Section 3

LIMITS TO RECREATIONAL ACCESS
INTRODUCTION

In this session, some of the constraints are discussed that must be recognized in the planning, implementation, and management of any recreational access scheme. Four separate but interrelated constraints are considered. Devinny et al. address the inherent limitations of rocky shore systems in supporting extensive recreational use. Ditton approaches the issues from the perspective of social constraints and concerns which affect recreational access. Spharler discusses the issue from an applications standpoint through his remarks on the design constraints related to improving coastal access. The session concludes with Burke, who analyzes the transportation planning limitations of coastal access.

The paper by Devinny seeks to alert planners and managers to the potential damage that sensitive coastal ecosystems can sustain as a result of unrestricted use by recreationists. The authors contend that the damage to the resource base poses several immediate and possibly equally damaging effects. They note that the immediate effects of trampling, taking, littering, etc., can upset the balance of coastal ecosystems. In some situations, the secondary effects of changes in organism populations have influenced the populations of predators, prey, and competitor organisms. The management tool of public education is discussed as a method of alleviating this condition. The success of this method has been documented in some areas, but Devinny feels that other resource protection measures besides public education are also necessary.

Ditton’s paper examines a different dimension of the same issue addressed by Devinny. Ditton discusses the limits to recreational access from the perspective of planning and management for recreationists. He asks the obvious but most often overlooked question: Access for whom? He notes that recreational access involves more than simply equating presence on site with satisfaction that recreational access is more than just access to ocean resources. He suggests that a successful access plan must supply coastal recreation experiences that are satisfying. To accomplish this, he recommends that access plans and management efforts consider the motivations and satisfactions of recreationists. Ditton identifies research needs, and states that “we need to be a little less concerned with simply providing access and more concerned with the nature of the experience being accessed.”

Spharler’s concern is with design opportunities and constraints. He addresses the issue from his years of experience with the California Department of Parks and Recreation. This department is faced with the formidable task of providing access for recreationists to the state-operated coastal units. Spharler’s approach is dependent upon locating and siting recreational access areas. Resource characteristics, along with planning and design considerations, are given priority over the motivation and satisfaction of recreationists. It was recognized in the forum discussions that such concerns are not mutually exclusive.

Burke’s paper links coastal access to the limitations imposed upon the recreationists by transportation; additionally, he expands his analysis of this issue to include the associated impact of energy conservation on any access program. Burke’s analysis acknowledges the complex dimensions of access issues as discussed by Ditton, Spharler and Devinny.

Burke states that transportation planning for coastal access requires that coastal travel behavior and network system design be cooperatively evaluated. Burke links these factors together throughout his analysis. By citing specific examples (Laguna Beach and Capitola) he shows that measures need to be developed which minimize the congestion on coastal access arterials and suggests several mechanisms that might serve to alleviate some of the congestion such as LCP comprehensive planning in which travel behavior, travel time, trip distance, vehicle operating characteristics, and indirect energy requirements are considered. Burke acknowledges that given the adversary relationship that exists between state and local governments, such an approach will not be easy. He advises planners to provide decision-makers with as many alternatives as possible in dealing with the transportation aspects of the access issue.

Andrew Manus
Director
Sea Grant Marine Advisory Program
University of Delaware
formerly Marine Resources Specialist
Sea Grant Marine Advisory Program
University of California
AN INTRODUCTION TO THE EFFECTS OF RECREATIONAL USE ON ROCKY INTERTIDAL ECOSYSTEMS

DR. JOSEPH S. DEVINNY is Assistant Professor in the Departments of Civil Engineering and Environmental Engineering at the University of Southern California, Los Angeles, California.

Rocky shore ecosystems are a recreational resource that brings many visitors to the coast. The pleasant hours spent by the curious student, the seeker of seafood, or the casual visitor constitute a strong justification for increased public access to the shore. But excessive human attention can damage these attractive ecosystems. Some immediate mechanisms of this damage are known:

**Taking** — Many species are taken as game or as bait for fishing. Casual visitors take souvenirs. Students on organized field trips are often assigned the task of making collections, and researchers often remove organisms for further study.

**Tampering** — Almost every visitor picks up a few animals for a closer look. When these organisms are not replaced in their proper microhabitat, they may die. Many species prompt endless poking and prodding, which may eventually be fatal. If a rock is turned over during the hunt for curiosities and is not replaced, the attached animals and plants are left exposed. In some cases, visitors intentionally poison tidepools with copper sulfate or chloride bleach to obtain samples or game — and all organisms suffer.

**Trampling** — Some species are crushed by a single human footstep; the stronger ones may survive at first, but they are eventually worn down by continuous foot traffic.

**Disturbing** — Species which use the rocky shore for breeding or forage may be lost if they are continually frightened away.

**Littering** — The food scraps, fish bait, and fish cleanings often left at the shore provide food for scavengers. The abundances of the scavenging species will rise. In extreme cases rats and even a feral cat have become permanent rocky shore residents.

**Secondary Effects** — All of the species on the rocky shore are interdependent parts of a balanced ecosystem. When one population changes because of taking, tampering, trampling, or littering, abundances of predators, prey, or competitors will also change.

General references to the damage abound in the literature. Ricketts, et al. lamented the loss of intertidal organisms to wasteful collectors, and the California Coastal Zone Conservation Commission (1975) recognized the problem of excessive use. Unfortunately, the many general descriptions have been followed by only a few quantitative studies specifically directed to the problem.

Widdowson surveyed intertidal seaweed populations in southern California at a set of sites which had previously been investigated by Dawson. Both he and Dawson found that the number of species was declining. Dawson mentioned collectors as a possible contributing cause. Widdowson showed in more detail that the decline at each site was correlated (by rank) with three factors: (1) human use, (2) sewage pollution, and (3) air pollution. The strongest correlation was with human use measured in terms of parking availability, length of walk, and degree of local housing development.

