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INVENTORY

OF

ACTIVE WATER RESOURCES RESEARCH PROJECTS

IN

NORTH CAROLINA

An

Institute Report

July 1, 1971

This research inventory is published by the Institute to encourage coordination between research groups and avoid duplication of effort. Projects listed herein are funded from a wide variety of public and private sources. It reflects the total water resources research effort in North Carolina and is not limited to the Institute program.

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CONSOLIDATED UNIVERSITY OF NORTH CAROLINA:

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UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE
UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
UNIVERSITY OF NORTH CAROLINA AT WILMINGTON

NORTH CAROLINA STATE UNIVERSITY

CONSOLIDATED UNIVERSITY OF NORTH CAROLINA

NORTH CAROLINA STATE UNIVERSITY

School of Agriculture and Life Sciences

Department of Animal Science

Dr. James M. Leatherwood

1. Title: Utilization of Fibrous Wastes as Sources of Nutrients

   Location: Raleigh, North Carolina

   Description: To develop a biological technique for the conversion of natural cellulosic wastes such as newspaper-sawdust to products that can be used as sources of nutrients for animal feeding.

   Starting Date: 1968 Completion Date: 1972

Department of Botany

Dr. Charles E. Anderson

1. Title: The Effect of Fluoride on Reproduction and Metabolism in Chlamydomonas reinhardtii

   Location: Aurora, North Carolina

   Description: Analyzing rates of cell division and the ability of these cells to manufacture protein and also changes in permeability of the cells; changes of ultrastructure of the cells.

   Starting Date: 1967 Completion Date: Continuing

2. Title: Environmental Control of Growth and Reproduction of North Carolina Marsh Plants

   Location: North Carolina Coast

   Description: Flowering, growth patterns and seed germination are being related to salinity, temperature and photo period for a variety of plant species occurring in North Carolina salt marshes.

   Starting Date: 1968 Completion Date: Continuing

Dr. Harold E. Schlichting, Jr.

1. Title: The Concentration of Phosphates from Industrial Waste Water by Selected Blue-Green Algae

Location: Pamlico Marine Laboratory

Description: The study of nitrogen-phosphorus relationships in the growth of blue-green algae in the Pamlico Estuary.

Starting Date: 1970 Completion Date: 1972

Dr. Ernest D. Seneca

1. Title: Seed and Seedling Ecology of Salt Marsh Plants

Location: North Carolina salt marshes

Description: Seed germination and seedling response to salinity, temperature, and photo period by various salt marsh plants.

Starting Date: 1967 Completion Date: Continuing

Dr. Larry A. Whitford (Emeritus)

1. Title: Studies of Fresh-Water Algae Occurring in Winter with Notes on Their Ecology

Location: Mostly eastern half of North Carolina

Description: Collections of the rarer algae most common in late winter will be made together with notes on their habitat and ecology. Brief papers will be published on new or rare species.

Starting Date: 1969 Completion Date: Continuing

2. Title: Fresh-Water Diatoms of North Carolina

Location: Whole state

Description: Since the fresh-water diatoms have never been carefully investigated, a study will be made of the state flora and notes taken on the ecology of species.

Starting Date: 1971 Completion Date: Continuing

Department of Crop Science

Dr. Jerome B. Weber

1. Title: Reactions of Soil Constituents and Organic Chemicals

   Location: North Carolina State University

   Description: Adsorption-desorption reactions between organic and inorganic soil colloids and aromatic organic compounds in aqueous systems.

   Starting Date: 1962 Completion Date: Continuing

2. Title: Reactions and Movement of Herbicides in Modified Soils

   Location: Upper Coastal Plain Experiment Station, Rocky Mount, North Carolina

   Description: The relationships among soil constituents, such as clay minerals and organic matter, and herbicide phytotoxicity and herbicide movement on modified soil environments under field conditions. Ecological changes in weed populations as influenced by herbicides and herbicide movement through the soil profile are also being examined.

   Starting Date: 1968 Completion Date: Continuing

3. Title: Effect of Soil pH on Herbicide Phytotoxicity and Movement

   Location: Tidewater Experiment Station, Plymouth, N. C.

   Description: The relationship of soil pH and herbicide phytotoxicity and movement are being examined on a high organic soil under field conditions.

   Starting Date: 1968 Completion Date: Continuing

Department of Economics

Dr. James A. Seagraves

1. Title: An Economic Study of Municipal Surcharges on Industrial Wastes

   Location: Raleigh, North Carolina

   Description: Emphasis is being placed on the response to surcharges with a comparison of synthetic budgeting and regression approaches. Implications for rate setting and monitoring systems will be explored.

   Starting Date: 1969 Completion Date: 1972

Department of Entomology

Dr. Richard C. Axtell

1. Title: Prevention of Pesticide Pollution from Coastal Insect Control Programs

Location: Raleigh and various coastal areas

Description: Evaluation of various chemical control measures and their impact on the estuarine ecosystem. Development of data for predicting pest population levels and the resultant need for control measures.

Starting Date: 1970 Completion Date: 1975

Dr. William V. Campbell

1. Title: Investigation of Insects Affecting Vegetation Used in Coastal Dune Stabilization

Location: Coastal North Carolina and North Carolina State University

Description: American beach grass Ammophila breviligulata Fernald used in dune stabilization on the North Carolina Outer Banks is attacked by destructive insects, especially by a previously unknown, undescribed scale insect Eriococcus carolinae Williams. High populations of E. carolinae have resulted in loss of beach grass stands. Information is needed on the biology and control of this pest and associated insects in the complex. The recreational and wildlife interests necessitate a research and control program that will halt the spread of the destructive insects without environmental contamination.

Starting Date: 1970 Completion Date: 1975

Dr. Frank E. Guthrie

1. Title: Adaptation of Organisms to Pesticides

Location: Raleigh, North Carolina

Description: The physiological mechanisms permitting adaptation of organisms to pesticides are examined. The contribution of tissue, cellular, and subcellular components are separated in an attempt to explain effects of pesticides at the molecular level. The phenomena of biological magnification of pesticides will be studied with the tools of toxicology.

Starting Date: 1971 Completion Date: 1976

Dr. Kenneth L. Knight

1. Title: Effectiveness of Ditching in Estuarine Marshes for Mosquito Control

Location: Coastal North Carolina

Description: Appraisal of the ecological effects of mosquito control marsh ditching. This study is involved with evaluating the effectiveness of the mosquito control accomplished by the ditching.

Starting Date: 1970 Completion Date: 1972

Dr. Thomas J. Sheets

1. Title: Persistence of Pesticides in Soil

Location: Several locations in North Carolina

Description: Experiments conducted in cooperation with research workers in the Departments of Crop Science and Horticultural Science on the persistence of herbicides in soils.

Starting Date: 1966 Completion Date: Continuing

Dr. Thomas J. Sheets and Dr. J. R. Bradley

1. Title: Contamination of Surface and Ground Water with Insecticides and Herbicides Applied to Cultivated Crops

Location: Rocky Mount and Lewiston, North Carolina

Description: Experiments are in progress at two locations. Runoff from small plots are analyzed for pesticides applied according to recommended agricultural practices. Ground water samples from wells of different depths are analyzed periodically. Persistence and movement in soil are also being followed.

Starting Date: 1969 Completion Date: Continuing

Department of Food Science

Dr. Daniel E. Carroll and Dr. Maurice W. Hoover

1. Title: Characterization of Sweet Potato Processing Wastes

Location: North Carolina State University

Description: Sweet potato processing waste will be analyzed for BOD, COD, TOC and carbohydrate composition. Specific purposes include: (1) correlation values and regression equations between

TOC, COD AND BOD, (2) development of a differential method of analysis for carbohydrate constituents, and (3) investigate an in vitro technique of determining oxygen demand of the waste water.

Starting Date: 1971 Completion Date: 1973

Dr. V. A. Jones, Mr. Roy E. Carawan, Dr. A. P. Hansen

1. Title: Water and Wastewater Management in Dairy Processing

Location: North Carolina State University

Description: The purpose of this study is to evaluate the potential for controlling water use and pollution in a large, commercial fluid milk and ice cream processing plant. Specific objectives include: (1) establish current levels of water consumption and waste generated by unit processes; (2) examine mechanical devices to monitor or control water and wastes; (3) determine relationship of factors relating to strength of wastes; and (4) develop an educational program to encourage water conservation and waste elimination in dairy processing.

Starting Date: 1971 Completion Date: 1972

Dr. N. C. Miller, Jr.; Dr. R. E. Sneed (Bio and Ag Engineering); Dr. D. C. Sanders, Dr. C. H. Miller, and Dr. G. R. Hughes

1. Title: Low Volume Irrigation on Vegetable Crops

Description: See Dr. D. C. Sanders, et al, Department of Horticultural Science for description.

Dr. Neil B. Webb

1. Title: Investigations of Levels and Methods of Reclamation of Proteins from Seafood Processing Operations

Location: North Carolina State University

Description: Determination of levels of proteins lost from normal seafood processing operations and the development of methods for the reclamation of the proteins.

Starting Date: 1971 Completion Date: 1975

Dr. Neil B. Webb and Dr. Frank B. Thomas

1. Title: Development of Marine Industries Harvesting and Processing Systems - Investigations and Demonstrations on the Processing and Marketing of Seafoods

Location: North Carolina State University

Description: To expand the programs in research and extension for the seafood processing industry of North Carolina. This project includes research investigations and advisory services in the areas of handling fresh seafood products, further processing of seafoods and the utilization and reclamation of waste (by-products) from seafood processing operations.

Starting Date: 1970 Completion Date: 1975

Department of Horticultural Science

Dr. Conrad H. Miller and Dr. Ronald Sneed (Biological and Agricultural Engineering)

1. Title: Crop Response of Cucumbers, Okra, Pepper, Southern Peas and Tomatoes to Irrigation

Location: Horticultural Crops Research Station, Clinton, N. C.

Description: To determine irrigation water requirements and critical moisture demand period(s) for these horticultural crops.

Starting Date: 1971 Completion Date: 1974

Dr. Conrad H. Miller and Dr. R. E. McCollum (Soil Science Department)

1. Title: Effect of Evaporative Cooling on Fruit Set and Development of Snapbeans

Location: Leonard Training Schools, McCain, North Carolina

Description: Apply low volume of water to snapbeans during bloom period (6-8 days) while ambient temperatures are above 90°F. Mineral nutrition variables are also included at this Sandhills location.

Starting Date: 1970 Completion Date: 1972

Dr. D. C. Sanders, Dr. C. H. Miller, Dr. G. R. Hughes, Dr. R. E. Sneed (Bio & Ag Engineering), and Dr. N. C. Miller, Jr. (Food Science)

1. Title: Low Volume Irrigation on Vegetable Crops

Location: Jackson Springs, Sandhills Research Station

Description: The effect of low volume irrigation on crop cooling will be evaluated. Special attention will be given to plant growth, crop yield, and product quality. Various parameters of the soil-plant-atmosphere-continuum will be measured and correlated with crop response under treatment conditions.

Starting Date: 1971 Completion Date: 1976

Dr. D. C. Sanders, Dr. G. R. Hughes, and Dr. C. H. Miller

1. Title: The Influence of Various Environmental Parameters on Snapbean Flowering

Location: Raleigh, North Carolina

Description: Snapbeans will be grown under various levels of nutrition and exposed to variations in light intensity, temperature and moisture stress-- then the effect of these variables evaluated on flower formation and fruit set.

Starting Date: 1971 Completion Date: Continuing

Dr. D. C. Sanders, Dr. R. Wayne Skaggs and Dr. C. R. Willey (Bio and Ag Engineering)

1. Title: An Evaluation of the Use of Waste Heat for Soil Warming in the Southeast

Description: See Dr. R. Wayne Skaggs, et al, Department of Biological and Agricultural Engineering, for description.

Dr. V. H. Underwood, Dr. W. B. Nesbitt, Dr. Ronald Sneed (Bio and Ag Engineering), Dr. G. A. Cummings (Soil Science), and Dr. D. D. Mason (Statistics)

1. Title: Muscadine Grape Irrigation and Cultural Practices Study

Location: Sandhills Research Station, Jackson Springs, N. C.

Description: Deals with the effects of nitrogen and potassium nutrition, irrigation and vine size upon vigor, survival yield, fruit set and fruit quality.

Starting Date: 1968 Completion Date: 1978

Dr. C. Richard Unrath

1. Title: The Influence of Growth Regulation and Environmental Control Factors on Apple Production and Quality

Location: Cleveland County, E. Lutz & Sons Orchard, and Burke County, Fruit Ridge Orchard, John Bronstrom

Description: Comparison of effects of undertree and overtree sprinkler irrigation of apples. Effects of evaporative cooling on modification of environment and quality and yield of apples.

Starting Date: 1969 Completion Date: 1979

Department of Microbiology

Dr. Jerome J. Perry

1. Title: The Microbial Degradation of Hydrocarbons in Marine Environments

Location: North Carolina State University

Description: The major objective of this study is an increased knowledge of the organisms in littoral areas that can utilize hydrocarbons, crude oil, pesticides, and related substrates. The effect of hydrocarbons on the littoral community will also be investigated.

Starting Date: 1970 Completion Date: 1975

Department of Plant Pathology

Dr. Ellis Cowling and Dr. H. M. Chang (Department of Wood & Paper Science)

1. Title: The Structure of Lignin in Relation to the Morphology of the Cell Wall

Location: North Carolina State University

Description: This study is directed towards examining the nature and structure of lignin with the ultimate objective of either developing commercially valuable products from it or modifying its nature if it is left in paper. Water effluent problems will be reduced substantially if these goals are attained.

Starting Date: 1969 Completion Date: 1974

Department of Sociology & Anthropology

Dr. A. Clarke Davis

1. Title: Public Participation in Water Pollution Control Policy and Decision Making

Location: Raleigh, North Carolina

Description: A study of two aspects of the water pollution problem--(1) the extent to which it is defined as a major problem; (2) the nature and extent of public participation in the efforts of public agencies to control the problem.

Starting Date: 1970 Completion Date: 1972

Department of Soil Science

Dr. S. W. Buol

1. Title: North Carolina Soil Survey

Location: Entire state

Description: In cooperation with the USDA the North Carolina Agricultural Experiment Station is engaged in the survey of the state. In addition to mapping the soils studies are made to determine water-holding capacity, runoff, water-table depth and frequency and duration of flooding on these soils.

Starting Date: Continuing Completion Date: Continuing

Dr. G. A. Cummings; Dr. D. D. Mason (Statistics); Dr. Ronald E. Sneed (Bio & Ag Engineering); Dr. V. H. Underwood; and Dr. W. B. Nesbitt (Horticultural Science)

1. Title: Muscadine Grape Irrigation and Cultural Practices Study

Description: See Dr. V. H. Underwood, et al, Department of Horticultural Science, for description.

Dr. J. W. Gilliam and Dr. S. B. Weed

1. Title: Contribution of Fertilizers to the Pollution of Waters

Location: North Carolina Coastal Plain

Description: To determine the direct contribution of fertilizers to the contamination of surface and subsurface waters of the North Carolina Coastal Plain as affected by soil physical and chemical properties, surface and subsurface drainage, date of fertilizer application and cropping sequence.

Starting Date: 1971 Completion Date: 1974

Dr. J. Fulton Lutz

1. Title: Fertilizers and Organic Wastes Applied to Soils in Relation to Environmental Quality

Location: Raleigh, North Carolina

Description: Regional project to include studies of fertilizers and organic wastes (such as cattle and poultry manure) on the quality of percolating and runoff water, and on plant growth.

Starting Date: 1971 Completion Date: 1976

Dr. R. E. McCollum and Dr. Conrad H. Miller (Horticultural Science)

1. Title: Effect of Evaporative Cooling on Fruit Set and Development of Snapbeans

Description: See Dr. Conrad H. Miller, et al, Department of Horticultural Science, for description.

Dr. Charles D. Sopher

1. Title: Soil Productivity and Effects of Soil Properties and Their Interactions with Management Practices and Climatic Factors

Location: North Carolina Lower Coastal Plains

Description: In part, this project involves studying the moisture supplying power of various soil series. Included in the study will be the effects of rainfall amounts and distribution on crop yields produced on selected soils.

Starting Date: 1971 Completion Date: 1976

Dr. S. B. Weed

1. Title: Inactivation and Loss of Pesticides from Soil

Location: Raleigh, North Carolina

Description: To determine mechanisms of inactivation and loss of pesticides by/from soil colloids by studies of (a) retention and release; (b) movement of water through soil; (c) non-biological degradation.

Starting Date: 1969 Completion Date: 1974

Dr. William W. Woodhouse, Jr.

