

INVENTORY OF RESEARCH
IN
WATER POLLUTION AND RELATED FIELDS

COLUMBIA BASIN AND PACIFIC COAST STATES

1962

Compiled by
Edward F. Eldridge
Research and Technical Consultation Project

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
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PREFACE

This is the fifth annual inventory of research on water pollution and related subjects prepared and distributed by the Portland, Oregon office of the Division of Water Supply and Pollution Control, U. S. Public Health Service. Initially, these inventories covered only those projects underway in the Pacific Northwest. The area covered was expanded in 1961 to include the states of Alaska, Arizona, California, Idaho, Montana, Nevada, Oregon and Washington and the western portion of British Columbia. The 1962 inventory covers this same area.

Many of the projects listed in 1961 were not completed in that year and, consequently, are again contained in this inventory with any change in status indicated. A considerable number of new projects are also listed.

Material for these inventories has been supplied by the various individuals and organizations conducting the studies. Every effort has been exerted to make the information contained herein as accurate as possible. If significant errors have been made, they will be corrected, if they are called to the attention of the compiler.

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RESEARCH PROJECT INVENTORY

Index No.

ARIZONA

UNIVERSITY OF ARIZONA, TUCSON

- 1 SOIL AND WATER TESTING. H. V. Smith, G. E. Draper and H. Corrie. Agricultural Experiment Station. A study of the quality of domestic and irrigation waters. Supported in 1962 by State funds, \$12,675. The manuscript, "The Quality of Arizona's Domestic Waters," is being printed for publication.
- 2 SURVIVAL OF PATHOGENS IN SEWAGE STABILIZATION PONDS. Quentin Mees and Jack R. Hensley. Reuse of water is of paramount importance in areas where water supply is a problem. Whether reuse takes the form of irrigation, recharge, or industrial use, health protection becomes a factor of prime importance. Reuse of the effluent from stabilization ponds employed for treating raw sewage in agricultural areas is becoming widespread. Since frequency of virus isolations, concentrations of various parasitic organisms, as well as concentrations of certain pathogenic bacteria have varied with different types of treatment, it becomes increasingly significant that a study of the survival of these organisms in the stabilization pond effluent be conducted. Location - Arizona. Funds from National Institutes of Health. \$15,083. Project ended May 1961.
- 3 INVESTIGATIONS OF SITES, METHODS, AQUIFER DETERIORATION CONTROL, AND EFFECTS OF ARTIFICIAL GROUND-WATER RECHARGE OF ALLUVIAL-BASINS TYPICAL OF THE ARID SOUTHWESTERN UNITED STATES, L. G. Wilson and Sol D. Resnick. Started in the spring of 1958. Projects: (1) Effectiveness of pea-gravel filters in removing suspended sediment from water. Status: Continued into 1962. (2) Effectiveness of pits to recharge near-surface dewatered aquifers. Status: Continued into 1962. (3) Possibility of recharging excess irrigation water.

Status: Continued into 1962. New Projects:
(1) Starting date - Spring 1961. Effectiveness of grasses for removal of sediment from flood water prior to artificial groundwater recharge.
(2) Starting date - Fall 1962. Effectiveness of various filters in sustaining recharge rates and maintaining low soil moisture tension.
Supported by State funds, \$14,000 per year.

ARIZONA STATE UNIVERSITY, TEMPE

- 4 COMMUNITY METABOLISM IN MONTEZUMA WELL, ARIZONA, G. A. Cole and W. T. Barry. Location - Montezuma Castle National Monument. Project started June 1, 1960, to be completed May 30, 1962. Supported by National Science Foundation Funds. \$23,200.
- 5 ENGINEERING BIOASSAY DEVELOPMENT, John W. Klock. Supported by Public Health Service (NIH) Grant of \$23,729. Grant started on May 1, 1962 and will end April 30, 1964.
- 6 INFLUENCE OF MONOMOLECULAR FILMS ON WIND-GENERATED WATER WAVES, Paul F. Ruff. Starting date July 1, 1962. Supported by U. S. Bureau of Reclamation. \$20,000.
- 7 STUDIES ON WATER AVAILABILITY AND PLANT GROWTH, Daniel O. Robinson. Continuing in 1962. A part-time unsponsored project.
- 8 WASTE WATER RECLAMATION, John W. Klock, with the cooperation of Maricopa County Health Dept., U. S. Public Health Service, Del E. Webb, Inc., and Citizens Utility Co. Project started July 1962. Supported by Bureau of Reclamation. \$3,500.

U. S. DEPARTMENT OF AGRICULTURE, ROCKY MOUNTAIN
FOREST AND RANGE EXPERIMENT STATION, ARIZONA STATE
UNIVERSITY, TEMPE

- 9 RELATION OF SPECIES TO SOIL TEXTURE AND SALINITY AND WATER TABLE HEIGHT, J. S. Horton and J. L. Gary. Objectives: To obtain information on

soil characteristics and water table depth as they relate to distribution and development of phreatophyte vegetation. Continued in 1962. Supported by Federal funds.

- 10 LYSIMETER COMPARISONS OF WATER USE, SEDIMENT, RUNOFF FROM SEMI-DESERT SHRUB AND GRASS, G. E. Glendening and C. P. Pase. Objectives: To compare the water use, sediment production, and runoff from open lysimeters occupied by chaparral shrubs with that from open lysimeters occupied by native perennial grasses. Supported by Federal funds. Terminated in 1962.
- 11 EFFECT OF RESEEDING ON EROSION AND RUNOFF FROM SUMMIT WATERSHEDS, L. R. Rich. Objectives: To determine the influence on precipitation-runoff, and precipitation-sediment yield relationships of brush to grass conversion by artificial reseeding and gully plugging on the Summit watersheds. Supported by Federal funds. Completed in 1962.
- 12 COMPARISON OF INFRARED GAS ANALYZER WITH OTHER METHODS OF MEASURING EVAPOTRANSPIRATION, J. S. Horton and J. P. Decker. Objectives: To compare several methods (infrared analyzer, weighing lysimeter, volume lysimeter, etc.) for measuring evapotranspiration. Supported by Federal funds. Continued in 1962.
- 13 EFFECT OF BRUSH CONTROL ON EVAPOTRANSPIRATION AT NATURAL DRAINAGE WATERSHEDS, P. Ingebo and C. P. Pase. Objectives: To evaluate the results of converting a mixed shrub-grass cover to native perennial grasses in terms of water and sediment yields. Supported by Federal funds. Continued in 1962.
- 14 EFFECT OF TIMBER HARVEST ON WATER YIELD IN MIXED CONIFER FOREST, L. R. Rich. Salt River Valley Water Users Association cooperating. Objectives: To determine what influence advanced timber management practices have on sediment production and water yields. Supported by Federal funds. Continued in 1962.
- 15 STREAMFLOW CHARACTERISTICS OF CHAPARRAL WATERSHEDS, G. E. Glendening, P. Ingebo and C. P. Pase.

- Prescott National Forest cooperating. Objectives: To determine the relationships between individual sample watersheds, under present existing conditions, with respect to water and sediment yields, in anticipation of later watershed treatment comparisons. Supported by Federal funds. Continued in 1962.
- 16 EFFECT ON STREAMFLOW OF CONVERTING WHITE FIR TO PERENNIAL GRASS, L. R. Rich. Salt River Valley Water Users Association cooperating. Objectives: To determine how different kinds and amounts of vegetation influence water and sediment yields by replacing the white fir with perennial grass. Supported by Federal funds. Continued in 1962.
- 17 MEASUREMENT OF EVAPOTRANSPIRATION IN THE FIELD WITH INFRARED GAS ANALYZER, J. S. Horton and J. P. Decker. Objectives: To make direct estimates of annual evapotranspiration with natural stands of tamarisk, Bermuda grass, seep-willow, arrow-weed, and other phreatophytes. Supported by Federal funds. Continued in 1962.
- 18 STREAMFLOW AND SEDIMENT PRODUCTION IN MIXED CONIFER-WILLOW CREEK, L. R. Rich. Apache National Forest and Arizona Game and Fish Commission cooperating. Objectives: To determine (1) the effect of timber management systems such as block or opening cutting of forest vegetation on water and sediment yields; and (2) the effect on water and sediment yields of water management systems such as replacing the mixed conifer forest vegetation with perennial grass or aspen. Supported by Federal funds. Continued in 1962.
- 19 SEDIMENT PRODUCTION IN RELATION TO LOGGING PONDEROSA PINE ON CASTLE CREEK, L. R. Rich. Apache National Forest cooperating. Objectives: To determine what influence Forest Service methods of harvesting ponderosa pine timber have on water and sediment yields. Supported by Federal funds. Continued in 1962.
- 20 EFFECT OF COVER CHANGES IN CHAPARRAL ON SEDIMENT - 3-BAR, G. E. Glendening, P. Ingebo, and C. P. Pase. The Tonto National Forest, Salt River Valley Water Users Association and the Arizona Fish and Game Commission are cooperating in this project.

Objectives: To determine the effects of wildfire on streamflow and sediment yields from the granite-soiled 3-Bar Chaparral watersheds; and the influence thereon of the natural return of brush cover, with and without reseeding, and with and without sprout control. Supported by Federal funds. Continued in 1962.

- 21 SEDIMENT FROM SEMI-DESERT GRASS AND SHRUB WATERSHEDS - SUMMIT, L. R. Rich. Objectives: To determine the effect of amounts, rates and seasonal distribution of precipitation on runoff and sediment yields from the small, steep, and highly erodible granitic watersheds under mixed semi-desert grass and shrub cover. Supported by Federal funds. Continued in 1962.
- 22 A COMPARISON OF WATER AND SEDIMENT YIELDS ON THE BASE ROCK LYSIMETERS, G. E. Glendening and C. P. Pase. Objectives: To compare water yield and soil stability of a stand of the introduced Lehmann lovegrass, a stand of native curly mesquite grass, and a natural semi-desert grass - half-shrub type. A continuing project supported by Federal funds.
- 23 CHANGES IN VEGETATION, LITTER AND SEDIMENT YIELD FOLLOWING STRIP BURNING IN CHAPARRAL, C. P. Pase, G. E. Glendening and P. Ingebo. Objectives: To evaluate effect of prescribed cool-season burning of contour strips in chaparral on vegetation, grass sediment yield, and soil moisture disposition. A continuous project supported by Federal funds.
- 24 HYDROLOGIC CHARACTERISTICS OF CHAPARRAL, P. Ingebo. Objectives: To determine seasonal and total water yield in relation to precipitation pattern and other site factors. Supported by Federal funds. Continuing.

U. S. DEPARTMENT OF AGRICULTURE, ROCKY MOUNTAIN
FOREST AND RANGE EXPERIMENT STATION, ARIZONA
STATE COLLEGE, FLAGSTAFF

- 25 SEDIMENT MOVEMENT FROM CHANGES IN PONDEROSA PINE (BEAVER CREEK). Objectives: To determine changes in streamflow sediment concentrations as a result of land practices on pine watersheds. Continued in 1962.
- 26 SEDIMENT MOVEMENT FROM CLEARING JUNIPER (BEAVER CREEK). Objectives: To determine changes in streamflow sediment concentrations as a result of clearing juniper. Continued in 1962.
- 27 PRECIPITATION AND STREAMFLOW IN PONDEROSA PINE TYPE (BEAVER CREEK). Objectives: (1) The precipitation gages are being maintained primarily for evaluation and correlation of precipitation data with runoff, erosion, sedimentation, and soil moisture, and to obtain a pattern of rainfall intensities, frequencies, duration, and distribution on the small pine watersheds on Beaver Creek. (2) To collect stream discharge data from small pine watersheds for the purpose of evaluating the effects of various forms of land management on streamflow. Continued in 1962.

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION,
FORT COLLINS, COLORADO

- 28 SEDIMENT PRODUCTION IN RELATION TO LOGGING PONDEROSA PINE ON CASTLE CREEK. Project located at the Sierra Ancha Experimental Forest near Tempe, Arizona. Started in 1956 and expected to be completed in 1968. The objective is to determine what effects timber harvesting in ponderosa pine have on water and sediment yields.
- 29 COMPARISON OF WATER OF SEDIMENT YIELDS ON THE BASE ROCK LYSIMETERS. Project located at the Sierra Ancha Experimental Forest near Tempe, Arizona. Started in 1962. The objective is to determine the differences in sediment yield for the 1/50-acre lysimeter with artificially-established

stands of Lehmann lovegrass and curly mesquite compared with yields from a stable stand of native perennial grasses and half-shrubs.

