



# VANISHING NIGHT SKIES:

*The Effects of Light Pollution on the  
National Park System*

*A survey by the National Parks and  
Conservation Association, March 1999.*

This survey was prepared by David J. Simon, NPCA Southwest regional director, and Scott R. Babcock, a Stanback Conservation Program intern from the Nicholas School of the Environment, Duke University. NPCA extends a special thanks to the National Park Service for participating in the survey.

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What compares to the inspiration of lying under a canopy of stars, with the Milky Way splashed across the evening sky? Like diamonds on black velvet, the stars dazzle the senses, touch the spirit, humble the individual, and incite a sense of curiosity and extraordinary wonder.

Seeing the awesome grandeur of a star-filled night sky is a wondrous experience for national park visitors—an experience seldom possible in America's growing cities and suburbs, where most stars are not visible at night. While under ideal conditions, one might see more than 2,500 stars plus our galaxy's Milky Way, in a typical suburb only 200 to 300 stars are visible; in large cities, perhaps only a few dozen. Estimates are that only 10 percent of the U.S. population can see an unsullied night sky.

Thus, many visitors are unexpectedly astounded and captivated when they view the night sky from within our national parks. Like clean air and water, wildlife, or the sounds of nature, a clear, dark night sky is an intrinsic part of the national park experience that must be protected for present and future generations.

And just like the air and water, the skies over our national parks are increasingly threatened. Unfortunately, the stars visible from our national parks are becoming increasingly difficult to see. The biggest culprit in this quiet crisis is light pollution, which is most often caused by excessive or misdirected outdoor lighting. Light pollution from highways, homes, office buildings, and other developments can affect national parks that are more than 100 miles away. In addition, some National Park Service and private park concession facilities add unnecessary glare to the night sky.

While some remote parks are insulated from the effects of light pollution, many are not.

In addition to obscuring the stars, excessive light pollution can seriously compromise the educational story presented in many national parks. Observing the night sky has been a crucial human activity since the Pleistocene era, inspiring wonder and curiosity, shaping religious beliefs, propelling scientific inquiry, and motivating and guiding global exploration to the present day. From the builders of celestial calendars at Chaco Culture National Historical Park in New Mexico to the builders of rockets at Canaveral National Seashore in Florida, the mission of our national parks could not be complete without dark night skies to help tell these stories.

Although the public believes that the National Park System and all of its resources are protected, the truth is more complicated. Unless light pollution problems are remedied, dark night skies within parks will continue to disappear. The National Parks and Conservation

## PART I

# EXECUTIVE SUMMARY

Association has been concerned about this problem for some time. In the summer of 1998, NPCA asked professionals of the National Park Service for more information about light pollution problems in the national parks. NPCA distributed the survey to superintendents at 376 park units. NPCA's analysis focused particular attention on 130 parks that allow overnight visitation, 77 percent of which responded to the survey. In all, 189 of 376 park units responded to the survey. Included in that total are 43 of the 54 sites designated as National Parks. We believe the responses are representative and that the survey offers the first comprehensive assessment of the status of light pollution issues across the National Park System. The results are profoundly disturbing.

## *Findings*

- Across the nation, dark night skies are an intrinsic park resource that must be protected and a vital component of park educational programs. Ninety-four percent of all parks that offer overnight visitation consider dark night skies an important resource. Sixty-two percent of these overnight parks offer some type of night sky interpretive program.
- Light pollution is a widespread problem for national parks, regardless of size or geographic location. Nearly two-thirds of National Park System units that offer overnight visitation consider light pollution a resource problem. In four of five U.S. regions (see Appendix 3), nearly 70 percent of the parks report light pollution problems.
- Light pollution is considered by the National Park Service to be a serious problem at many national parks, and many locations within the parks. More than 35 percent of parks that reported light pollution problems judged it to be a "moderately serious" or "very serious" resource problem. Seventy percent of parks reported problems from both specific and diffuse sources in several areas of the park.
- So far, actions taken to reduce light pollution by the National Park Service and adjacent communities have been extremely limited. While 79 percent of parks that consider dark skies an important park resource have taken some steps to reduce light pollution within park boundaries, only 12 percent have taken steps in all areas of their parks. The National Park Service has done nothing in nearly 21 percent of the parks that report problems. In addition, America's communities are failing to support the protection of night skies: of all parks with overnight visitation, only 10 percent report the presence of helpful ordinances in nearby/adjacent communities that limit light pollution.
- Overnight parks can play a better role in increasing public awareness about the effects of light pollution through night sky interpretive programs.
- Many parks have the potential to take significant steps to reduce light pollution within their own boundaries. The Park Service has made some progress in this area but much more could be done.

## *National Parks and Light Pollution – the Range of Impacts*

Light pollution not only substantially hinders stargazing, but can also cause a host of other negative consequences.

- Beach lighting along coastal areas such as Florida's Gulf Islands National Seashore can lead newly hatched sea turtles astray, drawing them toward the sources of light rather than the glimmering sheen of the ocean. <sup>1</sup>
- Endangered dark-rumped petrels nesting within Haleakala National Park in Hawaii are killed when they are attracted to bright street lights. <sup>2</sup>
- Scientists have found that bright lights on tall buildings can confuse migratory birds. <sup>3</sup>
- Circadian rhythms of some plants can change under 24 hours of bright light, causing deciduous trees near streetlights to lose their leaves too late in the year. <sup>3</sup>
- Inappropriate exterior lighting wastes energy, costing the United States more than \$1.5 billion annually. <sup>4</sup>

## *Recommendations*

NPCA offers five recommendations to protect the National Park System from light pollution and urges prompt action to ensure that the night skies over our national parks retain their natural splendor.

Fortunately, solving light pollution problems does not simply mean shutting off all lights. Actually, many of the most effective steps are surprisingly easy and will be cost-effective in the long run for the National Park Service, private landowners, and businesses outside the parks.

1. The National Park Service must be proactive and lead by example to aggressively reduce sources of light pollution within the national parks. NPS and concessioner facilities should be retrofitted using the best available technology, including low-pressure sodium lamps and "cut-off shields" that eliminate horizontal and upward projecting light and direct light downward. The National Park Service should assess how much it would cost to change current lighting sources to more efficient, less costly ones. Congress must provide NPS with sufficient funds for this purpose. Park officials at Chaco Culture National Historical Park were able to cut energy costs by 30 percent by changing the lighting systems there.
2. The National Park Service should expand night sky interpretation programs. Educating park visitors about the night sky is not only part of the interpretive story of many parks (e.g., where Native Americans built celestial-based calendars), but is also crucial for increasing public awareness about light pollution.

