or and within sight of, the park boundary (see Reference). Existing mining exploration activities have disrupted the visual landscape from the park. Improved roads are increasing vehicular traffic on the Kanab Plateau. The park is concerned that utility scale solar facilities could further disrupt the visual landscape. Lands available for solar energy development are included in line of sight views from numerous key observation points in the park. The park identifies AHPRC to protect visual resources. Reference: Bureau of Land Management. 2011. Northern Arizona Proposed Withdrawal Draft Environmental Impact Statement Arizona Strip District Office, AZA-035138. Available at: http://www.blm.gov/az/st/en/prog/mining/timeout/deis.html Additional Resource Conflict Concerns Cultural Resources. There are Traditional Cultural Properties throughout the park. In addition, there is a National Register district. Special Management Areas. There are numerous special management areas in the park, including proposed wilderness and flight free areas. The park is a designated World Heritage Site.

Great Basin National Park

GRBA AHPRC Locations



GRBA AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**GRBA_1**	Soils susceptible to wind erosion occur around much of the park. Dust is the number one source of PM-10 (particulate matter 10 microns or smaller) air pollution in the area surrounding the park. Annual windrose data from the park's highest and most representative remote automated weather station indicates the strongest and most prevalent winds are from the south to SSE, with the next greatest wind speeds and vectors from the NW to NNW (see Reference, Figs. 8-21, 23). Recent data also indicates that a third set of vectors from the southwest occur occasionally in the fall. The data indicates that fugitive dust from solar energy facility development is likely to be driven into the park. Lands available for solar energy development occur in areas where soils are classified in Wind Erodibility Groups 1 and 2. Solar energy development, including construction and post-construction activities, service road maintenance and use, loss of vegetation, and disturbance of soil crusts could produce significant quantities of fugitive dust. The park is concerned that these disturbances could increase dust emissions and adversely affect air quality and visibility, and degrade visual, including night sky, resources, and disrupt sensitive ecosystems. The park identifies AHPRC to protect air quality and ecological resources. Reference: D. DuBois, M. Green, R. Powell, J. Xu, J. Ashby. 2006. Evaluation of Meteorological and Air Quality Monitoring at Great Basin National Park, Final Report. Desert Research Institute, Las Vegas, NV
Wetlands	**GRBA_3**	Wetlands are important resources in Spring Valley and Snake Valley. Located on the west and east sides of the park, wetlands in Spring and Snake Valleys support landscape integrity and corridors for wildlife migration between the park and other mountain ranges in the region. The valleys also provide important food sources for the maternity bat colony in Rose Guano Cave, located six miles from the park. Bats from the colony are persistent in the park and represent an important part of ecosystems in the region. Lands available for solar energy development in the area of analysis coincide with, or lie adjacent to, important wetlands. The park is concerned that extractions of groundwater to support solar energy facilities may reduce groundwater discharge in wetlands, disrupt wildlife habitat and migration, and alter water quantity (runoff) and quality (sedimentation). The park identifies AHPRC to protect wetlands, wildlife habitat and migration corridors, and water resources and ecological conditions. Additional Resource Conflict Concerns

		The park is concerned about the cumulative effects of water development for solar energy development and other land uses in the region. Considering the proposed Clark, Lincoln, and White Pine Counties Groundwater Development area (see Reference), the potential cumulative effects of solar energy development may have a profound impact on the limited groundwater resources that supply natural wetland systems in Spring and Snake valleys. Reference: Bureau of Land Management. 2011. Draft Environmental Impact Statement for the Clark, Lincoln and White Pine Counties Water Development Project. Nevada Groundwater Projects Office, Reno, NV
Critical Habitat	**GRBA_6**	There are three active sage grouse leks in the vicinity of the park. In addition, large areas of Spring and Snake Valleys consist of nesting, early brooding, and late summer sage grouse habitat. The park is surrounded by the Spring/Snake Valley Sage Grouse PMU and is in the middle of the Greater Sage Grouse CISA. The park is concerned that, in light of the potential listing of the sage grouse, and management actions to being taken to restore sagebrush steppe communities in the eastern portion of the park to enhance sage grouse habitat and increase the population, development of solar energy on the lands available could adversely affect efforts to protect sage grouse. A lek located east of the park indicates the success of efforts to protect this species (see Reference). The park identifies AHPRC to protect sage grouse habitat. Reference: Bureau of Land Management. 2011. Draft Environmental Impact Statement for the Clark, Lincoln and White Pine Counties Water Development Project, Appendix F3.6, Fig. F3.6-10. Nevada Groundwater Projects Office, Reno, NV
Naturalness	**GRBA_8**	Lands available for solar energy development surrounding the park are rated as having high naturalness value and represent intact landscapes of high integrity. The protection of intact landscapes and their inherent scenic values is a primary management goal of the park as identified in the enabling legislation. The park is concerned about protecting intact landscapes to maintain biological (genetic) diversity of resident park wildlife populations. The development of solar energy facilities on these lands could increase fragmentation of the landscapes, promote invasion of non-native and invasive plants, particularly along road corridors, and increase rates of erosion, sedimentation, and runoff. The park identifies AHPRC to protect landscape integrity and scenic values.

Landscape Permeability	**GRBA_9**	Lands available for solar energy development surrounding the park are rated as having high landscape permeability. High landscape permeability is ecologically important for populations of bighorn sheep, mountain lions, and other mammals such as elk, mule deer, and medium- to large-sized carnivores. The long-term persistence of some species depends on intact landscapes to connect surrounding areas to the park. The park is concerned about the potential for solar energy facilities to cause fragmented landscapes and disrupt genetic diversity of park wildlife populations. The park identifies AHPRC to protect landscape integrity and wildlife habitats.
Nighttime Lights	**GRBA_10**	The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment. Dark night sky is an important element of the park's scenic qualities as well as an important resource to amateur astronomers, sky watchers, and other visitors. Each summer, the park hosts a 3-day astronomy festival and ranger-led star gazing programs two nights a week. A night sky inventory was performed recently which confirmed that the area surrounding the park is among the few places in the United States where light pollution is low. Lands available for solar energy development occur in areas surrounding the park (Nevada and Utah) that have high quality dark night sky. The park is concerned that solar energy development could degrade the park's dark night sky. The park is also concerned that solar facilities within 50 miles of the park be required to install only down-shielded, dark night sky appropriate lighting approved by the NPS and the International Dark Sky Association. The park identifies AHPRC to protect dark night sky. Additional Resource Conflict Comments Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198

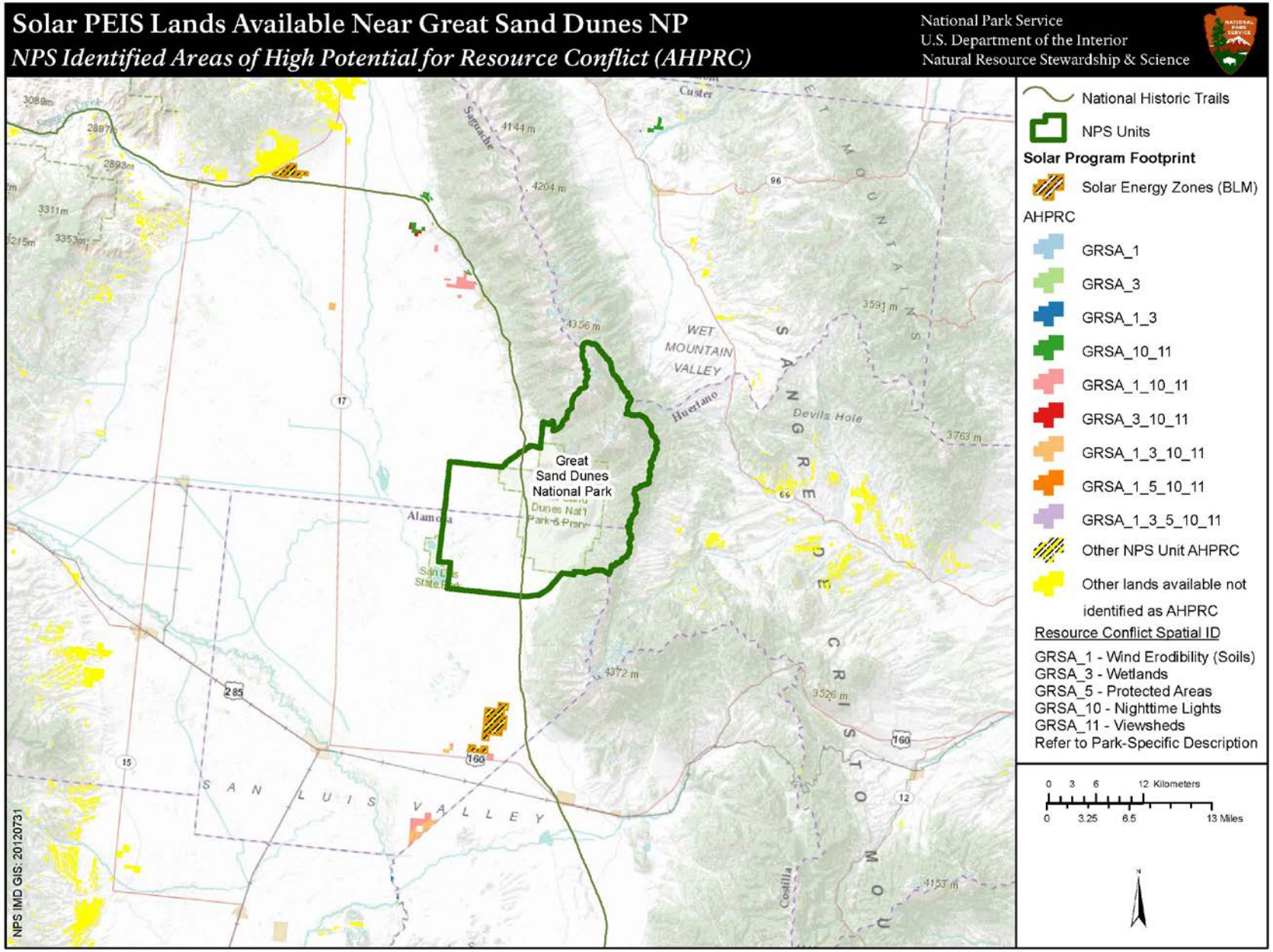
		Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewshed	**GRBA_11**	The park is one of the few places in the world where the visitor can experience the solitude and reverence of ancient bristlecone pine forests at high altitude, set against a seemingly boundless landscape of pristine valleys and lofty mountain ranges. It is one of the few places where a camera can capture images of the scope and scale of that experience. Lands available for solar energy development occur on the scenic landscapes surrounding the park. The park is concerned solar energy development located in line of sight from key observation points in the park, could disturb the scenic vistas integral to the park visitor experience in the area of analysis, and specifically at locations within foreground and middle visual zones. The park cannot preserve that visitor experience unless the high scenic quality lands are protected. The park identifies AHPRC to protect visual resources. Additional Resource Conflict Concerns Visual Resources. Public Law 99-565 established Great Basin National Park "…to preserve for the benefit and inspiration of the people a representative segment of the Great Basin of the United States possessing outstanding resources and significant geologic and scenic values…." An excerpt from the park's General Management Plan describing the importance of its scenic resources states, "The views across Snake Valley and Spring Valley as visitors approach the park and from various locations within the park greatly enhance experiences and are a significant park resource. Although these valleys are not within the park boundary, they are critical in conveying the theme of the 'Great Basin physiographic region' to visitors. Without the contrasting valley basins, the mountainous lands inside the park can illustrate only a portion of that theme. The loss or visual impairment as a result of major industrial, commercial, or military activity would alter the pastoral scene that adds a critical dimension to the national park." Two additional excerpts from the Summary chapter of the GMP state, "Resources of particular concern include …air quality and the vistas across the two broad valley basins to the east and west…" and "To preserve the significant views of the Snake Valley and Spring Valley basins, which are an integral part of the Great Basin experience, the Park would review, evaluate, and make recommendations to local governments concerning all proposals for major developments or activities that might affect the visual integrity of the valleys." (Final General Management Plan, Development Concept Plans, Environmental Impact Statement, Great Basin National Park, Nevada; ROD published March 2, 1993.) Specifically noted in the second paragraph of the Summary chapter for the General Management Plan is "… preservation of important scenic, natural, geologic, and cultural resource values (including the viewsheds from Wheeler Peak,

		bristlcone pine forests, Wheeler Peak cirque, and the Osceola Ditch).” Because of its extensive high relief centered on the Southern Snake Range, it is difficult to avoid substantial impacts to the park’s scenic values when developments are sited in the adjacent valleys. The adjacent valley approaches themselves are considered to be components of the visitor experience. Additionally, large areas of the surrounding valleys are visible from the peak of Mt. Wheeler, the prime viewing point within the park. A hiking trail to the peak accommodates approximately 1,200 visitors per year that manage to make the strenuous hike to the top to experience the relatively unspoiled beauty of the surrounding Great Basin. The park viewshed analysis map (Key Observation Points-12/5/11) shows that large portions of the lands available for solar energy development in the valleys adjacent to the park are visible from 13% - 55% of the selected KOPs. The KOPs were chosen based on significant points of interest including visitor center, scenic pullouts on the Wheeler Peak Scenic Drive, peak elevations at or near hiking trails or bristlecone pine groves, within bristlecone pine groves, park campgrounds, and points along the Osceola Ditch. Citing the BLM Manual H-8410-1, Visual Resource Inventory, Sec. I.B. (General Guidance): “Sensitive areas such as those near major highways or communities or adjacent to national parks should be given special treatment.” Also refer to H-8410-1, sec. III. A. (Sensitivity Level Analysis). The park has determined that the areas surrounding GRBA rank high for sensitivity level factors 1-4. Factor 5 is also applicable when consideration of the Highland Ridge Wilderness abutting the southern boundary of the park is included. Protected areas. Three protected areas in Spring Valley - Swamp Cedar Natural Area, Pygmy Sage Natural Area, and Shoshone Ponds Natural Area - are dependent on groundwater discharge. These areas provide water and forage, and are central to the integrity of the landscape. Species of Special Management Concern are dependent on these resources to support migration from/ to the park. Wildlife migration, including seasonal movement, is critical for maintaining population numbers and genetic diversity in the populations. Lands available for solar energy development in the area of analysis occur near these protected areas. In addition, lands available for solar energy development are located within the gross boundary of the Highland Ridge Wilderness within in “cherry-stemmed” areas of the wilderness. The park is concerned about the effects of groundwater extraction to support solar energy facilities, and the potential to adversely affect the protected areas, including wilderness values and wildlife migration. Cumulative Development Effects. The projects identified below are located in the vicinity of the park and need to be considered when analyzing the cumulative effects of proposed solar energy projects. Spring Valley Wind Project - The 150 MW wind farm is under construction on 7,673 acres of