BRITISH COLUMBIA

CANADIAN DEPARTMENT OF AGRICULTURE, SUMMERLAND, B. C.

- 30 EFFECTS OF TIME AND PLACE OF SAMPLING ON QUALITY OF IRRIGATION WATER FROM MOUNTAIN STREAMS, J. C. Wilcox. Location - Okanagan Valley, B. C. Started in 1956 and continuing. Supported by funds of the Department.
- 31 QUALITY OF PRESENT AND POTENTIAL SOURCES OF IRRIGATION WATER IN SOUTHERN BRITISH COLUMBIA, J. C. Wilcox. Started in 1956 and continuing. Some 200 samples have been collected and analyzed. Supported by Department funds.

FISHERIES RESEARCH BOARD OF CANADA, BIOLOGICAL STATION, NANAIMO, B. C.

- 32 MULTIVARIATE ANALYSIS OF ENVIRONMENTAL RESPONSE DOMAINS, D. F. Alderdice. Funds from Research Board. Report being prepared for publication.
- 33 TRACING SEWAGE AND INDUSTRIAL WASTES IN THE SEA USING RHODAMINE B DYE, M. Waldichuk and J. R. Markert. Started April 1961 and continuing in 1962. Funds from Research Board, \$5,000.
- 34 EVALUATION OF THE NITROSOLIGNIN TEST FOR KRAFT PULP MILL EFFLUENT IN SEA WATER AND DEVELOPMENT OF SUITABLE STANDARDS, M. Waldichuk and A. E. Werner. Location - Nanaimo, B. C. Testing of modified procedure continued in 1962. Supported by Canadian Federal Government, \$1,000.
- 35 TOXICITY OF MALATHION TO YOUNG COHO SALMON, D. F. Alderdice. Location - Biological Station, Nanaimo, B. C. Supported by Research Board. Preliminary experiments continued in 1962.

- 36 SEPARATION OF KRAFT (SULFATE) PULP MILL EFFLUENT INTO CHEMICALLY DIFFERENT FRACTIONS AND TESTING TOXICITY OF SAME USING DAPHNIA IN BIOASSAY, A. E. Werner.
Location - Nanaimo, B. C. A study of the toxicity to Daphnia of the organic sulphur compounds and their oxidation products in black liquor (Kraft) is being made. Continued in 1962. Supported by Canadian Federal Government, \$5,000.
- 37 TOXICITY OF KRAFT UNBLEACHED EFFLUENT FRACTIONS TO DAPHNIA PULEX, A. E. Werner. Location - Biological Station, Nanaimo, B. C. A study of pure sulphur compounds known to be present in Kraft pulp mill effluents. Continued in 1962. Supported by Research Board.
- 38 BEHAVIOR OF PARTICULATE MATERIALS FROM PULP MILL EFFLUENTS IN THE SEA, A. E. Werner, M. Waldichuk and J. R. Markert. Project conducted at the laboratory of the biological station. Preliminary analysis of gasses evolved from particulate materials settled in Alberni Harbor have been made. Fractionation of pulp mill effluent suspended solids has been carried out with an elutriator, as a start in particle size and shape analysis. Project started January 1962. Supported by Canadian Federal Government.
- 39 FOAMS IN BLEACHED KRAFT PULP AND NEWSPRINT MILL EFFLUENTS, M. Waldichuk, J. R. Markert, in co-operation with Vancouver Island pulp mills that are supplying effluents. The major foam problem from pulp mills arises from effluents in the bleach plant. Suppression of foam can be achieved with zinc hydrosulphite, bleach effluent from groundwood treatment and with green liquor dregs from recausticizing plant. Supported by funds from the Canadian Government. Started July 1962.
- 40 PHENOL DISTRIBUTION IN A MARINE INLET RECEIVING PETROLEUM REFINERY WASTES. Continuing project with the first phases completed. M. Waldichuk. Location - Burrard Inlet, Vancouver, B.C. Supported by Canadian Federal Government, \$1,500. Project continuing in 1962.

- 41 LONG-TERM EFFECTS OF DISPOSAL OF SULPHITE AND KRAFT PULP MILL WASTES INTO MARINE INLETS, M. Waldichuk and others. Location - Alberni Inlet and Neroutsos Inlet on Vancouver Island. Publication by M. Waldichuk, "Some Oceanographic Characteristics of a Polluted Inlet in British Columbia," J. Marine Research, Vol. 17, p. 536, 1958. Supported by Canadian Federal Government, \$10,000. Project continuing in 1962.

CALIFORNIA

UNIVERSITY OF SAN FRANCISCO

- 42 SLUDGE BANK CHANGES IN A BRACKISH BAY, F. P. Filice and S. Dederian. Location - San Francisco Bay. This project started with a Public Health Service grant. Continued in 1962.

SAN FRANCISCO STATE COLLEGE

- 43 SURVIVAL OF SERRATIA MARCESCENS PHAGE IN SECONDARY SEWAGE TREATMENT EFFLUENT USED FOR IRRIGATION, D. W. Fletcher and graduate students. Continued in 1962.
- 44 THE ECOLOGY OF A TIDAL STREAM IN CALIFORNIA, James P. Mackey and Edward W. Kirschbaum. Project located in Corte Madera Creek, Marin County, California. Started in 1959 and continuing.

HUMBOLDT STATE COLLEGE, ARCATA

- 45 CIRCULATION AND WATER QUALITY OF HUMBOLDT BAY, CALIFORNIA, J. A. Gast, E. O. Salo, G. H. Allen and D. Skeesick. Covering period from June 1, 1961 to May 31, 1962. Supported by funds from Atomic Energy Commission.
- 46 AN OCEANOGRAPHIC STUDY BETWEEN POINTS OF TRINIDAD HEAD AND EEL RIVER, G. H. Allen, M. Oliphant and P. Baker. Location - coastal waters of northern California. General survey of marine area not now receiving wastes. Field work completed. Present contract for writing annual report 1961-

62 and final report. Supported by California Water Pollution Control Board, \$20,000.

- 47 IMPROVEMENT OF SEWAGE OXIDATION POND EFFLUENTS BY FISH AND OTHER ORGANISMS, J. W. DeWitt, C. Hazel, E. Beilfuss and R. Ridenhour. A three-year study beginning September 1, 1961. Supported by Public Health Service (NIH) grant of \$18,000.

LONG BEACH STATE COLLEGE

- 48 ANIMAL SUCCESSION IN NEWLY CONSTRUCTED BOAT HARBORS, Donald J. Reish and students. Location - southern California. Continuing and will be completed in 1963. Supported by funds from the National Science Foundation, \$21,000.

UNIVERSITY OF CALIFORNIA - INSTITUTE OF MARINE RESOURCES - LA JOLLA

- 49 INVESTIGATION OF THE FOOD-CHAIN INTERMEDIATES BETWEEN KELP AND FISHES, Carl L. Hubbs, K. A. Clendenning, D. L. Leighton and L. G. Jones. The nutrient effects of sewage effluent are considered in this study. Continuous since December 1959. Supported by funds from the National Science Foundation, \$25,500.
- 50 THE EFFECTS OF WASTE DISCHARGES UPON KELP, W. J. North, K. A. Clendenning, H. L. Scotten and D. L. Leighton. Continuous since July 1, 1957. Supported by funds from the California State Water Pollution Control Board, \$10,000 yearly.
- 51 STUDY OF BEHAVIOR AND SIGNIFICANCE OF TRACES OF CERTAIN RADIOACTIVE SUBSTANCES FOUND IN THE HYPERION TREATMENT PLANT, CITY OF LOS ANGELES, T. R. Folsom, A. T. Rossano, J. E. McKee and G. J. Mohanrao. A study of radioactivity to plant from city and comparison with other cities. Continuing since October 1, 1959. Supported by Atomic Energy Commission, \$83,420 yearly.

STANFORD UNIVERSITY, PALO ALTO

- 52 EVAPORATION SUPPRESSION, Joseph B. Franzini. A study of evaporation suppression by chemical means -- the use of monomolecular films. Reported in publication, "Evaporation Suppression Research," Water and Sewage Works, May and June 1961 issues. Supported by Public Health Service (NIH) grant, \$17,250.
- 53 INFILTRATION PHENOMENA, J. B. Franzini. A four-year study starting September 1961. Supported by Public Health Service (NIH) grant of \$24,000 yearly.

UNIVERSITY OF CALIFORNIA, DAVIS

- 54 INORGANIC AND ORGANIC IMPURITIES OF IRRIGATION WATERS AFFECTING SOIL PROPERTIES AND PLANT GROWTH, L. D. Doneen and J. W. Biggar. Supported by University of California, \$17,000.
- 55 SOIL INTERACTION WITH ORGANICALLY POLLUTED WATER, J. W. Biggar, G. R. Dott and L. D. Doneen. Supported by U. S. Public Health Service grant, \$15,000.

UNIVERSITY OF CALIFORNIA, BERKELEY

- 56 GROUNDWATER HYDROLOGY, David K. Todd and project staff. This is a continuing project of the University of California Water Resources Center. \$35,000.
- 57 ECONOMIC EVALUATION OF WATER, P. H. McGauhey, Harry Erlich and E. M. Lofting, Sanitary Engineering Research Laboratory. Location - Richmond Field Station. Continued in 1962. Funds from Water Resources Center, \$16,300.
- 58 BIOLOGICAL ASPECTS OF FAILURE OF SEPTIC TANK PERCOLATION FIELDS, P. H. McGauhey and John Winneberger, Sanitary Engineering Research Laboratory. Location - Richmond Field Station. Continued in 1962. Funds from Federal Housing Administration, \$28,000.

- 59 REACTION KINETICS OF ANAEROBIC FERMENTATION SYSTEMS,
E. A. Pearson and John Andrews. A continuing
project. May 1962 - April 1963. Supported by
grant from Public Health Service (NIH), \$15,300.
- 60 AN INVESTIGATION OF WATER AND SEDIMENT QUALITY AND
POLLUTIONAL CHARACTERISTICS OF SAN FRANCISCO BAY,
E. A. Pearson, R. E. Selleck and P. N. Storrs.
Location - Berkeley and Richmond. July 1962 to
June 1963. Supported by funds from State of
California, \$122,630.
- 61 TRAVEL OF SYNTHETIC DETERGENTS IN PERCOLATING WATER,
P. H. McGauhey and Stephen A. Klein, Sanitary
Engineering Research Laboratory. Location -
Richmond Field Station. Continued in 1962.
Funds from Public Health Service (NIH). \$19,998.

UNIVERSITY OF CALIFORNIA - SANITARY ENGINEERING
RESEARCH LABORATORY, BERKELEY

- 62 TRANSPORT OF RADIOACTIVITY WITH SUSPENDED SOLIDS
IN ESTUARY SYSTEM, W. J. Kaufman and P. C. Klingeman.
Project located at Richmond, California. Starting
date August 1961 and continuing through September
1963. Supported by funds from the University of
California and Atomic Energy Commission.
- 63 INVESTIGATION OF ESTUARINE EXTERNAL TRACERS, R. E.
Selleck and D. L. Feverstein. Project conducted
at Richmond, California. Starting date, August
1961 and continuing through January 1963. Sup-
ported by University of California, \$5,000.
- 64 PRIMARY PRODUCTIVITY OF SUISUN BAY, R. E. Selleck
and D. I. Jenkins. Project located at Richmond,
California. Continuing from July 1, 1962 through
June 30, 1963. Supported by University of Calif.,
\$13,000.
- 65 NUTRITIONAL AND DISEASE TRANSMITTING POTENTIAL OF
SEWAGE GROWN ALGAE, W. J. Oswald, R. C. Cooper and
J. H. Meyer. This is a project of the Sanitary
Engineering Research Laboratory and the School
of Public Health. Location - Engineering Field

Station, Davis, California. A five-year study starting September 1, 1961. Continued in 1962. Supported by a Public Health Service (NIH) grant of \$43,000.