Chan studied human use specifically, including both plants and animals, in his study, emphasizing the effects of educational field trips. He compared areas of heavy, moderate, and light use, and found use was associated with reductions in abundances of mussels, rock snails, anemones, and seastars (Figure 1). Only 77 visitors per hectare visited the moderate-use area in a 5-week period, so just a few people were sufficient to cause significant change. Chan also tested the utility of a vigorous public education program. He found that the fraction of visitors collecting could be reduced by half or more, and that the number of organisms taken by each could be reduced by a like amount (Figure 2). Thus, education reduced the total number of organisms taken by about 75%. However, some people continued to collect, particularly taking attractive species like seastars.
Zedler investigated the effects of public use at Cabrillo National Monument in San Diego County. She observed people at the beach to determine the number present at various times and their most common activities. Many of these activities held clear potential for damage to intertidal populations; after walking, standing, and picking up animals, poking anemones was the next most common activity. She found the abundances of several species different in areas of high and low use. Changes in abundances occurred when use intensities changed. Experiments also showed specific effects from trampling and rock turning.

Zedler also discovered a more subtle effect: a change in the size distribution of the owl limpet Lottia gigantea. Larger individuals were considerably less abundant in an unprotected area than at the Cabrillo National Monument, where taking is restricted. Presumably, game hunters preferentially harvested the largest animals.

**Methods**

We have approached the problem of measuring these effects by comparing the biological communities at sites receiving various degrees of human use. The immediate difficulty was to account for differences among the communities resulting from variation in other environmental factors. We have planned to do this in three ways: (1) by surveying a large number of biological communities and isolating human use effects with a system of multivariate analysis; (2) by surveying systems before and after a significant change in the degree of human use; and (3) by comparing selected sites that are similar in all environmental characteristics except the degree of human use. At this early point in our study we can report only on a study of the third kind. We have found an example where we believe the important difference between a pair of sites is the degree of public use. We caution that our observations are preliminary, and that our subjective belief that the effect of recreational use is the primary cause of the differences in the biological community has not yet been confirmed by objective analysis of a complete data set.

We examined sites at King Harbor in Redondo Beach, California (Figure 3). One site is at the end of the outer breakwater and can be reached only by boat or by an arduous half-hour walk over the rocks. The second site is at the end of a short jetty and can easily be visited by the large numbers of people attracted to a nearby recreational complex. The two sites are otherwise quite similar. Both are made of large boulders and slope steeply to meet a sand bottom at a depth of about 3 meters. They are separated by only about 100 meters of water. The outer breakwater probably provides some protection from wave action to the jetty, but it is likely that the difference is small.

We examined the biological communities along four transects at each site. Two were placed on the protected, harbor side of each structure, and two were on each exposed area. We placed meter-square quadrants along the transects at each meter and counted the organisms present or estimated their abundances.

**Results**

The survey produced records for 58 species of plants and animals in a total of 43 quadrants. We did not discover a significant difference in total numbers of species present at the jetty and breakwater. Striking differences in the abundance of individual species, however, were seen. Most prominently, the exposed side of the breakwater supported a dense bed of the California mussel Mytilus californianus while we found only scattered individuals on the exposed side of the jetty. A list of species whose abundances were sharply different at the two sites was prepared.

**Summary of Available Data**

We have combined our own results with those of Chan and Zedler to produce a tentative list of those species thought to be affected by public use (Table 1). Strong evidence and obvious mechanisms exist for some; others are indicated with less certainty. A description of the evidence and discussion of possible secondary effects is included.
Conclusions

Rocky intertidal ecosystems are readily damaged by human use. Despite suggestions in the literature (California Coastal Zone Conservation Commission, 1975) there is no evidence that there is a "carrying capacity" below which no use effects are seen. Rather, light use causes a small amount of damage; heavy use causes serious damage. We see effects most commonly as reductions in species abundances, but a few species increase in abundance as a result of reduced competition or predation.

Because taking of organisms is a major cause of the damage, vigorous law enforcement is likely to reduce the effects of recreational use. Public education is also helpful, as demonstrated by Chan. However, although Chan's program certainly reduced damage in the area, the effects were not eliminated. Even a few careless visitors can cause significant damage.

We therefore believe that a conservation program like those used in the national forests should be developed for rocky intertidal areas. Some areas should be maintained totally free of interference to serve as species reservoirs. Other areas should be restricted to only light use, to allow public contact with "nearly natural" systems. Finally, those areas open to unrestricted public use should be closed occasionally to allow the ecosystems to recover.

Acknowledgements

Cynthia Ogasaward and Rick Klink provided data confirming our results. We thank Dr. Joy Zedler and Dr. Gordon Chan for permission to use their results. Claudia McMahon aided manuscript preparation.

References

Table 1
Species Affected by Public Use

*M. californianus* (common mussel)

Chan: Much lower abundances in high-use area, 2/m² vs. 422/m² in low use area

Zedler: Lower abundances in high-use area; decreased abundance when use was increased

Devinnny: Much lower abundances in high-use area

*M. californianus* is taken for food and bait, and may be damaged by trampling or tampering. A major predator, however, is the seastar, which is severely reduced in abundance by even light use. *M. californianus* is the keystone species of a well-developed intertidal community, and many associated species are no doubt lost with it.

---

**Piaster sp.** (seastar)

Chan: Much lower abundances in high- or moderate-use areas; 0.03/m², 0.007/m² vs. 0.9/m² in low use area

Zedler: Found only 2 specimens in a moderate-use area: probably in abundance much lower than natural areas

Devinnny: Found no specimens in high- or low-use area, though many were seen on nearby inaccessible pilings

*Piaster* sp. is a favorite souvenir. It is taken despite the most strenuous efforts to dissuade collecting. Loss of the significant predatory activity of *Piaster* is likely to alter communities considerably.

---

*Acanthina spirata* (rock snail)

Chan: Lower abundances in high-use area; no effect in moderate-use area

Zedler: Data inconclusive for the related species, *A. lugubris*

*Acanthina* is an attractive snail and may be collected by casual visitors. It is an important intertidal predator.