1. Title: Coastal Dune and Dredge Spoil Stabilization

Location: Coastal North Carolina

Description: (1) Study of role of vegetation in the protection of coastal dunes, with primary emphasis on long-term stabilization. Sea oats (Uniola paniculata) is currently receiving major attention. (2) Productive use of dredge spoil in North Carolina sounds and estuaries. Initial efforts centered on procedures for establishment of smooth cordgrass (Spartina alterniflora) in the tidal zone, with other species at higher elevations.

Starting Date: 1970 Completion Date: 1975

Department of Zoology

Dr. B. J. Copeland

1. Title: Ecology of the Pamlico River Estuary

Location: Pamlico Marine Laboratory, Aurora, North Carolina

Description: Support for staff and facilities. General project is the effect of phosphate mining operation on the estuarine ecology.

Starting Date: 1971 Completion Date: 1972

2. Title: Effects of Power Plant Effluents on Ecology of Cape Fear Estuary

Location: Cape Fear Estuary

Description: To determine the effects of cooling water withdrawal upon the population structure of the Cape Fear Estuarine Ecosystem and to determine the thermal death, critical thermal maxima and metabolic response of marine organisms to increasing temperatures.

Starting Date: 1971 Completion Date: 1975

Dr. B. J. Copeland and Dr. John E. Hobbie

1. Title: Nutrients and Eutrophication in a North Carolina Estuary

Location: Pamlico River, North Carolina

Description: Measurements of the inputs of phosphorus and nitrogen compounds to the estuary will be continued as well as the standard measures (oxygen, temperature, salinity) necessary for interpretation. To determine the importance to the biota and fate of these nutrients, techniques will be developed that are suitable for measuring community response such as metabolism and species diversity. Also, the nitrogen-phytoplankton and nitrogen-sediment relationships will be investigated.

Starting Date: 1971 Completion Date: 1972

2. Title: Nutrient Budgets for North Carolina Estuaries

Location: Neuse, Pamlico, Albemarle and Cape Fear Estuaries

Description: Nutrient budgets will be measured for the above estuaries. The object is to determine if effects of eutrophication already noted in the Pamlico River extend to other estuaries in North Carolina.

Starting Date: 1970 Completion Date: 1975

Dr. William W. Hassler

1. Title: Status and Abundance of Striped Bass in the Roanoke River, Albemarle Sound and Tar River, North Carolina

   Location: Roanoke River, Albemarle Sound, Tar River, North Carolina

   Description: Population estimates of striped bass in the Roanoke River; creel census surveys of sport and commercial fishing; tagging studies; estimate of spawning success; survival and mortality; trawling studies, etc.

   Starting Date: 1955 Completion Date: Continuing

2. Title: Life History Studies of Marine Fishes

   Location: Oregon Inlet, Hatteras, Ocracoke, Morehead City, North Carolina

   Description: Life history studies involving age-growth, reproduction, maturation, spawning, movements, migrations, food and ecology.

   Starting Date: 1958 Completion Date: Continuing

3. Title: The Abundance, Exploitation, Migration, and Propagation of the Dolphin, Coryphaena Hippurus in North Carolina

   Location: North Carolina coastal area

   Description: Study and evaluation of the local abundance, the rate of exploitation, the survival and mortality rates, growth, movements, and habits of the dolphin off the North Carolina coast. The migration and movements of this species in the western Atlantic and Caribbean will also be investigated. Fish cultural studies will be made on the dolphin at Hatteras, North Carolina, and at a selected site in the tropical area in regard to rearing techniques, diets, food conversion and growth.

   Starting Date: 1970 Completion Date: 1975

Dr. John E. Hobbie

1. Title: Activities of Heterotrophic Bacteria in Subarctic Lakes and Oceans

   Location: Norwegian Institute for Water Research, Oslo

   Description: The mode of life and survival mechanisms of open ocean and subarctic lake bacteria will be compared. If both are the same, as is likely from the rigor of these environments, then it would be much easier and more efficient to follow the lake bacteria.

   Starting Date: 1971 Completion Date: 1972

Dr. John E. Hobbie and Dr. B. J. Copeland

1. Title: Nutrients and Eutrophication in a North Carolina Estuary

   Description: See Dr. B. J. Copeland for description.

2. Title: Nutrient Budgets for North Carolina Estuaries

   Description: See Dr. B. J. Copeland for description.

Dr. Garland Pardue

1. Title: Effects of Stream Channelization and Drainage on Fish and Wildlife

   Location: North Carolina State University and streams in eastern North Carolina

   Description: This is an ecological study of the effects of stream channelization and wetland drainage on fish and wildlife. It is the first phase of a two-phase project and will be carried out prior to construction. Subsequent to the drainage, a second phase project will be conducted.

   Starting Date: 1971 Completion Date: 1974

School of Design

Department of Landscape Architecture

Mr. Joseph A. Porter

1. Title: Park Development and Recreation in the Yadkin R. Valley

   Location: Yadkin R. Valley in Davie, Davidson and Rowan Counties

   Description: Use of P.L. 566, pending scenic rivers and farmland taxation legislation to create regional recreation facilities.

   Starting Date: 1971 Completion Date: 1971

Schools of Engineering and Agriculture and Life Sciences

Department of Biological and Agricultural Engineering

Professor David H. Howells

1. Title: Director, Water Resources Research Institute

Location: Raleigh, North Carolina

Description: An intercampus program of the Consolidated University of North Carolina for the promotion and support of multidisciplinary research on water problems of North Carolina and coordination of research and educational programs dealing with water resources.

Starting Date: 1965 Completion Date: Continuing

Dr. Frank J. Humenik

1. Title: Animal Waste Characterization and Disposal

Location: North Carolina State University at Raleigh

Description: Model field lagoons for anaerobic treatment of swine waste will be investigated with the view of developing sound operational and design criteria.

Starting Date: 1969 Completion Date: 1971

2. Title: Design Criteria for Swine Waste Treatment Systems

Location: North Carolina State University at Raleigh

Description: Model field treatment systems are being studied to provide specific information for the development of design criteria for anaerobic lagoons, series lagoons, aerated lagoons and land application of lagoon wastewater.

Starting Date: 1971 Completion Date: 1973

3. Title: Biological Treatment and Utilization of Agricultural, Processing and Municipal Wastes

Location: North Carolina State University at Raleigh

Description: Biological methods for the removal and conservation of waste nutrients for ultimate conversion of harvested biomass into a suitable food or feed supplement are being investigated.

Starting Date: 1969 Completion Date: 1974

Dr. George J. Kriz

1. Title: Evaluation of Water Supply on the Outer Banks (In cooperation with U.S. Geological Survey)

   Location: Raleigh and North Carolina coast

   Description: Analog modeling of fresh water supply of the Outer Banks as a basis for determination of available supply and criteria for safe yield to avoid overdraft and salt-water intrusion.

   Starting Date: 1968 Completion Date: 1971

2. Title: Water Level Control in Coastal Plain Soils

   Location: Lower Coastal Plain in North Carolina

   Description: Development of criteria for subsurface irrigation in the Coastal Plain in the interest of improved water management for both organic and mineral soils.

   Starting Date: 1968 Completion Date: 1971

3. Title: Land Development and Water Management of Lower Coastal Plain Soils

   Location: Raleigh and eastern North Carolina

   Description: To develop criteria for land development and efficient water management in the lower Coastal Plains so that production is increased, costs and labor requirements are reduced, and conservation practices are adaptable to farming operations.

   Starting Date: 1968 Completion Date: 1973

Dr. R. Wayne Skaggs

1. Title: Hydraulic Properties of North Carolina Coastal Plain Soils and Their Relation to Drainage Design Criteria

   Location: North Carolina

   Description: To investigate water movement into and through the soil in order to develop criteria for drainage requirements of crops with special emphasis on the North Carolina Coastal Plain soils so that efficient water management can be practiced.

   Starting Date: 1969 Completion Date: 1974

Dr. R. Wayne Skaggs, C. R. Willey and Douglas Sanders (Horticultural Science)

1. Title: An Evaluation of the Use of Waste Heat for Soil Warming in the Southeast

Location: Clayton, North Carolina

Description: An evaluation will be made of the amount of heat from the cooling waters of electric generating plants that can be transferred to the soil system during all seasons of the year and of the extent to which the soil environment and the production of crops can be modified by soil warming.

Starting Date: 1971 Completion Date: 1972

Dr. Ronald Sneed and Dr. Conrad H. Miller (Horticultural Science)

1. Title: Crop Response of Cucumbers, Okra, Pepper, Southern Peas, and Tomatoes to Irrigation

Description: See Dr. Conrad H. Miller, et al, Department of Horticultural Science, for description.

Dr. R. E. Sneed, Dr. D. C. Sanders, Dr. C. H. Miller, and Dr. G. R. Hughes (Horticultural Science), and Dr. N. C. Miller, Jr. (Food Science)

1. Title: Low Volume Irrigation on Vegetable Crops

Description: See Dr. D. C. Sanders, et al, Department of Horticultural Science, for description.

Dr. Ronald Sneed, Mr. V. H. Underwood, Dr. W. B. Nesbitt (Horticultural Science), Dr. G. A. Cummings (Soil Science), and Dr. D. D. Mason (Statistics)

1. Title: Muscadine Grape Irrigation and Cultural Practices Study

Description: See Dr. V. H. Underwood, et al, Department of Horticultural Science, for description.

Dr. Ronald E. Sneed and Dr. Robert S. Sowell

1. Title: Agricultural Water Demand in North Carolina: Phase I

Location: Raleigh, North Carolina

Description: This is an exploratory phase of an effort to develop computer models (1) to determine water requirements for a given level of agricultural activity in a specified area and (2) to determine, for a given quantity of water available to

agriculture in a specified area, the optimum level of agricultural activity. The availability of sufficient data for the proposed models will be evaluated in this first phase of the study.

Starting Date: 1971 Completion Date: 1972

Dr. Cliff R. Willey

1. Title: Drainage Requirements of Crops on Coastal Plains Soils with Restricted Rooting Depth

Location: Upper Coastal Plains Research Center, Rocky Mount, North Carolina

Description: The reduction in yield caused by temporary flooding of the root zone of various crops during three stages of growth will be investigated on a field with a severe plowpan condition. Plots will be flooded several days, depending on the rate of development of oxygen deficiency in the root zone.

Starting Date: 1971 Completion Date: 1973

Dr. Ralph E. Williamson

1. Title: The Influence of Root Physiology and Morphology on Plant Response to Aeration

Location: Raleigh, North Carolina

Description: Experiments are conducted to ascertain the physiological, morphological, and cytological changes that occur in roots under conditions of poor aeration. An attempt is being made to define poor aeration in terms of the level of oxygen and carbon dioxide. Some experiments are conducted to determine the length of time that roots can tolerate inadequate soil oxygen and excess carbon dioxide without permanent damage to the root system.

Starting Date: 1964 Completion Date: 1971

2. Title: Effect of Water Table Depth on Crop Performance

Location: Raleigh, North Carolina

Description: Crop plants are grown in the field in lysimeters which hold one or more cubic yards of soil. The lysimeters are protected from rain by automatic movable shelters. Water table depths are maintained at 6-12-18-24-30-36 and 40 inches below the soil surface during the growing season. Certain measurements such as the soil moisture content, oxygen, diffusion rate in the root zone and oxygen partial pressure are made. Yields both as to quantity and quality are determined.

Starting Date: 1963 Completion Date: 1971

Dr. Edward H. Wiser

1. Title: Water Balance Ahoskie Creek

Location: Bertie County, North Carolina

Description: See Project No. 1 under SCS-USDA for description.

Starting Date: 1965 Completion Date: Continuing

2. Title: Factors Affecting Water Yields from Small Watersheds and Shallow Ground Aquifers

Location: North Carolina State University

Description: The objectives are (1) to correlate runoff rates and yields to watershed characteristics and climatic conditions, and (2) to correlate shallow groundwater yields to site and climatic conditions. Approach: the water balance of the small tributaries of Ahoskie Creek will be investigated including measurement of soil moisture content and water table heights. A limited amount of work will be done on improved computer storage and retrieval procedures. A conceptual framework for computer model will be developed; this may include detailed studies of aspects sufficiently well understood for conceptualization. Computer models will be developed although digital techniques will be emphasized. Possibilities in the use of analog and hybrid computers will be experienced.

Starting Date: 1969 Completion Date: 1972

School of Engineering

Department of Chemical Engineering

Dr. Harold Hopfenberg

1. Title: Water Treatment by Membrane Ultrafiltration

Location: North Carolina State University at Raleigh

Description: The effect of solute asymmetry on flux-limiting concentration polarization in aqueous ultrafiltration processes is studied in an attempt to improve membrane separations for pollution abatement.

Starting Date: 1969 Completion Date: 1972

Dr. V. T. Stannett and Dr. H. B. Hopfenberg

1. Title: Preparation and Properties of Grafted and Polyblended Membranes for Desalination

   Location: Raleigh, North Carolina

   Description: Research on novel methods of membrane preparation and modification for use in reverse osmosis process for purification of saline waters.

   Starting Date: 1967 Completion Date: 1971

Department of Civil Engineering

Dr. Michael Amein, Dr. C. E. Knowles (Department of Geosciences), Dr. Robin P. Gardner (Nuclear Engineering)

1. Title: Water Flow Through Coastal Inlets

   Location: North Carolina State University at Raleigh

   Description: Measurement of water velocity and discharge through tidal inlets. Development and testing of mathematical models for inlet flows.

   Starting Date: 1970 Completion Date: 1975

Dr. Michael Amein and Dr. N. E. Huang (Department of Geosciences)

1. Title: Circulation and Diffusion Through Estuarine Waters

   Location: Raleigh, North Carolina

   Description: Study of circulation and diffusion in estuaries and sounds by arithmetical models and testing of the models with measured field data.

   Starting Date: 1970 Completion Date: 1975

Dr. Michael Amein

1. Title: Circulation in Pamlico Sound

   Location: Raleigh, North Carolina

   Description: Study of circulation of inflows and outflows and wind in Pamlico Sound, North Carolina.

   Starting Date: 1969 Completion Date: 1971

2. Title: Development of Operational Programs for Numerical Flood Routing in Rivers and Reservoirs

Location: Raleigh, North Carolina

Description: Development of computer program for routing flood flows through river channels and reservoirs. The programs will be based on the numerical solution of the equations of unsteady flow.

Starting Date: 1970 Completion Date: 1972

Dr. Newton V. Colston, Jr.

1. Title: Characterization and Treatment of Urban Runoff

Location: Raleigh and Durham, North Carolina

Description: The purpose of this research is to evaluate urban runoff pollutant yields, its effect upon water quality management objectives, and the potential of physiochemical treatment of urban runoff.

Starting Date: 1971 Completion Date: 1973

Dr. William S. Galler

1. Title: Interdisciplinary Study of Water Quality and Pollution Abatement

Location: NASA, Langley Research Center, Hampton, Virginia

Description: Interdisciplinary systems engineering design for a water quality and pollution abatement model.

Starting Date: 1971 Completion Date: 1971

Dr. William S. Galler and Dr. Charles B. Davey (Departments of Forestry and Soil Science)

1. Title: Animal Waste Composting with Carbonaceous Material

Location: Raleigh, North Carolina

Description: Combining of two waste products (poultry manure and sawdust) and composting by means of aerobic-thermophilic process to produce soil amendment.

Starting Date: 1968 Completion Date: 1971

Dr. Jerry L. Machemehl

1. Title: Coastal Erosion

Location: North Carolina

Description: Preparation of Chapter 10 of North Carolina Water Plan for State Planning Officer.

Starting Date: 1971 Completion Date: 1972

Professor Charles Smallwood, Jr., and Dr. N. V. Colston, Jr.

1. Title: Water and Waste Management in Sweet Potato Processing

Location: Civil Engineering Department, NCSU, Raleigh, N. C.

Description: A reduction in a liquid waste by using dry caustic peeling to produce a semi-solid waste in the sweet potato industry.

Starting Date: 1971 Completion Date: 1973

Professor Charles Smallwood, Jr.

1. Title: Urban Erosion as a Source of Pollution

Location: Civil Engineering Department, NCSU, Raleigh, N. C.

Description: Examination of the feasibility of several kinds of economic penalties to control erosion resulting from urban development, such as road construction and shopping centers.

