# California Coastal Plan

## *California Coastal Zone Conservation Commissions*

## December 1975

The California Coastal Plan was prepared with financial assistance from the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, under the provisions of the Federal Coastal Zone Management Act of 1972.

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STATE OF CALIFORNIA EDMUND G. BROWN JR., Governor

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December 1, 1975

TO GOVERNOR EDMUND G. BROWN JR.,
THE MEMBERS OF THE CALIFORNIA LEGISLATURE, AND
THE PEOPLE OF CALIFORNIA

This report transmits to you the California Coastal Plan mandated by the Coastal Initiative (Proposition 20) in 1972.

The Coastal Plan has evolved through countless hours of public hearings, public review of draft proposals, and informational meetings—public participation in resource planning on a scale unmatched in California.

Because this Plan takes into account the wide range of often-conflicting views expressed to us, because the Plan was written by 84 Commissioners on six Regional Commissions and one State Commission, and because we ourselves reflect a broad spectrum of ideas about the coast, the Plan does not speak with a single voice. All of us subscribe to some recommendations more strongly than to others, and all of us share the frustrations inevitable in being not the sole author but the contributing authors of the Plan.

Nonetheless, we submit to you a Plan that we believe speaks for the people of California, a Plan that can guide us in dealing with an uncertain future, a balanced Plan designed to meet two principle objectives:

1. Protect the California coast as a great natural resource for the benefit of present and future generations.

2. Use the coast to meet human needs in a manner that protects the irreplaceable resources of coastal lands and waters.

The Coastal Plan is being delivered on time. We had an extremely limited time within which to prepare it, and a limited amount of money, considering the complexity of our assignment. We recognize that, because this is a long-range Plan, designed to serve California for many years, some of our recommendations cannot be put into effect immediately. And we recognize that there will inevitably be some conflicts among our policy recommendations; difficult choices will have to be made, for example, where a coastal area is ideally suited for recreation but can

be degraded by overuse. Thus, we strongly emphasize the need for a continuing California coastal agency to make the sometimes-difficult decisions necessary to insure that the policies of the Plan are put into effect over the next several years.

In addition to preparing the Plan, the Regional and State Coastal Commissions have acted on more than 16,000 permit applications since early 1973. The permit procedure in the Coastal Initiative was designed to insure that improper development did not defeat the Plan before it could be completed. We have, however, approved a very high percentage of the permit applications; where necessary, we have required conditions to insure appropriate density of development, protection of ocean views, and, of great importance, increased public access to the oceanfront in appropriate areas.

To meet the deadlines in the Coastal Initiative, the workload for us has been enormous. The Commissioners, all of whom serve part-time, have put in long hours of meeting and preparation time. Commission and staff members have worked nights, weekends, and holidays to meet deadlines. I know of few governmental agencies where so much work has been done for the taxpayer's dollar.

Now, the future of the California coast is in your hands; under present law, the Coastal Commissions will go out of existence on December 31, 1976. We stand ready to help in any way we can as you consider the Coastal Plan, and its proposals for the conservation and wise use of the California coast.

Sincerely,

M. B. Lane
Chairman

# CONTENTS

# COMMISSIONERS[1]

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1 This list includes all Commissioners who have served since establishment of the California Coastal Zone Conservation Commissions in 1973. Those marked with asterisks served on the Commissions but were not members as of October 3, 1975, the date of printing the Coastal Plan. Abbreviations following the names of public representatives show the appointing authority: (G) Governor, (S) Senate Rules Committee, (A) Speaker of the Assembly.

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# Part I: Summary and Introduction

## HOW TO USE THE COASTAL PLAN

The Coastal Plan has four parts:

- **Part I: Summary and Introduction** summarizes the Coastal Plan's findings and policy recommendations, the proposals for carrying out the Plan, the Plan's economic impact, its protection of landowners' rights, and the national interest in the coastal zone.
- **Part II: Findings and Policies** sets forth the Commission's findings of fact about coastal issues and problems and its official recommendations to the Governor and Legislature on policies for coastal conservation and development.
- **Part III: Carrying Out the Coastal Plan** presents the recommended implementation program, with both local and State responsibilities as well as dollar costs and possible sources of funds.
- **Part IV: Plan Maps and Regional Summaries** specifically applies the policies to the geography of the coast, describing in both narrative and graphic form the resources and features affected by Plan policies.
- The **Appendix** contains a glossary defining certain terms, lists of the Part II policies and Part III recommendations, and a foldout legend for the maps in Part IV. It also explains how the Plan was prepared, reproduces the Coastal Act of 1972 (Proposition 20), and lists staff members and others who helped produce the Coastal Plan.

# SUMMARY AND INTRODUCTION

# THE COASTAL INITIATIVE AND THE FUTURE OF THE COAST

In adopting the 1972 Coastal Initiative (Proposition 20), the people of California declared that:

"The permanent protection of the remaining natural and scenic resources of the coastal zone is a paramount concern to present and future residents of the State and nation;" and

"It is the policy of the State to preserve, protect, and where possible, to restore the resources of the coastal zone for the enjoyment of the current and succeeding generations."

But the Coastal Initiative did not provide a permanent program. Rather, it established temporary Commissions to plan for the future of the coast and to temporarily control development. Under present law, the Coastal Commissions will go out of existence at the end of 1976.

What will happen then?

One possibility is a return to the wasteful, piecemeal, sprawling kind of development that has already overrun many once-open parts of the coast, and to the overdevelopment in some coastal cities that has congested local streets and walled off coastal vistas from all but those fortunate enough to live on the immediate oceanfront.

Another possibility, the one recommended in this Coastal Plan, is for the people of California to protect the unique qualities of the coast, both in cities and in rural areas, and to guide coastal conservation and development accordingly.

The choice for California in 1976 is this: Shall the coast be abused, degraded, its remaining splendor eroded, or shall it be used intelligently, with its majesty and productivity protected for future generations?

## What the Coast Is

The California coast is many things along its nearly 1,100 miles of land and water, from the redwood forests of the north to the palm trees of the south.

- The coast is a place for hundreds of thousands of Californians to escape the heat of the city on a summer day. But they often face a frustrating traffic jam trying to get to the beach, and they may find no place to park when they do arrive.
- The coast is a special combination of climate, soil, and ocean breeze that is uniquely valuable for many crops: trees, artichokes, flowers, brussels sprouts, etc. But high taxes and the pressures of the expanding city threaten agricultural land and, as happened in so many other parts of California, irreplaceable farm land may be paved over for housing.
- The coast is a neighborhood near the water, where you can walk to a nearby beach or to a bluff to see the ocean surf. But the coastal neighborhoods can be overrun by incompatible development. Land values may become so high that there is little chance to preserve small homes and family neighborhoods; older homes that could be renovated may instead be

torn down, to be replaced by bigger and usually more expensive residential buildings.

- The coast is a small lot on the ocean, a place to build your home and retire. But if too many other people do the same thing, you won't have a quiet, isolated place; you'll find your ocean view blocked by other buildings, your roads and highways crowded.
- The coast is a sought-after place for power plants, offshore oil production, onshore refineries, and moorings for supertankers. But there is great controversy about where they should be, what the environmental risks are, and who should make the ultimate decisions about them.
- The coast is the nearshore ocean waters that provide fish of great value for sportsmen and for food supply. But overfishing, destroying coastal wetlands, and using the ocean to dispose of polluting wastes diminish the bountiful marine life along the California coast.
- The coast is a place to surf, to fish, to swim, to go boating, to sunbathe, to picnic, to bicycle, to study tidepools, to look for rocks and shells, to play volleyball, to walk, to sit, to gaze — in short, to play, and sometimes simply to enjoy the inspiration and serenity the coast can provide.

## Planning at a Time of Rapid Change

No single plan can foresee all the problems or provide all the answers for the future of the California coast. This would be true at any time, but it is particularly true during the present era of rapid change.

In late 1975, as this Coastal Plan is being completed, Californians are increasingly aware that the postwar era of seemingly-endless abundance may be over. There is great uncertainty as to the future: are technological advances just over the horizon that will usher in new periods of prosperity? Or will our lives become austere as shortages of materials force massive readjustments?

Nobody can know all the answers, of course, but there is much we do know: that natural resources are limited; that inflation is in part caused by wasteful use of land and other finite resources; that increasing costs of energy and raw materials can only cause major changes in the lives of Californians; and that the irreplaceable agricultural lands needed to feed the world's growing population should not be squandered on developments that can be built elsewhere.

There is increasing recognition that no society can long survive if it dissipates its resources recklessly. Wasteful use of land and water will sooner or later be costly. Although it may be expensive to protect coastal resources, in the long run it may be even more expensive not to. The costs of the misuse of land and water are paid by us all — in higher costs of food, housing, and transportation, and in a diminished quality of life.

The Coastal Plan is thus designed to achieve the long-term protection and productivity of coastal resources. The Plan is intended to be as useful during a time of scarcity as during a time of abundance: in either time, the careful use of limited coastal resources is necessary if the coast is to be protected for future generations.

## What Are the Coastal Commissions?

**The Coastal Commissions — one State Commission and six Regional Commissions — were established by passage of a citizen initiative, Proposition 20, in the election of November 1972. The Coastal Commissions were directed (1) to prepare a "comprehensive, coordinated, enforceable plan for the orderly, long-range conservation and management of the natural resources of the coastal zone," and (2) during the planning period, to regulate development in coastal waters and in a 1,000-yard shoreline permit area to insure that improper development did not undercut the plan being prepared.**

**The six Regional Commissions are:**

- **North: Del Norte, Humboldt, and Mendocino Counties**
- **North Central: Sonoma, Marin, and San Francisco Counties**
- **Central: San Mateo, Santa Cruz, and Monterey Counties**
- **South Central: San Luis Obispo, Santa Barbara, and Ventura Counties**
- **South: Los Angeles and Orange Counties**
- **San Diego: San Diego County**

# MAJOR FINDINGS AND POLICY RECOMMENDATIONS

The essence of the Coastal Plan is that the coast should be treated not as ordinary real estate but as a unique place, where conservation and special kinds of development should have priority. Coastal resources are limited; meeting human needs while safeguarding the coast will require special measures.

The Plan's 162 policy recommendations form the framework of a management program concerned with both natural and manmade coastal resources.

- The Plan actively **promotes:** productive agriculture, viable communities and neighborhoods, expansion of commercial fishing activity and fisheries research, acquisition of additional parklands, restoration of degraded coastal environments, and continued development of existing ports and marinas.
- The Plan seeks to **achieve balance** where there is a competition among goals, such as where increasing coastal access competes with resource protection, where economic development conflicts with conservation, where urban expansion competes with the retention of natural areas, or where short-run gains result in the forfeiture of long-run economic benefits.
- The Plan is **highly restrictive** in its control over the dredging and filling of coastal wetlands, its protection of areas of unusual natural or historic value, and in its regulation of activities that involve substantial environmental risk or the loss of productive agricultural or forest lands.

The major findings and policy recommendations of the Plan are:

Zuma Beach, northern Los Angeles County

## Coastal Waters

**Improve the Productivity of the Marine Environment.** California's coastal waters are among the world's most productive marine environments. Since the turn of the century, however, there has been an ominous decline in the quantity of food fish caught in the State's coastal waters, especially near intensively developed urban areas. The reasons for this are threefold: overharvesting of some popular fish, shellfish, and marine mammals has depleted their numbers; until recently, the ocean has been viewed as a convenient dumping ground for all sorts of waste products, including materials poisonous to marine life; and coastal wetlands, which serve as "nursery grounds" for many species of fish and wildlife, have been dredged and filled for development.

**Protect Against Overharvesting.** The Coastal Plan calls for a coordinated program of marine resources management to combat overharvesting and to maintain high yields of fish, both for food supply and for sportsmen. High priority is given to meeting the needs of commercial fishermen and to the expansion of "aquaculture" (growing marine organisms under controlled conditions).

**Protect Coastal Water Quality.** The Coastal Plan specifies that all wastes released into the ocean should receive adequate treatment and that wastewater discharges into enclosed bays and estuaries be phased out when necessary for estuarine protection. The Plan supports (and proposes some expansion of) the current programs of the State's Water Quality Control Boards and the Department of Fish and Game. Power plants, or other industries that use ocean water for cooling, would be required to have special design measures to help protect marine life from being drawn into the cooling system, and from the effects of the discharge of heated water back into the ocean.

To insure careful handling of petroleum, cleanup of accidental spills, and prompt payback of damages and cleanup costs, the Plan calls for a $100 million oil spill liability fund, to be financed by a two-cent per barrel tax on oil entering California.

**Control Diking, Filling, and Dredging of Wetlands.** Nearshore waters, estuaries, marshes, and wetlands are the most productive part of the sea — and the most vulnerable to damage. The Plan proposes strong measures to protect the State's remaining wetlands. Restoration of wetland areas of comparable productivity would be required as a condition of many dredging or fill approvals. The Plan recognizes that expansion of some developments, such as ports and energy installations, may be necessary in wetlands, but establishes stringent provisions to minimize any harmful effects of such expansion.

**Protect Against Harmful Effects of Seawalls, Breakwaters, and Other Shoreline Structures.** Seawalls, breakwaters, groins, and other structures near the shoreline can detract from the scenic appearance of the oceanfront and can affect the supply of beach sand. The Plan limits the construction of shoreline structures to those necessary to protect existing buildings and public facilities, and for beach protection and restoration. Special design consideration is proposed to insure continued sand supply to beaches, to provide for public access, and to minimize the visual impact of the structures.

## Coastal Land

**Protect Coastal Streams and Plan Carefully for Coastal Watersheds.** Coastal streams collect and channel waters draining from the land to the ocean, and thus form a fundamental linkage between shore and sea. Sediments and pollutants deposited in these streams can affect coastal wetlands as much as dredging and filling. The Plan recommends that comprehensive coastal watershed management plans be drafted to protect streamside vegetation, to maintain salt-water-freshwater balance, to protect the quality of water feeding coastal wetlands, to control sand supply (and thus protect ocean beaches from erosion), and to protect streams important as spawning areas for steelhead and salmon.

**Retain Natural Habitat Areas.** The richness of the nearshore ocean habitat is matched by the richness of the nearshore coastal land habitat. Many plants, animals, birds, and marine creatures are completely dependent upon the unique environment of the coast and can only survive in this setting. The Plan provides for careful protection of habitats of particular importance or rarity through acquisition, by controls on recreational uses, and through regulation of adjacent development.

**Encourage Coastal Agriculture.** The presence of the sea moderates the coastal climate, helping to create an extended growing season and to protect coastal crops from frost damage. The rich alluvial soils in coastal valleys, combined with temperate climatic conditions, create some of the

finest and most productive agricultural land in the nation. Plan policies seek to support agriculture and to discourage conversion of these highly productive agricultural lands to other uses. The Plan proposes to alleviate the pressures of high property taxes and urban utility assessments that can force conversion of farm land to urban development. Also proposed are direct economic support and technological assistance. Controls are recommended to limit urban encroachment into agricultural areas and to regulate rural subdivision of land and lot splitting. The Plan recognizes, however, that some conversion of lower quality agricultural lands to other uses may be unavoidable in places where it has become uneconomical to continue farming. The Plan thus recommends standards to govern the conversion of farmlands surrounded by urban development and the partial conversion of larger parcels of less productive rural lands in ways that would allow some residual agriculture.

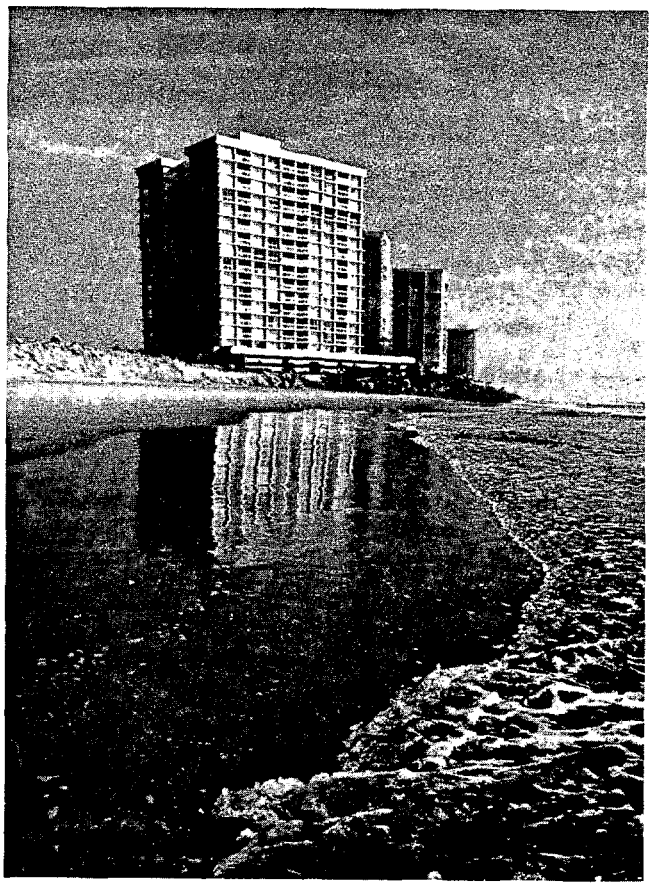
**Encourage Continued Timber Production.** The coastal forests in northern California are a valuable, renewable economic resource. The Plan seeks to maintain forests in long-term production with controls necessary to protect streams from erosion, to protect against damage to fish-spawning areas, and to protect the scenic beauty of forested areas. The Plan recommends that present tax laws be amended to encourage sustained forest yield by taxing timber only as it is cut, rather than taxing the value of all standing trees, as under the present system.

**Conserve Soil and Mineral Resources.** The soils and minerals of the coastal zone are irreplaceable resources of California. The Plan requires that local building and grading ordinances include effective measures to control erosion. Sand and gravel extraction would be barred in environmentally sensitive or highly scenic areas, and site restoration would be required where mining is permitted.

**Protect Coastal Air Quality.** In many urban areas, increasing numbers of people want to live and work along the coast because of its relatively clean air. Coastal Plan policies would exclude major new pollution-generating developments (refineries, fossil-fuel power plants, freeways) from portions of the coastal zone now designated as problem "air quality maintenance areas" unless there is no less environmentally damaging alternative. Where permitted, such developments would have to be designed and sited to minimize adverse effects on coastal air quality. The Plan would require the cumulative impact of development on coastal air quality to be considered in land use and transportation plans.

## Coastal Appearance and Design

**Protect the Scenic Beauty of the Coast.** The California coastline is a visual resource of great variety, grandeur, contrast, and beauty. In many areas coastal development has respected the special scenic quality of the shoreline, but in others, incompatible development has degraded and altered the attractiveness of the coast. Plan policies provide guidelines for various types of development in highly scenic areas and in areas affording the public prominent coastal views.



Coronado

The overriding design goal is that in scenic areas new development should be visually unobtrusive and subordinate to its setting. Development should be sited to protect coastal views and be landscaped to soften its visual impact. Construction materials should blend either with the natural setting or with adjacent structures. Massive structures such as major industrial plants and shopping centers should be built back from the

shoreline. The Plan bans unsightly billboards along the coastline and requires the removal of existing billboards from such areas within 10 years. The specific design objectives for various coastal areas would be established through local design review programs developed by local governments. To help combat litter, the Plan recommends that the Legislature consider enacting a law forbidding the sale of non-returnable or non-biodegradable containers.

The Plan policies contain detailed guidelines for development in different coastal settings including standards for construction affecting wetlands, sand dunes, bluffs, headlands, islands, canyons, riverways, and uplands.

## Coastal Development

**Encourage Orderly, Balanced Development.** Recognizing the need for continued development in appropriate areas, Plan policies propose that new development be concentrated in places able to accommodate it (i.e., areas with adequate water supply, sewer service, road and public transportation capacity, etc.).

New development would not be allowed to continue to leapfrog and sprawl over open lands but would, instead, be directed to already-developed areas. Along the immediate shoreline, priority would be given to "coastal-dependent" developments such as ports that by their very nature require coastal sites.

In rural areas not identified as containing significant natural resources, as highly scenic areas, or as viable agricultural lands, first preference in determining permitted uses would go to development that would preserve the open character of sites and serve the needs of coastal visitors (e.g., riding stables, campgrounds, or tourist accommodations). Residential development would be given lower priority but would be permitted where other types of development were infeasible. Plan policies recognize that certain potentially hazardous industrial activities (liquefied natural gas processing works and nuclear power plants) may require remote locations but seek to minimize the proliferation of these through site consolidations.

The Plan also recognizes that some of the unique communities along the coast, such as La Jolla, Venice, and Mendocino, are themselves coastal resources, and recommends special standards for protection of their scenic and community qualities.

**Protect Against Natural Hazards.** Development along the coast of California is threatened by a number of natural hazards such as floods, earthquakes, landslides, cliff erosion, and tidal waves (tsunami waves). The Plan proposes policies to restrict new development in floodplains, require that a geologic hazards description be made a part of residential sales information, place limitations on uses of land within coastal areas of highest risk, prevent public subsidies for hazardous development, and provide setbacks from erosion-prone bluffs.

## Energy

**Reduce Energy Consumption.** Energy conservation can not only conserve petroleum and other resources, thus strengthening the nation's self-sufficiency, but it can also help to protect coastal air, land, and water from unnecessary oil, gas, and power-generating facilities. Expanding demands for oil and gas will result in increased tanker movements and port development, or in additional offshore oil production, or both, and in refinery expansion. Growing electricity consumption increases pressures for construction of coastal power plants, and some are likely to be fueled by oil. Plan policies recognize that energy conservation programs should be applied statewide, and that the primary responsibility for implementation of such programs rests with the State Energy Commission. The policies recommend to the Energy Commission a detailed program for energy conservation, which could be implemented separately within the coastal zone only if the Energy Commission fails to meet its own legislative deadline for implementing a statewide conservation program by July 1, 1977.

Plan policies also advocate that tax incentives be provided to encourage energy self-sufficiency in building design. The Plan urges development and exploratory programs to expand use of alternative energy sources such as solar, wind, and geothermal energy, and energy from solid wastes and methanol.

**Siting Energy Facilities.** The Plan recommends that the Energy Commission have authority over the siting not only of new power plants but also of all other major energy facilities including those for petroleum production and refining. The coastal agency would, under the Plan, have concurrent jurisdiction in site selection and certification for sites in the coastal zone. The Plan would

**not** exclude energy installations from the coast, but rather would require that both inland and coastal sites be fully evaluated so that necessary new energy facilities will be provided in a manner least damaging to all of the State's natural resources.

**Power Plants.** Power plants would be permitted within the coastal zone at sites jointly certified by the Energy Commission and the coastal agency. The Plan provides that adequate freshwater supplies for agricultural irrigation be reserved before any fresh water is appropriated for evaporative power plant cooling at inland sites, and urges research on the use of agricultural waste water for cooling. Among the most significant considerations would be demonstrations by a utility (1) that the plant is needed despite energy conservation efforts; (2) that alternative coastal and inland sites have been evaluated, and the proposed site is the least environmentally damaging site; (3) that the plant would be compatible with neighboring land uses; (4) that, where feasible, a substantial coastal area would be provided for public use; and (5) that adverse visual impact would be minimized. Plants could not be built in areas identified as highly scenic nor could they increase pollution in problem air quality areas.

**Offshore Petroleum Development.** Plan policies would allow offshore petroleum development, provided it is part of a clearly defined energy conservation and development program for the country or for the western states, provided stringent environmental safeguards are made part of the entire exploration and production schedule, and provided there is careful planning to minimize onshore impacts.

The policies also recommend revising current Federal leasing practices to provide for withholding approval of offshore petroleum development until the offshore exploration has been sufficiently completed to determine the extent of the oil and gas available and the environmental impacts from extracting it.

**Tanker Terminals.** Tanker terminals would be permitted under criteria including the following: (1) existing facilities should be used to their maximum capacity before new port facilities are developed; (2) oil companies should be encouraged to trade crude oil supplies to minimize the need for petroleum transport and costly new terminal facilities; (3) existing harbor areas should be used to accommodate the tankers that will transport Alaskan oil (tankers with drafts of about 65 feet), but larger tankers to transport oil imports should be restricted to deepwater offshore terminals away from environmentally sensitive areas; and (4) new terminals should be planned for multicompany use and should have adequate equipment for oil spill containment.

**Liquefied Natural Gas [LNG] Terminals.** Terminals for importing LNG would be permitted under the following criteria: (1) until concerns about the public safety risks inherent to LNG marine terminal operations have been satisfied, there should be only one LNG terminal for California, at a site remote from heavily populated areas; (2) if the public safety concerns can be satisfied, consideration should be given to building LNG terminals in already-developed port areas to minimize adverse environmental impacts; and (3) LNG terminals should meet rigorous design and operational standards for safety.

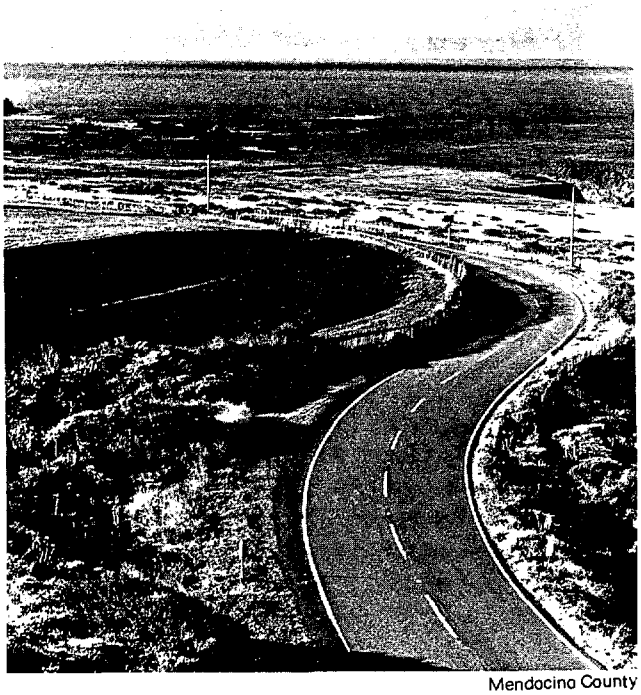
## Transportation

**Limit Adverse Environmental Effects of Coastal Access Roads.** Access to much of the State's coastline is over roads that were built to meet the needs of another era. Increasing volumes of coastal visitors sometimes fill the roads to their limits, and there have been growing numbers of second-home owners and long-distance commuters. High-volume freeways, with their graceful curves and generous widths, are ill-suited to the rugged landforms of much of the coastline and would cut massive swaths through coastal neighborhoods.

Plan policies seek to improve the efficiency of existing roads by promoting use of public transit and by mandating transportation plans that pay special attention to weekend congestion problems. Coastal roads should be designed, as many in California have been, to reflect their use as recreational routes and should include such amenities as scenic vista points, rest stops, beach accessways, and picnic grounds. The Plan recommends that local land use proposals be evaluated against road building and transit plans to make sure that land developments do not overrun the capacity of the roads and effectively block access to coastal visitors.

**Regulate Parking at the Coast.** If everyone insisted on driving his car to the water's edge it wouldn't be long before much of the coastline

would be paved for parking. Plan policies would restrict expansions of oceanfront parking lots but would provide for added parking immediately inland, well designed and connected to the shoreline by trails or shuttle buses. New developments would be required to have sufficient on-site parking or, in some cases, to provide payments to local transit systems.



Mendocino County

**Improve Public Transit.** Public transit is little-used for recreational travel, so on weekends fleets of transit vehicles used for access to work and school sit idle. There is excellent potential for increasing the use of public transit for recreational trips (experimental programs from San Francisco to beaches in southern Marin County have filled buses to capacity). Because public transit is less polluting than private automobiles and more efficient in its use of road capacity, transit is given strong preference for coastal transportation in many areas, and the Plan supports programs that would increase the attractiveness of transit to coastal visitors.

**Provide for Water and Air Transportation.** Port and airport facilities are vital to the State's economy, but expansion of either can have serious environmental consequences. Plan policies provide for increases in both air and water transportation, within a system of environmental safeguards. Except for ports handling hazardous materials, all port expansion would be channeled to existing port areas, and these would be used to their maximum potential before new diking or filling of water areas would be allowed. The potential for airport expansion within the coastal zone is limited, and the Plan recommends avoiding expansion of coastal sites, especially where this would require filling wetlands or losing recreational potential.

## Public Access to the Coast

**Guarantee Rights to Public Access to the Coast.** Public access to the ocean is a right specifically set forth in the California Constitution. But it has not always been enforced, and many parts of the coast are now fenced off from the public or are otherwise inaccessible. The Plan proposes that existing legal rights of public access to the coast be enforced, and that reasonable requirements for public access be established in new developments along the coast. Recognizing that additional public access will require additional policing, litter control, and other such measures, the Plan provides that public accessways in new developments be set aside but not opened for public use until a public agency accepts responsibility for maintenance and liability. Where a new oceanfront development could not reasonably provide public access within its boundaries, appropriate in-lieu payments to an acquisition fund may be required to help buy nearby property for public access.

**Create Opportunities for Persons of All Income Levels to Live Near the Coast.** In recent years much coastal property has increased rapidly in value so that people of limited means, including many elderly people, can no longer afford to live in some coastal neighborhoods. Older residences that could be renovated are torn down, generally to be replaced by larger and more expensive buildings. Policies give preference to coastal developments that would be accessible to people of diverse incomes, also stressing shared ownerships, rentals, and a retention of existing moderate-income housing.

**Encourage Multiple Use of Coastal Lands.** Part of the beachfront at the Marine Corps' Camp Pendleton in San Diego County has been opened

to the public, with management of the beach by the State Department of Parks and Recreation. The Plan proposes that on other military lands, consistent with security and safety, oceanfront areas be opened for public use. And the Plan recommends similar public access to the oceanfront, where appropriate, in major installations such as port facilities, power plants, etc.

## Recreation

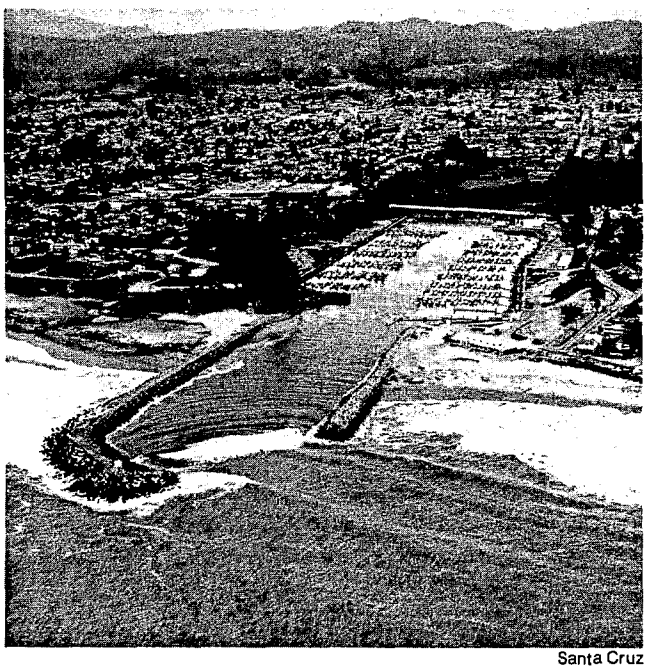
**Increase Coastal Recreation But Protect Coastal Resources.** The California coast provides recreation for millions of people every year—many from within the State, but many from other parts of the country and the world. Serving their needs provides California with jobs and income constituting a valuable part of the State's economy. Visitor surveys, filled campgrounds, and jammed parking lots make clear that even more visitors would be at the coast if there were more room for them.

The Coastal Plan proposes to expand recreational opportunities, by purchasing not only oceanfront beach and park land but also land just inland from the coast for parking and other support facilities, so the oceanfront can be reserved for recreation. Priority would be given to coastal areas close to major metropolitan centers. Where coastal communities are unduly burdened with the costs of maintaining recreational facilities enjoyed by inland residents, Plan policies recommend that State funds be made available to the extent they are needed to offset local costs of serving visitors. Where public purchase is not proposed, the Plan gives priority to private developments serving recreational and visitor needs over other types of development on the coast and encourages recreational facilities serving all income ranges, i.e., campgrounds, rental housing, or resort hotels.

But the Plan also recognizes that many coastal areas cannot accommodate unlimited crowds without environmental damage; indeed, too many people in an area can destroy the very features that attracted the visitors to the coast in the first place. Recreational areas would be managed to respect the natural capacity of park lands. (The State Parks and Recreation Department now allows only a certain number of people at a time into Point Lobos State Reserve south of Carmel, to protect a spectacular coastal promontory.) The Plan provides that limits be placed on public access and recreational use as necessary to protect coastal tidepools, bluffs, dune vegetation, and other such fragile areas; but also that additional sites be acquired as recreational demand increases so that facilities are not overburdened.

The Plan encourages construction of a coastal trail system, but with adequate policing and maintenance to protect adjacent agricultural lands from vandalism or other damage. Off-road recreational vehicles would be prohibited on the immediate beachfront, except at Pismo Beach in San Luis Obispo County and in a limited number of other places where stringent environmental standards could be met.

**Encourage Recreational Boating, But Protect Wetlands.** The demand for recreational boating has grown sharply in recent years, and in many coastal marinas there is a shortage of berths. In the past, small-boat marinas were often created by dredging and filling valuable marshlands or other wetlands, thus destroying fish and wildfowl habitat. Because such areas are essential to protect the State's fish and wildlife, and because boating can be accommodated elsewhere without habitat destruction, the Plan provides that new or expanded small-boat marinas



Santa Cruz

be built in natural harbors, in deep water (that is, deeper than marshes and wetlands), and in areas dredged out from dry land. In addition, dry storage, rental programs, multiple ownership, and other means are proposed to provide for more boating while protecting wetland values.

## Scientific and Educational Resources

**Protect Sites of Scientific, Historic, or Educational Value.** The Plan builds upon existing programs to protect sites of historic, archaeological, or scientific importance from being put to incompatible use. The policies advocate an intensified effort to identify and provide protection for the coast's historic and archaeological resources.

## Restoration

**Restore Degraded Coastal Areas.** New recreational opportunities can be provided, new habitat areas created, and blighted coastal neighborhoods renovated through a coastal restoration program.

Because of the profusion of coastal subdivision and lot splitting and the extreme costs of providing urban services and access to remote developments, a restoration program is recommended to reduce the numbers of undeveloped coastal lots. Purchases are recommended to protect areas usable by the public and in areas where costs of extending urban services would exceed the costs of buying lots. In some cases, lots in common ownership would be consolidated. Owners of individual buildable lots would be guaranteed construction rights or, alternatively, public purchase at full market value in locations where plans call for acquisition.

# CARRYING OUT THE PLAN

No plan dealing with controversial matters is likely to be self-enforcing. The Coastal Plan thus recommends that the following implementation program be established:

**Local Government Responsibilities for the Coast.** Because city and county government is accessible and accountable to its constituents, because statewide coastal concerns should be reflected in local planning and regulation, and because Plan implementation should be streamlined to reduce costs and delays, primary responsibilities for carrying out the Coastal Plan should rest with local governments. Within three years of the effective date of State legislation to carry out the Plan, local governments along the coast should be required to bring their General Plans into conformity with the Coastal Plan. Local governments would submit their plans to the Regional and State Coastal Commissions for certification as to conformity with the Coastal Plan. After all the local plans in a region had been certified, the Regional Commission would go out of existence. Local governments would then control coastal conservation and development, subject to a system of limited appeals to the State Commission to insure that approved local plans and thus the Coastal Plan were being followed in day-to-day decisions.

**Coastal Resource Management Area.** Because the Coastal Plan seeks to provide for the wise use and protection of coastal resources, local plans would be required to conform to the Coastal Plan in an area designated as the coastal resource management area. This area, shown in detail on the Plan Maps in Part IV, is the area of varying width along the coast containing the coastal waters, wetlands, beaches, bluffs, agricultural lands, and coastal communities and neighborhoods that are the subject of Plan policies. In some cities, the coastal resource management area is **less** wide than the 1,000-yard permit area established in the 1972 Coastal Act (Proposition 20). In rural areas and other areas of undeveloped land, the resource management area may extend to the inland boundary of the coastal zone to include coastal agricultural lands and streams and areas where the cumulative impact of development would limit public access to the coast (e.g., Malibu, Big Sur). As provided by the 1972 Coastal Act, the California coastal zone is the water areas under State jurisdiction, the offshore islands, and land areas inland to the

highest elevation of the nearest coastal mountain range, except that in Los Angeles, Orange, and San Diego Counties, the boundary does not extend more than five miles from the mean high tide line.

**Permit and Appeals System.** To insure that unwise development decisions do not occur while local plans are being brought into conformity with the Coastal Plan, the permit and appeals system specified in the 1972 Coastal Act would remain in effect except that (1) the standards for issuing and denying permits would be compliance with the Coastal Plan, not the 1972 Coastal Act; (2) permits would also be required within the coastal resource management area for the conversion of any prime agricultural land to other uses and the conversion of other agricultural land in parcels of 20 acres or more; (3) anywhere within the coastal zone, a Commission permit would be required for major water, sewer, transportation, or energy developments that could adversely affect coastal resources; and (4) permits would **not** be required where a Regional Commission (or the State Commission, on appeal) determined after public hearing that development of a particular type or in a particular area would not adversely affect coastal resources.

**Permits and Appeals After Certification.** After a local plan has been certified by the Coastal Commissions as being in conformity with the Coastal Plan, local governments would have primary implementation responsibility, subject to a system of limited appeals to the State Coastal Commission to insure that the approved local plan and the Coastal Plan were being followed in day-to-day conservation and development decisions.

**State Coastal Agency.** After the Regional Commissions have gone out of existence, a State Coastal Commission with 12 members — one-third appointed by the Governor, one-third by the Speaker of the Assembly, and one-third by the Senate Rules Commitee — would have the following responsibilities: (1) carry out the planning and research necessary to keep the Coastal Plan up to date in light of changing conditions; (2) assist local governments in Plan implementation; and (3) through the appeals process, monitor the decisions on proposed coastal conservation and development.

**State and Federal Agency Responsibilities.** The Plan provides that all State agencies, and all Federal agencies to the extent applicable under Federal law, be required to conduct their activities in full compliance with Coastal Plan policies. The Coastal Commission would seek to insure that California maintains a Coastal Plan complying with the standards of the Federal Coastal Zone Management Act of 1972, thus qualifying the State for Federal funds to help carry out the Plan, and also insuring that Federal agencies would be required to follow the Plan unless an overriding national interest compelled other actions.

**Proposed Bond Issue.** The Plan proposes that a limited number of key coastal properties be bought by the public, primarily for oceanfront recreation and for the protection of wildlife habitat. Based on assessments by county assessors, the parcels **tentatively** proposed for acquisition have a total market value of about $180 million. Because of inflation, and because some assess-

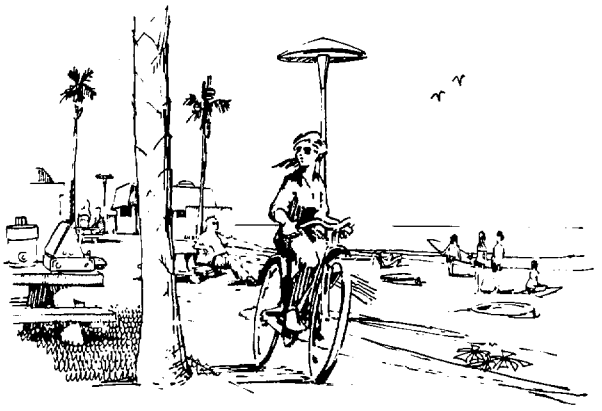
## The Legal Basis for Statewide Planning

**The State of California has legal power to regulate and control land use. This regulation, using such forms as zoning, is part of the inherent power possessed by all States and is commonly called the police power — the power to regulate public and private activity to protect the health, safety, and welfare of the general public.**

**The California Constitution and other State laws delegate certain police powers, including the power to plan and control land use, to cities and counties in carrying out their local or municipal affairs. The State, however, retains the ability to plan, protect resources, and even control land use in areas or on subjects of greater than local concern.**

**As one court has said in a case involving the Coastal Commissions, "Where the ecological or environmental impact of land use affect the people of the entire State, they can no longer remain matters of purely local concern." The court added that "the impact of an activity which in times past has been purely local, may under changed circumstances transcend municipal boundaries . . . Where the acitivity, whether municipal or private, is one that can affect persons outside the city, the State is empowered to prohibit or regulate the externalities" (CEEED v. California Coastal Zone Conservation Commission, 118 Cal. Rptr, 315 [1975]).**

ments have not been updated recently, estimates may be low with regard to some parcels. On the other hand, the total cost may be reduced by eliminating some parcels from the list (the Commissions are continuing to review the acquisition proposals) and by purchasing easements rather than full title in some cases. The Plan proposes that, after further review of the proposed acquisitions, a bond issue be submitted to the voters of California in 1976 to pay for prompt purchase of coastal properties.



**Costs of Carrying Out the Plan and Possible Sources of Funds.** Costs of carrying out the Coastal Plan are (1) the cost of land acquisition, not expected to exceed $180 million to $200 million together with some additional operating and maintenance costs to park agencies as new beaches and parks are open; (2) the cost of Coastal Commission permit and appeals administration, estimated at $1 million to $1.5 million per year; (3) the cost of further Coastal Commission planning to keep the Coastal Plan up to date and to assist local governments in Plan implementation, estimated at $1 million to $1.5 million per year; and (4) the cost to local governments of bringing their plans into conformity with the Coastal Plan, estimated at $600,000 to $800,000 per year for three years.

The Plan proposes that these costs be paid from several possible sources:

- The bond issue cited above;
- Federal acquisition grants from the U.S. Land and Water Conservation Fund;
- Federal planning grants (once California's Coastal Plan has been certified as in compliance with the Federal Coastal Zone Management Act of 1972, California will be eligible for two-thirds of the planning and administrative costs of carrying out the Plan);
- Taxes on the production and transport of petroleum on and across California coastal waters, because a principal purpose of coastal planning is to provide adequately for needed energy production consistent with environmental protection; and
- Perhaps from added fees on pleasure boats or added taxes on visitor accommodations in coastal areas, in both cases requiring those who benefit most from coastal recreation and amenities to help pay the costs of protecting the coast.

# APPLYING PLAN POLICIES

Part II of the Coastal Plan sets forth the policies upon which conservation and development decisions in the coastal zone should be based, and Part III recommends ways of carrying out the Plan. Part IV specifically applies the Plan policies to the geography of the coastal zone — the sea, wetlands, beaches, farmland, hills, and urban areas.

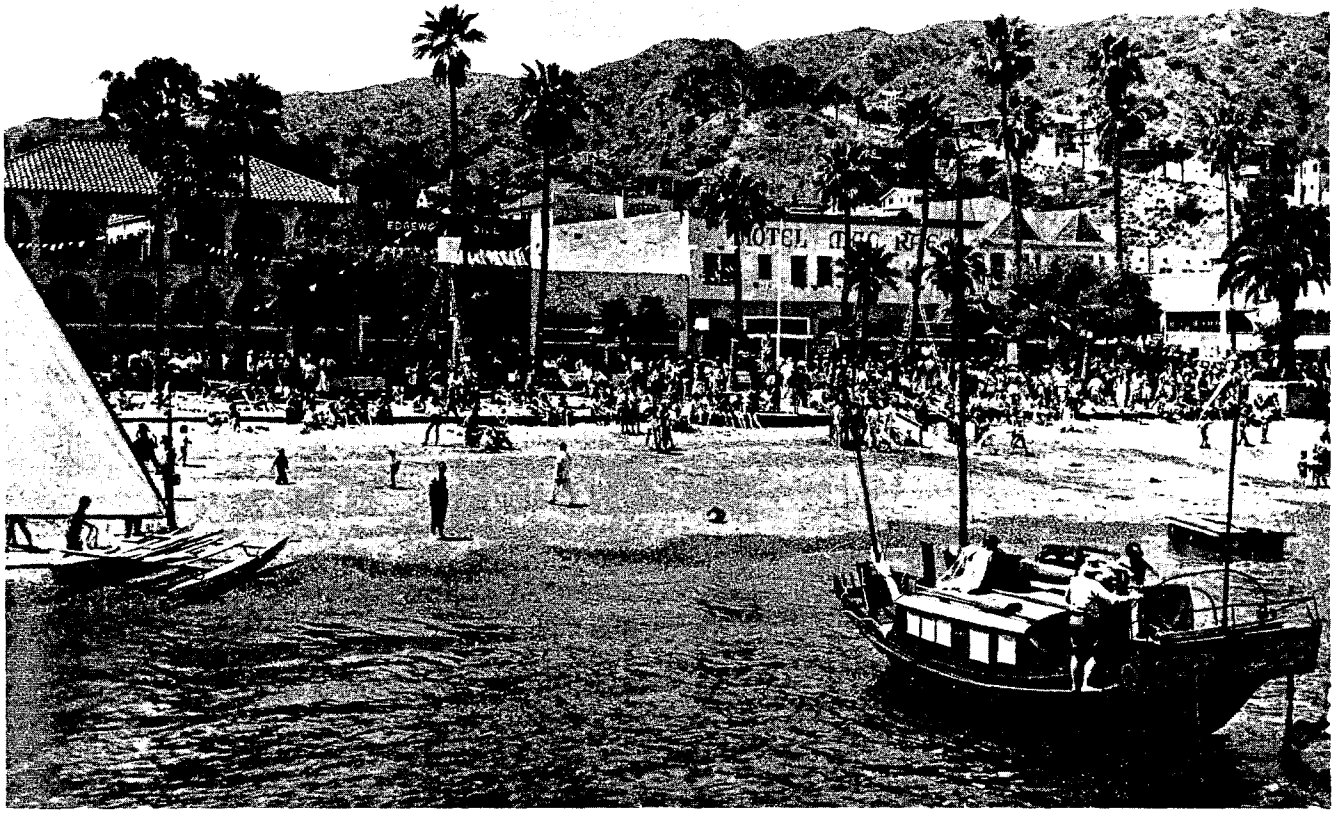
The Plan Maps, Map Notes, and Regional Summaries can be used by anyone interested in knowing the location and extent of coastal resources and developed areas as well as what the Plan proposes for a particular part of the coast. For example, areas for possible public acquisition and restoration are shown, as are possible sites for coastal trails and coastal access, and in some cases, areas within which urban growth could be encouraged or restricted.

# THE FUTURE ENVISIONED BY THE PLAN

The Coastal Plan envisions a future for California's coast that includes:

- An orderly transition between fully developed communities and productive farm and grazing land.
- Recreational boating increased, consistent with wetland protection.
- New residential development concentrated and served by public transit, so that roads to the coast are kept uncongested.
- Downtowns and neighborhood commercial areas renewed and refurbished, with no further construction of sprawling shopping centers that destroy valuable farmland on the fringes of the cities.
- Traffic flowing smoothly through cities to the shore, with many vehicles being shuttle buses from nearshore parking lots where motorists have left cars.
- Well-maintained, older, less-expensive housing that provides opportunities for people of all incomes to live near the ocean, and clearly blighted areas replaced by new residential construction.
- Many more people enjoying beaches, coastal resorts, hotels, and waterfront restaurants.
- Power plants as needed to serve an economy that employs effective energy conservation, and every power plant sited and designed to minimize environmental damage and hazards.
- Expanded and more efficient facilities at existing ports, to take advantage of the great energy and cost savings of ocean transportation, and port developments planned to minimize environmental degradation.
- Beyond the urban areas, a largely undisturbed coastline that can be enjoyed from comfortable tour buses, cars, motorcycles, and from miles of foot, bike, and horse trails, with many more carefully planned beach access areas, and campgrounds.
- Agricultural lands kept in agricultural produc-

Avalon, Santa Catalina Island



tion with taxation based not on potential subdivision but on farmland needed to feed a growing population; and with incentives for Californians to work in productive agriculture.

- In the North Coast Region, a more vigorous visitor industry, an enhanced agriculture, and a timber industry made stronger by more widespread use of sustained yield practices and by an increased demand for wood products to replace increasingly expensive and dwindling manufacturing and construction materials such as plastics and steel.
- And overall, continued growth channeled both to achieve greater savings in public costs by concentrating development, roads, utilities, and to protect coastal wetlands, farmlands, views, and other natural resources.

# NATIONAL INTEREST IN THE COAST

**The California Coastline Is a National Resource.** The California coastline is of more than local or even State importance; it is a resource of national significance; it comprises more than half of the western coastline of the contiguous 48 states.

Visitors from across the country enjoy the scenic beauty and recreational facilities along the coast. Foreign goods bound for consumers in inland states and U.S. products on their way to distant countries pass through California ports. Petroleum, timber, and farm produce for the coastal zone are shipped to the rest of the nation.

Use of the coastal land area and adjacent waters for national defense and national security is of paramount importance to the country because of military installations located along the coast. This is particularly true of the numerous Navy installations with defense missions necessarily requiring operational use of such areas.

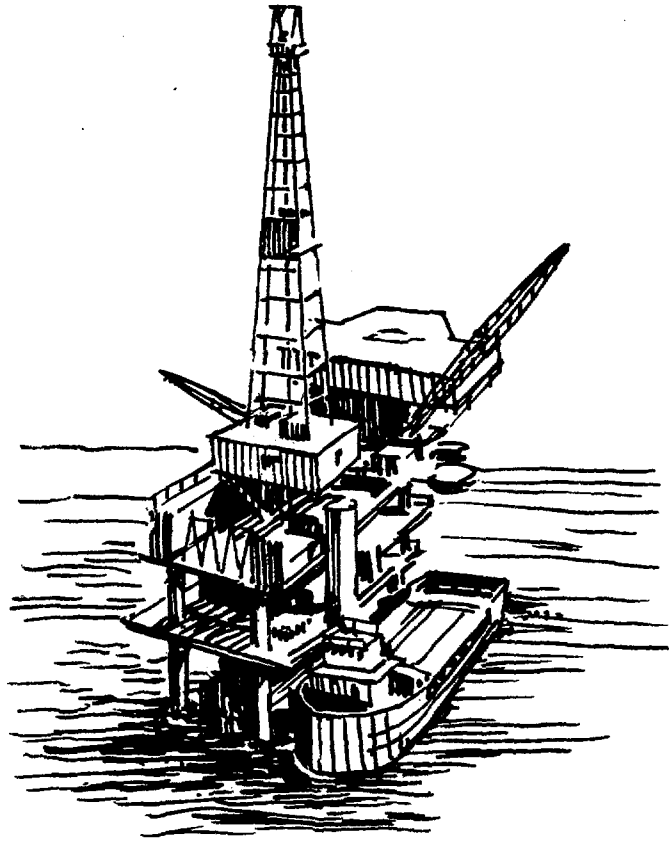
**The Federal Coastal Zone Management Act.** Recognizing the distinct and irreplaceable value of this country's coastline, the U.S. Congress enacted the Coastal Zone Management Act of 1972 (PL 92-583) which states, "...it is national policy. ..to preserve, protect, develop, and where possible, to restore or enhance, the resources of the nation's coastal zone for this and succeeding generations" (Section 303[e]). The language is almost identical to one of the objectives of the California Coastal Act (Proposition 20): "...to preserve, protect, and where possible, to restore the resources of the coastal zone" (Public Resources Code, Section 27001).

Under the Federal Act, California has received financial assistance for the preparation of the Coastal Plan, which will be submitted to the Department of Commerce--the agency responsible for administering the Federal Act—in the form approved by the State Legislature and the Governor. Once approved by the Secretary of Commerce, the Coastal Plan will provide the basic policies for both state and national interests in the coastal zone. The Federal Act requires Federal agencies to comply with an approved state coastal zone management program "to the maximum extent practicable" (Section 307[c]).

To ensure that the national interest is adequately addressed in the Coastal Plan, the Federal Act requires that the state coastal zone "management program provides for adequate consideration of the national interest involved in the siting of facilities necessary to meet requirements which are other than local in nature" (Section 305[c][8]).

**Planning for the National Interest.** Recognizing its responsibilities to the rest of the nation, California in its coastal planning has made every effort to consider the national interest in issues affecting the coast. The Plan's policies recognize national defense and national security as important aspects of national interest, because without the attainment of such objectives, all other goals and objectives can be threatened. The policies on the protection of agricultural land recognize the importance of California farm production to the rest of the nation and also acknowledge the world food shortage. The policies calling for recreational and public-oriented uses to have a high priority along the coast reflect the increasing popularity of the coast as a tourist destination. The Plan's energy policies, especially important because of the Department of Interior's

proposals to lease vast Outer Continental Shelf (OCS) areas for petroleum exploration and extraction, take into account California's role in national energy supply. The energy policies are based on a willingness to respond with a broader state role in meeting the nation's energy requirements if such a need is clearly identified and if California's environmental, economic, and legal interests are properly planned for and protected. Because needs — national, state, and local — may change in the future, if occasions should arise where certain federal activities would conflict with Coastal Plan policies, the representatives of the Federal and State agencies concerned should consult and cooperate to resolve the conflicts consistent with national objectives.



**Planning for Federal Activities.** One part of the national interest is the planning for activities carried out by Federal agencies in the coastal zone. To bring the activities of the many Federal agencies within the context of the comprehensive planning called for in the Federal Coastal Zone Management Act, the Act provides that "each Federal agency conducting or supporting activities directly affecting the coastal zone shall conduct or support those activities in a manner which is, to the maximum extent practicable, consistent with approved state management programs" (Section 307[c][1]). The Federal Act also excludes "from the coastal zone ... lands the use of which is by law solely to the discretion of or which is held in trust by the Federal Government" (Section 304[a]). In recognition of the paramount importance of national defense and national security, in California this exclusion is interpreted to include all lands and waters within the coastal zone used for national defense or subject to the jurisdiction of the Department of Defense and both present and future needs for operational air space and land and water areas. Moreover, the planning for areas surrounding military installations should be coordinated with local Department of Defense representatives so these areas are not used in a manner that would conflict with national security needs. And just as military operations should be protected from incompatible surrounding uses by the coastal zone management program, it is anticipated that Federal agencies, being equally aware that environmental problems do not respect jurisdictional boundaries, will do their utmost to comply with applicable Coastal Plan policies.

**Federal-State Cooperation to Protect the National Interest.** California has received extensive assistance and cooperation from many Federal agencies in the preparation of the Coastal Plan. Moreover, as required by Federal regulations, early drafts of the Plan elements have been provided to numerous Federal agencies for review and comment. For example, the Coast Guard, Federal Energy Administration, Maritime Administration, National Park Service, Fish and Wildlife Service, National Marine Fisheries Service, U.S. Geological Survey, Forest Service, Bureau of Land Management, National Aeronautics and Space Administration, Navy, and Army Corps of Engineers have all commented extensively on the Preliminary Coastal Plan and/or provided useful data and information for preparing it.

Through this process, there has been an opportunity for national interests, as perceived by Federal agencies, to be incorporated into the preparation of the Plan. Although there is general support for the Coastal Plan objectives among Federal agencies, there may be some disagreement in applying the Plan policies to particular circumstances. Nevertheless, continued cooperation can ensure that the national interest is protected through a uniform application of the Coastal Plan policies to the entire coastal zone by whichever local, State, or Federal agency has

regulatory jurisdiction. Where the Coastal Plan would conflict with an overriding national need under unforeseen circumstances, it may be necessary to amend or override the Plan policies in the national interest. Such cases can be expected to be rare. Except for national defense and national security needs as established by the President and the Congress, the determination of national interest needs, along with any measures necessary to mitigate the adverse impacts of meeting those needs, should be made cooperatively by the affected local, regional, State, and Federal agencies.

Clearly, national defense and national security are among the highest priorities in the management of the coastal zone. Coastal zone military installations are important components in their local areas, and represent a stable and substantial contribution to the State economy. Because military defense installations are excluded from the coastal zone, State or local approval for related activities is not required. The decisions on whether or not such activities will comply with environmental safeguards rest with the Department of Defense. The defense agencies — and in particular the Navy, which is the Federal agency most dependent on coastal installations for its continued operations—have displayed increasing sensitivity to environmental issues in their operations. The Navy has also cooperated in the development of California's coastal zone management program by making its interests known. It is Navy policy to conduct Navy activities to the maximum extent practicable consistent with the State Plan, as long as national defense objectives are protected. To this end, the Navy intends to permit review, subject to security restrictions, of its master plans, general development maps, and offshore operating area requirements, for comment and recommendation by the agencies responsible for carrying out the Coastal Plan.

Other Federal agencies have also indicated their willingness to cooperate in a similar manner. There has, for example, been extensive cooperation with the Army Corps of Engineers, which shares regulatory authority with the Coastal Commission over the waters and wetlands of the coastal zone, with the Federal Power Commission on the siting of liquefied natural gas facilities, and with the Environmental Protection Agency on air and water quality standards. Through a continuation of this process of discussion, negotiation, and arbitration when necessary, among local, state, and federal interests, differences can be addressed cooperatively, and the entire coastal zone be treated as an interrelated environmental and economic system.

# PUBLIC INTEREST IN THE COASTAL ZONE

The public interest in the California coastal zone is as diverse and varied as is the 1,100-mile coast itself. To varying degrees, the people of California, the people of the United States, and even the people of many parts of the world benefit from the California coastal zone.

The public interest in the coastal zone is in:

- its use for national defense;
- its timber and its oil and other minerals;
- the electric power generated along its shore;
- the products shipped around the world from its ports, and the imports that arrive in California harbors;
- the fish and other food produced in the coastal zone;
- living on or near the coast;
- enjoying the beaches and parks of the coast, the clean coastal air, and the serenity and inspiration of the unparalleled variety of coastal forests, mountains, bluffs, estuaries, and waters.

The public interest in the coastal zone is embraced by the two objectives of the Coastal Plan, which are to:

1. Protect the California coast as a great natural resource for the benefit of present and future generations.

2. Use the coast to meet human needs, in a manner that protects the irreplaceable resources of coastal lands and waters.

# ECOLOGICAL PLANNING PRINCIPLES

The ecological planning principles and assumptions underlying the Coastal Plan are as follows:

- No one part of an ecosystem operates independently of any other. Therefore, alterations within an ecosystem should be carefully considered as to their impacts on other portions of the ecosystem.
- Air, soil, water, and light are the basic physical requirements for an environment to sustain life.
- Organisms have requirements essential to life. If any of these requirements are met in amounts too small to satisfy the organism, it will not be able to survive in a particular area.
- People are an important part of coastal ecosystems. People change ecosystems, and in doing so can improve human living conditions. But changes in the natural environment can also result in undesirable consequences as, for example, the introduction of pollutants into the air and water can harm human health.
- Every ecosystem has a carrying capacity, which is limited. Coastal zone management must recognize the limiting factors, and they should be of primary concern in environmental analysis. People must recognize the balance of nature and limit use of natural resources so that they do not destroy options for the future.

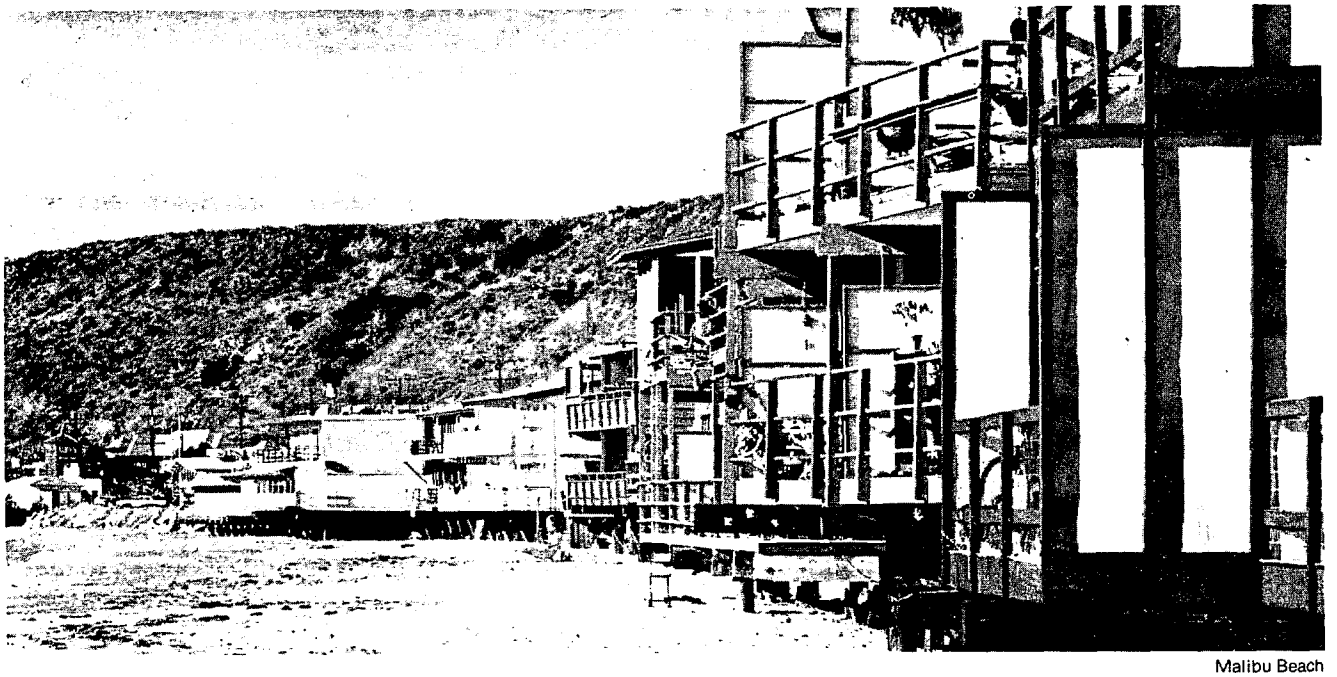
# RIGHTS OF PROPERTY OWNERS

The Coastal Plan recognizes fully that the ownership and use of private property are fundamental concepts in the law and traditions of the United States. This nation's long history of personal liberty, as well as its material prosperity, have resulted in large part from the freedom and private enterprise encouraged by the private ownership and use of resources. The Constitutions of both the United States and the State of California protect property owners against the taking of their property without just compensation. The Coastal Plan cannot violate these Constitutional mandates, and it does not.

**Landowners' Rights Protected.** The Coastal Plan protects the rights of landowners. The Plan proposes that some key coastal properties be bought by the public for public use or environmental protection; the owners of such property would be paid fair market value for their holdings. If such property is not in fact bought by the public, the property may be put to other uses by its owner consistent with Coastal Plan policies. The Coastal Plan proposes development standards, similar to those in long-established city and county laws, under which new buildings would be designed to minimize interference with ocean views from public roads, and to provide public access to the oceanfront where appropriate.

The property rights of a landowner are not absolute. Rights can and do change over time, and the rapid urbanization of the United States during the 20th century has led increasingly to restrictions on the use of private property—restrictions held by the courts to be constitutional. For example, the U.S. Supreme Court held 25 years ago that property owners could not create an enforceable agreement requiring racial discrimination in the future sale of their land. For many years, laws have prohibited the use of property in a way that would result in health hazards or noxious effects on the public at large. And local zoning laws have been upheld by the courts since 1926.

**Rights and Expectations.** The issue is not whether property owners **rights** could be violated; under Federal and State Constitutions they could not be. The issue, at least in may places, is that property owners' **expectations** may be affected. When people buy land, they often expect a certainty of financial return greater than when they buy securities or make other investments. Because they may live on the land and farm it, be-



Malibu Beach

cause they pay property taxes on it, and because of the recent rapid rise in land values in many areas, many people expect to make money by holding or using land, and they believe they deserve to be compensated if their expectations are not realized. Under the Coastal Plan, as under many Constitutional land use laws, people can use their land in a variety of ways, but in some cases not as fully or intensively as they might like.

**Development in Both Public and Private Interest.** The Coastal Plan recognizes that in many coastal areas open lands now providing spectacular ocean views are in fact lands that have been divided into small lots generally intended for single-family homes. If all the owners build single-family houses, as presumably they eventually expect to do, and if all the homes are screened and landscaped, motorists on the publicly financed scenic State Highway 1 will not see the ocean but the backs of a nearly solid wall of houses. The Coastal Plan recommends policies to deal with this situation. In appropriate areas, lots not yet built upon could be bought back from their owners—at fair market value—so that the land could be preserved as open space or, alternatively, replanned, redivided, and resold for a clustered form of development that would preserve substantial open areas. If the property is not covered by a public program of this or similar type, then the Plan recognizes that the owner of an individual lot, having no legal or physical impediments to restrict development and having no reasonable use other than a single-family home, will be able to build such a home on it.

But the Plan would require that such houses be designed, built, and landscaped to minimize interference with public views from Highway 1, and to safeguard wherever feasible public access to the publicly owned tidelands. Thus, with no taking whatever of an owner's property, the owner of coastal land might be required to build in a slightly different manner from what he might otherwise like to do. This is no different from the existing city and county ordinances, accepted by landowners and public alike, that require, for example, street dedications or front and side yard setbacks from a property line. In other words, established law already requires that an owner of land take public needs into account in his private development.

**Public Access to the Ocean.** The Plan would not take any private property for public use, but rather seeks to protect existing public rights of access to the ocean and other navigable waters. Just as the California Constitution protects private property rights, so it also protects rights of public access. The State Constitution, adopted in 1879, provides in Article XV, Section 2, that 'The People Shall Always Have Access to Navigable Waters. No individual, partnership, or corporation, claiming or possessing the frontage or tidal lands of a harbor, bay, inlet, estuary, or other navigable water in this State, shall be permitted to exclude the right of way to such water whenever it is required for any public purpose, nor to destroy or obstruct the free navigation of such water; and the Legislature shall enact such laws as will give the most liberal construction to this provision, so that access to the navigable

waters of this State shall be alwavs attainable for the people thereof."

**Summary.** In summary, the Coastal Plan, if carried out as presented in this report, would not take any landowners' rights. In some cases, it might change his expectations, but there are many factors other than the Coastal Plan that can influence future land values — for example, the value of land for second-home subdivisions depends, in part at least, on the price and availability of gasoline for driving to distant areas. Thus, there can be many reasons for financial success as well as financial reverses in the ownership of land, as in the ownership of securities or any other investment. Although no compensation for loss of expectations is legally required, perhaps there should be a public policy debate as to its desirability. At the very least, however, it could be difficult indeed to correctly measure declines in value, and to fairly assess the many factors that might be responsible. And there is yet no tradition of public responsibility for guaranteeing the success of private investments in land or in anything else.

# ECONOMIC IMPACT OF THE PLAN

Protecting California's coast is essential for the State's long-term economic well-being. The Coastal Plan calls for economically sound measures: well-planned, orderly development to curb the wasteful use of land; vigorous protection of the coastal resources that are the basis of the multi-million dollar coastal tourist industry and the thousands of jobs it provides; and similar protection for coastal farmlands, timberlands, and ocean fisheries—all of which provide jobs and income for Californians.

**Factors in Economic Analysis.** Economic activity along the coast is affected by many factors of which the Coastal Plan is only one. Interest rates, population growth, unsold or under-used buildings, and the availability of energy are all factors that will affect building activity along the coast. The coastal economy, and indeed the State's economy, may also be affected in less obvious ways. For example, there is an economic loss when low-quality, sprawling development is allowed to overrun land suitable for much better development. There is an effect on the consumer's food bill when prime agricultural land is converted to other uses—followed by efforts to achieve comparable production on less valuable land through energy-intensive applications of irrigation water and fertilizer. The past misuse of California's coastal resources has caused unmeasured but real economic losses.

**Short-Term Vs. Long-Term Economics.** The gradual, piecemeal degradation of natural resources has not usually been recognized as a major economic loss. Rather, attention has been concentrated on short-term economic benefits: when a marsh was filled, attention was given to the jobs created by new construction, and a resulting increase in the local tax base. Similarly, building houses on prime farmland has usually been seen as economically beneficial. But there is increasing evidence of long-term losses that may not be so visible. Filling marshes, bays, and estuaries, which are essential nursery grounds for many species of fish and wildfowl, can gradually decrease the ocean fisheries—and the jobs and income, together with food supply, that ocean fishing provides. There may well be serious long-term consequences from the increasing loss of prime agricultural land—effects not only on food prices but on the ability of this nation to help feed the world's growing population, and to export food in return for petroleum, metal ores, and other products from abroad.

The Coastal Plan recognizes, in short, that protection of coastal resources is essential to a sound economic future for California. Specifically:

- **The Coastal Plan Seeks to Protect the Economic Value of Public Enjoyment of the Oceanfront.** While it may not be possible to determine precisely the dollar value of a day of recreation or inspiration provided by ocean beaches, parks, bluffs, and trails, there are clear dollar values attributable to the coastal visitor economy. And the Coastal Plan seeks to increase public access to the oceanfront in appropriate areas; to provide tourist accommodations from campgrounds to hotels, resorts, and meeting centers; and to give

preference to these public activities over private housing in suitable coastal areas. If Californians were to allow the coast to be further degraded, ocean views to be blocked by poorly-designed buildings, and access to beaches restricted, they would be risking the future of one of the most important economic assets of the State—coastal visitors.

Security Pacific Bank, in its 1975 Coastal Zone Economic Study, wrote that "tourism is a vital economic base industry, i.e., its income accrues from sales to people from outside the state, and it brings in 'new dollars.' Some of its benefits include the direct and indirect support of a multi-industry infrastructure, the employment of many relatively unskilled workers, and the taxes paid by the tourist...Tourists make relatively small demands on a region's public services (police and fire protection, street maintenance, etc.) and yet they contribute heavily toward providing employment and income and in reducing the tax burden of local residents."

• **The Coastal Plan Seeks Orderly, Balanced Development, Reducing the Excess Costs of Urban Sprawl.** "The Costs of Sprawl," a study made in 1974 by Real Estate Research Corporation for the Federal government, showed that well-planned, concentrated development means savings to the public of between 5 and 33 per cent when compared with wasteful, land-consuming development. The savings are in the costs of roads, sewer and water lines, etc., and also in travel time for residents, the need for services such as schools and fire stations, etc. And, of increasing importance, well-planned developments can save greatly on energy. The Coastal Plan seeks **not** to stop growth and development, but to direct new construction primarily into the rebuilding and upgrading of already-developed areas where additional development can be accommodated. The issue is not **whether** there should be new development, but **where.**

• **The Coastal Plan Seeks to Protect the Harvesting of Renewable Resources — Agriculture, Forestry, and Ocean Fisheries.** Thousands of jobs and millions of dollars in annual crop production depend on the unique combination of California's coastal soils and climate. Protecting California's agricultural lands is not only a coastal issue; it is obviously a problem of Statewide concern. But the Coastal Plan seeks to maintain the long-term productivity of coastal farmlands, grazing lands, and timberlands for their long-term economic value. Similarly, the Plan seeks to protect ocean fishing, both commercial fishing and sport fishing. The Plan therefore seeks to protect the coastal estuaries and wetlands essential to California's ocean fishery, and to protect coastal water quality. The economic values are clear: the Security Pacific study noted that in 1972, the most recent year for which detailed figures are available, California landings and shipments of commercial fish were valued at $162.5 million. The study added that "the real value of commercial fishing to the State and regional economies of California in terms of primary, secondary, and tertiary income and employment is difficult to assess. In most cases, these values are probably understated. California fishermen range many miles from their home ports in search of their catch — from Alaska on the north to South America on the south — and in many instances, they market their catch at the nearest suitable port in order to shorten their turnaround time. Consequently, California's official published valuation figures are understated in that they include neither the value of the fishing catches, the profits, nor the wages, resulting from deliveries to non-California ports. There is a positive effect, however, in that these monies are brought back to California and introduced into the state and regional economies as export or 'new' dollars."