- 66 TREATMENT OF ORGANIC INDUSTRIAL WASTES BY LAGOONING, W. J. Oswald and Robert C. Cooper. A project of the Sanitary Engineering Research Laboratory and School of Public Health. May 1, 1962 to April 30, 1963. Supported by Public Health Service, \$14,100 yearly.
- 67 LOW FLOW CHARACTERISTICS OF THE LOST RIVER SYSTEM, G. T. Orlob and P. C. Woods. Project started July 1, 1961. Study was prompted by potential agricultural pesticide pollution of wild fowl refuges. Supported by funds from Water Resources Center, University of California, \$10,500 yearly.
- 68 HIGH-ORDER WATER DECONTAMINATION, W. J. Kaufman and E. Edgerley, Jr. Location - Sanitary Engineering Research Laboratory, Berkeley campus. A continuing project supported by Public Health Service (NIH) grant, \$15,000.

UNIVERSITY OF CALIFORNIA - WATER RESOURCES CENTER

- 69 WATER QUALITY MANAGEMENT, G. T. Orlob and P. C. Woods. A continuing project supported by University of California funds, \$11,000 yearly.

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES

- 70 INVESTIGATION OF GAS PRODUCTION WITHIN SANITARY LANDFILL, R. C. Merz and J. Harth. Started December 1, 1961 and will continue into 1963. Funds from California Water Pollution Control Board, \$29,500.
- 71 FACTORS CONTROLLING UTILIZATION OF SANITARY LANDFILL SITE, R. C. Merz, R. Stone, K. Kohlhoff, R. Rodrique, R. Beluche and J. Harth. Location - Walnut, California. Started May 1, 1960. Continuing into 1963. Progress Report is available. Supported by grant from Public Health Service (NIH), \$77,331.

UNIVERSITY OF SOUTHERN CALIFORNIA - HANCOCK
FOUNDATION, LOS ANGELES

- 72 RELATIONSHIP OF BOTTOM-DWELLING FORAMINIFERA TO OCEAN DISPOSAL, J. M. Resig. Location - Southern California. This project was in its fourth year in 1962 and was supported by Public Health Service funds, \$19,000.

CALIFORNIA INSTITUTE OF TECHNOLOGY, PASADENA

- 73 COLD REGIONS ENGINEERING, R. F. Scott. A compilation of research on engineering problems associated with Arctic regions. Supported by Department of Army (Snow, Ice and Permafrost Research Establishment, Wilmette, Illinois, Corps of Engineers). Continued in 1962.
- 74 HEAT FLOW, FREEZING AND THAWING OF SOILS, Ronald F. Scott. Involves the problems of depths of thaw and freeze in Arctic and temperate zone soils. Supported by Department of Army (Arctic Construction and Frost Effects Laboratory, Corps of Engineers). Continued in 1962.
- 75 WASTEWATER RECLAMATION BY PRESSURIZED RECHARGE OF AQUIFERS, W. R. Samples. Includes studies of the treatment necessary before injection of water into the underground and the degree of reclamation the underground might give the used water. Publication by J. E. McKee and W. R. Samples, "Sewage Reclamation by Pressurized Recharge of Aquifers." Proceedings of the U.S.P.H.S. symposium on Ground Water Contamination, Cincinnati, Ohio, April 7, 1961. Project continued in 1962. Supported by funds from U. S. Public Health Service (NIH).
- 76 CHARACTERISTICS OF FLUID FLOW THROUGH EXPANDED POROUS MEDIA, William R. Samples, F. McMichael and N. H. Brooks. This project has to do with problems of water filtration and seepage control in earth dams and levees and other problems involving the transport of solids in fluids. Continued in 1962. Supported by a grant from U. S. Public Health Service (NIH).

- 77 REVISION OF WATER QUALITY CRITERIA REPORT, Jack E. McKee and Harold W. Wolf. Involves bringing up-to-date the report on water quality criteria. Work continuing in 1962. Supported by funds from the California Water Pollution Board and U. S. Public Health Service.
- 78 EVALUATION OF THE CLOGGING POTENTIAL OF WATER FOR GROUNDWATER RECHARGE, Jack E. McKee. Study involves turbidity, suspended solids, algae concentrations, and calcium-carbonate equilibria as potential clogging parameters. Publication by J. E. McKee, "Research Needs in Groundwater Pollution." Proceedings of symposium on Groundwater Contamination, U. S. Public Health Service, Cincinnati, Ohio, April 1961. Project continued in 1962.
- 79 STUDY OF RELATIONS BETWEEN TRANSPORT OF SEDIMENT AND THE HYDRAULIC CHARACTERISTICS OF STREAMS, Vito Vanoni, N. H. Brooks and J. F. Kennedy. Supported by funds from the U. S. Department of Agriculture. Two publications by J. F. Kennedy in reports of W. M. Keck Laboratory of Hydraulics and Water Resources. "Stationary Waves and Antidunes in Alluvial Channels," and "Further Laboratory Studies of Roughness and Suspended Load of Alluvial Streams." Project continued in 1962.
- 80 TURBULENCE AND PARTICLE ENTRAINMENT IN SETTLING TANKS, Vito A. Vanoni and John F. Kennedy. Supported by funds from the U. S. Public Health Service. Project continued in 1962.
- 81 40-METER PRECISION TILTING FLUME, Vito A. Vanoni and N. H. Brooks. The design and construction of a 40-meter precision tilting flume to be used in studies of sediment transport, turbulence and diffusion, flow in channels of non-uniform roughness, flow around submerged objects, and the design of hydraulic structures. Supported by National Science Foundation.
- 82 ENERGY DISSIPATOR FOR FLOW IN SAN DIEGO OCEAN SEWAGE OUTFALL, Norman H. Brooks. The purpose of this study is to provide the details for the construction

of an energy dissipator in pipelines with high flow rates. Such a situation exists at the San Diego Sewage Treatment Plant which will be built on a bluff approximately 90 feet above sea level. Supported by Holmes and Narver-James Montgomery, consulting firm, Los Angeles.

- 83 MECHANICS OF DUNES AND ANTIDUNES IN ERODIBLE-BED CHANNELS, John F. Kennedy. A comprehensive analytic model of free surface flow over an erodible bed has been developed and used to investigate the stability of the fluid-sand bed interface and the characteristics of bed features. Supported by U. S. Public Health Service grant. Submitted for publication in Journal of Fluid Mechanics, August 1962.
- 84 MECHANICS OF FLUID FLOW AND SEDIMENT TRANSPORT IN SAND-BED CHANNELS NEAR CRITICAL CONDITIONS, Vito A. Vanoni, N. H. Brooks and J. F. Kennedy. A study of problems in transport of sediment in streams of low velocity. Supported by National Science Foundation.
- 85 WASTEWATER RECLAMATION BY PERCOLATION AND GROUND-WATER MOVEMENT, J. E. McKee, K. R. Johansson, L. Hartmann and M. E. Holland. A study of the chemical, physical and biological phenomena associated with the percolation of municipal and industrial effluents into soil and the travel of mixed effluent and other groundwater. A major problem is the biochemical stability of detergents in soils. Supported by California State Water Pollution Control Board.
- 86 OCCURRENCE AND BEHAVIOR OF RADIOCESIUM AND OTHER GAMMA-RAY EMITTERS IN SEWAGE SLUDGE, G. J. Mohanrao, A. T. Rossano, Jr., T. R. Folsom. Inspection of samples of sewage sludge indicated unexpected amounts of radiocesium. The objective of this study is to determine the source of radiocesium and whether or not a cesium-concentrating mechanism of unexpected effectiveness is present. Supported by U. S. Atomic Energy Commission.
- 87 ACTION OF CHLORAMINE TOWARD ESCHERICHIA COLI, W. C. Boyle and K. R. Johansson.

CALIFORNIA DEPARTMENT OF FISH AND GAME

- 88 DELTA FISH AND WILDLIFE STUDY, D. W. Kelly, D. Gannslé, C. Blunt, J. Turner, D. Lollock, R. Painter, W. Griffith, R. Mall, S. Sasaki, and T. Farley. Study of the fish and wildlife and their food organisms in the San Joaquin Delta. Supported by California Dept. of Water Resources, \$250,000 yearly.

SOUTHWEST BRANCH, SOIL AND WATER CONSERVATION
MANAGEMENT DIVISION, U.S.D.A. AGRICULTURAL
RESEARCH SERVICE, POMONA

- 89 INFLUENCE OF COLORADO RIVER WATER UPON IRRIGATION AND DRAINAGE OF THE SAN JACINTO BASIN, CALIFORNIA, Sterling Davis and Luther B. Grass. Location - Hemet, Calif. Started July 1955 and continuing in 1962. Supported by U.S.D.A. funds.
- 90 SALINITY CONTROL PLOT STUDY, Sterling Davis and Luther B. Grass. Location - Moreno, California. Started May 1961, and continuing in 1962. Supported by Federal funds in cooperation with Eastern Municipal Water District.
- 91 ARLINGTON-HIGHLANDS, SALINITY TREND INVESTIGATION, Sterling Davis and Luther B. Grass, with U.S.D.A. Soil Conservation Service staff, Riverside, Calif. Location - 8 miles south of Riverside, California. Started in May 1961 and will continue for 5 years or more. Supported by U.S.D.A. funds.
- 92 EXPLORATORY STUDY ON MANGANESE AND IRON SOLUBILITY IN SUBSOILS, Luther B. Grass. A comparative study of reducing agents reveals presence of large reserve of easily reducible iron and manganese in two Imperial Valley soils. When subjected to leaching under reducing conditions, 1.53 lbs. of iron and 2.61 lbs. of manganese were removed per acre-foot of leachate. Evidence suggests that organic matter and biological activity may stimulate the rate of the reaction which affects the solubility. The problem is increasing in Imperial and Coachella Valleys, with clogging of tile drains constituting a serious expense in irrigation. Supported by U.S.D.A. funds.

U. S. DEPARTMENT OF AGRICULTURE, SALINITY LABORATORY,
RIVERSIDE

- 93 TOLERANCE OF PLANTS TO BORON, John T. Hatcher, George Y. Blair and L. V. Wilcox. Location - Laboratory in Riverside, California. Supported by funds from ARS and U. S. Department of Agriculture. Boron is extremely toxic to plants. It occurs in toxic concentration in some irrigation waters and saline soils and is a potential pollutant because of its widespread use. This is an extension of boron-tolerance studies started many years ago. Project active in 1962.
- 94 THE PRECIPITATION OF CALCIUM FOR IRRIGATION WATERS AND SOIL SOLUTIONS, Glen W. Akin, L. V. Wilcox and M. G. Keyes. This is a study of the equilibria involved in the precipitation of CaCO_3 on natural waters. Supported by funds from ARS and U. S. Department of Agriculture. Project active in 1962.
- 95 SALT-BALANCE CONDITION OF THE RIO GRANDE PROJECT, L. V. Wilcox and M. G. Keyes. This is a cooperative project between USBR; U. S. Section International Boundary & Water Commission; and USGS salt-balance and salt-burden studies are the principal objectives. A great deal of information has accumulated on the effect of irrigation return flows on the quality of water of the Rio Grande. Supported by funds from ARS, U. S. Department of Agriculture. Project active in 1962 and manuscript approved for publication.

U. S. ARMY DISTRICT ENGINEER, SAN FRANCISCO

- 96 INTERIM REPORT FOR FLOOD CONTROL AND ALLIED PURPOSES, RUSSIAN RIVER, CALIFORNIA, (H.D. 547-87-2; Authorized FC Act of 1962). Engineer District, State of California, Sonoma County Flood Control and Water Conservation District and other Federal Agencies. Location - Dry Creek, Sonoma County, California. Started August 1960. Report on Industrial and Municipal Water Requirements completed December 1960. Report on Public Health aspects completed September 1, 1961. Funds - General Investigations, U. S. Army Corps of Engineers, Civil, \$1,200,000.

