DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

Annotated Bibliography on Research Conducted in Coastal Lagoons and Estuaries of the Pacific Coast of the United States

by

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FOREWARD

This report was prepared by the United States Geological Survey (USGS) as one part of a series of reports on Pollution Studies of Drakes Estero and Abbotts Lagoon, Point Reyes National Seashore. The research program is under the technical supervision of the National Parks Service (NPS), and was conducted by the U.S. Geological Survey, and by private organizations. The references in this bibliography were assembled during a literature survey conducted to provide a background for a study on lagoons and estuaries of the west coast of the United States, Canada, and Mexico.

The study and report preparation received supervision from Dr. H.E. Clifton (USGS) and Dr. Gary Fellers (NPS). The work was conducted through funding provided by the National Park Service under an Interagency Agreement #IA8000-7-8001.

Any comments about this publication are appreciated.

PREFACE

1. The U.S. Geological Survey (USGS) has ongoing research projects focused on studying nearshore processes, hazards, and environmental aspects of the coastal areas of the United States. The goals of the USGS were utilized by the National Park Service (NPS) in that NPS has ongoing land management responsibilities over public lands placed under the park service jurisdiction. The National Park Service interest in developing a sound land management program for the Point Reyes National Park area necessitated research on sedimentation, pollution, of the Drakes Estero and Abbotts Lagoon area, and an evaluation of previous research on other West Coast lagoons and estuaries to better understand the scientific background available.

2. A research program entitled, Pollution Studies Project of Drakes Estero and Abbotts Lagoon, Point Reyes National Seashore, (PSP)was developed to provide quantitative data for use in formulating a sound land management program. The project was designed to meet the following objectives:

3. The PSP is divided into four major study areas: Annotated Bibliography, sediment and sedimentation rates, Herbicide (Pesticide) input into the lagoons, and nutrient input into the lagoons from surrounding farmland.

   a. The annotated bibliography is intended to compile relevant literature on coastal embayments of the West coast of the United States to provide a scientific background for the present study.

   b. The sediment of Drakes Estero and Abbotts Lagoon were investigated to develop a baseline of sediment distribution and the rate of sediment filling. This information will provide a data base that can be used to compare increases or decreases in the amount of sediment entering the lagoons.

c. The farming areas that surround the lagoons use various types of herbicides and pesticides that if used in appreciable amounts can have detrimental effects on the marine environments. Sediment samples from cores were analyzed for the presence of a wide variety of chemical agents.

d. The area surrounding the two lagoons is used for both dairy and beef ranching. The NPS wanted to ascertain the amount of nutrients being introduced into the lagoons from stream runoff, and what the possible effects of this input has on the lagoon environment.

4. The references in this bibliography are listed alphabetically by senior author surname and chronologically for multi-authored publications. Author abstracts were simply reproduced when possible and sited simply by (Author) at the end of the abstract. When another bibliography was utilized for the reference, the authors name was placed in parenthesis and put at the end of the annotation and the reference included in the body of the text. Those publications reviewed have no notations at the end of the annotation. References with no corresponding annotations or abstracts were those that could not be reviewed prior to the completion of this publication. The references are cross referenced in the subject index.

Introduction

This report is a compilation of annotations and abstracts of published and unpublished technical literature involving research and management practices in embayments of the Pacific Coast of the United States. This bibliography was prepared by Roberto J. Anima of the U. S. Geological Survey as part of the Pollution Studies Project of Drakes Estero and Abbotts Lagoon, Point Reyes National Seashore. The research project was an interdisciplinary study funded by the National Park Service designed to investigate the amounts and types of pollutants and sediment entering Drakes Estero and Abbotts Lagoon, located on Point Reyes National Seashore. This bibliography establishes a data base on research conducted on coastal lagoons and estuaries.

The bibliography contains 498 entries and was produced on an Apple MacIntosh using Microsoft Word word processing program, and stored on double density 3.5 inch disk.

POLLUTION STUDIES PROJECT OF DRAKES ESTERO AND ABBOTTS LAGOON,

ANNOTATED BIBLIOGRAPHY ON RESEARCH CONDUCTED IN COASTAL LAGOONS AND ESTUARIES OF THE PACIFIC COAST OF THE UNITED STATES.

A

Ahrens, J. P., 1967, A model study of the entrance channel, Depoe Bay Oregon: U.S. Army, Corps of Engineers Engineering Research Center, Technical Memo. no. 23, Fort Belvoir, 17 p.

A scale model study was conducted at the Coastal Engineering Research Center to see if a proposed widening of the entrance channel at Depoe Bay would allow appreciably more wave energy to enter the harbor area. A linear, undistorted Froude scale of 1 to 120 was used. The model was constructed of mortar in a wave stand 72 ft long and 1.5 ft. wide, with a stillwater depth of about 1.0 ft in the deeper area beyond the harbor entrance. Ponding in the model bay, due to wave action, was noted and for waves traveling from offshore through the channel and into the bay ranged from greater than 1.0 for long waves to less than 0.1 for short waves. (Author)

Alkie, W. A., 1987, Washington State Department of Ecology, Wetlands Program: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 1787-1794.

Wetland management is discussed from a multiple strategies approach which incorporates the elements of technical and financial assistance, enforcement, regulations, education, and research.

Allen, G. H., and Hill, D.,1987, Restoring of Butcher's Slough Estuary - a case history: Coastal Zone '87, v. 4, Proceedings of the

Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3674-3687.

Butcher's Slough is located at the northern edge of Humboldt Bay, California. This paper reviews the historic freshwater land use of the slough and the planning process that lead to an acceptable restoration plan. Construction procedures, costs, and estuarine related values integrated into the restoration plan are discussed.

Alpine, A. E., Cloern, J. E., Cole, B. E., and Cheng, R. T., 1979, Variations in the relationship between In-vivo fluorescence and chlorophyll a in the San Francisco Bay estuary: EOS, Transactions, American Geophysical Union, v.60, no. 46, p. 851.

This study utilized water chemistry data from monthly cruises over a two year period in San Francisco Bay in determining the potential problems of using in -vivo fluorescence to determine chlorophyll a in San Francisco Bay. The conclusion is that the methods used for the open ocean cannot be readily used for the determination of phytoplankton biomass in San Francisco Bay based on the same assumptions.

Amme, D., 1985, Establishing native plant communities on a coastal sand fill, Berkeley, California: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 1717-1730.

This report is on the problems and successes in establishing native plant communities on a landfill project at Berkeley, California. Over 150 native plants were tested at the project site with only 70 of these species thriving and spreading over the area. The report details soil properties, and the problems of coastal landfill projects.

Anderson, M. E., 1987, An examination of the history and political processes involved in the reclamation of Alameda Beach, Alameda, California: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p.

1420-1431.

This paper examines the history and political processes which transformed eroded tidal flats along the east shore of San Francisco Bay into a reclaimed beach which received the American Shore and Beach Preservation Association Award of Merit.

Andrews, R. S., 1965, Modern sediments of Willapa Bay, Washington; a coastal plain estuary: University of Washington Department of Oceanography, Technical Report no. 118, Ref. M65-8, Seattle, 60 p.

This report gives an overview of the sediment characteristics of Willapa Bay and discusses the intricate channel system in this tidally influenced estuary. The enterance to the estuary has been eroding the north side of the enterance which is attributed to the littoral drift patterns along the open coast. The material being eroded is then being deposited as spits and shoals at the enterance. The paper also looks at the distribution of Foraminifera in relation to the sedimentary environment in the bay, and the mineralogy of the sediment which suggest that the main sediment source of the estuary is from the mouth of the Columbia River.

Angelis, De M. A., and Gordon, L. I., 1979, Nitrous oxide and methane in Alsea Bay, Oregon: EOS, Transactions, American Geophysical Union, v. 60, no. 46, p. 846.

Surface waters of Alsea Bay, a relatively pristine estuary on the Oregon Coast, were analyzed for N_2O on a weekly or biweekly basis during the summer of 1979. The estuary was found to be a variable source of N_2O to the atmosphere with saturation values ranging from 104% to 239%. Cyclic variations of N_2O over a three month period were observed. Freshwater input from the Alsea River averaged 8.9 nmoles/l N_2O. Concurrent measurements of CH_4 with an average value of 5188 nl/l. (Author)

Angelis, De M. A., and Gordon, L. I., 1985, Upwelling and river runoff as sources of dissolved nitrous oxide to the Alsea Estuary,

Oregon: Estuarine Coastal & Shelf Science, v. 20, p. 375, Oregon State University Research article 1.

Surface waters of Alsea Bay, an unpolluted estuary on the Oregon coast, were analyzed for nitrous oxide, nitrate and nitrite on a weekly or biweekly basis during the summer of 1979. The estuary was found to be a variable source of N_2O to the atmosphere. Large and rapid increases in the concentrations of N_2O, NO_{-2} occurred at the beginning of the sampling period and are attributed to the influx of nutrient-rich upwelling water into the estuary with the tide. The subsequent decline in concentrations of nitrate, nitrite and nitrous oxide over the remainder of the summer is attributed to a decrease in upwelling intensity, an decline in nitrification rates and to assimilatory nitrate reduction. Measurements of nitrous oxide at six stations along the Alsea River were also made in September and October before and after the onset of the rainy season. Samples taken after flood conditions were established were systematically 50% higher than pre-flood samples. The data suggest that soil runoff results in elevated concentrations of N_2O in rivers. (Author)

Anima, R. J., 1989, Sediment characteristics and environmental processes of Drakes Estero, Point Reyes National Seashore, California, U.S.A.; Second International Research Symposium On Clastic Tidal Deposits, University of Calgary , Alberta, Canada, Program and Abstracts, p.4.

A poster session presented on the sediment and sedimentary environments found in Drakes Estero, California. Poster consists of photos of various parts of the Estero, diagrams, maps, and figures of the variation of sediment sizes, worm tube types, zonation of vegetation, bathymetric map, and geophysical record interpretation. The poster suggest that sediment size decreases from medium to fine grained sand at the mouth of the lagoon to silt and clay in the upper reaches of the branching bay that make up the lagoon system. The fine grained sand found in the central part of the lagoon is deposited directly from the open coast during periods when the mouth of the lagoon is located to the west

of its 1984 through 1988 position, when oceanic swell has a more direct approach. Geophysical profile interpretations are suggest that the ancient river valley that Drakes Estero occupies has been filled with between 25 and 30 m of sediment near the mouth of the lagoon.

Anima, R. J., Bick, J. L., and Clifton, H. E., 1989, Sedimentologic consequences of the January 1982 storm, Tomales Bay, California: *in* Landslides, Floods, and Marine Effects of the Storm of January 3-5, 1982, in the San Francisco Bay Region, California, U.S. Geological Survey Professional Paper #1434, p. 283-310.

The January 1982 storm caused considerable damage due to increased runoff resulting in flooding and debris flows in the Tomales Bay area. Sampling in the Bay one month after the storm showed that flood-derived sediment tended to be concentrated near the sources of sediment input (i.e., stream mouths). Subsequent sampling six to nine months after the storm showed that the flood layer was still discernable in certain areas, but totally reworked by organisms in other areas. The absence of a significant amount of sediment over the proposed storm layer suggest that major sedimentation occurs only during storm events such as the one in January 1982.

Anima, R. J., 1980, Effects of tidal cycles and organisms on a sandy intertidal runoff channel in Willapa Bay, Washington: Geological Society of America, Abstracts with Programs, Corvallis, Oregon, The Geological Society of America, Cordilleran Section, 76th annual meeting, v. 12: 3, p. 94.

This study addressed the changes in texture, channel morphology, primary and secondary sedimentary structures, and vegetation zonation of a sandy intertidal runoff channel.

Anima, R. J., Clifton, H. E., and Phillips, R. L., 1989, Comparison of modern and Pleistocene estuarine facies in Willapa Bay, Washington: *in* Reinson, G. E., ed., Modern and Ancient Examples of Clastic Tidal Deposits- A Core and Peel Workshop; Canadian

Society of Petroleum Geologists, Second International Research Symposium on Clastic Tidal Deposits, August 22-25, 1989, Calgary, Alberta, Canada, p. 1-19

Presentation of methods used to core the modern estuarine deposits of Willapa Bay to study the types of depositional structures found in a variety of depositional environments. The modern examples were compared to Pleistocene estuarine deposits that are found outcropping along the eastern side of the bay. Cores of the modern channels and intertidal flats and epoxy peels of the terraces are presented with similar types of structures found in both modern and ancient deposits.

Arthur, J. F., and Ball, M. D., 1979, Factors Influencing the entrapment of suspended material in the San Francisco Bay-Delta Estuary: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 143-174.

Inorganic suspended particulate matter, turbidity, particulate nutrients, phytoplankton, *Neomysis mercedis* (Holmes), certain other zooplankton, and juvenile striped bass (young-of-the-year), accumulate in an entrapment zone located in the upper San Francisco Bay-Delta estuary (Sacramento-San Joaquin River System). The location of this entrapment zone is regulated by the magnitude and the pattern of river inflow, as well as the tidal excursion. At Delta outflow indices of 20 m^3 s^{-1}; the zone was located 40-45 km upstream of its location at 1,800 m^3 s^{-1}; tidal movement of the zone is from 3 to 10 millimho·cm^{-1} (1-6$^{o}/_{oo}$ salinity). The concentration of constituents in the zone varied directly with Delta outflow, water depth, and tidal velocity. Depending on the constituent and environmental conditions at the time of measurement, the suspended-material concentration varied form as little as twice to as much as several hundred times the upstream or downstream concentration. The most significant environmental aspect of the entrapment zone may be that the quantity of phytoplankton and certain other estuarine biota appear to be enhanced when the zone is located in upper Suisun Bay. (Author)

Atwater, B. F., 1979, Ancient processes at the site of Southern San Francisco Bay: Movement of the crust and changes in sea-level: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 31-45.

Atwater relates the evolution of San Francisco Bay to the movement of lithospheric plates over the last 150 million years, and to the worldwide sea-level fluctuation during the past few million years which has caused episodic submergence and emergence of present Bay floor. He presents a scenario of events based on geologic and historic facts that lead to the configuration of present San Francisco Bay.

Atwater, B. F., Hedel, C. W., and Helley, E. J., 1977, Late Quaternary depositional history, Holocene sea-level changes, and vertical crustal movement, southern San Francisco Bay, California: U.S. Geological Professional Paper 1014, 15 p.

Sediments collected for bridge foundation studies in southern San Francisco Bay, Calif., record estuaries that formed during Sangamon (100,000 years ago) and post-Wisconsin (less than 10,000 years ago) high stands of sea level. The evolution of the present-day bay can be reconstructed from the elevations and C^{14} ages of plant remains from the 13 core samples collected.

Sea level in the vicinity of southern San Francisco Bay rose about 2 cm/yr from 9,500 to 8,000 years ago. The rate of relative sea-level rise then declined about tenfold from 8,000 to 6,000 years ago, and it has averaged 0.1-0.2 cm/yr from 6,000 years ago to the present. This submergence history indicates that the rising sea entered the Golden Gate 10,000-11,000 years ago and spread across land areas as rapidly as 30 m/yr until 80,000 years

ago. Subsequent shoreline changes were more gradual because of the decrease in rate of sea-level rise. (Author)

Atwater, B. F., 1987, Evidence for great Holocene earthquakes along the outer coast of Washington State: Science, v. 236, p. 942-944.

Intertidal mud has buried extensive, well-vegetated lowlands in westernmost Washington at least six times in the past 7000 years. Each burial was probably occasioned by rapid tectonic subsidence in the range of 0.5 to 2.0 meters. Anomalous sheets of sand atop at least three of the buried lowlands suggest that tsunamis resulted from the same events that caused the subsidence. These events may have been great earthquakes from the subduction zone between the Juan de Fuca and North America plates.

Audet, J. J., 1987, Resolving marine pollution data and information needs with a Federal network: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 976-992.

This paper concentrated on the potential Federal resources that are available to managers, decision-makers and others for obtaining up-to-date environmental information and data products for specific coastal marine pollution issues.

Ayala, L., Rahman, M. S., and Safaie, B., 1974, Functional design of a small craft harbor and recreational facilities on Limantour Spit: University of California, Water Resources Archives, University of California, Berkeley, CA., unpublished student paper, 81 p.

This report is a preliminary study of the design and construction of a small craft harbor and a small condominium community in Drakes Bay. The report includes: design details for the harbor entrance and jetty construction, shore protection structures and inner harbor moorings, bulkheads, and decking. Also included is an Environmental Impact Statement.

B

Baehr, J. C., 1953, Penetration of salt water and its effect on tidal areas of the United States of America: Proceeding 18th International Navigation Congress., v. Sec. II, p. 81-107.

A description of the salinity intrusion conditions of 20 estuarine areas, including San Francisco Bay and the Los Angeles area, California.

Baker, E. T., Cannon, G. A., Jr. and Curl, H. C., 1983, Particle transport processes in a small marine bay: Journal of Geophysical Research, Seattle, Wa., v. 88: 14, p. 9661-9669.

This study determined that Elliott Bay serves as a sediment sink for suspended material from Main Basin of Puget Sound due to the decrease in current speed into the Bay. The study is based on data collected utilizing moored sediment traps, and moored transmissometer/current meters.

Ball, M. D., and Arthur, J. F., 1979, Planktonic chlorophyll dynamics in the Northern San Francisco Bay and delta: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 265-285.

The results of a cooperative multi-agency study of phytoplankton biomass, measured as chlorophyll, in the Sacramento-San Joaquin Delta, Suisun Bay, Suisun Marsh, and San Pablo Bay during 1969 through 1977 is summarized. The factors influencing phytoplankton biomass distribution, occurrence, and distribution of dominant phytoplankton classes, and the chlorophyll - pheo-pigment relationships are discussed.

Balleraud, P., Chou, S. J., and Leslie, K., 1974, Feasibility report for the design, construction and operation of a small boat marina and condominium community on Limantour Spit and within Drakes Estero: University of California Water Resources Archives, University of California, Berkeley, unpublished student paper, 95 p.

A theoretical development project for the Drake's Estero,

Estero De Limantour Estuary. The report describes the planned construction, and evaluation of the environmental influences of the construction, and site factors including geology, topography, seismology, tides, beach profile, wind and wave climate, currents, meteorology, and other design considerations.

Barnby, M. A., Collins, J. N., and Resh, V. H., 1985, Aquatic microinvertebrate communities of natural and ditched potholes in a San Francisco Bay Salt marsh: Estuarine, Coastal and Shelf Science, 20, p. 331-348.

This is a study on the effects of mosquito control ditches on aquatic microinvertebrate populations and communities, such as the affect on population density and community structure of terrestrial plants, the abundance of a resident song sparrow, and both the population density and species richness of estuarine fish in San Francisco Bay, California.

Barnes, C. A., and Barder, R. G., 1955, Humboldt Bay, California- A literature survey: University of Washington, Department of Oceanography, Pullman, WA, 144 p.

A literature survey of publications concerned with Humboldt Bay, including: physical geography, cultural geography, precipitation, temperature, wind and weather, hydrology, regional geology, seismology, sedimentation, shoreline changes, hydrography, physical oceanography, tides, currents, waves, tsunamis, and marine biology.

Barnes, C. A., Duxbury, A. C., and Morse, B. A., 1972. Circulation and selected properties of the Columbia River effluent at sea: *in* Pruter, A.T., and. Alverson, P.L., eds., The Columbia River Estuary and adjacent ocean waters Seattle: University of Washington Press., Seattle, Wash., p. 41-80.

No Review

Barrick, R. C., and Prahl, F. G., 1987, Hydrocarbon geochemistry of the Puget Sound Region-III: Polycyclic Aromatic Hydrocarbons: *in* sediments: Estuarine, Coastal and Shelf Science, v. 25, p.175-191.

Ninety-six sediment samples were analyzed from 24 Pb^{210} dated cores to characterize sources and distributions of polycyclic aromatic hydrocarbon in Puget Sound. The results suggest that the main sources are areas of industrialization, urbanization, and rivers associated with coal bearing strata.

Bartsch-Winkler, S., and Ovenshine, A. T., 1984, Macrotidal subarctic environment of Turnagain and Knik Arms, upper Cook Inlet, Alaska: Sedimentology of the intertidal zone: Journal of Sedimentary Petrology, U.S.A., v. 54, p. 1221-1238.

An extensive sheet of silty sand crossed by tidal channels is exposed at low tide in Turnagain and Knik Arms, Alaska. Transportation and deposition of sediment composing this sheet is the result of strong tidal currents due to the maximum spring tidal range of approximately 11.4 m. In Turnagain and Knik Arms, the initiation of the flood tide is accompanied by the occurrence of a tidal bore that travels at a speed of 4 m/sec or more up the tidal channels. In intertidal environments in many parts of the world, physical processes of sedimentation are by the activities of the infauna. However, in Turnagain and Knik Arms, virtually no macrofauna exist, and so the area provides an opportunity to study depositional processes and sedimentary structures without the masking effects of bioturbation. Suspended-sediment values for Turnagain and Knik Arms are greatest in the summer months and nearest low-tide stages. Ice flows form during winter months and, in combination with the freezing of intertidal sediment to several meters of depth, have a significant effect on sediment dispersal and on the deepening and increased stability of the tidal channels. The intertidal sediment is mainly very well sorted, medium to very fine sand and coarse silt, with a notable paucity of gravel, coarse sand, and clay. Sediment accumulates in sandbars oriented parallel to the axis of the estuary. Textural and facies patterns reflect decreasing current energy, first, as a function of distance from the mouth of the estuary and, second, as a function of topographic elevation on the sandbars. The intertidal deposits in Turnagain Arm contain a transitional upward-fining sequence which is analogous to point bar and channel-bar successions described by other workers. The base of the sequence contains parallel-laminated silty sand. At the top of the sequence is a unit of organically rich parallel-laminated silt and sandy silt. This suite of sedimentary features and textures indicates changing current velocities and directions as bars emerge or are modified during ebb tide, and the vertical sequences could potentially be used to record intertidal bar erosion and aggradation by point-and channel-bar migration, a process carried out primarily by bed-load currents. (Author)

Barwis, J. H., 1975, Catalog of tidal inlet aerial photography: U.S. Army Corps of Engineers, Engineering Waterways Experiment Station, Vicksburg, Miss., 176 p.

Data on approximately 600 aerial photographic coverages of tidal inlets are presented in tabular form, along with information on how any given photograph may be obtained. The compilation covers inlets along the Atlantic, Gulf, and Pacific coasts of the contiguous U.S. coastline from 1938 to 1974, and includes the following information:

1. Inlet name
2. Geographic Coordinates
3. National Ocean Survey navigation chart covering inlet
4. Georef. grid square
5. Month and year of photography
6. Federal, state, or commercial agency holding film
7. Project number
8. Pertinent exposure numbers
9. Scale
10. Film type

Information is also given on sources of additional photography, and on obtaining photography of beach areas between any two inlets. An index, by Corps of Engineer District, is also presented.

______1976, Annotated bibliography on the geologic, hydraulic, and engineering aspects of tidal inlets: U.S. Army Corps of Engineers, Engineering Waterways Experiment Station, Vicksburg, Miss., 333 p.

This bibliography presents abstracts and annotations 1000 published and unpublished reports, dated 1973 and earlier. The publications focus on the geologic and engineering aspects of tidal inlets. References are given on tidal hydraulics, engineering structures, littoral processes, stratigraphy and geologic history, coastal aerial photography, and Corps of Engineers reports of investigation of individual inlets.

Bascom, W. J., 1954, The control of stream outlets by wave refraction, Journal of Geology, v. 62, no. 6, p. 600-605.

Wave refraction is discussed for three general models, which reflect conditions found at the mouths of the Sooes River, Ozette River, Coos River, Coquille River, Garcia River, Quillayute River, Raft River, Neskowin River, and the entrances to San Diego Bay, Morro Bay, and Mugu Lagoon. Explains the theory and construction of wave refraction diagrams, and the effects of refracted waves on several coastal configurations involving inlets.

Bella, D. A., and Grenney, W. J., 1972, Estimating dispersion coefficients in estuaries; Technical Note: Journal of the Hydraulics Division, American Society of Civil engineers, v. 98, no. HY3, p. 583-589.

Three methods of computing one-dimensional mixing in estuaries based on salinity data are examined. The errors associated with steady state models are discussed.

Bennett, J. T., and Peterson, M. L., 1979, Accuracy of the unsupported lead-210 dating technique in oxic estuarine sediments: Eos (American Geophysical Union), San Francisco, Calif., American Geophysical Union, v. 60: 46, p. 852.

Sediments from Dabob Bay, Washington were investigated to determine the accuracy of the unsupported lead-210 dating techniques. Sediment samples were collected from bottom samples and compared with samples of settling particulate material collected using sediment traps moored 50 to 60 m above the bottom.

Benninger, L. K., Lewis,D. M., and Turekian, K. K., 1975, The use of natural Pb-210 as a heavy metal tracer in the river-estuarine system: *in* Church, T. M., ed., Marine Chemistry in the Coastal Environment: American Chemical Society Monograms, v. 18, p. 202-210.

The naturally occurring radioactive isotope of lead, Pb-210, provides a valuable tracer for the behavior of heavy metals in the soil-stream-estuary system. Since it is continuously produced only as a member of the U-238 decay series, it is free from the problems of environmental or analytical contamination so often encountered in stable heavy metal studies. In addition, because of its half-life of about 22 years it is useful not only as a tracer but also as a dating tool to monitor events of the past 100 years.

Lead-210 can be supplied to the soil-stream-estuary system through two pathways: (1) atmospheric Rn-222 released from soils to the atmosphere decays to Pb-210 which then follows the fate of aerosols, ultimately to be returned to the Earth's surface via atmospheric precipitation; (2) terrigenous--Ra-226 in soils, rocks, streams and groundwater generates Pb-210 which is in some degree subject to mobilization.

Berquist, J. R., 1978, Depositional history and fault-related studies, Bolinas Lagoon, California: Ph.D., Stanford, California, Stanford University, v. 248 , 248 p.

This report investigates the depositional system of Bolinas Lagoon. An emphasis is placed on the effects of the 1906 earthquake and logging in the mid-nineteenth century. Topographic surveys taken from 1854 to 1950 and previously unpublished photographs taken from 1906 to 1977 are used to elucidate the changing morphologies of the lagoon and bluffs near the lagoon. Seismic profiling and coring were used to determine the low-resolution, long-time-frame depositional history.

Four of the major points made are: (1) cliffs to the northeast of the lagoon receded 30-70 m between 1854 and 1929 and are continuing to erode, (2) mid-nineteenth-century redwood logging correlates with sediment accumulation rates of 1.3 to 1.9 cm/yr. that are three to six times higher than post-1906 rates of 0.3 to 0.4 cm/yr, (3) up to 115 cm of sediment has accumulated since 1849 in some parts of the lagoon, (4) an anomalously coarse-grained sediment was found during coring that may correlate with the 1906 earthquake. (Jaffe)

Berquist, J. R., 1978, Depositional history and fault-related studies, Bolinas Lagoon, California: U.S. Geological Survey Open-File Report 78-802, p. 164.

Blume, J. A., and Associates, 1964, Report on proposed hydraulic model study of Bolinas Harbor: Bolinas Harbor District, prepared for the Board of Commissioners, Bolinas, California.

The purpose of this report is to present; (1) basic oceanographic data applicable to the immediate area of the site of Bolinas Harbor entrance; (2) information concerning two schemes for the development of the entrance into the inner basin; (3) outline a series of recommended hydraulic model investigations to compare the relative degree of sheltering provided by the two schemes during periods of severe storm wave activity and to ascertain how these coastal structures will effect and be effected by the littoral process.

Boatman, C. D., and Buchak, E. M., 1987, Application of a ecosystem/water quality model as a tool for managing estuarine water quality: Coastal Zone '87, v. 4, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3932-3945.

Budd Inlet, a small partially mixed estuary located in Puget Sound, Washington was studied to identify the cause of low dissolved oxygen concentrations which occur in the inlet and evaluate the effects of existing and proposed effluent discharge from a wastewater treatment facility.

Boehlert, G. W., Morgan, J. B., and Yoklavich, M. M., 1983, Effects of volcanic ash in estuarine sediment on the early life history stage of the Pacific herring, *Clupea Narengus pallosi*: Water Resources Research Institute, Oregon State University, Corvallis, Oregon, 72 p.

Experiments were conducted on larvae of Pacific Herring at various developmental stages. The larvae were collected at the Columbia River and in controlled settings exposed to ashes. The effects were minimal.

Boggs, S., and Jones, C. A., 1976, Seasonal reversal of flood-tide dominant sediment transport in a small Oregon estuary: Geological Society of America Bulletin, v. 87, p.419-426.

This study focused on the transport of marine sediment within the estuary and the ability of the estuary to trap and retain sediment from both fluvial and marine sources. Sediment movement was investigated by use of fluorescent tracers and by study of sedimentary structures and heavy mineral assemblages. The bathymetry of the estuary was mapped, and salinity, temperature, and current velocity were measured.

Bondareff, J. M., and Pittman, L., 1987, Recent developments under the Coastal Zone Management Act; Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 490-503.

This is a development summary of the Coastal Zone Management Act and the grants provided to the states to administer management programs in their areas. The paper discusses problems encountered in the courts to administer the programs.

Borgeld, J. C., Creager, J. S., Walter, S. R., and Roy, E. H., 1978, A geological investigation of the sedimentary environment at sites E, G, and H near the mouth of the Columbia River: Seattle:

Department of Oceanography, University of Washington, Final Report to Department the Army, Corps of Engineers, Portland District, Contract no. DACW57-77-C-0035, 71 leaves, plus 75 leaves of plates.

No Review

Broenkow, W. W., and Smith, R. E., 1972, Hydrographic observation in Elkhorn Slough and Moss Landing Harbor, California, October 1970 to November 1971: Moss Landing Marine Laboratories, Annual Report, Part 3, July, 74 p.

Seasonal changes in water chemistry of Elkhorn Slough and Moss Landing Harbor were monitored beginning in October of 1970. The data (October, 1970 - November, 1971) can be used in determining the distribution through flushing and mixing mechanisms of domestic and industrial effluents, and their effects on the chemical profile of the slough and harbor.

Brogdon, N. J., Jr., 1972, Grays Harbor Estuary, Washington; report 2, north jetty study, hydraulic model investigation: U.S. Waterways Experiment Station, Vicksburg, VA., U. S. Army Engineer Waterways Experiment Station Tech. Report H-72-2, Report 2, 8 p., plus 122 leaves of plates.

This study focused on determining the effects of several plans for the rehabilitation of the North Jetty of the entrance to Grays Harbor Estuary. The test results consist of current velocity, tidal height, and salinity measurements; shoaling patterns in the entrance area; dye dispersion characteristics; and photographs of surface current patterns.

Brown, H. E., and Clark, G. D.,1958, Closure of the breach in Bay Ocean Peninsula, Oregon: Proceedings of the American Society of Civil Engineers, Jour. Waterways and Harbors Div., v. 84, no. W.W. 1, paper 1515, 20 p.

This paper describes how Bayocean Peninsula, a natural sand, gravel, and boulder barrier about 4 miles in length which separated Tillamook Bay from the Pacific Ocean, was breached by ocean storm waves. The paper presents the history of erosion and the design and construction of rock fall and sand fill closure structures.

Brown, W. M., III,1971, A preliminary investigation of suspended-sand discharge of the Russian River, Sonoma County, California: U.S. Geological Survey, Water Resources Division, Sacramento, CA., Open-File Report no. 11 p.

Preliminary studies show that the suspended -sand discharge of the Russian River to its estuary reach was an estimated 510,000 tons per year, or about 380,000 cubic yards per year, for a 5-year period beginning October 1, 1964. A need for more detailed sand-transport analyses is indicated by a prevailing instability in sediment-transport, water-discharge relations because of recent flood effects, the complexity of the regulated river system an insufficiency of pertinent sand-transport data, and the unknowns of estuary processes.

_______ 1971, Preliminary investigation of suspended sand discharge of the Russian River: U.S. Geological Survey Open-File Report , 24 p.

This report compiles periodic observations from November 1965 to March 1967 and daily observations from April 1967 to September 1969 to determine the suspended-sand discharge of the Russian River to the river's estuary. An estimated 380,000 cubic yards per year, for a 5-year period beginning October 1, 1964, reached the estuary. Initially the Russian River's sand discharge was estimated using a rating curve of suspended-sand discharge vs. average daily discharge. However, this method failed because of too few data points (25) resulting in a poorly defined relationship at high discharges, where most of the sand transport is expected to occur. So, the total suspended-sediment discharge was used and an assumed 10 percent sand or coarser component to estimate the sand transport at Guerneville gaging station. This discharge was extrapolated to a discharge at the estuary based on drainage area.

Two notes of caution about the report: (1) because of the complexity of sediment processes in the estuary, it is not clear how much of the sediment reaching the estuary ends up in the ocean, and (2) the data is effected by the large storms of 1964-65. (Jaffe)

________1973, Erosion processes, fluvial sediment transport, and reservoir sedimentation in a part of the Newell and Zayante Creek Basins, Santa Cruz County, California: Prepared in cooperation with the City of Santa Cruz, U.S. Geological Survey Water Resources Open-File report, order no. 71-58, 31 p.

Sediment transport in the Newell and Zayante basins, located about eight miles north of Santa Cruz, California, were estimated from (1) a reservoir survey of Loch Lomand in 1971 that was compared with a preconstruction survey of 1960, and (2) sampling of sediment transported in suspension by Zayante Creek during the 1970 and 1971 water years. At least 46 acre-feet of sediment transported in suspension accumulated in Loch Lomond in a 10-year period, and an unmeasured quantity of very fine sediment in the form of a thin layer over much of the reservoir bottom was observed. This sediment occupied less than 1 percent of the original capacity of Loch Lomond, but the value of measured sediment deposition is probably conservative in view of the unmeasured deposits observed and a reservoir trap efficiency of about 95 percent

________ 1973, Streamflow, sediment, and turbidity in the Mad River Basin, Humboldt and Trinity Counties, California: U.S. Geological Survey Water-Resources Investigation no. 36-73, 57 p.

Streamflow, sediment discharge, and turbidity characteristics, as they relate to a proposed reservoir on the Mad River near Butler Valley and the river system downstream from it, are addressed in this report. The findings are based on using pre-1970 data from 15 sites in the Mad River basin and additional data collected at three of the sites between 1970 and 1973. There is no grain-size data presented in this report.

The major findings of this study were that: (1) the Mad River discharged and average suspended-sediment load of 2,710,000 tons per year during a 13-year period beginning October 1957, (2) about 66 percent of the suspended sediment was derived from sources upstream from a proposed reservoir site on the Mad River near Butler Valley, and (3) the high rate of suspended-sediment discharge and the corresponding sediment-induced turbidity of the streamflow constitute potential problems in the operation of the proposed reservoir.

________1975, Sediment transport, turbidity, channel configuration, and possible effects of impoundment of the Mad River, Humboldt County, California: U.S. Geological Survey Water-Resources Investigation no. 26-75, 63 p.

Sediment-transport conditions were determined at stations on the Mad River near Arcata and Kneeland. Using a release-flow model and an empirical equation, the long-term suspended-sediment discharge at Kneeland was estimated to be about 60 percent of the long-term suspended-sediment discharge at the Arcata station. Long-term (100-yr) suspended-sediment discharge at Mad River near Arcata is computed to be 2,220,000 ton/yr, of which 615,000 ton/yr is sand size fraction. During 1971-72, bedload transport in the Mad River near Arcata was an estimated 60,000 ton/yr or about 2 percent of the suspended-sediment discharge.

The study of the proposed impoundment determined that: (1) release flow could transport the expected inflow of sediment particles less than 2 millimeters in diameter for the reach of the river downstream from the impoundment site, (2) release flows could transport about 130,000 tons per year of bed material particles less than 76 millimeters in diameter, (3) release flows could be expected to degrade the channel for about 24 kilometers downstream from the impoundment, and (4) turbidity of release flows would be about the same as pre-impoundment turbidity for an average year. (Author)

Brown, W. M., III, and Ritter, J. R., 1971, Sediment transport and turbidity in the Eel River Basin, CA.: U.S. Geological Survey Water-Supply Paper 1986, 70 p.

The Eel River has the highest recorded average annual suspended sediment yield per square mile of drainage area of any river its size or larger in the United States. This yield, in tons per square mile, is more than 15 times that of the Mississippi River and more than four times that of the Colorado River. During the 10-year period beginning October 1957, the Eel River discharged an average suspended load of more than 31 million tons per year according to measurements made at the Eel River at Scotia, the station farthest downstream on the main channel of the Eel River. An additional suspended-sediment discharge averaging more than 1/2 million tons per year during the same period was derived from the basin of the Van Duzen River, a tributary which enters the Eel River a few miles downstream from Scotia. This project also determined the quantity of sediment transported by streams in different areas of the Eel River basin in order to compare sediment yields among selected regions of the basin, and studied the relation of turbidity to the concentration of suspended sediment.

Brown, W. M., III, and Jackson, L. E., Jr., 1973, Preliminary map of erosional and depositional provinces and descriptions of sediment-transport processes in south and central San Francisco Bay Region, CA: U.S. Geological Survey Miscellaneous Field Studies Map MF-515, scale 1:125,000, 3 sheets, 21 p.

This is a preliminary report addressing the sediment system of the south and central San Francisco Bay region. The text describes the major factors--geology and topography, soils, vegetation, communities, land use, rainfall and runoff, and erodibility--affecting the sediment system and how these factors interact within each province with respect to the sediment system. Quantitative information is provided on the three map sheets which include case studies of typical processes of the sediment system in the study area. (Jaffe)

Browning, B. M., 1972, The natural resources of Elkhorn Slough, their present and future use: California Department of Fish and Game, Sacramento, CA, Coastal Wetland Series, no. 4, 105 p. and appendices

This report summarizes the history of Elkhorn Slough, ecological attractions, educational value, and problems facing its continued existence.