• **The Coastal Plan Recognizes the Possible Need for Energy Installations and Production.** The Coastal Plan recognizes that some future coastal sites may be needed for new or expanded power plants, that new port terminals may be needed for larger petroleum tankers, and that offshore petroleum production may be required as part of a national energy conservation and development program. The Plan provides standards by which necessary energy installations may be accommodated, consistent with the protection of coastal economic and environmental resources.

• **The Coastal Plan Seeks to Provide Other Economic Benefits.** The Coastal Plan seeks to protect the coastal streams that deliver sand to ocean beaches; beach erosion costs property owners and governmental bodies several million dollars every year for building groins, jetties, and other erosion-combating structures, and for importing sand. And the Coastal Plan also seeks to maintain and enhance coastal air quality; air pollution causes millions of dollars annually in crop damage, and inestimable damage to human health.

# Part II: Findings and Policies

## HOW TO USE PART II

- For an overview, see summary of findings and policies in Part I, beginning on page 5.
- The Glossary can be found in the Appendix.
- Policy "tagline" index, also at the back, provides a numerical list of policies.

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## USE OF "SHALL" IN PLAN POLICIES

The Coastal Act requires submission to the Governor and the Legislature of an enforceable Coastal Plan, and the Plan's policies are therefore generally written with the verb "shall." The entire Plan is, of course, the recommendation of the Coastal Commissions: the Commissions recommend that legislation be enacted and other steps taken to give the policies the force of law. In a sense, then, the policies are similar to draft legislation, so that, upon approval by the Governor and the Legislature, the policies "shall" be carried out.

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The policies also provide criteria for ensuring that coastal developments are consistent with protection of coastal resources. Unless specifically stated otherwise in the policy, it is intended that the burden of demonstrating compliance with the criteria rests with those proposing the development.

# BASIC GOALS FOR COASTAL PLANNING

## Findings

**Planning for Conservation and Development to Be Consistent with Coastal Zone Act.** The California Coastal Zone Conservation Act declares that the coastal zone is a distinct and valuable natural resource, and requires that planning for conservation and development be consistent with all of the following objectives:

- The maintenance, restoration, and enhancement of the overall quality of the coastal zone environment, including, but not limited to, its amenities and aesthetic values;
- The continued existence of optimum populations of all species of living organisms;
- The orderly, balanced utilization and preservation, consistent with sound conservation principles, of all living and non-living coastal zone resources; and
- The avoidance of irreversible and irretrievable commitments of coastal zone resources.

## Policy

**1. Basic Goals for Coastal Zone Conservation and Development.** The basic goals for conservation and development in the coastal zone shall be: (1) protect, enhance, and restore the natural resources of the coast; (2) protect, enhance, and restore the manmade resources of the coast — the special communities and neighborhoods that have unique cultural, historic, and aesthetic qualities; (3) give priority to coastal-dependent development — uses of land and water that by their very nature require coastal sites — over other development on the coast; (4) maximize access to the coast for people of all income ranges, consistent with the protection of coastal resources; and (5) encourage orderly, balanced development that avoids wasteful sprawl by concentrating new growth in already-developed areas with adequate public services or in other areas near major employment centers consistent with resource protection policies.

# MARINE ENVIRONMENT

# OCEAN RESOURCES MANAGEMENT

## Findings

**Marine Resources Are Essential.** Life on earth is completely dependent upon the ocean as:

- a source of fresh water as a result of evaporation and atmospheric transport that brings precipitation on the land,
- the temperature-regulating system which permits life to exist on earth,
- a major source of oxygen for the atmosphere, and
- a great reservoir of animal protein.

The sea provides man with food, economic opportunity, educational and scientific resources, recreation, and inspiration. While the role of the sea as a source of food is already important, it is expected to become even more important in the future. Coastal waters are at a minimum four times more productive than the open ocean; even though the waters over the continental shelves comprise only 10 per cent of the world's ocean surface, 90 per cent of the world's fisheries are concentrated in this zone.

**California's Coast Is Especially Productive.** The California coastal marine environment is among the most productive in the world as it is enhanced by:

- a rugged sea floor with extensive structural relief that provides a variety of habitats,
- wind and currents which cause the upwelling of nutrient-rich deep waters to the surface;
- kelp beds that support an abundant variety of life;
- rocky tide pools and intertidal areas which sustain many unique species; and
- estuaries and wetlands that are among the world's most biologically productive ecosystems.

**Rugged Sea Floor Is One Physical Factor In Sustaining Biological Productivity.** Twenty-seven submarine canyons exert significant biological and geological control over the continental borderland by providing conduits for transmission of nutrient-rich deep water to the inshore environment. Underwater ridges, banks, mountains, and scattered islands also cause turbulent mixing in the water column by deflecting currents and waves, thus enhancing the fertility of the sunlit surface waters where the vitally important process of photosynthesis occurs. These topographic features also provide areas of unique habitat and serve as spawning grounds.

**Kelp Beds Also Contribute Greatly to the Coast's Biological Productivity.** Kelp beds and kelp forests are a significant marine resource as they contribute to the high biological productivity of California's marine environment. Kelp serves as a sanctuary, nursery area, habitat, and food source for so many species that kelp supports a far greater variety and total amount of life than does a temperate land forest. The great "biomass" (the amount of living matter per unit area) of kelp functions as food and shelter as well, and provides an abundance of living matter to the surrounding sea. Kelp is usually found in rocky coastal environments from the intertidal zone to depths of 80 to 100 feet of water. Kelp is a source of many products useful and valuable to people, such as the thickeners and stabilizers in foods, cosmetics, and medicines, and additives in industrial products. In San Diego, for example, the value of the kelp harvested in 1972 was estimated at more than $500,000 and the market value of products derived from the harvest at 10 times that amount. Kelp not only serves as a valuable source of natural products but also tends to dissipate wave action and thus retards processes of wave erosion along the shoreline.

**Some Human Activities Have Caused Kelp Bed Losses.** While the size of California's kelp beds varies radically over time in response to natural changes in water temperature and currents, they appear to have declined in overall distribution from about 100 to 75 square miles of area since the turn of the century. Some of this reduction is attributable to human activities that involve the following: sewage discharges that smother the sea floor with wastes, reduce water clarity needed for photosynthesis, and may contribute to a rise in the abundance of sea urchins that feed on kelp; thermal waste discharges that increase the temperature of the water beyond the tolerance of the plant; and toxic discharges of DDT and heavy metals. Overharvesting of kelp beds can also cause damage to the resource, although with a program of controlled harvesting, administered by the Fish and Game Commission, augmented by restoration efforts based upon appropriate research and observation, natural growth (at least of the giant kelp species) can sustain continued harvest in appropriate areas. Different varieties of kelp and different growing conditions in northern and

southern California, however, require careful evaluation in developing proper controls or prohibitions on harvesting. Despite kelp's unique role in the productivity of the coastal environment, no kelp interpretive center exists to inform and educate the public of the extraordinary importance of these plants. (See Policy 150 regarding the recommendation that certain kelp beds be included in a coastal reserve system.)

**Aquaculture in Coastal Waters.** Aquaculture (water agriculture) involves the cultivation and harvest of aquatic organisms. Currently it produces most of the mollusks marketed on the West Coast. In the future,aquaculture techniques may be improved and applied to other species, reducing costs and increasing availability of fish and shellfish as sources of protein. Coastal lagoons and estuaries are the predominant locations for aquaculture operations. Generally, aquaculture can coexist with any activity that does not cause pollution or deterioration of the marine environment. Some species can even thrive in heated waters in the vicinity of energy generating plants. Other species may be able to utilize nutrients from properly treated sewage discharges. The net impact may be a reduction of diversity, however. Some aquaculture operations may require the use of open waters now accessible to the public, thereby converting them to "private" waters. Additionally, aquaculture alters a natural habitat by selective cultivation of a plant or animal and so may displace other species.

**Vitality of California's Coastal Fisheries.** Living marine resources are not only important in supplying protein and other products, but they also contribute at least $600 million annually to the California economy, including income from processing, retailing, sport fishing, and fishing gear suppliers. The continued vitality of California's coastal fisheries (commercial and recreational) will require effective State, national, and international management to restore and maintain harvestable species at "optimum sustainable yield" (the catch level that can be continued indefinitely while stock is maintained or restored).

**Changes in International Fisheries Management.** There is increasing international recognition of the importance of the world seas and the need to deal with urgent ocean problems, such as overfishing of some species, affecting all living marine resources. International Law of the Sea Conferences in recent years have been working towards better management of the world oceans. The United States Senate has established the Ocean Policies Committee to aid in the transition to new national and international priorities affecting the sea's resources. Similarly, the State Assembly Subcommittee on Coastal Resources is exploring California's interests in worldwide ocean management. Emerging from the international efforts is the concept of jurisdiction over ocean resources extending 200 miles offshore from each coastal nation, rather than the present 12-mile jurisdiction. While this gives the United States authority over one-fifth of the world's fish stocks, including the valuable fisheries off California, it also requires increased international cooperation in sharing and managing these resources wisely.

**National Programs Being Developed.** The National Marine Fisheries Service of the National Oceanic and Atmospheric Administration (NOAA) is preparing the first National Plan for Marine Fisheries. As projected in that plan, the activities of Federal and state fisheries agencies will be expanded dramatically. New Federal and state laws, budget allocations, and compacts will undoubtedly follow the now established pattern of cooperation between Federal and state agencies. Individual states, or interstate organizations, will assume some direct control of new national fisheries policies within the 12-mile "territorial sea."

**California's Fisheries Management System Needs Improvement.** Present State management and regulations may be inadequate, especially as California takes on an expanded role in ocean resources management programs. Research and monitoring programs are often fragmented and incomplete. Within California's jurisdiction, the State Legislature regulates commercial fisheries, while the Department of Fish and Game is primarily concerned with sport fishing. Some fishing regulations are seen as punitive, particularly in view of the fact that California's commercial fishermen, sport fishermen, as well as fishermen from other states and nations, must all compete for available resources, yet are not all subject to the same laws. Overfishing — in the absence of regulations or by unregulated foreign or illegal fishing operations — can seriously deplete fish stocks to the detriment of commercial and sport fisheries, the general public, and the marine environment. A more comprehensive and better-funded program is needed to undertake marine resources management within the State's jurisdiction and to coordinate with other state, Federal, and international programs.

**Human Activities Affect Marine Resources.** The intimate details of the nature and diversity of living resources of the sea are not yet completely understood nor are all of the impacts of human activities upon the organisms and processes of the sea immediately apparent. It is clear, however, that marine resources are profoundly influenced by many human uses of the marine ecosystems. Pollution of water, over-exploitation of fish stocks, and destruction of essential habitat areas

all diminish the opportunity for people to benefit from the economic, recreational and other values of marine resources. Significant opportunities exist not only to protect but to restore the natural productivity of the marine environment as a renewable resource.

## Policies

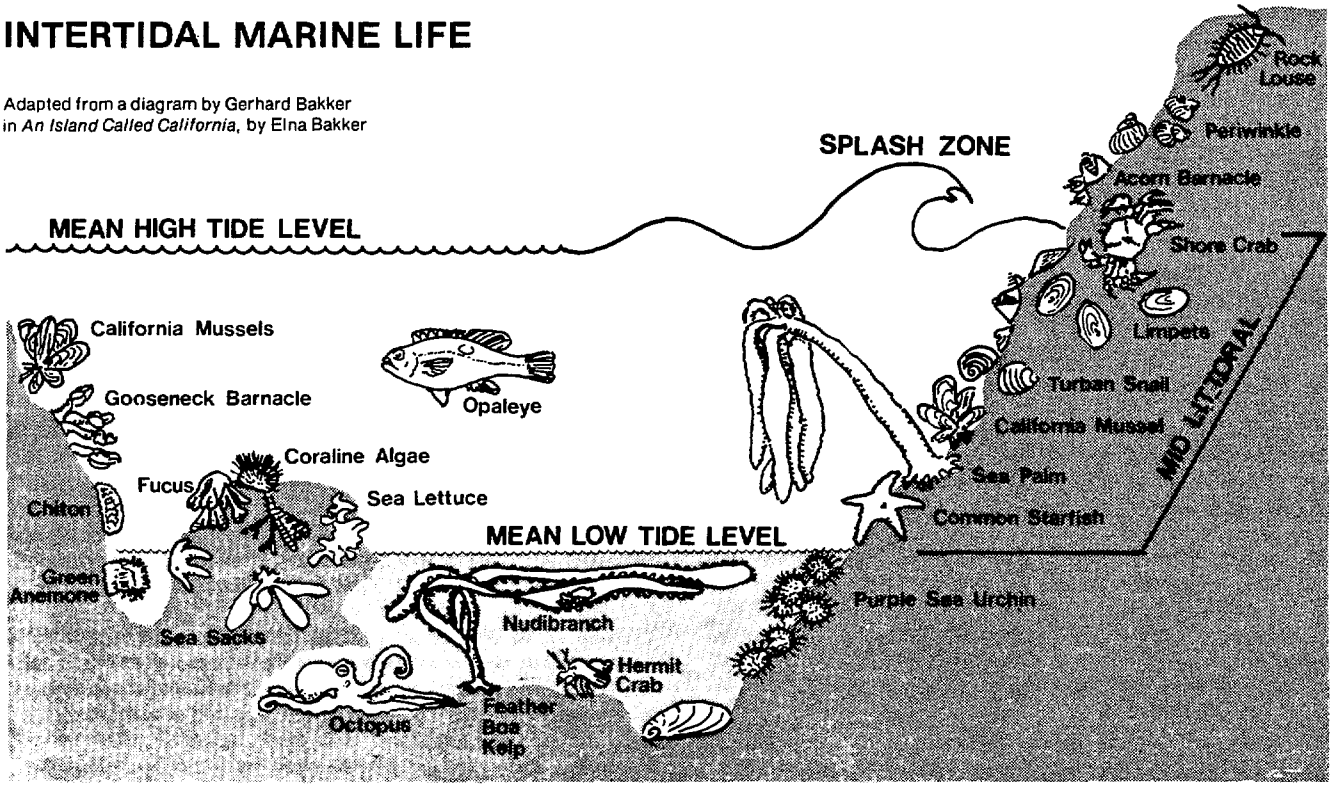
**2. Basic Policy: Protect, Enhance, and Restore Marine Resources.** Public policy at all levels of government shall seek to maintain, enhance, and, where necessary, restore marine resources. While the entire ecosystem is important, special protection shall be given to areas and species of special biologic or economic importance including those identified by the State Water Resources Control Board as Areas of Special Biological Significance, by the State Department of Fish and Game, and in the Coastal Plan. Uses of the marine environment — for commerce, food supply, waste disposal, mineral extraction, and recreation — shall be carried out in a manner that sustains the productivity of coastal waters and does not threaten the existence of native species.

**3. Maintain Healthy Populations of All Marine Organisms.** Healthy populations of all species of marine organisms shall be maintained, adequate for commercial, recreational, scientific, and educational purposes. To this end:

**a. Effective Marine Resource Management.** The State Department of Fish and Game and the Fish and Game Commission shall be adequately funded (from the General Fund as well as from hunting and fishing licenses and fines) and adequately staffed to maintain responsibility for the management of living marine resources. They shall be charged with exercising jurisdiction over both commercial and sport fisheries and kelp harvesting. The Department of Fish and Game shall coordinate its research and management programs with the comprehensive ocean water quality research and regulatory program described in Policy 6. It shall also continue to be responsible for maintaining and restoring scientific, educational, recreational, and aesthetic uses of living marine resources; developing and implementing habitat restoration and kelp propagation programs; disseminating public information; monitoring and coordinating marine research programs; and, based on determinations of population structure and dynamics and monitoring of fish

## INTERTIDAL MARINE LIFE

Adapted from a diagram by Gerhard Bakker
in *An Island Called California*, by Elna Bakker



capture rates, establishing standards to assure optimum sustainable yield (the catch level that can be continued indefinitely while stock is maintained or restored) of all harvestable species. Present kelp harvesting regulations of the Fish and Game Commission shall continue to be refined and evaluated to prevent degradation and to maintain an optimum sustainable yield of kelp resources, based on scientific research and taking into account regional variations. Programs shall be investigated and, where appropriate, implemented for: (1) a commercial fishing academy, (2) hatcheries and stocking, and (3) limited entry to fisheries resources (e.g., limiting the number of fishermen, boats, or gear that may be used to harvest a resource, similar to the present regulation of kelp harvesting), particularly in the abalone and lobster fishery. The entry of private enterprise into hatchery and stocking activities shall be encouraged. Performance objectives for each of these responsibilities shall be agreed upon with the Department of Fish and Game, and progress in meeting the objectives shall be reviewed annually or biannually by the coastal agency and reported to the Governor and the Legislature. (Although this marine resource management program may be accomplished through a redirection of existing priorities and funding, it is recognized that additional programs and funding may be required. Further study will be needed to determine precise costs, legislative authorization, and program changes to carry out this policy. See Part III section on financing the Coastal Plan.)

b. **Cooperation with Other States and Nations.** California shall continue to seek effective fisheries management with adjacent states and shall support national and international fisheries control adequate to protect worldwide marine resources.

**4. Criteria for Aquaculture.** New or expanded aquaculture operations in coastal waters shall be encouraged under permit safeguards administered by the Department of Fish and Game (including use of adequate controls to prevent the accidental escape of non-native species) especially where they would preserve, restore, and enhance marine areas for public use and would not displace productive natural habitats. Where infringement on public use or natural habitat would occur, potential food production shall be weighed against the loss to the public of the fishery and the changed value of the natural habitat.

Eureka harbor

**5. Upgrade Commercial Fishing Facilities.** Facilities serving the commercial fishing industry shall be protected and upgraded. Adequate berthing space and shoreline support (e.g., boatworks and space for fish buyers and equipment suppliers) shall be provided for commercial fishing boats and commercial party boats.

a. **Reserve Adequate Space for Commercial Fishing Facilities.** Existing commercial fishing harbor space shall not be eliminated or reduced unless the demand for commercial fishing facilities no longer exists or adequate substitute space has been provided. New or major expansions of recreational boating facilities that might use up remaining harbor areas suitable for commercial fishing facility development shall be permitted only if facilities serving commercial fishing in the area are adequate or if construction of needed additional facilities is assured.

b. **Allow for Needed Commercial Fishing Facilities.** New or expanded commercial fishing facilities requiring dredging or filling of coastal waters shall be allowed where (1) there is a need for the new facilities or expansion that cannot be met by more efficient use of existing facilities within the harbor or by facilities in nearby harbors, and (2) the need cannot reasonably be met by placing the facilities in open water areas. Conversion of such expanded commercial fishing facilities to recreational boating use shall not be justified on the basis of greater economic return from recreational boating.

c. **Provide Public Access.** The public shall be afforded access to commercial fishing harbors consistent with security and safety.

# COASTAL WATER QUALITY

## Findings

**Water Quality Management Involves Many Jurisdictions.** Current water quality management programs are based on the primary requirements in the 1972 Federal Water Pollution Control Act and its amendments. In California, the State Water Resources Control Board and the Regional Water Quality Control Boards are the primary agencies for water quality management. They administer the discharge permit requirements mandated by State and Federal regulations and prepare required basinwide and specific area wastewater discharge plans and programs. They also administer Federal grants for upgrading of treatment facilities and designate Areas of Special Biological Significance. The State Board's Ocean Waters Plan sets waste discharge quality requirements to protect beneficial uses of ocean water, including maintenance of marine life; its Thermal Plan places restrictive requirements on existing and new thermal discharges, though there has been some question as to their appropriateness and the need for individual resolution in applying the requirements; and the Bays and Estuaries Policy severely limits the discharge of municipal waste waters and industrial process waters to enclosed water bodies. A variety of local, subregional, and regional authorities are involved in collection and treatment of waste waters. Local health departments authorize septic tanks in areas without sewer systems. Thus, current water quality management programs are divided among Federal, State, regional, and local jurisdictions.

**Some Water Quality Program Changes Underway.** A number of additional important water quality programs are currently being developed. The U.S. Environmental Protection Agency (EPA) is applying effluent limitations for various types of domestic and industrial sources of waste water. Regulations for electric power generating plants (important for both thermal and other effluent components) were proposed in March 1974. A number of Regional Water Quality Control Boards are currently developing erosion control policies under the requirement that general sources of pollution, such as construction practices, be controlled.

**Coastal Plan Can Set Stricter Standards.** The Federal Coastal Zone Management Act requires that the Federal requirements and those of State and local governments pursuant to the Federal Act may not be weakened in any way by the coastal management program, although the Coastal Plan may impose stricter wastewater quality criteria.

## Policy

**6. Expand Ocean Water Quality Research and Regulatory Program.** A comprehensive ocean water quality research and regulatory program based on that presently carried out by the State Water Resources Control Board shall be expanded and implemented cooperatively by the State Water Resources Control Board, the State Department of Fish and Game, and other appropriate State and local agencies. The protection of areas of special biologic importance (see Policy 2) shall be the first priority. The program shall include empirical studies of the present condition of marine living resources (baseline studies), assessment of damage from various activities, and evaluation and appropriate control of all potentially hazardous discharges and development affecting the marine environment, as further described in Policies 7-14. (Although this program may be accomplished in part through a redirection of existing priorities and funding, it is recognized that additional programs and funding may be required. Further study to determine precise costs, legislative authorization, and program changes is needed to carry out these policies. (See Part III section on financing the Coastal Plan.) This program shall be closely coordinated with the living marine resources management program described in Policy 3. Program results shall be reviewed annually by the coastal agency, evaluated, and reported to the Governor and the Legislature.

# WASTE DISCHARGES

## Findings

**Waste Discharges Impair Essential Water Quality.** Currently at least 130 waste disposal outfalls annually discharge 444 billion gallons (1.36 million acre-feet) of domestic and industrial sewage that has received varying degrees of treatment into California's wetlands, estuaries, and coastal waters. Such discharges seriously impair water quality that is essential to the health of marine as well as human life.

**Enclosed Water Bodies Are Especially Vulnerable to Damage.** Enclosed bodies of water such as bays, estuaries, and lagoons, with their limited water circulation and abundant plant and animal species, are more susceptible to damage

from water pollution than is the open ocean. Most wastes discharged into the water consume oxygen as they decompose. Many wastes are natural products that the sea can decompose and reintroduce into the life cycle, but with large amounts of organic material or with discharges into enclosed or semi-enclosed areas with poor water circulation, wastes can cause fish kills, algal blooms, stagnation, foul odors, and smothering of benthic (bottom-dwelling) organisms.

**Mid-1977 Deadline for Secondary Treatment of All Sewage.** Following primary treatment of raw sewage, wastes still contain 60 to 70 per cent of the original organic material when they are discharged. Federal law now requires that, by July 1977, all sewage receive secondary treatment, or its equivalent, which will remove 80 to 90 per cent of the oxygen-demanding organic wastes. Secondary treatment may also reduce the concentrations of micro-organisms, chemicals, heavy metals, particulates, and silt loads in discharged waste waters.

**Many Present Discharges Are Inadequately Treated.** At present many of the sewage discharges into coastal waters are inadequately treated. Only 15 per cent of all municipal waste waters discharged off the coast of Los Angeles and Orange Counties in 1973 received secondary treatment, for example. This results in an intense concentration of pollutants in the area between Newport Bay and El Segundo. Santa Cruz's Eastcliff sewage plant and Pacific Grove's plant both discharge effluent with only primary treatment into Monterey Bay, although these plants are scheduled to tie into improved sanitation systems in the next few years. There are many other areas suffering adverse effects from the discharge of inadequately treated waste water.

## Policies

**7. Basic Policy: Maintain, Manage, and Restore Ocean Water Quality.** The natural quality of ocean water appropriate to the maintenance of optimum populations of marine organisms and for the protection of human health shall be maintained, managed, and where necessary, restored. Using either the U.S. Environmental Protection Agency or State Water Resources Control Board (SWRCB) standards, whichever is more stringent, as a minimum, all agencies shall take appropriate action to assure that this goal is met. The State Water Resources Control Board, which is the agency authorized to set waste discharge standards, shall set those standards appropriate to assure that the objectives of this policy are met; the coastal agency shall approve, modify, or disapprove development proposals and plans within its area of jurisdiction to assure that the objectives of this policy will not be frustrated by inappropriate development. SWRCB and the coastal agency shall periodically report to the Governor and the Legislature progress toward achieving the objectives of this policy.

a. **Upgrade Existing Municipal and Industrial Discharges.** All municipal and industrial waste discharges shall be upgraded to meet the goals and standards of the Federal Water Pollution Control Act as amended, and to comply with Section 13379 of the California Water Code, which requires compliance with these amendments. The ultimate goal shall be the removal of all pollutants from waste discharges. Highest priorities in the coastal area shall be given to improving or eliminating discharges that adversely affect (1) wetlands, estuaries, other biologically sensitive sites, (2) areas important for water contact sports, (3) areas that produce shellfish for human consumption, and (4) ocean areas subject to massive waste discharge (e.g., between Newport Bay and El Segundo). Outfall sites and equipment shall also be improved to provide substantial diffusion of discharged waste waters as provided by the present water quality standards.

Ford Ord sewage outfall

b. **Phase Out Discharges to Enclosed Bays and Estuaries.** Existing discharges of municipal waste waters and industrial process waters to streams, wetlands, enclosed bays, and estuaries shall be phased out as soon as possible (as provided by the State Water Resources Control Board's Water Quality Control Policy for Enclosed Bays and Estuaries of California),

and new discharges shall be prohibited unless the waste water is (1) necessary to maintain water flow or water level in the receiving waters and (2) consistently treated to enhance the quality of receiving waters while maintaining the natural balance of the ecosystem.

c. **Require Adequate Treatment for New or Enlarged Discharges to Other Coastal Waters.** New or enlarged sewage systems and treatment plants discharging to other coastal waters shall meet present Federal requirements, and all wastes shall be treated sufficiently to maintain the natural quality of ocean waters and thereby to sustain optimum healthy populations of marine organisms (e.g., fisheries, kelp beds) and maintain human health and suitability, where appropriate, for water contact sports. The effects of discharges shall be determined on the basis of specific studies of each proposed outfall location, considering ocean chemistry and mixing processes, marine life conditions, other present or proposed outfalls in the vicinity, and relevant aspects of areawide waste treatment management plans and programs, but not considering, for purposes of this policy, convenience to the discharger.

d. **Control Discharges from Non-Sewered Developments.** New or expanded coastal developments that are not connected to sewer and sewage treatment systems shall be required to meet strict waste discharge requirements to prevent adverse impacts, including long-term and cumulative impacts, on marine waters.

e. **Restrict Expansion of Substandard Sewage Systems.** Expansion of sewer service in areas with substandard treatment and disposal facilities shall not be permitted until adequate facilities are in operation.

f. **Require Source Control.** Toxic and hard-to-treat substances shall be pretreated at the source if such substances would be incompatible with effective and economical treatment in municipal treatment plants (e.g., as presently required as a regulation of the State Water Resources Control Board's grant program for municipal facilities).

**8. Stress Reclamation of Waste Water.** Reclamation and reuse of adequately treated waste water (for agricultural, industrial, recreational, fish and wildlife, marsh enhancement, or domestic use) shall be fully considered as a preferred alternative to discharges into coastal waters and as a desirable component of all water and waste water management programs. High priority for funding shall be given to projects necessary to offset the continued depletion of coastal area water supplies (both surface and groundwater) and to decrease the need for water importation programs. (See also Policy 23 regarding water reclamation as part of water supply planning.)

**9. Strictly Regulate Wastes from Vessels.** Discharges of sewage, waste waters, and other materials from vessels and related facilities shall be regulated to prevent adverse environmental impact upon enclosed bodies of water (e.g., by using sewage system hookups for large ships at berthing docks and holding tanks and pumpout facilities for small craft). This policy may require further State and Federal action for full implementation. Similarly, discharges from vessels into open waters shall be regulated to prevent adverse impacts. Environmental Protection Agency standards and Coast Guard certification procedures shall be rigorously enforced.

# HEATED AND COOLED DISCHARGES

## Findings

**Power Plants Use and Discharge Huge Volumes of Water.** Over three trillion gallons (9.2 million acre-feet) of seawater are now used every year to cool power plants on the coast and are then discharged at warmer temperatures into marine waters. Based on industry data, the amount of coolant water circulated through the Southern California Edison plants within the South Coast region alone would cover a 12-square-mile area, one foot deep, daily. Additional uses of seawater, especially for major heating and cooling systems in energy facilities, are proposed.

**Industrial Uses of Seawater Have Adverse Effects.** Coastal waters used for heating or cooling purposes, industrial processes, or mineral extraction can adversely affect the marine environment. Water is discharged at temperatures higher than ambient conditions. For example, thermal discharges from power plants between El Segundo and Huntingon Beach

increase the surface ambient water temperature at any given time by 4° F. or greater over a combined area of almost two square miles. New currents or turbidity are created near intake and outflow points. Marine life is subjected to entrainment in the system. Chemicals used in such systems can kill many plants and animals.

**Many Potential Effects of Heated Discharges.** Research to date has been inconclusive in determining the exact beneficial and detrimental impacts of heated water discharges, but potential effects can include the following:

- Some species that cannot tolerate the warmer water will leave or die off. (Kelp is among heat-sensitive organisms, with adverse effects generally at temperatures exceeding 66° F.)
- Other native species and aquaculture operations may be enhanced by warmer temperatures.
- Reproduction and migration patterns of some species may be disrupted.
- In restricted water bodies, the amount of oxygen dissolved in the water may decrease, while the amount required for life processes will increase.

**Little is Known About Effects of Cooled Water Discharges.** In the process planned for use at proposed liquefied natural gas (LNG) facilities on the California coast, large amounts of seawater would be used to heat the supercooled LNG, transforming it to a gas through heat exchangers in the vaporization facility. In the process, the seawater is cooled; it is returned to coastal waters at temperatures as much as 12° F. below ambient temperatures. Although it is known that

reductions in water temperature can be fatal to marine life, little specific data has been developed on the effects of continuous cold water discharges on marine ecosystems. There is reason to suspect that unnatural reductions in temperature have a particularly severe effect on embryonic and fetal development. Because the problem has not yet presented itself in California, the State Water Resources Control Board has not developed standards for cold water discharges comparable to those for heated discharges. Under existing rules and procedures, the Regional Water Quality Control Boards would regulate such discharges on a case-by-case basis to prevent adverse effects on beneficial uses of the receiving waters.

**Entrainment Kills Marine Organisms.** Many marine organisms, including phytoplankton, zooplankton, fish larvae, and small fish, are entrained as water is drawn from the sea for use in industrial or power plants. Many of these entrained organisms are killed due to pressure and temperature changes, impingement, physical abrasion, and chemicals. This problem remains to be resolved at any site circulating seawater for heating or cooling purposes.

**Chemicals Cause Additional Adverse Effects.** Periodic "hot cycle" or chemical treatments with biocides for flushing the cooling or heating systems can cause additional damage to marine organisms in the immediate vicinity of the outfall.

## Policy

**10. Avoid Adverse Effects of Thermal Discharge and Entrainment.** The adverse environmental effects of the intake of seawater and of discharges of heated or cooled seawater shall be reduced consistent with those Coastal Plan policies calling for restoration or enhancement of coastal waters, using the U.S. Environmental Protection Agency standards in effect July 1, 1975, or State Water Resources Control Board standards, whichever is more stringent, as a minimum. All State agencies shall take appropriate action to assure that these goals are met.

a. **Criteria for Permitting Thermal Discharges.** New warmed or cooled water discharges shall be permitted where (1) rapid return of discharged water to normal ambient temperature can be assured; (2) the discharge enhances, is important in restoring, or otherwise maintains the optimum population abundance and diversity of marine life, and (3) the best available mitigation measures have been incorporated as necessary to minimize adverse effects on marine life. Cooled water discharges shall be permitted only where there is no other feasible use of the cooled effluent in commercial or industrial operations.

b. **Prohibit All Harmful Discharges into Areas of Special Biologic Importance.** New warmed or cooled water discharges into areas of special biologic importance, such as Areas of Special Biological Significance as identified by the State Water Resources Control Board, coastal wetlands, marine reserves, wildlife refuges, education and research reserves, or in the vicinity of kelp beds, shall be permitted only if the discharge will enhance the quality of the receiving waters and will not alter the natural balance of the ecosystem.

c. **Study Marine System at Future Sites of Seawater-Using Plants.** To assure adequate measures to protect the marine environment, "baseline" studies of the existing marine system shall be conducted in the area that could be affected by a seawater-using industrial or power plant for a statistically valid period of time (usually not less than two years). The study shall be made in advance of the anticipated start of construction at the expense of the plant developer, and shall be made by independent marine experts.

d. **Prefer Closed or Evaporative Cooling Systems.** As a general rule, until more is known about the effects and methods for mitigating impacts of once-through cooling systems, closed or evaporative systems shall be preferred. The decision for each site shall be based on a consideration of the overall environmental advantages and disadvantages of each system.

e. **LNG Plants Shall Seek to Use Already Heated Water.** Where feasible, LNG vaporization plants shall be required to use heated effluents from nearby power plant or other industrial operations, rather than seawater at ambient temperatures, for a heat source.

f. **Minimize Entrainment.** For each coastal power plant or other installation using seawater for cooling or industrial processing, the best available site, design, and technology shall be used to minimize the intake and mortality of all forms of marine life. Design shall include such features as offshore intake points, velocity caps, and fish return systems.

g. **Research Effects of Thermal Discharges.** A State agency shall be adequately empowered and funded to direct and coordinate research on the environmental effects of thermal (heated or cooled) discharges, antifoulant biocides, and entrainment of organisms.

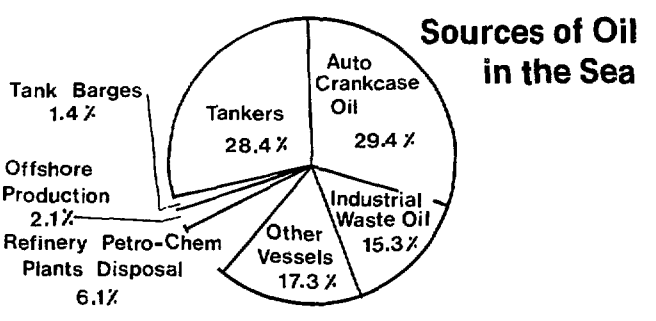
h. **Monitor Discharges, Require Mitigation Measures.** Existing and new thermal discharges shall be periodically monitored (by independent investigators or a State agency). It is recommended that the Legislature authorize a State agency to require appropriate mitigation measures or alternative heating or cooling systems where significant adverse impacts are discovered.

# OIL AND TOXIC SPILLS

## Findings

**Several Sources of Oil in the Sea.** Oil enters the sea from several sources, including deballasting of tankers, bilge pumping, ship accidents, vessel operations and ship yards, sewage effluents, oil well accidents, fallout from air pollution, and natural seepage.

**Oil Spills Have Differing Reported Impacts on Marine Environment.** There are conflicting opinions on the environmental effects of oil spills, but in general oil spills are more hazardous to the marine environment in nearshore areas than in deep water because the productivity of shoreline, estuarine, and bay and harbor areas is affected immediately. The damaging effects tend to be more severe from refined products than from crude oil. Although some animal species (possibly including some rare or endangered species) are highly vulnerable to petroleum and could be wiped out by a major oil spill, many species with adjacent reproductive stocks seem to reassert themselves following the initial die-off after a spill.




**Long-Term Effects of Spills Not Completely Known.** Oil is absorbed by many bottom sediments and re-emitted for many months or years after a spill. Sub-lethal effects of oil pollution may endanger the long-term survival of a species or the entire ecosystem; however there have been few research projects on these effects and conclusions so far have been equivocal.

**Further Studies of Effects, Complicated by Natural Seeps, Are Under Way.** Additional research on the sources and effects of oil in the ocean is being conducted by various groups in California. Studies on the effect of spills along the coast are complicated by the presence of natural oil

and gas seeps that regularly emit petroleum, with unknown effects on the marine environment. The Division of Oil and Gas has documented over 50 seeps and seep areas between Point Conception and Huntington Beach, and many more seeps probably exist; although oil and gas seeps have occurred near the sea in Marin and Humboldt Counties, there are no specifically located offshore seeps north of Point Conception.

**Coastal Communities and Activities Are Impacted by Spills.** Oil spills are aesthetically displeasing; they cover beaches, create odors, can impart an unpleasant flavor to fish, and may have significant economic and psychological impact on human communities within the coastal zone. Recreation, commercial fishing, and water-related activities suffer the most severe direct damage, but can recover in the absence of further spills. Of all the existing or proposed Federal offshore production areas — on the Gulf of Mexico, Atlantic, and Alaskan continental shelves — only California's producing area is located close to a large human population (10 million plus) that is directly affected by the environmental, aesthetic, psychological and economic effects of offshore production.

**Amount of Damage Depends on Several Factors.** The amount of damage from an oil spill varies in degree and duration depending on the quantity and type of oil, the degree to which it has been refined, wind and wave conditions, and the location of the spill, with the most serious damage normally taking place in nearshore waters and enclosed bays and estuaries. Some cleanup procedures taken to counteract the effects of an oil spill may be more destructive than the spill itself, such as the use of detergents or techniques that coagulate and sink oil to the ocean floor.

**Existing Oil Liability Measures Are Inadequate.** Although California has suffered several oil spills off its coast, primarily from tanker mishaps and deballasting of fouled water, and from an offshore oil platform blowout, existing liability programs are largely inadequate.

- **State.** The State of California itself has no funding to pay the costs of oil spill damages but instead relies on the State Attorney General to file suit against the appropriate contingency or compensation funds or against other parties for cleanup costs and damages incurred by the State. Other individuals damaged by oil spills must seek their own relief.
- **Federal.** The Federal Water Pollution Control Act makes a tanker owner or operator liable for cleanup costs up to $14 million, and a terminal operator liable for up to $48 million. Liability is unlimited if there is willful negligence or misconduct; but there is no liability if the discharge was caused solely by an act of God, act of war, negligence by the U.S. Government, or the act or omission of a third party. There is also a National Contingency Fund of $35 million, provided by the U.S. Treasury, for use of the Coast Guard or EPA in cleaning up spills, or for reimbursement to states of their costs incurred in cleanup. These laws apply to cleanup liability, but do not provide for compensation of damages. The Deepwater Port Licensing Act, passed in late 1974 to govern deepwater port development in Federal waters, creates a deepwater port liability fund of $100 million by a tax levy of two cents per barrel on oil that is loaded or unloaded at the terminal. The bill makes owners and operators of vessels liable, without regard to fault, for discharges and damages up to $20 million, and makes deepwater port licensees liable, without regard to fault, for up to $50 million. Costs and damages not actually paid by the vessel owner/operator or port licensee would be compensated by the liability fund. Draft Senate legislation relating to Outer Continental Shelf (OCS) development proposes a similar scheme to cover spills caused by drilling and production activities offshore. The Council on Environmental Quality and President Ford have proposed creation of a single national liability fund to cover spill cleanup costs and damages from all sources in State or Federal waters.
- **International.** Two international industry voluntary compensation funds, TOVALOP and CRISTAL, provide oil pollution liability coverage for participating companies of $10 million and $30 million, respectively, for cleanup and third-party damages. In addition, two international conventions that would establish civil liability, with limits, and an international compensation fund have been proposed and are being circulated for ratification; they would become effective only if ratified by the U.S. Senate and by a sufficient number of other nations.

**Existing Liability Programs Are Inadequate.** Except for the liability provisions of the Deepwater Port Licensing Bill, the existing liability programs are inadequate for a variety of reasons: some provide only for cleanup costs, and not for damages; all provide dollar amounts that may be inadequate in the event of a major spill; all leave a very heavy burden upon states and individuals to litigate for compensation of damages; all leave the question of liability to the law of ordinary negligence, rather than to strict liability. The proposed alternative programs would variously remedy these deficiencies. Enforceability of liability laws may be greatly facilitated by development of techniques for tracing spills to their sources.

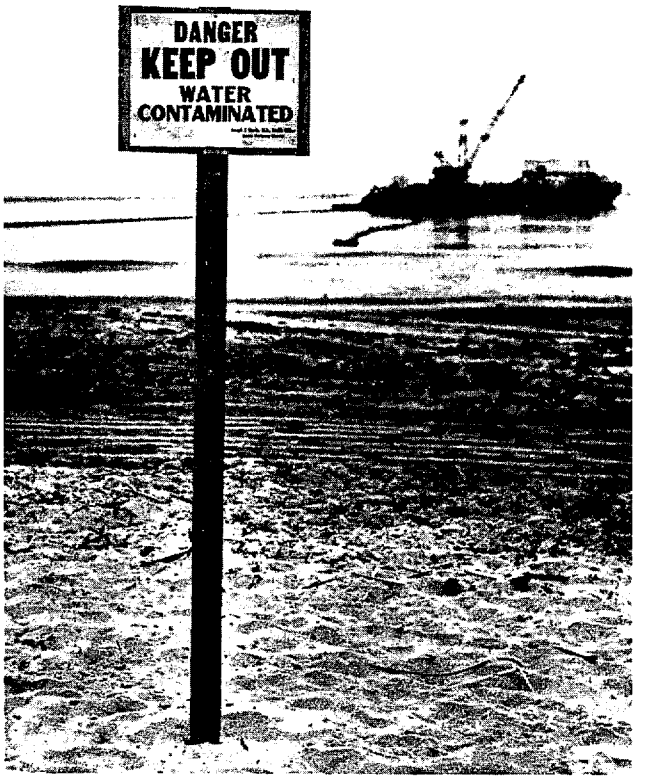
**Several Toxic Substances Harm Marine Life.** Chlorinated hydrocarbons (such as DDT) and polychlorinated biphenyls (PCB) as well as heavy metals (such as mercury, lead, silver, cadmium, copper, chromium, and zinc) find their way into the marine environment from a variety of sources, including domestic and industrial effluents, rainwater runoff (containing pesticides and other substances from urban and agricultural areas), ship repair yards where anti-fouling paints are removed, and air pollution fallout. Some of these substances accumulate in sediments, complicating dredge removal and disposal. Most of these substances, in excess quantities, have been shown to have some adverse effects on marine organisms, and there is evidence that some, such as DDT and PCB, may also ultimately effect humans because they may build up in concentration as they move up the food chain. The most effective, economical, and equitable means to control such substances is to contain or treat them at the source.

## Policies

**11. Prevent Release of Oil and Toxic Substances by Strict Regulation.** The release in unnatural amounts of fuel and oil, many chemicals, heavy metals, and other toxic substances into the marine environment shall be strictly regulated to minimize adverse environmental effects. Specifically:

a. **Site, Design, and Operate Petroleum Facilities to Prevent Adverse Impacts.** Petroleum facilities (e.g., drilling or production platforms or vessels, tanker terminals, refineries, oil separation, treatment or storage facilities, and pipelines) shall be permitted where (1) accidental spills will not have a significant adverse impact on environmentally sensitive or highly scenic areas, as identified in the Coastal Plan or by State Water Resources Control Board, the Regional Water Quality Control Boards, Department of Fish and Game, Department of Parks and Recreation, the State Lands Commission, or other appropriate public agencies; (2) the best available technology and mitigation measures have been incorporated to prevent oil leaks and spills; (3) adequate plans, personnel, and equipment exist from the project's inception to guarantee prompt reporting, abatement, containment, and cleanup of any discharge from such a facility or related operations; (4) the facility is consistent with Coastal Plan energy policies; and (5) there is no alternative location that would result in less environmental damage.

b. **Research and Regulation Enforcement.** The State Water Resources Control Board, the State Lands Commission, or other appropriate State agencies shall be adequately empowered and funded (1) to direct and coordinate research on the effects of oil, heavy metals, and other contaminants on the marine environment, on new techniques for spill prevention, containment, and cleanup, and on methods of tagging or "fingerprinting" oil to determine spill sources in conjunction with Federal programs; (2) to develop and enforce design, construction, operation, maintenance and inspection requirements for facilities and vessels, and training standards for personnel handling oil and other pollutants (e.g., subsea drilling and production, fueling, and deballasting equipment and practices); (3) to work with private industry and all concerned local, State, and Federal agencies in providing prompt and adequate discharge reporting procedures, response capability, and abatement, containment, and clean-up programs under coordinated supervision; and (4) to develop and enforce regulations restricting the use, sale, and manufacture of highly toxic substances (such as certain boat anti-fouling paints) and minimizing routine or accidental releases of other harmful substances. It is recommended that the Legislature consider funding these research and enforcement programs out of the fund proposed in Policy 12 below.



Santa Barbara after February 1969 oil spill

c. **Make Polluters Liable for Damage.** Polluters shall be liable to fines and for all damages from oil (see following two policies) or other toxic spills resulting from their operations, whether negligent or not. Bonds (or other adequate assurance of financial responsibility) shall be required for potentially hazardous operations.

**12. Enact State Oil Spill Liability Measures.** Because there is as yet no Federal legislation adequate to guarantee the immediate availability of funds for cleanup operations and prompt compensation of damages resulting from oil discharges, and because the State should seek to ensure maximum effectiveness of oil spill contingency plans and maximum care and use of highest state-of-the-art technology in all petroleum operations, it is recommended that the Legislature enact the following measures:

a. **Establish California Oil Spill Liability Fund.** An oil spill liability fund, to be administered by the Secretary of the California Resources Agency, shall be established to provide for all abatement, containment, and cleanup costs and to compensate all damages caused by oil discharges in any California or Federal navigable water or reaching the shoreline thereof, result-

ing from any drilling, production, processing, or transport associated with development of the offshore or onshore petroleum resource or with operation of any tanker or tanker terminal, without regard to the cause of the discharge, except that the fund shall not be liable for any discharge caused solely by an act of war. Administrative and arbitration procedures shall be established to allow claimants showing proof of damages within a specified time period to be compensated promptly without protracted and expensive litigation. The fund shall recover any money spent for abatement, containment, and cleanup operations or for compensated damages, from offshore and onshore owners and operators, tanker and tanker terminal owner and operators, or other parties, as described below in paragraph (d) of this policy. A part of the fund shall go annually toward further development of oil spill containment and cleanup technology, research and surveillance programs for identifying the sources of oil spills, and operating expenses of State and Federal oil spill disaster contingency plans (see Policy 11[b], above). The liability fund shall be created and maintained by levy of a two-cent fee on each barrel of petroleum produced from a well on State lands, on each barrel of petroleum produced from a well on Federal lands that enters California for treatment, processing, or delivery, and on each barrel of foreign-produced petroleum loaded or unloaded at California tanker terminals. The liability fund shall have a standing limit of $100 million. Fees shall be levied only at times when the fund contains less than that amount, or when claims against the fund exceed $100 million.

b. **Liability for Spill Costs.** Except when an offshore lessee or operator, or the owner or operator of any tanker, tanker terminal, or equipment or facility used in the production, processing, or transportation of oil can prove that an oil discharge from its operations was caused solely by an act of God, an act of war, negligence by the U.S. Government, or the act or omission of a third party, the lessee, owner or operator shall be liable to the liability fund for all costs and damages resulting from such discharge and paid by the fund. Such liability shall not exceed $20 million for individual owners and operators of offshore equipment, tankers, or other equipment or facilities used in the production, processing or transportation of oil, and $100 million for individual terminal owners and operators, unless it can be shown that such discharge resulted from the gross negligence or willful misconduct of the owner or operator, in which case liability shall be for the full amount of all cleanup costs and damages.

c. **Drillers Shall Post Bonds.** Prior to leasing, each applicant for permission to drill on State tide and submerged lands shall be required to show the State Lands Commission evidence of secured financial responsibility in the amount of $20 million for each individual lease.

d. **Register Drillers and Tanker Owners and Operators.** All drilling applicants and all owners and operators of tankers operating in California waters shall register with the California Secretary of State for service of process.

**13. Create Single National Oil Spill Liability Fund.** The California Legislature and the California Congressional delegation are urged to support Federal legislation creating a single national oil spill liability fund, covering oil discharges from all sources related to production, processing, or transportation of oil, incorporating the measures proposed in Policy 12. In the event such Federal legislation is enacted, any unilateral California legislation on this subject shall be repealed.

# RUNOFF

## Findings

**Runoff Can Degrade Coastal Water Quality.** Abnormal silt loads (in runoff waters from construction, grading, removal of vegetation, and other upland developments and activities) can damage marine resources, especially in estuarine areas, because of sedimentation and increased turbidity. In addition to silt and toxic substances, surface runoff can carry excessive organic matter (e.g., from failing septic tanks, logging debris, and agricultural operations) that further degrades marine waters. Siltation can also necessitate costly and environmentally damaging silt removal projects.

## Policy

**14. Control Runoff That Degrades Coastal Waters.** Runoff shall not be permitted to degrade coastal waters, especially wetlands, estuaries, nearshore reefs, tidepools, kelp beds, and other sensitive areas. To this end:

a. **Control Adverse Water Quality or Quantity Impacts of Runoff from Developments.** Developments that could directly or cumulatively aggravate runoff problems or create a significant adverse impact on coastal waters (because of such factors as induced erosion, harmful runoff materials, failing septic tanks, and animal wastes) shall be permitted only if adequate measures are taken to prevent degradation of water quality or unnatural changes in the rate of waterflow into coastal waters.

b. **Treat Polluted and Contaminated Runoff at Source.** Runoff that contains substantial amounts of pollutants and contaminants (including certain urban, industrial, agricultural, and boat and shipyard runoff) shall be treated or contained at the source, in accordance with areawide waste treatment management programs required to be developed by Section 208 of the 1972 amendments to the Federal Water Pollution Control Act. First priority for such programs shall be given to areas where the impact of pollutants and contaminants on the receiving waters is greatest. Storm water runoff shall be monitored periodically for the presence of pollutants; harmful pollutant loads found shall be traced and controlled.

c. **Adopt Ordinances to Control Runoff, Erosion, and Silt.** A runoff, erosion, and silt-control model ordinance shall be developed by the coastal agency, the State Water Resources Control Board, the Division of Forestry, and other involved agencies, and shall be adopted and enforced throughout coastal watersheds by all appropriate regulatory agencies. (See also Policies 21-23 on watershed management.)

# COASTAL WATERS, ESTUARIES, WETLANDS

## Findings

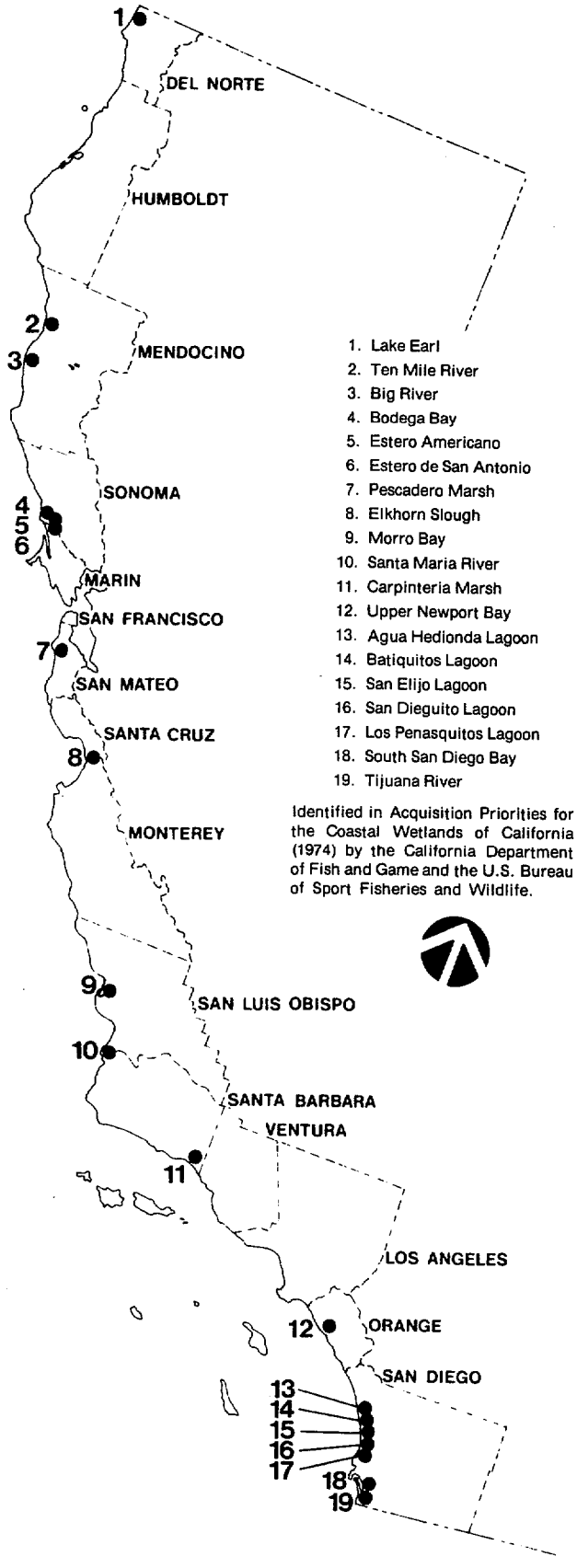
**Coastal Waters Are Highly Productive.** Nearshore coastal waters (and especially estuaries and wetlands) are extremely productive. Coastal estuaries are mouths of rivers, lagoons, and enclosed bays (all areas that are connected permanently, periodically or occasionally to the sea and within which seawater is occasionally or periodically diluted with freshwater runoff from the land). Coastal wetlands, made up of tidal marshes and mudflats and related freshwater marshes, are a vital part of the productive coastal water system. Coastal waters are generally rich in nutrients carried from the land by the rivers and streams that also bring fresh water to these areas. And the generally shallow depths of estuaries and wetlands often allow sunlight to penetrate to the bottom, permitting plant growth to take place. The open water areas are also an important component of the total coastal marine environment, although they may not be as productive or fragile as shallow estuaries and wetlands.

**Estuaries and Wetlands Are a Vital Link Between the Land and the Sea.** Salt marshes are one of the most productive living systems known, ranking in productivity with intensively cultivated rich tropical agriculture. Salt marsh plants transfer phosphorus compounds from the mud into the water, increasing the amount of this nutrient available to the microscopic plants (phytoplankton) that are a basic element in the marine food chain. Tidal mudflats support the growth of blue-green algae that fix atmospheric nitrogen so that it can be assimilated by other plants. The estuarine system is much more extensive than the areas subject to tidal influence. The area between the upper edge of the tidal zone and the surrounding upland vegetation communities and freshwater marshes can be critical in maintaining the environmental balance in estuaries and in providing habitat for shorebirds. In addition, the amount, timing, and quality of fresh water entering an estuary is essential to the existence of plant and wildlife habitats.

**Many Fish, Bird, and Animal Habitats Are Found in Sheltered Coastal Waters.** Many fish, water-fowl, shorebirds, wading birds, and other animal species use the productive coastal estuaries and wetlands either directly for spawning, nesting, resting, or feeding or indirectly as a provider of essential food through the food chain. Many rare or endangered species are entirely dependent on habitats found in California coastal waters. Because of the abundant wildlife present, estuaries and wetlands are valuable educational, research, and scenic resources.

**Certain Wetlands Have Been Identified as Most Productive.** The California Department of Fish and Game and the U.S. Bureau of Sport Fisheries and Wildlife, in their joint report of April 1974, entitled Acquisition Priorities for the Coastal Wetlands of California, have identified 25 high priority wetland areas for acquisition, based primarily on their fish and wildlife values and threats to their continued existence as a

## Most Productive Coastal Wetlands




Identified in Acquisition Priorities for the Coastal Wetlands of California (1974) by the California Department of Fish and Game and the U.S. Bureau of Sport Fisheries and Wildlife.

natural resource. Nineteen of these are in the coastal zone. Of the 19, nine have been given top priority and have been studied and mapped in more detail: Elkhorn Slough, Morro Bay, Carpinteria Marsh, Upper Newport Bay, Batiquitos Lagoon, San Elijo Lagoon, Los Penasquitos Lagoon, South San Diego Bay, and Tijuana River. Study continues on the other 10 priority coastal zone wetlands: Lake Earl, Ten Mile River, Big River, Bodega Bay, Estero Americano, Estero de San Antonio, Pescadero Marsh, Santa Maria River, Agua Hedionda Lagoon, and San Dieguito Lagoon.

**Estuaries and Wetlands Are Very Vulnerable to Abuse.** Coastal estuaries and wetlands are particularly vulnerable to being used by man in ways that provide economic benefits but nevertheless destroy their natural values. Coastal estuaries and wetlands have been dredged for ports and marinas, subjected to sedimentation from upland erosion, filled to provide new land for development, used as sumps for domestic sewage and industrial waste, and deprived of freshwater inflow by water diversions. Of the original 197,000 acres of marshes, mudflats, bays, lagoons, sloughs, and estuaries in California (excluding San Francisco Bay), the natural productivity and open space values of 102,000 acres (52 per cent) have been destroyed by dredging or filling. Of California's remaining estuaries and wetlands, 62 per cent have been subjected to severe damage and 19 per cent have received moderate damage. In southern California, 75 per cent of the coastal estuaries and wetlands have been destroyed or severely altered by man since 1900. Two-thirds of 28 sizable estuaries existing in southern California at the turn of the century have been dredged or filled.

**Dredging and Mining Can Have Adverse Environmental Effects.** Dredging and mining can affect marine resources in several ways. Dredging tidal mudflats and salt marshes can completely destroy these most productive parts of the estuarine system. Newly dredged channels can change water circulation patterns in estuaries and can introduce new conditions that certain species cannot tolerate. Dredging and mining operations stir bottom mud, which can cause turbidity that limits photosynthesis in a small area and can recirculate oxygen-demanding or toxic materials that may have been trapped in the mud. These effects can be limited if careful dredging methods are used. Finally, disposal of the dredged materials ("spoils") can smother benthic (bottom-dwelling) organisms.

**Some Beneficial Effects Are Possible.** Dredging and spoils disposal can also be environmentally beneficial. Valuable marine environments may be able to be restored by dredging diked former wetlands to return them to tidal action, or by deepening lagoons that are drying up. The substrate for benthic plants and animals may be improved by dredging. Sandy dredge spoils placed on or near beaches or in littoral currents can aid in the replenishment of beach sand along the coast.

## Policies

**15. Give Special Protection to Estuaries and Wetlands.** All remaining coastal estuaries and wetlands and buffer areas necessary to protect their water areas, vegetation, waterfowl, fish, and other wildlife values shall be preserved, enhanced, and where possible, restored. To this end:

a. **Restrict New Development in Wetlands.** New development, including diking, filling, and dredging, in existing or restorable wetlands shall be permitted only if (1) the existing functional capacity of the wetland is maintained or enhanced (i.e., some alteration but no net reduction in the quantity and quality of species); (2) replacement areas are provided for dredged, filled, or diked areas (pursuant to Policy 17); (3) there is no less environmentally damaging alternative; and (4) the development conforms with an adopted comprehensive estuarine management plan (see paragraph [c] below) and is otherwise consistent with the applicable Coastal Plan policies. Any alteration of the State's 19 most productive coastal wetlands as identified and mapped in the report of April 1974 by the U.S. Bureau of Sport Fisheries and Wildlife and the California Department of Fish and Game entitled Acquisition Priorities for the Coastal Wetlands of California (see finding above) shall be limited to the following: very minor incidental public service facilities (e.g., burying cable or pipelines), restorative measures, nature study, possible commercial fishing facilities in Bodega Bay, and possibly other development in already-developed parts of south San Diego Bay. Development in other wetlands shall be limited to the following: (1) military facilities essential to the national defense; (2) expansion of existing commercial fishing harbors, ports, or airports; (3) the minimum necessary entrance channel to a marina or other boating facility excavated from dry land; (4) those portions of coastal dependent energy facilities that cannot be located on dry land or in open water areas; (5) very minor incidental public service facilities such as buried cable or pipelines; (6) restorative measures pursuant to paragraph (b) below; and (7) nature study, aquaculture, or similar resource-dependent activity.

b. **Restore Degraded Wetlands.** Degraded marsh areas and diked but unfilled former wetlands capable of restoration shall be restored for natural resource values and biological productivity, and new marsh areas shall be created except where they would significantly reduce open water areas or adversely affect water circulation. A restoration priority list and schedule shall be developed cooperatively by the coastal agency, the Department of Fish and Game, the State Lands Commission, and appro-

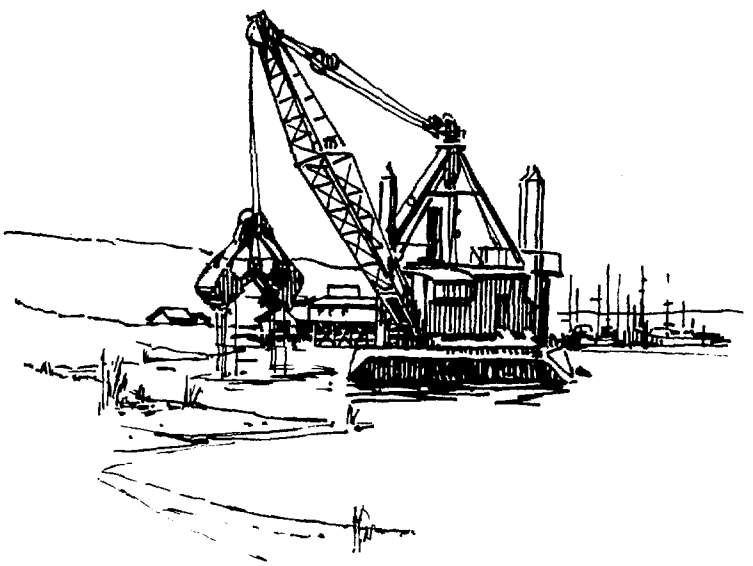
Elkhorn Slough, north of Jetty Point Road

priate regional and local agencies specifying which sites shall be restored first to enhance coastal resource values, including fisheries production or the maintenance of rare and endangered species, and considering maintenance of prime agricultural lands created from former wetlands. No new development in restorable wetlands shall be permitted inconsistent with this policy. Restorable wetlands for the purposes of this policy shall include all degraded marshes or diked but unfilled former wetlands except that the coastal agency may exclude those that it determines, based on appropriate scientific study and Department of Fish and Game concurrence, are not capable of restoration and do not possess a significant wildlife value (e.g., existing or potential habitat of rare and endangered species or for species of sport, commercial, or special scientific interest, or functional contribution to the Pacific Flyway).

c. **Prepare and Implement Comprehensive Estuarine Plans.** Before any significant change in the functional capacity of a wetland or estuarine area is permitted, an overall management plan shall be prepared by the public agencies and private interests involved for review and approval by the coastal agency. The plan shall be based on the study of each estuary or wetland and its surrounding and tributary areas, encompassing an area defined by the surrounding physical and environmental characteristics rather than by existing political jurisdictions. The plan shall (1) place first priority on natural resource protection and restoration, research and educational opportunities, and recreational and aesthetic values; (2) assess public health issues, aquaculture potential, possible alternative sources of fresh water, whether the area is burdened with a public trust, and the impact of any proposed facilities that can be provided in accordance with other Coastal Plan policies; (3) specify the management programs necessary to protect, enhance, and restore the wetland and estuarine resources, including controls on development in adjoining upland areas; and (4) specify the responsible agencies and funding sources to carry out the management programs. For intensification of use in areas now committed to industrial or port use, a port master plan for that portion of the estuary, when certified by the coastal agency as consistent with the Coastal Plan, may be substituted for the otherwise required management plan. Such a port master plan shall include a review of existing water quality, habitat areas, and quantitative and qualitative biological inventories in the area of the individual port, together with plans for enhancement or restoration of the marine environment and habitat. Any significant expansion of existing port or industrial areas into a wetland or estuarine area, however, shall be allowed only upon completion and implementation of a management plan for the surrounding estuarine or wetland area.

**16. Protect Other Coastal Waters by Limiting Dredging, Diking, and Filling.** The water areas and biological productivity of coastal waters other than wetlands shall also be protected from unnecessary encroachment. To this end:

a. **Criteria for Diking or Filling.** Diking or filling of coastal waters (other than for shoreline structures as defined in Policy 19) shall be permitted only where necessary and in accordance with applicable Coastal Plan policies and where there is no less environmentally damaging alternative for: (1) port or airport expansion, national defense, or coastal-dependent facilities; or (2) specifically approved restoration projects (e.g., diking to create freshwater habitats or reduce sedimentation).



b. **Criteria for Dredging.** Dredging of coastal waters shall be permitted in accordance with other applicable Coastal Plan policies and where there is no less environmentally damaging alternative for: (1) new or expanded port, energy, or national defense facilities; (2) maintaining existing or restoring previously dredged depths in existing navigational channels,

turning basins, vessel berthing and mooring areas, and boat launching ramps; (3) entrance channels or minor deepening of natural harbor areas for new or expanded recreational boating facilities; (4) new or expanded commercial fishing harbors; (5) incidental public service purposes such as burying cables and pipes, inspection of piers, etc.; (6) mineral extraction, including sand for restoring beaches, except in biologically sensitive areas; and (7) restoration purposes (e.g., to restore water circulation) provided that the results are carefully monitored and evaluated for restorative value. The need for dredging shall be minimized by careful design and location of facilities with respect to existing water depths and water circulation and siltation patterns and by efforts to reduce controllable sedimentation. Where bottom materials are highly contaminated, dredging or mining shall be avoided.

**17. Require Replacement Areas for Diked or Filled Areas.** Where landfill or diking of any coastal water or dredging of a wetland is permitted, except in accordance with an approved estuary or wetland restoration program pursuant to Policy 15(b), equivalent compensation areas of equal or greater biological productivity shall be created near the site (for example, by restoring degraded wetland areas) to replace the diked, filled, or dredged areas. If no appropriate restoration site is available to the applicant, an in-lieu fee sufficient to provide an area of equivalent productive value shall be dedicated to an appropriate public agency, a replacement site purchased by the public agency, and the restoration activity begun before the dike or fill project may proceed. (See also Policy 153 regarding provision of replacement areas.)

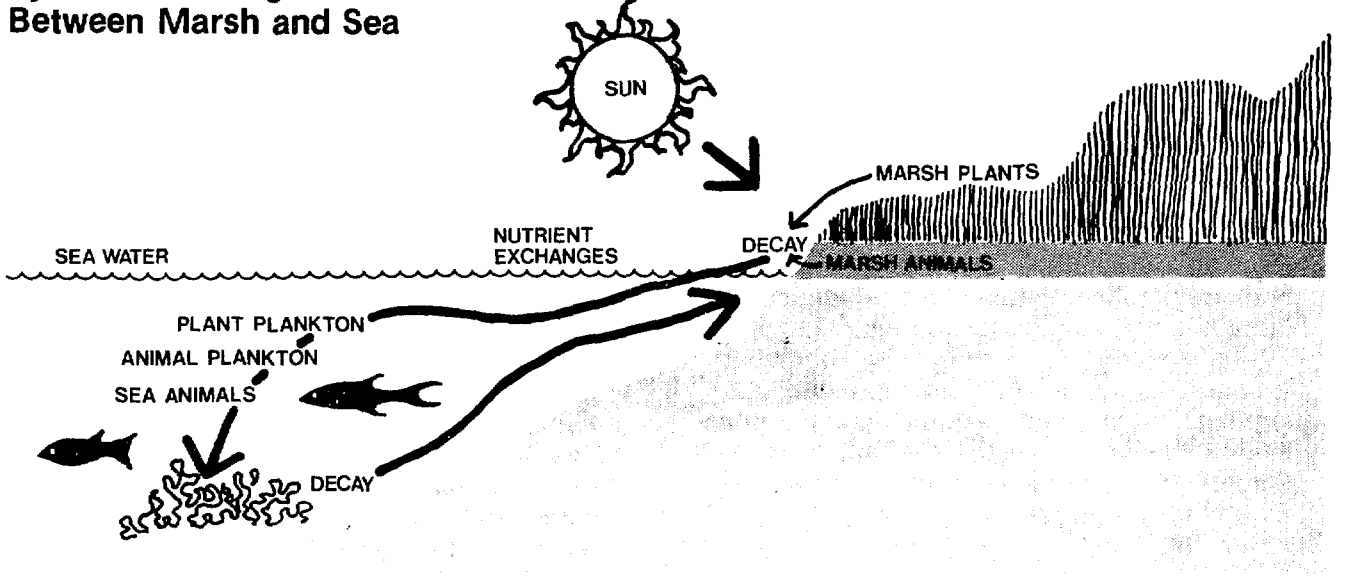
**18. Regulate Permitted Dredging.** Permitted dredging shall be planned, scheduled and carried out to avoid disruption to fish and bird breeding and migrations, marine habitats, and water circulation.

a. **Analysis Before Dredging.** Bottom sediments or sediment elutriate (basically materials that can go into solution when sediment is disturbed) shall be analyzed for toxicants prior to dredging or mining, and dredge spoils disposal regulated in accordance with the most recent approved dredging criteria promulgated by the Regional Water Quality Control Boards or the Environmental Protection Agency, whichever would most effectively achieve the objectives of this policy.

b. **Disposal of Dredged Sediments.** Specific disposal policies may be modified based on results of on-going research in coordination with the State Water Resources Control Board, the Environmental Protection Agency, and other involved agencies. Otherwise, the following shall apply:

- Dredge spoils suitable for beach replenishment shall be transported for this purpose to appropriate beaches or into suitable longshore current systems.
- Dredged sediments meeting criteria specified by the Regional Water Quality Control Boards

**Cycle of Exchange of Nutrients Between Marsh and Sea**



and the Environmental Protection Agency for freshwater, estuarine, or marine disposal may be deposited at open-water sites designated to minimize potential adverse impacts on marine organisms or in fill sites specifically authorized by the coastal agency. Dredge material shall not be transported from coastal waters into estuarine or freshwater areas for water disposal.

- Dredged material exceeding approved water quality criteria must be placed either on dry land in a manner that prevents pollution of marine, underground, or surface water or, if land disposal is infeasible or environmentally unacceptable, at designated deep ocean sites (depths greater than 100 fathoms).
- Ocean dumping of other materials shall be subject to Region IX EPA authorization.