- 97 COMPREHENSIVE SURVEY REPORT, EEL RIVER BASIN, CALIFORNIA, Engineer District, U. S. Fish and Wildlife Service, Federal Power Commission, U. S. Bureau of Reclamation, U. S. Forest Service and U. S. Public Health Service. Draft report due March 1963. Supported by U. S. Army Engineers, Civil, funds \$10,000.
- 98 REVIEW REPORT FOR FLOOD CONTROL AND ALLIED PURPOSES, RUSSIAN RIVER, CALIFORNIA, Engineer District, U. S. Fish & Wildlife Service, Federal Power Commission, Bureau of Reclamation, U. S. Public Health Service, State of California, and Sonoma and Mendocino Counties. Draft report scheduled for March 1963. Supported by General Investigations, U. S. Army Corps of Engineers, Civil, \$12,000.

U. S. GEOLOGICAL SURVEY - BRANCH OF QUALITY OF WATER, MENLO PARK

- 99 SEPARATION, IDENTIFICATION, AND MEASUREMENT OF ORGANIC SUBSTANCES IN WATER AND METHODOLOGY, William L. Lamar. Continued in 1962. Supported by Federal funds.
- 100 CRITERIA FOR DISTINGUISHING WATERS OF DEEP ORIGIN, Donald E. White, H. C. Whitehead, and C. E. Roberson. Started in 1957, continued in 1962. Goal is to find chemical criteria to distinguish connate, magmatic and metamorphic waters. Source of funds, Federal.
- 101 MINERAL CONSTITUENTS IN GROUNDWATER AND THEIR ORIGIN, John H. Feth, Charles E. Roberson, Wilfred L. Polzer, H. Collins Whitehead. Started in 1956. Part I studied chemical character of waters available for recharge in western U. S. Water-supply paper is in review covering this. Part II deals with waters emerging from monolithologic aquifers. A water-supply paper reporting results of empirical studies in this area is in review. Work continued in 1962 on chemical characteristics and equilibrium relations in waters associated with granitic

rocks and their constituent minerals. Supported by Federal funds.

U. S. GEOLOGICAL SURVEY - BRANCH OF QUALITY OF WATER,
SACRAMENTO, CALIFORNIA

- 102 WATER QUALITY INVESTIGATION OF LIVERMORE VALLEY, CALIFORNIA, R. T. Kiser. Project started July 1959. Completed in 1962. Supported by funds from the U. S. Geological Survey and the California Department of Water Resources.
- 103 SPECTROGRAPHIC DETERMINATION OF MINOR ELEMENTS, W. D. Silvey. Location - Sacramento, California. Continued through 1962. Supported by funds from the U. S. Geological Survey and the California Department of Water Resources.

ENGINEERING - SCIENCE INC., ARCADIA, CALIFORNIA

- 104 DEVELOPMENT OF IMPROVED BIOLOGICAL INDICATORS FOR ASSESSING EFFECTS OF INDUSTRIAL WASTES ON MARINE RECEIVING WATERS, H. F. Ludwig, R. Wagner and R. Carter. Location - Oakland, California. A continuing project started in 1960 and continuing in 1962. Supported by a Public Health Service contract.
- 105 DEVELOPMENT OF CIVIL DEFENSE PREPAREDNESS PROGRAM FOR MUNICIPAL WATER WORKS, H. F. Ludwig and J. A. Harmon. From March 1962 to March 1963. Supported by research contract with the Office of Civil Defense, Dept. of Defense. Conducted at Arcadia, California.
- 106 STUDY OF GASES PRODUCED IN REFUSE FILLS AND THEIR MOVEMENT THROUGH ADJACENT GROUND, H. F. Ludwig, W. Bishop and R. Carter. Location - San Gabriel Valley. A three-year study starting December 1961. Supported by the California State Water Pollution Control Board.
- 107 STUDY OF WASTE DISPOSAL ALTERNATIVES FOR LAKE TAHOE BASIN, Harvey F. Ludwig, P. H. McGauhey, E. A. Pearson, G. Rohlich and R. Eliassen. Location - Lake Tahoe. A study starting

December 1961 and completed March 1962. Includes extensive investigations (limnological) as related to waste disposal. Supported by Lake Tahoe Area Council.

- 108 STUDY OF THE NATURE AND SIZE OF VARIOUS PARTICULATES IN WATER SUPPLIES AS RELATED TO TREATMENT PROCESSES, H. F. Ludwig and R. Carter. Located at Oakland, California. Started in 1961. Supported by Public Health Service (NIH) grant.

CITY OF SAN DIEGO - UTILITIES DEPARTMENT

- 109 DEVELOPMENT OF LABORATORY APPARATUS FOR DETERMINATION OF "FLOATABLE MATTER" IN CONNECTION WITH OCEAN OUTFALL DISPOSAL OF PRIMARY SEWAGE TREATMENT PLANT EFFLUENT. Project continued in 1962.
- 110 INVESTIGATION OF PROTECTIVE COATINGS IN WATER AND SEWAGE TREATMENT, DISTRIBUTION AND COLLECTION SYSTEMS. Continued in 1962.
- 111 THE USE OF ELECTRONIC FISH SCREENS IN THE CONTROL OF FISH. Continued in 1962.
- 112 COMPARISON OF COLIFORM COUNTS BY THE MEMBRANE FILTER VS. LACTOSE BROTH. Completed in 1961. Report written in 1962, "A Comparison of Membrane Filter Counts and Most Probable Numbers of Coliforms in San Diego's Sewage and Receiving Waters."
- 113 EFFECTS OF HEAVY METALS ON THE DIGESTION OF PRIMARY SEWAGE TREATMENT PLANT SLUDGE. Continued in 1962.

SAN DIEGO REGIONAL WATER POLLUTION CONTROL BOARD

- 114 INVESTIGATION OF GROUNDWATER CONDITIONS IN THE SAN DIEGO RIVER VALLEY, SAN DIEGO COUNTY. California Department of Water Resources. Study of the lower reaches of San Diego River. Main source of recharge is sewage effluents. Completed in 1962. Supported by funds from San Diego Regional Water Pollution Control Board, \$5,000.

- 115 INVESTIGATION OF WATER QUALITY IN MISSION BASIN
SAN LUIS REY RIVER, SAN DIEGO COUNTY. California
Department of Water Resources. Survey to deter-
mine effect of groundwater recharge, with sewage
of an overdrafted basin. Recharge point less
than three miles from ocean. First report be-
fore recharging began, dated May 1958. Field
work completed in 1962. Location - Oceanside,
California. Supported by funds from the San
Diego Regional Water Pollution Control Board,
\$2,000.
- 116 FIELD SURVEILLANCE OF CIRCULATION IN SAN DIEGO
BAY, Marine Advisors, Inc. To be completed May,
1963. Supported by funds of Board, \$8,900.
- 117 AN ECOLOGICAL STUDY OF THE MARINE ENVIRONMENT IN
THE VICINITY OF CANYON DE LAS ENCINAS. California
State Department of Fish and Game, Charles Turner.
To provide background data prior to initiation of
a sewage discharge. Completed in 1962. Sup-
ported by funds of the San Diego Regional Water
Pollution Control Board, \$3,000.
- 118 INVESTIGATION OF GROUNDWATERS OF SAN JUAN AND
TRABUCO CREEKS, ORANGE COUNTY. California Dept.
of Water Resources. An investigation of basic
hydrology, geology and groundwater quality with
emphasis on boron and syndet concentration and
sources. Field work completed in 1962. Funded
by Board, \$2,000.
- 119 A PHYSICAL AND BIOLOGICAL STUDY OF SAN DIEGO BAY.
Marine Advisors, Inc. An investigation of the
comparative biological population and the
physical condition of the Bay during and im-
mediately after a severe phytoplankton bloom.
Completed May 1962. Funded by Board, \$2,000.
- 120 AN ECOLOGICAL STUDY OF THE KELP BEDS IN THE
VICINITY OF CANYON DE LAS ENCINAS, Wheeler North.
To provide background data prior to sewage
discharge. Supported by funds of Board,
\$2,100.

CENTRAL COASTAL REGIONAL WATER POLLUTION CONTROL
BOARD

- 121 WATER QUALITY INVESTIGATION IN SANTA MARIA VALLEY. California Department of Water Resources. Source of funds: Board budget. \$4,000. Completed July 1961 except for report.
- 122 EVALUATION OF EFFECT OF WASTE DISCHARGES ON GROUND-WATER QUALITY IN THE LOMPOC PLAIN. Department of Water Resources and U. S. Geological Survey. Location - Northern Santa Barbara County. Started 1961. Extended for another year through 1962 to July 1963. Supported by Board funds - \$10,000.
- 123 QUALITY OBJECTIVES FOR GROUNDWATERS - SAN BENITO COUNTY. California Department of Water Resources. Completed June 30, 1962 except for report. Supported by funds from Board budget, \$4,000.
- 124 WATER QUALITY INVESTIGATION OF SAN LUIS OBISPO COUNTY COASTAL PLAIN. California Department of Water Resources. To be completed in 1964. Supported by funds of Board, \$3,000.
- 125 GROUNDWATER CONDITIONS NEAR ALLIED FOODS, INC., SANTA CLARA COUNTY. California Department of Water Resources. Report due February 1963. Supported by funds of Board, \$800.
- 126 EROSION STUDIES, SAN LORENZO VALLEY, SANTA CRUZ COUNTY, CALIFORNIA. Department of Water Resources. Completed in 1962. Supported by Board, \$1,200.

LOS ANGELES COUNTY SANITATION DISTRICTS

- 127 OCEANOGRAPHIC STUDY TO ESTABLISH CRITERIA FOR CONTROL OF CHLORINATION OF SEWAGE EFFLUENT FROM OCEAN OUTFALL, John D. Parkhurst, Frank R. Bowerman, Malcolm L. Whitt, Franklin D. Dryden. Observations of ocean current, magnitude and direction from 0' to 600' depth, temperature, salinity, dissolved oxygen, plankton, turbidity, coliform concentrations, and meteorological conditions at time of observations. Location -

White Point, Los Angeles County. Started July 1960, continued into 1963. Supported by funds from the Sanitation Districts, \$50,000.

- 128 EFFECT OF WIND, TIDE AND WEATHER CONDITIONS ON NEARSHORE OCEAN CONDITIONS, John D. Parkhurst, Walter E. Garrison, Malcolm L. Whitt, Franklin D. Dryden. Location - along the Palos Verdes coast. Started June 1961. Continued into 1963 and expanded to specifically bear on the proposed location of a fourth ocean outfall in the vicinity of White Point. Supported by funds from the Sanitation Districts, \$25,000.
- 129 A STUDY OF THE PARAMETERS OF ACTIVATED SLUDGE PLANT OPERATION, Carl Nagel, J. D. Parkhurst, W. E. Garrison, C. W. Carry, F. D. Dryden. Project located at Whittier Narrows Water Reclamation Plant. A study of the operating variables which affect the quality of reclaimed waste water from 10 mgd water reclamation plant. Constant controlled influent flow rate provides basis for comparison of costs and effluent quality when plant is operated as standard activated sludge, contact stabilization, and step aeration processes. Starting date, August 1, 1962. Supported by Sanitation Districts, \$10,000.
- 130 PILOT PLANT STUDY OF ABS REMOVAL FROM SECONDARY EFFLUENT BY FOAM-FRACTIONATION, F. D. Dryden, M. L. Whitt, and J. D. Parkhurst. Project located at Pomona Water Reclamation Plant. A study to develop design criteria and cost data on practical plant scale foam stripping process and a satisfactory method of foam disposal. Starting date, November 15, 1962. Supported by Sanitation Districts, \$10,000.

COUNTY SANITATION DISTRICTS OF ORANGE COUNTY,
CALIFORNIA

- 131 STUDIES OF OCEAN TEMPERATURES, NEARSHORE CURRENTS AND BOTTOM SEDIMENTS ADJACENT TO MARINE OUTFALL, R. E. Stevenson. Terminated in 1962. A project supported by Districts funds, \$7,500 per year.

MASONITE CORPORATION, UKIAH, CALIFORNIA

- 132 LAND IRRIGATION UTILIZING PULP MILL PROCESS WATER.
Masonite Corp. Started September 1962. Supported by corporation.