		BLM lands in north Spring Valley, five miles east of GRBA. The project will consist of 75 wind turbines, 27 miles of roads, an electrical substation, and utilize an existing 230 kilovolt (kV) transmission line for distribution. Park comments provided to the BLM for the EA and FONSI included viewshed, night sky, cultural resources, biological resources, and cumulative impacts. Wilson Creek Wind Project- Potential 31,000-acre project on BLM lands located about 22 miles south of GRBA and consisting of up to 350 wind turbines and 990 MW of power. Project scoping report completed and draft EIS is being prepared. Potential park issues include viewshed, night sky, and cumulative impacts. Hamblin Valley Wind Project - Potential 43,812-acre project area would be located about 10 miles south east of GRBA and is administered by the BLM Fillmore Field Office (17,939 acres), in Utah, and BLM Schell Field Office (25,873 acres), in Nevada. This project is in the planning stage; BLM has issued ROWs for the met towers. Potential park issues include viewshed, night sky, biological resources, and cumulative impacts. Clark, Lincoln and White Pine Counties Groundwater Development Project – Includes 306 miles of a buried water pipeline; 323 miles of 230 kilovolt (kV), 69 kV and 25 kV overhead power lines; seven electrical substations; three pressure reducing facilities; five pumping stations; six regulating tanks; a 40 million-gallon-per-day buried storage reservoir; and a 165 million-gallon-per-day water treatment facility. Extensive ROWs in both Spring and Snake Valleys surrounding the park for development and significant acreage impacted by water table drawdown. NPS comments on the DEIS address concerns for air quality, water resources (quantity and quality), soils, wildlife (aquatics, plants, migratory species), land uses, recreation, rangeland, special designations, Native American traditional values, and socioeconomics. TransWest Express Transmission Line Project – 700 mile long, 600 KV line through WY, UT, CO, and NV. One alternative alignment would be 10 miles south of the park. Scoping report completed and DEIS is being prepared. Potential park issues include viewshed, night sky, biological resources, and cumulative impacts. Nevada Oil and Gas Developments – The September 2011 Ely District Oil and Gas lease sale EA identified three parcels in Spring Valley. The largest, 30,538 acres, is located less than two miles from the park's western edge. Potential park issues include viewshed, air quality, wildlife, vegetation, and cumulative impacts. Utah Oil and Gas Developments – In 2009, the Fillmore District BLM office had proposed leasing multiple parcels on the Utah side of Snake Valley within six miles of the park. Leases were subsequently withdrawn until the district RMP has been updated, which is in progress. Potential park issues include viewshed, air quality, and cumulative impacts.

Great Sand Dunes National Park

GRSA AHPRC Locations



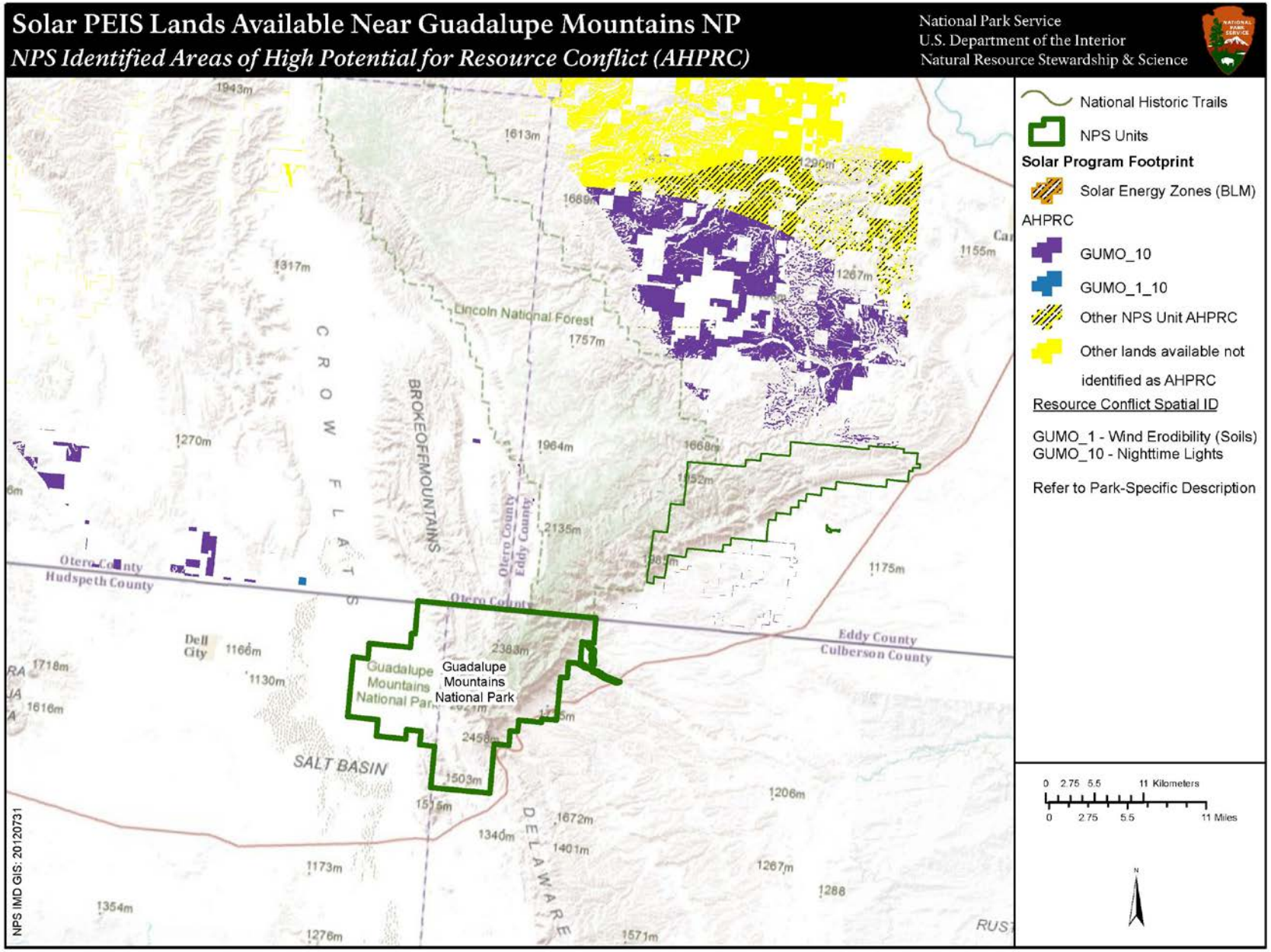
GRSA AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**GRSA_1**	Soils with high wind erosion potential exist around much of the park. Lands available for solar energy development north and south of the park occur in areas where soils are classified in Wind Erodibility 1 and are susceptible to wind erosion. The park is a Class 1 air quality area which is afforded the highest protection under the Clean Air Act. Existing air quality conditions in the park include: reduced visibility due to human-caused haze and fine particulates; reduced average natural visibility (from about 170 miles to about 100 miles); and reduced visibility (less than 65 miles) on high pollution days. The disturbance of these soils associated with construction and post-construction, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. The park is concerned that these disturbances could increase dust emissions and adversely affect air quality and visibility and cause violation of the National Ambient Air Quality Standards (NAAQS). The park identifies AHPRC to protect air quality. Reference: Air Quality in National Parks 2008 Annual Performance & Progress Report Natural Resource Report NPS/NRPC/ARD/NRR—2009/151
Wetlands	**GRSA_3**	Lands available for solar energy development south of the park occur in areas identified as wetlands. The large, interconnected system of wetlands in the San Luis Valley is an important resource. The park is concerned that development near wetlands could affect connectivity of habitats within the park. The park identifies AHPRC to protect connected habitats associated with wetlands.
Protected Areas	**GRSA_5**	Lands available for solar energy development south of the park are located near two wilderness areas. The park identifies AHPRC to protect connected habitats in specially-designated areas.
Nighttime Lights	**GRSA_10**	Lands available for solar energy development, including the Fourmile East SEZ, occur in areas having dark nighttime lights. There is increasing research showing dark sky importance to ecosystem function, and demonstrating the multiple adverse impacts of light pollution to community ecology (see Reference). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. The park is concerned about the effects of solar energy development on the park's dark night sky. Although potential night sky impacts could be reduced significantly by appropriately designed site lighting for facility operations and security,

		the park is concerned about the effects of cumulative increase in nighttime lights on the park's dark night sky resource. The park identifies AHPRC to protect dark night sky. Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewshed	**GRSA_11**	The scenic vistas from the park are considered unique due to the presence of the sand sheet and dune field. Lands available for solar energy development in light of sight of key observation points could diminish these important landscape vistas. The park is concerned about the development of solar energy facilities in areas having mostly agricultural and natural, undisturbed vistas and effects of a landscape change on the park visitor experience. Key scenic vistas are identified in the park's General Management Plan (Pg. 27). Lands located north and south of the park are in line of sight with key observation points, including the park dune field and along the main park access road. The park identifies AHPRC to protect visual resources.

Guadalupe Mountains National Park

GUMO AHPRC Locations



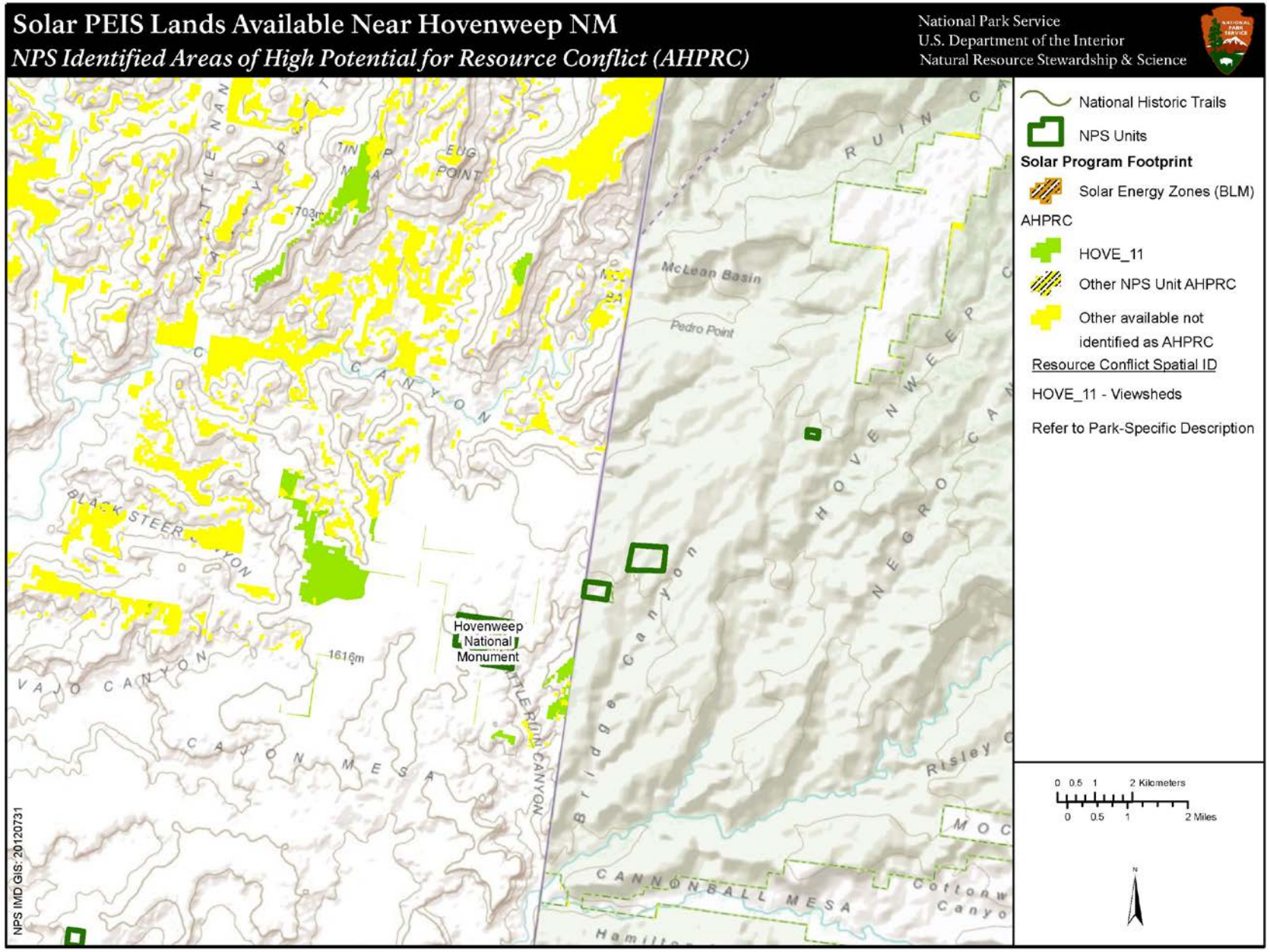
GUMO AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**GUMO_1**	Lands available for solar energy development located northwest of the park (Crow Flats) occur where soils are classified in Wind Erodibility Group 1 and have a high potential for dust generation. The park is a Class 1 air quality area which is afforded the highest protection under the Clean Air Act. While aeolian processes are a natural condition, an excess of fugitive dust can exacerbate health problems for humans and wildlife, reduce visibility, and reduce the enjoyment of park visitors. Construction and post-construction activities, service road maintenance and use, loss of vegetation, and disturbance of soil crusts caused by development on these soils could generate significant dust emissions. Although recent trend analysis of visibility at the park reveals the visibility condition is stable, the park is concerned that solar energy development could generate excess dust and impact that park's air quality, vegetation, and sensitive habitats. A recent fugitive dust event occurred as a result of high traffic volume on roads in the Crow Flat area during the 2010 Cutoff Fire. The park identifies AHPRC to protect air quality. References: Air Quality in National Parks 2008 Annual Performance & Progress Report Natural Resource Report NPS/NRPC/ARD/NRR—2009/151 Additional Resource Conflict Concerns Guadalupe Mountains National Park was designated a Class 1 air quality area by the 1977 amendments to the Clean Air Act (Public Law 95 – 217). The Class 1 air quality area designation requires the preservation of existing air quality, and is intended to protect areas of unique scenic value. Under the terms of the Clean Air Act, the wilderness portion of Guadalupe Mountains National Park is designated Class 1. The 1977 amendments require that state implementation plans protect visibility in a 100 km (62 mile) region around Class 1 areas.
Nighttime Lights	**GUMO_10**	The existing dark night sky is a significant natural resource in the Guadalupe Mountains Wilderness. Few NPS units or locations in the west rival the park's nighttime viewing opportunity. Lands available for solar energy development north and northwest of the park are located in areas of dark night sky. Lands available for solar energy in the area of analysis for dark night sky at Carlsbad Caverns NP are also within the park's area of analysis for dark night sky. The park is concerned that development of solar energy facilities on these lands could affect the park's dark night sky. The park identifies AHPRC to protect dark night sky.

