

INTRODUCTION

The National Forests: America's Great Outdoors. This slogan has been used in recent years to describe America's national forests. The National Forest System, made up of more than 150 land units from Alaska to Puerto Rico, encompasses an area the size of California, Oregon, and Washington combined. The National Forest System is managed by the Forest Service, a Federal agency within the U.S. Department of Agriculture. The Forest Service has more than 35,000 employees committed to efficient multiple-use management that is responsive to the citizens' needs and desires while ensuring that healthy forests and grasslands reflect a strong land ethic and scientific management.

Since its inception in 1906, the Forest Service has been widely accepted as a conservation leader, first in the United States and more recently in the world. One element of this leadership is in the use of alternative energy. In response to Executive Order 12759, Federal Energy Management, and Executive Order 12902, Energy Efficiency and Water Conservation at Federal Facilities, the ongoing Forest Service Energy Conservation Program is a major focal point of the Forest Service's efforts to conserve energy in its operation of facilities and equipment. Accordingly, the Program's directive states, "managers at all levels must seek to improve operations to reduce energy use, and strive to emphasize the use of renewable sources of energy."

Many of the facilities within the national forests are remote and inaccessible to the electrical grid power sources. Traditionally, engine generators using fossil fuels have been a source of remote power. More recently, however, renewable sources of energy are being pursued, particularly photovoltaic power, as a part of integrating more sustainable design into the network. Several national forest units have implemented successful projects while working closely with the Photovoltaic Systems Assistance Center (PVSAC) at the U.S. Department of Energy's Sandia National Laboratories in Albuquerque, New Mexico. In addition, many Forest Service units have worked independently on a variety of photovoltaic power applications. Others have considered photovoltaics as an alternative energy source, but have not implemented photovoltaics due to barriers, such as lack of familiarity, technical expertise, or funding.

The Forest Service, through Tonto National Forest and the PVSAC, entered into a partnership agreement, *Renew the Forests*, in the fall of 1994 to identify current applications and increase the use of photovoltaics in our forests. The first phase of this partnership was to survey the national forests, laboratories, and research stations with the following objectives:

- Identify and characterize existing photovoltaic system applications.
- Determine acceptance of existing applications and barriers to expanded use.
- Identify potential applications.

The current report summarizes results of this first phase. Tonto National Forest represented the Forest Service because of the direct engineering experience of its staff and because of its interest in and positive experiences with photovoltaics and other

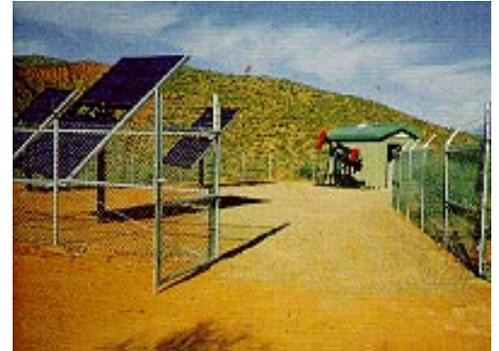
renewable-energy technologies. The second phase of the partnership is to identify a variety of pilot projects that represent sound technical and economical options, and are diverse in both application and geographic location. A separate report on these projects will be forthcoming. The PVDAC and Tonto National Forest anticipate that these projects will promote appropriate application of photovoltaics and will develop enhanced in-house capabilities within the Forest Service.

PHASE I: PROCEDURE AND METHODOLOGY

In February 1994, the National Park Service issued a survey questionnaire to all field units concerning the use of photovoltaics and other sustainable energy practices. In conformance with a partnership agreement with the PVDAC, this questionnaire became the basis for a published report, *Renew the Parks – Renewable Energy in the National Park Service* (February 1995). The Forest Service initiated a similar survey questionnaire to all field units in December 1994, requesting replies by the end of March 1995. Using the Park Service effort as a model, the Forest Service developed its own survey format and content. The Forest Service survey focused exclusively on photovoltaics. Upon review and approval of the survey form by the PVSAC, a cover letter was drafted and both were transmitted to the Forest Service Washington Office for review, signature and distribution to all field units. Under the signature of Sterling J. Wilcox, Acting Associate Deputy Chief of the National Forest System at that time, the survey was transmitted to all national forests, laboratories and research stations.

RESPONSE RATE NEARLY 70 PERCENT

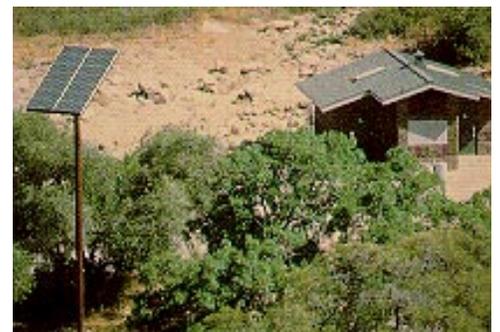
One hundred and one forests and two research stations responded to the survey request (a 68 percent total response rate). Thirty-two forests (32 percent) states they had no existing photovoltaic installations and did not complete the survey. The nearly 70 percent response rate required telephone and electronic mail follow-up and a longer response time than initially planned. The work needed to get a high response rate provided a good deal of additional information about communication and infrastructure within the Forest Service.



TONTO NATIONAL FOREST, ARIZONA

Tonto Basin Ranger District Cholla Campground

*2800-watt array, 5-hp jackpump.
15,000 gallons per day from 280 feet of
head provides water for a 300-unit
campground.*



CORONADO NATIONAL FOREST, ARIZONA

Santa Catalina Ranger District, Lower Bear Campground

Used to provide for composting toilet system.

IDENTIFICATION OF BENEFITS

First, the original transmittal letters were addressed to forest supervisors and station directors, not to individuals acquainted with each forest's facilities. This delayed completion of the survey in many cases. Direct mailing to appropriate individuals would have been more effective, but there was no way to identify these individuals prior to the survey. Second, unfamiliarity with available photovoltaic technology at many of the forest units led to a reprioritization of the survey. This is not uncommon: it affected the similar *Renew the Parks* effort by PVDAC and National Park Service. Finally, because of the turbulent times of downsizing and reinvention, many Forest Service employees were adjusting to new responsibilities and priorities, and experience common to most Federal agencies and private companies.

CHARACTERIZATION OF EXISTING PHOTOVOLTAIC SYSTEMS

APPLICATION AND ACCEPTANCE

More than 500 systems were identified in the survey response. Out of necessity, radio communications used extensively throughout the Forest Service are often needed to cover remote mountainous terrain. Consequently, communication transmission and repeater sites are the most common remote power need and frequently feature application of photovoltaics, with more than 300 sites identified in the survey, representing more than 60 percent of the reported photovoltaic installations. It can be assumed that many, if not most, of the forests that did not respond to the survey utilize this application as well. As shown in Figure 1, lighting, remote monitoring, restroom power and water pumping applications occur with similar frequency, each representing three to nine percent of the total response. Remote facility power represents a scant one percent. Other applications (ten percent) include lake aeration, water disinfecting, host site power generators, electric fences for cattle and wildlife management, mobile-trailer-mounted generators, ventilation systems and battery rechargers.

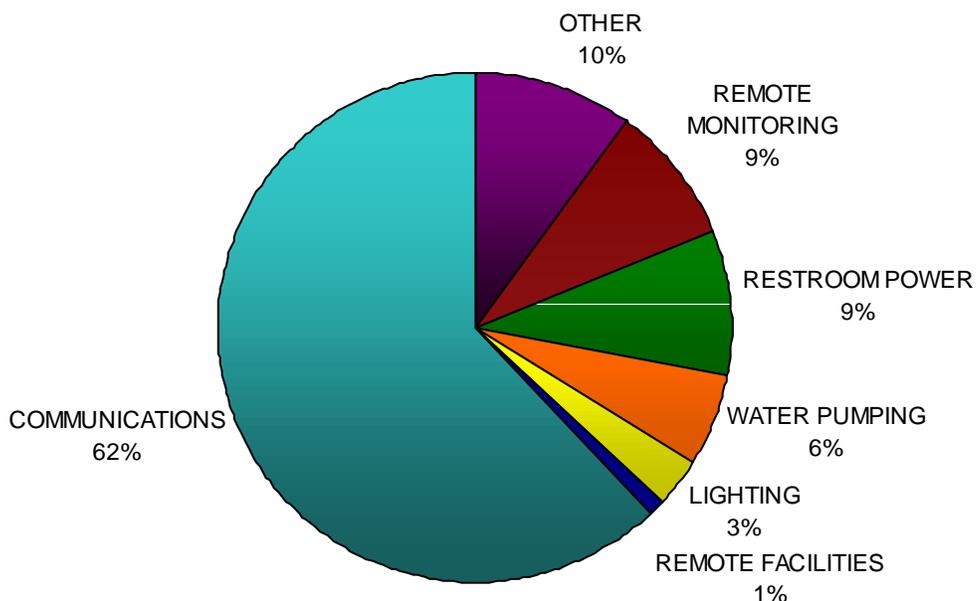


Figure 1. Existing systems - applications

SYSTEM CHARACTERIZATION

Each forest/station was asked to provide a variety of information on its existing systems (Figure 2). Ninety-eight percent of the systems were cost-effective, important data for establishing confidence in potential users. Most of these systems were installed in the past 5 years, coinciding with improved performance and decreased cost of photovoltaic hardware during this period. It is also encouraging that more than 15 percent of the existing systems have been in service for 10 years or more. The survey indicated that approximately 50 percent of the systems are operated year round. This coincides with the number of systems reported as communication applications, which are typically in service year round.

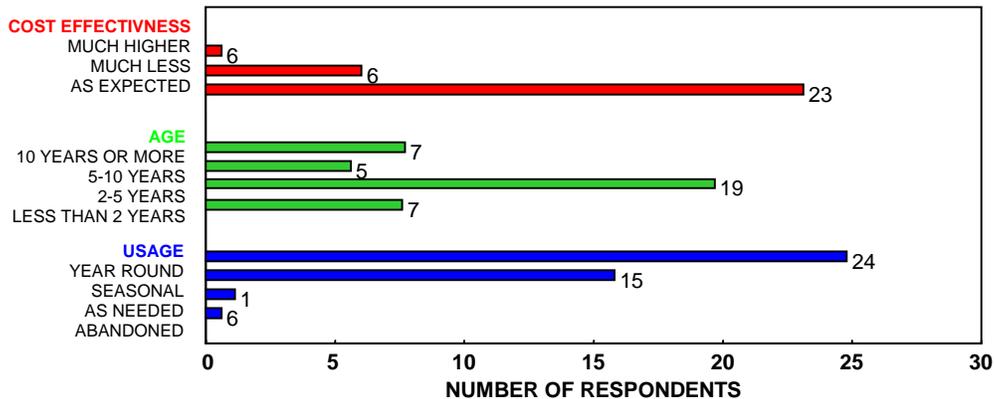


Figure 2. Characterization of systems

EVALUATION OF COMPONENTS: SYSTEM SATISFACTION

System components including photovoltaic modules (panels), controllers, trackers and batteries were evaluated on a scale relative to user satisfaction. The survey indicates that overall system satisfaction is greater than 98 percent (Figure 3). Approximately two-thirds of the system components were rated as better than satisfactory. This acceptance record lends strong support to continued and expanded use of photovoltaics. Responses indicating unsatisfactory systems (2 percent of the total) focused on modules and batteries. Further analysis shows that the main concern with modules was theft or vandalism and not component failure. Theft and vandalism will continue to be associated with photovoltaic components, particularly with unprotected modules and batteries. Proper siting and security measures, such as security fencing and vandal-resistant hardware, are responsible for the low overall frequency of vandalism and should be used in future projects. This low number of problems is important to potential users, because theft and vandalism are perceived by many with no experience with photovoltaics as major deterrents or barriers to their use.

With regard to battery performance and technology, several factors emerge from the survey. Accurate load calculations, which are critical for adequate system sizing, appear to be the weak link in the few deficient systems identified. Electrical loads are often estimated when detailed information is not readily available. Power requirements and

duty cycles for equipment, fixtures, and so forth, must be obtained to achieve an accurate design. In addition, other factors, such as insulation data, seasonal load variations, system autonomy, battery depth of discharge, temperature, and charge efficiency are often inadequately addressed. However, as the photovoltaic industry and technology have progressed, so has design expertise. System design software that takes these factors into account has been developed, and it can accurately evaluate battery and other component operations, providing a reliable estimate of system performance when realistic load information is available.

EVALUATION OF COMPONENTS: SYSTEM DAMAGE

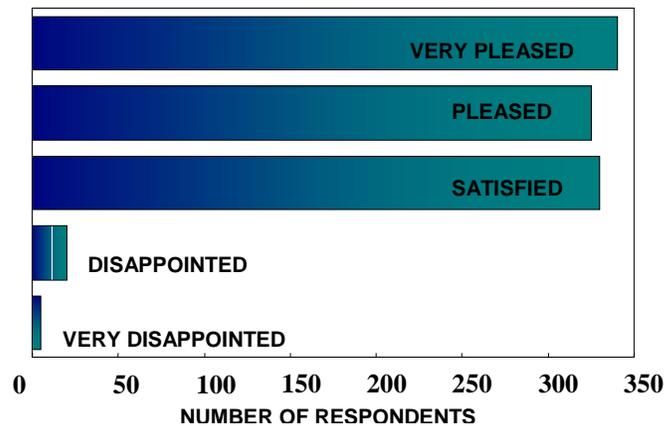


Figure 3. Overall satisfaction with photovoltaic systems

Very few respondents reported significant damage to their systems. As noted in Figure 4, weather appears to be the greatest source of damage. This is particularly true of communication sites, which are typically on mountaintops where snowloads, freezing temperatures, wind, and lightning are major concerns. Most damage can be prevented through proper design. Array supports and inclination, component insulation and heating, and proper grounding are all system elements that, when adequately designed, minimize weather-caused damage.