IDAHO

UNIVERSITY OF IDAHO, MOSCOW, CHEMICAL ENGINEERING DEPARTMENT

- 133 SCALE-UP OF A BERNOULLI-TYPE AERATION DEVICE, M. L. Jackson. Starting date August 1960. Completed June 1962. Supported by Public Health Service, \$5,800.
- 134 FLOTATION OF COLLOIDS FROM POTATO WASTE, M. L. Jackson. Continued through 1961 and 1962. Supported by funds from the State of Idaho, \$2,200.

IDAHO FISH AND GAME DEPARTMENT, BOISE, IDAHO

- 135 WATER QUALITY INVESTIGATIONS, W. E. Webb and J. C. Simpson. A statewide investigation starting October 31, 1958 and to be completed October 31, 1963. Funds from Dingell-Johnson appropriation about \$10,000 per year.

POTATO INDUSTRY OF IDAHO

- 136 TREATMENT AND UTILIZATION OF POTATO PROCESSING WASTES, from information supplied by Miles Willard, Chairman for the Engineering Committee of the Industry. The objectives of this study are: (1) Preliminary investigation of anaerobic digestion of potato wastes; (2) Attempts to dewater filtered settled potato waste by pressing; (3) A study of various methods of secondary treatment to determine which may be the most applicable to potato wastes.

MONTANA

MONTANA STATE COLLEGE, BOZEMAN

- 137 BIOLOGY OF THE MADISON RIVER, J. C. Wright and T. Roeder, Department of Botany. A preliminary survey to locate area for further study. Funds for a further project applied for. Starting date June 1, 1961. Completed in 1962. Supported by MSC Research Foundation, \$1,000.
- 138 HYDROBIOLOGY OF MADISON RIVER AND ITS HEADWATERS, J. C. Wright, I. K. Mills, R. J. Graham, R. M. Horrall, T. S. Roeder, J. R. Heaton and D. M. Gillespie. Conducted in Yellowstone Park and south central Montana. Study of the effect of various physical and chemical environments on productivity, community structure and composition. The next budget of the river system as effected by thermal discharge, climatic conditions and impoundments will also be investigated. A three-year project starting Sept. 1, 1962. Supported by Public Health Service grant, \$34,436.
- 139 DEVELOPMENT OF DIGITAL COMPUTER PROGRAM (IBM 1620) - COMPUTATION DISSOLVED OXYGEN SAG FOR A RIVER SYSTEM, E. R. Dodge. Completed December 31, 1962.

MONTANA FISH AND GAME DEPARTMENT

- 140 STREAM SEDIMENT INVESTIGATION. Location, south-east Montana. A study of the relationship between stream sedimentation and the production of trout. Completed in July 1962.

OREGON

OREGON STATE UNIVERSITY

- 141 OCEAN OUTFALL DIFFUSERS, Charles E. Behlke and Fred J. Burgess. To investigate the hydraulic and sanitary engineering problems of the diffusion of industrial wastes and sewage in ocean waters of various densities. This study

involves the use of models. Supported by a Public Health Service grant of \$19,408 for the first year (1961). Continued in 1962 with similar support.

- 142 SUPERCRITICAL FLOW CHANNEL JUNCTIONS, Charles E. Behlke and Harold Pritchett. To investigate forces and wave patterns generated at the confluence of two channel junctions transporting water at supercritical flow rates. Continued in 1962. Financed in the amount of \$12,410 per year by the Bureau of Public Roads.
- 143 RADAR ANALYSIS OF EFFECTS OF TOPOGRAPHY ON STORMS IN WESTERN OREGON, Fred W. Decker. Radar observations of precipitation patterns in storms will provide material for mesometeorological analysis of the effects of the Coast Range and Cascade Mountain topography on these storms. Continued in 1962. Supported by \$30,000-a-year grant by U. S. Army.
- 144 WATER SURVEY, ALSEA RIVER BASIN, Donald W. Chapman. To inventory the water resources of the Alsea River Basin and to provide a base for research in watershed relationships. Continued in 1962. Financed by Oregon State University, \$4,400 per year.
- 145 THE APPLICABILITY OF LINEAR PROGRAMMING TO PROBLEMS OF WATERSHED DEVELOPMENT, Emery N. Castle. To determine the extent to which linear programming has value in specifying the optimum combination of benefits for a river basin; to evaluate the use of linear programming as a technique for determining the height, location, and number of dams; and to evaluate the use of linear programming as a tool in the management of constructed dams. Completed June 1962. Financed by Oregon State University, \$16,416 yearly.
- 146 SOIL SURVEY, ENGINEERING EXPERIMENT STATION PROJECT NO. 240, Glen L. Martin. To establish information regarding engineering properties of soils throughout the State of Oregon. Continued in 1962. Financed by grant of Oregon State Highway Department, \$4,200 per year.

- 147 EFFECTS OF LOGGING ON AQUATIC RESOURCES, Donald W. Chapman. To determine the effects of two types of timber harvest upon the physical and biotic characteristics of two small coastal streams. Continued in 1962. A joint undertaking by Oregon State University, Georgia Pacific Corp. and U. S. Geological Survey, \$20,000 per year.
- 148 STANDARDIZING FIELD ESTIMATES OF EVAPORATIVE SOIL MOISTURE LOSS RATE, William P. Lowry. To enable comparison of measurements made in a freely fluctuating field environment with those from a controlled laboratory as to the relationships between soil moisture content and evaporation rate. Continued in 1962. \$1,000 per year.
- 149 THE APPLICATION OF DIFFUSION THEORY TO WATER FLOW IN UNSATURATED SOILS, D. D. Evans. To test diffusion theory as it applies to water flow in unsaturated soils. A joint undertaking of Oregon State University and Western Soil and Water Research Committee, \$8,000. Continued in 1962.
- 150 AN ANALYTICAL AND EXPERIMENTAL STUDY OF TWO-DIMENSIONAL ENCLOSED FLOW DIVISION, Harold D. Pritchett and Charles E. Behlke. Oregon State University and National Science Foundation, \$900 per year. Continued in 1962.
- 151 ELECTRONIC COMPUTER ANALYSIS OF DRAINAGE PROBLEMS, John W. Wolfe. Programming the ALWAC and/or the IBM709 computer for the solution of drainage problems and obtaining field measurements to check the theoretical drainage solutions. Oregon State University and Western Soil and Water Research Committee, \$6,000 per year. Continued in 1962.
- 152 DRAINAGE OF STRATIFIED SOILS, PROJECT 418, John W. Wolfe and D. D. Evans. Determine depth and spacing criteria for tile drainage. Evaluating methods for improving the drainage of the less permeable soils, and improving the methods for measuring hydraulic conductivity. Continued in 1962. Oregon State University, \$6,000 per year.

- 153 FREQUENCY AND AMOUNT OF IRRIGATION FOR SELECTED CROPS, D. D. Evans and J. W. Wolfe. To determine irrigation regimes necessary for certain agricultural crops. Continued in 1962. Oregon State University, \$10,500 per year.
- 154 ADAPTATION OF SPRINKLER IRRIGATION TO SOILS OF LOW INTAKE RATE, John W. Wolfe. To develop methods of sprinkler irrigation useful in soils having a low water intake rate. Continued in 1962. Oregon State University, \$7,000 per year.
- 155 WASTE WATER LAGOON CRITERIA FOR MARITIME CLIMATES, Fred J. Burgess and Martin Northcraft. To determine the feasibility of using waste water oxidation lagoons in maritime climates as an economic solution to waste treatment problems of cities and industries. Research emphasis has been on establishment of loading criteria, reaeration mechanics, bacterial survival and disinfection requirement. Continued in 1962. Financed by Public Health Service grant, \$9,000 per year.
- 156 ENGINEERING-CHEMICAL AND BIOLOGICAL ASPECTS OF DEEP TRICKLING FILTERS, Fred J. Burgess and C. M. Gilmour. To establish loading criteria, removal efficiencies and biological reaction rates as a function of depth, contact time and surface area in the biological contact processes of a deep filter. Continued in 1962. A Public Health Service grant of \$14,700 per year.
- 157 ECOLOGICAL STUDIES OF AN EXPERIMENTAL STREAM, Fred J. Burgess, Charles E. Warren, Jack Lattin, Harry K. Phinney, Joseph Wales, and Peter Doudoroff. To increase understanding of the factors determining and controlling the production in streams of biological organisms of direct or indirect interest to man. Continued in 1962. Supported by a Public Health Service grant of \$21,070 per year.
- 158 ENVIRONMENTAL CONDITIONS IN SPAWNING GRAVEL, Robert W. Phillips. To evaluate gravel permeability and intra-gravel water velocity and dissolved oxygen content in salmonid spawning gravels. Continued in 1962. Oregon Game Commission, \$10,000 per year.

- 159 INFLUENCE OF ENVIRONMENTAL CONDITIONS ON EMBRYONIC SURVIVAL OF SALMONIDS, Robert W. Phillips. To determine the effect of varied intra-gravel environmental conditions on survival of salmonid embryos in stream gravels. Continued in 1962. Oregon Game Commission, \$10,000 per year.
- 160 GRAVEL ENVIRONMENTAL STUDIES IN CONTROLLED CONDITIONS, Homer J. Campbell. To determine the effect of intra-gravel water conditions on survival of salmonid embryos in a controlled environment. Continued in 1962. Oregon Game Commission, \$10,000 per year.
- 161 THE INFLUENCE OF DISSOLVED OXYGEN UPON THE SURVIVAL, DEVELOPMENT, GROWTH, AND MOVEMENT OF FRESHWATER FISH, Charles E. Warren, Peter Doudoroff and Dean Shumway. To learn through ecologically oriented laboratory studies how oxygen may influence the biological activities and functions of freshwater fish. Continued in 1962. Supported by a grant of \$13,618 per year, Public Health Service.
- 162 FARM PONDS, Carl Bond. To determine present pond management practices in Oregon, formulate management practices in ponds built for fish production, determine possibilities for fish rearing in irrigation and stock watering ponds, and provide basic limnological data on ponds. Continued in 1962. Oregon State University, \$9,500 per year.
- 163 STUDIES OF THE TROPHIC DYNAMICS OF SIMPLIFIED COMMUNITIES IN ARTIFICIAL STREAMS, C. E. Warren and Harry K. Phinney. To study in simplified plant and animal communities under different experimental conditions of light and nutrients the pathways, rates and efficiencies of energy exchange. Continued in 1962. National Science Foundation, \$8,500 per year.
- 164 A STUDY OF THE NATURE OF THE CONSTITUENTS RESPONSIBLE FOR THE TOXICITY OF KRAFT PULP MILL WASTES, Charles E. Warren, Peter Doudoroff, Elliot N. Marvell and George Chadwick. To isolate, identify and determine the toxicity to fish (and mammals next) of compounds present in Kraft Pulp Mill wastes. Continued in 1962. Public Health Service yearly grant of \$9,405.

- 165 CHEMISTRY AND TOXICOLOGY OF CYANIDES IN AQUEOUS SOLUTIONS, Harry Freund, Peter Doudoroff and Charles E. Warren. To determine the toxic phases of complex cyanide solutions and means of chemically measuring these. Terminated in 1962. Supported by Public Health Service grant, \$8,643 per year.
- 166 BIOLOGICAL STUDIES OF THE COMMON GUPPY AS A LABORATORY ANIMAL, George Chadwick, Peter Doudoroff and Charles E. Warren. To increase knowledge of the physiological and population ecology of the guppy to provide a basis for greater laboratory use of this animal. Continued in 1962. \$1,500 per year.
- 167 THE BIONOMICS OF FISHES AND SHELLFISHES WITH PARTICULAR REFERENCE TO THE ECOLOGICAL FACTORS AFFECTING BIOLOGICAL PRODUCTIVITY IN OREGON BAYS AND ESTUARIES, R. E. Dimick, W. P. Breese and H. K. Phinney. Obtain bionomic information of the important fishes and shellfishes species of Oregon bays in relation to ecological factors; continue the development of aqua-culture procedures for oysters, clams and other marine species of importance; obtain reliable biological information as to the resistances and susceptibilities of marine organisms to various pollution conditions. Continued in 1962. Oregon State University, \$10,000 per year.
- 168 THE INFLUENCE OF KRAFT AND SULFITE PROCESS PAPER MILL WASTES ON THE SURVIVAL, REPRODUCTION, DEVELOPMENT AND GROWTH OF OYSTERS, R. E. Dimick and W. P. Breese. Determine the concentrations of pulp mill wastes that will not reduce the production of oysters. Continued in 1962. National Council for Stream Improvement, \$14,000 per year.
- 169 AN EXPERIMENTAL STUDY OF THE RESISTANCE OF REPRESENTATIVE MARINE ANIMALS TO VARIOUS POLLUTIONAL CONDITIONS IN MARINE ENVIRONMENTS, R. E. Dimick and W. P. Breese. To determine the effects of selected toxicants on marine fish, shellfish and other groups. Terminated in 1962. Supported by Public Health Service grant, \$9,500 per year.