Starting Date: 1970 Completion Date: 1973

2. Title: Pollution of Shellfish Waters by Agricultural Runoff

Location: North Carolina State Board of Health

Description: Study to develop background information on compatibility of agricultural and aquacultural development in contiguous land-water areas. (Newport River)

Starting Date: 1971 Completion Date: 1972

3. Title: The Relative Amounts of Fresh Water from Surface and Subsurface Runoff to Flow in North Carolina Estuaries

Location: Civil Engineering Dept., N. C. State Univ. at Raleigh

Description: L. Hall will be intern with U.S. Geological Survey during SS 1971 to initiate studies of methodology for a complex hydrological regime.

Starting Date: 1971 Completion Date: 1972

Dr. C. C. Tung and Dr. J. F. Ely

1. Title: Reliability Analysis and Optimum Design of Marine Structures

Location: North Carolina State University at Raleigh

Description: Safety analysis and design of marine structures under the action of wind, wave and currents.

Starting Date: 1971 Completion Date: 1972

Department of Engineering Research

Mr. Edwin H. Bentzen, III

1. Title: Qualitative Analysis of North Carolina Mineral Industries' Tailings

Location: Minerals Research Laboratory, Asheville, N. C.

Description: Spectroscopically examine tailing samples from mineral processing plants in North Carolina.

Starting Date: 1971 Completion Date: Continuing

Mr. J. Philip Neal

1. Title: North Carolina Feldspar Evaluation

Location: Minerals Research Laboratory, Asheville, North Carolina

Description: Appraisal of waste from granite quarries for feldspar content, plus end-use of feldspar, quartz, and fines.

Starting Date: 1967 Completion Date: Continuing

Department of Nuclear Engineering

Professor J. R. Bohannon, Jr.

1. Title: Study of In-line Paper Mill Process Variables

Location: Weyerhaeuser Paper Company, Plymouth, North Carolina

Description: A complete study using N.A.A. to follow paper mill process variables from point of entry to mill effluent for budgetary, product control, and pollution purposes.

Starting Date: 1967 Completion Date: Continuing

2. Title: NAA Measurement of Mercury in Water Supplies

Location: North Carolina

Description: NAA measurement of mercury in industrial wastes and in river water in order to help certain types of industries control their mercury pollution problems.

Starting Date: 1970 Completion Date: Continuing

Dr. Robin P. Gardner, Dr. Michael Amein (Civil Engineering), and Dr. C. E. Knowles (Geosciences)

1. Title: Water Flow Through Coastal Inlets

Description: See Dr. Michael Amein, et al, Department of Civil Engineering, for description.

School of Forest Resources

Department of Forestry

Dr. Charles B. Davey and Dr. William S. Galler (Department of Civil Engineering)

1. Title: Animal Waste Composting with Carbonaceous Material

Description: See Dr. William S. Galler, Department of Civil Engineering, for description.

Mr. L. Wayne Haines

1. Title: Effect of Forest Fertilization on Water Quality and Yield

Location: Wake County, North Carolina (Schenck Memorial Forest); Durham County, North Carolina (Hill Forest)

Description: The study is investigating the influence of nitrogen (N) and phosphorus (P) fertilizers applied to forests, at current operational levels, on water quality (N and P content) and yield.

Starting Date: 1971 Completion Date: Continuing

Dr. T. Ewald Maki

1. Title: Drainage, Site Preparation and Site Improvement in Relation to Regeneration of Marketable Tree Species and Development of Stands on Pocosin Lands

Location: Hofmann Forest, Onslow and Jones Counties, N. C.

Description: Evaluation of the effects of physical treatments, including ditching, disking, bedding, and burning, and various chemical treatments such as liming and fertilizing on the rhizosphere, on the changes in native vegetation, on water-table behavior and on the survival, initial growth and development of seedlings, saplings, and pole stands of pines and hardwoods.

Starting Date: 1962 Completion Date: Continuing

2. Title: Relative Productivity of Lower Piedmont Sites for Pines or Hardwoods

Location: Mainly Hill and Hope Valley Forests, Durham and Chatham Counties, but also on industry lands

Description: Assessment of site quality in relation to establishment and growth of different species of pine and hardwood, and the influence of vegetation control and site preparation and improvement measures on soil moisture, particularly during the critical stand establishment period.

Starting Date: 1958 Completion Date: Continuing

3. Title: Water Quality and Yield in Relation to Silvicultural Treatments

Location: Hill Forest (Durham County) and Schenck Memorial Forest (Wake County)

Description: Exploration of possible changes in water quality and yield from small watersheds in response to silvicultural treatments such as thinnings, stand conversion, fertilization, prescribed burning, and the like.

Starting Date: 1968 Completion Date: Continuing

4. Title: Effect of Inundation and Deer-browsing on Hardwood Regeneration in the Roanoke River Bottomlands

Location: Halifax and Bertie Counties, North Carolina (A) joint study by the Forestry Extension and Forestry Departments of North Carolina State University

Description: The study is investigating the relative influence of the changed water regimes imposed on Roanoke River bottomlands by Kerr Dam and the browsing of a very heavy deer herd on the establishment and growth of hardwood timber. Three forest stand conditions, tupelo-cypress-swamps, ash flats, and sweetgum sites are being studied by comparing regeneration protected from the deer herd with those exposed to browsing.

Starting Date: 1963 Completion Date: Continuing

5. Title: Bedding, Ditching, and Fertilizing Effects on Establishment and Growth of Pines on Wetland Sites

Location: Hofmann Forest, Jones and Onslow Counties, North Carolina

Description: Experiments will be installed mainly with loblolly and pond pine to test the effects of degree of drainage, microsite alteration through bedding, and site quality

manipulation through fertilization on the survival and initial growth of the pine species. Water-table behavior will be determined by means of plastic well pipes, sufficiently perforated to reflect changes readily in water levels.

Starting Date: 1970 Completion Date: 1972

Dr. T. Ewald Maki with Dr. W. L. Hafley, Dr. J. O. Lammi and Dr. Donald H. J. Steensen

1. Title: Effects of Changes in Land Use on Water Yields from Municipal Watersheds

Location: Durham Watershed

Description: Economic evaluation of the effects of changing land use and land treatment on increases in water yield and quality from a forested municipal watershed.

Starting Date: 1968 Completion Date: 1972

Recreation Resources Administration

Professor Gordon A. Hammon

1. Title: Development of a System Determining the Capacity of Water Resources to Support Various Types and Combinations of Recreation Use

Location: North Carolina State University at Raleigh

Description: Capacity as evidenced by visitor satisfaction and behavioral patterns under different degrees of use intensity will be interpreted and will suggest the consequences of administrative alternatives as they may affect the capacity/intensity relationship.

Starting Date: 1968 Completion Date: 1971

Department of Wood and Paper Science

Dr. H. M. Chang and Dr. Ellis B. Cowling (Plant Pathology)

1. Title: The Structure of Lignin in Relation to the Morphology of the Cell Wall

Description: See Dr. Ellis B. Cowling, et al, Department of Plant Pathology, for description.

Dr. William T. McKean, Jr.

1. Title: Oxidation of Sulfur and Organic Sulfur Compounds in Kraft Pulping

Location: Raleigh, North Carolina

Description: This study is directed toward in-plant and water pollution control.

Starting Date: 1969 Completion Date: 1972

Professor Charles N. Rogers

1. Title: Water Reuse in Pulp and Paper Manufacturing

Location: North Carolina State University

Description: Determine the extent to which water contaminants can be accommodated in water using pulp and paper unit processing operations.

Starting Date: 1970 Completion Date: 1972

School of Liberal Arts

Department of Politics

Dr. Jackson M. McClain

1. Title: Application of Program Budgeting to Natural Resources

Location: North Carolina State University

Description: An effort to define in relatively concrete terms programs in natural resources and to apply modern budgetary techniques in establishing policy and financing resource programs by priority.

Starting Date: 1971 Completion Date: 1973

School of Physical Sciences and Applied Mathematics

Department of Chemistry

Dr. Kenneth Hanck

1. Title: Effect of Organic Pollutants on the Chelation Capacity of Natural Waters

Location: Piedmont Region of North Carolina

Description: Development of analytical procedures for measuring the chelation capacity of natural water. Examination of natural water samples to determine if chelation capacity has been adversely affected by man.

Starting Date: 1971 Completion Date: 1972

Department of Statistics

Dr. Don W. Hayne, Mr. David W. Turner and Mr. Paul H. Geissler

1. Title: Consulting on Fisheries Problems

Location: On campus, North Carolina State University, and throughout ten Southeastern States

Description: The Southeastern Cooperative Fish and Game Statistics Project, a unit of the Institute of Statistics, services the statistical needs of member states insofar as fisheries (and game) projects are concerned. Many problems in aquatic biology are covered. These are of wide variety covering fisheries biology and management, physical and biological limnology and the ecology of aquatic fauna and flora. The largest category of problems is concerned with the appraisal of sport fishing, both fresh water and marine.

Starting Date: 1959 Completion Date: Continuing

Dr. D. D. Mason, Dr. G. A. Cummings (Soil Science), Dr. Ronald E. Sneed (Bio & Ag Engineering), Dr. V. H. Underwood, and Dr. W. B. Nesbitt (Horticulture Science)

1. Title: Muscadine Grape Irrigation and Cultural Practices Study

Description: See Dr. V. H. Underwood, et al, Department of Horticultural Science, for description.

Department of Geosciences

Mr. Albert V. Hardy

1. Title: Weekly Precipitation Probabilities, North Carolina Stations

Location: State Climatologist's Office

Description: Plan to compute probabilities of precipitation amounts for standard calendar weeks for all North Carolina stations having sufficient record; to be used to supplement

present monthly normals. The weekly normals will be useful in planning for farm activity such as planting and harvesting dates and for planning other outdoor activity.

Starting Date: 1967 Completion Date: Continuing

Dr. N. E. Huang and Dr. Michael Amein (Civil Engineering)

1. Title: Circulation and Diffusion Through Estuarine Waters

Description: See Dr. Michael Amein, et al, Department of Civil Engineering, for description.

Dr. C. E. Knowles

1. Title: Beach Equilibrium Processes and Stabilization

Location: North Carolina State University

Description: A statistical study of the equilibrium of beach slopes and movement of water in the sand is being explored.

Starting Date: 1971 Completion Date: 1972

Dr. C. E. Knowles, Dr. Michael Amein (Civil Engineering), and Dr. Robin P. Gardner (Nuclear Engineering)

1. Title: Water Flow Through Coastal Inlets

Description: See Dr. Michael Amein, et al, Department of Civil Engineering, for description.

Dr. Walter J. Saucier and Dr. Allen Weber

1. Title: Precipitation Variability over North Carolina

Location: North Carolina State University at Raleigh

Description: Variabilities of rainfall in space and time over North Carolina are being determined for obtaining improved descriptions of rainfall events as they bear on water supply and the variable effects of evaporation.

Starting Date: 1971 Completion Date: 1972

Dr. Charles W. Welby

1. Title: Model and Probability Study of Groundwater in Crystalline Rocks

Location: Raleigh, North Carolina

Description: Model is being constructed to study relations between recharge to groundwater and well yields in different geologic and geomorphic situations. Published data as well as model studies are being evaluated in probability terms.

Starting Date: 1968 Completion Date: 1971

School of Textiles

Department of Textile Chemistry

Dr. Carl E. Bryan

1. Title: Survey of the Literature on Colored Wastes from Dyestuffs

Location: School of Textiles, North Carolina State University

Description: Objectives are to prepare a survey of scientific and technical literature on colored wastes discharged as effluents by the textile, paper and tanning industries; to prepare a survey of statutes, regulations, and court decisions regarding the discharge of these colored wastes; to establish a clearing house for the dissemination of unpublished information about research and development activities in the area of colored wastes.

Starting Date: 1971 Completion Date: 1971

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

CONSOLIDATED UNIVERSITY OF NORTH CAROLINA

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

College of Arts and Sciences

Department of Botany

Dr. Max H. Hommersand

1. Title: Growth and Ecological Adaptation of Monodus from Sewage Treatment Plants at Morehead City, North Carolina

Location: Morehead City, North Carolina

Description: Culturing and laboratory studies on growth of Monodus under a variety of conditions, responding to a range of environmental parameters including: light density, light quality, carbon dioxide, pH, temperature, salinity, and nutrients growing.

Starting Date: 1970 Completion Date: 1972

Dr. Max H. Hommersand and Charles F. Rhyne

1. Title: Growth, Life History and Ecological Adaptations of Species of Ulva

Location: Chapel Hill and Morehead City, North Carolina

Description: A comparative morphological, taxonomic and life history study is being carried out on species of Ulva and Enteromorpha, growing in artificial ponds supplied with treated sewage effluent or occurring in eutrophic water of Calico Creek, Morehead City, North Carolina. Emphasis is being placed on experimental investigations concerning the induction of internal physiological conditions leading to reproduction.

Starting Date: 1968 Completion Date: Continuing

Dr. J. Frank McCormick

1. Title: Ecological Inventory of Bald Head Island

Location: Smith Island Complex, North Carolina

Description: Analysis of the structure and metabolism of natural ecosystems will follow an inventory of species and community composition and distribution. Maps will be prepared for topography, water table, vegetation and environmental gradients.

Starting Date: 1969 Completion Date: 1974

Department of Chemistry

Dr. Richard P. Buck

1. Title: Electrical Properties of Specific Ion Electrodes

   Location: Chapel Hill, North Carolina

   Description: Characterization of crystals used as specific ion electrodes. Impedance of membranes used in membrane electrodes.

   Starting Date: 1968 Completion Date: 1972

Dr. James L. Coke

1. Title: Organochlorides in Aquatic Ecosystems of North Carolina

   Location: University of North Carolina at Chapel Hill

   Description: Project to examine biological monitoring systems for persistent organochlorides in streams of North Carolina in order to devise a continuous comprehensive survey system for river basins.

   Starting Date: 1970 Completion Date: 1972

Department of Geography

Dr. Arthur J. Hawley

1. Title: The Present and Future Status of North Carolina's Wetlands

   Location: Geography Department, UNC, Chapel Hill

   Description: A review of various points-of-view about what "wetlands" are, leading to an adequate definition and classification system. Present uses of wetland areas will be assessed and changes occurring inventoried as a basis for recommendations.

   Starting Date: 1971 Completion Date: 1972

2. Title: The Growth and Diffusion of Irrigation in the Humid Eastern United States since 1939

   Location: Geography Department, UNC, Chapel Hill

   Description: (1) Cartographically and statistically identify and determine the threshold values of critical factors associated

with this growth. (2) Develop a simulation model to project this growth and the resulting water use patterns into the future.

Starting Date: Continuing Completion Date: Continuing

3. Title: Farm Ponds in the United States--A New Resource or Environmental Hazard?

Location: Geography Department, UNC, Chapel Hill

Description: Determine the distribution and uses of farm ponds throughout the U.S. and examine their roles in rural landholdings. Special attention will be given to both positive and negative aspects of pond construction, especially those unplanned.

Starting Date: 1970 Completion Date: 1971

Dr. Richard J. Kopec

1. Title: The Effects of a Small Town on the Hydroclimate

Location: Chapel Hill, North Carolina

Description: Automobile traverses during the four seasons will be conducted in order to measure the absolute and relative humidities in and around Chapel Hill. The distribution of humidity values will be mapped, analyzed and related to the region's macroclimate.

Starting Date: 1971 Completion Date: 1973

Department of Geology

Dr. Roy L. Ingram

1. Title: Erosion and Deposition in Sounds of the North Carolina Coast

Location: Chapel Hill and Morehead City, North Carolina

Description: Predictions of future sites of erosion and deposition based on geological studies of sediments, analyses of aerial photographs, and current measurements.

Starting Date: 1970 Completion Date: 1975

Dr. Paul C. Ragland

1. Title: Trace Elements in Ground Water

Location: North Carolina

Description: Use of trace elements for geochemical prospecting.

Starting Date: 1965 Completion Date: Continuing

Dr. Daniel A. Textoris

1. Title: Petrology of the Castle Hayne Fm. and Related Aquifer Rocks, North Carolina

Location: Vicinity of Castle Hayne to New Bern, North Carolina

Description: After field samples are taken, the rocks will be studied by thin section analysis, X-ray diffraction, and Cathode luminescence to determine the disgenesis of the limestone. The unit is an important aquifer, and realization of how and why the permeability and porosity developed can lead to better control and development of the water.

Starting Date: 1966 Completion Date: 1972

Dr. Joel Watkins and Dr. Virgil Mann

1. Title: Geophysical Survey of Sedimentary Rocks

Location: University of North Carolina at Chapel Hill and Northeastern North Carolina

Description: Geophysical survey of the sedimentary rocks underlying the sounds in the northeast portion of the state. Such work can lead to the identification of geological structures that are potential oil reservoirs.