Brzezinski, M. A., and Holton, R. L., 1983, A report on the macroinvertebrates of the Columbia River Estuary found in deposits of volcanic ash from the May 18, 1980 eruption of Mount St. Helens: Estuaries, v. 6, no. 2, p. 172-175.

Following the May 18, 1980 eruption of Mount St. Helens, up to 11.5 cm of volcanic ash was deposited in sections of the upper Columbia River estuary. A survey of the benthic infauna of this area indicates that most taxa were able to inhabit the ash, suggesting that the material is nontoxic to most groups. However, the abundance of the taxa examined was dependent on the distribution of the ash within the sediment column. Except for the oligochaetes, animal densities were reduced in areas where volcanic ash lay atop the sediment surface as compared to areas where the ash layer had been buried beneath, or mixed with sands and/or muds. The ash apparently affects the infauna through some physical means, possibly related to its fine grain size. (Author)

Burgy, R. H., 1970, Bolinas Lagoon Study, the watershed, runoff and sedimentation, The Conservation Foundation, Washington, D.C.

This study identified land-use factors beneficially or adversely influencing the environment. Gaged sedimentation of Olema Creek and Pine Gulch Creek. Used DH-48 suspended sediment sampler. Maps of drainage areas and surface soil types are included. (U. S. Army Corps of Engineers)

Burke, J. E., 1981, Coastal access analysis in California: An assessment of recreation transportation analysis in coastal planning: University of California, Berkeley, Institute of Transportation Studies, 85 p., ITS-RR-81-7.

The purpose of this report is to determine how coastal access has been analyzed from a transportation planning perspective. Included is a critical review of seven transportation studies undertaken with local coastal planning programs in California. This report investigates the methodologies that can be used to address this issue. A nontechnical approach was used.

Burt, W. V., and Marriage, L. D., 1957, Computation of pollution in the Yaquina River Estuary: Sewage and Industrial Waste, v. 29, no 12, p 1385-1385.
A one-dimensional steady state mixing model was used to compute potential pollution in the Yaquina estuary.

Burt, W. V., and McAllister, B., 1958, Hydrography of Oregon estuaries, June 1956 to September 1958: Office of Naval Research Reference 58-6, School of Science, Oregon State College, Corvallis, Oregon, 18 p.

Gives temperature and salinity data in tabulated form for Alsea, Columbia, Coos, Nehalem, Netarts, Siletz, Sisuslaw, Tillamook, Umpqua, and Yaquina estuaries between June 1956 and September 1958.

Burt, W. V., and McAllister, B., 1959, Recent studies in the hydrology of Oregon estuaries: Research Briefs, v. 7, no. 1, Fish Commission of Oregon, p. 14-27.

Classifies Oregon estuaries by mixing characteristics and mentions biological applications and pollution and engineering problems.

Burt, W. V., and Queen, J., 1957, Tidal overturning in estuaries: Science, no. 8, v. 126, p. 973-974.

A density overturning which provides vertical mixing during flood tide is described for Coos Bay, Oregon.

Byrne, J. V., and Kulm, L. D., 1967, Natural indicators of estuarine sediment movement: Proc. American Soc. Civ. Eng., v. 94, paper 5924, Jour. Waterways and Harbors Div., no. WW 2, Paper 5220, p. 242-244.

Sediment movement within Yaquina Bay, Oregon, has been determined through the use of sediment texture and composition and related to the hydrography of the estuarine system. These natural indicators reveal at least two major sources of sediment: a river source and a beach or nearshore source. Marine sands are introduced into the bay by tidal currents or by onshore winds and transported upstream 6 miles from the bay entrance. Sands from the Yaquina River remain within the estuary while the suspended silts and clays are deposited primarily on tidal flats or carried out to sea on the ebb tide

Sedimentation in Yaquina Bay appears to be largely seasonal. Maximum deposition occurs during the winter and spring when river runoff is highest. During these seasons littoral drift, coastal winds, and estuarine hydrographic systems promote the transport of beach or nearshore marine and dune sands into the estuary. During summer and fall, deposition is slight due to less favorable climatic and hydrographic conditions.

C

Caldwell, J. M., 1956, Wave action and sand movement near Anaheim Bay, California: Beach Erosion Board, Tech. Memo. 68, 21 p.

This paper presents the results of a study on the hydrographic, wave characteristics, and other physical data of the stretch of beach from Surfside to the mouth of the Santa Ana River, California. The purpose of the study was to ascertain why severe erosion of the beach immediately to the south of Anaheim Bay occurred shortly after the construction of the jetties at the mouth of the bay. The results indicate that longshore drift was not considered prior to the construction of the jetties.

California Advisory Commission on Marine and Coastal Resources, 1970, Proceedings of the Sixth Meeting of the California Advisory Commission on Marine and Coastal resources: California Advisory Commission on Marine and Coastal Resources, Sacramento, CA, 119 p.

Discussion held by various department leaders and committee heads about the development of California's Coastal Environment. Included were budgets, coastal management, offshore drilling, and pesticide use.

______1970, Proceedings of the Eighth Meeting of the California Advisory Commission on Marine and Coastal resources: California Advisory Commission on Marine and Coastal Resources, Sacramento, CA, 86 p.

Report of proceedings on coastal zone management from the standpoint of proposed and enacted legislation. Various reports presented by department heads.

______ 1970, Reports on the Proceedings of the Ninth and Tenth Meeting of the California Advisory Commission on Marine and Coastal resources. Ninth and Tenth California Advisory Commission on Marine and Coastal Resources, Sacramento, CA, 133 p.

Report discussing policy issues, legislation, budget, and the role of San Francisco Bay Conservation and Development Commission.

______1971, Proceedings of the Twelfth Meeting of the California Advisory Commission on Marine and Coastal resources: California Advisory Commission on Marine and Coastal Resources, Sacramento, CA, 40 p.

Report regarding the 1971 Coastal Management Legislation. Presentations given by various department heads and committee leaders. State policy and developmental issues are discussed.

California Central Coast Regional Commission, 1974, Summary, intensity of development; an element of the coastal plan: California Central Coast Regional Commission, illustrations, archived at the university of California, Berkeley, Water Resources Archives, 54 p.

This report describes the intensity element that was derived from the requirements of the California Coastal Zone Conservation Act.

_______1975, Tentative findings and policies to be recommended by the Central Coast Regional Commission to the California Coastal Zone Conservation Commission: California Central Coast Regional Commission, Unpublished, archived at the University of California, Berkeley, Water Resources Archives, 33 p.

Findings concerning the California Coast such as hazardous areas for development, population levels, the coast as a public resource. The Central Coast Regional Commission suggests policies to regulate development in urban areas, preserve critical coastal resources, and ownership of land along the shoreline.

California Coastal Alliance, 1972, Newsletters, Fact Sheets, Miscellaneous Pamphlets: California Coastal Alliance, Woodside, California, 1 envelope of loose sheets.

Literature prepared for the public to inform them of present proposals concerning the coastal zone. A general news report of pertinent stories and information.

California State Coastal Commission, 1972, Comprehensive Ocean Area Plan (COAP): California Coastal Zone Commission, San Francisco, California, 1 v., 70 p.

A study undertaken to provide a general understanding of California's coastal zone. Concerned with planning and management. A description of the state's natural environment, an analysis of selected land and water uses and COAP recommendations. Also provided are sample maps and photos.

_______1977, Local Coastal Program Regulations: California Coastal Zone Commission, San Francisco, California, 58 p.

These regulations prescribe the procedures for the preparation, approval, and amendment of any local coastal program adopted by the California Coastal Commission. The regulations include a common methodology for local coastal programs.

_______1979, Coastal News; California Coastal Commission, San Francisco, California, various volumes from 1978 and 1979 each about 6-8 p.

This is a newsletter from the California Coastal Commission which reports the coastal news such as latest legislative action, workshops and court decisions concerning the coast.

California Coastal Zone Conservation Commission, 1974, Recreation: California Coastal Zone Conservation Commission, San Francisco, California, 52 p.

This paper lists the state wide findings concerning recreation on the California Coast. Included are discussions of future recreation use of the coast, conflicts between recreational activities, economic importance of recreation, and the policies adopted by the State in response to the findings.

_______1974, The Coastal Land Environment: California Coastal Zone Conservation Commission, San Francisco, California, 81 p.

This is a report of state wide findings and policies concerning the coastal land environment as a natural system. It is concerned with coastal natural areas, including salt marshes; coastal streams and flood plains; coastal mineral resources; coastal soils and their special values for agricultural and forestry use; the coastal air shed as directly influenced by the ocean.

California Department of Water Resources, 1969, Eel River development alternatives, supporting studies: California Department of Water Resources, Sacramento, CA, Bulletin no. 172, appendix, 120 p.

Outlines the procedures and criteria used in the study of Eel River development alternatives, and gives details of the various alternatives. Includes economic criteria, geology and design, water supply studies, flood control studies, environmental studies, and a discussion of each project alternative.

_______ 1969, Eel River development alternatives: California Department of Water Resources, Sacramento, CA, Bulletin no. 172, 36 p.

The report summarizes the cost, water supply, flood control, and recreation affects of the principal alternatives. In addition, the report contains discussions of some of the environmental effects of these alternatives, such as impact on fish and wildlife, land inundated, and people displaced.

California State Federal Inter-agency Group, 1969, Eel and Mad River Basins, Master Plan Hydrology: California State-Federal Inter-Agency group., Sacramento, CA, 99 p.

This report presents tabulations of estimated unimpaired runoff for the 56-year period from 1911 to 1966 at gaging stations and damsites within the Eel and Mad River Basins. These data are the results of a detailed reevaluation of surface runoff within the basins, superseding runoff estimates of previous studies cited in chapter 1. The scope of this study is limited to long-term surface runoff estimates, with no consideration of flood hydrology, flow duration, or water requirements. Detailed discussions of these parameters can be found in the Bulletin no. 136 office report, "Project Hydrology", and in Bulletin no. 142-1. (CCSTWS)

Callaway, R. J., 1961, Physical and chemical oceanographic data, Umpqua River estuary, Oregon, Part II: January 25-26, 1961: U.S. Department of Health Education and Welfare, Portland Oregon, 9 p. Abstract.

Oceanographic data collected in the Umpqua River estuary, Oregon, during the period January 25-26, 1961 are tabulated. Temperature, salinity, velocity, and dissolved oxygen were observed at various depths over the tidal cycle at one station. Temperature and salinity observations were made from the ocean to

11.5 miles upstream upon completion of the 25 hour station. A brief discussion of results is presented.

________ 1961, Physical and chemical oceanographic data, Umpqua River estuary, Oregon, Part III: March 21-22, 1961: U.S. Department of Health Education and Welfare, Portland Oregon, 9 p. and tables.

Oceanographic data collected in the Umpqua River estuary, Oregon, during the period March 21-22, 1961 are tabulated. Temperature, salinity, velocity, and dissolved oxygen were observed at various depths over one tidal cycle at a mid channel anchor station located near the mouth of the river.

________1971, Applications of some numerical models to Pacific Northwest estuaries: *in* Technical Conference on Estuaries of the Pacific Northwest 1971, Oregon State University, Corvallis, Experiment Station Circular no., 42, p. 27-29.

No Review

________1971, Applications of some numerical models to Pacific Northwest estuaries: *in* Proceedings, Technical Conference on Estuaries of the Pacific Northwest, Oregon State University, Corvallis, Experiment Station Circular no., 44, 343 p.

No Review

Canning, D. J., and Hashim, W. A., 1987, Nisqually River management plan: Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3293-3305.

The Nisqually River was dedicated as a wildlife refuge under Substitute House Bill 323 intended to protect the delta and river. This paper is a summary of procedural solutions to the legislative mandate, and resulting solutions to management plans and issues.

Carlson, P. R., and McCulloch, D. S., 1974, Aerial observations of suspended-sediment plumes in San Francisco Bay and the adjacent Pacific Ocean: U.S. Geological Survey Journal Research, v. 2, no.

5, p. 519-526.

Aerial observations of suspended-sediment patterns in the San Francisco Bay estuary system, together with shipboard water-property measurements, show that a plume of highly turbid, low salinity water associated with the Sacramento-San Joaquin River system bifurcates in the central bay. During a winter storm period when Sacramento-San Joaquin discharge was about 7800 cu. m/s, one lobe of the plume flowed 15 km south of the San Francisco-Oakland Bay Bridge while the main lobe flowed seaward 30 km, covering an area of about 900 sq. km. Salinity differences of 1-2 parts per thousand and light transmission differences of 15-20 percent were measured between the plume and the ambient waters. As the discharge from the Sacramento-San Joaquin River system decreased to 100 cu. m/s, the surface area of the plum in the Gulf of the Farallones decreased to about 100 sq. km.

Casebier, T. A., Lawrence, J. T., 1973, Physical dynamics of Arcata Bay: Humboldt State University, Arcata, Ca., In fulfillment of directed study requirements, Robert Thompson, Advisor, Spring 1973.

Investigation of the physical parameters of the circulation dynamics within Arcata Bay. The oscillatory tidal motion, establishing hydraulic gradients, is seen as the dominant factor governing transport flow. A numerical method for predicting current velocities is applied. Salinity distribution of the Arcata Bay-Sonoma Channel system is recorded. Salinity is generally shown to be a function of open ocean conditions, Eel River flow and drainage carried directly into the Bay by a complex system of streams and canals.

Chan, G. L., 1971, A survey of marine life on the Pt. Reyes National Seashore Park: Kentfield, California, College of Marin, 79 p.

Dr. Gordon Chan compiled a baseline study of the major marine organisms from data gathered by his College of Marin students on subtidal and intertidal marine fauna and flora. The study was based on faunal and floral counts along nine transect lines within Point Reyes National Seashore. The report includes base maps with lists of organisms found as well as discussion of interesting aspects of each site, and difficulties encountered. The study ran two profile lines in Drakes Estero and discussed briefly the fauna of Abbotts Lagoon. This is a very good study that gives an overall view of the types of organisms found in the area.

________ 1972, A study of the effects of the San Francisco Oil Spill on Marine Organisms, Part I: Unpublished Paper, College of Marin, Kentfield, California.

This paper addresses the effects of the oil spill that occurred on January 18, 1971 when two Standard Oil vessels collided near the Golden Gate Bridge. The spill released 840,000 gallons of Bunker C fuel which was washed up on intertidal shore of the area north and south of the bridge.

Chang, H. H., and Stow, D. A., 1988, Sediment delivery in a semi-arid coastal stream: Journal of Hydrology, v. 99, p. 201-214.

The transport and yield of bed sediment in Buena Vista Creek have been studied. Spatial and temporal variations of sediment characteristics were simulated using a calibrated mathematical model for time-dependent fluvial process-response. The simulation results are useful for identifying stream reaches of potential erosion and deposition; they are also employed to obtain mean annual yields at different stream locations. The study illustrates how channel storage of sediment, a major factor affecting sediment yield, can be quantified by an erodible boundary model. Mathematical simulation also accounts for storage effects caused by the works of man, a task that cannot be easily accomplished by other methods.

The fluvial model simulates the interrelated changes in channel-bed profile and channel width based upon the river's tendency to seek uniformities in sediment discharge and power expenditure. Scour and fill of the channel bed are accompanied by significant changes in channel width, which may contribute more to sediment storage. Thus, sediment routing must be based upon an erodible-boundary model, but not and erodible-bed model.

Cheng, G. L., and Gartner, J. W., 1985, Harmonic analysis of tides and tidal currents in South San Francisco Bay, California: Estuarine, Coastal and Shelf Science, v. 21, p. 57-74.

Tidal currents were monitored using current-meter moorings in South San Francisco bay, and harmonically analyzed with respect to water level and current velocity. The study show that tidal current in the South Bay is bi-directional and that the magnitude of tidal current are correlated with the basin bathymetry. Also the residual current patterns vary between summer and winter months as a function of prevailing winds.

________ 1982, Tides, tidal and residual circulation in South San Francisco Bay, California: EOS, American Geophysical Union, (Abstract), v. 63, no. 45, pg 946.

This paper presents the results of water level observations from tide stations and current observations from current meter moorings in South San Francisco Bay (South Bay). The data were harmonically analyzed using a least squares method without inference. The year long records suggest 16 harmonic constituents of tidal phases within the South Bay. The analyses show further that the Eulerian residual circulation deduced from the current meter data showed a persistent anti-clockwise gyre to the west during summer months due to westerly prevailing wind. Opposite patterns have been observed during winter when there was no prevailing wind.

Cherry, J. A., 1964, Sand movement along a portion of the northern California coast: University of California, Hydrology Laboratory, Report Hel 4-4, Berkeley, University of California, v. Hel 4-4, 150 p.

This study looked at the long-term beach and offshore sand movement along the portion of the northern California coast between Drakes Bay and the Russian River. An analysis of hindcast

swell data, availability of sand for transport, refraction diagrams, and knowledge of stable shapes of sedimentary coastlines suggested that under present conditions little net longshore movement of sand occurs in the area, and that the beaches are generally in equilibrium with negligible supply or loss of sand. The surface sediment samples were collected from beaches and offshore zones. The study outlined twelve sedimentary petrologic provinces on the basis of the patterns of heavy mineral distribution.

________ 1964, Sand movement along a portion of the northern California coast: U.S. Army Corps of Engineers, Coastal Engineering Research Center, Washington, D.C., Report no. TM-14, (AD-628 866), 129 p.

This study utilized surface sand samples from beach and offshore zones to study the long-term beach and offshore sand movement along a portion of the northern California coast between Drakes Bay and the Russian River. The study suggest that twelve sedimentary petrologic provinces exists during the present sedimentation period based on heavy mineral distribution. The petrologic analysis were combined with hindcast swell data, data on the availability of sand for transport, refraction diagrams and the knowledge of stable shapes of sedimentary coastlines to suggest that under present conditions little net longshore movement of sand occurs in the study area. The study also suggest that the beaches within the area are generally in equilibrium with negligible supply or loss of sand.

________ 1965, Sand movement near Point Reyes, California: Shore and Beach, American Shore and Beach Preservation Association, O'Brien Hall, University of California, Berkeley, CA., 5 p.

The heavy mineral and grain size characteristics of the beach and offshore sand near Point Reyes, California, indicate that very little net sand movement occurs along the beaches in the area. In effect, Point Reyes acts as a barrier to littoral sand transport. A wave refraction analysis show that the predominant

ocean swell breaks essentially parallel to the beaches near Point Reyes.

________ 1966, Sand Movement along Equilibrium Beaches North of San Francisco: Journal of Sedimentary Petrology, v. 36, no. 2, p. 341-357.

Techniques of tracing heavy minerals and predictions based on swell data were used on equilibrium beaches along Point Reyes to suggest that no significant supply of sediment is being added to the beaches at the time of this study.

Chin, J. L. and White, L. A., 1988, Sedimentary furrows in San Francisco Bay, California -- characteristics and initial observations: EOS, Transactions, American Geophysical Union, v. 69, no. 44, p. 1258.

Longitudinal bedforms detected using side-scan sonar in San Francisco Bay are documented. These bedforms called sedimentary furrows are found only in the main tidal channel in water depths of 7-18 meters of South San Francisco Bay and on Pinole Shoal in San Pablo Bay.

Clark, J. E., Brabb, E. H., Greene, G., and Ross, D., 1984, Geology of Point Reyes Peninsula and implications for San Gregorio Fault history: Tectonics and Sedimentation Along The California Margin, Society of Economic Paleontologist and Mineralogist, v. no. 38, p. 67-86.

On land mapping and offshore seismic profiling of the Point Reyes area enable the recognition of three distinct facies within the granitic basement rocks and recognition of two Neogene lithogenetic sequences that are separated by a regional unconformity--a middle and upper Miocene sequence (Laird Sandstone and Monterey Formation) and an upper Miocene and Pliocene sequence (Santa Margarita Sandstone, Santa Cruz Mudstone, and Purisima

Formation).

Comparison of similar basement and Tertiary sedimentary rocks in the Point Reyes, Santa Cruz Mountains, and Monterey areas indicates about 150 km (90 miles) of right-slip along the San Gregorio fault since late Miocene time, rather than the 70-115 Km (43-70 miles) slip for the San Andreas fault produces a total displacement of about 455 km (280 miles) for the San Andreas fault north of San Francisco. (Author)

Clay, R. H., 1967, Study program of Willapa Bay, Washington: U.S. Army Engineer District, Seattle; 59th Mtg. Com. on Tidal Hyd., 14-16 Feb., 1967, 7 p.

This report outlines the objectives of a feasibility study to determine and evaluate the most achievable method of erosion control, principally in the Cape Shoalwater area. Information on Willapa River and harbor, and Naselle River, of southwestern Washington is presented. The feasibility study had to determine navigation needs with a view toward an existing navigation project and report to the Committee on Tidal Hydraulics on the proposed plan of study.

The study utilized available data on the topography of the study area, condition surveys, dredging records, and erosion studies. Included in the study is historic information on the migration of channels in Willapa Bay, and the amount erosion that at Cape Shoalwater undergone.

Clifton, H. E., 1982, Estuarine Deposits: *in* Scholle, P. A., and Spearing, D.,eds.,Sandstone Depositional Environments, Memoir American Association of Petroleum Geologists, Tulsa, Oklahoma, 74101, U.S.A., v. 31, p. 179-184.

This paper is based on analysis of depositional facies in Willapa Bay, Washington. The estuarine environment is described in terms of morphology (tidal flats, tidal channels, bedforms), processes (tides, waves, river discharge), sediment texture (sources, sorting, areal distribution), sedimentary structures (physical verses biological, location and type verses tidal influence and sediment texture), vertical sequences (migration patterns of tidal channels), estuary fill complexes, and economic aspects (hydrocarbon source potential). The paper briefly describes how the modern estuarine environment can be identified in the rock record.

________ 1983. Discrimination between subtidal and intertidal facies in Pleistocene deposits, Willapa Bay, Washington. Journal of Sedimentary Petrology, v. 53, p. 353-370.

Through the use of box coring and tube coring in a variety of depositional settings from the estuary inlet to the upper intertidal to supratidal marsh were investigated in Willapa Bay, Washington. The purpose of the investigation was to get an understanding of the modern processes working on the sediments of Bay. The core samples served as modern analogs of continuous exposures of Pleistocene terrace deposits that are found along the east shore of the estuary. Three sea-level still stands were identified in the terrace deposits that related directly to the modern estuarine deposits.

Clifton, H. E., Phillips, R. L., and Hunter, R.E., 1973, Depositional structures and processes in the mouths of small coastal streams, southwestern Oregon: Coastal Geomorphology, Coates, D. R., ed.: Proc., 3rd Ann. Geomorph. Sym. Ser., Binghamton, S.U.N.Y., p. 115-140.

The mouths of coastal streams form a unique depositional environment, in which sedimentation is controlled by a combination of waves, tides, and river discharge. Examination of processes and deposits in the mouths of small streams along the coast of southern Oregon provides considerable data on stream-mouth sedimentation on a coast characterized by high wave energy and moderate tidal range.

Depositional structures and processes in such a setting

depend primarily on discharge and may be classified accordingly. The very smallest streams (discharge on the order of 0.01 m^3 sec^{-1} or less) modify the beach topography but slightly. Such streams flow in small intricately braided channels; the internal structure of the streambed material consists mostly of highly lenticular bedding, commonly defined by concentrations of heavy minerals. Larger streams (discharge on the order of 0.01 m^3 sec^{-1}) ,are more deeply incised into the beach. On the beds of such streams, sand streams, sand ripples predominate, except in main channels that are occupied by standing waves and antidunes. Fluctuation between planar and antidune bedforms generates a pulsing flow in the lower reaches of such streams. During rising tide or periods of high waves, swash processes will either bury or destroy the stream deposit. If preserved, the deposit will consist of thin sheets of ripple or other lenticular bedding interlayered with parallel swash lamination.

Streams with larger discharge are deeply incised into the beach and have a bedform predominantly of megaripples. These structures may reverse their direction with incoming tide. Within the actual mouth of the stream, where wave action predominates, the bedform is generally planar.

The largest streams entering the coast of southern Oregon, such as the Rogue and Coquille Rivers, form complex tidal estuaries, the discussion of which is beyond the scope of this paper.

Seasonal variation in discharge may cause different parts of some streams to evolve through several of the stages described above, an evolution that appears, over several years, to be relatively systematic. The resulting deposit will therefore show corresponding systematic transitions between the depositional facies.

Ancient examples of stream-mouth deposits are rare, but can be recognized owing to their character and association. (Authors)

Clifton, H. E., and Phillips, R. L., 1980, Lateral trends and vertical sequences in estuarine sediments, Willapa Bay, Washington: *in*

Field, M.E., Bouma, A., Colburn, I., Douglas,R., and Ingle, J., eds., Quaternary Depositional Environments of the Pacific Coast, Pacific Coast Paleogeography Symposium #4, American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, Pacific Section, California, 1980, p. 55-71.

Willapa Bay, Washington was studied in detail to look at the variations of the bay sediment and associated bedforms. The study examined the physical and biological variables that affected the formation and disruption of primary physical structures. The lateral changes related to depositional setting are detailed with a sequence model of how the changes are preserved in the sedimentary record. Side-scan sonar, box coring, pipe coring, diving, and experimentation were utilized to carry out the investigation.

Clifton, H. E., Kvenvolden, K. A., and Rapp, J. B., 1984, Spilled oil and infaunal activity--Modification of burrowing behavior and redistribution of oil: Marine Environmental Research, v. 11, p. 111-136.

North slope crude oil was used to determine the degree of modification to the burrowing behavior of infauna (shrimp), and the extent of redistribution of the oil into the sediment on sandy intertidal flats of Willapa Bay, Washington. The experiment suggests that when small amounts of oil are introduced into the individual burrow openings the oil has no long range effect on burrowing behavior. But if oil is saturates the sediment , which was done in the experiment, a sharp reduction in the number of burrow openings accrues. Burrowing organisms have the capacity to introduce measurable amounts of oil into the subsurface where it can be retained long after the surface oil has washed away, which illustrates the need for careful sampling in an attempt to locate or monitor the presence of spilled oil in the substrate.

Clifton, H. E., Phillips, R. L., and Anima, R. J., 1989, Sedimentary facies of Willapa Bay, Washington, A comparison of modern and Pleistocene estuarine facies: Canadian Society of Petroleum

Geologists' field guide to: Second International Research Symposium on Clastic Tidal Deposits, August 22-25, 1989, Calgary, Alberta, 62 p.

This field guide gives an overview of the modern deposits of Willapa Bay and their relationship to modern sea level and tide elevations. The guide then describes each depositional setting from the inlet to the bay, the tidal channels, the muddy and sandy fluvial-tidal point bar systems. The modern deposits are then compared to the Pleistocene terrace deposits.

Cloern, J. E., 1979, Phytoplankton ecology of San Francisco Bay system: The status of our current understanding, : *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 247-264.

A study of the phytoplankton dynamics in the San Francisco Bay system based on monitoring the phytoplankton communities and how density and compositional changes reflect environmental stress. The species composition and population density of phytoplankton communities which are sensitive to environmental changes, can be used as a signal of radical environmental changes. These abrupt changes in the populations and their density are being used as clues as to what the causes of changes within an estuarine system are.

Cloern, J. E., 1983, Tidal mixing, freshwater inflow, and phytoplankton dynamics in South San Francisco Bay, California: Estuaries, v.6, no. 3, p. 322.

South San Francisco Bay (SSFB) was sampled intensively during 1982 to follow short-term (daily-weekly) and long-term (seasonal) responses of the phytoplankton community to changes in the degree of salinity stratification. Phytoplankton biomass increased when the water column was salinity-stratified, and the degree of salinity stratification varied periodically with the spring-neap and semi-annual tidal cycle during the winter-spring

"wet" season when freshwater inflow was high. During the summer-fall "dry" season, the water column remained mixed, regardless of tidal current speed, and phytoplankton biomass remained low. Hence, these observations are consistent with the hypothesis that density stratification and phytoplankton dynamics are intimately controlled by two processes: (1) freshwater inflow to the estuary, and (2) turbulent mixing generated by tidal currents. In fact, the degree of salinity stratification can be predicted from the bulk parameter Q/u_m^3, where Q is river discharge into the estuary (a measure of buoyancy flux), and u_m^3 is the cube of maximum tidal current speed (an index of turbulent mixing). Short-term variations in stratification have profound implications for the SSFB ecosystem. For example, during stratified periods we observed (1) decreased turbidity (presumably as suspended inorganic particles settled out of the surface layer), (2) increased surface chlorophyll, (3) increased relative abundance of nanoplankton (<22μ) relative to net plankton, (4) increased phytoplankton primary productivity (1.6 g C per m^2 per d compared to <0.3 g C per m^2 per d during destratified periods), and (5) accelerated residual currents from gravitational circulation. Hence, the physical and biological nature of SSFB vary over short and long time scales in response to temporal variations in tidal currents and freshwater inflow. (Author)

Cloern, J. E., and Oremland, R. S., 1983, Chemistry and microbiology of sewage spill in South San Francisco Bay. Estuaries, v.6, no. 4, p. 399-406.

During three weeks of September 1979, the breakdown of a waste treatment plant resulted in the discharge of a large volume (1.5×10^7 m^3) of primary-treated sewage into a tributary of South San Francisco Bay, California. Chemical and microbial changes occurred within the tributary as decomposition and nitrification depleted dissolved oxygen. Associated with anoxia were relatively high concentrations of particulate organic carbon, dissolved CO_2, CH_4, C_2H_4, NH_4^+, and fecal bacteria, and low phytoplankton biomass and photosynthetic oxygen production. South San Francisco Bay

experienced only small changes in water quality, presumably because of it large volume and the assimilation of wastes that occurred within the tributary. Water quality improved rapidly in the tributary once normal tertiary treatment resumed. (Author)

Coats, R., Farrington, C., and Williams, P., 1987, Enhancing diked wetlands in Coastal California; Coastal Zone '87, v. 4, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3688-3700.

This paper discusses the management and enhancement of diked wetlands in coastal California. The paper outlines the need for clear biological and hydrological objectives, the need for information on topography, soils, runoff, tidal regime, and flow control structures for each study site. Finally, the need for computer modelling to test the findings and determine the best measures to be taken for each study site.

Cole, B. E., and Alpine, A. E., 1986, Biomass and productivity of three phytoplankton size classes in San Francisco Bay: Estuaries, v. 9, no. 2, p. 117-126.

Primary productivity of three size classes of phytoplankton (<5 µm, 5-22 µm, >22 µm) was measured monthly at six sites within San Francisco Bay throughout 1980. These sites in the three principal embayments were chosen to represent a range of environments, phytoplankton communities, and seasonal cycles in the estuary. Temporal variations in productivity for each size class generally followed the seasonality of the corresponding fraction of phytoplankton biomass. The 5-22 µm size class accounted for 40- to 50% of the annual production in each embayment, but production by phytoplankton >22 µm ranged from 26% in the southern reach to 54% of total phytoplankton production in the landward embayment of the northern reach. A productivity index is derived that predicts daily productivity for each size class as a function of ambient irradiance and integrated chlorophyll *a* in the photic zone. For the whole phytoplankton community and for each size class, this index was constant and

estimated as ~0.76 g Cm^{-2} (*g* chlorophyll *a* Einstein)$^{-1}$. The annual means of maximum carbon assimilation numbers were usually similar for the three size classes. Spatial and temporal variations in size-fractionated productivity are shown to be primarily due to differences in biomass rather than size-dependent carbon assimilation rates. (Author)

Columbia River Estuary Data Development Program (CREDDP), 1983, Bathymetric Atlas of the Columbia River Estuary, Astoria: Columbia River Estuary Data Development Program, scale 1:60,000, 1 atlas, 16 p.

No Review

Connor, C. L., 1979, Holocene sedimentation in Richardson Bay, California: Geological Society of America, Abstracts with Programs, San Jose, California, The Geological Society of America, Cordilleran Section, 75th annual meeting, v. 11: 3, p. 73.

This paper examined the rate of sediment filling of Richardson Bay through the use of foraminifera, diatoms, ostracodes, and other invertebrates. The study included and investigation of the distribution of *Eucalyptus* spp. pollen, variation in sediment size, and clay mineralogy from 9 borehole sites along the salt-marsh margins of Richardson Bay. The study revealed a record of gradual infilling of fine-grained estuarine sediments over the past 10,000 years. A single radiocarbon date obtained from a basal peat overlying nonmarine alluvial sand near the town of Mill Valley indicates that stable salt-marsh vegetation was present in the northwestern arm of the bay 4600 +/- 165 years ago and agrees within error limits with a Holocene sea-level curve developed by Atwater, Hedel, and Helley in 1977 for southern San Francisco Bay. The average sedimentation rate over the last 4600 years is estimated to be 0.2 cm/yr for the inner part of the bay. Bioturbation of uncertain extent has made precise location of the elevations of introduced *Eucalyptus* spp. difficult.

Conomos, T. J., 1979, Properties and circulation of San Francisco Bay waters,: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 47-84.

A framework study of dispersion characteristics,and circulation and mixing relationships was conducted for various reaches of the San Francisco Bay system. The study utilized bathymetric profiles, meteorological data, fluvial discharge records, tidal cycles, oceanic influences, salinity and water temperature measurements to describe the physical processes which control the distribution of circulation and mixing within the system.

Conomos, T. J., Peterson, D. H., Carlson, P. R., and McCulloch, D. S., 1970, Movement of seabed drifters in the San Francisco Bay estuary and the adjacent Pacific Ocean: a preliminary report: U.S. Geological Survey Circular 637-B, p. B1-B8.

1345 seabed drifters were released during March 5-6, 1970 in San Francisco Bay and on the continental shelf within 90 kilometers of the Golden Gate to determine the near bottom water circulation pattern in the vicinity of the bay. All releases were made in water depths less than 180 m (100 fathoms). By April 22, 1970, only 18 percent of the drifters had been recovered along shore-lines. This report presents two figures showing the locations of release and recovery for the recovered seabed drifters.

Conomos, T. J., and Peterson, K. H., 1976, Suspended-particle transport and circulation in San Francisco Bay: An overview, Estuarine Processes, v. II, Circulation, Sediments, and Transfer of Material in the estuary, Academic Press, p. 82-97.

This paper describes the San Francisco Bay environment, emphasizing the agents that supply, resuspend, and transport sediment. It describes dispersal patterns within the bay and the nearby ocean, comparing and contrasting seasonal differences between the dissimilar northern and southern reaches of the bay. The expected future changes in the sedimentary regime of the Bay are examined.

Conomos, T. J., Smith, R. E., Peterson, D. H., Hager, S. W., and Schemel, L. E., 1979, Processes affecting seasonal distributions of water properties in the San Francisco Bay estuarine system : *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 115-142.

A summary of the distributions of several basic conservative (temperature, salinity, alkalinity) and nonconservative (hydrogen-ion activity-pH. turbidity, chlorophyll *a*, suspended particulate matter, plant nutrient, and dissolved-oxygen concentrations) properties in near-surface, mid-channel water throughout the entire San Francisco Bay system by season, and to identify sources and sinks of some of these properties. Particular emphasis was placed on describing the dominant processes controlling their seasonal variations.

Conomos, T. J., and Peterson, D. H., 1983, Biological and chemical phenomena associated with turbidity maxima in partially mixed estuaries: Estuaries, v. 6, no. 3, p. 264, Abstracts for the Seventh Biennial International Estuarine Research Conference October 22-26, 1983, Session on The Estuary as a Filter: Geological Processes, Virginia Beach, Virginia.

Although much progress has been made during the last few decades in demonstrating the importance of physical processes on turbidity maxima in partially mixed estuaries, insufficient attention has been directed towards explaining the observed biological and chemical phenomena in these maxima. The biogenic fraction of the suspended particles comprising the turbidity maximum, although generally less abundant than the lithogenous fraction, is nevertheless of great importance as an estuarine filter. Field work in San Francisco Bay and elsewhere, coupled with numerical modeling efforts, has shown that the residual (estuarine) circulation cell explains the accumulation and maintenance of biogenous as well as lithogenous components of the turbidity maximum at the null zone. The null zone is also considered the zone of longest advective replacement time (or residence time) which permits the plankton to have a greater influence on water chemistry. Hence, in estuaries with turbidity maxima of low or moderate concentrations of suspended lithogenous particles (less than 50-70 mg per l), photosynthesis of phytoplankton occurring during the summer periods of low river inflow causes a relative decrease of pH. This process does not appear to work effectively, however, in estuaries with higher concentrations of suspended lithogenous particles (greater than 70 mg per l) because light attenuation by the suspended particles is great and, as a result, phytoplankton photosynthesis and associated phenomena are severely light limited. (Author)

Cooper, W. S., 1967, Coastal dunes of California: Geological Society of America Memoir 104, 313 p.

A complete geomorphic study of the coastal sand dunes of the California coast including five localities in northern Baja California. This work is the final addition to a project designed to cover the Pacific Coast of the United States, Oregon and Washington being covered in Memoir 72 of the Geological Society of America.

The introduction to this work includes a description of the overall geomorphic features, the climate, oceanic features, vegetation, and the influence of man to the California coast.

Twenty-seven dune localities were investigated. Each study site includes a general setting of each area, the geomorphic history of the area, a detailed description of the dune areas, plant zonation, and dune configuration.

Cornell, Howland, Hayes, and Merryfield, 1971, Umpqua River Gravel Study, for the Umpqua River Navigation Co., Eugene, Oregon: 22 p.

A study of six-mile stretch of the Umpqua River just downstream from Scottsburg to determine whether the natural deposits of gravel within the study area are naturally replenished after being removed for commercial purposes.

Costa, S., and Stork, J., 1982, Humboldt Bay prototype collection: Humboldt State University, Arcata, Ca. U. S. Army Corps of Engineers San Francisco District, California, under contract DACW07-81-C-0029.