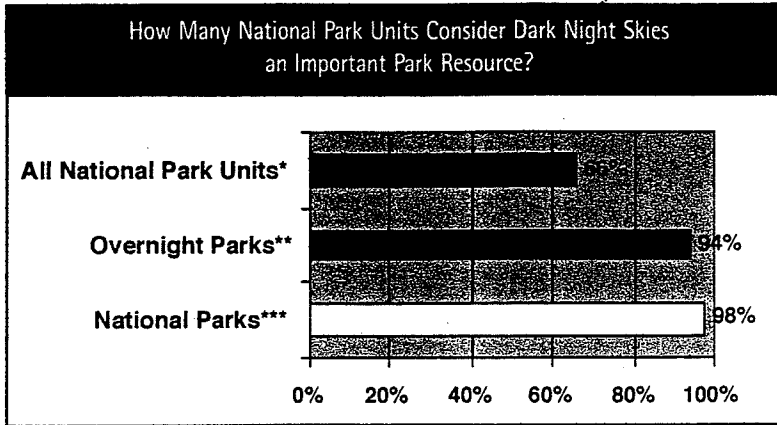
3. Gateway communities adjacent to parks, as well as communities at greater distances, should adopt progressive outdoor lighting ordinances to reduce light pollution. Currently the cities of Tucson and Flagstaff, Arizona, have ordinances to limit light pollution near observatories. NPCA believes that all communities near national parks should have similar rules to protect night skies.
4. Congress should bolster the Environmental Protection Agency's existing "Green Lights" program. The program, which provides incentives to install energy-efficient lighting, could be expanded to assist communities near parks to reduce light pollution. In addition to reducing light pollution, installing energy-efficient lighting decreases the demand for electricity and reduces costs.
5. Congress should support and strengthen the Clean Air Act; EPA and the National Park Service should aggressively enforce it. Air pollution can also affect stargazing. Progress in reducing light pollution will be futile if air pollution that affects national parks is not curtailed. Air pollution from power plants, mobile sources, factories, cities, fires, and other sources inside and nearby the national parks must be monitored and reduced to prevent further deterioration of night sky quality.
6. Light pollution in the Midwest, Pacific, and Intermountain regions should be addressed before the problem becomes more widespread and serious.

NPCA urges attention to reducing light pollution in our national parks before it is too late. Without prompt action, we are denying future generations this precious experience in our national parks that we now take for granted. Nothing less than the beauty of the heavens is at risk.

End Notes:

1. Hones, 1998
2. Haleakala National Park, 1998, NPCA Survey Response
3. Upgren, Arthur R. "Night Blindness: Light Pollution is Changing Astronomy, the Environment, and Our Experience of Nature." Natural Resources Defense Council. 1996
4. Crawford, David. International Dark Sky Association.

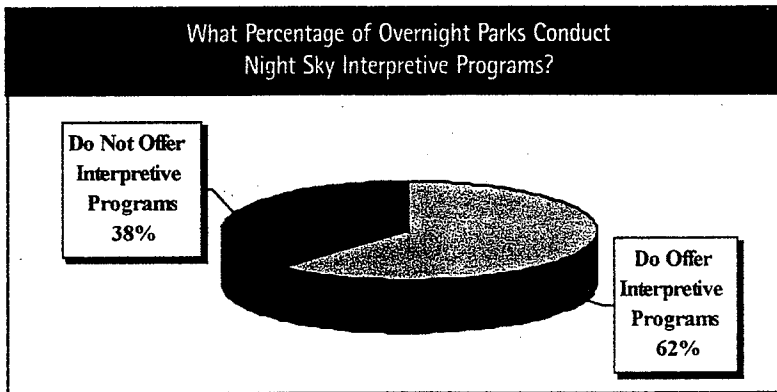
FIGURE 1



- Dark night skies are a vital park resource, just like clean air and water and wildlife. Approximately 98 percent of the responding National Parks consider dark night skies an important park resource.
- Two-thirds of the National Park System units responding, including a wide variety of overnight and day use parks, consider dark night skies an important park resource.
- Protecting night skies from light pollution is even more important at parks that encourage camping and overnight use. Ninety-four percent of all overnight parks within the National Park System that responded consider dark night skies an important park resource.

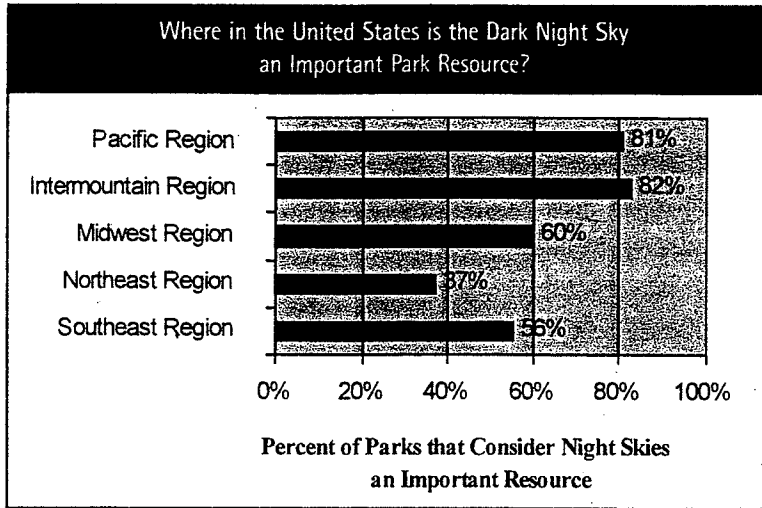
\*Category includes all park units, e.g., national parks, monuments, historic sites, battlefields, etc. One hundred and eighty-nine of 376 national park units responding (50 percent).  
 \*\*Category includes park units with overnight visitation. One hundred of 130 overnight national park units responding (77 percent).  
 \*\*\*Category includes only those sites designated as National Parks. Forty-three of 54 National Parks responding (80 percent).

FIGURE 2



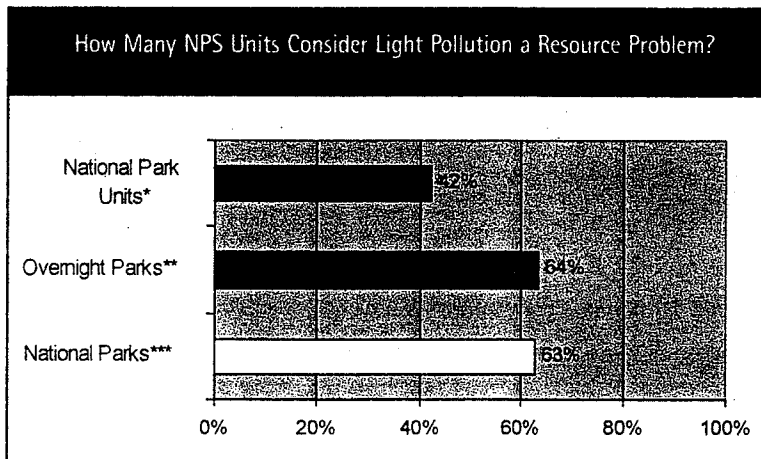
- Sixty-two percent of responding overnight national park units offer night sky interpretive programs.