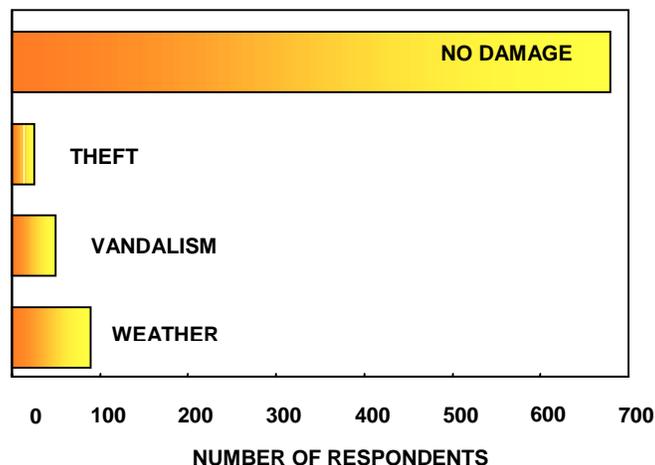


Figure 4. Overall system damage

BARRIERS TO EXPANDED APPLICATION

Initial cost was mentioned most often by survey respondents as a barrier to expanded use of photovoltaics. Further analysis of responses revealed that lack of familiarity by both designers and operating personnel, together with uncertain performance, were often mentioned as problems. A general lack of knowledge and awareness of current photovoltaic technology, including its cost-effectiveness and reliability, has fostered its poor reputation with many Forest Service technical and maintenance personnel. The cost of photovoltaics per watt-hour of energy produced has dramatically decreased over the last several years due to more efficient, reliable hardware and greater industry competition. Proper economic evaluation, such as life-cycle cost analysis, will often favor the photovoltaic option. With increasing cost-share and partnership opportunities, initial cost should diminish as a major barrier to photovoltaic installations. It is hoped that the partnership between the Forest Service and PVDAC will enlighten Forest Service personnel about successful applications of photovoltaic technology and help dismiss misperceptions that deter its expanded use.

Other barriers to expanded use were concerned with vandalism and theft, heavy shade canopy, lack of support at management levels, and availability of grid power. Photovoltaics is not the answer in every situation, and each factor noted in the survey must be addressed. Most obstacles, however, have been overcome at one time or another; and, as technology transfer through continued successful application is dispersed, these barriers should diminish.

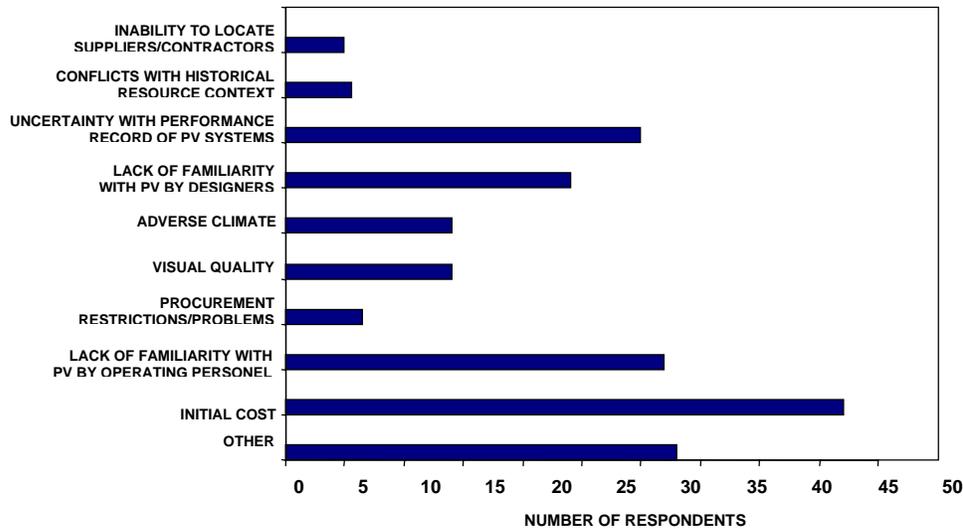


Figure 5. Barriers to the use of photovoltaics

PROPOSED PROJECTS

More than 200 potential photovoltaic applications were identified in the survey, based on existing power needs. This number could double or even triple as the remaining forests become more familiar with the technology's potential, including its reliability and sustainability. It is interesting to note that communication sites, where photovoltaics

have been most frequently applied (typically out of necessity), are not the most frequently proposed project sites. One reason may be that many of the communication sites requiring the technology already have it. As shown in Figure 6, Forest Service personnel appear to recognize a broader spectrum of applications; for example, 60 percent of the proposed projects are for remote facility power and water pumping. Figure 1 shows that, by contrast, existing installations with remote facilities and water pumping applications comprise only about 10 percent of the total response, whereas communications represent more than 60 percent. Considerable opportunity still exists for communications applications; however, the survey response reflects increased consideration for recreation and lighting applications, as well.

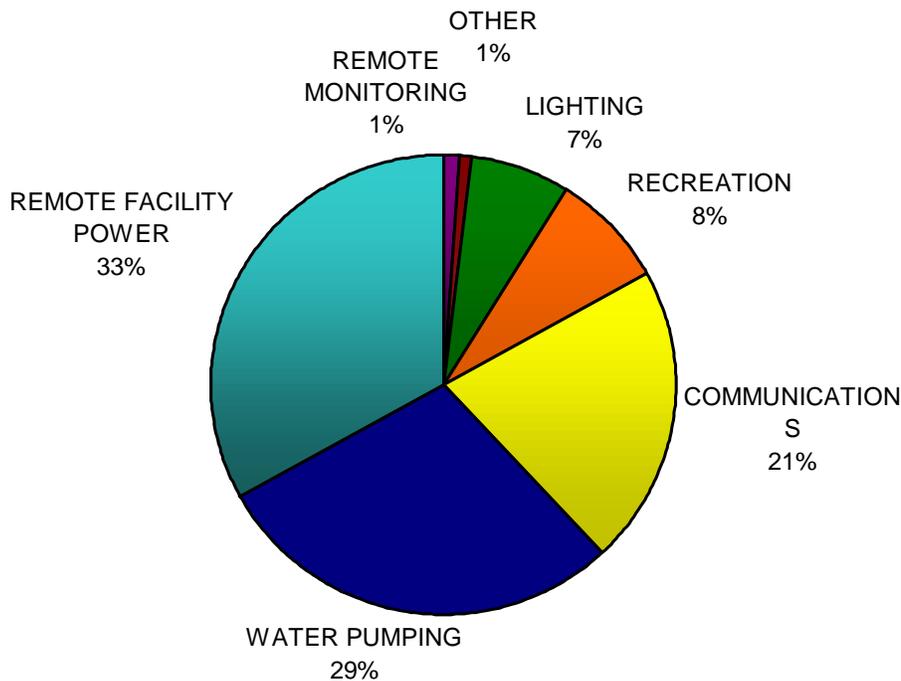


Figure 6: Proposed systems - applications

PARTNERSHIPS AND FUNDING

There is no lack in the availability of technical assistance in planning and implementing photovoltaic projects. Partnerships in funding are also available, often providing a win-win project for all. Many opportunities exist to form partnerships with various Government agencies and departments, national laboratories, utility companies, and private and public associations (especially those involved in environmental preservation), and with the photovoltaics industry. Reduced- or no-cost or cost-share assistance can come in the form of feasibility studies, design, contract preparation, project funding, pilot programs, system monitoring, interpretive efforts, and so forth. The Energy Policy Act of 1992 and Executive Order 12902, Energy Efficiency and Water Conservation at Federal Facilities (Federal Register, March 10, 1994), are catalysts for greater

cooperation among agencies and departments. The Department of Energy was directed by Executive Order 12902 to develop a plan for increasing “the use of solar and other renewable energy sources” and to “develop a model set of recommendations to assist agencies in eliminating identified barriers” to implementation of the Act. The Order established several mechanisms by which partnerships among various organizations might be facilitated. One such opportunity may be “performance contracting,” through which initial capital outlay is offset by energy cost savings achieved through use of renewable energy systems. Some power utilities and private companies are offering “power purchase agreements,” through which only power is purchased by the user, and the renewable energy system hardware is owned, operated, and maintained by the supplier. This agreement provides dependable power at a guaranteed price.

The Tonto National Forest worked closely with the PVSAC to design and construct one of the largest stand-alone recreation sites in the country. The Cholla Recreation Site, a remote campground and boating site at Roosevelt Lake Recreation Area, was funded by the Bureau of Reclamation as an enhancement measure associated with the reconstruction of Roosevelt Dam. A currently proposed project on the Prescott National Forest may join the One Shot Antelope Foundation, Arizona Department of Game and Fish, Forest Service, PVSAC and local ranchers in a partnership to install a photovoltaic water system that will benefit cattle and wildlife, and improve range.

These are some resources that may be used in seeking partnerships:

- The Photovoltaic Systems Assistance Center at Sandia National Laboratories has provided outstanding technical and funding assistance to many Federal agencies on renewable energy projects. For additional information, contact Hal Post at (505) 844-2154 or Mike Thomas at (505) 844-1548.
- The Department of Energy’s Federal Energy Management Program can provide technical and project financing assistance to Federal agencies for cost-effective energy conservation, water conservation, and renewable energy projects.
- The Photovoltaic Services Network is an organization of over 40 members electric utilities that assists its members in the application and procurement of photovoltaic systems.
- The Western Area Power Administration is very interested in promoting the use of energy conservation and renewable energy to member utilities and their customers.
- The Utility Photovoltaic Group is a national organization that can provide a variety of assistance to accelerate the use of photovoltaic power by utilities.

IDENTIFICATION OF PILOT PROJECTS

The second phase of the partnership agreement with the PVSAC is to implement appropriate pilot projects. We identify these planned projects here to indicate how the

technology can meet the changing needs of the Forest Service and to show their types and sizes, and the rationale behind them.

A call for projects was extended to those forests that responded to the survey through Forest Service electronic mailing. Of the projects submitted, 13 were in 12 different forests. An effort was made to select projects that were diverse in both type of application and geographic location, and that would expand current types of applications. Project technical assistance will be

coordinated through the Tonto National Forest with PVSAC assistance, as required, to assure proper cost analysis, design, equipment selection, procurement, and installation.

The following are short synopses of each project selected with the preliminary cost estimate for each project. A separate report will document project implementation, including details of the design, specific hardware and sizing, and justification. This report should be ready for publication by the end of calendar year 1996.

PHASE II: PROJECT SYNOPSES

BIG PINE SIGHTLESS INTERPRETIVE TRIAL

Siskiyou National Forest – Oregon

Big Pine Trail is on the Galice Ranger District near Grants Pass, Oregon. It was designed and constructed in 1988 to be accessible to those with walking difficulties. In 1990, it was discovered that students from a school for the blind were regularly using the trail. A Forest Service employee would meet the bus, and lead children into Big Pine Campground, where the trail was located. Other methods were then sought to make the interpretation more self-guiding, and the Forest Service ultimately advertised in the local community paper for ideas. A local electronics storeowner contacted the Forest Service for more information on the site and came up with an idea that was eventually refined into the current project.

The project will place eight digital speech modules along an interpretive loop trail (one for each existing sign), enabling a sightless person to walk this trail and benefit from the interpretation along the route. This project will provide a deep-woods experience for blind visitors. The local phone company is also a partner in this effort.

Total Estimated Cost of Project: \$10,250

PINE GLEN CAMPGROUND WATER SYSTEM

Talladega National Forest – Alabama



FLATHEAD NATIONAL FOREST,
MONTANA

Spotted Bear Ranger District, Stone Hill Communications Site

*200-watt array, 12-volt/24-volt
microwave system, propane generator
backup.*

*Used to provide radio and
telecommunications to remote districts.*

Pine Glen Campground is located on the Shoal Creek Ranger District within a 2-hour drive of Atlanta, Georgia, site of the 1996 Summer Olympics. Due to the expected shortage of accommodations in the Atlanta area during the Olympics, the Regional Office expects Talladega National Forest to receive a large number of campers. Pine Glen presently has 32 campsites, and could expand up to 60 campsites. The campground and a small day use area can currently accommodate up to 150 people at one time. The campground is open year round to accommodate summer use and the fall/winter/spring hunting seasons.

The campground is located approximately 15 miles from electrical service, which makes photovoltaics an ideal power option. In 1992, a photovoltaic powered water pumping system was installed to provide water to the campground. Except for several weeks of rainy weather at different times of the year, the system functioned very well. To the dismay of the district, all panels and controls were stolen in December 1994. A new photovoltaic water system design has been completed, allowing for new restroom construction, campground expansion, additional water storage, and stronger security measures.

Total Estimated Cost of Project: \$25,000

BENCHMARK CABIN REMOTE FACILITY POWER

Lewis and Clark National Forest – Montana

Benchmark Cabin is located on the Rocky Mountain Ranger District in the South Fork Sun River drainage, near the confluence of Straight Creek and South Fork Sun River at an altitude of approximately 5,200 feet. The surrounding mountain peaks are 8,000 feet high, and the valley where the log cabin is situated is approximately one-quarter mile wide. The cabin is accessible by Forest Service road, but no utilities are available. Propane lights have been installed, but have been identified as a safety hazard. The log cabin was constructed in the 1930's by the Civilian Conservation Corps (CCC). The cabin is in constant use for 7 months of the year by employees of the Forest Service as well as other government agencies.

The project will supply power for a water pump, a VHF radio and electric lights. The photovoltaic equipment will improve safety, health, and communication at a cabin located 32 miles from its nearest neighbor.

Total Estimated Cost of Project: \$16,400

WILSON FLOWAGE LAKE AERATION, CONVERSION FROM DIESEL TO PHOTOVOLTAICS

RILEY CREEK WORK STATION, REMOTE FACILITY POWER

Chequamegon National Forest – Wisconsin

The Chequamegon National Forest is south of Lake Superior in north-central Wisconsin. The region has a natural history of glacier activity resulting in numerous lakes, rivers, and moraines on the forest. Remnants of the ancient Geogebic Iron Range now offer beautiful vistas and hiking trails.