The study provides field data necessary to adequately implement and verify a numerical model of the circulation of Humboldt Bay.

Cowie, G. L., and Hedges, J. I., 1988, Reactivity of particulate amino acids in a coastal environment (Dabob Bay, WA.); EOS, Transactions, American Geophysical Union, v. 69, no. 44, p. 1122.

A year long multiple depth trap provided sediment and material which were measured for amino acid content. The results reflected seasonal variability in organic matter sources and biological processes.

Cox, J. M., Ebbsmeyer, C. C., and Coomes, C. A., 1987, Drift of floatable materials in Puget Sound: Washington; Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3517-3532.

The results of a study that used surface drift cards, sticks, and sheets of paper released within portions of Puget Sound and the Straits of San Juan De Fuca are presented. The purpose of the study was to predict the fate of floatable materials within the study areas.

Crarat, H. R., and Glaser, R., 1971, Color aerial stereograms of selected coastal areas of the United States: National Ocean Survey, 93 p.

This text is primarily an example of the quality of NOS aerial photographs available to potential users. A brief review is given of photographic techniques, as well as information pertinent to the purchasing of reproduction. Forty-five stereograms are presented, each with a explanatory text.

Inlet stereograms include: Portsmouth, N.H., harbor entrance; Great Egg Inlet, N.J.; Beaufort Inlet, N.C.; Government Cut, Miami Beach, Fla.; Turning Basin, Corpus Christi, Tex.; Sausalito, Calif.; Noyo Bay, Calif.; Tenmile Creek, Oreg.; and Fish Creek, Turnagain Heights, Alaska. (J.H. Barwis)

Crescent City Harbor District, 1986, Engineering and economic feasibility study inner basin, Crescent City Harbor, California: Crescent City Harbor District, Crescent City, CA., 30 p.

This report consists of evaluation of tides, tsunamis, winds, soil analysis, and economics of crescent City Harbor, California.

Cromwell, J. E.,1973, Interaction of dynamic processes, sediments, and organisms during the formation and modification of a barrier lagoon (abs): Geological Society of America, Cordilleran Section Meeting, Abstracts with Programs, p. 30.

Laguna Superior and its associated water bodies are located east of Salina Cruz, Mexico, along the Pacific coastal plain of the Isthmus of Tehuantepc. The interaction of dynamic processes, sediments, and organisms is examined in order to identify the sedimentological features reflecting these interactions and to use this knowledge in interpreting the geological history of this unusual barrier lagoon. Within the lagoon is a separate and complete barrier whose geometry in conjunction with the main (external) barrier divides the lagoon into Laguna Superior, Laguna Inferior, and Mar Tileme. Preliminary results indicate that the prevailing, often violent, offshore winds have been instrumental in the formation of the barriers and are also reflected in the water exchange and circulation, the distribution of plant and animal assemblages, and the character and distribution of the sediments within the lagoons. (Author)

Cross, J. N., Hardy, J. T., Hose, J. E., Hershelman, G. P., Antrim, L. D., Gossett, R. W., ;and Crecelius, E. A., 1987, Contaminant concentrations and toxicity of sea-surface microlayer near Los Angeles, California: Marine Environmental Research, v. 23, p. 307-323.

Contaminants in the microlayer near Los Angeles, with two sampling sites in San Pedro Bay, were investigated to determine the composition and concentrations of contaminants from the nearshore areas receiving different amounts of anthropogenic inputs and to look at the toxicity of the samples to the embryos of fish that might be exposed to the microlayer *in situ.*

Cummings, J. C., 1962, Recent estuarine and marine sediments, Coos Bay Area, Oregon (abs.): American Association of Petroleum Geologist Bulletin, v. 46, no. 2, p. 263.

Texture and mineralogy of sediment samples taken along the 12-mile length of Coos Bay suggest derivation of the estuarine sediments from two sources: (1) sediment in the inner bay is chiefly fine sand and is similar to the detritus carried by Coos River: (2) sediment in the outer bay is mostly medium-grained sand, with an increase in grain size toward the bay mouth. This sand is most closely related mineralogically to sands along the coast north of Coos Bay. Thus, it appears that although sediment in the inner bay has been brought to it by Coos River, sediment in the outer bay has been derived chiefly from the influx of beach and dune sands carried over North Spit by the prevailing westerly winds and into the mouth of the estuary by tidal currents. (Author)

________ 1963, Estuarine and marine sediments, Coos Bay area, Oregon: Abstracts of Papers Presented at the Section Meetings at the Twenty-first Annual Meeting of the Oregon Academy of Science, Oregon State University, Corvallis, Oregon, p.15.

Sediment sources and distribution are determined based on textural analysis of samples collected in the Coos Bay area, both inside the estuary and in the offshore area.

Cunniff, S. E., 1987, Implementation of habitat-based evaluations: Issues and solutions; Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2084-2098.

This is an outline of habitat evaluation procedures (HEB) assessment method developed by the U.S. Fish and Wildlife Service to quantify habitats in terms of habitat stability and value, and total area of available habitat.

Curtis, W. F., Culbertson, J. K., and Chase, E. B., 1973, Fluvial-sediment discharge to the oceans from the conterminous United States: U.S. Geological Survey Circular 670, p. 17.

Suspended-sediment discharge data obtained from 27 drainage areas during the period 1950-69 were used to estimate the sediment mass contributed to the oceans from the conterminous United States. The quantity of sediment transported as bedload was estimated and added to the suspended load to arrive at a total sediment yield.

Sediment yields to the oceans from individual basins, presented in a table, are also compared to estimates by previous workers. The table includes average annual total sediment yields for San Francisco Bay (3,585 tons/yr), Mad River (2691 tons/yr), and the Eel River (29,345 tons/yr). Average annual water and suspended-sediment discharge are also given for the gaging stations closest to the ocean for the Salinas, Russian, Eel, Mad, and Klamath Rivers.

Unfortunately, no sediment-size data is given for the samples so it is difficult to determine the amount of beach sediment supplied by the rivers. Also, the 400 year flood of 1964 in northern California was not included in the analysis. (Author)

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Daetwyler, C. C., 1966, Marine geology of Tomales Bay, Central California: Pacific Marine Station, University of the Pacific and Scripps Institution of Oceanography, Research Report no. 6, p. 169.

The stratigraphic succession and major internal structure of the Recent sediments in the southern two-thirds of Tomales Bay were determined by combining an acoustic-reflection survey (Sonoprobe) with lithologic data obtained from cores and test borings. This investigation was focused on determining the relative effects of normal depositional processes and contemporaneous strike-slip faulting on the recent sediment facies, thickness, distribution, and depositional history in Tomales Bay. The lithologic variations found in the sediments of the bay are attributed to (1) the location and character of the sediment sources and (2) the dispersal of sediment by tidal currents.

Dahl, T. E., 1987, Wetlands mapping in the coastal zone: Progress towards a national data base: *in* Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 465-476.

This paper summarizes the area of coverage by the National Wetlands Inventory (NWI) and the interest by Federal and State agencies to develop and maintain a digital map data base with acreage and statistical summaries of our national wetlands.

Dale, R. H., and Rantz, S. E., 1966, Hydrologic reconnaissance of Point Reyes National Seashore Area, California: U.S. Geological Survey Open-File Report 66-22, p. 37.

A hydrologic reconnaissance of the Point Reyes National Seashore Area was performed in 1964-65 to appraise potential sources of water supply at park sites where visitor accommodations are proposed. This report includes discharge data for 1964-64 for the creeks in the park; a 1:62,500 scale, generalized geologic map of the park; and runoff and precipitation maps.

A substantial portion of the report is devoted to precipitation patterns. Rainfall in the park is orographically influenced with mean annual precipitation ranging from 20 inches near the ocean to about 40 inches at a 1400' elevation at the park's east boundary. The variation of the mean annual precipitation is illustrated by a 64 year record (1878 to 1943) at the lighthouse where rainfall ranged from a low of 9.56 inches in 1924 to a high of 45.91 inches in 1890.

Dames and Moore, Inc., 1974, Coastal processes study of Moss Landing Harbor, California: Survey Report no. 0086-32. For the U.S. Army Corps of Engineers, San Francisco District, 69 p.

This study reviewed the scour and accretion problems near the entrance of Moss Landing Harbor based on the literature and data search of pertinent information, a field study the week of June 3, 1974, and interviews with knowledgeable residents in the Moss Landing area and Professor Joe Johnson (University of California at Berkeley). The report identifies the principle causes of both problems and recommends solutions to alleviate the situation. The historical accretion and scour, shoreline change, littoral transport, tide levels, wave climate, wave refraction, wave diffraction, tidal currents, shoaling, and scour, are discussed. The study also includes shoreline change maps, and wave refraction diagrams in addition to aerial photography.

Darienzo, M. E.,1987, Late Holocene geologic history of a Netarts Bay salt marsh, Northwest Oregon coast and its relationship to relative sea level changes. [Graduate school of the University of Oregon Corvallis, Oregon, Masters Thesis]: 94 p.

Study of Late Holocene relative sea level changes off the Northwest Oregon coast utilizing stratigraphy of Netarts Bay salt marsh shows that salt marsh development at the southern end of Netarts Bay is tied into episodic sea level rises. The last rise occurred within the last 750 years. Cores of salt marsh deposits reveal repetitive sequences of sediment generated as a result of salt marsh growth, submergence (with sand deposition and tidal flat formation), and salt marsh reestablishment. The repetitive sequences are caused by either a sudden rise in relative sea level related to a tectonic subsidence event (subduction-generated earthquakes) or a gradual rise in relative sea level accompanied by episodic sand deposition owing to storms, floods or channel migration. (Author)

Delmonte, R. C., and Johnson, J. W., 1971, The influence of bed material size on the tidal prism-area relationship in a tidal inlet. University of California, Berkeley, Hydraulic Engineering Lab., Report no. HEL-24-8, (AD-733 282), 17 p.

Field data from a large number of tidal inlets on sandy coasts of the United States were analyzed and a relationship was established between the tidal prism and the minimum flow cross section of the entrance channel. Detailed sampling of bottom sediment was not available, but a summary of samples in the Golden Gate and its approaches showed little range in grain size. This finding indicates flow resistance in that vicinity may be controlled more by from resistance of ripples and sand waves than by grain size alone. To evaluate the effect of grain size more precisely, tests were repeated with different size sand grains and the results of the test compared. Test procedures and results are presented.

Dendrick, K. G., 1987, Tidal marshland elevations in San Francisco Bay, California: Historic Accounts and surveying results; Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 1030.

A short paper briefly outlining the short comings of historic tidal marshland elevation surveys when applied to resolving jurisdictional questions.

Denes, T., Tong, L., and Walls, B., 1987, Integrated disposal studies in San Francisco Bay: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 1207-1219.

This paper presents a brief description of the study being conducted by the U.S. Army Corps of Engineers on the accumulation of dredged material at the Alcatraz Disposal Site in San Francisco Bay. The site was thought to have high enough tidal velocities to disperse the dredged material out to sea but a subsurface mound of sediment was detected and the potential of becoming a hazard to navigation was recognized.

Dent, E. J., 1935, Layout of outer protective works, maintenance of depths in harbors, on sandy shores, and before mouths of estuaries: Proc., 16th Int. Cong. on Nav., Sec, II-I, Paper no. 69 p.

Provides general geomorphological information, longshore transport rate estimates, and brief improvement histories for Ocean City Inlet, Md., Columbia River, Oreg.-Wash., Rockaway Inlet, N.Y., and Grays Harbor, Wash. (J.H. Barwis)

Dettle, M., Domurate, G., Kendell, T., Dolan, T., and Wilson, S., 1987, California Coastal Literature inventory systems: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2297-2305.

This report outlines the features of a microcomputer database of over 2300 coastal references for California developed as part of the Coast of California Storm and Tidal Waves Study by the U.S. Army Corps of Engineers.

Dickert, T. G., and Sorensen, J., 1978, Collaborative land-use planning for the Coastal Zone: Volume 1, A process for local program development, University of California Institute of Urban & Regional Development, Zenuneby Institute of Marine Resources, La Jolla, Ca, (Sea Front Publication no. 52, 120 p.), IURD monograph no. 27 IMR.

The two volume monograph, Collaborative Land Use Planning for Coastal Zone, reports research conducted during the late 1970's. The research was aimed at developing methods for managing the cumulative impact of coastal development and evaluating the operability of the collaborative planning process as mandated by the California Coastal Act.

Ditsworth, G. R., 1966, Environmental factors in coastal and estuarine waters: Bibliographic Series, v. I, Federal Water Pollution Control Administration Publication WP-20-2, 61 p.

References to literature pertaining to the marine waters of Oregon are provided.

Dollar, S. J., Smith, S. V., Hollibaugh, J. T., and Vink, S. M., 1988, Annual cycle of benthic nutrient flux in a temperate estuary; Tomales Bay, California: EOS, Transactions, American Geophysical Union, v. 69, no. 44, p. 1114.

Abstract on a program to characterize system-scale biogeochemical reactions in Tomales Bay.

Domenowske, R. S., 1987, Municipality of Metropolitan Seattle West Point Beach Restoration: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2141-2152.

The construction of a natural appearing beach like condition is discussed and its effect on stabilization, intertidal habitat possibilities, and recreational use in the West Point area of Seattle, Washington.

Downing, A. M., Sweeney, C. E., Demlow, T. C., and Eysink, W. D., 1987, Predictions of shoaling rates for a new harbor in Puget Sound, Washington: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p.1247-1260.

Shoaling rates in the proposed Naval Station Puget Sound are discussed in terms of physical and numerical modeling methods. The paper presents detailed figures on the proposed dredging sites and the problems predicted for siltation of the site after dredging.

E

Ebbsmeyer, C. C., Day, M. E., Coomes, C. A., and Cox, J. M., 1987, Sewage trapping by water parcels in Puget Sound, Washington: Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on

Coastal and Ocean Management, Seattle, Washington, p. 3502-3516.
An overview of experimental results of sewage effluent into Puget Sound is presented to aid coastal zone managers in making more informed decisions concerning the discharge of effluent and other contaminants.

Environmental Research Consultants, Inc., 1974, Environmental Impact Report, Eureka-Arcata Regional Sewage Facility Project: Prepared by Environmental Research Consultants, Inc., Arcata, California.
An overview of biological, physical, and social conditions in the Eureka-Arcata area.

Ewing, K., 1986, Plant growth and productivity along complex gradients in a Pacific Northwest brackish intertidal marsh: Estuaries, v. 9, no. 1, p. 49-62.
This study was carried out in the intertidal brackish marsh formed by the Skagit River as it enters Puget Sound in Washington. Environmental characteristics were measured (soil texture, organic carbon in fines, soil column temperature, free soil water salinity) to determine growth and production responses of the various plant species across the marsh as a result of environmental variations.

F

Faber, P., and Liebster, J., 1987, California's Fourteen years of Coastal Zone Management; Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2954-2967.
This paper highlights the successes, failures, and unresolved issues of 14 years of California's Coastal Zone Management Program. A good table illustrating areas along the coast where monitoring of issues has been recorded.

Farfan, B. C., and Alverez-Borrego, S., 1983, Variability and fluxes of nitrogen and organic carbon at the mouth of a coastal lagoon. Estuarine, Coastal and Shelf Science, v.17, p. 599-612.

This work examines the tidal exchanges of heat, inorganic nitrogenous nutrients, and various forms of organic matter at the mouth of San Quintin Bay, Baja California, Mexico. It also attempts to elucidate the main factors responsible for the short-term fluctuations of these seawater properties. To accomplish this, a time series sampling was carried out at the mouth of the bay from 25 June to 5 July, 1979. The bay systematically exported heat, with an average of $1.2X10^{10}$ kcal per half tidal cycle during the sampling period. Inputs of nitrite and nitrate during upwelling were of major importance to the productivity of the lagoon., During non-upwelling conditions the trend was toward a dynamic equilibrium in the oxidized inorganic nutrient fluxes. There were significant exports of ammonia. These ammonia exports were, on average, about 20% of the nitrate plus nitrite imports. Ammonia concentrations were related to metabolic and mixing processes and might be an important export product throughout the year, as a result of the reduced state of the sediments. During the sampling, there were imports of particulate organic carbon and nitrogen. The C/N ratio suggests that the main origin of organic detritus was other than the breakdown of eelgrass in the bay. There were mostly imports of diatom carbon, but fluxes of dinoflagellate carbon were always near equilibrium. Zooplankton showed both exports and imports. Variability in the zooplankton carbon was mostly related to diel vertical migration. There were no significant exports of floating seagrass, not even during spring tides.

Farmer, J. D., Ronan, T. E., Jr., and Miller, M. F., 1981, Modern and ancient biogenic structures Bodega Bay, California and Vicinity: in, Modern and Ancient Biogenic Structures, Bodega bay, California, Frizzell, V., Editor, Annual Meeting Pacific Section SEPM Field Trip 3, Society of Economic Paleontologists and Mineralogists, Los Angeles, California, U.S.A.

A field trip guide that covers the coast from Salt Point State Park, CA. to Bodega Harbor, CA. intended to relate modern and ancient biogenic structures found in the fossil assemblage

from the German Rancho Formation at Salt Point State Park to the modern biogenic structures found on the modern tidal flat at Bodega Harbor, California.

Feely, R. A., Massoth, G. J., Gendron, J. F., and Paulson, A. J., 1983, Phase associations of trace metals in vertically settling particulate matter from Puget Sound: Estuaries, v.6, no. 3, p. 274, Abstracts for the Seventh Biennial International Estuarine Research Conference, October 22-26, 1983, Session on Chemical Oceanography of Estuaries, Virginia Beach Virginia.

The distributions of Mn, Fe, Ni, Cu, Zn, Cd and Pb in oxide, organic, and residual phases of vertically settling particulate matter were studied and compared with the underlying sediments to investigate the processes affecting the compositions and fluxes of these materials. Settling particles were collected with sequentially-sampling sediment traps (325 cm^2) moored at four depths located near the center of the main basin of Puget Sound. Trap samples were selectively extracted for trace metals in the oxide, organic, and residual phases, respectively, using solutions consisting of: (1) 0.04 N hydroxylamine hydrochloride in 25% acetic acid; (2) 10% hydrogen peroxide, and (3) an Ultrex HCl-HNO_3-HF acid mixture, and analyzed by atomic absorption spectrometry. The results indicate that for Fe, Mn, Zn and Pb residual and oxide phases were the most important phases controlling the vertical flux; whereas residual and organic phases controlled the vertical flux of Cu and Cr. The Cd flux was predominantly controlled by oxide and organic phases. For several of the trace metals, notably Mn, Cr, Ni, and Zn, the flux in the organic phase was higher in summer than in winter. The average annual flux data have been used to compute scavenging residence times for several trace metals in Puget Sound. Relatively short scavenging residence times (i.e., <50 days) were calculated for those metals that were significantly enriched in the oxide phases, such as Mn and Pb. In contrast, longer scavenging residence times (> 100 days) were calculated for metals enriched in organic phases, such as Cu. These results suggest that biogeochemical processes in the water column play a major role in affecting the scavenging residence times of trace metals in Puget Sound. (Author)

Festa, J., and Peterson, D. H., 1982, Numerical simulation of phytoplankton photosynthesis in partially mixed estuaries: Northern San Francisco Bay: EOS, American Geophysical Union, v. 63, no. 45.

The effects of inorganic suspended particulate matter on phytoplankton photosynthesis was studied in San Francisco Bay.

Fisacherly, G. M., 1970, Estuary entrance, Umpqua River, Oregon: U. S. Army Engineer Waterways Experiment Station, Technical Report H-70-6, 1 v., 177 p.

This study utilized a model of the Umpqua River Estuary which was capable of reproducing and measuring tides, tidal currents, waves, salinity intrusion, fresh water inflow, and shoaling distribution. The data gathered allowed for the formulation of the optimum plan for the reduction of shoaling and the elimination of cross currents in the navigation channel at the entrance.

Fisher, H. B., 1972, A lagrangian method for predicting pollutant dispersion in Bolinas Lagoon, Marin County, California: U.S. Geological Survey Professional Paper 582-B, p. B1-B32.

A numerical method is described which is capable of predicting the movement and dispersion of a pollutant in a tidal embayment. The method requires a knowledge of the embayment geometry and of a typical tidal cycle of water surface elevations at various interior points. The model includes a convective step, a diffusive step, and a concentration-decay step.

Fisher, H. B., 1982, Composite current diagrams for South San Francisco Bay: EOS, American Geophysical Union Abstract, v. 63, no. 45, p. 946.

Synoptic plots of prototype currents are compared with the results of numerical models developed from current meter data collected in south San Francisco Bay.

Fisher, J. J., and Simpson, E. J., 1979, Washover and tidal sedimentation rates as environmental factors in development of a transgressive barrier shoreline: Coastal research symposium on Barrier islands from the Gulf of St. Lawrence to the Gulf of Mexico, Boston, Mass.: 1979, Acadamic Press, p. 127-148.

No review

Folger, D. W., 1972, Characteristics of estuarine sediments of the United States. U.S. Geological Survey Professional Paper 742, 94 p.

This report is a compilation of data on texture and composition of bottom sediments, including the hydrologic factors that influence them, in 45 estuaries in the conterminous United States. A paragraph of references from the 1950's and 1960's about San Francisco Bay is included.

Fonseca, M. S., Fisher, J. S., Zieman, J. C., and Thayer, G. W., 1982, Influence of the seagrass *Zostra marina L.*, on current flow: Estuarine, Coastal and Shelf Science, v. 15, p 351-364.

A salt-water flume was used to describe the mechanics of current flow around an artificial *Zostra marina* meadow. Shear velocity and roughness height were positively correlated with seagrass surface area, and were positively/negatively correlated with current velocity. Current velocity intrusion into the meadow before diminution and maximum reduction (both at the 2 cm height line) proceed by factors of 1.25 and 2.07 cm into the meadow per cm s^{-1} of current velocity, respectively.

Froude number was correlated with mean bending angle of the canopy as a whole. Maximum bending had occurred with Froude = I, but most bending had taken place by Froude = 0.4, a velocity of 40-50 cm s^{-1} in this experiment.

The meadow edge is the most dynamic zone of a seagrass meadow in regard to current flow. Bending of the shoot canopy is

a mechanism for re-direction of current flow and in-canopy reduction of current velocity. Meadow dimensions may be regulated by scouring processes in different hydraulic regimes. Shoot bending and subsequent in-meadow current velocity reduction are mechanisms that affect self-shading and photosynthetic capabilities as well as providing habitat stability. (Author)

Fonseca, M. S., Zieman, J. C., Thayer, G. W., and Fisher J. S., 1983, The role of current velocity in structuring eelgrass (*Zostra marina L.*) meadows: Estuarine, Coastal and Shelf Science v.27, p. 367-380.

Measurements of velocity profiles, bathymetry, and surface sediment characteristics across eelgrass (*Zostra marina* L.) meadows yielded information on community development processes and functional attributes of this ecosystem. Height/length ratios of the meadows were positively correlated with tidal current velocity. Low, medium, and high current regimes were separated by surface current velocities of approximately 50 and 90 cm s^{-1}. *Z. marina* can tolerate approximately 120-150 cm/sec current velocities in the areas studied. Per cent silt-clay and organic matter content of the surface sediments are negatively associated with shear velocity, suggesting that meadows in high current areas are sources while meadows in low current areas are sinks of autochthonous detritus. Current velocity maintains eelgrass meadows at different equilibrium levels (relative climaxes). The different equilibrium levels are theorized to provide unequal habitat utilization potentials for the associated faunal community.

Fox, W., 1987, Modeling dilution of wastewater outfalls in a tidal estuary: Coastal Zone '87, v. 4, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3867-3878

The results of initial dilution modeling for recent wastewater outfall siting studies conducted in Puget Sound is presented.

Frenkel, R. E., Boss, T., and Schuller, S. R., 1978 Transition zone vegetation between intertidal marsh and upland in Oregon and Washington: United States Environmental Protection Agency Grant R804963-01, Corvallis, Oregon, Oregon State University, 320 p.

No review

Frolander, H. F., Flynn, M. J., Spring, C. S., Zimmerman, S. T., and Miller, C. B., 1971, Yaquina Bay zooplankton survey I: Data Report 48, reference 71-72, Department of Oceanography, Oregon State University, Corvallis, Oregon, 27 p.

Report provides 7 1/2 years of data on zooplankton, temperature dissolved oxygen and salinity within Yaquina Bay.

Frolander, H. F., and Russell, H. J., Jr., 1963, *Acartia tonsa* as found in Yaquina Bay: Abstracts of Papers Presented at the Section Meetings at the Twenty-first Annual Meeting of the Oregon Academy of Science, Oregon State University, Corvallis, Oregon, p.4.

The report discusses the finding of the planktonic copepod, Acartia tonsa in Yaquina Bay which was previously thought to only extend as far north as San Francisco Bay.

Fuller, C. C.,1982, The Use of Pb-210, Th-234 and Cs-137 as tracers of sedimentary processes in San Francisco Bay, California: University of Southern California, Los Angeles, USC Sea Grant Institute for Marine and Coastal Studies, 251 p.

Measurements of Th-234, Pb-210, and CS-137 in the sediments, water column, and suspended particles of the San Francisco Bay, were taken in attempt to identify sedimentary processes and the geochemical behaviors of reactive elements in this estuarine system.

Fulton, K., 1981, A manual for researching historic coastal erosion: University of California, Institute of Marine Resources,Santa Cruz, Ca., Science Writing Program, Report T-CSGCP-003, A California Sea Grant College Publication, La Jolla, Ca., 56 p.

This manual is intended to help land-use planners, geologist, engineers, and others concerned with coastal erosion to collect historical information about shoreline, sea bluff, and cliff retreat.

Furota, T., 1983, Seasonal fluctuation of macrobenthic community in a tidal flat and an adjacent subtidal bottom: Estuaries, v.6., no. 3, p. 324.

Monthly samples of macrobenthos living on a tidal flat and a subtidal bottom in lower Columbia River estuary had been taken since November 1980 to October 1981. Bottom sediment consisted of sand, muddy-sand and mud, in upper-middle intertidal, lower intertidal flats and a subtidal bottom respectively. The salinity of interstitial waters changed between 1.5 and 16.2% showing lowest salinities in early summer at the subtidal bottom through a year. Thirty-eight species of invertebrates were indentified through the investigation. Dominant species consisted of estuarine animals, i.e., polychaetes *Neanthes limnicola* and *Hobsomia florida,* bivalve *Macoma balthica,* and gammarid amphipods *Euhaustorius estuaris* and *Corophium salmonis*. Smaller polychaetes *Pygospio elegans* and *H. florida and* a gammarid amphipod *C. salmonis* tended to be abundant in stable sediments such as patchy flats among marsh vegetations at higher tidal zone and mud-sand bottoms at lower tidal zone. Some gammarid amphipods, *Corophium spinicorne and Eogammarus* spp., occurred associating with eel-grasses. Populations of Spionid polychaetes (*P. elegans, polydra ligni* and *Pseudopolydra kempi*) decreased in early summer relating with low salinity. Distributions of a gammarid amphipod *E. estuaris* tended to be restricted within the sandy intertidal flat. Changes of animal compositions and distributional patterns through a year were quite little. These suggest that the community structure of macrobenthos in the observed area is controlled mainly by physical conditions rather than biological interactions.

G

Galloway, R. L., 1977, Geology of the Point Reyes peninsula, Marin County, California: Bulletin 202 California Division of Mines and Geology, Sacramento, California, 72 p.

Galloway's work describes the regional geography of the Point Reyes area from the San Andreas Fault on the east to the Pacific ocean on the west. The work describes the geology and regional structural style of the area with detailed descriptions of stratigraphy and distribution of each geologic formation.

Galloway, W. E., 1976, Sediments and stratigraphic framework of the Copper River fan-delta, Alaska: Journal of Sedimentary Petrology, v. 46, no. 3, p. 726-737.

This paper describes the major depositional environments of the Copper River delta in the Gulf of Alaska. The morphology and internal stratigraphy of the delta system are detailed.

Gast, J. A., 1962, An oceanographic survey of the Humboldt Bay system; physical and chemical data: Humboldt State University, Department of Oceanography, Arcata California, Special report no. 1, 72 p.

This volume presents a tabulation of physical and chemical observations made at various locations in Humboldt Bay during the period from September 1961 to September 1962. The positions of the sampling stations are shown. Values of dissolved inorganic phosphate-phosphorous and silicate-silicon are given from the surface to near the bottom depths.

Gelfenbaum, G., 1982, Suspended sediment response to semidiurnal and fortnightly tidal variations in a mesotidal estuary; Columbia River, U.S.A.: Marine Geology, v.52, p. 39-57.

A turbidity maximum is the dominant feature of the suspended-sediment concentration field in the Columbia River estuary, U.S.A. In this estuary, the turbidity maximum is an unsteady feature which changes on semidiurnal, fortnightly and seasonal time scales. In response to the semidiurnal tides, the turbidity maximum is advected landward and seaward and may have an excursion of approximately 20 km. In response to the fortnightly

tidal variations, the turbidity maximum degenerates, or decreases in concentration, during neap tides and regenerates, or increases in concentration, during spring tides. Finally, in response to seasonal freshwater discharge variations, suspended-sediment concentrations in the turbidity maximum increase and its general location is pushed seaward during high discharge conditions and, conversely, concentrations decrease and its general location is farther landward during low discharge conditions. The magnitude of suspended sediment concentration variations for these three time scales is similar. Therefore, any consideration of estuarine dynamics and the suspended-sediment concentration field in the Columbia River estuary should include the semidiurnal and fortnightly time scales as well as the seasonal ones. Because the Columbia is a mesotidal estuary and fortnightly tidal variations are not extremely large, it is expected that these time scales (and associated processes) may be important in many other estuarine systems. (Author)

Gigvere, P. E., 1970, The natural resources of Bolinas Lagoon, their status and future: California Department of Fish and Game, Sacramento, CA., Coastal Wetland Series, no. 31,.107 p.

This report summarizes the lagoon's history, ecological attractions, educational values and the problems facing its continued existence. Sources of additional and more specific information age given.

Gladwell, J. S., and Tinney, E. R., 1962, Umpqua Estuary Model Study: Washington State Institute of Technology Bulletin 265, Pullman, Washington, 107 p.

Describes the Umpqua model (equipped for accurate reproduction and measurement of prototype phenomena) used for pollution testing.

Glanzman, C. F., Glenne, B., Burgess, F. J., 1971, Tidal Hydraulics, flushing characteristics, and water quality of Coos Bay: Engineering Experiment Station, Oregon State University,

Corvallis, Oregon, p. 103.

This report studies the mixing characteristics of Netarts Bay with emphasis given to potential pollution impacts.

Glenn, J. L., 1973, Relations among radionuclide content and physical, chemical, and mineral characteristics of Columbia River sediments: U. S. Government Printing Office, Washington D.C., Professional Paper 433M, 52 p.

No review

_______ 1978, Sediment sources and Holocene sedimentation history in Tillamook Bay, Oregon: data and preliminary interpretations. U.S. Geological Survey, Denver, CO., Open-file report 78-680, 64 p.

No review

________ 1980, Sediment sources and Holocene sedimentation in Tillamook Embayment, Oregon: Geological Society of America, Abstracts with Programs, Corvallis, Oregon, The Geological Society of America, Cordilleran Section, 76th annual meeting, v. 12: 3, p. 107.

Radiocarbon data, cores, and acoustic subbottom surveys were utilized was to estimate the rate of sediment deposition in the Tillamook embayment. The study suggest that the rate of sediment deposition roughly paralleled the rate of world-wide sea-level rise.

Glogoczowski, M., and Wilde, P., 1971, River mouth and beach sediments, Russian River, California, to Rogue River, Oregon: Part A. Introduction and grain size analyses: Univ. Calif., Hyd. Engr. Lab, Rept. HEL 2-36, 73 p.

Sixty-five samples of intertidal, beach, and river mouth and bar environments from the northern California and southern Oregon coast are analyzed for grain-size properties. These samples were taken to provide source area information for a projected study of the offshore sediments of the northern California continental shelf. The data are presented graphically as cumulative weight percent curves and histograms with respect to grain size. The statistical parameters median, sorting coefficient, skewness, and kurtosis are calculated for each sample. (Authors)

Goodwin, C. R., Emmett, E. W., and Glenne, B., 1970, Tidal study of three Oregon estuaries: Oregon State University, Department of Civil Engineering, Bulletin, no. 45, 45 p.

This report is a summary of tidal elevations, current velocities and physical characteristics in the Yaquina, Alsea, and Siletz estuaries.

Gross, R. L., 1982, The social environment of Noyo Harbor and probable impact of proposed harbor development alternatives; U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA., Contract no. DACW07-82-M-0596.

This is report is the results of a feasibility study conducted by the U.S. Army Corps of Engineers on modifying the Noyo River and Harbor located south of Fort Bragg, Ca. This study provides socio-economic data relating to four proposed river and harbor planning alternatives.

Gustafson, J. F., 1968, Ecological study Bolinas Lagoon, Marin County, California: Audubon Canyon Ranch Bolinas Harbor District, County of Marin, Marin Conservation League, 45 p.

This report focuses on marine invertebrates, marine vertebrates and marine plants by habitat in Bolinas Lagoon. The study also includes data on the importance of species in major trophic cycles, distribution frequency, and the role and sensitivity of species to pollutants. Thirty-one areas were selected within the lagoon for sampling of invertebrate populations with considerations being given to water quality, and sediment size.

H

Hager, S. W., Cole, B. E., and Schemel, L. E., 1979, Phytoplankton productivity measurements in the San Francisco Bay estuary: A comparison of four methods: EOS, Transaction, (Abstract) American

Geophysical Union, vol 60, no. 46, p. 852-853.

Four methods of estimating phytoplankton productivity were compared, using data from 24 hour _in situ_ incubations in the San Francisco Bay estuary. The analytical methods used were measurement of changes in: 1) pH and alkalinity in the water, and calculation of the changes in total inorganic carbon by the pH method, 2) radioactive labelled carbon retained on filters, 3) dissolved oxygen in the water (O_2), and 4) dissolved ammonia, nitrate and nitrite in the water 9N). The relative standard errors of the methods were 5% using C^{14} and O_2, and 8% using N and the pH method. Comparison of the rates by linear regression analysis showed that the O:C:N production and uptake stoichiometry is similar to average stoichiometry of marine phytoplankton. Exceptions occur when nitrogen uptake is light-saturated at lower light intensities than are carbon uptake and oxygen production. Overall, the largest variations from the average stoichiometry were seen between experiments, perhaps indicating systematic analytical variations as well as real differences in the phytoplankton populations and ambient conditions observed. (Author)

Hamilton, P., 1981, Columbia River Estuary hydrodynamic modeling: Unpublished report. Vancouver. WA: Colombia River Estuary Data Development Program.
No review

_______1983, Numerical modeling of the depth dependent salinity intrusion for the Coal Point Deepening Project in the Columbia River Estuary. Final report. Portland: U.S. Army Engineer District.
No review

_______1984, Hydrodynamic modeling of the Columbia River Estuary. Astoria, Oregon: Columbia River Estuary Data Development Program.
No review

Hammond, D. E. and Fuller, C. C., 1979, The use of Radon-222 to estimate benthic exchange at atmospheric exchange rates in San Francisco Bay: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 213-230.

This paper discusses preliminary results of the use of naturally occurring radon-222 to estimate the rate of vertical mixing in the water column and the rate of exchange across the sediment-water and air-water interfaces in San Francisco Bay.

Handley, L. R., Quammen, M. L., and Johnston, J. B., 1987, Wetland analysis for lower San Francisco Bay: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 1154.

A short paper on the work by the Environmental Protection Agency, and the U.S. Fish and Wildlife Service on wetland maps produced from topographic maps and aerial photography.

Hardy, J. T., Apts, C. W., Crecelius, E. A., and Bloom, N. S., 1985, Sea-surface microlayer metals enrichments in a urban and rural bay: Estuarine, Coastal and Shelf Science, 20, p. 299-312.

Water samples collected in rural Sequin Bay and urban Elliott Bay were analyzed to improve microlayer sampling techniques and compare the differences in the concentrations of several metals (Pb, Zn, Cu, Fe and Cd) between the microlayer and bulk water, and between an urban and rural coastal bay. The study also tested the validity of a previously developed laboratory model for predicting microlayer metal enrichments from known atmospheric deposition rates.

Hardy, J., Kiesser, S., Antrim, L., Stubin, A., Kocan, R., and Strand, J., 1987, The sea-surface microlayer of Puget Sound: Part I. toxic effects on fish eggs and larve: Marine Environmental Research, v. 23, p. 227-249.

The intention of this study was to determine at four sites

within Puget Sound, the densities of neuston, including fish eggs, establish what the *in situ* and laboratory lethal and sublethal toxic effects to the surface microlayer(SMIC) is, and to determine what is the degree of association of toxicity with contaminated urban bay areas and with visible sea-surface films or slicks.

Hardy, J. T., Crecelius, E. A., Antrim, L. D., Broadhurst, V. L., Apts, C. W., Gurtisen, J. M., and Fortman, T. J., 1987, The sea-surface microlayer of Puget Sound: Part II. Concentrations of contaminants and relation to toxicity: Marine Environmental Research, v. 23, p. 251-271.

This study focused on determining the concentrations, sources, ultimate fate, and biological effects of sea-surface contamination at four sites within Puget Sound. The study conducted a preliminary assessment of the magnitude of spatial and temporal variability in aquatic surface contamination. It investigated the probable sources of contamination and the relationship between contaminant concentrations and the toxic effects on fish reproduction found in an earlier study.