# SAND MOVEMENT AND SHORELINE STRUCTURES

## Findings

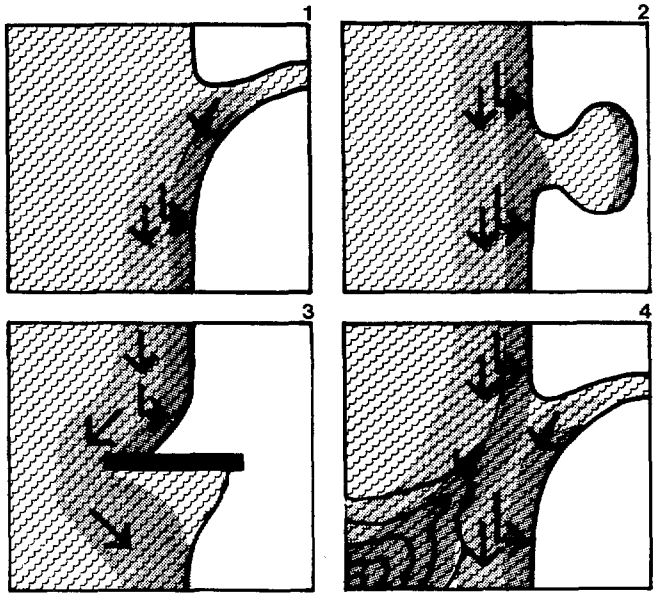
**Ocean Beaches Depend on Sand.** Ocean beaches are one of the most highly valued recreational features of the California coastal environment. But many of these beaches are being lost to erosion. The stability of a sand beach depends on maintaining the dynamic equilibrium of a "sand budget" — a balance between sand brought to a section of beach and that removed from it, either by nature or by man's action. (See the Coastal Land Environment section on coastal streams regarding the supply of sand from inland sources).

**Sand Is Moved Along the Shore.** Beach sand is transported by wind, waves, and wave currents in three kinds of movement — offshore, onshore, and longshore. The sand, when put into suspension by wave action, may move laterally along the shore in longshore currents; at the same time it is being transported offshore and returned onshore. The sand movement along the shore occurs within relatively distinct sections of the coast, sometimes called "littoral cells." These extend from the point where the sand supply is introduced to the shoreline, mostly by streams, downdrift to the place where it is swept out to sea, often irretrievably into offshore canyons. There sometimes are small indentations in the coast partly isolated from the sand movement system of the littoral cells by rocky headlands; within these areas, cliff erosion and onshore currents supply the sand to small pocket beaches. In addition to wave action, wind can move both beach sand and sand dunes. Sand is also lost by abrasion, coastal subsidence, and mining.

**Human Activity Increases Beach Sand Losses.** Human activity has not only reduced the supply of sand; it has also increased the rate of loss, or changed the distribution, through improper design and placement of groins, jetties, breakwaters, and dredged channel entrances in shoreline waters. Another problem can be loss of sand dunes to wind action due to their disruption by vehicles, removal of vegetation, or excessive foot traffic.

**Measures to Restore Beaches Involve Environmental Problems.** Several measures attempt to maintain sand supplies on beaches, but many of these efforts involve environmental problems and require repeated work. Maintenance of beach sands is attempted by either increasing the supply of sand to a depleting beach or by decreasing the movement of sand off the beach. Several methods for

### Sand Movement Along the Coast




1. Sand being introduced into littoral cell system by coastal stream.
2. Rocky headlands shelter pocket beach, supplied with sand by onshore currents and cliff erosion.
3. Marine structure interrupting sand movement, causing buildup on one side, sand loss downdrift.
4. End of littoral cell as sand is swept into submarine canyon, beginning of new cell as another stream moves sand into the coastal waters.

Crescent City breakwater constructed of tetrapods

increasing sand supply are:

- Mining offshore sand sources;
- Placing harbor dredge material on nearby beaches or into longshore currents; and
- Transporting material from inland sand sources to depleted beaches, including material accumulated behind inland dams.

Methods for decreasing sand loss from beaches may include:

- Structures to reduce the longshore movement of sand, such as groins and detached breakwaters;
- Devices to reduce wave action, such as submerged reefs or detached breakwaters;
- Sand bypassing systems to pass the sand by a harbor entrance that has altered the natural longshore movement of sand; and
- Recycling systems that collect sand at down-coast sinks and transport it to the up-coast end of the littoral cell.

To be effective, measures for controlling sand supply and loss must consider impacts on the total littoral system.

**Beach Sand Losses Are a Costly Problem.** The necessary combination of measures to maintain beach sands can be extremely expensive, costing over $1 million for a single beach restoration project at Doheny State Beach, Orange County, for example, and often involving high annual costs for on-going sand replenishment. Damage due to beach erosion in California was approximately $10 million in 1965. The Water Resources Council projects the annual loss to be $15.7 million in 1980 and $29.7 million by 2000, unless large-scale preventive measures are taken. The principal means to prevent continued property damage and public cost should be to control developments in erosion hazard areas and to protect and restore natural sand supply systems to the maximum extent possible. But positive sand supply management measures will also be needed.

**Shoreline Erosion Is Being Studied.** The U.S. Army Corps of Engineers and the California Department of Navigation and Ocean Development operate a cooperative program to study shoreline erosion. The current study program is almost complete in southern California and is continuing in northern areas. These research programs only indicate broad erosion problems, however, and accurate understanding of erosion processes requires analysis of specific sites before protective structures are designed or constructed. Additionally, the Corps of Engineers' Coastal Research Center provides for public distribution of pertinent reports on coastal engineering and coastal processes.

**Shoreline Structures Also Affect Marine Life, Access, and Views.** In addition to their effect on shoreline sand movement, marine structures (such as dikes, piers, and jetties) can impair productive habitat areas by interfering with water circulation, although properly designed structures may provide positive benefits as havens for small fish and as nesting and roosting sites. Marine and shoreline structures can also impair access to and along the shore and degrade the visual qualities of the coast.

## Policies

**19. Criteria for Seawalls, Breakwaters, and Other Shoreline Structures.** Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted only when designed to eliminate or mitigate adverse impacts on shoreline sand systems and when required (1) to maintain public recreation areas or to serve necessary public service, commercial fishing, energy, or transportation facilities (including ports) where there is no less environmentally harmful alternative, or (2) to protect principal structures of existing developments that are in danger from present erosion where the

coastal agency determines that the public interest would be better served by protecting the existing structures than in protecting natural shoreline processes. In addition:

a. **Mitigate Impairment of Sand Supply or Transport.** Permitted shoreline works shall incorporate mitigation measures to minimize and compensate for any impairment of local sand supply or adverse effects on the longshore transport of sand. Incremental construction shall be required, where possible, to allow ongoing evaluation and appropriate modifications. The project owner shall be responsible for continued sand transport, where such transport is required.

b. **Design of Structures.** Shoreline works and other marine structures shall be designed to (1) be the minimum necessary for their purpose (taking into account the geology of the area so that erosion is not accelerated at the edges of such structures), (2) be as visually unobtrusive as possible (see also Coastal Appearance and Design policies), (3) be compatible with maximum possible shoreline access and use (e.g., as far landward as possible in the case of seawalls), and (4) protect or enhance marine life conditions.

c. **Phase Out Existing Harmful Structures.** Existing marine structures that are found by the coastal agency or other State or regional agencies to cause water stagnation contributing to pollution problems and fish kills shall be phased out or upgraded.

**20. Initiate Positive Programs to Restore Sand Supply.** Because of the extensive alteration of sand supply from past human activities and because of the importance of beaches for preventing erosion damage and for public recreation, positive programs for managing and restoring sand supply shall be given high priority and appropriate measures (such as recycling sand from downcoast sinks to upcoast beaches, removing sediment buildup behind upstream dams, sand bypassing techniques, or possibly innovative new techniques such as modifying the height, steepness, and direction of wave approach) shall be undertaken to provide continued beach sand replenishment. To this end, a comprehensive program to conduct and evaluate studies of sand supply and movement and to recommend and undertake management and restoration measures shall be developed cooperatively by all agencies involved, with the active participation of the coastal agency. An appropriate lead agency shall be designated by the Legislature, and technical resources of agencies such as the U.S. Geological Survey, Army Corps of Engineers, State Department of Water Resources, Department of Navigation and Ocean Development, Division of Mines and Geology, State Lands Commission, California Department of Parks and Recreation, universities, colleges, local and regional agencies, private entities wishing to participate, and marine laboratories shall be utilized in carrying out this program. The coastal agency shall review and report progress annually to the Governor and the Legislature.

# COASTAL LAND ENVIRONMENT

## Findings

**Coastal Land Environment Is a Dynamic System.** The coastal land environment is a combination of the soils, air, plants, animals, minerals and water courses as they are affected by or themselves affect the ocean — from the pounding surf line to the quiet inland valleys where the coastal fog influences plant species and growth. The land environment is a dynamic, interrelated system composed of:

- Streams that collect from entire watersheds to drain into coastal waters;
- Natural areas, including the vital shoreline habitats that are the link between life in the sea and life on land and that harbor many rare species;
- Coastal agriculture and forestry that are enhanced by rich soils and the maritime climate;
- Coastal mineral resources, primarily sand and gravel; and
- The coastal airshed that is directly influenced by the ocean.

# COASTAL STREAMS AND WATERSHED MANAGEMENT

## Findings

**Coastal Streams Are Vital to the Natural System of the Coast.** Coastal streams directly affect the coastal environment:

- They are vital to anadromous fish that live in both salt and fresh water;
- They collect and transport sand from the watershed to supply coastal beaches;
- They are valuable to the aesthetic and recreational enjoyment of coastal waterways; and
- They are interrelated with the estuarine systems that in turn are essential to the productivity of the marine environment.

Coastal streams also significantly influence flooding, natural ecosystems, agricultural water supply, and groundwater recharge within the coastal land environment. Watershed areas are thus an ideal focus for developing management techniques to maximize utilization and preservation of natural resources of the coastal zone.

**Streams Are Essential Habitat for Anadromous Fish.** Salmon and steelhead trout spend part of their lives in the sea and part in freshwater streams. These fish are an important State recreational resource and, in the case of salmon, a commercial resource as well, but their abundance has declined by at least 50 per cent over the past 30 years, primarily because of human activities. The upstream spawning and nursery areas have been the most severely damaged habitat areas.

**Human Activities Damage Stream Habitat.** The upstream habitat has been damaged by many activities:

- Dams that provide no adequate fish bypass facilities and that flood large spawning and rearing areas;
- Water diversions and stream channelization;
- Sand and gravel mining from streambeds;
- Grading or logging operations that induce habitat-smothering erosion and siltation along streambanks, even from remote sites in the watersheds;
- Land fills for various purposes;
- Increases in water temperature caused by removal of shade vegetation; and
- Discharges of toxic, thermal, or organic pollutants into habitat streams.

**Present Regulations Are Inadequate.** The State Department of Fish and Game, Regional Water Quality Control Boards, and Division of Forestry all have some regulatory powers dealing with stream habitat, but there is no agency with authority over new projects affecting habitat areas, and funding of existing programs is inadequate to enforce present habitat protection measures. The Department of Fish and Game notes that existing authority and funding is inadequate to provide full protection to spawning areas.

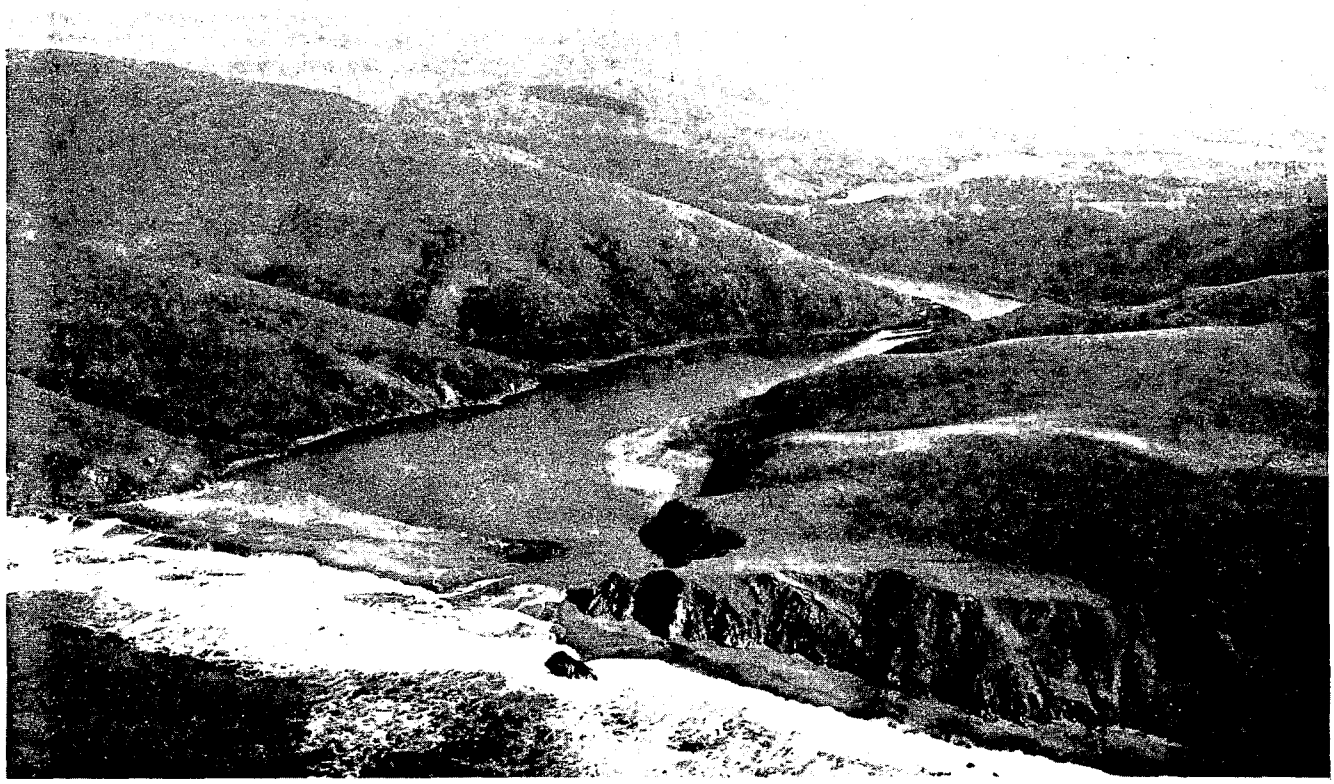
**Beach Sand Is Generated and Transported by Coastal Stream Flooding.** Though beach sand may come from cliff erosion, landslides, dunes, or onshore transport, most of California's beach sands are delivered by coastal streams. The principal mechanism by which the sands are collected and transported is flooding. The amount of sediment contributed by each stream depends on such factors as the area of the watershed, erodability of the watershed formation, runoff, land use, and stream slope. A number of studies have been done in the transport of beach sands from major rivers. For instance, in the past two years the U.S. Geological Survey has completed studies on the Eel, Mad, and Russian Rivers and Redwood Creek.

**Human Activities Reduce Stream Flooding and Thus Affect Beach Sand Supply.** Dams, settling basins, all flood control works, watershed erosion control, certain farming practices, urbanization, control of natural runoff on range and forest land, etc., reduce the natural flood flows of coastal streams and so eliminate or impair the continued generation and delivery of beach sands. Where the normal process of sand supply has been seriously impaired, severe depletion of beach sands and accelerated beach erosion has resulted, necessitating costly and continuous sand importation measures. (Conversely, in some cases downstream channelization in the alluvial plain may assist sand transport through the plain to the beaches.)

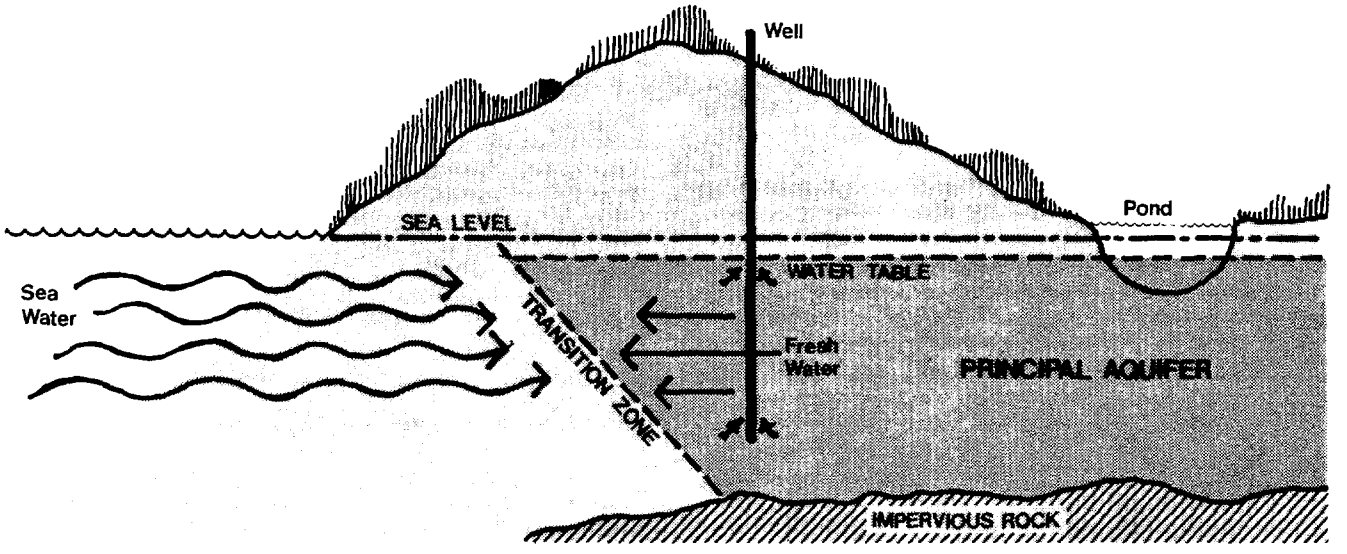
**Ground Water and Surface Water Are Interrelated.** Ground water and surface water are naturally interrelated. Surface waters recharge groundwater supplies and ground water often feeds springs, streams, and riparian habitat. Overexploitation of surface water will prevent adequate recharge of aquifers, especially where stream flow is important in recharge. Overuse of ground water can affect surface supplies by drying up streams and springs fed by the ground water and can adversely affect the groundwater supply by drawing in salt water. This can often have a damaging effect on the native habitats that depend on this water supply. At present, there is no effective coordinated environmental management of groundwater and surface water resources.

**Ground Water Supplies Are Recharged from Many Sources.** Groundwater supplies are recharged by precipitation, seepage from rivers and streams, absorption and storage of rainfall by soils, and in some cases from underflow from adjacent areas. The rate of recharge is dependent on the type of soil, density of vegetation, intensity of rainfall and terrain, buildings, coverage with impermeable surfaces, and compaction of soil. The recharge area of an aquifer (water supply) can be reduced by development that decreases the rate and area of permeability for recharge, by compaction of soil, and by channelization of rivers and other flood control projects. The underground geology of an area must be well known in order to have a clear understanding of the recharge and movement of ground water.

Sonoma County



## Groundwater Hydrology
**and Saltwater Intrusion**




**Overdraft of Aquifers Has Adverse Effects.** If an aquifer is overdrafted, in addition to the adverse effects on surface waters noted above, the geologic structure of the aquifer itself (especially in thick clay formations) may be changed. The aquifer may lose its future water storage and structural capacity through subsidence or compaction. Subsidence, an actual sinking of the ground surface, can also cause damage to roads, buildings, and other structures.

**Overdrafts Also Threaten Water Quality.** As a result of continuing overdraft of groundwater supplies and the reduction of freshwater recharge, salt water has intruded into underground freshwater reservoirs. Natural causes, such as long periods of low rainfall, may also contribute to saltwater intrusion, but are relatively insignificant compared to man-induced causes. Saltwater intrusion contaminates the water supply and can harm soil quality for agricultural use by increasing the level of various salts with continued irrigation. The quality of the water can also be damaged by septic tank effluent, buildup of nitrates and pesticides from irrigation water, and other pollutants.

**Effective Groundwater Management Is Needed.** Because of these potential development impacts, it is crucial in effective water resources management to prepare and use accurate maps showing the geology of the groundwater basins and their recharge areas. The impact of development, both in terms of the amount of groundwater to be drafted and the effect on groundwater recharge should be assessed in terms of this geologic information.

**Alternatives to Groundwater Drafting Should Be Developed.** To offset the continued depletion of water supplies (both surface and ground water), alternative sources will be needed. Importation of water and use of reclaimed water are the main sources. Reclamation of waste water can help conserve limited water supplies, thus avoiding the potential adverse effects of overdrafts, including the problems of subsidence and saltwater instrusion. It can reduce California's dependence on costly and environmentally disruptive interbasin water transfers. Reclamation of waste water can also eliminate the adverse effects of disposing of partially treated waters into coastal waters. In many areas the use of reclaimed water is preferable to importation because agricultural water costs (at lower than drinking water standards) may be stabilized or even lowered (in contrast with the often higher cost of imported fresh water), because water importation may entail high energy costs and because water importation may in some instances induce development in coastal resource areas. On the other hand, in some coastal areas the initial quality of the water may be so poor as to preclude its reclamation for beneficial uses.

**Water Injections May Be Able to Correct Saltwater Intrusion.** Saltwater intrusion can usually be alleviated, either by reducing overdrafts that lower the water table or by creating a freshwater barrier (by injecting water into wells located along the coast to raise the water level above sea level). Freshwater injections can also replenish underground reservoirs for continued use from inland wells, but they may be expensive and require consideration of complex hydrologic conditions.

**Water Conservation Reduces the Problems Associated with Increasing Water Supply.** The adverse economic and environmental effects of overuse of water supplies can all be reduced by lowering the rate of growth in demand for water use. Much water use is inefficient or unnecessary, such as overwatering of agricultural and landscaping areas, planting non-native vegetation that requires more water, and use of inefficient plumbing fixtures.

## Policies

**21. Basic Policy: Establish Comprehensive Watershed Management.** Within coastal watersheds as mapped in Part IV, the planning and management of land use, and the development of projects having the potential for adverse impact on coastal

resources, shall be on a comprehensive watershed basis, to avoid damage to coastal streams, estuaries, and wetlands. To this end: (1) watershed management plans shall be prepared under the direction of a lead agency (as designated by the Legislature) with the full participation of the coastal agency, and shall be completed within four years of the effective date of legislation implementing the Coastal Plan, as set forth in Policy 22; (2) land uses and water supply programs shall be compatible with watershed protection, as set forth in Policy 23; and (3) major projects located in or adjacent to streams or wetlands (e.g., water diversions, flood control projects, and other such works) that could have significant impacts on coastal resources shall be reviewed and regulated to prevent significant adverse impacts, as set forth in Policy 24.

**22. Prepare and Implement Comprehensive Watershed Management Plans.** Comprehensive watershed management plans shall be undertaken to provide long-term assurances that coastal land uses and development will not adversely impact coastal groundwater resources, streams, wetlands, and estuaries.

a. **Procedure for Preparation and Implementation of the Plans.** A lead agency at the State level designated by the Legislature (e.g., the Resources Agency, Department of Conservation, or Water Resources Control Board) shall coordinate watershed planning and work closely with affected local governments, other State agencies, and Federal agencies. The coastal agency shall participate in an advisory role in the overall watershed planning program and shall review and comment on that portion of watershed plans beyond the coastal resource management area. That portion of watershed plans within the coastal resource management area shall be submitted to the coastal agency for certification as to consistency with the Coastal Plan and for incorporation into local coastal plans. (To the extent that a program under Sections 201, 208, or 303[e] of the Federal Water Pollution Control Act fully addresses the concerns enumerated in these policies, such programs may be submitted as the management programs for coastal watersheds.)

b. **Content and Goals of the Plans.** The watershed management plans shall relate upland and shoreline land use management to the protection and restoration of the marine environment; use consistent assumptions, standards, and criteria for determining appropriate future population levels and land uses within each coastal watershed; consider statewide interbasin interests (e.g., true costs of water importation); and otherwise assure that allowable development conforms to the Coastal Plan. The plans shall stress the protection of coastal groundwater resources, streams, wetlands, and estuaries, and shall prevent significant adverse impacts on these resources with particular attention to the following:

- Loss of natural riparian vegetation that has significant value for erosion control, flood restraint, wildlife habitat, or recreational amenities;
- Degradation of anadromous fishery resources;
- Loss of water-oriented recreational opportunities on coastal streams;
- Loss of or reduction of coastal sand supply where needed for protection against shoreline erosion, for maintenance of beaches, or for industrial sand supply;
- Adverse alteration of saltwater-freshwater balance in coastal wetlands;
- Sedimentation impacts on coastal streams and wetlands;
- Reduction of existing agricultural production and processes;
- Degradation of groundwater resources;
- Reduction of needed surface recharge areas as a result of development and accompanying increases in impervious surfaces;
- Saltwater intrusion, which has adverse impacts on agriculture, wildlife, or other resources;
- Land subsidence resulting from the lowering of the water table; and
- Irreversible commitment of recoverable mineral deposits, including sand and gravel.

**23. Relate Development and Water Supply Decisions to Coastal Watershed Management Plans.** Because water supply programs may significantly decrease the surface flow of key coastal streams and deplete groundwater supplies, and because they may also require costly, often environmentally damaging interbasin water transfers, reservoirs, diversion structures, and water supply plans shall be consistent with approved coastal watershed management plans. Because the amount and location of development heavily influences water supply plans and programs, levels of development shall be correlated with water supply programs that are consistent with approved watershed management plans.

a. **Conform Water Supply Plans to Watershed Plans.** To avoid the potential adverse impacts of water supply projects on coastal resources, agencies that provide water service (for municipal, industrial, or agricultural use) shall develop water supply plans directed toward implementing approved watershed management plans and based on a thorough inventory of surface and subsurface supplies, coordinated wastewater management, and conservation of water.

b. **Development Shall Not Adversely Affect Local Water Resources.** Based on the local inventory of surface and subsurface water supply, new development may utilize local water supplies unless the responsible water supply agency or the coastal agency finds that the potential exists for substantial adverse impacts on coastal zone resources (e.g., degradation of anadromous fish runs, saltwater intrusion into groundwater supplies, reduction of groundwater recharge). The impact of development shall be evaluated to avoid depletion of underground water supplies and to assure protection of surface drainage necessary for water supply replenishment or habitats. Before development that could adversely affect water supplies is allowed, impervious surface limitations, floodplain zoning, and other development standards designed to protect groundwater and surface drainage areas shall be established at the local or regional level as part of the implementation of approved watershed management plans (see Policy 22).

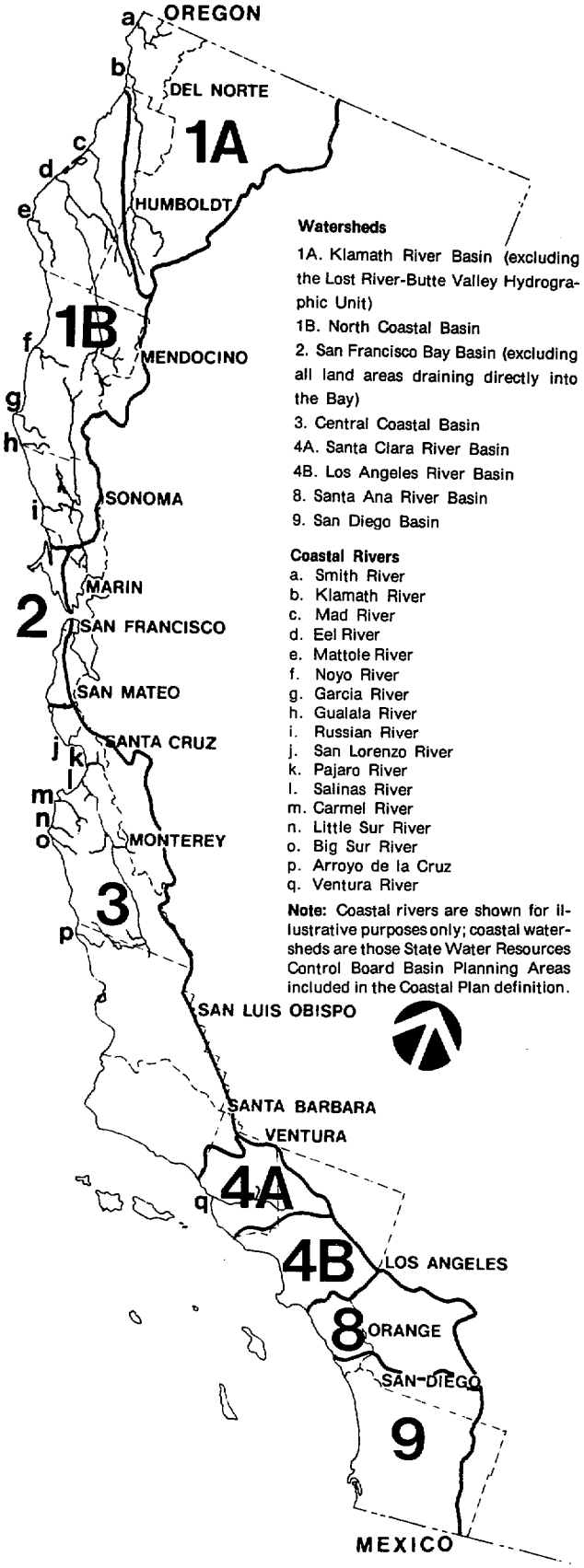
c. **Avoid Need for Future Water Importation.** Because water importation may entail high energy demands, and may in some instances encourage inappropriate development in coastal resource areas, decisions concerning development in the coastal area shall be in accord with water management plans and programs that minimize the need for interbasin transfers and that consider total water basin impacts. Development that individually or cumulatively has the potential for inducing the future importation of water shall be permitted only if local, regional, or State water plans that have been determined to be consistent with the Coastal Plan provide for such importation.

d. **Water Management Shall Stress Conservation.** The Department of Water Resources shall be adequately empowered, and receive additional funding if needed, to gather and disseminate information on water supply and use, to research and implement regional and statewide programs for water conservation and reclamation, and to assist in local programs. Cities and counties shall incorporate water conservation measures in both their planning and building code programs. It is recommended that the Legislature require the conservation element of local general plans to include specific provisions addressing water conservation. Appropriate alternatives for recycling and conserving water shall be implemented, including the reclamation of waste water, especially for non-domestic uses, restructuring of user charges to discourage unnecessarily high consumption, monitoring of private wells, and public education.

**24. Review Major Projects Affecting Coastal Streams.** Because of their potentially severe impacts on coastal streams, wetlands, and estuaries, structures such as permanent dams, flood control and water diversion projects, or stream channelizations, and major activities such as mining, removal of riparian vegetation, road construction, logging, grading, or discharge of toxic, thermal or organic pollutants in or near (within 100 feet) of coastal streams or wetlands shall be regulated to avoid or mitigate significant adverse impacts as listed in Policy 22.

a. **Project Review Procedures.** The coastal agency shall review and comment on projects outside the coastal resource management area that would adversely affect coastal resources, and through the Environmental Impact Report review process, recommend appropriate mitigation measures. Within the coastal resource management area this policy shall be implemented through certification (with appeals allowed) of watershed management plans as part of local implementation programs as specified in Part III. To prevent adverse impacts prior to implementation of a watershed management plan, an agency designated by the Legislature shall have interim permit authority in the watershed outside the coastal resource management area over all major projects involving stream diversion or permanent structures either in or adjacent to streams or wetlands (within 100 feet) to protect coastal resources; within the coastal resource management area the coastal agency shall have interim permit authority. Upon implementation of approved watershed plans, the coastal agency's permit authority over specific projects shall be limited to requiring mitigation measures that would enable the project to conform to the Coastal Plan; projects conforming to the approved watershed plan shall not be denied.

## Coastal Rivers and Watersheds




**b. Criteria for Projects That Would Alter Natural Streams.** Channelizations, dams, or other alterations of rivers and streams shall be permitted only for (1) necessary water supply projects or (2) flood control projects where no other method for protecting existing structures in the floodplain is feasible and such protection is necessary for public safety or to protect existing development. Permitted flood control projects shall be of the minimum size necessary to protect existing development. In the case of water supply, projects shall be of a size consistent with the long-term protection of surface water and groundwater resources and with the maintenance of optimal habitat functions of streams, wetlands, and estuaries.

**c. Approved Projects Must Mitigate Damage.** Any agency having permit authority over stream-blocking structures shall require that such structures incorporate the best available mitigation measures, including (1) provision of anadromous fish runs or fish ladders, (2) maintenance of sand transport capability within the streams or alternative supply or other replacement for the loss of needed beach sand, and (3) replacement of any fish, wildlife, or valuable plant habitat adversely affected by the project to a substantial degree (such as by increasing hatcheries' capacity or restoring degraded areas). Costs of such mitigation measures shall be included in the operating budgets of the projects.

**d. Provide Interim Protection of Sand Supply.** Where information is lacking or incomplete to document sand supply from inland sources or the effect of coastal mining, an appropriately designed study project shall normally be completed prior to approval of any activity that would interfere with natural sand supply and transport processes. However, if it can be established that such delay would result in unwarranted hardship, and that the public interest could be adequately protected through the posting of a bond or other appropriate legal guarantees, to be forfeited if the project is subsequently established to be detrimental to coastal resources, a project may be allowed to commence prior to the completion of such a study. (See Policy 20 regarding an overall program for study and management of sand supply and movement.)

**25. Provide Special Protection for Anadromous Fish Streams.** In addition to the regulation of stream-blocking structures, the upstream spawning and nursery areas needed by salmon and

steelhead trout shall be protected and restored.

a. **Extend Authority of Existing Agencies.** The authority and funding of the Department of Fish and Game, the Regional Water Quality Control Boards, and the Division of Forestry shall be extended if needed to ensure that salmon and steelhead trout habitats will be restored and protected from the adverse effect of human activities. It is recommended that Sections 1601 and 1602 of the Fish and Game Code be amended to provide protective measures prescribed by the Department of Fish and Game when a proposed project would have significant adverse impacts on the fish and wildlife resources of the State. Where spawning areas cannot be restored, appropriate mitigation measures (such as the building of additional fish hatcheries) shall be employed.

b. **Carry Out Systematic Stream Investigations.** The Department of Fish and Game shall be adequately funded and staffed to carry out a more comprehensive anadromous fish program, including (1) systematic surveys of anadromous fish streams to determine fish populations; (2) identification and delineation of critical spawning habitat and associated riparian vegetation, its conditions, and its potential for improvement; and (3) developing and undertaking appropriate management and restoration programs. Appropriate maps and reports shall be forwarded to the Division of Forestry to effectuate those provisions of the Forest Practice Act relating to stream protection and wildlife management and to appropriate agencies, including local agencies, for control of polluting discharges and other environmentally damaging activities.

# NATURAL HABITAT AREAS

## Findings

**Important Habitat Areas Are Found in the Coastal Zone.** Many and varied species of animals and plants make their homes in the natural environment of California's coastal zone. Each living community harbors a distinct group of birds, animals, and plants, which interact with each other and their environment as a complex, often unique ecosystem. Some of the types of living communities (ecosystems or habitat areas) in the coastal zone are: dunes, wetlands (including salt and freshwater marshes and associated vegetation), riparian (banks of water bodies) vegetation, tidepools, redwood and other forests, coastal scrub and sage, and grasslands. Agricultural lands are also of key importance to wildlife. Many species of animals range through several ecosystems for diverse food and shelter and some plants are found in more than one type of ecosystem. But many species can survive only in one such ecosystem.

**Natural Areas Provide Benefits to People.** The various natural areas within the coastal zone are utilized by people for food and fiber production, for enjoyment, for recreation as varied as birdwatching and hunting, for scientific investigation and experimentation, and for education and training.

**Many Human Activities Have Destroyed Coastal Natural Areas.** Substantial destruction of natural areas along California's coast has been caused by such factors as expanding urban development, the noise and pressure of recreational activities, alterations of vegetative cover, and the indiscriminate use of pesticides. These activities are reducing the habitat areas available to all plants and animals and are threatening some species and some unique communities, which can exist only in limited areas, with extinction. The continued existence of abundant and varied life forms on the coast depends upon proper safeguards for whole living communities as well as for plant and animal habitats. An especially serious problem in coastal zone wildlife management is the degradation or reduction of wetlands, tidepools, and dunes — the narrow and often fragile transition zone between marine and terrestrial ecosystems.

**Unique Habitat Areas and Rare Species Need Protection.** Public land ownership, including wildlife refuge areas and parks, preserves many habitat areas, but much of the unique natural area of the coast is still unprotected. The State Department of Fish and Game has some regulatory power to protect habitat areas of rare and endangered animal species and to restrict hunting of threatened animals. Rare and endangered plant species have recently been extended some limited protection on the Federal level, and Section 5001.5 of the State Public Resources Code provides protection for rare and endangered living communities. However, there is limited, if any, regulatory power to assure that more living communities, and individual plant and animal species, do not become rare and endangered in the future.

## Policies

**26. Preserve Significant Natural Areas and Rare Species.** Ecologically significant areas of all coastal natural living communities shall be pre-

served by appropriate means such as public acquisition or incentives to private owners (e.g., conservation easements). (See Policy 150 regarding the establishment of coastal reserves to protect such habitat areas and Part IV for identification of areas.) Rare or endangered plants, animals, and communities shall be protected from destruction or further degradation, and restoration efforts shall be aggressively pursued. Activities shall be restricted and public access shall be carefully managed to prevent significant disruption of the habitat values. It is recommended that new legislation to assist in the designation, preservation, and restoration of rare or endangered plants and communities (habitat types) be adopted, patterned after or expanding existing laws mandating protection for endangered species.

**27. Protect Fragile Habitat Areas.** Natural habitat areas that are fragile, such as tidepools, sea caves, rocks, islets, dune plant habitat areas, and riparian habitat areas, shall be used only for those activities that are directly dependent on these natural resources, such as nature education or research, and only to the extent to which no significant disruption of habitats or environmental damage will occur, except as provided for coastal-dependent development (see Policy 62). (See also Recreation section on Controlling Recreation to Protect Resources.)

**28. Control Development Adjacent to Significant and Fragile Habitat Areas.** Development in areas adjacent to significant or fragile habitat areas shall be controlled carefully to prevent adverse impacts which may significantly degrade the qualities of those areas. Specifically:

a. **Priority for Complementary Uses.** Priority shall be given to proposed developments or activities that are complementary to wildlife uses, such as hunting and fishing preserves or grazing lands that serve as auxiliary feeding areas for wildlife.

b. **Restrict Disturbance of Shoreline Habitats.** New development shall be of a type and intensity and set back so as to prevent significant adverse impact to these habitat areas. No unnecessary disturbance or destruction of existing shoreline and intertidal habitats or dune vegetation shall be permitted.

c. **Maintain Natural Vegetation.** New development, including new divisions of land and construction on existing lots, shall be regulated to maintain a natural vegetation buffer strip along all lakes, lagoons, wetlands, and intermittent and perennial rivers and streams (excluding those carrying water only very rarely, and not in a distinct channel) in the coastal resource management area. The strip shall be as wide as necessary for protection of habitat areas, but in no case less than 50 feet wide except for minor intrusions upon natural vegetation (e.g., small boat docks, utility pipe lines, etc.). The strip shall normally consist of indigenous vegetation, but in partially developed areas appropriate landscaping may be acceptable where the habitat area will not be adversely affected.

**29. Minimize Habitat Damage Wherever Development is Permitted.** In addition to the special criteria governing significant or fragile habitat areas identified in Policies 26-28 above, development (including urban development, roads, logging, farm operations, or other human activities that reduce or affect natural areas) shall be regulated in other portions of the coastal resource management area to minimize the amount of natural land and vegetation that is altered and to strictly avoid unnecessary impact of such activities on these ecological resources.

# AGRICULTURE

## Findings

**Coastal Zone Soil and Climate Create Special Conditions for Agriculture.** Particular combinations of soil and climate along the coast create special conditions that provide high productivity for agriculture. The moderating marine influence extends the effective growing season, provides timing and yield advantages for national markets, and reduces the dangers of large-scale crop-loss from freezing. Crops realizing these benefits may be termed coastal-related. (See Glossary.) The rich soil resources of the coastal zone are not limited to the production of speciality crops, and in the event of need, agricultural production could be converted to staple crops. Many of the soils could grow varieties of wheat, oats, and other basic cereals, vegetables, and many other necessary crops.

**Type and Extent of Coastal Agriculture.** Over 3.5 million acres are now being used for agriculture within the coastal counties, with about 340,000 used for principal coastal-related crops. The balance is used for irrigated or non-irrigated pastures for sheep and for dairy and beef cattle. Some pasture lands could be converted to specialty crop-producing areas if market, financial, climatic, and water supply conditions were favorable. Even for grazing, coastal lands enjoy unusually high productivity. Coastal-related agricultural lands in many areas extend several miles inland.

**Much Coastal Agricultural Land Is Prime.** Much of the coastal agricultural land is considered prime by U.S. Soil Conservation Service standards and by the broader definition, which includes economic factors, used for the State's preferential tax program, the Williamson Act (Government Code, Section 51201), which is as follows:

- All land which qualifies for rating as Class I and Class II in the Soil Conservation Service land use capability classifications.
- Land which qualifies for rating 80 through 100 in the Storie Index Rating.
- Land which supports livestock used for the production of food and fiber and which has an annual carrying capacity equivalent to at least one animal unit per acre as defined by the U.S. Department of Agriculture.
- Land planted with fruit- or nut-bearing trees, vines, bushes, or crops which have a nonbearing period of less than five years and which will normally return during the commercial bearing period on an annual basis from the production of unprocessed agricultural plant production not less than $200 per acre.
- Land which has returned from the production of unprocessed agricultural plant products an annual gross value of not less than $200 per acre for three of the previous five years.

**Non-Prime Lands Are Also Valuable.** Lower quality soils can also be valuable for producing crops with special climatic requirements, such as avocados, brussels sprouts, broccoli, artichokes, and celery. Grasslands constitute a major renewable resource that, as livestock feed, is converted to milk, meat, and other products.

**Coastal Agriculture Is Economically Important to California.** Coastal agriculture provides as many as 350,000 jobs in and serving agricultural operations within five miles of the coast. Agriculture and food processing employment is substantial in some counties (e.g., Santa Cruz and Monterey). Gross revenues from agricultural crops are a major factor in the State's economy. In 1969, the value of the 24 principal coastal crops in the 15 coastal counties was estimated at almost $500 million — more than half of the State total for these crops. Nationwide, coastal crops are important economically and as food supply.

**Urban Development Threatens Coastal Agricultural Lands.** Vast areas of agriculturally productive lands in California

Harvesting lettuce, Guadalupe (south of Pismo Beach), San Luis Obispo County

have been lost to urban expansion. One out of 12 acres (about 8 per cent) of cropland in the coastal counties were lost in the 1960's. Although some recent studies indicate that public revenues from agriculture are greater than public costs, the traditional concern for an expanding economy, employment, and tax base, combined with current tax assessment policies, continue to give precedence to urban development. Urbanization pressure causes other problems for agriculture:

- Subdivisions and lot splits fragment land and ownership patterns, making some farm operations less practical;
- High land costs and taxes increase operating costs;
- Residential development near agricultural areas brings complaints about farm dust, odor, pesticides, and noise, while it increases the problems of vandalism, trespass, dogs and other animals, and air pollution that adversely affect agriculture.

**Retention of Coastal Agricultural Lands Provides Many Benefits.** World food shortages, price increases, and national balance of payment considerations have spurred public interest in preserving productive agricultural lands. Projections of future food needs — and the lesser efficiency or impossibility of growing many crops outside the coastal zone — make existing coastal agricultural lands a natural resource of statewide and national concern. Fuel and fertilizer costs, and the probability that future yield increases will be achieved only through energy-demanding techniques, add to the value of naturally fertile coastal lands. Retention of agricultural land, whether for specialty crops or less intensive grazing, not only helps provide food but can also guide urban growth, reduce public expenditures for urban service extensions, preserve open space and wildlife habitats, provide beneficial use of land that is hazardous or inappropriate for other types of development, and maintain future land use options, such as conversion of grazing lands to more intensive crops.

**Agriculture Can Have Adverse Environmental Effects That Require Control.** Agricultural operations may have such adverse effects as introduction of toxic pesticides and nutrients leading to eutrophication of watercourses, removal of large areas of native vegetative cover (common in the development of citrus and avocado orchards), and heavy drafts on surface and groundwater supplies.

**Greenhouses Have Special Characteristics.** In some coastal areas, prime agricultural lands are covered by greenhouses. Significant conversions of open field agriculture to greenhouses have occurred in recent years. Greenhouses may offer economic advantages in production of several crops (notably vegetable seedlings, flowers, and houseplants) but may also impose substantial environmental costs: loss of open space, increased per-acre energy and water use, loss of soil capability by grading or compaction, pesticide and nutrient concentrations in increased runoff.

**Greenhouses May Be Appropriate in Urban-Rural Fringe.** The profitability of greenhouses can support higher land and water costs. The visual impact of the structures is lessened by placing them adjacent to existing development. They may allow continued productive use of productive lands without many of the common urban-agricultural use conflicts (such as spraying affecting nearby residents).

**Additional Preservation Measures for Coastal Agriculture Are Needed.** Some agricultural preservation measures are now in effect in California, but new and expanded techniques and increased public awareness are needed to preserve valuable production areas. Local and State efforts to preserve agriculture are hampered by the lack of a Federal agricultural land policy, although agricultural lands are a national resource. Existing laws do not adequately provide for the preservation of valuable agricultural land. This problem is not unique to the coast, although it is perhaps more urgent there due to high urbanization pressures. Possible techniques to discourage land speculation include:

- Further revision of State and local tax assessment policies;
- Strengthening the Williamson Act (for instance, by authorizing the coastal agency to designate preserves);
- Revision of State and Federal inheritance taxes;
- A "land gains" tax on land-sale profits.

Development easements or purchase-leaseback arrangements (scenic lands could be leased for limited grazing) could offer semi-permanent public protection of agricultural lands. Loan programs (such as long-term, low-interest loans for capital improvements needed to meet environmental quality regulations) and subsidies may also be necessary to maintain the economic viability of agricultural operations, as might the mandatory application of protective measures by local jurisdictions (for example, by requiring local governments to zone prime agricultural lands for exclusive agricultural use).

**Good Management Is Essential to Maintain Profitable Agriculture.** Whether or not individual agricultural holdings can be maintained as economically productive units is dependent on good management as well as resource (land capability) and fiscal considerations. Therefore, economic evaluations done on a parcel-by-parcel basis must consider the efficiency of current and past management practices for a particular parcel (including the willingness to make appropriate capital investments) as part of the determination of the parcel's long-term economic viability.

## Policies

**30. Basic Policy: Protect Agriculture and Its Economic Viability.** Because coastal agriculture contributes substantially to State and national food supply and is a vital part of the State's economy, the State's goal shall be to maintain agricultural lands in agricultural production.

**a. Preserve Prime Agricultural Lands.** Prime coastal agricultural lands (as defined in the Williamson Act, Government Code, Section 51201) and all lands now being used or appropriate for producing coastal-related crops shall be maintained in agricultural use, except as provided in Policies 32, 33, and 35 below. These lands are to be protected both to meet current agricultural production needs and as a land reserve to meet future food production needs.

**b. Preserve Other Agricultural Land in Suitable Locations.** Other coastal lands shall also be protected for productive use if (1) they are now in or have potential for agricultural use for crops and grazing and are suitable for such use (i.e.,

unless the applicant demonstrates that continued or renewed agricultural use is infeasible due to excessive farming costs); and (2) they are located in areas where a significant amount of land is in agricultural use or where maintaining agricultural lands in open space uses helps implement other Coastal Plan policies (e.g., watershed management).

c. **Assure Land Valuation Consistent with Maintenance of Agricultural Uses.** Because the economic future of much coastal agricultural land is threatened by many factors (e.g., inflation in costs of labor, energy, materials, and borrowing; production cost increases resulting from past development policies, high tax and utilities assessments; breakdown of land holdings into parcels of uneconomic size for agriculture; and conflicts with vandalism from nearby urban development), new programs are needed to help offset current practices whereby agricultural land is priced at non-agricultural uses by the private market. It is recommended that (1) tax relief measures be implemented as soon as possible (see Policy 31); and (2) other economic problems, such as high interest rates for farm loans, be analyzed statewide to determine whether the State should provide financial assistance to agriculture and, if so, what would be the best approach.

d. **Implement Land Use Policies While Developing Long-Term Programs.** The long-term statewide approaches outlined in paragraph (c) above and in Policy 31 may require considerable time to complete. In the meantime, many of the economic problems affecting coastal agricultural production that result from development pressures can be effectively addressed through Coastal Plan Policies 32-37. These policies shall be implemented as soon as possible while work continues on solutions to the broader economic problems confronting agriculture statewide.

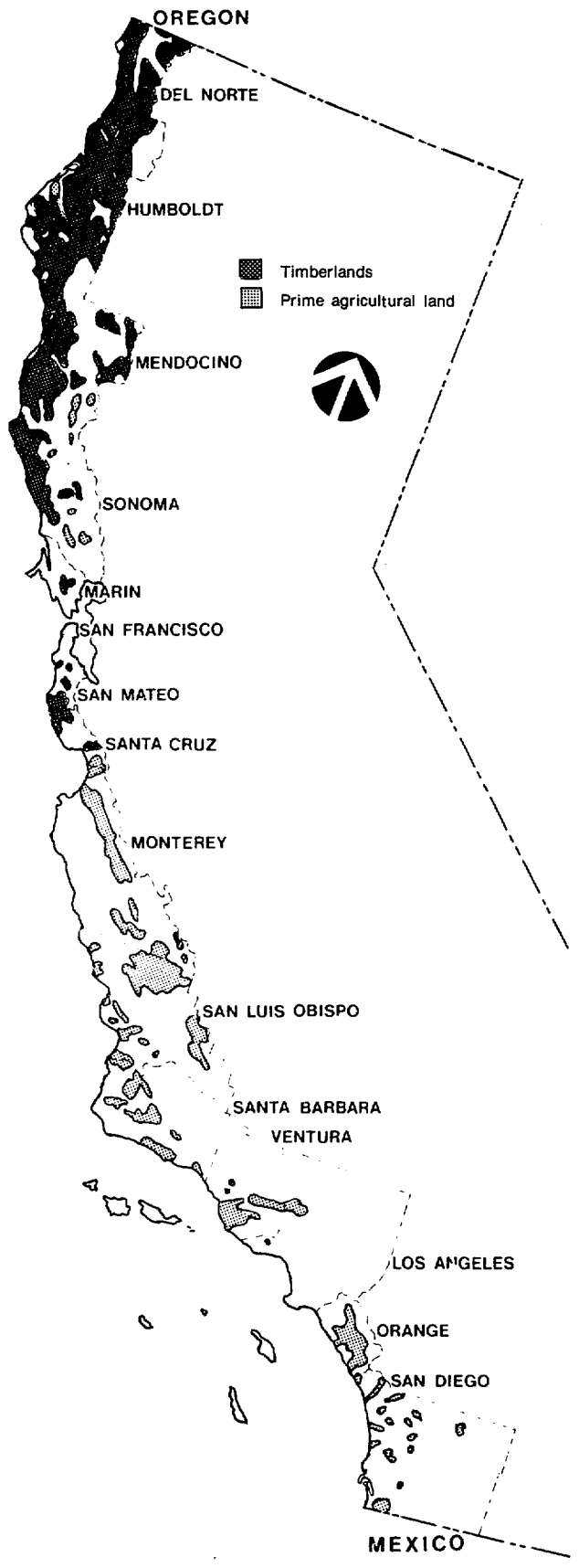
**31. Provide Statewide Programs for the Maintenance of Agricultural Lands.** Because protection of agricultural lands involves complex economic and land use problems resulting from urban encroachment and development pressures on remaining agricultural lands, it is recommended that high priority be given statewide to appropriate programs to assist in preserving and maintaining productive agricultural uses including: (1) agricultural zoning and land use regulation, (2) tax assessment based on agricultural value, (3) scenic easements and similar programs, and (4) statewide financial assistance and research programs. These statewide measures shall be vigorously pursued, and the coastal agency shall cooperate with other agencies to implement the following:

a. **Maintain Agriculture Through Local Regulations.** Acting in accordance with Article 28 of the State Constitution, which establishes the importance of agricultural soils for the production of food and fiber and as an economically viable way to retain land in open space, it is recommended that the State provide permanent protection of such valuable lands through legislative action and require the application of protective measures (e.g., land use regulations that prevent unwarranted conversions and strengthened subdivision controls) by local jurisdictions statewide.

b. **Revise Tax Laws.** To prevent property tax hardships on owners of agricultural lands, it is recommended that (1) the Williamson Act be revised and/or existing laws (e.g., AB 4107, providing that property tax assessments shall reflect restrictions on use) be rigorously applied; (2) taxation of agricultural lands be based on actual productivity rather than on potential productivity or some non-agricultural use; (3) State and Federal inheritance and income tax laws be reevaluated and revised to avoid adverse impacts on agriculture; (4) specific consideration be given to exempting farm families from State inheritance taxes after permanent use restrictions have been placed on crop or grazing lands or to changing State inheritance taxes, similar to current Federal legislation recently introduced, to drastically reduce such taxes for farm families; and (5) legislation be enacted declaring that the regulation of agricultural lands in accordance with the provisions of the Coastal Plan be deemed an enforceable restriction and that, notwithstanding any other provisions of law, the highest and best use of agricultural land in the coastal zone is agriculturally related use.

c. **Develop Research and Other Programs to Assist Agriculture.** It is recommended that existing agencies (e.g., the University of California Division of Agricultural Sciences, U.S. Soil Conservation Service, State Department of Food and Agriculture, and others) continue and expand programs to assist agriculture such as research and development of integrated pest control management, agricultural waste controls, and long-term management practices designed to avoid soil erosion and soil degradation. Where severe erosion, soil degradation, or agricultural waste pollution is occurring, governmental agencies shall be authorized to require range improvement practices or other corrective measures.

## Timber and Agricultural Lands in Coastal Counties

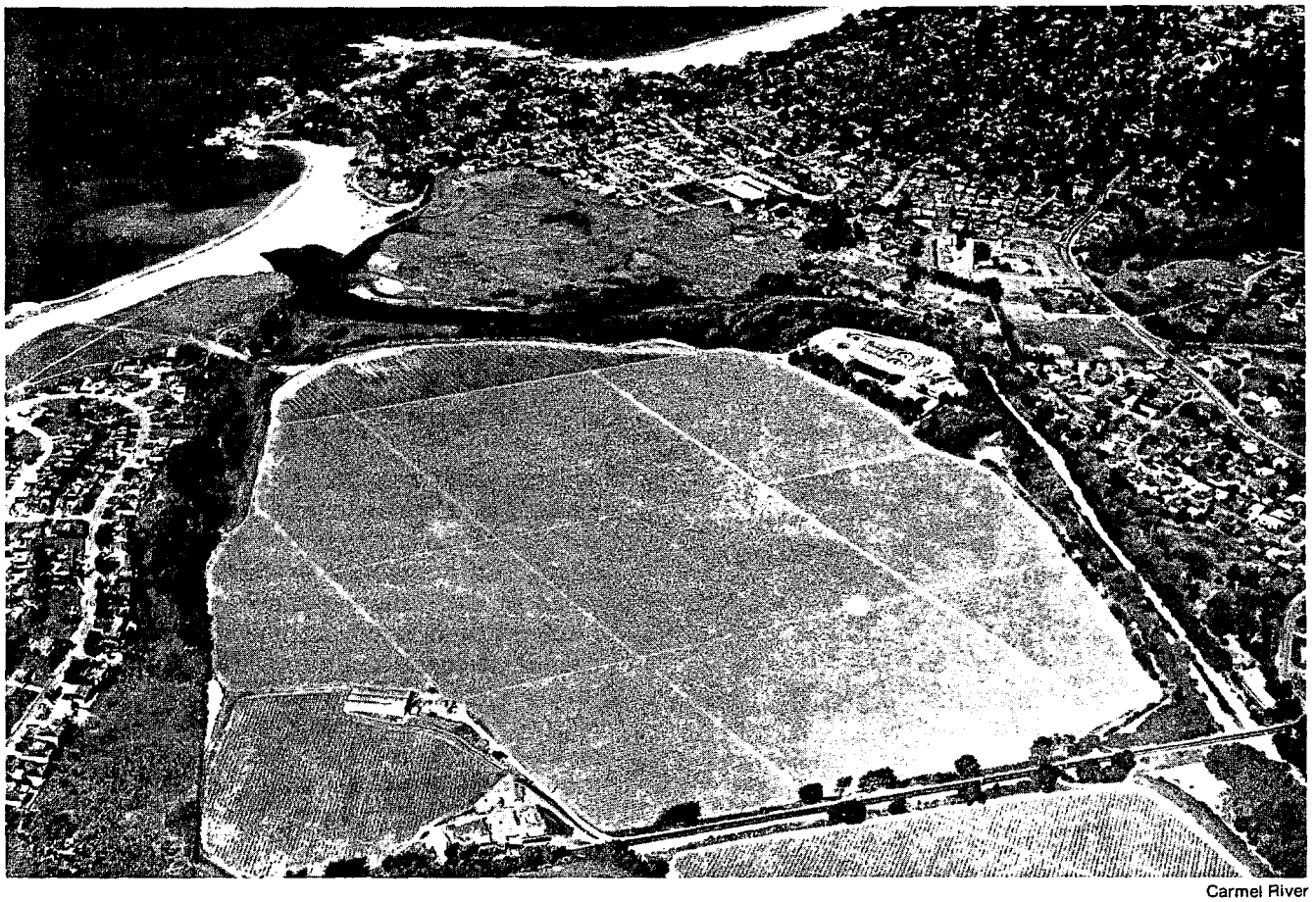



**d. Provide State Economic Assistance if Appropriate.** It is recommended that, where other means of preserving agricultural lands and maintaining agricultural uses are not effective, agricultural assistance programs be fully investigated and appropriate actions implemented, such as direct farm loans, loan guarantees, and agricultural use easement or purchase-leaseback techniques.

**e. Selective Public Acquisition of Agricultural Lands in the Coastal Zone.** To permanently curtail urban intrusions into prime agricultural areas adjacent to expanding communities when all other methods of achieving this objective prove inadequate, selective public acquisition of easements or other interests in land shall be used to establish limited agricultural buffers (similar to such acquisition programs now in effect in a number of eastern states). Acquisition of such interest should also be used to protect prime lands not now in production but needed to meet long-term food needs. A revolving fund program should be established to assemble prime lands that are now subdivided into parcels of uneconomic size and then to resell the combined larger holdings to farmers and ranchers.

**f. Provide Financial Help to Relieve Specified Hardships Situations in Coastal Zone Agriculture.** For farm families approaching retirement, scenic easements over agricultural lands might be purchased as an alternative to conversion as a source of retirement income. (See also Part III regarding acquisition programs.) Because of higher costs of farming near urban fringe areas resulting from public approval of development next to farms, public financial assistance in some form may be necessary to keep land in agricultural production (e.g., tax relief). If other techniques fail, public acquisition should be considered. To this end, selective acquisition of easements or other interests in land may be used by local governments and by the proposed Conservation Trust (see Part III).

**32. Establish Stable Urban-Rural Boundaries.** Because the sprawl of urban development into nearby agricultural areas has systematically diminished the available amount of agricultural land and has generated serious land use conflicts between existing agricultural and encroaching urban uses, further urban encroachment into prime agricultural lands shall be curtailed; however, some limited development may be allowed on the urban fringe to complete logical urban development patterns and to assure a well-defined, stable demarcation between urban and agricultural uses.



Carmel River

To establish stable urban-rural boundaries, a three-step program set forth in paragraphs (a), (b), and (c) below shall be implemented in coastal zone areas containing coastal agricultural lands. The three basic steps are: (1) analyze the subregional agricultural economy to determine generally the scale of agricultural activity necessary to provide the flexibility to meet changing market conditions; (2) establish specific local agricultural maintenance programs; and (3) establish stable urban-rural boundaries along the urban fringe by designating long-term land uses for specific parcels (based on the two preceding steps). These three steps shall be implemented as follows:

a. **Consideration of the Subregional Agricultural Economy.** As part of the subregional planning process, an analysis of the local agricultural economy (relying primarily on existing data) shall be made to determine the steps necessary for the long-term protection of agricultural lands and for reconciling conflicts between agriculture and existing development in urban-rural fringe areas. One purpose of the economic study shall be to identify danger points where the cumulative effect of individual conversions aimed at establishing stable urban-rural boundaries could severely weaken or undermine the stability of the agricultural economy of the area. The study shall include at least the following considerations: (1) estimates of the acreage and types of agriculture sufficient to provide a safe and conservative margin of activity necessary for sustaining a viable agricultural economy and to maintain a scale of activity capable of meeting changing market conditions and providing competitive economies of scale for production and labor; (2) the level and mix of agricultural activity necessary to support the required service facilities and industries (processors, buyers, farmworker housing); (3) parcel sizes for individual crops of the subregion required to maintain a competitive market position; and (4) recommendations for implementing a program to protect remaining agricultural lands from conversion.

b. **Assure Long-Term Agricultural Land Use.** Based on the subregional analysis of the agricultural economy, local general plans and zoning shall provide for (1) preservation of agricultural areas sufficient to protect the economic vitality of the subregion; (2) the orderly development for urban uses of available lands not suited for agriculture prior to

conversion of any agricultural lands; (3) an implementation program involving long-term measures in addition to zoning to protect agricultural lands (including the establishment of stable and clearly delineated buffer areas between urban and agricultural uses by such means as purchase of open space easements — see Policy 36(f); and (4) specific measures to assure that projected levels of urban development in the subregion will not significantly increase public service costs or assessment costs of agricultural lands (e.g., for sewer or water services) or degrade air quality to a degree that would have significant adverse impacts on agricultural productivity.

c. **Designate Land Uses for Fringe Area Parcels.** The agricultural protection program may also designate some agricultural land for conversion where agricultural viability is severely limited by urban-rural conflicts or where conversion is necessary for development to create viable neighborhoods and establish a stable limit to urban development (with particular regard for the requirements of Policy 37). For instance, evaluations shall be conducted of existing fringe neighborhoods employing socio-economic and public services planning criteria to identify viable neighborhood sizes. Based on these evaluations a very limited number of fringe parcels may be converted; specific parcel designations shall be made on the basis of the criteria set forth in Policy 33(a) as related to the data and programs developed in the steps in paragraphs (a) and (b) above.

d. **Interim Policy for Urban Centers Surrounded by Prime Agricultural Lands.** Because some coastal cities (i.e., developed areas of the Oxnard Plain, the Carpinteria Valley, the Salinas Valley, and the Pajaro Valley) are completely surrounded by prime agricultural land and might otherwise suffer disruption of recent efforts to foster orderly development, prior to completion of the subregional agricultural plan, expansion of an existing developed area onto prime agricultural lands shall be permitted if (1) there are no alternative areas for expansion that would result in less environmental damage; (2) the only parcels considered for conversion shall be those located within a contiguous band surrounding the developed area which already has major services in place (e.g., sewer trunk lines) and where parcels can reasonably be developed within one year of the effective date of legislation enacting the Coastal Plan; and (3) conversion would be consistent with the criteria of Policy 33(a).

**33. Designate Use of Remaining Agricultural Parcels Within Highly Developed Areas.** Because the designation of future uses of agricultural parcels located within highly developed areas generally would not involve significant impacts on the subregional agricultural economy (in contrast with fringe area parcels), designations of prime agricultural parcels located within these highly developed areas shall be made on a parcel-by-parcel basis, in accordance with the criteria in paragraph (a) below, rather than on the basis of a subregional agricultural economic study. Except as provided in paragraph (c) below, these parcels shall be designated as part of the subregional or local coastal planning process. The parcel-by-parcel decisions shall weigh the economic value of continued agricultural production on individual parcels against the potential benefits resulting from conversion pursuant to other Coastal Plan policies (for instance, encouraging the concentration of development within existing developed areas). Parcels not located within highly developed areas shall be governed by the provisions for urban fringe area parcels contained in Policy 32. For purposes of this policy, highly developed areas are those where 80 per cent of the land area within one-half mile of the perimeter of the parcel is developed to a density of at least three residential units per net acre or to 80 per cent of the maximum commercial or industrial usage permitted by zoning for the area.

a. **Criteria for Designation.** The designation of a parcel for either agricultural or urban use shall consider at least each of the following: (1) the long-term agricultural production yield potential of the parcel in question; (2) the size of the parcel and whether the parcel can be combined with adjacent or nearby agricultural parcels for agricultural purposes; (3) whether the parcel is contiguous with developed areas; (4) whether the parcel is in close proximity to urban services such as roads, sewer and water; (5) whether the parcel could be maintained in productive use by use of greenhouses; (6) energy, transportation, and water costs compared with inland areas where the same crops are grown; (7) potential for generating development pressure on nearby agricultural parcels; (8) the absence or presence (for five years or more) of agricultural-urban use conflicts and the severity of such conflicts; (9) whether the parcel could provide recreational uses; and (10) whether the conversion of the parcel to urban development would further other Coastal Plan policies (e.g., concentrating development in existing urbanized areas) or contribute to the completion of partially filled neighborhoods.

b. **Designated Parcels Should Remain in Agricultural Use.** If a parcel is designated for agricultural use, the designation shall be for not less than 10 years.

c. **Prevent Conversion Prior to Making Specific Designations.** Prior to adoption of subregional or local coastal plans, parcels or contiguous areas of prime land that are five acres or more in size and have been in agricultural production for at least two seasons in the past 10 years shall not be converted to development in whole or in part; conversion of other small-parcel agricultural land within a highly developed area shall be allowed only in accordance with Policy 34. Immediate conversions shall be allowed for parcels of two acres or less in existing subdivisions where more than 50 per cent of the parcels are already developed and the parcel is generally surrounded by urban development.

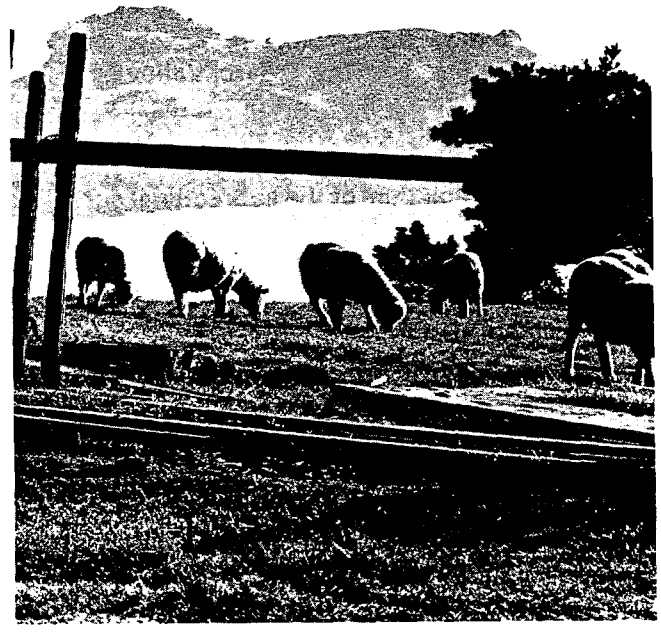
**34. Criteria for Maintaining Non-Prime Agricultural Lands in Production.** The conversion of lands that are not prime or suitable for coastal-related crops shall not be permitted unless (1) the applicant demonstrates, in accordance with paragraph (a) below, that continued or renewed agricultural use of the parcel is infeasible on a long-range basis because of the location, size, soil type, or other characteristics; (2) as specifically provided for prime agricultural lands; or (3) the conversion of non-prime lands would further the Coastal Plan policies of preserving prime agricultural lands and of concentrating development in existing urban areas in proximity to major employment centers or providing public recreational opportunities compatible with nearby agricultural uses.

a. **Determination of Infeasibility.** Determination of infeasibility for continued or renewed agricultural use shall be made after consultation with local agricultural producers and appropriate professional advisors. If the infeasibility is economic in form, before conversion is permitted, the possibility of tax relief, public loan assistance and public acquisition, and probable future needs for agricultural production shall be examined. This shall include the possible recombination of small parcels (e.g., rural subdivisions) into larger units where agriculture can be profitably practiced.

b. **Partial Conversion Preferred.** The partial conversion of such lands to compatible uses (see Policy 57) providing sufficient income to allow continued agricultural use of the remainder of the parcel shall be considered the preferred alternative to total conversion. Such partial conversions shall meet the following conditions: (1) the limited development is compatible with continued agricultural use on the parcel and on surrounding parcels and does not increase tax assessments on nearby agricultural parcels (see Policy 37); (2) as much of the parcel as feasible will be kept in agricultural use; and (3) the area retained for agricultural production shall be placed under long-term (i.e., 25-30 years or longer) agricultural use restrictions. This partial conversion alternative shall be considered in primarily rural areas.

c. **First Opportunity for Public Purchase.** Prior to the aproval of any conversion of such lands, the applicant shall grant the Coastal Conservation Trust (see Part III section on Acquisition and Restoration of Coastal Lands) the first "right of refusal" to purchase such lands at a value equivalent to the conversion value.

**35. Permit Only Agriculturally Related Development on Agricultural Lands.** New development on agricultural lands shall be limited to construction necessary for farming and timber harvesting, such as farm residences and buildings, farmworker accommodations, farm and lumber service facilities, farm and lumber roads, or other uses attendant to an agricultural or timber-harvesting economy, except for conversions approved pur-



Sonoma County

suant to Policies 32-34 or for special facilities as provided in paragraph (b) below. Major agricultural service facilities, however, shall be located within rural communities unless such a location is infeasible. Any such development permitted on agricultural lands shall be sited and designed to minimize adverse impacts on agricultural operations.

a. **Greenhouses.** Greenhouses may be permitted on agricultural lands within developed areas or the urban-rural fringe in accordance with agricultural protection plans. Outside of these areas, greenhouses that degrade soil capabilities of prime land shall be treated as conversions.

b. **Special Facilities.** Agricultural lands may be converted to non-agricultural use where (1) conversion is required for public service, energy, and transportation facilities or for mineral extraction; (2) the proposed facility or activity is necessary and is consistent with other Coastal Plan policies; (3) there is no alternative location that would meet the same need with less environmental damage; and (4) such facilities are sited and designed to minimize adverse impact on the agricultural resource.

**36. Limit Division of Land Within Agricultural Areas.** Except for conversions permitted pursuant to Policies 32-35, subdivisions and lot splits shall not be permitted to reduce agricultural parcels to a size that could be uneconomic or impractical for continued agricultural production on the parcels in question or on adjoining parcels (e.g., 40-acre minimums would allow only a total of 25 residences in a 1,000-acre area whereas 5-acre minimums would allow 200 residences with the potential for significant increase in dog, road, and vandalism problems). Where divisions of agricultural lands are allowed for agricultural purposes (such as long-term leasing of specific parcels), the approval of such divisions shall be conditioned on the recording of appropriate restrictions precluding the future division of the parcels and limiting the use of the parcels to agricultural activities. It is recommended that the Subdivision Map Act be amended to exempt agricultural lands from the requirement for the recorded division of land for long-term leases where the purpose of the lease is for agricultural production or an agriculturally-related use.