Wilson Flowage is a 150 acre reservoir that the Forest Service purchased about 8 years ago. The reservoir is 8 feet deep at most; much of it is no more than 3 to 4 feet deep, with a very low water exchange rate. These two factors have led to fish dieoff in winter, when the thick ice coverage results in freezeout and low oxygen content. A diesel-powered aerator was installed 5 years ago, greatly improving fish survival. In fact, the lake is now managed for trophy fish. The Forest Service manages the surrounding area as non-motorized and is moving to semiprimitive management. The existing diesel-powered aerator is not compatible with this management objective because of high noise levels. In addition, there is a significant environmental concern with potential for a spill of diesel fuel in this wetland area. The aerator also requires twice-weekly maintenance, which is expensive because of its remote location. The proposed photovoltaic unit will require no supplemental power, reduce noise, and minimize maintenance costs.



**CHEQUAMEGON NATIONAL FOREST,
WISCONSIN**

Lake Three, Fisheries Project

Lake aeration pump.

The Riley Creek Work Station, a 1930's vintage CCC building in a remote section of the forest, is one of many that were operated on the forest during the Great Depression. The station is used for supply storage and as a workshop. Currently, a gasoline-powered generator is used. The photovoltaic system will eliminate use of the generator and improve safety to employees by providing adequate lighting. The site will be utilized year round.

Total Estimated Cost of Projects: \$39,000

KRASSEL WORK CENTER REMOTE FACILITY POWER

Payette National Forest – Idaho

Krassel Work Center is located on the South Fork of the Salmon River at an elevation of 3,900 feet. Two structures were originally built on the site in the late 1930's. In the 1970's, eight structures were added and the site was made a helibase. Krassel also has a fixed-wing landing strip. Twelve people are currently stationed at Krassel. Occupied from May to September, the site is a base for a helitack crew, pilot, fuel truck driver, fire

management officer, dispersed recreation crew, and site building manager. In addition to seasonal use, the site houses transit personnel from the Payette Supervisor's Office and Krassel District Office.

Photovoltaic equipment is being installed to supply the helitack office/warehouse with ac power. The site currently has a propane generator. Photovoltaics will provide power for audio-visual equipment for training, small power tools, an office copier, lights, and communication equipment. Currently, workers are starting up a 25 kilowatt generator to run the copier or lights. It is hoped that generator use will be reduced to one day per week, primarily for laundry purposes.

Total Estimated Cost of Project: \$10,000

RAFT RIVER RIPARIAN IMPROVEMENT PROJECT

Sawtooth National Forest – Idaho/Utah

The project site is on the west end cattle allotment in the Raft River Mountains in the extreme northwest corner of Utah, in Box Elder County. The site is on a ridgetop in moderately steep-sloped country with pinon-juniper and mountain mahogany overstory and sagegrass understory. The allotment was first grazed by cattle and sheep belonging to early settlers. Sheep no longer graze on the allotment, which now supports approximately 2,790 head-months of grazing from June through September.



**SAWTOOTH NATIONAL FOREST,
IDAHO**

**Burley Ranger District,
Raft River Mountains**

1440-watt array, 1.5-hp triplex piston pump.

*Capacity is 7500 GPD at 335 ft of head.
Used by ranchers in pastures rotation as part of a range management project.*

Photovoltaic equipment will enable the Forest Service to install a water system that will supply water to both livestock and wildlife for considerable less installation and maintenance cost than conventional water systems for this location. Cattle that water on this system will have less reason to inhabit the riparian bottoms, reducing damage to these critical-habitat areas.

Total Estimated Cost of Project: \$9,500

MAMMOTH/GOOSEBERRY WATER SYSTEM

Manti-LaSal National Forest – Utah

The Mammoth Guard Station and Gooseberry Campground, located on the Price Ranger District, serve a dispersed recreation area on the Wasatch Plateau at over 9,000 feet elevation. Approximately 200 persons at one time are served by the campground during peak use periods in the spring, summer, and early fall.

The proposed photovoltaic water pumping system will replace an existing hydraulic ram pump that supplies water to fill a 19,000-gallon storage tank. Due to numerous mechanical failures with the hydraulic ram, the high cost of maintaining the ram and the importance of having a reliable potable water supply at this site, various water pumping alternatives were considered. A photovoltaic water pump was chosen for its lower life cycle cost, high available insolation, and adaptability to the existing water system, and to demonstrate the viability of solar water pumping as an alternative at other forest sites.

Total Estimated Cost of Project: \$16,000

COTTONWOOD PICNIC GROUND WATER SYSTEM

Cimarron National Grassland – Kansas

Cottonwood Picnic Ground is located 8 miles north of Elkhart, Kansas, in the southwest corner of the state. The site is predominantly used by Elkhart residents, travelers, and truckers. The geography consists of sandy, rolling hills with grasses, cactus, and other low-profile vegetation. Cottonwood trees provide a shaded environment for the picnic site on the bank of the Cimarron River. Although the river has no flowing water, the water table is generally very low. The area is generally arid, receiving approximately 10 inches of rain per year. The picnic ground was established by the local Lion's Club in the late 1950's, and stewardship of the land was given to the Forest Service in 1954.

The Forest Service has made significant upgrades to the site, adding restrooms, tables, boardwalks, playground equipment, and additional landscaping. However, the single most requested amenity has never been provided: potable drinking water. In conjunction with the Kansas State Department of Health and Environment, the Forest Service has decided to pursue a photovoltaic-powered water pump and chlorine disinfecting system, because electric power is not available at the site.

Total Estimated Cost of Project: \$21,000

RICHLAND CREEK CAMPGROUND WATER SYSTEM

Ozark/St. Francis National Forest – Arkansas

The project site is located just inside the boundary of the Richland Creek Wilderness Area at the junction of Richland Creek and Falling Water Creek. This is a high-use primitive area frequented by canoeists, hunters, and hikers on the Ozark Highlands Trail. The existing water source is a hand pump, which is now closed for use due to ongoing contamination of water samples. The new photovoltaic water system will allow for a constant water supply, with filtration and disinfecting to once again provide safe potable water.

Total Estimated Cost of Project: \$9,000

**RATTLESNAKE RECREATION SITE,
WATER PUMPING SYSTEM/RESTROOM POWER**

Tonto National Forest – Arizona

The Forest Service is developing recreational facilities at Rattlesnake Cove, located on the Cave Creek Ranger District at Bartlett Lake (on the Verde River), to address and correct management deficiencies due to overuse and changing use of existing facilities on this urban interface lake. The level of development will be raised substantially from semiprimitive motorized use to rural/urban. The forest plans to provide parking spaces and facilities for visitors, consistent with the developable land base, available shoreline, and envisioned recreational activities. Capacity will be increased from approximately 200 to more than 1000 persons at one time. Vault toilet buildings will be replaced with flush toilet facilities, showers, potable water hydrants, and remadas.



**TONTO NATIONAL FOREST,
ARIZONA**

**Cave Creek Ranger District,
Rattlesnake Cove Recreation Site**

*240-watt system powers restrooms lights,
fans, and motion sensors.*

Photovoltaics will supply power for a large jackpump providing up to 10,000 gallons of water per day, as well as area and restroom lighting. Grid power is several miles away, and forest policy would require the connection to be buried, making it extremely expensive. Photovoltaics was clearly the favored option.

Total Estimated Cost of Project: \$50,000

**SCHULMAN GROVE INTERPRETIVE SITE,
REMOTE FACILITY POWER**

Inyo National Forest – California

Schulman Grove is located in the Ancient Bristlecone Pine Forest of the White Mountains in east-central California. It is approximately 10 miles east of Bishop, at an altitude of 10,150 feet. Abundant sunlight is a dominant characteristic of the area. A 1,200 square foot log construction building is being built as an interpretive center. It will replace an aging travel trailer, which could accommodate six visitors at best. The site will operate from May through September.

The proposed log building features glazing, skylights, and a lightwell to provide ambient light to visitors and employees. The design feature is incorporated because the power grid is 2 miles away. Because of the pristine, tranquil nature of the area, noise associated with generator power is unacceptable. The area manager is requesting photovoltaic power to operate exit lights, a cash register, a cellular phone, and a radio and battery recharger.

Total Estimated Cost of Project: \$15,000

SUGGESTED REFERENCES

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Risser, V., **Working Safely With Photovoltaic Systems**, Photovoltaic Design Assistance Center, July 1991.

Holz, M., **Maintenance and Operation of Stand-Alone Photovoltaic Systems**, Naval Facilities Engineering Command, Southern Division; DoD Photovoltaic Review Committee; Photovoltaic Design Assistance Center; December 1991.

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Thomas, M., H. Post and A. VanArsdall, **Photovoltaics Now – Photovoltaic Systems for Government Agencies**, SAND88-3149, Sandia National Laboratories, Albuquerque, New Mexico, November 1995.

Renew the Parks – Renewable Energy in the National Park Service: Photovoltaic Systems, U. S. Department of Interior, National Park Service, Denver Service Center; Photovoltaic Design Assistance Center; February 1995.

Directory of the U.S. Photovoltaics Industry, Solar Energy Industries Association, March 1996.

To order these documents, please contact the Photovoltaic Systems Assistance Center:

E-MAIL: pvsac@sandia.gov
PHONE: 505-844-3698
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APPENDIX A – EXISTING PHOTOVOLTAIC SYSTEMS

EXISTING PHOTOVOLTAIC SYSTEMS

5-Feb-96					
REGION	FOREST	STATE	LOCATION	TYPE OF SYSTEM	MET OBJECTIVES
1	CLEARWATER	ID	NORTH FORK RD - OSIER RIDGE	COMMUNICATIONS	YES
1	CLEARWATER	ID	POWELL RD - JAY POINT	COMMUNICATIONS	YES
1	CLEARWATER	ID	NORTH FORD RD - KELLY CREEK	COMMUNICATIONS	YES
1	CLEARWATER	ID	POWELL RD - BEAVER RIDGE	COMMUNICATIONS	YES
1	CLEARWATER	ID	LOCHSA RD - WALDE MOUNTAIN	COMMUNICATIONS	YES
1	CLEARWATER	ID	POWELL RD - ROCKY POINT	COMMUNICATIONS	YES
1	CLEARWATER	ID	LOCHSA RD - CASTLE BUTTE	COMMUNICATIONS	YES
1	CLEARWATER	ID	POWELL RD - DIABLO MOUNTAIN	COMMUNICATIONS	YES
1	CLEARWATER	ID	PIERCE RD - HEMLOCK BUTTE	COMMUNICATIONS	YES
1	CLEARWATER	ID	NORTH FORK - BALD MOUNTAIN	COMMUNICATIONS	YES
1	CLEARWATER	ID	NORTH FORK RD - BLACK MOUNTAIN	COMMUNICATIONS	YES
1	CLEARWATER	ID	NORTH FORK RD - EAGLE POINT	COMMUNICATIONS	YES
1	CLEARWATER	ID	NORTHFORK RD - JUNCTION MOUTAIN	COMMUNICATIONS	YES
1	CLEARWATER	ID	POWELL RD - BEAR MOUNTAIN	COMMUNICATIONS	NO
1	CLEARWATER	ID	LOCHSA RD - COOLWATER MOUNTAIN	COMMUNICATIONS	YES
1	CLEARWATER	ID	POWELL RD - ROUNDTOP RAW S ST	REMOTE MONITORING	YES
1	CLEARWATER	ID	CLEARWATER SO -TWIN MICO RAW	REMOTE MONITORING	YES
1	CLEARWATER	ID	NORTH FORK - KELLY RAW S ST	REMOTE MONITORING	YES
1	CLEARWATER	ID	POWELL RD - POND RAW S STATION	REMOTE MONITORING	YES
1	CLEARWATER	ID	PALOUSE RD - PALOUSE RAW S STATION	REMOTE MONITORING	YES
1	CLEARWATER	ID	PALOUSE RD - SHOCK RAW S STATION	REMOTE MONITORING	YES
1	CLEARWATER	ID	CLEARWATER SO - BABY MICO RAW	REMOTE MONITORING	YES
1	CLEARWATER	ID	PIERCE RD - PIERCE RAW STATION	REMOTE MONITORING	YES
1	IDAHO PANHANDLE	ID	TRAIL CAMP	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	SIMMONS PK. COMM. SITE	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	SADDLE MTN. COMM. SITE	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	INDIAN MTN. COMM. SITE	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	MIDDLE SISTER L.O.COMM.SITE	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	HUCKLEBERRY L.O. COMM. SITE	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	DUNN PEAK L.O. COMM. SITE	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	EMERALD CK GARNET AREA	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	SNOW PEAK COMM. SITE	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	RED IVES WORK CENTER	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	LITTLE GUARD L.O. COMM.SITE	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	LUNCH PEAK LOOKOUT COMM. SITE	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	MAGEE WORK CENTER	COMMUNICATIONS	YES
1	IDAHO PANHANDLE	ID	SURVEYOR'S RIDGE COMM. SITE	COMMUNICATIONS	YES