Harmon, D. D., and Cascos, P., 1979, A comparison of seasonal distributions of inorganic nitrate and silicate between shoal and channel zones in Northern San Francisco Bay: EOS, Transactions, American Geophysical Union (Abstract), v. 60, no. 46, p. 852.

Ammonia, nitrate, and silicate concentrations in two major shoal areas in the northern San Francisco Bay varied seasonally and spatially during 1978-1979. During winter, when Sacramento-San Joaquin River inflow is high ($>300\ m^3\ sec^{-1}$) and phytoplankton biomass is low, nutrient concentrations are high ($Si \leq 240 \mu gatl^{-1}$, $N \leq 104 \mu gatl^{-1}$) and spatial (lateral) variability is small. During summer, when river inflow is lower ($<200 m^3\ sec^{-1}$) and phytoplankton biomass is higher, nutrient concentrations are relatively low ($Si \leq 35 \mu gatl^{-1}$, $N \sim 0 \mu gatl^{-1}$) and spatial variations appear. The summer depression of nutrient concentrations results from (1) decreased nutrient input from the rivers and (2) increased uptake by phytoplankton, particularly in

the shoals as residence time and algal growth rates increase. During the part of the year when phytoplankton productivity is light-limited, depressions of nutrient concentrations appear first in the shoal areas and later in the main channel, presumably because the average water-column light intensity and algal growth rates are higher in the shoals than in the channel. Such decreases in nutrient concentrations and increase in phytoplankton biomass appeared earlier in a year of low river flow (1979) than high river flow (1978). (Author)

Harms, J. C., Southard, J. B., Spearing, D. R., and Walker, R. G., 1975, Depositional environments as interpreted from primary sedimentary structures and stratification sequences: Society of Economic Paleontologists and Mineralogists, Short Course no. 2. Tulsa, OK., 161 p.
No review

Harts, W. W., 1909, Description of Coos Bay, Oregon, and the improvement of its entrance by the government: Trans. Am. Soc. Civ. Eng., v. 46, p. 482-506; with discussion of same p. 507-550.

After a brief description of shoaling conditions at other major Oregon inlets, physical conditions at the Coos Bay entrance and design criteria and costs of the jetty construction plan are given. Background information includes hydrographic surveys (1863, 1879, 1885, 1894, 1899). (J.H. Barwis)

Haven, D. S., and Morales-Alamo, R.,1966, Aspects of biodeposition by oysters and other invertebrate filter feeders: Limnology and Oceanography, v. 11, p. 487-498.

Quantities of suspended matter removed by oysters (Crassostrea virginica) and deposited as feces or pseudofeces varied seasonally reaching maxima in September. Below 28° C, measurable quantities were not produced. At certain seasons, levels of suspended solids influenced quantities of biodeposits. Laboratory studies indicated that the oysters on 0.405 hectare of an estuarine bottom may produce up to 981 kg of feces and pseudofeces weekly. Of the particles, 95% were under 3μ in diameter. All types of algal cells present in the surrounding water were represented. The deposits contained 77-91% inorganic matter, mostly illite, chlorite, and mixed-layer clays, 4-12% organic carbon, and 1.0 g/kg phosphorus. Biodeposits of filter feeders such as barnacles, tunicates, and other lamellibranchs were similar to those of oysters. Filter feeders may influence deposition, transport, and the compositions of suspended sediments in estuaries. A possible relationship between the removal from suspension and the subsequent deposition of radionuclides associated with particles of clay, silt, or planktonic algae and feces or pseudofeces is suggested. (Author)

________ 1972, Biodeposition as a factor in sedimentation of fine suspended solids in estuaries: The Geological Society of America, Memoir 133, p. 121-130.

Filter feeders, such as mollusks, tunicates, and barnacles, ingest particles as small as 1 micron during their feeding process and void them in fecal pellets which range from 500 to 3,000 microns in length; these pellets settle at a much faster rate than their component particles. Feces and pseudofeces that settle to the bottom are termed biodeposits. Oyster biodeposits contain 77 to 91 percent inorganic matter, 4 to 12 percent organic carbon, and about 1.0 gram per kilogram of phosphorus. Fecal pellets are alternately deposited and resuspended by tidal currents. They settle and accumulate in areas of estuaries where the fine particles themselves would not. A portion of the biodeposits settling on sediment surfaces is mixed into subsurface deposits and may alter the textural and chemical properties of the original sediments.

Hawley, N. L., and Jones, B. L., 1969, Sediment yield of coastal basins in Northern California, 1958-64: U.S. Geological Survey Open-File Report (64-124), 19 p.

Results of a sediment data-collection program in the Eel, Mad, Van Duzen, and Trinity River Basins, during the 7-year period from October 1957 to September 1964 indicates that sediment discharge of the Eel River was greater than any of the other three rivers. Average annual suspended-sediment discharge of the Eel River at Scotia was 13,480,000 tons. Average annual sediment yields for the Mad River near Arcata and the Van Duzen River near Bridgeville were 1,401,170 and 1,400,000 tons- respectively. Particle size analyses show that the suspended sediment from the Eel, Mad, and Van Duzen Rivers average about 40 percent clay, 40 percent silt, and 20 percent sand.

Hayes, M. O., 1975, Morphology of sand accumulations in estuaries: an introduction to the symposium: *in* Geology and Engineering, Cronin, L. E., ed., Academic Press, Inc., v. 2., p.3-22, New York, N.Y.

This paper gives an excellent overview of the variables that effect the accumulation of sand in estuaries. The author then focuses on the three types of estuaries, i.e., microtidal, mesotidal, and macrotidal and describes the differences and similarities of each type.

Heagerty, D. D., 1987, Major offsite mitigation: Batiquitos Lagoon: Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2544-2548.

This is a project summary highlighting the benefits of the Batiquitos Lagoon, California Enhancement Project which will mitigate a 72 hectare (180 acre) Pacific Texas Oil Pipeline project. The mitigation project proposes to restore tidal flushing to lagoon and increase habitat potential for marine fisheries and endangered species.

Healy, R. G., Bantu, J. S., Clark, J. R., and Duddleson, W. J., 1978, Protecting the Golden Shore: Lessons from the California Coastal Commissions: The Conservation Foundation, Washington, D.C., 257 p.

The book concentrates on 1972-1976, the passage of Prop. 20 and the termination of the 1976 Coastal Act. It reaches a number of conclusions regarding the most successful and unsuccessful aspects of the Coastal program and what happens when state government takes a direct role in land use policy.

Hedges, J. I., Clark, W. A., and Cowie, G. L., 1988, Fluxes and reactivities of organic matter in a coastal marine bay: Limnology and Oceanography, v. 33, no. 5, p. 1137-1152.

The fluxes of bulk particulate material, organic carbon, nitrogen, neutral sugars, and lignin-derived phenols in the water column and through the water-sediment interface of Dabob Bay, Washington are reported in this paper.

________ 1988, Organic matter sources to the water column and surficial sediments of a marine bay: Limnology and Oceanography, v. 33, no. 5, p. 1116-1136.

This is a study of the lignin, elemental, and stable carbon isotope compositions of particulate organic materials in the water column and surface sediments of Dabob Bay, Washington.

Hedgpeth, J. W., 1979, San Francisco Bay: The Unsuspected Estuary: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 9-29.

Hedgpeth gives a very interesting historical background of San Francisco Bay from the first explorers in the area to the colonization by merchants and gold seekers. He points out the lack of scientific information on the ecology of the bay before the great flood of 1862. Hedgpeth outlines the evolution of scientific research in San Francisco Bay from the end of the hydraulic mining in 1884 and the cursory involvement by U. C Berkeley thru the work of Atwater, Conomos, Arthur and others involved in modern research of San Francisco Bay.

Hedgpeth, J. W., and Obrebski, S., 1981, Willapa Bay: A historical perspective and a rationale for research: Office of Biological

Services, U. S. Fish and Wildlife Service, U. S. Department of the Interior Washington, DC. FWS/OBS-81/03, 52 p.

Willapa Bay is presented in its ecological framework outlining the various fish resources of the bay and how the changes taking place in the logging industry will improve the habitat for continued fisheries. The paper gives a very good overview of the Bay and its historical production of both logging and fisheries. The final conclusion of the paper is that Willapa Bay has the potential to increase its natural resources through management and conservation.

Heiser, J. S., 1979, Coastal futures; legal issues affecting the development of the California Coast: Standard Environmental Law Society, Standard Environmental Law Annual v. II, 203 p., Available at University of California, Berkeley, Water Resources Archives.

The articles in this annual address a number of key legal issues concerning adequate protection of the California coast. Included is a discussion of "The California Coastal Act of 1976: Allocating coastal land use responsibilities between state and local governments."

Helland, R. O., 1953, Water power of the coast streams of Oregon: U.S. Department of the Interior, 46 p.

Gives a general description of Oregon coastal streams and discusses them in terms of water supply and storage sites and plan of development, with conclusions regarding potential for power. Includes the Nehalem River, Wilson and Trask Rivers (Tillamook Bay), Nestucca River, Siletz River, Alsea River, Siuslaw River, Coos river, and Coquille River.

Helley, E. J., and Averett, R. C., 1971, A preurbanization reconnaissance study of Lake Earl: U. S. Geological Survey, Department of the Interior, Open File Report, no. 2018-07, 17 p.

This study was performed to point out how urbanization would effect Lake Earl. Increased concern over the stability of the sand dunes bordering the lake, as well as the future quality of the water were concerns. This report includes the physical setting and water quality of Lake Earl and presents a study proposal for a full evaluation of the present water quality and the potential influence of urbanization on its shores.

Herbert, J., 1971, The North coast rivers: Sierra Club, San Francisco, CA, Northern California Regional Conservation Committee, 24 p.

A review of water resources projects under the California Water Plan concentrating on the Eel, Trinity and Klamath Rivers. Data focus on environmental impact (fishing, recreation etc.); offers alternative development plans.

Herrmann, F. A., 1968, Model studies of navigation improvements, Columbia River Estuary: Report. I: Hydraulic and salinity verification: U.S. Army Engineers, Waterways Experiment Station,Vicksburg, Miss., Tech. Report 2-735, 109 p.

No review

_______ 1970. Tidal prism measurements at the mouth of the Columbia River; hydraulic model investigation: U.S. Army Engineers, Waterways Experiment Station, Vicksburg, Miss., Miscellaneous Paper H-70-3, 4 p.

No review

Herron, W. J., and Harris, R. L., 1972, Case history of Mission Bay Inlet, San Diego, Calif.: Conference on Coastal Engineering, 13th, Proceeding, p. 801-822.

Mission Bay is about 2 miles north of San Diego Bay, California. It was originally an estuary consisting of about 4000 acres of very shallow marsh lands. Subsequent to 1875 the San Diego River discharged into the southeast corner of the bay and was the predominant source of upland drainage and sedimentation. The area is semiarid and while the river has a flood flow capability of over 100,000 cfs, there has not been a flood approaching this magnitude since 1927.

The natural tidal inlet was confined on the south by the rocky shoreline of Point Loma but was always open to the sea. Prior to its development in 1948 the tidal prism was about 4.5 X 10^8 cu ft. and the area of the entrance channel was 6 X 10^3 sq ft. This natural entrance channel was somewhat smaller than that developed by O'Brien in his analysis of equilibrium flow areas but was constrained by Ingraham Boulevard.

Mission Bay was the first harbor in southern California to be designed and built with a "non-scouring" entrance channel. The premise was, that if there was no outside source of shoaling materials and if bottom current velocities were reduced to where bottom material could not be moved, maintenance of harbor and entrance channel design depths would be reduced to a minimum. (Author)

Hicks, D. M., 1985, Sand dispersion from an ephemeral river delta on the wave dominated Central California Coast: University of California, Santa Cruz, CA., Ph.D. Thesis, 210 p.

Discusses sediment yield from the San Lorenzo River and the modification by wave action of the delta of the San Lorenzo River.

Hill, M. R., 1970, Barrier beach: California Division of Mines and Geology, Mineral Information Service, v. 23, no. 12, p. 231-233.

This paper reviews observations made during the time-lapse filming of modifications of Crokhite Beach (Rodeo Lagoon, Marin County, Calif.) including the formation of tidal inlets. Inlets were seen to form as the growth of a channel that returned water that was impounded by wave-overtopping of the barrier to the sea

Hodgkinson, N. B., 1933, Ballona Creek Outlet, data on tidal currents and tidal prism: Los Angeles Co. Flood Control District.

Data are compiled from individual soundings and float observations taken at Outlet to Ballona Creek from October 1930 to April 1931. Conclusion is that velocities due to tidal currents in this locality can have but slight significance in relation to littoral drift, and that other factors, such as storm currents and wave action, are probably major factors in modifying shorelines and causing shoals. (Com. on Tidal Hyd.)

Hofstra, T. D., and Sacklin, J. A., 1987, Restoring the Redwood Creek estuary: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 812-825.

This paper discusses the effects the construction of a flood control project had on physical and biological processes of the estuary at the mouth of Redwood Creek. The paper outlines the biological and social issues of opening the estuary mouth that otherwise floods the lower 5.1 kilometers of the creek and what measures were taken to solve the problem. The paper illustrates how applied research and agency coordination effectively responded to environmental problems.

Holland, R. C., and Sweeney, K. W., 1987, Mitigation features for marinas: Coastal Zone '87, v. 4, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 4167-4178.

This is a case study of the John Wayne Marina development located at Sequin Bay off the Straits of Juan de Fuca. The paper outlines the incorporation of environmental mitigations into marina designs.

Hollibaugh, J. T., and Smith, S. V., 1988, Exchange of DON Between Tomales Bay, California, and the Coastal Ocean: EOS, Transactions, American Geophysical Union, v. 69, no. 44, p. 1256.

Data collected over a two year period were used to examine net DON (dissolved organic nitrite) fluxes in Tomales Bay, California. DON export was found to account for about 25% of the fixed N lost from the system and was 30 to 520% of the DIN import flux.

Hostettler, F. D., Rapp, J. B., Kvenvolden, K. A., and Luoma, S. N., 1988, Biogenic and anthropogenic organic markers as source discriminants and sediment transport indicators in South San

Francisco Bay, California: U.S. Geological Survey Open-File Report 88-408, 16 p.

This report studies the feasibility of using the content of biogenic and anthropogenic molecular marker compounds found in sediment samples collected from near-shore sites in South San Francisco Bay in determining sediment transport directions.

Howey, T. W., and Blackmon, J. H.,1987, Use of a geographic information system as a tool for making land use management decisions for coastal wetlands in a state regulatory program: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 399-413.

This report summarizes setup and use of a geographic information system used by the Coastal Management Division of the Louisiana Department of Natural Resources in making decisions concerning proposed activities along the gulf coast and the possible consequences of these activities.

Hughes, F. W., and Rattray, M., Jr., 1980, Salt flux and mixing in the Columbia River Estuary: Estuarine and Coastal Marine Science, v. 10, p. 479-493.

The Columbia River Estuary at low discharge falls in classes Ib and 2b of the Hansen & Rattray (1966) classification system with the former occurring upstream where the salinity gradients are weakest. During high discharge it falls in the relatively unexplored region bounding classes Ib, 2b and 4. It is typified by both strong tidal and mean currents modified by bathymetry and channel curvature. The dominant lateral dynamic balance is between the pressure gradient, centrifugal, and Coriolis forces.

The estuary has a strong vertical salinity gradient and also a marked transverse gradient required for the lateral dynamic balance. More than half the upstream salt flux, balancing the downstream mean flow advective salt flux is directly due to correlation between tidal components of velocity and salinity and between each of these and the tidal variation of cross-sectional area. The remaining upstream salt flux arises from the vertical gravitational circulation.

The mean stratification and circulation for both, high and low dischargees yield theoretical estimates of the diffusive fraction of the upstream salt flux in reasonable agreement with the observed values. They also lead to reasonable estimates of P and F_m for low discharge conditions but for high discharge only the estimates of P is reasonable. Neither the high discharge estimate of F_m nor the vertical profiles of velocity, U, and salinity, S, fit the theoretical models. (Author)

Hull, D. M., 1987, Salmon restoration in Humboldt Bay: A model of citizen and government participation: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 1821-1835.

This paper outlines the efforts of two organizations in successfully reversing the decline of the salmon resources in Humboldt Bay. The City of Arcata and the Humboldt Fish Action Committee utilized the expertise from Humboldt State University and the College of the Redwoods with guidance and funding from the California Department of Fish and Game to set up three trapping stations and restore part of Butchers Slough.

Huzzey, L. M., Cloern, J. E., and Powell, T. M., 1988, Mechanisms and ecological significance of lateral circulation in a coastal plain estuary: EOS, Transactions, American Geophysical Union, v. 69, no. 44, p. 1256.

This study shows the variability in salinity and phytoplankton biomass as a result of circulation patterns and stream runoff across the channels of San Francisco Bay. Current data and tidal observations were incorporated to determine variabilities.

I

Inman, D. L., 1980, Summary report of mans impact on the California coastal zone: California Department of Boating and Waterways, The Resources Agency, Sacramento, CA., 150 p.

This report summarizes information necessary to understand nearshore processes; outlines some principles of coastal zone planning that are compatible with these natural processes; and presents recommendations for correcting specific coastal problems. Santa Cruz Harbor and Bolinas Lagoon are discussed in detail.

Isaacs, J. D., 1946, Preliminary report on harbors, havens, and anchorages of the Pacific Coast from San Francisco to the Straits of Juan de Fuca: University of California, Berkeley, Department of Engineering, Fluid Mechanics Laboratory Report no. HE-116, 1 volume.

This report was prepared as a guide to oceanographic investigations, facilities, sites for the installation of instruments, and small boat operations along the Pacific Coast. An attempt was made to cover all of the primary and secondary entrances from San Francisco to the Straits of Juan de Fuca. The captions on the photographs present the general information and constitute the bulk of the report. The author has personally negotiated every passable entrance in a small craft (with the exception of Bolinas and Mendocino Bays) and has sheltered in the havens.

Isselhardt, C., Osuch, L., and Wilde, P., 1968, Recent sediments of Bolinas Bay, California, Part A, Introduction and Grain Size Analysis: University of California, Hydraulic Engineering Laboratory, Report HEL 2-19, Berkeley, 55 p.

Three types of samples are examined in this report: (a) 6 rock samples from the cliff on the north shore of Bolinas Bay, (b) 12 beach samples, and (c) 44 marine rock and sediment samples from Bolinas Bay. Rock samples are from surface outcrops. Beach samples were scooped from the surface at low tide. Marine samples were obtained on 26-27 March 1968 from the converted fishing boat San Michele. Bottom samples were obtained by an orange peel grab and thus were representative of approximately the upper 15 cm of sediment. Grain size-frequency distribution curves included. (J.H. Barwis)

Isselhardt, C., Osuch, L., and Wilde, P., 1968, Recent sediments of Bolinas Bay, California, Part B. Mineralogical Data: University of California, Berkeley, Hydraulic Engineering Laboratory, College of Engineering, Part B (one of three parts), (HEL-2-22.)155 p.

This part of a study of Bolinas Bay involves the heavy mineralogy of 49 sediment samples. Graphs are used to illustrate the findings. Grain size and heavy mineral analyses of 6 cliff, 12 beach, and 44 marine sediment and rock samples from Bolinas Bay. Part of a study of sediment transport on the continental shelf off Central California. Mineralogical data is in tables and graphs.

J

Jackson, P. L., and Granger, O., 1987, Developing findings of fact for hazard mitigation and preparedness plan for the city of Waldport / Alsea Bay Area, Lincoln County, Oregon: Coastal Zone '87, v. 4, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3809-3818.

The procedures involved in addressing the hazard of marine flooding at Alsea Bay, Oregon are discussed and how to use these findings as a requirement of Oregons state wide planning and lands permit process, as pact of preparedness planning.

James, W., 1970, A photographic analysis of Oregon Estuaries: Department of Civil Engineering, Oregon State University, Corvallis, Oregon.

Includes general description, photographs, and photographic analyses of the following Oregon estuaries: Tillamook, Alsea, Coos, Umpqua, Siletz, Siuslaw, Nestucca, Nehalem, Coquille, Salmon River, Sand Lake, Netarts, and Yaquina.

Jarman, C., 1987, Alternatives to fee simple acquisition of property for estuarine reserves: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 161-169.

The paper addresses the sequence of congressional decisions which lead to the National Estuarine Reserve Research System. Problems are outlined in cost over run in the acquisition, development, and operation of estuarine reserves. The study discusses the options that could be pursued by states in establishing estuarine research reserves.

Jay, D. A., 1984, Circulatory processes in the Columbia River Estuary, Astoria, OR: Final report on the circulation work unit of the Columbia River Estuary Data Development Program, P. O. Box 175, Astoria, Or. 58 p.
No review

Johannessen, C. L., 1964, Marshes prograding in Oregon: aerial photographs: Science, v. 146, p. 1575-1578.
Aerial photographs, survey charts, and field mapping were utilized to relate the expansion of marshes with the growth patterns of clumps of tidal marsh plants in seven estuaries along the Oregon coast. The author investigated the chronology of colonization that marsh plants follow in the expansion process.

Johnck, E., Keino, R. J., and Wallden, T., 1970, The California Coastline - Its problems and prospects: California Bureau of Outdoor Recreation, Pacific Southwest Region, Sacramento, CA, Brochure.
A pamphlet on the California coastline, including its problems, its environment, highways, industrial interests, national concerns, and regulatory power.

Johnson, H. D., Brown, E. G., Jr., and Robie, R. B., 1978, Land Use within the California Coastal Zone: California Resources Agency, California Department of Water Resources, Sacramento, CA, Bulletin 207, 181 p.
Report that includes 161 land maps which cover the Coastal Zone from Oregon to Mexico identifying agricultural, native, urban, and recreational classes of land.

Johnson, J. W., 1949, Relationship between wind and waves, Abbotts Lagoon, California: University of California, Berkeley, Department of Engineering, Fluid Mechanics Laboratory, 6 p. , Report no. HE-116-306.

A series of observations on wind generated waves were made in Abbotts Lagoon, California, to better define the relationships between wind and wave characteristics on relatively small bodies of water of limited fetch. The experimental methods are described and a relationship between wave height and information that is presented includes a relationship between wave steepness and wave age, wind gradients, and typical frequency distribution of wave heights.

_______1963, Bolinas Lagoon Entrance: Report to Board of Commissioners, Bolinas Harbor District, Bolinas, California.

A report on the problem of developing the Bolinas Lagoon includes discussion of design wave, wave refraction and diffraction effects, degree of protection, sediment problems and advisability of hydraulic model studies. Basic data available for this study included:

(1) wave refraction diagrams by U. S. Army Corps of Engineers

(2) Wave statistics from National Marine Consultants, 1960.

(i) wave statistics for seven deep water stations along the California Coast.

(ii) wave statistics for 10 most severe storms of northern California, 1951-1960.

(3) Unpublished studies of nearshore sediment movement. (Barwis)

_______1965, Study of high water levels in Drake's Bay, California: Illustrations, not published, 21 leaves, available at the

University of California, Berkeley, Water Resources Archives.

The purpose of this study was to predict the possible maximum high water levels in Drake's Bay, California. A discussion of factors in fixing a possible maximum high water is presented. The factors are (1) astronomical tides, (2) meteorological effects, (3) wave action, (4) tsunamis, and (5) shoreline processes.

_______1965, Nearshore sediment movement, Central California coast: Chap. 23: Coastal Engineering, Santa Barbara Specialty Conference, 1965, New York: American Society of Civil Engineers, p. 537-559.

Longshore transport of sediment between the Russian River and Half Moon Bay is small. Four techniques were employed in this consideration: coastline configuration in light of prevailing wave energy; source and distribution of light and heavy minerals; use of radioactive tracers; and sedimentation at both natural and stabilized harbor entrances. (J. H. Barwis)

_______1969, Tide gage; tidal relationships, tidal prism data, Bolinas Bay and Bolinas Lagoon: University of California, Berkeley, Water resources Archives, 1 v.

This report considers tidal relationship, and tidal prism data, and USGS tide gage charts for Bolinas Lagoon, in May 1968.

_______ 1969, Stabilization of the Bolinas Lagoon Inlet; Report to Bolinas Harbor District: University of California, Hydraulic Engineering Laboratory, Berkeley, 38 p.

In any tidal lagoon at a particular time, there is a close relationship between the hydrology, the ecology, sedimentation processes, circulation patterns, etc., of the lagoon and the entrance to the ocean. Thus, the lagoon and the ocean constitute integrated system which will remain in relative equilibrium only if the entrance remains relatively stable as to cross-sectional area, location, and bed roughness. Any factor which might increase the sedimentation rate within the lagoon, for example,

would affect the entrance area which in turn would affect the circulation pattern in the lagoon, create possible pollution problems, and thereby cause a general trend of deterioration of the lagoon in all aspects. In order to maintain the integrity of the entire Bolinas lagoon-ocean system, it is necessary that in the lagoon the ecologically depleted areas be rehabilitated, circulation patterns be improved, and pollution and sedimentation be reduced. These factors and the creation of a harbor of refuge of limited capacity can be achieved most effectively by a stabilized entrance channel. The discussion to follow, therefore, is concerned with structures which will stabilize the entrance to Bolinas Lagoon with a minimum of maintenance problems to both the channel and the adjacent shoreline. To arrive at a recommended design requires the analysis of all available oceanographic data such as tides, wave action, currents, sediment movement, and both short- and long-term shoreline changes. In detail, the study consists of the following: (a) analyze all available data on wave characteristics for Bolinas Bay and vicinity. These wave data include information from hindcasts, visual observations at Stinson State Park and Bolinas, and a wave gage installed in Bolinas Bay in February 1969. The wave climate, the characteristics of littoral currents, and a design wave should result from this study. (b) analyze periodic bottom surveys completed for the Bolinas Harbor District in 1968-69 and evaluate the seasonal changes that occur in the nearshore area of Bolinas Bay. (c) analyze all available data on beach profiles taken at various times along the Stinson Spit and evaluate the probable source of sediments and the general character of littoral processes within Bolinas Bay. (e)evaluate various methods of stabilizing the entrance into Bolinas Lagoon with the objective of creating a harbor of refuge for small craft, rehabilitating the ecology of the lagoon, and reducing pollution and sedimentation problems. (Author).

_______1970, Seasonal bottom changes, Bolinas Bay, Calif.: Coastal Engineering Conference, 12th Proc., v. II, no. 85, p. 1383-1396.

Seasonal variations of scour and fill are presented, based on a five-survey, 1-yr study. In the 22-yr period between 1948-1970, the position of the high tide line showed a seasonally cyclic variation, with the greatest between-year variations shown by the spring months. (J. H. Barwis)

_______1971, Tidal inlets on sandy shores (abs.): Nat. Coastal Shallow Water Research Conference, Abs., v.2, p. 120.

Sandy shorelines approach an average equilibrium configuration, in planform and profile, under the influence of the wave climate, the tides and tidal currents, and the local winds acting on the material that forms the shore. The tides and tidal currents vary in a predictable sequence, but waves and local winds occur randomly and shorelines exhibit correspondingly random deviations from an average configuration. The most active position of most shorelines is found in and near inlets where strong currents move the material stirred up by wave action.

The research now in progress involves laboratory experiments on tidal inlets to determine the relation between the minimum throat area and the tidal prism. An office study of available field data is being coordinated with the laboratory program. The elements of the hydraulic regimen include the dissipation in a tidal basin, (b) power available for maintenance of flow area, (c) closure criteria, (d) value of tidal prism in maintaining interior channels, (e) velocity at the throat of a tidal inlet, (f) duration of the tide, (g) inlets as traps for littoral transport, and (h) wave refraction by currents at an inlet. (Author)

_______1971, Bottom sediment characteristics near entrance to San Francisco Bay: University of California, Berkeley, Hydrologic Engineering Laboratory, Technical report HEL 24-3, 27 p.

The bed material in Golden Gate, its approaches, and the adjacent beaches show a relatively small range in grain size: fine sand (125-250 μ) to coarse sand (500-1000 μ). Therefore, there appears to be no relatively coarse material of the gravel sizes available on the bottom which could serve as an armoring

surface and thus control the frictional resistance to flow in and out of Golden Gate. Generally, coarse material is found in those locations where the current velocities are high. From the limited data available, however, it appears that flow resistance in Golden Gate and vicinity is probably controlled more by form resistance of ripples and sand waves than by grain size alone (Author)

_______ 1972, Tidal inlets on the California, Oregon and Washington coasts: Hydraulic Engineering Laboratory HEL 24-12, University of California, Berkeley, 56 p.

Discusses factors affecting the stability of tidal inlets and gives characteristics of California, Oregon, and Washington coastal inlets including numbers of jetties, tidal data, bay dimensions, and wave climate.

_______1973, Bolinas Lagoon Inlet, California: Univ. Calif. Hyd. Engr. Lab., Rept. HEL 24-15, Berkeley, 44 p.

To adequately define the importance of the variables involved in the hydraulic and sedimentary characteristics of inlets on sandy shorelines, data are necessary on such items as (a) simultaneous tide measurements in the ocean and in the lagoon, (b) frequent bottom surveys of the inlet throughout the year, (c) friction losses, and (d) bottom sediment size distribution and sand waves. Obviously such measurements are difficult, expensive, and often hazardous to make. Bolinas Lagoon inlet is a natural laboratory in which a large amount of data has been collected over the years (perhaps more than any other lagoon in existence). Even then, the data are insufficient to adequately define the importance of the variables involved in the relations discussed above. For the record, however, the source, nature, and availability of data on the Bolinas Lagoon inlet are summarized as a guide to possible future desirable studies at Bolinas, as well as inlets elsewhere.

Information is given on wave data, wave power, littoral currents, sedimentation processes, inlet characteristics, and sediment transport by tidal currents. (Author)

_______1973, Characteristics and behavior of Pacific Coast tidal inlets: Proc. Am. Soc. Civ. Eng, Jour. Waterways, Harbors, and Coas. Engr. Div.., v. 99, no. WW3, Paper 9927, p. 325-339.

All generally available navigation charts and tidal data were critically examined for 48 tidal inlets, lagoons, and bays along the coasts of California, Oregon, and Washington to determine the tidal prism and throat area of the inlets. Twenty-five of the inlets yielded data which were considered reliable, and a relationship between tidal prism and inlet area was formulated. All 25 inlets, except one, were originally in erodible material, although in numerous instances the inlets have been now stabilized by jetties. Some inlets depart radically from a fairly good relationship between tidal prism and throat area for most inlets. The probable reason for this departure is examined. Whether or not an inlet is always open, always closed, or open on occasions, appears to be related to the ratio of wave power to tidal power. An approximate closure criterion is presented from an analysis which considered 46 of the inlets. (Author)

_______1974, Bolinas Lagoon Inlet, California: U.S. Army Coastal Research Center, Miscellaneous Paper no. 3-74, Fort Belvoir, 46 p.

The hydraulic and sedimentary characteristics of tidal inlets on sandy coasts have long been of interest to engineers involved in harbor design and maintenance. O'Brien (1931), in a study of west coast inlets, proposed a relationship between the minimum inlet area below mean sea level and the tidal prism. Other investigators in recent years have proposed similar relationships. A re-analysis of data from inlets on U. S. Coasts by O'Brien (1967), resulted in a later observation (O'Brien, 1971); he believed that the equilibrium relationship between inlet area and tidal prism as he originally proposed seemed to be a first approximation and that the next effort should be for quantitative understanding of deviations form the approximation. If the flow area is determined by the tidal prism, then this area is in constant process of adjustment because the tide range, and

the related tidal prism, varies continually.

The Bolinas Bay-Bolinas Lagoon system is a natural laboratory in which a large amount of data has been compiled on hydrography, wave action, tidal hydraulics, sediment transport, sedimentation, and the ecosystem. however, the data are insufficient to adequately define the importance of the inlet area and tidal prism. The source, nature, and availability of data on the Bolinas Lagoon Inlet are summarized as a guide to possible future studies at Bolinas, and other inlets. (Author)

_______1976, Closure conditions of Northern California lagoons: Shore and Beach, July 1976, p. 20-23.

This study investigates the effects of wave approach and wave energy on determining the opening or closure of northern California coastal lagoons. The author uses the size of the lagoon, the tidal prism of each lagoon, and the exposure of the entrance of the lagoon to wave approach as variables. The lagoons studied were Bolinas Lagoon, Drakes Estero, Abbotts Lagoon, Tomales Bay, Bodega Harbor, and the Russian River, as well as comparisons to four other northern California lagoons. The investigation utilized statistical wave data form deep water offshore stations and available wave refraction diagrams to calculate the annual wave power near the entrance of each lagoon. The author presents diagrams that include rose diagrams to show the predominant seasonal swell direction at each location, and with this he relates the predominant open or closed condition of each lagoon. The work shows that lagoons with little to no tidal prism and no protection from direct wave approach are kept closed. Whereas those lagoons that are protected by headlands from direct wave approach and have a high enough tidal prism to flush out the entrance to the lagoons are kept open year around.

Johnson, R. G., Bryant, W. R., and Hedgpeth, J. W., 1961, Ecological survey of Tomales Bay - Preliminary report of the 1960 Hydrographic Survey: University of the Pacific, Pacific Marine Station, Dillion Beach, CA, Research Report, no. 1, 13 p.

Part of a larger program of studies to investigate basic problems in marine ecology and geology in Tomales Bay. Hydrographic data reported in this survey include: temperature, salinity, oxygen, transparency, and currents. Also includes a physical description of Tomales Bay.

Johnson, V. G., and Cutshall, N. H. 1975, Geochemical baseline, data, Youngs Bay, Oregon, 1974. Final report. Corvallis: Oregon State Univ., School of Oceanography.
No review

Josselyn, M., and Buchholz,J. W.,1984, Marsh restoration in San Francisco Bay: A Guide to Design and Planning: Technical Report #3, Tiburon Center for Environmental Studies, San Francisco State University, 104 p.

This guidebook is an analysis of existing San Francisco Bay tidal wetland restorations in Marin County and a guideline to successful habitat design in future restorations. It is written for government planners, regulators, and resource managers; for environmental consultants and their clients; for members of environmental organizations; and for educators and students. The recommendations are based on field studies conducted in San Francisco Bay marsh restorations or natural tidal marshes. The primary focus has been on biological aspects although some attention has been given to hydrology and sedimentation.

Josselyn, M., Duffield, J., and Quammen, M. L., 1987, An evaluation of habitat use in natural and restored tidal marshes in San Francisco Bay, California: Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3085-3094.

This paper focuses on the use by wildlife of restored and natural wetland habitats in San Francisco Bay, California.

Josselyn, M.,1985, Do nutrients or physical factors control macroalgal growth in temperate estuaries?: Estuaries, v. 8, no. 2B, p. 30A.

Nuisance blooms of macroalgae occur at various locations throughout San Francisco Bay each summer. Growth occurs primarily subtidally and biomass accumulates onshore where the algae decay. The primary genera involved include: Polysiphonia, Enteromorpha, Cladophora, and Ulva. Growth responses to ambient irradiance, salinity, and temperature indicate that light penetration may be most limiting to growth whereas salinity affects seasonal distribution in the estuary. Enrichment experiments using nitrate show enhanced growth only at high light levels and not at irradiance typical of controlled by reduced freshwater inflow which results in higher salinities and lower turbidity. Lower phytoplankton biomass in summer may also increase light penetration.

K

Karp, L. B.,1975, Review of coastal changes at Bodega Harbor inlet: University of California, Berkeley, CA, CE 299 student paper to Prof. Johnson, 1975, Berkeley, 51 leaves, folding maps, photos.

The inlet and improvements at Bodega Harbor on the Sonoma County coast were studied with the aid of aerial photographs, maps, and historical records. The sediment movement by wave refraction occurring in the vicinity was found to compare closely with the theories of prominent coastal engineers. Shoreline changes were compared during the period of improvement. Equilibrium of Bodega Bay was found to exist with significant changes made only by man.

Kemp, P. F., Swartz, R. C., and Lamberson, J. O., 1986, Response of the phoxocephalid amphipod, *Rhepoxynius abronius,* to a small oil spill in Yaquina Bay, Oregon: Estuaries, v. 9, no., 4B, p. 340-347.

A spill of approximately 284,000 liters of Bunker C and diesel fuel oils occurred at the entrance of Yaquina Bay, Oregon following the wreck of the freighter *Blue Magpie* on 19 November, 1983. A portion of this oil entered the lower estuary and was deposited on subtidal benthic habitats occupied by the phoxocephalid amphipod *Rhepoxynius abronius*. This species is particularly sensitive to contaminants in sediment had previously been studied at the same site, and was affected by the spill. The oil was initially present as small, sand-coated globules at the study site, and persisted in association with detritus and sediment for months. Bioassays with *Rhepoxynius abronius* showed that the oil globules were not acutely toxic unless mixed into the sediment at concentrations of 1.0 parts per thousand or greater. A series of 10-d bioassays before and after the spill showed that sediment collected from oiled subtidal sites did not become acutely toxic to this species. Although the density of the *R. abronius* population declined by 75% after the spill, similar declines of the same population were observed at this site in fall 1980. Oil-exposed *R. abronius* from Yaquina Bay were slightly more sensitive to cadmium in sediment than individuals for Whidbey Island, Puget Sound, Washington. Although mean fecundity was greater in 1984 than in 1981, recruitment following the spill was lower than in the 1980-1981 study. Thus, there is limited evidence for a small impact of the oil spill on this sensitive amphipod.

Kennedy, V. C., Kendall, C., Zellweger, G. W., Wyerman, T. A., and Avanzino, R. J., 1986, Determination of the components of stormflow using water chemistry and environmental isotopes, Mattole River Basin, California: Journal of Hydrology, v. 84 p. 107-140.

