are concerned with a thing called "carrying capacity". That is, how many people can use a picnic area, beach, nature trail, canoe, water-ski, etc., before the activity is spoiled?

There are some who say "No problem." When it's too crowded for family A they'll leave. But the B's will come and probably the C's after them. Each group in turn establishes a higher norm.

Perhaps it can work this way for people but one of our most critical problems is the subtle but often devastating effect of crowds on the vegetation of outdoor areas.

The sequence of uncontrolled and intensifying use goes like this: (1) compaction begins to change the soil. This is worse on heavier clay soils. (2) The small plants that make up the erosion-fighting groundcover go, (3) shrubs and reproduction trees go, (4) older trees "stag-head" (tops die back and die, (5) finally, the area becomes so shabby that it is either abandoned or partially restored at great expense. Popular wooded picnic areas are particularly vulnerable to this.

#### **Planning for Protection**

Planning for protection, of both the people and the natural resource, must start with the designers, but they must communicate the intent of the plans to the experienced maintenance people and put their feed-back into the system.

In critiquing designs we must try to visualize the crowds of people coming to use our facility and say to ourselves, "What else will they want to do?" As we identify and list each element of undesirable use we modify the plans in two ways. First, make adverse use so inconvenient, using barriers, thorny plants etc., that the user's selfinterest prevails. Second, be prepared to make some management compromises between what the public might want and a practical use that they might accept.

In one large park visitors were carving name and initials into the huge posts supporting the roof of the main shelter. Realizing that expensive repairs would soon be needed the park officials considered signs and security officers to confiscate knives, but fortunately tried a little creative thinking and realized that the motive of the carvers was not vandalism, but recognition. A set of similar posts were set up in a half circle in the area. They were labeled for regional groupings of states. The carvers, as predicted, switched to the "regional" posts. When a post filled up with initials it was easily replaced with a fresh one.

A National Park Service author wrote suggesting that you place yourself as a park user, doing things they might want to do, yet in a way to minimize damage:

- 1. Put paths and walks in lines of natural circulation. Some have even suggested it would be good to wait until the second year before putting in permanent walks. Put them in where the paths were worn during the first year.
- 2. Keep your rest rooms and other service buildings and parking lots related to the principal activity areas of the park.
- 3. Use low barriers to control traffic.
- 4. Where possible, use vegetation to replace fences. If proper plant materials are chosen

you eliminate the cost of painting fence and add to the attractiveness of the area. If shrubs must be kept low for security, then make the barrier wide and prickly.

- 5. Fixed tables and stoves will concentrate use and reduce "human erosion" of surrounding vegetation.
- 6. Limited capacity parking lots tied in with the traffic patterns and good transfer-points will help protect sensitive areas from overloading.

As the designers and maintenance planners do their creative reviewing of park areas, they must remember that protection planning requires not only design skills on the drawing boards, but also psychology and observation of human nature in the field. People will move tables to get out of sun or smoke. People will park in the shade. People will slide down or run down a hill if it looks shorter.

Management is the key word. Park and recreation landscape use implies interaction between people and the resources. From the wilderness to the garden land-managers have a job of developing designs that can be maintained.

#### There Is a Choice

We can meet the high operating costs of poorly designed facilities or learn to be more critical of original designs.

Costly features in a proposed design include awkwardly shaped areas of turf or paving that require extra maneuvering to mow, fertilize, sweep or snowplow. Designs that do not allow for traffic circulation and easy access to activity areas for service and maintenance vehicles take more time to maintain.

Other time-wasters include poor access to utilities and lack of hook-ups for light and water. Poor design increases costs of snow removal if hand shoveling is required to move or load snow and ice. In fact, any designs that require hand work because power tools and large equipment cannot reach the area should be closely reviewed.