FIGURE 3



- In four of five regions, 50 percent or more of the park units that responded consider dark night skies an important park resource.
- In two of five regions (Pacific and Intermountain) more than 80 percent of day use and overnight parks consider dark night skies an important park resource.

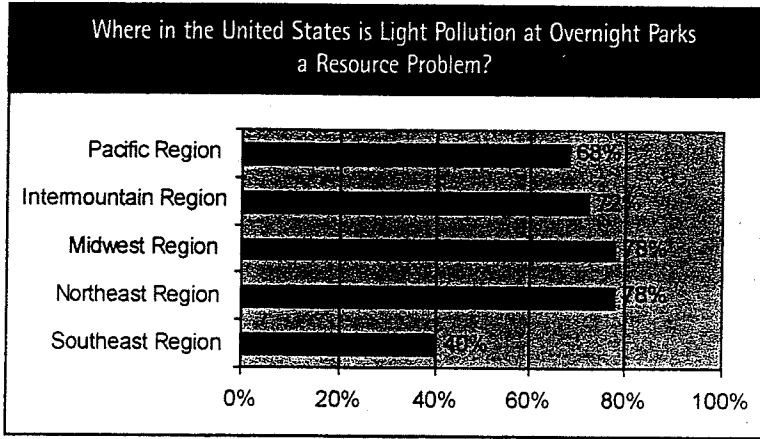
FIGURE 4



- Forty-two percent of all national park units that responded, including both day-use and overnight parks, consider light pollution a resource problem at their park.
- Nearly two-thirds of the responding park units within the park system that permit overnight stays consider light pollution a resource problem.
- Nearly two-thirds of the National Parks that responded consider light pollution a resource problem.

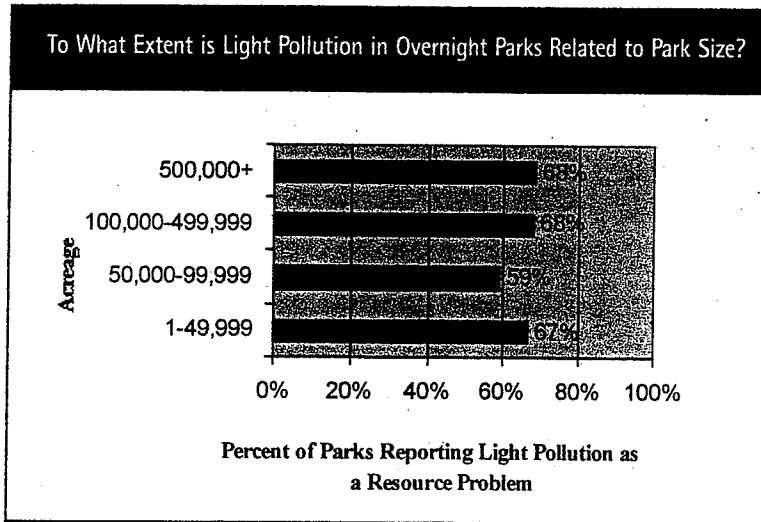


FIGURE 5



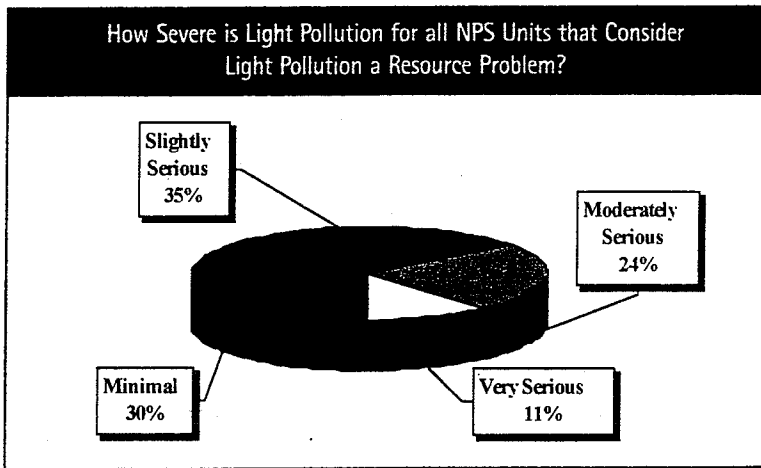
- In four of five regions, more than two-thirds of all overnight parks responding consider light pollution a resource problem.
- In two of five regions, nearly 80 percent of the overnight parks responding consider light pollution a resource problem.

FIGURE 6



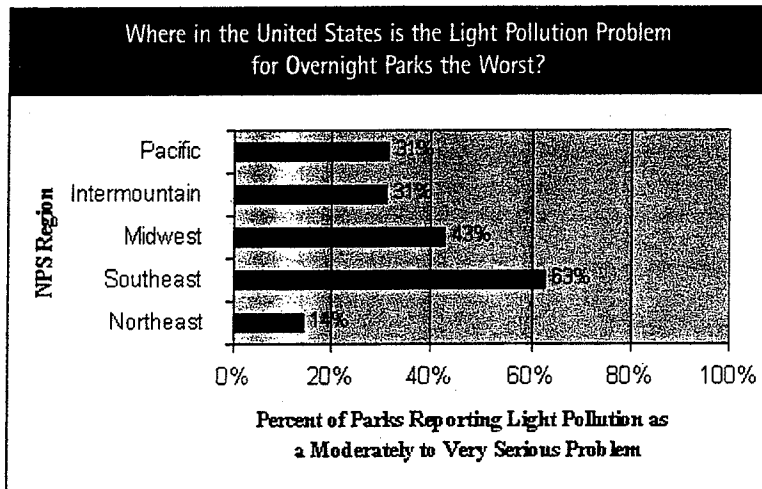
- At least two-thirds of park units responding in virtually every size category reported resource concerns about light pollution.