The chemical and isotopic composition of rainfall and stream water was monitored during a storm in the Mattole River basin of northwestern California. About 250 mm of rain fell during 6 days (~80% within a 42 h period) in late January, 1972, following 24 days of little or no precipitation. River discharge near Petrolia increased from 22 $m^3\ s^{-2}$ to a maximum of 1300 $m^3\ s^{-1}$ while chloride and silica concentrations decreased only from 3.2 to 2.1 and 11.5 to 8.6 mg l^{-1}, respectively. Meanwhile, the isotopic composition of the river changed from $\partial D = -42\%\ ^o/_{oo}$, $\partial^{18}O = -6.8\ ^o/_{oo}$ and 40 tritium units (T.U.) to extreme values at highest flow of $\partial D = -35\ ^{o}/_{oo}$, $\partial^{18}\ 0 = -5.9\ ^{o}/_{oo}$ and 25 T.U. in response to volume-weighted rainfall averaging $\partial D = -19.5\ ^{o}/_{oo}$, $\partial^{18}\ 0 = -3.1\ ^{o}/_{oo}$ and 18 T.U.

Despite much rainfall of a composition quite different from that of the pre-storm river water, "buffering" processes in the watershed greatly restricted changes in the chemical and isotopic content of the river during storm runoff. Because of the physical and hydrologic characteristics of the watershed, major contributions of groundwater to stormflow are very unlikely. The large increase in dissolved chemical load observed at maximum river discharge required that extensive interaction with, and presumably penetration of, soils occurred within a few hours time. Such a large increase in chemical load also required subsurface stormflow throughout a high proportion of the watershed. Chemical and isotopic stabilization of stormflow is believed to be due mainly to displacement of pre-storm soil water, with some effects on river chemistry due to rapid chemistry due to rapid rain-soil interactions.

The isotopic and chemical composition of pre-storm soil moisture cannot readily be predicted a priori because of possible variability in rainfall composition, evaporation, and exchange with atmospheric moisture, nor can it be assumed that baseflow has a predictable relation to the chemical or isotopic composition of water displaced from soils during storms. Therefore, it seems inappropriate to draw conclusions as to the relative proportions of groundwater and rainfall in runoff from a particular storm based only on the average compositions of rainfall, stormflow, and pre-storm river water, as has been done in most previous isotope hydrograph studies.

Given the great variation in hydrology, topography, soil characteristics, rainfall intensity and quantity, etc. from place to place, the relative amount of overland flow, subsurface flow from the unsaturated zone and of groundwater in stormflow can vary greatly in time and space. (Author)

Kentula, M. E., and McIntire, C. D., 1986, The autecology and production dynamics of eelgrass (*Zostera marina* L.) in Netarts Bay, Oregon: Estuaries, v. 9, no. 3, p. 188-199.

The research concerned itself with the production dynamics of *Zostera marina* , specifically with the autecology of *Zostera*, the above ground production in the intertidal region for a growing season, and the fate of the above ground biomass.

Kinnetic Laboratories, Inc., 1981, In-situ field data gathering stations, San Francisco Bay-Delta, salinity intrusion with navigation channels: Kinnetic Laboratories, Inc., Santa Cruz, California, Report no. KLI-81-1, 116 p.

Temperature, current speed, and current direction, optical transmissivity electrical conductivity, and tidal stage were measured half hourly at five three-level and one one-level stations between February, 1979 and June, 1980. The stations were located in the San Pablo Bay to Suisun Bay area, including Carquinez Strait, in Northern California. Their purpose was to learn more about the freshwater-saltwater circulation pattern and further verify the Corps' Sausalito-based hydraulic model of the San Francisco Bay-Sacramento-San Joaquin Delta region. The main report describes the system of instruments and the associated data processing programs developed to transfer the data from cassettes to nine-tract tapes, to screen it, and present it on fiche.

Kistritz, R. U., Hall, K. J., and Yesaki, I., 1983, Productivity, detritus flux, and nutrient cycling in a *Carex lyngbyei* tidal marsh: Estuaries, v. 6, no. 3, p. 227-236.

Net annual primary production of a sedge *Carex lyngbyei* dominated tidal marsh in the Fraser River estuary, British Columbia, Canada was 634 g ash-free dry weight (AFDW) per m^2 per year (687 g dry weight per m^2 per yr). Mean maximum shoot elongation during the short (May to August) growing season was 1.88 cm per day from overwintering shoots. The maximum above ground standing crop of 690 g AFDW per m^2 represented only 25% of the total belowground biomass, which appears to be controlling

most of the critical life history processes of the sedge marsh. An estimate of 14% of the above ground standing crop was lost through leaching of dissolved organic carbon from the growing plant. Above ground tissue losses, which were negligible during the growing season, occurred primarily via translocation in autumn and tidal export during the winter. *In situ* measurements showed that, of the original maximum standing crop, approximately 38%, 37%, and 25% were lost by downward translocation, tidal export, and sediment burial, respectively. Based on changes in above and belowground nutrient pools, rapid spring (May to late June) uptake rates of 109 mg N per m^2 per day and 12.2 mg P per m^2 per day during late June to the end of August. Above ground leaching rates were estimated as 23.9 mg N per m^2 per day and 7.8 mg P m^2 per day; root uptake occurred primarily after late June. Nutrient levels in decomposing litter more than doubled over the winter period showing a pattern of nutrient enrichment characteristic of marsh ecosystems. (Author)

Klingeman, P. C., and Kaufman, W. J., 1963, Transport of Radionuclides with San Francisco Bay Sediments, Progress Report, 1961-62 water year: Sanitary Engineering Research Laboratory, College of Engineering and School of Public Health, University of California, Berkeley, CA., SERL report no. 63-7, 70 p.,

The general objective of this study was to ascertain the distribution of radionuclides in the waters and sediments of northern portions of the San Francisco Bay system. Of particular interest was the distribution and movement with bay sediments, of fission products of recent fallout origin.

Knebel, H. J., Conomos, T. J., and Commeau, J. A., 1977, Clay-mineral variability in the suspended sediments of the San Francisco Bay system, California, Journal of Sedimentary Petrology, v. 47, no. 1, p. 229-236.

This paper investigates the variability in the relative amounts of chlorite + kaolinite, illite, and montmorillonite in suspension and in the sediments of San Francisco Bay. The results

indicate that the relative amounts of chlorite + kaolinite are highest in the northern reach of the bay where the source is the Sacramento-San Joaquin River system. Illite was found to be always dominant in the southern reach due to the resuspension of clay minerals from the bay floor by tides and waves. The paper discusses the various factors responsible for the variations in clay mineralogy, among those considered are size segregation of particles by differential erosion or settling, particle sizes, and provenance of the clay minerals.

Knotts, J. M., 1971, Sedimentation in the Middle Fork Eel River Basin, California: U.S. Geological Survey, Department of the Interior Open-File Report,(2001-06), 60 p.

Estimates of long-term sediment yields from several of the larger tributaries in the Middle Fork Eel River basin and probable distribution characteristics of sediment within the largest and smallest of the proposed reservoirs were made to determine the feasibility of a reservoir. Sedimentation data used in the study were obtained during 1956-58. The bulk of these data consisted of records of daily suspended-sediment discharge and analyses of periodic sediment samples from hydrologic stations established on several of the larger tributaries. Special measurements were made during the 1968 storm season to determine parameters required for the indirect Muller equation. Estimates of total sediment yield were made by extending short-term flow records. (CCSTWS)

Knotts, N. P., and Barrick, R. C., 1976, Hydrodynamics of Grays Harbor, Washington: *in* Maintenance Dredging and the Environment of Grays Harbor, Washington: Appendix A. U.S. Army Corps of Engineers, Seattle, Washington.

No review

Kolpack, R. L., 1982, Sediment dynamics in King Harbor, California: EOS, Transactions, American Geophysical Union, v. 63, no. 27-52, p.975.

This abstract suggests that energy conditions when

controlled by various factors can influence the grain size distribution within a small harbor. Due to these conditions, transport processes can be distinguished from factors related to sediment supply based on the grain-size, which is a direct reflection of energy conditions that are influenced by the harbor geometry.

Krone, R. B., 1979, Sedimentation in the San Francisco Bay System: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 85-95.

Sediment inflows to the San Francisco Bay system have been significantly affected by man since the 1860's. Mining and agriculture caused large increases in sediment inflows during the late 1800's, and rapidly increasing fresh water diversions for irrigation are now causing depleted sediment inflows. In addition, maintenance dredging within the system alters sediment transport.

Sediments entering the system by land drainage consist largely of silts and clay minerals. These materials enter with high winter river flows and settle initially in the upper bays. Daily spring and summer onshore winds generate waves that suspend fine materials and hold them in suspension while tidal- and wind-driven currents circulate the suspended material throughout the system and to the ocean.

The effectiveness of waves in suspending deposited material increases rapidly with decreasing water depth. As the upper bays fill with sediment to depths where wave action resuspends the annual load at the same rate as the supply, the water depths tend to remain constant there, and further accumulation of sediment in the system occurs seaward. Evaluation of historical bathymetric surveys, including the effects of rising sea level, shows progressive sedimentation in the system that is now approaching Central Bay. Future fresh water diversions will materially slow

this trend and will cause reduced turbidity from sediment particles.

Kulm, L. D., and Byrne, J. V., 1966. Sedimentary response to hydrography in an Oregon estuary: Marine Geology, v. 4, p. 85-118.

Depositional environments are defined based on 133 sediment samples collected from Yaquina Estuary, Oregon. The samples were collected from a deep channel and two main tidal flats and analyzed mechanically, chemically, and mineralogically. These environments (beach, dune, channel, tidal flat) fall into two depositional realms, marine and fluviatile, and a transitional zone. The marine realm has water of normal salinity and vigorous wave and tidal action; sediments are well-sorted, subangular to subrounded, fine to medium sand. In the fluviatile realm, water is brackish, and energy lower. Sediments are poorly sorted, angular to subangular, silt to coarse sands. Sediments of the transition zone have variable characteristics. The sediments of each depositional environment are described in terms of texture and composition, with particular reference to heavy minerals, and it is shown that the heavy mineral assemblages of the marine and fluviatile realms are distinct. The sediments have two main sources; either marine terrace and inshore shelf deposits, or Tertiary sediments of the Yaquina drainage basin. The magnitude of transport of sediments from these two sources varies with season and weather conditions.

________1967, Sediments of Yaquina Bay, Oregon: Estuaries, *in* Lauff, G.H., ed.: American Association for the Advancement of Sciences Publication 83, p. 226-238.

This study describes three realms of deposition based on sediment texture and mineralogy of samples collected in Yaquina Bay, Oregon. The chief sources of Recent sediments are Tertiary rocks of the bordering Coast Range, Pleistocene marine terraces and estuarine deposits near the bay mouth, and Recent beach and dune sands flanking the entrance. The tidal currents transport sediment onto the tidal flats while suspended river sediments

enter the bay during periods of high runoff, which occurs during the winter months. The shoals that are found along the main channel and turning bay have remained constant for 12 yrs. It was found that about 275 cu yd of sediment accumulated on a beach behind the south jetty from 1888 to 1961.

Kvenvolden, K. A., Blunt, D. J., and Clifton, H. E., 1979, Amino-acid racemization in Quaternary shell deposits at Willapa Bay, Washington: Geochimica et Cosmochemica Acta, v. 43, p. 1505-1520.

Extents of racemization (D/L/ratios) of amino acids in fossil *Saxidomus giganteus* (Deshayes) and *Ostrea lurida* Carpenter were measured on shell deposits exposed at 21 sites on the east side of Willapa Bay, Washington. Amino acids from *Saxidomus* show less variability in D/L rations and, therefore, are of greater use in correlation and age estimation than are amino acids of *Ostrea*. Shells of two different ages, about 120,000 ±40,000 yr old and about 190,000 ±40,000 yr old, are present. These ages correspond to Stages 5 and 7 of the marine isotope record defined by Shackleton and Opdyke in 1973, and hence the shell deposits likely formed during two different high stands of sea level. The stratigraphic record at Willapa Bay is consistent with this interpretation. (Authors)

L

Landahl, J., 1988, Sediment-level fluctuation in a mussel bed on a 'protected' sand -gravel beach: Estuarine, Coastal and Shelf Science, v. 26, p. 255-267

Studies of a dense population of the blue mussel (*Mytilus edulis*) between an abrupt lower boundary at +0.6 m above MLLW, and an indistinct upper limit at +2.3 m above MLLW on a sand-gravel beach at Quartermaster Harbor, Vashon Island, WA, evaluated the effects of physical and biological factors on patterns of abundance and distribution. Winter storms caused little sediment movement high on the shore either inside or outside patches of mussels, but large fluctuations (>3 cm) at mid- and low-shore levels sometimes caused burial and mortality. even high mussel

biomass (25 kg m^{-2}) did not prevent large-scale sediment level change.

Leahy, E. J., and Inman, L. B., 1976, Dredge sediment movement tracing in San Francisco Bay: U. S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Miss., for U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA. 106 p.,

This report describes research efforts conducted to; (a) identify the chemical elements suitable for use as neutron-activated tracers, (b) tag the San Francisco Bay sediments, (c) introduce the tagged mineral particles into the dredged material, and (d) analyze the collected sediment samples.

Leopold, L. B., Collins, L., and Inbar, M., 1984, Channel and flow relationships in tidal salt marsh wetlands: California Water Resources Center University of California, Davis: U.S. Geological Survey G830-06, Water Resources Center Project UCAL-WRC-W-629, 15p.

Synoptic measurements were made of water stage and current velocity at seven locations along the 3 mile length of Tule Slough. Tule Slough is located in the Petaluma Marsh which borders the Petaluma River north of San Pablo Bay, California. The findings suggest that the open unvegetated ponds found in the tidal marsh area are connected by subterranean channels to the headward tip of the nearest minor tributary channels. Not all marshes have these ponds and the ponds have variable rates of change since the 19th century surveys. Little changes were noted in stream morphology along certain areas of the streams length which differed from findings in previous studies.

Levin, L. A., 1983, Drift tube studies of Bay-Ocean Water exchange and implications for larval dispersal: Estuaries, v. 6, no. 4, p. 364-371.

Surface water transport and larval dispersal potential within Mission Bay, San Diego, California and along the southern California coast were studied with drift test tubes. Drift tubes, released once during each season at six sites inside Mission Bay, traveled up to 173 km north and 205 km south of Mission Bay at maximum rates of 36 cm per s (north) and 50 cm per s (south). The findings were used to estimate probability of larval transport out of Mission Bay for the intertidal spionid polychaete *Pseudopolydora paucibranchiata* (Okuda) which occurred in the back of the bay. Outer coast drift tube returns were used to determine potential for gene flow, via larval exchange, between populations in isolated bays along the California coast. Drift tube recoveries and larval abundances in the plankton indicate that few *Pseudopolydora* larvae leave Mission Bay, but that longshore currents can carry those which do to other suitable bay habitats.

Lipps, J. D., and Erskian, M. G., 1969, Distributional patterns of estuarine microfaunas: Geological Society of America Abstracts with Programs Meeting in Eugene, Oregon, part 3, p. 36.

Foraminifera and thecameoba found in northern California estuaries comprise three characteristic faunas. These include a fauna typical of nearshore marine intertidal environments, an Ammonia fauna characteristic of euryhaline areas, and a thecamoebian fauna found in fresh water. The faunas are distributed in four different patterns in various estuaries near Bodega Bay, California.

The typical estuarine pattern includes an intertidal fauna occupying the mouth of an estuary, and euryhaline fauna in the middle tidal areas, and a thecamoebian fauna in the freshwater upper reaches. In seasonally high discharge estuaries (Russian River) the indigenous euryhaline fauna is absent, although the other two faunas maintain their normal patterns. Estuaries with low discharge and open exchange with the sea (Estero Americano) have intertidal and euryhaline faunas but the freshwater one is absent. Estuaries with a barrier at their mouths lack the intertidal or euryhaline faunas.

Principally these patterns are related to the rate of freshwater runoff through the estuary. The marine intertidal fauna may be carried into the mouth of estuaries by tides and may maintain populations there because of the nearly normal marine conditions. The estuarine fauna, however, may never establish itself in seasonally high discharge estuaries because of periodic freshwater flushing. By contrast, in low discharge estuaries the intertidal and euryhaline faunas may predominate, with high salinities excluding the thecameobians from even the upper reaches. (Abstract)

Lockett, J. B.,1963, Phenomena affecting improvement of the lower Columbia Estuary and entrance: Prepared for Federal Interagency Sedimentation Conference of the Subcommittee on Sedimentation, ICWR, Jackson Miss. 51 p.
No review

_______1967, Sediment transport and diffusion; Columbia Estuary and entrance: WW-4, Proc. A.S.C.E., J. Waterways and Harbors Division, v. 93, p. 167-175.
No review

Lohmar, J. M., Macdonald, K. B., and Janes, S. A., 1980, Late Pleistocene-Holocene sedimentary infilling and faunal change in a Southern California coastal lagoon: *in* Field, M. E., and others, eds, Quaternary Depositional Environments of the Pacific Coast: Pacific Coast Paleogeography Symposium 4, Los Angeles, California, The Pacific Section, Society of Economic Paleontologists and Mineralogists, v. 4, p. 231-240.

Goleta Slough (Santa Barbara County, California) is typical of several small estuaries and lagoons located along the semi-arid southern California coast. The slough presently consists of dendritic, shallow subtidal channels surrounded by intertidal salt marsh vegetation (mostly *Salicornia virginica*). It is the last remaining remnant of a large marine embayment that spread into the Goleta Valley basin as sea level rose toward the close of the last glacial period. Stratigraphic data from numerous Goleta Valley water wells indicate that the late Pleistocene embayment was filled by peripheral fluvial sands which wedge out into marine

silts and clays closer to the slough's ocean entrance. Sequential air photographs (1928-present) reveal alluvial fans advancing into the slough from the adjacent Santa Ynez Mountains during the late stages of filling. Living and relic foraminiferal faunas suggest that these fans reduced an open, well flushed coastal lagoon to a system of narrow subtidal channels leading from a restricted ocean inlet, frequently closed by longshore sedimentation. Five paleoenvironments associated with lagoon and salt marsh settings were recognized in shallow cores collected from the slough: (1) subtidal ponds and channels, (2) intertidal flat, (3) intertidal salt marsh, (4) marsh creeks, and (5) alluvial fans. The subtidal lagoon sediments contain a diverse stenohaline (fossil) foraminiferal assemblage that has been replaced in the present slough interior by a single living euryhaline species (*Ammonia becarri*). Open coast foraminifera are presently found only near the slough's ocean entrance, where conditions approximate a lagoonal environment. The occurrence of marsh sediments in cores collected beyond the present slough boundary indicates a reduction in the extent of the fringing salt marsh. The present marsh vegetation lacks the zonation typical of areas subject to regular tidal flooding. These faunal and floral changes indicate that a steady decline in marine influence has accompanied infilling and closure of the Goleta Slough. A similar general pattern is characteristic of many estuary-lagoon sites along the southern California coast. (Author)

Loose, T. L., 1969, Ecology of intertidal foraminifera, Bodega Head, Sonoma County, California: Geological Society of America Abstracts with Programs, pg 37-38

Living foraminiferal populations collected from exposed rocky coast tidepools on Bodega Head, Sonoma County, California, comprise a distinct fauna, characterized by *Glabratell ornatissima* (Cushman) and *Rosalina globularis d'Orbigny*. Of the thirty-three species which make up the death assemblage, twenty-five species were found alive.

Exposure to breaking waves and rapid diurnal changes in temperature, salinity and oxygen concentration produce a stressful high energy environment, quite unlike the stability of deeper depths.

Population size shows that the Foraminifera tend to be concentrated in algae and bottom sediments which offer the most protection against these changes. Population size ranges from few (0-3) to several hundred Foraminifera per 30 cubic-centimeter sample. This variation results from the protection provided by algae or bottom sediment, with the most tightly matted algae having the largest numbers of Foraminifera.

Applied computer studies, using cluster analysis with Jaccard's and Fager's Coefficients on the living population, confirm the population distributions and indicate that the species of Foraminifera occur in all protected microhabitats in this environment, without particular preference.

Luepke, G., and Clifton, H. E., 1983, Heavy-mineral distribution in modern and ancient bay deposits, Willapa Bay, Washington, U.S.A: Sedimentary Geology, v. 35, p. 233-247.

Two dominant mineralogic assemblages were found in the modern sediments of Willapa Bay, Washington. The assemblages were based on the heavy-mineral distributions of the amounts of hornblende, orthopyroxene, clinopyroxene. One assemblage was found to have originated from the Columbia River, the other from the rivers that discharge into the estuary from the east. The Columbia River sediments are suggested to have been transported by longshore currents to the north and by tidal currents into the estuary.

The second assemblage is subdivided into three sub-assemblages with sources from the rivers that flow into the estuary and from the Pleistocene terraces that surround the bay.

The study demonstrates how heavy mineral deposits can be used to identify the interaction between oceanic and river influences on a modern estuary, and the influence of a tidal prism within the estuary.

Luoma, S. N., Cain, D. J., Johansson, C. E., and Thomson, E. A., 1983, Effects of trace metals (Cu, Ag, Zn) on a population of the estuarine clam *Macoma balthica* living near a point of sewage discharge in South San Francisco Bay: Estuaries, v. 6, no. 3, p. 320.

Studies of a population of *Macoma balthica*, conducted through seven years in South San Francisco Bay, indicate Cu, Ag and/or Zn discharged from a sewage treatment plant directly affect animal survival. Metal concentrations in animal tissues are consistently highest in early winter, and are lowest during summer. The winter maximum and summer minimum are influenced by metal discharge rates and the rate of flow of freshwater into the estuary. Animals at the metal-enriched station are 50-fold more tolerant of Cu than animals from less enriched stations in the bay and take-up trace metals more rapidly than less tolerant organisms at the same exposure. Copper, silver and zinc metallothionein (MT)-like protein has been identified in the metal-enriched, metal-tolerant organisms. Metal concentrations in the MT-like fraction increase when metal uptake is observed in nature, but metal-binding capacity appears to saturate when the highest metal concentrations are observed in mid-winter (MT-spillover). In three of the seven years studied, *M. balthica* virtually disappeared for several months from the metal enriched mudflat (but not from other mudflats in the bay) shortly after very high tissue metal concentrations were observed. High metal-tolerance, MT-spillover and metal-induced population declines all indicate adverse effects of metals at this station.

Luoma, S. N., and Cain, D. J., 1979, Fluctuations of copper, zinc, and silver in Tellenid clams as related to freshwater discharge- south San Francisco Bay: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 231-246.

Significant contamination of the tellenid clam *Macoma* *balthica* with Cu and Ag was observed at stations in southern San Francisco Bay. The degree of contamination appeared to be greatly influenced by the discharge of fresh water into the South Bay. Local runoff appeared to provide an important source of the contaminants, especially in the summer and fall. Fresh-water discharge, either from local sources or from the Sacramento-San Joaquin Delta, also provided the force that flushed biologically available Cu and Ag from South Bay, and the degree of this flushing force appeared to determine the magnitude of the annual peak in Cu and Ag concentrations of the clam. A metal discharge index, combining an indirect estimate of annual metal loading (derived from cumulative rainfall), with the inverse of fresh-water discharge into the bay on Ag and Cu contamination in South Bay. Significant differences between temporal variations in Zn concentrations in the clams and the variations in Cu and Ag concentrations suggest all contaminants do not behave similarly in South Bay. (Author)

Lutz, G. A., Hubbell, D. W., and Stevens, H. H. Jr., 1975, Discharge and flow distribution, Columbia River Estuary: Prepared in cooperation with the U. S. Atomic Energy Commission, U. S. Geological Survey Prof. Paper 433-P, Washington, D.C.: U.S. Govt. Printing Office, 31 p.
No review

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Magura, L. M., 1972, Sediment production in the Eel River drainage of California and its relation to watershed management: Unpublished Student Report, University of California, Berkeley, Water Resources Archives, 22 p.

Relationship between current short-term discharged suspended sediment records and long-term geologic evidence of erosion and deposition is discussed.

Malek, J. F., and Palmero, M. R., 1987, Application of a management strategy for dredging and disposal of contaminated sediments to proposed U.S. Navy homeport project at East Waterway, Everett Harbor, Washington: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p.1261-1277.

This paper reviews the studies and conclusions of the U.S. Army Corps of Engineers Technical Assistance Program to the U.S. Navy Homeport project. The paper presents an overview description and explanation of program development, interpretation of test results, and the influence and consequences of text results and project solutions to other contaminated sediment situations in Puget Sound.

Malins, D. C., McCain, B. B., Myers, M. S., Brown, D. W., Bruya, J. E., Morado, J. F., and Chan, S. L., 1983, Epizootiological relations between toxic chemicals and diseases in fish and shellfish from Everett Harbor, Washington: Estuaries, v. 6, no. 3, p.331.

Possible links between chemical pollution and serious diseases in bottom-fish and crabs from Everett Harbor, an industrialized bay in Washington state were studied. Toxic chemicals in sediments and biota were determined by gas chromatography, high-pressure liquid chromatography, and mass spectrometry. Diseases in sole [e.g., English sole, (*Parophrys vetulus*)] and Dungeness crabs (*Cancer magister*) were evinced histologically. Correlations were found between high levels of chemical pollution and serious liver diseases (e.g., neoplasms) in English sole, Moreover, preliminary findings suggest that similar associations may exist for certain abnormalities in crabs (e.g., necrosis and granuloma formation in the hepatopancreas and antennal gland). Further studies are in progress to verify these conclusions. The implications and significance of the Everett findings are discussed with respect to understanding the effects of pollution on urban marine environments.

Marcus, L., 1987, Wetland restoration and port development: The Batiquitos Lagoon Case: Coastal Zone '87, v. 4, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 4152-4166.

A two year planning effort coordinated by the California State Coastal conservancy on work to restore Batiquitos Lagoon, California, is summarized.

Maresca, J. W., Jr., 1979, HF radar measurements of San Francisco Bay tidal currents flowing through the San Pablo Strait: EOS Transactions, American Geophysical Union, v. 60, no. 46, p. 844.

This study measured surface and subsurface currents between the Tiburon Peninsula and the San Pablo Strait. The surface currents were obtained by using a portable low power coherent-pulse HF coastal wave radar. The subsurface measurements were acquired by moored current meters. The differences between the surface and subsurface measurements were the result of surface wind stress, inflow of fresh water from the Sacramento Delta, and the location of the measurement.

Marriage, L. D.,1958, The bay clams of Oregon: Fish Commission of Oregon, Educational Bulletin #2, Portland, Oregon, 29 p.

Describes the various types of clams generally found in Oregon estuaries and also lists the types present in each specific estuary. Also gives estuary surface areas.

Mason, C. O., and Slocum, D. A., 1987, Wetland replacement - Does it work?: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 1183-1197.

Report on an evaluation of 32 wetlands created to replace wetlands destroyed by filling and dredging. Conditions which contributed to the success and those that limited the success of replacement wetlands are summarized.

Mason, J., 1970, Point Reyes the solemn land: DeWolfe Print., North Shore Books, Inverness, California, 196 p.

This is a brief history of the Point Reyes National Seashore, California that outlines the original discovery through the colonization by early settlers. The book highlights the various families that originally settled in the area with stories about various incidents that occurred. Also included is a section that lists the many ship wrecks that occurred in the offshore areas and the events that lead to the area being included in the National Park System.

Matsuda, R. I., 1987, Development of a predischarge environmental baseline study for a proposed marine municipal outfall: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2061-2068.

The general objective of this study was to develop an environmental baseline that would provide information from which a cost-effective discharge monitoring program could be developed. This program would detect environmental changes resulting from a wastewater discharge site on Puget Sound.

McAllister, W. B., and Blanton, J. O., 1963, Temperature, salinity, and current measurements for Coos Bay, Oregon: Data Report no. 10, Reference 63-23, Department of Oceanography, Oregon State University, Corvallis, Oregon, 33 p.

Temperature, salinity, and current measurements extending over one or more tidal cycles were made at various times in Coos Bay, Oregon, during the three year period 1960-1963.

McAnally, W. H. Jr., Brogdon, N. J., Jr., Letter, J. V. Jr., Stewart, J. P., and Thomas, W. A., 1983, Columbia River Estuary hybrid model studies, Report 1; Verification of hybrid modeling of the Columbia River mouth: Hydraulic Laboratory Tech. Report HL-83-16. Vicksburg, Miss.: U.S. Army Engineer Waterways Experiment Station. No review

McAnally, W. H. Jr., Brogdon, N. J., Jr., and Stewart, J. P., 1983, Columbia River Estuary Hybrid Model Studies, Report 4. Entrance channel tests: Hydraulics Laboratory Tech. Report HL-83-16. Vicksburg, Miss.: U.S. Army Engineer Waterways Experiment Station. No review

McAnally, W. H. Jr., Thomas, W. A., and Letter, J. V. Jr., 1980. Physical and numerical modelling of estuarine sedimentation: Paper presented at the International Symposium on River Sedimentation, Beijing, China.

No review

McCulloch, D. S., Peterson, D. H., Carlson, P. R., and Conomos, T. J., 1970, Some effects of fresh-water inflow on the flushing of South San Francisco Bay: A preliminary report, U.S. Geological Survey Circulation 63A, 27 p.

No review

McKemay, B., and Wallace, D., 1987, Best management practices for small-scale agriculture: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 970-978.

Best Management Practices (BMPs) are discussed and recommended as non-regulatory techniques for minimizing water degradation into estuarine and coastal waters. The paper points out that small-scale animal keeping operations are the most common farm activities affecting estuarine and coastal waters.

McPhee, M. W., and Wolfe, L. D. S., 1987, Special Canada-U.S. workshop/Panel: Achieving practical solutions in estuarine management: Canadian - U.S. experiences on the Pacific North Coast: Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3391-3394.

This short paper outlines the case study areas focused upon in this workshop designed to draw ideas and experiences from Canadian and U.S. studies on Pacific coast estuaries.

Miller, R. C., and Ramage, W. D., 1928, A study of physical and chemical conditions in San Francisco Bay especially in relation to the tides: University of California Press, Berkeley, California, v.

31, no. 11, p. 201-267.

The physical conditions of San Francisco Bay including depth, salinity, temperature and nature of the bottom were studied. Also includes studies on the tidal prism, current velocity, and dissolved oxygen.

Minard, C. R., Jr. 1964, The erosional and depositional history of the coast of northern California: University of California hydraulic Engineering Laboratory, Report HEL 2-10, Berkeley, 63 p.

Seven distinct areas characterized by particular assemblages of heavy minerals ("mineralogic provinces") have been identified along the coast of Northern California between the mouth of the Russian River and the southeastern end of Drakes Bay. This paper substantiates the theory that these "mineralogic provinces" are related not only to the present cycle of erosion and deposition but also to a prior cycle (or cycles). Neither present day littoral transport of sand nor the local contribution of detritus can adequately explain the current distribution of the "mineralogic provinces." The paper proposes that an earlier period of lower sea level which promoted the erosion of rocks that contain the mineral assemblages and the downcoast transport of the resulting detritus. This low stand of sea level was followed by the re-advance of the sea (to its present level) and the consequent erosion of rocks with a different and distinct assemblage. Recent erosion has resulted in the local deposition of non-Franciscan detritus (principally dioritic material) and the masking or drastic dilution of many of the Franciscan-derived sediments brought in by earlier littoral drift. Occurrence of older,pre-existing wave-cut beaches and cliffs in association with older beach and dune deposits indicates that much of the present coastal configuration was sculptured before the present cycle of erosion. And that the present day coastal erosion, in many cases, has not proceeded to the point reached during an earlier period.

_______1971, Quaternary beaches and coasts between the Russian River and Drakes Bay, California: Hydraulic Engineering Laboratory College

of Engineering University of California, Berkeley. Hel-2-35

This study was conducted to determine what conditions in the past promoted or inhibited the movement of large quantities of sand down the coast of northern California from the Russian River to Double Point. These sediment movement conditions were then compared with those at present. The study also investigates the influence that past erosional and depositional features have had upon the present littoral sand budget. The modern and ancient wave-cut platforms, sea cliffs, beaches, and coastal dunes were examined in the field and on air photos, and reconnaissance-type maps were drawn of these features. Also heavy mineral analyses were made to determine the source of the deposits along the coast. Previous investigations have shown that persistent swell from the northwest tends to move sand southward along the coast of northern California but that little net longshore transport takes place west of the San Andreas Fault zone between the Russian River and Double Point.

Minter, D. J., 1983, Intertidal sulfur cycling: Abstracts For The Seventh Biennial International Estuarine Research Conference, Oct. 22-26, 1983, Session on Sulfate Reduction and Iron-sulfur Interactions in Marsh and Estuarine Sediments, Virginia Beach, Virginia, Estuaries, v. 6, no. 3, p. 297,

Coos Bay (Oregon) was studied for change in the dynamics of benthic sulfur cycling over the course of one year. Sulfide production, sulfide emission to the atmosphere, and carbon dioxide fixation at the sediment surface were measured at a natural muddy location as well as at a disturbed location higher in organic matter. Chlorophyll,

, and phaeophytins were measured at several depths within the sediment. At both locations the rate of sulfide production was high (on the order of 10^{-4} moles per m^2 per h) requiring the consumption of as much carbon as was fixed *in situ* by photosynthesis. At both locations a similarly high rate of sulfide emission was measured; peak emission rates occurred during

the winter months. At both locations carbon dioxide uptake in the dark was minimal. At the disturbed location about half the carbon dioxide was fixed by photosynthetic bacteria using electron sources other than water, yet if all the needed electrons came from sulfide only an amount half that of sulfide emitted would be required. Bacteriochlorophyll was measurable only at this disturbed location. A minor concentration peak at the surface and a major peak ten centimeters beneath the surface were found; both peaks were greatest during fall and winter months.

Mogulof, M. B., 1975, Saving the Coast: Lexington Books, Lexington, MA. 136 p.

This book concerns itself with the goal and value conflicts over coastal zone control in California and the consequences of Proposition 20. Also the respective roles of agencies, commissions, governments in dealing with coastal policy are discussed.

Molenaar, D., 1982, Point Reyes National Seashore and the San Andreas Fault, CA.: Wilderness Press, Berkeley, CA, pictorial landform map.

Map of Point Reyes and the San Andreas Fault including towns, parks, visitor centers, topographic and shoreline features, streams, roads, and trails.

Mondor, C., 1987, Canada's policy for National Marine Parks: Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3545-3555.

The policies Canada exercises in managing their National Marine Parks is summarized in four main parts, including: 1.) review of the marine ecosystems characteristics that distinguish them from terrestrial systems, 2.) the legal framework governing the creation of a Marine National Park, 3.) how the characteristics and the legal framework dictate the procedures used, and, 4.) that each jurisdiction requires unique guidelines characteristic of the particular area.

Moore, J. T., and Orrett, E. B., 1971, Refraction diagrams for Bolinas Bay, Drakes Bay, Bodega Bay: University of California, Berkeley, Water Resources Archives, 1 volume.

Calculations of refraction coefficients and hand drawn refraction diagrams for the three locations.

Morales-Alamo, R., 1972, Biodeposition as a factor in sedimentation of fine suspended solids in estuaries: *in* Environmental Framework of Coastal Plain Estuaries, Nelson, B. W., ed., Geological Society of America Memoir 133, p. 121-130.

Filter feeders, such as mollusks, tunicates, and barnacles, ingest particles as small as 1 micron during their feeding process and void them in fecal pellets which range from 500 to 3,000 microns in length; these pellets settle at a much faster rate than their component particles. Feces and pseudofeces that settle to inorganic matter, 4 to 12 percent organic carbon, and about 1.0 gram per kilogram of phosphorus. Fecal pellets are alternately deposited and resuspended by tidal currents. They settle and accumulate in areas of estuaries where the fine particles themselves would not. A portion of the biodeposits settling on sediment surfaces is mixed into subsurface deposits and may alter the textural and chemical properties of he original sediments.

Morey, B., 1944, Preliminary report on beach survey of Point Reyes, California determined by aerial photographs: University of California, Berkeley, College of Engineering, Fluid Mechanics Laboratory Report no.HE-116-32

Aerial photographs were used to compare beach surveys of bottom topography at an observation station at Point Reyes, California.

Mudie, P. J., and Byrne, R., 1980, Pollen evidence for historic sedimentation rates in California coastal marshes: Estuarine, Coastal and Marine Science v. 10, no. 3, p. 305-316.

Pollen of selected alien plants were used as chronological markers to estimate sedimentation rates during the period of European settlement. Four coastal marshes in central and southern California: Bolinas Lagoon, Drakes Estero, Los Penasquitos Lagoon, Mission Bay, and a control site from a small fresh water pond at Lake Ranch located 10 km northwest of Bolinas Lagoon.

This study is the first to use pollen markers in the estuarine environment. The work includes radiocarbon dates from six California salt marsh sites from which calculations of Holocene sedimentation rates can be made as well as comparisons to the pollen analysis

The study gives good information on the major features of drainage basins studied. Identifies the four pollen types used as markers, with historical background on time of introduction to the study areas. Based on the history of the pollen found historic sedimentation rates were calculated

Muretta, P. A., 1982, The California State Conservancy; A Guide for Planners: University of Southern California, Los Angeles, CA, Institute for Marine and Coastal Studies, Sea Grant Marine Advisory Services, 30 p. (USCSG-A501-82)

A description of the authority of the California State Coastal Conservancy. Items discussed include acquisition of land and development to enhance or restore coastal resources.

Murphy, R. C., and Kremer, J. N., 1985, Bivalve contribution to benthic metabolism in a California Lagoon: Estuaries, v. 8, no. 4, p. 330-341.