Field of lilies, Smith River, Del Norte County

**37. Regulate Development and Land Division Near Agricultural Areas.** Except for conversions permitted pursuant to Policies 32-35, new development, land division, or the formation of urban assessment districts shall be allowed adjacent to agricultural lands only if (1) the type of use proposed will not interfere or conflict with continued agricultural use and the development is designed to avoid conflict with farming practices (e.g., clustering housing as far away from agricultural spraying areas as possible); and (2) it will not have an adverse economic effect on the long-term preservation of agricultural lands (e.g., adjacent lands are under agricultural use restrictions and agricultural lands will not be assessed for urban services or taxed on the basis of urban property values).

# FORESTRY

## Findings

**Commercial Timberland Is a Valuable Coastal Resource.** The commercial timberland of the coastal zone is a valuable natural and economic resource. It must be managed carefully to ensure its maintenance as a renewable economic resource, to retain its valuable wildlife, fisheries habitat, and scenic and recreational potential, and to protect watersheds from erosion and excessive runoff due to the removal of vegetation. The basis of a sound, healthy timber industry is protection and husbandry of soil. The California Forest Practice Act of 1973 has as major objectives the maintenance of commercial timberland to ensure long-term sustained yield, and the protection and enhancement of fish and wildlife habitat, soil and watershed resources, and recreational use of timberland.

**Improper Management Has Reduced Forest Resources.** In the past, unsound forest management practices, conversions of timberland to other uses such as residential development or agriculture, and site dominance by non-commercial successional species have contributed to the decline in the historical timber inventory in California. Land divisions have often produced small uneconomic parcels that force the harvesting of timber when it is not desirable.

**Revision of Timber Taxation Methods Is Needed.** Current methods of timber taxation, which treat most mature standing timber as "property," encourage unsound forest management on small timber ownerships, resulting in reduced forest yield. Revision of present timberland taxation practices (for example, replacing the property tax with a "yield tax" that would tax the timber as it is removed) is needed to encourage conservation and long-term renewal of this resource.

## Policies

**38. Protect Coastal Forest Resources.** Because timber is renewable while many other vital construction and industrial raw materials are not, timber harvesting is a vital and necessary industry that should be encouraged and safeguarded. To that end, forestry resources shall be managed as part of comprehensive watershed management, as set forth in Policies 21-25. Timber harvesting

Old-growth coastal redwoods, Humboldt County

and timberland conversions shall maintain long-term productivity and protect environmental quality, including the fisheries resources of coastal streams, while encouraging appropriate use of this important renewable resource, using the criteria in the following sections. These policies shall be implemented primarily by the Division of Forestry and the Board of Forestry and through local coastal plans, with participation and comment by the coastal agency. The coastal agency shall review and report progress toward meeting these objectives annually to the Governor and Legislature.

a. **Restrict Conversion of Productive Timberlands.** Conversions of high-quality redwood, Douglas-fir, or other coastal commercial timberlands (site I, II, or III) to other uses or their division into units of non-commercial size shall be allowed only for necessary timber processing and related facilities and for specific uses that may be permitted as provided in Policy 35 for agricultural lands. Other coastal areas now in use for forestry shall be protected for productive use and open space value except as provided for non-prime agricultural land conversion (see Policy 34).

b. **Protect Scenic Qualities of Timberland.** Timber harvesting, including road construction and debris removal, shall be regulated to protect the scenic quality of areas that are highly visible from public roads, foot and bicycle trails, coastal rivers and streams, beaches, and parks. Such regulation shall favor use of selective timber-harvesting methods or the use of small, carefully designed clear-cut areas. Buffer areas shall be preserved to provide maximum feasible screening of new logging operations from such public viewing points.

c. **Protect Water Quality from Adverse Effects of Logging.** Timber harvesting in key watershed areas (those that are vital to the water supply of coastal communities or that drain into sensitive coastal water areas such as wetlands) and along all stream banks shall be strictly regulated and forest management practices within these areas conducted to prevent such adverse effects as damage to stream and riparian habitats, siltation, or harmful runoff. Specific "buffer zones" shall be established (with assistance from water quality, wildlife, and fisheries agencies) where commercial harvesting of timber shall be closely regulated or not allowed.

d. **Restore and Enhance Timber Resources.** Programs for rehabilitation and enhancement of commercial timber resources shall be developed, with State encouragement or appropriate incentives, and implemented according to priorities developed as part of watershed plans.

**39. Modify Taxation to Encourage Sustained Yield.** Because the current practice of annually assessing timber lands encourages the conversion of those lands rather that sustained yield timber management, it is recommended that State laws governing timber taxation be amended to require taxation of timber when it is harvested (i.e., stumpage tax) instead of taxation annually in the manner of real property. Although the ultimate tax yield over the years would be the same, appropriate adjustments to offset the temporary inequities that may occur to both timber property owners and local governments during the conversion to the new taxation system need to be included.

# SOIL AND MINERAL RESOURCES

## Findings

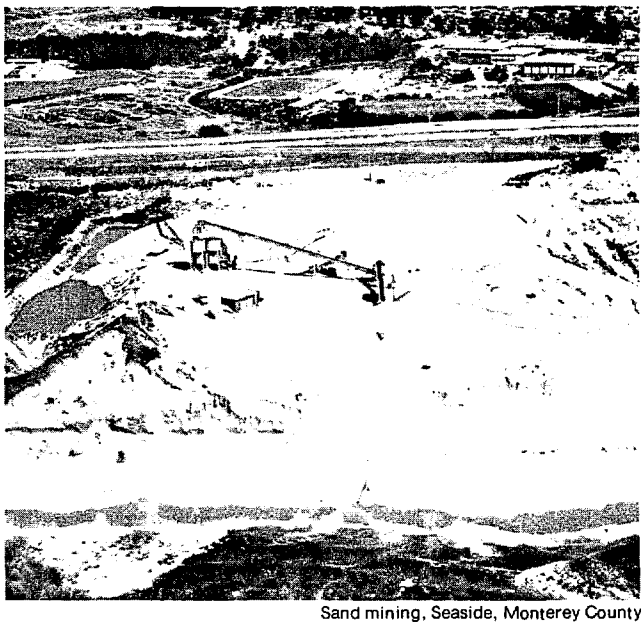
**Soil Quality Is Important to Coastal Conservation and to Development Decisions.** Soil is a valuable and irreplaceable coastal zone resource. Soil absorbs and stores rainfall that recharges underground aquifers, sustains agriculture and timber production, and supports natural vegetation, wildlife habitat, and a great variety of human activities. Soil maps inventory the distribution, quality, and limitations of the land. Such maps can aid in land use planning and in review of development proposals by identifying areas of prime soil for agriculture and timber production and areas with potential soil erosion, waste disposal, instability, or other problems. Several coastal counties have already completed detailed soil surveys. Data presently available includes the California Soil Vegetation Survey, which includes soil and vegetation information for over eight million acres of upland soil, and Department of Water Resources surveys classifying California lands for suitability for agriculture in terms of slope, soil

texture, and other limiting characteristics. Major land use categories, including urban development, agriculture, and certain types of recreation, are being mapped periodically to determine changes in land use. Most of the coastal areas have been mapped twice at an interval of about 10 years.

**Several Non-Petroleum Minerals Are Extracted in the Coastal Zone.** California's coastal zone contains many non-petroleum minerals; sand and gravel are the most important economically. Construction material needs can be largely met by mining non-coastal mineral deposits, with the exception of specialty sand and other unique coastal minerals. Increased demand for non-petroleum minerals is leading to increased interest in offshore mining. Recent developments in offshore mining technology are helping to make offshore mining competitive with land operations. Seawater also holds promise as a source of more salt, magnesium, and other minerals. On land, the geographic sprawl of cities threatens to cover many mineral deposits, primarily sand and gravel resources located near urban areas. Also, urban residents often object to nearby mining operations.

**Sand and Gravel Extraction Involves Environmental Impacts.** Mineral extraction, primarily of sand and gravel, involves many environmental hazards. Open-pit mining removes all vegetation, creates disposal problems, may pollute both air and surface water, and deprives wildlife of habitat. Suction dredging (using vacuum pressure to recover underwater resources) disrupts bottom life, can pollute the water with silt and residual material, and can create dredge-spoil disposal problems. Dragline mining, which scrapes off surface materials with a bucket suspended from an arm, either on land or underwater, can cause the environmental damages of either open-pit mining or suction dredging. Sand and gravel extraction also can reduce spawning grounds. Mining of coastal sands has noticeably depleted this resource in some locations.

**Mining Regulations Are Needed.** Strict environmental controls such as dredge disposal standards, dust and noise control equipment, and reclamation of pit mines, could alleviate many of the problems, although they would also increase mineral extraction costs. Some such regulation is now being done, but it is not uniform throughout the coastal zone.



Sand mining, Seaside, Monterey County

## Policies

**40. Protect Coastal Soil Resources.** Soil productivity shall be protected and development regulated to prevent soil depletion or degradation. Existing building and grading regulations aimed at minimizing erosion shall be strengthened and strictly enforced, including review of local ordinances to ensure that they fully conform with the Coastal Plan. To this end, natural resource inventories, including detailed soil surveys, shall be completed for the entire coastal zone and used to identify valuable soils that shall be protected when formulating land use plans and evaluating proposed projects.

**41. Regulate Mining.** Mining shall not be allowed in sensitive areas such as marshes, lagoons, "living dunes," some streams, and other coastal water areas and landforms that are fragile, valuable, or highly scenic natural environments. Mining shall be allowed in other coastal areas if (1) the mineral extraction will not have a substantial or long-lasting adverse impact upon coastal resources; and (2) in the case of sand mining, the sand supply of the particular watershed is sufficient or alternative sand supply is provided to allow mining without significant adverse impact. (See also Policy 18 regarding dredging and spoils disposal, and Policy 24 regarding stream mining.) In addition:

a. **Provide Buffer Areas.** Buffer areas shall be preserved to provide maximum feasible screening of new on-land extraction operations from coastal roads, trails, water bodies, beaches, and recreation areas.

b. **Restore Mined Areas.** After completion of permitted mining operations, mineral extraction areas shall be reclaimed and replanted to ensure slope stability, erosion control, and adequate drainage and to offer as natural an appearance as possible. Park and open space use shall have the highest priority for the utilization of restored extraction sites.

c. **Establish Environmental Protection Standards.** Noise and dust, surface water pollution, and waste materials and spoils disposal shall be controlled to minimize adverse impacts. It is recommended that uniform statewide regulations be adopted and enforced to provide appropriate standards for these impacts, as well as for reclamation of extractive sites. Implementing these requirements will require the cooperation of the many local, regional, and

statewide agencies that would be involved, coordinated by an agency such as the State Office of Planning and Research.

**42. Inventory and Reserve Mineral Deposits.** To reduce the pressure to mine sand and gravel and other non-petroleum mineral resources in fragile coastal areas, the location, quantity, and quality of mineral resource deposits shall be inventoried statewide, concentrating on potential resources near urban areas where materials can be transported at reasonable cost. Near-city mines and reserves shall be protected from urban encroachment. Designations of appropriate mining sites shall be a part of comprehensive watershed management plans, described in Policy 22.

# AIR QUALITY

## Findings

**Clean Air Is a Coastal Zone Resource.** Clean air is an identifiable economic resource contributing to activities such as cut-flower and specialty crop agriculture and recreation. Coastal areas with clean air also provide a needed refuge for people with asthma and other illnesses. Beyond these tangible benefits, the fresh ocean breeze is appreciated by residents and visitors throughout the coastal zone.

**Air Quality Varies Throughout the Coastal Zone.** Air quality varies greatly among different sections of the coast. Pollution sufficiently severe to damage human health occurs in some locations (generally urbanized areas with adverse meteorological and topographic conditions) and contrasts with normally clean air in others. Certain areas of the State where the national ambient air quality standards are not expected to be achieved by 1980 or to be maintained through 1985 have been designated as Air Quality Maintenance Areas by the California Air Resources Board. Designations were based on the following criteria: (1) areas where the standards are currently exceeded and are not projected to be achieved by 1980, (2) areas currently meeting the national standards in which increased emissions are expected to cause a violation of the standards before 1985, and (3) in the San Francisco Bay Area and South Coast Air Basins, the entire air basin, if any county in the basin meets the criteria above. Coastal areas or air basins designated by the State include the South Coast, San Francisco Bay Area, and San Diego Air Basins, and Monterey County.

**Air Pollutants Originate from Many Sources.** Air pollutants originate from many sources. Motor vehicles constitute the single largest source of nitrogen oxides, carbon monoxide, and organic gases; industry, including fossil-fueled electricity-generating plants, is the chief source of sulfur dioxide. Suspended particulate matter comes from mining, agricultural, and lumber operations, as well as from motor vehicles, incineration, and the combustion of fuel. All these are in addition to natural pollutants such as dust and saltwater particulates.

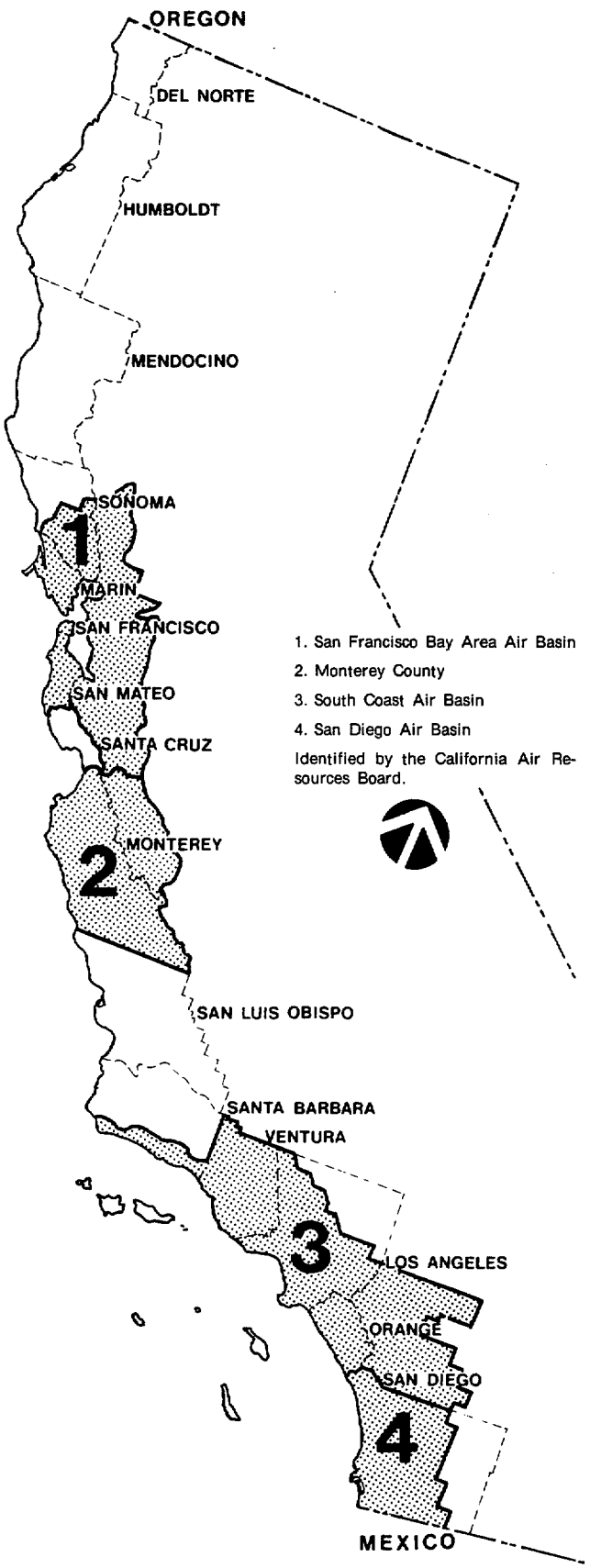
**Distinct Climate of the Coast Affects Air Pollution.** Several distinct meteorological aspects of the coast affect air pollution problems. Temperature inversion layers, which trap pollutants by stopping upward air movement, tend to occur more frequently, at much lower levels, and last longer into the day along much of the coast, because of high-pressure centers off the Pacific Coast or land-water temperature differentials. Land-sea breezes are caused by the temperature differential between the land surface and the ocean surface, on both a daily and seasonal basis. These breezes may push pollutants back and forth without dispersing them throughout a larger area, especially where the topography helps trap pollutants and when winds are relatively weak, as they are in winter. During the summer season, the fog and low clouds along the coast usually prevent formation of photochemical smog, but as winds move the air inland, pollutants produced in the coastal zone can contribute to severe smog at inland locations where the pollutants react with sunlight. Sulfur dioxide pollution is more dangerous in coastal fog areas, where chemical reactions can produce a weak solution of sulfuric acid, injurious to human, animal, and plant health, and damaging to many materials.

**Air Pollution Threatens Public Health and Coastal Zone Resources.** Air pollution limits specifically set to protect human health are now being exceeded in some locations along the coast, creating not totally quantified but very real damage and human suffering. Studies made under Environmental Protection Agency (EPA) auspices are increasingly quantifying the detrimental effects upon health of air pollution levels even under existing secondary standards. In addition to the impacts on human health, the extent of air pollution damage to wildlife and vegetation (including native plants, forests, landscaping, and agricultural crops) is also increasingly being documented. A statewide study estimates crop losses alone from air pollutants in 1970 to be almost $26 million, not including invisible damage.

**Development Patterns May Affect Air Pollution.** The location and intensity of air pollution concentrations greatly influence its effect. Studies suggest intensive transportation corridors are major sources of concentrated vehicle emissions creating a special hazard for humans, wildlife, and plants located nearby. When freeways encourage a net increase in vehicular mileage, they also add to total air basin pollution. Buildings also affect pollution dispersal, generally slowing wind speed over urban areas and modifying wind patterns within particular building masses.

**Project Design Can Help to Minimize Air Pollution.** Careful project design can minimize interference with wind currents,

## Coastal Air Quality Maintenance Areas




especially in local circulation patterns, and can thus maintain natural ventilation. Properly located vegetation barriers ("green belts") can substantially reduce particulate air pollution and some types of gaseous pollutants, especially near ground level, by trapping it on the foliage. Even a 30-foot-wide strip densely planted with trees and shrubs can filter out more than a quarter of some types of pollutants. Project designs which minimize automobile use also aid in reducing pollution.

**Further Air Quality Regulations Are Needed.** Present regulation of air pollution in California is shared among local Air Pollution Control Districts, the State, and the Federal government, and is coordinated by the State Air Resources Board. Present regulations focus on limiting pollutants emitted from stationary and vehicular sources. There is currently no authority to coordinate land use and transportation systems as a means to control air pollution, but this is now being proposed by the Air Resources Board and the EPA. Indirect source controls are also being developed. The EPA is also considering limiting the extent of allowable degradation of existing air quality in any air basin, rather than setting only upper limits on total pollution levels. In addition to requiring each state to prepare and enforce a plan to meet the primary national ambient air quality standards, the Federal Clean Air Act also required each state to prepare and submit by June 1975 an air quality maintenance plan showing how air quality standards will be maintained.

## Policy

**43. Design and Operate Coastal Developments to Protect Air Quality.** New coastal developments (including small-scale development that, together with other projects of the same type would have a cumulative adverse effect upon coastal air quality) shall be planned, designed, and operated to protect and restore coastal zone air quality to the maximum extent possible.

a. **Strive for Maintenance and Restoration of Coastal Air Quality.** Air quality maintenance plans stressing maintenance and restoration of coastal air quality shall be prepared by the appropriate air quality agencies with the cooperation and participation of the coastal agency. Similar cooperation shall be exercised in developing air quality carrying capacity estimates for each clean air region.

b. **Major Pollution Sources.** Major pollution-generating developments, including but not limited to refineries, oil separation, treatment, and storage facilities, airports, freeways, fossil fuel electric generating plants, and major modernization or expansion of any existing such developments shall:

- meet all applicable Federal, State, and local performance and emission standards and regulations;

- be designed, sited, built, and operated using the best available technology and operating procedures to minimize pollution;
- not prevent or interfere with the attainment or maintenance of any applicable ambient air quality standards; and
- not cause significant detrioration of local or regional coastal air quality with respect to any pollution type.

In addition, such developments shall not be built in areas of the coastal zone designated by the California Air Resources Board as Air Quality Maintenance Areas (areas where any national ambient air quality standards are exceeded currently and are not projected to be achieved by 1980, or where such standards are currently being met but increased emissions are expected to cause a violation of the standards before 1985), or in locations where such coastal resources as resort or agricultural areas would be adversely affected, unless (1) there is no alternative inland or coastal location where siting would result in less environmental degradation, and (2) further criteria in Policy 79, regarding fossil fuel power plants, and Policy 88 regarding refineries, are met.

c. **Residential and Commercial Development.** Additional residential development shall wherever possible be located in areas served by public transit systems. (See Policy 59 regarding limitation on remote, auto-dependent developments.) Public transportation and reductions in total vehicle miles traveled shall be strongly encouraged in all new and existing developments by such means as requiring financial contributions to public transit systems in lieu of otherwise required parking spaces (normally in areas served by public transportation), public subsidies of bus systems, and restricting arterial design capacities and on-site parking. (See also Transportation chapter.)

d. **Project Siting and Design.** New projects in the coastal zone shall be evaluated and appropriate mitigation measures required to reduce pollution problems (e.g., on-site open space, green belts, internal circulation systems, and buildings designed and sited to maintain favorable wind currents).

# COASTAL APPEARANCE AND DESIGN

## Findings

**The Coast Is a Visual Resource.** For the most part, the California coastline is an outstanding visual resource of great variety, grandeur, contrast, and beauty that can be enjoyed by all the people of the State. Visual attractions such as the dramatic meeting of land and water, clear skies, unspoiled natural areas filled with wildlife, and the rich texture of urban shorelines add to the quality of life for coastal residents, visitors, and workers, and contribute to the economic success of the tourist industry by attracting many vacationers to the coastline.

**Complexity of Analyzing Coastal Visual Resources.** The systematic analysis and management of coastal visual resources are complex and difficult because of the great variety of natural conditions and the wide spectrum of the degree of development along the coast. At the broadest level the following nine types of landforms have been found to encompass most conditions along the coast; therefore, these are reasonable categories for coastal zone appearance and design policies and guidelines, and lend themselves to greater specificity at the local level based on detailed inventories of existing conditions and problems:

- **Beaches** that may be narrow to broad sand, shingle, cobble, or rock with a wide degree of vegetation ranging from none to thick grasses, such as the Silver Strand, Ten Mile Beach, and Stinson Beach.
- **Sand Dunes** that vary greatly in height and in the degree of vegetation they support, such as Murray Dunes, Monterey Bay Dunes, and Salmon Creek Beach.
- **Coastal Bluffs** that are the angular, irregular coastal edges of marine terraces rising at least ten feet above sea level, such as Point St. George, Santa Cruz North Coast, and Goleta Point.
- **Headlands** that usually fall steeply into the sea along a jagged angular, irregular shoreline, such as Big Sur, Cape Vizcaino, and the Golden Gate Headlands.
- **Wetlands and Estuaries** that encompass bays, lagoons, inlets, and their surrounding wetlands, such as Bolinas Lagoon, San Dieguito, and Pescadero Lagoon.
- **Islands** ranging from large rocks to the expansive Channel Islands, such as Indian Island, Farallon Islands, and Santa Catalina Island.
- **Headlands, Hillsides, and Canyons** that are usually steep and rugged and include rare vegetation, small scale features, abundant wildlife, and outstanding visual features, such as Bixby Canyon, Los Trancos Canyon, and the San Clemente hillsides.
- **Upland Terraces and Plains** that are generally broad, flat coastal lands stretching inland from the sea to the coastal mountains, such as much of the Mendocino Coast, San Mateo coastline, and the Irvine Properties.
- **Rivers and Streams** that are the upland portion of estuaries that are connected to the sea and that are often meandering, broad open areas shaped by the paralleling hills, such as the Smith, Tijuana, and Russian Rivers

**Deterioration of the Appearance of the Coast.** In some areas, manmade changes have provided new access to the coast and new opportunities to enjoy the coast, while respecting the special visual quality of the coastal environment. But in other areas, the coastline has been degraded by new developments and other alterations that do not harmonize with the scenic qualities of natural areas or do not respect the unique visual resources found in developed coastal areas. In its most general terms, this deterioration is due to various aspects of urbanization that could have been better designed to minimize their negative effects. These issues include:

- **Scale, height, materials, and colors** of buildings and structures that, when inappropriate to the landform and existing patterns and scales of development, can degrade the appearance of both communities and natural areas.
- **Community boundaries** that are often ignored, creating visually displeasing "sprawl" development. (See Policy 59.)
- **Signs** that can block views, create visual clutter, and mar the appearance of otherwise attractive communities.
- **Alteration of natural landforms** by cutting, grading, filling, or vegetation removal that can cause visual scars, result in unsightly erosion, and destroy scenic areas.
- **Landscaping** that is often inadequate in new development, creating the appearance of harsh structures imposed on the coastline.
- **Views** that when blocked destroy the most important visual quality that identifies coastal areas.
- **Utility and communications facilities** that can cause visual blight when overhead lines, towers, and poles intrude into scenic areas or clutter views of the coast in developed communities.
- **Public service, commercial, and industrial facilities** such as manufacturing plants, shopping centers, power plants, sewage treatment facilities, solid waste disposal facilities, water storage tanks, pumping stations, and power and communication substations that can be major visual

intrusions in the coastal environment because of their size and appearance.

- **Transportation and parking facilities** that can result in cutting and filling of the natural landscape and the well-known "sea of asphalt" in urban areas. (See Transportation chapter policies on roads and parking lots.)
- **Mineral extraction and timber harvesting** that are generally considered to be unattractive activities that should be screened from public view. (See Policies 38 and 41.)

**The Need for Design Evaluation.** The Coastal Zone Conservation Act of 1972 requires that one objective of the Coastal Plan be "the maintenance, restoration, and enhancement of the overall quality of the coastal zone environment, including, but not limited to its amenities and aesthetic values" (Public Resources Code, Section 27302 [a]). In order to achieve this objective, it would be ideal if highly specific design criteria could be established for all new development along the coast. But because of the great variety in the existing character of the coastline, because of the dynamic changes taking place in social values and building technology, and because different people have different concepts of "beauty," necessitating intensive involvement of community residents in determining the desired visual qualities that should exist in the hundreds of communities along the coast, highly specific criteria cannot be established for the entire coast at this time. Until design plans, specific criteria, and enforcing regulations can be formulated by coastal communities and the coastal agency, the application of general design guidelines, refined to as much specificity as possible by regional and local amplification, through a design review process, appears to be the best method for guiding development to preserve or restore the attractive appearance of the coast. (See also the Restoration of Coastal Resources chapter.)

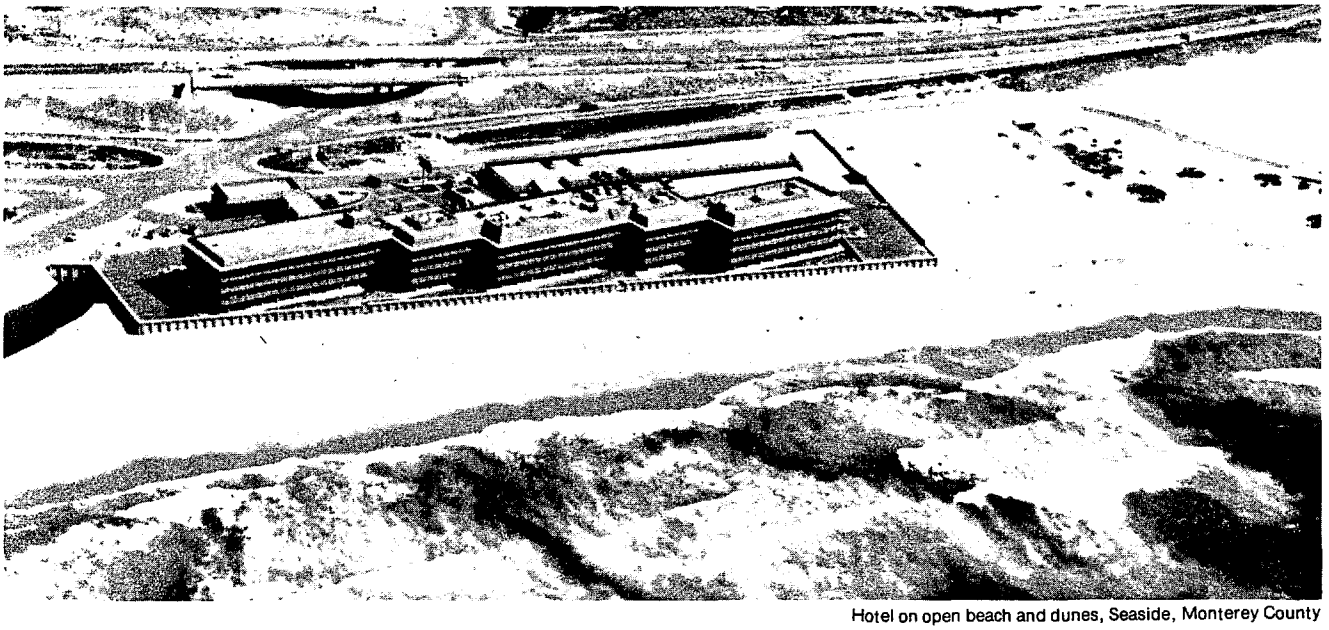
# PROTECTING COASTAL VISUAL RESOURCES

## Policies

**44. Design Development to Protect Coastal Viewshed.** The visual qualities of the California coast shall be considered a resource of public importance. Within the "coastal viewshed," as defined below, new development shall be designed so that the viewshed quality can be preserved where existing natural or manmade areas are scenic, can be enhanced by the addition of attractive improvements, and can be restored by the removal of undesirable visual elements (see chapter on Restoration of Coastal Resources for restoration policies). The coastal viewshed is the coastal lands and waters that can be seen from the major coastal access roads, trails, and railroads (those paralleling the coast and those leading to the coast from inland areas); from public vista points and recreational areas; and from the water's edge.

**45. Protect the Visual Quality of Highly Scenic Areas.** New development shall not be permitted to degrade highly scenic natural, historical, or open areas and shall be visually subordinate to the scenic quality of these areas. The areas that require this special consideration shall include: (1) landscape preservation projects designated by the State Department of Parks and Recreation in the California Coastline Preservation and Recreation Plan; (2) open areas identified in the Coastal Plan as being of particular value in providing visual contrast to urbanization, in preserving natural landforms and significant vegetation, in providing attractive transitions between natural and urbanized areas, in carrying out the policies of the Coastal Plan, or as scenic open space; and (3) scenic areas and historical districts designated by cities and counties in their design procedures and standards prepared pursuant to Policy 46.

**46. Establish Local Design Procedures and Standards.** Cities and counties within the coastal viewshed shall prepare and implement design procedures and standards as a part of their general plans. These shall be required to include appropriate guidelines, criteria, and standards that are consistent with appearance and design policies of the Coastal Plan; a sign ordinance to apply the guidelines set forth in Policy 54; and definitive design criteria for improving the appearance of the shoreline based on detailed studies of the oceanfront area carried out by cities and counties. Areawide design guidelines shall be formulated as part of design procedures and standards so that development proposals can be coordinated in order to maximize open space preservation; to protect view corridors, natural vegetation, landforms, and other features; to effectively link open space systems with paths and bikeways; to reduce the need for duplicating circulation systems; and to minimize the appearance of visually intrusive structures. Transportation, land use, utility, and recreational planning shall be coordinated with the preparation of the design procedures and standards.



Hotel on open beach and dunes, Seaside, Monterey County

**47. Establish a Design Review Process.** New development within the coastal viewshed that would have a significant visual impact shall be subject to design review. This review shall be to ensure that development and its cumulative impact are consistent with the design guidelines contained in Policies 49 to 56 and with the special policies for each individual Region.

a. **Design Review Process.** To evaluate visual aspects of development proposals and to advise public regulatory agencies on both design issues and the application of other Coastal Plan policies through design techniques, and, in particular, to assist in determining whether a proposed development that would not comply precisely with the guidelines in Policies 49 to 56 would, nevertheless, be visually compatible with the surrounding environment's attractive qualities because of its innovative and sensitive design: (1) professional design assistance shall be available to the staff of the coastal agency; (2) local governments shall consider establishing design review boards; and (3) regional design review boards shall be established by the coastal agency when necessary to evaluate and advise on development proposals that are of regional significance or that are in areas not served by local design review boards. Design review boards shall consist of persons who have displayed an understanding and appreciation of the history, aesthetics, and goals of coastal communities, and design professionals (e.g., architects, landscape architects, urban designers, planners, engineers, artists, sculptors, etc.).

b. **Require Coordinated Design Plans.** Where development is proceeding rapidly in small neighborhood areas or on adjoining or nearby properties in undeveloped areas, the area shall be considered as a single unit, and the project sponsors shall be required to jointly prepare an overall design plan to coordinate open space, internal circulation, design themes, view protection, and other visual elements and to meet the requirements of the design guidelines and other Coastal Plan policies.

c. **Prepare Area Plan for Intense Development.** Major new development that would be of a substantially greater density or intensity of use than the surrounding area shall be in accordance with an area plan, prepared at the project sponsor's expense, that specifies the general location of uses by height, bulk, and density, and that indicates the location or methods for preserving open space, ocean breezes, views, and public access. The impact of any proposed major structures on views, shadows, glare, and wind patterns shall be evaluated as part of the area planning.

d. **Large, Intensive Subdivisions and Developments Must Have Detailed Design Plans.** A detailed design plan shall be required for subdivision and development of nearcoast area properties larger than three acres, or development proposals of more than 15 dwelling units per acre in suburban areas (20 per acre in urban areas). It shall be prepared at the project sponsor's expense and shall demonstrate that the development will comply with Coastal Plan design policies.

**48. Reduce Litter in Coastal Areas.** All public recreational areas, scenic road turnouts, and other such areas shall contain adequate, well-designed

litter receptacles. Maintenance (emptying) of these receptacles, raking of beaches, and anti-litter patrols along highways and in wilderness areas shall receive high priority in state budgeting and local cleanup campaigns. To greatly reduce litter along the coastal roads, waterfront recreational areas, and in shoreline communities, it is recommended that the Legislature consider enacting laws to prohibit the sale in California of non-returnable glass bottles, aluminum and metal pop-top cans, and non-biodegradable plastic packaging.

# DESIGN GUIDELINES FOR VIEWSHED DEVELOPMENT

## Policies

**49. Design Guidelines: Compatibility with Natural Environment.** The scenic value of natural landforms shall be preserved, enhanced, and restored. Development shall be compatible with existing natural features and terrain. The visual intrusion of structures into scenic open spaces shall be minimized by clustering the structures near other existing natural and manmade vertical features (such as tree masses, hills, rock outcrops, and existing structures). To ensure that structures are compatible with the natural environment, the following guidelines for development on specific landforms shall apply except either (1) where it would make an existing parcel unusable and where public acquisition of such a parcel is not appropriate (see Policy 155), or (2) where it is determined, under the provisions of Policy 47 (a), that a proposed development that would not comply with the guidelines would, nevertheless, be visually compatible with the natural environment's visual qualities.

a. **Design Guideline: Beaches.** No permanent structures shall be permitted on the open beach itself except facilities necessary for public health and safety (e.g., beach erosion control structures and life guard towers) or structures found to be necessary for public welfare. Other structures or other improvements shall be located inland from the open beach.

b. **Design Guideline: Sand Dunes.** Development that would significantly hamper natural dune movement, that would conflict with the visual form of dune ridgelines, or destroy dune-stabilizing vegetation, shall not be permitted. Pedestrian and vehicular traffic in fragile sand dune areas shall be minimized.

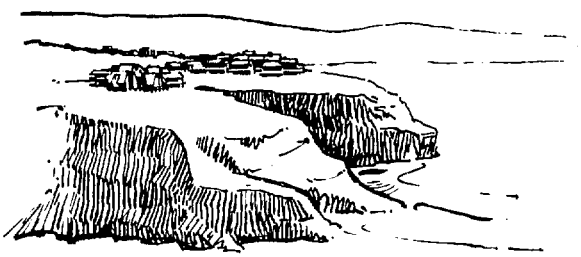
c. **Design Guideline: Coastal Bluffs.** Development on bluffs shall be controlled to minimize bluff degradation. No structures shall be permitted to be built on a bluff face except for access stairways (which shall be for public use, few in number, and conveniently located to public accessways) and erosion control structures, such as seawalls, that would be in conformance with Policy 19. Approved structures shall be constructed of materials that reproduce natural colors and textures as closely as possible. Drainpipes shall be minimized by collecting runoff and directing it landward, where possible, and shall be unobtrusive in appearance. No dumping over coastal bluffs shall be permitted except where necessary for erosion control measures specifically authorized by the coastal agency and consistent with other Coastal Plan policies. Blufftop development shall be set back from the bluff edge sufficiently far to ensure that the development would be visually unobtrusive when viewed from the shoreline except in highly developed areas where adjoining development is nearer the bluff edge, or in special cases where a facility that would be used by substantial segments of the public has been

justified in an approved urban design plan for the area. (See also Policy 70 regarding development in bluff hazard areas.)

d. **Design Guideline: Wetlands and Estuaries.** The open visual appearance of estuaries and their surrounding beaches and wetlands shall be retained intact. Public accessways shall be designed to respect the visual and ecological fragility of estuaries and their adjacent land areas. Coastal roads shall be located on the inland side of the estuaries. (See also Marine Environment section on Coastal Waters, Estuaries, and Wetlands.)

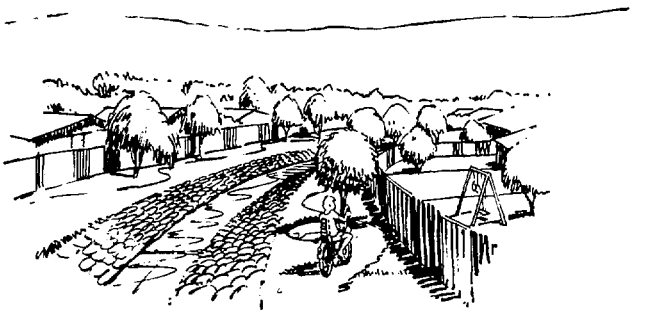
e. **Design Guideline: Islands.** Development on islands, except for lighthouses and ancillary facilities necessary for public safety, shall blend with the natural visual form of islands and shall not extend above the natural silhouette of the island.

f. **Design Guideline: Headlands, Hillsides, and Canyons.** Private roads on headlands shall be visually screened, and driveways connecting to the coastal highway minimized in number. The transitions between headlands and related stream canyons shall be left in a natural state with bridges over canyons minimized in number, combined, and located at the narrowest crossing points as far inland as physically feasible and environmentally acceptable. Grading, cutting, and filling in canyons and arroyos and on hillsides shall be in accordance with Policy 53. Buildings on canyon edges and hilltops shall be visually unobtrusive when seen from the canyon or valley floors below. Coastal canyons with recreational and natural study value shall not be used for sanitary landfill sites where satisfactory alternatives are available.



g. **Design Guideline: Upland Terraces and Plains.** Structures located in open grassland areas where they would be highly visible shall be minimized in number and clustered near existing natural or manmade vertical features, and development on upland hilltops and ridges shall be visually unobtrusive when seen from the terraces or plains below.

h. **Design Guideline: Rivers and Streams.** Development shall be set back from the edge of coastal rivers, streams, and other natural waterways to protect riparian vegetation, minimize erosion, and preserve the visual contours of the waterway. Channelization projects, where specifically authorized and consistent with other Coastal Plan policies, shall include landscaping, public trails, and linear parks to mitigate the visual damage resulting from the channelization and to maintain, enhance, or restore recreational opportunities.



**50. Design Guideline: Protection of Coastal Views.** Except as provided in Policy 47(a), development (including buildings, fences, paved areas, signs, and landscaping) shall not be allowed to significantly block views of the shoreline from key public viewing points such as roads that terminate at the coast, roadside turnoffs, recreation areas, and beaches. In addition:

a. **Views of Natural Features from Roads.** In major new development, views of attractive natural features (such as dunes, the surf, coastal bluffs, outcroppings, and estuaries) from the nearest public thoroughfare shall be protected and public vista areas shall be provided.

b. **Limit Seaward Extent of Oceanfront Development.** To protect existing views in developed areas, new oceanfront area development shall not extend farther seaward than the adjacent structures unless (1) this would make an existing parcel unusable and where public acquisition of such a parcel is not appropriate (see Policy 155), and (2) such development is in accordance with other policies of the Coastal Plan.

**51. Design Guideline: Scale, Height, Materials, and Colors.** Except as provided in Policy 47(a), development either shall be visually compatible with the character of the surrounding attractive area or shall enhance the quality of areas that have been degraded by existing development.

Materials and colors used in coastal construction shall be selected for compatibility both with the structural system of the building and with the appearance of the building's natural and manmade surroundings. Pre-set architectural styles (e.g., pseudo-Spanish mission and standard fast-food restaurant designs) shall be avoided.

**52. Design Guideline: Landscaping.** Except as provided in Policy 47(a), plant materials shall be used to integrate the manmade and natural environments, to screen or soften the visual impact of new developments, and to provide diversity in developed areas. In new development, existing attractive vegetation shall be protected and plants similar in habit, form, and water requirements to vegetation common to the particular coastal region shall be used as the predominant additional landscaping material in order to reduce the need for irrigation systems and extensive maintenance programs.

**53. Design Guideline: Alteration of Natural Landforms.** The visual destruction of natural landforms caused by cutting, filling, grading, or vegetation removal shall be minimized, and the following guidelines shall apply, except as provided in Policy 47(a):

a. **Minimize Landform Alterations for Permitted Developments.** Landform alteration for building sites, access roads, and public utilities shall be minimized by (1) concentrating development on relatively level areas so that steeper hillsides can be left undisturbed, (2) designing structures to fit hillside sites rather than altering the landform to accommodate buildings designed for level sites, (3) waiving minimum street-width requirements and using one-way circulation systems so that necessary hillside roads can be as narrow as safely possible and can conform to natural topographic contours, and (4) prohibiting new buildings and their support facilities (such as road and utility expansions) that would require grading, cutting, or filling that would significantly and permanently alter the appearance of natural landforms.

b. **Restore Natural Contours.** After any permitted temporary alteration of natural landforms during construction, timber harvesting, or mineral extraction, the topography shall be restored to as close to the natural appearance as possible, and the area landscaped in accordance with Policy 52.

South of Shelter Cove, Mendocino County

**54. Design Guideline: Signs.** Signs and billboards shall not be allowed to block significant coastal views, cause visual clutter that conflicts with the ordered design of coastal communities, or detract from the natural beauty of the coast. Cities and counties, as part of their design procedures and standards shall develop sign ordinances applying the following guidelines. Until these ordinances have been enacted, the guidelines shall be applied by the coastal agency to specific coastal areas that can be seen from principal coastal access roads, trails, and railroads along the coast, and from major lateral transportation corridors with views of the coastline, except as provided in Policy 47(a).

a. **Ban Off-Premise Commercial Signs.** New off-premise commercial signs (those that do not advertise a use being made of the premises, the name of the owner or use, or a product, service, or entertainment available on the premise) shall not be permitted. After a suitable amortization period not to exceed 10 years, existing off-premise signs shall be removed.

b. **Alternatives to Commercial Signs and Billboards.** In place of off-premise commercial signs, coastal communities could provide alternative means for informing the public about commercial services and products available in the communities. These alternatives could include low-power radio broadcasts or local radio station programs and spots designed for travelers, and kiosks or other well-designed, integrated displays at roadside turnouts near major community entrances. The California Department of Transportation shall cooperate in designing and erecting attractive signs to alert travelers about these informational displays and in providing roadside turnouts.

c. **Design of On-Premise Commercial Signs.** On-premise commercial signs, for identification and information purposes only, shall be designed as an integral part of the structure they are identifying, shall complement or enhance the appearance of the surrounding area, and shall not block coastal views.

d. **Design Few, Simple, Harmonizing Information and Direction Signs.** Public information and direction signs shall be of a simple, easy-to-read design, shall make use of materials and colors that harmonize with surrounding elements, and shall be as few in number as possible.

**55. Design Guideline: Utility Structures.** The visual degradation of the coastal landscape caused by power and communication lines and towers shall be minimized by applying the following standards except as provided in Policy 47(a) or where immediate compliance would be infeasible:

North of San Diego

a. **Avoid Duplication of Facilities.** Utility distribution and transmission facilities shall be designed as a coordinated system to avoid unnecessary duplication.

b. **Undergrounding of Distribution Facilities.** New distribution facilities and service connections shall be placed underground except where undergrounding would be inconsistent with sound environmental planning or where the cost of undergrounding would be so high as to deny service. Cities and counties shall develop programs for undergrounding existing distribution facilities and service connections in scenic and highly visible coastal areas as part of subsequent planning (see Policy 161).

c. **Undergrounding of Transmission Facilities.** New and existing transmission facilities (i.e., powerlines of more than 40 KV) within highly scenic areas (as identified in Policy 45) shall be undergrounded where feasible in accordance with a program developed jointly by the coastal agency and the California Public Utilities Commission.

**d. Design of Above-Ground Facilities** Except where inconsistent with sound environmental planning, new above-ground transmission facilities shall (1) follow the least visible route (e.g., canyons, tree rows, and ravines), (2) cross ridgelines at the most visually unobtrusive locations, (3) follow, not compete with, either natural features of the terrain or manmade features in developed areas, and (4) be well designed, simple and unobtrusive in appearance, have a minimum of bulk, use the minimum number of elements permitted by good engineering practice, and make use of colors and materials compatible with local surroundings.

**56. Design Guideline: Major Public Service, Commercial, and Industrial Facilities.** Except as provided in Policy 47(a), major public service facilities (such as power plants, sewage treatment facilities, solid waste disposal facilities, water storage tanks, pumping stations, power and communications substations) and major industrial and commercial facilities (such as manufacturing plants and shopping centers) that do not require water- or oceanfront locations shall not be located in the oceanfront area unless there is no less environmentally damaging alternative. Wherever located, these facilities shall be designed in a manner that is compatible with the surrounding natural landforms and manmade environment (e.g., by use of harmonizing colors, textures, and massing or by undergrounding). Where safety, noise, or other functional considerations make it impossible to integrate public service or industrial facilities into the community structure, they shall be screened from public view (by use of natural terrain and vegetation or buffer areas and artificial screening).

# COASTAL DEVELOPMENT

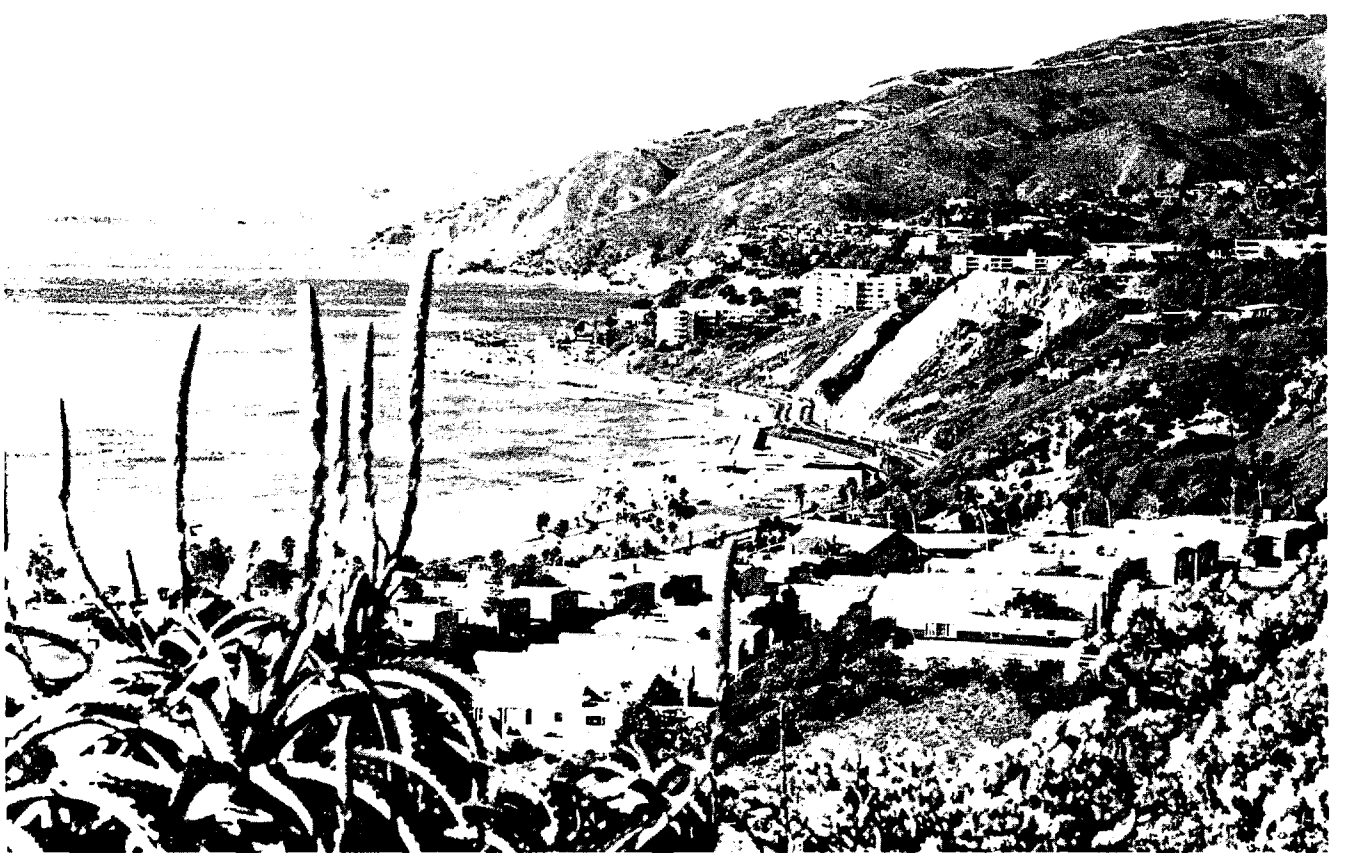
# DEVELOPMENT AND NATURAL RESOURCES

## Findings

**Natural Resources Support Human Life and Uses of the Coast.** Valuable natural resource areas of the coastal zone have been identified in preceding Plan chapters. These finite resources, which often extend inland farther than 1,000 yards, support human life and make possible enjoyment and use of the coast. Such resources include:

- wetlands and estuaries,
- tidepools,
- coastal streams vital to anadromous fish runs and continued sand supply to the coast,
- natural areas that should be preserved for future scientific study, education, and public enjoyment,
- habitats of rare and endangered species of animals and plants,
- agricultural (including grazing) and forestry lands,
- mineral deposits,
- clean air,

Pacific Palisades



- sandy beaches and dunes,
- recreational lands and waters, and
- highly scenic areas and coastal landforms.

## Policy

**57. Design Development to Complement Natural and Scenic Resource Areas.** In natural and scenic resource areas other than those designated for maintenance in agricultural or forestry uses (see Policies 30-34 and 38) and where some development may be allowed consistent with the resource protection and access policies of the Coastal Plan, first priority shall be given to activities that complement the resource values of the site (such as farm residences) or allow for compatible recreation use (such as horse stables and riding facilities, dude ranches and summer camps, outdoor recreation, fishing and hunting preserves, and small-scale tourist facilities to the extent that the need for them outside already developed areas can be demonstrated). If no other use is feasible or appropriate, individual homes may be permitted, provided that minimum acreage and siting requirements are first established in accordance with the resource preservation and scenic view policies of the Coastal Plan, with particular regard to the cumulative impact of potential development in the area for which the requirements are to be adopted.

# SPECIAL COASTAL COMMUNITIES AND NEIGHBORHOODS

## Findings

**Certain Small Towns and Neighborhoods Within Large Urban Areas Are Significant Coastal Resources.** Certain communities and neighborhoods have special cultural, historical, architectural, and aesthetic qualities that are as important to the coastal zone as are its natural resources. These areas are resources either because they have a physical coherence that complements the visual character of the coastal zone, or because they provide significant opportunities for access to the coast through pedestrian orientation or through the provision of housing and recreation-oriented commercial facilities in a broad price range.

**Special Characteristics of Such Coastal Areas.** These resource areas include both small coastal towns and coastal neighborhoods in larger cities that are characterized by orientation to the water, usually a small scale of development, pedestrian use, diversity of development and activities, public attraction and use of facilities, distinct architectural character, historical significance, or ethnic or cultural characteristics sufficient to yield a sense of identity and differentiation from nearby areas. Examples include such different coastal communities as:

- The Ocean Beach and La Jolla areas of the City of San Diego and the community of Encinitas in San Diego County,
- The Naples area of Long Beach and the Venice area of the City of Los Angeles,
- The Pierpont Beach area of the City of Ventura,
- Summerland in Santa Barbara County,
- Morro Bay and Cayucos in San Luis Obispo County,
- Carmel in Monterey County,
- The town of Bolinas in Marin County, and
- The towns of Mendocino in Mendocino County and Ferndale in Humboldt County.

**Careful Development Is Required to Complement the Distinctive Qualities of Special Neighborhoods.** As recreational and visitor attractions and as an integral part of the experience of the coast, distinctive coastal neighborhoods are of value to their residents and the public at large. Maintaining their qualities is dependent on maintaining the prevailing scale and mix of development. In some areas large-scale condominiums, townhouses, highrises, shopping centers, and motel developments are replacing architecturally interesting and lower-density, smaller-scale uses, destroying special places and neighborhoods, displacing lower-income residents in favor of the more affluent, and increasing the level of traffic congestion in the community for residents and visitors alike.

## Policy

**58. Protect and Enhance Special Coastal Communities and Neighborhoods.** The unique cultural, historical, architectural, and aesthetic qualities of special coastal communities (e.g., La Jolla, Carmel, Mendocino) and neighborhoods that contribute to the enjoyment of the coast shall be protected and, where feasible, enhanced. New developments shall not be allowed to significantly detract from the special qualities of these areas. The protection

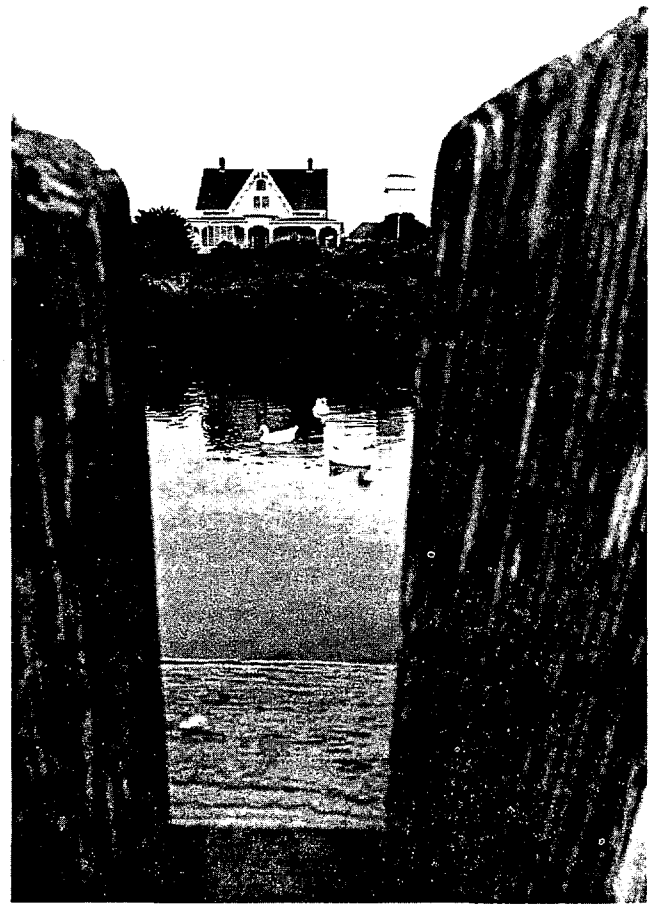
this policy offers may not be used in any way for exclusionary purposes.

a. **Identification of Special Communities and Neighborhoods.** The special qualities of coastal communities and neighborhoods, although hard to define with precision, nevertheless exist in a limited number of places and include the following: (1) areas characterized by a particular cultural, historical, or architectural heritage and continuity that is distinctive in the coastal zone; (2) areas presently recognized as important visitor destination centers on the coastline; (3) areas with small-scale and limited automobile traffic providing opportunities for pedestrian and bicycle access for visitors to the coast; (4) areas having a physical scale consistent with and complementary to coastal landforms or having a particular physical coherence that adds to the visual attractiveness of the coast for residents and for the general public traveling to the coast; (5) areas that provide a diversity of coastal housing opportunities, particularly for low- and moderate-income persons and the elderly; or (6) areas within walking distance of a beach with generally 20 per cent of all parcels in either small-scale hotel-motel or beach-oriented commercial uses. Normally such coastal neighborhoods and communities will be within walking distance of the coastline — roughly 1,000 yards — but in some cases they may extend further landward.

b. **Community Participation.** As part of the subregional or local coastal planning process (see Policies 161 and 162), residents of a coastal neighborhood or community, perhaps organized in community advisory committees, shall assist in determining the particular values of their area and how new development can be consistent with them.

c. **Restrict Inappropriate Development.** Development out of scale, size, or social character shall not be allowed in designated special communities and neighborhoods. In determining the appropriateness of a proposed development, consideration shall be given to intensity of use (e.g., lot size, unit size, residential composition, height, bulk), pedestrian accessibility, open space, economic and social factors, and the cumulative impact that potential development would have on an area's resources.

d. **Coastal-Dependent Development and Access Facilities Desirable.** Considerations of appropriateness of development shall not preclude coastal-dependent development or coastal access and visitor-serving facilities. In coastal villages in rural surroundings, visitor facilities shall be consistent with the local community scale in size and shall not necessarily be concentrated in any one village or location.



McCallum House (inn), Mendocino

e. **Design Guidelines.** Permissible new or expanded development shall be designed to be compatible with the special values and character of the community and shall avoid the overcrowding of access roads and local streets. Development shall (1) strengthen the physical form of the community or neighborhood, (2) enhance and restore visual qualities by being of a bulk, height, and color that is compatible with the existing character, (3) harmonize with the essential design characteristics that distinguish the place from other communities (e.g., a rustic weathered or whitewashed appearance of the waterfront), (4) protect ocean views from many vantage points, and (5) provide for maximum pedestrian circulation and shoreline access. Motels in rural coastal villages, for example, shall be unpretentious in appearance (stereotyped motel-chain architecture shall be prohibited) and shall feature some small separate structures rather than large bulky facilities so as to complement the detached homes and small commercial buildings that characterize most such villages.

# ORDERLY, BALANCED DEVELOPMENT

## CONCENTRATING DEVELOPMENT IN URBAN AREAS

### Findings

**Priorities Are Needed Among Competing Coastal Zone Uses.** The coast is an extremely desirable place to live, work, and play. In the past 30 years, California's population has tripled to more than 20 million; 85 per cent of this population lives within 30 miles of the coast, and 64 per cent within the 15 coastal counties. In San Diego County, nearly 56 per cent of the population lives within 5 miles of the coast. Pressures for all types of development on or near the coast are high and can be expected to increase due to increased leisure time, mobility, changing life styles, and immigration from some inland communities. The finite resources of the coastal zone cannot, however, accommodate all the pressures for development and change and still meet the needs of present and future generations for recreation, production of agricultural crops, and the enjoyment of unique coastal experiences. Therefore, priorities must be established among competing uses of the coast, to assure orderly, balanced use and preservation of coastal zone resources.

**Concentrating Development Enhances Use of the Coastal Zone.** If development is prevented from sprawling over large land areas by being channeled to already developed areas (where public services exist), and by increasing the intensity of development in some areas consistent with the objectives of the Coastal Plan, the following advantages over sprawling development will often result:

- Natural, agricultural, and other coastal resources will be preserved for the economic benefits and human enjoyment they provide;
- A desirable contrast and diversity between city and country will be maintained;
- Air pollution and energy needs will be diminished because of shortened trips and the increased feasibility of public transportation;
- Duplication and costs of public services will be reduced by utilizing services already in place;
- Opportunities for increased physical and visual access to the coast for all people will be increased;
- Options for the future will be preserved by setting aside larger areas of land for potential future uses;
- Irreversible and irretrievable commitments of land inconsistent with the Coastal Plan will be avoided; and
- Existing downtown areas that have declined as a result of suburban sprawl will be revitalized.

**Growth Can Be Accommodated Away from the Coastline.** There are many alternatives to intensive urbanization of the shoreline and nearcoast area. Many existing urban areas inland from the coast could accommodate such growth without degrading coastal resources.

**Properly Located High-Intensity Development Can Absorb Some Demand for Coastal Land.** High-rise office buildings, large apartment and condominium buildings, shopping complexes, amusement parks and tourist attractions, and similar high-intensity developments in appropriate areas of cities can, if properly designed and located, absorb a substantial portion of the demand for those purposes that is now directed at older residential neighborhoods, open space areas, and other resource areas in the coastal zone. In addition, such high-intensity development near the coast, especially in existing downtown areas, could at the same time enhance the viability of mass transit and reduce the consumption of energy used for heating and cooling because of the milder climate of coastal areas. High-intensity development could also take up some of the presently underused capacity of many sewer and water systems without the need for costly new expenditures for public services and, by being located in existing urban areas, avoid the extension of growth-inducing services to open space or resource areas.

### Policies

**59. Concentrate Development in Already Developed Areas.** New residential, commercial, industrial, and institutional development shall be channeled into existing developed areas able to accommodate additional development, areas suitable and planned for redevelopment, or in areas determined in subregional or other approved implementation plans (see Policies 161 and 162) to be consistent with the goals set forth in the findings above. (The developed areas delineated in Part IV of the Coastal Plan are shown for general reference purposes and not for purposes of applying this policy. The precise designation of where growth should be concentrated consistent with Coastal Plan policies shall be as shown in approved Regional Supplements, subregional plans, or local coastal plans.) To this end:

a. **Use Developed Areas Effectively Before Allowing Expansion Along Coast.** New residential, commercial, industrial, and institutional development shall not be permitted to sprawl, project by project, into open areas. Expansions of existing developed areas (other than expansion on the inland side of the community) shall

New subdivision, Half Moon Bay

not be allowed until the land resources within the existing developed areas are effectively used.

b. **Locate Visitor Facilities Near Existing Developments.** Visitor-serving facilities shall be located in or adjacent to some existing developed areas consistent with the community scale objectives of Policy 58, in existing isolated developments (such as Sea Ranch and Timber Cove), and at selected points of attraction for visitors such as at the entrance to Point Reyes National Seashore).

c. **Concentrate Commercial Development.** Commercial development shall be located where travel conflicts between residents and coastal visitors are minimized. To this end, general commercial development such as shopping centers shall, wherever feasible, be located where local residents may travel to such developments without driving along major routes to and along the coast. Existing general commercial developments that cause significant adverse impacts on coastal access shall be relocated to areas consistent with this policy where possible.

d. **Channel High-Intensity Development to Appropriate Areas.** High-intensity development shall be channeled towards existing downtown areas and other areas within and outside of the coastal zone where: (1) development would not adversely affect coastal resources or coastal access; (2) mass transit capable of serving the development already exists or is planned and funded; and (3) development pressure on resource areas is relieved through enforceable development restrictions.

e. **Restrict Significant Developments in Areas Removed from Employment and Commercial Centers.** Major new residential, commercial, institutional, or industrial developments or other traffic-generating uses in locations removed from employment and commercial service areas shall be permitted only if (1) the project will be adequately served by public transportation that reduces pollution, total vehicle mileage, and energy consumption (such as buses); or (2) the project will not contribute directly or cumulatively to significant degradation of air quality and will not result in unnecessary fuel consumption. Determinations of air quality impact and fuel consumption shall include consideration of distances to employment and service centers and alternative locations for such developments.

f. **Plan Development to Reduce Auto Dependence.** New development shall be planned to: (1) facilitate provision or extension of transit service, (2) provide commercial facilities within or adjoining residential development to minimize the need for outside travel, and (3) provide non-automobile circulation within the development (e.g., shuttles, bikepaths, and walkways).

**60. Criteria for Divisions of Rural Land.** The division of land outside areas designated for concentrating development (see Policy 59) shall be permitted either if it is in accordance with an adopted subregional or local coastal plan or, in the absence of such an approved plan, if all of the following conditions are met: (1) more than 80 per cent of the usable lots in a non-urbanized area have been developed to existing zoned capacity; (2) the parcels resulting from the division would be no smaller than the average size of surrounding parcels; (3) no significant growth-inducing impact or precedent for development in a natural resource or scenic resource area would be established by the division; (4) the division would not restrict future options for productive lands or lands of significance because of their scenic, wildlife, or recreational values; and (5) all public services are readily available. (See also Policy 36 regarding agricultural lands and Policy 38 regarding forestry lands.) Where an increase in the number of parcels available for residential use is permitted, priority shall be given to lands in or near already developed areas. This policy shall not be interpreted to require development of parcels that would adversely affect coastal natural and scenic resources. This policy shall not apply to areas where 80 per cent of the land within a half-mile radius of the proposed division of land is developed to a density of two units per acre or more.

# PROVISION OF PUBLIC SERVICES

## Findings

**Public Services Availability Influences Development.** The type, size, timing, and location of providing public service and transportation facilities, such as roads, water, and sewers, are major determinants of the pattern of land use. Their availability, or lack thereof, often directly encourages or discourages development. Extending urban services into coastal recreational, agricultural, and wildlife areas would make possible development that might not otherwise occur. Excessive expansion of services in already-developed areas can result in additional development to the extent of creating unwanted congestion and impeding public access to the coastline. Programming service provision in accordance with land use objectives is necessary for balanced and orderly development.

## Policy

**61. Regulate New or Expanded Public Service and Transportation Facilities.** Public service and transportation facilities, especially sewer and water systems and roads, shall be provided or expanded only to the extent that the location and amount of development and population that the systems will potentially serve is consistent with other Coastal Plan policies. Similarly, special districts or local governments shall not be formed or expanded except where assessment for and provision of the service would be in accord with these policies. Where the physical effects of the expansion of the public service system itself are in conflict with Coastal Plan policies, service system expansion shall not be permitted, and development shall be regulated to assure that the capacity of the existing service system is not exceeded. Plans for major sewer, water, and road systems and assessment districts with the potential for adverse effects on coastal resources or access shall be reviewed by the coastal agency for conformity with the Coastal Plan. (See also the Coastal Land Environment section on Coastal Streams and Watershed Management, regarding water supply systems; the Transportation chapter regarding transportation facilities; and Policy 56, regarding siting and design of major public facilities.)

# COASTAL-DEPENDENT AND INDUSTRIAL DEVELOPMENT

## Findings

**Coastal-Dependent Developments Require Oceanfront Area Sites.** Some developments are "coastal-dependent" in that they must have an oceanfront area site to be able to function at all. These include fishing, aquaculture, and port facilities, extraction of coastal minerals (e.g., sand and offshore petroleum), tanker terminals, boat works and shipyards, and marinas.

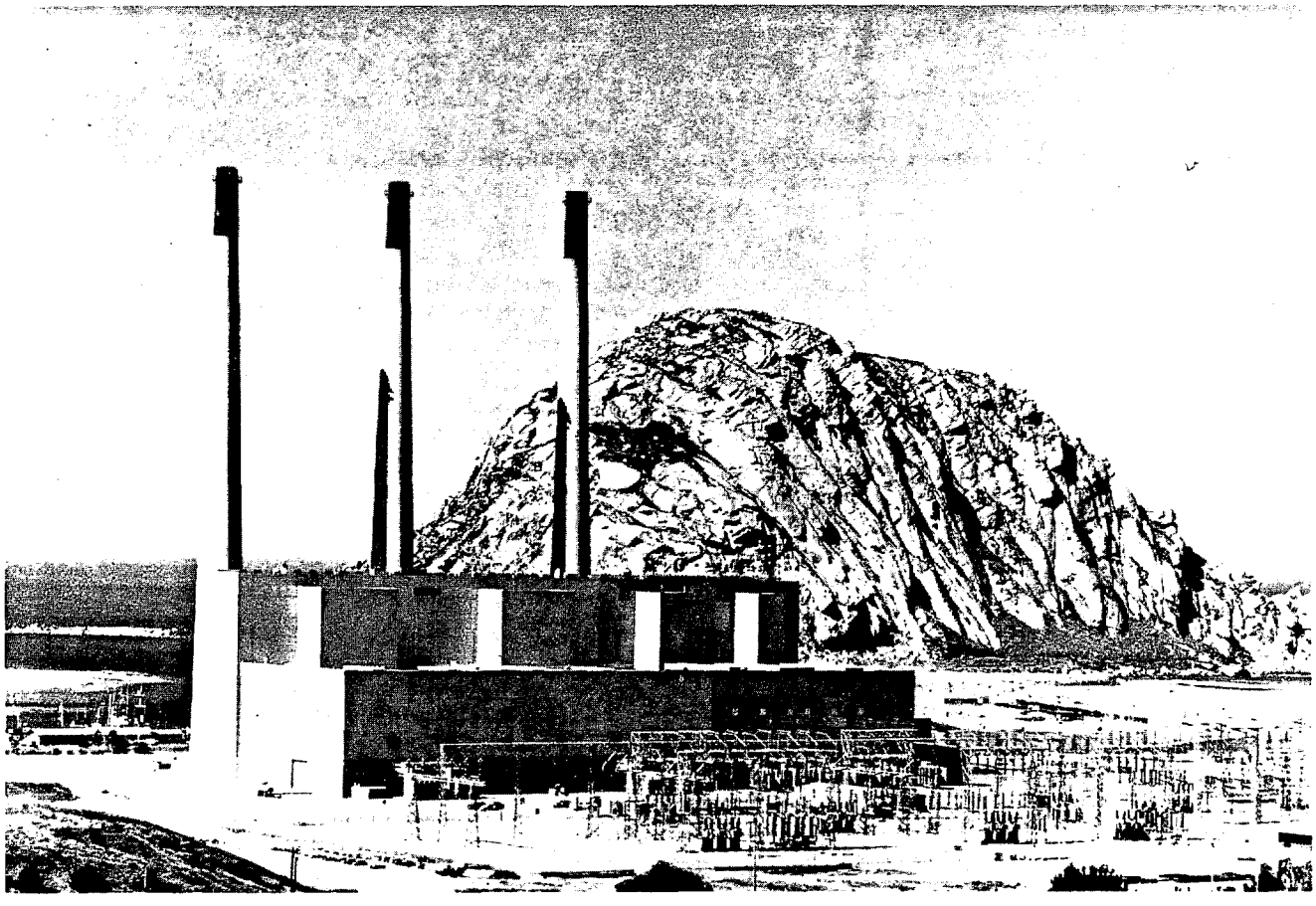
**Industrial Developments May Have Special Siting Requirements.** Although obviously essential to the State's economy, industrial developments can have major impacts on the coast, consuming valuable lands, intruding on the visual qualities of the coast, interfering with access, and affecting air and water quality. Locations for industry must take into account these impacts on the coastal environment. In addition, planning for industrial sites should take into account safety concerns and growth-inducing effects.