Starting Date: 1970 Completion Date: Continuing

Department of Zoology

Dr. Charles E. Jenner

1. Title: Environmental Control of Seasonal Activity--Seasonal Distribution of Marine Zooplankton

Location: Chapel Hill, North Carolina

Description: Effect of photo-periodism on the growth and reproduction of various aquatic insects.

Starting Date: 1950 Completion Date: Continuing

Dr. Alan E. Stiven

1. Title: Population Processes of Macrodecomposers in Fresh Water Flowing Systems and Marine Salt Marshes

   Location: Chapel Hill, North Carolina

   Description: Comparative analysis of the dynamics, genetics, and energetics of gastropod populations in a gradient of heterogeneous discrete environments; aim is to isolate the intra and inter population control mechanisms and determine the gastropod-detrital processes and impact on stream and salt marsh ecosystems.

   Starting Date: 1966 Completion Date: Continuing

Dr. Rupert J. Riedl

1. Title: Studies on the Marine Sand Biome

   Location: North Carolina Coast

   Description: A study of the faunistics and ecology and physiology of the sand-living animals on the North Carolina Coast and other areas.

   Starting Date: 1969 Completion Date: Continuing

Graduate School

Center for Urban and Regional Studies

Professor Shirley F. Weiss, Dr. Edward J. Kaiser, Dr. R. J. Burby, III, and Dr. Thomas G. Donnelly

1. Title: New Town Development--Convergence of Concept and Reality

   Location: Center for Urban and Regional Studies

   Description: An exploratory study of new town development as a healthful and viable alternative to other forms of planned or unplanned growth. The relationship between reservoir access.

   Starting Date: 1969 Completion Date: 1971

Professor Shirley F. Weiss, Dr. Raymond J. Burby, III, and Dr. Thomas G. Donnelly

1. Title: The Effects of Authorization for Water Impoundments on Shore Land Transition

   Location: Center for Urban and Regional Studies

   Description: Study involves the identification of original landowners at the time of reservoir authorization and the attempt to determine the factors affecting land transitions (ownership, value, and utilization) prior to impoundment. The purpose of the study is to develop and test a model to predict short-term changes in land ownership, land value, and land utilization and to work out a system for monitoring the changes as they occur.

   Starting Date: 1970 Completion Date: 1973

Department of City and Regional Planning

Dr. David H. Moreau

1. Title: Planning of Regional Water Resource Systems for Urban Needs

   Location: UNC, Chapel Hill, North Carolina

   Description: A case study of water resources planning in the urbanizing area of the North Carolina Piedmont.

   Starting Date: 1970 Completion Date: 1972

2. Title: Evaluation of an Urban Information System

   Location: Charlotte, North Carolina

   Description: An urban information system under construction for the City of Charlotte, North Carolina, is being evaluated with respect to its capacity to serve the emerging needs of urban water resource planners and managers.

   Starting Date: 1970 Completion Date: 1973

Institute of Marine Sciences

Dr. A. F. Chestnut (Director)

1. Title: Estuarine Monitoring Program

   Location: Coastal area of North Carolina

Description: Eighteen stations selected in various salinity levels in the estuary will be sampled at monthly intervals to determine measurable residues of chlorinated hydrocarbons in oysters, clams, fish and plankton samples. Chemical analyses will be made at Department of Interior, Bureau of Commercial Fisheries Biological Laboratory, Gulf Breeze, Florida.

Starting Date: 1966 Completion Date: Continuing

2. Title: An Updated "Survey of Marine Fisheries"

Location: Coastal North Carolina

Description: Production of a new synopsis of marine fisheries and resources of North Carolina. Biology, life history, distribution of species with descriptions of methods of capture and catch statistics will be included. Appropriate specialists will contribute to the many aspects relating to marine fisheries and resources.

Starting Date: 1970 Completion Date: Continuing

Dr. A. F. Chestnut and Professor Hugh J. Porter

1. Title: Development of Aquaculture Techniques

Location: Coastal North Carolina

Description: The objectives are to develop techniques for mass culture of specific species of commercial value that are of importance and readily marketed in local fisheries. Initial studies will be centered upon sedentary species such as oysters, clams and scallops. These will be expanded later to include shrimp, stone crabs and selected species of fish.

Starting Date: 1970 Completion Date: 1973

Dr. A. F. Chestnut, E. J. Kuenzler, C. M. Weiss, C. Jenner, A. B. Williams, M. Hommersand, W. J. Woods, A. Stiven, J. D. Johnson, and E. McMahan

1. Title: Optimum Ecological Designs for Estuarine Systems of North Carolina

Location: Institute of Marine Science, Morehead City, N. C.

Description: A study of the self-design process in experimental marine ponds toward the aim of establishing new ecological combinations capable of mineralizing the river wastes of urban North Carolina and providing alternative new types of food harvest.

Starting Date: 1968 Completion Date: Continuing

Dr. William E. Fahy

1. Title: Experimental Study of Influence of Environmental Factors on Developing Skeleton of Marine Fishes

   Location: Morehead City, North Carolina

   Description: Ova from female Fundulus majalis (Cyprinodontidae; Teleosts) are fertilized and placed in incubation apparatus. Different constant temperatures and different fluctuating temperature regimes are utilized to discover nature, time and extent of response of skeletal structures (vertebrae, fin rays, scales and other meristic elements to them). Proper statistical procedures are used to evaluate results.

   Starting Date: 1960 Completion Date: Indefinite

Dr. Jan J. Kohlmeyer

1. Title: Morphological and Taxonomical Studies of Marine Fungi

   Location: Mainly United States East Coast

   Description: All species of higher marine fungi are examined microscopically and are illustrated. Taxonomy of these organisms is reevaluated.

   Starting Date: Continuing Completion Date: Continuing

2. Title: Survey of Distribution of Marine Fungi in the Tropics

   Location: Tropical and Subtropical Oceans

   Description: Higher marine fungi from tropical habitats, especially from mangrove stands are identified. Their geographical distribution and ecological importance are determined.

   Starting Date: Continuing Completion Date: Continuing

3. Title: Study of Algicolous Marine Fungi

   Location: U.S. East and West Coasts (and herbarium studies)

   Description: Parasitic, saprophytic, and symbiotic fungi from algae are identified and described. The role of fungi in the degradation of the hosts is examined.

   Starting Date: Continuing Completion Date: Continuing

Professor Hugh J. Porter

1. Title: Ecological Study of the Hard Clam (Mercenaria) Populations in North Carolina Waters

   Location: Bogue Sound, Core Sound and Coastal Waters Off Shackleford Banks

   Description: Morphometric characteristics of two species and their intergrades in nature are being investigated; gonadal cycles in relation to time and temperature are followed; factors influencing hatchery culture of juvenile stocks are being investigated.

   Starting Date: Continuing Completion Date: Continuing

2. Title: Survey of Marine and Estuarine Mollusca in North Carolina Waters

   Location: All marine and brackish water areas in North Carolina

   Description: Permanent catalogued collections of North Carolina mollusca are established at the Institute. Additions are made from collecting trips in brackish and marine areas from ecological investigators. This collection will aid in a published list of North Carolina mollusca with their known North Carolina range.

   Starting Date: Continuing Completion Date: Continuing

3. Title: Investigation on Setting Behavior of Commercial Oysters

   Location: North Carolina estuaries

   Description: The distribution and intensity of oyster setting throughout the potential oyster growing areas of North Carolina, but particularly in Bogue Sound, is being monitored. Possible environmental conditions influencing setting are being investigated.

   Starting Date: Continuing Completion Date: Continuing

4. Title: Study of the Genus Busycon

   Location: Bogue Sound in North Carolina

   Description: Members of the genus living in marine waters of the Carolinas are being reared in tanks at the Institute of Marine Sciences in order to learn of possible ecological and taxonomic differences between species.

   Starting Date: 1970 Completion Date: 1972

Professor Hugh J. Porter and Dr. A. F. Chestnut

1. Title: Development of Aquaculture Techniques

   Location: Coastal North Carolina

   Description: See Chestnut and Porter, University of North Carolina, for description.

   Starting Date: 1970 Completion Date: 1973

Dr. Frank J. Schwartz

1. Title: Systematics, Zoogeography, and Ecology of Marine Fishes of the Western Atlantic

   Location: North Carolina and adjacent waters

   Description: Many species are being examined for growth, food, embryology, parasites, and other aspects of their biology to better understand the species and the fish fauna of the western Atlantic. Migratory aspects are being investigated by tagging, using plastic dart tags.

   Starting Date: 1968 Completion Date: Continuing

2. Title: Fish Fauna of the Newport River Complex as Related to Present Ecological and Environmental Features

   Location: Newport River system near Morehead City, North Carolina

   Description: The fish fauna on a seasonal basis will be investigated and related to present and proposed environmental ecological conditions.

   Starting Date: 1970 Completion Date: Continuing

3. Title: Bioenergetics of Fish Fauna and Eel Grass Communities

   Location: Newport River and Adjacent Sounds

   Description: Eel grass beds are important elements as they provide a substrate for many invertebrate and vertebrate organisms. The effect on each other will be investigated with notes on the interaction with prevailing ecological conditions.

   Starting Date: 1970 Completion Date: Continuing

Dr. Austin B. Williams

1. Title: Studies on Macroplanktonic Crustaceans of the Pamlico Sound Complex

Location: Western Pamlico Sound, Pamlico River and Neuse River in North Carolina

Description: (a) Secure data on recruitment of larval forms, (b) establish index of the nature of the larval complex before possible alterations by mining and other engineering projects, and (c) analyze relationship between certain physical events and relative larval abundance.

Starting Date: 1966 Completion Date: Continuing

2. Title: A Revision of the Genus Callinectes

Location: Principal Museums in Western Hemisphere and Europe

Description: A taxonomic revision of the genus Callinectes (blue crab of commerce and its relatives) on a world-wide basis.

Starting Date: 1967 Completion Date: 1971

Dr. William J. Woods

1. Title: Studies on Hydrography and Plankton of Western Pamlico Sound

Location: Western Pamlico Sound

Description: In situ studies of primary production, nutrient enrichment experiments and analyses of various factors that influence and measure production.

Starting Date: Continuing Completion Date: Continuing

Institute of Government

Professor William A. Campbell and Professor Milton S. Heath, Jr.

1. Title: Research-scientific Classification of Waters for Pollution Control

Location: University of North Carolina at Chapel Hill

Description: Research conducted at request of the Chancellor concerning legal aspects of the proceeding pending before the State Board of Water and Air Resources to create a research-scientific classification. Includes a study of the constitutional aspects of the proposed classification.

Starting Date: 1969 Completion Date: 1972

2. Title: Legal and Administrative Aspects of Coastal Zone Management

Location: University of North Carolina at Chapel Hill

Description: Research conducted on behalf of the Commissioner of Commercial and Sports Fisheries in connection with his development of a State plan of estuarine and coastal zone management. Involves constitutional issues, problems of identifying affected land areas, and questions of administrative organization.

Starting Date: 1970 Completion Date: 1972

Professor Warren J. Wicker and Professor Milton S. Heath, Jr.

1. Title: Organizational Arrangements for Public Water Services in North Carolina

Location: Chapel Hill, North Carolina

Description: Survey of existing organizational arrangements; legal authority for the provisions of services; and development of specific organizational arrangements for selected areas in North Carolina.

Starting Date: 1963 Completion Date: Continuing

Professor Warren J. Wicker

1. Title: Pilot Study of Financing of Local Share of Beach Erosion Control Projects

Location: Brunswick County and Chapel Hill, North Carolina

Description: In meeting the local share of the cost of beach erosion control and hurricane protection projects, municipal and county governments are currently authorized to use various methods. This study will project different models.

Starting Date: 1970 Completion Date: 1971

School of Law

Professor Thomas J. Schoenbaum

1. Title: Water Pollution Control in North Carolina

Location: University of North Carolina at Chapel Hill

Description: An identification of the issues and tentative proposals for reform of North Carolina's water pollution control program.

Starting Date: 1969 Completion Date: Continuing

Dr. Seymour W. Wurfel and Thomas J. Schoenbaum

1. Title: North Carolina Marine Resources Legal Research Program

Location: University of North Carolina at Chapel Hill

Description: The research objective is to formulate an appropriate legal regime to promote North Carolina ocean exploration and to improve the capability to develop and conserve marine resources. Library and empirical research will be combined to review the adequacy of existing law; to propose a legislative program if appropriate and to assist in the development of new administrative practices if desired.

Starting Date: 1970 Completion Date: Continuing

School of Public Health

Department of Environmental Sciences and Engineering

Professor James C. Brown, Dr. James C. Lamb, III, and Dr. Lawrence L. Kupper (Department of Biostatistics)

1. Title: Improvement of Performance of Trickling Filter Plants

Location: Chapel Hill, North Carolina

Description: Development of information on techniques and design criteria to enhance the performance of trickling filter plants through optimizing operating procedures and use of techniques requiring minimum plant modification.

Starting Date: 1969 Completion Date: 1972

2. Title: Effect of Phosphorus in Detergent on Algal Growth Potential

Location: Chapel Hill, North Carolina

Description: To study the effect of phosphorus and non-phosphorus detergents on the algal growth potential of biologically and chemically treated wastewaters.

Starting Date: 1971 Completion Date: 1971

3. Title: Investigation of Curricula, Materials and Methodology for Training Operators of Wastewater Treatment Facilities

Location: Chapel Hill, North Carolina

Description: A committee study to determine operator training needs and methods.

Starting Date: 1971 Completion Date: 1972

Dr. J. Donald Johnson

1. Title: The Chemistry of Chlorine and Bromine as a Water Disinfectant

Location: Chapel Hill, North Carolina

Description: The rates of reaction of bromine in natural water are being compared with those of chlorine. Bromine and bromine products appear to be equally effective and sometimes more so compared to chlorine as a water disinfectant. The rates of reaction and decomposition of bromine and chlorine products are being studied to determine whether bromine can be expected to maintain more effective residuals for a longer period than chlorine. The rate limiting steps in halogen disinfection are being modeled by mass transport processes.

Starting Date: 1967 Completion Date: 1975

2. Title: Coordination Reactions in Estuarine Waters Using Selective-ion Electrodes

Location: Chapel Hill, North Carolina

Description: In situ as well as laboratory measurements of both metal ion and non-metals using selective-ion electrodes are being made on estuarine waters. These activity results are compared to concentrations using standard analytical methods such as colorimetric and atomic absorption techniques. Activity and concentration measurements are compared considering both non-specific ionic strength effects and specific ion association, coordination or pairing reactions to define the extent of the effective concentrations of these ions in solution.

Starting Date: 1967 Completion Date: 1972

3. Title: Water-clay Interactions in Estuarine Sediments

Location: Chapel Hill, North Carolina

Description: Pore water to bottom water ratios of cationic equivalents are being measured in an estuarine system. Comparisons are made between the exchange capacities of the clays present in the sediments as a function of extraction technique and clay mineralogy.

Starting Date: 1967 Completion Date: 1972

Dr. Edward J. Kuenzler

1. Title: Effects of Mosquito Control Ditching on Estuarine Ecosystems

Location: Morehead City, North Carolina

Description: Appraisal of ecological effects of ditching for mosquito control upon the ecology of the irregularly flooded Juncus marsh; evaluation of the effectiveness of the program for controlling mosquitoes; evaluation of changes in the marsh; study of the changes in the exchange of nutrients between the marsh and surrounding waters.

Starting Date: 1970 Completion Date: 1972

Dr. James C. Lamb, III

1. Title: Evaluation of Acute Effects of Dyes on Fish and on Growth and Photosynthetic Activities of Algae

Location: Chapel Hill, North Carolina

Description: Conduct of bioassays on 40-50 categories of dyestuffs and development of procedures for evaluating their impact on algae in biological treatment systems.

Starting Date: 1971 Completion Date: 1972

Dr. James C. Lamb, III, and Professor James C. Brown

1. Title: Improvement of Performance of Trickling Filter Plants

Description: See Dr. James C. Brown, et al, for description.

Dr. Donald T. Lauria

1. Title: Design of Small Water Supplies in Developing Countries

Location: Chapel Hill, North Carolina, and Central America

Description: Development of a mathematical model for the centralized planning of water supply systems in developing countries.

Starting Date: 1969 Completion Date: 1972

Dr. John Lyman

1. Title: Office of Marine Sciences

   Location: North Carolina

   Description: Director of Office of Marine Sciences, North Carolina, and Sea Grant Coordinator, North Carolina Institutional Sea Grant Program.