This study focuses on the populations of suspension feeding bivalves that constitute a metabolically important component of the benthos in Colorado Lagoon, Long Beach, California. Oxygen and nutrient flux were measured *in situ* at monthly intervals over a two-year period. The paper gives estimates of bivalve metabolism that were based on regressions of oxygen and ammonium flux on a measure of clam biomass adjusted allometrically. The introduced bivalve, *Mercenaria mercenaria*, occurs at maximum densities exceeding 400 per m^2. Based on mean densities (143 per

m^2), bivalves contributed more than 50% of the 77 mg O_2 per m^2 per hr mean annual oxygen uptake and the 191 μM per m^2 per hr mean ammonium release. Although bivalve biomass was not correlated with other inorganic nutrient flux, on an annual basis the sediments were a source of phosphate (26 μM per m^2 per hr annual average range 5 to 50) and a small sink of nitrate and nitrite. Net primary production, ammonium flux, and phosphate flux showed great annual variability while respiration was relatively constant. Total community oxygen uptake was not correlated with temperature. Long term incubations revealed no obvious rhythms. The benthic flux of ammonium and phosphate was calculated to supply more than the annual requirement of lagoon phytoplankton.

N

Neiheisel, J., and Weaver, C.E., 1967, Natural indicator of estuarine sediment movement, discussion (of paper 5220) by Byrne, J. V., and Kulm, L. D., 1967: Proc. Am. Soc. Civ. Eng., Jour. Waterways and Harbors Div., v. 93, no. W.W.4, p. 263-265.

This study investigated the use of natural indicators to interpret sediment movement in Yaquina Bay, Oregon, this study was similar to a study of sediment dispersal in layered and well-mixed estuaries in the southern United States by Neiheisel and Weaver. Clay minerals and heavy minerals were used not only to delineate sediment movement but also to obtain information on the hydrodynamic factors effecting deposition. This study shows that the Coriolis force in an estuary deflects the current and sediment flow to the right of tidal propagation. The authors suggest that the effects of Coriolis force could be demonstrated by studying natural trace minerals in the marine and fluviatile sources.

Nichols, D. R., and Wright, N. A., 1971, Preliminary map of historic margins of marshland, San Francisco Bay, California: U.S. Department of the Interior, Geological Survey Open File Report, Basic Data Contribution, 9 p.

Changes in the margins, size, and depth of San Francisco Bay in historic time have been the subject of much controversy.

Estimates of the area that filled have been cited as evidence that one of the nation's most scenic estuaries is rapidly being destroyed. Widespread concern has been voiced on the possible disastrous effects of a great earthquake on structures built on fill overlying soft saturated sediments in the Bay. Legal questions have arisen over the boundaries of original land grants bordering the Bay and the blocking of navigable channels by filling or diking. Data bearing on these and related problems, however, have not been readily accessible or easily compiled.

The location of former margins of salt marshes and old sloughs and channels have been determined for small areas of the Bay or for specific sites. The character of sediments in and between old channels and sloughs may vary markedly and may greatly affect the stability of fill and evaporation ponds. A detailed synthesis of early surveys for the entire Bay area has long been needed for regional and local planning efforts and for engineering projects. The accompanying map was prepared from the earliest available U.S. Coast and Geodetic Survey (C&GS) topographic surveys to satisfy these needs. In this compilation "the Bay" is used to refer collectively to all areas marginal to the San Francisco Bay, including Carquinez Strait, San Pablo, Grizzly, Suisun, and Honker Bays.

Nichols, F. H., 1983, Abundance fluctuations among benthic invertebrates in two Pacific estuaries: Estuaries, v. 6, no. 3, p. 329.

Long-term investigations of two Pacific coast estuarine habitats are used to examine the time scales and mechanisms of structural variations in estuarine benthic communities. An 8-year study of a San Francisco Bay mudflat has revealed a high degree of short-term variation in a species-poor (<30 species) invertebrate community. The numerically dominant species, undergo large seasonal and annual abundance fluctuations reflecting opportunistic life histories and routine physical disturbance of the habitat (e.g., seasonal erosion of the sediment surface). This community persists over the long term, and only very long data sets may provide evidence of permanent, natural or human-

induced changes. In contrast, the benthic community at 200-m depth in the main basin of Puget Sound comprises a more diverse (>120 species) infaunal community of "equilibrium" species subject to little physical disturbance. However, a 20-year data set shows that numerical dominance can shift markedly form one species to another at irregular, multiyear intervals. These shifts may reflect (1) changing equilibria among potentially competing surface-deposits feeders and (2) interannual changes in water-mass characteristics (e.g., circulation, productivity). These data sets demonstrate the importance of knowing the amplitude and periodicity of natural population abundance fluctuations before attempting to demonstrate the effect of anthropogenic influences on such communities.

________ 1985, Increased benthic grazing: An alternative explanation for low phytoplankton biomass in Northern San Francisco Bay during the 1976-1977 drought: Estuarine, Coastal and Shelf Science, v. 21, p. 379-388.

The report looks at the two-year drought's effects on the phytoplankton biomass in terms of salinity, decline in chlorophyll *a* concentration, and the upstream migration of estuarine benthic invertebrates. The study suggests that prolonged low river flow and increased salinity, benthic food webs could become more important than planktonic food webs in the upper part of the estuary.

________ 1985, Abundance fluctuations among benthic invertebrates in two Pacific estuaries: Estuaries, v. 8, no. 2A, p. 136-144.

Long-term studies to examine (1) contrasting time scales and mechanisms of structural variation within tow benthic communities and (2) the usefulness of long data sets for evaluating human impact. A 10-year study of a San Francisco Bay mudflat, the details of which are reported elsewhere, has revealed large short-term (on the order of months) variations in species abundances within a community composed predominantly of opportunistic species. The study site, located in highly urbanized estuary, is

subject to the influence of a nearby sewage-treatment facility. However, rapid changes in population size of the common species, in part due to periodic natural habitat disturbance, impedes the detection of anthropogenic influences on community composition. Only a very long-term data set may provide evidence of progressive change. Data collected for a 20-year period on the benthic community at 200 m depth in the main basin of Puget Sound, and environment subject to little apparent habitat disturbance, show that numerical abundance of the common species can also change markedly. Here, however, numerical dominance shifts from one species to another at irregular, multiyear intervals. Recent increased in two heretofore rare species, and a significant increase in total numbers of individuals suggest that long-term changes may be occurring in this community. These two long-term data sets demonstrate the importance of measuring both the amplitude and the periodicity of fluctuations in population size of aquatic species as well as long-term fluctuations and patterns in environmental factors before attempting to demonstrate the effect of anthropogenic influences on aquatic communities. The results of these studies also demonstrate the usefulness of long-term data sets for revealing the potential importance of interactions among species in determining abundance patterns in the soft-bottom benthos. (Author)

Noble, R. M., 1971, Shoreline changes Humboldt Bay, California: University of California Hydraulic Engineering Laboratory Report HEL 24-2, Berkeley, California.

This report discusses the shoreline changes near the Humboldt Bay entrance from the time that it was an unimproved tidal inlet through the years of modifications to the bay entrance..

O

Obando, S. I., 1983, Biomass and production of *Zostera marina* in San Quintin Bay, Baja California, Mexico: Estuaries, v. 6, no. 3, p. 290, Abstracts for the Seventh Biennial International Estuarine

Research Conference Oct. 22-26, 1983, Virginia Beach, Virginia.

Zostera marina beds of San Quintin Bay were studied from June to December 1982, with monthly sampling to determine biomass, and bi-weekly sampling for overall production rates. A leaf marking technique was used to measure production rate. Samples were taken along three transects and at different tidal heights. The results give above ground and belowground production of epiphytes biomass, turions chlorophyll, sediment organic matter, and sediment chlorophyll content.

Oceanographic Institute of Washington, 1977, A summary of knowledge of the Oregon and Washington coastal zone and offshore areas; by the Oceanographic Institute of Washington, 312 First Avenue North, Seattle, Washington, Volume 1,646 p.

An investigation to gather all pertinent information from published and unpublished research documents, on the geology, meteorology, oceanography, marine ecology, terrestrial ecology, water quality, marine traffic and navigational hazards, industrial and commercial activities, petroleum industry activities, demography and socio-economic characteristics, land and water use characteristics, pollution sources, transportation systems, and recreational resources of the Oregon and Washington coastal zone.

Oregon Coastal Conservation and Development Commission, 1973, Coastal wetlands of Oregon: 159 p.

This report gives descriptions, management practices, and an inventory of Oregon's wetlands.

Oregon Division of State Lands, 1972, Inventories of filled lands in Alsea, Nehalem, Nestucca, Salmon, Sand Lake, Siuslaw, Tillamook, Umpqua, and Yaquina estuaries: (separate reports), Salem Oregon.

Each report gives a brief description of the estuary and drainage basin; map of the estuary with landfill locations; individual maps of the parcels on which landfills are located; and tables showing parcel ownership, date filled, construction dates, usage (past and present), permit information and fill acreage.

Oregon Division of State Lands, 1973, Preliminary information for wetlands reports: 3 p.

Gives material on the following estuaries: Tillamook, Netarts, Sand Lake, Nestucca, Siuslaw, Salmon, Umpqua, Nehalem, Yaquina, Alsea, and Siletz including MHT and MLT surface areas, ownership and deed information, drainage basin area, fresh water yield, and the amount of accretion at jetties.

Oregon State University at Corvallis, 1971, Technical Conference on estuaries of the Pacific Northwest, Corvallis, Proceedings: Oregon State University, Corvallis, Oregon, Department of Oceanographic Engineering, Experiment Station, Circular no. 42, v. I, 343 p.

Compiled papers on estuaries of the Pacific Northwest.

_______ 1972, Second Annual Technical Conference on estuaries of the Pacific Northwest, Proceedings, Corvallis, 1972: Oregon State University, Corvallis, Oregon, Department of Oceanographic Engineering, Experiment Station, v. II, 111 p.

Compiled papers on estuaries of the Pacific Northwest.

_______1973, Third Annual Technical Conference on estuaries of the Pacific Northwest, Corvallis, Proceedings,1973: Oregon State University, Corvallis, Oregon, Department of Oceanographic Engineering, Experiment Station, Circular no. 46, v. III, 111 p.

Compiled papers on estuaries of the Pacific Northwest.

_______1974, Fourth Annual Technical Conference on estuaries of the Pacific Northwest, Corvallis, Proceedings,1974: Oregon State University, Corvallis, Oregon, Department of Oceanographic Engineering, Experiment Station, Circular no. 50, v. IV, 78 p.

Compiled papers on estuaries of the Pacific Northwest.

Oregon State University Department of Civil Engineering, 1969, Tidal flats in estuarine water quality analysis; progress report:

Research Grant WP-01385-01, Federal Water Pollution Control Administration, 45 p.

Describes the tidal flat system; gives data on benthal oxygen uptake, free sulfides in overlying water, particle sizes, volatile solids, and salinity profiles.

Orsi, J. J., and Mecum, W. L., 1986, Zooplankton distribution and abundance in the Sacramento-San Joaquin Delta in relation to certain environmental factors: Estuaries, v. 9, no. 4A, p. 326-339.

The dominant members of the freshwater zooplankton in the Sacramento-San Joaquin Delta were those typical of temperate zone rivers *Bosmina* and *Cyclops* among the crustaceans and *Keratella, Polyarthra, Trichocerca* and *Synchaeta* among the rotifers. The estuarine or brackish component of the plankton was represented by the copepod *Eurytemora affinis* and the rotifer *Synchaeta bicornis*. Abundance of freshwater zooplankton was highest in the San Joaquin River near Stockton, the region with the highest chlorophyll *a* concentrations and highest temperatures. This was also the region least affected by water project operations, which alter the normal river flow patterns and bring large volumes of zooplankton-deficient Sacramento River water into the plankton genera was positively correlated with chlorophyll *a* concentrations and temperature but not with net flow velocity. Only *Bosmina* had a significant and negative correlation with abundance of a predacious shrimp, *Neomysis mercedis*. Extreme salinity intrusion in 1977 reduced freshwater zooplankton abundance throughout most of the delta to seven-year lows. All zooplankton groups showed a long-term abundance decline from 1972 to 1978. In the cases of rotifers and copepods, this decline was significantly correlated with a decline in chlorophyll *a*.

Ortman, D. E., 1987, Washington CZMP-The first shall be last: Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2968-2982.

Washington's coastal zone program is described as well as amendments to this program and coastal management activities over the last decade.

P

Paez-Osuna, F., and Mandelli, E. F., 1985, ^{210}Pb in a tropical coastal lagoon sediment core: Estuarine, Coastal and Shelf Science, v. 20, p. 367-374.

This work describes the technique applied to study sedimentation rates using ^{210}Pb analysis on a core from Laguna Mitla, a lagoon on the west coast of Mexico.

Page, B. M., 1970, Sur-Nacimiento fault zone of California: Continental margin tectonics: Geological Society of America Bulletin, v. 81, no. 3, p. 667-690.

This work describes the significance of the Sur-Nacimiento fault zone in southern and central California and the continental shelf. The paper describes the relationship of the Franciscan Assemblage and the granitic and metamorphic basement rocks of the Salinian Block. The Sur fault is addressed in terms of its origin, and the sequence of displacement events through time to its present configuration.

Partch, E. N., and Smith, J. D., 1978, Time dependent mixing in a salt wedge estuary: Estuarine and Coastal Marine Science, v. 6, p. 3-9.

Measurements of the profiles of salinity and velocity at a station in the Duwamish River estuary, Puget Sound, Washington indicate that the turbulent mixing through the density interface is highly time dependent with the most intense mixing occurring at the maximum current speed during the ebb. Additional measurements of the turbulent kinetic energy and the turbulent flux of salt by the eddy correlation technique verify that interpretation. The vertical turbulent salt flux and the turbulent kinetic energy vary by an order of magnitude over the tidal cycle and approximately half of the total vertical salt transport mechanisms of turbulence generation operate at various times during the tidal cycle and the intense mixing periods are shown to coincide with conditions favorable for the formation of an internal hydraulic jump.

Pause, P., Leslie, K., Wilde, P., and Henshaw, P., 1972, River mouth and beach sediments-Yankee Point to Hurricane Point, California, Part A: Introduction and Grain Size Analyses: University of California, Berkeley, Hydraulic Engineering Laboratory, College of Engineering, HEL-2-37, 22 p.

Seventeen intertidal and stream samples from Monterey Bay - Point Sur Area were analyzed for grain size properties. These samples were taken to provide source area information for the study of the offshore sediments of the central California continental shelf. The data are presented graphically as cumulative weight percent curves and as histograms with respect to grain size. Statistical parameters including median, sorting coefficient, skewness and kurtosis are calculated for each sample.

Pavlou, S. P., and Dexter, R. N., 1979, Distribution of polychlorinated biphenyls (PCB) in estuarine ecosystems: Testing the concept of equilibrium partitioning in the marine environment: Environmental Science & Technology, Seattle, Wa., URS co., v. 13 (1), p. 65-71.

No review

Peat, Marwick, Metchell and Company, 1971, North Coast Harbor Study: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, Prepared by Peat, Marwick, Mitchell and Company, San Francisco, California, 1 v., various pagings.

The north coast of California between Cape San Martin and the California - Oregon border was investigated for potential harbor facilities.

Percy, K. L., Sutterlin, C., Bella, D. A., and Klingeman, P. C., 1974, Descriptions and information sources for Oregon's estuaries: Corvallis, Oregon, Oregon State University Sea Grant College Program, Corvallis, 294 p.

This report is a summary of known information on the twentyone estuaries of Oregon';s coast. The report gives information on each estuary, such as general location, nearby population centers, dimensions of surface area, (tidelands, and submerged lands), drainage basin area, tides and currents, river discharges, salinity and classification by mixing, sediments, water quality information, biological information, physical alterations, estuary uses.

Pestrong, R., 1965, The development of drainage patterns on tidal marshes: Stanford University Publications, Geological Sciences, v. 10, no. 2, 87 p.

This report describes the drainage patterns of the tidal marshes of South San Francisco Bay, Bodega Bay, Tomales Bay, and Bolinas Lagoon. The study focuses on environmental conditions, the geomorphology of drainage systems, the hydraulic geometry of the drainage systems, channel migration, and the erodibility of sediments.

________ 1969, Tidal flat sedimentation at Cooley landing, Southwest San Francisco Bay: Stanford University, Stanford, CA, 61 p.., prepared in cooperation with San Francisco State, Department of Geology.

Tidal marsh and mud flat sedimentation was studied on portions of the southwestern side of San Francisco Bay. Sediments transported and deposited within this low energy environment are distributed in accordance with a principle of scour and settling lag, put forth for sediments in the North Sea. The finer sediments are concentrated nearer the higher portions of the tidal flats and marshes where the growth of the tidal channels accompanies the extension of the marsh onto the tidal flat. This development is documented on aerial photographs taken during a six year period.

Peters, D. D., and Bohn, J. A., 1987, National Wetlands Inventory Mapping for San Francisco Bay/Delta Area, California: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean

Management, Seattle, Washington, p. 1171-1182.

This paper outlines the work of the U.S. Fish and Wildlife Service on their series of wetland maps for the San Francisco Bay, Sacramento/San Joaquin Delta and surrounding areas.

Peterson, C. D., Scheidegger, K. F., and Schrader, H. J., 1984, Long - term processes of sediment supply and retention in response to rising sea level (Holocene Transgression) in and Active-Margin estuary, Alsea Bay, Oregon: Society of Economic Paleontologist and Mineralogist, Annual Midyear Meeting, Abstracts, San Jose, California, p. 64.

The study investigated the Holocene depositional evolution of Alsea Bay, Oregon. Cores, seismic profiling and C^{14} age dating, and sediment analyses techniques were used to determine that Alsea Bay is well supplied with sediment, and retains <15% of the terrestrial sediment supplied to it during the last 10 $x10^3$ years.

Peterson, C. D., Scheidegger, K. F., Komar, P. D., , and Niem, W., 1984, Sediment composition and hydrography in six high-gradient estuaries of the northwest United States: Journal of Sedimentary Petrology, v.54, no. 1, p.86-97.

Small estuaries of the northwestern United States are fed by high-gradient streams which range widely in mean fluvial-discharge rates. Sediment composition in these estuaries differs with grain size and with the relative abundances of river- and beach-derived sand. In order to determine to what degree sediment composition is related to the relative influence of tidal and river flow in these active-margin estuaries, the modern sediment compositions in six Pacific Northwest estuaries were analyzed by standard grain-size and heavy-mineral techniques. The average textural and sand-source compositions for each bay were calculated on a percent surface-area basis. Estuarine sediment compositions are compared and found to be correlated with a hydrographic parameter H_r (mean tidal-prism volume: mean fluvial discharge rate $\times$ 6 hours) computed for each bay. Both % mud and % beach sand increase as

the dimensionless hydrographic ratio (H_r) increases. Unusual results in two of the estuaries are attributed to man-made alterations in one estuary and to eolian transport of beach sand into the other estuary.

Peterson, C., Scheidegger, K. F., and Komar, P. D., 1980, Historical sedimentation patterns, processes and rates in Alsea Bay, a drowned river estuary on the Oregon coast: Geological Society of America, Abstracts with Programs, Corvallis, Oregon, Cordilleran Section, 76th annual meeting, v. 12: 3, p. 146.

Investigations are underway of the transportation and depositional patterns of sediments in Oregon estuaries, with the results from Alsea Bay typical of the other estuaries. In order to evaluate the factors controlling sediment patterns in Alsea Bay, 107 samples were obtained of surface sediments within the bay, adjacent coastal beaches, and rivers entering the estuary. Each sample was analyzed for its grain size distribution, light and heavy-mineral assemblages, and degree of grain roundness. The latter two were most useful in distinguishing marine from fluvial sands, and for determining the nature of the mixing processes in the estuary.

Alsea Bay is a "sink" for both marine and fluvial sands. Strong tidal flood currents have transported marine sands 3.5 km into the estuary along the northern shore, but riverine-tidal ebb currents have restricted the intrusion of marine sands to about 2.5 km along the southern shore. Prominent channels serve as pathways for the transport of marine and fluvial sands into the mid-part of the estuary. Mixing and deposition are influenced by lateral migrations of channels. Unchannelized transport and deposition occurs over broad intervening sand-wave fields and along back-bay margins. Bedforms and radiographs of sedimentary structures further support our interpretations of the complex circulation and sediment transport patterns in the estuary.

Stereo aerial photographs (1939 to present) and bathymetric charts (1879 to present) have been used to determine long-term changes in the patterns of channels in Alsea Bay. The greatest morphological changes in the mid- and upper-estuary correspond to mans attempts to alter the circulation patterns through the construction of levees and dikes.

Peterson, C., 1983, Sedimentation in small active-margin estuaries of the Northwestern United States: PhD thesis Oregon State University, Corvallis Oregon, 158 p.

Modern sediments found in small active-margin estuaries of Oregon (Alsea Bay, Salmon Bay, Siletz Bay, Siuslaw Bay, Tillamook Bay) and Washington (Grays Harbor) are derived from river and beach sources and are discriminated on the bases of grain-size, grain-rounding, and heavy-mineral assemblages. Seasonal, sediment dispersal-patterns indicate that river sand, silt, and clay are transported down the estuaries during winter periods of high fluvial discharge. Beach sand is transported up the estuaries by horizontally asymmetric tidal-currents during summer periods of low fluvial discharge.

Average sediment compositions in these estuaries (e.g., mud, sand and river sand, beach sand) vary considerably and are found to be correlated with a hydrographic parameter H_R (mean tidal-prism volume: mean fluvial discharge rate x 6 hours) computed for each bay. Both percent mud and percent beach sand in the estuaries generally increase as the dimensionless hydrographic ratio (H_R) increases.

Seismic reflection data and C^{14}-dated (wood) core samples from Alsea Bay, Oregon indicate that Holocene sediment fills an ancestral river valley to a depth of 55 m below present sea level. Down core changes in sediment structure, sediment composition, and embayment salinity imply three stages of deposition including: (1) fluidally dominated deposition (10×10^3 to 7.5×10^3 yrs B.P.); (2) deep-water estuarine deposition (7.5×10^3 to 5×10^3 yrs B.P.); and (3) shallow-water estuarine deposition (5×10^3 yrs B.P.). A major decline in sedimentation rate at about 5×10^3 yrs B.P. follows a decline in rate of eustatic sea level rise and a corresponding decrease in sediment-volume accumulation rate. The fluvially dominated basin has not provided an efficient trap for

either beach sand or river silt-clay relative to river sand during the Holocene transgression. (Author)

Peterson, D. H., 1979, Sources and sinks of biologically reactive Oxygen, Carbon, Nitrogen, and Silica in Northern San Francisco Bay: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 175-193.

A knowledge of estuarine hydrodynamics and of appropriate sources and sinks is used to predict micronutrient and dissolved-gas distributions in the northern part of San Francisco Bay between the Golden Gate and Rio Vista. A series of inferences about the processes which control Oxygen, Carbon, Nitrogen, and Silica (OCNSi), based on their observed distributions are presented.

Peterson, D. H., Hager, S. W., Harmon, D. D., and Smith, R. E., 1979, Nitrogen assimilation by phytoplankton in the San Francisco Bay Estuary: EOS, Transactions, (Abstract) American Geophysical Union, v. 60, no. 46, p. 852.

Daylight and 24-hour in situ incubations were used to estimate rates of oxygen production and carbon and nitrogen assimilation by phytoplankton in the San Francisco Bay estuary. Under conditions of apparent nutrient saturation, nitrogen assimilation by phytoplankton differed from oxygen production or carbon assimilation because nitrogen assimilation continued at night. The relative rates of nitrogen assimilation during night were proportional to the (depth-dependent) light intensity of the previous day and were similar, but not identical, to the productivity vs. light intensity relation for oxygen and carbon during daylight. Net photosynthetic performance of phytoplankton (oxygen production and carbon assimilation) is lower when averaged over 24 hours than for the daylight hours only because photosynthesis ceases at night while phytoplankton respiration (oxygen consumption and carbon dioxide production) continues.

Ammonia preference over nitrate by phytoplankton was observed when ammonia concentrations were above about 2 μg atoms liter^{-1}. This preference may explain why, in over 1,600 analyses of northern Bay waters, ammonia concentrations were almost never high when nitrate concentrations were low and it provides an impressive indication of the importance of phytoplankton activity to the water chemistry.

Peterson, D. H., 1975, Processes controlling the dissolved silica distribution in San Francisco Bay: *in,* Estuarine Research v. 1 Chemistry, Biology, and the Estuarine System, Cronin L.E., ed., Academic Press, Inc., p. 153-187.

Dissolved silica supplied to San Francisco Bay undergo major variations in its seasonal distribution. The study characterizes these variations in dissolved silica in relation to high river discharge, phytoplankton utilization, and mixing of river and ocean waters.

Petrauskas, C., and Borgman, L. E., 1971, Frequencies of crest height for random combinations of astronomical tides and tsunamis recorded at Crescent City, California: University of California, Berkeley, Hydraulic Engineering Laboratory, College of Engineering, Technical Report HEL-16-8, 64 p.

Extreme tidal fluctuations intensify the severity of tsunamis relative to overtopping of protective structures and to resulting property damage, while low tidal fluctuations decrease the severity of tsunamis. A computerized method was developed to evaluate the effect of the time of occurrence of tsunami on the maximum water level elevation associated with the tsunami. The end result of the computation is a frequency histogram for the fraction of the year the astronomical tides would combine with a given recorded tsunami to produce a specified water level elevation. The method of analysis is applied to the 1960 and 1964 tsunamis at Crescent City, California.

Phillips, N., 1988, The function of salinity and temperature on the distribution of *Mastocarpus papillatus* (C. Agardl) Kutzing in North San Francisco Bay: EOS, Transactions, American Geophysical Union, v. 69, no. 44, p.1110.

This study looked at the effects of salinity and temperature on the distribution of red alga *M. papillatus*. This was done along two transect lines over one annual cycle. The results show that photosynthetic tolerances of both life phases of this alga are consistent with salinity and temperature regimes and distributional patterns for the estuary.

Phleger, F. B., 1970, Foraminiferal populations and marine marsh processes: Liminology and Oceanography, v. 5, p. 522-534.

Seven tidal marshes were studied on the Pacific coast of North America to relate foraminiferal populations to mean tide levels. The information can be used to estimate tidal regime, current velocities, and water exchange in a coastal lagoon containing marshes if area and bathymetry of the lagoon areas are known. The study details the diversity of faunas as a function of current velocities, water temperature, water salinity, detrital sediment input, and displacement of species due environmental factors.

Pickart, A. J., 1987, Parameters controlling the success of dune revegetation at King Salmon, California: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 1746-1758.

A sand spit was restored through jetty construction and fill at King Salmon in Humboldt Bay, California. This paper outlines the results of a two-year investigation on the suitability of different native plant species and planting treatments for stabilization of the newly created spit.

Pirie, D. M., and Steller, D. D., 1974, California coast nearshore processes study: Final Report ERTS-1 Experiment #880: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, Geoscience Division of Georesource International, Inc., Seal Beach, CA, 164 p.

This utilized ERTS-1 imagery to analyzed the nearshore processes along the California coast. The findings were confirmed using U-2 photography, low altitude aircraft remote sensing, and sea truth data. The major objectives of the study included the interpretation of nearshore currents, sediment transport, river discharge and estuarine surface characteristics. Current direction in the coastal area was detectable in such detail that it is now being used in coastal protection, harbor development and ocean engineering projects along the California coast. The surface current characteristics for the three major ocean currents (Oceanic, Davidson and Upwelling) and for each month were plotted.

Porterfield, G., 1981, Sediment transport of streams tributary to San Francisco, San Pablo, and Suisun Bays, California, 1909-66: U.S. Geological Survey Water-Resources Investigation 80-64, 92 p.

This study points out that although hydraulic mining ceased in California in 1884 but the effects on streams continued. In 1917, G.K. Gilbert estimated that sediment transported to the Sacramento-San Joaquin Delta averaged about 2 million cubic yards annually prior to the discovery of gold in 1848 and increased to about 18 million cubic yards annually during 1849 to 1914. Gilbert also predicted that hydraulic-mining effects would continue for about 50 years after 1914 with annual sediment transport averaging not less than 8 million cubic yards. To test Gilbert's prediction, sediment transported to the San Francisco Bay system was estimated based on sediment inflow data collected during 1957-66. During the period 1909-66, sediment was transported to the San Francisco Bay system at an average rate of 8.6 million cubic yards per year. About 7.4 million cubic yards, or 86 percent, of this sediment was derived from the Sacramento-San Joaquin River basins upstream from their confluence near Antioch. Gilbert's prediction was reasonably accurate.

Postma, H., 1969, Chemistry of coastal lagoons: *in* Lagonas Costeras, Un Simposio, UNAM Unesco, Mexico D.F., p. 421-430.

The composition of the water in coastal lagoons generally differs considerably from that in the adjacent open sea; moreover, lagoons show great differences among themselves. The principal factors causing this variety will be discussed. Beside supply from the land, a number of hydrographic and other factors determine the concentrations of chemical compounds and suspended matter. Among these are the tidal range and the water exchange with the sea; the supply of river water and excess precipitation or evaporation; the type of water circulation (estuarine or otherwise) and the exchange of elements between water and sediments. In turn, the chemical properties of lagoon waters influence biological and geological conditions. This will be illustrated by examples. (Author)

Powell, H., 1980, The decomposition of organic matter in an anoxic estuarine environment: Geological Society of America, Abstracts with Programs, Corvallis, Oregon, Cordilleran Section, 76th annual meeting, v. 12: 3, p. 147.

This study investigated the decomposition of organic matter in an anoxic estuarine environment from the interstitial water and sediment chemistry of a core from Yaquina Bay. The study used experimental laboratory methods to determine that varying amounts of decomposition occur down core due to sediment texture and the source of organic material. Also that mixing of pore water with overlying estuarine water may occur.

Q

Queen, J., and Burt, W. V., 1955, Hydrography of Coos Bay, Oregon State University, Department of Oceanography, Data Report no. 1.

Eleven stations were monitored in and near Coos Bay, Oregon, for salinity, water temperature, current velocity, tide stage and height, hydrogen sulfide and PH, cloud cover, and air temperature. Data was collected over a three-year period.

R

Rantz, S. E., and Moore, A. M., 1965, Floods of December 1964 in the Far Western United States: U.S. Geological Survey Open-File Report (65-1311), 205 p.

The floods of December 1964 in the Far Western States were the most damaging in the history of the area. They were outstanding not only for record-breaking peak discharges, but also for the unusually large area involved -- Oregon, northern California, western Nevada and Idaho, and southern Washington.

Coastal drainage basins in California north of San Francisco Bay were flood-effected. Damage was relatively light in the small coastal basins between San Francisco Bay and the Russian River. Damage was substantial in basins to the north of the Russian River and flood peaks were commonly the highest ever recorded.

Maximum stage and discharge data are given for selected coastal streams in northern California. Daily suspended-sediment data for the period of the storm is given for the Russian and Mad Rivers.

Rantz, S. E., and Thompson, T. H., 1967, Surface-water hydrology of California coastal basins between San Francisco Bay and Eel River: U.S. Geological Survey Water-Supply Paper 1851, 60 p.

This report presents an analysis of the surface-water hydrology of the coastal basins of California that lie between the north shore of the San Francisco Bay and the south boundary of the Eel River basin. Precipitation, runoff, flow, and flood frequency information is presented for basins and streams within the study area.

Seven major floods have occurred in the region in the past 25 years. In many of the coastal basins south of the Russian River, six of the seven floods were of nearly equal magnitude. In the Russian River basin the flood of December 1964 was generally the maximum of these events, but in the coastal basins north and west of the Russian River the flood of December 1955 generally produced the greatest peak discharges. A flood-frequency study of the region indicates that the magnitude of floods of any given frequency can be related to size of drainage area and to mean annual basin wide precipitation. Mean annual basin wide precipitation is an excellent index of the relative magnitude of storms of any given frequency because the bulk of the precipitation occurs during several general storms each year, and the same number of general storms occur at all stations in any given year.

Rantz, S. E., 1968, Average annual precipitation and runoff in north coastal California: U.S.Geological Survey Hydrologic Investigation Atlas HA-298, scale 1:1,000,000, 1 sheet, 4 p.

The hydrologic characteristics of California coastal basins north of San Francisco Bay are presented on four 1:1,000,000 scale maps. The maps show the area's principal drainage systems and hydrologic units and include isopleths of average annual precipitation, runoff, and evaporation. The relationship between average annual runoff and average annual runoff and average annual precipitation and potential evapotranspiration is apparent from looking at these maps. Multiple linear regression equations relating these elements are derived for each of the two physiographic sections or subregions of the study area -- the Coast Ranges and the Klamath Mountains.

_______1972, Runoff characteristics of California streams: U.S. Geological Survey Professional Paper 2009-A, 38 p.

The general relationships between runoff characteristics and climate, topography, and basin geology for California streams are addressed in this report. A 1:250,000 scale, color map divides California into precipitation zones. Along the north coast of California, a mean annual rainfall is usually greater than 40 inches. In central coastal California mean annual precipitation ranges from 10 to greater than 40 inches. Mean annual water discharges for six Coast Range streams are also included in this report.

Reguzzoni, J. L., Zimmerman, R. C., and Josselyn, M., 1988, The effect of transplant techniques on photosynthesis of eelgrass (*Zostera marina L.*): Implications for long term survival in San Francisco Bay: EOS, Transactions, American Geophysical Union (abstract) v. 69, no. 44, p. 1111.

This study suggests that *Z. marina* will only grow successfully in depths of less than 5 m due to the high turbidity. The results are based on observations made after a transplanting effort of the eelgrass, and the transplanting locations of light areas and dark areas.

Reneau, S. L., 1981, Recent sedimentation along the Big River estuary, Mendocino County: University of California at Santa Cruz, published in California Geology, California Division of Mines & Geology, Sacramento, CA, v. 34, no. 122, p. 255-259.

Estuaries provide a habitat for both sessile and migratory organisms that, in many cases, are of economic importance to man. A geomorphic study was performed along the Big River Estuary in 1979 as part of a natural resource survey. During this study it was revealed that major geomorphic changes, resulting from substantial sedimentation, have occurred in the estuary during this century. The vegetation distribution on the salt marsh flats has changed because of this sedimentation.

Revelas, E. C., Germano, J. D., and Rhoads, D. C., 1987, Reconnaissance of benthic environments: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2069-2083.

The rationale behind Remote Ecological Monitoring of the Seafloor (REMOTS) approach and the associated analytical procedures are presented with the results of two REMOTS surveys conducted in Puget Sound in 1985.

Rice, P. M., 1974, Closure conditions at the mouth of the Russian River: U. S. Army Corps of Engineers, Jacksonville District, Florida: Shore and Beach, Journal of the American Shore and Beach

Preservation Assoc., O'Brien Hall, University of California, Berkeley, v. 43, no. 1, p.15-20.

This paper gives an overview of the changes that have taken place at the mouth of the Russian River in order to establish a navigable channel. The paper emphasizes the importance of providing a channel for the ingress and egress of fish to an from spawning grounds in the river.

_______1974, The mouth of the Russian River: University of California, Berkeley, Department of Wave Engineering, Division of Hydraulic and Sanitary Engineering, 166 p.

Hydrographic and hydrologic investigations were conducted on the mouth of the Russian River with accompanying history of policy decisions regarding work in the area. Discussion of the characteristics of the physical parameters that govern the closure of the river mouth are also presented.

Ritter, J. R., 1969, A summary of preliminary studies of sedimentation and hydrology in Bolinas Lagoon, Marin Co., California: U.S. Geological Survey ,Circular, no. 627, 22 p.

The U. S. Geological Survey is investigating sedimentary and hydrologic conditions in Bolinas Lagoon, an 1100-acre lagoon 15 miles northwest of San Francisco. The program began in May 1967 and will continue into 1970. Only the study results analyzed before June 1968 are summarized in the report.

Two series of measurements of suspended-sediment load and water discharge in the lagoon inlet showed that much of the suspended sediment is sand and that the average velocity was as much as 4.7 fps. Littoral drift near the inlet was generally toward the inlet, whereas farther from the inlet the pattern is irregular. Circulation velocities in the lagoon decrease rapidly away from the inlet, but probably remain high enough to erode bottom sediment along the channels. In most of the lagoon, median size of bottom sediment was fine sand. Sediment was derived chiefly from Monterey Shale. (Author)

_______ 1969, Preliminary studies of sedimentation and hydrology in Bolinas Lagoon, Marine County, California, May 1967 - June 1968: U.S. Geological Survey, Department of the Interior, Water Resources Division, Sacramento, CA, Open-File Report, 67 p.

In May 1967 the U.S. Geological Survey began an investigation of the hydrology and sedimentation in Bolinas Lagoon in cooperation with the Bolinas Harbor District and Marin County. The lagoon, a potential small craft harbor, seemed to be filling with sediment. The purpose of the investigation was to define the sources and movement of sediment in the lagoon.

_______1969, Measurement of water flow and suspended-sediment load, Bolinas Lagoon, Bolinas, California: U.S. Geological Survey Professional Paper 650-B, p. 189-193.

Measurement of water flow and sediment load at the lagoon inlet for a 10-hr tidal period (flood tide and ebb tide on 22 Jun 1967) revealed that in that specific period of time 152 tons of suspended sediment were carried into the lagoon by the flood tide, whereas only 36 tons were carried out of the lagoon by the ebb tide. However, the major ebb tide which was not measured probably carried the largest load of the day. Bed load made up as much as 18% of the total load during flood tide and 15% during ebb tide. Ten water measurements and seven sediment measurements were made during the flood tide (lower low water to lower high water). Six water measurements and five sediment measurements were made during the ebb tide (lower high water to higher low water). One measurement each of water and sediment was made during the second flood tide. The maximum measured water flow and maximum average velocity during flood tide were 5810 cfs and 3.5 fps, respectively; during ebb tide the maximums were 3720 cfs and 2.4 fps. The range of flood tide was about 4 ft and ebb tide about 1.3 ft. Higher temperatures of water at the inlet possibly indicated lagoon water and ebb tide, and lower ones, ocean water and flood tide. (Author)

_______1971, The hydrologic and sedimentary environment of Bolinas Lagoon, California, (abs.): Eos (Am. Geoph. Union Trans.), v. 52, no. 4, 207 p.