		Additional Resource Conflict Comments Dark Night Sky. Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93 Wetlands. The park is concerned about disturbances to seeps, springs, and wetlands in the vicinity of the park due to water development. There are limited water resources available in the region for wildlife to use. The development of water for solar energy facilities in the area of analysis could affect the availability and use of water for park resources.

Hovenweep National Monument

HOVE AHPRC Locations

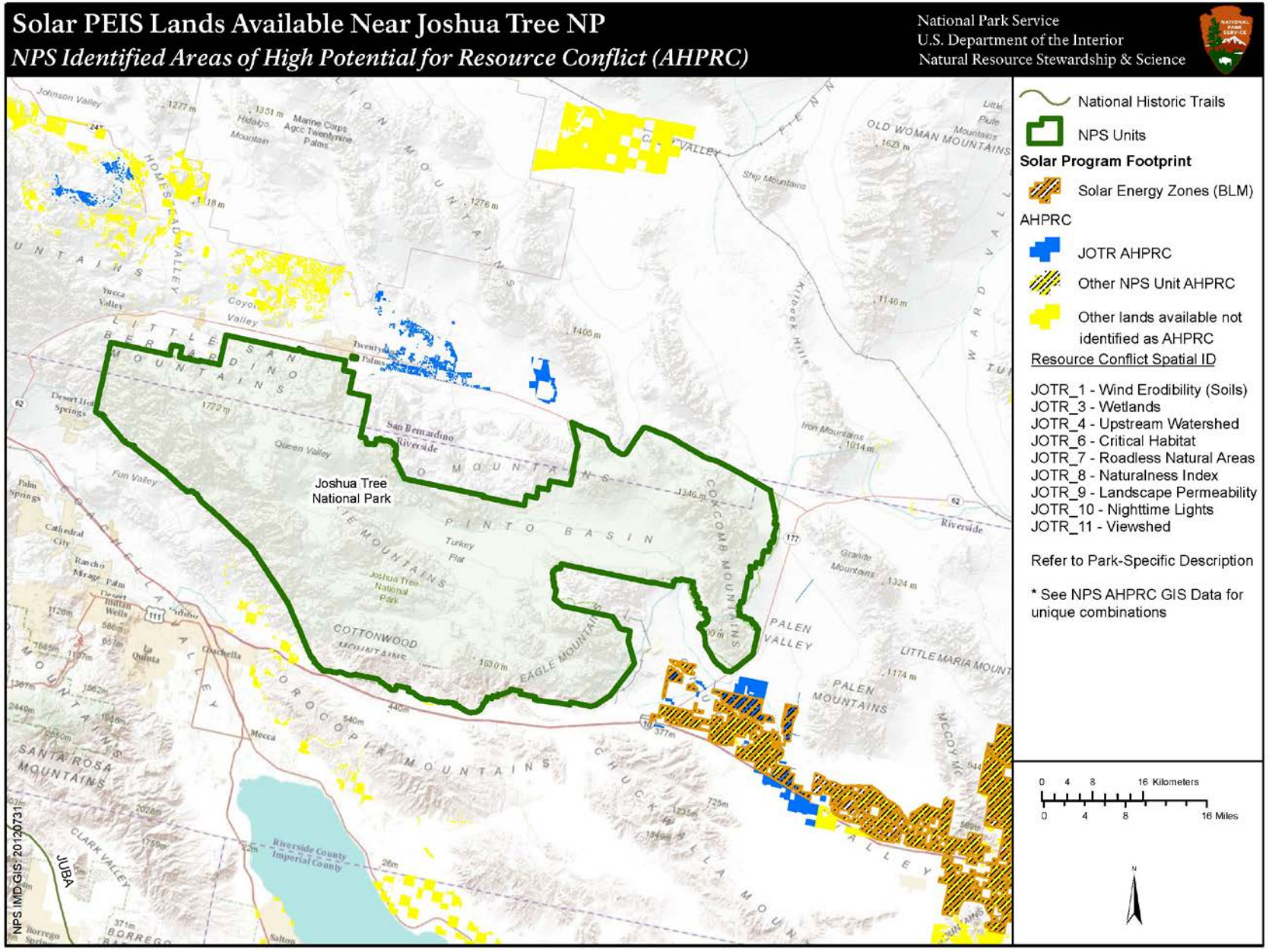


HOVE AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Viewsheds	**HOVE_11**	Lands available for solar energy development coincide with BLM-classified Visual Resource Managmenet (VRM) Class IV areas. These areas are within the park's viewshed, and are an important element of the scenic and dark night sky resources. These VRM Class IV areas in the vicinity of the park may be misclassified. The park is concerned that solar energy development could adversely affect the scenic landscapes, dark night sky, natural soundscapes and wildlife. The park identifies AHPRC to protect visual resources, natural sounds and wildlife. [See additional HOVE_IMR_Analysis.gdb and HOVE_VRM_Viewshed_11Dec11.pptx files in the HOVE folder in the park specific zip file download].

Joshua Tree National Monument

JOTR AHPRC Locations



JOTR AHPRC Descriptions

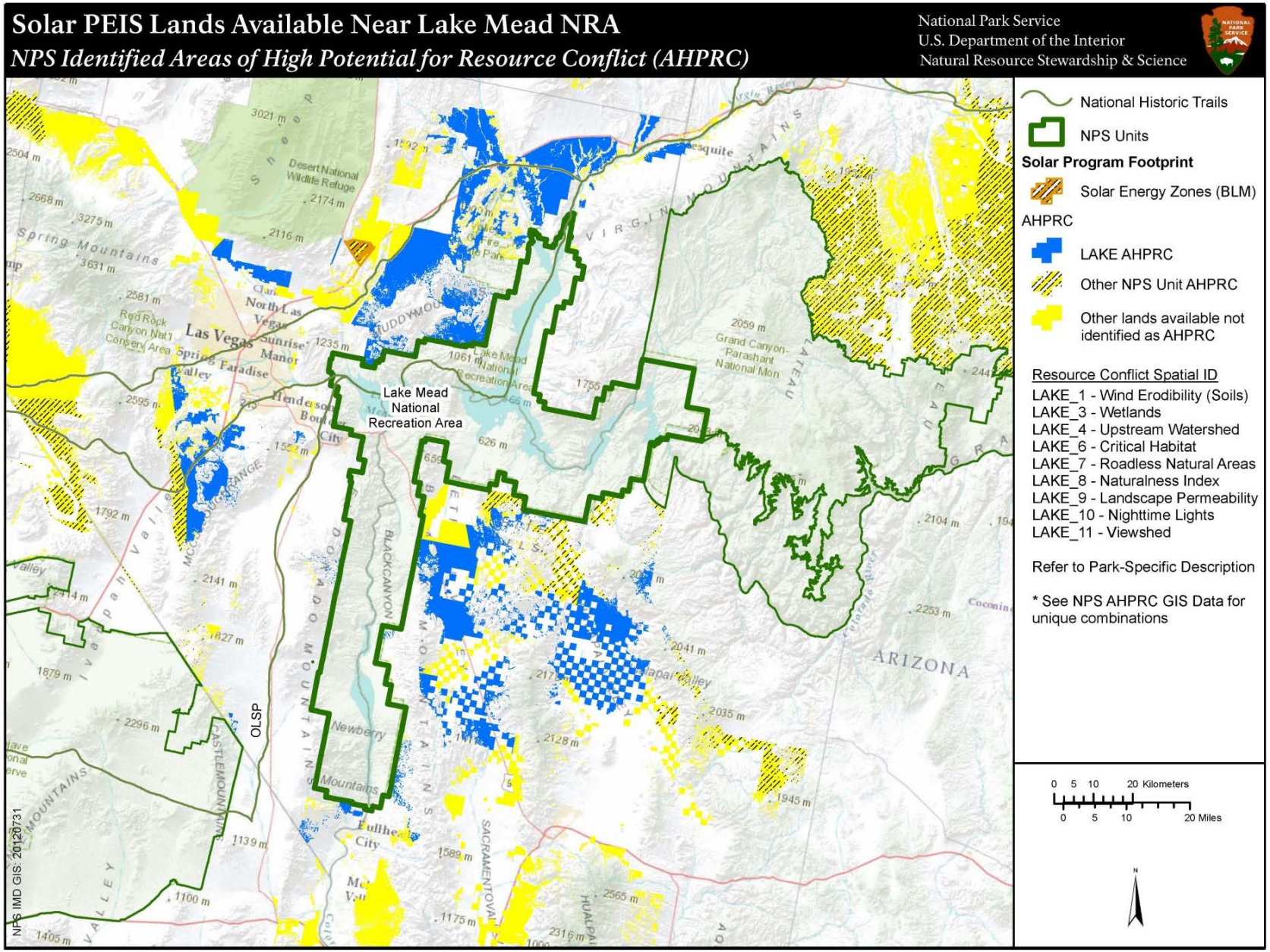
Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**JOTR_1**	Soils with high wind erosion potential exist around much of the park. Dust is the number one source of PM-10 (particulate matter 10 microns or smaller) air pollution in the Mojave Desert. The park is a Class 1 air quality area which is afforded the highest protection under the Clean Air Act. Lands available for solar energy development are located northwest, north, and southeast of the park are in areas where soils are classified in Wind Erodibility Groups 1 and 2. Construction and post-construction activities, service road maintenance and use, and loss of vegetation and disturbance of soil crusts soils in these areas could produce significant quantities of fugitive dust. The park is concerned that these disturbances could increase dust emissions and adversely affect air quality and visibility, cause violation of the National Ambient Air Quality Standards (NAAQS), and disrupt sensitive desert ecosystems. The park is concerned that soil disturbances due to the construction and operation of solar energy facilities could degrade air quality in the park. The park identifies AHPRC to protect air quality and desert ecosystems. References: Air Quality in National Parks 2008 Annual Performance & Progress Report Natural Resource Report NPS/NRPC/ARD/NRR—2009/151 Additional Resource Conflict Concerns The combination of north-south trending mountain ranges and prevailing desert winds produce corridors of unique desert ecosystems in the park and surrounding areas. The winds and the habitats created by blowing sands are integral to these ecosystems. Existing land developments to the south and southwest of the park, including mountain areas, disrupt these systems.
Wetlands and Upstream Watersheds	**JOTR_3** **JOTR_4**	In an environment where water is scarce, the presence of springs, palm oases, and wetlands is critical for species relying on these sites. Wetlands contain species that are uniquely adapted to the harsh desert environment. The park is concerned about the loss of water availability, habitat connectivity and availability of these sites. The park identifies AHPRC to protect water resources, wetlands and upstream watersheds.
Critical Habitat	**JOTR_6**	Lands available for solar energy development occur near critical habitats and in corridors connecting these habitats. Habitat connectivity and wildlife migration corridors are important landscape features for maintaining viable populations of protected species in the park. The park is concerned that solar energy development could adversely affect existing wildlife connectivity

		areas and protection of species. The park identifies AHPRC to protect desert tortoise connectivity areas consistent with designations of priority connectivity areas by the USFWS.
Roadless Areas, Naturalness and Landscape Permeability	**JOTR_7 JOTR_8 JOTR_9**	Lands available for solar energy development occur in areas having high roadless, naturalness, and landscape permeability values. The park is concerned that lands available for solar energy development in and adjacent to the western portion of the Riverside East SEZ could fragment roadless natural areas and moderately permeable landscapes, including important habitat along the base of the Palen Mountains. To avoid fragmentation of habitats and protect landscape integrity, the park identifies AHPRC within and adjacent to the SEZ.
Nighttime Lights	**JOTR_10**	The extraordinarily dark sky near the park is a value which draws many park visitors. From the 2010 Joshua Tree National Park Visitor Study, 65% of the park visitors identified "Dark, starry night skies" as an important resource to protect. Nighttime light conditions were inventoried using satellite imagery. Important light sources (i.e. campgrounds, high use locations) and dark sky locations were identified. Nighttime light sources were identified to the west and southeast of the park. The identified high darkness locations, within the surrounding higher light pollution locations to the west and southeast of the park indicate the special value of these high darkness patches to the park's night sky landscape. The dark sky landscape coincides with roadless and areas of high naturalness value. The park is concerned about the potential increase of nighttime lights resulting from construction, operation and additional secondary light pollution associated with solar facilities on lands available for solar energy development. The park identifies AHPRC to protect dark night sky. Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References:

		Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewsheds	**JOTR_11**	In the 2010 Joshua Tree National Park Visitor Study, 90% of the park visitors surveyed identified "Views without Development" as the leading park resource to be protected. Lands available for solar energy development, including lands within and adjacent to the Riverside East SEZ, occur with park viewsheds where there are largely undeveloped vistas to the north, east, and southeast of the park. The park is concerned that solar energy development that are in lines of sight from several key observation points in the eastern third of the park could diminish important vistas. The park identifies AHPRC to protect visual resources. Additional Resource Conflict Concerns In addition to viewsheds, the park identifies wilderness, dark night sky, connected habitats, sand transport processes, and water quantity as resources potentially at risk from the influence of external development. The park is concerned about the protection of natural soundscapes, and overall visitor experiences.