A more practical alternative to hand work is to be more critical of the designs when they are still on paper. Don't let architects preconceive a design until the intended use is clear. Work with them and learn to visualize the people using the facility. In absorbing data in preparation it is important to consider the activity not a structure. Henry Elder said "... to present a problem as "church", "school", or "house" is to accept a problem with a previous solution for minor improvement." Instead, focus on "worship" rather than church, "learning" rather than school, and "living" rather than house." It follows then that we must also con-sider "play" rather than playground. We must also try to provide ways in which the designers extend their contacts with the project through the construction phases into the actual operation and maintenance.

This overall concern and supervision, including a few trips to see the people using (or misusing) the completed facilities, is much easier when the designers are "in-house" as compared to consultants.

Follow-up inspections take time and consultants must be paid if we expect the service. Too often the important evaluation phase is eliminated to reduce project costs. This supervisory role is also critical in the choice of materials for the construction.

The design concepts must be translated from blueprints into specifications and finally into materials of many kinds. The control of high maintenance costs may begin with design concepts, but it becomes more critical as materials are chosen. We must decide on the size of trees to plant, whether to seed or sod, what sort of paving for paths, walks, roads, and parking areas, and whether to paint the walls or to use natural materials. Do some designs and materials seem to "attract" vandalism? While a mistake can always be corrected by rebuilding, the subsequent costs are usually higher.

Choice of materials goes beyond varieties of trees and shrubs to include a bewildering range of lumber, tile, concrete and glass. We must make realistic estimates and balance initial costs with projected annual maintenance. We must steer equally between the fragile structure that collapses regularly from over use and must be rebuilt or replaced, and the slick white elephant facility that interests no one but "is so easy to maintain".

It is the use by the people that is the payoff. We must design facilities that can and will be used and then develop them with the most durable and appropriate materials that we can afford.

#### The maintenance question

What does use imply? When we design a park facility we attempt to predict the ways in which people will want to use it. When we come to maintain it, we are concerned with the ways they actually do use it.

Maintenance is routine recurring work which must be done to keep a park and recreation facility in such a condition that it can be used at its original or designed capacity or capability. When damage occurs, repairs restore the facility to its original capacity. Many agencies also include small additions, changes, expansion and remodeling in this category. In this way small changes in the way people use the areas can be accommodated without complete redesign. It's almost like changing a tire without stopping the car.

### **Preventive Maintenance**

As people begin to use the newly developed area, we must shift more and more toward preventive maintenance. This relates to protection planning in the design process. Both involve study of the user-patterns that develop and planning appropriate modifications as time goes by.

1. As the use builds up increase the frequency of litter pickup. If the park is clean in the morning more people use the trash cans. When ethnic festivals, holiday weekends and



other heavy litter is forecast many agencies send crews and trucks in at midnight after the first day or early the next morning. Heavy use areas like Disney-World keep trash-collectors, (neatly uniformed and radio-dispatched) on the move among the visitors so that litter never accumulates.

- 2. Make repairs quickly. Add the "three R's" to your maintenance plan: Repaint splashes, splatters, and graffiti. Creative comments on our walls invite others to comment. Repair minor damage quickly. Hard use results in wear and breakage. Prompt repair protects you from liability and eliminates more damage from vandals. Finally, Replace things that break too often. This is where your record keeping pays off and can justify replacing window glass with one of the more expensive, but break-resistant plastics.
- 3. As the traffic gets heavier go to harder surfaces: When the path gets too dusty and/or muddy, add wood chips. When the feet pound the chips to sawdust, put in gravel. If the use still increases or if the elderly or handicapped have problems, go to asphalt (in various colors) or concrete. Each surface requires different consideration for the most efficient maintenance.

### Management tools for maintenance

To meet the challenges of this more systematic correlation of design and maintenance a number of management tools are being developed by concerned administrators and tested in park systems across the country.

These management tools adapt procedures developed in business and industry to our problems of balancing park use and protection of the resource. They include:

- 1. Maintenance standards: What is the desired result?
- Maintenance plans: Written and graphic application of the standards to specific activity areas.
- 3. Job schedules, work programs and budgets: Implementing the maintenance plans.

