Energy, Utility, and Waste Management Systems

The park's aging and inadequately maintained infrastructure has become an increasing burden in both dollars and the risk posed to public health and park resources. While progress has been made in improving the park's energy efficiency and reducing its solid waste flow, its water and sewage systems will require major upgrades in the near future in order to prevent a major calamity. An assessment of the park's water and sewage treatment facilities that was completed in 1999 found many items of "high risk," meaning they could cause serious environmental damage if not corrected.

Getting Down and Dirty

Yellowstone operates water and sewage systems in 23 areas of the park. As now mandated by state and federal law, these systems require seven-day-a-week staffing by licensed operators located no more than one hour away.

Water treatment. To ensure that the 300 million gallons of water consumed by park staff and visitors each year are safe, surface water or water from underground sources obtained via well or spring-water pump systems is piped through some 605,000 feet of buried lines and treated in a chemical coagulation/filtration system. The four plants in the park are run by 16 certified water/sewer plant operators. The water treatment systems include underground and aboveground storage tanks and four small reservoirs that provide domestic water for the Mammoth and Old Faithful areas. Water production cost $816,000 in 1998. As with the park's buildings, preventive maintenance is minimal, and many of the park's developed areas are served by old, failing water-collection systems. The treatment plant at Old Faithful can barely keep up with the demand in the spring when the water it draws from the Firehole River is highly turbid and requires extensive filtering.

Money down the drain. Built from the 1930s to the 1950s, the park's 855,000 feet of water and sewer lines have not been replaced as needed and are therefore subject to liquids leaking in or out of the pipes. The clay sewage lines in the Old Faithful area, many of which go through thermally altered ground, may once have been state-of-the art, but they aren't any more, and the water lines sometimes emit steaming water. The high mineral content of the water at Old Faithful and Norris eats holes through the pipes. Water leaks of up to 15,000 gallons per day have become commonplace in the park, in some cases costing hundreds of dollars per day in the loss of treated water.

Sewage spills. The park's 26 sewage treatment systems include septic tanks, trickling filters, aerated lagoons, and activated sludge systems that handle 270 million gallons a year. As a result of increasing volume as well as employee training and other health and safety requirements, sewage treatment costs jumped from $341,231 in 1992 to $845,000 in 1998. Yet many of the systems are worn out and could fail at any time, including the plant at Old Faithful. Since 1988, the park has experienced an average of one major spill per year; four major incidents occurred in 1998 in which raw or partially treated sewage was discharged into water courses, and at least three other spills were caught before the sewage reached water or wetlands.

Final effluent from the plant serving the Madison area is pumped to a lagoon with no emergency storage; power failures have many times sent sewage to a nearby wet meadow—only luck and vigilance have prevented it from reaching the Madison River into which the meadow drains through a culvert. Of the four plants in the Norris area, the one at the geyser basin has been out of service for five years because sewage was running out of the mounds; during power outages or pump failure, sewage from a pump station backs up to a tank and then overflows to a meadow by the Gibbon River. The sewer system at Tower Fall is a septic tank and leach field that is on the verge of failing as a result of overloading.

Recycling and refuse disposal. About 2,634 tons of solid waste were generated in the park in 1998 —1-3/4 pounds for each visitor and employee. Refuse from park concessions, campgrounds, and picnic and housing areas is collected from one to three times a day from April through September and sent daily to three transfer stations, from where it is trucked out of the park for disposal. By agreement with Park County, Montana, Yellowstone maintenance crews also collect trash from Cooke City, with the county paying its share of tipping fees at the disposal sites. During the winter in the park interior, solid waste must be held in storage containers until the roads open in the spring.

Recycling Pays Off

By recycling paper, cardboard, glass, and aluminum, Yellowstone and its concessioners diverted nearly 400 tons (more than 12 percent)of its solid waste stream in 1998. Some of the glass is recycled as "glassphalt" that has been used for paving in the park, including the parking lot at Mud Volcano; the rest is taken to cement plants or used for road base. Making recycling more convenient for visitors is a challenge yet to be overcome; unstaffed centers could attract bears and other wildlife.

The Headwaters Cooperative Recycling Project, a partnership with nine adjacent counties in Montana that began in 1997, provides a specially designed truck to collect and transport aluminum, steel, and newspaper to recycling centers. The project area includes 45 small communities and rural areas which have more than 90,000 residents and visitors. The project is intended to save participants hauling costs as well as tipping fees, and eventually reduce the amount of acreage needed for landfills in greater Yellowstone.

The park's disposal costs have risen from $14 per ton in 1982 to $86 per ton in Park County in 1999, and from $81 to $115 per ton in West Yellowstone, Montana, in just the last five years. But despite increasing visitation, recycling has enabled the park to keep the amount of material going to landfills and incinerators somewhat stable. Park employees can recycle batteries, motor oil, used paint thinner, and materials such as glass, aluminum, tin cans, cardboard, office paper, and newsprint.

Composting. With the goal of reducing the solid waste that must be removed from the park by up to 75 percent and reducing costs by up to $50 per ton, Yellowstone has developed a partnership with counties in southwestern Montana to consider construction of a composting facility outside the park. The U.S. Department of Energy provided funding for the feasibility study which was completed in 1997; with assistance through cooperating partnerships, a composting facility is expected to be operating by the end of 2000.

Hazardous materials disposal. Historically, materials of all kinds were dumped in the park's own landfills and subsequently buried. As a result, occasional leaching of unknown substances now has the potential to damage park resources and violate state and federal laws. Because their contents are unknown, more than a hundred 55-gallon barrels have had to be treated as if they contained hazardous wastes, at a cost of $750 per barrel for analysis and $500 for disposal. Handling of hazardous materials also requires special training and equipment for park staff.