## Policies

**62. Give Priority to Coastal-Dependent Development.** Coastal-dependent developments, which by their very nature require a coastal site, shall have priority over other development on or near the shoreline. Where coastal-dependent industrial, commercial, and recreational developments (such as ports, yacht basins, certain mineral extraction activities —such as salt evaporation or special grades of sand for glass) would have a substantial adverse effect on coastal resources, they shall be permitted only if (1) alternative locations are either infeasible or more environmentally damaging; (2) a careful balancing of environmental effects against regional, State, and national economic needs is made, with irreversible environmental damage weighing heavily in the comparison; and (3) the environmental damage is mitigated to the maximum extent technically feasible in the design and execution of the project. (See also relevant policies in the Coastal Land Environment, Recreation, Transportation, and Energy chapters, and Policy 153 requiring restoration measures for developments that degrade coastal resources.)

**63. Criteria for Location of Industrial Development.** Industrial development shall be concen-

Power Plant, Morro Rock



Near Ventura

trated in already developed areas unless public health or safety requires other locations as provided in the Energy chapter. New industrial facilities (except for coastal-dependent industry as provided in Policy 62) shall not adversely affect environmentally sensitive coastal resources, highly scenic areas, and manmade resources. All potentially hazardous industrial activities or other industrial development that Coastal Plan policies have determined cannot be located in already-developed areas (e.g., possibly liquefied natural gas plants or nuclear power-generating facilities) shall be sited a safe distance away from population centers. All potential industrial sites in such areas shall be used to the maximum extent feasible (subject to safety requirements) prior to the commitment of any new areas.

# DEVELOPMENT IN HAZARDOUS AREAS

## Findings

**Certain Coastal Areas Are Hazardous for Development.** Certain types of land areas are hazardous for development and this should be taken into account in locating future development. Hazardous areas include:

- Presently unprotected and undeveloped flood hazard areas;
- Fault zones and other areas of high seismic risk;
- Tsunami (seismic sea wave) run-up areas, and
- Unstable soils, slopes, coastal cliffs, and bluffs subject to landslide and mudslides.

# FLOOD-HAZARD AREAS

## Findings

**Coastal Stream Flooding Provides Several Benefits.** Minor flooding is a frequent occurrence; major floods occur less frequently but unpredictably. Although the harmful effects of flooding are well understood, people do not always realize that the beneficial role of floods on coastal streams include:

- the maintenance of salmon and steelhead spawning grounds;
- the continued supply of beach sands;
- the removal of vegetation choking the river channel, restoring the channel's capacity to contain minor flood flows;
- the long-term deposition along the floodplain of sediments that provide highly fertile soils;
- flushing of undesirable salts from the surface layers of soils; and
- the preservation of valuable plant communities on overflow lands, such as giant redwood groves.

During flooding, floodplains augment the streambed's normal capacity and provide a temporary storage area for flood waters. Uncontrolled development in flood-hazard areas (i.e., 100-year floodplains) diminishes both of these functions.

**Flood Damage Results from Poorly Conceived Uses of Floodplains and Flood-Hazard Areas.** The loss of life and property damage caused by floods is due in large part to man's poorly conceived uses of floodplains. Because clearing of vegetation and surface paving of areas reduce the porous surface area, they can contribute to the intensity of flooding. Buildings, bridges, and other obstructions back up the flood water until those obstructions are swept away. Demolished structures may then contribute hazardous debris and pollution downstream. The cumulative effect of many small structures reduces the floodplain's storage capacity. Along with changes in hydrologic characteristics of the watershed, such reduction may increase velocity of flood waters, thereby diminishing seepage necessary for groundwater recharge. Flooding may also destroy valuable habitat areas and kill wildlife.

**Necessity to Restrict Development in Flood-Hazard Areas Is Increasingly Recognized.** In the past, emphasis has been on flood control projects that often ignore the beneficial aspects of floods. Public policy now recognizes that many floodplains should not be developed in a way that requires construction of costly public-financed flood protection works, and that allowable uses should be those that can endure periodic flooding and not contribute to the flood hazard. Under the Flood Disaster Protection Act of 1973 (PL 93-234), the flood insurance program of the Department of Housing and Urban Development (HUD) offers incentives and will soon implement sanctions to encourage local governments to restrict uses in identified flood-hazard areas. On the State level, the Cobey-Alquist Floodplain Management Act now requires establishment of floodplain regulations as a condition of State contributions toward the cost of lands, easements, and rights of way for local flood control projects.

**Costly Flood Control Projects Can Be Avoided by Floodplain Controls.** Substantial public funds can and should be saved by early planning that permits acquisition of right-of-way before land costs escalate and by land use regulations that eliminate the need to build costly protective structures. Additionally, flood insurance premiums and federally subsidized insurance costs can be reduced by preventing inappropriate floodplain uses. Because flood-hazard area policies (or lack of policies) in one community can endanger communities at far distant points, consistent application of flood-hazard area policies throughout a watershed is needed.

## Policy

**64. Restrict Development in Flood-Hazard Areas.** To avoid the need for new flood control works and interference with natural watershed processes that would adversely affect coastal resources such as sand supply and anadromous fisheries, development in flood-hazard areas shall be regulated as follows:

a. **Criteria for New Developments in Unprotected Flood-Hazard Areas.** Only new developments that can sustain periodic flooding and that will not create public burdens by aggravating the flood problem, impeding floodwater storage capacity, or increasing pressure for new flood control projects shall be allowed in presently unprotected flood-hazard areas (those subject to inundation by a 100-year flood), consistent with the existing Federal insurance program. Examples of permissible uses include agriculture and recreation, with necessary incidental structures.

b. **Restrict Use of Flood-Hazard Areas during Flood-Prone Periods.** During flood-prone periods, flood-hazard areas shall not be used for log decks or storage of materials that can be carried downstream by flood waters unless mitigation (such as anchoring devices or berms) is adequate.

c. **Review Inland Flood-Hazard Area Projects That Could Affect Coastal Zone.** It is recommended that the Legislature establish procedures to ensure opportunities for public review of proposed inland flood-hazard area projects that could adversely affect lives and property in the coastal zone. (See also Coastal Land Environment section on Coastal Streams and Watershed Management.)

# GEOLOGIC HAZARD AREAS

## Findings

**Four Major Geologic Hazards Pose Substantial Risks to Human Life and Property.** The four major geologic hazards in the California coastal zone are: (1) earthquakes (ground shaking, rupture, or liquefaction); (2) tsunami (seismic sea waves) and storm waves; (3) landslides and mudflows; and (4) bluff and shoreline erosion, including loss of beach sands. All of these may involve substantial risks to human life or property. Subsidence of land areas can also pose major problems for development. Development that interferes with or ignores these natural geologic processes may impose direct or indirect danger and costs on the public and accelerate or aggravate long-term natural geologic processes of the coast. Of direct concern for shoreline management are the shoreline erosion processes; most of the others are of broad concern throughout the State.

### EARTHQUAKES

**Earthquakes Are Common in the Coastal Zone.** Much earthquake activity in California occurs within the coastal zone, which is part of the earthquake-prone belt extending around the rim of the Pacific Ocean. The coastal area contains many complex fault zones. Ground shaking and liquefaction of certain soil materials (especially fill) can cause tremendous damage in addition to the rupture at the

fault; however, proper engineering can overcome some of these hazards.

**Earthquakes Are Unpredictable.** Almost every section of the coastal zone has experienced earthquakes with various intensities. The recorded history of approximately 175 years is too brief, however, for definitive assessment of the earthquake vulnerability of any coastal section. In all areas, seismic activity is virtually certain, but it may not occur for centuries. Similarly, the absence of any high-intensity shock in any area in the past 175 years does not rule out earthquake possibility.

**Definitive Studies of Earthquake Hazard and Probability Are Lacking.** Definitive studies of earthquake hazard and probability are lacking. The technology of data collecting, processing, and interpretation, although rapidly improving, is still in a state of development. Only the areas of recent high-level earthquake activity have been intensively studied. Instrumentation and seismic theory itself is in the process of continual revision. Maps of active fault areas only indicate a portion of the earthquake-prone areas in the State. Many earthquakes occur in previously unmapped areas.

**Potential Earthquake Damage in the Coastal Zone Is Great.** The scale of earthquake shaking hazard is indicated by the California Division of Mines and Geology projection of $21 billion in damage statewide between 1970 and 2000 if the present rate of losses continues into the future. A large amount of this damage would occur in the coastal zone.

## TSUNAMI AND SEA WAVES

**Tsunami and Other Sea Waves Can Cause Coastal Damage.** Large-scale seismic sea waves (tsunami) in the Pacific Ocean basin have caused some degree of damage along much of the California coast; for example, large waves followed the 1964 Alaskan earthquake. Nearshore earthquakes can generate localized tsunami, such as the Santa Barbara Channel event of 1812. Much damage can also occur as a result of waves and winds during great storms, as for example the storm of February 1960 in northern and central California. A combination of storm waves and high tide, or storm waves and a tsunami, or all three, could cause especially severe damage along the California coast.

**Susceptibility to Tsunami Varies Along the Coast.** Tsunami damage recurs in certain areas of the coast more than in others, because waves may be focused by the configuration of the ocean floor. Generally, the coast north of Point Conception is more susceptible to Pacific Ocean events, while areas such as Santa Barbara and Santa Monica are more susceptible to locally generated tsunami. Crescent City on the north coast has been repeatedly damaged. Areas from Santa Barbara to San Diego suffered minor damage from the great waves of 1964. These tsunami struck the southern coast at low tide; had high tide prevailed, damage might have been greater.

**Identifying Areas of Probable Tsunami Risk Can Aid Land Use Decisions.** Assessment of tsunami hazard on the California coast is based on a brief and partial history. No such assessment can anticipate future extraordinary events. However, identifying areas of probable tsunami risk can provide useful information for land use decisions. Limited mapping of possible runup areas in southern California is now under way by the U.S. Army Corps of Engineers for the Federal Flood Insurance Program (in part based on earlier work by the U.S. Geologic Survey). The State Division of Mines and Geology has outlined general areas vulnerable to tsunami along the coastline. Local and regional studies are often available to augment this information.

## LANDSLIDES

**Many Landslides Occur in the Coastal Zone.** Much of the landslide activity in California occurs in the coastal zone, due to the instability of the prevailing rock units and the steep-canyon topography of the coastal ranges. Many types of landslides, both ancient and recent, are observable, including rock falls, slides, and slow and fast mudflows, but many have been obscured by erosion and subsequent vegetation growth. Landslides and fast mudflows are caused by earthquake ground shaking, unstable rock formations, supersaturated ground material, torrential rainfall, and poorly planned development of landslide-prone areas. (For example, building on steep slopes, especially involving cuts and fills, may increase landslide risk if not properly planned).

**Fast Mudflows Are Also a Problem in the Coastal Range.** A special problem in the California coastal range is the potential for fast mudflows on canyon walls and on alluvial plains or canyon mouths. The potential for these mudflows is greatly increased by sudden heavy precipitation and by loss of ground cover, especially from fire. Revegetation programs after fire can help in reducing risks, but complete

Old coastal highway, Princeton, San Mateo County

stabilization of these flow-prone areas is virtually impossible. In spite of this, these sites are often developed and suffer from later damage (for example, Topanga Canyon in southern California and the Big Sur area in central California). If the present rate continues, for the 30-year period after 1970 landslide damage statewide is expected to total $10 billion, according to a projection by the Division of Mines and Geology. Much of this will occur in the coastal zone.

**Slope Stability Hazards Can Be Minimized by Mapping and Regulation.** Slope-stability mapping is a primary tool for assessing potential landslide hazard, while regulation of land use and site preparation is the chief means of minimizing slope stability hazards. At present, both mapping and regulation are incomplete within the coastal counties. Mapping has often been undertaken only when intensive development is contemplated and landslide hazard is suspected; however, the Division of Mines and Geology has or is preparing maps for Sonoma, Marin, Santa Cruz, Ventura, Los Angeles, Orange, and San Diego Counties. Regulation is normally adopted only after damaging landslides occur. Slope-stability maps must be supplemented by specific analysis of individual sites if construction is proposed in areas indicated to be hazardous.

## SUBSIDENCE

**Subsidence Is Also a Hazard in Some Coastal Areas.** Subsidence is the relative sinking of the surface of the earth's crust in limited areas. This geologic hazard can be either natural or man-induced (primarily from overdraft of subsurface liquids such as water and petroleum); can break or shift many structures, such as buildings, transmission lines, and pipelines; and can cause inundation of beaches and low-lying areas. The South Coast Region has suffered and may still suffer from the greatest amount of subsidence in the coastal zone. The Division of Mines and Geology estimates that statewide losses due to subsidence will total $26 million between 1970 and the year 2000 if current practices are continued. Continuous monitoring of surface elevation changes and associated horizontal movements is necessary for early detection of subsidence. (See Policy 83[g] regarding measures to minimize subsidence hazard in petroleum extraction operations).

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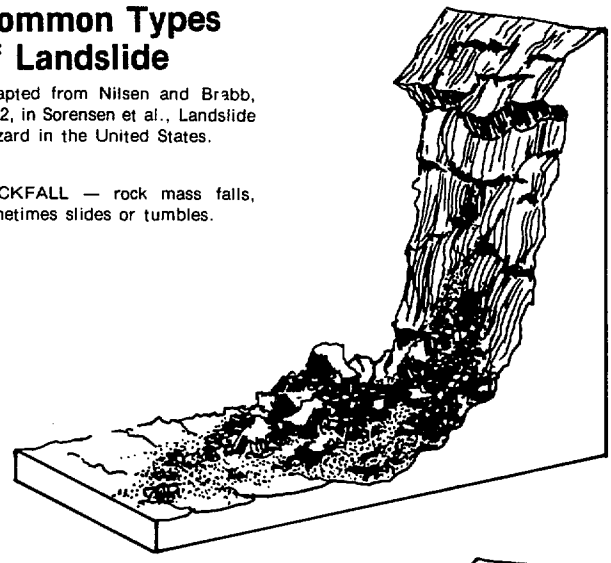
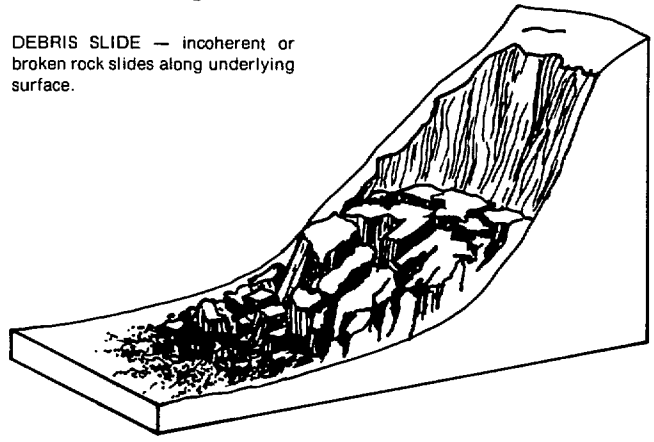
**Legislation to Expand State Geologic Hazards Program Has Been Recommended.** The Joint Legislative Committee on Seismic Safety in January 1974 recommended several measures, including (1) broadening the provisions of the Alquist-Priolo Act (which presently is limited to concern about construction on or near certain active fault traces) to include all major geologic hazards and to cover State and Federal, as well as local and private, projects; and (2) assigning responsibility for setting criteria for and reviewing land use policies related to geologic hazards to an effective State agency able to work with local governments. Legislative response, however, has been incomplete. In 1974 the Seismic Safety Commission Act was enacted, establishing a Seismic Safety Commission, which is developing valuable information through the strong-motion instrumentation program and will make further recommendations. Legislation that would have required geologic reports for subdivisions in areas of high geologic risk (as designated by local Seismic or Safety Plan Elements) and in all areas of 2:1 slope or greater was passed by the Legislature in 1974 but vetoed by Governor Reagan.

## Common Types of Landslide

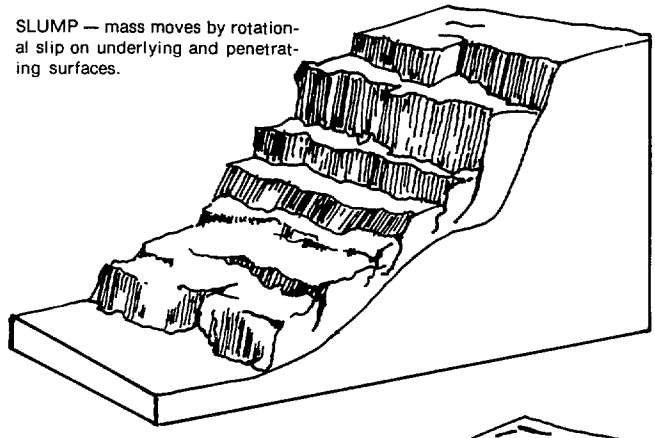
Adapted from Nilsen and Brabb, 1972, in Sorensen et al., Landslide Hazard in the United States.



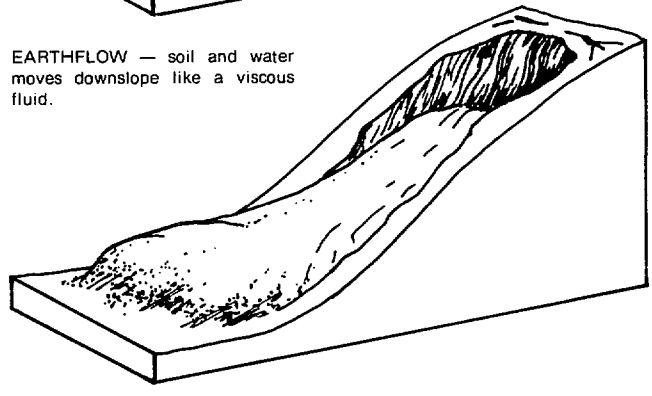
ROCKFALL — rock mass falls, sometimes slides or tumbles.



DEBRIS SLIDE — incoherent or broken rock slides along underlying surface.



SLUMP — mass moves by rotational slip on underlying and penetrating surfaces.



EARTHFLOW — soil and water moves downslope like a viscous fluid.

## Policies

**65. Improve Statewide Geologic Safety Measures.** Measures to ensure geologically safe land use in California and particularly within the coastal zone are necessary to protect the public. To this end:

a. **Improve Local Government Geologic Hazards Programs.** Local governments' seismic safety elements of general plans, and planning, funding, and implementation of city and county geologic hazards programs, shall be improved. It is recommended that legislation be adopted requiring local governments to: (1) adopt, implement, and enforce at a minimum Chapter 23, dealing with earthquake-resistant design requirements, and Chapter 70, dealing with grading requirements, of the Uniform Building Code; and (2) conduct geologic evaluations and require adequate engineering specifications to determine to the extent possible site stability and structural safety for all proposed construction projects and subdivisions that are in areas identified by appropriate governmental agencies as being of high geologic hazard or for projects that involve public service facilities and high-occupancy buildings (e.g., police and fire stations, schools and hospitals, major utility and industrial structures, multi-story residential and commercial buildings).

b. **Strengthen State Role in Geologic Programs.** It is recommended that legislation be enacted assigning, empowering, and adequately funding the State Division of Mines and Geology or other appropriate State agency to: (1) designate geologic risk areas; (2) recommend and, where necessary, impose appropriate land use and building regulations related to the designations; (3) research and recommend appropriate improvements to the Uniform Building Code to both the International Conference of Building Officials and local governments; (4) be responsible for enforcing standards and site review for proposed State projects and for advisory review of Federal projects; (5) establish criteria for local governments' specific review of construction projects in hazard areas; and (6) review and approve local seismic safety plans, land use policies, and building code standards and enforcement for consistency with statewide designations and goals. State funding assistance to the local government for disaster relief and other such programs could be made contingent upon satisfactory geologic hazards policies and enforcement. The State agency shall also compile and distribute to all appropriate State, regional, and local agencies, the large amount of pertinent data on geologic hazards being developed by such agencies as the State Division of Mines and Geology, U.S. Geological Survey, National Ocean Survey, U.S. Army Corps of Engineers, the Seismological Laboratory of California Institute of Technology, local governments, universities, colleges, and private organizations. This information shall be fully utilized in the formulation of land use plans and building standards, and in development evaluations, including septic tank and erosion control considerations, affected by geologic conditions.

**66. Require Filing of Geologic Hazards Information.** Geologic hazards information developed by qualified personnel and approved by an appropriate governmental agency for specific areas or sites shall be permanently filed in the public records of the coastal counties. The full reports shall be cited and a summary of all relevant conclusions, understandable to the layman, shall be included as part of the chain of title to property (and be a normal part of a title report) and also as part of the State Real Estate Commissioner's report for subdivisions.

**67. Review and Regulate New Developments for Geologic Safety.** In coastal areas of high geologic hazard as defined below, all proposed structures for human occupancy and other developments that could significantly alter geologic processes or contribute to hazards shall be reviewed and regulated to avoid risks to life and property.

a. **Definition of High Hazard Areas for Development.** Areas of high geologic hazard include: (1) seismic hazard areas delineated on fault maps as subject to potential surface rupture, on soils maps indicating materials particularly prone to shaking or liquefaction, and in local and regional seismic safety plans; (2) tsunami runup areas delineated by U.S. Army Corps of Engineers' 100-year recurrence maps, by other scientific or historic studies, and other known areas of tsunami risk; (3) landslide hazard areas delineated on slope stability maps, and in local and regional geologic or safety plans; (4) bluff and cliff areas designated as unstable (see Policy 70); (5) beach areas that are subject to erosion; and (6) other geologically hazardous areas designated by the Coastal Plan.

b. **Project Review Procedure.** Where such project review is necessary, geologic and soils reports of the site prepared at the applicant's expense shall be required unless adequate and currently applicable information is already available. Until

the statewide system recommended in Policy 65 is in effect, project review shall be by the coastal agency or an agency designated by it to carry out this function subject to independent review by the coastal agency within its area of jurisdiction. (For example, some local governments are or may become adequately staffed and authorized to perform project review, and the Forestry Board may adequately review potential hazards of timber operations).

c. **Division of Mines and Geology to Assist.** It is recommended that the Legislature enable and fund the Division of Mines and Geology to serve in an official advisory capacity to the coastal agency to assist as necessary in project review. A review team shall be available, where necessary, with expertise in geology, seismology, coastal processes, oceanography, soils engineering, engineering geology, structural engineering, civil engineering, architecture, landscape architecture or coastal botany, and building code enforcement. The team may include personnel from other State agencies as well as local experts. The coastal agency may also establish advisory boards to supplement this agency assistance.

d. **Interim Land Use Designations.** Pending more precise data and land use regulations, appropriate land uses, such as agriculture, forestry, sand and gravel mining, outdoor recreation, and parking lots, shall be encouraged in all currently undeveloped areas of high geologic hazard.

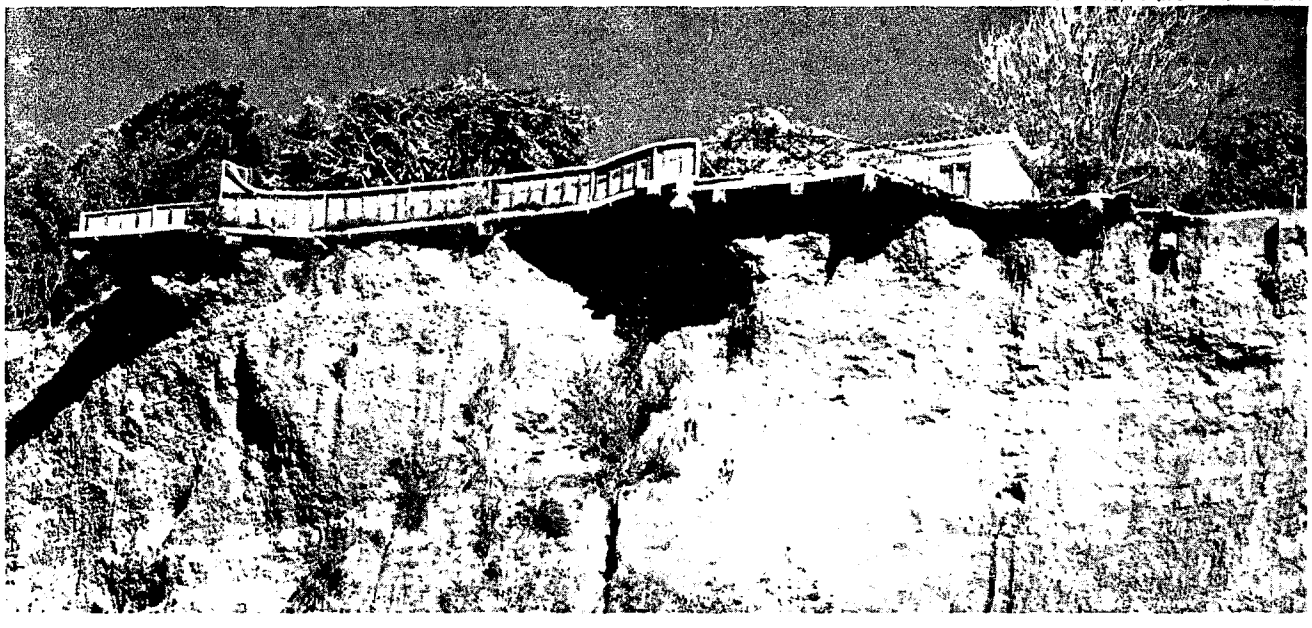
e. **Criteria for Development in Hazard Areas.** Proposed structures for human occupancy or developments that could contribute to potential hazards, such as cuts and fills in landslide areas, shall be permitted in high geologic hazard areas only if site treatment and construction techniques (permissible in accordance with other Plan policies) are adequate to overcome the hazard.

f. **Public Buildings in Hazard Areas.** All existing high-occupancy public buildings within areas of high geologic hazard shall be phased out or adequately protected as soon as feasible.

g. **Restrict Reconstruction in Hazard Areas.** In locations where structures have been rendered unfit for human occupancy by geologic instabilities, reconstruction shall be prohibited unless geologic and engineering data on the site demonstrates that the proposed replacement structure will not be rendered unfit for human occupancy in the future by the same type of geologic event.

**68. Prevent Public Subsidy for Hazardous Developments.** While the standards set forth in Policy 67 above shall be binding in the coastal resource management area and are strongly recommended for all areas of high geologic hazard statewide, it is recommended that State legislation be enacted to further assure that, if for any reason new structures for human occupancy are built in high geologic hazard areas without precautions to substantially eliminate risk to life and property: (1) there shall be no public assistance for such construction or reconstruction (e.g., FHA loans, publicly-financed service facilities, etc.) and no presumption of public liability for property loss (e.g., disaster loans or forms of insurance borne

Pacific Palisades, north of Santa Monica



by the general public); and (2) all occupants and successor purchasers of such structures shall be advised of the hazard and liability.

**69. Establish Safety Measures for Possible Tsunami Occurrence.** Communities within the 100-year tsunami (seismic sea wave) runup zone shall include within their safety elements a disaster preparedness plan for a tsunami occurrence; such a plan shall include evacuation routes and an effective emergency warning system capable of adequately informing all residents and visitors of an impending tsunami occurrence. Based upon accumulated information, the Department of Navigation and Ocean Development shall establish and enforce standards for marinas and harbors, including debris clearance and emergency evacuation procedures, to reduce potential damage from tsunami ocurrences.

# BLUFFTOPS

## Findings

**Bluff Erosion Is Caused by Natural Processes and Human Activities.** The breakdown of seacliffs and bluffs by wave action is a natural and constant process, the rate of erosion depending on such factors as the resistance of the cliff material, the conformation of the shoreline, the height of the cliff, the erosion from upland areas, and the direction of approach, height, and frequency of waves. Much of the coast consists of terraces of former beach sand overlying a bedrock; the sand layer is very erodible. In addition to natural causes, cliff erosion can be accelerated by saturation from irrigation or other increased water runoff at bluff tops, disruption of surface materials (for example, by foot traffic over bluffs), undercutting of the base, removing sand or rock materials that protect the base, loading by structures on the top, and improperly designed walls or stairways down the bluff face. Runoff water and saturation can be the major source of cliff and bluff erosion in many areas where landscaping and irrigated fields have been permitted on bluff tops. In many cases, drainage could be directed away from the bluff to correct this problem.

**Natural and Artificial Measures Can Protect Bluffs.** The best natural defense of seacliffs against wave action is a fronting beach that is both high and wide. Areas of seacliff lacking natural protection can be preserved by artificial means, such as construction of a beach seaward of the cliffs; armoring the cliff with rock or other non-erodible material; construction of offshore reefs or breakwaters to reduce wave energy that reaches the cliffs; and construction of cliff retaining walls.

**Bluff Protective Works Are Costly and Involve Problems.** However, these measures can be extremely costly, may be unsightly in the case of retaining walls, may interfere with access along the shore, may require continual sources of sand for replenishment, and must be carefully engineered to avoid beach erosion and shoaling elsewhere along the shoreline. A decrease in sand supply (especially affecting pocket beaches) also may result in some cases when artificial protective measures interfere with natural bluff erosion processes.

**Avoiding Extensive Protective Works Requires Control of Development.** The best means of avoiding the many problems associated with construction of bluff protective works, including public costs and visual impact on the natural landforms of the coast, is to limit construction on or near bluffs that might eventually require such works. Some additional protective works may be required, however, for certain public service facilities and for protecting existing structures.

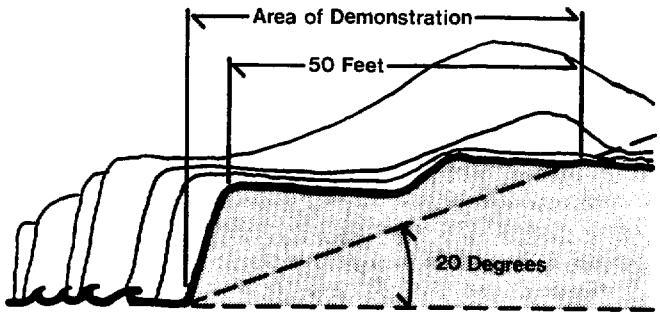
## Policy

**70. Regulate Bluff and Cliff Developments for Geologic Safety.** Bluff and cliff developments shall be permitted if design and setback are adequate to assure stability and structural integrity for the expected economic lifespan of the development and if the development (including storm runoff, foot traffic, grading, irrigation, and septic tanks) will neither create nor contribute significantly to erosional problems or geologic instability of the site or surrounding area. Design solutions shall in no case include destruction of cliffs and bluffs by excavation or other means. Bluff protection works may be permitted only in accordance with Policy 19. With that exception, no new lot shall be created or new structure built that would increase the need for bluff protection works.

a. **Expert to Evaluate Site Stability.** The demonstration of stability shall include a report prepared by a registered geologist, a professional engineer specializing in soils engineering, and/or a certified engineering geologist acting within their areas of expertise, based on an on-site evaluation. The report shall consider (1) historic cliff erosion, (2) cliff geometry,

(3) geologic conditions, including soil and rock characteristics, (4) landslides, (5) wave and tidal action, (6) ground and surface water conditions and variations, (7) potential effects of earthquakes, (8) the effects of the proposed development including landscaping and drainage measures, and (9) any other factors that may affect slope stability. The report shall express a professional opinion as to whether the site and development will meet the above standards during all foreseeable normal and unusual conditions, including ground saturation and maximum 100-year probable seismic forces (using best available information), throughout the lifespan of the project. The report shall use a currently acceptable engineering stability analysis method and shall also describe the limitation in this professional judgment due to assumptions and unknowns in the analysis. The degree of analysis required shall be appropriate to the degree of potential risk presented by the site and the proposed project; no significant risk to human life shall be acceptable.

b. **Area of Stability Demonstration.** As a general rule, the area of demonstration shall include the base, face, and top of all bluffs and cliffs




(of 10 feet in height or greater measured from the toe of the cliff face) extending inland to a line formed by a 20-degree angle from the horizontal plane at the base of the cliff or bluff (a 2.75:1 slope) or 50 feet from the top edge of the cliff, whichever is greater. However, the coastal agency may designate a lesser area of demonstration in specific areas of known geologic stability (as determined by adequate geologic evaluation and historic evidence) or where adequate protective works already exist, and may designate a greater area of demonstration and/or an area of absolute development exclusion in areas of known high instability.

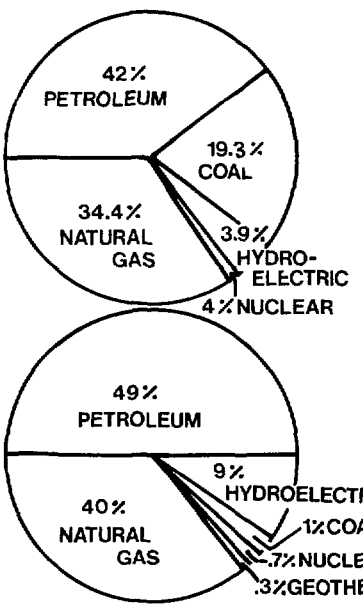
# ENERGY

# ENERGY AND THE COAST

## Findings

**California Coastal Zone Contributes to the State's Energy Supply in Several Ways.** The land and water of California coastal zone is now used, and can be used more to contribute to the State's energy supply in five principal ways:

- To provide sites and ocean cooling water for power plants that generate electricity;
- To provide sites for drilling, production, treatment, storage, and pipeline facilities for oil and gas operations onshore and on submerged lands beneath State and Federal offshore waters;
- To provide terminals to moor and offload tankers and barges bringing crude oil and refined products to California, the region, and the nation;
- To provide sites for oil refineries; and
- To provide special terminals and onshore plant facilities for liquefied natural gas imports.




**Energy Sources (1970)**

**UNITED STATES**
(National Petroleum Council, U.S. Energy Outlook, 1971)

**CALIFORNIA**
(Resources Agency, Energy in California, 1973)

**Coastal Plan Seeks to Protect the Coast Yet Provide for Needed Energy.** A principal goal of the Coastal Plan is to protect, enhance, and restore the coastal environment while also providing for energy facilities for which a clear public need and a need for siting along the coast can be shown. Coastal planning does not seek to sacrifice the environment of the rest of California; little would be gained if a coastal area were to be saved at the price of even greater environmental damage inland. Energy planning for the coastal zone must take into account estimates of State and national energy needs, strategies for reducing the need for coastal energy development through energy conservation programs and application of alternative energy forms, and the environmental impacts of locating energy facilities in the coastal zone and inland.

**Demand and Supply Forecasts for Conventional Energy Sources.** Primary conventional energy sources used in California are petroleum (crude oil), natural gas, hydropower, and nuclear power. Based on present demand/supply forecasts (using traditional forecast methodology), demand for these primary sources will exceed supply.

### PETROLEUM SUPPLY AND DEMAND

**Petroleum Demand Exceeds Supply.** California petroleum demand at present outstrips in-State production, and the deficit is likely to increase.

**New Sources Needed to Meet Even a Reduced Demand Growth.** To meet even a reduced demand growth for petroleum, new sources of supply will be needed. Supply requirements can be met by:

- Increased development of onshore petroleum, including increased exploration and expanded secondary and tertiary recovery and development of the Elk Hills Naval Petroleum Reserve;
- Development of State and Federal offshore petroleum resources; and
- Alaskan and foreign imports.

Increased on shore production offers the least environmental risk, but, except at Elk Hills, has a limited potential for increasing supplies. New sources could require major new developments in the coastal zone which could have substantial adverse environmental impacts.

**California's Role in National Petroleum Supply Needs Updating.** At present, California's only defined role in national energy supply is based on its historical and continuing role within Petroleum Administration for Defense District V (PAD V — California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii). Proposals currently exist, however, to make California a transfer point for crude oil to be brought by tanker from Alaska and sent by pipeline to the Midwest.

**California Is Heavily Oil-Dependent.** Oil now accounts for more than 50 per cent of California demand for primary energy. The major oil requirements are for energy (electricity generation, agricultural and municipal water pumping, industrial process heating, vehicle fuels, liquid petroleum gas) and production of oil-derivative products.

**Present Oil Demand Growth Projections Foresee Increased Demand Levels.** Leading studies on oil demand growth for California completed during 1973-75 have forecast high oil demand growth (4-5 per cent annually) because of: (1) a continued decrease in the availability of natural gas; (2) failure of nuclear plants to come on line as scheduled; and (3) a continuation of pre-1973 gasoline consumption growth. However, such projections did not consider the significant potential for demand growth reduction (to 2-3 per cent annually) from (1) increased oil prices, (2) conservation measures, and (3) accelerated development of alternative energy sources. Consequently a re-examination of traditional forecast assumptions and methodology is needed.

**Oil Prices Increase May Reduce Demand.** Since late 1973 foreign oil prices have risen abruptly by as much as 100 to 300 per cent, in turn forcing price increases in domestic oil and petroleum products. Such oil price increases, and the 1974 oil embargo, have led to new emphasis on energy conservation measures and alternative energy source development, and may depress oil demand growth. A major effect of the price surge is to throw into question all public projections of demand and supply of petroleum that pre-date the increase.

**Several Other Factors May Also Help Reduce Oil Demand Growth Rate.** Both the Federal Energy Administration and the new California State Energy Resources Conservation and Development Commission are specifically charged with developing conservation programs to help conserve oil. The Coastal Commission is also required to conserve and manage coastal resources, including both energy resources and other coastal resources that would be affected by energy-related development. Most existing petroleum demand forecasts do not reflect adequate consideration of the potential for demand reduction through such programs.

Factors besides price increases and conservation programs that could help reduce the oil demand growth rate include:

- An increased availability of natural and synthetic gas, methanol, and alternative energy sources to replace reliance on petroleum (especially for electrical power generation);
- Changes in lifestyle, particularly in reduced use of the private automobile and of electricity;
- A continued decline in the State population growth; and
- A lower growth rate in the national economy.

**State's Crude Oil Production Fails to Meet Demand.** California crude oil production has steadily declined since 1968-69 from about 1,000,000 barrels per day in 1968 to about 917,000 barrels per day in 1973. In 1973, only 55 per cent of the crude oil for California refineries came from within the State; 31 per cent came from foreign sources and 14 per cent came from other states. Projections for 1975 indicate that California will furnish only 49 per cent of its own crude oil for refineries, with 41 per cent coming from foreign countires and 10 per cent from other states. If demand/supply trends of the recent past should continue, the portion of State demand satisfied by State crude production would drop markedly by 1985. However, because of possible demand growth reduction factors considered above and the potential for increased development of California's potential recoverable onshore and offshore oil resources, a huge in-State deficit is by no means inevitable.

**Alaskan Crude Oil Will Reduce Need for State Production and Foreign Imports.** Much of California's future crude oil supply is expected to come from the Alaska North Slope project via pipeline and tanker, beginning as early as 1978. Although the Stanford Research Institute forecast in mid-1973 that oil from this source would amount to 600,000 barrels per day per day in 1980, and 850,000 barrels in 1985, more recent information indicates that California could receive as much as 1.2 million barrels per day beginning as early as 1978.

**State Demand for Low-Sulfur Fuel Oil Exceeds Present Supply.** As natural gas supplies have recently been curtailed, the short-term demand for fuel oil for use in industry and in electric power generation has increased. State air quality regulations require the use of low-sulfur oil when natural gas is not available. Much of California's crude oil is high in sulfur content, and although several new projects are under construction or planned, California refineries presently lack adequate direct desulfurization capacity to meet low-sulfur crude oil demands. Therefore these demands must be met either by import of low-sulfur crude for refining in California, or by import of refined low-sulfur fuel oil.

**State Petroleum Planning Needs Better Coordination with Energy Planning.** At present no State agency is responsible for planning petroleum-related development activities within the context of a comprehensive program of energy development and conservation in California. The State Division of Oil and Gas forecasts petroleum supply and demand and drafts policies for petroleum development, but it does not directly determine policy for other sources of energy. The State Lands Commission makes decisions relating to development of the petroleum resource underlying State-owned lands. The new State Energy Commission determines policy for power plant siting and energy conservation, studies petroleum supply and demand, and recommends development and conservation policy, but under present law it cannot determine policy for siting petroleum-related development.

## NATURAL GAS SUPPLY AND DEMAND

**Natural Gas Demand Exceeds Supply.** Natural gas is a desirable fuel because it is relatively clean burning. Its extraction and transportation, however, involve many impacts similar to those associated with oil. The demand and supply of natural gas is important to coastal planning because it will help determine the need for:

- Liquefied natural gas (LNG) facilities in California;
- Facilities proposed by electric utilities and oil companies to provide additional low-sulfur fuel oil to substitute for

natural gas in power plants and other industries; and

- Production of natural gas associated with oil reservoirs in California's outer continental shelf.

In California, as in the rest of the U.S., the demand for natural gas continues to increase rapidly while traditional sources of supply are dwindling. At the present projected growth rates, without additional supplies some curtailment in peak service to residential and commercial customers could occur as early as 1978 in southern California.

**Conservation Programs, Price Increases, Other Factors Influence Future Demand.** Future demand for natural gas will be influenced by the impact of energy conservation programs and price increases. Price elasticity studies suggest that increases in price may decrease demand for natural gas through conservation and customer switching to alternative forms of energy. On the other hand, although broad energy conservation programs will presumably result in more efficient use of existing gas supplies, they may also stimulate additional gas demand in the residential and commercial sectors, where direct use of natural gas is more energy efficient than use of electricity. Moreover, price increases of other energy sources may also increase customer switching to gas. For these reasons it is difficult to firmly estimate future demand.

**Present Natural Gas Supply Sources Cannot Meet Demand.** California produces less than one-fourth of its natural gas needs. Moreover, California's total proved reserves of natural gas have been declining since 1963; if present State production and demand trends continue, only 17 per cent of demand will be met by the State reserves by 1985. In 1973, California imported 78 per cent of its gas supply — 61 per cent from the southwestern states and 17 per cent from western Canada. However, both the El Paso Natural Gas Company and the Transwestern Pipeline Company have been allowed by the Federal Power Commission (FPC) to curtail their deliveries of gas to California, and further curtailment can be expected in the near term. Additionally, in 1974 the Canadian National Energy Board refused to permit expanded deliveries of natural gas to the U.S. from Alberta, pending evaluation of the adequacy of reserves to meet Canada's own project needs.

**New Domestic Sources Could Conceivably Increase State Supply.** Potential new domestic natural gas sources include: (1) large reserves of natural gas on the Outer Continental Shelf; (2) large natural gas reserves associated with Alaskan oil deposits; (3) significant quantities of gas trapped in tight rock formations in the Rocky Mountains; and (4) two synthetic natural gas-from-coal (SNG) plants proposed in northwestern New Mexico using coal strip-mined in Utah. All have major environmental impacts that will have to be taken into account. If the SNG project is completed despite the environmental problems, California may receive as much as two-thirds of the output of these plants via pipeline beginning as early as 1970-80, representing a very small percentage increment in overall supply. Other potential sources capable of incrementally supplementing natural gas supplies are methane gas produced from sewage, sanitary landfills, or individual units; and SNG from oil (naphtha), production of which is being considered at a proposed refinery near Carlsbad.

**Alaskan and Foreign Natural Gas Imported as Liquefied Natural Gas (LNG).** Where pipelines for long-distance transportation of natural gas do not exist, natural gas is being transported in ships in very cold (about -260° F.) liquid form, which reduces its volume by a factor of more than 600. Projects have been proposed to import liquefied natural gas (LNG) into California from practically every major oil-producing area in the world. Import of LNG into California from Alaska and abroad will require LNG port, storage, and gasification facilities, all of which will be located in the coastal zone and involve significant environmental and safety risks. The exact magnitude of LNG imports is difficult to estimate at this time.

**Potential of New Natural Gas Supplies Is Substantial.** Substantially more gas may be available by the early 1980s than is presently being expected by the gas utilities. Several studies conclude that even without extensive new conservation measures, if regulatory and pricing policies were altered to encourage development of sources, sufficient gas could be available by the mid-1980s to meet nearly all of the presently projected national gas demand. It is conceivable that a modest resurgence of gas consumption by large industrial and utility users would then be possible.

**Less Natural Gas Available to Fuel Power Plants.** Power plants, classified as low-priority users of natural gas, substitute fuel oil for gas when gas supply is interrupted. In recent years electric utilities could count on natural gas for up to 90 per cent of their fuel needs, but in 1974 only about 15 per cent of fuel needs were met by gas. If present consumption trends continue, and if no new natural gas should become available, utilities might have to depend on fuel oil for as much as 90 per cent of their needs by 1976.

## ELECTRICITY SUPPLY AND DEMAND

**Electricity Demand Determines Need for Development of New Supply.** The need for electricity will determine the need for various means of supplying electricity, many of which will directly affect the coastal zone. In 1973, 59 per cent of California's electricity was generated by burning oil and gas (oil 30 per cent, gas 29 per cent); 31 per cent was produced by hydroelectric sources; and 10 per cent by other sources such as nuclear, coal, and geothermal. Most of California's fossil fuel and nuclear power plants are located in the coastal zone, and utilities are considering new or expanded power plants at coastal sites. Such power plants can have many environmental, safety, and land use impacts. (See section on power plant siting.)

**Electricity Demand Is Growing.** Electrical energy demand is growing both absolutely and as a share of the total energy market as a result of (1) its versatile applicability, (2) increasing supply pressures on oil and natural gas, and (3) development of new uses, products, and processes.

**Electrical Energy Use Varies Among Market Sectors.** The principal electrical energy market sectors in California are:

- Residential — 29 per cent,
- Commercial — 38 per cent,
- Industrial — 28 per cent,
- Other, including pumping of agricultural and municipal water — 5 per cent.

The commercial sector is both the largest and fastest growing.

**Residential Consumption.** More than half the electricity consumption in the residential sector is due to three types of uses: space conditioning (heating and cooling), water heating, and refrigeration, with space conditioning growing fastest. Demand in the residential sector as a whole has

increased for several reasons: (1) the number of new households has grown faster than population; (2) the use of air conditioners has increased; (3) until recently utilities actively promoted all-electric homes; and (4) many new and sometimes less efficient appliances have been introduced and have approached market saturation. Due to stabilization in the growth rate of new households and the approaching market saturation of many appliances, however, residential demand growth has been forecast to decline significantly, even without price rises and conservation measures.

**Commercial Consumption.** In the commercial sector, electricity is used primarily for air conditioning, food and products refrigeration, and lighting. Increased commercial electricity use has been forecast to continue, but the sector's sensitivity to electricity price increases and other market factors may help restrain growth.

**Industrial Consumption.** Industrial electricity demand growth has been due to (1) increased industrial output and floor space, (2) greater electricity use per unit of output, and (3) increased use of electricity instead of primary fuels in industrial processes. The rate of growth has been forecast to slow in the future because of conservation practices.

**Consumption Patterns Vary By Region.** Electrical energy usage patterns differ regionally within California. Southern California consumes two-thirds of statewide electrical energy produced and has a faster growth rate than northern California. Both northern and southern California, however, have recently been experiencing declining growth rates in population and overall electrical energy use. Because of variations in weather conditions, there are also regional differences in the months of maximum electrical energy usage. Pacific Gas and Electric system peak occurs in July, whereas the San Diego Gas and Electric system peak occurs in December. California's maximum monthly electrical energy usage is usually during August.

**Potential for Reduction in Electricity Demand Growth.** The growth in demand for electricity in California has averaged 7.7 per cent over the last 25 years. It has now begun to slow, but there is considerable potential for further demand growth reduction through vigorous energy conservation measures, the impact of rising electricity prices and price rate restructuring, and the development of alternative energy sources. Slowed population and economic growth rates in California will also contribute independently to a lower electricity demand growth. In the long-term, increased prices, intensive conservation efforts, new energy systems, and revised price structures could probably reduce California's estimated demand by as much as 30 to 40 per cent of the conventional projections for the year 2000. (See section on energy conservation.) Present demand forecasts do not yet adequately reflect these factors.

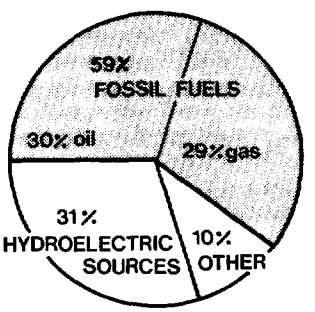
**State Energy Commission Will Improve Forecast Methodology.** The Warren-Alquist Act (AB 1575) provides for the State Energy Commission to make improved electricity demand forecasts to serve as the basis for electrical generation facility siting. The Energy Commission will develop a standard forecasting methodology to be employed by the utilities in providing input to an independent forecast to be developed by the Commission.

**Conventional Demand/Supply Projections Are Pessimistic About Alternative Energy Sources.** Many conventional demand/supply projections assume that there will be no significant contributions from alternative energy sources and no major breakthroughs in energy technology that will have a significant impact on electricity supply in this century. Among electric utilities and State agencies such as the Resources Agency and the Public Utilities Commission, there is a consensus that over half of all new capacity in California required to meet electricity demand in the year 2000 will be obtained by nuclear fission power plants, one tenth from hydroelectric power, and only one tenth from geothermal power. No potential contribution is identified from solar, wind, or solid wastes. If these sources appear at all in conventional forecasts, they are typically allocated only token supply contributions or are dismissed as "futuristic." Stronger, more forceful research and development programs at the State and Federal levels, however, could expedite development of the full potential of alternative energy sources for use in California.

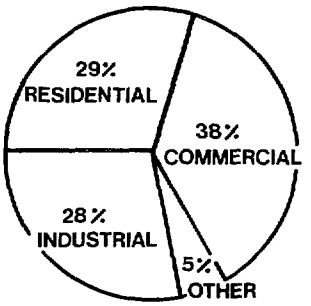
**Electric Utilities Plan on Basis of Available Technology.** Electric utilities take a cautious approach to including alternative sources of electricity generation in supply mix projections because: (1) electric utilities are held responsible for meeting whatever demand for electricity actually exists, and they therefore plan almost exclusively on the basis of available technology as the means to meet 5, 10, and even 20-year demand forecasts; (2) the lead time required for construction of any generating facility is significant: typical lead times are 6 years for a combined cycle fossil fuel plant, and up to 12 years for a nuclear plant.

**Electricity Supply Forecasts Form Basis For Other Supply Forecasts.** Although the electric utility supply forecasts represent only one possible supply scenario, they are used as a principal basis for planning by a broad range of public agencies dealing with such complex issues as petroleum and natural gas supply, port facilities, land use, and water resources.

**Serious Environmental Impacts Implied in Continued Dependence on Conventional Supply Mix Forecasts.** The consequences implied in conventional supply mix forecasts




**Electricity Supply in California (1973)**




**Electricity Use in California**

are serious: (1) increasingly severe environmental disruptions for fossil fuel extraction, processing, and delivery; (2) consumption for electrical generation purposes of nonrenewable hydrocarbons that are more valuable for other uses; (3) increased problems of air pollution; (4) problems of nuclear fuel transport security, radioactive waste handling and disposal, and potential nuclear reactor hazards, which do not yet have definitive solutions; (5) and problems of cooling water supply and marine life impacts. Such energy planning as has been done in California has been based primarily on the conventional utility projection of electricity supply mix.

**Alternative Energy Sources Look Increasingly Desirable and Feasible.** Energy sources for electricity generation that previously were thought to be economically unattractive or technologically unattainable have recently become more desirable or more feasible because of (1) escalating price levels for competing conventional energy sources; (2) new concern for environmental protection, human health and safety, and conservation of nonrenewable hydrocarbon resources; (3) new levels of research commitment for alternative source development; and (4) new concern about political implications of dependence on international markets for energy supply.

**Alternative Energy Sources Could Yield Half of New Capacity Required.** It is possible that alternative sources of energy that may be environmentally less damaging or less hazardous than the sources shown in most conventional electricity supply projections may make a greater contribution to future electricity supply than is presently acknowledged.

A hypothetical alternative scenario for future electrical generation capacity in California suggests that alternative energy sources (solar, geothermal, wastes, wind, and pumped hydroelectric for peak hour demand) for electric power generation might be provided by the following sources by the year 2000:

| | | |
|---|---|---|
| Solar | 16,900 | Megawatts (Mw) |
| Geothermal | 12,800 | Mw |
| Wastes | 3,200 | Mw |
| Wind | 3,000 | Mw |
| TOTAL | 35,900 | Mw |

This capacity would represent half of all new generating capacity required between 1973 and 2000 (based on the Rand Study Case "2" — i.e., base case plus price increases), in contrast with the conventional supply mix forecast of less than 15 per cent from these combined sources. This scenario assumes a strong policy commitment by government bodies and electric utilities to high levels of research and development of alternative energy technologies and to extensive marketing and public education. The future share of generation that will actually be provided by each of these technologies is uncertain, and depends on such things as comparative economics, environmental acceptability, and lead time required from earliest date of feasibility.

**Long-Term Demand Reduction Through Increased Prices and Conservation Measures.** In the long-term, increased prices, intensive conservation efforts, new energy systems, and revised price structures could probably reduce California's estimated demand by as much as 30 to 40 per cent of the conventional projections for the year 2000.

# ENERGY CONSERVATION

## Findings

**Impact of Energy Facilities on the Coast Can be Reduced by Energy Conservation Measures.** The need for energy-producing facilities can be reduced, and the impact on the coastal zone thereby lessened, by vigorous energy conservation measures. Substantial savings can be achieved by curtailing wasteful consumption of energy without harming the economy of the nation or the State. Some experts estimate that as much as 40 per cent of present total energy consumption is wasteful, and that conscientious application of a broad energy conservation program to all sectors of the energy market — homes, businesses, industry, and transportation — could halve our historical energy growth rate. The Ford Foundation Energy Policy Project, for example, concluded that the national energy growth rate could be reduced from the present level of nearly 5 per cent to 1.7 per cent annually without any significant adverse economic effects.

**Utility Rate Structures Encourage Consumption.** One of the most important and direct ways to encourage more efficient energy use is to change electric and gas utility rate structures to accurately reflect all of the internal and external costs of producing and delivering additional service. Present rate structures often encourage consumption by charging reduced per-unit prices for large consumers. Present pricing structures also make no attempt to discourage demand during periods of peak load. Peak load generation typically results in use of the least efficient generating equipment. Consumption during peak periods, then, is costlier than during off-peak hours. The Wisconsin Public Service Commission in 1974 made a landmark rate decision requiring a major electric utility to implement (1) "flat" rates, except where the traditional "declining block" rate structure can be proved to encourage the most efficient allocation of energy, and (2) a system of peak-load pricing that would result in higher rates during summer months, when the system's peak loads occur. In California, the California Public Utilities Commission (CPUC) has rate-setting authority. The new State Energy Commission will not assume this function. The CPUC has recently undertaken a study of alternative rate structures to analyze possible new approaches for application in California.

**Forty Per Cent of Energy Used in Homes and Businesses Is Wasted.** The residential and commercial sectors of society account for about one-third of the nation's annual energy consumption and their consumption is increasing at

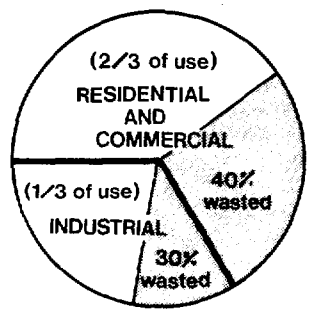
the rate of 5.4 per cent per year. They consume two-thirds of California's electricity. Overall, it is estimated that nearly 40 per cent of the energy these sectors consume is wasted. Waste occurs due to poor insulation and ventilation; inefficient heating and cooling systems; poorly maintained and designed appliances; and wasteful use of lighting, appliances, and heating and cooling.

**Energy Consumption in Industry Can Be Cut up to 30 Per Cent.** The industrial sector accounts for about 41 per cent of total annual energy consumption in the U.S., and about 33 per cent in California. Although energy consumption per unit of industrial output has decreased over the decades, substantial energy waste still exists in energy-inefficient work schedules and industrial processes, poorly maintained equipment and machinery, use of outdated direct-heat apparatus with heat transfer efficiencies as low as 5 per cent, and failure to recover and reuse waste heat and waste materials by recycling. Savings of at least 10 per cent of the energy used in the industrial sector should be possible with only minimal efforts, while 30 per cent or more could be saved with concerted application of currently feasible technology.

**Energy Consumption in Transportation Can Be Cut by 15 to 25 Per Cent.** Transportation of passengers and freight accounts for about 25 per cent of nationwide energy use, and nearly 35 per cent in California. Transportation modes have become increasingly energy consumptive. As presently used, automobiles, which account for 90 per cent of all passenger movement, use more than twice as much energy per passenger mile as buses; in large part this is because on the average each car carries only 1.3 passengers. Automobile inefficiency is increased by high-speed driving, air conditioners, automatic transmissions, poor tires, and unnecessarily large engine size and car weight. Remote, scattered, or low-density developments not only increase dependence on automobiles but also tend to require greater travel distances, causing increased air pollution and fuel consumption. About one-third of all freight transport in the nation is by truck, although trucks use over 3½ times more energy per ton mile than railroads, and 5 times more than pipelines. Savings of 15 to 25 per cent are possible in the transportation sector using only short and mid-term conservation measures (e.g., consumer education, lower speed limits, rate and service improvements on public transit, and rail freight transport).

**Energy Consumption in Electric Utilities Operations Can Be Reduced in Several Ways.** Energy consumption in electric utilities operations can be reduced through improvements in power generation technologies; reductions in transmission losses by use of improved equipment and by siting generation facilities near to load centers; and use of once-through seawater cooling systems rather than evaporative cooling or dry tower systems, though such cooling systems may have adverse effects on the marine environment. In electric utilities operations, the trade-offs for achievement of energy conservation are often stark: a utility may accept energy inefficiencies to avoid high capital costs of alternative equipment, to utilize a generation or cooling technology that meets its particular system needs (e.g., a gas peaking turbine or pumped hydropower project to meet peaking capacity needs), or for other economic considerations; similarly, a conservationist or land use planner may support equipment design or siting standards that sacrifice some energy efficiency in order to meet specific land use planning or environmental goals.

**State Energy Commission Is Mandated to Develop Energy Conservation Programs.** The State of California has already begun to move toward design of energy conservation measures for uniform implementation statewide. The State Energy Commission has a broad mandate to develop programs for reducing wasteful, unnecessary, inefficient, and uneconomic uses of energy through energy pricing strategies; improved lighting, insulation, climate control systems, and other building design and construction standards; improved standards for appliance efficiencies; and advances in power generation and transmission technologies. The Energy Commission is mandated by law to prescribe such standards by July 1976, which shall then take effect statewide by July 1977.




**Energy Consumption and Wastage — By Sector**

**Some Legislative Energy Conservation Measures Will Soon Be Implemented.** Other energy conservation measures that have been initiated by the Legislature include:

- SB 277 (Health and Safety Code, Chapter 11), which requires development by the Department of Housing and Community Development of minimum insulation standards for residential structures. Such standards have now been adopted by the Legislature as regulations effective February 22, 1975, to be applicable statewide and enforced by local agencies;
- SB 144 (Health and Safety Code, Chapter 11.5), requiring similar development of insulation standards for new nonresidential structures, to become effective near the end of 1975; and
- SB 1521 (Public Resources Code, Section 25950), to eliminate pilot lights in gas appliances.

The CPUC has recently played an active role in energy conservation efforts by ordering utilities to undertake voluntary conservation programs and to mandatorily curtail uses by specific customer groups.

**Coastal Commission Can Recommend Energy Conservation Policies to Energy Commission.** Despite the broad mandate of the Energy Commission to develop energy conservation programs, and the strong interest in having such programs applied statewide, strong reasons remain for the Coastal Commission to develop policies for energy conservation. First, under the Energy Commission's enabling legislation, its regulations pertaining to lighting, insulation, climate control systems, and other building and design standards, including recommended energy budget codes, may not be developed and enforceable before mid-1977. Energy conservation policies recommended in the Coastal Plan will provide significant input into the Energy Commission's

energy conservation program. Second, development in the coastal zone will continue during the period prior to enforceability of the Energy Commission standards. Energy conservation standards that are already clearly identifiable can serve as guidelines for new construction, to begin working toward reduction of energy demand growth. Third, the Energy Commission's mandate does not include land use and development planning measures designed to reduce energy consumption.

**Energy Budget Codes Set Maximum Energy Consumption Levels.** Experts believe that substantial reduction of energy consumption could be achieved by designing and implementing "energy budget codes," which would require new buildings to meet maximum allowable levels of energy consumption according to building type, net building floor area, number of stories, height of individual stories, and local climate, among other possible criteria. Use of energy budgets would require architects, engineers, and builders to design with some focus on energy conservation, but would afford them maximum flexibility as to what conservation measures to employ. The Ohio Board of Building Standards has recently adopted an energy budget code. The California State Energy Commission is mandated by AB 1575 to recommend per unit energy requirement allotments based on square footage for various classes of buildings. No date is set within which the State Energy Commission must perform this function. Standards developed will not be mandatory.

## LIGHTING

**Lighting Consumes One-Fourth of U.S. Electricity.** Lighting represents 20-25 per cent of all electricity sold in the U.S. In office buildings, lighting represents an average of 40 per cent and in some cases up to 60 per cent of electricity used. Decorative lighting, advertising and display lights, exterior wall lighting, and other promotional uses are also large users of electricity.

**Lighting Levels Can Be Reduced Without Sacrificing Visual Acuity and Physiological Needs.** Nationally, average lighting intensity in commercial buildings has risen from 35 footcandles in 1940, to 85 in 1958, and to 124 at present. Many experiments confirm that lighting levels between 10 to 50 footcandles are sufficient for most visual acuity and physiological needs where levels of 60 to 150 footcandles are now being provided. Illumination levels can be significantly reduced in corridors, lobbies, passageways, and storage areas. Within work areas (e.g., classrooms or offices), use of selectively higher lighting levels for "task zones" can both reduce total lighting needs and heighten the effectiveness of the people working in the area. Lighting levels for tasks up to 100 footcandles can be achieved in most buildings designed for a maximum average requirement of 2.3 watts per net rentable square foot.

**Reduce Lighting Needs by Using Natural Light.** Lighting needs can be further reduced by using natural light wherever possible to replace electrical lighting. In major multistory office buildings or schools, about 25 per cent of the energy normally used in lighting might be saved if the lighting fixtures near windows could be manually switched off, or automatically operated by a photo cell.

**Fluorescent Lamps Are More Efficient than Incandescent Lamps.** Incandescent light bulbs are inefficient energy converters. Less than 10 to 14 per cent of the energy consumed results in useful lighting; the rest goes into heat. Fluorescent lamps are more than three times as efficient.

**Heat-of-Light Systems Lower Resultant Heat and Need Less Cooling.** Excessive and inefficient lighting also wastes energy indirectly by increasing the heat load, thereby increasing the need for cooling. Typically, every two watts of lighting requires one watt of cooling by air conditioning. "Heat-of-light" systems are available that reduce the amount of heat from lighting and thus the amount of air that must circulate in the air-conditioning system.

**High Pressure Sodium Lamps Are More Efficient in Street Lighting.** The high pressure sodium lamp (HPS) is a fairly recent development in street lighting and other outdoor illumination. For various lighting configurations, systems using mercury vapor lamps, which at present are most common, consume 2.3 to 2.9 times the energy required to produce an equivalent amount of light with a system using HPS lamps. The HPS lamp is initially costlier than the mercury vapor lamp; it also has a shorter life, and thus requires more investment in replacement lamps. Experts concur, however, that because of greater lamp efficiency, HPS systems are less costly over the system life cycle than mercury vapor lamps. Where existing street lighting in California uses series circuits, HPS lamps, which at present can operate only on a multiple circuit, are not compatible. In addition to using more efficient lamps, it may also be possible to reduce the illumination level of street lighting without adversely affecting public safety.

**Outdoor Illuminated Signs and Ornamental Lighting Consumption Can Be Reduced by Regulation.** Electrical consumption for promotional signs and lighting could be reduced through regulating the size, type of lighting, and extent of such uses. Regulation of signs for public safety and welfare reasons (including aesthetic values) has been upheld by court decisions. According to sign industry data, electric signs use less than 2/10 of 1 per cent of the total energy used in California (the percentage of total electricity used is slightly higher). New lighting standards for energy conservation will ultimately be developed and prescribed by the Energy Commission for mandatory application statewide. These standards are to be developed and applicable by mid-1977.

## HEATING AND COOLING

**Fifty Per Cent of Existing Heating/Cooling Demand Is Caused by Air Infiltration.** Of the total national consumption of energy, 18 per cent is for heating buildings. Only one out of every 10 buildings operates at 90 per cent or more of potential energy efficiency. Up to 50 per cent of the heating and cooling demand in existing buildings is a result of infiltration of outside air because of inadequate insulation, caulking, and weather-stripping. If these "leaks" were plugged in all existing buildings, 7.2 per cent of total nationwide energy consumption could be saved.

**Stringent Insulation Standards in New Construction Can Achieve Significant Energy Savings.** In new construction, more stringent insulation standards (applicable to walls, ceilings, and floors) and double glass windows, possibly

with special coating, could effect significant reductions of energy usage. Savings of up to 50 per cent of the energy required for heating and 20 per cent of the energy required for cooling in new residential construction and 10 per cent of both the heating and cooling energy in new commercial construction can be achieved.

**Energy Consumption Doubles with Use of Electric Space Heating.** Use of electric resistance space heating results in consumption of at least twice as much energy to heat a given space as direct use of a primary fuel (e.g., gas or oil). The conversion efficiency for a fossil or nuclear fuel thermal electric power plant is only about 35 per cent; inefficiencies in transmission and delivery systems still further reduce the overall conversion efficiency for electric space heating. If gas is used directly for space heating, overall conversion efficiency will range from 50 to 80 per cent, even considering inefficiencies due to improper furnace adjustment and start-up and shut-down operations.

**Air Conditioning Puts Severe Seasonal Strain on Electric Generating Resources.** Air conditioning's share of annual total national energy consumption has grown from an infinitesimal amount 20 years ago, to 1.6 per cent in 1960, to 2.5 per cent in 1968, to possibly as much as 4 per cent now. Because most of this energy is consumed during just a few months of the year, the strain air conditioning loads put on electric generating resources can be severe. One of every two homes in the country has at least one room air conditioner. One-half of the houses being built today are centrally air conditioned, compared to one-twentieth a decade ago.

**With Proper Controls, Central Heating/Air Conditioning Systems Can Be Flexible and Efficient.** Among various types and makes of conventional room air conditioning units, energy efficiency in actual "cooling capability" can vary by as much as 80 per cent. Large central heating and air conditioning systems generally use 10 to 15 per cent less energy on the average than smaller decentralized systems. If central systems are to operate with the same flexibility as individual systems, however, proper controls must be installed. In portions of the temperate coastal zone, proper design of structures and landscaping can obviate the need for air conditioning.

**Shading Windows from Direct Sunlight Can Substantially Reduce Heat Build-Up Inside Buildings.** The use of trees, shutters, sun screens, awnings, or roof overhangs to shade windows from direct sunlight can substantially reduce heat build-up in buildings, and thus air conditioning requirements. Special glazing (metal-coated and/or double wall glass) can cut both cooling and heating requirements by about half. It is much more efficient to screen glass on the exterior, rather than with blinds, drapes, etc., on the interior of a building.

**Heat Transmission Rates Vary with Building Surfaces.** Heat transmission rates are also affected by the proportion of exterior walls, the amount of surface area in windows (heat loss and gain from windows causes much greater energy use than the potential saving in natural lighting), and the color, orientation, shape, and angle or exposure of building surfaces.

**Operable Windows Aid Natural Ventilation.** Operable windows in lieu of fixed glass will allow natural ventilation to enter the building, eliminating some of the need for air conditioning and mechanical ventilation during much of the year. Such windows must be well fitted and weather-stripped to reduce infiltration of outside air.

**Heating/Cooling Systems' Designs, Based on Outdoor Conditions, Can Be Redesigned for More Efficiency.** Heating and cooling systems are usually based on outdoor conditions not exceeded more than 2-2½ per cent of the time. Except for facilities for the elderly, for industrial processes, or for health care, such systems could be designed for the 5 per cent condition with only a slight increase in discomfort during a few hours per year. Excessive safety margins and failure to account for people and appliance heat-loads also result in oversized space conditioning equipment and inefficient operation.

**Reduce Heating/Cooling Requirements by Reusing Already-Circulated Air in Buildings.** Heating and cooling of vast amounts of outdoor air that circulate through buildings can also consume energy wastefully. By reusing already-circulated air, the amount of outdoor air required for ventilation can be substantially reduced, from 5-15 cfm (cubic feet per minute) per person to 3-4 cfm per person in most buildings. Air quality can be maintained by using odor-absorbing devices and better filtration. Initial costs are no greater, since savings in fans, heating and cooling equipment, and ductwork more than offset the added costs for better filters and odor absorption equipment, and there are significant savings in energy and operating costs. Heat exchangers, which allow the use of already air-conditioned exhaust air from a building to preheat or precool system intake air, are a means for reducing heating and cooling requirements in large buildings.

**Heat Exchangers Recapture the Energy of Waste Heat.** The present lack of capability of buildings to store heat and cold and to control temperatures of appropriate areas separately results in a loss of energy which otherwise could be used later to offset peak electrical demand loads. Conventional chimneys, fireplaces, combustion devices, kitchen, laboratory, and laundry exhaust hoods are all energy wasters. Heat exchangers, can also be used to recapture energy otherwise given off as waste heat, such as from fireplaces, kitchen, laundry or major appliances, to be used later to offset peak demand loads.

## APPLIANCE EFFICIENCY

**Gas Pilot Lights Waste Energy Except in Water Heaters.** It is estimated that continually operated or lighted gas pilot lights consume more than 223 billion cubic feet of gas per year in the 30 million gas-heated homes in the U.S. Pilots on gas dryers and other appliances in commercial, governmental, and industrial facilities wastefully use additional volumes of gas. Pilots use about one-third of a typical gas range's overall consumption, and in some cases may account for as much as 50 per cent of the gas use, especially if pilot flames are set too high.

**Electric Ignition Devices Can Replace Pilots.** Safe electric or other "intermittent" ignition devices actuated only when the appliance is in operation are available today to replace pilots in most residential-type appliances and can be built into new gas appliances or retrofitted to existing appliances. Electric ignition devices add to the initial cost of a new appliance (about $3 to $30), but given current gas shortages and rising prices, they are likely to be substantially less expensive to the consumer than pilot lights when costs are calculated over the life of the appliance. Replacing pilots in

existing equipment, however, may cost $80 to $100, which may not be recouped through lower operating cost over the remaining life of the appliance. Unlike gas pilots in other fixtures, water heater pilots are efficient because the pilot flame contributes directly to heating the water.