   Starting Date: 1970 Completion Date: Continuing

Professor Frederick E. McJunkin

1. Title: Associate Director, Water Resources Research Institute

   Location: Chapel Hill, North Carolina

   Description: An intercampus program of the Consolidated University of North Carolina for the promotion and support of multidisciplinary research on water problems of North Carolina and coordination of research and educational programs dealing with water resources.

   Starting Date: 1965 Completion Date: Continuing

2. Title: Special Assistant to the Director, North Carolina Department of Water and Air Resources

   Location: Raleigh, North Carolina

   Description: Coordination and liaison between academic research community and state water resources planning and research program; consultant and adviser to the Department on State Water Plan, research, and special projects.

   Starting Date: 1971 Completion Date: Continuing

3. Title: Surveillance of Drinking Water Quality

   Location: Worldwide (Chapel Hill, North Carolina)

   Description: Review, analysis, and development of methodology and protocol for insuring drinking water quality in developing countries.

   Starting Date: 1969 Completion Date: 1971

4. Title: Engineering Measures for Control of Schistosomaisis

   Location: Africa, Brazil (Chapel Hill, North Carolina)

Description: Preparation of manual on engineering measures for control of schistosomaisis in water resource development schemes in tropical countries.

Starting Date: 1971 Completion Date: 1972

5. Title: Dual Water Systems

Location: Chapel Hill, North Carolina

Description: See Project 1, Daniel A. Okun, for description.

Dr. Daniel A. Okun and F. E. McJunkin

1. Title: Dual Water Systems

Location: Chapel Hill, North Carolina

Description: To investigate the circumstances in which it would be feasible to provide two separate urban water systems--potable and for all other purposes.

Starting Date: 1969 Completion Date: 1971

Dr. Daniel A. Okun

1. Title: Regional Public Water Supply Systems

Location: Chapel Hill, North Carolina

Description: To develop a method for determining the most efficient arrangement of public water supply facilities to provide a given level of service for a region and criteria for determining when small systems should be grouped together and large systems extended.

Starting Date: 1971 Completion Date: 1972

Dr. Charles R. O'Melia

1. Title: The Role of Polyelectrolytes in Filtration Processes

Location: School of Public Health, UNC, Chapel Hill, N. C.

Description: A mathematical model for removal efficiency in filtration has been developed. Experiments are being conducted using idealized suspensions and secondary effluent to test this model.

Starting Date: 1970 Completion Date: 1972

2. Title: Adsorption of Hydrolyzed Metal Ions at Solid-solution Interfaces

Location: Chapel Hill, North Carolina

Description: Adsorption of hydrolyzed metal ions at solid-solution interfaces occurs in most natural systems and in many water and waste-water treatment processes. This research deals with the mechanisms of the process. A model has been developed and is being tested.

Starting Date: 1969 Completion Date: 1972

3. Title: Coagulation in Estuaries

Location: UNC, Chapel Hill, North Carolina

Description: Clays and other colloids coagulate and settle in estuaries. These phenomena produce "sediment traps" which lead to accumulation of nutrients in estuaries. This research seeks to develop a model for this process and to test it in the laboratory and in the field (the Pamlico estuary).

Starting Date: 1970 Completion Date: 1973

4. Title: Effects of the Estuarine Environment on Phosphorus Adsorption on Clays

Location: UNC, Chapel Hill, North Carolina

Description: Phosphorus adsorbs on clays. It is proposed that the extent of this adsorption is affected by the ionic strength of the solution. Phosphorus adsorbed on clays in a fresh water environment could be desorbed when the clays pass into an estuarine zone. This research involves development and laboratory testing of a model for this problem.

Starting Date: 1971 Completion Date: 1972

5. Title: Adsorption of Dyes by Activated Carps

Location: UNC, Chapel Hill, North Carolina

Description: The kinetics and thermodynamics (adsorption capacity) of activated carps for dyes used for polyester fibers is being experimentally investigated in the laboratory.

Starting Date: 1971 Completion Date: 1972

6. Title: Filtration of Calcium Phosphate Using Polymeric Filter Aids

Location: UNC, Chapel Hill, North Carolina

Description: The removal of calcium phosphate formed by adding lime to secondary effluent will be studied. Polymer type and dosage will be studied as a function of pH, (Ca^{2+}), alkalinity, and (PO_4). This is a laboratory investigation.

Starting Date: 1971 Completion Date: 1972

7. Title: Coagulation in Natural Waters

Location: UNC, Chapel Hill, North Carolina

Description: Natural waters contain considerable quantities of colloidal and suspended material: it is estimated that the average concentration of these materials in fresh waters is in the order of 900 mg/l. These materials are primarily inorganic; they have a high specific surface (1-100 m^2/g), and can adsorb soluble organic substances and some nutrients (e.g., phosphates). The reactivity of nutrients and organics in natural waters can, therefore, be influenced by the transport of these colloidal particles and the reaction (coagulation) which they undergo. The proposed research will construct and test models for coagulation in natural waters.

Starting Date: 1970 Completion Date: 1972

8. Title: Salinity Effects in the Adsorption of Phosphates on Clays

Location: UNC, Chapel Hill, North Carolina

Description: We propose to determine experimentally in the laboratory the influence of salinity in the adsorption of phosphate ions on two clays, illite and kaolinite. These clays comprise a large portion of the sediment in the North Carolina coastal region. We also propose to obtain field samples of clay sediments from the Pamlico and Albemarle systems and to determine the extent to which phosphorus is presently adsorbed on these materials. Finally, we plan to interpret the data obtained in these studies in the light of existing theories of adsorption. Successful completion of this research will aid in developing predictive models for the quality of North Carolina coastal waters.

Starting Date: 1971 Completion Date: 1973

9. Title: Coagulation in Water and Wastewater Treatment and Natural Aquatic Systems

Location: UNC, Chapel Hill, North Carolina

Description: Pollutants in water and wastewater are generally removed by aggregating them to a size suitable for removal by gravitational settling. In lakes, estuaries, and the ocean the fate of colloidal substances and also of adsorbable soluble

material can depend upon the extent to which coagulation occurs in these natural aquatic systems. We are presently developing conceptual models for these coagulation processes and are planning to test these models in the laboratory and in the field. This experimental testing requires that the number and size of colloidal particles be observed as a function of time. Under pertinent conditions of temperature, destabilization and power input (more precisely, the velocity gradient which produces contact between particles). Successful completion of this research will provide a predictive model for the effects of colloidal and adsorbable pollutants on test processes and natural systems.

Starting Date: 1970 Completion Date: 1972

Dr. Jabbar K. Sherwani

1. Title: Sensitivity Analysis of Damage-Duration-Return Period Relationships of Low Flows

   Location: Chapel Hill, North Carolina

   Description: Economic consequences must explicitly be made a part of any criterion that governs water quality. As an extension of the present research project on low flows, it is proposed to arrive at optimum water quality management based on the total performance of a stream (not in the critical period alone) through a sensitivity analysis of damage-duration-return period relationships. To begin with, only two states of nature, i.e., magnitudes of low flow and temperatures will be considered. Because of the availability of hydrologic data and considerable work on the potential economic development of the area, French Broad River in North Carolina will be taken as a model.

   Starting Date: 1967 Completion Date: 1972

2. Title: Computer Simulation of Aquffers of Coastal Plain of North Carolina

   Location: Chapel Hill and Raleigh, North Carolina

   Description: Investigations of the dynamic behavior of the Castle Hayne aquifer through:

   (1) Specification of aquifer characteristics at different locations and of boundary configuration using general purpose analog and digital computers.

   (2) Direct analog model of the groundwater system using a passive resistance-capacitance network.

   (3) Use of passive analog and digital computers to predict response of the aquifer; i.e., to forecast the water-level changes under different assumed conditions of replenishment and extractance.

   Starting Date: 1968 Completion Date: 1971

Dr. Charles M. Weiss

1. Title: Nature of Exotic Substances in Surface Waters and Implications as Water Supply Contaminants

   Location: UNC-Chapel Hill, North Carolina

   Description: A network of water sampling stations on the Haw and New Hope Rivers that will form New Hope Lake will be sampled, in order to establish through integrative procedures the presence of exotic and other unknown materials that might be present in measurable quantities.

   Starting Date: 1971 Completion Date: 1972

2. Title: Environmental Inventory (Aquatic) Belews Creek Project

   Location: UNC, Chapel Hill, North Carolina

   Description: An environmental inventory baseline is being established on the biota of the Belews Creek impoundment now under construction to serve as a reference point for future changes if they should occur when the power plant goes into operation.

   Starting Date: 1970 Completion Date: Continuing

3. Title: Effects of Temperature Enrichment on the Ecology of Streams

   Location: UNC, Chapel Hill, North Carolina

   Description: Artificial streams have been constructed from fiber glass to establish standardized running water ecologies for the evaluation of the impact of temperature enrichment on the stream biota.

   Starting Date: 1971 Completion Date: Continuing

4. Title: Response of Natural Phytoplankton Populations to Thermal Shock

   Location: UNC, Chapel Hill, North Carolina

   Description: Through the use of Carbon-14 productivity and measurements, the effects of thermal discharge on a body of water will be examined in terms of the impact this temperature increment has on fixation by the indigenous population of phytoplankton. The field work will be carried out at the Allen Steam Plant, Duke Power Company.

   Starting Date: 1971 Completion Date: Continuing

5. Title: Water Quality Management in Impoundments

Location: Chapel Hill and New Hope River Basin

Description: This project will develop a management plan for the New Hope Reservoir to prevent adverse effects and loss of beneficial uses because of water quality deterioration arising out of the large quantities of phosphorus and nitrogen discharged to the reservoir by tributary streams.

Starting Date: 1968 Completion Date: 1972

6. Title: Algal Assay Procedures

Location: UNC, Chapel Hill, North Carolina

Description: Laboratory and field studies for the development of an algal assay procedure.

Starting Date: 1969 Completion Date: Continuing

Department of Biostatistics

Dr. Lawrence L. Kupper, Professor James C. Brown, and James C. Lamb, III

1. Title: Experimental Designs for Trickling Filters

Description: See Professor James C. Brown, et al, for description.

UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

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UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

Department of Biology

Dr. Edward F. Menhinick (working with Dr. Charles Weiss of UNC-CH and Dr. Lorin Jensen of Johns Hopkins University)

1. Title: Effect of Heated Effluents on Plankton

Location: Lake Norman, North Carolina

Description: Studies of species and numbers of plankton around Marshall Steam Plant.

Starting Date: 1968 Completion Date: 1972

Department of Engineering

Dr. Carlos G. Bell

1. Title: Non-agricultural Drainage and Soil Conservation

Location: N. C. Department of Water and Air Resources

Description: A draft chapter for the State Water Plan will be prepared on this subject.

Starting Date: 1971 Completion Date: 1972

Department of Geography

Dr. J. C. Darner

1. Title: Occurrence of Selected Pathogenic Bacteria in Dried Sewage Sludge

Location: UNC, Charlotte; Charlotte Sanitation Plants

Description: Dried sewage sludge, presently sold by the Charlotte Sanitation Department for mulch and compost, is being examined for the presence of selected enteric pathogens and selected non-enteric spore-forming pathogens.

Starting Date: 1971 Completion Date: Continuing

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO

CONSOLIDATED UNIVERSITY OF NORTH CAROLINA

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO

Department of Chemistry

Dr. Henry L. Anderson, II

1. Title: Heat Capacities of Electrolyte Solutions

Location: UNC, Greensboro, North Carolina

Description: Measurement of the heat of dilution of alkali metal and alkaline earth metal halides and sulfates from 30-80°C. Relative heat capacities and other thermodynamic properties will be calculated.

Starting Date: 1970 Completion Date: 1972

Dr. John R. Jezorek

1. Title: The Effect of Nonaqueous Aprotic Solvents on the Structure of Water

Location: Greensboro, North Carolina

Description: Measurements of the heats of precipitation of heavy metal iodides in mixtures of aprotic solvents and water to determine points of structure maximum and structure collapse as a function of solvent composition.

Starting Date: 1970 Completion Date: 1973

UNIVERSITY OF NORTH CAROLINA AT WILMINGTON

CONSOLIDATED UNIVERSITY OF NORTH CAROLINA

UNIVERSITY OF NORTH CAROLINA AT WILMINGTON

Department of Biology

Dr. James F. Parnell

1. Title: Smith Island: A Resources Capability Study

   Location: University of North Carolina at Wilmington, N. C.

   Description: This project will develop an integrated description of the biotic and physical systems of the area and their ability to support human use. Results of field surveys of the various components (e.g., vegetation, land vertebrates, marine organisms, soils, topography, and geology) will provide an understanding of existing conditions, indicated modifications which might result from more intensive human use, and form the foundation for a more detailed study leading to a recommended land use plan for the area.

   Starting Date: 1970 Completion Date: 1971

2. Title: Use of Drainage Spoils as Natural Habitats

   Location: Intracoastal Waterway

   Description: Observations will be made of the species of plants and vertebrates that recolonize dredge spoil islands along the Intracoastal Waterway. By demonstrating the association of vegetation with the use of such islands by nesting birds, it is hoped that it will be possible to manage the islands in the future so that they will result in an improvement in the natural habitat.

   Starting Date: 1971 Completion Date: Continuing

Department of Geology

Dr. Paul A. Thayer

1. Title: Development of Porosity and Permeability in the Castle Hayne Ls.

   Location: Superior Stone Company Quarry, New Bern, North Carolina

   Description: Petrographic analysis of the Castle Hayne Limestone indicates that measured porosity and permeability values are controlled chiefly by original skeletal mineralogy and post-depositional diagenetic effects in the present non-marine environment.

   Starting Date: 1969 Completion Date: 1971

2. Title: Petrography of the Durham-Deep River-Wadesboro Triassic Basin

Location: Eastern Piedmont, North Carolina, from Oxford to South Carolina line

Description: Approximately 500 samples are being examined in thin-section to determine areal variations in mineralogy, texture, bulk properties, and sedimentary structures. This data will be useful for predicting reservoir characteristics.

Starting Date: 1969 Completion Date: 1972

DUKE UNIVERSITY

DUKE UNIVERSITY

School of Engineering

Department of Civil Engineering

Dr. P. A. Vesilind

1. Title: Viral Contamination of Streams

Location: Duke University, Department of Civil Engineering

Description: The prevalence and movement of viruses and potential hazards to public health.

Starting Date: 1971 Completion Date: Continuing

Graduate School of Arts and Sciences

Department of Botany

Dr. T. W. Johnson, Jr.

1. Title: Systematics of Fungi in Marine Phytoplankton

Location: Coastal North Carolina (Duke Marine Lab)

Description: Collection and identification of marine "Phycomycetes." Occurrence and distribution of phytoplankton parasites and their developmental morphology.

Starting Date: 1964 Completion Date: 1970

2. Title: Aquatic Fungi of Icelandic Waters and Soil

Location: Iceland

Description: Collection, isolation, identification and ecological distribution of aquatic fungi (marine and fresh water).

Starting Date: 1964 Completion Date: 1971

Dr. Paul J. Kramer

1. Title: Effects of Water Stress on Plant Processes

Location: Durham, North Carolina

Description: This includes measurements of effects of water stress on shoot and root growth, processes such as photosynthesis, respiration, translocation, absorption of salt and

water and stomatal opening and study of causes for differences in susceptibility to injury from drought.

Starting Date: 1968 Completion Date: 1974

2. Title: Causes of Differences in Drought Resistance

Location: Durham, North Carolina

Description: An attempt to learn more precisely in terms of plant processes and structures why some species and varieties of plants are more drought resistant than others.

Starting Date: 1969 Completion Date: 1974

Dr. Richard B. Searles

1. Title: Phenological Studies of Marine Algae Associated with Grass Beds

Location: Duke University Department of Botany, Durham, North Carolina, and Duke Marine Laboratory, Beaufort, North Carolina

Description: Collection and identification of algae from Zostera and Diplanthera beds in the Beaufort region throughout the year.

Starting Date: 1968 Completion Date: Continuing

2. Title: Studies of Marine Algae from Off-shore Rock Outcrops

Location: Durham and Beaufort, North Carolina

Description: Collection and identification of attached marine algae growing on the rock outcrops off the Carolinas.

Starting Date: 1968 Completion Date: Continuing

Department of Geology

Dr. Orrin H. Pilkey

1. Title: Marine Geology of the Atlantic Shelf of the Southeastern United States

Location: Durham and Beaufort, North Carolina

Description: This is an investigation of the major sediment parameters between Cape Hatteras, North Carolina, and Cape Kennedy, Florida. Included in this is an inventory of possible economic mineral resources. Special emphasis is being placed on carbonate sedimentation.