---

*Lottia gigantea* (giant limpet)

Zedler: Found the size distribution changed in a high-use area; large specimens were absent

Devinnny: Specimens over 2 cm totally absent in high-use area; common in low-use area

*Lottia* is taken as food, so the largest individuals disappear first. Because the large individuals defend large territories, their elimination may result in an increase in the competing populations of limpets or barnacles.
Collisella digitalis (limpet)

Zedler: Lower abundances in high-use area when C. digitalis was generally abundant. Experiments showed C. digitalis easily killed by disturbance. Average size was less in an area of heavy use.

Devinny: Found lower abundances in high-use areas.

*Collisella digitalis* is a large attractive limpet and may commonly be taken as a souvenir. If it is dislodged and not carefully replaced, it will die; like all limpets, it cannot right itself. Zedler also showed that just wiggling the shell caused a 12% mortality rate because the anti-dessication seal with the rock was broken.

Pragmatopoma californica (sand castle worm)

Zedler: Lower abundance in high-use area.

*P. californica* builds fragile tubes of sand and mucous. Colonies are easily crushed or broken off by a single footstep, and trampling may be the cause of loss.

Spirorbis sp. (calcareous tube worm)

Zedler: Experiments show this worm, which usually grows on the bottoms of rocks, dies within a few weeks if the rock is turned and left.

Anthopleura sp. (anemone)

Chan: Much reduced abundances in areas of moderate or high use.

Zedler: Increased abundance in areas of high use, despite common visitor harassment.

Devinny: Reduced abundances in high-use areas.

*Anthopleura* is poked by visitors who wish to see it retract and squirt. It seems likely that this could result in loss of some individuals, and may be the cause of the reductions seen by Chan and Devinny. The contrary results found by Zedler could result from the loss of a locally important competitors or another unknown cause.

Balanus glandula (acorn barnacle)

Zedler: Possible reductions in high-tide, high-use areas.

Devinny: Lower abundances in high use areas.

*Balanus* may be crushed by foot traffic.
Chthalamis fissus (buckshot barnacle)

Zedler: Experiments showed continuous trampling could cause significant damage. But abundances were higher in high-use areas.

Devinny: Observed bare spots on rocks commonly used as stepping stones. Overall, abundances were higher in high-use areas.

Chthalamus can be destroyed by heavy foot traffic, but where the use is not severe, it is benefitted. This may result from elimination of the predator, Piaster, or the competitor, Balanus.

Pollicipes polymerus (gooseneck barnacle)

Devinny: Much lower abundances in high-use areas.

Pollicipes is widely recognized as strongly associated with Mytilus. Its loss may be the result of the loss of the mussel. Game hunters also take Pollicipes as food.

Phyllospadix scomberi (surf grass)

Zedler: Abundance increased in area where use was reduced.

Phyllospadix is probably damaged by trampling. It is the keystone species for a well-developed marine community, and its loss may cause loss of associated species or increases in populations of competitors.

Centroceras clavulatum (filamentous red alga)

Zedler: Higher abundance in areas of high use.

Centroceras is a small alga which rapidly invades areas where the biological community has been disturbed. Zedler (1978) suggests public use may provide it with an opportunity for rapid colonization.

Coralline algae

Zedler: Lower abundances of Corallina spp. in areas of high use. Experiments further showed Corallina spp., Jania crassa, and Lithothrix aspergillum are broken or destroyed by foot traffic.

Devinny: Corallines (primarily Bossiella plumosa) exhibited a “cropped” appearance in the high-use area where it occurred on rocks which were convenient stepping stones.

Coralline algae may be particularly susceptible to trampling because they are abundant on horizontal rock surfaces, are brittle, and grow slowly.

Gulls, sea lions

Devinny: Gulls were abundant and sea lions commonly sighted in low-use area. Occurrences were far fewer in the high use area. These are typical of higher species whose feeding or breeding may be interrupted by repeated human disturbance.
RECREATIONAL ACCESS: SOME SOCIAL CONSTRAINTS AND CONCERNS

ROBERT P. DITTON is Associate Professor in the Department of Recreation and Parks, Texas A&M University, College Station, Texas.

"Coastline in Crisis," as reprinted from the San Jose Mercury News was useful to me in preparing for this conference. Besides providing a good overview, the article revealed what I detect to be of primary interest here — a concern with the past, present, and future impacts of private interests on collective resources. I was surprised that little was said about the coastal recreation phenomena besides apparent conflict, crowding, and a lack of facilities. This is often the case in coastal crisis pieces!

What is wrong with a situation or what we are opposed to is often more clear than what we are in favor of. Whether we have the private interests in tow or not does not mean that anybody is really concerned that recreational experiences are better or worse — we just have not gotten that far yet. In fact, I would submit that our approach to coastal access is really quite primitive.

While the coastal access problem is a long-standing one, many still choose to evaluate our success in overcoming the problem by pointing to the extent of shoreline miles or coastal acres in public ownership or publicly available. This preoccupation with miles and acres and number of access points or attendance figures seems to assume that satisfying recreation experiences will follow — they may not! This assumption is apparently safe as long as no studies are made of coastal visitors to see if their experiences measured up to their expectations. Research in other recreation and park settings (national parks, national forests, wild rivers) is demonstrating that we can no longer equate presence on the site with satisfaction and assume that everyone will respond the same way — positively for an understanding of how user expectations can be evaluated.

The topic of access becomes slippery here: are we simply concerned with access to natural resources or with something much more, namely coastal recreation experiences that are satisfying? Are we concerned with access simply as a means to various unknown ends, or are we concerned with the ends as well? If not the latter, we need to be. Hopefully, this conference will help us to transcend legal, biological, and bureaucratic matters to explore these complex and important social concerns.

Some Social Constraints to Access

Several factors have been investigated extensively to help us better understand non-participation or reduced participation in certain outdoor recreation activities. These include: (1) the amount of time devoted to work; (2) the extent of unobligated time; (3) the cost to participate; (4) income as a determinant of participation; (5) the age of the participant; (6) the family life cycle, and (7) infirmity and disabilities. Understanding these factors will help us to better understand current visitation as well as to develop a comprehensive access system that takes these factors into account.

