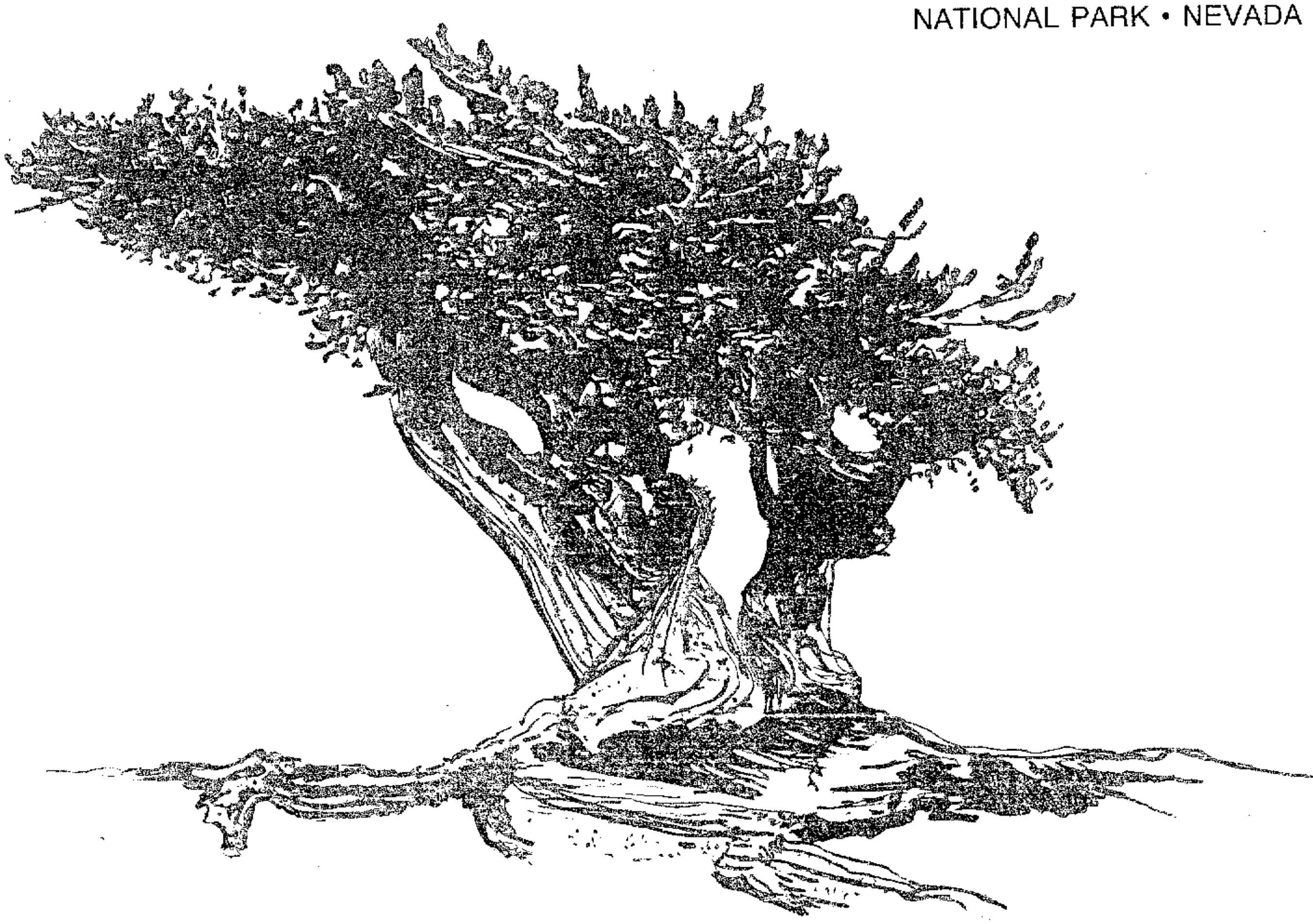
final
general management plan
development concept plans
environmental impact statement

GREAT BASIN
NATIONAL PARK • NEVADA



DEVELOPMENT CONCEPT PLAN
WHEELER PEAK PULLOUT/TRAILHEAD
GREAT BASIN NATIONAL PARK
UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
148 • 20048 • DSC • SEPT 91

VIEW
RESTORED AREA
DEVELOPED AREA
SURFACED ROAD
SURFACED TRAIL
VEGETATION/SCREEN

N

0 50 100 FEET

would be removed following construction of the new treatment facility. The gravel access road to the ponds would be removed and restored to natural conditions.