Starting Date: 1965 Completion Date: Continuing

2. Title: Bathymetry on the North Carolina Continental Margin

Location: Durham and Beaufort, North Carolina

Description: Involves compilation of RV Eastward soundings obtained on various research cruises and bathymetry of the continental slope and the continental rise is emphasized.

Starting Date: 1967 Completion Date: Continuing

3. Title: Marine Geology of the Puerto Rico Shelf

Location: Durham and Beaufort, North Carolina

Description: A survey of insular shelf sediment patterns and sedimentary processes.

Starting Date: 1971 Completion Date: Continuing

Department of Pathology (Marine Laboratory)

Dr. Benjamin Trump

1. Title: Mercurials Pollution in Water

Location: Duke Marine Laboratory, Beaufort, North Carolina

Description: Studies of the effects of mercurials toxicity upon marine fish particularly emphasizing the toxicity on kidney tubules. Both structural and functional changes will be studied using isolated flounder kidney tubules.

Starting Date: 1971 Completion Date: 1972

Department of Zoology and Biochemistry (Marine Laboratory)

Dr. Michelle Gilles-Baillien

1. Title: Modifications in the Composition of the Blood and Tissues and Osmoregulation in the Diamondback Terrapin

Location: Marine Membrane Physiology Laboratory, Beaufort, North Carolina

Description: A study of the evolution of the osmotic pressure and of the concentrations in Na, K, Cl, urea and amino acids when the diamondback terrapin is adapted from seawater to freshwater.

Starting Date: 1970 Completion Date: 1973

2. Title: Changes in the Permeability Characteristics at the Level of the Bladder, Colon and Jejunum Mucosae During Osmotic Stress

   Location: Marine Membrane Physiology Laboratory, Beaufort, North Carolina

   Description: A study of the permeability to water and Na for all three epithelia when the diamondback terrapin is adapted from seawater to freshwater.

   Starting Date: 1970 Completion Date: 1973

3. Title: Hibernation and Osmoregulation Process in the Diamondback Terrapin

   Location: Marine Membrane Physiology Laboratory, Beaufort, North Carolina

   Description: Essentially a study of the modifications in the composition of blood and tissues of terrapins hibernating either in seawater or in freshwater.

   Starting Date: 1970 Completion Date: 1973

Departments of Zoology and Botany (Marine Laboratory)

Dr. Richard Barber and Dr. Susan Huntsman

1. Title: Phytoplankton Nutrition and Organometallic Complexes in the Sea

   Location: Duke University Marine Laboratory

   Description: This research studies the interaction between phytoplankton and metals in the sea concentrating on the role of organometals formed by the chelation of transition metals with biogenic organic ligands. Electron paramagnetic resins and continuous culture methods will be used in this study.

   Starting Date: 1971 Completion Date: 1972

Department of Zoology (Marine Laboratory)

Dr. C. G. Bookhout

1. Title: The Effects of Controlled Environmental Factors on the Development of Estuarine and Oceanic Crustacea

   Location: Duke University Marine Laboratory, Beaufort, North Carolina

Description: Objectives: (1) to study, under controlled laboratory conditions, the larval development of crabs and barnacles; (2) to determine how temperature, salinity, light and pesticides affect molting and survival, and (3) to study the distribution of crab larvae in offshore waters of North Carolina.

Starting Date: 1963 Completion Date: Continuing

2. Title: Predoctoral and Postdoctoral Oceanographic Trainee Awards for Research Aboard RV/EASTWARD

Location: Duke University Marine Laboratory, Beaufort, North Carolina

Description: The objectives of the training awards are to provide a nucleus of vigorous young people studying the various aspects of biological oceanography or research projects complementary to and compatible with biological oceanography; e.g., marine geology, chemical oceanography, etc., using the RV/EASTWARD and shore facilities at the Duke University Marine Laboratory. The awards are intended to provide the requisite added sea experience for students who have completed their doctorate. In their sea training and research, trainees are encouraged to develop competence as chief scientists aboard the EASTWARD before their research is completed and to lead one or more expeditions.

Starting Date: Continuing Completion Date: Continuing

Dr. John D. Costlow, Jr.

1. Title: The Effects and Controlled Environmental Factors on the Development and Endocrine Mechanisms of Crustacean Development

Location: Beaufort, North Carolina

Description: What endocrine organisms are present in crustacean larvae and what part do they play in development.

Starting Date: 1969 Completion Date: 1971

2. Title: Studies on Molting and Growth in Larval and Adult Barnacles and Larval Decapods

Location: Duke University Marine Laboratory

Starting Date: 1970 Completion Date: 1971

3. Title: The Effects of Water Current on Growth of the Bay Scallop, Aequipecten irradians (Lamark)

Location: Duke University Marine Laboratory

Starting Date: 1969 Completion Date: 1971

Dr. Bruce C. Coull

1. *Title: Shelf, Slope and Deepsea Meiobenthos

Location: Beaufort, North Carolina

Description: Quantitative and qualitative analysis of meiobenthic populations and their ecology between North Carolina and Bermuda.

Starting Date: 1968 Completion Date: 1971

2. *Title: Zoogeography and Parallel-level Communities of Meiobenthic Harpacticoida

Location: Bermuda, Jamaica, Barbados, Cyprus, Virgin Islands

Description: Comparison of $CaCo_3$ fauna from different areas. The Co_3 communities appear to be distinct parallel level-bottom communities.

Starting Date: 1966 Completion Date: Continuing

Dr. Raymond Gilles

1. Title: Cellular Volume Regulation in Callinectes sapidus During Changes in the Salinity of the Environment

Location: Marine Membrane Physiology Laboratory, Beaufort, North Carolina

Description: This project is devoted to the study of the part taken by amino acids in the cellular volume adjustment of the nerves of Callinectes sapidus during its adaptation to media of various salinities.

Starting Date: 1970 Completion Date: 1973

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* Predoctoral or Postdoctoral Trainee Awards

2. Title: Intermediary Metabolism and Energy Production in Callinectes sapidus During the Osmoregulation Process

Location: Marine Membrane Physiology Laboratory, Beaufort, North Carolina

Description: This project attempts to study the part taken by carbohydrates and amino acids in the production of the energy required by Callinectes sapidus for its adaptation to changes in the salinity of the environment.

Starting Date: 1970 Completion Date: 1973

3. Title: The Anaerobic Metabolism in Intertidal Molluscs

Location: Marine Membrane Laboratory, Beaufort, North Carolina, and Molecular Biology Division, Veterans Administration Hospital, San Francisco, California

Description: This project will study the anaerobic metabolism of Mytilus californianus during changes in the quality of the environment (mainly oxygen availability).

Starting Date: 1971 Completion Date: 1974

Mr. Charles Kellogg

1. *Title: Behavior and Ecology of Adult Hermit Crabs (Paguridae) Inhabiting the North Carolina Continental Shelf and Upper Slope

Location: Duke University Marine Laboratory

Starting Date: 1969 Completion Date: 1971

Mr. John G. Newton

1. Title: Extensions of Submarine Canyons on the Hatteras Abyssal Plain

Location: Duke University Marine Laboratory

Description: Hatteras Canyon and other canyons from the Northeastern United States terminate in the Hatteras Abyssal Plain. Charts and block diagrams are being constructed to show the extent of these features.

Starting Date: 1969 Completion Date: Continuing

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* Predoctoral and Postdoctoral Trainee Awards

2. Title: Subsurface Features of the North Carolina Continental Shelf

Location: Duke University Marine Laboratory

Description: Buried channels and north-eastward dipping sub-bottom reflecting surfaces are found on the continental shelf off Southport, North Carolina. Mapping these features is in progress.

Starting Date: 1971 Completion Date: Continuing

Mr. John G. Newton and Dr. I. E. Gray

1. Title: A Marine Biological Atlas of North Carolina

Location: Duke University Marine Laboratory

Description: Atlas providing reference material concerning benthic flora and fauna and descriptions of habitats.

Starting Date: 1970 Completion Date: 1972

School of Forestry

Dr. Kenneth R. Knoerr

1. Title: Modeling the Energy and Water Balance of Natural Ecosystems

Location: Durham, North Carolina

Description: The development of computer simulation models, based on fundamental physical and biological processes, for the prediction of the energy and water balance of natural ecosystems.

Starting Date: 1969 Completion Date: Continuing

2. Title: Application of the Energy Balance Approach to the Interpretation of Watershed Response

Location: Franklin, North Carolina

Description: A cooperative study with the U.S. Forest Service, Coweeta Hydrologic Laboratory, Franklin, North Carolina, with Mr. Lloyd W. Swift as principal investigator for the Forest Service. The study will evaluate the relationship between changes in the surface energy balance and changes in watershed yield produced by the removal of forest cover. These energy

balance-water yield relationships will be investigated on both north and south facing watersheds to provide the maximum contrast in watershed energy supply.

Starting Date: 1966 Completion Date: Continuing

Dr. Charles W. Ralston

1. Title: Nutrient Content of Groundwater in Wetland Forest Types

Location: Santee Exp. Forest, Francis Marion N. F., South Carolina

Description: Study of variations in chemical composition of groundwater as related to wetland vegetation types and seasonal trends.

Starting Date: 1968 Completion Date: 1970

2. Title: Nutrient Balance of Coastal Forest Watersheds

Location: Santee Experimental Forest

Description: Study of nutrient additions and losses for three-gauged watersheds in the lower Coastal Plain in South Carolina.

Starting Date: 1968 Completion Date: 1970

Dr. James E. Wuenscher

1. Title: Environmental Considerations in Land and Water Use Planning in River Basins

Location: Eno River Basin, Orange and Durham Counties, North Carolina

Description: Development of techniques for the use of ecosystems as the basic unit for resource use planning, with particular emphasis on river basin systems. A complete ecological survey of the Eno River Basin will be used as the basis for an ecologically sound land-use plan.

Starting Date: 1971 Completion Date: 1973

EAST CAROLINA UNIVERSITY

EAST CAROLINA UNIVERSITY

School of Arts and Sciences

Department of Biology

Dr. Vincent J. Bellis

1. Title: Ecology of Benthic Organisms

   Location: Marine Science Center, Manteo, North Carolina

   Description: Distribution of habitat requirements of benthic organisms in Croatan Sound.

   Starting Date: 1970 Completion Date: Continuing

Dr. Charles E. Bland and Edward P. Ryan

1. Title: Studies on Reproduction and Fungal Parasites Affecting Reproduction in the Blue Crab, Callinectes sapidus

   Location: Duke Marine Lab , Beaufort, N.C. and E.C.U., Greenville,N.C.

   Description: A survey of the fungal pathogens of the Blue Crab and other crabs of the North Carolina coast.

   Starting Date: 1970 Completion Date: 1975

Dr. Joseph G. Boyette

1. Title: Natural History and Ecology of Fishes Inhabiting Small Streams

   Location: Eastern North Carolina

   Description: Data are being gathered on pirate perch, mud minnows, swamp fish, brook lamprey, and others.

   Starting Date: 1967 Completion Date: Continuing

Dr. Graham J. Davis

1. Title: Factors Affecting Growth and Floral Initiation in Proserpinaca palustris (Mermaid Weed)

   Location: East Carolina University, Greenville, North Carolina

   Description: Relation of root growth to flowering and effects of chemicals such as malathion, antigibberellins, and abscisic acid on flowering and growth.

   Starting Date: 1960 Completion Date: Continuing

2. Title: Factors Affecting Growth and Reproduction of Submerged Aquatic Plants of the Currituck Sound, North Carolina

Location: East Carolina University, Currituck Sound and ECU Field Station at Manteo, North Carolina

Description: Growth and reproduction of aquatic seed plants as related to salinity, temperature and each other including field and laboratory studies. Special emphasis on Myriophyllum spicatum (Eurasian water milfoil).

Starting Date: 1970 Completion Date: Continuing

Dr. John S. Laurie

1. Title: Encystation of Marine Cercariae, Some More-or-less Complete

Location: Beaufort/Morehead City, North Carolina; Gloucester, Massachusetts; Puget Sound, Washington

Description: The program involves the encystation of marine cercariae, the ultrastructure of marine parasites and eventually some from freshwater hosts; physiology and biology of flatworms from chimaerian hosts.

Starting Date: 1969 Completion Date: Continuing

Dr. James S. McDaniel

1. Title: Nutrition of Free-swimming Larval Helminths

Location: Greenville, North Carolina (Coastal waters of variable salinity)

Description: An attempt to determine the effect of natural and altered water systems on the invasive stages of helminth life cycles.

Starting Date: 1969 Completion Date: Continuing

Dr. Edward P. Ryan and Dr. Charles Bland

1. Title: Reproductive Biology of the Blue Crab and the Maine Lobster in North Carolina Waters

Description: See Dr. Charles E. Bland for description.

Dr. A. Mason Smith

1. Title: A Search for Tumors Occurring in Aquatic Animals

Location: Currituck Sound, Roanoke River, Shallow Bag Bay

Description: A survey will be made to determine the incidence of tumors in aquatic animals (invertebrates and vertebrates) in several estuarine areas in eastern North Carolina. Each area has been chosen for a particular known pollution factor.

Starting Date: 1971 Completion Date: Continuing

Division of Continuing Education

Mr. Herman D. Phelps

1. Title: Continuing Education Program for Commercial Fishermen

Location: East Carolina University

Description: A continuing education program for commercial fishermen in northeastern North Carolina. First phase of the program will deal with the development of skills and techniques of harvesting, processing, marketing and promoting seafood and marine products. The latter phase will be the training and upgrading of fishermen in current biological facts and principles relative to the marine environment. This will be done on a practical level which will insure application by the layman.

Starting Date: 1970 Completion Date: 1975

Department of Geology

Dr. A. Ray Jennings

1. Title: Groundwater Hydrology of North Carolina Coastal Plain

Location: North Carolina Coastal Plain

Description: A continuing study of the water quality and movement through Cretaceous and Tertiary aquifers.

Starting Date: 1968 Completion Date: Continuing

Dr. Stanley R. Riggs and Dr. Michael P. O'Conner

1. Title: Recent Sediments of Northeastern North Carolina Estuaries and Their Relation to Plio-Pleistocene Mineral Deposits

Location: East Carolina University and Northeastern Coastal North Carolina

Description: The objectives of this research are to provide (1) a basic understanding of the estuarine sediments of northeastern North Carolina; (2) an evaluation of the potentially economic sediment deposits; (3) knowledge of the temporal,

spacial and genetic relationships of the sedimentary units; and (4) the development of models for sedimentary mineral exploration in the Plio-Pleistocene deposits of coastal northeastern North Carolina.

Starting Date: 1970 Completion Date: 1973

2. Title: Estuarine Geology and Ecology of the Pamlico River V and Northern Pamlico Sound

Location: Beaufort, Pamlico and Hyde Counties, North Carolina

Description: This study is a part of a larger program involving study of the modern estuarine sediments and processes to provide models for interpreting the Tertiary stratigraphy of eastern North Carolina.

Starting Date: 1968 Completion Date: Continuing

3. Title: Late Cretaceous and Tertiary Stratigraphy of Eastern North Carolina.

Location: Eastern North Carolina

Description: A continuing study involving detailed lithological and stratigraphic investigation of the surface and quarry exposures to clarify the regional stratigraphic framework for eastern North Carolina.

Starting Date: 1968 Completion Date: Continuing

GUILFORD COLLEGE

GUILFORD COLLEGE

Department of Biology

Dr. Robert R. Bryden

1. Title: Taxonomy of the Hydras Using Limnological Methods

Location: Several small lakes and ponds in the Piedmont of North Carolina

Description: The taxonomy of this small group of organisms is in very poor condition chiefly related to the fact that it is necessary to study reproducing forms in order to make final classifications. As a result of previous studies, this program attempts to reexamine the taxonomy of the hydras.

Starting Date: 1959 Completion Date: 1972

ST. ANDREWS PRESBYTERIAN COLLEGE

ST. ANDREWS PRESBYTERIAN COLLEGE

Department of Biology

Dr. Clarence E. Styron

1. Title: Effects of Calefaction and Salinity Stresses on Survival, Growth, and Feeding Rates of the Hard Clam, Mercenaria mercenaria

Location: St. Andrews College, Laurinburg, North Carolina

Description: Effects of calefaction and salinity stresses on survival, growth, and feeding rates of Mercenaria mercenaria larvae are being investigated via factorial experiments under laboratory conditions. Food preferenda studies will also be underway for larvae.