- 170 ECOLOGY OF KOKANEE SALMON, Donald W. Chapman and H. J. Rayner. To determine ecological requirements of kokanee salmon and the reaction of kokanee stocks to varied environments. Continued in 1962. Oregon Game Commission, \$15,000 per year.
- 171 FUNGITOXIC RESIDUES IN SOIL, WATER AND PLANTS, Roy A. Young and Malcolm E. Corden. Starting date May 1, 1961. Continued in 1962. Supported by Public Health Service, \$11,000 per year.
- 172 SEDIMENT PRODUCTION OF FORESTED WATERSHEDS - A U. S. GEOLOGICAL SURVEY PROJECT, Robert Williams, Don Chapman. Alsea Water basin, Oregon. A cooperative study with Oregon State University. Project started November 1958 and continued in 1962. Supported by State and Federal funds, \$9,300. A summary report (Miscellaneous Paper 110 Agricultural Experiment Station, OSU) contains a summary of the results of the first year's study. A progress report is under preparation by the U.S.G.S. covering the first two years.
- 173 WATER QUALITY MANAGEMENT BY LOW FLOW AUGMENTATION, F. J. Burgess. The purpose of this project is to develop the criteria and program logic to determine by a digital computer the dissolved oxygen profiles in a complex stream system receiving various sources of pollution as well as flow augmentation from reservoir storage. Supported by U. S. Public Health Service.
- 174 EFFECTS UPON A RECEIVING STREAM CAUSED BY DISCHARGING CHLORINATED AND/OR UNCHLORINATED WASTES HIGH IN ALGAL CONCENTRATION, F. J. Burgess. The purpose of this study is to determine the rate and nature of the decomposition of organic substances from oxidation lagoons from which the effluent may be chlorinated for bacterial control. Supported by U. S. Public Health Service Traineeship Award.
- 175 DEGRADATION OF KRAFT MILL WASTES IN SALINE WATER, D. C. Phillips. To determine the reaction rate of the degradation of kraft mill wastes in water

of various salinities to better understand the effects of such wastes on marine waters. Supported by U. S. Public Health Service Traineeship Grant.

- 176 HIGH-PRESSURE - HIGH-SHEAR BIOLOGICAL TREATMENT, D. C. Phillips and F. J. Burgess. To determine methods by which the reaction rates of the activated sludge treatment may be significantly increased. Supported by U. S. Public Health Service Grant, \$11,900 per year.
- 177 BIOCHEMISTRY AND PHYSIOLOGICAL ECOLOGY OF POISONED FISH, V. H. Freed and C. E. Warren. To gain an understanding of the action of the toxic materials and the influence of them on the ecological condition of fish. Supported by Public Health Service Grant, \$24,500 per year.
- 178 MICROBIOLOGY OF OREGON MARINE ENVIRONMENT, Paul R. Elliker, C. M. Gilmour, and W. V. Burt. A program of research in marine microbiology. Supported by a National Science Foundation Grant, \$64,600.
- 179 RELATIONSHIP OF AQUATIC FLORA TO WATER QUALITY AND POLLUTION, H. K. Phinney. The relationship of algae to water quality. Supported by Agricultural Experiment Station, Oregon State University, \$400 per year.
- 180 AN ECONOMIC EVALUATION OF THE SALMON AND STEELHEAD SPORT FISHERY IN OREGON, W. G. Brown and E. N. Castle. To estimate the quantitative relationships needed for an appraisal of the economic value of the salmon and steelhead sport fishery in Oregon. Supported by Oregon State Game Commission, \$24,000.
- 181 AN ECONOMIC EVALUATION OF WATER POLLUTION CONTROL, E. N. Castle and F. J. Burgess. To develop a methodology which will permit evaluation of monetary benefits and costs of water pollution control. Supported by Public Health Service Grant, \$31,000 per year.

PORTLAND STATE COLLEGE, PORTLAND, OREGON

- 182 BENTHIC FAUNAL INDICATORS OF POLLUTION IN COOS BAY (OREGON), J. A. Macnab, D. McKey-Fender, D. C. Gregory and Ruth Winchell. Location - Oregon Institute for Marine Biology at Coos Bay. The study will involve monitoring the effects of pollution on bottom animals. Started September 1, 1961 and continued in 1962. A three-year project supported by Public Health Service grant totaling \$75,498.
- 183 HEAVY METAL POISONS IN WATERS AND INDUSTRIAL WASTES, C. R. Johnson and research assistants. Chemistry Department. Project started September 1, 1961 and continued in 1962. Supported by Public Health Service grant, \$9,749 first year.
- 184 WATER POLLUTANTS DETERMINABLE BY GAS CHROMATOGRAPHY, J. W. Ferguson and R. L. Boster. Period of study, September 1, 1961 to September 1, 1964. Supported by Public Health Service (NIH) grant of \$23,426 (total).

NATIONAL COUNCIL FOR STREAM IMPROVEMENT, CORVALLIS, OREGON

- 185 PULP AND PAPER MILL WASTE DISPOSAL BY IRRIGATION AND LAND APPLICATION, R. O. Blosser and E. L. Owens. Location - Oregon State University. Field studies in progress at mill sites. Started 1960 and continued in 1962. Supported by Council funds, \$5,000 per year.
- 186 EFFECT OF TIDE ACTION IN LOWER PORTLAND HARBOR ON NATURAL SELF-PURIFICATION CHARACTERISTICS OF THE LOWER WILLAMETTE RIVER, R. O. Blosser and E. L. Owens. To establish the manner in which observed tide action affects the dissolved oxygen profile sag during critical low-flow periods in the lower Portland Harbor. Supported by Council funds.
- 187 CHARACTERISTICS OF KRAFT MILL EFFLUENT, R. O. Blosser and E. L. Owens. A study of the sanitary characteristics of kraft mill wastes that may contribute to odors in the vicinity of their discharge. Supported by Council funds.

OREGON FISH COMMISSION, PORTLAND, OREGON

- 188 OBSERVATIONS ON THE ECOLOGY OF THE OCEAN BEACH IN RELATION TO PAPER MILL EFFLUENTS, C. Dale Snow and Emery Wagner. Started in 1958 and continued in 1962. Supported by Fish Commission funds.
- 189 OBSERVATIONS ON POLLUTION AND OTHER FACTORS AS THEY AFFECT THE FISHERY OF THE LOWER COLUMBIA RIVER, George Hirschhorn and R. N. Thompson. Started in 1959 and continued in 1962. A phase of the Washington Department of Fisheries and Oregon Fish Commission's Columbia River spring chinook test program. Supported by Fish Commission funds.
- 190 MINIMUM FLOW STUDIES. Water Resources Section, R. L. Rulifson, Roy Sams and Lincoln Pearson. Location - Willamette River Basin. A study designed to develop criteria for establishing minimum stream flows for the maintenance of fish life. Data collected are: range of stream flows, bottom composition, gravel permeability, subsurface water velocity, dissolved oxygen, pH, water and air temperature and other water quality data. Supported by state funds for 1961 to 1963, \$40,000.

OREGON GAME COMMISSION - RESEARCH DIVISION - OREGON STATE UNIVERSITY, CORVALLIS, OREGON

- 191 THE EFFECT OF LOGGING ON AQUATIC RESOURCES, H. J. Campbell and R. W. Phillips. Location - Drift Creek tributaries, Lincoln County, Oregon. Now in fourth year of pre-logging calibration of environmental factors on three virgin streams. Embryo survival studies in field and laboratory at various oxygen levels and gravel sizes. Began September 1959. Continued in 1962. Supported by license fees for salmon and steelhead trout fishing, \$25,000 annually.

PUBLIC HEALTH SERVICE, DIVISION OF WATER SUPPLY
AND POLLUTION CONTROL, PORTLAND, OREGON

- 192 IMPROVED ANALYTICAL METHODS, W. A. Moore and associates. Project presently involves studies of methods for the determination of sugars, pentachlorophenol and sulfite waste liquor in the minute quantities present in natural waters as a result of the discharge of industrial wastes. Supported by Public Health Service.
- 193 A STUDY OF THE EFFECTS OF PULP AND PAPER MILL WASTES ON WATER QUALITY AND MARINE RESOURCES OF PUGET SOUND, A. F. Bartsch and staff. A field study involving pulp mill wastes and their various components; the patterns of travel within Sound waters; the effects on aquatic marine life; and other chemical, physical and biological factors attending the disposal of these wastes. Project located primarily in the waters adjacent to Everett, Anacortes and Bellingham on Puget Sound and Port Angeles on the straits of Juan de Fuca. Continued during 1962. Supported by Public Health Service.
- 194 DEVELOPMENT OF TECHNIQUES FOR ECONOMIC BASE ANALYSIS, John H. Davidson and E. F. Snyder. Studies to develop a better understanding of the relationships between types of industries and population as a predictive tool for forecasting the future economic base. Techniques will have an application in water resource comprehensive planning. Supported by Public Health Service.
- U. S. GEOLOGICAL SURVEY, GROUNDWATER BRANCH,
PORTLAND, OREGON
- 195 ARTIFICIAL RECHARGE THROUGH WELL TAPPING BASALT AQUIFERS AT SALEM HEIGHTS WATER DISTRICT, B. L. Foxworthy, E. R. Hampton and D. Price. Location - Salem, Oregon. A study of the movement of water in basalt. Started October 1961. Field work completed in 1962 and final report in preparation. Supported by U.S.G.S. and District fund, \$8,000.

- 196 ARTIFICIAL RECHARGE OF BASALT AQUIFERS AT THE DALLES, OREGON, B. L. Foxworthy, R. C. Newcomb and others. Supported by funds from the U. S. Geological Survey and the Dalles City. Report completed and in review in 1962. \$8,000.
- 197 HYDROLOGY OF THE COLUMBIA RIVER BASALT (Research into all phases of geohydrology of this volcanic terrane.) R. C. Newcomb and others. Indirect relation to pollution and water quality - expected to yield new information on modes of groundwater recharge to and movement in basalt aquifers. Continued in 1962. Supported by U. S. Geological Survey funds, \$16,800.
- PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION,
U. S. FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE,
PORTLAND, OREGON
- 198 PHYSICAL SOIL PROPERTIES RELATED TO EROSION, D. D. Wooldridge (Forest Hydrology Laboratory, Wenatchee). Objective: to determine for the major soil types in forests and related ranges of the PNW, the physical properties which are related to their inherent stability and susceptibility to erosion. Continued in 1962. Supported by Department of Agriculture funds.
- 199 RELATION OF SOIL PROPERTIES TO CLIMATIC FACTORS, A. N. Balci and D. D. Wooldridge (Forest Hydrology Laboratory, Wenatchee). Presently doing physical and chemical analysis of soils from eastern and western Washington. Continued in 1962. Supported by U. S. Department of Agriculture funds.
- 200 EFFECT OF LOGGING AND ROAD BUILDING ON WATER YIELD AND SEDIMENTATION, N. Bethlahmy. Located in Bull Run Watershed. Watersheds gaged since 1957. Logging treatments to begin in 1964. Supported by the U. S. Dept. of Agriculture and Portland Bureau of Waterworks.
- 201 EFFECTS OF SKYLINE, HIGH LEAD AND TRACTOR LOGGING ON SOIL SURFACE CONDITIONS AND SURFACE BULK DENSITY, C. T. Dyrness, Forest Sciences Laboratory, Corvallis. Project located in H. J. Andrews

Experimental Forest, Blue River, Oregon. Logging being done in 1962 and 1963. Supported by U. S. Department of Agriculture.

