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**SURVEY OF THERMAL RESEARCH PROGRAMS
SPONSORED BY FEDERAL, STATE, AND
PRIVATE AGENCIES (1970)**

Gerald U. Ulrikson
Walter G. Stockdale

OAK RIDGE NATIONAL LABORATORY

operated by

UNION CARBIDE CORPORATION

for the

U.S. ATOMIC ENERGY COMMISSION

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ECOLOGICAL SCIENCES DIVISION
and
ENVIRONMENTAL QUALITY PROGRAM

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MARCH 1971

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TABLE OF CONTENTS

Introduction	1
Productive Uses	4
Bio-Effects	4
Limnological Effects	10
Combination and General	14
Cooling Towers	16
Modeling	17
Surveys - Ecological	20
Surveys - Temperature and Physical	24
Surveys - General	26
Investigators - with Addresses	28

INTRODUCTION

In the first quarter of 1970, the environmentally oriented divisions and projects at Oak Ridge National Laboratory began to concern themselves with the magnitude of heated condenser water discharges into our nation's streams from nuclear electrical generating stations. It became apparent that an investigator, assessing any environmental impact from such a discharge, must know what research has been completed, is underway, or planned in order to intelligently sift out facts from fantasy and to determine what areas of our knowledge in the technical and life sciences field large unknowns exist.

Some of this search has already been accomplished. The U. S. Department of the Interior, Office of Water Resources Research, has published abstracts of projects in their catalogues, most of which is not directly connected to thermal discharges from electrical generating stations. The Edison Electric Institute (EEI) surveyed the investor-owned member utilities concerning projects completed, on going or planned. They published a report of this survey in June 1969 and are planning to issue another report in the fall of 1970. The AEC Director of Regulation conducted during 1969 a survey of power plant licensees and applicants for licenses of nuclear electrical generating stations for planned or projects underway concerning the effects of thermal discharges at proposed or selected sites. The results of this survey were placed in the AEC Public Document Room as the report "Thermal Effects Studies by Nuclear Power Plant Licensees and Applicants - 1969." The Smithsonian Institute maintains the Science Information Exchange and can provide information on projects relating to thermal discharges.

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Our assessment of this work was that there still existed important projects that had not been incorporated into available bibliographic summaries and that the seriousness of the problem merited a more complete study.

The Environmental Quality Study Project, composed of personnel from both physical and life sciences programs at ORNL, working in cooperation with the Ecological Sciences Division undertook this survey in the spring of 1970 as a means of completing the inventory of planned or actual research connected with thermal discharges into the nation's streams. This report is the result of the survey which was made of state and federal agencies and those colleges and universities with known programs in the field of ecology or oceanography. The electric utility industry was not included because of previous documentation in the EEI and AEC surveys. Each state and approximately 150 colleges, universities, and federal agencies were contacted. Responses were received from 144 reporting 283 various projects ranging from possible beneficial uses of thermal discharges to the detrimental effect on aquatic life.

The projects tabulated on the following pages are divided into nine main categories: Productive Uses, Bio-Effects, Limnological Effects, Combination and General, Cycling Towers, Modeling, Surveys - Ecological, Surveys - Temperature and Physical, Surveys - General. In each category the title of the projects, the location investigator(s), sponsor and duration are listed. Each project is numbered for cross-indexing with an alphabetical listing of all investigators with addresses in a concluding section.

Since this is only a partial survey in this particular field of scientific interest, the reader is urged that the report be used in conjunction with surveys previously mentioned and with the catalogue of abstracts of water research periodically issued by the Office of Water Resources Research. The reviews of published literature in the field by C. C. Constant (1968, 1969, 1970) and bibliographies by Nancy Menzel (1969) and Kennedy and Mihursky (1967) will be a most helpful adjunct to the above.