Lake Mead National Recreation Area

LAKE AHPRC Locations



LAKE AHPRC Descriptions

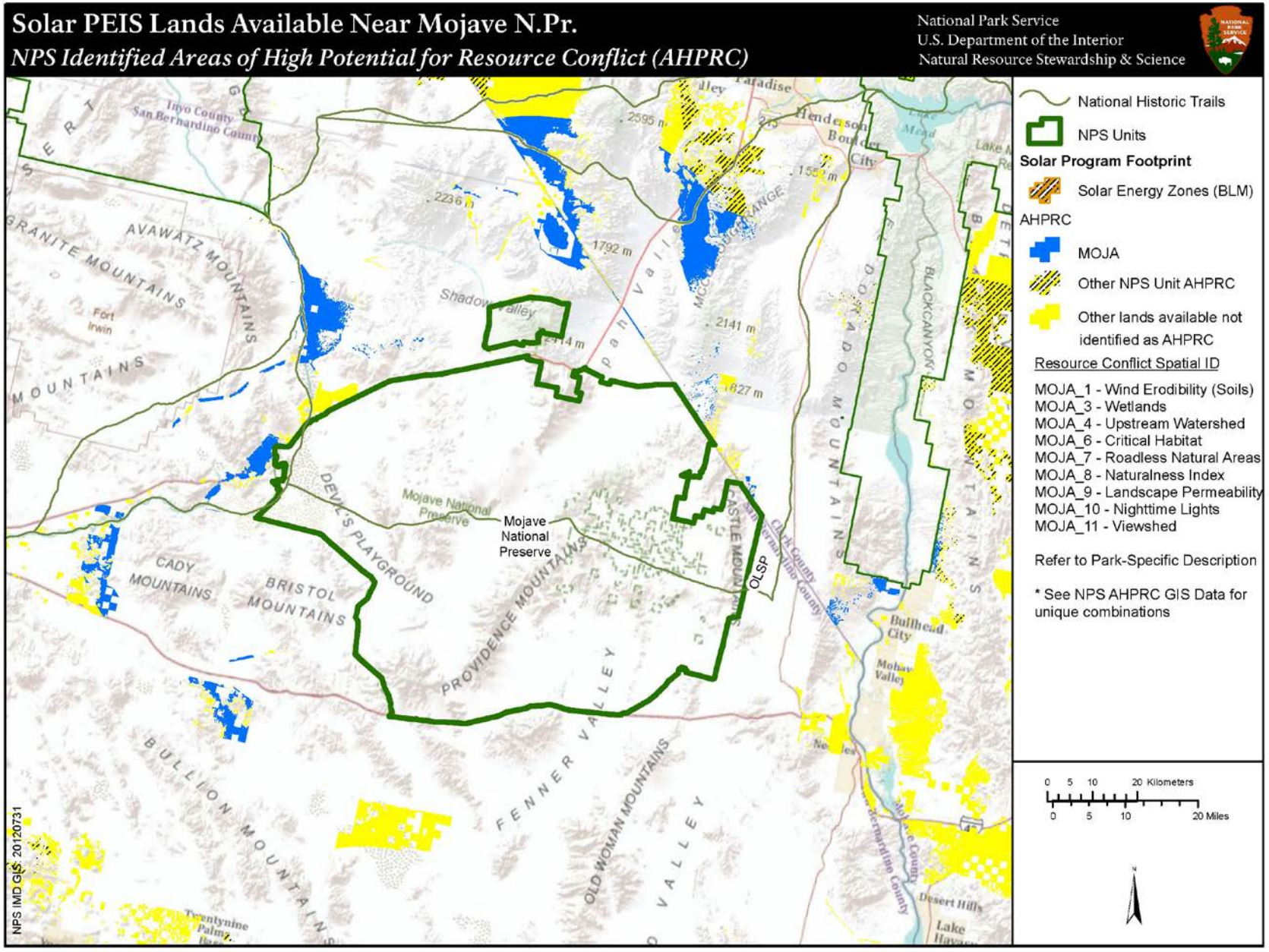
Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind and Water Erodibility	**LAKE_1**	Dust is the number one source of PM-10 (particulate matter 10 microns or smaller) air pollution in the Mojave Desert. Lands available for solar energy development occur in areas around much of the park where soils have high wind erosion potential. Construction and post-construction activities, service road maintenance and use, loss of vegetation, and disturbance of soil crusts caused by development on soils classified in Wind Erodibility Groups 1 and 2 could generate significant dust emissions. The park is concerned that increased particulate loads could degrade air quality and visibility in the park and surrounding areas. The park identifies AHPRC to protect air quality and visual resources.
Critical Habitat	**LAKE_6**	Lands available for solar energy development occur near critical habitats and in corridors connecting these habitats that are important for protecting the viability of the park's wildlife, including desert tortoise and bighorn sheep. Habitat connectivity and wildlife migration corridors are important landscape features for maintaining viable populations of protected species in the park. The park is concerned that existing wildlife connectivity areas in the area of analysis are protected. The park identifies AHPRC to protect desert tortoise connectivity areas consistent with designations of priority connectivity areas by the USFWS. Additional Resource Conflict Concerns On the Arizona side of the park, there is a significant "checker-board" of land ownership. However, there are some areas of consolidated federal ownership along the eastern side of Lake Mohave in the Black Mountains. The Black Mountains support the largest desert bighorn sheep population in the U.S. and the responsibility for managing this bighorn sheep habitat is shared between the NPS and BLM. The park recently partnered with the Federal Highway Administration, Arizona Department of Transportation, and Arizona Department of Game and Fish to build bighorn sheep overpasses on U.S. Highway 93. These crossings came at a cost of approximately $5 million and were funded by the Federal Highway Administration. The NPS and BLM are actively working to maintain the integrity of this bighorn sheep population. The development of solar energy near this important resource could undermine these efforts. To protect the park's wildlife habitat including these important linkages, the park identifies AHPRC in the Black Mountains area.
Wetlands, Upstream Watershed,	**LAKE_3 LAKE_4 LAKE_7**	Wetlands and Upstream Watersheds. In an environment where water is scarce, the presence of springs, palm oases, and wetlands is critical for species relying on these sites. Wetlands contain species that are uniquely adapted to the harsh desert environment. Lands available for solar

Roadless Areas, Naturalness Land and Landscape Permeability	**LAKE_8** **LAKE_9**	energy development occur in upstream watersheds and/or are near wetlands. The park is concerned about the loss of habitat connectivity and availability of these sites. The park identifies AHPRC to protect wetlands, upstream watersheds, and water resources and ecological conditions. Roadless, Natural Areas and Landscape Permeability. Lands available for solar energy development surrounding the park have high roadless, naturalness, and landscape permeability values and represent intact landscapes of high integrity. The protection of intact landscapes and their inherent scenic values is a primary management goal of the park because these landscapes are important for maintaining biological (genetic) diversity of resident park wildlife populations. Increased land disturbance also promotes invasion of non-native and invasive plants, particularly along road corridors, and increased rates of erosion, sedimentation, and runoff. The park is concerned about the protection of intact landscapes and their inherent scenic, hydrologic, and ecological values from the effects of solar energy development. The park identifies AHPRC to protect landscape integrity, and visual and wildlife resources.
Nighttime Lights	**LAKE_10**	The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment. Dark night sky is an important element of the park's scenic qualities, as well. Lands available for solar energy development are located east, west, and north of the park in areas of dark night sky. The park is concerned that solar energy development could adversely affect the park's dark night sky. The park identifies AHPRC to protect dark night sky. Additional Resource Conflict Comments Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93

Viewsheds	**LAKE_11**	The park possesses high quality visual resources, including undisturbed open vistas. Lands available for solar energy development occur with a number of park viewsheds. Protecting the largely undeveloped views surrounding the park is critical to preserving the visitor experience. The park is concerned that solar energy facilities located in line of sight from key observation points within the park could adversely affect scenic landscapes. The park identifies AHPRC to protect visual resources. Additional Resource Conflict Concerns Special status areas exist along the majority of the lands surrounding the Nevada side of the park. The classification of these lands as right-of-way avoidance or non-development areas would protect over 90% of the park boundary in Nevada from cross-boundary development effects.

Mojave National Preserve

MOJA AHPRC Locations



MOJA AHPRC Descriptions

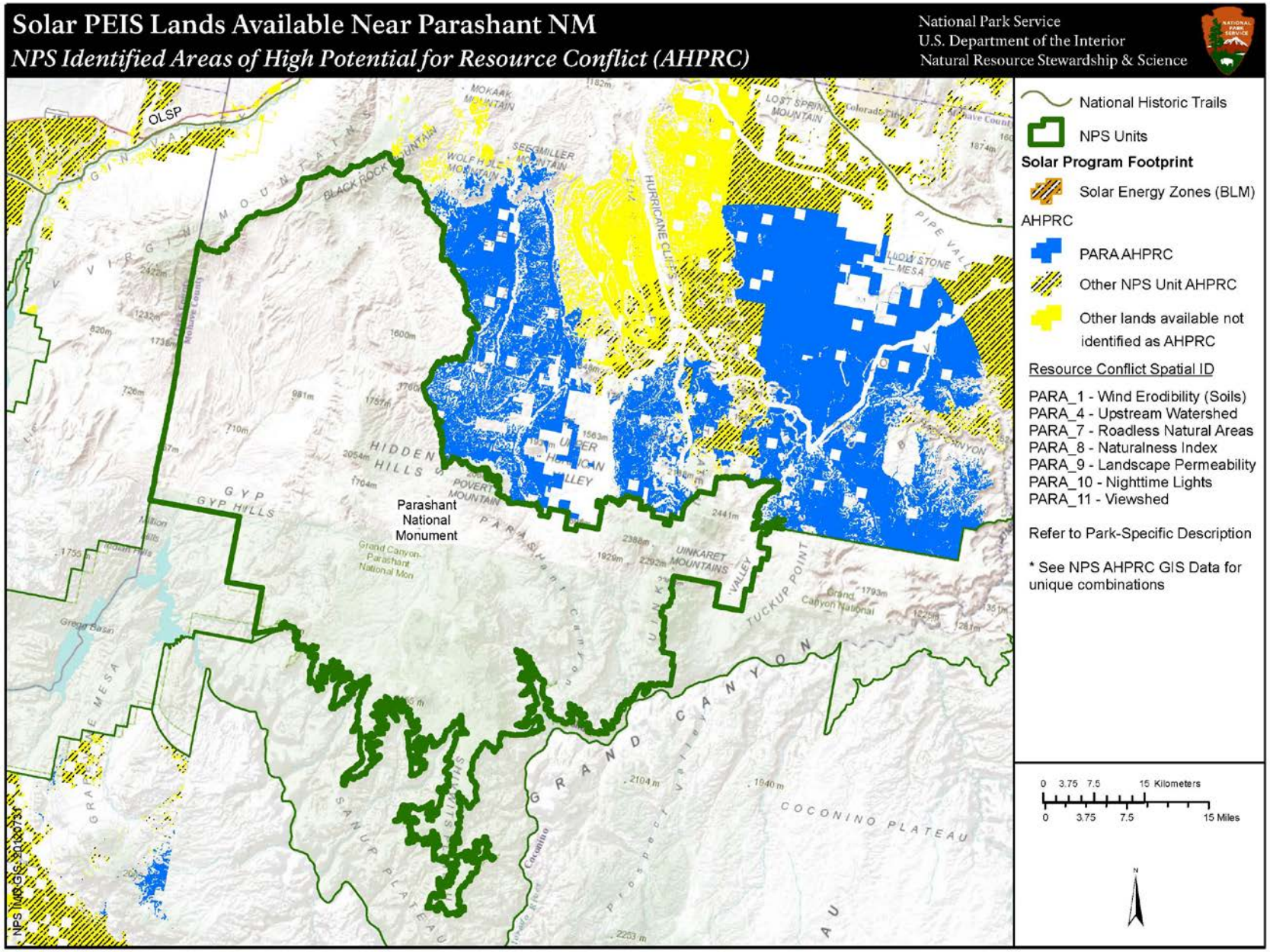
Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**MOJA_1**	Soils susceptible to wind erosion occur around much of the park. Dust is the number one source of PM-10 (particulate matter 10 microns or smaller) air pollution in the area surrounding the park. Lands available for solar energy development are located in areas where soils are classified in Wind Erodibility Groups 1 and 2. Solar energy development, including construction and post-construction activities, service road maintenance and use, and loss of vegetation and disturbance of soil crusts on could produce significant quantities of fugitive dust. The park is concerned that these disturbances could increase dust emissions and adversely affect air quality and visibility in the park. The park identifies AHPRC to protect air quality. Additional Resource Conflict Concerns Water erosion. The park also identifies AHPRC to protect resources from the effects of water erosion. This includes areas within a half mile of water erosion sensitive soils in the area of analysis to avoid introduction of sediment and contaminants into sensitive wetlands from runoff during construction and operations.
Wetlands and Upstream Watersheds	**MOJA_3** **MOJA_4**	In an environment where water is scarce, the presence of springs, palm oases, and wetlands is critical for species relying on these sites. Wetlands contain species that are uniquely adapted to the harsh desert environment. The park is concerned about the loss of habitat connectivity and availability of these sites. The park identifies AHPRC to protect water resources, wetlands and upstream watersheds.
Critical Habitat	**MOJA_6**	Lands available for solar energy development occur near critical habitats and in corridors connecting these habitats. Habitat connectivity and wildlife migration corridors are important landscape features for maintaining viable populations of protected species in the park. The USFWS designated desert tortoise connectivity areas as Priority 1 in the Ivanpah Valley, and other lands available for solar energy development near the park. The park is concerned that existing wildlife connectivity areas in the area of analysis are protected. The park identifies AHPRC to protect desert tortoise connectivity areas consistent with the areas designated by the USFWS.
Roadless Areas, Naturalness Index and Landscape Permeability	**MOJA_7** **MOJA_8** **MOJA_9**	Lands available for solar energy development surrounding the park possess a high naturalness value. Some lands are located within roadless areas and/or possess moderate to high landscape permeability values. These resource conditions are representative of intact landscapes. The protection of intact landscapes and their inherent scenic values is a primary management goal of the park because these landscapes are important for maintaining biological (genetic) diversity of resident park wildlife populations. Increased land disturbance also promotes invasion of non-