- 202 EFFECT OF LOGGING AND SLASH BURNING ON CHEMICAL PROPERTIES OF STREAMFLOW, R. L. Fredriksen. Project located in H. J. Andrews Experimental Forest, Blue River, Oregon. Watersheds gaged since 1952. Watersheds being logged 1962 and 1963. Supported by U. S. Department of Agriculture.
- 203 HYDROLOGY AND SEDIMENT PRODUCTION - SUGAR PINE - DOUGLAS-FIR FORESTS, Jack Rothacher, Forestry Sciences Laboratory, Corvallis. Project located in South Umpqua Experimental Forest near Tiller, Oregon. Watersheds gaged since 1960. Supported by U. S. Department of Agriculture.
- 204 HYDROLOGY AND SEDIMENT PRODUCTION IN MIXED CONIFER FOREST, H. G. Herring, Forest Hydrology Laboratory, Wenatchee. Project located in Entiat River Basin, Washington. Watersheds gaged since 1959. Supported by U. S. Department of Agriculture.
- 205 METHODS OF REVEGETATING GAME RANGES FOR WATERSHED STABILIZATION, D. D. Wooldridge, Forest Hydrology Laboratory, Wenatchee. Project located in eastern Washington and Oregon. Supported by U. S. Department of Agriculture.
- 206 SEDIMENT PRODUCTION FROM SWAUK SANDSTONE SOILS IN CENTRAL WASHINGTON, D. D. Wooldridge, Forest Hydrology Laboratory, Wenatchee. Sediment from three small drainages in Mission Creek watershed measured. Project continued in 1962. Supported by U. S. Department of Agriculture.
- 207 EFFECT OF ROAD BUILDING ON STREAM SEDIMENTATION IN OLD-GROWTH DOUGLAS-FIR WATERSHEDS, R. L. Fredriksen and J. S. Rothacher. Project located in H. J. Andrews Experimental Forest, Blue River, Oregon. Measurements of sediment production underway. Supported by Department of Agriculture funds. Continued in 1962.

- 208 EFFECT OF HARVESTING OLD-GROWTH DOUGLAS-FIR ON SEDIMENTATION, J. S. Rothacher. Project located in H. J. Andrews Experimental Forest, Blue River, Oregon. Publication, "Watershed Disturbance from Tractor and Skyline-Crane Logging." D. D. Wooldridge, Journal Forestry 58, p. 369 (May 1960). Supported by Department of Agriculture funds. Continued in 1962.

U. S. SOIL CONSERVATION SERVICE, PORTLAND, OREGON

- 209 WATER TEMPERATURES, L. D. Marriage and Service field and office staff. The collection of existing water temperatures in various watersheds on which reservoirs are proposed in an attempt to make the best use of reservoirs for fisheries and to predict the effect on fishery habitat. Location - Middle Fork Hood River, Pine Valley and Napa River. Thermographs installed for continuous recording. Service funds, \$1,000.

WASHINGTON

WASHINGTON STATE UNIVERSITY, PULLMAN

- 210 BIOLOGY AND CHEMISTRY OF SPHAEROTILUS, J. L. Stokes and M. A. Rouf, Department of Bacteriology. Dates of study, June 1961 to June 1964 as determined by grant by the Public Health Service - amount, \$40,000.
- 211 LIMNOLOGICAL STUDY OF ANAEROBIC-AEROBIC SEWAGE PONDS, G. H. Dunstan, R. H. Green and G. H. Bowen, Division of Industrial Research. This study is a continuation of a state-supported project previously entitled "An Investigation of Stabilization Pond Loadings in the Purification of Sewage." The purpose of the study is to determine the biological organisms which contribute to stabilization in anaerobic-aerobic lagoon systems at high loadings, and to relate them to the physical and chemical changes which occur in the stabilization process. Primary emphasis is being placed on algae species, but other

- predominating organisms also will be evaluated under environmental conditions associated with high pond loadings. Continued in 1962 - Concludes March 1963. Supported by funds from the Public Health Service, \$15,272.
- 212 ANALYSIS OF ORGANIC PESTICIDES BY GAS CHROMATOGRAPHY, E. Hindin, G. H. Dunstan, Donald May. This study is to develop gas chromatographic methods for the analysis of specific organic pesticides in water. Field studies will be used to evaluate the methods. Report, "Analysis of Synthetic Organic Pesticides in Water," J. AWWA, January 1962. Continued in 1962. Supported by funds from the National Institutes of Health, \$15,479 third year.
- 213 THE EFFECT OF INDUSTRIAL WASTES ON ANAEROBIC DIGESTION, Ervin Hindin. Project concluded in 1962. Report, "Disposal of Potato Chip Wastes by Anaerobic Digestion," Washington State University Tech. Bull. 255.
- 214 SEPTIC TANK PERFORMANCE AT LOW TEMPERATURES, G. H. Dunstan, E. Hindin, R. H. Green and D. S. May. In this study three tanks are being operated at 33, 40 and 69°F respectively. The project was completed in 1962 and a report published. Supported by U. S. Public Health Service contract, \$5,700.
- 215 SPOKANE VALLEY GROUNDWATER POLLUTION STUDY, G. H. Dunstan, R. H. Phillips, R. E. Cavin and J. W. Crosby III. Project located in the Spokane Valley east of Spokane. Started June 1962 and completed. This study consisted of drilling test holes in septic tank drain fields and collecting soil samples for coliform. Soils were also tested for detergents. Report published.
- 216 TREATMENT OF POULTRY WASTES, R. H. Green in cooperation with Poultry Science Dept. Started September 1962 in the poultry building on Washington State University campus. Supported by the University, \$3,500.

- 217 SULPHITE WASTE TREATMENT, R. H. Green, G. H. Dunstan.
Purpose is to study whether or not selected dilute sulphite wastes (wash waters) can be successfully disposed of by mixing with municipal sewage in stabilization ponds. Supported by University funds, \$1,850.
- 218 EFFECT OF IRRIGATION USE ON QUALITY OF RETURN WATERS, G. H. Dunstan, Carl A. Rambow, P. Bennett. This study was conducted in the Columbia Basin irrigation project with supplemental studies on the effect of soils on return flow quality conducted at the University in cooperation with the agricultural department. Work concluded and report in preparation. Supported by funds from the U. S. Public Health Service.
- 219 WATER RECLAMATION FROM SEWAGE BY SOLVENT EXTRACTION, E. Hindin, G. H. Dunstan and Donald May. Location - Washington State University, Pullman, Washington. Studies of use of permeable membranes. Started October 1, 1961. Continued in 1962. Supported by U. S. Public Health Service, \$14,637 second year.
- 220 SPHAEROTILUS CONTROL FOR IRRIGATION WATER, B. A. Nakata and G. H. Dunstan. To study nitrogen and phosphorus requirements of sphaerotilus, the availability of various inorganic and organic nitrogen and phosphorus compounds and the relative amounts required per unit of carbon source. Started April 1961. Supported by U. S. Public Health Service, \$12,325, first year of a three-year period.
- 221 NUTRIENT INPUT TO WASHINGTON SOILS FROM ATMOSPHERIC SOURCES, C. D. Moodie, Department of Agronomy. Project conducted at Pullman and at eight other experiment stations. This project is intended to provide data on the quantity of nutrients contributed to soils and crops by rainfall and irrigation waters. Rainfall is being collected at eight locations around the state of Washington and analyzed for its nutrient content. Supported by Washington Agricultural Experiment Station, \$3,000.

- 222 SOIL TESTING, A. R. Halvorson and C. D. Moodie, Department of Agronomy. This project is concerned with the routine analysis of soil and water samples. The data are used to make fertilizer recommendations. The analyses of irrigation water taken from wells, streams and return flow are interpreted in terms of hazards associated with their continued use on land. Research is conducted relative to the levels of soil tests to crop response to fertilization. The objective is to further the proper use of fertilizers and to conserve the soil and fertilizer resources. Supported by State funds, \$30,000. .

UNIVERSITY OF WASHINGTON, SEATTLE

- 223 QUALITY OF IMPOUNDED WATER AS INFLUENCED BY SITE PREPARATION, R. O. Sylvester, R. W. Seabloom, Tacoma Water Division, Corps of Engineers, Soil Conservation Service. Location of project at Howard Hanson impoundment, Green River, Wash. Project started May, 1962. Supported by Public Health Service demonstration grant, \$14,500 per year.
- 224 EFFECT OF REFUSE DISPOSAL ON WATER QUALITY, R. W. Seabloom and W. L. Dunn, Civil Engineering Department. Location - Union Bay, Lake Washington, Seattle. (Seattle refuse is dumped along margin at Union Bay in a semi-sanitary fill operation). Started in 1958 and continued in 1962. Funds from University, \$550.
- 225 AMINO ACID UTILIZATION IN ACTIVATED SLUDGE, D. A. Carlson. Started September 1, 1961 and continued in 1962. Supported by grant from the Public Health Service, \$12,857.
- 226 THE EFFECT OF MOLECULAR SUBSTITUTION ON BIO-OXIDATION, R. H. Bogan and J. A. Servizi, Civil Engineering Department. Starting date January 1, 1962. Funds from Public Health Service and the University. Continued in 1962.

- 227 A STUDY OF THE EXCHANGE AND RETENTION OF RADIO-NUCLIDES IN SOILS, R. H. Bogan and J. E. Mocca, Civil Engineering Department. Starting date September 1961; completed May 1962. Funds from Atomic Energy Commission.
- 228 DEVELOPMENT, DESIGN AND STUDY OF WASTE TREATMENT FACILITIES FOR HANDLING CLOSE CYCLE WORKS, R. H. Bogan, Civil Engineering Department. A preliminary study of waste disposal in a space environment. Continued in 1962. Supported by research contract with Boeing Airplane Co., Aero-Space Division.
- 229 OCEANOGRAPHIC MODEL STUDIES OF PUGET SOUND, M. Rattray, Jr., H. G. Farmer and P. Kovala, Oceanographic Department. Started in 1961; terminated in 1962. Supported by grant from National Science Foundation.
- 230 THEORETICAL STUDIES ON THE DYNAMICS OF ESTUARINE CIRCULATION, M. Rattray, Jr. and D. V. Hansen, Oceanographic Department. A one-year project started September 15, 1961 and ended in September 1962. Supported by grant from National Science Foundation.
- 231 LAKE WASHINGTON STUDY, W. T. Edmondson, Department of Biology. A three-year study of the ecology of the lake as affected by nutrients from waste effluents and land runoff. A special emphasis on algal production. Supported originally by National Science Foundation funds of \$42,300 for the three years and recently continued for an additional three years by a National Science Foundation grant of \$118,000.
- 232 MOVEMENT OF WATER AND ASSOCIATED CHEMICAL ELEMENTS IN A FOREST ENVIRONMENT, S. P. Gessel, D. Cole, Department of Forestry, and Seattle Water Department. Location - Seattle Cedar River watershed. Expanded in 1962 to include removing vegetation from plots. Supported by National Science Foundation funds.