### Importance of good supervision

Less obvious than these techniques are the powers of maintenance procedures to affect designs. Good landscape design whether gardens, playing fields, or support areas, may be continued for a long time under good maintenance, or quickly lost without it. The shift from hand labor to the use of skilled workers and specialized machines has brought the art of the landscape manager to a higher level than ever before.

Since the effect of the design is rarely complete when the construction is finished it is essential to have a good supervisor to guide the maintenance for the five or ten years until it can be fully realized. It is vitally important that the man in charge of maintaining the area have the esthetic ability to appreciate the design and the enthusiasm to maintain it.

This point emphasizes the need for care in selecting and developing maintenance super-

visors. Try to select people with as much technical and management know-how as you can. Then help them gain an appreciation for the rest of it by encouraging them to talk with people who have the ability and enthusiasm. Designers and maintenance people should meet together, talk together and share their insights. It pays off in park and recreation facilities that do what they are supposed to do and keep on doing it.

In summary, park and recreation facilities are designed to be used in certain ways. Maintaining them implies that they are used. The more they are used, the more maintenance will be needed to keep them functioning in the way that they were designed. Designers should work with maintenance people and maintenance supervisors must develop the ability to appreciate the design and the enthusiasm to maintain it. We must design for maintenance and maintain the design. **WTT** 

Attable it is the preceding paratons impossible are tasks performed daily within the more manage able confirms of the ban likego Wild Animal Park The park has compressed northern, southern an essient Africa and Asia into an 1.200 arre wildlift preserve in the San Parquel Valley 30 miles north of San Pare of the first stat stal press to mark and an still leaves the park is the parts of san first stat stall leaves the park is the parts and environ mants of southern California, more than 3.000 with animals and about 3.000 different types of plants

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### AFRICAN SAVANNAH, ASIAN SWAMPS MAKE CALIFORNIA ZOO HOME

Consider a job as guardian of the savannahs, the open plains of Africa. The sun beats down relentlessly on the vast stretches of grass struggling to grow in poor soil and, in the dry seasons, with little moisture. Antelope, giraffes, rhinoceros, hippos, leopards, lions and zebras feed on the grass, tramping it into the ground, and eat the plants down to their roots.

Or consider a job overseeing the rain forest and swamps of southeastern Asia. Heavy rains deluge the area twice each year, in July and January. Land is swampy, a mixture of silt and runoff water from the mountains. Animals live in the trees to avoid the water and move around by "flying."

Much like the preceding missions impossible are tasks performed daily within the more manageable confines of the San Diego Wild Animal Park. The park has compressed northern, southern and eastern Africa and Asia into an 1,800-acre wildlife preserve in the San Pasqual Valley, 30 miles north of San Diego. But that still leaves the park's staff contending with the diverse terrains and environments of southern California, more than 3,000 wild animals and about 3,000 different types of plants.

It was a different story six years ago. When the park opened in May of 1972, verdant hillsides and lush gardens were only a figment of horticulturist Jim Gibbons' imagination.

"My first experience with the Wild Animal



Making a habitat for exotic animals out of vast areas of cut and empty hills has taken six years.

Park was a sunny day in January, 1972," Gibbons recalled. "Arriving at the park site early one morning, I looked over vast areas of cut and empty hills and tried to visualize how we would do away with the nakedness. I realized we had quite a job to do, so the entire gardening force dug in and in six years I believe we finally have begun to cover the grounds in verdant growth."

In the early spring of 1972, the horticultural staff began to create a forest. The park's hills and slopes were bulldozed bare and then hydroseeded, a process of applying seeds and slurry with pressure guns. Literally, it was an uphill battle. Bare decomposed granite on the slopes was interspersed with fractured rock outcroppings; the only hopeful signs for plantings were good drainage and porous soil.

An almost constant irrigation program was necessary to germinate the seeds. For the park's water needs, a half-million gallon steel water storage reservoir had been completed in September, 1971, and in the fall of 1972, a water line was completed to the Reed Reservoir, which was incorporated into the City of Escondido water system. Water also is re-used from the sewage treatment plant for irrigation.