**Intermittent Ignition Devices Will Soon Be Required by Law.** In May 1974, SB 1521 (Public Resources Code, Section 25950) was approved, prohibiting the sale or installation of new residential-type gas appliances (furnace, air conditioner, heater, refrigerator, stove, range, dishwasher, dryer, decorative fireplace log, or other similar device, but not including a water heater) equipped with a pilot light 24 months after an intermittent ignition device has been demonstrated or certified by the State Energy Commission, or January 1977, whichever is later. This long lead time was included in the legislation primarily to guarantee advance notice to appliance manufacturers, retailers, and contractors.

**Routine Maintenance of Gas Appliances Will Effect Energy Savings.** The efficiency of most gas appliances, including water and space heaters, can be reduced as much as 50 per cent by dirt build-up or improper adjustment. Routine maintenance of such appliances could effect substantial energy savings.

**Energy Savings Can Be Realized Through Improved Appliance Efficiencies.** Home and business appliances using both electricity and natural gas account for approximately eight per cent of total national energy consumption. Water heaters alone use four per cent of the national energy budget. Appliances vary greatly in the amount of energy required for identical tasks. Innovations in appliance technologies frequently result in more energy-intensive appliances. Frost-free refrigerators and freezers, for example, use nearly twice as much energy as manual defrost units; and color televisions use about 40 per cent more energy than black and white sets. More efficient appliances may initially cost more, but they enable consumers to save money in operating costs. Labeling of appliances as to energy efficiency would enable the public to make informed purchases, and would encourage energy efficient design by appliance manufacturers. The State Energy Commission is mandated to prescribe standards for minimum levels of operating efficiency for all appliances whose use requires a significant amount of energy on a statewide basis. One year after adoption of such standards, sale of non-complying appliances in California will be illegal.

## BUILDING MATERIALS

**Aluminum Production Requires Six Times More Electric Energy than Steel.** It takes approximately six times as much electric energy to produce a ton of aluminum as a ton of steel. Analysis of a high-rise building has demonstrated that its skin would require 5.75 million pounds of stainless steel, which takes .77 million kwh to produce, compared to only 4 million pounds of aluminum, which, however, takes 2.1s million kwh to produce.

**Wood Is the Only Renewable Major Building Material.** Wood is significantly more favorable in energy required for production than steel or aluminum. The production of a ton of finished wood takes only 12 per cent of the energy required to produce a ton of steel and 2 per cent of that required to produce a ton of aluminum. Wood is also the only renewable major building material. Concrete and masonry have higher heat storage capacity and longer life cycles than metals or wood.

## Policies

**71. Restructure Utility Rates to Encourage Energy Conservation.** To encourage energy conservation and peak-load demand reduction, the California Public Utilities Commission and the State Energy Resources Conservation and Development Commission (hereafter "Energy Commission") are urged to revise rate structures to more accurately allocate the increased costs of peak load production and construction of new or expanded production and transmission facilities.

**72. Recommendations for Statewide Energy Conservation Measures in New Developments.** Non-essential consumption of energy shall be reduced statewide, thereby reducing the adverse environmental impact of energy supply facilities on the coast. Pursuant to the Warren-Alquist Act (Public Resources Code, Section 25400 et seq.), the Energy Commission is required to prescribe energy conservation standards to be in effect statewide by July 1, 1977. Because of the close relationship between effective energy conservation and the possible need for new and expanded coastal energy facilities, the following energy conservation standards are recommended to the Energy Commission for consideration in carrying out its mandated activities.

The energy conservation requirements of the Warren-Alquist Act, if carried out in a timely and effective manner, will achieve the goals of this policy; but if for any reason an energy conservation program is not in effect statewide by July 1, 1977, then, because of the great importance of energy conservation to coastal protection, the coastal agency shall be empowered to begin an energy conservation program by requiring, after public hearings, that the energy conservation standards be included in local coastal plans. Until such time, the application of energy conservation measures to proposed developments in the coastal agency's jurisdiction shall be encouraged as a contribution to energy efficiency and resource conservation.

a. **Recommendation to Establish Energy Budgets for New Developments.** It is recommended that an energy budget code be formulated setting required energy budget performance levels for a range of building types, sizes, occupancies,

projected levels of use, and location. Major new developments should then be required to demonstrate compliance with the energy budget code by submission of an energy budget, signed by a California registered engineer or certified architect, stating the energy inputs and outputs of the proposed development in BTUs per cubic foot or in watts per square foot; the extreme mean heat loss/gain of all buildings in peak heating and cooling seasons; microclimate description of the building site; and outline specifications for microclimate modifiers such as planting, total building exterior cladding material, building insulation, building thermal inertia and energy storage capability, and for major energy using and controlling equipment such as lighting, heating, ventilating, and air conditioning. An energy budget should not be required for residential developments of less than four dwelling units, industrial projects of less than 5,000 square feet of floor area, or commercial or institutional structures of less than 2,700 square feet, provided a California registered engineer or certified architect states in writing that the proposed design would meet the required performance level for the project type. It is recommended that a State-financed program directed by the Department of Housing and Community Development be instituted to provide in-service training for building inspectors to administer the energy budget code through local building codes.

b. **Recommended Energy Conservation Specification Standards.** It is recommended that until an energy budget code is adopted, the following energy conservation specification standards apply to all new development. Following adoption of an energy budget code, developments meeting the required energy budget levels would be exempt from the specification standards.

**Recommended Standards for Lighting:**

- Lighting should not exceed 2.3 watts (2.5 volt-amperes) per square foot except in instances where higher levels are shown to be necessary for high visual acuity tasks and public health and safety.
- Only efficient lamps and luminaires, as defined in the proposed Standard 90-P of the American Society of Heating, Ventilating, Refrigeration, and Air Conditioning Engineers (ASHRAE), should be allowed.
- In large buildings, selective or light-sensitive switches should be provided to avoid electric lighting in portions of the building receiving adequate natural light or not in use.

**Recommended Standards for Signs and Facade Lighting:**

- Electric lighting of new advertising or ornamental signs should be allowed only for on-site identification signs containing the name, address, and major product or service of the business, and these signs should be illuminated only during darkness and only when the business is open to the public.
- Building and facade lighting, exclusive of signs, should be no greater than 1,000 watts or 2 per cent of the total interior lighting load of the building, whichever is greater.

**Recommended Standards for Space and Water Heating:**

- Electric resistance heating (water or space) should be allowed only if natural gas is not available, electrical heating is needed for medical, health or public safety reasons, some other unusually high requirement for clean heat exists, or where a back-up system for solar heating and cooling systems can be provided feasibly only by electric resistance heating.

**Recommended Standards for Building Climate Control:**

- Mature planting, exterior architectural shading, or reflecting and/or insulating glass or screen should be provided to shade or protect windows receiving direct sunlight in warm climates.
- Properly weather-stripped operable sash and vents should be provided in all exterior rooms for which ventilation is required by the local building code.
- Variable thermostats should be required for areas with different air conditioning requirements.
- New conventional compressive refrigeration air conditioning should be permitted only if the life cycle costs of the conventional system are substantially less than the lowest-cost and most energy-efficient alternative systems available. (Alternatives may include cooling systems based on evaporative cooling, solar cooling, nocturnal radiation, absorption refrigeration, heat pumps, rock-bed regenerators, and coolness storage, among others. (See the section on Alternative Energy Sources.)

**Recommended Standards for Pilot Lights and Gas Flames:**

- Gas pilot lights (except water heater gas pilots) should not be permitted unless the gas pilot device has a substantially lower life-cycle cost or is more energy-efficient than an electric ignition or other alternative system or is required for public health or safety reasons.
- Open gas flames for advertising, promotional, or decorative purposes should not be allowed.

c. **Recommended Energy Conservation in Street Lighting System.** It is recommended that new street and highway and other public lighting luminaires should be of the high pressure sodium (HPS) type, or an approved alternative type equal in energy efficiency, unless environmental, aesthetic, public safety, or system compatibility reasons dictate the use of a different type of system. The Legislature should consider the feasibility of establishing a capital improvement fund, through a bond issue or other appropriations, to finance the conversion of existing State, county, and municipal incandescent or mercury vapor-type street and highway lighting to the HPS type or equivalent. Funds expended could be repaid from energy cost savings resulting from the conversion. Other appropriate energy-conserving devices and design (e.g., reduction of lighting levels consistent with public safety, use of astronomical clocks that eliminate lighting during daylight) should also be incorporated in all new public lighting systems.

**73. Recommendations for Additional Energy Conservation Measures.** It is recommended that the Energy Commission and the Legislature, as part of a comprehensive statewide energy conservation program, implement certain other conservation measures statewide, as follows: (1) tax legislation to encourage the use of lighter automobiles with smaller engines and increased energy efficiencies; (2) legislation requiring that all appliances sold in California meet specified energy efficiency standards and that all appliances be clearly labeled with energy efficiency or energy consumption information; (3) implementation of a long-range phased program for improving the energy use standards of existing buildings in California, including replacing energy-inefficient equipment. Special loans and/or tax incentives should be considered to assist in upgrading insulation and incorporating low- or non-fuel-using technologies that involve higher capital costs.

# ALTERNATIVE ENERGY SOURCES

## Findings

**Non-Petroleum Energy Sources Could Provide 50% of Added Generating Capacity in California by Year 2000.** There are advantages and disadvantages to development and use of all forms of energy. Oil and gas, however, on which California now relies for about 90 per cent of its total primary energy, have the potential to cause significant adverse environmental impacts at all points of the fuel sequence: extraction, transportation, processing, and consumption. There are several alternatives to continued heavy dependence on oil and gas that are environmentally superior both for the coastal zone and for California, and that help conserve hydrocarbons for more valuable uses such as petrochemicals. These sources cannot in the short term supplant a continuing fundamental dependence on oil, gas, and even nuclear fission, in California. But with a strong policy commitment by government bodies and electric utilities to high levels of research and development, and extensive marketing and public education, it is possible that non-petroleum alternative energy sources could provide as much as 50 per cent of the additional electrical generating capacity needed in California by the year 2000, and in so doing substantially reduce a broad array of environmental impacts on the coast and throughout California. (See findings "Conventional Demand/Supply Projections Are Pessimistic About Alternative Energy Sources" and "Alternative Energy Sources Could Yield Half of New Capacity Required" above, in section on Electricity Supply and Demand.)

### SOLAR ENERGY

**Solar Energy Has High Potential and Fewest Environmental Problems.** Solar energy is unlimited in its supply and appears to pose the fewest environmental problems of any major energy source. It can make a significant and immediate contribution both on a small scale, for heating and cooling individual buildings, and on a large scale, for major electric power generation. The basic technology for solar energy applications exists; the principal remaining barriers to broad feasibility concern economics and engineering refinements to overcome the low energy intensity of sunlight, its daily

and seasonal variability with weather and time, and the need for associated energy storage systems. There is also concern over the large land areas and fresh water for cooling that could be required for large-scale solar energy power stations. California is particularly well suited for development of solar energy because of its high number of hours of sunshine. The South Coast Region lies in a particularly favorable location for mean daily solar radiation. As measured in units of Langleys (Ly), for comparison, the data for Seattle is 300 Ly, Phoenix 500 Ly, Los Angeles 463 Ly, and South Coast coastal locations about 450 Ly.

**Use of Solar Systems Can Save Fossil Fuels.** Implementation of solar energy systems can be directly correlated with potential savings in natural gas. In a large area of southern California, more than two-thirds of the natural gas consumed directly in space and water heating could be saved by the use of solar energy. On a month-to-month basis, the share of space and water heating provided by solar energy can be expected to range from 50 per cent to 80 per cent. Since solar energy can supply the major share of energy for space and water heating on a year-round basis, utilization of solar energy can directly reduce the growth in baseload demand for natural gas. A corresponding reduction in requirements for new gas supply would also be indicated, or, alternatively, more natural gas could be burned in the South Coast Region's electrical generating plants.

**Economic Barriers to Solar Energy Can Be Overcome.** Solar energy systems for heating and cooling in new construction are now practical in both large commercial buildings and houses. Although the capital investment required for solar systems is higher than conventional systems (which increases marketing problems for home builders), any cost evaluation of heating systems should be done on a life-cycle basis. Leasing systems, now being studied, may overcome some of the marketing problems. The life-cycle costs of a solar heating and cooling system in the new General Services Administration building in Manchester, New Hampshire, for example, are estimated to be 25 per cent less than the costs of conventional electric resistance heating and electric compression cooling. The economic advantages of solar systems should improve as production techniques reduce the initial costs, and as the costs of conventional fuels increase. Economy and energy-efficiency can be further enhanced when:

- Both cooling and heating are accomplished through utilization of the solar energy collector;
- The solar energy system components and the building heating and cooling systems are compatible with each other and are integrated in a total systems concept; and
- The buildings and the conventional mechanical and electrical systems are initially designed and constructed to conserve energy.

**Solar Energy Can Heat Water and Heat/Cool Buildings.** As many as 60,000 solar water heaters are said to be in use in south Florida today, nearly all having been installed in the 1930s and 1940s before the advent of all-electric living. They are also in common usage in several foreign countries including Japan, Australia, and Israel. With minor engineering developments and relatively simple architectural modifications, solar energy could now be used in some areas of this country for both space and water heating at prices competitive with oil and gas furnaces. Commercially installed solar heating and cooling in single buildings may be in wide use in many parts of the nation by 1985 and will be common by 1993. It is possible that an intensive development effort could bring these dates five years closer. The National Science Foundation/NASA Solar Energy Panel predicted that ultimately solar energy could supply 35 per cent of the nearly 20 per cent of the U.S. energy consumption now consumed for heating and cooling, and that it will significantly reduce summer peak electricity demands. However, even if supported by energy storage systems, individual solar units may not be capable of supplying total energy needs for space conditioning and water heating. In addition to the solar units, builders may have to install some conventional supplemental equipment. Solar active (mechanical heat transfer) systems — that is, solar systems using flat-plate solar collectors with circulating fluid — can optimally provide up to 90 per cent of the total water and space heating needs of a house in the southern California coastal area, with gas assistance as the back-up fuel. Solar passive (direct heat transfer) systems, such as a roof-pond system, can optimally provide up to 100 per cent of the heating and cooling needs of a house.

**Heat Pumps Can Heat or Cool a Given Space.** A heat pump system can be operated by solar power. A heat pump is, in effect, a refrigeration machine that can work in a reverse cycle; thus it can either heat or cool a given space. Large electric heat pumps can heat as efficiently as properly maintained gas furnaces; they can cool two to three times more efficiently than most cooling systems.

**Nocturnal Cooling Is the Simplest System that Both Heats and Cools.** Roof-pond nocturnal cooling systems are technically feasible and practical for residential and low-load buildings in desert or valley climates such as in southern California. The operating cost would be only a fraction of the cost of electrical refrigeration. This is the simplest system that can accomplish both heating and cooling.

**Rock-Bed Regenerators Provide a Cooling System.** Rock-bed regenerator (RBR) cooling systems use evaporation of water in the discharge air to chill rocks in a switched-bed rock-filled recuperator, which then cools inflow air. RBRs have been used successfully in Australia. The power consumption is an eighth of that needed for mechanical refrigeration.

**Solar Energy Conversion in Existing Houses Is Difficult.** Conversion of existing houses to solar energy is more problematical. No more than about 35 per cent of existing houses can be retrofitted to solar energy because of shading by other buildings or trees, or because building orientations or roof angles are not suitable collectors. Retrofitting of older houses with solar systems would be difficult to justify on a life cycle cost basis because of the shorter remaining life of the buildings.

**Effective Delivery System Available Soon.** One of the major obstacles to near-term implementation of solar energy systems is the present lack of an effective delivery system (design, production, marketing, and installation skills). However, such a delivery system is now beginning to appear in California; several corporations have undertaken programs for producting and marketing solar units. With some governmental encouragement, the delivery system necessary for broad implementation of solar systems could be available within a few years.

**Institutional Barriers to Solar Energy Use.** Other barriers to wide use of solar systems are institutional. The building

and real estate industries are slow to adopt and promote any new device that raises capital costs even if long-term overall costs are lower; there are no published building design guidelines for solar energy utilization; and there are no known existing building code regulations for solar units. In addition, although some electric utilities have made low-level research commitments to development of individual solar units, there has until recently been little or no serious commitment from electric utilities, State and county energy planners, or legislators to this application of solar energy. The Los Angeles City Council has begun a program of solar energy investigation and development, and as an initial step will heat municipal swimming pools with solar energy.

**Solar Energy Use Needs Legislative Support.** New legislation is needed to encourage the use of solar energy systems. Florida has passed a measure requiring new home plumbing to be designed to facilitate future installation of solar water heating equipment. Arizona and Indiana have passed tax legislation encouraging installation of solar equipment. Essential to any solar energy program would be a public information program.

**Sun Rights Legislation Will Ensure Access to Solar Radiation.** "Sun rights" legislation is also needed to ensure user's access to solar radiation free and clear of potential obstructions on contiguous property. Appropriate regulations must consider the shadows, angles, and orientation of buildings varying with the time of day, the season, climatological conditions, and the slope of the building site. Setback regulations in zoning codes are precedents for sun rights laws.

**Large-Scale Electricity Generation Needs Further Development.** The full potential of solar energy can be realized only after large-scale generation of electricity from solar energy becomes technically and economically feasible. Steam-electric systems based on the initial conversion of solar energy to heat have yet to be built on any but the smallest scale, and the necessary technology for large-scale plants, though well understood theoretically, has not been adequately demonstrated on a commercial scale. The principal problem scientists and engineers face is making solar-generated power economically competitive with other electric power sources. The constraint of high initial costs may without government encouragement, delay the commercial testing of large-scale solar-thermal power generation until 1990, although unforeseen and unprecedented rises in fossil fuel prices since mid-1973 have suddenly made solar-thermal power significantly more competitive.

**High Solar Plant Potential in Southeast California.** Solar collecting equipment for large-scale solar-thermal plants can be centralized for commercial production of power only in areas with high annual sunlight-hour values. Much of southern, and particularly southeastern California, receives as much solar radiation and annual sunshine — up to 4,000 hours per year — as any other area in the U.S.

**Solar-Thermal Power Plants Need Large Amounts of Land.** The principal environmental concern about large-scale solar-thermal power plants is the commitment of many square miles of land to collecting surfaces. The NSF/NASA Solar Energy Panel estimated that at 20 per cent efficiency a 1,000 Mw solar generating plant — about the size of the nuclear power plant units being built today — will require about 15 square miles or 9,600 acres of land. It is difficult to compare this with the amounts of land required by different methods of electrical energy generation, but the 2,000 Mw coal-burning plant in the Four Corners area, for example, will require the strip mining of 40 square miles of land for fuel during its operating lifetime. Improved technology resulting in better efficiency would significantly reduce land use for solar plants.

**Solar-Thermal Power Plants Create Heat Waste Disposal Probem.** The potential for waste heat disposal problems would still be present in large-scale solar-thermal power plants. Such plants would still require cooling water, and this may be a problem since the optimal locations for solar plants will be arid. There is also some concern that large-scale solar collecting surfaces may upset local thermal balances, but the consequences, if any, are thus far expected to be quite small.

**Solar Cells Offer Alternative to Solar-Thermal Power Generation.** A second approach to production of electricity from solar energy involves the use of solar cells. Solar cells convert sunlight directly into electricity without the need for intermediate thermodynamic cycles. Solar cells were used to power manned orbiting spacecraft. Presently, however, solar cells are too costly, too inefficient, and not sufficiently durable to have practical application for large-scale commercial electricity production. Some scientists believe, however, that solar cell technology is sufficiently far advanced that mass production of rooftop units for new housing could become competitive within three to five years, and that use of solar cells to power new houses may be common in 10 years.

**Potential for Ocean Thermal Gradient Electricity Generation Is Small.** A less-promising approach to production of energy from solar energy involves the use of the difference in temperature between the sun-warmed ocean surface and the cold ocean depths in a heat engine to produce low pressure steam to drive a turbine and produce electricity. Ocean waters off the California coast, however, offer insufficient temperature differences.

## WIND ENERGY

**Wind Is Potentially Important Energy Source.** Wind energy is pollution-free, involves no fuel costs, and is non-depletable. If wind were actively promoted, and its problems solved, it could become an important auxiliary energy source. Various sources indicate that by the year 2000 wind energy could provide from 1 to 20 per cent of total national electrical energy needs. Thus far, however, no California public agency or electric utility forecast for future California energy supply includes any contribution from wind energy.

**Some Potential for Individual Windmill Units.** Individual windmill generating units can make single buildings or small building clusters wholly or partially energy self-sufficient, but such units are no longer manufactured in quantity, and individual unit capital cost (including battery storage) is presently high.

**Problems of Wind Energy Must Be Solved.** Wind is a problematic source of electrical energy. It is erratic, low in average velocity and density, and variable in direction, and its energy is not easily stored on a large scale. Wind will make its most significant contributions to energy needs

only when systems have been developed that can efficiently and inexpensively convert wind to electricity or other energy forms on a very large scale. Scientists believe that these problems are not technologically difficult. The principal environmental concern is with the appearance and noise of individual and large-scale wind generation equipment. Some scientists have suggested installations far offshore to maximize wind potential and to mitigate environmental concerns. Additional wind research is required to establish the ultimate potential of California's coastal and inland wind resource.

## SOLID WASTES

**Solid Wastes Are a Potentially Important Energy Resource.** Solid wastes represent still another resource with substantial energy potential already exploited in other parts of the world, although recycling of suitable waste material may result in greater overall benefits to society from both an energy and a resource preservation point of view. Half of the 75 million tons of solid wastes produced annually in California is collectable, and that refuse could furnish 10 per cent of the fuel oil needed by utilities at prices competitive with other power generation fuels, or could furnish gas for direct use by residential and commercial customers. Despite the significant potential of solid waste conversion for reducing the demand for depletable fossil fuels and nuclear expansion in California, few efforts have been made to realize the potential. The State Solid Waste Management Board, established in 1972, may help overcome institutional problems that partially impede development of State and county programs for the recovery of energy — and materials — from solid waste. Detailed below are four principal methods of energy recovery from wastes.

**Incineration Already in Use in Two Major American Cities.** Incineration, or direct burning, of refuse can produce recoverable heat for production of steam, which in turn can be used in power plants (St. Louis), in industry, and in local heating and cooling systems (Nashville). Incineration systems can present air pollution problems.

**Pyrolysis Pilot Project Proposed for El Cajon.** Pyrolysis is a flexible method by which separated, shredded, treated wastes are heated in a kiln to cause their chemical decomposition into various low heat-value gaseous or liquid hydrocarbons. These can be utilized with other fuels in conventional fossil fuel plants. SRI expects commercial systems will be available in 1976-77. An EPA-funded pilot plant proposed for El Cajon would process about 200 tons of solid wastes per day, with each ton ultimately producing one barrel of low heat-value oil. San Diego Gas & Electric would burn the oil either directly or mixed with No. 6 fuel oil to produce steam for electric power generation. A Baltimore pilot project newly in operation will convert 1,000 tons per day into gas for steam generation.

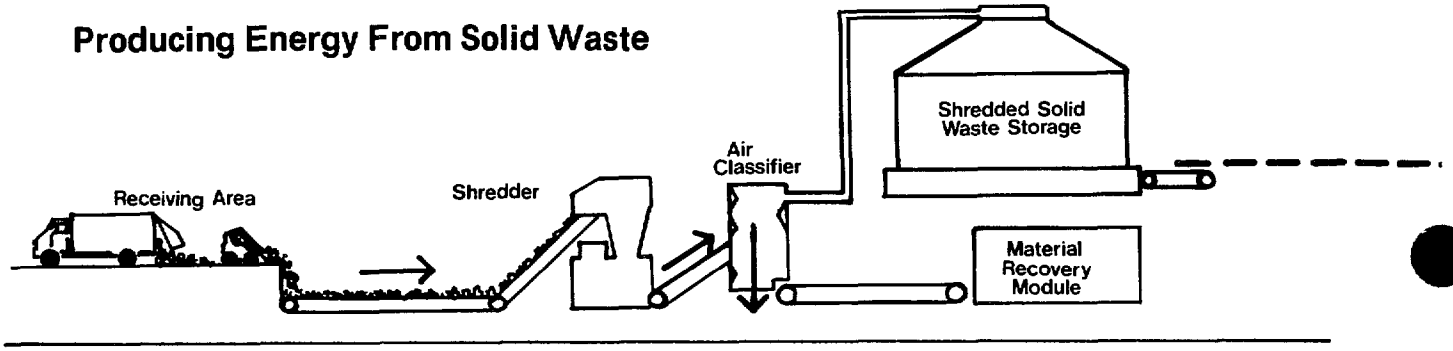
**Hydrogenation Most Efficient System for Obtaining Oil from Wastes.** Hydrogenation involves adding steam carbon monoxide and a catalyst to organic wastes in a pressurized container and applying heat to cause chemical reduction into a heavy paraffinic oil and other hydrocarbon forms. A system using dry waste solids can produce as much as two barrels of oil per ton of solids. Several pilot plants are in operation or are planned with commercial application expected by 1980.

**Bacterial Conversion Can Produce Methane Gas from Solid and Liquid Wastes.** Bacterial conversion is a process using anaerobic bacteria (which flourish without free oxygen) to decompose organic wastes to produce a mixture that is 72 per cent methane — the principal component of gas. A ton of dry organic waste can produce 10-20,000 cubic feet of methane. Commercial recovery of methane is feasible at sanitary land fills. Sanitary engineering has long utilized anaerobic digestion, but use of this process to maximize methane recovery has received little or no attention. Methane recovery from the secondary treatment of liquid wastes can make an important incremental contribution to natural gas supplies.

## METHANOL

**Methanol Provides a Versatile Fuel for Immediate Use.** Methanol, or methyl alcohol, constitutes an alternative fuel form whose widespread use could immediately help to solve both energy supply and pollution problems. Methanol is a colorless, odorless liquid which can be made from practically any other fuel — natural gas, petroleum, coal, oil shale, wood, and farm and municipal wastes — giving methanol practically unlimited flexibility in utilizing various energy sources as the economy and conditions dictate, and offering a means of reducing the nation's waste disposal problems.

**Methanol Can Be Easily Implemented into Present Fuel Economy.** Methanol use would not require any major changes in current technology to accommodate its integration into the present economy. It can be easily stored in tanks in the same manner as conventional fuels and can be shipped or piped, as can conventional petroleum products. More importantly, up to 15 per cent methanol can be added to commercial gasoline in cars now in use without requiring engine modification. Some carburetor adjustment would be



required. This methanol-gasoline mixture results in higher octane ratings (thus reducing the need for lead), improved economy, lower exhaust temperatures, lower emissions, and improved performance. Tests have shown that engine conversions to accommodate 100 per cent methanol, which cost about $100 per vehicle, result in one-twentieth the amount of unburned fuel and one-tenth the amount of carbon monoxide released to the atmosphere compared to burning gasoline, and would eliminate the need for catalytic treatment of exhaust. Even greater economy and performance could be expected from engines designed specifically for the use of methanol.

**Some Adjustments Needed for Storage and Distribution.** The use of methanol in automobiles will require larger fuel tanks, since specific fuel consumption of methanol is higher on a weight and volume basis than gasoline. However, specific energy consumption per mile will be lower because higher compression ratios and simpler pollution controls can be used. The storage of methanol mixed with gasoline may present some problems because methanol is much more soluble with water than is gasoline; where condensation will form in gasoline storage tanks (sometimes causing corrosion) methanol will absorb the water, keeping the tanks dry. Problems may arise in the storage of large quantities of methanol mixed with gasoline, unless the tanks are dried out prior to injection. Distribution systems for methanol fuel must also be more water-free than existing gasoline distribution systems. A further problem is the corrosive effect of methanol upon some kinds of metals used in fuel distribution and storage facilities (including auto fuel tanks).

**Methanol Can Be Used in Electric Power Generation.** A potential use of methanol is for electric power generation, particularly in gas turbines. A recent test comparing use of methyl fuel with use of No. 5 fuel oil and natural gas in a full-scale boiler demonstrated that use of methyl fuel resulted in elimination of particulate and sulfur compound emissions, substantial reductions in nitrogen oxide emissions and carbon oxide concentrations; and negligible emissions of aldehydes, acids, and unburned hydrocarbons. Soot deposits in the furnace from previous oil firing were burned off with methyl fuel, thereby allowing higher heat transfer rates and higher efficiencies.

**Availability of Methanol Is the Major Problem.** The principal drawback to the immediate use of methanol is its availability. The technology for initial production and use on a large scale exists. A 1972 AEC report estimated the cost of producing methanol from lignite, coal, and natural gas to be slightly higher than the costs of producing gasoline from crude oil. Since 1972, however, the cost of crude oil, particularly from foreign sources, has increased dramatically, thereby making methanol production comparatively more economical.

## HYDROPOWER

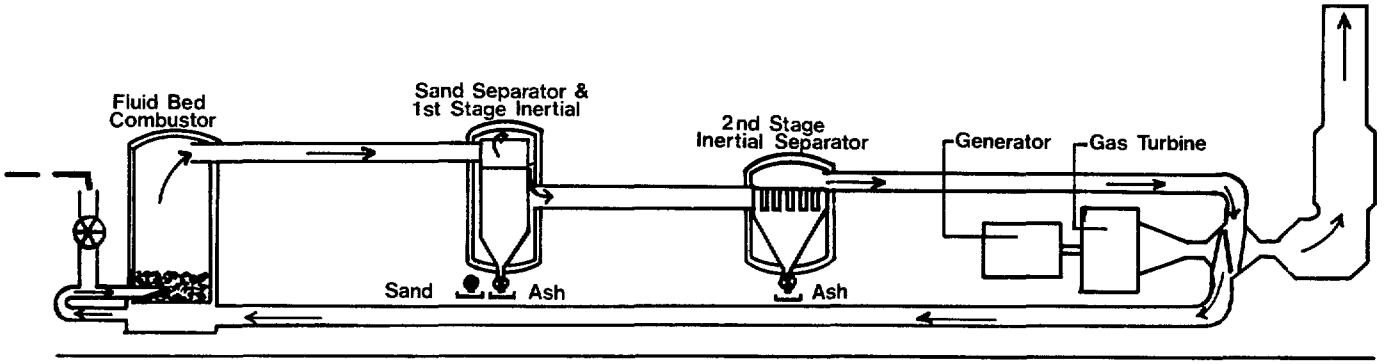
**Hydropower's Role in Future Energy Mix Is Limited.** The percentage of California's electricity supply provided by hydropower has declined sharply from 59.7 per cent of the total electricity supply in 1950 to about 36 per cent in 1970 (9 per cent of the State's overall energy supply). Hydropower appears unlikely to meet any substantial part of an increase in the State's energy needs. There are undeveloped potential hydropower sites in California; however, their limited potential, combined with concern about the environmental impact of such facilities, land use conflicts, and high capital costs, may preclude significant future hydropower development within the State.

**California Imports Significant Portion of Hydroelectric Power.** In 1970, 23 per cent of California's hydroelectric power was transmitted from facilities located along the lower Colorado River and in the Pacific Northwest. Because of the expected increase of energy demand within the latter area, however, it is possible that export of electrical energy to California in future years may significantly decline.

**Pumped Hydropower May Be Used to Store Energy.** A principal use of hydropower in the future may be in "pumped hydropower" projects for storing energy to meet peak demand. Such projects would permit more efficient use of base load power plants, and would help reduce the need for additional power plants otherwise necessary primarily, to meet peak demand, although in many instances such projects may actually require more electrical energy for pumping than they actually produce. Present plans of electric utilities project 3,600 megawatts of pumped hydro capacity by 1991, and one source forecasts 10,500 Mw pumped hydro capacity by 2000. Pumped hydro projects can in some instances be built at existing hydroelectric sites, but would otherwise involve reservoir and dam construction, with attendant land use and environmental problems, and with loss of fresh water and increased water salinity due to evaporation.

## COAL

**Importance of Coal as a Direct Fuel in California Is Minimal.** Although the U.S. has an overwhelming abundance of coal, California has no significant indigenous coal supplies. Coal has not traditionally been an important fuel in California; the high costs of transporting it, and the lack of large coal



deposits closer than 350-550 miles from the State's major cities, have made coal a less attractive primary energy alternative in a state relatively rich in oil and gas. Strict State air quality regulations have made coal a still less desirable fuel in California, though desulfurization and particulate control are available.

**California Imports Electricity Generated by Out-of-State Coal-Fired Plants.** In 1970 coal provided only 1 per cent of California's energy needs. By 1985 this figure is predicted to rise to 3 per cent. Most of this increase will be accounted for by increases in the amount of coal-fired electricity generated in Arizona, Nevada, or the Four Corners area and imported by high-voltage transmission into southern California. SRI has estimated that 5,000 to 15,000 Mw of electric generation capacity from out-of-State coal-burning power plants could be available to California users by 2000.

**Synthetic Natural Gas to be Produced from Coal and Imported to California.** When commercial production of synthetic natural gas (SNG) from coal is begun in the Rocky Mountain coal deposit areas, California will begin to receive some measure of SNG from coal by pipeline — primarily for residential and commercial use. If large-scale gasification plants scheduled for construction and operation near mine sites in the western states should come on line as scheduled, such SNG imports could begin as early as 1979-80. Though gas from these plants would amount to a very small percentage of California's gas requirement, SRI has forecast that SNG from coal may constitute as much as 16 per cent of California's natural gas use by 1990. The cost of developing such sources, as well as the amount of water required, however, has put some of the more optimistic figures in doubt.

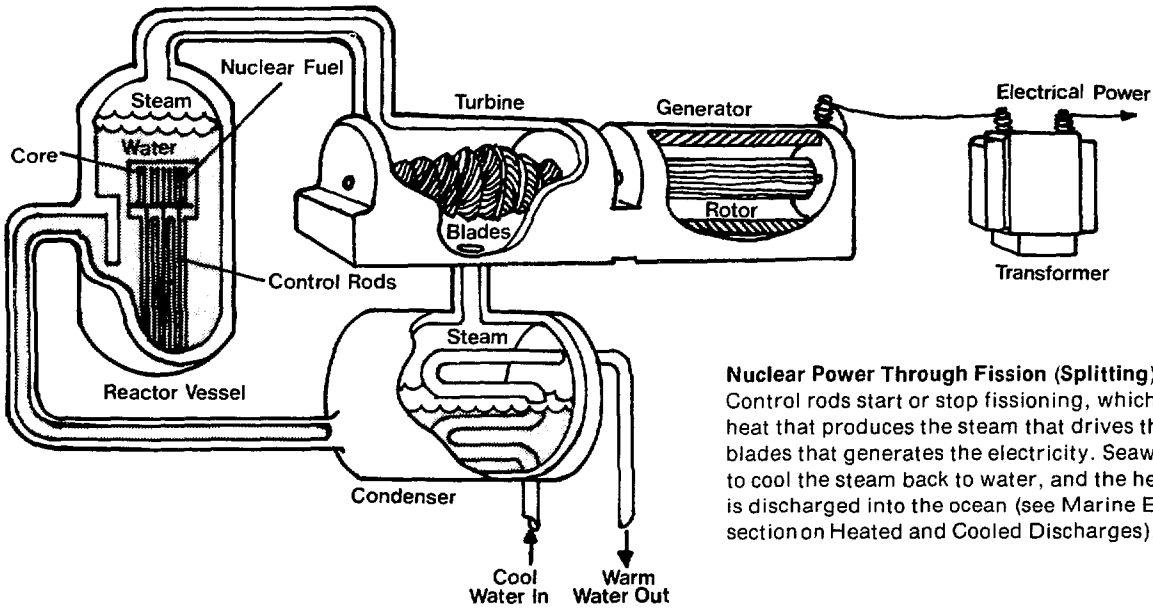
**Environmental Problems from Use of Coal.** The coal mining and coal conversion operations in the Rocky Mountains and Four Corners areas have severe environmental consequences in the immediate mining areas.

## NUCLEAR FISSION

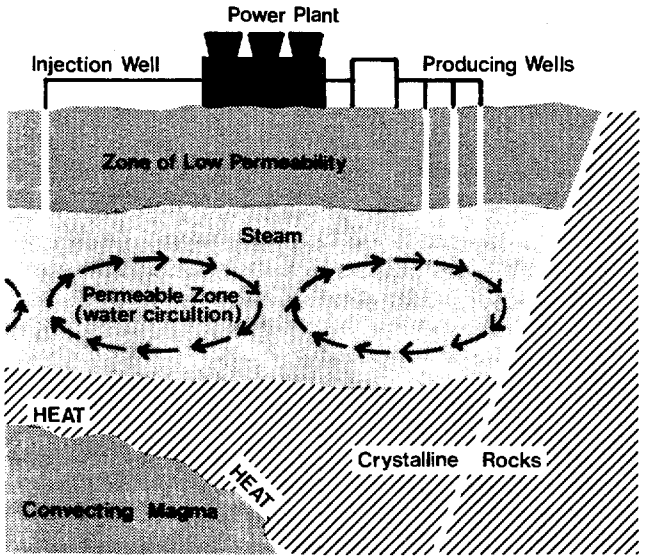
**Nuclear Fission Power Generation Expected to Grow; Public Safety Concerns.** The AEC predicted that nuclear energy will become the dominant source of electricity in the 1990s and will account for as much as 60 per cent of the nation's generating capacity in the year 2000. The proponents of nuclear power point out that it is smog-free, and that its use reduces air pollution that would otherwise result from fossil fuel power generation, and conserves fossil fuels. They also argue that nuclear energy is safe, the prospects of a serious accident extremely small, and express optimism over the resolution of radioactive waste disposal problems. Opponents question the reliability and high cost factors in nuclear reactors; there is a growing public concern, also, over such matters as the safety hazard associated with the potential for a serious accident that might permit escape of radioactive material; the possibility of acts of sabotage or terrorism using nuclear materials stolen prior to or during the transport of fuels or wastes; and the uncertainty as to how to dispose safely of nuclear waste materials that will remain highly toxic for many thousands of years.

**Nuclear Plants Require Cooling Systems.** Light-water reactors (LWRs), in which the U.S. has invested most heavily, are thermally less efficient than fossil fuel power plants, and therefore emit more waste heat. High-temperature gas-cooled reactors (HTGRs) are thermally as efficient as the most modern fossil fuel plants. Systems for dissipation of waste heat can have significant environmental and land and water use impacts.

**Breeder Reactors Also Have Problems.** France, England, and the Soviet Union have experimental liquid-metal fast breeder reactors (LMFBRs) in operation at this time. The Federal government is committed to the rapid development and widespread deployment of this technology. Most of the problems associated with converter reactors also affect




**Nuclear Power Through Fission (Splitting) of Atoms:** Control rods start or stop fissioning, which creates the heat that produces the steam that drives the turbine blades that generates the electricity. Seawater is used to cool the steam back to water, and the heated seawater is discharged into the ocean (see Marine Environment section on Heated and Cooled Discharges).




## Geothermal Energy

**Geothermal Resources.** In places where the earth's crust is shallow or heavily fissured, as along major earthquake faults or in areas of recent volcanic activity, hot magma may penetrate close enough to subsurface waters or brines to heat them. The resulting hot water or steam may find its way to the surface as geysers, fumaroles, or hot springs; or it may be tapped from underground reservoirs within permeable rock or in fissures using conventional oil and gas well-drilling and production techniques. At The Geysers (photo on page 109), a geothermal field under development by PG&E, dry steam is tapped and released directly through turbines to generate electricity. Most geothermal reservoirs, including those in California's Imperial Valley, contain hot, mineral-laden brine rather than steam, making their use for electricity production more problematical.

breeder reactor development. In fact, because breeder reactors require a fast neutron flux and a highly concentrated fuel, they actually present greater health and safety problems than conventional reactor technology.

**Accelerated Breeder Reactor Program May Be Unwarranted.** The breeder reactor program is being accelerated because of an apparent fear of an eventual shortage of uranium, but a California Institute of Technology study shows that even the most enthusiastic projected expansion of nuclear power generation through 2020 could be fueled from presently known domestic uranium supplies. Though the cost for these supplies would rise, the effect on the average delivered cost of electricity would be minor. Other recent analyses have similarly concluded that there is not sufficient justification for an accelerated breeder reactor development program. The most recent Federal budget for energy research and development reflects a slight decrease in emphasis on breeder reactor development as the principal energy resource of the future.

## GEOTHERMAL ENERGY

**Geothermal Power Is a Desirable Energy Source.** Geothermal energy has great potential in California. Despite environmental problems of waste water disposal, soil erosion, disruption of wildlife habitat, disposal of drilling muds, hydrogen sulfide and small Radon 222 air emissions, land subsidence, and noise, the geothermal fuel cycle (including mining, milling, actual use, waste processing, and disposal) is less polluting than that of fossil or uranium fuels. Geothermal energy represents a very long-term resource that may have the potential to supply up to 15 per cent of the additional electrical energy capacity required by 2000. California's only commercial geothermal energy is produced from a dry steam field called The Geysers in Sonoma County, under development by PG&E; geothermal energy has non-electric applications in California for heating water and buildings and for recreation (hot mineral baths, for example).

**Geothermal Potential Is Significant.** There are 35 potential geothermal resource areas covering more than 15 million acres within California. Geologic research and activity has largely been confined to the three most promising sites: The Geysers, with a present capacity in excess of 400 Mw; the Imperial Valley; and the Mono Lake-Long Valley area. A fairly conservative range of potential generating capacities (listed in megawatts) from geothermal sources is as follows:

| (Year) | The Geysers | Imperial Valley | Other Areas |
|---|---|---|---|
| 1980 | 1,300 | 0-700 | 0 |
| 1990 | 1,300-3,000 | 1,000-4,000 | 0-3,000 |
| 2000 | 1,300-5,000 | 1,000-8,000 | 0-3,000 |

## TIDAL ENERGY

**Tidal Energy Not Promising in California.** Although the total potential energy in the world's tides is enormous, and represents a nondepletable source of energy, present technology can only economically convert tidal energy to electricity where tidal ranges are very large and inlet mouths are small enough to make damming for a hydroelectric plant feasible. Such conditions are rare, and exist nowhere in the U.S. except in Maine and Alaska. The damming of an entire bay or estuary for a tidal hydroelectric generating plant has severe environmental and ecological effects. Unless there is a radical redesign of existing technology for the conversion of tidal energy, California should not expect tidal energy to make a contribution to meeting its energy requirements.

## NUCLEAR FUSION

**Nuclear Fusion Is Not a Commercial Reality in This Century.** Nuclear fusion differs from nuclear fission in that energy is released through fusing the nuclei of two atoms, rather than through splitting atoms. Nuclear fusion would use as basic fuel heavy hydrogen, which is limitlessly available in seawater. The various economic, environmental, and safety

advantages expected from nuclear fusion appear to make it a significantly more viable long-term energy alternative than fossil fuels or nuclear fission. Even with greatly increased research and development activity, however, most experts believe that various theoretical and technical problems still blocking the path to electricity from fusion are so enormous that fusion probably will not become a commercial reality or a significant factor in meeting California or national energy needs within this century.

## ENERGY STORAGE

**Energy Storage Increasingly Important in Energy Systems Planning.** Energy storage is becoming increasingly important in planning energy systems that minimize the environmental impact of meeting energy demand. Energy storage techniques can be applied to enable longer periods of operation for base load power plants and thereby reduce the requirement for additional generating facilities; to change energy from one form to another for more economical, convenient, or environmentally clean transmittal or application; and to make practically feasible such alternative energy sources as solar, wind, tidal, and thermal gradients, which produce energy inconsistently or at a very slow rate. Significant energy storage techniques include pumped hydro storage, fuel cells, storage batteries, flywheels, and conversion of energy in other forms into hydrogen.

## Policies

**74. Encourage Development of Alternative Energy Sources.** Development of alternative energy sources shall be encouraged for large-scale power-generating facilities and for new and existing small-scale developments.

a. **Require Consideration of Alternative Energy Sources.** Every proposal for a major energy installation shall include detailed evaluation of alternative methods for providing the same amount of energy.

b. **Provide Tax Incentives for Energy-Efficient and Energy Self-Sufficient Development.** It is recommended that the Legislature enact laws providing tax incentives (e.g., income tax credits, reduced property tax rates) for building owners or developers to install low- or non-fossil fuel energy systems, which might include solar-assisted water and space heating, solar-assisted cooling, nocturnal cooling, evaporative cooling, heat pumps, absorption refrigeration, photovoltaic electrical energy generation, total energy systems with waste heat recovery, anaerobic sewage generation of methane gas for energy use, windmill electric generators, fuel cells, energy storage systems, and other feasible alternative energy systems.

c. **Work to Resolve Problems of Other Alternative Energy Sources.** The Energy Commission, the California Public Utilities Commission, the Legislature, and where appropriate such State agencies as the Division of Oil and Gas, the Geothermal Resources Board, the Solid Waste Management Control Board, and the Water Resources Control Board, are urged to undertake programs to determine the potential of alternative energy sources in California and to resolve technological, environmental, economic, institutional, and legal problems presently hindering their development. Such programs shall focus particularly on developing (1) the large geothermal resource present in California; (2) large-scale commercial and single-building solar and wind conversion technologies; (3) energy and materials recoverable from solid wastes (including animal wastes) and sewage; and (4) methanol as a more efficient, less polluting fuel form to substitute for other conventional hydrocarbon forms.

**75. Recommendation for Implementing Solar Heating and Cooling Systems.** The following measures are recommended to the Energy Commission for its consideration in developing statewide programs for implementing alternative technologies. However, if for any reason the Energy Commission is unable to effectuate such programs by July 1, 1977, then, because of their importance to coastal protection, the coastal agency shall be empowered to require, after public hearings, that these alternative energy measures be included in local coastal plans. Until such time, where proposed developments are otherwise consistent with the Coastal Plan, the application of alternative energy measures to such developments in the coastal agency's jurisdiction shall be encouraged.

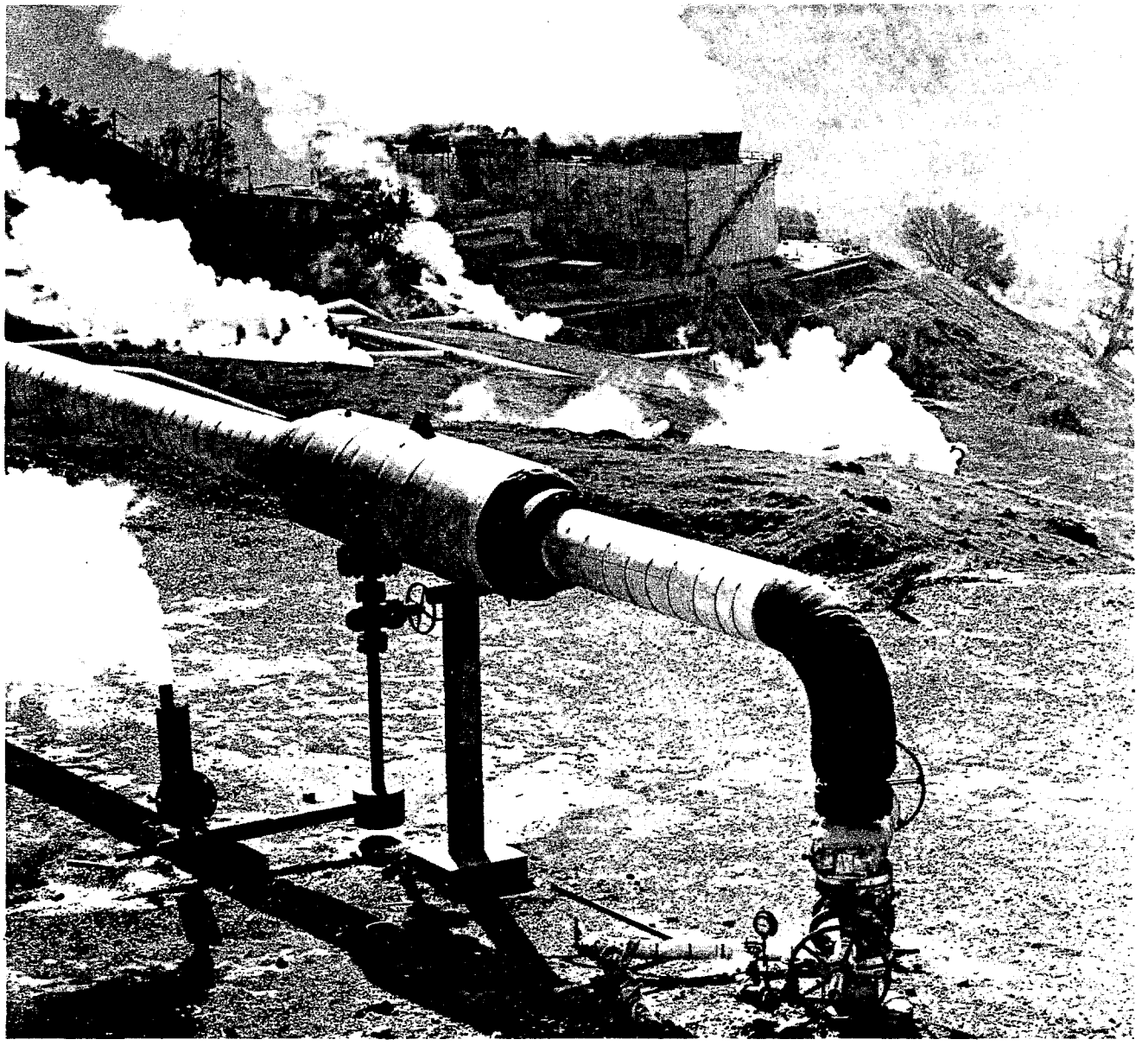
a. **Recommendation to Determine When Delivery System Exists.** The Energy Commission (or the coastal agency, after July 1, 1977) should determine, after appropriate public hearings, whether an effective delivery system for solar-assisted heating or solar-assisted or nocturnal cooling exists in California — that is, whether the professional expertise in design, manufacture, installation, and maintenance of solar-assisted heating systems or solar-assisted or nocturnal cooling systems capable of meeting at least 50 per cent of the building's projected heating or cooling needs with a high degree of reliability, and comparable to conventional systems in costs over the life of the systems, exists in the State, and whether the necessary

hardware is commercially available. Such a determination should take into account the varying climatic conditions throughout the State.

b. **Recommendation to Require Alternative Heating and Cooling Systems.** Once it has been determined that an effective delivery system exists, solar-assisted water and space heating systems and solar-assisted or nocturnal cooling systems (where buildings require cooling systems) should be required on all new or substantially remodeled residential, commercial, institutional, and industrial structures, and on heating systems for such facilities as swimming pools, except where, in individual cases, a solar system (1) is impractical because of site conditions or adjacent obstructions that severely limit solar collection, (2) could not be incorporated in the project within a reasonable period of time, or (3) will not provide a lower cost than the proposed conventional system over the life of the system. Such solar systems should include adequate energy storage capability (determined based on climatic and peak load characteristics of various regions) to provide heat during periods of abnormally severe weather conditions and to prevent use of conventional systems for back-up during peak load periods.

c. **Recommendation to Require Capability to Incorporate Solar Collector System.** Until an effective delivery system exists, new structures should (1) have the structural and design capability to later incorporate, a solar collector

The Geysers geothermal field, Sonoma County



system, with clear and optimum exposure to the sun, capable of reducing by 50 per cent the gas or electricity used for water and space heating; and (2) install the solar-assisted water and space heating systems upon the subsequent determination that a solar-assisted system with a life-cycle cost lower than conventional systems is available. Consideration should be given to requiring performance bonds to ensure compliance.

d. **Recommendation for Testing and Certification; Retrofitting of Solar Heating Systems; "Sun Rights" Ordinances.** It is recommended that the Legislature and the Energy Commission (1) set testing and certification standards for solar systems; (2) undertake a program that will lead to retrofitting with solar heating systems existing buildings and swimming or hydro pools that use gas and/or electricity, wherever technically and economically feasible; and (3) require that local government agencies adopt "sun rights" ordinances to ensure that owners of buildings or property will have the benefits of free and clear access to sun radiation on existing or potential collector systems at all times of the year.

# ENERGY FACILITY SITING AND DESIGN

## Findings

**Warren-Alquist Energy Act Creates New State Energy Commission.** On January 7, 1975, the California Energy Resources Conservation and Development Commission (hereafter referred to as the Energy Commission) came into existence. This new Commission, created through passage of the Warren-Alquist Energy Act (AB 1575; Public Resources Code, Section Section 25000 et seq.) in the 1974 Legislative session, has a broad mandate to:

- Assess trends and to forecast statewide demand for electricity and other forms of energy;
- Determine the need for new power plants and to evaluate and certify proposed designs and sites either on the coast or inland (power plants in the coastal permit zone still require separate Coastal Commission permit approval);
- Study and promote the development of new alternative energy resources and new generation and transmission techniques;
- Prescribe and carry out new and expanded energy conservation measures; and
- Make recommendations to the Governor and Legislature for State policies and actions for the orderly development of all potential sources of energy to meet the State's needs.

**Siting Authority of State Energy Commission Is Limited.** Despite its very broad mandate to act on energy issues, the State Energy Commission has authority to approve siting for only one of the five types of energy supply-related development that could affect the coastal zone: electric power plants and transmission facilities. Most of the new power plants presently being planned by electric utilities, however, are explicitly exempted from the provisions of the Energy Act. More significantly, under its present mandate the State Energy Commission will not determine when or where exploration and development of State offshore oil reserves will occur, or have permit authority for siting onshore facilities associated with State and Federal offshore oil development, tanker terminals, refineries, or liquefied natural gas terminal and gasification facilities, all of which are projects of significance to coastal planning and management.

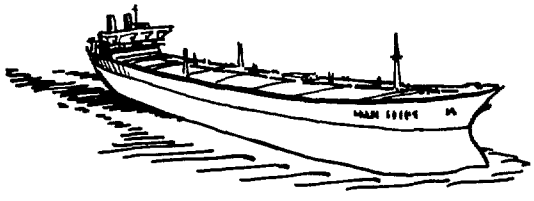
**Other Agencies Lack Sufficient Jurisdiction.** Other State agencies, such as the State Lands Commission, the Public Utilities Commission, the Water Resources Control Board, the Division of Oil and Gas, and the Air Resources Board, all regulate activities affecting energy development in California, but none has the jurisdiction over all such facilities that would permit a comprehensive, balanced approach to energy conservation and development throughout the State. The Coastal Commissions now have authority over power plant siting in the 1,000-yard coastal permit area.

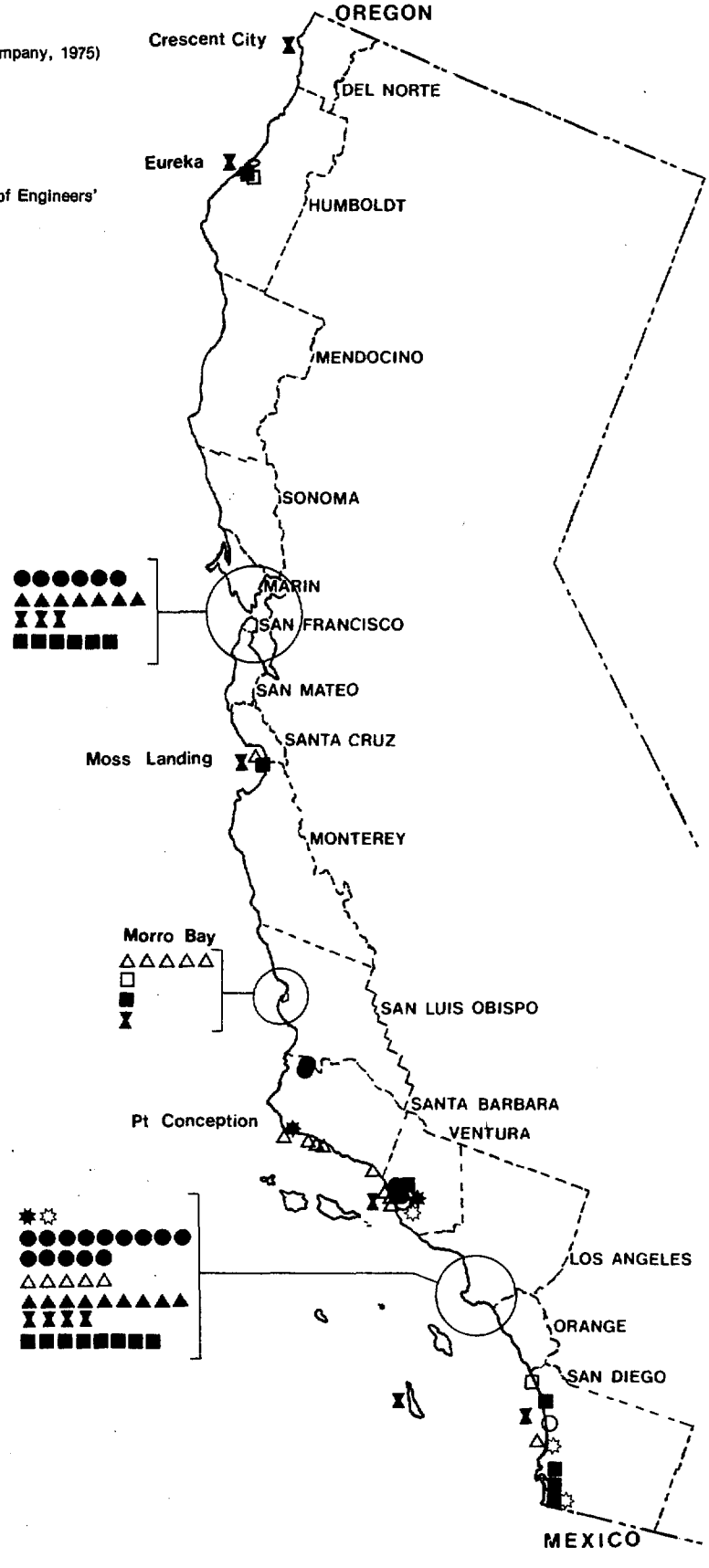
**Coordination by One Statewide Energy Authority Needed.** Determinations of energy needs and development of an inventory of sites for all major energy facilities might best be coordinated by a single statewide energy authority, with the opportunity for intensive review and comment at all planning stages afforded to all concerned agencies, and with a separate, concurrent permit authority for coastal siting decisions reserved to the coastal agency.

**Coastal Agency Can Work Closely with Other Agencies on Siting Permits.** The goal of comprehensive energy planning will be best served by the coastal agency's working closely with the Energy Commission and other State and local agencies in developing its siting policies and evaluating permit applications.

# EXISTING, PROPOSED, AND POTENTIAL COASTAL ENERGY FACILITIES

- ✸ Proposed liquefied natural gas (LNG) marine terminal
- ✡ Possible alternative LNG marine terminal
  (Both LNG identifications by Southern California Gas Company, 1975)
- ● Existing refinery
- ○ Proposed refinery
- ▲ Existing tanker berthing facilities
- △ Offshore tanker terminal, conventional buoy mooring
- ⧗ Potential deepwater port sites (identified in Army Corps of Engineers' West Coast Deepwater Port Facilities Study, 1973)
- ■ Existing fossil fuel power plant
- □ Existing nuclear power plant





## Policy

**76. Establish a Statewide Agency to Plan and Certify All Energy Facilities.** It is recommended that the Legislature extend the site planning and certification authority of the Energy Commission to include, in addition to electric power plants, all major oil, gas, or other energy source production, processing, and transmission facilities within the State. It is also recommended that the coastal agency have permit authority (concurrent with that of the Energy Commission if its authority is extended as proposed above) over the need, environmental, and land use aspects of any such facilities proposed in whole or in part within the coastal zone. Prior to exercising its permit authority over such coastal facilities, the coastal agency shall receive from the Energy Commission for its evaluation a formal finding as to the need for the facility and the availability of acceptable alternative sites. The coastal agency's permit authority over coastal energy facilities shall be exercised consistent with approved local coastal plans.

Preparation and approval of such local plans shall, to the extent possible, anticipate and fully consider the possible need for coastal energy facilities to help meet statewide and national energy requirements. The State Lands Commission shall continue to have leasing authority over facilities proposed for location on State lands. All other concerned local, State, and Federal agencies shall have full opportunity to review and comment at designated stages of any application before the Energy Commission. To minimize conflicts between the Energy Commission and the coastal agency, the coastal agency shall participate fully in review and comment procedures for all initial stages of site planning, and shall explore the feasibility of holding joint public hearings with the Energy Commission on site selection and facilities siting proposals.

It is recommended that the Legislature consider mandating the Energy Commission to establish, in coordination with the coastal agency and all concerned California agencies, a prioritized list of predesignated, approved inland and coastal sites for each of the various types of energy facilities, to further reduce the time necessary for decisions on nominated sites and facilities. Until a prioritized list of approved sites is established, applications for coastal energy facilities shall include designation and evaluation of at least two reasonable alternative inland or coastal sites reasonably capable of supplying the applicant's service or market area.

# POWER PLANTS

## Findings

**Several New Power Plant Sites Will Be Needed.** Additional fossil-fueled and nuclear power plants may be needed in the future even if energy conservation programs are successfully implemented and alternative energy sources become commercially available. Under reasonable assumptions regarding demand growth, and assuming 2,000-6,000 megawatts (Mw) per site with some expansion at existing sites, seven to 20 major new fossil- or nuclear-fueled power plant sites may be needed by the year 2000 for California. With a particularly vigorous and successful effort to develop alternative energy sources and implement conservation measures, it is possible that as few as three to nine new fossil or nuclear power plant sites may be needed statewide. With successful electricity conservation measures, the lower ends of these ranges may prove attainable.

**Alternative Energy Sources Will Also Require Power Generation Sites.** Development of alternative energy sources such as solar, geothermal, and wind, will also require sites for power generation facilities. Wind development may require large-scale facilities sited on the coast, though there are inland sites with equally good wind generation potential. Solid waste processing plants could be sited in the coastal zone, but are not coastal-dependent. Geothermal and large-scale solar plants will be located inland. Large-scale wind generation units would present aesthetic and land use problems, though design specifications are uncertain at this time. Small-scale or building use of solar or wind energy in the coastal zone would occur as part of building construction, and present few significant adverse environmental impacts.

**Nuclear Power Plant Siting Concerns.** The major concerns involved in nuclear power plant siting on the coast are:

- Safety hazards resulting from the high potential for strong earthquake events in much of the coastal zone (see Development chapter section on Geologic Hazard Areas) or from the potential for serious accident (e.g., loss of coolant) that could permit escape of radioactive materials;

- Proximity of nuclear power plants to population centers on the coast and the adequacy of emergency evacuation planning;
- Effects on the productive nearshore marine environment of entrainment and thermal or chemical discharges from the cooling systems;
- The impact of plant and associated structures, such as switchyards and transmission lines, on scenic natural areas; and
- Alteration and permanent use of sizable quantities of land for the plant itself, cooling towers, switchyards, transmission lines, and transportation and storage facilities, and surrounding population exclusion areas.

**Fossil Fuel Plant Siting Concerns.** The major concerns involved in fossil fuel power plants on the coast are:

- Public health and safety hazards from air pollution and the transportation of volatile fuels,
- Effects on the marine environment, similar to those encountered with nuclear plants,
- Impacts on scenic and natural areas, and
- Land use considerations.

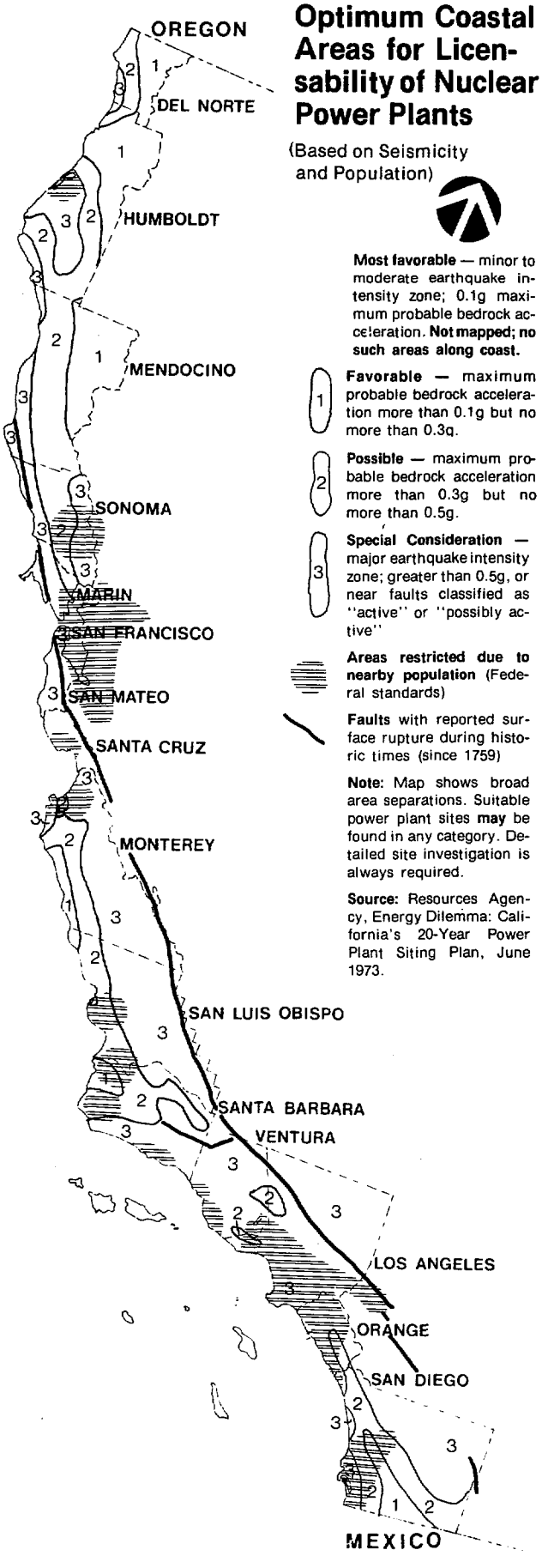
**Power Plants Traditionally Located Near the Coast.** Though a variety of factors influence siting decisions, power plants have traditionally been located near the coast in order to make use of the free, abundant, and nondepletable waters of the ocean and to be close to the major load centers of the State. Ninety per cent of California's thermal power generating capacity is sited along the coast or in the San Francisco Bay system.

**Few Coastal Sites Are Suitable for Nuclear Power Plants.** Very few coastal sites are suitable for nuclear power plants, compared to a much larger number of potential inland sites. The radiation hazard potential of nuclear power plants requires that the utmost care be exercised to site them away from areas of seismic risk and from population concentrations. Few coastal areas meet these criteria, while the areas of the State that offer the least seismic risk are located inland. Studies done by the Rand Corporation and the Environmental Quality Laboratory of the California Institute of Technology concluded that only about 50 miles of coastline may be suitable for nuclear power plants. Using less conservative assumptions about safety, a study conducted for the California Resources Agency concluded that 140 miles of coastline might be suitable, but no coastal areas were considered optimal from the standpoint of safety compared to other areas of the State. The California utilities are presently considering about 12 new coastal sites for power plants between now and the year 2000.

**Inland Areas Offer Siting Options.** There are many more potential nuclear power plant sites inland than on the coast that meet seismic safety and population concentration standards. The principal constraints on inland siting are the availability of adequate water for evaporative cooling towers and the need to dispose of "blow down" (water of high salinity concentrated by evaporation in the cooling tower). If sufficient cooling water is available, inland siting of nuclear power plants is both economically and technologically feasible; the electric utilities have proposed to build at some inland sites where sufficient freshwater supplies have already been allocated for cooling. Because of the importance of fresh water for agriculture and other uses, however, proposals

## Optimum Coastal Areas for Licensability of Nuclear Power Plants

(Based on Seismicity and Population)




**Most favorable** — minor to moderate earthquake intensity zone; 0.1g maximum probable bedrock acceleration. **Not mapped; no such areas along coast.**

**Favorable** — maximum probable bedrock acceleration more than 0.1g but no more than 0.3g.

**Possible** — maximum probable bedrock acceleration more than 0.3g but no more than 0.5g.

**Special Consideration** — major earthquake intensity zone; greater than 0.5g, or near faults classified as "active" or "possibly active"

**Areas restricted due to nearby population** (Federal standards)

**Faults** with reported surface rupture during historic times (since 1759)

**Note:** Map shows broad area separations. Suitable power plant sites **may** be found in any category. Detailed site investigation is always required.

**Source:** Resources Agency, Energy Dilemma: California's 20-Year Power Plant Siting Plan, June 1973.

to use additional fresh water for inland power plant cooling have been vigorously challenged. Much of the cooling water requirement inland could be met by reuse of municipal and agricultural waste water. There may be competition between uses of waste water for cooling and other beneficial purposes. New crop strains may be developed that could use what is now agricultural waste water. If the problem of nutrients, and other water quality problems, can be solved, the continued discharge of agricultural waste water into the Central Valley river system will reduce salt water penetration into the Delta. Widespread use of waste water for cooling would necessitate the construction of wastewater collection, treatment, and transportation facilities and adequate restrictions on the disposal of blow down in the waters of the State. The cost of such facilities could be defrayed by the electric utilities themselves. Energy conservation measures, and use of more efficient reactors such as the high-temperature gas-cooled reactor (HTGR — see finding under "Nuclear Fission" in section on Alternative Energy Sources) coupled with dry or dry/spray cooling towers, would minimize the pressures for developing additional freshwater sources.

**Power Plant Once-Through Cooling Systems Can Adversely Impact the Marine Environment.** The cooling systems of both fossil and nuclear power plants can have adverse environmental effects. Once-through cooling systems of the designs now used in all existing coastal power plants (cooling water is used once and then discharged into the ocean or other water body) have multiple impacts on the marine environment and have potential for ecological damage caused by increased ambient water temperatures, entrainment of marine life, and other effects as described in the Marine Environment chapter. Redesign may reduce those impacts.

**Use of Evaporative Cooling Towers Eliminates Many Impacts on the Marine Environment.** Evaporative cooling towers consume 25-40,000 acre-feet of water per year per 1,000 Mw, and release heat directly to the atmosphere. Evaporative cooling towers may cause localized atmospheric changes (such as fogging) and drift (fallout of particles carried in water droplets) which under some conditions could be adverse; but these problems can be minimized or eliminated by modern engineering and strategic siting. Evaporative cooling towers using salt water are becoming more feasible as drift eliminators are improved, reducing the danger of contaminating the surrounding land area. Such towers would eliminate many of the concerns over impacts to the marine environment but would present the added problem of generating concentrated brine that requires disposal.