FIGURE 7



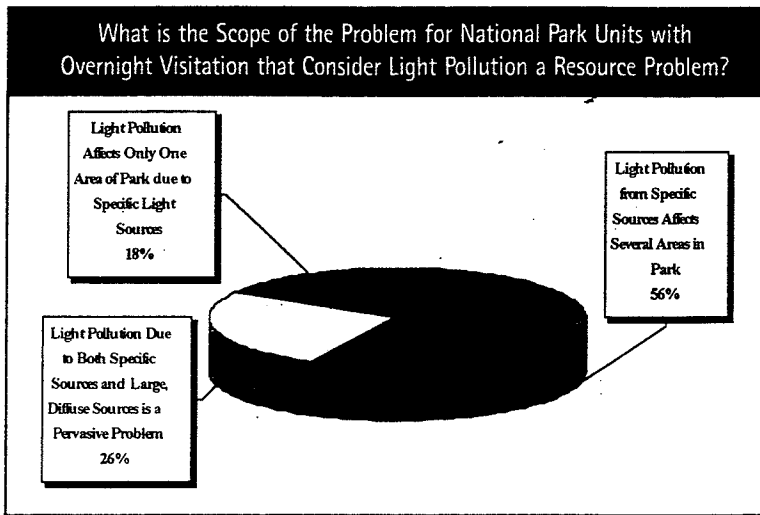
- Approximately 35 percent of all national park units that consider light pollution a resource problem, including day use and overnight parks, consider the problem to be very serious or moderately serious.

FIGURE 8



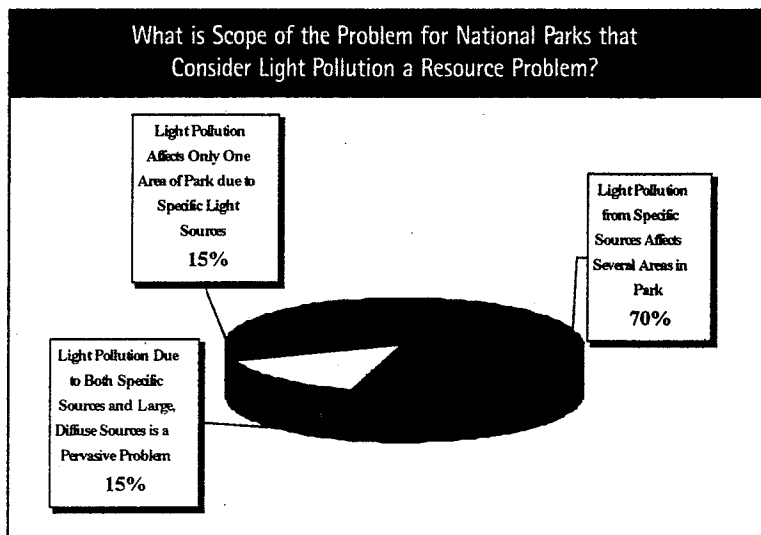
- Light pollution is widespread and considered a moderately to very serious problem in at least one-third of all overnight parks responding in four of five regions. (Northeastern parks may be more tolerant because light pollution is ubiquitous.)
- Approximately 63 percent of all overnight parks in the Southeast region consider light pollution a very serious to moderately serious resource problem.

FIGURE 9



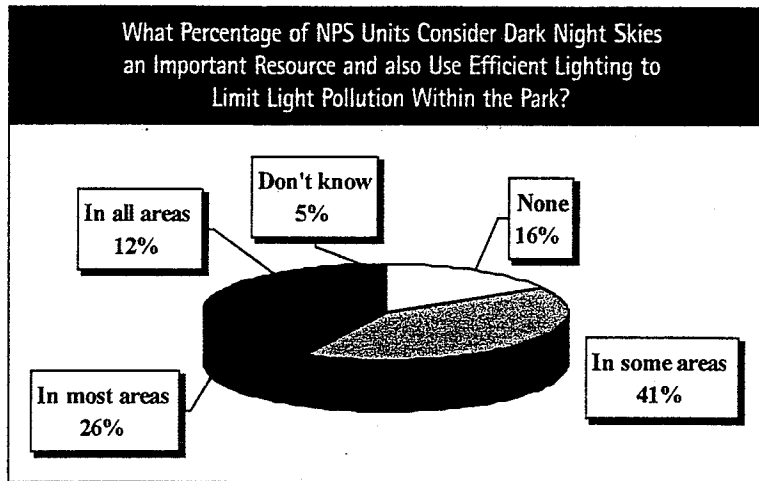
- For the responding overnight parks that suffer from light pollution, 56 percent report problems in several areas of the park.
- More than 25 percent report that light pollution is a pervasive problem attributed to both specific sources and large, diffuse sources.

FIGURE 10



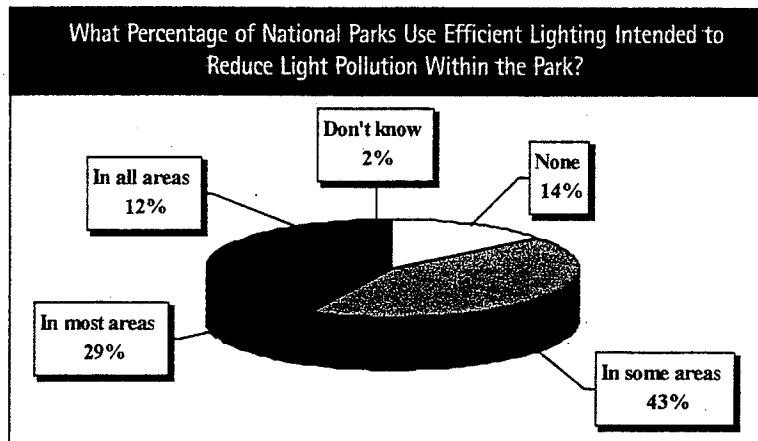
- Seventy percent of the responding national parks that consider light pollution a resource problem are affected by specific sources in several areas of the park.
- Fifteen percent of the responding national parks that consider light pollution a problem described it as a pervasive problem from both specific sources and large, diffuse sources.

FIGURE 11



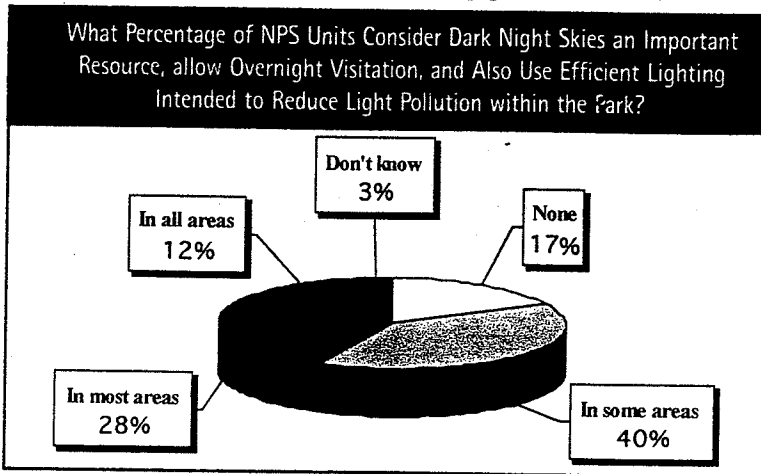
- Sixteen percent of day use and overnight parks that consider dark night skies an important resource report that no effort has been made to reduce internal light pollution. Another 41 percent have taken steps in some areas within the park.
- Nearly eight of ten (79 percent) of parks that consider dark night skies an important resource have taken some steps to reduce light pollution within park boundaries, but only 12 percent have taken steps in all areas of the park. Nearly one-fifth either has done nothing or doesn't know if any action has been taken to reduce internal light pollution.