An investigation of sedimentary and hydrologic conditions in Bolinas Lagoon, an 1100-acre lagoon, 15 miles northwest of San Francisco began in May 1967 and ended in 1970. Measurements of suspended-sediment load and water discharge in the lagoon inlet showed that much of the suspended sediment is sand and that the average current velocity was as much as 4.7 fps. Littoral drift near the inlet was generally toward the inlet, whereas farther from the inlet the pattern is irregular. Circulation velocities in the lagoon decrease rapidly away from the inlet, but probably remain high enough to erode bottom sediment along the channels. In most of the lagoon, median size of bottom sediment was fine sand. Sediment was derived chiefly form Monterey Shale. (Author)

_______1972, Sediment transport in a tidal inlet: Conf. Coastal. Engr., 13th, Proc., p. 823-842.

Suspended-sediment discharge in or near the inlet to Bolinas Lagoon, Calif., was measured during seven ebb tides and six flood tides. The measured suspended load for the ebb tides ranged from 3 to 1150 tons and for the flood tides from 49 to 152 tons. The suspended load is directly related to the tidal range; therefore, because lower low water at Bolinas Lagoon usually follows higher high water, the major ebb tide of the day usually transports more sediment than other daily tides. Measured bed load averaged 16 percent of the total load.

Most of the transported sediment was sand, the concentration of which had considerable temporal lateral, and vertical variation. On the other hand, the concentration of suspended sediment finer than sand remained relatively constant. A given water discharged usually occurs twice during a tide. When a given water discharge first occurs during and ebb tide, the corresponding suspended-sediment discharge is less than it is when the same water discharge occurs later. An inverse relation is noted during the flood tide.

Suspended-sediment discharge generally was related directly to average velocity. The measured average velocity for a given flow in the inlet was as much as 4.9 fps and the maximum average velocity measured in a single vertical was 6.7 fps. The relation of the average velocity ($\bar{u}$) for a tide to the tidal range (R) in the inlet was

$$(\bar{u}) = 1.21R^{0.51}$$

By using the average velocity calculated by the equation above and the average cross section of the inlet for a tide, the tidal flow in the inlet can be approximated. (Author)

_______1973, Sand transport by the Eel River and its effect on nearby beaches: U.S. Geological Survey Open-File Report, 73-236, 17 p.

An analysis of the mineralogy and textural parameters of the Eel River beach sands was performed to determine the sources of the sands. The Eel River basin in California has one of the largest sediment yields per unit area in the world. Sand composes about 25% of the total sediment transported by the river into its estuary. The annual sand load averaged about 4,600,000 tons for the 58 year period of 1911-1914 and 1917-1970. Most of this sand probably enters the ocean, some is lost to the Eel Canyon, and some is deposited offshore near the Eel River mouth.

Ritter, J. R., and Brown, W. M., III, 1971, Turbidity and suspended-sediment transport in the Russian River Basin, California: U.S. Geological Survey Open-File Report 72-316, 100 p.

The Russian River in north coastal California is persistently turbid. To determine the source of the turbidity and the rate of sediment transport in the basin, a network of sampling stations was established in February 1964 along the river, on some of its tributaries, and near Lake Pillsbury in the upper Eel River basin.

Turbidity and concentration of suspended sediment, expressed in milligrams per liter, were highly correlative ($r>0.90$) at almost every sampling station. The correlation differed for each

station and varied slightly each year. From correlations between turbidity and the size of particles in suspension it is concluded that a concentration of particles finer than sand produces a higher turbidity than does an equal concentration of sand. Most of the persistence of turbidity seemed to be produced by particles finer than sand carried in suspension.

Ritter, J. R., Brown, W. M., III, 1973, Bolinas Lagoon, Marin County, California. Summary of Sedimentation and Hydrology, 1967-69 with a section on Fluorescent-Tracer Study of Sediment Movement: U.S. Geological Survey Open File Report, no.,WRI-19-73, WRD-73-019, 82 p.

Sedimentation in Bolinas Lagoon presently averages about 16-acre-feet per year. Depositional rates based on sediment budget studies, topographic maps, and geological evidence indicate that the lagoon would fill 0.5 to 1.0 foot in the next 50 years and would fill to the highest high water level in 340 to 650 years.

Studies from 1967 to 1969 indicated that approximately 80 acre-feet of sediment was transported into and 86 acre-feet was transported out of Bolinas Lagoon annually by tidal flows. Cliff erosion west of the inlet and littoral drift provided the principal sources of the sediment transported into the lagoon by flood tides. Winds and streamflow brought additional sediment. Measurements of tidal flows and suspended-sediment discharge in the lagoon inlet showed that: (1) most of the suspended sediment is sand, (2) the average velocity was as much as 4.9 feet per second, (3) instantaneous suspended-sediment discharge reached rates as large as 11,600 tons per day on a ebb tide, (4) tidal flows ranged from 180 to 2,800 acre-feet, and (5) corresponding suspended-sediment discharge ranged from 3 to 1,200 tons.

Romberg, P., Healy, D., Lund, K., 1987, Toxicant reduction in the Denny Way combine sewer outflows (CSO): Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3467-3479.

Puget Sound, Washington was studied to determine the sources

of pollutants, amounts, types, dispersion, and depth of burial in offshore sediment. The results of this study are presented.

Ronan, T. E., Jr., Miller, M. F., and Farmer, J. D., 1981, Organism-sediment relationships on a modern tidal flat, Bodega Harbor, California: in Modern and Ancient Biogenic Structures, Bodega Bay, California, Frizzell, V., ed., Annual Meeting Pacific Section SEPM Field Trip 3, Society of Economic Paleontologists and Mineralogists, Los Angeles, California, U.S.A., p. 15-31.

The purpose of this study is to describe the physical and geological setting of Bodega Harbor; characterize the sediment of the sandy intertidal flats; describe the traces and trails made by the organisms that inhabit this area; illustrate the biological interactions of these organisms; and describe the distributional controls of the traces and their paleoecological implications.

Rowntree, R. A., 1973, Morphological change in a California estuary: Sedimentation and marsh invasion at Bolinas Lagoon: Ph.D. Dissertation, Department of Geography, University of California, Berkeley. 271 p.

This study looks at the rate and nature of estuarial aging in Bolinas Lagoon by comparing data from other coastal estuaries. The study investigates the morphological changes in the lagoon in relation to watershed and littoral zone land-use. Previous reports on the study area are reviewed in detail and suggestions for re-evaluation of the data are made where needed. The author emphasizes the need to review all available data accurately and consider all the environmental variables that have influenced the study area before interpretations are made.

A good overview of marshland vegetation is made with comparisons of the effects that certain vegetation has had on other estuaries of the west coast. Land management measures are reviewed that may help reduce the rates of sediment infilling into the lagoon with the environmental effects such land management methods might impose on the system. The author outlines methods to establish accurate surveys and continue follow up surveys to fully understand the rates of morphological change in the estuarine and lagoon environment.

________1974, Coastal Erosion: The meaning of a natural hazard in the cultural and ecological context: *in* Natural hazards: Local, National, Global, White, G. F., ed., Oxford University Press, London, England, 1984, p 70-79.

The purpose of this paper was to describe coastal damage and expenditures at Bolinas Lagoon, CA. And how a natural hazard takes on meaning at the individual and community levels of awareness.

Rubin, D. M., McCulloch, D. S., and Hill, H. R., 1983, Sea-floor-mounted rotating side-scan sonar for making time-lapse sonographs: Continental Shelf Research, v. 1, no. 3, p. 295-301.

A rotating side-scan sonar system was designed to make time-lapse sonographs of a circular area of the sea floor. To construct the system, the transducers of a commercial side-scan system (frequency 105 kHz; pulse length -.1 ms; horizontal beam width 1^{o}; vertical beam width 20^{o}; beam depressed 10^{o} with respect to horizontal) were mounted 2 m above the sea floor on a vertical shaft that had a rotation speed of 0.5 rpm.

The radially collected sonar images are recorded linearly on a standard side-scan recorder. To convert the linear record to a radial record, the original moving record is photographed through a slit by a rotating camera, exposing a circular image on film.

Records that are collected with this system offer several advantages over records that are collected with towed systems. Bottom features are presented in nearly true plan geometry, and transducer yaw, pitch, and roll are eliminated. Most importantly, repeated observations can be made from a single point, and bedform movements of <50 cm can be measured. In quiet seas the maximum useful range of the system varies from 30 m (for mapping ripples) to 200 m (for mapping 10-m wavelength sand waves) to 450 m or more (for mapping gravel patches).

Rubin, D. M., and McCulloch, D. S., 1979, The movement and equilibrium of bedforms in Central San Francisco Bay: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 97-113.

By observing the tidal velocity, grain size, water depth and bedform dimensions and directions in Central San Francisco Bay, the local hydraulic environment that prevailed when the bedforms were produced allowed for estimates of sediment transport rates to be made with some reservation. The work discusses the types and distribution of bedforms in the Central Bay, the direction of bedload transport, rates of sand-wave migration, frequency of sand wave movement, and the hydraulic factors that control bedform distribution.

_______1980, Single and superimposed bedforms: A synthesis of San Francisco Bay and flume observations: Sedimentary Geology, v. 26, p. 207-231.

Tidal currents with maximum depth-averaged velocities ranging up to 250 cm/sec have generated ripples, two- and three-dimensional sand waves, and upper flat beds on the floor of central San Francisco Bay. Determination of the hydraulic conditions under which the observed beds exist, indicates that the bed configuration at any point in the bay is a function of the local velocity, sediment size, and depth. The bay observations, for flows up to 85 m deep, were combined with shallow-flow observations and a single set of bed-phase boundaries was determined for the combined data. Critical shear velocities calculated for the transitions from ripples to sand waves and from sand waves to upper flat beds, in flows tens of meters deep, are within 10% of critical shear velocities observed for the same transitions in flume flows only tens of centimeters deep.

Comparison of bedform sequences suggests that, for flows up to tens of meters deep, beds of 0.25-0.50 mm sand respond to increasing flow velocities by forming ripples, two-dimensional sand waves, three-dimensional sand waves, and flat beds. At any constant depth, equilibrium sand waves increase in height and migration rate as flow velocity increases. The wavelength and maximum height of both two-and three-dimensional sand waves increase with depth also, but migration rates decrease. Because the maximum size of both kinds of bedforms varies with depth, classification schemes based on size arbitrarily separate genetically similar bedforms.

In the bay, in contrast to flumes, sand waves having the largest height-to-depth ratios occur in relatively coarse sand. Tidal and seasonal velocity fluctuations are interpreted to be more destructive to finer-grained sand waves, because in finer grain sizes sand waves are stable at a relatively narrow range of velocities.

Ripples, sand waves, and upper and lower flat beds are commonly superimposed on larger bedforms. Small bedforms can exist in equilibrium on the larger bedforms because the large bedforms generate boundary layers in which the small bedforms are locally stable. The distribution of small bedforms superimposed on larger bedforms reflects lateral and vertical variations in shear velocity in flow over large bedforms.

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Sample, T., 1987, Rediscovery of the lower Duwamish River Estuary: Solutions to pollution by point and non-point source controls: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2134-2140.

The Duwamish River Estuary empties into Puget Sound near downtown Seattle. Since 1960 pollution controls have been implemented to reduce the amounts of pollutants entering the system and a system of monitoring to determine point sources. This paper outlines the progress to date of this monitoring system and sites the cooperation between agencies in orchestrating the clean-up plan.

Sawlan, J. J., 1977, A study of fine-grained sediment from Willapa Bay, Washington: Geological Society of America, 90th annual meeting, Abstract with Programs, Seattle, Washington, v. 1158, p. 7.

The distribution pattern of clay minerals in fine-grained surface sediments of Willapa Bay, Washington, a well-mixed coastal plain estuary, indicates that most of the sediment is derived from local fluvial sources. This sediment is characterized by high montmorillonite/illite ratios (~1.5) and the clay mineralogy reflects that of the principal rivers discharging into the estuary. Bottom sediment collected from the northwest portion of the bay near the estuary entrance contains equal proportions of montmorillonite, illite, and chlorite. The clay mineral composition of these samples is similar to that of the lower Columbia River suspended sediment load and the adjacent mid-Washington continental shelf modern silt deposit. This suggests that the Columbia River is the source of the fine-grained material in the surface sediments of the estuary. Sediment accumulation rates derived from the sediment budget calculations and corroborated by Pb^{210} geochronology are consistent with accumulation rates measured in other similar estuaries. (Abstract)

Scheidegger, K. F., Kulm, L. D., and Runge, E. J., 1971, Sediment sources and dispersal patterns of Oregon continental shelf sands: Journal of Sedimentary Petrology, v. 41, p. 1112-1120.

This study determined the dominant direction of littoral transport of sediment over the past 18,000 years based on heavy mineral analysis of river sediments of Oregon and northern California.

Scheidegger, K. F., and Phipps, J. P., 1976, Dispersal patterns of sand in Grays Harbor estuary, Washington: Journal of Sedimentary Petrology, v. 46, p. 163-166.

A heavy mineral study in Grays Harbor, Washington, was undertaken to determine the sources and dispersal patterns of sands in the estuary. Using conventional heavy mineral analysis

three provinces of sand deposition were clearly outlined: marine, mixed, and river. Sands with a heavy mineral suite characteristic of the marine province extend more than 11 km into the estuary, suggesting that the lower part of the estuary is being filled by marine sands. The results of this study suggest that routine heavy mineral analysis of sands in estuaries may have much practical importance to those interested in predicting the long term directions of dispersal of sands that may be dumped in the estuary as a consequence of dredging activity.

Schemel, L. E., Harmon, D. D., and Peterson, D. H., 1983, Response of Northern San Francisco Bay estuary to riverine inputs of dissolved inorganic carbon, nitrogen, phosphorus, and silicon: Abstracts for the Seventh Biennial International Estuarine Research Conference, Oct. 22-26, 1983, session on The Estuary as a Filter: Chemical/Geochemical Processes, Estuaries, v. 6, no. 3, p. 276,.

Transport of riverborne solutes is controlled by time dependent variations in river flow, solute concentrations, or both. The estuarine distributions of riverborne solutes can be complex due to river transport variability, other hydrodynamic factors, such as estuarine circulation, tides, and winds, and the operation of estuarine (source/sink) processes. Our ten-year data set of dissolved inorganic carbon, nitrogen, phosphorus, and silicon (DIC, DIN, and DIS, respectively) from northern San Francisco Bay estuary illustrates the estuarine response to riverine solute inputs over a wide range of conditions. A simplifying feature in this estuary is that vertical mixing is generally strong and the effects of many water-depth dependent processes, such as photosynthesis, are rapidly averaged over the water column. This allow the analysis of riverborne solute distributions with respect to salinity and facilitates numerical simulations. DIC (as estimated from alkalinity) is not greatly influenced by estuarine processes, but exhibits both linear and nonlinear distributions seasonally. The major factor contributing to the nonlinear distributions is time-dependent variations in the fresh water inflow concentration. As expected, the greatest

nonlinearity occurs in the landward reach of the estuary. Distributions of DIS are more complex, but they can be interpreted primarily in terms of river supply, sea water-fresh water mixing, and removal from the water column by photosynthetic utilizations and field data both show that photosynthetic removal is effective in producing nonlinear DIS distributions only when the fresh water inflow rate falls below 400 m^3 per sec. The numerical simulations require unrealistically high utilization rates in order to produce nonlinearity at higher river flow rates. DIN and DIP estuarine distributions appear to be more complex than DIC and DIS distributions. This complexity is partly due to stronger influences of estuarine sources of nitrogen and phosphorus and/or faster recycling times. For example, DIN averages only one half of the total water column nitrogen and the annual anthropogenic waste nitrogen input is about one-quarter or more of the annual riverine DIN input. Distributions of DIN and DIP can be simplified by comparing them to the DIS distribution during phytoplankton blooms. (Author)

Schemel, L. E., and Hager, S. W., 1986, Chemical variability in the Sacramento River and in Northern San Francisco Bay: Estuaries, v. 9, no. 4A, p. 270-283.

This paper examines chemical variability over time scales of days to weeks. Alkalinity, dissolved silica ammonium, and nitrate, as well as specific conductance and salinity were measured to relate the variability of chemical species to river discharge for water years 1982 through 1984. The results indicate that variations in chemical species were smaller than variations in flow in the Sacramento River. Dilution of concentrations of dissolved silica and ammonium occurred by increasing river flow. Specific conductance and alkalinity appeared to increase with runoff from agricultural areas. Nitrate concentrations increased during the early runoff from storm events.

Schlocker, J., 1974, Geology of the San Francisco North quadrangle, California: U.S. Geological Survey Professional Paper, no. 782, 109 p.

This paper is an extensive description of the deposits of the San Francisco North quadrangle. It consist of two 1:24,000 scale, color maps that include: (1) the geology, and (2) bedrock surfaces and landslide localities with a table of probable causes for landsliding. Sediment grain size and petrology of beach sands are used to locate the source of beaches along the Pacific shore of San Francisco. The paper suggest that the probable sources of the beach sand and the related onshore dunes are the poorly consolidated Pliocene (2 to 5 Million years old) and Pleistocene (10,000 to 2 million years old) Merced Formation, the younger formations along the shore to the south, and the sands of the continental shelf. The sands of the continental shelf probably were deposited by the ancestral Sacramento-San Joaquin River, during the Wisconsin Glaciation (about 85,000 to 7,000 years ago), when sea level was lower.

Schwartz, D. L., 1983, Geologic history of Elkhorn Slough, Monterey County, California: Masters Thesis, San Jose State University, San Jose California,102 p.

Borehole data below the mouth of Elkhorn Slough suggests a transgressive sequence of non-marine to marine sediments. The study investigated the sediments and microfossils to determine the erosional and depositional history of Elkhorn Valley during the past 16,000 to 18,000 years before present. The study determined that the Elkhorn Valley had a quiet water estuary or coastal embayment approximately 5,000 years ago which has filled at a rate of 1.6 mm/yr leaving some portions of the lagoon isolated. The study further suggests that Elkhorn Valley would have evolved into a dry alluvial valley based on the sedimentation rates had it not been for the installation of the jetties at Moss Landing Harbor.

Scott, D. B., and Medioli, F. S., 1978, Vertical zonations of marsh foraminifera as accurate indicators of former sea-levels: Nature, v. 272, p. 523-531.

Tijuana Lagoon, California and Chezzetcook Inlet, Nova

Scotia were sampled to reconstruct a pattern of apparent Holocene sea-level rise. Foraminifera and salt marsh deposits were used to establish two subzones in each study site.

Serene, R. J., and Mercer, B. W., 1975, Dredge disposal study San Francisco Bay and estuary: U. S. Army Corps of Engineers San Francisco District, San Francisco, CA, Crystalline Matrix Study, Appendix E: Battelle Contract Number DACW07-73-C-0080, Final Report, 215 p.

This is a study concerning environmental impact of dredging operations which investigates the factors associated with dredging, the technology used in dredging operations, the present system used of aquatic disposal, and alternative disposal methods.

Serr, E. F., Scott, R. G., Walker, T., and Calzascia, E., 1974, Smith River gravel study: California Department of Water Resources, California Resources Agency, Sacramento, CA, 25 p.

This report discusses sand and gravel deposits along the lower Smith River. The report gives the sand and gravel replenishment rates, extraction methods used in mining operations, the quantities extracted, what are possible alternative mining sites, and economic aspects of mining gravel. Maps and color photographs are included.

Shapiro and Associates, Inc., 1980, Humboldt Bay, Wetlands Review and Baylands analysis, 3 volumes: U. S. Army Corps of Engineers, San Francisco District, under Contract DACW07-78-C-0082 by Shapiro and Associates, Inc., Seattle, WA., 3 v.

Volume I contains the summary and findings of the study and includes the following: The study purpose, objectives, and assumptions; a description of the study area; a discussion of the importance of wetlands and wetland types found in the study area; a discussion of typical activities in the study area including impacts and legal/administrative process; and an identification of gaps in knowledge of the area with recommendations for future studies. Volume II is a review and discussion of known existing information on the physical, biological, land use, and sociocultural aspects of the study area. Volume III describes the detailed classification and mapping of habitat types conducted as part of the study. The entire study area was classified and mapped from aerial photos at a scale of 1:6000.

Shults, D. W., Ferraro, S. P., Ditsworth, G. R., and Sercu, K. A., 1987, Selected chemical contaminants in surface sediments of Commencement Bay and the Tacoma waterways, Washington, USA: Marine Environmental Research, v. 22, p. 271-295.

This paper describes the amount and spatial distribution of sediment contamination along transects in Commencement Bay and four of the waterways which enter the Bay. The study compares its results with the findings of previous studies and suggest sources or modes of contamination.

Silva, P. C., 1979, The benthic algal flora of Central San Francisco Bay: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 287-311.

This study is based on a sustained program begun in 1968 to monitor the benthic algal flora of San Francisco bay. The work reviews the various habitats for benthic algae, and characterizes environmental factors and their effects on the distribution within the Bay.

Simmons, D. M., 1987, A new approach to watershed planning: Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2726-2740.

A discussion of the role of the Hood Canal Coordinating Council in the management of natural resources in the Hood Canal watershed, and possible implications for coastal resource management in other areas.

Simmons, H., 1971, The potential of physical models to investigate estuarine water quality problems: Proceedings, 1971 Technical Conference on Estuaries of the Pacific northwest, Oregon State University, Corvallis, Oregon, Engineering Experimental Station Circular no. 42, p. 4-28.

Describes existing physical models of Columbia River, Umpqua, Grays Harbor, and Tillamook estuaries and gives their uses.

Simpson, G. L., 1978, Shoal migration and dune encroachment, North Harbor, Moss Landing, California: Masters Thesis, San Jose State University, San Jose, California, 44 p.

Field observations and aerial photographs were used to determine the landward progradation of the barrier spit complex that protects Moss Landing Harbor. The study investigates what measures can be incorporated to stabilize the encroachment.

Sinha, E., and McCosh, B., 1974, Coastal estuarine and nearshore processes; An Annotated Bibliography: U.S. Water Resources Information Center, 218 p.

One thousand and nine annotated references to the literature on Coastal Estuarine and Nearshore Processes are presented. The order of presentation is alphabetical by name of first author. A subject outline identifies the geologic, geomorphic, meteorologic, and oceanographic references which deal with the highly variable interactions in the estuarine and the nearshore zone. Included in the subject outline is the identification of references on models, method, and instruments used in the study of coastal processes. References to studies in various parts of the world are specified in the geographic outline.

Siowolop, S., and Albert, H., 1979, California's coastal wetlands: University of California, La Jolla, CA, California Sea Grant College Program, Institute of Marine Resources, 39 p.

The study addresses the management of coastal wetlands in California. The work discusses the problems created between conservation, residence, recreation, industry and the obligation of implementing the laws set up to deal with the wetland environment. Also the limitations of the wetland to recover from man's encroachment

Skinnarland, K., Fletcher, K., and Dohrmann, J., 1987, Puget Sound: A plan for its future: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 976-992.

In the late 1970s, several studies and investigations of Puget Sound revealed serious problems of bacterial contamination, toxic contamination of sediments and marine organisms, and wetland loss. In response, the State of Washington created the Puget Sound Water Quality Authority to develop a comprehensive plan for the cleanup and management of the Sound. The Authority prepared technical reviews of the Sound's environmental problems and analyzed current programs to control contamination, while working to increase public awareness of the Sound and involve citizens in the planning process. In December 1986, following public hearings on a draft plan, the Authority adopted the Puget Sound Water Quality Management Plan. The plan is comprehensive, with major programs for nonpoint sources, municipal and industrial sources, stormwater contaminated sediments, shellfish and wetland protection, and public education and information. Other plan elements deal with monitoring, research, and laboratory certification. Existing state and local agencies are responsible for implementation of the plan. The Authority works to assure compliance with the plan and provides oversight and technical assistance.

Sloan, D., 1981, Pleistocene estuarine deposits beneath central San Francisco Bay: evidence for high sea level or low river dischargee: Abstracts with Programs - Geological Society of America, v. 13: 7, p. 556.

During part of the last major interglacial, conditions in San Francisco Bay were more fully marine than at any time during the present interglacial. The record of these conditions is preserved in the youngest of several Pleistocene estuarine units intercalated with alluvial and aeolian deposits lying beneath some 30 m of Holocene estuarine muds.

The youngest Pleistocene deposit consists of over 31 m of mud which record a single transgression. Overconsolidation of the uppermost sediments suggests that approximately 13 to 30 m of additional sediment have been removed by erosion. Thickness and extent of the deposits, absence of overlying Pleistocene estuarine sediments and C^{14} dates of greater than 40,000 yrs on overlying peaty muds suggest that they formed during oxygen-isotope stage 5.

Foraminifera and diatoms, preserved in 25% and 84% respectively of 217 sieved borehole samples, indicate increasing salinity and water depth, and decreasing water temperature with time. Most of the sediments record estuarine conditions comparable to those prevailing in the present San Francisco Bay system. Microfossils in the uppermost deposits beneath the erosional unconformity indicate a fully marine circulation and a low sedimentation rate. No known counterparts to these uppermost deposits are preserved in the Holocene estuary.

The unusually marine conditions in the uppermost deposits raise several possibilities; 1) and increase in water storage in the bay as a result of higher sea level, as indicated by deposits of greater real extent and thickness than Holocene bay deposits; 2) the opening of another seaway in addition to the constricted Golden Gate, as suggested by nearshore and estuarine sediments in a correlative stratigraphic position, exposed in and just south of San Francisco; and/or 3) low river discharge into the bay.

Smith, B. J., ,1963, Sedimentation in the San Francisco Bay system; sedimentation in esturaries, harbors, and coastal areas: Symposium 3, Federal Inter-Agency Sedimentation Conference, Proceedings, Miscellaneous Publication, 970, U.S. Department of Agriculture, p. 765-708

In this landlocked series of embayments of 430 square miles the annual sediment load approximates 8 million cubic yards, 85.5%

from the Sacramento-San Joaquin River system and 14.5% from Bay area streams. Upon entry into the Bay system, the density of the bedload decreases variably for different bays; the sand content is lost and silt increased while clay content remains constant. It is concluded that tidal and wind-wave-induced turbulence erodes bottom deposits and inhibits settlement; contributions from littoral sources outside Golden Gate are discounted. Historical sedimentation evidences cyclic trends, but there have been extensive changes, particularly in the last 100 yr with the diversions of drainage. (Author)

________ 1966, The tides of San Francisco Bay: San Francisco Bay Conservation and Development Commission, San Francisco, CA, 42 p.

This is a study of the tidal action in San Francisco Bay. Tide tables and figures are included.

________ 1966, Sedimentation aspects of San Francisco Bay: San Francisco Bay Conservation and Development Commission, 48 p.

The effects of tidal movement, and shoaling on the sediment in San Francisco Bay are discussed. The paper presents a good overview of early work done on San Francisco Bay by G. K. Gilbert on the amount of sedimentation that occurred during the gold mining of 1850 through 1914.

Smith, L. H., 1987, A review of circulation and mixing studies of San Francisco Bay, California: U.S. Geological Survey Circular 1015, 38 p.

This report summarizes a number of previous reports on circulation and mixing in San Francisco Bay and then relates this to observes circulation and mixing patterns to relate the importance of the physical factors for low-inflow and high-inflow conditions. With this overview the questions of what quantity of freshwater inflow is necessary to prevent salt intrusion into the Sacramento-San Joaquin Delta, and what salinity distributions in the bay would result from various inflow patterns. Also what quantity of freshwater inflow is sufficient to flush pollutants through the bay.

Smith, R. E., Herndon, R. E., and Harmon, D. D., 1979, Physical and chemical properties of San Francisco Bay waters, 1969-1967: U.S. Geological Survey Open-File Report 79-511, 607 p

This paper presents data on the physical and chemical properties of San Francisco Bay waters that were collected on 76 cruises over the period 1967 to 1969 at about six-week intervals at 36 stations. The stations were located along the axis of the Bay from Calaveras Point in South San Francisco Bay to the town of Rio Vista on the Sacramento River. On most of the cruises vertical profiles of the water properties were taken at 12 of the 36 stations. The samples were analyzed for physical and chemical characteristics including: salinity, temperature, light transmission, and suspended particulate weight. The results of these analyses and the analytical methods used are documented in this report.

Snyder, R. M., and Landrum, F. R., 1987, Estuarine rehabilitation, a management perspective: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 251-266.

This paper points out that no suitable methodology for evaluating any proposed wetland changes, and their influence on ecosystems stability and abilities to respond to the changes has been formulated. The paper addresses the need for management to educate itself to the ecological impacts of wetland changes.

Spiker, E. C., and Schemel, L. E., 1979, Distribution and stable-isotope composition of carbon in San Francisco Bay: *in* Conomos, T. J., ed., San Francisco Bay, the Urbanized Estuary, Fifty-eighth Annual Meeting of the Pacific Division American Association for the Advancement of Science held at San Francisco State University, San Francisco, California, p. 195-212.

The importance of carbon in estuaries is fundamental because estuaries are valuable environments for carbon fixation by aquatic plants and estuarine production is essential in maintaining some fisheries. The San Francisco Bay estuarine system receives carbon from natural sources as well as large amounts from the surrounding urban area, primarily in the form of municipal wastes. The sources and dynamics of carbon in San Francisco Bay waters were studied by evaluating the distributions of some important organic and inorganic forms and their stable carbon isotope compositions.

Standing, J., Browning, B. M., and Speth, J. W., 1975, The natural resources of Bodega Harbor: California Department of Fish and Game, Sacramento, CA, Coastal Wetlands Series, no. 11, 183 p.

The purpose of this report was to document the natural resources of Bodega Harbor, the use they receive, and the problems that affect those resources. Bodega Harbor is unique among the coastal wetlands remaining on the coast of California. A natural embayment formed by the San Andreas Fault, the harbor is the only fishing port between San Francisco and Noyo Harbor, in Mendocino County, and is extremely important for its marine-oriented uses and commercial fish-related facilities. In addition to its significance as a port, Bodega Harbor has a large variety and quantity of marine, wetland and upland habitats. These habitats support a variety of wildlife and makes the harbor and extremely interesting and attractive recreational area.

Stein, J. E., Hom, T., Castillas, E., Friedman, A., and Varanasi, U., 1987, Simultaneous exposure of English Sole *Parophrys vetulus* to sediment-associated Xenobiotics: Part 2---Chronic exposure to a urban estuarine sediment with added ^{3}H-Benzo [a]pyrene and ^{14}C=Polychlorinated Biphenyls: Marine Environmental Research, v. 22, p. 123-149.

This study consisted of exposing English sole for up to 108 days to sediment from the Duwamish River estuary, which is an industrialized area of Puget Sound, WA., and to sediment from a non-industrialized area of the Hood Canal. The study assessed the bioavailability of aromatic hydrocarbons (AHs) and PCBs in the Duwamish River sediment by natural processes. The study concluded that the accumulation of AHs and PCBs from sediment by English sole is significant in contaminated environments, and accumulation in non-contaminated environments undetectable.

Sternberg, R. W., Cacchione, D. A., Drake, D. E., and Kranck, K., 1986, Suspended sediment transport in an estuarine tidal channel within San Francisco Bay, California: Marine Geology, v. 71, p. 237-258.

A recently developed instrumentation system has been used to monitor simultaneously flow conditions and suspended sediment distribution in the bottom boundary layer of a tidal channel within San Francisco Bay, California. Measurements were made every 15 min over six successive flood and ebb tidal cycles. They included mean velocity profiles from four electromagnetic current meters within 1 m of the seabed; mean suspended sediment concentration profiles from seven miniature nephelometers placed within 1 m of the seabed three times during the tidal cycle. The instrument system was retrieved during each slack water period to exchange the suspended sediment sample bag. While the instrument was deployed STD-nephelometer measurements were made throughout the water column and water samples were collected each 1-2 h and bottom sediment was sampled at the deployment site.

Size distributions of the suspended sediment samples, estimates of particle settling velocity (w_s), friction velocity (U_*), and reference concentration (C_a) at $z = 20$ cm were used in the suspended sediment distribution equations to evaluate their ability to predict the observed suspended sediment profiles. Three suspended sediment particle conditions were evaluated: (1) individual particle sizes in the 4-11 ø (62.5-0.5 µm) size range with the reference concentration C_a at $z = 20$ cm (C_f); and (3) individual particle sizes in the 4-6 ø size range, flocs representing the 7-11 ø size range with the reference concentration predicted as a function of the bed sediment size distribution and the square of the excess shear distribution equation to deviations in the primary variables w_s, U_*, and C_a.

In addition, computations of mass flux were made in order to show vertical variations in mass flux for varying flow conditions. (Author)

Sternberg, R. W., Johnson, R. V., II, Cacchione, D. A., and Drake, D. E., 1986, An instrument system for monitoring and sampling suspended sediment in the benthic boundary layer: Marine Geology, v. 71, p. 187-199.

An instrument system has been constructed that can monitor and sample suspended sediment distributions in the benthic boundary layer. It consists of miniature nephelometers and suspended sediment samplers placed within one meter of the seabed. The system is capable of continuously monitoring suspended sediment profiles at eight levels between 14 and 100 cm above the seabed and collecting suspended sediment samples at four levels (20, 50, 70 and 100 cm) three times during a deployment period.

The suspended sediment system is designed to fit into the instrumented tripod GEO-PROBE which contains four electromagnetic current meters, pressure sensor, bottom stereo camera, two temperature sensors, transmissometer, and a Savonius rotor current meter. Sensor operation, data recording, and sediment sampling events are synchronized. Thus detailed measurements of the near-bottom flow conditions are made concurrently with suspended sediment measurements. The combined system has been used in sediment transport environments within San Francisco Bay, California, and Puget Sound, Washington. (Author)

Stevens, B. G., 1983, Resource partitioning among age-classes of the Dungeness Crab, *Cancer magister*, in Grays Harbor, Washington: Estuaries, v. 6, no. 3, p.273,

Age class patterns were found for selected feeding areas, types of food ingested, and salinity preference, of the habitat of *Cancer magister*. The findings suggest *C. magister* shows ontogenetic changes in preference for certain habitat types, and that salinity and food requirements probably play a significant role in this selection process. Spatial separation of age classes

allows reduced agnostic interactions, which often results in cannibalism and reduced competition for local food sources.

Stevenson, R. E., and Emery, K. O., 1958, Marshlands in Newport Bay, California: Allan Hancock Foundation Occasional Paper no. 20, p. 1-109

This paper presents a detailed analysis of salt-marsh development through a discussion of physiographic, hydrologic, sedimentologic, and floral data of a modern environment .

Stockdate, E. C., and Horner, R. R., 1987, Prospects for wetlands use in storm water management: Coastal Zone '87, v. 4, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 3701-3714.

The paper outlines what is known from the literature regarding the use of wetlands for storing urban runoff and controlling non-point pollution. It then discusses what is not known, and concludes with principles for using freshwater wetlands for water quality improvement.

Striplin, P. L., Sparks-McConkey, P., and Day, M. E., 1987, Identifying depositional areas in Puget Sound: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 1848-1861.

Two hundred sediment samples collected along depth contours in 5 acres of Puget Sound were analyzed for volatile solids, 5-day biochemical oxygen demand, percent water and grain size. From this analysis sampling stations were classified according to their depositional characteristics for each area. The study was conducted in support of the Puget Sound Dredge Disposal Analysis.

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Thom, R. M., 1984, Composition, habitats, seasonal changes and productivity of macroalgae in Grays Harbor estuary, Washington: Estuaries, v. 7, no. 1, p. 51-60.

Twenty-nine taxa of macroalgae were collected from the Grays

Harbor estuary, Washington, from 17 April 1980 to 4 June 1981. Outer (oceanic) sites contained higher numbers of species than sites located in the inner portion of the estuary. Macroalgae were found in several habitats including attached to boulders, logs, tree roots, other algae, and angiosperms, as mats in sand, and drift. *Fucus distichus* ssp. *edentatus* and *Enteromorpha intestinalis* occurred at the greatest number of sites and were found throughout the year. The standing stock of the perennial *Fucus* remained relatively constant, while that of and *E. intestinalis* and *Blidingia minima* var var. *subsalsa* complex showed a significant peak between late spring and early summer as well as a winter minimum. The occurrence of most other taxa was highly seasonal. Net productivity rates for the most abundant macroalgal taxa were moderate to high relative to rates published for algae in other North American estuaries. It is concluded that, although inconspicuous, macroalgae may represent an important contributor of organic carbon to the Greys Harbor estuarine system.

Thomas J. Murry and associates, 1972, Development program for Tillamook Bay, Oregon: Tillamook County, Port of Bay City, and Port of Tillamook Bay, Oregon, 81 p.

A study to investigate a development program for Tillamook Bay following completion of the new south jetty.

Thompson, J., 1981, Sediment grain-size distribution in San Francisco Bay, California: January, February, and August 1973: U.S. Geological Survey, Menlo Park, CA, Open-File Report 81-1332, 34 p.

Van Veen grab samples were taken at 43 stations in January and February 1973 and at 42 of the same stations in August 1973 in San Francisco Bay, the sediment grain size data is presented in this paper. The mean and median grain size, sorting, skewness, kurtosis, and size-class percentages and ratios are presented for each stations. It was found that the coarsest sediment in the study area, 0.25 mm mean diameter, was found at the opening to the bay where more than 95 percent of the bed material is sand size.

Seasonal changes in grain size were minimal, with greater variation occurring in the extremities of the bays.

Thompson, R. W., 1971, Recent sediments of Humboldt Bay, Eureka, California: Humboldt State University, Arcata, CA, Final report, Petroleum Research Fund no #799-G2, 62 p.