Likewise, we recognize that the needs of coastal community residents (recreational needs as well as other needs) often vary sharply from those of transient non-residents. Also, there are the interests of residents and lifelong residents to consider. While the public interest is clear with regard to public trust lands and waters, it is fuzzy with regard to taking into account these often-varying interests. Access for whom is a most important question. Such differentiation of users and their needs are often lost in decision-making where the main concern is for "the greatest good for the greater number."
Then there is the matter of social equity — who pays and who benefits? Are costs widely distributed and benefits narrowly distributed, or are benefits widely distributed and costs narrowly distributed, or are efforts being made toward some equitable distribution of costs and benefits? Often, recreation planners and managers are accused of protection and perpetuating the interests of the privileged. A thoroughly considered access program can move to counter this concern. But how far can it go ensuring that less fortunate people have access to a beach is one matter; access to offshore sailing and fishing is quite another! In his recent article Symonds\(^5\) helps us by asking some important questions: If access facilities were to be built, who would use them? If a permit to build a boating harbor were denied, who would be denied access to coastal waters? If a marina were to be constructed for boating access, what proportion of the general public would be excluded from other kinds of access at the particular site?

Additionally, we need to be concerned with people's willingness to pay for recreational access. While the public sector has traditionally had the major responsibility for providing certain recreation opportunities at low or no charge, the private sector has emerged as a major supplier of camping, boating, and fishing facilities and/or access. Alternately, the private sector is making no rush to take on the public sector's role as the purveyor of beaches, beach access, and related experiences. Why? Since beach access and use has been traditionally free, it is difficult to build a case for managing this recreation activity. With management attention, certain use conflicts might be avoided and people might be willing to pay more than they currently do for beach access. As prices rise, the private sector might be more willing to invest in beach access — as they have been in boating, fishing and scuba access.

Finding access to fishing and boating resources presents a contrasting set of public-private relationships. Here the private role is dominant. The private sector provides the delivery or access system to public waters i.e., the pier, party boat, or charter boat. Without private involvement, offshore waters would be reserved only for those wealthy enough to provide their own access and facilities. While the public sector enjoys resource management responsibilities offshore, it has chosen not to provide access to these resources (and probably could not accord the expenditure anyway).

Some Additional Concerns

Most articles we read today on coastal access have a definite legal bent. As a result, the issue is clear cut — the public either has access to public trust lands (through easement or fee simple acquisition) or it does not. The type of access afforded, whether it is effective, and whether it provides satisfying recreational experiences are qualitative concerns that are often overlooked.

Our legal focus is followed closely by matters of the environmental impact of access facilities and use. In access planning, biological matters are considered first and often exclusively. Here rests the concern with finding the elusive "magic number" called a carrying capacity. Biological scientists, who generally have been unable to provide quantitative evidence of significant resource degradation in recreation and park areas as a result of increased use (delicate areas aside) continue to try to make us believe that the "range science" carrying capacity analogy is worthy of our management attention\(^4\); the available evidence simply does not support it.

In the coastal access arena today, there appears to be little interest in people and their coastal experiences. There is little concern with the impacts of perceived crowding. More often than not in problem-solving, planners and managers resort to intuition and simply extend their own values to the situation. If a particular beach is intensively used and looks crowded to them, then it must be crowded and something should be done to alleviate the problem. Often, there is meager evidence offered in support of limiting use. This is the case where a "solution" may become the problem.

How can we plan for and manage coastal access with such a limited understanding of people? If our output concern is acres and miles of access or the number of or spacing of access ways, it is easy. If our output concern is providing experiences that are satisfying to people, greater understanding of recreational participants is essential. We need to know, for example, that the average recreationist for whom we often plan does not exist — many recreation and park plans have this erroneous focus. We need to know that there are different types of recreationists and recreation experiences within each category such as beaching, boating, and fishing. These broad generic activity labels get us into trouble. Somehow they lead us to believe that beachgoers, for example, are some large homogeneous group. To the contrary, as one of my graduate students Marty Schwartz found, beachers on Galveston Island (Texas) can be subdivided according to their motivations into several groups: (1) spiritualists, (2) naturalists, (3) status seekers, (4) individualists, (5) energetic beachers, and (6) average beachers (nothing distinctive).\(^2\) We need to know considerably more about those who seek access to our coasts if we are to be effective in providing access — access that is meaningful to people.
Instead of planning to meet the needs of the most nondescript potential coastal user (average Californian?) for the most general kind of recreational experience (going to the beach?), we need to segment our planning and management efforts based on a greater understanding of people, their motivations, and their satisfactions. What I am saying is that we need to be a little concerned with simply providing access and more concerned with the nature of the experiences being accessed. If we fail to do so, we may find in the future that satisfactions rather than access ways are in fact the scarce commodity.

Research Needs

Additional basic research is needed that focuses on the sociopsychological elements of coastal recreation experiences. Studies of beach users, for example, and their reasons for going to the beach are essential if we are to know that they are satisfied with their beaching experiences. This work will help us to identify sources of dissatisfaction which need to receive additional planning and managerial attention.

We need to know considerably more about coastal recreation users (who they are, where they come from, type of groups, social profiles, and previous coastal recreation experience). We need to evaluate people's perceptions of crowding during their coastal recreation experiences and at specific access locations. Finally, we need users' evaluation of broad management alternatives that can be used both to protect the natural resource base and to reduce perceived crowding.

References


Suggested Readings

DESIGN CONSTRAINTS ON PROVIDING COASTAL ACCESSWAYS

LON SPHARLER is Manager of the State Park System Planning Division of the California Departments of Parks and Recreation, Sacramento, California.

My experience with coastal accessways comes primarily from years of association with the California State Park System. Because of this perspective, I address the constraints and limitations that govern the selection and development of major accessways of state or regional significance. I will generally avoid the problems of providing small accessways within developed or developing urban or second-home communities.

The State Park System and Access

The California State Park System has as its major missions the protection and interpretation of significant examples of the state’s natural and cultural heritage and the provision of large-scale outdoor recreation opportunities. It owns roughly one-fifth of California’s coastline and is a major supplier of coastal access.