		native and invasive plants, particularly along road corridors. The park is concerned about the protection of intact landscapes and identifies AHPRC to protect biological diversity, naturalness and roadless values, and landscape integrity.
Nighttime Lights	**MOJA_10**	As stated in the park's enabling legislation, the dark night sky is a resource to be preserved. Lands available for solar energy development in areas having dark night sky. These areas tend to be roadless and have a high naturalness value. There is increasing research showing dark sky importance to ecosystem function, and demonstrating the multiple adverse impacts of light pollution to community ecology (see Reference). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. The park identifies AHPRC to protect dark night sky and landscape integrity. Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewsheds	**MOJA_11**	The scenic vistas associated with the park are considered unique and are so identified in the California Desert Protection Act. Lands available for solar energy development occur within viewsheds that provide vast, undisturbed open vistas for visitors. The park is concerned that solar energy facilities located in light of sight of key observation points could diminish important park vistas. The park identifies AHPRC to protect visual resources.

		Additional Resource Conflict Concerns The park is also concerned about impacts to birds, including raptors and song birds, and bats. Significant direct and indirect loss of plant and wildlife habitat due to construction of towers (for solar facilities and transmission lines), roads, buried lines and ancillary facilities may be expected. A complete ecological inventory could be required to identify species potentially affected during all seasons, including but not limited to locally unique species, rare natural communities, wetlands, threatened and endangered species and state sensitive species or species of special concern. Coordination with the NPS will be required to ensure inventory and mitigation measures are appropriate and necessary.

Parashant National Monument

PARA AHPRC Locations



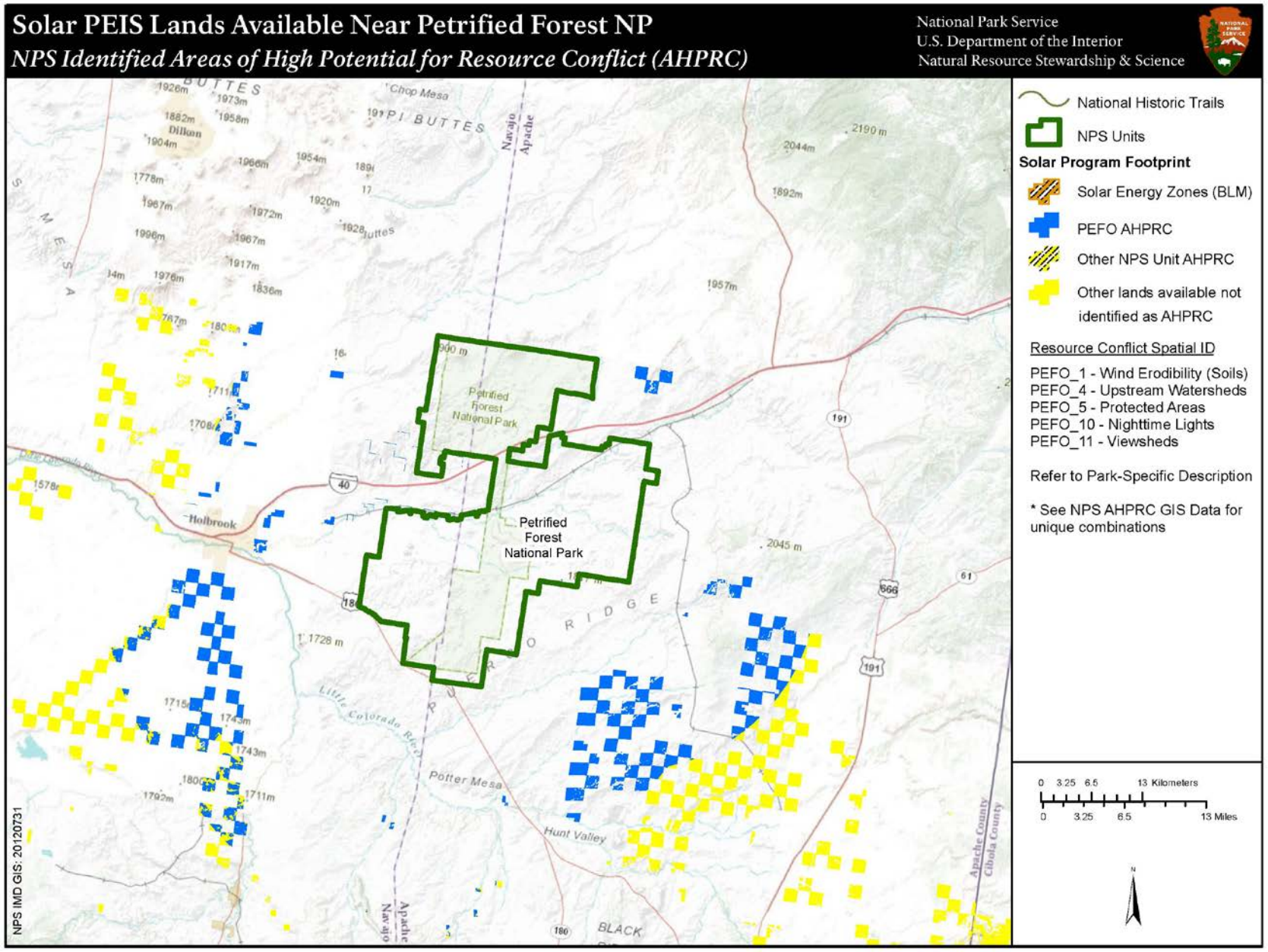
PARA AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**PARA_1**	Dust is the number one source of PM-10 (particulate matter 10 microns or smaller) air pollution in the area surrounding the park. Soils with high wind erosion potential exist around much of the park. Disturbance of soils classified in Wind Erodibility Groups 1 and 2 related to the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. The park is concerned with increased dust emissions that could adversely affect air quality and visibility in the park. The park identifies AHPRC to protect air quality.
Upstream Watersheds, Roadless Areas, Naturalness Index, and Land Permeability	**PARA_4** **PARA_7** **PARA_8** **PARA_9**	Lands available for solar energy development located northeast of the park lie in an upstream watershed. The development of solar energy facilities in this area has potential to disturb soils, and increase rates of erosion, sedimentation and runoff. These impacts may affect water quality and quantity in the park. Lands available for solar energy development surrounding the park possess a high naturalness value. Some lands are located within roadless areas and/or possess moderate to high landscape permeability values. These resource conditions represent an intact landscape. Preservation of intact landscapes and their inherent scenic values is a primary management goal of the park since these areas are critical to sustaining biological species diversity and genetic diversity of resident park wildlife populations. Increased land disturbance also promotes invasion of non-native and invasive plants, particularly along road corridors. The park identifies AHPRC to protect water resources and ecological conditions, roadless areas and landscape integrity.
Nighttime Lights	**PARA_10**	The park manages dark night sky as a natural resource. There is increasing research showing dark sky importance to ecosystem function, and demonstrating the multiple adverse impacts of light pollution to community ecology. Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. Lands available for solar energy development occur in areas east and north of the park having high quality dark night sky. The park is concerned that solar energy development in areas that are roadless and have a high natural value, could adversely affect the park's dark night sky. The park identifies AHPRC to protect dark night sky. References: National Park Service. 2006a. Night Sky Quality Monitoring Report, Parashant National

		Monument, Arizona, McDonald Flat, February 24, 2006. Available at: <http://nature.nps.gov/air/lightscapes/monitorData/para/mF20060224.cfm>. Accessed August 30, 2010 Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewsheds	**PARA_11**	The park is concerned about the protection of vast undisturbed open vistas of the surrounding landscapes to preserve the unique park visitor experience. Lands available for solar energy development in a line of sight from key observation points within the park are identified as AHPRC.

Petrified Forest National Park

PEFO AHPRC Locations



PEFO AHPRC Descriptions

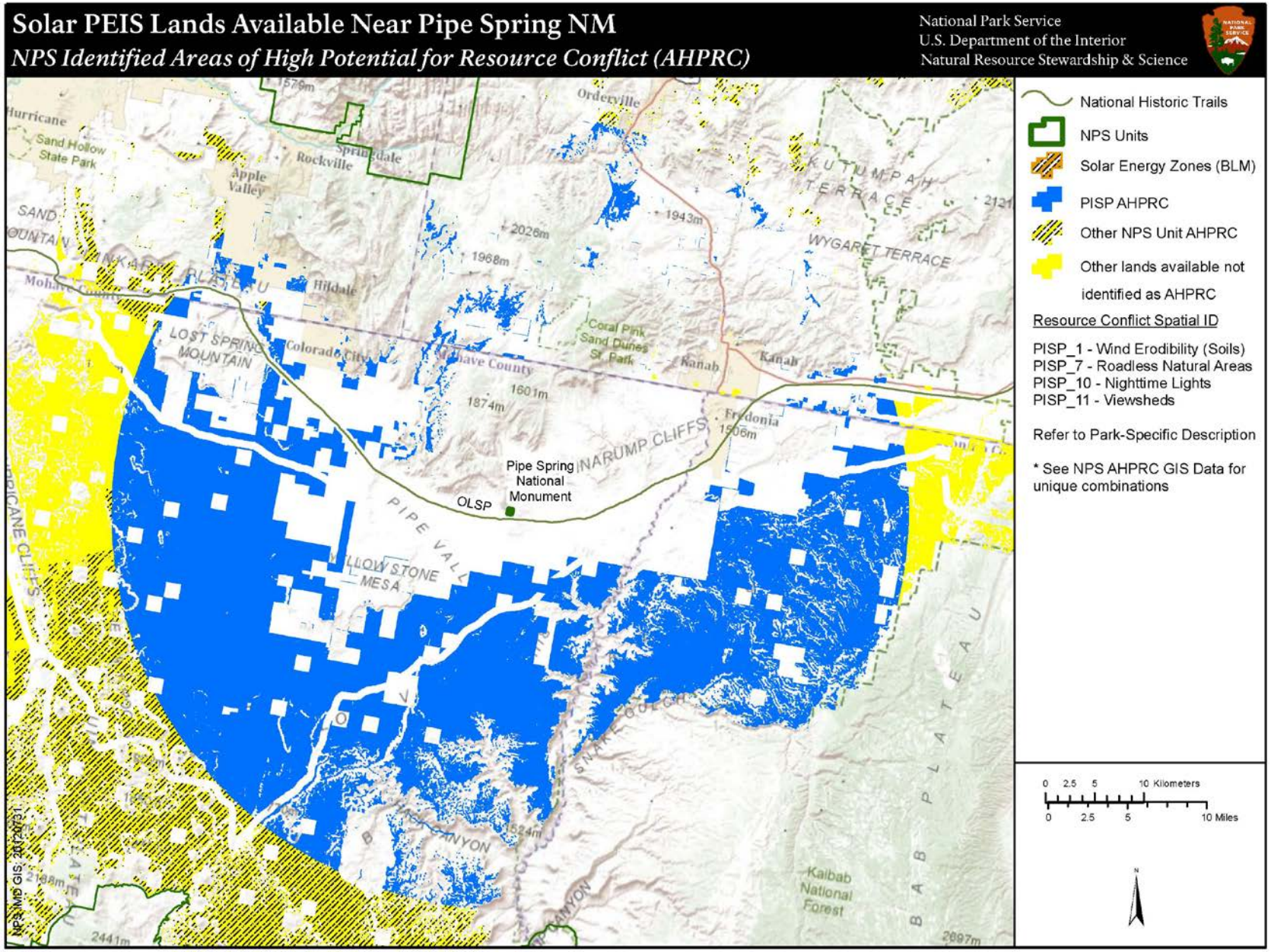
Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**PEFO_1**	Lands available for solar energy development in the area of analysis occur where soils are susceptible to wind erosion and are classified in Wind Erodibility Groups 1 and 2. Areas identified as susceptible to wind erosion are located southeast, southwest and west of the park. Prevailing winds carry soils and fine particulates into the park. Disturbance of these soils from the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. The park is a Class 1 air quality area under the Clean Air Act which is afforded the highest protection under the Clean Air Act. The park is concerned that increased particulate loads may degrade air quality (visibility) and visual resources, and increase soil deposition in and around petrified wood and vegetation. The park identifies AHPRC to protect air quality, and visual and petrified wood resources. References: Field, J. P., J. Belnap, D. D. Breshears, J. C. Neff, G. S. Okin, J. J. Whicker, T. H. Painter, S. Ravi, M. C. Reheis, and R. L. Reynolds. 2010. The ecology of dust. Frontiers in Ecology and the Environment 8:423–430. Neff, J. C., A. P. Ballantyne, G. L. Farmer, N. M. Mahowald, J. L. Conroy, C. C. Landry, J. T. Overpeck, T. H. Painter, C. R. Lawrence, and R. L. Reynolds. 2008. Increasing aeolian dust deposition in the western United States linked to human activity. Nature Geoscience 1:189-195 Okin, G. S., J. E. Bullard, R. L. Reynolds, J.-A. C. Ballantine, K. Schepanski, M. C. Todd, J. Belnap, M. C. Baddock, T. E. Gill, and M. E. Miller. 2011. Dust: Small-scale processes with global consequences. EOS, Transactions, American Geophysical Union 92 Air Quality in National Parks 2008 Annual Performance & Progress Report Natural Resource Report NPS/NRPC/ARD/NRR—2009/151
Upstream Watersheds	**PEFO_4**	Lands available for solar energy development located northeast of the park lie in an upstream watershed. The development of solar energy facilities in this area has potential to disturb soils, and increase rates of erosion, sedimentation and runoff. These impacts may affect water quality and quantity in the park. The park identifies AHPRC to protect water resources.
Protected Areas	**PEFO_5**	Lands available for solar energy development occur near designated wilderness. High profile structures associated with solar energy facilities, could adversely affect park viewsheds. Low-