In cooperation with the state of Nevada and the town of Baker, the Park Service would drill a water well or wells in the Baker vicinity to provide water for the Baker site. Funding and operational costs might be shared by the state and federal government to build a facility and distribution system to provide water to both the park and the community of Baker.

An additional 100,000-gallon water tank would be installed to provide for increased water needs at the Great Basin visitor center, Lehman Cave interpretive center, campgrounds, and park housing area. This would double the existing storage capacity to 200,000 gallons, providing a greater peaking capacity for the water supply to meet anticipated demands. The existing access road to the water storage tanks would be retained.

Water, electricity, and sewage lines would be extended below ground from the proposed sewage treatment facility in the Baker vicinity to the facilities at the 80-acre Baker site (orientation center, administration building, maintenance compound, and housing area). Within the park, water, sewage, and electricity lines would be extended below ground from the existing Lehman Cave development to the new cave ticket sales kiosk and restroom, the Great Basin visitor center, and the Lehman Flats campground.

Rural Subzone

The rural subzone would be accessible by two-wheel-drive or four-wheel-drive vehicles along designated gravel access roads. It would provide rustic camping areas and trailhead access into the park's semi-primitive and primitive subzones. The rural subzone would include the upgraded unsurfaced roads leading into the Strawberry Creek area in the northernmost part of the park and along the eastern park boundary at Snake Creek, Big Wash, and Lexington Arch. Small areas in the southern and southwestern sections of the park including Big Spring Wash, Highland Ridge, and Decathon Canyon would also be included in this subzone. No off-road vehicle use would be permitted in rural areas.

From a visitor's perspective the rural subzone would bridge the gap between frontcountry and backcountry use. Although easily accessible, it would offer a greater degree of solitude and an escape from the heavily used areas in the modern subzone. For those planning more demanding hiking,

PARK ENVIRONMENT

NATURAL ENVIRONMENT

Climate

Great Basin National Park lies in a cold desert climate. Cold deserts are characterized by cold, harsh winters, low precipitation scattered fairly evenly throughout the year, and great extremes in both daily and seasonal temperatures. Typically, winters are cold and relatively dry with occasional snow or rainfall from storms coming predominately from the west off the Pacific Ocean. Because of the rain shadow effect created by the Sierra Nevada range, only the strongest storms contribute much precipitation. Summers are generally hot and dry with frequent mountain thunderstorms. There is a wide elevation range within the park and a corresponding range of mean temperatures and rainfall. Higher elevations have much greater annual precipitation and lower mean annual temperatures.

Air Quality and Visual Resources

Air quality in the vicinity of the park is excellent at the present time. Until it was shut down, the single major stationary source of air pollution was the copper smelter at McGill, Nevada, approximately 35 miles northwest. At present, the Intermountain Power Project coal-fired power plant at Lynndyl, Utah, 100 miles northeast of the park, is the nearest major air pollution source. Future sources could include several proposed coal-fired power plants, including the White Pine County plant (1,500 mW), to be located near Ely, Nevada, 35 miles northwest of the park, the Thousand Springs plant (2,000 mW), 150 miles north, the Harry Allen plant (2,000 mW), 140 miles south, and a plant (unknown mW) to be located next to the existing Gardner power plant on the Moapa Indian Reservation, 135 miles south of the park. A number of hazardous waste incinerators are also proposed, the closest of which would be located on the Utah-Nevada border on the Goshute Indian Reservation, 50 miles north of the park.

The park also has exceptional visual quality. The central southwest, including eastern Nevada, generally has the best visual quality anywhere in the United States. Mean standard visual ranges greater than 120 miles are noted throughout the year, with the best visibility occurring during the winter (for example, the median visual range at Great Basin during the winter of 1987 was 182 miles; Air Resource Specialists, 1986, 1988). These visibility data are confirmed by data regarding fine particles, which play a major role in visibility impairment. The lowest average fine mass concentrations nationally occur in an area extending from northern California and southern Oregon to the Four Corners region, including eastern Nevada (Cahill, Eldred, and Feeney 1986).