1	IDAHO PANHANDLE	ID	MONUMENT MT. COMM. SITE	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D6 WILDERNESS STATION	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D1 SLATEPOINT L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D5 SHEEP HILL L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D5 SCHOONER L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D6 BAILEY LAKE COMM. SITE	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D4 PILOT KNOB L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D1 CHAIR POINT L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D7 FOG MTN. COMM. SITE	COMMUNICATIONS	NO
1	NEZ PERCE	ID	D5 SALMON MOUNTAIN L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D5 OREGON BUTTE L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D4 CORRAL HILL L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D5 HELL'S 1/2 ACRE L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D6 SCHLISSER L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D1 HEAVEN'S GATE L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D7 IRON MTN. COMM. SITE BLDG #2	COMMUNICATIONS	NO
1	NEZ PERCE	ID	D7 COOLWATER L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D6 GARDINER L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	D7 IRON MTN. COMM. SITE BLDG #1	COMMUNICATIONS	NO
1	NEZ PERCE	ID	D7 INDIAN HILL L.O.	COMMUNICATIONS	YES
1	NEZ PERCE	ID	HUNGRY RIDGE	ELECTRIC FENCE	YES
1	NEZ PERCE	ID	TAMARACK RIDGE	ELECTRIC FENCE	YES
1	NEZ PERCE	ID	D8 ELK CITY/MOOSE CREEK	ELECTRIC FENCE	YES
1	NEZ PERCE	ID	D6 WILDERNESS STATION	REMOTE MONITORING	YES
1	BEAVERHEAD	MT	MADISON RD/WADE LAKE CAMPGR	WATER PUMPING	YES
1	BITTERROOT	MT	WEST FORK/BARECONE	COMMUNICATIONS	YES
1	BITTERROOT	MT	WEST FORK/SPOT MT. LOOKOUT	COMMUNICATIONS	YES
1	BITTERROOT	MT	STEVENSVILLE/WILLOW MT. LOOKOUT	COMMUNICATIONS	YES
1	BITTERROOT	MT	DEER MT. COMMUNICATION SITE	COMMUNICATIONS	YES
1	BITTERROOT	MT	WEST FORK/PARADISE	COMMUNICATIONS	YES
1	BITTERROOT	MT	WEST FORK/MAGRUDER	COMMUNICATIONS	YES
1	BITTERROOT	MT	SULA/TE PEE PT. LOOKOUT	COMMUNICATIONS	YES
1	BITTERROOT	MT	WEST FORK/HELLS 1/2 ACRE LOOKOUT	COMMUNICATIONS	YES
1	BITTERROOT	MT	WEST FORK/LOOKOUT MT.	COMMUNICATIONS	YES
1	BITTERROOT	MT	WEST FORK/PARADISE LAUNCH SITE	REMOTE MONITORING	YES
1	KOOTENAI	MT	TONY PEAK	COMMUNICATIONS	YES
1	KOOTENAI	MT	THREE RIVERS D4	COMMUNICATIONS	YES
1	KOOTENAI	MT	CALX MTN.	COMMUNICATIONS	YES
1	KOOTENAI	MT	WEBB MTN.	COMMUNICATIONS	YES
1	KOOTENAI	MT	KELLER MTN.	COMMUNICATIONS	YES
1	KOOTENAI	MT	HENRY MTN.	COMMUNICATIONS	YES
1	KOOTENAI	MT	MOUNT MARSTON	COMMUNICATIONS	YES
1	KOOTENAI	MT	SQUAW PEAK	COMMUNICATIONS	YES

2	GR.MESA UNCOMPADRE G	CO	JUNCTION/COLLBRAN-DIVIDE FORK	RESTROOM POWER	YES
2	GR.MESA UNCOMPADRE G	CO	OURAY/YANKEE BOY BASIN	RESTROOM POWER	YES
2	PIKE SAN ISABEL	CO	SOUTH PLATTE RD/DEVILS HEAD	RESTROOM POWER	YES
2	PIKE SAN ISABEL	CO	SOUTH PLATTE RD/TWIN CONES	RESTROOM POWER	YES
2	PIKE SAN ISABEL	CO	CIMARRON NAT. GRASSLAND/ELK	WATER PUMPING	YES
2	PIKE SAN ISABEL	CO	CIMARRON NAT. GRASSLAND/ELK	WATER PUMPING	NO
2	PIKE SAN ISABEL	CO	SALIDA RD/COTTONWOOD PICNIC	WATER PUMPING	YES
2	NEBRASKA	NB	CHADRON, NE	OTHER	NO
2	MEDICINE BOW	WY	VARIOUS COMMUNICATION SITES	COMMUNICATIONS	YES
2	MEDICINE BOW	WY	HAHNS PEAK/LYNX LAGUNITA	RESTROOM POWER	YES
2	MEDICINE BOW	WY	LYNX PASS GUARD STATION	WATER PUMPING	YES
3	APACHE SITGRAVES	AZ	GENTRY L.O./HEBER RD	COMMUNICATIONS	YES
3	APACHE SITGRAVES	AZ	BIG LAKE L.O.SPRINGERVILLE RD	COMMUNICATIONS	YES
3	APACHE SITGRAVES	AZ	FENCE LAKE, N.M.	COMMUNICATIONS	YES
3	APACHE SITGRAVES	AZ	CHEVELON BUTTE/CHEVELON RD	COMMUNICATIONS	YES
3	APACHE SITGRAVES	AZ	ESCODINA L.O./ALPINE RD	COMMUNICATIONS	YES
3	APACHE SITGRAVES	AZ	DEER SRPINGS L.O./HEBER RD	COMMUNICATIONS	YES
3	APACHE SITGRAVES	AZ	ALPINE/BLUE VISTA	VENTILATION	YES
3	APACHE SITGRAVES	AZ	BLACK RIVER, EAST FORK	WATER PUMPING	YES
3	COCONINO	AZ	SCHNEBLY HILL REPEATER MORMON	COMMUNICATIONS	YES
3	COCONINO	AZ	HUTCH MTN REPEATER LONG VALL	COMMUNICATIONS	YES
3	COCONINO	AZ	BLUE RIDGE RESERVOIR BLUE RIDGE	RESTROOM POWER	YES
3	COCONINO	AZ	LOWER LAKE MARY PG MORMON LAKE	RESTROOM POWER	YES
3	COCONINO	AZ	LOCKETT MEADOW PEAKS RD	RESTROOM POWER	YES
3	COCONINO	AZ	MOQUI GROUP CAMP BLUE RIDGE	RESTROOM POWER	YES
3	COCONINO	AZ	LITTLE ELDEN SPR HORSE CAMP	RESTROOM POWER	YES
3	COCONINO	AZ	ASHURST LAKE CG MORMON LAKE	RESTROOM POWER	YES
3	CORONADO	AZ	SANTA CATALINA/MOLINO BASIN T	RESTROOM POWER	YES
3	CORONADO	AZ	SANTA CATALINA/LWR BEAR CNY T	RESTROOM POWER	YES
3	CORONADO	AZ	SANTA CATALINA/MDL BEAR CNY T	RESTROOM POWER	YES
3	CORONADO	AZ	DOUGLAS RD/E.COCHISE STRNGHL	RESTROOM POWER	YES
3	CORONADO	AZ	DOUGLAS RD/HORSESHOE CANYON	WATER PUMPING	YES
3	KIABAB	AZ	NO. KAIBAB RD/BIG RIDGE	COMMUNICATIONS	YES
3	KIABAB	AZ	NO. KAIBAB RD/SOUTH CANYON	COMMUNICATIONS	YES
3	KIABAB	AZ	NO. KAIBAB RD/CRAZY JUG	COMMUNICATIONS	NO
3	KIABAB	AZ	NO. KAIBAB RD/RED BUTTE L.O.	COMMUNICATIONS	YES
3	KIABAB	AZ	NO. KAIBAB RD/BUCK RIDGE	COMMUNICATIONS	YES
3	KIABAB	AZ	D2/DOGTOWN AMPHITHEATER	REMOTE FACILITY POWER	YES
3	KIABAB	AZ	D1 - WHITEHORSE LAKE CAMPGROUND	RESTROOM POWER	NO
3	KIABAB	AZ	D2/DOGTOWN AMPHITHEATER	RESTROOM POWER	YES
3	TONTO	AZ	PLEASANT VALLEY RD - AZTEC	COMMUNICATIONS	YES
3	TONTO	AZ	CAVE CREEK RD - NEW RIVER	COMMUNICATIONS	YES
3	TONTO	AZ	P.V. CROUCH MESA	COMMUNICATIONS	YES

3	TONTO	AZ	PLEASANT VALLEY RD - CROUCH MESA	COMMUNICATIONS	YES
3	TONTO	AZ	C.C. NEW RIVER	COMMUNICATIONS	YES
3	TONTO	AZ	P.V. AZTEC	COMMUNICATIONS	YES
3	TONTO	AZ	TONTO BASIN RD - CHOLLA CAMPGROUND	LIGHTING	YES
3	TONTO	AZ	TONTO BASIN RD - UPPER SALT	LIGHTING	YES
3	TONTO	AZ	TONTO BASIN RD - CHOLLA CAMPGROUND	REMOTE FACILITY POWER	YES
3	TONTO	AZ	TONTO BASIN RD - ROOSEVELT	REMOTE MONITORING	YES
3	TONTO	AZ	MESA RD - PALO VERDE	RESTROOM POWER	YES
3	TONTO	AZ	MESA RD - THE POINT	RESTROOM POWER	YES
3	TONTO	AZ	TONTO BASIN RD - CHOLLA CAMPGROUND	RESTROOM POWER	YES
3	TONTO	AZ	MESA RD - BAGLEY FLAT	RESTROOM POWER	YES
3	TONTO	AZ	TONTO BASIN RD - UPPER SALT	WATER DISINFECTION	YES
3	TONTO	AZ	TONTO BASIN RD - CHOLLA CAMPGROUND	WATER PUMPING	YES
3	TONTO	AZ	TONTO BASIN RD - CHOLLA CAMPGROUND	WATER PUMPING	YES
3	TONTO	AZ	TONTO BASIN RD - ASH CREEK	WATER PUMPING	YES
3	TONTO	AZ	PLEASANT VALLEY RD - ROSE SPRI	WATER PUMPING	YES
3	TONTO	AZ	CAVE CREEK RD - SYCAMORE CAN	WATER PUMPING	YES
3	TONTO	AZ	TONTO BASIN RD - PUNKIN CENTER	WATER PUMPING	YES
3	CARSON	NM	CAMINO REAL RD	RESTROOM POWER	NO
3	CARSON	NM	JICARILLA RD	WATER PUMPING	NO
3	CIBOLA	NM	MAGDALENA/GRASSY LOOKOUT	COMMUNICATIONS	YES
3	CIBOLA	NM	MAGDALENA/MT. WITHINGTON	COMMUNICATIONS	YES
3	CIBOLA	NM	SANDIA RD/CEDRO COMMUNICATIONS	COMMUNICATIONS	YES
3	CIBOLA	NM	SANDIA RD/COD LONG HOST SITE	HOST SITE POWER	YES
3	CIBOLA	NM	SANDIA RD/HOST SITE SYSTEMS	HOST SITE POWER	YES
3	CIBOLA	NM	SANDIA RD/ CEDRO CG LIGHTING	LIGHTING	YES
3	CIBOLA	NM	SANDIA RD/DOC LONG SECURITY LI	LIGHTING	YES
3	CIBOLA	NM	LAS HUERTAS PG	PICNIC GROUND POWER	YES
3	CIBOLA	NM	SANDIA RD/DOC LONG ROADSIDE	RESTROOM POWER	YES
3	CIBOLA	NM	SANDIA RD/DOC LONG 4 UNIT	RESTROOM POWER	YES
3	CIBOLA	NM	MT. TAYLOR/BLUEWATER TOILET	RESTROOM POWER	YES
3	CIBOLA	NM	SANDIA RD/CEDRO CG RESTROOM	RESTROOM POWER	YES
3	CIBOLA	NM	SANDIA RD/BALSAM GLADE	RESTROOM POWER	YES
3	CIBOLA	NM	SANDIA RD/DOC LONG	RESTROOM POWER	YES
3	CIBOLA	NM	SANDIA RD/BALSAM GLADE	RESTROOM POWER	YES
3	CIBOLA	NM	SANDIA RD/DOC LONG	WATER DISINFECTION	YES
4	BOISE	ID	SWANHOLM	COMMUNICATIONS	YES
4	BOISE	ID	D3 - SUNSET MOUNTAIN LOOKOUT	COMMUNICATIONS	NO
4	BOISE	ID	TRIPOD MOUNTAIN LOOKOUT	COMMUNICATIONS	YES
4	BOISE	ID	WHITEHAWK MOUNTAIN LOOKOUT	COMMUNICATIONS	YES
4	BOISE	ID	EAST MOUNTAIN LOOKOUT	COMMUNICATIONS	YES
4	BOISE	ID	BEAR VALLEY MOUNTAIN	COMMUNICATIONS	YES
4	BOISE	ID	D5 - JACKSON PEAK LOOKOUT	COMMUNICATIONS	YES

4	BOISE	ID	D1 - TRINITY MOUNAIN LOOKOUT	COMMUNICATIONS	YES
4	BOISE	ID	D4 - THUNDERBOLT MTN LOOKOUT	COMMUNICATIONS	YES
4	BOISE	ID	SOUTH FORK MICROWAVE	COMMUNICATIONS	YES
4	BOISE	ID	GRAPE MOUNTAIN	COMMUNICATIONS	YES
4	BOISE	ID	D5 - PILOT PEAK II	COMMUNICATIONS	NO
4	BOISE	ID	DOG MOUNAIN	COMMUNICATIONS	YES
4	BOISE	ID	ATLANTA GUARD STATION	COMMUNICATIONS	YES
4	BOISE	ID	GARDEN VALLEY GUARD STATION	COMMUNICATIONS	YES
4	BOISE	ID	D5 - PILOT PEAK	COMMUNICATIONS	YES
4	BOISE	ID	STOLLE MEADOWS GUARD STATION	COMMUNICATIONS	YES
4	BOISE	ID	THORN CREEK BUTTE LOOKOUT	COMMUNICATIONS	YES
4	BOISE	ID	D6 - HAWLEY MOUNTAIN LOOKOUT	COMMUNICATIONS	YES
4	CARIBOU	ID	SODA SPRINGS/CARIBOU MTN.	COMMUNICATIONS	YES
4	CARIBOU	ID	POCATELLO/SCOUT MTN.	COMMUNICATIONS	YES
4	CARIBOU	ID	MONTPELIER/MINNETONKA CAVE	COMMUNICATIONS	YES
4	CARIBOU	ID	MONTPELIER/CUB RIVER G.S.	COMMUNICATIONS	YES
4	CARIBOU	ID	POCATELLO/SCOUT MTN. G.S.	COMMUNICATIONS	YES
4	CARIBOU	ID	SODA SPRINGS/STEWART PEAK	COMMUNICATIONS	YES
4	CARIBOU	ID	POCATELLO/E. FORK OF MINK CK.	ELECTRIC FENCE	YES
4	CARIBOU	ID	SODA SPRINGS RD	ELECTRIC FENCE	YES
4	CARIBOU	ID	S.O. ROAD CREW/FOREST WIDE	MOBILE TRAILER	YES
4	CARIBOU	ID	POCATELLO/CHERRY SPRINGS	VENTILATION	YES
4	SALMON CHALLIS	ID	ULYSSES MOUNTAIN	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	FAIRVIEW GUARD STATION	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	BOUNDRY CREEK STATION	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	LITTLE CREEK	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	COPPER BASIN	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	LONG TOM LOOKOUT	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	STORMY PEAK LOOKOUT	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	FLAT TOP	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	STEIN MOUNTAIN	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	INDIANOLA GUARD STATION	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	LANTZ BAR	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	MIDDLE FOR PEAK	COMMUNICATIONS	NO
4	SALMON CHALLIS	ID	SHEEPHORN LOOKOUT	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	SALT CREEK	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	POTTAMAN PEAK	COMMUNICATIONS	NO
4	SALMON CHALLIS	ID	TWIN PEAK	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	INDIAN CREEK	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	WALKER RIDGE	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	BONANZA GUARD STATION	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	SUNSET PEAK	COMMUNICATIONS	YES
4	SALMON CHALLIS	ID	LOON CREEK	COMMUNICATIONS	YES

