Case Study: Joshua Tree National Park

The Los Angeles metropolitan area in southern California has seen tremendous population growth since the early 1900s (see Table 1). The 2000 Census named Los Angeles County the most populated county in the United States. The growth has continued to spill into the surrounding counties, three of which (Orange, San Bernardino, and Riverside) are also among the 20 most populated counties in the United States. Population growth on such a large scale presents huge challenges, including pressures on public services, sprawling suburbs, and the resulting environmental and social problems. For example, in 2002, the American Lung Association named the Los Angeles–Riverside–Orange County region as the metropolitan area with the worst ozone air pollution. In that same year, San Bernardino County was named the county with the worst ozone air pollution. Those two areas have filled the number-one slot on both lists since the American Lung Association first began publishing reports on air quality several years ago.

Table 1. Los Angeles County Population and Population Density: 1900–2000

Year	Population	Population Density (residents/mi^2)
1900	170,298	42
1950	4,151,687	1,023
2000	9,519,338	2,345

Source: U.S. Census Bureau, www.census.gov.

A World Apart

Travel 140 miles east of Los Angeles into San Bernardino and Riverside Counties, and you will find yourself in a different world, amid evergreen creosote bushes and cacti, jackrabbits and lizards, and some of the best rock climbing in the world. Welcome to Joshua Tree National Park (JTNP), home to several of California's ecoregions, including two desert ecosystems that come together in a dramatic

and unique transition zone within the park. Those desert ecosystems owe their distinguishing characteristics to differences in elevation. The dry Colorado Desert lies below 3,000 feet in elevation in the eastern region of the park. Evergreen creosote bushes, funnel-shaped ocotillo with canelike branches, and fluffy-looking yet very spiny teddy bear cholla characterize the area. Climb to higher elevations of 3,000 feet or more in the northern region of the park, and you enter the wetter and somewhat cooler Mojave Desert. This is the only place you will find the unique plant, the Joshua tree, that gives the national park its name and its shaggy branches and spiky leaves.

The park is not all desert. Various mountain ranges border the park, and several can even be found within the park where elevations reach more than 5,000 feet. Scattered throughout the park are numerous natural springs and seeps, both important water sources for wildlife. There are also five natural oases, islands of green vegetation that owe their existence to the small amount of water close enough to the surface to support life. Those oases provide habitat for the California fan palm, the largest native palm in the United States and the only native palm in the western United States.

Case Study: Joshua Tree National Park (cont.)

Desert Alive

JTNP is home to a rich variety of wildlife. The desert may not seem a likely spot for amphibians, which need water in their aquatic stage, but, nonetheless, you can find the California tree frog (a species of special concern) and two types of toads. You can also see lizards basking in the sun, and you might even run into snakes in the area where six species of rattlesnake live. You might sneak a peek at the state reptile, the elusive and threatened desert tortoise, which spends 95 percent of its time under the ground. More than 250 bird species have been identified, including the golden eagle and the roadrunner. As part of the Pacific flyway, many migratory birds travel through JTNP as they abandon the heavy snows of nearby mountains, seeking warmer weather. Fifty-two species of mammals live within the park, including 24 small rodent species and 21 bat species. Nocturnal prowlers include bighorn sheep, black-tailed jackrabbits, bobcats, coyotes, foxes, and mule deer.

In 1936, the area was designated as a National Monument to protect the region's plant and animal diversity and the cultural resources of early people (humans have inhabited the area of the park for more than 9,000 years!). In 1994, President Bill Clinton signed the California Desert Protection Act, designating Joshua Tree National Monument as a national park and adding more than 230,000 acres to the protected area. Today, more than 1,250,000 people visit JTNP annually. They come to enjoy the unique scenery and educational programs, bicycle, bird watch, camp, draw, hike, paint, picnic, and rock climb. Many people come for the quiet and solitude that only a desert can provide.

Something in the Air

Although the biodiversity and topographic diversity of JTNP distinguish it from the neighboring urban regions, air pollution is a problem that both areas share. Years ago, you could stand at Key's View, look out at the desert, and see across the Salton Sea to Mount Signal in Mexico, some 100 miles away. Yet today, on the warm winter days and during the hot summer months, visitors arriving at that same spot are lucky to see Mount San Jacinto just across the Coachella Valley—about 20 miles away. Interfering with the view is a haze of photochemical (light-reacting) smog. Ozone (O_3) is a light reacting or photochemical smog that produces a brown haze in the troposphere, the Earth's lower atmosphere. Another type of smog that interferes with the views of Joshua Tree National Park is from very fine particulate matter (e.g. dust and aerosols). The combination of the two types of smog place JTNP at the top of another notorious list: national parks with the worst air quality.