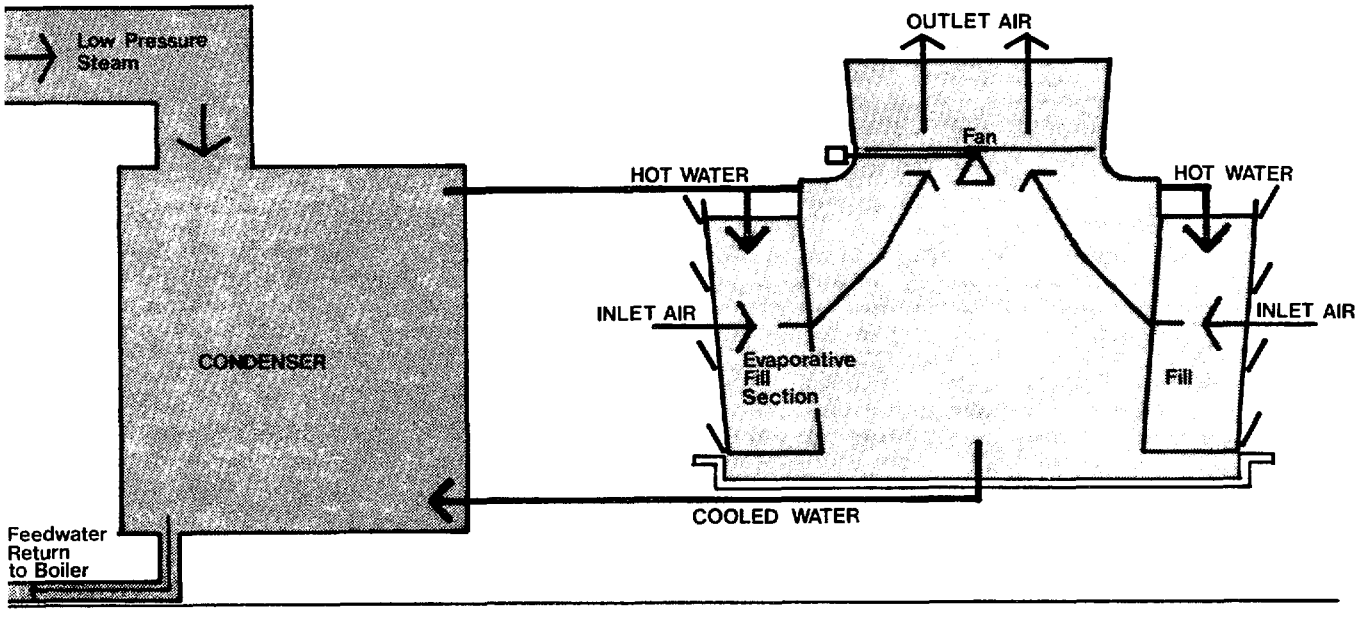
**Viability of Dry Cooling Towers Not Established.** Dry cooling towers, which operate like a car radiator, and dry/spray towers, which add an evaporative system in combination with dry towers, require little or no water but are larger and more expensive than evaporative towers. While dry cooling towers are technically feasible their commerical viability for use with large-scale power plants has not yet been established.

**Cooling Towers Are Visually Obtrusive.** All cooling towers are large structures, with resulting visual impacts, and they result in some efficiency penalties in the use of energy sources. While there is some loss in energy efficiency in the use of cooling towers (dry towers are less energy-efficient than evaporative towers), this energy cost may be necessary to reduce depletion of other resources.

**Reactor Types and Cooling Systems.** Because of their lower efficiency in converting heat energy to electricity, nuclear light water reactors (LWRs) give off more waste heat than fossil fuel plants or other types of nuclear plants, and therefore require more cooling. The commercial feasibility of the HTGR, which has a higher efficiency and therefore requires less cooling than the LWR, has now been demonstrated. HTGRs using dry/spray or dry cooling tower systems appear to be well adapted for use at inland sites where water availability for cooling is a significant problem.

**Underground Siting Is Feasible.** Underground siting is technologically feasible, but is more expensive than above-ground siting. The environmental benefits of underground sites are considerable because of reduced visual impact,

## Mechanical Draft and Wet Cooling Tower Power Plant Cooling System



possible safety advantages afforded by some types of rock formations, and the potential for multiple use of the land.

**Offshore Nuclear Plants Are Feasible But Potentially Hazardous.** It now appears technologically feasible to construct offshore nuclear plants on floating platforms or artificial islands. However, this is much more likely to occur on the East Coast, where the wide, shallow continental shelf permits mooring and breakwater construction at some distance from shore, than off the shore of California, where the shelf drops off abruptly into deep waters. Although offshore siting would significantly reduce land use conflicts and the environmental effects of cooling systems, serious questions remain regarding visual impacts if located close to shore, the potential hazard to navigation, and the likelihood that a major accident resulting in release of radioactive materials would cause immediate contamination of the biosphere. Such hazards have not yet been adequately reviewed. Although two plants are being planned for sites offshore of New Jersey, no offshore plant has yet been licensed by either the Atomic Energy Commission or its successor, the Nuclear Regulatory Commission. Siting concepts have also been developed for floating nuclear plants in manmade or dredged lagoons.

**Fossil Fuel Plants Adversely Impact Air Quality.** Fossil fuel plants in California are expected to be primarily oil-fired in the future because of the decreasing availability of natural gas. Oil-fired power plants represent large stationary sources of oxides of nitrogen and sulfur, and the problem of sulfur dioxide emissions will become particularly severe if low-sulfur fuels become unavailable. Though significant research and engineering efforts to reduce air pollutant emissions are continuing, fossil fuel plants at present do have a significant adverse impact on air quality, particularly in critical air areas where pollution levels are already exceeded, and in areas especially sensitive to air pollution, such as specialty agricultural and coastal recreation areas (see Coastal Land Environment chapter).

Moss Landing power plant (oil storage tanks in foreground), Monterey County

## Policies

**77. Coastal Agency Role in Siting Coastal Power Plants.** Pursuant to Policy 76, the coastal agency shall have permit authority over the need, land use, and environmental aspects of new or expanded power plants in the coastal zone, including those projects exempted by law from the Energy Commission permit requirement. Where the two agencies exercise concurrent permit authority, the coastal agency shall make its permit decision prior to the Energy Commission's final certification decision. In conducting its review, the coastal agency shall work closely with the Energy Commission to identify potential coastal concerns early in the application process, minimize the potential for conflict, and enable a final decision on applications within a reasonable time.

**78. Coastal Agency Role in Ongoing Site Identification Process.** The coastal agency shall be granted a substantial ongoing role in Energy Commission statewide policy formulation and site identification processes, including the establishment of a prioritized list of predesignated, approved inland and coastal sites for power plants, as proposed in Policy 76. The role of the coastal agency in siting power plants shall not be interpreted as an effort to exclude all power generation facilities from the coastal zone. Site selection and facility approval shall proceed with the goal of protecting inland as well as coastal resources, and the need for sites and facilities shall be measured by the Energy Commission within the context of a comprehensive energy conservation and development program.

**79. Criteria for Siting and Design of Coastal Power Plants.** New and expanded power plants shall be permitted in the coastal zone when the following criteria and standards can be met.

a. **Energy Conservation and Peak Load Reduction Efforts.** The applicant must demonstrate that energy conservation efforts, including concerted efforts by the applicant within its service area, cannot reasonably reduce base-load and peaking requirements sufficiently to eliminate the need for the proposed facility.

b. **Coastal Sites Vs. Alternative Inland Sites.** The applicant must show that using reasonable alternative inland sites or alternative technologies would have greater adverse environmental impacts than would be the case with a coastal site. Environmental impacts shall be those presently identifiable. In evaluating alternative sites and technologies, in addition to the factors included in the Warren-Alquist Act, consideration shall be given to use of evapora-

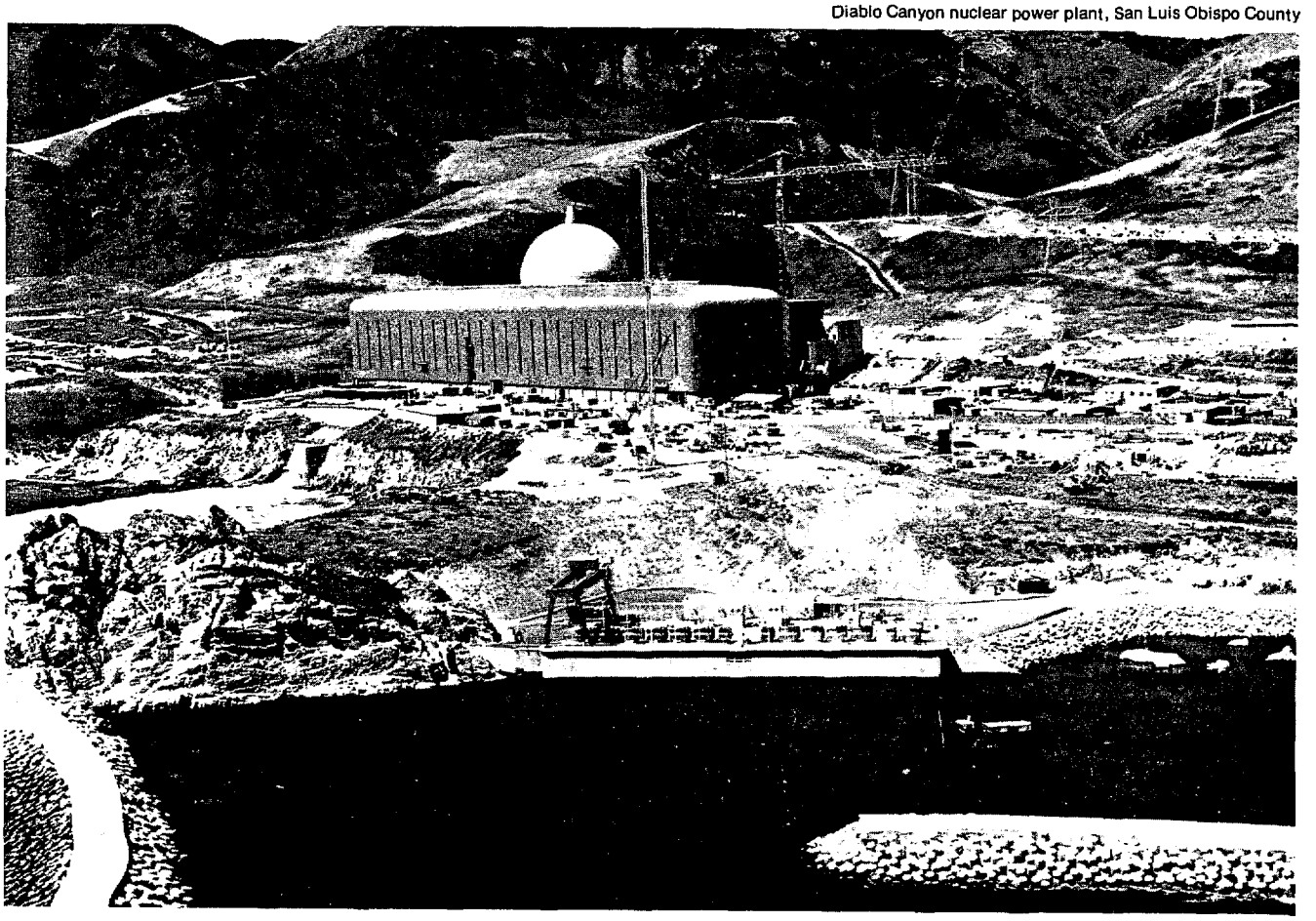
tive, dry, dry/spray, and salt water evaporative cooling towers, and the following potential water sources shall be considered in evaluating the impact of providing cooling water at inland sites: (1) surplus freshwater supplies already allocated to power generation but not presently being used; (2) agricultural or municipal waste water; (3) freshwater supplies that can eventually be replaced by waste water; and (4) other freshwater supplies, if it is determined that there is sufficient water available after the reasonable needs of other priority users are met so as not to deprive inland or coastal areas of fresh water needed for agricultural production of groundwater maintenance. To assist in evaluating alternative sites the utility or utilities proposing the coastal site shall submit a comprehensive evaluation of reasonable alternative coastal and inland sites and generating technologies, including the environmental and economic reasons for rejecting them in favor of the proposed site, sufficiently in advance of a desired decision that an adequate and independent analysis can be made. The primary responsibility for the identification of such alternative inland sites shall rest with the Energy Commission, and the identification or certification of such a site by that Commission demonstrates that such suitable alternative inland sites are available.

c. **Plant Expansions Favored Over New Coastal Sites.** In the case of a proposal for a new coastal site, the applicant must show that the need for new capacity cannot or should not be met by plant expansion at an existing inland or coastal site that has been identified as suitable for expansion. The primary responsibility for the identification of such sites suitable for expansion shall rest with the Energy Commission.

d. **Conflict with Coastal-Dependent Uses at or near Site.** The applicant must demonstrate that the proposed power plant and the land use restrictions that may be required by the Energy Commission on the area surrounding a plant, for protection of public health and safety, will not conflict with other existing or planned coastal-dependent land uses at or near the site.

e. **Nuclear Plants Must Be in Seismically Safe Areas.** In the case of a nuclear power plant, the applicant must show that the proposed site is in an area of minimum seismic hazard in

Diablo Canyon nuclear power plant, San Luis Obispo County



comparison to alternative sites reasonably capable of serving the applicant's service area and that the proposed plant is designed to safely withstand the effects of the most severe seismic activity thought possible in the site area.

f. **Radiation Hazard Criteria.** In the case of a nuclear power plant, the applicant must show that the number of people and their distribution within the potential radiation hazard area meets and is limited to Federal Nuclear Regulatory Commission and State Energy Commission criteria and that the people can be readily evacuated in the event of an emergency.

g. **Use Least Environmentally Damaging Technologies.** The applicant must show that the generation and cooling systems proposed are the least environmentally damaging technologies projected to be available at the time of scheduled construction. The cooling system technology employed shall meet the requirements of Policy 10. Improvements in the cooling systems of existing facilities at the site may be weighed by the coastal agency in determining compliance with this subsection.

h. **Fossil Fuel Plants in Air Quality Maintenance Areas.** In addition to meeting the standards set forth in Policy 43, new or expanded fossil fuel-fired electric generating facilities shall not be built in areas of the coastal zone designated by the Air Resources Board as Air Quality Maintenance Areas or in areas where such coastal resources as health resorts or agricultural lands would be adversely affected, unless there would be a net decrease in generating system emission over the entire air basin of pollutants for which national or state ambient air quality standards have been established. Reduction in emissions can be accomplished by modernization or retirement of existing facilities. Priority consideration shall be given to reducing emissions at existing facilities that affect the specific area to be affected by emissions from the proposed project. In addition, consideration shall be given to utilizing plant equipment and design capable of easy conversion to such clean fuels as methanol, when they become available, or there should be findings of fact that methanol is not and will not be practical for use at the particular plant.

i. **Minimize Environmental and Scenic Impacts.** The applicant must design and locate the plant so as to minimize adverse visual impact on the shoreline and adverse environmental effects, including but not limited to effects on fish and wildlife and their habitats, and on scenic, agricultural, and other resources of the coastal zone. The plant shall not be located in a highly scenic area as defined in Policy 45.

j. **Public Access Area Necessary.** The applicant must show that a substantial area will be established for permanent public use and enjoyment of the coast. This may include a substantial dedication to the public of land, which need not be adjacent to the plant site but shall be of the same quality and in the same general area.

**80. Remove Outmoded Power Plants from Beach Areas.** As alternative, less environmentally damaging technologies become widely available, so that some of the existing fossil fuel or nuclear generating facilities can be phased out and removed, priority shall be given to removal of those facilities that are in prime beach recreation areas.

# PETROLEUM DEVELOPMENT

## Findings

**California's Potentially Recoverable Petroleum Resources.** California has two general areas of petroleum production: onshore and State submerged lands offshore. In addition there are Federal submerged lands offshore beyond three miles. Estimates as to how much recoverable oil remains in these areas vary greatly, depending on assumptions as to:

- the size of known reservoirs, and of reservoirs thought to exist because of favorable geological conditions but not yet verified;
- economic factors such as price of crude oil and cost of exploration and production;
- technological factors such as capability to recover petroleum at increased water depths, and improved secondary recovery methods;

- the percentage of the oil in California reservoirs ultimately recoverable (average recovery efficiency).

The figures below (in billions of barrels) give a representative range of estimates, each based on varying assumptions and methodologies, of California's remaining recoverable petroleum resource:

| | Demonstrated Reserves | Undiscovered Recoverable Reserves | Estimated Total Recoverable Reserves |
|---|---|---|---|
| **Onshore** | | | |
| Calif. Resources Agency ('73) | 5.1 | 6.8 | 11.9 |
| U.S. Geological Survey ('75) | 3.7 | 4.0 to 11.0 | 7.7 to 14.7 |
| Natl. Petroleum Council ('73) | n.a. | 5.1 | (5.1+) |
| **Offshore** | | | |
| Resources Agency | 0.9 | 5.7 (to 1,200 ft.) | 6.6 |
| USGS | 1.1 | 2.0 to 5.0 (to 636 ft.) | 3.1 to 6.1 |
| NPC | n.a. | 12.4 | (12.4+) |
| Western Oil & Gas Assn. ('74) | n.a. | 6.0 to 19.0 (no depth limit, So. Cal. only) | (6.0+ to 19.0+) |
| | | TOTAL (range) | 10.8+ to 33.7+ |

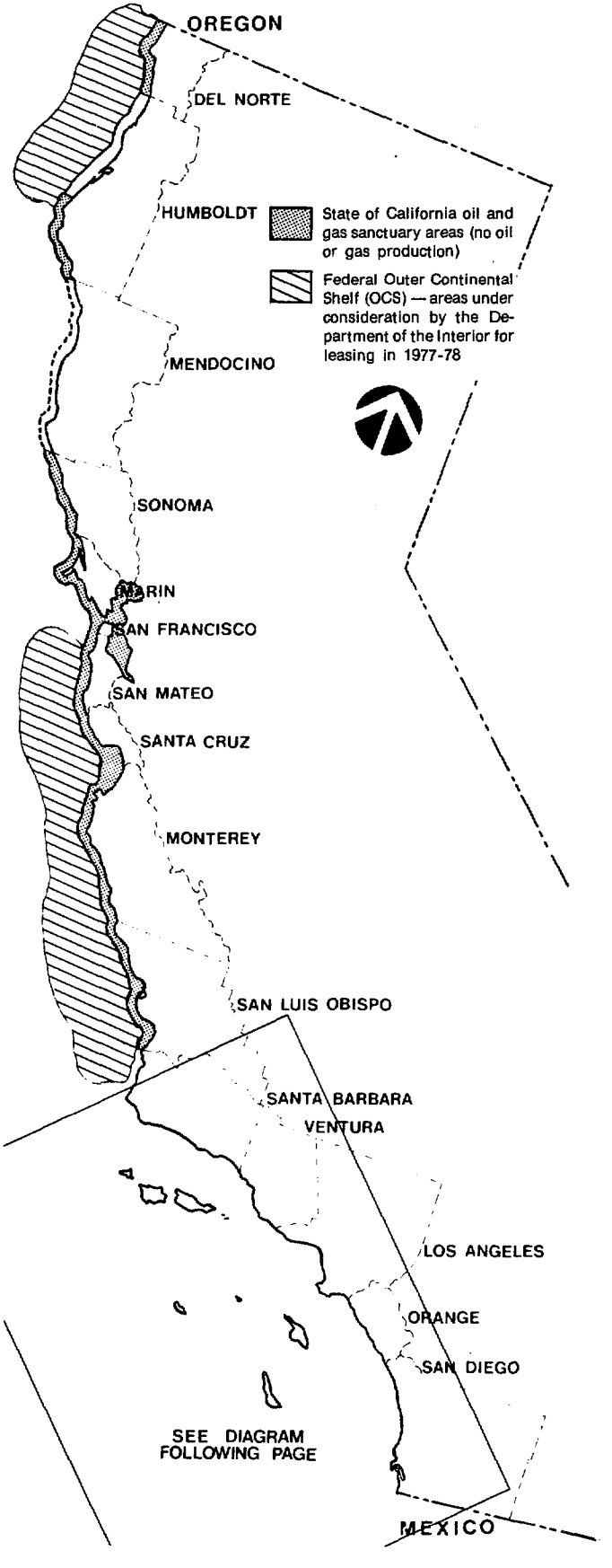
The degree of uncertainty in measuring the petroleum resource is evident. Estimates as to total recoverable reserves onshore and offshore range from about 11 billion barrels to about 35 billion barrels.

California's historical average recovery efficiency is only about 25 per cent of the total original oil-in-place. If increased oil prices and improved recovery technologies should allow an improved California recovery efficiency of up to 35 per cent, as some experts believe possible, amounts of oil substantially larger than those listed above will be possible both from demonstrated and yet undiscovered reservoirs.

**Offshore Areas Are Future Locations of Oil and Gas Production.** California's onshore petroleum resources are still very substantial, though the largest reservoirs have probably been discovered and substantially developed already, and most of the remaining undiscovered onshore resource may lie in smaller pools and at greater depths than the reservoirs that historically have accounted for much of California's oil production. Increased onshore production will depend on improved secondary and tertiary recovery techniques, and on rising oil prices that encourage increased exploration, deeper drilling, and secondary and tertiary recovery from discovered reservoirs. The offshore resources now offer the least expensive option for rapid production of large volumes of oil in California. Much of the California offshore resource is close to the shoreline, and therefore production facilities may be highly visible from the coast. Most of the oil off the shore of California is believed to lie beneath Federal submerged lands beyond the State's jurisdiction, as much as 65 per cent of it at water depths of 1,500 feet or more. The extent and cost of developing the Federal offshore resource cannot be completely known until after exploratory drilling has occurred.

**Current Offshore Production Comes from Both State and Federal Leased Areas.** Most of the present California offshore production comes from operations in the Santa Barbara Channel and offshore Wilmington and Huntington Beach reservoirs. There are substantial production operations on Federally leased tracts in the Dos Cuadros and Carpinteria fields. According to 1971 data, there are more than 1,800 actual producing wells on State-owned submerged lands

## Existing and Proposed Offshore Petroleum Leasing



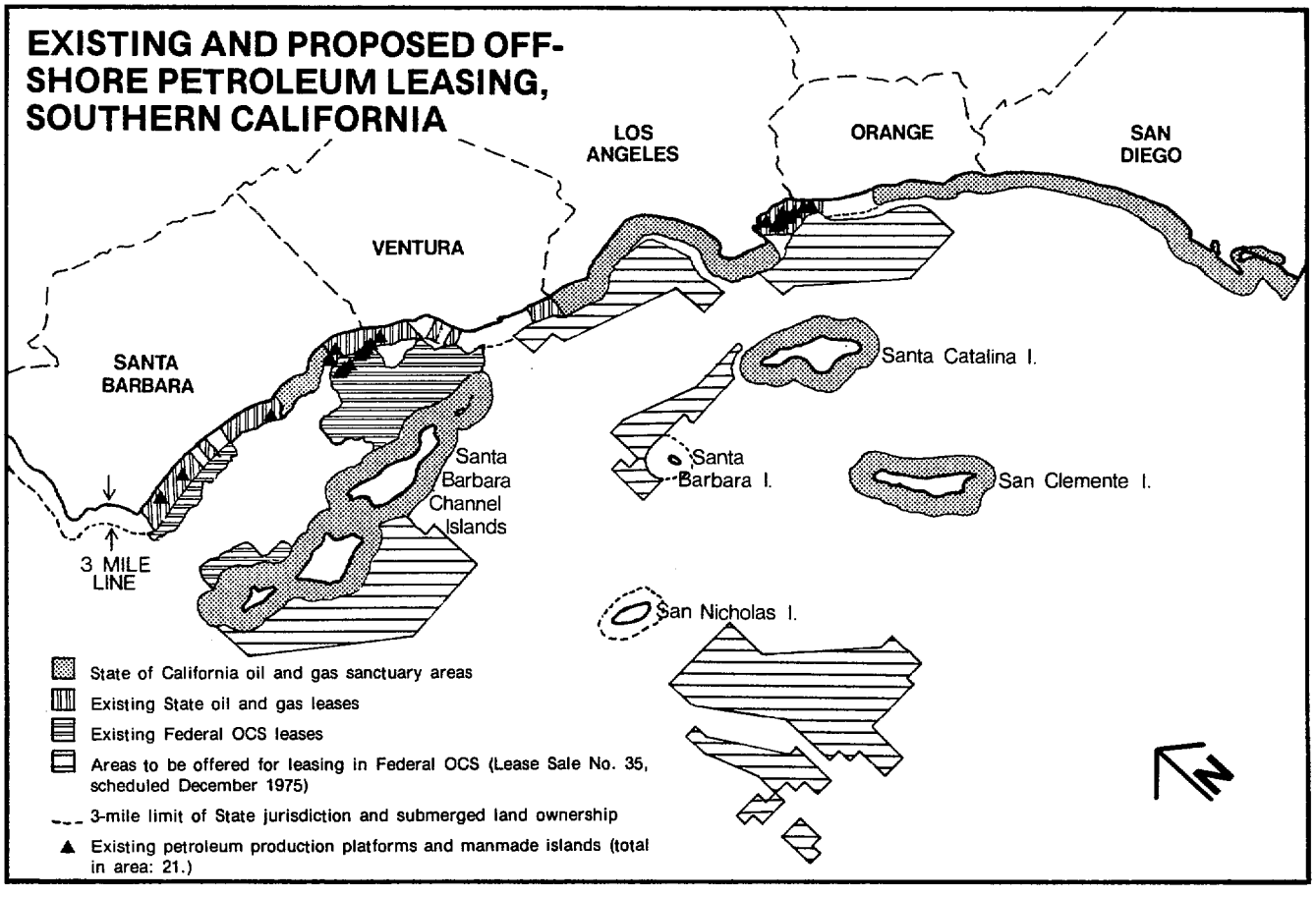
between Point Conception and Huntington Beach. The State receives lease payments and royalties from any petroleum production on its submerged lands, which are managed by the State Lands Commission. The vast majority of the State's submerged lands have been made State petroleum resource sanctuaries in which no petroleum recovery activities are allowed. Laws creating additional petroleum sanctuaries have been proposed in the California Legislature and the U.S. Congress. Coastal cities (e.g., Long Beach) also hold contracts allowing them to receive a portion of net profits from offshore operations adjacent to their coastline; the State Lands Division maintains operating supervisory authority on the tracts.

**Moratorium Placed on New Offshore Drilling in State Waters.** In 1969, following the blowout on a platform in Federal waters off Santa Barbara, the State Lands Commission placed a moratorium on new drilling offshore in State waters. In December 1973 the Commission voted to permit drilling of new wells from already-built platforms on existing leases, subject to approval on a lease-by-lease basis. In late 1974 the Commission granted aprovals to several oil companies for such drilling, but in early 1975, the Commission, under the new administration, reversed these decisions pending further evaluation. In mid-1975 the Commission gave ARCO approval for 17 new wells from existing Platform Holly in the Santa Barbara Channel.

**Federal Lease-Sale of Southern California OCS Areas Scheduled for Late 1975.** The Department of the Interior has called for lease proposals from oil companies for petroleum drilling in huge areas of the Outer Continental Shelf (OCS) off the shore of Los Angeles County but beyond the three-mile State jurisdiction, for lease proposals for large areas off central and northern California at a later date, and for increased drilling on existing Federal leases in the Santa Barbara Channel. (If the Department of the Interior decided to proceed with its lease-sale of the southern California area, the sale was to occur in November 1975. The Governor and all concerned State agencies publicly requested that the lease sale be postponed until (1) California had completed its coastal planning effort, and (2) the Congress had taken final action on draft legislation effecting numerous essential reforms in the leasing procedures.)

**New Proposals for Separating Exploration and Production Decisions.** Under present offshore leasing procedures, oil companies are granted the right to ultimately develop and produce offshore at the time a lease is granted, before any exploratory drilling has occurred, and when little is known about the characteristics of the possible offshore petroleum resource. Changes in these procedures, to separate the decision to allow exploratory drilling from the decision to allow development and production, would permit public agencies to make offshore production decisions and plan for offshore and onshore development on the basis of firmer knowledge as to the nature, extent, and location of the offshore resource. In addition to facilitating coastal planning and management, such procedural changes could, if properly designed,

- Reduce lead times for exploratory drilling;
- Reduce industry expenditures for bonus bidding, thereby freeing capital for other purposes;
- Allow for royalty schedules keyed to the characteristics



of a particular reservoir, thereby guaranteeing a fair return to government on the sale of a public resource; and

- Provide for appropriate compensation to any company not permitted to produce discovered oil and gas.

The changes discussed here are included in draft legislation before Congress to amend the Outer Continental Shelf Lands Act.

**California Has No Direct Control Over Federal Offshore Drilling.** Although these Federal activities may affect California's ocean water quality, marine life, and scenic values, could possibly deplete oil reservoirs extending under adjacent State submerged lands, and may directly lead to significant onshore developments of refineries, tanker terminals, storage tanks, and pipelines, California has no direct control over the Federal leasing plans at this time.

**Deficiencies in Federal Offshore Regulation and Supervision Are Being Remedied.** In the past, Federal regulations governing drilling and production procedures on Federal submerged lands, including requirements for depth of casing for blow out preventers and crew training and supervision, have been less stringent than California Division of Oil and Gas regulations governing operations on State submerged lands, where there have been no significant spills resulting from offshore oil and gas operations. Deficiencies in Federal regulations led directly to the well blowout in Federal waters off Santa Barbara in 1969. Federal regulations, procedures, and regulatory staff are now being greatly upgraded. It is expected that when revision of Federal regulations for the Pacific Coast area is completed, they will be in substantial conformance with those of the State.

**Petroleum Production Is Declining.** The leasing of lands, exploration, drilling, and production of petroleum is an expensive and risky process. Offshore exploration and production operations are generally much more expensive than onshore activities. Exploration for petroleum has generally decreased in California and nationwide over the past 20 years, and the success rate of finding and completing new petroleum fields has also steadily declined. Petroleum shortages, increased costs of extraction, and the need for technological research continually push the price of petroleum upward, which in turn should allow increased exploration and research toward technological advances. Over the first six months of 1974 exploratory and drilling activity increased. Production of petroleum in the Los Angeles basin peaked in 1969; the same is true for production in the coastal area of the basin. Exploratory drilling has been at historically low levels in both the onshore and offshore portions of the coastal area. Oil production and development drilling are both likely to continue to decline, although the increases in crude oil prices since 1973 may reduce the production decline rate below the approximately 10 per cent per year rate normally experienced by California oil wells. It is projected that the average rate of decline in California production shipped to Los Angeles/Long Beach area refineries will be four per cent per year to 1985.

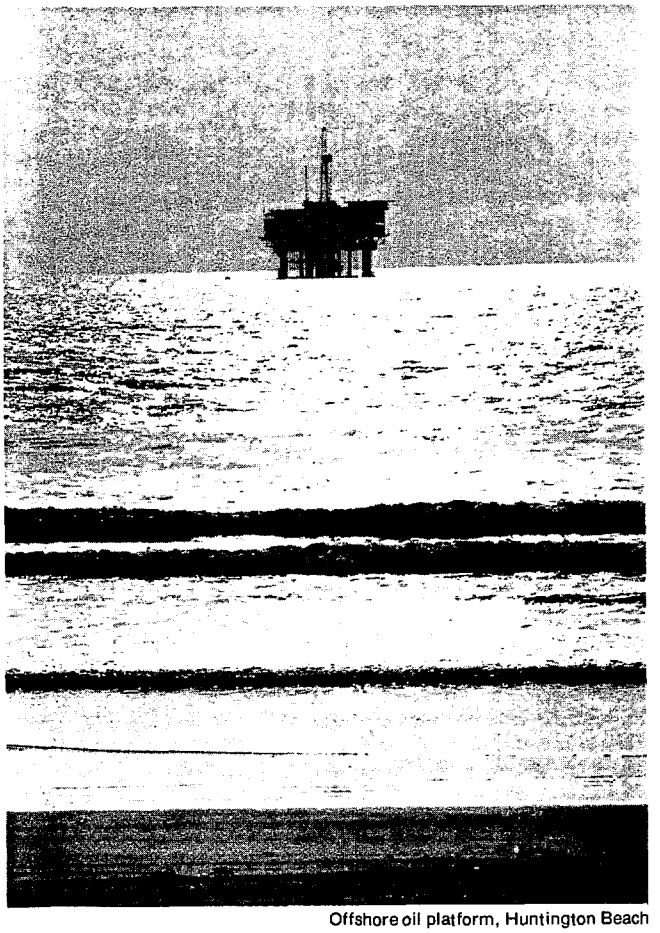
**California Has a Low Recovery Rate.** The nationwide recovery efficiency of oil has steadily increased to approximately 31 per cent. California's 25 per cent recovery efficiency lags behind other major oil and gas producing regions because of:

- Generally high viscosity of much of California's oil, and the relatively low natural pressures in the underground reservoirs to help oil and gas recovery;
- Complex geologic formations holding the petroleum, with many reservoir problems; and
- To a lesser degree, lack of State regulation that might maximize ultimate recovery of oil and gas by regulating well completion and production practices.

**California Has Less Stringent Regulation over Petroleum Development.** Completion and production practices in many oil-producing states, including Alaska, Louisiana, Texas, and Wyoming, are regulated by a state agency (the Canadian province of Alberta also regulates petroleum development). California's laws do not provide for actual regulation of completion and production practices by the Division of Oil and Gas, and the California petroleum industry is allowed very wide discretion in production rates and such practices as simultaneous production from many pools, and optional ratios of gas/oil production, which in turn can lead to low recovery efficiencies. Some other states also have requirements for public disclosure of exploratory data within some period of time after filing with the state regulatory agency, to increase geologic investigations, stimulate exploration, promote a more competitive industry, and increase oil production; and the Department of the Interior has proposed regulations for OCS lease purchasers that would require public disclosure of geological and geophysical data following the purchase, to be made public within six months. California has no such disclosure requirement.

**Secondary and Tertiary Production Methods May Improve Petroleum Recovery.** Secondary and tertiary production methods offer the promise of increased efficiency in recovering oil and gas. California has benefited from secondary recovery innovations and their applications. About 15 per cent of California's present oil production comes from secondary recovery operations. In some reservoirs, very little primary production is possible, but secondary recovery may increase production after primary recovery by 10-50 per cent of the original oil in place, and tertiary recovery may offer the potential for a total recovery of 30-70 per cent. Substantial improvements in recovery efficiency will require improved technology, greater capital investments, higher well maintenance costs, and a higher price for refined products. With a greatly increased effort at secondary and tertiary methods average recovery efficiency for California may ultimately go as high as 35-40 per cent of original oil in place. Increased primary, secondary, and tertiary production from existing wells will entail substantially fewer new developments and land use conflicts than exploration and drilling for virginal reservoirs, onshore or offshore.

**Offshore Oil Structures Are Visually Prominent.** Offshore petroleum operations are usually conducted from manmade platforms above the water's surface. Exploratory drilling and some production drilling are primarily accomplished from mobile platforms, whereas most production of oil and gas is controlled from fixed platforms. There has been objection by some segments of the public to their use, based primarily on aesthetic grounds and concern for navigational safety. Because of their size and the elevation of coastal lands, these platforms can be seen from the coast even when located at great distances (12-20 miles) from the shoreline; they are particularly prominent when located near the coast. The existing designs apparently have large margin for improvement. Some members of the public note with approval the beneficial effects of platforms on sport fishing. The deepest platform production in the world presently is in 420 feet. The Exxon Company plans to construct and operate a fixed



Offshore oil platform, Huntington Beach

platform in 850 feet of water in the Santa Barbara Channel. At present there are 12 platforms off the shore of California. According to two environmental impact statements by the Department of the Interior on southern California and Santa Barbara Channel offshore petroleum activities, from 24 to 91 additional platforms may be required to exploit the California offshore resource.

**Platforms and Islands Have Potential for Multiple Public Uses.** Artificial islands or platforms for offshore oil drilling facilities can provide public uses other than that of extracting oil. This would require some engineering adjustments within sound principles of industrial and marine safety on the platforms. Facilities for other uses that might be appropriate for some installations are scientific research and education labs; general public viewing areas for the observation of drilling operations; government installations (Coast Guard, weather service); facilities for aquaculture operations; and self-sustaining platform power equipment.

**Submerged Systems Reduce Costs and Aesthetic Impacts But Increase Environmental Risks.** As of mid-1974 approximately 40 individual wells in shallow water on State lands in the Santa Barbara Channel area had been completed entirely underwater rather than from permanent platforms, by using subsea completion systems. Such systems still require support facilities on permanent platforms or onshore, but permit reduction in the number of platforms required for the development of the offshore resource. More sophisticated submerged production systems, which would permit clustering of numerous wells completed subsea around a single subsea center that would in turn pump the oil and gas to facilities on platforms or onshore, would still further reduce the need for platforms. This would reduce both the aesthetic impacts of offshore development and the great expense of constructing platforms in deep waters. Actual experience with subsea completions and submerged production systems in deep water is still extremely limited. The difficulties involved in servicing or repairing such systems, or re-entering and plugging a well in the event of a blowout, mean increased environmental risk. Such facilities need to be tested extensively by industry under operational conditions, with full observation afforded to appropriate government agencies, before they are utilized in deep water offshore activities, and new regulations for such systems need to be developed.

**Offshore Drilling Is More Hazardous than Onshore.** Oil and gas leaks in offshore drilling or production are statistically rare, and steadily improving offshore drilling technology and operating procedures should still further reduce the incidence of occurrence. However, the programmatic Environmental Impact Statement prepared by the Bureau of Land Management for the nationwide accelerated Federal offshore leasing program noted that major spills associated with OCS development are statistically inevitable. The California offshore environment is relatively mild compared to the environment in offshore drilling areas elsewhere in the world, such as the North Sea and the Gulf of Alaska, and this somewhat reduces the environmental risks. Nevertheless, even in California offshore drilling generally involves greater environmental hazards than onshore drilling and involves some particular hazards:

- People are at a logistical disadvantage in working in the offshore environment, whether on the surface or underwater. Response time to crisis is slower than onshore, and the ability to maintain equipment and receive supplies is constrained.
- Offshore facilities are subjected to more danger, including storms, vessel collisions, seawater corrosion, low water temperature problems, water currents, seismic activity, and tsunami (seismic sea waves). Platforms can be designed and constructed to withstand known Pacific Coast phenomena.
- Leaks of oil and gas are more difficult to plug and oil is more quickly dispersed over a broad area.
- Most of the California offshore resource lies beneath submerged lands that are seismically highly unstable.
- Much of the offshore resource lies beneath submerged lands in water depths greater than current production technology can overcome.
- Submerged pipeline laying and maintenance may be complicated by seismic instability, extreme water depths, and the highly uneven bathymetry of the California outer continental shelf.

**Basic Spill Cleanup Methods Help Minimize Environmental Damage.** If an oil spill should occur, the substances must be contained and recovered quickly to minimize environmental damage. Present containment methods utilize floating booms or pneumatic curtains which confine the oil. Recovery methods include use of absorbing materials (e.g., straw), suction devices, adhesive materials to remove the oil from seawater, and skimming mechanisms that remove oil from water. Oil may also be dispersed into the water column by the addition of chemicals, collected with gelling substances, forced to the sea floor by combining with sinking agents, or burned with combustion fluids. Use of sinking and burning

agents are generally forbidden by the State Department of Fish and Game.

**Spill Containment and Cleanup Methods Are Still Inadequate.** Since 1969 larger amounts of money have been spent on improving oil spill prevention and containment programs and for cleanup equipment. Although the technology for containment and recovery of offshore oil spills has improved since the Santa Barbara spill, no system is likely to be completely effective. Using presently available equipment, oil containment and recovery can be reasonably effective in calm waters; but moderate to stormy conditions (winds of 20 or more knots and wave heights over five feet) will seriously hinder deployment of equipment, and will spread the spill regardless of containment attempts. Such conditions will also act to disperse and degrade the spill. Most oil spill contingency plans, including the National Oil Spill Contingency Plan implemented under the guidance of the Coast Guard, and the State of California Oil Spill Contingency Plan, have been tested under simulated conditions but have not yet been proven under actual crisis situation. (For further findings on oil spills and spill liability, as well as Coastal Plan policy, see Marine Environment chapter.)

**Oil Field Brines Can Be Disposed of by Reinjection into Oil Producing Zones.** Inadequately treated oil field brines released at sea are highly polluting. In many instances, these brines can practically be disposed of by reinjecting them under pressure into oil producing zones. In addition to protecting water quality and decreasing odors associated with oil production, this practice can frequently help increase oil recovery from already-developed reservoirs. The Water Resources Control Board presently issues discharge requirements and the Division of Oil and Gas regulates any reinjection of brines.

**Offshore Production Will Encourage Onshore Development.** Offshore petroleum production may encourage greater industrialization in certain areas of the coastal zone, will increase water and land transportation, and will necessitate construction of onshore and offshore oil and gas pipelines and separation, treatment, and storage facilities. Production off the shore of California could reduce the need for additional tanker terminal capacity along the coast to service oil imports, but may result in pressure for additional terminals for barges and tankers transporting petroleum from offshore wells.

**Impacts of Offshore Production Can Be Minimized by Consolidating Facilities.** With many companies involved in offshore petroleum development along broad areas of the coast, there is great potential for unnecessary duplication of offshore platforms, pipelines, and oil transport terminals, and onshore pipelines, separation and treatment facility sites, and storage tank areas. This could result in industrial sprawl that could change the fundamental character of lengthy sections of the coastline. Unitization (i.e., development of a single reservoir spanning several leases as a single unit by a single operator) results in increased production and fewer facilities offshore. Consolidation or sharing of transfer terminals and onshore facilities can concentrate necessary support activities within a few selected areas. Both unitization and consolidation are now practiced by the oil industry for economic reasons, but they also can offer environmental, aesthetic, and land use advantages.

Near Rincon Point, Ventura County

## Policies

**81. Basic Policy for Offshore Petroleum Development.** New offshore oil and gas development shall be permitted if:

- The Federal Government (for Federal Outer Continental Shelf lands) or the State Energy Commission, State Lands Commission, coastal agency, and other appropriate State agencies (for offshore State lands) have clearly identified development of the offshore petroleum resource as: (1) an integral and high-priority part of a comprehensive, balanced national energy conservation and development program that gives consideration to full-scale energy conservation programs, alternative energy source development, and short- and long-term resource availability; or (2) a necessary energy source for California and Petroleum Administration for Defense District V (PAD V, consisting of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii), considering energy conservation and alternative energy sources development measures and also considering the anticipated inflow to California and PAD V of oil and other forms of energy from all other sources (e.g., onshore oil production, Alaska North Slope oil and gas production, production in other regions of Alaska, and foreign oil and gas imports) and California's projected capacities to refine and store the anticipated inflow of oil from these sources; and
- The coastal agency has determined that the possible impacts on coastal marine, air, and onshore resources resulting from offshore petroleum development are acceptable under the policies set forth in the Coastal Plan.

**82. Recommendation to Separate Permit Review of Petroleum Exploration Phase and Development/Production Phase.** In order that, prior to a decision whether to grant private companies the right to develop and produce publicly owned offshore and onshore petroleum resources in the coastal zone, as much data as possible can be acquired about the resources, their value, and the offshore and onshore environmental impacts of production, it is recommended that the present system for leasing State lands for oil and gas production be changed to separate permit review of the exploration phase from the development/production phase, as follows:

a. **Exploratory Phase.** Exploratory drilling on a lease shall proceed only after (1) the State Lands Commission has prepared an environmental impact report (EIR) on the exploratory phase activities; (2) the coastal agency has issued a permit for the exploratory phase activities; and (3) the State Lands Commission has approved an exploration program.

b. **Development and Production Phase.** Development and production shall proceed only after (1) the State Lands Commission has prepared an EIR on all aspects of the development and production phase; (2) the Energy Commission has made a formal finding of need for the oil and gas resources discovered during exploration; (3) the coastal agency has reviewed the Energy Commission's finding of need, evaluated the environmental and land use planning aspects of the development and production phase, and has issued a permit; (4) the Energy Commission, if it is given statewide authority for siting offshore and onshore oil and gas production activities and facilities (as recommended in Policy 76), has issued its certification; and (5) the State Lands Commission has approved a development and production program. The EIR on the development and production phase shall include one-, five-, and 10-year plans for development, production, and all related offshore and onshore development, including platforms, submerged production systems, pipelines, separation, treatment, and storage facilities, refineries, harbor facilities, and tanker terminals anticipated. It shall also describe the economic, environmental, and aesthetic impact on the immediate area and the entire coastal zone of offshore and onshore facilities and operations, including all transportation and distribution facilities, and all measures to mitigate any environmental hazards of onshore and offshore activities, including alternatives to the anticipated facilities, programs for containment and recovery of potential oil spills, and improvements in marine traffic lanes, navigational equipment, and traffic control. To the extent such information is not provided in the EIR, the coastal agency shall require that it be submitted during the coastal permit review. Following submission of an application for development and production that includes complete and adequate information about the resource and all proposed activities and facilities, a decision shall be rendered within a defined period of time, to be set by the Legislature. It is recommended that the Legislature also give full consideration to possible alterations in other aspects of leasing that may be complementary to the proposed separation of the exploration and pro-

duction decisions, including alternative forms of bidding that could reduce the size of cash bonus bids; government sponsorship of or participation in exploration; and appropriate compensation for any company denied the right to produce discovered petroleum reserves.

c. **If the Leasing System Is Not Changed.** If the present leasing system is not changed as recommended above, the EIR preparation and permit review process proposed above for the development and production phase shall be applied for all phases prior to granting permission for exploration.

**83. Criteria for Siting and Design of Petroleum Facilities.** On publicly or privately owned lands in the coastal zone, offshore and onshore drilling and production and related facilities shall be permitted where, in addition to the standards set forth in Policy 11, all of the following criteria are met. Compliance shall be required by the coastal agency as a condition of any required coastal permit, by the State Lands Commission as a condition of a lease on State-owned lands, and by the Division of Oil and Gas.

a. **Use Best Well Sites.** Proposed well sites shall be the least environmentally hazardous and aesthetically disruptive sites feasible.

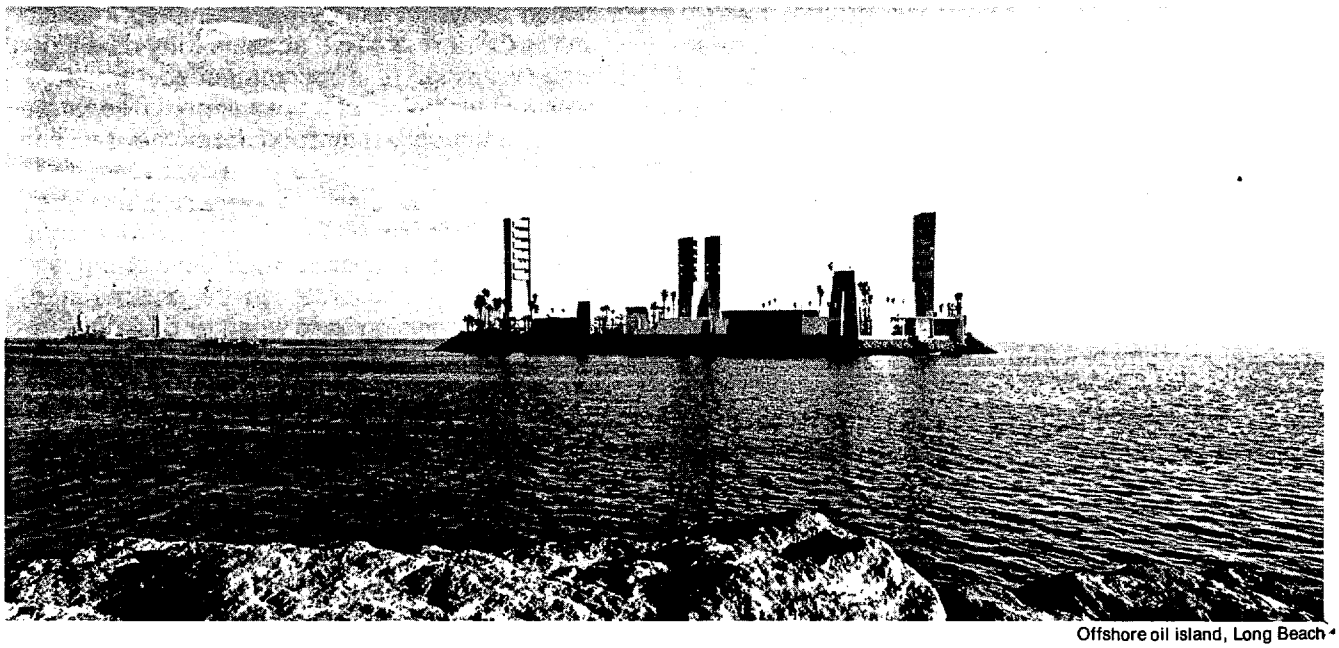
b. **Assure Geologic Safety.** The geologic characteristics of proposed well sites shall be adequately evaluated and determined to be consistent with safe drilling and production.

c. **Consolidate Drilling, Production, and Processing Sites.** Petroleum-related facilities and operations shall be consolidated (i.e., drilling, production, separation facilities, and support sites shall be unitized — developed and operated as a unit by a single company or group of companies for the benefit of all interested companies — or shall be shared) to the maximum extent feasible and legally permissible, unless such consolidation will have adverse environmental consequences and will not significantly reduce the number of producing wells, support facilities, or sites required to produce the reservoir economically and with minimal environmental impacts. Unitization negotiations shall be entered into by all operators covering one producing structure, and unitization of a new offshore field shall be carried out before commercial production is initiated. The unitization or consolidation requirements shall apply to (1) all types of offshore platforms; (2) submerged production systems; (3) onshore drilling and production facilities; (4) pipelines; (5) separation, treatment, and storage facilities; (6) transfer terminals related to petroleum production; (7) rights-of-way for transporting produced oil and gas; (8) equipment lay-down areas; and (9) port facilities to supply and service offshore platforms.

d. **Use Submerged Systems Where Feasible and Environmentally Safe.** Subsea completion of wells and submerged production systems shall be used where environmentally safe, as demonstrated through adequate testing of equipment by industry, observed by the appropriate government agencies, and where technically and economically feasible. Where oil platforms or islands would have a substantial adverse environmental effect, including degradation of aesthetic values, no offshore drilling shall be permitted unless and until subsea completions or submerged production systems are demonstrated to be environmentally safe.

e. **Platforms Preferred Over Islands; Minimize Impact of Platforms.** Where subsea drilling, completion, or production is found to be infeasible or environmentally unsafe, thereby making platforms or islands necessary to development of the resource, or where platforms are necessary to service subsea systems, the following criteria shall apply:

- Platforms shall be preferred over islands wherever safety considerations permit.
- The number of offshore platforms shall be minimized by using each platform to drill as many wells, and/or to service as many subsea completion and production systems, as is technically and economically feasible.
- The design of the platforms or islands shall be consistent with the general design criteria of the Coastal Plan and shall be subject to review and approval by the immediately landward local governments as well as by the coastal agency and State Lands Commission.
- The waters surrounding new platforms or islands shall be open to sport fishing, diving, and boating, consistent with boating safety rules and practices.
- If an island is determined to be needed, multi-purpose public interest uses, including small-boat landing piers and amenity public recreation areas, scientific and educational facilities (e.g., marine biology, oceanography and metereology research stations), Coast Guard or U.S. Weather Service station, or aquaculture operations, shall be incorporated



Offshore oil island, Long Beach

into the project to the extent technically and economically feasible and consistent with public safety and other policies of the Coastal Plan.

- All water that contacts working surfaces of oil islands (including rain runoff) shall be contained and not allowed to drain in an untreated state into the ocean. Treatment shall be adequate to remove essentially all petroleum or unnatural amounts of chemical residues from the estimated maximum amounts of runoff water.
- Platforms or islands shall not be sited where a hazard to vessel traffic might result from the facility or related operations. Platforms shall not be permitted until a navigational safety system for coastal waters is in effect, in accordance with Policy 119.

f. **Minimize Impact of Petroleum Facilities Onshore.** Drilling, production, and support facilities onshore, including separation and treatment plants, pipelines, transfer terminals, storage facilities, and equipment lay-down areas, shall be designed and located to minimize their adverse environmental impacts consistent with recovery of the resource. Where such onshore development would result in substantial impacts on the resources of the coastal zone, it shall be permitted only where there is a need for the project (as specified in Policy 81), where feasible alternatives would have a greater adverse environmental impact, and technology that would substantially reduce such impacts will not be available in the immediate future (e.g., new technology for carrying out subsea production, oil and gas separation, storage, and natural gas liquefaction that might reduce the need for large onshore facilities).

g. **Prevent Subsidence; Reinject Oil Field Brines.** Liquid and gas extraction projects that could cause or contribute to subsidence hazard (where there is a potential for significant present or future damage to property or environment) shall be prohibited; such existing operations shall be stopped, unless it is determined that there is no reasonable alternative. In such cases, the best available techniques for minimizing or preventing land subsidence shall be utilized. Lease or unit operators constructing new facilities shall reinject all oil field brines into oil producing zones unless injection into other subsurface zones will reduce environmental risks. Exceptions to reinjection will be granted only after approval by the appropriate agencies (including the Regional Water Quality Control Board) of detailed plans adequately providing for the elimination of petroleum odors and all potential fresh water or ocean water quality problems. Monitoring programs to record land surface and nearshore ocean floor movements shall be continued in all areas of subsidence problems and shall be initiated in locations of new large-scale fluid extraction on land or nearshore before operations begin. Such monitoring shall continue during and after liquid and gas extraction operations until surface conditions have stabilized. Costs of monitoring and mitigation programs shall be borne by liquid and gas extraction operations, overseen by an appropriate State agency.

**84. Recommendations for Increasing Oil Recovery Efficiency.** It is recommended that the Legislature (1) enact legislation to require the California Division of Oil and Gas and the State Lands Commission to regulate petroleum completion and production for individual wells, including setting maximum efficient rates of production, as analogous government agencies do in other major oil-producing states; and (2) adopt a resolution calling for the Federal Energy Administration to encourage primary, secondary, and tertiary production from existing wells.

**85. Recommendation for Disclosing Exploration and Production Data.** To improve the information base for State energy planning and to encourage exploratory activities, thereby encouraging possible petroleum discovery and production both onshore (where petroleum activities are environmentally preferable) and offshore, it is recommended that the Legislature require all original exploratory and production data from surveys or drilling of wells (including all logs, complete well histories, cores, drilling cutting, water samples, chemical analyses, pressure and temperature measurements, etc., but excluding proprietary interpretive information) on publicly or privately owned California lands to be submitted within 60 days after finishing to the Division of Oil and Gas, with appropriate assurances of strict confidentiality, and to be made public information one year after submittal, except that where such public disclosure would result in severe inequity to a well operator, year-to-year extensions of confidentiality may be granted by the Division of Oil and Gas. The Energy Commission and the State Lands Commission shall be allowed access to all such data on a confidential basis for the purposes of energy resource development planning.

**86. Recommendations for Avoiding Adverse Impacts of Federal OCS Petroleum Development.** It is recommended that the Governor, the Legislature, the California congressional delegation, and all concerned State agencies seek agreement from the Department of Interior and other Federal authorities that Federal Outer Continental Shelf (OCS) leases will be approved by the Department of Interior only if the following conditions are met:

a. **Demonstration of Need.** Need for Federal OCS development off California shall be clearly determined as required in Policy 81.

b. **Develop and Disclose Long-Term Plans.** One-, five-, and ten-year plans for petroleum production and all related development as described above in Policy 82, and their impacts on the California coast, shall be fully developed and disclosed. It is recommended that the present leasing system be changed to separate pre-production exploration from the decision to develop and produce on a lease, in order that data about the OCS resource, its value, and the offshore and onshore environmental and planning implications of developing and producing the resource can be accumulated prior to a decision as to whether private companies should be given the right to produce.

c. **Provide for Public Review.** Opportunities for effective review of proposed OCS exploration and development plans shall be provided for the general public, interested units of State, regional, and local government, and other segments of the communities most immediately affected by OCS development activities.

d. **Prevent Drainage of State Petroleum Sanctuaries.** The leases in question shall be sufficiently separated from the State petroleum sanctuaries to prevent drainage of oil and gas reservoirs that may lie partially on State submerged lands.

e. **Establish Stringent Safety Standards.** Petroleum production under Federal jurisdiction off the California coast shall be made subject to safety standards at least as stringent as those for production on State-regulated offshore areas, including those contained in the California Division of Oil and Gas regulations and the manual of procedures of the State Lands Division and standards set forth in Coastal Plan policies. (See especially Policies 11, 83, and 119.)

f. **Evaluate Unitization or Consolidation Possibilities.** The possibility of unitization or consolidation of all operations and facilities both offshore and onshore shall be fully evaluated and required where feasible, as described in Policy 83(c) for California operations.

g. **Consider Use of Subsea Systems.** The possibility of use of submerged drilling, completion, and production systems that have been adequately tested to meet rigid environmental safety standards shall be fully evaluated as a partial alternative to platforms and required where technically and economically feasible, except where use of platforms would not cause any significant adverse aesthetic or other environmental impact.

h. **Some OCS Revenues Should Go to States.** It is recommended that the Federal government provide funds to California and to other coastal

states prior to leasing, with the funds to be reimbursed either through a fee related to production volumes, or by making available a portion of its revenues from OCS lease sales or production royalties, or by granting funds from some other source, to assist the State and local governments in (1) planning for and overcoming or mitigating any adverse impact of this production (e.g., planning for transportation terminals, additional refineries, pipelines, separation, treatment, and storage facilities, and other support facilities in a way that minimizes environmental impacts); and (2) purchasing land for recreation or providing other amenities along the coast to help offset the impact of OCS development.

i. **Designate Sanctuaries in Certain Areas.** Sites and tracts shall be designated as Federal petroleum resource sanctuaries (1) if they are unusually subject to the risk of oil spills due to geological seismic disturbance; or (2) if they offer unusual coastal aesthetic assets or the local economy is particularly dependent upon the protection of coastal aesthetic assets. Portions of the Santa Barbara Channel, Monterey Bay, Santa Monica Bay, and San Pedro Bay would appear to be candidates for sanctuary status.

j. **Compatibility with Coastal Plan Policies.** Federal OCS development and related activities shall be compatible with all other policies set forth in the Coastal Plan.

# REFINERIES

## Findings

**Existing Refineries Are Near Cities and the Coast.** The 37 existing California oil refineries have a total capacity of 1.9 million barrels per day (b/d), which is expected to expand to 2.3 million (b/d) on completion of construction projects in 1976. Of these refineries, 15 are in the Los Angeles area (1,060,000 b/d), 6 in the San Francisco Bay area (585,000 b/d), 11 in Bakersfield (181,000 b/d), and the remaining 5 at scattered sites (74,000 b/d). These sites were chosen by the oil companies primarily to accommodate the large market areas (major cities), but also, in part, to be close to supplies of crude oil (both inland and waterborne). Most of the Los Angeles and San Francisco plants refine crude produced in-State as well as foreign crude brought in by tanker. No single State agency oversees the siting of refineries to maximize the efficient and safe location of facilities and minimize the environmental impacts.

**Three Refinery Expansions Are Proposed in the Coastal Zone.** There are 11 projects for additional refinery capacity proposed in California. Only two of these are at sites in the coastal zone. The one major coastal zone site expansion — El Segundo — was approved by the Coastal Commission in June 1974. Another coastal project is a new 100,000 b/d refinery proposed near Carlsbad, set back one to two miles from the coast and designed primarily to provide low sulfur fuel oil to San Diego Gas and Electric's Encina power plant. A third project, a new 60,000 b/d refinery proposed in 1974 near Ventura, has apparently been postponed or dropped altogether.

**Refineries Emit Air Pollutants.** Petroleum refining produces emissions of particulates, sulfur oxides, nitrogen oxides, olefins (reactive hydrocarbons), aldehydes, ammonia, hydrogen sulfide, and carbon monoxide. The type of emissions and emission levels from any particular refining operation will depend on the type of process units the refinery employs, among many other variables. Refinery air pollution emissions have been decreased in modern refineries by improved combustion technology, better operating procedures, and more conscientious control efforts, but they have not been eliminated.

**Existing Refineries Normally Do Not Exceed Ambient or Stationary Source Standards For Most Types of Pollutants.** In administering the Federal Clean Air Act, the Environmental Protection Agency, State agencies (Air Resources Board) and local Air Pollution Control Districts (APCDs) control the allowable levels of some pollutants from single stationary sources (such as refineries) and also set standards for ambient air quality. In California, existing refineries generally do not exceed ambient or stationary source standards for emissions of sulfur oxides, nitrogen oxides, particulates, and carbon monoxides during normal operations. Under the Clean Air Act, major new stationary sources are to be prohibited if they would interfere with the attainment or maintenance of ambient air quality standards. It is possible that a new refinery might be capable of meeting the stationary source emission standards, but not be permited because it would interfere with attainment of national ambient air standards or with other more rigorous air quality goals. (See also the Coastal Land Environment section on Air Quality regarding current air quality degradation standards.)

**Hydrocarbon Emissions Are of Special Concern.** Of particular concern are refinery hydrocarbon emissions. Reactive hydrocarbons combine with oxidants and sunlight in a photochemical reaction to produce photochemical oxidants. The Federal ambient hydrocarbon standards are a guideline to help achieve the ambient photochemical oxidant standard.

At least one major study, however, disputed by the oil industry, questions the technological ability of any refinery to meet the Federal standards for hydorcarbon emissions, and cites the need for further study of this critical issue. A 1975 informational report of the Air Resources Board staff concludes that hydrocarbon emissions from storage tanks represent 40-80 per cent of refinery hydrocarbon emissions, and that the floating roofs used on new tanks can very substantially reduce, but not eliminate, hydrocarbon emissions. Two recent studies by the National Academy of Sciences and the University of Southern California School of Medicine suggest a relationship between hydrocarbons emitted by certain refinery processes and a higher incidence of lung cancer mortality in populations exposed to the hydrocarbon in question. These studies are still incomplete, and the conclusions are admittedly extremely tentative. Refineries can, however, contribute to the deterioration of the overall quality of an air basin, which in turn can cause eye and lung irritation and aggravate respiratory and cardiac ailments. There are presently no comprehensive State or local regulations governing the residential use of land within specific distances from refineries.

**Refinery Pollution Impacts Elsewhere.** Refineries can also have adverse effects on agricultural activities and flora generally, and on property. (See Coastal Land Environment section on Air Quality.)

**Refinery Emissions May Be Offset by Reduced Emissions From Its Products.** While even the most modern refineries will produce some emissions, the production of "cleaner" petroleum products can result in a net reduction of air pollutant emissions in an area. This can occur when these "cleaner" products replace more highly polluting products presently in use. Maximum restorative benefit to an area that already has air quality problems can be achieved by siting the refinery outside of the problem air area, while utilizing the cleaner products within the area.

**California Lacks Adequate Desulfurization Refining Capacity.** One of the beneficial products that refineries can contribute is low sulfur fuel oil. Low sulfur fuels or natural gas must be burned in fossil fuel-powered electricity-generating power plants in order to meet air pollution emission standards. The demand for low sulfur fuels has increased greatly in the past two years with the decrease in availability of natural gas for use in power plants and industry. California presently lacks sufficient desulfurization refining capacity to meet this demand. California has therefore had to rely on importing large volumes of low sulfur crude oil and residual fuel oil, both of which are expensive and hard to obtain on the world market.

**Additional Desulfurization Capacity Offers Advantages.** If desulfurization capacity is constructed in California, refinery costs will be significantly increased. The import requirements for hard-to-get low sulfur crude oil, however, will decrease, and although the total volume of crude oil needed in California will not be reduced, the ability to utilize high sulfur fuel oil will provide greater supply flexibility and reduce crude costs. New desulfurization refining capacity is now under construction at the Standard Oil of California's Richmond and El Segundo refineries (175,000 b/d at each site); and the new Macario refinery proposed near Carlsbad would also have direct residual fuel oil desulfurization capability. California could benefit from additional refinery desulfurization capability.

**Refinery Siting Is a Complex Problem.** The degree to which states can allow air quality to be "degraded," even if it would still meet Federal ambient air quality standards, is presently the subject of intensive review by the California Air Resources Board. Further refinery capacity may be forced to move outside Air Quality Maintenance Areas if it interferes with attainment of air quality goals; but, on the other hand, refineries may not be permitted to significantly deteriorate the air quality of areas that do not violate air quality standards. Air quality regulations and their implementation are extremely controversial, and are presently in a state of flux.

**Physical Siting Criteria For Refineries.** Although small refineries can be built on tracts no larger than 200-300 acres in size, major new refineries typically require as much as 500-1,500 acres of land, including a surrounding landscaped buffer area. They require water supplies for cooling, and treatment facilities adequate to handle large waste volumes. They are large-scale, visually intrusive industrial developments. Even the most modern refineries may occasionally emit noise and odors, and they represent significant single sources of air pollutants.

**Remote Siting of Refineries Is Feasible With an Increase in Product Costs.** Primarily because refined products must be kept segregated during shipping and storage operations, the transportation of refined products is more costly than transportation of crude oil; therefore, proximity of refinery sites to market areas is a greater industry priority in siting decisions that proximity to tanker terminals. For example, Standard Oil of California would be willing to pipe crude oil a distance of 277 miles from its proposed (now postponed) Estero Bay superport to its Richmond refinery. Thus, refineries are not "coastal-dependent." Added transportation costs resulting from remote siting would presumably be passed on to consumers as product price increases. Other factors that must be addressed in remote siting considerations are the availability of properly zoned land, pipeline easements, water supply for cooling, and net energy and materials requirements. Siting of refineries away from market areas (in California, away from air quality maintenance areas) is feasible, and would help restore air quality in such areas; but it would raise the cost of refined products by as much as one to three cents per gallon.

**Refineries Have Impacts on Nearby Developments.** Refineries can encourage the nearby construction of petroleum-associated industries (petrochemical, plastics), which can lead to rapid industrial growth and increased population. In the short term, refineries enlarge the tax base of the host community; in the longer term, they very substantially increase municipal services requirements and may ultimately lead to a decline in residential and commercial property values. Many of these potential impacts can be mitigated by rigorous planning and new technology; but they cannot be eliminated.

**Safety Considerations in Refinery Siting.** Refineries have a large potential for fire and explosion. State and Federal regulations and the considerable efforts of refinery owners can minimize this potential. Optimal safety considerations require siting refineries away from seismic areas and separating them from surrounding populations by a buffer area.

**Water Quality and Solid Waste Disposal Affect Refinery Siting.** The EPA has identified a wide range of water pollutants which are emitted by oil refineries in either their process

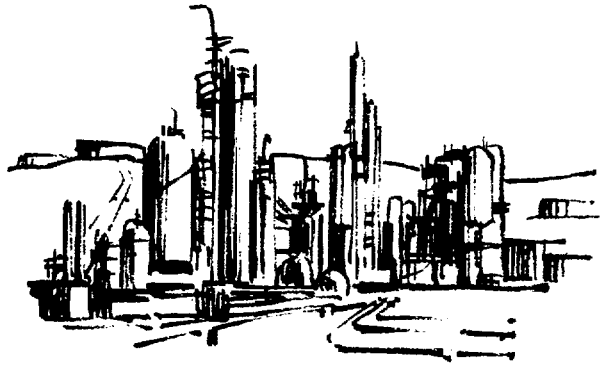
or cooling water streams. At presently used levels of treatment, additional oil refinery capacity discharging wastes to the marine environment would degrade the waters of the coastal zone to a degree not consistent with the objectives of the Coastal Act. Modern water treatment technologies can reduce these emissions, and once-through cooling systems, sometimes used to dilute pollutants to meet discharge standards, can be eliminated. Removal of pollutants from the air and water discharges from refinery systems will result in accumulations of solid or semi-solid waste products, for which proper disposal must be provided.

## Policies

**87. Coastal Agency Role in Refinery Siting.** The coastal agency shall have jurisdiction over the need, land use, and environmental aspects of new or expanded refineries proposed in the coastal zone, in accordance with Policy 76. For the purposes of Policy 88(a) below, the Energy Commission shall determine the availability of preferred alternative coastal sites. The coastal agency shall participate with the Energy Commission and all other concerned State, local, and Federal agencies in statewide refinery siting policy development, as proposed in Policy 76.

**88. Criteria for Siting and Design of Coastal Refineries.** New refineries or expansions of existing refineries shall be permitted in the coastal zone when the following criteria and standards can be met.

a. **Need and Best Location for Facilities.** The applicant shall demonstrate, and the Energy Commission shall have found, that there is a public need for such facilities, determined in coordination with determinations of need for offshore petroleum production in Policy 81 and tanker terminals in Policy 89. The coastal agency, in consultation with the Energy Commission and other concerned State and local agencies, shall consider the need, land use, and environmental aspects of the proposed project and determine that there is no identified, reasonable alternative inland or coastal location where siting would result in less environmental degradation.



b. **Design and Site Facilities to Minimize Adverse Impacts.** The applicant shall demonstrate that the project is designed and sited to minimize any adverse environmental effects, including provision of a sufficient buffer zone to minimize impacts on surrounding property. In no event shall a new oil refinery be permitted in a highly scenic area (as defined in Policy 45), on any of the Channel Islands, or in or near environmentally sensitive areas.

c. **No Degradation of Air Quality.** In addition to meeting all applicable standards set forth in Policy 43, new or expanded refineries shall be permitted in Air Quality Maintenance Areas and in areas where such coastal resources as health resorts or agricultural lands would be adversely affected only if the negative impacts of the project upon air quality are more than fully offset by reductions in gaseous emissions in the area by the users of the fuels or, in the case of an expansion at an existing site, total site emission levels, and site levels for each emission type for which national or State ambient air quality standards have been established (i.e., hydrocarbons, sulfur dioxide, oxides of nitrogen, carbon monoxide, and particulates), do not increase.

d. **Site and Design Refineries to Protect Public Satety.** Refineries shall be sited and designed to minimize exposure of surrounding property and population to the consequences of possible large fires and explosions, and shall be sited away from areas of substantial seismic risk.

e. **Encourage Construction of Desulfurization and Methanol Capacity.** Applicants for additional refinery capacity in California (but not necessarily in the coastal zone) shall maximize the addition of desulfurization capacity designed to produce low-sulfur fuels, unless the Energy Commission determines some greater public need outweighs the advantages of such a requirement. Consideration shall be also given

to providing for the production and storage of methanol and synthetic fuels.

f. **Minimize Use of Once-Through Cooling.** New or expanded refineries shall minimize the need for once-through cooling by using air-cooling to the maximum extent feasible and by using treated waste waters from in-plant processes for cooling tower makeup. Construction of new cooling facilities to replace once-through facilities and new water treatment plants designed to reduce the discharge of pollutants into the marine environment shall be permitted when consistent with other Coastal Plan policies. (Once-through systems in new or expanded refineries are permitted only according to the standards set by Policy 10.)