4	SALMON CHALLIS	ID	PINYON PEAK	COMMUNICATIONS	YES
4	SAWTOOTH	ID	SNRA/HORTON PK.	COMMUNICATIONS	YES
4	SAWTOOTH	ID	SNRA/SHEEP MOUNTAIN	COMMUNICATIONS	YES
4	SAWTOOTH	ID	FAIRFIELD DISTRICT/LICK CREEK	COMMUNICATIONS	YES
4	SAWTOOTH	ID	FAIRFIELD DISTRICT/STEEL MOUNTAIN	COMMUNICATIONS	YES
4	SAWTOOTH	ID	BURLEY/BLACK PINE PEAK	COMMUNICATIONS	YES
4	SAWTOOTH	ID	FAIRFIELD/DISTRICT/IRON MOUNTAIN	COMMUNICATIONS	YES
4	SAWTOOTH	ID	TWIN FALLS DISTRICT/MAGIC MTN	COMMUNICATIONS	YES
4	SAWTOOTH	ID	FAIRFIELD DISTRICT/BIG SMOKEY	COMMUNICATIONS	YES
4	SAWTOOTH	ID	SNRA/MT. ZUMWALT	COMMUNICATIONS	YES
4	SAWTOOTH	ID	SNRA/BASIN BUTTE	REMOTE MONITORING	NO
4	SAWTOOTH	ID	BURLEY/MOBERGE	REMOTE MONITORING	YES
4	SAWTOOTH	ID	BURLEY/MOBERGE	REMOTE MONITORING	YES
4	SAWTOOTH	ID	STANLEY/HORTON PEAK	REMOTE MONITORING	YES
4	TARCHEE	ID	TWINFALLS/TRAIL GULCH	WATER PUMPING	YES
4	TARCHEE	ID	BURLEY RANGER DISTRICT	COMMUNICATIONS	YES
4	TARCHEE	ID	DUBOISE RD - SIGNAL MOUNTAIN	COMMUNICATIONS	YES
4	TARCHEE	ID	PALISDE RD - BRADY MOUNTAIN	COMMUNICATIONS	YES
4	TARCHEE	ID	DUBOISE RD - MAHOGANY MOUNTAIN	COMMUNICATIONS	YES
4	TARCHEE	ID	PALISDE RD - RED MOUNTAIN	COMMUNICATIONS	YES
4	TARCHEE	ID	ASHTON RD - BISHOP MOUNTAIN	WATER PUMPING	YES
4	HUMBOLDT	NV	MTN. CITY RD	WATER PUMPING	YES
4	HUMBOLDT	NV	MTN. CITY RD	WATER PUMPING	YES
4	HUMBOLDT	NV	MTN. CITY RD	WATER PUMPING	YES
4	HUMBOLDT	NV	MTN. CITY RD	WATER PUMPING	YES
4	HUMBOLDT	NV	MTN. CITY RD	WATER PUMPING	YES
4	HUMBOLDT	NV	MTN. CITY RD	WATER PUMPING	YES
4	HUMBOLDT	NV	MTN. CITY RD	WATER PUMPING	YES
4	ASHLEY	UT	DRY RIDGE COM SITE	COMMUNICATIONS	YES
4	ASHLEY	UT	EAST PARK RIDGE	COMMUNICATIONS	YES
4	ASHLEY	UT	FLAMING GORGE	RESTROOM POWER	YES
4	ASHLEY	UT	GREEN RIVER TOILETS	RESTROOM POWER	YES
4	ASHLEY	UT	UPPER STILLWATER TOILET	RESTROOM POWER	YES
4	ASHLEY	UT	DUCHESNE/GRAVVIEW	RESTROOM POWER	YES
4	FISHLAKE	UT	BEAVER RD - DELANO PEAK	COMMUNICATIONS	YES
4	FISHLAKE	UT	LOA RD - MT TERRAL	COMMUNICATIONS	YES
4	FISHLAKE	UT	LOA RD - MT TERRAL	COMMUNICATIONS	YES
4	FISHLAKE	UT	BEAVER RD - DELANO PEAK	COMMUNICATIONS	YES
4	MANTI-LA SAL	UT	D1 - TIDDS RIDGE REPEATER	COMMUNICATIONS	YES
4	MANTI-LA SAL	UT	D5 - GOOSEBERRY GS	COMMUNICATIONS	YES
4	MANTI-LA SAL	UT	D3 - STUART GS	COMMUNICATIONS	YES
4	MANTI-LA SAL	UT	D3 - MONUMENT PEAK	COMMUNICATIONS	YES
4	MANTI-LA SAL	UT	D3 - MAMMOTH GS	COMMUNICATIONS	YES

4	UINTA	UT	SO	COMMUNICATIONS	NO
4	WASATCH CACHE	UT	MT. VIEW/BRIDGER	REMOTE FACILITY POWER	YES
4	WASATCH CACHE	UT	MT. VIEW/STATE LINE RESTROOM	RESTROOM POWER	YES
5	CLEVELAND	CA	CLEVELAND NF	COMMUNICATIONS	YES
5	LAKE TAHOE MGMT UNIT	CA	BIG MEADOWS TH	WATER PUMPING	YES
5	LASSEN	CA	LASSEN NF	COMMUNICATIONS	YES
5	MENDOCINO	CA	COLELO R.D./ANTHONY AK.	COMMUNICATIONS	YES
5	MENDOCINO	CA	STATE OF CA/MT. KONOCIT	COMMUNICATIONS	YES
5	MENDOCINO	CA	STONYFORD R.D./ST. JOHNS MT.	COMMUNICATIONS	YES
5	MENDOCINO	CA	UPPER LAKE RD/GOAT MT.	COMMUNICATIONS	YES
5	MENDOCINO	CA	UPPER LAKE R.S./HIGH GLADE	REMOTE MONITORING	YES
5	MENDOCINO	CA	MOBILE UNIT #2	REMOTE MONITORING	YES
5	MENDOCINO	CA	MOBILE UNIT #1	REMOTE MONITORING	YES
5	MENDOCINO	CA	STONYFORD R.S./ALDER SPRINGS	REMOTE MONITORING	YES
5	MENDOCINO	CA	STONYFORD R.D./STONYFORD W.S.	REMOTE MONITORING	YES
5	MENDOCINO	CA	COVELO R.D./EEL RIVER W.S.	REMOTE MONITORING	YES
5	MENDOCINO	CA	UPPER LAKE R.S./SODA CREEK STATION	REMOTE MONITORING	YES
5	SAN BERNARDINO	CA	BLACK MOUNTAIN	COMMUNICATIONS	YES
5	SAN BERNARDINO	CA	BUTLER PEAK	COMMUNICATIONS	YES
5	SAN BERNARDINO	CA	CAJON MOUNTAIN	COMMUNICATIONS	YES
5	SAN BERNARDINO	CA	ONYX PEAK	COMMUNICATIONS	YES
5	SAN BERNARDINO	CA	TAHQUITZ PEAK	COMMUNICATIONS	YES
5	SAN BERNARDINO	CA	LUNA MOUNTAIN	COMMUNICATIONS	YES
5	SAN BERNARDINO	CA	SAN GORGONIO CG #1	LIGHTING	YES
5	SAN BERNARDINO	CA	SAN GORGONIO CG #2	LIGHTING	YES
5	SAN BERNARDINO	CA	RIBBONWOOD EQUESTRAIN CAMP	LIGHTING	YES
5	SAN BERNARDINO	CA	HEART BAR STATION	REMOTE FACILITY POWER	YES
5	SEQUOIA	CA	SHERMAN	COMMUNICATIONS	YES
5	SEQUOIA	CA	SHIMNEY PEAK	COMMUNICATIONS	YES
5	SEQUOIA	CA	JORDAN LOOKOUT	COMMUNICATIONS	YES
5	SEQUOIA	CA	BUCK ROCK	COMMUNICATIONS	YES
5	SEQUOIA	CA	TOBIAS	COMMUNICATIONS	YES
5	SEQUOIA	CA	BAKER POINT	COMMUNICATIONS	YES
5	SEQUOIA	CA	OAK FLAT	COMMUNICATIONS	YES
5	SEQUOIA	CA	MULE PEAK	COMMUNICATIONS	YES
5	SEQUOIA	CA	BALD MOUNTAIN	COMMUNICATIONS	YES
5	SEQUOIA	CA	PIUTE	COMMUNICATIONS	YES
5	SEQUOIA	CA	DELIAH	COMMUNICATIONS	YES
5	SHASTA TRINITY	CA	BIG BAR-MONUMENT PEAK	COMMUNICATIONS	YES
5	SHASTA TRINITY	CA	MCCLLOUD-GRIZZLEY PEAK	COMMUNICATIONS	YES
5	SHASTA TRINITY	CA	YOLLA BOLLA - TOMHEAD LOOKOUT	COMMUNICATIONS	YES
5	SHASTA TRINITY	CA	BIG BAR - HAYFORK BALLY	COMMUNICATIONS	YES
5	SIERRA	CA	PINERIDGE/MONO CREEK CG	RESTROOM POWER	YES

5	SIERRA	CA	KINGS RIVER/KIRCH FLAT CAMP	RESTROOM POWER	YES
5	SIERRA	CA	KINGS RIVER/MAXON DOME TRAIL	RESTROOM POWER	YES
5	SIERRA	CA	PINERIDGE/JACKASS MEADOW CG	VENTILATION	YES
5	SIERRA	CA	PINERIDGE/FLORENCE DAY USE	VENTILATION	YES
5	SIERRA	CA	PINERIDGE/TAMARAK	VENTILATION	YES
5	SIERRA	CA	PINERIDGE/MONO HOT SPRINGS	VENTILATION	YES
5	SIERRA	CA	PINERIDGE/MONO CREEK TRAIL	VENTILATION	YES
5	SIERRA	CA	PINERIDGE/COYOTE NORIDC TRAIL	VENTILATION	YES
5	SIERRA	CA	PINERIDGE/VERMILLION CAMPGROUNDS	WATER PUMPING	YES
5	SIERRA	CA	MINARETS/MINARETS WORK	WATER PUMPING	YES
5	SIERRA	CA	MINARETS/CLOVER MEADOW CAMPGROUNDS	WATER PUMPING	YES
5	TAHOE	CA	SIERRAVILLE/BABBITT PEAK	COMMUNICATIONS	YES
5	TAHOE	CA	DOWNIEVILLE/SIERRA BUTTES	COMMUNICATIONS	YES
5	TAHOE	CA	NEVADA CITY/GROUSE RIDGE	COMMUNICATIONS	NO
5	TAHOE	CA	FORESTHILL/DUNCAN PEAK	COMMUNICATIONS	YES
5	TAHOE	CA	TRUCKEE/SQUAW VALLEY	LIGHTING	YES
5	TAHOE	CA	DOWNIEVILLE/SARDING CAMPGROUNDS	LIGHTING	YES
5	TAHOE	CA	DOWNIEVILLE/FIDDLE CREEK	LIGHTING	YES
5	TAHOE	CA	FORESTHILL/BIG RESERVOIR	LIGHTING	YES
5	TAHOE	CA	DOWNIEVILLE/CONVICT FLAT	LIGHTING	YES
5	TAHOE	CA	TRUCKEE/PROSSER CAMPGROUND	WATER PUMPING	YES
5	TAHOE	CA	FORESTHILL/DUNCAN PEAK	WATER PUMPING	YES
5	TAHOE	CA	SIERRAVILLE/BABBITT PEAK	WATER PUMPING	YES
5	TAHOE	CA	SIERRAVILLE/LITTLE TRUCKEE CAMPGROUND	WATER PUMPING	YES
6	SIUSLAW	OR	WALDPORT RD/CUMMINS PK.	COMMUNICATIONS	YES
6	SIUSLAW	OR	ALSEA RD/CANNIBAL MTN.	COMMUNICATIONS	YES
6	SIUSLAW	OR	HEBO RD/COUGAR MTN.	COMMUNICATIONS	YES
6	SIUSLAW	OR	HEBO RD/EUCHRE MTN.	COMMUNICATIONS	YES
6	UMATILLA	OR	WALLA WALLA RD LOOKOUT MT.	COMMUNICATIONS	YES
6	UMATILLA	OR	N. FORK JOHN DAY RD DESOLATIO	COMMUNICATIONS	YES
6	UMATILLA	OR	POMEROY RD COTTONWOOD PK.	COMMUNICATIONS	YES
6	UMATILLA	OR	POMEROY RD ECHLER MT.	COMMUNICATIONS	YES
6	UMATILLA	OR	POMEROY RD DIAMOND PEAK	COMMUNICATIONS	YES
6	UMATILLA	OR	HEPPNER RD MADISON BUTTE	COMMUNICATIONS	YES
6	UMATILLA	OR	WALLA WALLA RD BLACK MT.	COMMUNICATIONS	YES
6	UMATILLA	OR	WALLA WALLA RD TABLE ROCK	COMMUNICATIONS	YES
6	UMATILLA	OR	N. FORK JOHN DAY RD TOWER MT.	COMMUNICATIONS	YES
6	UMATILLA	OR	HEPPNER RD TAMANACK REPEATER	COMMUNICATIONS	YES
6	UMATILLA	OR	NORTH FORK JOHN DAY	ELECTRIC FENCE	YES
6	UMATILLA	OR	HEPPNER RD TUPPER RAWES	REMOTE MONITORING	YES
6	UMATILLA	OR	WALLA WALLA RD EDER BENCH	REMOTE MONITORING	YES