On January 1, 1979, the 108 coastal units in the state park system contained more than 83,000 acres with more than 206 miles of ocean frontage.

In 1978, more than 7,100 acres with about 12 miles of ocean shoreline were added to the system. This included additions to 28 units and the establishment of five new units. Many additional coastal acquisition projects are in the appraisal and negotiation stages.

In 1978, more than 35 million visits were made to the state-operated coastal units of the state park system. This does not include the use of state beaches operated by local agencies. The locally operated state beaches in Los Angeles County alone counted well over 10 million visitor days of use last year. The campgrounds at 33 coastal units of the system received over 830,000 site-nights of use last year. In addition, our sister agency, the Wildlife Conservation Board, has developed 22 fishing access sites and 9 fishing piers along the coast. These are operated by local agencies.

Type of Access

When you consider the wide variety of coastal accessways and the agility, ingenuity, and daring of many recreationists, it is difficult to say that there are any practical limitations to coastal access. In California, access sites range from high-volume-use metropolitan area swimming beaches to “wild” beaches in remote locations. Official accessways include 5-foot-wide easements between residential lots, ends of streets in older communities, small parks with parking and sanitary facilities, 25-foot-deep “pass and repass” easements paralleling the mean high tide line, promenades on city waterfronts, state beaches with parking for thousands of cars, and large resource-based coastal parks with a variety of outdoor recreation facilities.

Environmental settings include broad sandy beaches, rocky shores, sand dunes, and vertical bluffs of various heights.
Types of Planning and Design Considerations

A number of factors must be considered in locating and siting recreation access areas:

1. Natural character of the site
2. Existing and proposed land use patterns
3. User safety and health
4. Population to be served

These factors somewhat overlap, as is apparent in the subsequent discussion of the more significant problems faced in providing coastal access.

Tall Bluffs

Tall vertical bluffs are a major physical obstacle to pedestrian access. Each year, two or three people are fatally injured falling off cliffs at state areas. At one time, cliffs of moderate heights would be modified during site preparation or at least have roads or trails carved into their faces. During the past decade, such practices have been frowned upon. In a few cases, we have constructed elaborate stairways, but usually these are not economical to construct and almost impossible to maintain satisfactorily. Vertical bluffs in the 100- to 200-foot range have always been formidable.

Generally the public should be steered away from tall bluffs. However, these promontories often make excellent scenic overlooks. Such overlooks require careful development if the public is to be encouraged to use them.

Sand Dunes

Sand dunes present several problems. Roads and parking in areas of moving dunes are costly and difficult to maintain. Pedestrian traffic through fragile dune areas speeds their deterioration and accelerates the shifting of sand. The problem is compounded by the fact that dunes are attractive places to walk and play. Fencing and posting signs near parking areas and trails do some good, at least with responsible and conscientious people.

Coastal Terraces and Flood Plains

Coastal terraces and flood plains present a different kind of problem. They are flat and are ideally suited for parking lot construction. But because of the scarcity of agricultural land in the coastal zone, such land should be devoted to access parking only after other alterations have been thoroughly examined. Furthermore, the flood plains near the mouths of coastal creeks and rivers often contain sensitive wildlife habitats and archeological sites which should be protected.

Aesthetic Considerations

Obviously, accessways, especially parking areas, should be sited, designed, and landscaped to minimize their impact on the coastal scene. In most cases, blocking the ocean view is taboo. This is a matter of individual site analysis. The surrounding land use may be the determining factor. In some cases, it may be impossible to provide access parking that is acceptable from an aesthetic viewpoint.

Conflict with Neighboring Uses

Many coastal residents resent the periodic invasion of outsiders into their communities. They become especially concerned when we invite the invaders into their neighborhoods. Fencing, screening, frequent trash pickup, and frequent patrol are necessary to lower the level of local resentment and minimize the potential conflicts.

In some cases, access is not possible because of the nature of surrounding land uses. Military operations such as amphibious landings and rocket launchings sometimes result in the evacuation and temporary closure of some areas. On the other hand, our department is negotiating with the federal government to make certain military reservation beaches available for public use on a part-time basis.
Sanitary Requirements

Under California public health laws, recreational beaches must have adequate sanitary facilities. The standard is one toilet for each 500 users during maximum use periods. At least one toilet is required unless the local health officer determines that the beach is maintained primarily as an open space. The criteria used for such determination is the lack of developed access, the lack of parking facilities, the lack of lifeguard service, or when casual use does not exceed 50 people per mile of shore. The result, unfortunately, is unsightly chemical toilets up and down the coast, at least until funds can be budgeted for more permanent facilities.

Access for Special Populations

Providing access for certain user groups presents special problems. The disabled, particularly those in wheel chairs, are normally precluded from enjoying the use of sandy beaches. At one popular Orange County beach we are experimenting with paved trails out onto the sand with turnarounds near the water line. Our engineers have also designed a vehicle which will allow a disabled person to drive out onto the sand. The design is now being reviewed by the Department of Rehabilitation.

Scuba divers have the basic requirements, but because of the weight and bulk of their equipment, they would like to have dropoff points with vehicular access almost at the water's edge. In some rocky areas a safe "launching" or water entry area is needed. The department manages several underwater park and recreation areas. During the next five years we hope to have 10 additional underwater units. In most cases, these will have special facilities to meet divers' needs.

The Automobile Problem

Perhaps the most frequently observed coastal access problem is inadequate parking. Most recreationists arrive at the coast in an automobile and want to park close to their chosen destination. A survey in San Diego County showed that less than 18% of the beach users parked not more than 1,000 feet away from their destination. High volumes of recreationists compete with residents and shoppers for parking spaces near recreation destinations. Numerous vehicles seeking limited parking intensity already serious traffic problems. Vehicles seeking parking on arterials interrupt traffic flow. Illegally parked cars blocked roadways, alleys, and driveways. Beach users often must park on the inland side of heavily travelled coastal highways when they walk across and risk being struck by oncoming cars when they cross the highway. This pedestrian traffic also slows vehicular traffic and contributes to congestion.