This study was undertaken with the objective of categorizing and mapping the distribution of various types of surface sediments in Humboldt Bay, and relating the distribution of these sediments to their sources and to the physical and biological processes active within the bay. Specific purposes of the study was to provide information essential for sound conservation practices. These practices can then be employed in future development of the bay and as a contribution to our general knowledge of the processes and products of bay-estuarine sedimentation. The findings can be employed in various other geologic settings, where knowledge is required for the interpretation of the geologic record.

Thompson, R. W., 1971, Sedimentology and geologic history of Humboldt Bay, Eureka, California: National Coastal Shallow Water Research Conference, Abstracts, 2, p. 240.

Textural variations of the surface sediments in South and Arcata Bays correlate with bay-floor morphology. Bottoms of the inward branching tidal channels are covered by gravelly, shelly sand which becomes finer and more muddy with increasing distance from the tidal inlet. Clayey silt predominates on the tidal flats, and highly organic silty clay occurs in the few remaining salt marshes. Tidal flat sediments are olive gray to black and thoroughly stirred by the rich bay infauna. The general pattern of decreasing grain size away from the inlet is controlled by tidal currents. Exceptions to the general pattern result from: delta building by entering streams, wave reworking, commercial oyster harvesting, and channel dredging. Entrance Bay is characterized by sand bottom and beach morphology fashioned by large ocean waves which enter the artificially maintained inlet.

Sediment source, bay morphology, and geologic history are presented. (Author)

Trial, W. T., Jr., 1987, Nitrification in a salt wedge estuary: Coastal Zone '87, v. 3, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 2663-2677.

This study examined the result and potential effect of ammonium discharge to the Green-Duwamish River estuary from the Renton Wastewater Treatment Plant located 20.5 km upstream from Puget Sound, Washington.

Tuttle, A. E., and Dickert, T. G., 1987, Assessing cumulative impacts in wetland watersheds: Coastal Zone '87, v. 2, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 1760-1774.

This paper emphasizes the need for more protective regulation and acquisition of California wetlands due to the increased threat posed by impacts on their watersheds. The paper focuses on the need to halt direct loss of wetlands from the impacts of filling, dredging and diking, which have already destroyed 70 percent of the state's coastal marshlands. The report outlines the efforts of the California Coastal Commission and Coastal Conservancy.

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U.S. Army Corps of Board of Rivers and Harbors, 1927, The Ports of San Francisco, Oakland, Berkeley, Richmond, Upper San Francisco Bay, Santa Cruz, and Monterey, California: U. S. Army Corps of Engineers, Board of Rivers and Harbors, 317 p., Prot Series no. 12, (prepared by U.S. War Department, Washington, D.C.).

This is #12 of a series on principal ports of the USA, prepared to meet the needs of the War Dept. in its development of harbors. Extensive information on commerce, origin and destination of traffic, and the amount of business the port can handle are included.

U.S. Army Corps of Engineers Beach Erosion Board, 1962, Littoral studies near San Francisco using tracer techniques: U. S. Army Corps of Engineers, Beach Erosion Board, (now U. S. Army Corps of Engineers Coastal Engineering Research Center, Vicksburg, Miss.), Technical Memorandum no. 131, 60 p.

Discussion of littoral studies done in the San Francisco area using tracer techniques.

U.S. Army Corps of Engineers, Engineering Research Center, 1984, Shore Protection Manual; Volumes I & II: U. S. Army Corps of Engineers, Coastal Engineering Research Center, Vicksburg, Miss., Fourth Edition, U.S. Gov't Printing Office, Washington, D.C., 2 vols. various pagings.

This Shore Protection Manual was prepared to assemble in a single two-volume publication guidance on coastal-engineering practices for shore protection. "Coastal Engineering" is defined as the application of the physical and engineering sciences to the planning, design, and construction of works to modify or control the interaction of the air, sea, and land in the coastal zone for the benefit of man for the enhancement of natural shoreline resources. "Shore protection," as used in this Manual, applies to works designed to stabilized the shores of large bodies of water where wave action is the principal cause of erosion. Much of the material is applicable to the protection of navigational channels and harbors.

U.S. Army Corps of Engineers Office of the Chief of Engineers, Improvement of Harbors in California 1871-1915: U. S. Army Corps of Engineers, Office of the Chief of Engineers, Washington, D.C. annual report, all volumes available at the University of California, Berkeley, Water Resources Archives.

This document consists of annual surveys of improvements of harbors in California. All relevant surveys are listed by years from 1873 to 1907.

________ 1939, Report of preliminary examination of Russian River, California, for flood control: U. S. Army Corps of Engineers, Office of the Chief of Engineers, Washington, D.C., Flood Control Central, Service Files, 4 sections.

This is a file containing a copy of a resolution for flood relief for Mendocino County. Includes a map of the Russian River, compiled by the U.S. Geological Survey; copies of letters pertaining to questions asked in the Russian River Flood Control hearing September 13, 1938, in Santa Rosa; and a report of a preliminary examination of the Russian River.

________ 1950, Report on improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District: U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1949.

________ 1951, Report on improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1950.

________ 1952, Report on improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District: U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

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________ 1953, Report on improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1953.

________ 1954, Report on improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1954.

________ 1955, Report upon the improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1955.

________ 1956, Report upon the improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1956.

_______ 1957, Report upon the improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington,

D.C., various pagings.
Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1957.

________ 1958, Report upon the improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.
Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1958.

________ 1959, Report upon the improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.
Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1959.

________ 1960, Report upon the improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.
Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1960.

________ 1961, Report upon the improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.
Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1961.

________ 1962, Report upon the improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1962.

________ 1963, Report upon the improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1963.

________ 1964, Report upon the improvement of rivers and harbors in the San Francisco, California, District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1964.

________ 1965, Report upon the improvement of rivers and harbors in the San Francisco, California, District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1965.

________ 1966, Report upon the improvement of rivers and harbors in the San Francisco District: U. S. Army Corps of Engineers, San Francisco District; U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. Government Printing Office, Washington, D.C., various pagings.

Annual report of the Chief of Engineers, U.S. Army, on civil works activities in 1966.

________ 1966, Russian River, California; A letter from the Secretary of the Army Transmitting a letter from the Chief of Engineers, Department of the Army: U.S. Government Printing Office, Washington, D.C., 39th Congress Second Session, House document no. 518, 317 p.

A review of the reports on the Russian River, requested by a resolution of the Committee on Public Works, House of Representatives. The views of the State of California, the Departments of the Interior, Agriculture, Commerce, Public Health Service, and the Federal Power Commission are included together with the replies of the Chief of Engineers to the State of California, The Secretaries of the Interior and Commerce, and the Public Health Service.

________ 1933, Letter from the Secretary of War: U.S. House of Representatives, 73rd Congress, 2nd Session, Washington, D.C., Document no. 181, 53 p.

A letter from the Acting Chief of Engineers, United States Army, submitting a report, together with accompanying papers and illustrations, on Klamath River, Oregon and California for the purposes of navigation and efficient development of its water power, the control of floods, and irrigation.

U.S. Army Corps of Engineers Sacramento District, 1956, Flood volume frequency statistics for Pacific Coast streams: U. S. Army Corps of Engineers, Sacramento District, Sacramento CA, Technical Bulletin, no. 3, 19 p.

This was the third in a series of technical bulletins presenting the results of studies made under Civil Works Investigation Project no. 151, Flood Volume Studies West Coast. The primary objective of this project was the establishment of criteria for estimating run-off volume frequencies for streams draining the pacific slopes of the United States.

________1957, Ten year storm precipitation in California and Oregon Coastal Basins TBL-no. 4: U. S. Army Corps of Engineers, Sacramento District, Sacramento, CA, Technical Bulletin no. 4, 44 p.

To facilitate storm transposition or storm intensity comparison in the Pacific Coast areas over a long distance, the study reported in this bulletin was devoted to construction of an isohyetal map that is exceeded during general winter - type storms at any location on the average once every 10 years. Report also includes: Computation of normal annual precipitation; ratio of 10 - year storm precipitation to normal.

U.S. Army Corps of Engineers San Francisco District, 1931, Eel River Basin maps and profiles: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, 26 figures.

Collected Maps of the Eel River Basin.

________ 1938, Miscellaneous U. S. Army Corps of Engineers, San Francisco, Design Branch File, Bodega Bay (B-3-30): Prepared for U. S. Army Corps of Engineers, Office of the Chief of Engineers, Washington, D.C., by U. S. Army Corps of Engineers, San Francisco District,California, 1937, 2nd Endorsement by Shore Protection Board

Describes previous reports, shoreline changes, offshore hydrographic changes, discussion of proposed plans and recommendations for Bodega Bay Harbor entrance.

________ 1939, Eel River Flood Damage Map - Preliminary: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, 1 Map.

A map of the flooded area around the Eel River including flood elevations taken in 1938-39.

________ 1939, Preliminary examination - Klamath River: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, inclosures 2, 3, and 4, various Pagings and Figures.

Documents pertaining to a public hearing regarding the need for flood control projects, run-off and water flow retardation, and soil erosion prevention on the watershed of the Lower Klamath River, California.

________ 1942, Dredging in Bodega Bay: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, File 11-1-29.

One blue line of hydrologic survey and areas to be dredged.

________ 1942, Flood Control Survey Report - Klamath River California and Oregon: U. S. Army Corps of Engineers, San Francisco District, Volumes I, II, III: Volume I, 63 p. Volume II - Appendices, Volume III - Various enclosures.

This survey deals with flood control and related matters of Scott River drainage, an area of 680 square miles, and a nine-mile reach immediately above the mouth of the main stream.

________ 1942, Klamath River, California and Oregon, Drainage Basin index map: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, Map.

A map of the drainage basin for the Klamath River, including California and Oregon.

________ 1945, Interim Flood Control Survey Report, Salinas River, California: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, Authorized by public number 738, 22 June 1936 and public number 406 August 28, 1937, serial number 44, 2v.

In connection with the investigation of streams, certain possibilities of effective band-protection and channel-training works were developed to fit into any plan of flood control and water conservation. This report is limited to the channel improvement feature for the Salinas River from its mouth on Monterey Bay to its upstream end.

________ 1947, Bodega Bay Dredging: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, File 11-11-32.

One blue line of areas to be dredged and hydrologic survey.

________ 1949, Report on preliminary examination of harbors for light-draft vessels, Northern California: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA,.

Letters and articles relative to small-craft harbors, 1949. Wind roses at harbor site. Estimate of preliminary plans and 1949 cost estimates.

________ 1950, Survey Report on Humboldt Bay: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA,.1 v.

Map description of shoreline changes.

________ 1970, Cooperative shoreline processes study, photos of the Carmel River mouth: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, photos.

2-1/2" X 3-1/2" Color photos of Carmel River mouth.

________ 1970, Cooperative shoreline processes study, Photos Salinas River mouth; U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, photos.

2-1/2" X 3-1/2" Color photos of the Salinas River mouth.

________ 1973, Plan of study, dredge disposal study for San Francisco Bay and estuary; U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, 43 p.

A comprehensive study of San Francisco Bay which included water quality, waste disposal, resource planning, navigation channels, disposal methods, and dredging technology.

________ 1977, Photos of Humboldt Bay: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, photos.

Aerial photographs of Humboldt Bay and the adjacent coastline.

________ 1980, Noyo River and Harbor Model data: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, miscellaneous information, Noyo Harbor File.

Includes tide information, wave statistics, selected test waves, and foundation conditions. Also attached are Noyo River Water discharge records from October 1969 to September 1977.

________ 1980, Detailed project report and Environmental Impact Statement, Humboldt Bay-Fields Landing Channel, Humboldt County, California; U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, Small navigation project, Section 107 report.

This study, prepared at the request of the Humboldt Bay Harbor Recreation and Conservative District, was to determine the feasibility of improving the existing Federal navigation project at Fields Landing in Humboldt Bay. This report documented the planning process and fulfilled the requirements of the National Environmental Policy Act. Detailed appendices include economics, geology and soils, design and cost estimates, natural resources, and cultural resources. Geology and soils appendix includes hydrography of dredged channels, soil borings in channel areas, grain size curves from borings, liquid phase chemical analyses, bulk sediment analyses and standard elutriate tests.

________ 1980, Eel River Basin Resources: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, 450 p.

This report provides data on the resources, the economic base and the socioeconomic and cultural make-up of the Eel River basin. Original work was limited to erosion and sedimentation. Some of the topics covered are forestry, recreation, fisheries, agriculture, mining, ancillary industries, water and waste water, erosion/sedimentation, human resources and special concerns and growth policies.

________ 1978, Plan of study, Bolinas Lagoon: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, 62 p.

The proposed study was to collect data oriented toward defining the natural progressions as well as determining whether modifications are necessary to achieve the specific goals of enhancement and preservation of the ecosystem. The study addressed rehabilitative dredging and other means of restricting deposition of sediments.

________ 1980, Bolinas Lagoon sedimentation study, Draft Report: U. S. Army Corps of Engineers, San Francisco District, by Parsons, Brinkerhoff, Guade and Douglas, Inc., San Francisco, CA.

Review of existing reports and hydrologic surveys for Bolinas Lagoon and analysis of the erosion/deposition patterns within the lagoon over the past 10 years. The analysis was based primarily on the 1967 and 1978 hydrographic survey maps of Bolinas Lagoon which were provided by the Corps of Engineers.

________ 1981, Russian River Basin Study, Record of Public Meeting: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, 110 p.

A public meeting record concerning a Russian River Basin study of recreation, natural resources, sediment influx, flood management, and water quality.

U.S. Army Corps of Engineers, 1972, Gradation curves: from the North Pacific Division Testing Laboratory, Portland, Oregon.

Results of analyses of dredge samples from Siuslaw River, Tillamook Bay, Rogue River, Chetco River, Columbia River, Baker Bay (Washington), Yaquina Bay, Umpqua River, Coquille River, and Coos Bay. Includes information on sediment sieve analyses, void rations, densities, percent organic material, and roundness grade.

________ 1971, National Shoreline Study: Inventory Report Columbia -- U.S. Army Corps of Engineers,North Pacific Region Washington and Oregon, 88 p.

Describes physical characteristics, changes, littoral drift, ownership, and use of the Washington and Oregon shorelines.

U.S. Coast and Geodetic Survey, 1965, 1974, Drakes Bay, Limantour Spit, Maps: U.S. Coast and Geodetic Survey, (now National Ocean Service, Rockville, MD), maps.

Maps of Drakes Bay for various years.

U.S. Congress, House of Representatives, 1969, The nations estuaries: San Francisco Bay and Delta, California: U.S. House of Representatives, Washington, D.C., Hearings before a subcommittee (First Session), 564 p.

Examination by the subcommittee of the economy and efficiency of the Federal Government's policies and practices as they affect the environment of the San Francisco Bay and Delta.

U.S. Department of Agriculture, 1962, stabilizing sand dunes on the Pacific Coast with woody plants: U.S. Department of Agriculture, Soil Conservation Service, Miscellaneous Publication no. 892-6-PO, 18 p.

Establishing and maintaining permanent vegetation has proved to be a very effective and efficient means of stabilizing coast sand dunes. The damaged dune areas on the Pacific Coast of North America are the result of accelerated erosion caused primarily by the destruction of a cover of native vegetation. In some areas the climax cover was herbaceous, in others it was woody, and still others it was a combinations of herbaceous and woody plants. The choice of plants for the reconstruction of a permanent cover depends on the inherent limitations of the site and the intended land use for the area.

________ 1972, Sediment yield and land transport, The Klamath, Trinity, and Smith River Basins; Russian River, Mendocino Coastal and Clear

Lake Basins: U.S. Department of Agriculture, Soil Conservation Service, Portland, Oregon, Appendix number 2 of 3, 152 p.

This study presents the general physical characteristics and resources of the basins. Sediment rates are given and possibilities for the implementation of land treatment programs are discussed.

________ 1972, Sediment yield and land treatment, North Coastal area of California and portions of Southern Oregon: U.S. Department of Agriculture, Soil Conservation Service, Portland, Oregon, Main report following 2 other appendixes 135 p.

Objective of the study was to evaluate sediment yields, analyze land, water and management problems and to formulate methods of alleviating problems utilizing U.S. Department of Agriculture programs.

_______ 1970, Sediment yield and land treatment, Eel and Mad River Basins: U.S. Department of Agriculture - Soil Conservation Service.

The California Department of Water Resources requested a reconnaissance level study of sources and causes of high sediment yields in the North Coastal area and an assessment of the ability of existing USDA programs to solve the problems identified. This appendix involves the Eel and Mad River Basins; presenting general physical characteristics and resources of the area. The Soil Conservation Service, and Forest Service also cooperated in the effort.

U.S. Environmental Protection Agency, 1974, Herbicide Report, Chemistry and analysis environmental effects agricultural and other applied uses: United States Environmental Protection Agency, Washington, D.C., U.S. Environmental Protection Agency, v. EPA-SAB-74-001, 195 p.

An early report on herbicides that gives a good background on the types and classes of herbicides in use. The report illustrates the chemistry of the major herbicide groups and presents a chronology of new herbicides verses time to 1974. The report classifies herbicides under major chemical groups that aids in the understanding of relationships between compounds. The section on chemistry is very good and graphically illustrates the relationship of the chemical classes. Included with the illustrations is a brief summary of its characteristics, amount produced, exported, and disappeared in the United States between 1960 and 1970. Also the methods of analysis for the presence of the major classes is discussed. The report reviews the environmental effects of herbicides and gives a breakdown of effects of each major class on various organisms. The findings indicates that bioconcentration levels tend to be higher in fish and invertebrates, but that those amounts are very low. Also, herbicides are less toxic than pesticides, and insecticides, and the amounts of herbicides found outside of target areas is very low.

________ 1982, Environmental Impact Statement for the San Francisco Channel, Bay Dredged Material Disposal Site Designation: U.S. Environmental Protection Agency, Office of Water Criteria and Standards Division, Washington, D.C.

Evaluation of site for disposal of dredged material.

U.S. National Oceanic and Atmospheric Administration, 1983, Project instructions, circulation survey, Humboldt Bay, California.

This survey was the third of a three-phase field program in California estuaries. This phase of the program began in early October 1983 and continued through the middle of December 1983. The survey area was from the entrance to Hookton Channel in south Humboldt Bay to Bird Island in Arcata Bay.

U.S. National Park Service, 1959, Pacific Coast recreation area survey: U.S. National Park Service, Department of the Interior, Washington, D.C., 179 p.

The specific objective of the Pacific Coast survey was to inventory and report on important remaining undeveloped areas, or areas with relatively sparse development, valuable for recreation and other public purposes, along the Pacific Coast. The term "recreation" was used in the broad sense to apply to areas of scenic, scientific and historical interest, as well as those valuable for active recreation.

U.S. Secretary of the Army, 1949, Letter from the Secretary of the Army: U.S. Secretary of the Army, Washington, D.C., Document no. 286, House of Representatives, 81st Congress, 1st Session.

A letter from U. S. Army Corps of Engineers office of the Chief of Engineers, dated February 28, 1949, submitting a report, together with accompanying papers and an illustration, on a review of reports on San Francisco harbor and Bay, California. Requested by a resolution of the Committee on rivers and Harbors, House of Representatives, adopted on June 28, 1949.

________ 1950, Rivers in California, Russian River: U.S. Government Printing Office, Washington, D.C., 81st Congress, Second Session, House Document Number 585, 79 p.

A study of the Russian River area, its economic development, climatology, run-off, flood data and improvements, flood control plans, recreation, data on costs and benefits, and proposed plans.

________ 1966, Klamath River at and in the vicinity of Klamath, California: U.S. department of the Army, Washington, D.C., 70 p.

Collected correspondence concerning flood protection in Klamath River Vicinity including: Flood records, damage survey, precipitation records, runoff description, existing protective improvements, population analysis, urbanization, and cost estimates of recommended improvements.

________ 1966, Pajaro River Basin, California: Letter from the Secretary of the Army, U.S. Government Printing Office, Washington, D.C., House Document no. 491, 88 p.

Report on an interim report on the Pajaro River Basin and a proposed flood control project.

________ 1968, Mad River, Humboldt and Trinity Counties, California: U.S. War Department, 90th Congress, 2nd Session, House Document number 359, U.S. Government Printing Office, Washington, D.C.

A letter from the U. S. Army Corps of Engineers, Office of the Chief of Engineers, Department of the Army, submitting a report, together with papers and illustrations, on an interim report on the Mad River, Humboldt and Trinity Counties, California, for the study involving flood control.

U.S. Secretary of War, 1914, Harbor of Refuge at Point Arena, or elsewhere on the Pacific Coast, between San Francisco and Humboldt Bay, California: Letter from the U.S. Secretary of War, 63rd Congress, 3rd Session, House of Representatives, Washington, D.C., Document Number 1369, 39 p.

A letter from the Office of the Chief of Engineers. Report on preliminary examination for harbor of refuge at Point Arena, or other localities on the Pacific Coast between San Francisco and Humboldt Bay.

________1937, Noyo River and Harbor, California: U.S. War department, 76th Congress, 3rd Session, House of Representatives, Washington, D.C., Document Number 682, 17 p.

A letter from the Chief of Engineers, on a preliminary examination and survey of Noyo River. Including commerce, fishing industry, projects, and improvements needed.

________ 1944, Rivers in California, Pajaro River: U.S. Government Printing Office, Washington, D.C., a reference book with data on rivers in California, Congress, Second Session, House Document Number 505, 46 p..

A report of the Pajaro River including information pertaining to a description of the area, precipitation, run-off, floods, desired improvements, costs, benefits from improvement, and various plans for the river. Includes maps of the area.

U.S. War Department, 1937, A preliminary examination of the Mad River in Humboldt County, California, for flood control: U. S. Army Corps of Engineers, Office of the Chief of Engineers, U.S. War Department, Washington, D.C., Public Hearing.

Public hearing involving flood control, waterflow retardation, prevention of soil erosion and runoff of the Mad River.

________ 1937, Preliminary examination of San Lorenzo River in Santa Cruz County, California, for flood control and waterflow retardation & soil erosion prevention: U. S. Army Corps of Engineers, Office of the Chief of engineers, U.S. War Department: U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA., 1 v.

This is the report of the preliminary examination of San Lorenzo River for flood control and watershed retardation and soil erosion prevention on the watershed. This is a transcript of the public hearing, with inclosure 1 and exhibits 1 to 5 included, held December 1938.

U.S. Weather Bureau, 1940, The frequency of flood producing rainfall over the Pajaro River Basin, California: U. S. Weather Bureau, Hydrometeorological Section, River and Flood Division, in cooperation with the Flood Control Coordinating Committee, U.S. Department of Agriculture, 13 leaves, 26 plates.

This was the first of a series of reports which were intended to furnish to the flood control agencies analyzed rainfall data for use in structural and economic design.

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Verner, S. S., 1974, Proceedings of seminar on methodology for monitoring the marine environment: held in Seattle, Washington, in October, 1973: Report no. EPA/600/4-74-004, Washington,D.C., Environmental Protection Agency, 436 p.

This is a technical paper that gives an overall view of the marine environment.

Walters, R. A., Josberger, E. G., and Driedger, C. L., 1988, Columbia Bay, Alaska: an 'Upside Down' Estuary: Estuarine, Coastal and Shelf Science, v. 26, p. 607-617.

Circulation and water properties within Columbia Bay, Alaska were studied a found to be dominated by the effects of Columbia Glacier at the head of the Bay. The basin between the glacier terminus and the terminal moraine (sill depth of about 22 m) responds as an 'upside down' estuary with the subglacial discharge of freshwater entering at the bottom of the basin. The intense vertical mixing caused by the buoyant plume of freshwater creates a homogeneous water mass that exchanges with the far-field water through either a two- or a three-layer flow. In general, the glacier acts as a large heat sink and creates a water mass which is cooler than that in fjords without tidewater glaciers. The predicted retreat of Columbia Glacier would create a 40 km long fjord that has characteristics in common with other fjords in Prince William Sound.

Walters, R. A., and Gartner, J. W., 1985, Subtidal sea level and current variations in the northern reach of San Francisco Bay: Estuarine, Coastal and Shelf Science, v. 21, p. 17-32.

Analyses of sea level and current-meter data using digital filters and a variety of statistical methods show a variety of phenomena related to non-local coastal forcing and local tidal forcing in the northern reach of San Francisco Bay, a partially mixed estuary. Low-frequency variations in sea level are dominated by non-local variations in coastal sea level and also show a smaller influence from tidally induced fortnightly sea level variations. Low-frequency currents demonstrate a gravitational circulation which is modified by changes in tidal-current speed over the spring-neap tidal cycle. Transients in gravitational circulation induce internal oscillations with periods of two to four days.

Warme, J. E., 1969, Mugu Lagoon, Coastal Southern California: Origin, sediments and productivity: Lagunas Costeras, Un Simposio, Mexico, D.F., Unam-Unesco, v. 1, p. 137-154.

An investigation of the geomorphic development, sediments, flora, and fauna of a shallow coastal lagoon in southern California. A very good description of the distribution of sediment types within the lagoon and its relationship to the presence of flora and fauna. A good description of floral zonation within the lagoon system and lateral and horizontal zonation as a result of tidal range and sediment texture. The paper describes the microfauna found in the lagoon with foraminiferal, and ostracod populations described in some detail. The lagoons sedimentary history is discussed and a good overview of the tides and currents found within the lagoon is given.

Whitecomb, J., 1963, Shallow seismic reflection studies, Yaquina Bay, Oregon: Abstracts of Papers Presented at the Section Meetings at the Twenty-first Annual Meeting of the Oregon Academy of Science, Oregon State University, Corvallis, Oregon, p.17.

A very brief discussion of equipment used and methods used to acquire reflection profiles in Yaquina Bay.

Wick, W. Q., 1972, Crisis in Oregon estuaries: Oregon State University, Sea Grant Extension Marine Advisory Program, Newport, Oregon, 8 p.

Gives a brief description of the major Oregon estuaries and the possible crises occurring at each.

Wilde, P., Isselhardt, C., Osuch, L., Yancey, T., 1969, Recent sediments of Bolinas Bay, California: Part C. Interpretation and Summary of results: University of California, Berkeley, Hydraulic Engineering Laboratory, Report no. HEL-2-23, 86 p. Water Resources Abstracts (028246 W71-06929), Minneapolis, MN.

Samples of marine sediments and shore rocks from Bolinas Bay California, were analyzed for grain size and heavy mineral content. The work indicated that nearshore glaucophane and jadeite occur in locally high concentrations; distribution patterns of the heavy minerals shows a tongue of high concentrations of minerals that have a granitic source extending northwest form the San Francisco Bay, flanked on the north and northeast by increasing landward concentrations of Franciscan metamorphic minerals; and the major source of heavy minerals is the San Francisco Bay.

Wilde, P., and Yancey, T., 1970, Sediment distribution and its relations to circulation patterns in Bolinas Bay, California: Conference of Coastal Engineers, 12th, Proceeding, II, v. 86, p. 1397-1416.

Sediments in the bay are predominantly very fine sands. Some samples, particularly adjacent to Duxbury Reef on the west, have a coarse sand to pebble component. The primary mode of the marine samples is in the range 0.088 to 0.125 mm; whereas, the primary mode for beach material is from 0.175 to 0.25 mm. The range of median diameters of the marine samples is from 0.07 to 0.14 mm. The median diameters show a trend of decreasing grain size seaward parallel to the depth contours except opposite the entrance to Bolinas Lagoon where a tongue of relatively coarser material cuts across the depth contours. The range of other statistical parameters are (1) sorting coefficient 1.10 to 1.41, (2) skewness 0.83 to 1.18, and (3) kurtosis 0.15 to 0.32.

Among other things studies indicate:

(1) Source of heavy minerals is the San Francisco Bar.

(2) Circulation is counterclockwise.

(3) Tidal influence is restricted to within 1 mile of the inlet.

(4) Bay bottom sediments are in quasi equilibrium.

(Barwis)

Williams, J. R., 1967, Movement and dispersion of fluorescent dye in the Duwamish River Estuary, Washington: *in* U.S. Geological Survey Professional Paper 650-B, United States Government Printing Office, Washington, D.C., p. B245-249.

Rhodamine B was introduced 13.1 miles above the Duwamish River mouth on a falling tide, with a discharge of about 700 cfs, and dye concentrations were measured continuously for 67 hours at sites 5.4 and 8.3 miles downstream from the point of release. Times of travel to the 2 sites were 5 hours 2 minutes and 18 hours 40 minutes, respectively. Dye concentrations and travel times for all but the first peak at the upstream site were affected by tide. The dispersion coefficient at the downstream site (200 to 400 sq ft/sec) was considerably larger than that at the upstream sit (about 100 sq ft/sec) because of the tidal action.

Williams, L. G., Chapman, P. M., and Ginn, T. C., 1986, A comparative evaluation of marine sediment toxicity using bacterial luminescence, oyster embryo and amphipod sediment bioassays: Marine Environmental Research, v. 19, p. 225-249.

The sediment from Commencement Bay, Washington a heavily industrialized estuarine embayment was characterized for toxicity. The study established the feasibility of using the Microtox bioassay to directly measure the toxicity of sediments using saline rather than organic extracts. The results of the Microtox bioassay were then compared with oyster embryo and amphipod bioassays.

Winfield, T. P., McDonald, K., and Andersen, D. P., 1983, Decomposition of Lyngby's Sedge (*Carex lyngbyei*) and other plants common to intertidal wetlands in the Columbia River Estuary: Estuarine, v. 6, no. 3, Abstracts For The Seventh Biennial International Estuarine Research Conference, Oct. 22-26, 1983, Session on Tidal Freshwater Wetlands, Virginia Beach, Virginia, p. 279.

Lyngby's sedge (*Carex lyngbei*) is the most widespread and productive species of the tidal marshes in the Columbia River estuary. This study used the litterbag technique to investigate the decomposition rate of *Carex lyngbyei*, a major potential source of carbon to the estuary, and other common species (*Aster subspicatus, Potentilla pacifica, Festuca arundianacea, Scirpus validus, Agrostis alba, Juncus balticus, Triglochin maritimum,* and *Deschampsia cespitosa*). Litterbags were placed at high and low intertidal elevations at several sites throughout the estuary to study the effects of both elevation and distance from the river mouth on decomposition rates. Upstream distance indirectly reflects such variables as frequency and duration of tidal inundation, water temperature and salinity regime, etc. All plants studied decomposed faster in the upper estuary than the lower estuary. *Carex* decomposition rates ranged between 0.03 and 0.07 g dry wt loss per day in the lower estuary, and 0.07 g dry wt loss per day in the upper estuary. Differences in tidal inundation may explain this observation with the upper estuary receiving a greater degree of flushing than the lower estuary.

Winzler, and Kelly, 977, A summary of knowledge of the Central and Northern California Coastal Zone and offshore areas, volume I, Physical Conditions, Book 1, 402 p.

The report presents a literature survey and interpretation of existing knowledge in physical sciences of the coastal counties from Ventura to the Oregon Boarder. Each chapter contains information on the existing environment, informational and data gaps, on-going research, recommendations for further research, and a list of references.

________1977, A summary of knowledge of the Central and Northern California Coastal Zone and offshore areas, volume IV, Master Bibliography, Book 1, 793 p.

The master bibliography contains all references cited in the individual subject chapters (volumes I-III) as well as other uncited references relevant to the summary of coastal zone and offshore area knowledge- Included over 12,000 citations.

Wolf, E. G., Morson, B., and Fucik, K. W., 1983, Preliminary studies of food habits of juvenile fish, China Poot Marsh and Potter Marsh Alaska, 1978: Estuaries, v. 6, no. 2, p. 102-114.

During the year 1978, juvenile salmonids were collected form coastal streams running through China Poot Marsh and the stomach contents analyzed. Stomach contents of threespine stickleback (*Gasterosteus aculeatus*) and staghorn sculpin (*Leptocottus* *armatus*) from China Poot and of threespine stickleback from Potter Marsh were also analyzed; these two species were generally caught in tidal pools on the marshes. The juvenile coho salmon (*Oncorhynchus kisutch*) had the most varied diet; 37 different prey items were identified in the stomaches. By comparison, 25, 26, and 33 prey taxa were identified in the stomach contents of Dolly Varden char (*Salvelinus malma)*, threespine stickleback, and staghorn sculpin, respectively, Amphipods were the dominant prey of all fish collected from China Poot Marsh; *chironomidae* larvae were the most common item in the stomach contents of threespine stickleback from Potter Marsh. The diets of all species changed over the course of the study period; the change was most dramatic for juvenile salmonids and sculpins. (Author)

Wolfe, L. D. S., McPhee, M. W., and Wiebe, J. D., 1987, Methods of achieving cooperation in estuary management: The Fraser River Estuary case: Coastal Zone '87, Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, p. 839-851.

This paper discusses the management of the Fraser River estuary and the coordination achieved between government agencies.

Word, J. Q., Hardy, J. T., Crecelius, E. A., and Kiesser, S. L., 1987, A laboratory study of the accumulation and toxicity of contaminants at the sea surface from sediments proposed for dredging: Marine Environmental Research v. 23, p. 325-338.

The sediments from Everett Harbor, and Sequim Bay, Washington, were used in a laboratory experiment to determine the potential quantity of contaminants reaching the surface from dredged sediment disposal. The results suggest that the sediments from urban environment of Everett Harbor contained more suspended contaminants in suspension that the sediment from the clean environment of Sequim Bay.

Wright, R. H., 1971, Map showing locations of samples dated by radiocarbon methods in the San Francisco Bay region: U.S.

Geological Survey Miscellaneous Field Studies Map MF-317.

46 sites, encompassing a total of 76 C^{14} dates, are plotted on a 1:500,000 scale map of the San Francisco Bay region. Information about the site location, the C^{14} dates, and source of data are also given in a text section. Data from locations in the vicinity of the coast include: (1) the Bodega Bay area, and (2) coastal terraces in San Mateo and Santa Cruz Counties.

Z

Zedler, J. B., 1983, Multi-scale patterns in the distribution of Pacific Cordgrass: Estuaries, v.6, no. 3, Abstracts For The Seventh Biennial International Estuarine Research Conference, Oct 22-26, 1983, Session I. Marshes, Mangroves and Submerged Aquatics, Virginia Beach, Virginia, p. 311.

Spartina foliosa has a very patchy distribution at several spatial scales. In southern California it occurs only in some coastal wetlands; within a wetland it occupies mainly the lower marsh, but discrete patches appear elsewhere; within the low marsh its densities vary form 0 to 65 per 0.25 m^2. Correlations of abundance with existing environment factors fail to explain these patterns. However, long-term observations and experimental plantings suggest a model for cordgrass distribution: suitable intertidal habitat becomes available. Opportunistic species invade and develop a canopy. Flooding eventually occurs, reduces soil salinity, and increases seed germination. Patches of cordgrass appear within the canopy, where conditions for seedling growth are favorable and where grazing by small mammals is less likely. Patches expand slowly by vegetative reproduction under hypersaline conditions. Subsequent floods increase densities-in relation to preflood densities more so than environmental variables, and patchiness persists. Present-day patterns depend on site history and previous distributions of cordgrass.

________ 1983, Freshwater impacts in normally hypersaline marshes: Estuaries, v.6, no. 4., p. 346-355.

Heavy rainfall in 1978 and 1980 caused flooding of southern

California salt marshes. Examination of three marshes demonstrated a broad range of freshwater effects which correlated with the degree of change in soil salinity. At Tijuana Estuary (1980), a short-term reduction in the salinity of normally hypersaline soils was followed by a 40% increase in the August biomass of *Spartina foliosa*. At Los Penasquitos Lagoon (1978), a longer period of brackish water influence was followed by a 160% increase in August biomass of *Salicornia virginica*. At the San Diego River (1980), flood flows were augmented by major reservoir discharge. Continuous freshwater flow leached most of the marsh soil salts and caused replacement of halophytes by freshwater marsh species. The first two cases probably fell within the normal range of flooding events, even though the hydrology of both watersheds has been modified. The vegetation response was functional: productivity increased but there was no major change in species composition. As expected, vegetation rapidly returned to preflood conditions. However, the long-term fresh water flow in the San Diego River was unnatural. Floral composition changed as soils were leached of salts. Recovery following the return of saline soils has been slow because many native halophytes are not good colonizers. The system's resilience is limited, and modification of natural stream discharge can cause permanent changes in coastal wetlands. (Author)

Zenter, J., 1985, Wetland restoration in coastal California: A decade of management lessons: Estuaries, v. 8, no. 2B, p. 30A.

Ten years ago, the first restoration project in coastal California began a trend which has grown tremendously; today over $100 million is already committed for as many as 100 coastal wetland restoration projects to be built in the next few years. Despite this support, many scientists believe restoration is still "more art than science" and point to the lack of monitoring, research funding, and specific restoration goals and to several unsuccessful restoration attempts. This paper discusses the trends in the field and concludes that research funding is at an all time low while construction funds are at their highest level.

The lack of research data often creates conflicting and expensive permit conditions and monitoring programs which are unevenly applied exacerbating inter-agency and public-private conflicts. This study further concludes that the procedures of requiring wetland restoration as mitigation for wetland loss is at an early enough stage that lessons from other projects could be applied with positive results.

Zimmerman, R. C., Britting, S. B., and Alberte, R. S., 1988, Performance evaluation of putative ecotypes of Zostra marina L. (eelgrass): EOS, Transactions, American Geophysical Union, (abstract) v. 69, no. 44, p. 1110.

An investigation of ecotypic differentiation was conducted by collecting Zostra marina from northern, central, and southern California and culturing them in the controlled environment of Hopkins Marine Station for 30 days. Differences in the population were noted. The populations were then moved to Elkhorn Slough for long-term evaluation. Preliminary results were presented.

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