FIGURE 12



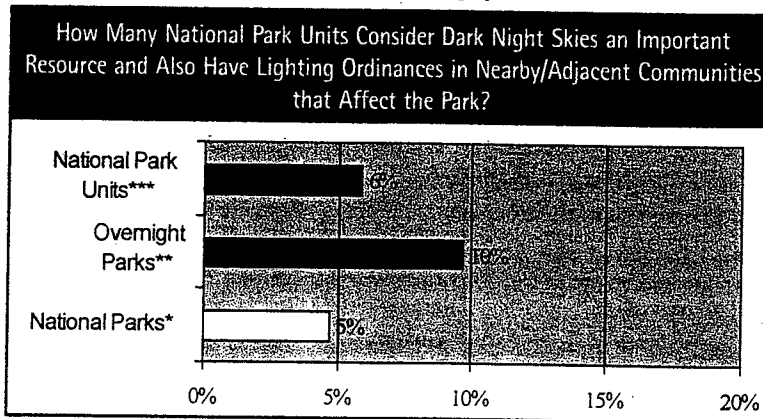
- Only 43 percent of the National Parks responding have taken measures to reduce light pollution in some areas.
- Only 42 percent of the National Parks responding have taken measures to reduce light pollution from most or all internal sources.
- Fourteen percent of the National Parks responding have done nothing to curb internal light pollution.

FIGURE 13



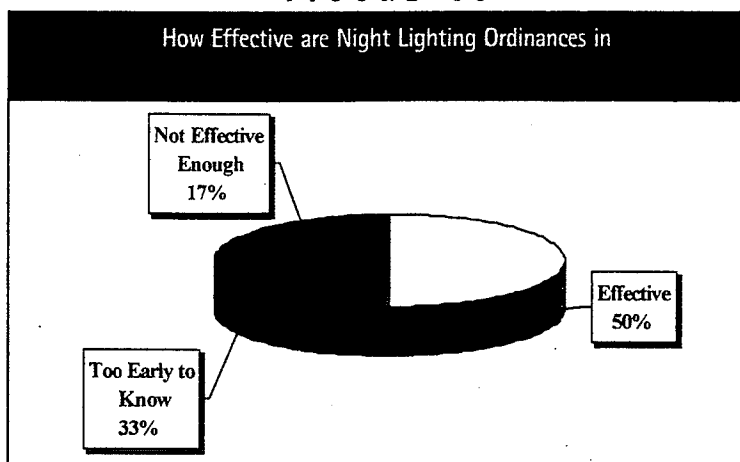
- Eighty percent of responding overnight parks that consider dark night skies an important resource have taken some actions in some areas of the park to reduce light pollution.
- Forty percent of responding parks have taken measures in most or all portions of the park to limit light pollution.
- Seventeen percent of responding overnight parks that consider dark night skies an important resource have taken no measures to limit internal light pollution.

FIGURE 14



- Only 6 percent of responding parks that consider dark skies important have nearby communities with lighting ordinances in effect to reduce light pollution.
- Only 10 percent of responding overnight parks that consider dark night skies an important park resource are near communities with night lighting ordinances.
- Only 5 percent of responding national parks that consider dark night skies important are near communities that have enacted lighting ordinances to reduce light pollution.
- Virtually all of the parks that reported being near communities with lighting ordinances are within the NPS Intermountain region.

FIGURE 15



- Of the 12 overnight park units that reported ordinances in nearby communities, 50 percent said ordinances are effective in reducing light pollution.

## PART 3

### Appendix 1

#### Response Rates

Figure 1. 189 of 376 overnight and day use park units responding (50 percent); 100 of 130 overnight park units responding (77 percent); 43 of 54 National Parks responding (80 percent).

Figure 2. 82 percent of overnight parks responding.

Figure 3. 29 of 36 day use and overnight parks within the Pacific region answering positively; 47 of 57 parks within the Intermountain region; 15 of 25 parks within the Midwest region; 13 of 35 parks within the Northeast region; 20 of 36 parks within the Southeast region.

Figure 4. 17 of 25 overnight parks within the Pacific region answering positively; 26 of 36 overnight parks within the Intermountain region; 7 of 9 overnight parks within the Midwest region; 7 of 9 overnight parks within the Northeast region; 6 of 15 overnight parks within the Southeast region.

Figure 5. 189 day use and overnight parks responding; 96 of 130 overnight parks units responding; 27 of 43 national parks responding.

Figure 6. For parks 1-49,999 acres, 22 of 33 overnight parks responding answered positively; for parks 50,000-99,999 acres, 13 of 22; for parks 100,000-499,999 acres, 17 of 25; for parks 500,000+ acres, 13 of 19.

Figure 7. Total of 82 day-use and overnight parks responding.

Figure 8. Overall, at least 75 percent of all overnight park units responded to the question in each region.

Figure 9. 63 overnight park units responding to the question.

Figure 10. 27 national parks that consider light pollution a resource problem responding to the question.

Figure 11. 110 day-use and overnight parks units responding.

Figure 12. 42 national parks responding.

Figure 13. 93 overnight parks responding.

Figure 14. 189 day use and overnight parks responding; 93 overnight park units responding; 43 of 54 national parks responding.

Figure 15. Total of 12 overnight parks responding.

## Appendix 2

November 13, 1998

Dear Superintendent:

We want to find out to what extent increased light pollution from both internal and external sources is diminishing the ability to experience clear, dark night skies in national park units. You are one of a handful of parks we did not receive responses from and your input would provide valuable information in addition to the survey responses we have already accumulated.

The NPS Management policies recognizes "intangible qualities such as natural quiet, solitude, space, scenery, a sense of history, sounds of nature, and clear night skies" as "important components of people's enjoyment in parks" and part of "the full spectrum of tangible and intangible attributes for which parks have been established and are being managed" (Ch 1:3).