A 1977 study in San Diego County found that only 2 of the 19 coastal recreation destination zones had no parking problems. Seven areas had severe or frequent problems. In Los Angeles and Orange Counties, the situation becomes intolerable on weekends. In and around coast-side commercial areas traffic can be intolerable on weekdays.

While not all accessways can or should have parking facilities, most of those operated by the state park system or regional agencies should have parking areas large enough to accommodate all but peak demand levels. The amount of parking provided should also be consistent with the capacity of the beach resource and the type of recreational experience the operating agency seeks to provide.

Ingress and egress from the nearest state highway or arterial should be direct and well signed. In no case should large-scale recreation traffic be routed through narrow residential streets or congested commercial districts.

Providing inland parking areas with shuttle service to the beach has often been recommended as the solution to the parking and traffic congestion problems. Unfortunately, shuttles have not proven to be very successful to date because of a variety of economic, psychological, and perhaps institutional problems. People will not use shuttles unless the schedules are frequent and dependable. Usually inland parking is a refuge of last resort. Before settling for remote parking areas, the motorist will have already added to the congestion at preferred seaside destinations. Experimentation and research are needed to overcome the difficulties. Certainly future attempts to provide shuttle services will have to be well planned, promoted, and orchestrated.
Alternatives to Automobile Access

A full discussion of public transit problems is next on the agenda; but I would like to point out one design requirement now. Buses are large and have difficulty in turning around. On the Malibu coast, the bus line ends where buses can conveniently turn around on the narrow and heavily travelled Pacific Coast Highway. There are many good beach access areas beyond the last bus stop.

The Department tries to encourage public transit authorities to extend existing transit lines to serve our near urban parks. We are sure that this can be done economically in many areas. We also would like to experiment with state-operated shuttle service from existing transportation nodes. In order to serve inner-city youth, we are now exploring the possibility of hiring charter buses to take children from urban recreation centers to nearby state parks and beaches.

We have a dream that someday there will be a safe coastal bike trail from Oregon to Mexico. This dream includes a chain of hostels at one-day intervals where families and youth groups can spend the night. Conveniently spaced between the hostels would be campsites for those who prefer to walk the coastal trail. The completed system may be decades away, but small segments of the trail are under construction. Some of the hostels are on the drawing board, and funds are available for constructing a pilot chain of hostels between a site in Marin County and Santa Cruz. This pilot chain will utilize two recently abandoned light stations. We hope to prove that at least a portion of our metropolitan population will take advantage of the alternative means of enjoying the coast if they can be assured of safe, convenient stopping places.

In the Los Angeles basin we are cooperating with local agencies in the construction of bike trails along major flood control channels leading to the ocean. The trails pass through some of California’s most densely populated communities.

Summary

Many physical and social problems are encountered in providing adequate public recreation access to our beautiful coastline. Through sound planning, careful design, and efficient management these problems can be avoided or overcome. The benefits to the public are worth the effort.
COASTAL ACCESS AND TRANSPORTATION PLANNING

JAMES E. BURKE is a lecturer in the College of Environmental Design, University of California, Berkeley, and is also a private consultant in environmental planning based in San Francisco, California.

This paper addresses coastal access as an issue of congestion in or near the coastal zone. For the recreationist, congestion might be encountered on the regional highway network, on a secondary road near the coast, at a parking facility, or on the accessway to the beach. Coastal access is sometimes concerned with providing an accessway to the beach, an important part of the recreationist's path but not always the most limiting one. Local coastal residents also face congestion in their travels, and this is also part of the coastal access issue.

Coastal access and energy conservation are linked most obviously by the number, type, and distance of trips to the coastal zone. But they are also linked by the level of congestion on the paths of coastal travelers. The reduction of congestion, therefore, seems to be a desirable primary objective of any local coastal planning program. However as we shall see, this is not a simple task. Differences in the primary concerns of the participants in the comprehensive planning process and the uncertainty of future coastal travel behavior are the reality of planning for coastal access.

Causes of Congestion on Coastal Access Routes

Congestion results when traffic volumes in a highway network exceed the capacity of one or more links in the network to carry traffic in a steady flow. At this point we have a network of unstable traffic flow, or congestion. In transportation studies the status of a link as it approaches a congested state is given by the ratio of predicted traffic volume to link capacity \( v/c \). From a transportation planning perspective, providing coastal access is a problem of matching traffic volumes to link capacities during those periods when congestion is likely to occur.

Traffic volumes of concern in coastal access analysis occur in California primarily on summer Sundays, although peak conditions can occur at any time of year for special events. The primary attraction is a "day at the beach," and factors such as free time and weather play an important role in determining attendance patterns. In any case, there is a high latent demand for beach use, particularly in the Los Angeles region where more than 10 million persons live within a 2-hour drive of the coast.

Critical to the analysis of coastal traffic are arrival and departure patterns. Studies conducted in the San Francisco Bay Area, Orange County, and San Diego County indicate that approximately half of the coastal recreationists arrive at their destination between 11 a.m. and 1 p.m., with other arrivals dispersed throughout the day. Departure patterns are not as clear although two factors tend to make the afternoon traffic peak even more pronounced than in the morning. First, activities that have different arrival patterns have similar departure patterns. For example beaches, marinas, golf courses, and other activities have similar peak departure periods, roughly 3 to 5 p.m., although their arrival patterns differ significantly for obvious reasons. Second, the California coast is known for an abrupt change in weather conditions, and late afternoon fog and chilly on-shore breezes usually send beach-lovers scrambling for their cars.

Another important factor in the analysis of coastal access traffic is its mix — in particular, the proportion of local traffic on coastal access routes. Although it is difficult to predict the degree to which local residents will use coastal access routes for typical weekend trips, simulation of their travel activity, even at trip-generation rates half the level of those of similar inland developments, indicates a significant impact on coastal access. In some areas the majority of vehicles on coastal access routes is expected to be those of local residents. Consider, for example, plans to construct 50,000 dwelling units...
to the south and east of Laguna Beach in Orange County, California. The area is already congested on summer weekends on Laguna Canyon Road, Pacific Coast Highway, and the San Diego freeway. Even the analysis of the impact of this build-out on future coastal access by pro-development interests indicates that it will be severe. One noteworthy point here is that there is no “accepted” method for studying the impact of local development on coastal access, or, for that matter, on recreation travel in general. Whereas the analysis of work trips is routinely taught in graduate schools and is undertaken throughout the country with U.S. Department of Transportation computer programs, prediction of recreation traffic volumes on coastal access routes is a new and often controversial area of analysis.