Starting Date: 1971 Completion Date: Continuing

WRIGHTSVILLE MARINE BIO-MEDICAL LABORATORY

WRIGHTSVILLE MARINE BIO-MEDICAL LABORATORY

Dr. Ralph W. Brauer

1. Title: Development of a High Pressure Aquarium

Location: Wrightsville Marine Bio-Medical Laboratory

Description: This facility will be equipped to receive and maintain deep-water organisms under the high-pressure and low-temperature conditions in which they live in the ocean. Thus, such activities as metabolism and reproduction can be studied in these forms, whose biology is still extremely poorly understood.

Starting Date: 1970 Completion Date: Continuing

RESEARCH TRIANGLE INSTITUTE

RESEARCH TRIANGLE INSTITUTE

Office of State and Regional Planning

Dr. Michael v.E. Rulison, Senior Economist

1. Title: Evaluation of Planning for Wetlands Drainage Projects in the Southeastern Coastal Plains

Location: Coastal Plains of North Carolina and South Carolina

Description: Objective: To evaluate the planning process used to design flood control and drainage projects for wetlands containing certain hardwood species. The projects in question are designed to reduce flood damage and increase agricultural productivity.

Starting Date: 1970 Completion Date: 1972

Engineering and Environmental Sciences

Dr. Clifford N. Click

1. Title: A Study of the Feasibility of Flow Smoothing Stations in Municipal Sewage Systems

Location: Research Triangle Park, North Carolina

Description: RTI will conduct for the FWQA a study to determine the feasibility of flow-smoothing as a means for increasing the useful capacity of sanitary sewer systems.

Starting Date: 1970 Completion Date: 1971

Dr. Forest O. Mixon

1. Title: Experimental Investigation of a Continuous Filtration Process for Municipal Waste Waters

Location: Research Triangle Park, North Carolina

Description: RTI is performing a study to establish technical and economic feasibility and define an application profile for a novel continuous filtration device for the treatment of wastewater.

Starting Date: 1970 Completion Date: 1972

Dr. John C. Orcutt

1. Title: Experimental Study of Fluidized Sludge Blanket Clarification as Applied to Sewage Treatment

Location: Research Triangle Park, North Carolina

Description: RTI is conducting an experimental study of a fluidized sludge blanket clarification using as feed to the process screened municipal sewage.

Starting Date: 1970 Completion Date: 1972

PRIVATE INDUSTRY

PRIVATE INDUSTRY

Cone Mills Corporation

1. Title: Research on Textile Wastes

   Location: Greensboro, North Carolina

   Description: Continuous studies on treatment of textile wastes from finishing and dyeing and effect of changeover to biodegradable compounds on treatment.

   Starting Date: Continuing Completion Date: Continuing

2. Title: Research on Lint-bearing Textile Wastes

   Location: Haw River, North Carolina

   Description: Study of effect of large amounts of short fibers in wastes on treatment.

   Starting Date: Continuing Completion Date: Continuing

3. Title: Research on Textile Wastes

   Location: Greensboro, North Carolina

   Description: Study of treatment beyond secondary treatment and the cost in relation to accomplishments.

   Starting Date: Continuing Completion Date: Continuing

Carolina Power and Light Company

1. Title: The Effects of Heated Water Effluents on a River and Estuary

   Location: North Carolina State Pamlico Marine Laboratory, Aurora, North Carolina

   Description: This study includes field sampling program and a laboratory study of thermal tolerance of some important aquatic organisms.

   Starting Date: 1967 Completion Date: 1971

2. Title: The Effects of Power Plant Operation on the Ecology in the Vicinity of an Estuarine Intake and Ocean Discharge

   Location: Southport, North Carolina

Description: This study includes a field program to investigate the effect of plant operation on the environment and a laboratory program to determine the effects of temperature acclimation, salinity, photoperiod and life stage on thermal tolerance of important marine and estuarine organisms.

Starting Date: 1968 Completion Date: 1975+

3. Title: The Effect of Thermal Loading on the Water Balance of a Large Cooling Lake

Location: Roxboro, North Carolina

Description: See project description for item 12 listed under Federal Agencies - USGS.

Starting Date: 1964 Completion Date: 1973

Duke Power Company

1. Title: Limnological Studies of Hydroelectric Impoundments

Location: Catawba River, North and South Carolina

Description: The effect of operation of reservoirs for hydroelectric purposes is investigated from the viewpoint of chemical water quality. Samples are taken at selected sites from each of twelve reservoirs on a monthly basis from November through April and on a biweekly basis from May through October. These samples are analyzed for dissolved oxygen, temperature, pH, turbidity, total iron, total manganese and biochemical oxygen demand. The results from these analyses are stored in the data bank program of Duke Power Company's electronic computer.

Starting Date: 1959 Completion Date: Continuing

2. Title: A Study of the Physical and Biological Principles Relating to Power Plant Condenser Cooling Water Discharges

Location: Lake Norman near Marshall Steam Station

Description: The distribution and biological effects of cooling water discharged from a thermal power plant will be investigated by obtaining hydrographic, meteorological and biological data. These studies will attach scientific significance to some empirical factors used in predicting the size of heat dissipation areas at both proposed and existing thermal plants under various plant loading and meteorological conditions.

Starting Date: 1966 Completion Date: Continuing

Gold Kist Poultry Division, Cotton Producers Association (In cooperation with Department of Economics and Department of Food Science, North Carolina State University)

1. Title: Water and Waste Management in Poultry Processing

Location: Durham, North Carolina

Description: Demonstration project involving changes in plant equipment and operations for the in-plant control of water use and waste discharges. Includes the installation of equipment, evaluation of effects, determination of economic implications, and formulation of guides for the industry as a whole.

Starting Date: 1970 Completion Date: 1972

The Mead Corporation

1. Title: Advanced Biological Treatment Project

Location: Chillicothe, Ohio

Description: Kraft pulp and paper mill clarified effluent was subjected to parallel and series combinations of high rate trickling filters, conventional aerated lagoon and oxidation ditch with brush aerator.

Starting Date: 1968 Completion Date: 1971

Riegel Paper Corporation

1. Title: Development of Disposal Facilities for Kraft Pulping Sludge

Location: Riegelwood, North Carolina

Description: To develop the most practical and least costly long-range means of disposing of primary waste sludge. Present use of lagoons must be abandoned as air pollution abatement measure. Areas of interest include: dry-piling, recovery for use in pulp or low-grade products.

Starting Date: 1967 Completion Date: Continuing

J. P. Stevens Company, Inc.

1. Title: Water Quality Analyses

Location: Garfield, New Jersey

Description: Development of analytical techniques for trace analyses of impurities of waste water.

Starting Date: Continuing Completion Date: Continuing

Weyerhaeuser Company

1. Title: Kraft Primary Sludge as a Soil Conditioner

Location: Plymouth, North Carolina

Description: Phase I of this project was completed last year. In Phase II the amount of sludge has been increased per acre to determine its effect on soybean crop. Phosphate content is also to be determined.

Starting Date: 1970 Completion Date: 1973

STATE AGENCIES

STATE AGENCIES

Department of Natural and Economic Resources

Office of Fisheries and Wildlife Resources

Division of Commercial and Sports Fisheries

1. Title: Scrap Fish Studies 2-95-R

Location: Morehead City, North Carolina

Description: To investigate the effects of commercially harvesting the young of important foodfish species on the future availability of adults of the same species.

Starting Date: 1969 Completion Date: 1972

2. Title: The Investigation of Methods for Improving and Evaluating the Quality of Seafood Products 2-100-R

Location: Raleigh, North Carolina

Description: To investigate methods of utilizing seafood by-products and improving and evaluating seafood product quality.

Starting Date: 1969 Completion Date: 1972

3. Title: Exploratory Fishery Program R/V Dan Moore

Location: Continental Shelf Waters off North Carolina

Description: State program to inventory the faunal components of commercial or potential commercial value off the North Carolina sea coast to determine their availability and suitability to established or new methods of harvesting.

Starting Date: 1968 Completion Date: Continuing

4. Title: Oyster Rehabilitation Program

Location: Morehead City, North Carolina

Description: To establish and manage state oyster management areas throughout the coastal area. This involves planting seed oysters and shells. Other cultch such as marl is being planted experimentally and compared with proven oyster shells.

Starting Date: Continuing Completion Date: Continuing

5. Title: Shrimp Studies

Location: Morehead City, North Carolina

Description: To obtain migration, growth, mortality, and yield potential information necessary for management of the species.

Starting Date: 1970 Completion Date: 1972

6. Title: Calico Scallop Studies

Location: Morehead City, North Carolina

Description: To conduct exploratory fishing and obtain biological information on calico scallop stocks offshore coastal North Carolina.

Starting Date: 1971 Completion Date: 1974

7. Title: Anadromous Fish Studies

Location: Morehead City, North Carolina

Description: Joint project inshore and offshore northern area of North Carolina to determine offshore and inshore utilization, spawning areas, nursery areas, spawning success and survival.

Starting Date: 1971 Completion Date: 1974

8. Title: Jelly Fish Studies

Location: Morehead City, North Carolina

Description: Conduct survey of species composition, determine relative and seasonal abundance, environmental conditions affecting occurrence, and economic impact of noxious coelenterates in coastal North Carolina.

Starting Date: 1971 Completion Date: 1974

9. Title: Continuing Survey, Inventory, and Monitoring of Fish Populations in Estuarine Areas

Location: Morehead City, North Carolina

Description: Continuing program to obtain information necessary for zoning estuarine areas and developing management plan.

Starting Date: 1970 Completion Date: Continuing

Wildlife Resources Commission

Division of Game

1. Title: Investigations of Potential Management Areas

   Location: Statewide

   Description: To undertake investigations of wetland areas which are considered suitable for future development as waterfowl management areas.

   Starting Date: 1971 Completion Date: 1972

2. Title: Waterfowl Population Inventories

   Location: Coastal North Carolina

   Description: To determine waterfowl populations, trends, fluctuations and species compositions.

   Starting Date: 1972 Completion Date: 1972

3. Title: Kill and Hunter Data

   Location: Currituck and Lake Mattamuskeet, North Carolina

   Description: To determine numbers and kinds of waterfowl killed, kill per hunter-day, average hunter-kill per season, total kills and crippling loss.

   Starting Date: 1971 Completion Date: 1972

4. Title: Waterfowl Banding

   Location: Statewide

   Description: To band waterfowl with special emphasis on wood ducks and black ducks.

   Starting Date: 1971 Completion Date: 1972

5. Title: Experimental Management of Impounded Salt Marshes

   Location: Gull Rock, Goose Creek, Pamlico Point, White Oak River Impoundments and Orton Plantation

   Description: To determine the value of impounded salt marshes for waterfowl. To determine the practicability of this type of impoundment for refuges and public hunting areas in coastal North Carolina.

   Starting Date: 1971 Completion Date: 1972

Division of Inland Fisheries

1. Title: Effects of Thermal Pollution Upon Lake Norman Fishes

   Location: Lake Norman, North Carolina

   Description: To determine the effects of heated condenser wastes upon Lake Norman fishes.

   Starting Date: 1971 Completion Date: 1972

2. Title: Statewide Creel Census

   Location: Raleigh, North Carolina

   Description: To obtain certain creel data necessary for the enlightened management of the fresh-water sports fishery of North Carolina.

   Starting Date: 1971 Completion Date: 1972

3. Title: Management Recommendations

   Location: Statewide

   Description: Secure the framework of reference and, through analyses of the data so obtained, derive specific management recommendations directed towards increased game-fish productivity within, and improved accessibility to, the Inland Fishing Waters.

   Starting Date: 1971 Completion Date: Indefinite

4. Title: River Basin Studies

   Location: Statewide

   Description: To study the probable effects of highway, dredging, waste disposal, or water development projects and, if indicated, to develop project modifications for the purpose of eliminating, reducing, or mitigating damage to the fishery resources.

   Starting Date: 1971 Completion Date: Indefinite

5. Title: Biological Monitoring

   Location: Statewide

   Description: To develop and calibrate an artificial technique for utilizing benthic invertebrates as indicators in the continuous biological monitoring of water quality.

   Starting Date: 1971 Completion Date: Indefinite

6. Title: Development of an Efficient Electrofishing Unit for North Carolina

   Location: Statewide

   Description: To develop and calibrate an electrofishing unit of sufficient versatility to function effectively over the spectrum of water quality in the inland waters of North Carolina.

   Starting Date: 1971 Completion Date: Indefinite

7. Title: Development of the Sport Fishing Potential of an Industrial Cooling Lake

   Location: Duke Power Company impoundment of Belews Creek, Forsyth County

   Description: To trace the environmental changes and fish population development in a new 3.775-acre lake constructed to dissipate waste condenser heat from a major steam generating plant.

   Starting Date: 1971 Completion Date: Indefinite

8. Title: The Mortality of Young Fishes in Water-Supply Diversions

   Location: Statewide where circumstances permit

   Description: A pilot study to explore the magnitude of and to develop methods for investigating the mortality of eggs and young fishes in raw-water diversions into pump intakes.

   Starting Date: 1971 Completion Date: Indefinite

9. Title: Biology of the Striped Bass Populations Spawning in the Tar and Neuse Rivers

   Location: Lower Neuse River

   Description: To better define the biology and ecology of the striped bass populations spawning in the Tar and Neuse Rivers.

   Starting Date: 1971 Completion Date: Indefinite

10. Title: The Biology and Effective Management of the Redbreast Sunfish in North Carolina

    Location: Southeastern North Carolina

    Description: To determine the ecology and effective management of redbreast sunfish in North Carolina waters.

    Starting Date: 1971 Completion Date: Indefinite

11. Title: The Use of Dyes in Pond Vegetation Control

Location: Six experimental ponds in Piedmont North Carolina

Description: A pilot study to explore the biological and economic feasibility of controlling excessive growth of submerged vegetation in fishing ponds through light screening of non-toxic dye concentrations.

Starting Date: 1971 Completion Date: Indefinite

12. Title: Small Lake Management

Location: Lakes Fisher and Concord, Cabarrus County

Description: To evaluate in terms of the game-fish harvest, certain fish-management practices applicable principally to restricted use municipal water supply lakes.

Starting Date: 1971 Completion Date: Indefinite

13. Title: The Bioeconomics of Supplemental Feeding Waters Under "Native Trout" Regulations

Location: Steels Creek and Upper Creek, Daniel Boone Wildlife Management Area

Description: To explore the biological and economic feasibility of supplemental feeding as a method for increasing the carrying capacity of trout waters.

Starting Date: 1971 Completion Date: Indefinite

Office of Recreation Resources

1. Title: North Carolina Outdoor Recreation Planning Program

Location: Recreation Commission, Raleigh and Regional Offices

Description: Three related work elements which are part of the State Comprehensive Outdoor Recreation Plan:

I. Lakes. This work element will basically consist of compiling data that are already assembled in various publications and records into a single inventory of lakes in the state, including their ownership and operation, size, location, characteristics, capacities and present levels of use, and their potentials for additional development and use. The needs for land use planning and zoning, improved management practices, additional public access, and legislation will be analyzed.

II. Islands. A major portion of this work element will be in further study and analysis of the North Carolina islands listed in the report completed by the Bureau of Outdoor Recreation. An effort will be made to verify the inventory. Those islands of local, state and national significance will be studied in relationship to their ownership and the legality of ownership, present use and the compatibility of this use with the unique character of the islands, potentials for further development and use for outdoor recreation purposes, management policies and recommendations, public access.

III. Watersheds and Flood Plains. This work element will involve a study of watersheds and flood plain areas in terms of planning, management, and zoning for proper use. Specifically, it will analyze the proper outdoor recreation uses of such areas. Related problems will be analyzed, such as flood control, further use (for outdoor recreation purposes) will be analyzed.

Starting Date: 1969 Completion Date: 1972

Office of Water and Air Resources

1. Title: An Evaluation of the Effects of Stream-Channel Improvements on the Hydrologic Conditions in the Creeping Swamp Creek Subwatershed

Location: The study area includes about 20 square miles of the subwatershed in Pitt, Craven and Beaufort Counties, North Carolina

Description: The objective of this study is to evaluate the effect of stream-channel improvement on ground water hydrology. Ground-water, surface-water and rainfall monitoring stations will be used to observe the long-term hydrologic relationships between channel improvement and ground-water conditions.

Starting Date: 1971 Completion Date: 1981

2. Title: An Evaluation of the Relationship of Field and Laboratory Permeabilities of Selected Coastal Plain Aquifers

Location: A continuing program to include the entire Coastal Plain. Initial work to be done in the Robeson County area.

Description: This study is a part of a statewide program of aquifer evaluation. The study will compare the hydraulic coefficients of aquifers obtained from field pumping tests and those obtained from laboratory testing. The resulting relationships should provide additional useful tools for aquifer evaluation when field pumping tests cannot be conducted.