Energy efficiency. One of Yellowstone's biggest environmental challenges is to provide reliable, cost-efficient electrical power to remote areas without causing adverse impacts. In 1982, the park's electric bill totalled $226,000; by 1997 it exceeded $960,000. Montana Power Company provides electricity to most of the park, including standby generators at four locations; four of the entrance stations are served by other utility companies. The park generates its own power at four locations and provides emergency standby power to smaller areas and to sewage lift stations.

Park buildings use a variety of heating systems; their primary heat source may be oil, propane, electricity, or wood. Since 1996, the park has used Department of Energy grants to replace inefficient fuel-oil furnaces with cleaner propane heating units for offices and employee residences. Grants from the U.S. Department of Energy have also been used to improve insulation and install double-paned windows at 13 park buildings including visitor centers, maintenance shops, and portions of park headquarters. In 1997, a noisy generator that had been powering the Lamar Ranger Station/Yellowstone Institute complex was replaced with a photovoltaic electrical system, the first of its kind in Yellowstone. Solar energy is now used to power the system 70 percent of the time on a yearly

basis, with a propane generator used as the backup. Similar systems are planned to replace existing generators in other outlying areas such as the Lewis Lake and Bechler ranger stations.

Fuel storage. Nearly all of the 224,318 gallons of gasoline and 144,806 gallons of diesel the park bought in 1998 to keep its vehicles running is stored in underground tanks. When larger than 1,000 gallons, such storage tanks are now subject to state regulation and reporting requirements. Since 1989, the park has brought all of its 114 regulated tanks into compliance, replacing them when necessary with new double-walled tanks and remediating any contaminated soil. However, the park also has about 150 smaller tanks located below and above ground, including many used to store heating fuel. About half of these tanks have been replaced with newer models that provide secondary containment, overspill protection, and hydrocarbon detection, but the remainder are apt to be either leaking or likely to do so in future because of their age and deterioration.

Program Needs

- UPGRADE INFRASTRUCTURE. Like the park's roads and buildings, utility systems require major reconstruction to bring them up to standard and sufficient funds to prevent a return to the deterioration that occurs without an ongoing program of cyclic maintenance.

- WATER AND SEWAGE TREATMENT. Construction of a new sewage treatment plant is scheduled to begin at Old Faithful in 2000, but funds must be obtained to upgrade or replace systems as needed to meet legal requirements and projected demand. Water treatment systems must also be repaired and regularly maintained to standards. Water pipes, sewer lines, hydrants, and manholes need to be regularly inspected, cleaned, and exercised to ensure that they will operate properly when needed. Cyclic replacement of equipment should occur on a scheduled basis.

- FUEL STORAGE. Funding is needed to replace faulty tanks so that the leaking and waste of stored fuel is prevented.

- ADDITIONAL STAFF. Added staff are needed to maintain the park's utility systems, increase composting and recycling efforts, and track the park's compliance with laws, regulations, and safety procedures needed to ensure a healthy environment for the park's resources, visitors, and employees.

Utility Systems

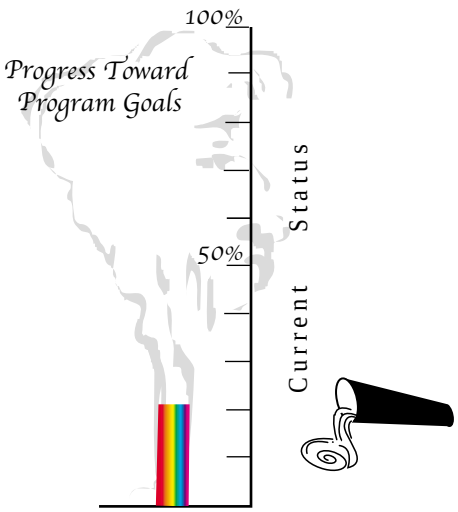
Stewardship Goals

The best available technology is used in the design, construction, operation, and cyclic maintenance of park buildings and utility systems.

Utility systems operators are professionally trained and provided with necessary equipment and support to ensure their safety on the job.

The park complies with all local, state, and federal regulations relating to utility systems and meets or exceeds standards designed to ensure human safety and resource protection.

The generation of solid waste is minimized, and where its creation cannot be eliminated, solid waste is reused whenever possible.



Current State of Resources/Programs

Generous grants have helped the park retrofit some buildings for energy efficiency and improved operation, but hundreds more structures need similar work as energy costs increase. Water and sewer lines lack regular maintenance and often leak.

Operators are well-trained and safety alarm systems are in place.

Sewage treatment systems at Old Faithful, Norris, and Madison are outdated, and the State of Wyoming cited the park for a sewage overflow into Yellowstone Lake in July 1998. Underground fuel storage tanks have been replaced to comply with federal regulations.

Recycling has reduced the park's waste stream 15% since 1994, and regional programs initiated or supported by the park have the potential to decrease the quantities and costs of managing solid waste.

1998 Funding and Staff

Recurring Funds	
Yellowstone N.P. Base Budget	$ 482,800
Cost Recovery/Special Use Fees	$ 1,400,300
Non Recurring Funds	
One-time Projects	$ 190,000
Fee Demonstration Program	$ 42,000
Staff	38.29 FTE

The human resources and funding necessary to professionally and effectively manage the park to stewardship levels will be identified in the park business plan.