The capacity of local access arterials is limited by factors that would apply to any highway: number of lanes, topography, line of sight, width of the roadway and shoulder, and the ability to pass, especially on two-lane roads. Additional factors that are significant in the analysis of capacity for coastal access are scenic views, cross traffic and unrestricted access, traffic controls (green time), and vehicle mix (including RVs and bicycles). In addition, destination or terminal condition can adversely affect the capacity of the transportation system as a whole. These include availability and access to parking, pedestrian traffic, and beach crowding. Although this last factor is not currently a problem in terms of total numbers, it may be with a respect to the compatibility among user groups.

In addition to the requirement for a coastal access capacity in the network, the arterial, the access road, the parking or unloading area, and the facility (beach or marina) there is also a requirement to match these capacities. Thus, the acquisition and development of new coastal facilities at locations where there are few coastal access arterials or where existing routes are already overcrowded will work against a policy of providing coastal access.

Coastal Access and Energy Conservation

Five factors determine the amount of energy used in coastal access travel:

1. Travel behavior
2. Travel time
3. Trip distance
4. Vehicle operating characteristics and indirect energy requirements.

Travel behavior includes those aspects of travel that are determined by the individual: the propensity for trip-making, vehicle occupancy (car pooling, etc.), and mode selection. When gasoline supplies become limited, there will probably be shifts in travel behavior. During the 1973-1974 gasoline shortage, automobile trips for shopping and social-recreational by persons above the poverty level dropped 14% and 20%, respectively, while public transit use, walking, and auto occupancy rose. On the other hand, work behavior patterns showed little or no change during this period. There are indications that similar shifts in behavior are occurring now, especially in California, where closing of weekend gas stations is almost certain to reduce the number of vehicles traveling to the coast.

At a rate of approximately three persons per car, coastal recreation trips have had more than twice the occupancy levels of preshortage work trips. This indicates an opportunity and a willingness to share automobiles for recreation trips. It is possible that ride-sharing for coastal recreation trips will increase to the capacity of the vehicle, thereby saving energy not only through fewer vehicles but through reduced congestion.

Public reaction to the possibility of shifting modes for coastal recreation trips from auto to transit has been decidedly negative in polls conducted in Orange and San Diego Counties prior to the current energy shortage. The reasons for this resistance are the expected ones: equipment, small children, long waiting times, and general inconvenience. Another deterrent is that transit programs are usually targeted for the near-coast area; it is nearly impossible for a person who lives some distance inland to ride transit to the coast. Of the individuals who ride transit to the coast out of necessity (captured riders) it is interesting to note that the vast majority of them are from the majority group of beach users: high school and college-age individuals.

In the past, this group has shifted from transit to auto as soon as an auto was available. But this trend could reverse in the future as gasoline remains scarce and automobiles become relatively more expensive. Coastal transit ridership could dramatically increase from the impact of this single group. But other groups such as families with low incomes, small children, and beach equipment may not be able to take advantage of expanding transit programs and face decreasing opportunities for coastal access.

The effect of the gasoline shortage on park-and-ride programs is an unknown. Before the shortage, Capitola in Santa Cruz County operated a program that successfully reduced downtown traffic and provided access to the city beach. Also, Orange County visitors indicated that they preferred a park-and-ride plan to other measures that mitigated against the use of the auto for coastal travel. The California Coastal Commission is pursuing a program of park-and-ride transit on the Orange County Coast between Newport Beach and Dana Point.
Recreational trip distances are the longest of all trip types, averaging 13 miles each way and accounting for more than 20% of the vehicle miles traveled according to the Nationwide Personal Transportation Study of 1969-1970. Coastal recreation trips in southern California appear to be longer than the national average. The average travel distance of a visitor to an Orange County Beach was found to be 18.5 miles. Forty percent of the Orange County beach users and as many as 10 percent of the San Diego County beach users are from Los Angeles County. A recent study in northern California indicated that 22% percent of the visitors to the Mendocino coast were from the San Francisco Bay area, 150 miles away.

Travel distance is not the only criterion for gasoline consumption. When congestion occurs, as it often does in coastal travel, travel time and vehicle operating characteristics must be included in the analysis. The most efficient speed for an automobile varies by type, but is approximately 40 to 50 miles per hour. At faster speeds the engine may operate more efficiently, but wind resistance reduces the mileage:fuel ratio. At lower speeds the engine is increasingly inefficient and a certain amount of fuel is wasted in idling. Thus, under optimal fuel economy conditions, a vehicle would travel at a steady, moderate speed, a rare occurrence on a summer day in the California coastal zone. While improving the mileage:fuel ratio is certain to conserve fuel for steady-speed conditions, fuel consumption under congested conditions can be changed only by increasing the capacity of the system or by changing the network configuration. Current research by the author indicates that highway network plans based on criteria such as minimizing travel distance or access time will not necessarily result in an energy-efficient network. This is of particular importance where new highway facilities (arterials) are included in the local coastal planning program.

There are indirect energy requirements for each mode of coastal access above and beyond the energy consumed in propulsion. These are station and maintenance energy, construction energy, vehicle manufacture energy, and energy required to access the mode. When the indirect factors are taken into account many of the expected means for conserving energy disappear. Recent urban transportation studies indicate that buses and van pools are the most energy-efficient modes. But a plausible hypothesis for coastal access is that there is little difference between autos with high occupancy levels and buses when compared on a total energy basis. Of course, for specific types of energy, such as gasoline, or when congestion effects are included, buses may be more energy-efficient. Further research is needed to access the energy impacts of different modes of coastal access.