Starting Date: 1971 Completion Date: Continuing

3. Title: A Hydrogeologic Cross-Section of the Southern Coastal Plain of North Carolina

Location: Hoke, Robeson, Bladen, Columbus and Brunswick Counties

Description: The object of this study is to identify, evaluate and correlate the aquifers and aquitards of the Southern Coastal Plain by construction of a series of multi-well ground-water research stations. Such research is vital to the proper development of the water resources of this region.

Starting Date: 1970 Completion Date: 1972

FEDERAL AGENCIES

FEDERAL AGENCIES

U.S. Department of Agriculture

Forest Service

Southeastern Forest Experiment Station

1. Title: Soil and Water Relations, Fertilization, and Wildlife Habitat Improvement

   Location: Marianna, Florida

   Description: A multidisciplinary research program to evaluate the effect of intensive cultural practices applied in the management of slash pine on wildlife, recreation, water, timber, and aesthetics for the betterment of an expanded population.

   Starting Date: 1971 Completion Date: 1976

2. Title: Quality, Quantity, and Timing of Streamflow in the Southern Appalachians

   Location: Coweeta Hydrologic Laboratory, Franklin, N. C.

   Description: To develop prediction methods and techniques for the effective management of forest resources for improved water quality, yield, and streamflow, and other purposes consistent with maintaining a quality environment.

   Starting Date: Continuing Completion Date: 1976

Soil Conservation Service

1. Title: Ahoskie Creek Watershed Study

   Location: Hertford, Bertie and Northampton Counties

   Description: A cooperative activity by the SCS, ARS, USGS and North Carolina Department of Water and Air Resources to collect, analyze, interpret and report basic data on rainfall-runoff relationships, hydrograph characteristics, crop distribution and yields, and channel behavior with respect to the rate of aggradation or degradation as these are affected by project works of improvement. The relationships established will be used in planning and evaluating proposed soil and water conservation measures, particularly P.L. 566 watershed projects in the lower Coastal Plain area of the Southeastern United States.

   Starting Date: 1963 Completion Date: 1972

2. Title: Effects of Stream Channel Improvements on Hydrologic Conditions in the Creeping Swamp Subwatershed

Location: Pitt, Craven and Beaufort Counties, North Carolina

Description: A cooperative activity by SCS, ARS, USGS, and North Carolina Department of Water and Air Resources. The objective of this project is to evaluate the effects of channel improvement on groundwater.

Starting Date: 1970 Completion Date: 1982

U.S. Department of the Army

Coastal Engineering Research Center, Washington, D. C.

1. Title: Field Study of Ocean Bar Response to Dredging Within the Throat of an Inlet

Location: Carolina Beach, North Carolina

Description: A 150,000-cubic yard deposition basin was dredged within the throat of Carolina Beach Inlet for the purpose of trapping bed load material. By trapping this material, the channels across the ocean bar could possibly maintain a deeper depth.

Starting Date: 1967 Completion Date: Continuing

2. Title: Experimental Study of Dune Building

Location: Core Banks, North Carolina

Description: The study consists of the construction of various types of sand fences and the planting of several species of grass to determine their effectiveness in building a dune by trapping windblown sand.

Starting Date: 1957 Completion Date: Continuing

3. Title: Low-weir Jetty

Location: Wrightsville Beach, North Carolina

Description: A jetty, with a 1000-foot weir section of concrete sheet piles, was constructed on the north side of Masonboro Inlet. The weir section allows littoral material to pass over the jetty and be deposited in a deposition basin located between the jetty and the navigation channel. When full, material is dredged by pipeline dredge from the deposition basin to the downdrift beach.

Starting Date: 1966 Completion Date: Continuing

U. S. Department of Commerce

National Oceanic and Atmospheric Administration - National Marine Fisheries Service

Center for Estuarine and Menhaden Research, Beaufort, North Carolina

1. Title: Menhaden Monitoring Program

Location: Inshore and Offshore Waters Along Atlantic and Gulf Coasts

Description: The activities of this program are: Surveying the Atlantic and Gulf menhaden purse seine fleets for data on distribution and amount of fishing effort; sampling Atlantic and Gulf menhaden landings for data on the age and size composition; surveying estuaries of Atlantic and Gulf coasts to measure the strength of incoming year classes; tagging sufficient adult menhaden to establish the contemporary degree of availability; estimating population growth and mortality; formulating mathematical models for the Atlantic and Gulf menhaden resources and using them to assess the effects of fishing on each resource, explain fluctuations in yield, forecast fishing success, determine best harvesting schemes, predict maximum sustained yields and project corresponding fishing effort.

Starting Date: 1955 Completion Date: Continuing

2. Title: Menhaden Predicting Program

Location: Inshore and Offshore Waters Along Atlantic and Gulf Coasts

Description: The activities of this program are: Determining the biological and physical factors that influence and determine the abundance, survival, and distribution of larvae, juveniles, and adults in the coastal marine and estuarine areas; delimiting the distribution and intensity of menhaden spawning and the effects of currents on the dispersal and transport of eggs and larvae; identifying the eggs and larvae of menhaden and other marine clupeoid fishes and to determine their rate of development in nature and in the laboratory; determining the fecundity or spawning potential of Atlantic and Gulf menhaden; and estimating relative and absolute abundance of larvae and juveniles as they enter and inhabit estuaries.

Starting Date: 1955 Completion Date: Continuing

3. Title: Elemental Cycling

Location: Beaufort, North Carolina

Description: Measurement of trace metal composition of estuarine organisms, sediment, and water. Turnover rates of trace metals in selected estuarine organisms and rates of exchange of these metals between estuarine sediments and water are measured. Studies of flushing rates of estuaries and circulation patterns in estuaries and nearshore waters in the vicinity of Beaufort, North Carolina.

Starting Date: 1968 Completion Date: Continuing

4. Title: Food Chain Analysis and Energy Transfer

Location: Beaufort, North Carolina

Description: Study of the character of food chains and measurement of the flow of energy and materials in the food chains in estuarine waters near Beaufort, North Carolina, including seasonal and structural changes in species composition and biomass, energy transfer routes, and efficiency of transfer in estuaries near Beaufort, North Carolina. Present studies are concerned chiefly with the rate of plant and herbivore production and with the development of mathematical models of food chains.

Starting Date: 1968 Completion Date: Continuing

5. Title: Environmental Interactions

Location: Beaufort, North Carolina

Description: Determine the manner in which pollutants such as radioactive wastes, pesticides, or thermal additions change the productivity of the estuarine ecosystem and the physiology of estuarine organisms. Describe the interactions of environmental factors--both natural and introduced--on the survival, growth, reproduction, and metabolism of important organisms.

Starting Date: 1968 Completion Date: Continuing

U. S. Department of the Interior

Geological Survey

1. Title: Thermal Study of Dan River

Location: Dan River, Rockingham County

Description: Measure intake and discharge water temperatures at Dan River Steam-electric generating plant and at selected points along Dan River below plant, to determine heat load, degree and distribution of heat in stream, and recovery and heat dissipation rates.

Starting Date: 1969 Completion Date: 1973

2. Title: Hydrology of Fractured Rocks

Location: Statewide

Description: The occurrence, availability, and movement of ground water stored in fractured rock and the overlying saprolite is being intensively studied. Particular emphasis in this investigation is being placed on the hydraulics of a fractured rock well and highly specialized pumping tests are being conducted to evaluate the phenomena involved.

Starting Date: 1966 Completion Date: 1972

3. Title: Flood-frequency Studies

Location: Statewide

Description: Data from the network of continuous and partial-record gaging stations are being analyzed to provide new information on the hydrologic characteristics of storms and high flows and to develop and improve methods of determining probability and extent of flooding.

Starting Date: 1953 Completion Date: Continuing

4. Title: Evaporation of Lake Michie, North Carolina

Location: Lake Michie, North Carolina

Description: An evaluation of the factors affecting lake evaporation in a humid region. Emphasis is on investigation of the magnitude of time-sampling errors in applying mass-transfer and water-budget methods to a study of lake evaporation in this climate.

Starting Date: 1961 Completion Date: 1972

5. Title: Low Flow and Water Availability Studies

Location: Statewide

Description: This project utilizes the data from continuous record and low-flow, partial-record gaging stations in both analytical and statistical studies of the relation between geologic, climatic, and topographic variables and various parameters pertinent to the frequency, occurrence, and probability of extreme low flows, both in time and space, for North Carolina streams.

Starting Date: 1961 Completion Date: Continuing

6. Title: Ground-water Resources of the Cape Hatteras National Seashore Recreational Area

Location: Outer Banks of North Carolina

Description: On the basis of ground-water levels and chloride content under static and pumping conditions; observations of height and width of the Banks; and history of storms, potential available water supply will be evaluated.

Starting Date: 1968 Completion Date: 1972

7. Title: Hydrology of Estuaries in North Carolina

Location: Coastal Areas of North Carolina

Description: Available data on tidal flows, chloride content, density currents, dispersion factors, and other pertinent estuarine factors are being studied to develop information needed to plan industrial and municipal development in coastal areas.

Starting Date: 1967 Completion Date: 1972

8. Title: Flood Plain Inundation and Urbanization Studies

Location: Charlotte, Durham, Lenoir, Morganton, Winston-Salem, North Carolina

Description: To evaluate the effects of urban growth and development on flood runoff. The principal emphasis is on evaluating the effects of impervious areas on flood stage and discharge.

Starting Date: 1964 Completion Date: 1973

9. Title: Temperature of Surface Water in North Carolina

Location: Statewide

Description: Using extensive existing records of air and water temperatures, normal seasonal values of water temperature will be determined for different sizes and types of streams in all areas of North Carolina.

Starting Date: 1967 Completion Date: 1973

10. Title: Chemical Quality of Surface Water in North Carolina

Location: Statewide

Description: The mass of data on the chemical constituents of streams will be studied and meaningful parameters will be

extracted. Variation of chemical quality with stage will be generalized and arealized. (In press - USGS Hydrologic Atlas #439.)

Starting Date: 1968 Completion Date: 1971

11. Title: Evaporation and Thermal Loading Analysis - Roxboro Lake

Location: Roxboro Lake, Person County, North Carolina

Description: To evaluate natural lake evaporation utilizing mass-transfer and water-budget techniques, and to assess general reservoir response to thermal loading with special emphasis on delineation of heat patterns (spatial and temporal) and determination of forced evaporation.

Starting Date: 1964 Completion Date: 1973

12. Title: Evaluation of Channel Improvement on Hydrologic Conditions in Creeping Swamp

Location: In the Creeping Swamp and adjoining basins of Beaufort, Craven, and Pitt Counties, North Carolina

Description: An evaluation of the changes that occur in the hydrology of a coastal-plain stream as the water table is lowered by channel dredging.

Starting Date: 1970 Completion Date: 1982

13. Title: Water Resource Potential of Northeast North Carolina Above Cape Lookout

Location: The tidewater region of northeast North Carolina

Description: A study of the complex hydrology of this relatively undeveloped region with emphasis on the definition of quantity and quality of the resource and the changes that development will bring.

Starting Date: 1971 Completion Date: 1973

14. Title: Dispersion and Time-of-travel of Salem Creek, Muddy Creek, and Haw River

Location: Winston-Salem, North Carolina, and vicinity

Description: Investigator will use fluorescent dye to trace the movement and dispersion of waste materials as they move downstream in the three streams.

Starting Date: 1971 Completion Date: 1972

Tennessee Valley Authority

1. Title: Effect of System of Small Dams on Flood Reduction

   Location: Tennessee Valley

   Description: This research is on the effect of systems of small dams on flood reduction as well as the combined effect of improvements in watershed management and dams on water yield, erosion, and sedimentation.

   Starting Date: Continuing Completion Date: Continuing

2. Title: Upper Bear Creek Experimental Project

   Location: Northwestern Alabama

   Description: The watershed research project is being conducted to develop numeric procedures (mathematical models) to project and expand basic data from smaller headwater areas downstream, to progressively parts of the same watershed, to provide information which can be transferred from one watershed to an ungaged watershed, and to evaluate alternate watershed programs. Field observations were terminated in the spring of 1971.

   Starting Date: 1962 Completion Date: 1972

3. Title: Thermal Phenomena in Hydrologic Systems

   Location: Tennessee Valley

   Description: The purpose of the study is to develop means of predicting water temperatures downstream from a source of temperature change as a function of time and distance from the source.

   Starting Date: Continuing Completion Date: Continuing

4. Title: Determination of Effects of Reservoirs on Water Quality

   Location: Tennessee Valley

   Description: Identification and quantitative evaluation of changes or effects on water quality brought about by impoundment in reservoirs. Methods are being devised to predict reservoir quality factors, such as stratification.

   Starting Date: Continuing Completion Date: Continuing

5. Title: Effects of Impoundment on Water Quality

   Location: Tennessee Valley

Description: Research is being done to develop or improve engineering methods which can be used in planning, designing and operating river and reservoir control structures associated with multipurpose water resources projects for management of water quality as well as quantities. Supporting studies on eutrophication of streams and reservoirs are being conducted.

Starting Date: Continuing Completion Date: Continuing

6. Title: Factors that Control the Growth of Aquatic Weeds

Location: Tennessee Valley

Description: The role of factors that control rates of growth and total standing crops of both planktonic and benthic plants is being studied in streams, reservoirs, and in the laboratory.

Starting Date: 1967 Completion Date: Continuing

7. Title: Effects of Temperature on Aquatic Life

Location: Tennessee Valley

Description: The effects are being studied of heated waters discharged to streams, lakes, and reservoirs on reproduction and growth of native warm-water fish and their supporting food chain organisms.

Starting Date: 1968 Completion Date: Continuing

8. Title: Efficiency of Fertilizer Use as Affected by Removal in Runoff and Drainage Water

Location: Western North Carolina, east Tennessee, and north Alabama

Description: This project will determine the extent to which fertilizer constituents are removed from a watershed in surface runoff and ground-water flow, so that judgments may be made as to the efficiency of fertilizer use and the chemical quality of downstream surface waters.

Starting Date: 1968 Completion Date: Continuing

9. Title: Aquatic Weed Control

Location: Tennessee Valley

Description: Studies of Eurasian watermilfoil and other aquatic weeds have been focused on methods of reproduction, vegetative colonization potential, water depths occupied, response to water level manipulation, and potential methods of control including the use of herbicides. Future studies will be directed toward

determining the role of environmental factors in aquatic weed control, such as nutrient and other ecological requirements, pathogens, insect vectors of plant disease organisms, insects as direct control agents, aquatic plant competition, and possibly the role of herbivorous fish.

Starting Date: Continuing Completion Date: Continuing

10. Title: Water Quality Model

Location: Tennessee Valley

Description: To develop a mathematical prediction model which would ultimately be sensitive to all water quality, resource management, and reservoir system operation needs. Initial emphasis will be on waterflow rate-temperature relationships.

Starting Date: 1970 Completion Date: Continuing

11. Title: Effects of Heated Water on Aquatic Life

Location: Tennessee Valley

Description: TVA has proposed a cooperative research project with the Water Quality Office, Environmental Protection Agency, to build and operate research facilities at the site of the Browns Ferry Nuclear Plant to study effects of heated water discharges on aquatic life. The basic elements of this research station would involve the construction of eight naturalistic stream channels, each 14 feet wide and 390 feet long. Two of these channels would serve as biological controls and would have unheated reservoir water passing through them continuously. Specified mixtures of natural and heated waters would flow through the other six channels. Temperatures in each of these three pairs of channels would be continuously held at fixed increments of temperature above that in the two control channels. The same selected species and numbers of warm-water fish would be placed in all channels and retained therein for continuous periods of two years or more for each major experiment. Special emphasis would be placed on determining the specific qualitative and quantitative effects of heat on spawning, egg fertilization, egg and larvae development, and rates of growth. Effects of heat would also be observed and measured on all significant components of the natural food web existing in the channels.

The research findings from this project should have wide application throughout the United States and in many other parts of the world, and should be of great value in setting or adjusting water quality standards for temperature. The data obtained in these experiments should help to define the degree of protection needed for aquatic life, together with the degree to which warm-water streams can be used, in the public interest, to absorb heated discharges from industry.

Starting Date: Pending

12. Title: Urban Hydrology Study

Location: Knoxville, Tennessee

Description: The objective of this study is to quantify with mathematical models the changes in quantity, rate, and quality of streamflow that results from urbanization. Models will be formulated by using data collected elsewhere and verified by using project data.

Starting Date: 1971 Completion Date: 1976

Note: While some of the TVA projects are not located within North Carolina, they were included because of their obvious interest to the state and its water resources program.