Your help in completing the attached survey will assist NPCA in our efforts to determine the extent of light pollution impacts on the National Park System, what is being done, and the scope of NPS needs in this area. This information will also assist NPCA in deciding how to best help address this issue. Your answers will provide some interesting, preliminary statistical information that may be extremely valuable in public education and in supporting the mission and needs of the National Park Service. The survey results will not be used to critique individual parks.

Thank you for your assistance. If you have any questions about completing the survey, please contact Dave Simon at NPCA's Southwest Regional Office at 505-247-1221, or Scott Babcock, NPCA Project Coordinator 919-309-9355.

Sincerely,

Carol F. Aten  
Executive Vice President  
Et  
Scott R. Babcock  
NPCA Project Coordinator  
Resource Economics and Policy  
Degree Candidate  
Master's of Environmental Management  
Duke University  
NPCA National Park Light Pollution Survey

## NCPA Park Light Pollution Survey

Your answers to the following questions will assist NCPA in our efforts to determine the scope of light pollution's impacts on America's National Park System and how best to address this issue. Please mark an "X" in the spaces provided or briefly answer the written responses. Please return electronically or feel free to print a hard copy and mail to the address provided at the end of the survey.

Please return this survey as soon as possible.

National Park Unit: (name or four-letter code): \_\_\_\_\_

Name, Title, and Phone Number of Person Completing This Survey:

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1.) Are dark night skies an important resource for this park unit?

a) yes\_\_\_ b) no\_\_\_

Briefly, if you answered "yes," why are night skies important? If you answered "no," why not?

1b.) Are night skies referred to in the park's authorizing/enabling legislation?

a) yes\_\_\_ b) no\_\_\_

2.) Has your park unit carried out any surveys that might determine how individual visitors value clear, dark night skies?

a) yes\_\_\_ b) no\_\_\_

If "yes," what were the results?

3.) Does the park offer any night sky viewing interpretive programs for visitors?

a) yes\_\_\_ b) no\_\_\_

If "yes," how often are these programs offered?

4.) Is light pollution, from either internal sources (e.g. from NPS, concessionaire, or visitor facilities) or external sources (e.g. gateway communities or adjacent development) currently a resource problem at this park?

a) yes\_\_\_ b) no\_\_\_

If you answered "no" to #4, please skip to Question #8.

5.) If you answered "yes" to #4, please indicate on a scale of 1 to 4 the severity of the problem:

\_\_\_1. Minimal \_\_\_2. Slightly serious\_\_\_3. Moderately serious \_\_\_4. Very Serious/Severe

6.) If you answered "yes" to #4, please indicate the nature/scope of the problem at your park unit (we are attempting to get a general feel for how much of the park is affected):

\_\_\_a) Light pollution affects only one area in the park due to specific light sources.

\_\_\_b) Light pollution from specific sources affects several areas in the park.

\_\_\_c) Light pollution due to both specific sources and large, diffuse sources (e.g. a nearby community/communities or developments) is a pervasive problem, routinely obscuring dark night skies throughout the park.

7.) If applicable, please give us an example(s) of a light pollution source(s), either internal, external, or both, affecting night skies at this park unit.

8.) If you answered "no" to #4, could or is light pollution expected to become a problem at this park unit in the future?

a) yes\_\_\_ b) no\_\_\_



9.) Do any gateway communities near this park unit currently cause light pollution that negatively affects dark night skies or night sky viewing?

- a) no\_\_\_                      b) yes\_\_\_

If yes, please list them:

Addressing External Light Pollution Sources

10.) Have NPS officials at this park raised the issue of protecting the park's dark night skies to local officials, planners, and/or adjacent property owners?

- a) yes\_\_\_                      b) no\_\_\_

11.) Which, if any, of these gateway communities (or counties, or appropriate political jurisdictions) currently has a lighting ordinance intended to protect dark night skies?

12.) If local lighting ordinances are in place, are they effective in practice in protecting national park-related night sky values at this park unit?

Addressing Internal Light Pollution Sources

13.) Do NPS facilities at this park unit utilize efficient lighting that is intended to minimize light pollution? (Efficient, low-polluting lights are commonly: shielded and directed downward, directed at angles no greater than the horizontal of the light fixture and are composed of "warmer," whiter light found in metal halide lamps and low-pressure sodium bulbs.)

- \_\_\_a) no                      \_\_\_b) yes, in some areas                      \_\_\_c) yes, in most areas  
\_\_\_d) yes, in all areas                      \_\_\_e) don't know

14.) Are efforts currently underway to minimize light pollution at this park unit?

- a) yes\_\_\_                      b) no\_\_\_  
\_\_\_a) the park has not discussed or addressed the issue at all.  
\_\_\_b) the park has discussed the issue but nothing has been done.  
\_\_\_c) the park is currently working to improve night lighting by installing new equipment or making other changes.  
\_\_\_d) the park has installed efficient lighting and taken all appropriate steps to minimize nighttime light pollution.

15.) If you answered "yes" to #14, please describe the park's efforts (e.g. the issue was addressed in recent planning or construction documents but work is not currently funded, the park has installed some new lighting, NPS is working with the park concessionaire to reduce light pollution, etc.):

16.) If you have ever estimated the cost of converting NPS facilities at this park unit to more efficient lighting in order to reduce light pollution, please describe your findings?

Additional Comments/Suggestions for Addressing this Issue:

Send Electronic replies to the Email address below:

Thank you very much for your assistance!!!

Scott Babcock

srb8@acpub.duke.edu

*If Returning a Hard Copy*

*Please Respond to:*

National Parks and  
Conservation Association

Attn: Scott Babcock

3920 Linden Terrace

Durham, NC 27705

## Appendix 3

### States and Territories Included Within Each of the Five Regions

Pacific	Midwest	Southeast
Alaska	North Dakota	North Carolina
Hawaii	South Dakota	Kentucky
Washington	Minnesota	Tennessee
Idaho	Wisconsin	Alabama
Oregon	Iowa	Tennessee
Nevada	Illinois	Mississippi
California	Indiana	Louisiana
	Michigan	Florida
Intermountain	Ohio	Virgin Islands
Montana	Missouri	
Wyoming	Nebraska	
Utah	Kansas	
Colorado	Arkansas	
New Mexico		
Arizona	Northeast	
Texas	Maine	
	New Hampshire	
	Vermont	
	New York	
	Connecticut	
	Rhode Island	
	New Jersey	
	Pennsylvania	
	Maryland	
	West Virginia	
	Virginia	
	Delaware	