- 233 THE EFFECTS OF LOGGING ON YIELD AND QUALITY OF
WATER FROM SOME MUNICIPAL WATERSHEDS, S. P.
Gessel and Leo Teller, Department of Forestry.
Work located in Cascade Mountains. Started
September 1961 and to continue to June 1963.
Supported by Resources for the Future, \$3,000.
- 234 HYDROLOGIC PROPERTIES OF FOREST HUMUS TYPES, S. P.
Gessel and Nihat Balci, Department of Forestry.
Conducted in Cedar River watershed. Started
August 1961 and continuing in 1962. Supported
by grant of Public Health Service, \$6,500.
- 235 EFFECTS OF LOGGING ON SALMON STREAMS IN SOUTH-
EASTERN ALASKA, D. E. Bevan, W. F. Royce, R. E.
Nece and P. Shapley, and research assistants.
A project of the Fisheries Research Institute
College of Fisheries under contract with the
Bureau of Commercial Fisheries. This is a co-
operative study with the Northern Forest Exper-
iment Station, U. S. Forest Service, Juneau.
Continued in 1962. Supported by funds from the
Saltonstall-Kennedy Act, \$48,000 annually.
- 236 EVALUATION OF AN IMPROVED PINK-SALMON SPAWNING
AREA, D. E. Bevan, W. F. Royce, R. E. Nece and
P. Shapley. Location - Indian Creek, Hollis,
Alaska. Started July 1, 1961 and continued
in 1962. A project of the Fisheries Research
Institute. Supported by U. S. Forest Service,
Bureau of Commercial Fisheries, Ketchikan Pulp
Company, Alaska Department of Fish and Game,
and Institute of Forest Products, \$10,000.
- 237 EVERETT BAY RESEARCH, D. E. Bevan, W. F. Royce
and R. Tyler, Fisheries Research Institute.
Started May 1, 1962. Supported by Everett
Technical Committee consisting of Weyerhaeuser
Timber Co., Scott Paper Co. and Simpson-Lee
Paper Co., \$12,500.
- 238 ECOLOGY OF PARALYTIC SHELLFISH TOXICITY IN
WASHINGTON, A. K. Sparks. A continuing project
to October 1962. A College of Fisheries pro-
ject. Location - in coastal waters of Wash-
ington. Supported by Public Health Service
funds, \$30,264.

- 239 ECOLOGY OF PARALYTIC SHELLFISH TOXICITY IN SOUTHERN ALASKA, A. K. Sparks. Studies located in south-eastern Alaska. Supported by U. S. Public Health Service grant, \$18,760.
- 240 STUDIES IN OYSTER PATHOLOGY, A. K. Sparks. A College of Fisheries project supported by the Public Health Service for the period March 15, 1961 to March 14, 1962, \$10,000.
- 241 BELLINGHAM BAY STUDIES, C. A. Barnes, E. E. Collias, Oceanographic Department. A study of water characteristics and movements and sediment characteristics. Supported by the Puget Sound Pulp and Timber Company.
- 242 COLUMBIA RIVER EFFECTS IN THE NORTHEAST PACIFIC, C. A. Barnes, G. C. Anderson, K. Banse, L. K. Coachman, J. S. Creager, M. G. Gross, D. H. McManus, U. Stefanson and T. F. Budinger, Oceanographic Department. To identify and trace Columbia River water as it moves and disperses at sea. Biological, geological, chemical and physical aspects are studied throughout year. Supported by Atomic Energy Commission.
- 243 OCEANOGRAPHIC STUDIES IN PUGET SOUND AND NORTHEAST PACIFIC, R. H. Fleming and staff, Oceanographic Department. Work in Puget Sound and coastal waters basic to understanding of water quality and water pollution. Water movement and diffusion, chemical and biological characteristics, nature and distribution of sediments, and oxygen utilization rates studied. Supported by Oceanographic Naval Research.
- 244 DISTRIBUTION OF RADIONUCLIDES IN MARINE ORGANISMS, BOTTOM MATERIALS AND WATER NEAR THE MOUTH OF THE COLUMBIA RIVER, A. H. Seymour and G. B. Lewis. Started January 1961 and continued in 1962. Supported by funds from Division of Biology and Medicine, U. S. Atomic Energy Commission.

WASHINGTON DEPARTMENT OF FISHERIES

- 245 THE EFFECT OF SULFITE WASTE LIQUOR ON OYSTERS AND WATER. Experimental work completed early in 1962. Data summarization and analyses now being carried on. Biological portion: C. E. Woelke, A. M. Andersen, D. R. Well. Water Quality portion: R. E. Westley, M. A. Tarr.
- 246 CLAM AND OYSTER LARVAE AS SPECIMENS FOR BIOASSAY, C. E. Woelke and D. T. Walsh. Present bioassay methods using adult shellfish require long time periods. Larval bioassay will shorten period of test. Finite statistical analysis of the techniques involved has been completed. Water from various bays and estuaries has been assayed using 48-hour larval development of the Pacific oyster. Control parameters have been studied using water from areas not suspect of pollution. Studies conducted in 1962 included water from known polluted areas and this phase of testing will be expanded in 1963. Two reports published.
- 247 RELATIVE TOXICITY OF SULFITE WASTE LIQUOR, C. E. Woelke, D. T. Walsh and M. A. Tarr. Dilutions of SWL ranging from 2-32 ppm were made up from digester liquor and the effect on 48-hour development of Pacific oyster larvae was determined. Digester waste from five different mills including all principal types of processes was evaluated. A total of 25-30 different samples of waste have been evaluated and work on this phase is complete. Studies on liquor components are being held in abeyance pending availability of components for testing. Report in preparation.
- 248 FIELD WATER BIOASSAYS, C. E. Woelke, D. T. Walsh. Location - Point Whitney. Control parameters have been evaluated using water from unpolluted areas. Water from various bays and estuaries is being evaluated using 48-hour development of Pacific oyster larvae.

- 249 BOTTOM SEDIMENT IN RELATION TO OYSTER GROWTH AND
CONDITION, C. E. Woelke, M. A. Tarr and D. T.
Walsh. Samples of bottom sediment are analyzed
for physical size composition, organic carbon,
total ash and inorganic salts, and this inform-
ation related to the fatness, growth and mortal-
ity of oysters. Work to date indicates a rela-
tionship between organic and oyster population.
Study continuing.
- 250 LIMNOLOGY OF THREE MEDIUM-SIZED RESERVOIRS AS RELATED
TO JUVENILE FISH MIGRATION, R. E. Westley, D. Stuckey
and W. Hoffman. Dr. George Anderson, Consultant.
Project located in Lakes Merwin, Baker and Shannon.
Study based on distribution of temperature, oxygen
and conductivity. Started March 1962. Supported
by funds of the Fish & Wildlife Service, \$30,000.
- 251 OYSTER BED PRODUCTIVITY PROJECT, R. Westley and M.
Tarr. A project designed to determine hydro-
graphic, chemical and biological differences
between areas which produce oysters of good and
poor fatness. Emphasis on primary productivity
of water. Project located in South Puget Sound
and Hood Canal. Started in 1961 and continuing
in 1962. Supported by Department of Fisheries.
- 252 WILLAPA BAY HYDROGRAPHIC PRODUCTIVITY PROJECT, R. E.
Westley, M. Tarr and C. Sayce. Project designed
to determine relationship between the well-being
of oyster population and hydrographic features
with emphasis on primary productivity of water.
Project located in Willapa Bay. Started in 1961
and continued through 1962. Supported by Dept.
of Fisheries.

BUREAU OF COMMERCIAL FISHERIES, U. S. DEPARTMENT
OF INTERIOR, SEATTLE

- 253 LIMNOLOGICAL STUDIES OF A LARGE IMPOUNDMENT, R. F.
Raleigh, D. Montgomery and C. Koski. Started in
1962 at Brownlee Reservoir, Snake River, Weiser,
Idaho. Part of a program to examine the behavior
of salmon migrants in a large impoundment in re-
lation to environment. Supported by Department
of Interior.

CROWN ZELLERBACH CORPORATION - CAMAS, WASHINGTON

- 254 DETERMINATION OF VARIABLES SUPPORTING SPHAEROTILUS GROWTH IN THE COLUMBIA RIVER, H. R. Amberg, J. F. Cormack and L. F. Lucas. A continuing project. Publication, "Slime Growth Control by Intermittent Discharge of Spent Sulfite Liquor," TAPPI, Vol. 45 (Oct. 1962). Supported by Crown Zellerbach Corporation funds, \$26,000.
- 255 COLUMBIA RIVER SURVEY, H. R. Amberg, J. F. Cormack and L. F. Lucas. \$27,650. A phase of a million-dollar research study aimed at developing products from waste material. Present emphasis is placed on spent sulfite liquor. Projects not detailed here because of confidential nature of some of the research.

GENERAL ELECTRIC COMPANY, HANFORD LABORATORIES

- 256 EVALUATION OF RADIOLOGICAL CONDITIONS IN THE COLUMBIA RIVER, R. F. Foster, R. B. Hall, R. W. Meisinger and J. K. Soldat, Radiation Protection Operation. This is part of the comprehensive environmental surveillance program. Some features provide information on the fate of radioactive materials. A continuing project supported by U. S. Atomic Energy Commission, \$250,000. Continued in 1962.
- 257 CHONDROCOCCUS COLUMNARIS AS A DISEASE ORGANISM IN FISH, M. P. Fujihara and P. A. Olson of Biological Laboratory. Includes studies on the nature of the columnaris organism, its nutrition, distribution in nature, response to radiation, and environmental conditions which lead to infection of fish. Supported by the Atomic Energy Commission, \$20,000. Continued in 1962.
- 258 EFFECTS OF HANFORD PROCESS EFFLUENTS ON AQUATIC ORGANISMS, P. A. Olson and R. E. Nakatani, Biology Laboratory. Major effort is expended on a continuous biological assay of reactor effluent water for practical demonstration of the effect of various effluent concentrations on the economically important salmonids. In addition, information is developed to fix upper limits of

- quantities of toxic substances used on occasions which can be added to the river with safety for fish populations. Supported by the Atomic Energy Commission, \$40,000. Continued in 1962.
- 259 SHORT AND LONG-RANGE ANALYSIS OF RELATIONSHIP AMONG WEATHER, IMPOUNDMENTS AND DIVERSIONS AFFECTING COLUMBIA RIVER TEMPERATURES, H. A. Kramer, Irradiation Processing Department. A continuing project supported by the Atomic Energy Commission. Continued in 1962.
- 260 METABOLISM AND TOXICITY OF RADIONUCLIDES IN AQUATIC ORGANISMS, R. E. Nakatani and P. A. Olson, Biology Laboratory. The studies center on investigating the pathological manifestation of radiation injury by internal emitters in fish. Supporting work includes studies on the uptake, distribution, retention of internal emitters by fish from water and food. Also, the ability of fish with non-lethal body burden of certain internal emitters to tolerate various environmental stress are under study. Supported by the Atomic Energy Commission, \$100,000. Continued in 1962.
- 261 GROUNDWATER INVESTIGATIONS (DISPOSAL OF RADIOACTIVE WASTES TO THE GROUND). G. J. Alkire, W. A. Haney, C. E. Linderoth, et al. Chemical Effluents Technology Laboratory. Started in 1947 and continued in 1962. Supported by Atomic Energy Commission.
- 262 CHEMISTRY AND KINETICS OF RADIOISOTOPE DISPOSAL IN THE COLUMBIA RIVER, R. W. Perkins, L. L. Humphreys and J. M. Nielsen, Radiological Chemistry. Continued in 1962. Supported by Atomic Energy Commission, Division of Biology and Medicine.
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- 266 BACTERIAL CHANGES IN COMMERCIALY HANDLED SHELL-
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- 267 RELATIVE BACTERIAL CONTENT OF SHELLFISH IN OVER-
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- 268 SANITARY SIGNIFICANCE OF FECAL COLIFORMS AND
FECAL STREPTOCOCCI IN SHELLFISH GROWING AREAS,
C. B. Kelly and staff. Supported by Public
Health Service. Continued in 1962 under
supervision of W. J. Beck, Acting Chief.
- 269 EVALUATION OF METHODS FOR THE EXAMINATION OF SEA
WATER AND SHELLFISH, C. B. Kelly and staff.
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ADDENDUM

The following projects were reported after the inventory was completed and sent to the printer.

STANFORD UNIVERSITY

- 270 STUDIES ON MOVEMENT OF VIRUSES IN GROUNDWATER,
 R. Eliassen, W. A. Drewry, A. Y. S. Prabhakara
 Roa and P. Kruger. Started in fall of 1962.
 Supported by U. S. Army, Medical Research,
 \$39,000.
- 271 RECLAMATION OF RE-USABLE WATER FROM SEWAGE, R.
 Eliassen and B. M. Wyckoff. Starting date,
 Sept. 15, 1962 and continuing until Sept.
 14, 1963. Supported in part by Public Health
 Service demonstration grant, \$40,260.