6	UMATILLA	OR	POMEROY RD ALDER RAWS	REMOTE MONITORING	YES
6	UMATILLA	OR	N. FORK JOHN DAY RD RANCH RAWS	REMOTE MONITORING	YES
6	UMATILLA	OR	N. FORK JOHN DAY RD CASE RAWS	REMOTE MONITORING	YES
6	UMPQUA	OR	TILLER RD/PICKETTE BUTTE	COMMUNICATIONS	YES
6	UMPQUA	OR	TILLER RD/ACKER BUTTE	COMMUNICATIONS	YES
6	UMPQUA	OR	DIAMOND LAKE RD/DOEHEAD	COMMUNICATIONS	YES
6	UMPQUA	OR	DIAMOND LAKE RD/PIG IRON	COMMUNICATIONS	YES
6	UMPQUA	OR	NORTH UMPQUA RD/CHILCOOT	COMMUNICATIONS	YES
6	UMPQUA	OR	COTTAGE GROVE RD/FAIRVIEW	COMMUNICATIONS	YES
6	UMPQUA	OR	COTTAGE GROVE RD/HAWLEY	COMMUNICATIONS	YES
6	UMPQUA	OR	DIAMOND LAKE RD/N. BOAT RAMP	LIGHTING	YES
6	UMPQUA	OR	NORTH UMPQUA RD/TAFT MTN.	REMOTE MONITORING	YES
6	UMPQUA	OR	NORTH UMPQUA RD/GRANDAD	REMOTE MONITORING	YES
6	UMPQUA	OR	COTTAGE GROVE RD/SUGARLOAF	REMOTE MONITORING	YES
6	UMPQUA	OR	DIAMOND LAKE RD/CINAMMON	REMOTE MONITORING	YES
6	UMPQUA	OR	DIAMOND LAKE RD/TOKETEE R.S.	REMOTE MONITORING	YES
6	UMPQUA	OR	TILLER RD/BUCKEYE	REMOTE MONITORING	YES
6	WALLOWA WHITMAN	OR	HCNRA/HAT POINT L.O.	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	HCNRA/SOMMERS POINT	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	HCNRA/KIRKWOOD	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	WAV/PT. PROMINANCE	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	HCNRA/PITTSBURG	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	HCNRA/LOOKOUT POINT	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	HCNRA/JIM CREEK BUTTE	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	WAV/RED HILL	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	WAV/HARL BUTTE	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	WAV/LICK CREEK	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	LA GRANDE/JOHNSON ROCK	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	PINE/SHEEP MOUNTAIN	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	PINE/SUMMIT POINT	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	HCNRA/CACHA CREEK	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	WAV/BILLY MEADOWS	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	WAV/BUCKHORN POINT	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	LA GRANDE/MULE PEAK	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	UNITY/TABLE ROCK	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	BAKER/MT. IRELAND	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	WAV/MT. HOWARD	COMMUNICATIONS	YES
6	WALLOWA WHITMAN	OR	WAV/AKERS BUTTE	COMMUNICATIONS	YES
6	GIFFORD PINCHOT	WA	WIND RIVER RD/3670	COMMUNICATIONS	YES
6	GIFFORD PINCHOT	WA	RANDLE RD/BURLEY MTN.	COMMUNICATIONS	YES
6	GIFFORD PINCHOT	WA	WIND RIVER RD/CANYON CR.	COMMUNICATIONS	YES
6	GIFFORD PINCHOT	WA	MOUNT ST. HELENS NVM/COLDWAT	COMMUNICATIONS	YES
6	GIFFORD PINCHOT	WA	RANDLE RD/SOUTH POINT	COMMUNICATIONS	YES

6	GIFFORD PINCHOT	WA	MOUNT ST. HELENS NVM/MITCHELL	COMMUNICATIONS	YES
6	GIFFORD PINCHOT	WA	MOUNT ST. HELENS NVM/WINDY	VENTILATION	YES
6	GIFFORD PINCHOT	WA	MOUNT ST. HELENS NVM/MONITOR	VENTILATION	YES
6	GIFFORD PINCHOT	WA	RANDLE RD/WAKEPISH SNO PARK	VENTILATION	YES
6	GIFFORD PINCHOT	WA	MOUNT ST. HELENS NVM/CLDWTR	VENTILATION	YES
6	GIFFORD PINCHOT	WA	WIND RIVER RD/BONNEVILLE TRIAL	VENTILATION	YES
6	GIFFORD PINCHOT	WA	RANDLE RD/YELLOWJACKETT POND	VENTILATION	YES
6	GIFFORD PINCHOT	WA	MOUNT ST. HELENS NVM/CLMRS B	VENTILATION	YES
6	MT BAKER SNOQUALMI	WA	WEST CHURCH MOUNTAIN	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	MT. BAKER LOOKOUT MTN. LOOKOUT	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	DARRINGTON - MINERS RIDGE LOOKOUT	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	WHITE RIVER -POCH PEAK	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	NORTH BEND - GRANITE MTN.	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	MT. BAKER WEST CHRUCH MTN.	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	DARRINGTON - NORTH MTN.	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	MT. BAKER PANORAMA DOME	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	MT. BAKER LEONARDS RIDGE	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	DARRINGTON -GREEN MTN.	COMMUNICATIONS	NO
6	MT BAKER SNOQUALMI	WA	DARRINGTON - LOST CREEK	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	MINER'S RIDGE LOOKOUT	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	WHITE RIVER -POCH PEAK	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	LEONARDS RIDGE	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	LOOKOUT MONTAIN LOOKOUT	COMMUNICATIONS	YES
6	MT BAKER SNOQUALMI	WA	ARTIST POINT VAULT TOILET	RESTROOM POWER	YES
6	MT BAKER SNOQUALMI	WA	MARTIN CREEK COMPOSTING TOILET	RESTROOM POWER	YES
6	MT BAKER SNOQUALMI	WA	SKYKOMISH DISTRICT	RESTROOM POWER	YES
6	MT BAKER SNOQUALMI	WA	MT. BAKER DISTRICT	VENTILATION	YES
6	MT BAKER SNOQUALMI	WA	MT. BAKER DISTRICT	VENTILATION	YES
6	OLYMPIC	WA	QUILCENE-CROWS NEST (BUCK MT.)	COMMUNICATIONS	YES
6	OLYMPIC	WA	HOOD CANAL - SPOON POINT	COMMUNICATIONS	YES
6	OLYMPIC	WA	QUILCENE - MAYNARD	COMMUNICATIONS	YES
6	OLYMPIC	WA	QUINAULT - SALMON RIVER LOOKOUT	COMMUNICATIONS	NO
6	WENATCHEE	WA	CLE ELUM/PEOH POINT	COMMUNICATIONS	YES
6	WENATCHEE	WA	CHELAN/OLD MAID MTN.	COMMUNICATIONS	YES
6	WENATCHEE	WA	ENTIATY/TYEE MTN.	COMMUNICATIONS	YES
6	WENATCHEE	WA	CLE ELUM/THORP MTN.	COMMUNICATIONS	YES
6	WENATCHEE	WA	CLE ELUM/RED TOP MTN.	COMMUNICATIONS	YES
6	WENATCHEE	WA	LEAVEWORTH/MINERS RIDGE	COMMUNICATIONS	YES
6	WENATCHEE	WA	NOCHES RD/NOCHES WA	RESTROOM POWER	YES
6	WENATCHEE	WA	NOCHES RD/NOCHES WA	RESTROOM POWER	YES
6	WENATCHEE	WA	ENTINT/LAKE CT	VENTILATION	YES
6	WENATCHEE	WA	LAKE WENATCHEE/GOOSE CR	VENTILATION	YES

6	WENATCHEE	WA	LEAVENWORTH	VENTILATION	YES
6	WENATCHEE	WA	ENTIAT/FOR CG	VENTILATION	YES
8	TALLADEGA	AL	SHOAL CREEK RD/HEFLIN, AL	COMMUNICATIONS	YES
8	TALLADEGA	AL	SHOAL CREEK RD/HEFLIN, AL	WATER PUMPING	YES
8	OCONEE	GA	ARMUCHEE/LAFAYETTE, GA	BATTERY CHARGER	YES
8	OCONEE	GA	ARMUCHEE/LAFAYETTE, GA	COMMUNICATIONS	YES
8	OCONEE	GA	COHUTTA/CHETSWORTH, GA	COMMUNICATIONS	NO
8	OCONEE	GA	ARMUCHEE/LAFAYETTE, GA	COMMUNICATIONS	NO
8	OCONEE	GA	VARIOUS (18 UNITS)	VENTILATION	YES
8	DANIEL BOONE	KY	STEARNS R.D./GREAT MEADOW	VENTILATION	YES
8	DANIEL BOONE	KY	STANTON R.D./KOOMER RIDGE	VENTILATION	YES
8	CROATAN	NC	RESEARCH SITE/SCOTLAND COUNT	REMOTE MONITORING	YES
8	CROATAN	NC	STSP STUDY SITE	REMOTE MONITORING	YES
8	SOUTHEASTERN EXPERIMENT	NC	SOUTHERN RESEARCH STATION	REMOTE MONITORING	YES
8	SOUTHEASTERN EXPERIMENT	NC	SOUTHERN RESEARCH LABORATORY	REMOTE MONITORING	YES
8	CHEROKEE	TN	WATAUGE RD/BEE SUCK TELE.	COMMUNICATIONS	YES
8	CHEROKEE	TN	TELLICO RD/PHEASANT FLDS PICNIC	VENTILATION	YES
8	ANGELINA	TX	S.O. ADMIN. SITE	VENTILATION	YES
8	DAVY CROCKETT	TX	TRINITY WORK CENTER	VENTILATION	YES
8	DAVY CROCKETT	TX	NECHES WORK CENTER	VENTILATION	YES
8	SAM HOUSTON	TX	SAN JACINTO WORK CENTER	VENTILATION	YES
8	SAM HOUSTON	TX	RAVEN RANGER STATION	VENTILATION	YES
9	HIAWATHA	MI	LITTLE BARDE NOC. REC. AREA	WATER PUMPING	NO
9	OTTAWA	MI	FSL GRAND RAPIDS, OTTAWA NF	BATTERY CHARGER	YES
9	CHIPPEWA	MN	FSL GRAND RAPIDS, CHIPPEWA NF	BATTERY CHARGER	YES
9	NORTH CENTRAL EXPERIMENT	MN	FSL GRAND RAPIDS, OTTAWA NF	BATTERY CHARGER	YES
9	NORTH CENTRAL EXPERIMENT	MN	FSL GRAND RAPIDS, HURON NF	BATTERY CHARGER	YES
9	NORTH CENTRAL EXPERIMENT	MN	FSL GRAND RAPIDS, CHIPPEWA NF	BATTERY CHARGER	YES
9	SUPERIOR	MN	GUNFLINT	LIGHTING	YES
9	SUPERIOR	MN	GUNFLINT/TOFTE	WATER PUMPING	YES
9	MARK TWAIN	MO	POTOSI	LIGHTING	YES
9	ALLEGHENY	PA	SO/MARIENVILLE ATV TRAILHEAD	RESTROOM POWER	NO
9	CHEQUAMEGON	WI	GLIDDEN DISTRICT, LAKE 3	LAKE AERATION	YES
9	CHEQUAMEGON	WI	PARK FALLS DISTRICT, TWIN LAKE	LAKE AERATION	YES