Hawaii Volcanoes NP (HA)  
 Isle Royale NP (MI)  
 Jean Lafitte NHP & Pres (LA)  
 Joshua Tree NP (CA)  
 Lake Mead NRA (AZ, NV)  
 Lake Roosevelt NRA (formerly Coulee Dam NRA) (WA)  
 Lava Beds NM (CA)  
 Lyndon B. Johnson NHP (TX)  
 Mammoth Cave NP (KY)  
 Mesa Verde NP (CO)  
 Mojave NPres (CA)  
 Muir Woods NM (CA)  
 Natchez Trace NST (AL, MS)  
 Natchez Trace Parkway (TN, AL, MS)  
 Natural Bridges NM (UT)  
 Obed Wild and Scenic River (TN)  
 Olympic NP (WA)  
 Organ Pipe Cactus NM (AZ)  
 Padre Island NS (TX)  
 Petrified Forest NP (AZ)  
 Pictured Rocks NL (MI)  
 Pinnacles NM (CA)  
 Point Reyes NS (CA)  
 Prince William Forest Park (VA)  
 Rock Creek Park (WASH., DC)  
 Rocky Mountain NP (CO)  
 Saguaro NP (AZ)  
 Saint Croix NSR (WI, MN)  
 Saint-Gaudens NHS (NH)  
 Santa Monica Mountains NRA (CA)  
 Sequoia and Kings Canyon NP (CA)  
 Shenandoah NP (VA)  
 Sitka NHP (AK)  
 Stones River NB (TN)  
 Sunset Crater NM (AZ)  
 Theodore Roosevelt NP (ND)  
 Tumacacori NHP (AZ)  
 Voyageurs NP (MN)  
 Walnut Canyon NM (AZ)  
 White Sands NM (NM)  
 Wupatki NM (AZ)  
 Yellowstone NP (WY, MT, ID)  
 Yosemite NP (CA)  
 Zion NP (UT)

**List of Parks Reporting Light Pollution as a Very Serious Resource Problem**

Chattahoochee River NRA (GA)  
 Chickamauga & Chattanooga NMP (GA, TN)  
 Colorado NM (CO)  
 Jean Lafitte NHP & Pres (LA)  
 Lake Mead NRA (AZ, NV)  
 Organ Pipe Cactus NM (AZ)  
 Rock Creek Park (WASH., DC)  
 Santa Monica Mountains NRA (CA)

**List of Parks Reporting Light Pollution as a Moderately Serious Resource Problem**

Assateague Island NS (VA)  
 Bandelier NM (NM)  
 Carlsbad Caverns NP (NM)  
 Cuyahoga Valley NRA (OH)  
 Death Valley NP (CA)  
 Effigy Mounds NM (IA)  
 Everglades NP (FL)  
 Fort Point NHS (CA)  
 Glen Canyon NRA (UT)  
 Golden Gate NRA (CA)  
 Gulf Islands NS (FL, MS)  
 Muir Woods NM (CA)  
 Natchez Trace NST (AL, MS)  
 Pinnacles NM (CA)  
 Rocky Mountain NP (CO)  
 Saguaro NP (AZ)  
 Saint-Gaudens NHS (NH)  
 Stones River NB (TN)  
 Yellowstone NP (WY, MT, ID)  
 Yosemite NP (CA)

**List of Parks Reporting Light Pollution as a Slightly Serious Resource Problem**

Arches NP (UT)  
 Badlands NP (SD)  
 Black Canyon of the Gunnison NM (CO)  
 Canyonlands NP (UT)  
 Cape Cod NS (MA)  
 Catoctin Mtn. Park (MD)  
 Crater Lake NP (OR)  
 Devils Tower NM (WY)  
 Isle Royale NP (MI)  
 Joshua Tree NP (CA)  
 Lake Roosevelt NRA (formerly Coulee Dam NRA) (WA)  
 Lava Beds NM (CA)  
 Mammoth Cave NP (KY)  
 Mesa Verde NP (CO)  
 Mojave NPres (CA)  
 Natural Bridges NM (UT)  
 Point Reyes NS (CA)  
 Prince William Forest Park (VA)  
 Saint Croix NSR (WI, MN)  
 Sequoia and Kings Canyon NP (CA)  
 Shenandoah NP (VA)  
 Sunset Crater NM (AZ)  
 Theodore Roosevelt NP (ND)  
 Walnut Canyon NM (AZ)  
 White Sands NM (NM)  
 Wupatki NM (AZ)

**List of Parks Reporting Light Pollution as a Minimal Resource Problem**

Acadia NP (ME)  
 Appalachian National Scenic Trail (NY, ME, NJ, VA, NC, GA, CT, NH, TN)  
 Big Bend NP (TX)  
 Bryce Canyon NP (UT)  
 Capulin Volcano NM (NM)  
 Chamizal NMem (TX)  
 Chiricahua NM (AZ)  
 Crater Lake NP (OR)  
 Curecanti NRA (CO)  
 Devils Tower NM (WY)  
 El Malpais NM (NM)  
 Grand Canyon NP (AZ)  
 Hawaii Volcanoes NP (HA)  
 Lyndon B. Johnson NHP (TX)  
 Natchez Trace Parkway (TN, AL, MS)  
 Olympic NP (WA)  
 Petrified Forest NP (AZ)  
 Pictured Rocks NL (MI)  
 Tumacacori NHP (AZ)  
 Voyageurs NP (MN)  
 Zion NP (UT)

**List of Parks that Reported Presence of Night Sky Ordinances in Nearby Cities/Communities**

Fort Sumter NM (SC)  
 Gulf Islands NS (FL, MS)  
 Everglades NP (FL)  
 Wupatki, Sunset Crater, and Walnut Canyon NM (AZ)  
*Flagstaff, AZ*  
 Saguaro NP (AZ)  
*Tucson, AZ*  
 Zion NP (UT)  
*Springdale, UT*  
 Southeast Utah Group (Arches NP (UT), Canyonlands NP (UT), Natural Bridges NM (UT), & Hovenweep NM (CO)  
*Grand County, UT (in its draft land use code).*  
 White Sands NM (NM)  
*Almagordo, NM*  
 Bandelier NM (NM)  
*Santa Fe is currently developing one.*  
 Fort Davis NHS (TX)  
*Jeff Davis County*  
 Pinnacles NM (CA)  
*San Jose, CA*  
 Joshua Tree NP (CA)  
*Twentynine Palms and Yucca Valley.*