Although the present visual quality at Great Basin is excellent, even slight increases in air pollutant concentrations could cause major decreases in visibility. Similarly, night sky vistas could be significantly diminished by artificial light or visibility-reducing pollutants at developments in the park vicinity. The park (and previously Lehman Caves National Monument) has been monitoring visibility for several years. From 1982 to 1987 park staff operated a manual teleradiometer, a 35mm camera, and a fine particulate (dichotomous) sampler. The teleradiometer and camera recorded the visibility from the park to four targets – Mount Moriah (18 miles), Conger Mountain (30 miles), Notch Peak (44 miles), and Peak 8070 (37 miles) – three times a day. In 1987 the teleradiometer was replaced with an automated visibility monitoring station. Under the auspices of the NPS visibility monitoring and data analysis program, this station is also part of the interagency monitoring of protected visual environments (IMPROVE) program.

In addition to monitoring the visual range observable from the park, since 1985 the park (and formerly Lehman Caves National Monument) pas operated a national atmospheric deposition program (NADP) sampler. This site collects precipitation samples, which are analyzed for pH, conductivity, and chemical composition. Since the automatic air quality camera reveals only the presence of particulate pollution, the NADP samples are extremely important for revealing nonvisible air pollutants.

The landscape of the South Snake Range is one of contrast. In the central portion are mountains, heavily timbered at mid elevations, that extend above timberline and are capped by alpine vegetation. Rising to over 12,000 feet, some of the summits are broad and rounded, others are glaciated with sharp, jagged peaks. Creek valleys are generally steep and narrow. At the southern end of the range many of the creeks lie in deep canyons. Surrounding the range on both the east and west sides are broad, flat, sparsely vegetated valleys. These valleys were once the floors of two separate lakes that have now evaporated.

Igneous and sedimentary rocks of varying ages form the South Snake Range. Some of the park, including the main developed area around Lehman Cave, is underlain by limestone deposits containing numerous caves. Quartzites and quartz monzonites form the base of the range and often are exposed at the surface.

The park has a geologic history representative of the eastern Great Basin. The mountains of western Utah as well as the South Snake Range contain large amounts of limestone, which was deposited on the floor of a warm, shallow sea during the Paleozoic era (between 600 and 245 million years ago). Fossil remains of marine organisms are occasionally present in the park's limestone formations.

Conditions changed in the Mesozoic era (between 245 and 67 million years ago) when the Great Basin region was uplifted and the former sea floor emerged as land and was gradually eroded. As the South Snake Range was elevated, it formed a large dome-shaped structure. Sedimentary formations in the upper section of Paleozoic rocks were stretched, eventually detaching from the rising dome and sliding down the sides, forming low-angle thrust faults.

Beginning about 45 million years ago and extending until 17 million years ago, volcanism dominated much of the Great Basin, and huge eruptions of ash and lava flows changed the landscape. Although volcanic rocks illustrate an important part of Great Basin's geologic history, none occur within the park boundary. There are some tertiary volcanics at the extreme southern end of the South Snake Range, about 10 to 12 miles south of the park.

Seventeen million years ago marked the end of volcanism and doming of the South Snake Range and the beginning of a change in geologic forces. At that time the earth's crust in what is now western Utah and most of Nevada began to uplift and stretch in reaction to a new stress. The crust cracked into great north-south aligned faults, which still move and continue to shape the Great Basin today. The geophysical causes of this new mode of deformation are still being debated, but the result – the alternating ranges and valleys that make up the Great Basin landscape – is obvious. The South Snake Range, which is the backbone of the park, is bound on its east and west sides by faults. Earthquakes attest to the movement along these faults that continues to elevate the range in relation to the adjacent Snake and Spring valleys.

Geologic processes of fairly recent times placed the finishing touches on the park's landscape. Erosion of the South Snake Range accompanied uplift, tearing down the mountains and depositing rocky debris as alluvium in the valleys and along the toes of the mountain slopes. The groundwater present in limestone formations dissolved some of the rock, forming solution caverns such as Lehman Cave and refilling parts of the caverns with crystalline deposits of great beauty.

During the cool, moist Pleistocene epoch, when large pluvial lakes filled the east and west margins of the Great Basin, the water level of Lake Bonneville on the east margin rose so high that it flooded several of Utah's valleys and reached its maximum westward extent in the Snake Valley, only 5 miles northeast of the park. To the west a much smaller but very deep lake filled Spring Valley. Today these valleys are composed of pluvial lake deposits and alluvium. The gentle hills approaching the base of the South Snake Range are primarily old alluvial deposits of varying origins.