When those early plants reached 18 inches high, the park began a vigorous fertilization program that continues today. Every three to four months, with IBDU (Par Ex slow release 25-4-8) fertilizer is applied by helicopter. "We needed a way to cover a large area in a short time," Gibbons said about the aerial fertilization. "It was effective and it wasn't all that expensive." The task of covering up to 400 acres with 10 tons of fertilizer, which would require the work of seven men for two weeks, can be finished in about one hour. A hopper beneath the helicopter is loaded in about three seconds by having a man on the ground ready to pour in the fertilizer. Gibbons said the animals pay the chopper little mind.

The slow release fertilizer releases nitrogen by movement of water in the soil and is not greatly affected by changes in temperature or bacterial action. All materials used by the park's horticultural staff must be approved by a veterinarian for toxicity as well.

As a result of fertilization and other intensive cultural programs, trees have reached heights averaging between 30 and 40 feet with four to sixinch diameters. Exceptional trees are closer to 60 feet with 10 to 12-inch diameters. Eucalyptus and acacia also have grown rapidly in just six years, along with other shrubs, vines, grasses and wild flowers. These products of years of care earned the horticultural staff the Grand Award in its category in a nationwide competition sponsored by the Professional Grounds Maintenance Society in 1976.

In addition to providing beauty, the forest serves as a screen, windbreak and food source for the animals. The eucalyptus is cut and transferred Woodridge Golf Club, Lisle, III.

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\*Rating for vehicle equipped with 9.50-8 rear tires.



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### **8 QUICK AERATOR**

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to the San Diego Zoo (park's parent facility) for nourishment of the koalas and the acacia provides browse and fodder for the giraffes and other park animals. Many native mammals and birds also find a home in the forest canopy.

Gibbons might feel like crawling up into that forest canopy himself once in awhile, for the past year's successes haven't eliminated the problems. This year the staff's biggest challenges have come not from the environment quirks of Africa and Asia, but from those of Southern California, where this season has been the wettest in nearly 40 years. Those unexpected crises aside, the idiosyncracies of caring for the native homelands of exotic animals remain. The habitats are vast - up to 125 acres; the environments are in a delicate balance. The animals would be the last to realize they weren't actually "at home." The 22-person horticultural staff, in addition to Gibbons, must make sure imported plants from East Africa don't end up in the Asian Highlands, for example. And then there's the problem of giraffes and elephants eating those expensive trees. Trees are ringed with telephone poles to dissuade the giraffes.

"It's altogether a different line of work," said Ray Michael, construction and maintenance manager. Michael and his 11-person staff are responsible for maintaining the existing buildings and supervising new construction. They're also responsible for knowing facts not in the mental storehouse of the ordinary person — like how high a baboon can jump (11 feet straight up and, if he's got the right footing, 15 feet horizontally). Gorillas can not cross the 15-foot-deep waterless moat that surrounds them, and they do have trouble climbing the smooth stucco plaster wall on the other side of the moat.

Those facts weren't quite as important when zoos were synonymous with cages. But these days, no wild animal in his right mind would want to escape from the San Diego Wild Animal Park. The gorillas, for example, have heated floors in their sleeping quarters and are fed warm milk every morning. "They're fed, they're cared for. Why would they want to leave?" asked Michael.

They don't. As a result, the park has become a major animal research center where many endangered species have reproduced. It is also a center for the animal lover. Visitors enter the park in the 17-acre Nairobi Village, which contains an Aviary, Petting Kraal, Animal Care Center, Congo River Fishing Camp, Gorilla Grotto, embarkation point for the Wgasa Bushline monorail and entrances to the Kilimanjaro Hiking Trail and Tropical America. The monorail takes passengers on a five-mile guided tour past social groups of various animal species; the hiking trail takes visitors on their own 1¼-mile East African safari, which affords a safe but close view of lions, tigers, cheetahs, giraffes, rhinos and other animals.

With all that, the park is less than half developed. Another 1,200 acres await the park's planners. But managing 1,800 acres still beats taking care of two continents. **WTT** 



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