## Appendix 4

### List of Parks that Reported Dark Night Skies as an Important Resource

Acadia NP (ME)  
 Amistad NRA (TX)  
 Apostle Islands NL (WI)  
 Appalachian National Scenic Trail (NY, ME, NJ, VA, NC, GA, CT, NH, TN)  
 Arches NP (UT)  
 Assateague Island NS (VA)  
 Badlands NP (SD)  
 Bandelier NM (NM)  
 Bent's Old Fort NHS (CO)  
 Big Bend NP (TX)  
 Big Cypress NPres (FL)  
 Big South Fork NRA (KY)  
 Black Canyon of the Gunnison NM (CO)  
 Bryce Canyon NP (UT)  
 Canaveral NS (FL)  
 Canyon de Chelly NM (AZ)  
 Canyonlands NP (UT)  
 Cape Cod NS (MA)  
 Capitol Reef NP (UT)  
 Capulin Volcano NM (NM)  
 Carlsbad Caverns NP (NM)  
 Catoctin Mtn. Park (MD)  
 Chaco Culture NHP (NM)  
 Channel Islands NP (CA)  
 Chattahoochee River NRA (GA)  
 Chickamauga & Chattanooga NMP (GA, TN)  
 Chiricahua NM (AZ)  
 Colorado NM (CO)  
 Congaree Swamp NM (SC)  
 Coronado NMem (AZ)  
 Crater Lake NP (OR)  
 Craters of the Moon NM (ID)  
 Cumberland Gap NHP (VA, KY, TN)  
 Curecanti NRA (CO)  
 Cuyahoga Valley NRA (OH)  
 Death Valley NP (CA)  
 Delaware Water Gap NRA (NJ, PA)  
 Denali NP & NPres (AK)  
 Devils Tower NM (WY)  
 Dinosaur NM (CO, UT)  
 Dry Tortugas NP (FL)  
 Effigy Mounds NM (IA)  
 El Malpais NM (NM)  
 Everglades NP (FL)  
 Fire Island NS (NY)  
 Florissant Fossil Beds NM (CO)  
 Fort Point NHS (CA)  
 Fort Raleigh NHS (NC)  
 Fort Union Trading Post NHS (ND)  
 Gateway NRA (NJ, NY)  
 George Washington Birthplace NM (VA)  
 Glacier NP (MT)

Glen Canyon NRA (UT)  
 Golden Gate NRA (CA)  
 Grand Canyon NP (AZ)  
 Great Sand Dunes NM (CO)  
 Great Smoky Mountains NP (NC, TN)  
 Guadalupe Mountains NP (TX)  
 Gulf Islands NS (FL, MS)  
 Haleakala NP (HA)  
 Hawaii Volcanoes NP (HA)  
 Homestead National Monument of America (NE)  
 Hot Springs NP (AR)  
 Hovenweep NM (CO, UT)  
 Hubbell Trading Post NHS (AZ)  
 Isle Royale NP (MI)  
 Joshua Tree NP (CA)  
 Kenai Fjords NP (AK)  
 Lake Mead NRA (AZ, NV)  
 Lake Roosevelt NRA (formerly Coulee Dam NRA) (WA)  
 Lassen Volcanic NP (CA)  
 Lava Beds NM (CA)  
 Lyndon B. Johnson NHP (TX)  
 Mammoth Cave NP (KY)  
 Mesa Verde NP (CO)  
 Missouri NRR (NE)  
 Mojave NPres (CA)  
 Mount Rainier NP (WA)  
 Muir Woods NM (CA)  
 Natchez Trace NST (AL, MS)  
 Natchez Trace Parkway (TN, AL, MS)  
 National Capital Parks-East (WASH,DC)  
 Natural Bridges NM (UT)  
 Navajo NM (AZ)  
 Niobrara NSR (NE)  
 North Cascades NP (WA)  
 Obed Wild and Scenic River (TN)  
 Olympic NP (WA)  
 Organ Pipe Cactus NM (AZ)  
 Padre Island NS (TX)  
 Petrified Forest NP (AZ)  
 Pictured Rocks NL (MI)  
 Pinnacles NM (CA)  
 Point Reyes NS (CA)  
 Prince William Forest Park (VA)  
 Redwood NP (CA)  
 Rock Creek Park (WASH., DC)  
 Rocky Mountain NP (CO)  
 Ross Lake NRA (WA)  
 Saguaro NP (AZ)  
 Saint Croix NSR (WI, MN)  
 Saint-Gaudens NHS (NH)  
 Salinas Pueblo Missions NM (NM)  
 Santa Monica Mountains NRA (CA)  
 Sequoia and Kings Canyon NP (CA)  
 Shenandoah NP (VA)  
 Sitka NHP (AK)

Sleeping Bear Dunes NL (MI)  
 Stones River NB (TN)  
 Sunset Crater NM (AZ)  
 Theodore Roosevelt NP (ND)  
 Thomas Stone NHS (MD)  
 Tumacacori NHP (AZ)  
 Virgin Islands NP (US V.I.)  
 Voyageurs NP (MN)  
 Walnut Canyon NM (AZ)  
 White Sands NM (NM)  
 Wilson's Creek NB (MO)  
 Wupatki NM (AZ)  
 Yellowstone NP (WY, MT, ID)  
 Yosemite NP (CA)  
 Zion NP (UT)

### List of Parks that Reported Light Pollution as a Resource Problem

Acadia NP (ME)  
 Appalachian National Scenic Trail (NY, ME, NJ, VA, NC, GA, CT, NH, TN)  
 Arches NP (UT)  
 Assateague Island NS (VA)  
 Badlands NP (SD)  
 Bandelier NM (NM)  
 Big Bend NP (TX)  
 Biscayne NP (FL)  
 Black Canyon of the Gunnison NM (CO)  
 Bryce Canyon NP (UT)  
 Canyonlands NP (UT)  
 Cape Cod NS (MA)  
 Capulin Volcano NM (NM)  
 Carlsbad Caverns NP (NM)  
 Catoctin Mtn. Park (MD)  
 Chattahoochee River NRA (GA)  
 Chickamauga & Chattanooga NMP (GA, TN)  
 Chiricahua NM (AZ)  
 Colorado NM (CO)  
 Crater Lake NP (OR)  
 Craters of the Moon NM (ID)  
 Curecanti NRA (CO)  
 Cuyahoga Valley NRA (OH)  
 Death Valley NP (CA)  
 Devils Tower NM (WY)  
 Dinosaur NM (CO, UT)  
 Dry Tortugas NP (FL)  
 Effigy Mounds NM (IA)  
 El Malpais NM (NM)  
 Everglades NP (FL)  
 Fort Point NHS (CA)  
 Gateway NRA (NJ, NY)  
 Glen Canyon NRA (UT)  
 Golden Gate NRA (CA)  
 Grand Canyon NP (AZ)  
 Great Sand Dunes NM (CO)  
 Gulf Islands NS (FL, MS)