The cool climate of the Pleistocene provided sufficient snowfall in the South Snake Range for alpine glaciers to form. Many of the high mountain valleys were deepened and scoured by moving ice. The glaciers also left behind jagged cirques, moraines, and small mountain lakes, providing an alpine appearance seemingly out of place in the arid region. The remnant glacier and rock glacier in the Wheeler Peak cirque are reminders of this climatic change.

A systematic soil survey has not been completed for Great Basin National Park. In general, the soils of the region reflect the moderate complexity of the parent material. They are fairly deep where formed over alluvium and quite shallow on hillsides. Most are excessively well drained. At elevations above timberline, soils are very poorly formed and often exist only in isolated pockets protected from the erosive effects of wind. The various soils, particularly those formed from limestone, often have specific plant communities associated with them.

Water Resources and Water Quality

The park has numerous small permanent and intermittent streams originating at higher elevations in the South Snake Range. The larger streams are on the east side of the park because of the more gradual elevation gradient and larger catchment basins on that side. Many of the smaller streams disappear into the ground before flowing out of the park. The larger streams usually flow out of the park and into the valleys on either side. There they evaporate, percolate into the substrate, or are channelled into irrigation ditches for use in valley ranches.

Baker and Lehman creeks are the two largest drainages in the park. The mean annual water yields on these creeks are 6,177 and 3,576 acre feet, respectively. Most of the water in the larger park streams is used by surrounding ranchers for stock watering or agricultural uses. The South Fork of Big Wash has been identified by the Park Service as being eligible for designation as part of the national wild and scenic rivers system.

There are six subalpine lakes in the park near the crest of the South Snake Range. All of these lakes are small and shallow, and all are on the east side of the range. The lakes receive most of their water from springs and subsurface water flow. During spring runoff the lakes rise to their highest levels and the water flow outs and into the permanent streams. After the runoff the lakes decrease in size through evaporation and subsurface seepage.

Because of the geological complexity of the area, the characteristics of groundwater flows are largely unknown; however, it is obvious these flows are significant and play an important role in hydrologic transport. There are numerous springs in the park, some of which hold surprisingly large quantities of water. In addition, there are many large springs on both sides of the South Snake Range in Spring and Snake valleys. These springs are obviously linked by groundwater flows to the catchment basins of the South Snake Range. The groundwater flows are also critical in the formation and maintenance of the numerous limestone caves within the park.

Both Spring and Snake valleys contain substantial underground aquifers with very large groundwater reserves.

The water quality of the streams of the park has not been extensively studied. Data gathered recently by the Environmental Protection Agency indicate that the water quality of the park's alpine and subalpine lakes is exceptionally good and it is likely that the high elevation streams possess similarly pure water. Lower elevation streams flow through riparian zones subjected to grazing, and it is suspected that water quality in these streams is degraded. The extent of this degradation is not known. Research and monitoring activities are currently underway at the park to obtain this information.

Most of the water that originates in the park is allocated by the state of Nevada for use by private individuals for agriculture and livestock watering on the ranches in Snake and Spring valleys. In general, the major uses for water and most points of diversion for taking water are outside the park boundary. Because of this, and with few exceptions, water flows through the park before being diverted, leaving the park's streams with naturally occurring water flows. One exception is lower Snake Creek, where water is diverted within the park and piped for about 3 miles across a permeable streambed, leaving the lower portion of the natural stream channel dry for much of the year.

Nevada's water law in based on the doctrine of prior appropriation. Under this doctrine, the entity that first diverts water for a beneficial use has the prior right to use the water, against all other appropriators that may wish to use the water later. The federal government may also hold federal reserved water rights, which arise from the purposes for which the land is reserved. When the federal government reserves land for a particular purpose, it also reserves, by implication, enough water unappropriated at the time of the reservation as is necessary to accomplish the purposes for which Congress or the president authorized the land to be reserved, without regard to the limitations of state law.

Within the park, water for visitor and administrative uses in the headquarters area is provided by an appropriative water right for Cave Spring – the same right that provided for the use of water to meet visitor and administrative needs at the former Lehman Caves National Monument. This water right was decreed in a 1934 adjudication, at which time the surface water rights in the Lehman and Baker Creek stream systems were determined.