APPENDIX B – BARRIERS TO EXPANDED USE

BARRIERS TO EXPANDED USE

5-Feb-96													
REGION	FOREST	STATE	INITIAL COST	FAMILIARITY	PROCUREMENT	VISUAL	CLIMATE	DESIGNERS	PERFORMANCE	HISTORICAL CONFLICTS	SUPPLY/ CONT	OTHER	DESCRIBE
1	BEAVERHEAD	MT	No	No	No	No	No	No	No	No	No	Yes	No barriers inhibiting PV systems
1	BITTERROOT	MT	No	No	No	No	No	No	No	No	No	Yes	No reason for not using PV
1	CLEARWATER	ID	No	No	No	No	No	No	No	No	No	Yes	Have installed PV systems
1	GALLATIN	MT	No	No	No	No	No	Yes	Yes	No	No	Yes	Limited identified needs
1	KOOTENAI	MT	Yes	No	No	No	No	No	No	Yes	No	No	
1	LOLO	MT	Yes	No	No	Yes	No	No	Yes	No	No	No	
1	NEZ PERCE	ID	Yes	Yes	No	No	No	No	Yes	No	No	No	
2	MEDICINE BOW	WY	Yes	No	No	No	No	Yes	Yes	No	No	No	
2	NEBRASKA	NV	Yes	Yes	No	No	No	Yes	Yes	No	No	No	
2	PIKE SAN ISABEL	CO	Yes	Yes	No	No	No	No	No	No	No	No	
2	ROUTT	CO	Yes	Yes	No	No	No	Yes	Yes	No	Yes	No	
2	SHOSHONE	WY	Yes	No	No	Yes	No	No	No	No	No	Yes	Vandalism, stolen panels
3	CARSON	NM	No	No	No	No	No	No	Yes	No	No	No	
3	CIBOLA	NM	No	Yes	No	No	No	Yes	No	No	No	No	
3	COCONINO	AZ	Yes	Yes	No	No	No	No	No	No	No	Yes	Lack of funds & personnel to maintain
3	CORONADO	AZ	No	Yes	No	No	No	No	No	No	No	Yes	Personnel resistance
3	LINCOLN	NM	No	Yes	No	No	No	Yes	Yes	No	No	No	
3	PRESCOTT	AZ	Yes	Yes	No	Yes	No	No	Yes	Yes	No	Yes	Questionable future use of site
3	SANTA FE	NM	No	No	No	Yes	No	No	Yes	No	No	Yes	Any practicality in bringing in grid power
4	BOISE	ID	No	No	No	No	No	No	No	No	No	Yes	No barriers inhibiting PV systems
4	CARIBOU	ID	Yes	No	No	No	No	No	No	No	No	Yes	Stream flow, distance to pump not cost
4	FISHLAKE	UT	Yes	No	No	No	No	No	No	No	No	No	
4	HUMBOLDT	NV	Yes	Yes	No	No	No	Yes	No	No	Yes	No	
4	MANTI-LA SAL	UT	Yes	Yes	No	No	No	No	Yes	No	No	No	
4	SALMON CHALLIS	ID	No	No	No	No	No	No	No	No	No	Yes	Lack of funds, and archaeology barrier
4	SAWTOOTH	ID	Yes	No	No	No	Yes	No	No	Yes	No	No	
4	TOIYABE	NM	Yes	Yes	Yes	No	No	Yes	No	No	No	No	
4	UINTA	UT	Yes	Yes	No	Yes	No	No	No	No	No	Yes	Noblett Site-not certain PV will deliver
4	WASATCH CACHE	UT	Yes	No	No	No	No	No	No	No	No	No	
5	ANGELES	CA	Yes	Yes	No	No	No	Yes	Yes	No	No	Yes	Vandalism
5	CLEVELAND	CA	Yes	Yes	No	No	No	Yes	No	No	No	No	
5	LOS PADRES	CA	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Vandalism, theft and shooting
5	SHASTA TRINITY	CA	Yes	No	Yes	No	Yes	No	No	No	No	Yes	Vandalism
5	STANISLAUS	CA	No	No	No	Yes	No	No	No	No	No	No	New CG in heavily timbered canyon

5	TAHOE	CA	No	No	No	No	Yes	No	No	No	No	Yes	Vandalism
6	COLVILLE	WA	No	No	No	Yes	Yes	No	No	No	No	Yes	Theft and vandalism
6	DESCHUTES	OR	No	Yes	Lack of time, one person shop								
6	GIFFORD PINCHOT	WA	No	No	No	No	Yes	Yes	No	No	No	No	
6	MT BAKER SNOQUALMI	WA	Yes	No	No	Yes	Yes	No	No	No	No	No	
6	OKANOGAN	WA	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Cost of system vs propane generator
6	ROGUE RIVER	OR	Yes	Yes	No	Yes	No PV at this time						
6	UMATILLA	OR	Yes	No									
6	UMPQUA	OR	No	No	No	No	Yes	No	Yes	No	No	No	
6	WENATCHEE	WA	Yes	No									
6	WINEMA	OR	Yes	No	No	Yes	Yes	Yes	Yes	No	No	No	
8	ANGELINA	TX	Yes	No	Yes	Shady sites							
8	CHEROKEE	TN	Yes	Yes	No	No	No	No	Yes	Yes	No	No	
8	KITATCHIE	LA	No	No	No	No	No	No	Yes	No	No	No	
8	OCONEE	GA	No	No	No	Yes	Yes	No	No	No	No	Yes	Forest fragmented, grid power close
8	OSCEOLA	FL	Yes	No	No	No	No	Yes	Yes	No	No	Yes	Vegetation, rec areas have trees
8	OZARK ST. FRANCIS	AR	No										
8	PISGAH	NC	No	No	No	No	Yes	No	No	No	No	No	
8	QUACHITA	AR	Yes	No	No	No	No	Yes	No	No	No	Yes	Lack of familiarity w/PV by managers
8	SUMPTER	SC	No	Yes	No	No	Yes	Yes	Yes	No	No	Yes	Vandalism
8	W.B. BANKHEAD	AL	Yes	Yes	No								
8	ALLEGHENY	PA	No	Yes	No	No	Yes	No	Yes	No	Yes	No	
9	CHEQUAMEGON	WI	Yes	No	Yes	Lack of funding							
9	HIAWATHA	MI	Yes	No	No	No	Yes	Yes	Yes	No	No	No	
9	HOOSIER	IN	No	No	No	No	No	Yes	Yes	No	No	Yes	Limited application, thick trees
9	HURON MANISTEE	MI	Yes	Yes	No	No	Yes	Yes	No	No	No	No	
9	MONONGAHELA	WV	Yes	No	No	No	No	Yes	Yes	No	No	No	
9	NORTH CENTRAL	MN	Yes	Yes	No	No	Yes	No	No	No	No	No	
9	SUPERIOR	MN	No	Yes	Vandalism at highway rest area								

APPENDIX C – PROPOSED PHOTOVOLTAIC SYSTEMS

PROPOSED PHOTOVOLTAIC SYSTEMS

5-Feb-96

REGION	FOREST	STATE	LOCATION	PROPOSED SYSTEM
1	KOOTENAI	MT	FOREST WIDE TOURIST INFO SYSTEM	INFO/SIGNS
1	LEWIS AND CLARK	MT	FOREST LAKE GUARD STATION	REMOTE FACILITY POWER
1	LEWIS AND CLARK	MT	FOREST LAKE GUARD STATION	WATER PUMPING
1	LEWIS AND CLARK	MT	HUNTERS SPRING GUARD STATION	REMOTE FACILITY POWER
1	LEWIS AND CLARK	MT	LITTLE SPRINGS ADMIN. SITE	REMOTE FACILITY POWER
1	LEWIS AND CLARK	MT	LITTLE SPRINGS ADMIN. SITE	COMMUNICATION
1	NEZ PERCE	ID	MOOSE CREEK R.S.	COMMUNICATION
1	NEZ PERCE	ID	MOOSE CREEK R.S.	REMOTE MONITORING
1	NEZ PERCE	ID	MEADOW CREEK CABIN	REMOTE FACILITY POWER
1	NEZ PERCE	ID	VARIOUS DISTRICTS	REMOTE FACILITY POWER
1	NEZ PERCE	ID	CLEARWATER RANGER DISTRICT	REMOTE FACILITY POWER
2	ARAPAHO ROOSEVELT	CO	BUCKHORN WORKCENTER	WATER PUMPING
2	ARAPAHO ROOSEVELT	CO	BUCKHORN WORKCENTER	REMOTE FACILITY POWER
2	ARAPAHO ROOSEVELT	CO	BUCKHORN WORKCENTER	LIGHTS
2	ARAPAHO ROOSEVELT	CO	BUCKHORN WORKCENTER	COMMUNICATION
2	GR. MESA UNCOMPARDE	CO	WOODS LAKE CAMPGROUND	WATER PUMPING
2	GR. MESA UNCOMPARDE	CO	WOODS LAKE CAMPGROUND	REMOTE FACILITY POWER
2	MEDICINE BOW	WY	ROB ROY CAMPGROUND	WATER PUMPING
2	MEDICINE BOW	WY	LAKE OWEN CAMPGROUND	WATER PUMPING
2	MEDICINE BOW	WY	YELLOW PINE CAMPGROUND	WATER PUMPING
2	NEBRASKA	NB	HALSEY NE	LIGHTS
2	NEBRASKA	NB	HALSEY NE	WATER PUMPING
2	PIKE SAN ISABEL	CO	CLOYSES LAKE	REMOTE FACILITY POWER
2	PIKE SAN ISABEL	CO	CIMARRON NATIONAL GRASSLAND	WATER PUMPING
2	PIKE SAN ISABEL	CO	COTTONWOOD LAKE PICNIC GROUND	WATER PUMPING
2	PIKE SAN ISABEL	CO	RAMPART RECREATION AREA	LIGHTS
2	PIKE SAN ISABEL	CO	O'HAVER CAMPGROUND	WATER PUMPING
2	PIKE SAN ISABEL	CO	A.G. RANCH SOUTH PLATTE R.D.	PORTABLE GENERATORS
2	PIKE SAN ISABEL	CO	RAMPART RECREATION AREA	CAMGROUND
2	PIKE SAN ISABEL	CO	VARIOUS DISTRICTS	PORTABLE GENERATORS
2	ROUTT	CO	WEST SHEEP MTN. ALLOTMENT	WATER PUMPING
2	ROUTT	CO	VARIOUS GUARD STATIONS	REMOTE FACILITY POWER
2	ROUTT	CO	MEDICINE BOW/ROUTT ALLOTMENT	WATER PUMPING
2	ROUTT	CO	YAMPA INFORMATION KIOSKS	REMOTE FACILITY POWER
2	ROUTT	CO	VARIOUS CAMPGROUND FEE STATIONS	REMOTE FACILITY POWER
2	ROUTT	CO	VARIOUS HANDPUMP UPGRADES	WATER PUMPING

2	ROUTT	CO	VARIOUS CAMPGROUND HOSTSITES	PORTABLE GENERATORS
2	ROUTT	CO	VARIOUS CAMPGROUNDS	CAMGROUND
2	ROUTT	CO	THUNDER BASIN ALLOTMENT	WATER PUMPING
3	APACHE SITGRAVES	AZ	SADDLE MOUNTAIN LOOKOUT	COMMUNICATION
3	APACHE SITGRAVES	AZ	PS KNOLL LOOKOUT	COMMUNICATION
3	APACHE SITGRAVES	AZ	GREY'S PEAK	COMMUNICATION
3	CIBOLA	NM	4TH OF JULY CAMPGROUND	WATER PUMPING
3	CIBOLA	NM	DOC LONG PICNIC GROUND	WATER PUMPING
3	CIBOLA	NM	SULPHUR CANYON PICNIC GROUND	CAMGROUND
3	CIBOLA	NM	DOC LONG PICNIC GROUND	REMOTE FACILITY POWER
3	CIBOLA	NM	4TH OF JULY CAMPGROUND	CAMGROUND
3	CORONADO	AZ	RUCKER FOREST CAMPGROUND	WATER PUMPING
3	CORONADO	AZ	RUCKER STATION	REMOTE FACILITY POWER
3	CORONADO	AZ	CAMP RUCKER	WATER PUMPING
3	KIABAB	AZ	DRY PARK, N KIABAB RD	COMMUNICATION
3	KIABAB	AZ	BIG SPRINGS, N KIABAB RD	COMMUNICATION
3	PRESCOTT	AZ	WALNUT CREEK WORKCENTER	REMOTE FACILITY POWER
3	PRESCOTT	AZ	WALNUT CREEK WORKCENTER	AUGMENTING DIESEL
3	PRESCOTT	AZ	WALNUT CREEK WORKCENTER	COMMUNICATION
3	PRESCOTT	AZ	WALNUT CREEK WORKCENTER	WATER PUMPING
3	TONTO	AZ	RATTLESNAKE RECREATION AREA	WATER PUMPING
3	TONTO	AZ	ROCK CREEK RIPARIAN IMP.	WATER PUMPING
3	TONTO	AZ	WINDY HILL WATER DISINFECTION	REMOTE FACILITY POWER
4	ASHLEY	UT	NO NAME RIDGE	COMMUNICATION
4	BOISE	ID	SILVER CREEK LOOKOUT	COMMUNICATION
4	BOISE	ID	ELK CREEK GUARD STATION	REMOTE FACILITY POWER
4	BOISE	ID	SCOTT MTN LOOKOU	COMMUNICATION
4	BOISE	ID	PILOT PEAK	WATER PUMPING
4	BOISE	ID	ELK CREEK GUARD STATION	COMMUNICATION
4	BOISE	ID	SILVER CREEK LOOKOUT	REMOTE FACILITY POWER
4	BOISE	ID	SCOTT MTN LOOKOU	REMOTE FACILITY POWER
4	BOISE	ID	LOWMAN RANGER STATION	COMMUNICATION
4	CARIBOU	ID	SODA SPRINGS GUARD STATION	REMOTE FACILITY POWER
4	CARIBOU	ID	SODA SPRINGS DISTSRICT	COMMUNICATION
4	FISHLAKE	UT	FARNSWORTH RESERVOIR	REMOTE FACILITY POWER
4	HUMBOLDT	NV	ILLAPAH ALLOTMENT	WATER PUMPING
4	HUMBOLDT	NV	STOVE SPRING	REMOTE FACILITY POWER
4	HUMBOLDT	NV	RYE GRASS ALLOTMENT	PORTABLE GENERATORS
4	HUMBOLDT	NV	WARD MTN CAMPGROUND HOST STA.	REMOTE FACILITY POWER
4	HUMBOLDT	NV	ELLISON GUARD STATION	REMOTE FACILITY POWER
4	HUMBOLDT	NV	CHERRY CREEK GUARD STATION	REMOTE FACILITY POWER
4	HUMBOLDT	NV	TOM PLAIN ALLOTMENT	PORTABLE GENERATORS
4	HUMBOLDT	NV	STOVE SPRING	WATER PUMPING