Much of the smog originates in the Los Angeles metropolitan area and surrounding counties. Each day of intense heat and sunlight in the Los Angeles Basin, ozone is formed when airborne gasoline fumes and industrial solvents combine with nitrogen oxides from vehicles and fossil fuel burning power plants. Wind blows the jumble of pollutants east, away from Los Angeles. As the sunlight and temperature increase during the day, the mass of pollutants warms and rises up and over the Little San Bernardino Mountains. As night arrives and temperatures drop, the mass begins to cool and settles in the valleys of JTNP, creating a layer of polluted air that covers much of the park. The same process occurs day after day. Increased sunlight and high temperatures lead to even higher concentrations of harmful ozone.

Summer months see the most days with the poorest air quality, but recently, the number of poor air quality days in the winter has been increasing. A combination of geography and climate make JTNP a prime location for the smog accumulation that decreases visibility. Other consequences of the increased levels of ozone in the troposphere include:

Case Study: Joshua Tree National Park (cont.)

- Increased nitrogen deposition that is believed to aid the spread of invasive plants
- Damage to plant tissue causing diminished growth and sometimes plant mortality
- Human health problems such as irritation and damage of the respiratory system and aggravation of asthma

Under Pressure

JTNP also faces challenges from growth and development in communities adjacent to the park. People are flocking to the area because of its lower cost of living (compared to Los Angeles), to escape the problems of city life, such as crime and traffic, or simply to reconnect with nature. The surrounding communities south of the park include resort towns like Palm Springs, Indian Wells, LaQuinta, and Palm Desert. North of the park lie the towns of Twenty-nine Palms and Yucca Valley, the U.S. Marine Corps Air Ground Combat Center (the largest U.S. Marine Corps base in the world), and Joshua Tree (an unincorporated rural community that has grown around the needs of tourists visiting JTNP). Population growth is affecting all of those areas, and the subsequent development is encroaching on the park.

A 9,000-acre area of land directly south of the park has been proposed as a site for the Joshua Hills development. Plans include 7,000 housing units, a three-million-square-foot industrial park, 12 golf courses, three hotels, a convention center, and several shopping centers. In addition, the lands surrounding the park are prime targets for power plants as California scrambles to meet the growing demand for electricity. One power plant has already been built near the park borders, and numerous others have been proposed. As more people move into areas around the park, they require new infrastructure and generate additional pollutants. The smog problem is exacerbated, and park visibility is further reduced.

Those problems are not the only consequences of increased population and development in the counties surrounding the park. Nineteen million people live within a three-hour drive of the park, and adding more people means increasing demands on the local infrastructure. Desert groundwater supplies are being depleted to meet increased water needs. The sanitation districts of Los Angeles County have proposed placing a landfill (the largest in the United States) next to JTNP. The National Parks Conservation Association has filed lawsuits against the proposed landfill, believing such a landfill would threaten air and water quality, create loose trash that would blow into the park, and destroy the views and solitude enjoyed by park visitors. More people in the area would also mean more visitors to the park. Having so many people enjoy the park has a downside—a decrease in the opportunities for solitude, one of the main draws of JTNP. Higher usage often translates into more stress on the fragile ecosystem. Higher usage also increases wear and tear on the cultural resources—such as rock art, historic buildings, and archeological sites—that are already threatened by environmental pressures from the additional sprawl and population.

Steps for the Future

Within the park, staff members are doing what they can to decrease their own environmental impacts. They are increasing their use of solar energy at campgrounds and park buildings. Soon all park vehicles will run on compressed natural gas or another alternative fuel. Yet, protecting JTNP from further harm will also require the efforts and actions of the individuals and communities that surround the park (whether they are adjacent or 140 miles away). Perhaps JTNP Superintendent Ernie Quintana put it best:

"We're at a critical crossroads now. In the past 10 years, Joshua Tree National Park has come of age. The pressures are from increasing visitation and [from] increasing by urban encroachment.…

Case Study: Joshua Tree National Park (cont.)

We, all municipalities and regulatory agencies, need to take a look now and project into the future on how to protect and provide open space, recreation, and development opportunities. We have to be wise where we want development to occur and protect areas of open space. Through planning, we have to do a better job of protecting the park and the quality of life we came here for—the openness, the night skies. If we're not careful, we'll lose it all."

Besides their work inside the park, JTNP staff members are also working with the surrounding communities. They conduct education programs to help communities see and appreciate the value of their park neighbor. Park staff members have set up a web-cam so anyone with an Internet connection can monitor the changes in air quality at specific points in the park. Such efforts are meant to encourage members of the surrounding communities to be "advocates" for the park and to realize that they can take important steps (even if they live 140 miles away in Los Angeles) to help protect the park from further environmental damage.

Questions to Consider:

- Do you think citizens in Los Angeles realize that their actions affect desert plants, animals, ecosystems, and people over a hundred miles away?
- What other steps do you think should be taken?
- How is the air quality in your town? (Visit www.epa.gov or contact local air quality management district.)
- Do you know of any similar situations near you?
- How do you think the actions of citizens in your community might affect distant communities and ecosystems?
- Are there negative impacts besides air quality and water pollution from your community that may be harming wildlife that is either migrating through or living at a distance?