The act that established Great Basin National Park specified that no new federal reserved water rights were created with the creation of the park. Reserved rights are limited to those associated with the initial establishment of Humboldt National Forest and Lehman Caves National Monument. Reserved water rights for national forest purposes apply on all former national forest lands reserved from public domain, which constitute most of the park.

Sufficient water for all wildlife, stock, and visitor needs would likely not be provided through the exercise of reserved water rights. Therefore, appropriative water rights would likely be required for these types of uses. Water systems in three of the campgrounds that the Park Service acquired from the Forest Service are fed by springs in the Baker/Lehman

Creek system. No rights were claimed for these springs in the 1934 adjudication, and it appears that no new surface water rights will be granted in this fully appropriated stream system. The extent of groundwater appropriation is not known.

Following a 1988 Nevada Supreme Court decision, federal agencies' water right applications for land management functions that are recognized as beneficial uses under Nevada law (for example, recreation, stock watering, and wildlife watering) will be treated on equal basis with applications by private landowners. To date, the Park Service has not applied to the state for water rights for these uses.

The extent of water appropriation in basins other than Lehman and Baker creeks will not be known until the rights in these basins are adjudicated.

Vegetation

The evolution of the vegetation in the park is linked to the geologic history of the area. About 130 million years ago the western half of North America was a level plain largely covered by a shallow sea, with tropical forests on dry land. The climate was warm and moist, and tropical plants requiring a warm frost-free environment thrived. About 100 million years ago, the epicontinental sea withdrew, and there was a general uplift of the Great Basin region. This uplift caused three phenomena that had a drastic effect on the earlier tropical vegetation: a general cooling of temperature, often interrupted by warmer periods; a progressive drying due to the increasing rain shadow effect of the rising Sierra Nevada and Cascade ranges; and fluctuations between wet glacial-pluvial and warm-dry periods, especially during the Pleistocene epoch. As part of this transition to a drier and more continental climate, temperate climate plants gradually replaced those dependent on a moister maritime climate. Many of the plants migrated from Eurasia.

Between 55 million and 25 million ago, in the northern part of the Great Basin the dominant vegetation community at lower elevations was the conifer-deciduous forest and above 4,000 feet was the montane conifer forest. In contrast, the semiarid and arid conditions of the southern Great Basin produced oak woodland, chaparral, thorn forest, and other semidesert vegetation.

Between 20 million and 5½ million years ago, southern Great Basin vegetation expanded into the central and northern Great Basin, eliminating the pure conifer forests from the mountain slopes and leaving oak/conifer woodlands; chaparral covered the lowlands. At the end of this period temperatures were distinctly higher than at present, but by 5 million years ago both temperatures and precipitation were similar to those of today. Between 4 and 2 million years ago a cooling trend began, leading to the ice ages of the Pleistocene. The flora of the Great Basin then was one of savanna and grassland, with riparian, semiarid woodland, and chaparral communities.

The Great Basin flora at the beginning of the Pleistocene was similar to that of today. There were four major glacial advances during the Pleistocene, and well-preserved geomorphic features, glacial moraines, cirques, and other glacial deposits in the area today show that glaciation was extensive in the South Snake Range. Also during this time a series of pluvial lakes formed within the valleys of the Great Basin; Lake Bonneville in western Utah and Lake Lahontan in northwestern Nevada were the largest. Conifer forests became established on some lower mountain slopes and in the parts of valleys not covered by lakes. During the warm interglacial periods shrubland and grassland communities expanded; some lowland trees died and some migrated into the uplands.

Toward the end of the Pleistocene, during a relatively warm interval from about 7,000 to 4,000 years ago, the climate became drier, the glaciers melted, many streams and rivers ceased their flow, and the evaporation of lakes exceeded the inflow, which may have caused elevational and latitudinal depression of the vegetation zones (migration downslope and to the south). Throughout the Great Basin region, the net effect of vegetational and geologic history was to produce the present high mountain "islands" of montane subalpine and alpine vegetation surrounded by low desert "seas" of sparse northern desert vegetation.

The vegetation types in and near the park today are described and illustrated on the Vegetation map. Each type consists of one or more vegetation communities, which are described separately. All information was derived from LANDSAT data on file at the National Park Service's Geographic Information System Division in Denver, Colorado.

Salt Desert Scrub/Shrub (1% of the park). This vegetation type is found on more saline soils on the valley floors that surround the park. There is very little salt desert scrub within the park, but it is widespread in the Great Basin physiographic region. It consists of two plant communities.