4	HUMBOLDT	NV	TENESSEE MTN ALLOTMENT	WATER PUMPING
4	HUMBOLDT	NV	HAYSTACK ALLOTMENT	WATER PUMPING
4	HUMBOLDT	NV	WHITEROCK ALLOTMENT	WATER PUMPING
4	HUMBOLDT	NV	ILLIPAH ALLOTMENT	PORTABLE GENERATORS
4	HUMBOLDT	NV	TELEPHONE ALLOTMENT	WATER PUMPING
4	HUMBOLDT	NV	DIAMOND A ALLOTMENT	WATER PUMPING
4	HUMBOLDT	NV	SHELLBACK SPRING	WATER PUMPING
4	MANTI-LA SAL	UT	CARPENTER RIDGE	COMMUNICATION
4	MANTI-LA SAL	UT	JOES VALLEY GUARD STATION	COMMUNICATION
4	MANTI-LA SAL	UT	BUCKEYE GUARD STATION	COMMUNICATION
4	MANTI-LA SAL	UT	WARNER GUARD STATION	COMMUNICATION
4	MANTI-LA SAL	UT	JOES VALLEY GUARD STATION	REMOTE FACILITY POWER
4	MANTI-LA SAL	UT	KIGALIA GUARD STATION	REMOTE FACILITY POWER
4	MANTI-LA SAL	UT	FLAGSTAFF PEAK	COMMUNICATION
4	MANTI-LA SAL	UT	KIGALIA GUARD STATION	COMMUNICATION
4	MANTI-LA SAL	UT	WARNER GUARD STATION	REMOTE FACILITY POWER
4	MANTI-LA SAL	UT	MAMMOTH GUARD STATION	REMOTE FACILITY POWER
4	MANTI-LA SAL	UT	GEYSER PASS	COMMUNICATION
4	MANTI-LA SAL	UT	DEADPAN PEAK	COMMUNICATION
4	MANTI-LA SAL	UT	GOOSEBERRY GUARD STATION	COMMUNICATION
4	MANTI-LA SAL	UT	GOOSEBERRY GUARD STATION	REMOTE FACILITY POWER
4	MANTI-LA SAL	UT	STUART GUARD STATION	COMMUNICATION
4	MANTI-LA SAL	UT	STUART GUARD STATION	REMOTE FACILITY POWER
4	MANTI-LA SAL	UT	MAMMOTH GUARD STATION	COMMUNICATION
4	MANTI-LA SAL	UT	INDIAN CREEK GUARD STATION	COMMUNICATION
4	MANTI-LA SAL	UT	BUCKEYE GUARD STATION	REMOTE FACILITY POWER
4	MANTI-LA SAL	UT	INDIAN CREEK GUARD STATION	REMOTE FACILITY POWER
4	MANTI-LA SAL	UT	KIGALIA GUARD STATION	WATER PUMPING
4	SALMON CHALLIS	ID	INDIANOLA	WATER PUMPING
4	SALMON CHALLIS	ID	PHI KAPPA GUARD STATION	WATER PUMPING
4	SAWTOOTH	ID	BURLEY DISTRICT - MT. HARRISON	COMMUNICATION
4	SAWTOOTH	ID	BURLEY DISTRICT - GEORGE PEAK	COMMUNICATION
4	SAWTOOTH	ID	KETCHUM DISTRICT - BALD MOUNTAIN	COMMUNICATION
4	SAWTOOTH	ID	TWIN FALLS DISTRICT - MIDDLE MOUNTAIN	COMMUNICATION
4	TARGHEE	ID	BEAR CREEK	CAMGROUND
4	TARGHEE	ID	SPRING CREEK	CAMGROUND
4	TARGHEE	ID	TRIAL CREEK	CAMGROUND
4	TARGHEE	ID	PALISADES RESERVOIR	CAMGROUND
4	TARGHEE	ID	CAVE FALLS	CAMGROUND
4	TARGHEE	ID	BIG SPRINGS	CAMGROUND
4	TARGHEE	ID	MCREA CAMPGROUND	CAMGROUND
4	TARGHEE	ID	ISLAND PARK DAM	CAMGROUND
4	WASATCH CACHE	UT	HEWINTA GUARD STATION	REMOTE FACILITY POWER

4	WASATCH CACHE	UT	MONTE CRISTO CAMPGROUND	WATER PUMPING
4	WASATCH CACHE	UT	MONTE CRISTO CAMPGROUND	REMOTE FACILITY POWER
4	WASATCH CACHE	UT	MONTE CRISTO CAMPGROUND	CAMGROUND
4	WASATCH CACHE	UT	MIRROR LAKE CAMPGROUND	AMPHITHEATER
4	WASATCH CACHE	UT	BRIDGER LAKE SRPING	REMOTE FACILITY POWER
4	WASATCH CACHE	UT	BLAKCS GUARD STATION	REMOTE FACILITY POWER
4	WASATCH CACHE	UT	BRIDGER LAKE SRPING	WATER PUMPING
4	WASATCH CACHE	UT	MIRROR LAKE CAMPGROUND	CAMGROUND
4	WASATCH CACHE	UT	MIRROR LAKE GUARD STATION	REMOTE FACILITY POWER
5	CLEVELAND	CA	HI POINT	WATER PUMPING
5	CLEVELAND	CA	PINE HILLS	COMMUNICATION
5	INYO	CA	SCHULMAN GROVE INTERPRETIVE SITE	REMOTE FACILITY POWER
5	INYO	CA	SCHULMAN GROVE INTERPRETIVE SITE	COMMUNICATION
5	INYO	CA	SCHULMAN GROVE INTERPRETIVE SITE	REMOTE FACILITY POWER
5	LAKE TAHOE MGMT UNIT	CA	VARIOUS RESTROOM VENTING	REMOTE FACILITY POWER
5	LASSEN	CA	GOUMAZ CAMPGROUND	LIGHTS
5	SAN BERNARDINO	CA	KELLER PEAK	COMMUNICATION
5	SAN BERNARDINO	CA	SAN SAVAINÉ	COMMUNICATION
5	SAN BERNARDINO	CA	PINE COVE	COMMUNICATION
5	SEQUOIA	CA	RICHBAR PICNIC AREA	WATER PUMPING
5	SEQUOIA	CA	BLACKROCK TRIALHEAD	WATER PUMPING
5	SEQUOIA	CA	TROY CAMPGROUND	WATER PUMPING
5	SHASTA TRINITY	CA	HAYFORK BALLY	COMMUNICATION
5	SHASTA TRINITY	CA	DENNY GUARD STATION	WATER PUMPING
5	SHASTA TRINITY	CA	DENNY GUARD STATION	REMOTE FACILITY POWER
5	SHASTA TRINITY	CA	HAYFORK BALLY	REMOTE FACILITY POWER
5	SHASTA TRINITY	CA	HARRIS SPRINGS GUARD STATION	WATER PUMPING
5	SHASTA TRINITY	CA	HARRIS SPRINGS GUARD STATION	REMOTE FACILITY POWER
5	STANISLAUS	CA	VARIOUS CAMPGROUNDS	LIGHTS
5	TAHOE	CA	VARIOUS RESTROOM LIGHTING	LIGHTS
6	GIFFORD PINCHOT	WA	APE CAVE RECREATION SITE	REMOTE FACILITY POWER
6	WALLOWA WHITMANN	OR	PITTSBURG LANDING CAMPGROUND	REMOTE FACILITY POWER
6	WALLOWA WHITMANN	OR	PITTSBURG LANDING CAMPGROUND	LIGHTS
6	WALLOWA WHITMANN	OR	RUSSEL MOUNTAIN LOOKOUT	COMMUNICATION
6	WALLOWA WHITMANN	OR	KIRKWOOD RANCH	REMOTE FACILITY POWER
6	WALLOWA WHITMANN	OR	PITTSBURG LANDING CAMPGROUND	AMPHITHEATER
6	WALLOWA WHITMANN	OR	PITTSBURG RANCH	REMOTE FACILITY POWER
6	WALLOWA WHITMANN	OR	CACHE CREEK RANCH	REMOTE FACILITY POWER
6	WALLOWA WHITMANN	OR	KIRKWOOD RANCH	WATER PUMPING
8	CHATTAHOOCHEE	GA	JOHN'S MOUNTAIN	COMMUNICATION
8	CHEROKEE	TN	SASAFRASS TELECOM SITE	COMMUNICATION
8	CHEROKEE	TN	WHITE ROCK TELECOM	COMMUNICATION
8	CHEROKEE	TN	COLD SPRINGS TELECOM SITE	COMMUNICATION

8	CHEROKEE	TN	SASAFRASS TELECOM SITE	COMMUNICATION
8	QUACHITA	AR	BIG BRUSHY REC. AREA	WATER PUMPING
8	QUACHITA	AR	WINDING STAIR REC. AREA	WATER PUMPING
8	QUACHITA	AR	RIVER BLUFF REC. AREA	WATER PUMPING
8	QUACHITA	AR	BARD SPRINGS	WATER PUMPING
8	QUACHITA	AR	ROCKY SHAOLS RC. AREA	WATER PUMPING
8	QUACHITA	AR	FULTON BRANCH REC. AREA	WATER PUMPING
8	QUACHITA	AR	SOUTH FOURCHE REC. AREA	WATER PUMPING
8	QUACHITA	AR	SHIRLEY RECREATOIN AREA	WATER PUMPING
8	QUACHITA	AR	FOURCHE MOUNTAIN REC. AREA	WATER PUMPING
8	QUACHITA	AR	KNOPPERS FORD REC. AREA	WATER PUMPING
8	QUACHITA	AR	LITTLE MISSOURI FALLS REC. AREA	WATER PUMPING
8	QUACHITA	AR	CRYSTAL RECREATION AREA	WATER PUMPING
8	QUACHITA	AR	WINDING STAIR REC. AREA	REMOTE FACILITY POWER
8	QUACHITA	AR	IRON SPRINGS RECREATOIN AREA	WATER PUMPING
8	QUACHITA	AR	DRAGOVER RECREATION AREA	WATER PUMPING
8	SOUTHEASTER EXPERIM.	NC	SCOTLAND CTY. EXP. SITE	REMOTE FACILITY POWER
8	SOUTHEASTER EXPERIM.	NC	SCOTLAND CTY. EXP. SITE	REMOTE MONITORING
8	SOUTHEASTER EXPERIM.	NC	SCOTLAND CTY. EXP. SITE	WATER PUMPING
8	SOUTHEASTER EXPERIM.	NC	SCOTLAND CTY. EXP. SITE	COMMUNICATION
8	TALLADEGA	AL	TASKA PICNIC AREA	LIGHTS
8	TALLADEGA	AL	SHEPHERD BRANCH SHOOTING RANGE	REMOTE FACILITY POWER
8	TALLADEGA	AL	TALLADEGA ATV TRAILHEAD	REMOTE FACILITY POWER
8	TALLADEGA	AL	LITTLE NATURAL BRIDGE	CAMGROUND
8	TALLADEGA	AL	WARDEN STATION HORSE CAMP	REMOTE FACILITY POWER
8	TALLADEGA	AL	TASKA PICNIC AREA	REMOTE FACILITY POWER
8	TALLADEGA	AL	WARDEN STATION HORSE CAMP	LIGHTS
8	TALLADEGA	AL	SHEPHERD BRANCH SHOOTING RANGE	LIGHTS
8	TALLADEGA	AL	TURNIPSEED HUNTER CAMP	LIGHTS
8	TALLADEGA	AL	TURNIPSEED HUNTER CAMP	REMOTE FACILITY POWER
8	TALLADEGA	AL	CHINNABEE RECREATION AREA	CAMGROUND
8	TALLADEGA	AL	CHINNABEE RECREATION AREA	LIGHTS
8	TALLADEGA	AL	CHINNABEE RECREATION AREA	WATER PUMPING
8	TALLADEGA	AL	PINE GLEN RECREATION AREA	CAMGROUND
8	TALLADEGA	AL	PINE GLEN RECREATION AREA	WATER PUMPING
8	TALLADEGA	AL	TALLADEGA ATV TRAILHEAD	LIGHTS
9	CHEQUAMEGON	WI	EMILY LAKE	REMOTE FACILITY POWER
9	CHEQUAMEGON	WI	BEAVER LAKE	REMOTE FACILITY POWER
9	CHEQUAMEGON	WI	HORSESHOE LAKE	REMOTE FACILITY POWER
9	CHEQUAMEGON	WI	GATES LAKE	REMOTE FACILITY POWER
9	CHEQUAMEGON	WI	NEWMAN LAKE CAMPGROUND	WATER PUMPING
9	CHEQUAMEGON	WI	NAMEGAGEN CAMPGROUND	WATER PUMPING
9	CHEQUAMEGON	WI	TWO LAKES CAMPGROUND	WATER PUMPING

9	CHEQUAMEGON	WI	SAILOR LAKE	AUGMENTING DIESEL
9	CHEQUAMEGON	WI	RILEY CREEK WAREHOUSE	REMOTE FACILITY POWER
9	CHEQUAMEGON	WI	WILSON FLOWAGE	AUGMENTING DIESEL
9	CHEQUAMEGON	WI	MARBLE CREEK RECREATION AREA	CAMGROUND
9	CHEQUAMEGON	WI	COUNCIL BLUFF RECREATION AREA	COMMUNICATION
9	CHEQUAMEGON	WI	SILVER MINES RECREATION AREA	LIGHTS
9	CHEQUAMEGON	WI	SILVER MINES RECREATION AREA	REMOTE FACILITY POWER
9	CHEQUAMEGON	WI	MARBLE CREEK RECREATION AREA	LIGHTS
9	MARK TWAIN	MO	COUNCIL BLUFF RECREATION AREA	CAMGROUND
9	MARK TWAIN	MO	COUNCIL BLUFF RECREATION AREA	LIGHTS
9	MARK TWAIN	MO	MARBLE CREEK RECREATION AREA	COMMUNICATION
9	MARK TWAIN	MO	COUNCIL BLUFF RECREATION AREA	REMOTE FACILITY POWER
9	MARK TWAIN	MO	SILVER MINES RECREATION AREA	COMMUNICATION
9	NORTH CENTRAL EXPERIM.	MN	MARCELL EXPERIMENTAL FOREST	REMOTE FACILITY POWER
9	SUPERIOR	MN	PFEIFFER CAMPGROUND	WATER PUMPING
9	SUPERIOR	MN	CADOTTE CAMPGROUND	WATER PUMPING
9	SUPERIOR	MN	MCDUGAL CAMPGROUND	WATER PUMPING
9	SUPERIOR	MN	BEARSKIN CAMPGROUND	WATER PUMPING