		profile structures could produce glare visible from designated wilderness. Solar energy development on the visible landscape could diminish the "solitude" or "primitive recreation" opportunities for park visitors. The park is concerned about the following specific areas: three sections to the northeast of the park (T20N, R26E, sections 4,6,and 8); five full and three partial sections to the west (T19N, R23E, Sections 18,20, part of Section 22, parts of Sections 24, 28, and 30, and T19N, R22E, part of Section 22, all of Section 24, and part of Section 26); and portions of 7 sections to the south (T18N, R22E, parts of Sections 12,14,20, and 22, and T18N,R23E, parts of Sections 8, 10, and 12). The park identifies AHPRC to protect wilderness. [See PEFO_Wilderness.shp in the PEFO folder in the park specific zip file download].
Nighttime Lights	**PEFO_10**	The park manages dark night sky as a natural resource. Lands available for solar energy development located northeast, east, southeast, southwest and west of the park occur in areas that are mostly free of nighttime lights. The park is concerned that development of solar energy facilities on these lands could adversely affect the dark night sky and the night sky viewing experience for visitors. The park identifies AHPRC to protect dark night sky. Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology ((Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: “the most noticeable effects will occur in those areas where lights are close to natural habitats.” The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewshed	**PEFO_11**	Lands identified under Protected Areas are coincident with park viewsheds. The line of sight views identified from key observation points in the park include natural and historic landscapes to the north-northeast, south, southeast, and west. The park identifies AHPRC to protect natural and

		historic landscapes.

Pipe Springs National Monument

PISP AHPRC Locations



PISP AHPRC Descriptions

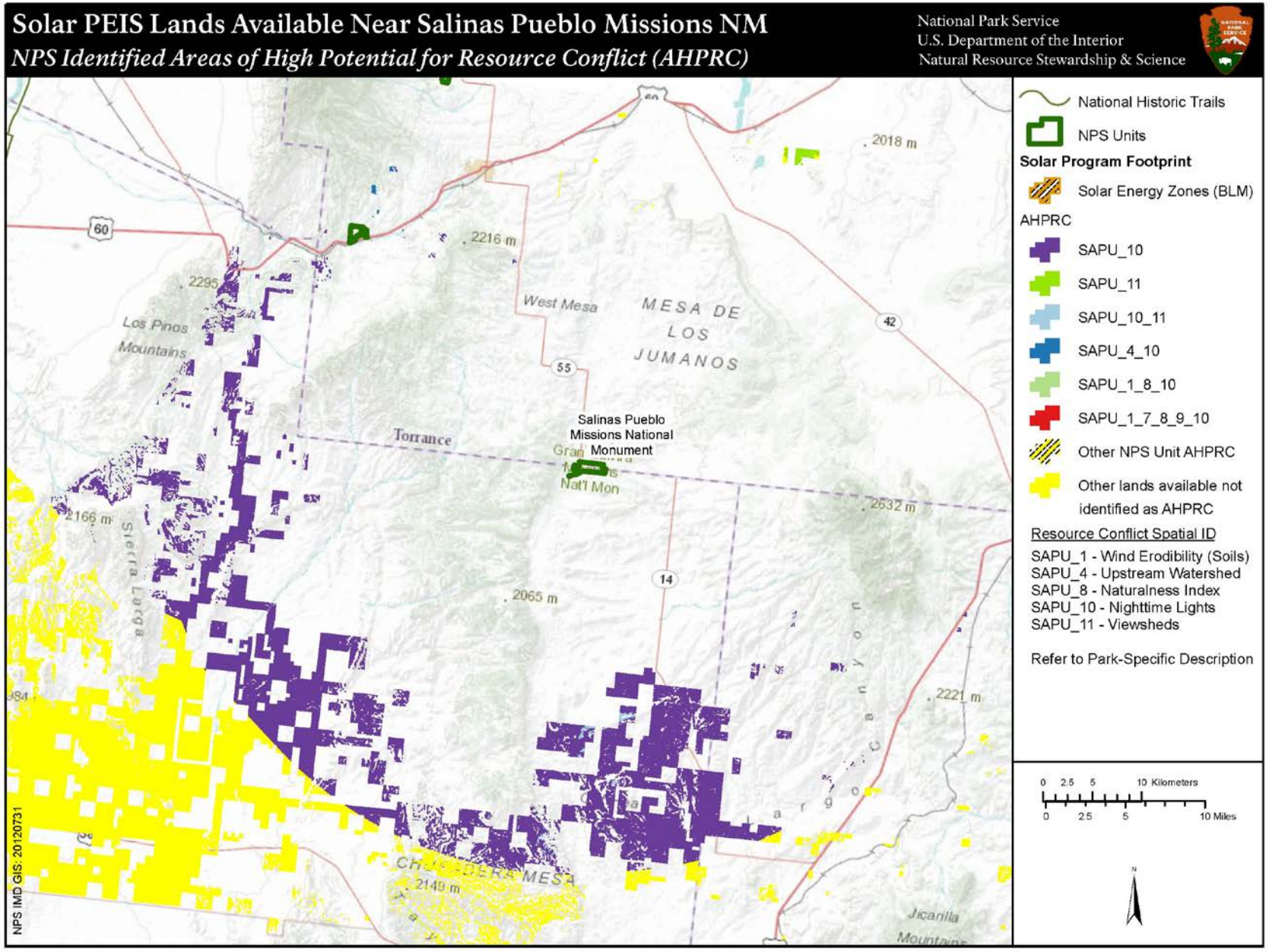
Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**PISP_1**	Lands available for solar energy development in the area of analysis occur where soils are susceptible to wind erosion and are classified in Wind Erodibility Groups 1 and 2. Areas identified as susceptible to wind erosion are located northwest, southwest, south and southeast of the park. Prevailing winds carry soils and fine particulates into the park. The park is concerned that disturbance of these wind erodible soils related to the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust and increase soil deposition in the park, particularly in and around historic ruins. The park identifies AHPRC to protect air quality and historic resources. References: Field, J. P., J. Belnap, D. D. Breshears, J. C. Neff, G. S. Okin, J. J. Whicker, T. H. Painter, S. Ravi, M. C. Reheis, and R. L. Reynolds. 2010. The ecology of dust. Frontiers in Ecology and the Environment 8:423–430 Neff, J. C., A. P. Ballantyne, G. L. Farmer, N. M. Mahowald, J. L. Conroy, C. C. Landry, J. T. Overpeck, T. H. Painter, C. R. Lawrence, and R. L. Reynolds. 2008. Increasing aeolian dust deposition in the western United States linked to human activity. Nature Geoscience 1:189-195 Okin, G. S., J. E. Bullard, R. L. Reynolds, J.-A. C. Ballantine, K. Schepanski, M. C. Todd, J. Belnap, M. C. Baddock, T. E. Gill, and M. E. Miller. 2011. Dust: Small-scale processes with global consequences. EOS, Transactions, American Geophysical Union 92:241-248
Roadless Areas	**PISP_7**	Lands available for solar energy development surrounding the park are in largely roadless areas. The park is concerned that land disturbance associated with solar energy development could diminish intact natural landscapes, increase rates of erosion and establishment of non-native plants. The park identifies AHPRC to protect roadless areas and landscape integrity.
Nighttime Lights	**PISP_10**	The dark night sky is a natural resource the park is trying to preserve. Nighttime operations and security lights on energy installations could diminish dark night sky and scenic values. The park is concerned that solar energy development on lands to the north, east, south, and west in the area of analysis could adversely affect this resource. The park identifies AHPRC to protect dark night sky. Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple

		adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewsheds	**PISP_11**	Lands available for solar energy development, located to the west, south and southeast of the park lie within park viewsheds that extend more than 50 miles. These views provide visitors an opportunity to experience the park's historic and scenic context. The park is concerned that solar energy development on lands within the line of sight of the key observation point could affect these historic and scenic landscapes. The park identifies AHRPC to protect visual resources. References: National Park Service. 1978. Pipe Spring National Monument Master Plan, p. B-1 ———. 1995. Statement for Management, p. 7 ———. 2000. Long Range Interpretive Plan, p. 5 ———. 2009. Physical Resource Information and Issues Overview Report, p.14 Additional Resource Conflict Concerns Various park planning and management documents, developed with public input, set forth goals for park visitor experience, education and enjoyment. A key document in the park's planning history, the Master Plan, issued in 1978, states the following as a management objective: "To cooperate with other governmental agencies, private organizations and interests, and members of the public to help ensure that regional land use changes, particularly energy development projects, do not result in impairment of the

		Monument's air quality, other components of the Monument's environment, or the experience of Monument visitors." (See Pipe Spring National Monument Master Plan (1978), p. B-1). The noted interests and efforts of the NPS in this regard include cooperation to protect the park's viewsheds. The park's Statement for Management – the park's most recent management planning document - states: "This setting on the Arizona Strip provides visitors with a sense of isolation and serenity due to the vast and spectacular expanse reminiscent of prehistoric and pioneer eras." (Statement for Management (1995), p. 7, and, Long Range Interpretive Plan (LRIP) (2000), p. 5. "Visitor Experience Goals" identified and listed in the LRIP include: "Experience the isolation and wide open spaces . . . Experience some of the many sensory elements of the site". (Id. at 9). The park report "Physical Resource Information and Issues Overview Report" (2009) states the following: "Air Resources and Visibility. The view from Pipe Spring is extraordinary, extending across the vast expanses of plateaus that extend south to Grand Canyon 35 miles away and a similar distance to the east where the Kaibab Plateau forms the horizon. The canyons of Kanab Creek are discernible to the south east. To the southwest the flattened volcanic dome of Mount Trumbull is clearly visible 40 miles away. Because the intervening ground is generally lower than Winsor Point almost all of this plateau country is visible from the Monument encompassing an estimated 300 square miles." Such a panoramic view is rare in the United States, and is particularly significant for three reasons: 1. Visitors can enjoy the esthetic beauty of this lonely landscape and appreciate the great distances to "nearby" communities, and other significant geographic locations. 2. It is clear that one of the attributes that attracted Native Americans and Mormon settlers to the location is the commanding view of the surrounding terrain and the security that is provided by the high ground, as well as long distance views of other historically important resource utilization locations. Conversely, the unfettered, distant views from other far-distant locations aided long distance travel to the site. 3. The exceptionally clear air that is normally present permits this view to be appreciated much as it was by the historic and pre-historic residents of Pipe Spring. (Physical Resource Information and Issues Overview Report (2009), p.14)

Salinas Pueblo Missions National Monument

SAPU AHPRC Locations



SAPU AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**SAPU_1**	Soils around Gran Quivira are classified Pirodel-Harvey-Pinon soils complex (aeolian with high wind-erodibility). Soils (primarily the Witt Series) around Abo and Quarai are generally less susceptible to wind erosion, but there is concern about increased soil disturbance from lands available for solar energy development. The park is concerned that disturbance of these soils on lands available for solar energy development in the area of analysis could generate increased deposits of particulates within the park. Increased deposition of windblown soils would adversely affect the visitor experience. The park identifies AHPRC to protect resources of the Gran Quivira unit from the effects of wind erosion. References: USDA. 1988. Soil Survey of Socorro County Area, New Mexico ———. 1970. Soil Survey Torrance Area, New Mexico National Park Service. 1997. Salinas Pueblo Missions National Monument Resources Management Plan ———. 1984. Land Protection Plan
Upstream Watershed	**SAPU_4**	Lands available for solar energy development are located in upstream watersheds. The development of solar energy facilities in this area could disturb soils, alter rates of erosion, sedimentation and runoff, and introduce invasive, non-native species in the park. The park is concerned that water resource development for solar energy could alter the quantity (runoff) and quality (sedimentation) of water resources and threaten native species occurring in the park. The area of specific concern is northeast of Abo. The park identifies AHPRC to protect resources of the Abo Unit. References: National Park Service. 1997. Salinas Pueblo Missions National Monument Resources Management Plan ———. 1984. Land Protection Plan
Naturalness Index	**SAPU_8**	Lands available for solar energy development occur in areas having a high naturalness value. The park is concerned about preserving the integrity of existing natural landscapes at all site units. These landscapes include forests, grasslands, and wildlife habitat, and also possess high quality natural sound and night sky resources. These conditions are particularly important for the