It is difficult to predict the future of coastal access in the midst of another gasoline crisis in California. Many energy conservation proposals have an implicit bias against recreation trips. The reason for this is clear: while nearly every identifiable group in American society has pitched in to reduce energy use, the number of recreation vehicles (vans, motorhomes, and four-wheel drive vehicles), with low mileage:fuel ratios has tripled to nearly 4 million in the last eight years. Recreationists have been labeled as energy wasters!

But coastal recreationists are not necessarily to be included in this group. Their travel behavior decisions, along with effective planning for coastal access, can reduce energy consumption. Presumably the need for coastal recreation will not disappear in the face of this or any other crisis. One question then is how to provide access and conserve energy; a larger question is how to provide access, environmental quality, and social equity for each member of the public.

**Comprehensive Planning**

Comprehensive planning for the California coastal zone is currently underway as local governments in the coastal zone prepare their Local Coastal Programs (LCPs) for approval by the California Coastal Commission. Our previous discussion would lead us to believe that the principal objective for the transportation component of an LCP is to reduce congestion, thereby directly improving access and indirectly reducing energy consumption. In reality, the process is not that simple, and quite often the local government and the CCC wind up talking at cross purposes to one another. Table 1 shows why. A state agency, such as the California Coastal Commission, and a local government have different primary concerns when it comes to transportation. For small local governments this conflict may not appear since planning for one set of concerns often encompasses the other, or there may be strong local support for state concerns as in the case of local governments that promote tourism. But in other cases differences between state and local primary concerns for transportation planning promote an adversary relationship that is often fueled by feelings of "state interference" or "inequitable local interests."

When the issue of congestion comes up, it is an issue of who causes it and who will pay for its mitigation. When new transportation facilities are considered the local government may argue that a link is needed to meet network-wide transportation requirements and it increases access to the coast. The state may counter that the local analysis is based on work trips and that the trips on the proposed link are actually overflow trips from a shorter path in the network (using a capacity-constrained
assignment procedure) and the network should be redesigned; that the environmental degradation caused by the proposed link is not considered in the local analysis; and that it does not increase coastal access but actually entices drivers to join the existing congestion on the coast. If, on the other hand, the state wanted to build a new highway facility and local interests opposed it, one need only to think back to the 1960s to imagine the outcome.

The prospect of energy shortages adds another complicating dimension to not only planning for coastal access but to transportation planning in general. What happens to our plans if travel behavior patterns change? If the input parameters for journey-to-work, trip generation, occupancy levels, mode split, and all the other typical inputs to transportation models change, obviously their results and the plans they support will have to change. And what if these behavior patterns are changing now and continue to change in the foreseeable future? Since it would take years to collect, analyze, and disseminate the relevant information, it seems appropriate to consider transportation planning strategies that could be implemented now that would reflect the uncertainty of the moment.

First, long-term plans should leave future decision makers with as many alternatives as possible. Second, in a situation where we face energy and fiscal crises and uncertainty is high, doing nothing becomes a viable alternative. That is, congestion may decrease without the implementation of any plan, while new highway facilities may become underutilized. Third, plans should utilize existing facilities and resources in innovative ways, such as large-scale bicycling, the use of jitneys, special trains, and even cars with high occupancy levels for coastal access.

Finally, I wish there were some easy answers for all of the planners involved in coastal transportation planning in California. But the fact is that we are involved in a process that is planning over a thousand miles of coastline down to the level of changing zoning maps and specifying a future land use for every parcel of land in each coastal jurisdiction. The accompanying transportation plans must mesh coastal and inland uses, along with state and local concerns. Without the energy crisis it is an arduous task; with it, we may be attempting the impossible. If the current energy shortages become a way of life, expect that these LCPs will change in years ahead. Anticipate it if you dare.

### Table 1

**Primary Concerns of State Coastal Agency and Local Government Approaches to Transportation Planning in the Coastal Zone**

<table>
<thead>
<tr>
<th>Objective</th>
<th>State Coastal Agency</th>
<th>Local Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastline access</td>
<td>Coastal access</td>
<td>Economic development</td>
</tr>
<tr>
<td>Clientele</td>
<td>Statewide Population</td>
<td>Local population</td>
</tr>
<tr>
<td>Trip Type</td>
<td>Recreation trips</td>
<td>Work, shopping trips</td>
</tr>
<tr>
<td>Network</td>
<td>Coastal access routes</td>
<td>Entire network in jurisdiction</td>
</tr>
<tr>
<td>Timing</td>
<td>Weekend; summer</td>
<td>Weekday; year round</td>
</tr>
<tr>
<td>Boundary</td>
<td>Concerns cross jurisdictional boundaries</td>
<td>Concerns do not cross jurisdictional boundary; looks to regional transportation agency for analytical framework</td>
</tr>
</tbody>
</table>

| Land use  | Zoning; detailed land use in small area studies as used | Broad categories of land use used to estimate trip ends |
| Relationship to other sectors | Directly concerned with other issues such as environmental quality, wetlands preservation, etc. | Single sector planning; transportation measures are used for evaluation of alternative plans |

60
References


2. California differs from other regions in the United States in this respect. The driving mechanism is the difference in air temperatures over the Pacific Ocean (50 - 60°F) and inland regions (100°F) during the summer months.


4. These are not just “paper plans.” They have been approved by local authorities and have been supported by millions of dollars of “front-end money.

5. See J. Burke “Recreation Planning in the Coastal Zone: Analytical Techniques, Information and Policies,” WD#278, Institute of Urban and Regional Development, University of California, Berkeley, 1977, for a discussion of these and related issues.


8. See VTN/Midwest Research Institute, Recreation Access Study, prepared for the U.S. Department of Transportation NTIS, PB # 241-994, 1975.

9. An important exception to this is the potential of AMTRAK to provide service from central Los Angeles and Orange Counties to the south Orange County and San Diego County beaches. If Camp Pendleton is eventually converted to a coastal recreation area it would be accessible by train for millions of Los Angeles region residents.

10. CPO, The San Diego Regional Coastal Access Study.


12. Orange County EMA, p. 48.


14. Orange County EMA, p. 66.

15. Orange County EMA, raw data; CPO, 51;68;85;104.