# TANKER TERMINALS

## Findings

**Petroleum Imports and Tanker Size Have Grown.** As California has increased its importation of crude oil and refined products over the past 20 years, tanker size and numbers have increased to handle the expanded import volume. The search for improved efficiencies and economies in transporting large volumes of crude oil has led to the development of supertankers (tankers over 100,000 dead-weight tons) and Very Large Crude Carriers (VLCCs, i.e., tankers larger than 200,000 dwt). Supertankers now use some of the State's tanker facilities, but the deep drafts of Very Large Crude Carriers cannot be accommodated in California tanker terminals. The need for more tankers and any new tanker facilities will be based on future import levels to meet the State's refinery needs and utility company imports.

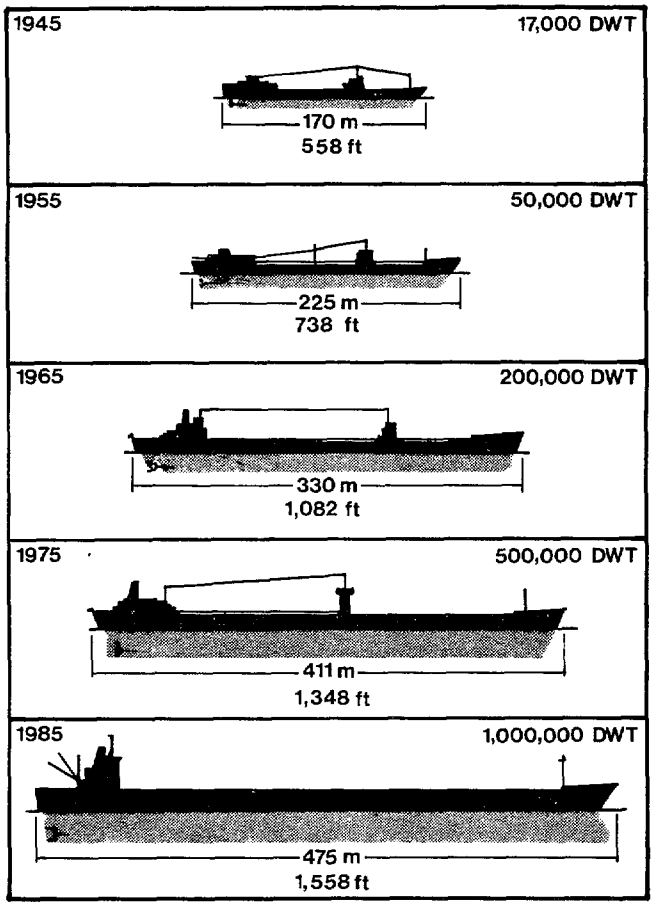
**Several Variables Affect Tanker Import Levels.** Variables that will affect tanker import levels are:

- General economic conditions in California and the West;
- California's in-State petroleum production;
- Possible reduced petroleum demand through energy conservation and increased prices;
- Possible reduced petroleum demand through development of alternative energy sources;
- Energy export and import levels to and from other states (i.e., oil and gas to the Midwest, electricity from Four Corners, natural gas from Alaska, etc.); and
- Federal energy policies affecting Outer Continental Shelf (OCS) production, production at the Elk Hills (California) and "Pet 4" (Alaska) Naval Petroleum Reserves, import levels, interstate shipment of oil, and siting of tanker terminals.

All of these factors will combine to determine the need for importation of petroleum by tankers.

**California Is a Regional Petroleum Supplier.** At present California plays a regional role in receiving and supplying oil and petroleum products to other states in the Petroleum Administration for Defense District Five (PAD V, consisting of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii). In recent years, California's role in supplying these states has declined, as the Pacific Northwest and Hawaii have developed their own terminal and refinery capacities. Some experts have forecast that by 1985 exports from California to other PAD V states will cease entirely, and that California's "regional role" will be, in effect to supply its own very large demand. It is more likely, however, that California will continue to account for some relatively

**Growth of Tankers Worldwide**



small amounts of petroleum exported to other states in the region, and planning for tanker terminals should reflect this fact.

**California's National Role in Supplying Energy Is Not Defined.** In recent months, at least two major oil companies have begun to consider plans to ship Alaskan oil to California terminals for subsequent pipeline transshipment to the Midwest. Despite oil industry assertions that planning for tanker terminals in California should accept this State's national role in supplying energy, such a possible role has not yet been clearly defined by any Federal agency as a part of any comprehensive national program for energy conservation and development.

**Most Alaskan Oil to Come in Tankers of 165,000 DWT or Less.** It appears that California's increased petroleum import needs may be met by Alaskan crude oil when the Alyeska pipeline begins operation in late 1977 or 1978. Because export of Alaskan crude oil to Japan is prohibited by the Alaskan Pipeline Act unless mandated by presidential proclamation, the Alaskan North Slope crude is expected to be transported by ship to the Pacific Northwest and California. Most oil companies report that the vast majority of the 1.2 to 2.0 million barrels per day volume of Alaskan oil expected to come to the West Coast will be transported in tankers under about 165,000 dwt.

**Foreign Low-Sulfur Crude Oil May Continue to Come in Tankers under 150,000 DWT.** Low-sulfur crude oil will probably continue to be imported from foreign sources, but this oil can be transported to California in conventional draft tankers of about 150,000 dwt or less, rather than VLCCs, with only minimal increase in consumer prices. Increases in California's direct desulfurization refining capacity will reduce the amount of low-sulfur crude oil imported.

**Existing California Tanker Terminals Are Below 150,000 DWT Capacity.** No existing California tanker terminal can accommodate conventional tankers larger than 138,000 dwt (Port of Long Beach), although, with only minor dredging and expansion of onshore pipelines and storage tank facilities, this limit could be increased to about 150,000 dwt for ships of conventional draft. With some modifications to existing facilities the Port of Long Beach could berth three tankers of up to 200,000 dwt of the wide beam configuration now being proposed. The Port of Los Angeles facilities can accommodate loaded tankers of about 90,000 dwt. And El Segundo offshore buoy systems can serve tankers of about 130,000 dwt. San Francisco Bay facilities at Richmond allow berthing of light-loaded tankers of 130,000 dwt. Although under unusual conditions a fully loaded 104,000 dwt tanker was able to cross the sand bar outside the Golden Gate, the bar normally prohibits the entry of any fully loaded tankers larger than 85,000 dwt.

**Tanker Terminals Can Be Sited Away from Refineries and Market Areas.** Tanker terminals have usually been sited in close proximity to refineries and power plants, which in turn have been located near product markets (metropolitan areas). Extensive pipeline systems are capable of reducing the need for this traditional clustering, however, allowing tanker terminals to be sited away from refineries, power plants, and product markets. For example, Standard Oil of California's proposed (now indefinitely postponed) Estero Bay terminal would have required about 280 miles of crude oil pipeline.

**Tanker Facilities Pose Potential Environmental Impacts.** Harbor or nearshore tanker facilities may require dredging and filling for both the berthing area and land storage tanks, with potential for significant adverse environmental effects on marine life and tidal action (as discussed in the Marine Environment chapter).

**Tanker Terminals Encourage Related Development.** Tanker terminals and related onshore facilities do not themselves require large amounts of land except for tank farms, but they can encourage related development that need not be situated near the coast. The presence of major refining capacity frequently leads in turn to the development of associated secondary industries (e.g., petrochemical, plastics) in the same immediate area. Tanker terminals that encourage refinery construction nearby onshore could, therefore, promote the use of valuable coastal land for purposes accomplished just as well at inland sites, could contribute indirectly to increases in air pollution in coastal areas, and could also induce growth of related commercial and residential areas. Tanker terminal siting strategies can be effectively coordinated with broad regional or State planning for growth.

**Several Deepwater Terminals Have Been Proposed For California.** Oil companies and utilities must by economic necessity look beyond the immediate future when investing millions of dollars for future tanker terminals. To reduce transportation costs, one oil company proposes to use VLCCs ranging from 200,000 to 400,000 dwt (water drafts of 60-90 feet) to ship crude oil to California from the Middle East and Indonesia, and to build a California terminal facility that could accommodate tankers of these dimensions. However, unless foreign imports into California from the Middle East and Indonesia, or from places similarly distant, are very high, the frequency of use of a California deepwater terminal might be insufficient to justify the cost of terminal construction and the commitment of coastal resources to such a project. If such imports totaled 170,000 b/d, for example (as some experts have estimated), all brought in supertankers of about 200,000 dwt, a supertanker terminal facility would be in use only about one-sixth of the time.

**Oil Companies and Utilities Have Proposed New or Expanded Tanker Facilities.** To meet their projected needs for increased volumes of oil from outside California, oil companies and utilities have proposed new or expanded tanker facilities at Estero Bay (up to 400,000 dwt, Standard Oil of California; now indefinitely postponed), Moss Landing and Morro Bay (up to 130,000 dwt, Pacific Gas & Electric), and Long Beach or Los Angeles Harbor (less than 200,000 dwt, Standard Oil of Ohio), with further proposals likely to follow. Standard Oil of Ohio has proposed to ship Alaskan crude oil to the Los Angeles area in 165,000 dwt tankers for subsequent transshipment to the Midwest through a yet-to-be-approved-or-constructed pipeline. ARCO is considering a similar plan, probably using tankers of up to 150,000 dwt. Presumably such transshipment proposals would be economically feasible only if there were a surplus of crude oil available in California.

**No State Agency Coordinates Tanker Terminal Siting.** At present no single State agency oversees and coordinates the siting of tanker terminals to maximize efficient siting and minimize environmental risks and impacts.

**Multi-Company Sharing of Facilities Reduces the Need for More Facilities.** Most existing tanker terminals are owned and operated by single companies, or by port jurisdictions that lease specific berths to single companies. Multi- company sharing of tanker facilities would reduce the need for new or expanded tanker terminals. Terminal efficiency (i.e., maximum volume with minimum waiting time and high use

of facilities) increases with the number of berths available to any ship. Thus, with multi-company use, more volume could be handled by existing facilities, reducing the need for new or expanded facilities for deep draft vessels. Such "common carrier" practices are being analyzed by the anti-trust division of the Justice Department.

**Existing Tanker Terminals Are Under-Utilized.** Existing tanker facilities are under-utilized, largely because many of them are operated by single companies which do not fill berth capacity. If terminal facilities were utilized to their maximum extent, it appears that California's petroleum needs could be accommodated in existing facilities for some time, given the following conditions:

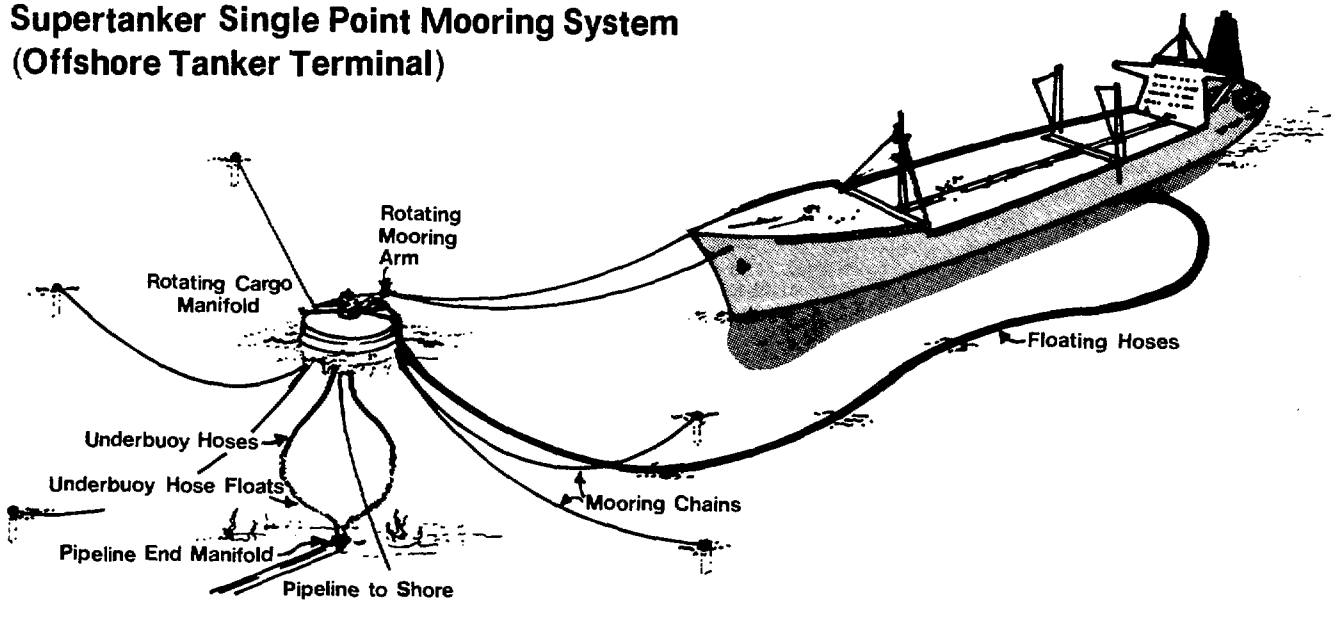
- California receives and refines the vast majority of Alaskan crude oil production;
- California's demand for petroleum does not exceed projected levels and California does not become a major exporter of crude oil to states outside of the region;
- Tanker size does not exceed about 150,000 dwt of conventional draft (or slightly larger, wide-beam vessels of comparable draft), with some existing facilities expanding to accommodate such tankers where only minor dredging is required; and
- Minor expansion of onshore pipelines and storage facilities occurs.

A representative of the U.S. Army Corps of Engineers stated in late 1974: "We agree that existing tanker facilities can accommodate Alaskan import volumes not only until at least 1985, but possibly to the year 2000. However, this alternative, where feasible, may not be the most economical. The need for deepwater terminals is a relative need and not an absolute need. The consequences of deferring offshore deepwater terminals could mean the loss of economic advantages and greater environmental hazard due to increased traffic at inshore harbors."

**Siting Considerations for Offshore Tanker Terminals.** California may eventually require expanded tanker terminal capacity to accommodate increased crude oil imports. The environmental siting considerations for new or expanded facilities offshore are as follows:

- **Offshore versus Nearshore Areas.** New offshore areas with naturally deep water would entail only minimal dredging for pipelines, could locate the tankers away from areas of critical biological concern in nearshore areas, and could be sited away from busy vessel traffic lanes so as to minimize the risks of oil spills. Offshore facilities, however, would be subject to greater wind and wave action and spills that occur would be more difficult to contain. New or expanded tanker facilities in nearshore areas would most likely involve more environmentally damaging dredging and filling, and pose greater risks of oil spills that could affect vulnerable marine life. Harbors, however, are sheltered from wind and waves and can provide better spill containment capability.
- **Physical Constraints to Siting.** Tanker terminals must be sited with careful attention to meteorological (wind, fog, storms), hydrographic (waves, tides, tsunami), and oceanographic (bathymetric and distance to shore) factors that will dictate the optimal sites available to serve onshore areas.
- **Offshore Offloading.** VLCCs can be unloaded into smaller "shuttle" tankers while remaining in deepwater areas offshore. This practice has already been used off California, but involves increased congestion of smaller tankers near onshore facilities and appears to present greater risks of operational oil spills. When done under benign weather conditions, this practice can be carried out with little additional risk; however, the lack of experience with this practice precludes any complete risk analysis based on operational experience.
- **Monobuoys versus Conventional Buoy System.** Tanker facilities used throughout the world include piers, floating barges, platforms, island, and offshore conventional buoy (multi-point) mooring systems and monobuoys (single point mooring systems). Offshore sites in California employ pier berths or conventional buoy systems (usually five to seven buoys) which have thus far proven satisfactory for tankers up to 130,000 dwt. Recent proposals have advocated using monobuoys. Monobuoys allow a tanker to freely

## Supertanker Single Point Mooring System (Offshore Tanker Terminal)



swing around the berthing facility and appear to involve fewer environmental hazards than conventional buoy systems, which hold tankers rigid, and thus fully exposed to wind, wave,and current action. Maintenance of hose lines is particularly important in any offshore system that is exposed to wind and wave action.

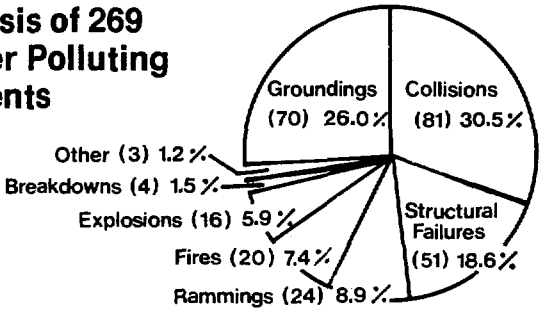
**Supertankers Offer Several Economic Advantages.** Supertankers reduce the transportation costs of crude oil roughly in proportion to the size of the ship and distance traveled. While the transportation costs to shippers may be substantially reduced through use of larger vessels (e.g., tankers of between 70,000 dwt, which carry about 450,000 barrels of crude oil, and 200,000 dwt, which carry about 1.5 million barrels of crude oil), particularly over very great distances such as between the Middle East and California, the price difference accruing to consumers is relatively much less significant (e.g., less than one cent per gallon of gasoline from Alaskan oil, and about two and a half cents per gallon of gasoline from Middle Eastern crude, with no guarantee that industry's cost savings will be passed on to consumers). Some of the savings from use of larger vessels results from reduced tanker fuel consumption per unit of oil transported.

**Oil Spill Severity Is Related to Tanker Size.** A major study for the Army Corps of Engineers concludes that "although larger tankers are, per unit of oil transported, lesser sources of pollution through casualties, it is also undoubtedly true that the potential for an incident of higher severity exists." Regarding terminal operations involving supertankers, the same report concludes that "although the frequency of terminal spills may decrease with the use of larger vessels, the severity will likely increase in proportion and the total net discharge will not be significantly changed." Definitive comparisons of tanker size to operational safety may be premature, however, until more data becomes available. Other factors directly related to frequency and size of oil spill are vessel age, design, single or double hull construction, and degree of compartmentalization; prevailing weather conditions, and regulations governing operations in severe weather; and degree of a crew's operational experience in particular waters in harbors, among other human factors. (See findings in Petroleum Development and Oil and Toxic Spills sections for conclusions regarding oil spill containment, cleanup, spill liability, and damage potential.)

**Tanker Design Criteria Need Upgrading.** Tanker design, equipment, and operational procedures have steadily improved over the past 20 years, allowing larger volumes of petroleum to be shipped, and reducing the risks of oil spills. Such improvement is due in substantial part to the work of classification societies, international conventions, and the U.S. Coast Guard, which set minimum standards for structural strength, machinery design, maximum load, and equipment requirements, and which promulgate regulations that address pollution control, vessel safety, and vessel design and operation, and navigation. Such regulation notwithstanding, oil spills have consistently occurred that might have been prevented or mitigated had the vessels had the safest tanker design features now available.

**Several Improved Design Features and Operational Procedures Are Now Available.** Such features are still not fully implemented in all new tankers, primarily because industry questions whether they are "cost effective." They include: design features that aid "load-on-top" procedures, which allow oil and water to be effectively separated and reduce the flushing of oil into the ocean; segregated ballast configurations that provide separate oil tanks and water ballast tanks; twin propellers and twin rudders for added maneuverability and operational backup; and auxiliary power systems (e.g., boiler or diesels) to propel the vessel if the primary system fails. Development by the U.S. Coast Guard of minimum performance standards for maneuverability and stopping capability would further encourage safe tanker design. Coast Guard studies indicate that double bottoms reduce the overall risk of spills. Standard Oil of California is building tankers with double bottoms for use in the coastal trade. Improvements in navigational safety systems are feasible using radar and other monitoring techniques to determine vessel positions and warn vessels against potential collisions.

**Analysis of 269 Tanker Polluting Incidents**




## Policies

**89. Basic Policy for Tanker Terminal Planning.** Planning for tanker terminal facilities in California shall be sensitive to State and national energy needs. As soon as possible, the Federal government, the State Energy Commission, and other concerned State agencies shall clearly define (1) the nation's energy needs and supply and distribution policies; and (2) California's role in a comprehensive national energy conservation and development program. Until such time, planning shall proceed, as before, on the basis of the petroleum needs of the Petroleum Administration for Defense District V (PAD V, consisting of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii). Federal, State, and private industry energy planners shall give serious consideration to providing for crude oil needs in other regions of the United States by encouraging oil companies to exchange volumes of crude rather than by shipping Alaskan crude by transcontinental pipeline through California (e.g., exchange Alaskan crude volumes needed in the Midwest for Middle Eastern oil otherwise destined for California markets, so that Alaskan oil could remain in PAD V, and Middle Eastern oil could be shipped over shorter routes to East Coast and Gulf ports to service the Midwest through existing pipelines.) If national policy determines that petroleum must

be moved through California to the Midwest or East, tanker terminals and associated development shall be approved if they can be designed, built, and operated in accordance with all applicable Coastal Plan policies.

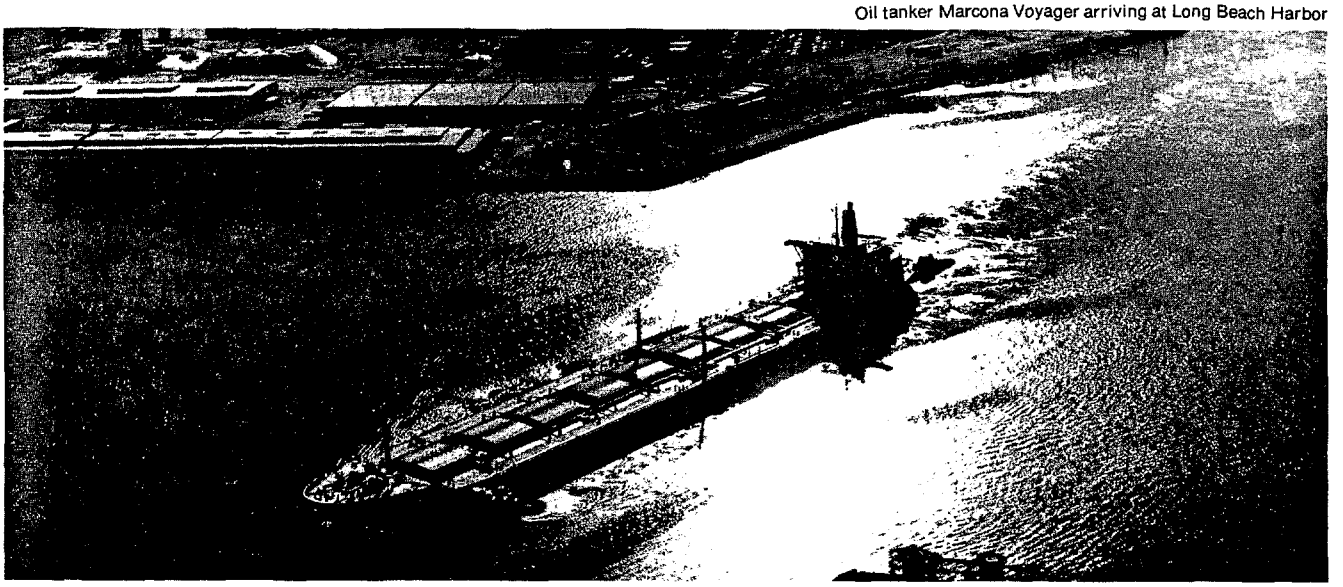
**90. Coastal Agency Role in Tanker Terminal Siting.** As proposed in Policy 76, the coastal agency shall (1) have jurisdiction over the need, land use, and environmental aspects of new or expanded tanker terminals in the coastal resource management area, (2) determine the availability of preferred alternative coastal sites, and (3) participate with the Energy Commission and all other concerned local, State, and Federal agencies in statewide tanker terminal development.

**91. Maximize Use of Existing Tanker Facilities.** Existing tanker facilities shall be utilized at maximum feasible berth occupancy, and multi-company use of existing facilities shall be encouraged, except where such policies would result in increased tanker operations and associated onshore development incompatible with land use and environmental goals for the area.

**92. Criteria For New or Enlarged Tanker Terminals.** New tanker terminals or expansions in an existing port area shall be permitted when (1) there is a need for new capacity that cannot be met with less risk or adverse environmental impacts through more effective use of existing terminal sites and facilities; (2) the facility is intended to accommodate tankers no larger than about 150,000 dwt of conventional design, or larger capacity, wide-beam tankers of comparable draft; (3) the proposed project will minimize the total volume of oil spilled in normal operations and accidents; (4) the location, design, and construction of the new capacity minimize the risks of other adverse effects to the environment, including the risk of collision from movement of other vessels; (5) the terminal will have ready access to the finest state-of-the-art containment and recovery equipment for oil spills; (6) the terminal will be operated as a multi-company use facility; (7) where operationally required, the terminal will have onshore deballasting facilities to receive any fouled ballast water from tankers; and (8) the onshore expansion of pipelines and of storage and pumping facilities associated with the new capacity is compatible with other Coastal Plan policies (particularly Policy 43) and with local land use and environmental goals. In addition to the foregoing criteria, new tanker terminals outside of existing port areas, or terminals to accommodate vessels larger than about 150,000 dwt of conventional design or tankers of comparable draft, shall be sited in deepwater areas (greater than 80 feet) sufficiently far offshore and so situated as to avoid risks to environmentally sensitive areas and shall use monobuoy offloading systems unless an alternative type of system can be shown preferable for a specific site.

**93. Recommendations for Improving and Enforcing Tanker Technology and Operating Procedures.** It is recommended that the Legislature petition Congress and the U.S. Coast Guard to (1) strictly enforce load-on-top design and operation on all petroleum tankers entering U.S. waters; (2) require that all tankers carrying crude oil and

Oil tanker Marcona Voyager arriving at Long Beach Harbor



refined products to U.S. ports have segregated ballast tanks; double bottoms; twin propellers and rudders, unless it can be demonstrated that such design features do not add significantly to operational safety or that a substitutable design feature provides better maneuverability and operational back-up; auxiliary power equipment (e.g., double boilers) for propelling the vessel in case of engine breakdown; and state-of-the-art navigational aids maintained in functional condition; (3) set performance standards ultimately requiring optimum maneuverability and operational back-up for all tankers; and (4) strictly enforce such requirements by increasing the number of vessels the Coast Guard actually visits for inspection and by maintaining radar or other monitoring control over vessels operating in and immediately around California ports and oil terminals. Outside port and terminal areas, the navigational safety system proposed in Policy 119 shall be established.

# LNG FACILITIES

## Findings

**Importation of LNG Requires Ship Terminals and Onshore Facilities.** Natural gas is considered to be the cleanest-burning fossil fuel and the most efficient for heating purposes. The most significant potential sources of natural gas for California are in Alaska and Indonesia and other foreign nations. To be transported economically by ship, natural gas must first be liquefied by cooling it to -259° F. to reduce its volume by a factor of 600. After shipment to areas near existing markets or pipelines, liquefied natural gas (LNG) is stored in large tanks and vaporized in a plant as it is needed. With present technology, terminal and associated facilities for LNG must unavoidably be situated immediately on the coast.

**Gas Companies Have Proposed Three Coastal Sites.** Western LNG Terminal Company (subsidiary of Pacific Lighting Company) is already seeking Federal Power Commission (FPC) approval for LNG terminals and facilities at Oxnard (Ormond Beach) to handle LNG from Indonesia, in Los Angeles Harbor to handle LNG from southern Alaska, and at Point Conception for LNG produced as gas on the Alaskan North Slope and piped to southern Alaska for liquefaction. Final FPC action on these three proposals is not expected prior to early 1976. PG&E has stated that the feasibility of locating such facilities in the San Francisco Bay Area is also currently being studied.

**FPC Is Considering Canadian Pipeline Alternative.** The Point Conception proposal is part of an alternative to a pipeline proposed through Canada that would serve California along with the western and midwestern U.S. and eastern Canada. A decision by the FPC is pending on the choice of the alternatives, but reportedly will not be forthcoming before late 1975 at the very earliest.

**LNG Is a Hazardous Substance.** LNG is difficult to handle because the extremely low temperature at which natural gas is liquefied causes unique stresses on normal containment materials and requires special alloys to avoid such stresses; and in the event of an escape of LNG, there is very rapid formation of a vapor plume, which the low temperature causes to hang close to the ground until its temperature increases to make the gas lighter than the air. Unconfined, the vapor mixed with air is not explosive, but in a mixture of 5-15 per cent vapor and air it is highly flammable. Within enclosed spaces, if thus mixed with air in the presence of an ignition source, it can explode. The primary danger present in a large-scale LNG spill is a very intense fire at the spill site; a more remote hazard is that the vapor plume could drift into enclosed spaces adjacent to a spill site and explode or catch fire.

**LNG Spill on Water Presents Fire or Explosion Hazard.** The greatest danger of serious fire or explosion would occur following a major spill of LNG on water; the consequences would be most serious in an active harbor area. The heat of the seawater and large spill surface area promote very rapid vaporization. The FPC staff has stated that if in a "worst case accident" an entire shipload of LNG (about 130,000 cubic meters) were released instantaneously without being ignited, it would evaporate in about 37 minutes, forming a very large, cold, dense vapor cloud. Scientists disagree as to how far downwind a vapor cloud might drift and remain flammable if not immediately ignited and if there are conditions of very light wind and stable air; for a 100,000 cubic meter spill, studies have variously predicted limits of flammability from as little as 3 miles to as much as 125 miles and for a 5000 cubic meter spill, from as little as one mile to as much as 22 miles. Experts believe it very unlikely that a vapor cloud of any size could form and drift very far without encountering an ignition source and causing a fire that would burn back to the site of the spill. One likely such ignition source would be the collision itself. The chances of an accident causing any spill can be reduced by special safety features for LNG carriers and by the Coast Guard's use of strict traffic control procedures during passage of loaded carriers into a harbor.

**Safety Measures Needed to Reduce Risk of LNG Spill on Water.** Because of the potentially disastrous effects of a large-scale LNG spill on water, particularly near a developed area, the Coast Guard prescribes and implements measures to ensure safe passage of LNG carriers into berthing facilities. Safety measures are determined according to conditions

at each particular site. Measures presently required by the Coast Guard for bringing LNG carriers into New York and Boston Harbors, for example, include: near-harbor escort of the LNG carrier by a Coast Guard vessel; controlling or halting other marine traffic in the area during loaded LNG carrier operation, depending on the circumstances; use of tug boats; special arrival notifications; and restrictions on proceeding under specified visibility conditions.

**LNG Spill on Land Also Dangerous.** The most significant potential for serious fire at LNG facilities on land would occur following complete or partial failure of a storage tank. This potential can be minimized by use of the highest quality structural and insulating materials, proven tank operating and rigid maintenance procedures, use of proven technology for tank venting, and construction of a containment around each tank sufficient in capacity to hold the entire tank volume in the event of complete failure. When a containment is filled with spilled LNG, a relatively small amount of LNG surface is exposed, and rapidly frozen ground acts as an insulator against a continued flow of ground heat; therefore vaporization occurs much more slowly than in the case of a spill on water.

**High Containment Dikes Will Confine Flammable Plume.** Under conditions of light wind and stable air, flammable vapor mixtures resulting from the failure of an LNG storage tank may initially extend downwind as far as a mile. LNG proponents, however, believe that in most instances, after the initial period of "flash" vaporization, the flammable zone will be as little as 200-400 feet downwind, and that if the containment is a high dike around each tank, as planned for facilities near populated areas, the flammable plume will be confined within the facility's property limits even under worst-case conditions.

**Danger Greatest at the Site.** If the vapor is ignited, the flame will burn back to the LNG pool, where the resulting fire could create intense radiant heat capable of igniting combustible materials within 500 feet, and endangering exposed personnel within 2,000 feet (with high dikes, these distances can be substantially decreased). Automatic and individually activated remote control devices around the plant site that release appropriate materials can help control LNG vapors and extinguish LNG fires.

**Accident Probability Is Low But Not Eliminated.** Statistically the probability of a very large accident involving LNG is very low. Except for its very low (cryogenic) temperatures and propensity to form a flammable vapor cloud that can drift downwind off the site of an accident, the problems and risks connected with LNG handling and storage are thought to be similar to those associated with handling and storage of such accepted hydrocarbons as gasoline and liquid propane. Improved LNG technology can now address the normal safety problems; however, the potential for serious accident caused by human errors, or by such events as earthquake, tsunami, disaster at a neighboring facility, a major act of war, sabotage, or airplane crash can be partially designed against, but not entirely eliminated.

**LNG Spill Harms Plants and Animals.** Plants and animals subjected to a dense cold vapor cloud of LNG would probably be killed. Birds might be able to evade the vapor cloud. The effects on marine populations of an LNG spill on water are not well known. The thermal shock caused by chilling of the surface water would presumably cause some measure of mortality, but probably would not have significant long term effects on marine populations.

**Methods of LNG Regasification Involve Problems.** Regasification at a receiving facility is typically carried out in one of two ways: using gas-fired vaporizers; or using seawater at ambient temperature as a heat source for vaporization.

- **Gas-Fired Vaporizers Pose Air Pollution Problem.** The disadvantages of gas-fired vaporizers for baseload use are that one to two per cent of the plant's output would be used to fire the vaporizers and that there would be continuous air pollution emissions.
- **Use of Seawater Adversely Affects Marine Life.** Use of seawater in LNG vaporization presents problems of entrainment of sealife as water is drawn into the system and discharge of cooled seawater at below ambient temperatures after its use in the system. (See Marine findings regarding the effects of entrainment and thermal discharges.)

Chemical biocides periodically added to the seawater for defouling of the water pipes also have the potential to adversely affect marine life if they are not neutralized. These effects would be subject to regulation by the Regional Water Quality Control Boards on a case-by-case basis to prevent adverse effects on beneficial uses of receiving waters.

**Physical Criteria for LNG Facility Siting.** Selection of a site best-suited physically to accommodate LNG port and plant facilities involves at least the following considerations:

- **Control of Nearby Development.** Facilities will require sites that minimize the exposure of population and property to the possible effects of a major accident. Land use controls, including purchase of surrounding lands, must be sufficient to prevent new development within the hazard zone around the LNG plant in the future.
- **Avoidance of Seismic Hazard Areas.** Facilities require sites away from areas of significant seismic hazard, and wherever sited, must be designed to withstand fully the maximum credible seismic risk at the site.
- **Deep-Draft Port Facilities.** Port facilities require navigable waters deep enough to accommodate LNG carriers (40 feet or greater draft) and sufficiently sheltered for year-round operation. Significant dredging might be required.
- **Sufficient Acreage for Land Facilities.** Land facilities require sufficient acreage for: storage tanks up to 125-150 feet high and 240-270 feet in diameter; space between tanks to permit dikes, runoff, and catch-basin facilities; additional space to reduce the potential for radiant heat from a fire at one tank igniting another tank; space for vaporization facilities capable of regasifying peak loads at rates of as much as five billion cubic feet or more per day; and space for a buffer area. Total acreage for land facilities may be as much as 100-200 acres.
- **Location Near Market Areas.** Land and port facilities need not be all in one contiguous parcel and the land facilities need not be immediately adjacent to the port; however, piping gas in its liquefied form outside of the facility is extremely expensive and increases exposure of life and property along the pipeline corridor to some risk. There are also economic advantages in siting LNG facilities near major market areas, although piping the regasified natural gas relatively long distances is clearly feasible.
- **Gas Transmission Systems.** Facilities must have adequate gas transmission systems.

**Potential Siting Alternatives: Rural, Industrial, Harbor, and Residential.** Very generally stated, a site selected in a rural area will pose the greatest impact upon the natural environment, but in the event of a major accident would expose

a minimum number of people to danger. Siting in a rural area could open the area to further port and industrial development, which in turn could encourage the growth of new residential communities. Industrial locations in developed harbors would tend to have a minimum impact on the natural environment, but would pose greater risk to human safety in the event of an accident. Harbors — particularly those with large industrial areas — will have heavier ship traffic, superior traffic control systems, calmer waters, and less exposed berths. Location near a residential area will have a moderate impact on the natural environment, could present social and economic impacts on the community, and would expose the population to the risks, however slight, of a major accident.

**Several Agencies Will Regulate Environmental and Safety Features of LNG Facilities.** The Federal Power Commission must approve projects for LNG imports from other states or foreign nations. It is the lead agency for such projects, and is responsible for preparation of environmental impact statements under the National Environmental Policy Act (NEPA). It is not yet clear whether FPC jurisdiction will preempt the right of State and local agencies to regulate the site location aspects of LNG facilities. Safety aspects will also be regulated by the Coast Guard (shipping-related), the Office of Pipeline Safety (land facilities), the Occupational Safety and Health Agency and the State Division of Industrial Safety (employee safety), the Federal Aviation Agency (aircraft safety), and the applicable local fire, harbor, and building and safety departments. Other environmental aspects will also be the concern of the designated lead agency under the California Environmental Quality Act (CEQA), the Army Corps of Engineers (marine facilities), the Regional Water Quality Control Board (RWQCB) and the local Air Pollution Control District (APCD). The NEPA and CEQA environmental impact review, and the RWQCB review, will also include review by other interested agencies as applicable.

## Policies

**94. Coastal Agency Role in LNG Facility Siting.** The coastal agency shall have jurisdiction over the need, land use, and environmental aspects of new or expanded liquefied natural gas (LNG) facilities in the coastal zone, in accordance with Policy 76. The coastal agency shall determine the availability of preferred alternative coastal sites, with the participation of the Energy Commission and all other concerned State, local, and Federal agencies, including the Federal Power Commission.

**95. Criteria for Siting and Design of LNG Facilities.** It may be desirable to locate some LNG facilities in the coastal zone. Any proposed LNG facility shall meet the following criteria:

a. **Limit Number of Terminals Until Safety is Assured.** Only one LNG marine terminal shall be permitted in the California coastal zone until (1) engineering and operational practices can eliminate any undue risk, or (2) guaranteed supplies of LNG and distribution system dependence on LNG are substantial enough that an interruption of service from a single LNG facility would cause substantial public harm.

b. **Human Health and Safety Paramount Consideration.** Until the risks inherent in LNG terminal operations can be sufficiently identified and overcome and such terminals are found to be consistent with the health and safety of nearby human populations, terminals shall be built only at sites remote from human population concentrations. Because of the public safety concerns and the goal of protecting against unnecessary development in a remote, pristine area, other development in the vicinity of such an LNG terminal site shall be prohibited. At such time as LNG marine terminal operations are found consistent with public safety, terminal sites in developed or industrialized port areas may be approved.

c. **Restrict Dredging and Filling.** Where permitted, new LNG port facilities shall not involve dredging or filling of wetland areas unless there is no less environmentally damaging alternative. Any such dredging and filling shall conform to Policies 15-18 of the Marine Environment chapter.

d. **Minimize Adverse Environmental Effects.** Where permitted, LNG facilities shall be located and designed to minimize adverse environmental effects. The applicant for an LNG marine terminal and onshore facilities shall submit a comprehensive evaluation of alternative coastal sites, including the environmental, economic, and operational reasons for rejecting them in favor of the proposed site, sufficiently in advance of a desired decision that an adequate and independent analysis can be made; such material shall be included in any environmental impact report required. Special consideration shall be given to Marine Environment Policy 10 regarding heated and cooled discharges.

**96. Require Safety Measures During Marine Operations.** All possible measures shall be taken to maximize the safe passage of LNG carriers into berthing facilities. Such measures shall include, where appropriate, application of measures presently used for LNG carriers in New York and Boston harbors: control or halting of other marine traffic by the U.S. Coast Guard during operation of loaded LNG carriers or during inclement weather conditions; near-harbor escort of LNG carriers by a Coast Guard vessel; use of tug boats in harbor areas; and safely designed berthing facilities sufficiently removed from other traffic flows and of sufficient size to permit maneuvering.

Outside port and terminal areas, the navigational safety system proposed in Policy 119 shall be established.

**97. Require Safety Measures at Onshore Facilities.** Any proposed LNG project in the coastal zone shall employ the following measures, unless safer feasible design, engineering, or operational measures are developed:

- **Storage Tanks.** Use the highest state-of-the-art engineering design and technology, proven alloys, double-wall tank construction (now standard in the industry), engineering design and operation that preclude sudden formation of a large quantity of vapor not adequately ventable by the pressure relief valve system, and sufficient spacing between tanks to minimize the possibility of an accident at one tank affecting another tank.
- **Containment Around Tanks and Pipelines.** Provide sufficient containment around each tank to hold the entire contents of the tank with a minimum surface area pool; near populated or developed areas, provide containment that includes a dike designed for maximum feasible reduction of vapor-plume travel, protection against severe weather or radiant heat from adjacent tanks in the event of a major fire, and protection against airplane crash or sabotage attempt; around exposed LNG pipelines, provide dikes or other containment structures capable of containing the maximum credible spill that might occur in a major rupture before shutdown of the entire pipeline system could be effected.
- **Protection Against Rupture.** To guard against storage tank or pipeline rupture, provide adequate and continuous monitoring, alarm, and process shutdown measures.
- **Standby Power.** Provide independent standby power system to maintain essential operational and emergency systems during a power failure.
- **Earthquake and Fire Protection.** Locate and design all LNG-related facilities to withstand the maximum credible seismic event for the area; provide all LNG-related facilities with the best available fire protection and fire-fighting technology, including adequate fire response plans, equipment, and personnel to control any major fire.

**98. Establish Liability for Accident Damage.** It is recommended that the Legislature establish strict liability for damage occurring as a result of LNG shipping or plant operations, except acts of war, and consider creation of a safety indemnity fund, financed by levy of a fee on LNG imports, to ensure that all damages and costs resulting from an LNG accident are quickly compensated. It is further recommended that sufficient research and development pertaining to LNG safety issues be pursued by the Legislature, the Public Utilities Commission, and the Energy Commission to deal adequately with safety issues posed by LNG importation projects in California.

# TRANSPORTATION

# TRANSPORTATION PLANNING AND THE COAST

## Findings

**State Transportation Planning.** Planning for all modes of transportation in California is conducted by the Department of Transportation (in the Business and Transportation Agency) and by statutorily designated regional transportation planning agencies (RTPAs). A statewide California Transportation Plan, prepared by the State Department of Transportation, is being considered by the State Transportation Board and is to be submitted to the State Legislature by January 1, 1976.

**Emphasis on Vehicular Transportation.** Current State transportation planning still heavily emphasizes vehicular transportation facilities and, to some extent, airports. Port, railroad, and public transit planning are still not given the emphasis necessary for truly comprehensive transportation planning.

**Inter-Agency Coordination Needed.** The relationship between local and regional transportation and planning agencies is a source of conflict in some areas, creating a need for interagency coordination. Additionally, local municipalities with State or Federal assistance, or through their own capital improvement programs, carry out their own street and highway improvement programs. In coastal areas, such improvements (by creating developments that increase traffic and parking) can often adversely affect coastal accessibility to resources of regional or statewide significance as well as the mobility in and among coastal communities.

**Factors Influencing Inter-Regional Policy Decisions.** The level of urbanization, type of terrain, the traffic mix, and the influence of corridor traffic between major metropolitan areas (e.g., San Diego-Los Angeles) are crucial factors in making inter-regional policy decisions.

**Traffic and Parking Congestion Problems in Coastal Zone.** A pressing transportation problem in the coastal zone is traffic and parking congestion. Congestion is actually a cluster of problems appearing in many forms:

- Weekend, holiday, special events, and summer recreational traffic and congestion along urban and intercity coastal routes;
- Workday rush-hour congestion in metropolitan regions;
- Parking and local traffic congestion in coastal communities;
- Decreased roadway capacity and safety resulting from conflicts between different types of traffic; and
- Increased air and visual pollution caused by slow-moving traffic.

In addressing these problems, coastal transportation policy and planning must deal with the characteristics and limitations of automobile traffic in a high-use recreational area (including special recreational peak travel periods, longer average trips, and recreational trips where the experience of driving along the coast is an important part of the trip) as well as the effects of commuter traffic.

**Coastal Access Improvements Must Be Strategically Planned.** Transportation systems are needed to improve public access to coastal resources. But certain kinds of improvements to the transportation system may change the character of existing natural resource areas and may lead to the expansion of urban centers or the creation of new ones. Coastal access improvements of all types — roads, transit services, bikeways, and footpaths — must be strategically planned to serve the following goals:

- Provision of public access to the oceanfront;
- Service to residential, recreational and commercial areas; and
- The protection of manmade and natural resources of the coastal zone.

**Emergency Transportation Needs Are a Special Problem.** The coastal zone has experienced blockages of roads and railroads because of slides and severe flooding. In 1964 the coastal area of Mendocino County was isolated for several days. Adequate airport facilities are important for search-and-rescue and forest fire-fighting operations. The Coast Guard provides boats and helicopters for emergencies along the coastline and harbor police and fire departments serve the port areas. Bus systems are an important means of evacuation. Communication among the operators of all emergency transportation systems is essential. Existing facilities are considered adequate for expected situations.

## Policies

**99. Consider Coastal Concerns in Transportation Plans.** The coastal agency shall participate directly in ongoing local, regional, and State transportation planning to ensure that all transportation concerns (e.g., weekend travel) and resource protection goals (e.g., air quality, energy conservation) of the Coastal Plan are considered in regional and State transportation plans. Principal concerns are as follows:

a. **Give Special Attention to Weekend, Holiday, and Special Events Travel.** It is recommended that State laws now requiring local, regional, and State agencies to prepare transportation plans be modified to require the addition of a weekend, holiday, and special events travel component to the plans as they affect access to and within the coastal zone. This component shall be prepared by a technical study group composed of representatives of the coastal agency, the State Department of Transportation, regional transportation planning agencies, and local jurisdictions. The study group shall determine the compatibility of Coastal Plan policies with existing transportation plans and make recommendations for modification of transportation plans and the Coastal Plan, where necessary to ensure consistency.

b. **Encourage Energy-Conserving and Non-Air-Polluting Transportation Forms.** Transportation plans shall include provisions for bicycle lanes and paths and for public buses, trains, and other energy-conserving and non-air-polluting transportation modes to the maximum extent possible. It is recommended that the Legislature require the Circulation Element of local General Plans to include a section on bike paths and lanes.

c. **Consider Emergency Transportation Needs.** Transportation plans shall include consideration of emergency transportation needs.

**100. Review Transportation Plans Affecting Coastal Resources or Access.** The coastal agency shall review and approve or disapprove those aspects of State, regional, and local transportation plans within the coastal zone that affect coastal resources or coastal access (e.g., roads and transit systems to and along the coast, ports, airports).

a. **Coastal Agency Authority Over Projects Included in Approved Plans.** Where a State, regional, or local transportation plan has been approved by the coastal agency, the agency's authority over specific projects (within the coastal agency's jurisdiction) shall consist of requiring conformity to coastal policies through mitigating measures and shall not extend to denying projects where they otherwise conform to the approved plan.

b. **Authority Over Projects Not Part of Approved Plans.** Until such transportation plans are prepared and approved, the coastal agency shall be empowered to review and approve or disapprove proposals for transportation construction and development that directly affect coastal resources and coastal access within the coastal zone and all transportation proposals within its area of jurisdiction.

# LAND TRANSPORTATION

## HIGHWAY 1 AND COASTAL ROADS

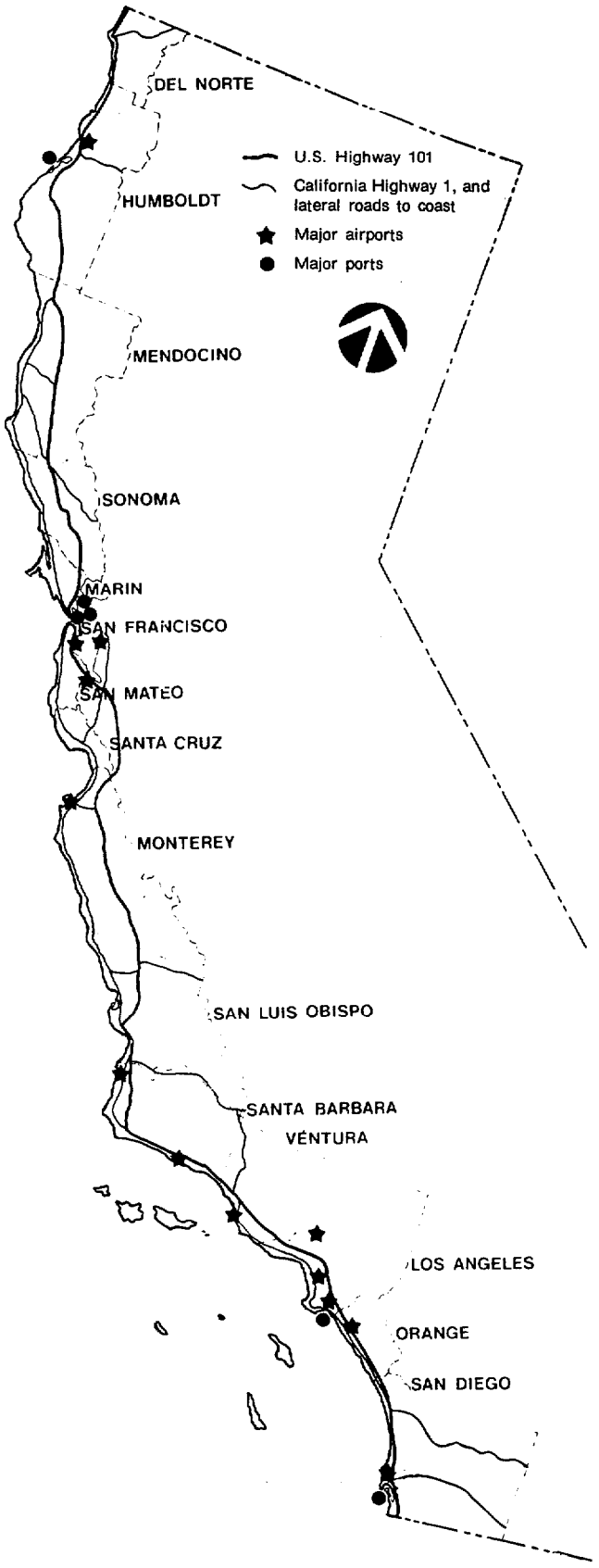
## Findings

**Multiple Types and Modes of Traffic on Coast.** Along the urbanized coastline are many different types of traffic (commuter, recreational, local) and a variety of traffic modes (cars, buses, trucks, motorcycles, bicycles) that all use the same road facilities. This combination of types and modes causes conflicts that greatly increase traffic congestion.

**Roadway Capacity and Traffic Flow.** Increased road capacity can initially work to reduce congestion on coastal roads, increase traffic flow, and improve the level of service. In many cases, however, expanded road capacity is absorbed by traffic generated by additional developments, so the resulting overall level of service is often not greatly improved and in some cases is diminished.

**Adverse Impacts of Roads on Coastal Resources.** The automobile is the principal means of transporting people to

## Coastal Transportation




the coast, but roads can have adverse environmental impacts on the coast. Poor construction methods can cause soil erosion, resulting in mud- and landslides, water pollution, flooding, and fire hazards, can reduce tidal flushing in coastal wetlands and lagoons, and can destroy natural ecosystems. Valuable coastal land and beach areas can be taken for road construction. Auto-generated air pollution can be a significant problem in coastal valley areas. High noise levels create an unpleasant experience for people and can also be harmful to wildlife. Some of the natural beauty of coastal areas can thus be destroyed by the construction of roads.

**Roads Induce Growth, Impede Access in Some Coastal Areas.** Development is most likely to follow highway construction when a new or improved road is provided in a desirable area of the coast near a growing metropolitan region. Where road improvements spur development by placing the coast within commuting distance of urban employment centers, such development can impede coastal access for all users in two ways: by decreasing the amount of potential recreational land available while increasing demand for recreational use in the immediate area; and by increasing traffic loads on coastal roads, causing traffic and parking congestion problems. On the other hand, new or improved roads are not as likely to spur additional development in congested already-developed areas, or distant rural areas, or where growth is effectively managed through direct land use controls.

**Coastal Scenic Roads Need Protection.** The State Scenic Highway Program was established in 1963 to protect viewshed corridors along State scenic roads. In 1965, the California Legislature passed the California Parkway Act to complement the Scenic Highway Program but it was never funded. The Parkways serve as "ribbon parks" giving access to a number of recreational areas along with preserving particularly unique scenery. These ribbon parks are desirable in some areas of the coast but the scale of the parks does not lend itself to all coastal areas. Therefore, a lesser-scale or in-between type of parkway is necessary, and could be encouraged by amending existing legislation or drafting new programs for parkways serving all the various parts of the coast.

## Policies

**101. Relate Land Use Decisions to Transportation Capacity.** Development controls should be the principal means of relating land use, access and coastal resource protection decision policies to transportation capacity. However, development controls are not always effective. Therefore, where the road system capacity is or should be limited based on coastal policies, a system of budgeting the remaining or planned capacity should be developed (1) so that public recreational and scenic uses of the coastal road system will not be limited by new private residential and commercial developments; (2) to reduce the costs to the public of extensive road construction; and (3) to reduce damage to coastal resources that might otherwise result from road construction. To this end, the coastal agency in cooperation with the

California Department of Transportation shall assign uses for the remaining capacity of road systems in the following manner:

a. **Determine Traffic Demand and Identify Problem Areas.** Present and projected weekday and recreational traffic demands shall be determined for each major through-road segment both along the coast and intersecting with the coast. Particular attention shall be focused on those areas where the road network is approaching or exceeding capacity during peak-demand periods, or where increased road capacity would result in significant adverse impacts on coastal resources.

b. **Determine Remaining Capacity.** For these road segments, the difference between the road's design capacity at an acceptable level of service and the current traffic load shall be determined — i.e., the amount of road capacity that could be available for new traffic demand beyond that generated by existing developments.

c. **Assign Remaining Capacity (Capacity Budget).** The remaining capacity shall be allocated according to the following priorities: first, coastal-dependent land uses, essential public services, and basic industries determined by the coastal agency to be vital to the economic health of the region, State or nation; second, public recreation, commercial recreation, and visitor-serving land uses; and third, other private and non-coastal-dependent uses. The capacity allocations shall be the "capacity budget" for the road segment, and shall be the basis for allowing any additional development that is otherwise in accord with Coastal Plan policies (e.g., the capacity allocated to recreational use shall be based on the environmental carrying capacity of the coastal resources). Existing developments that account for existing traffic demand are thus not a part of the "capacity budget" and are presumed to continue indefinitely. If the analysis in paragraph (b) determines there is no remaining capacity to be budgeted, no further substantial individual or cumulative development that would be dependent upon the deficient road segment shall be allowed. The capacity allocations arrived at in accordance with these priorities shall be used until public transit service or road capacity expansions approved in accordance with Coastal Plan policies provide sufficient additional capacity to permit a readjustment of the allowable level of development. (See North Central Coast Regional Summary Appendix for example of how capacity budgeting could work.)

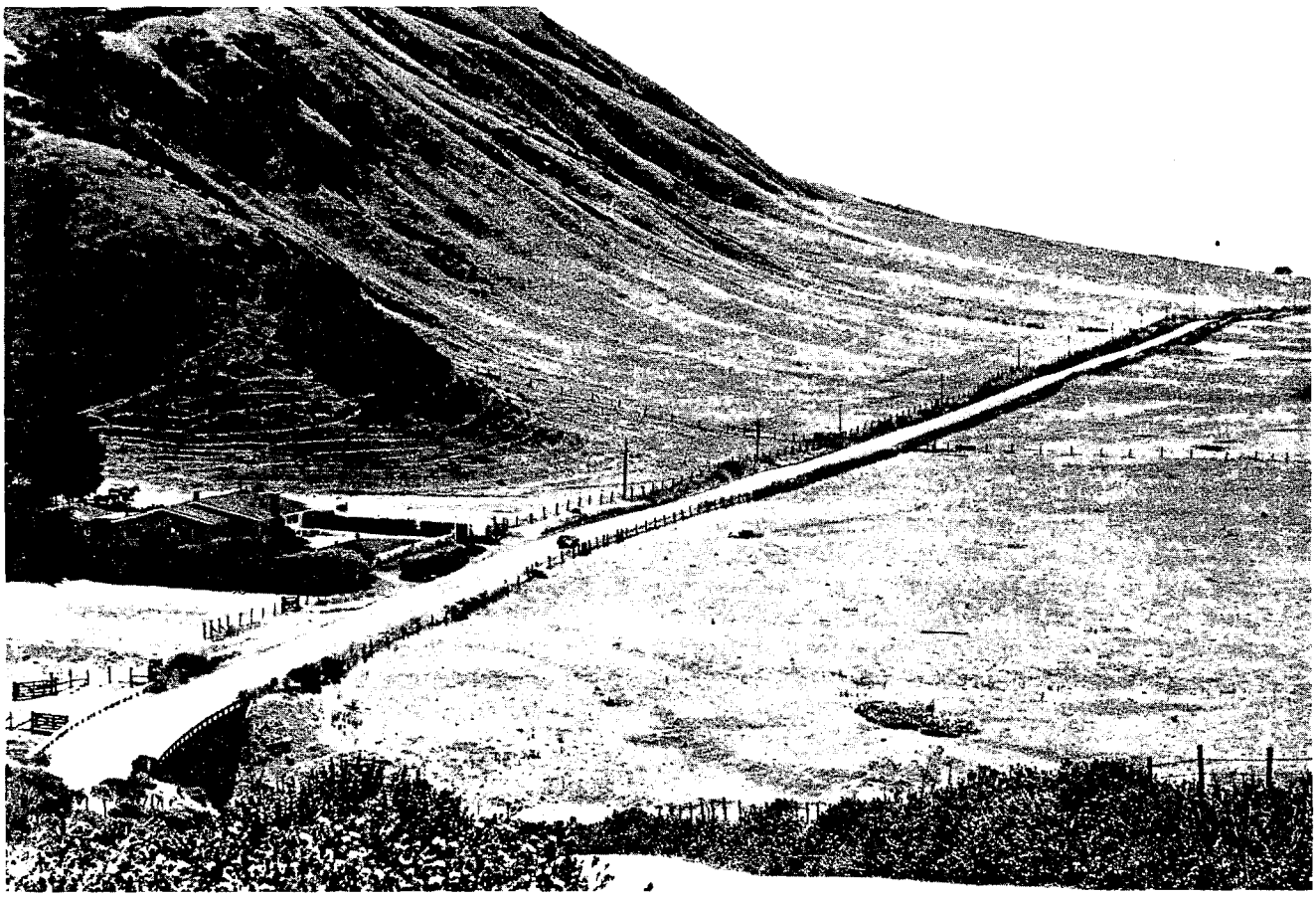
**102. Criteria for New or Expanded Coastal Roads.** The construction or expansion of coastal roads shall be allowed where the following criteria are met:

a. **Prevent Adverse Land Use Impacts.** The proposed project shall not open coastal rural areas for development nor allow for increased development except in accord with Coastal Plan policies; where a necessary increase in road capacity could encourage development inconsistent with the Coastal Plan, appropriate land use restrictions shall precede any road construction.

b. **Justify Project Need.** The project is determined to be necessary (1) because existing roads are carrying traffic volumes in excess of their assigned service volumes (capacity) and no alternate route is available or alternative means of transportation is feasible; (2) to provide increased public access to the coast consistent with coastal resource protection and other means of meeting this goal (e.g., public transit, diverting non-coastal traffic) have been found to be infeasible; or (3) for unquestionably needed traffic safety improvements where no other safety measures are possible.

c. **Eliminate or Minimize Adverse Environmental Impacts.** Road construction shall eliminate or minimize adverse impacts on sandy beaches; environmentally sensitive areas, including but not limited to coastal wetland or estuarine areas, historic or archaeological sites; and other significant manmade resources. Mitigation measures shall be employed in planning, design, and construction of new or expanded roadways, including minimizing interference with natural drainage patterns and the need for cutting, filling, and grading for roadway construction, in accordance with Policy 53. (See also Policy 43 regarding freeway construction affecting coastal air quality.)

**103. Develop Alternatives to Prevent Excessive Use of Coastal Routes.** Except where greater adverse environmental impact would occur, major transportation routes and public transportation systems shall be located sufficiently far inland to protect the scenic quality of the coastal road system and to reserve Highway 1 primarily for recreational use. Inland and lateral routes shall be improved and properly signposted to attract non-recreational through traffic away from coastal areas, consistent with the State Department of Transportation planning concept that "traffic which is not specifically oriented toward use of the coastal zone will be encouraged to use other nearby traffic corridors." Coordinated bus services, bus tours,



Highway 1 near Cape Mendocino

bus lanes, carpooling, and segregation of heavy vehicles from regular coastal traffic shall also be encouraged to reduce excessive traffic loads, as well as to reduce air pollution along coastal roads.

**104. Maximize Recreational and Scenic Value of Highway 1 and Other Coastal Roads.** The recreational use of coastal Highway 1 and other routes along the coast shall be maximized and their value as scenic roads, especially along the rural coastline, shall be protected. New and existing roads along the coastline with expansive views of the coastal waters shall be regarded as scenic routes. Toward this end:

a. **Preserve Rural Highway 1.** Highway 1 in rural areas of the California coast shall be kept a scenic two-lane road.

b. **Establish a Coastal Scenic Parkway Program.** It is recommended that a Coastal Scenic Parkway Program be established in conjunction with the State Scenic Highway Program, as provided for in State law. Highway 1 and all eligible State highways and county roads within the coastal zone shall be designated as part of the Scenic Highway Program, and, where applicable, the Scenic Parkway Program shall be instituted. Particular emphasis shall be placed on protecting the highway corridor in scenic areas.

c. **Use Shoreline Land Acquisition Law.** It is recommended that: (1) the State law (Streets and Highways Code, Section 880) that gives the State Highway Commission the authority to acquire shoreline property, between the mean high tide line of the ocean (including bays and estuaries) and a State highway up to 300 feet, be vigorously utilized where appropriate; and (2) this law be amended to enable the acquisition of all the area between the highway and the mean high tide line if more than 300 feet is needed to protect ocean views or shoreline recreational opportunities.

d. **Provide Roadside Recreational Amenities.** Funding shall be provided for additional roadside parks, information centers, vista points, and rest stops, including picnic grounds, drinking water, rest rooms, and overnight camp spaces where appropriate. Where safety and feasibility permit, parking shall be on the inland side of the road, with safe pedestrian

access provided to the coastline. To protect the visual experience of traveling along coastal roads, as adequate off-road parking and roadside view areas are provided, parking shall be prohibited along the seaward shoulder. Provisions shall be made where feasible along all such scenic routes for pedestrians, equestrians, and bicyclists.

e. **Design Standards for Scenic Coastal Roads.** New and existing scenic routes, including roadways along the coastline with expansive views of the ocean, shall be designed, constructed, and maintained with the highest regard for aesthetic considerations. Bridges, overpasses, parking areas, guardrails, and other such transportation and roadside facilities shall be integrated into the natural landscape so as to complement and enhance the surrounding area, and to retain scenic views and vistas. These facilities shall be harmonious with the scale and character of the existing road and/or any improvements suggested in other Coastal Plan policies. Small-scale elements such as lighting fixtures, directional signs, street furniture, and landscaping materials shall also be designed to visually identify coastal roads and to help orient coastal viewers.

f. **Regulate Development Along Scenic Routes.** Viewshed and roadside controls shall be required to protect the scenic qualities of roadway scenic corridors. (See also Coastal Appearance and Design chapter.)

g. **Promote Coastal Highway Tour Bus Service.** To reduce automobile traffic on parkways and scenic routes, it is recommended that the California Department of Transportation vigorously promote attractive tour bus service, on the model of the European tour bus system. (See Policies 107-111 regarding public transit.)

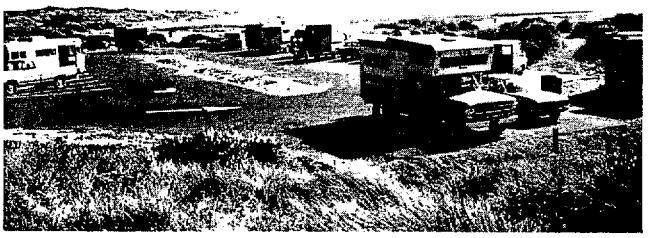
h. **Provide Public Information on Scenic Routes.** It is further recommended that information on the scenic corridors be made available to automobile clubs, bicycle clubs, YMCA, YWCA, tourist organizations, etc.

# PARKING

## Findings

**Adverse Impacts of Parking Facilities.** The demand for parking facilities is high along the coastline, but additional parking facilities would generally have negative environmental impacts and consume scarce coastal land. Encouraging automobile traffic as a form of local transportation may be detrimental to the overall quality of the coastal zone environment, causing air and noise pollution and the loss of visual and environmental amenities. Where parking is inadequate, however, cars spill over into surrounding streets and neighborhoods, or onto the shoulders of highways, causing congestion and impeding public access to the shoreline.

Humboldt County



**Shuttle Systems to Reduce Shoreline Parking Needs.** Shuttle systems, by acting as collectors from remote parking areas or transit transfer points, can greatly reduce the need for parking along the immediate shoreline. Shuttles can also be used to provide exclusive transit access to areas that are environmentally fragile or overused. Care must be exercised, however, for it would be possible for the remote parking reservoirs themselves to have detrimental environmental impacts.

## Policies

**105. Minimize Impact of Parking Facilities.** The adverse impact of parking facilities upon coastal visual resources shall be minimized while allowing for increased public access for the enjoyment of these resources.

a. **Use Shuttle from Remote Parking Areas if Possible.** Public transportation to coastal beaches shall wherever possible be provided from existing centralized parking lots (such

as at schools, shopping centers, drive-in theaters, or offices) when available during peak recreational use periods. It is recommended that public transit authorities investigate means and scheduling to implement such systems. Where it is physically possible to do so, upland parking facilities shall be provided, linked to coastal recreational facilities by trails, shuttle buses, or trams. New shoreline parking facilities shall be allowed only if none of the foregoing alternatives is feasible.

b. **Design Standards for Parking Facilities.** Where feasible, parking shall be consolidated for joint use by surrounding businesses and neighbors, and shall be below grade or underground, or in multi-story structures to prevent large, obtrusive lots, and shall be attractively designed and buffered with landscaping, berms, or other attractive screening materials. Where improved on-grade parking lots are permitted, in addition to similar berms or buffers, they shall generally have trees planted throughout the lots.

**106. Require Adequate Parking in New Developments.** New, intensified, or expanded coastal development shall be required to have either (1) adequate parking facilities to meet the demand generated by the development (standards shall be determined in subregional or local coastal plans based on the particular needs of the area); or (2) reasonably assured access by public transportation to replace the need for private vehicles and parking spaces to accommodate them provided a sum equivalent to the cost of providing the parking facilities that otherwise would be required is advanced to the local transit district for improvement of transit facilities and services.

# PUBLIC TRANSIT

## Findings

**More Coastal Transit is Needed.** Transit systems are presently used very little to gain access to and through the coastal zone, especially for recreational trips. Coastal transit systems could help reduce congestion and pollution and help provide coastal access to those without cars and those who wish to avoid the problems of traffic congestion and limited parking, though some improvement in roads may be necessary to accommodate improved bus service. Ninety per cent of the public demand for recreation is generated within two hours driving time of metropolitan areas, which have the greatest need for public transportation. Existing bus systems could provide service in metropolitan coastal regions through weekend use of idle vehicles. Present service is currently limited and/or inadequate in most coastal areas.

**Rail Passenger Service on Coast Is Increasing.** Railroad passenger service to and along the coast, now provided almost exclusively by Amtrak, was on a steady decline from the 1920s and 30s but has been increasing since 1971 along with the public's desire for effective mass transit. New coastal passenger railroad service is being proposed but limited funding is available.

**Problems of Coastal Transit Travel.** Problems of transit travel on the coast, including recreational travel, include:

- Inconvenience due to time requirements for home to destination trip, frequency of transit service, inflexible schedules, difficulties in traveling with children and the use of vehicles not equipped to carry recreational equipment;
- High farebox charges, especially for groups and families; and
- Lack of personal mobility at the destination.

While it is clear that transit operations cannot always substitute for coastal automobile travel, transit improvements — e.g., improved capability for handling recreational gear and expanded schedules — could increase transit use.

**Need for Funds for Transit Operations.** Mass transit generally cannot pay for itself with fares alone. Although it has long been established practice for government to encourage automobile travel systems through highway construction, government support for mass transit has been limited. While transit's major financial need is for operating costs, State and Federal subsidies provide primarily for planning and capital expenditures. Labor costs constitute the major portion of costs for bus transit, and the problem is compounded by the need for weekend service when labor costs are higher.

**Possible Source of Transit Funds.** Transit funding programs could include:

- Placing responsibility on major traffic generators (e.g., by requiring contributions to transit service),
- Assumption of some costs by other agencies that have jurisdiction in coastal areas (e.g., park and recreation agencies), or
- Subsidizing transit through charges on automobile travel (e.g., gasoline taxes, license fees, parking taxes).

## Policies

**107. Provide New Funding for Coastal Zone Transit.** It is recommended that new sources of funding for the necessary expansion of public transit in the coastal zone be provided, with emphasis on subsidies for extensions or upgrading of such service and providing operating costs and increased user conveniences (e.g., bus shelters). High priority in the allocation of transit funds by transportation agencies shall also be given to (1) feasibility studies for alternative transportation systems in the coastal zone; (2) seed money for the establishment of new transportation services to serve the coastal zone; and (3) demonstration projects for new service, with emphasis on innovative approaches that will maximize access while protecting coastal resources.

**108. Establish Priority of Transit Over New Roads for Cars.** Public transit shall be given priority over new or expanded roads for automobiles, particularly (1) where public transit is most economically feasible, because of high population concentrations and concentrated recreational uses, and/or where existing transit districts or facilities could expand weekend service; (2) where present highway or parking facilities are congested and public transit could provide additional access without the adverse effects of new roads and parking; (3) to provide exclusive access to fragile coastal areas, in order to limit the amount of use; (4) to link all coastal communities currently lacking such connections, especially northern California coastal communities with the San Francisco Bay Area; (5) where existing rail right-of-way or service could be improved to provide increased access to and along the coast; or (6) where critical air pollution levels either exist or are projected.

**109. Expand Transit in Urban and Air Quality Maintenance Areas.** Public transportation in urban areas and in Air Quality Maintenance Areas shall be developed, improved, and expanded in order to lessen dependence on the automobile for access to the coastline and in order to reduce air pollution levels. To this end:

a. **Improve and Expand Bus Service.** Coordinated bus service and tours, bus lanes, dial-a-bus service, jitney service to and from the coast, and intracity shuttle loops shall be developed. Commercial recreation and support facilities shall generally be clustered into multi-use complexes that can be served by public transit facilities.

b. **Design Bus Service for Recreational Users.** Public transportation shall include accommodations for the physically handicapped, bicyclists, surfers, divers, and others with bulky or specialized equipment, and weekend schedules shall be established with specific stops and pickup points designed to serve recreational users.

**110. Encourage Expanded Rail Service.** Amtrak and the rail companies shall be encouraged to expand intercity passenger rail service along appropriate existing rights-of-way in the coastal zone. An inventory of all coastal railroad rights-of-way shall be made and all rights-of-way potentially usable for railroad passenger travel shall be preserved for future rail service. No use shall

Amtrak train out of Gaviota, Santa Barbara County