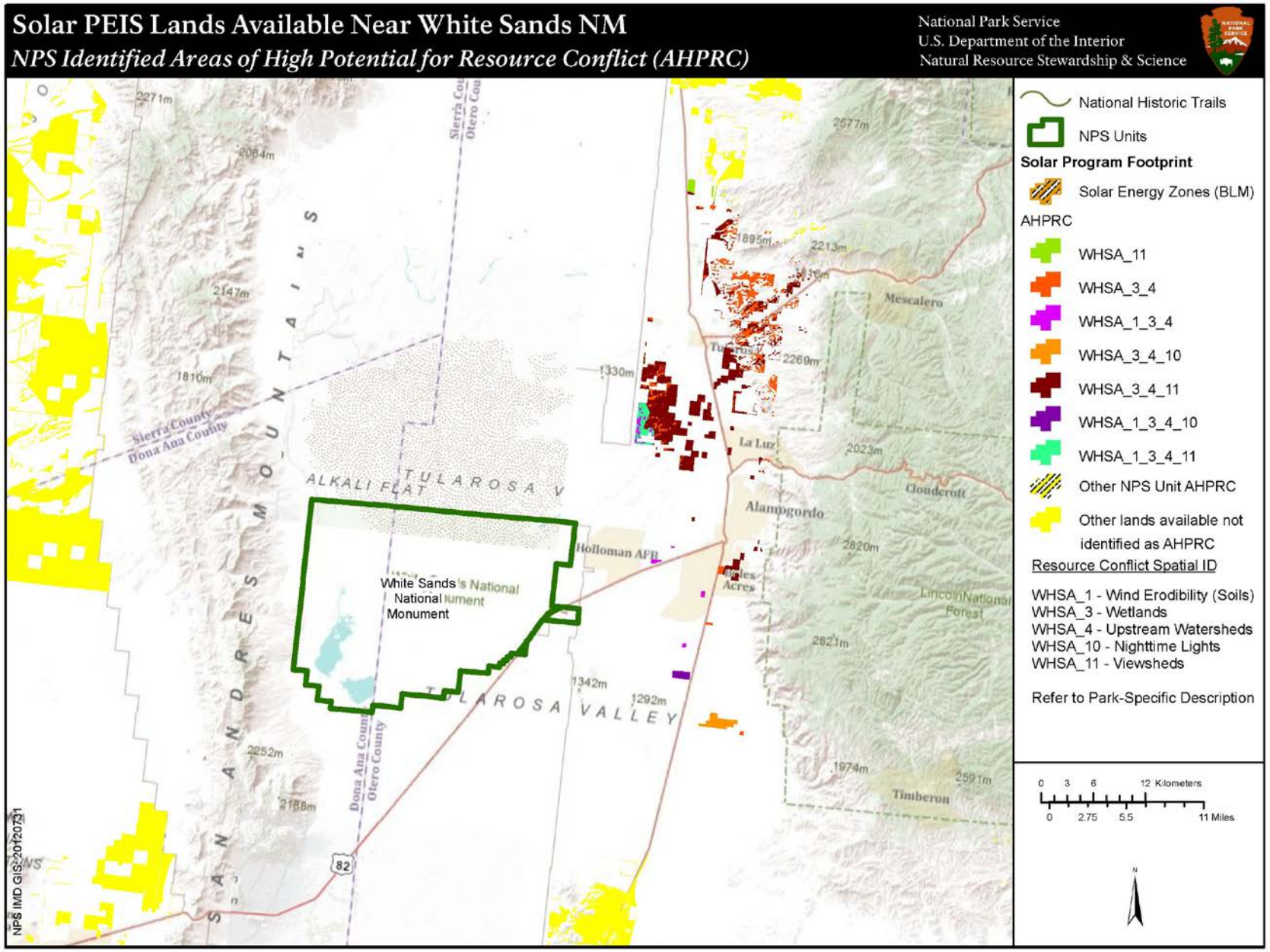
		management of Gran Quivira Unit where minimal landscape change has occurred. Park visitors value the serenity and solitude of the park and surrounding area, a significant interpretive aspect of the cultural history of the Gran Quivira Unit. The park identifies this AHPRC to protect landscape integrity. References: National Park Service. 2002. Abo Cultural Landscapes Inventory ———. 2002. Quarai Cultural Landscapes Inventory ———. 1997. Salinas Pueblo Missions National Monument Resources Management Plan ———. 1988. In the Midst of a Loneliness: The Architectural History of the Salinas Missions ———. 1984. Land Protection Plan Establishing Legislation P.L. 96-550, Dec. 19, 1980, Title VI Salinas National Monument (Now Salinas Pueblo Missions National Monument) University of New Mexico. 2010. Gran Quivira Unit Cultural Landscapes Inventory Additional Cultural Resources Comments The area surrounding the Gran Quivira is a known cave and karst resource. The park is also concerned about the protection of soil permeability and preservation of cave and karst formation. Caves in the area are known to contain cultural resources. Changes in soil permeability could alter cave and karst development and adversely affect cultural resources. The following references highlight these resources While the caves in the area around Gran Quivira are not completely understood, they have been compared to features found in the Carlsbad, NM area. There is a high potential for connectivity of these cave systems. References: National Park Service. 2005. Characterization of Near-Surface Geology and Possible Voids Using Resistivity and Electromagnetic Methods at the Gran Quivira Unit of Salinas Pueblo Missions National Monument, Central New Mexico
Nighttime Lights	**SAPU_10**	While the night sky is important to the park at all 3 site units, the dark night sky at Gran Quivira Unit is known as an excellent resource. Each year, the Lake County Astronomical Society in Illinois visits the park for a week-long study of the unique deep-space visibility of the area. The LCAS usually hosts a Star-Party for school-age children in the area during their visits to the park. The park also hosts a Star-Party for visitors. The night sky is important to researchers studying the relationship between astronomy and cultural features within the park, for example the petroglyphs of Abo. The pristine night sky is also a significant aspect of preserving the feel and sense of the pueblo ruins as they existed during the occupation periods. Visitors and researchers

		to the area frequently comment about the extraordinary nighttime visibility, particularly at the Gran Quivira Unit. Currently, there are no light intrusions impacting the dark night sky at Gran Quivira, and intrusions at Abo and Quarai are limited to Albuquerque, Belen, a detention facility at Estancia, and only occasionally from Mountainair. The park identifies AHPRC to protect the dark night sky at Gran Quivira and Abo Units. References: National Park Service. 2002. Abo Cultural Landscapes Inventory ———. 2002. Quarai Cultural Landscapes Inventory ———. 1997. Salinas Pueblo Missions National Monument Resources Management Plan ———. 1988. In the Midst of a Loneliness: The Architectural History of the Salinas Missions ———. 1984. Land Protection Plan Establishing Legislation P.L. 96-550, Dec. 19, 1980, Title VI Salinas National Monument (Now Salinas Pueblo Missions National Monument) University of New Mexico. 2010. Gran Quivira Unit Cultural Landscapes Inventory
Viewsheds	**SAPU_11**	Scenic vistas from archeological sites are relatively unimpaired in many areas. The vistas provide visitors a historical reference for the landscape that existed when the ancestral Pueblo people occupied the area. The park is concerned about preserving its viewshed at all three site units that comprise the park. While viewsheds at Abo and Quarai are impacted by several features and activities, the scenic and historical views from Gran Quivira are largely intact to the south, west, and east from the unit. The views to the north of Gran Quivira are somewhat altered, although the landscape is relatively intact, with the exception of the High Lonesome Wind Farm near Willard. The park is concerned about the potential for solar energy facilities in line of sight from key observation points within these units could affect the scenic vistas and historical landscapes for the Abo, Gran Quivira and Quarai Units. The park identifies AHPRC to protect scenic landscapes. The park also recommends that lands available for solar energy development in the area of analysis be restricted to designs for only below-the- horizon based on the highest elevation key observation points at each unit. References: National Park Service. 2002. Abo Cultural Landscapes Inventory ———. 2002. Quarai Cultural Landscapes Inventory ———. 1997. Salinas Pueblo Missions National Monument Resources Management Plan ———. 1988. In the Midst of a Loneliness: The Architectural History of the Salinas Missions ———. 1984. Land Protection Plan Establishing Legislation P.L. 96-550, Dec. 19, 1980, Title VI Salinas National Monument (Now Salinas Pueblo Missions National Monument)

		University of New Mexico. 2010. Gran Quivira Unit Cultural Landscapes Inventory

White Sands National Monument

WHSA AHPRC Locations



WHSA AHPRC Descriptions

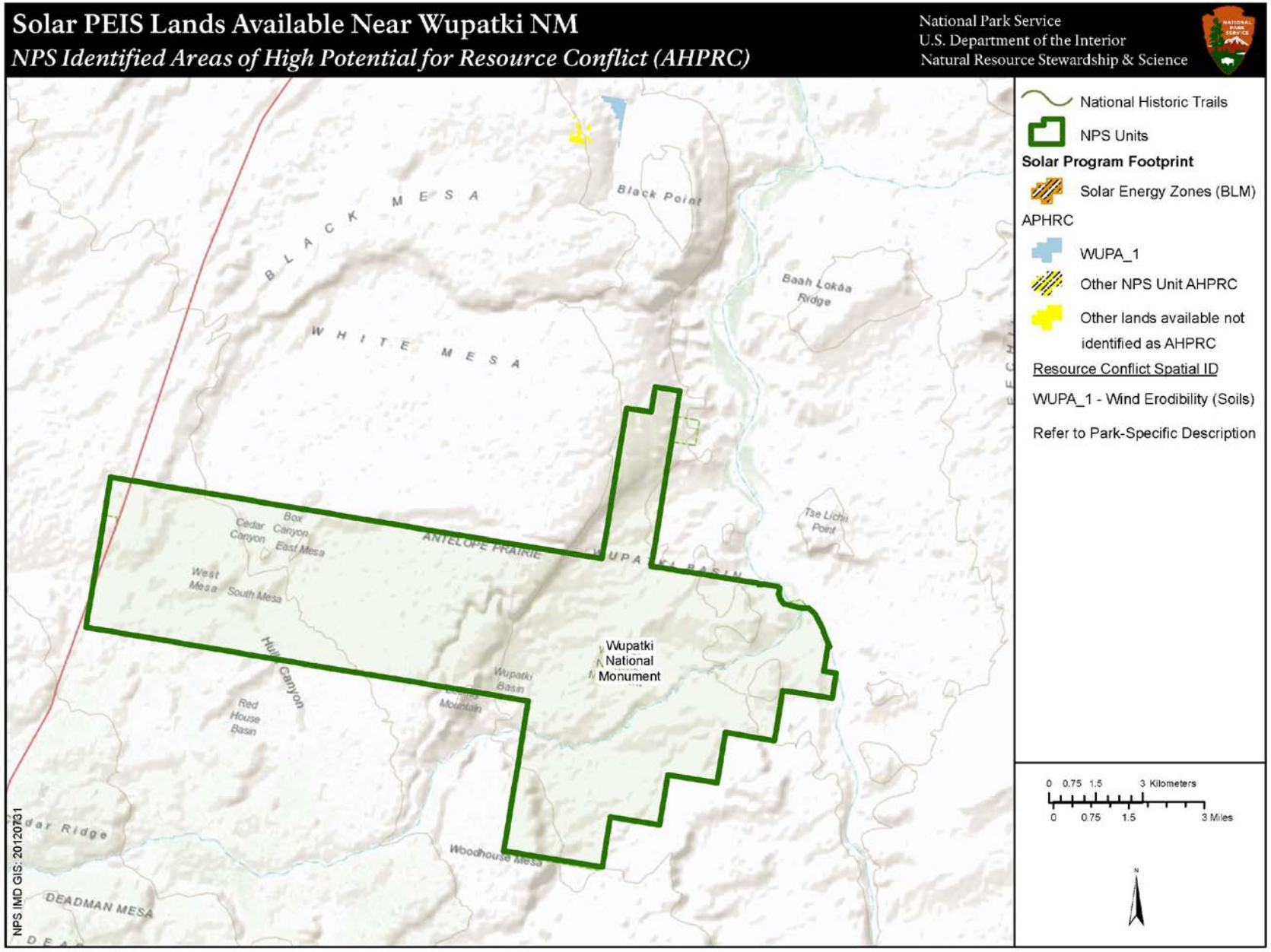
Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**WHSA_1**	Soils susceptible to wind erosion occur around much of the park. Lands available for solar energy development in the area of analysis are located to the east and northeast of the park where soils are classified in Wind Erodibility Groups 1 and 2 and have a high potential for dust generation. The disturbance of these wind erodible soils associated with the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. The park is concerned that disturbance of these soils on lands available for solar energy development poses a threat to air quality, aquatic species (including pupfish) habitat, and formation of soil crusts, and visitor experience at the park. The park identifies AHPRC to protect air quality, aquatic species, soil formation processes, and the visitor experience.
Wetlands	**WHSA_3**	The park contains playa lakes, wetlands, cottonwood groves, and other water-dependent features. Many wetlands are not identified in the USFWS inventory, including Raptor Lake, Lake Holloman, Lost River wetlands, Salt Pond, Mound Spring, and Malpais Springs. Lands available for solar energy development east and northeast of the park are located where water resource development in support of solar energy facilities could alter the direction and movement of surface and/or groundwater. The park is concerned about these effects on the water-dependent resources. The park identifies AHPRC to protect sensitive, surface- and groundwater-dependent resources. Additional Water Resources Comments Migratory birds. The significance of the park's water-dependent features is expressed in many national bird plans that list important species and habitats within and adjacent to the park. These plans include the North American Waterfowl Management Plan (NAWMP), Intermountain West Joint Venture (IWJV) Plan, the New Mexico Partners in Flight (NMPIF) Conservation Plan, U.S. Shorebird Conservation Plan, Intermountain West Regional Shorebird Plan and Partners in Flight, Arizona-New Mexico Mountains Ecological Conservation Plan (TNC), Colorado Plateau Ecoregional Conservation Plan (TNC), and the Southern Rocky Mountains Ecoregional Conservation Plan (TNC). Water resource development. The interaction between the perched water table beneath the dunes and the regional water table is not well known. The region of groundwater development along the eastern side of the Tularosa Basin from Tularosa to the Boles Acres has shown drastic changes in water levels over the last 60 years. Rapid water-level decline occurs from heavy pumping during drought periods, and rapid water-level rise from recharge events during periods

		of above –average precipitation (this was described by Shomaker and Associates, Inc. as part of the White Sands National Monument Inventory Report). Existing water- level contour maps provide useful information on the groundwater movement and effects of drawdown in the basin. Application of available analytical or numeric groundwater models is useful for analyzing the effects of groundwater withdrawal for solar energy development. The NPS is actively participating in studies of the regional groundwater system because it is concerned about further decline of groundwater levels near the park. The NPS recommends that solar energy development in the AHPRC be restricted to the lowest water-use solar technologies.
Upstream Watersheds	**WHSA_4**	Lost River provides habitat for a state listed pupfish, it is the only stream that flows into the park, and is believed to be a source of recharge to the shallow aquifer that stabilizes the dune system. Based upon evaluations of water levels and groundwater interaction with surface water, the park is concerned about protecting existing hydrologic processes, including groundwater recharge and the surface expression of groundwater in Lost River. Lands available for solar energy development east and northeast of the park occur in watersheds that lie upstream and upgradient of park waters. The park identifies AHPRC to protect water resources.
Nighttime Lights	**WHSA_10**	The dark night sky is an important resource for the park. While night sky conditions are affected by development to the east and northeast of the park, lands available for solar energy development occur in areas east and southeast where the night sky is darker. The park is concerned about the cumulative effects of additional nighttime lights resulting from solar energy development to the east and northeast of the park. The park identifies AHPRC to protect dark night sky. Additional Resource Conflict Comments Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: “the most noticeable effects will occur in those areas where lights are close to natural habitats.” The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References:

		Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewshed	**WHSA_11**	Lands available for solar energy development trending east to northeast of the park are within the park's viewshed. The park is concerned that solar energy facilities in line of sight from key observation points within the park, particularly northeast of the park could adversely affect scenic vistas. The park identifies this AHPRC to protect visual resources. [See WHSA_Viewshed.gdb in the WHSA folder in the park specific zip file download].

Wupatki National Monument

WUPA AHPRC Locations

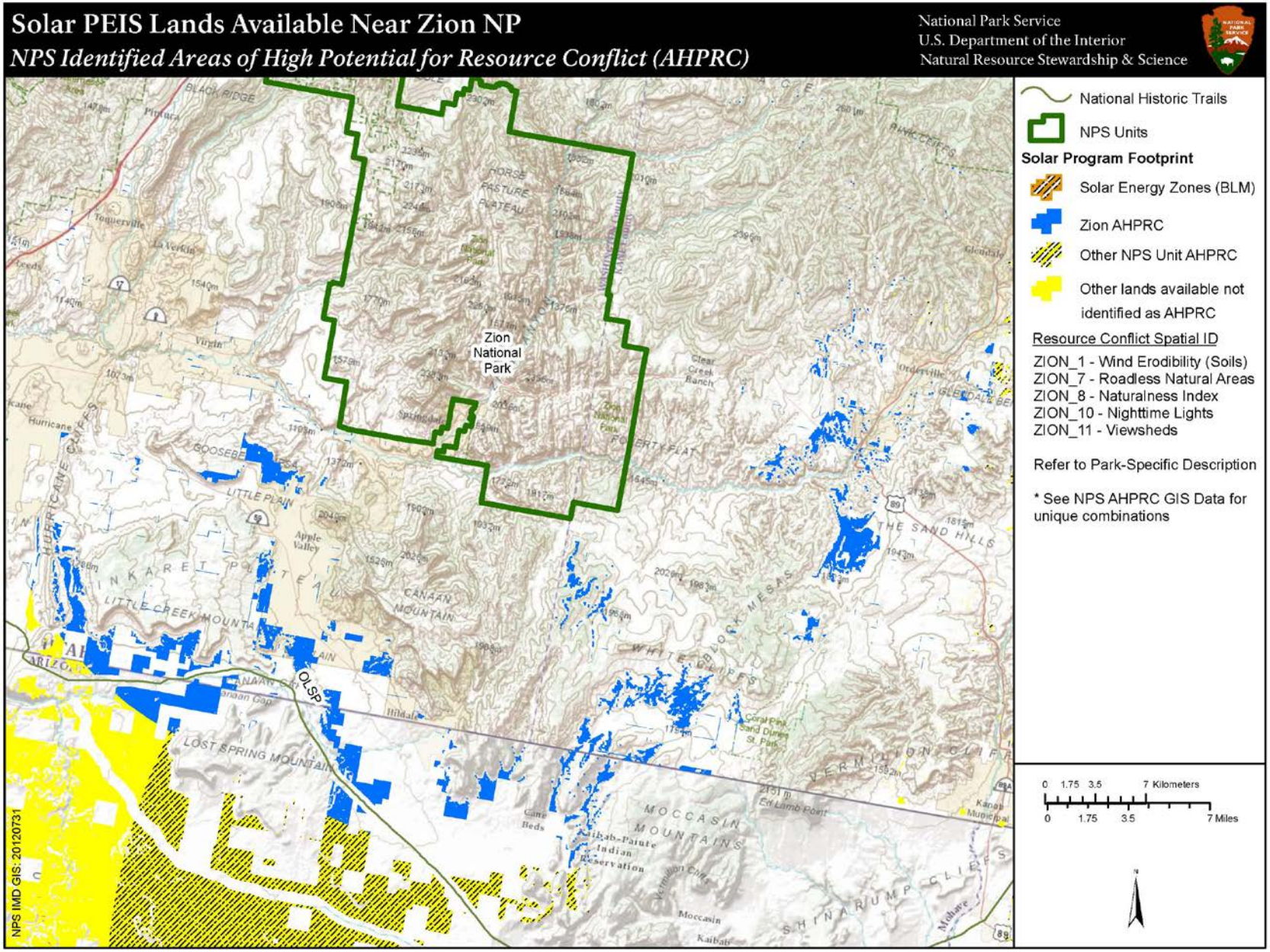


WUPA AHPRC Descriptions

Resource of Concern	Spatial Reference ID #	Resource Conflict Description
Wind Erodibility	**WUPA_1**	Lands available for solar energy development located north of the park occur on soils classified as Wind Erodiblity Group 1 (Northwest of Black Point) and are susceptible to wind erosion. The park is concerned that disturbance of these wind erodible soils related to the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust and increase soil deposition in the park, particularly in and around historic ruins. The park identifies AHPRC to protect visual and cultural resources.

Zion National Park

ZION AHPRC Locations



Resource of Concern	Spatial Reference ID #	Resource Conflict Justification
Wind Erodibility	**ZION_1**	Lands available for solar energy development are located occur in areas southeast to southwest of the park where soils are classified in Wind Erodibility Groups 1 and 2. These soils are susceptible to wind erosion. The park, and nearby Bryce Canyon NP, is a Class 1 air quality area under the Clean Air Act (see References), indicating that no significant degradation of air quality should be permitted under federally proposed actions. Numerous recent publications (see References) describe the downwind significance of dust emissions from low-elevation drylands. Effects of fugitive dust on visibility are demonstrated in monitoring data collected by the NPS. Deposition of wind eroded soils can affect plant and animal communities as well as eventually be eroded by water and affect riparian and watercourses in the park. Disturbance of these lands from the development of solar energy facilities, including construction and post-construction activities, service road maintenance and use, and loss of vegetation could produce significant quantities of fugitive dust. Such disturbance would exacerbate generation of dust and diminish visibility and other downwind resources. The park is concerned that soil disturbances due to the construction and operation of solar energy facilities could degrade air quality in the park and cause violation of the National Ambient Air Quality Standards (NAAQS). The increase in dust emissions and deposition of particulates and soil in the park could also degrade vegetation and wildlife habitats. The park identifies AHPRC to protect air quality. References: Field, J. P., J. Belnap, D. D. Breshears, J. C. Neff, G. S. Okin, J. J. Whicker, T. H. Painter, S. Ravi, M. C. Reheis, and R. L. Reynolds. 2010. The ecology of dust. Frontiers in Ecology and the Environment 8:423–430 Neff, J. C., A. P. Ballantyne, G. L. Farmer, N. M. Mahowald, J. L. Conroy, C. C. Landry, J. T. Overpeck, T. H. Painter, C. R. Lawrence, and R. L. Reynolds. 2008. Increasing aeolian dust deposition in the western United States linked to human activity. Nature Geoscience 1:189-195 Okin, G. S., J. E. Bullard, R. L. Reynolds, J.-A. C. Ballantine, K. Schepanski, M. C. Todd, J. Belnap, M. C. Baddock, T. E. Gill, and M. E. Miller. 2011. Dust: Small-scale processes with global consequences. EOS, Transactions, American Geophysical Union 92:241-248 Painter, T. H., J. S. Deems, J. Belnap, A. F. Hamlet, C. C. Landry, and B. Udall. 2010. Response of Colorado River runoff to dust radiative forcing in snow. Proceedings of the National Academy of Sciences 107:17125-17130 Air Quality in National Parks

		2008 Annual Performance & Progress Report Natural Resource Report NPS/NRPC/ARD/NRR—2009/151
Roadless Areas	**ZION_7**	Lands available for solar energy development to the southeast of the park coincide with a roadless area that contains moderately erodible soils. Lands available for solar energy development located on Gooseberry Mesa, to the southwest of the park, are acclaimed mountain bike recreation areas. This area is also adjacent to the BLM Smithsonian Butte Scenic Backway, set aside for a 9-mile scenic drive that is much the same as when John Wesley Powell explored it in the late 1800s. The remoteness of these landscapes helps preserve habitat integrity and land-forming processes. The park is concerned that solar energy development could increase disturbances to habitat quality, alter erosion processes that are integral to the landscape, and would be incompatible with the existing recreation resources available near the park The park identifies AHPRC to protect landscape integrity.
Naturalness Index	**ZION_8**	Lands available for solar energy development to the southwest and southeast of the park are identified as having high roadless and naturalness values and represent intact landscapes of high integrity. The protection of intact landscapes and their inherent scenic values is a primary management goal of the park because these landscapes are important for maintaining migration corridors and the biological (genetic) diversity of resident park wildlife populations. Increased land disturbance also promotes invasion of non-native and invasive plants, particularly along road corridors, and increased rates of erosion, sedimentation, and runoff. The park is concerned about the protection of intact landscapes and their inherent scenic, hydrologic, and ecological values from the effects of solar energy development. The park identifies AHPRC to protect landscape integrity, and visual and wildlife resources.
Nighttime Lights	**ZION_10**	Dark night sky is a wilderness character that the park is trying to preserve for visitors to the Congressionally-designated park wilderness area. The park manages dark night sky as a natural resource to provide opportunities for visitor enjoyment. Although some areas to the southeast, south and southwest have light sources, the areas for solar energy development located southeast to southwest of the park also occur in areas with high quality dark sky conditions. The park is concerned that nighttime operations and security lights on energy installations could adversely affect this resource undermining efforts to preserve dark sky. The park identifies as AHPRC to protect dark night sky. Additional Resource Conflict Concerns Research indicates dark sky is also import to ecosystem function, and demonstrates the multiple adverse impacts of light pollution to community ecology (Longcore and Rich, 2004). Animals can experience altered orientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors. A

		study of predation by bats, birds, skunks, toads, and spiders on moths found behavior patterns significantly altered by artificial lighting (Frank, 1988). The cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions (Longcore and Rich, 2004). Longcore and Rich predict of light pollution: "the most noticeable effects will occur in those areas where lights are close to natural habitats." The park is concerned that the siting of multiple solar energy facilities could decrease the quality of dark night sky in the park and produce noticeable effects to ecosystem function. References: Longcore T, and Rich C. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment 2 (4): 191–198 Frank KD. 1988. Impact of outdoor lighting on moths: an assessment. J Lepidop Soc 42: 63–93
Viewsheds	**ZION_11**	Lands available for solar energy development located southeast to southwest of the park occur in areas possessing scenic landscape qualities, where there is little evidence of development and a high visual sensitivity. Hikers in the southwest quadrant of the park on the elevated plateau of the Chinle formation have unobstructed views to the southwest, as do the periodic hikers to the Mount Kinesava and West Temple areas. The park is a Class 1 air quality area under the Clean Air Act, indicating that no significant degradation of air quality should be permitted under federally proposed actions. The park is concerned that solar energy facilities could be developed within line of sight from key observation points and adversely affect the scenic landscapes available to visitors who make the effort to climb to elevated viewpoints within wilderness. The park identifies AHPRC to protect scenic landscapes and visual resources.