PRODUCTIVE USES

<u>No.</u>	<u>Title</u>	<u>Location</u> ¹	<u>Investigator</u>	<u>Sponsor</u> ²	<u>Duration</u> ³
1	Study of the Operation of an Experimental Oyster Nursery in the Discharge Basin	Long Island, New York	G. Vanderbough and Son (Oyster Growers)	Long Island Lighting	Undetermined
2	Potential Benefits of Integrating a New Community and a Power Reactor with Special Reference to the Water Ecology	University of Rhode Island	D. Hammerschlag C. Rose	Submitted to USDI-OWRR	Proposed
3	Intensive Production of Animal Protein by Culture of Fish in Raceways Supplied with Warm Water	Alamosa National Wildlife Refuge, Colorado	W. H. Everhart	Submitted to AEC	Proposed 3 years
4	Reactor Cooling Water for Agro-Industrial Development Through Soil-Warming	Willamette Valley, Oregon	L. L. Boersma	OWRR-Pacific Power and Light Company	2 years
5	Use of Reactor Cooling Water from Nuclear Power Plants for Irrigation of Agricultural Crops	Willamette Valley, Oregon	L. L. Boersma	USDI-OWRR	3 years
6	Plant Water Relations	Oregon State University	L. L. Boersma	Water Resources Research Institute	3 years
7	Utilization of Heated Effluents from Nuclear Power Plants for the Propagation of Channel Catfish	Section 32, Township 5 North, Range 16 East, Nemaha County, Nebraska	E. H. Kendle	Nebraska Game and Parks Commission, Nebraska Public Power District and another not yet determined	3 years, beginning July, 1971
8	Beneficial Use of Thermal Effluent in Aquaculture	South Bay Power Plant Site, California	G. O. Schumann R. F. Ford	San Diego Electric and Gas Company	Active
9	Salt Water Rearing of Salmon	Manchester, Washington	T. Joyner	Bureau of Commercial Fisheries	4 years

BIO-EFFECTS

10	Thermal Tolerance of Fish and Fish Food Organisms-Natural Regime	Duluth, Minnesota	National Water Quality Laboratory, FWQA	Northern States Power Company	
11	Effect of Heated Discharges on Fish Productivity-Constant	Duluth, Minnesota	National Water Quality Laboratory, FWQA	Northern States Power Company	2 years

¹Denotes research site (e.g., field or laboratory location). See List of Investigators for mailing addresses.

²See appendix for a key to abbreviations.

³Starting dates often not identified by respondents.

BIO-EFFECTS

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
12	Effects of Heated Water Discharge on the Marine Environment	Redondo Beach, California	D. D. Pollard	Redondo Beach City Government	
13	Effect of Heat on the Biological, Microbiological, and Chemical Quality of Water	Pacific Northwest Water Laboratory	B. A. Tichenor A. G. Christianson W. L. Morse	USDI-FWPCA	7/67 and continuing
14	The Effects of Thermal Loading and Water Quality on Estuarine Primary Production	Natural Resources Institute University of Maryland Patuxent Estuary	J. A. Mihursky D. A. Flemer A. M. McErlean R. B. Biggs	USDI-OWRR	7/68-6/71
15	Effects of Simultaneous Variation of Temperature and Dissolved Oxygen on the Resistance of Fishes to Controlled Pollutants	School of Agriculture University of Connecticut	W. R. Whitworth R. A. Voyer	USDI-OWRR	7/68 and continuing
16	Effects of Hot Water Masses on Marine Fishes	Sandy Hook Marine Laboratory	D. W. Bridges	USDI-Bureau of Sport Fisheries and Wildlife	7/68 and continuing
17	The Thermal Requirements and Tolerances of Key Estuarine Organisms	Natural Resources Institute University of Maryland Patuxent Estuary	J. A. Mihursky A. M. McErlean	USDI-OWRR	Proposed
18	Thermal Effects on Biological Production in Nutrient Rich Ponds	Department of Zoology-Limnology, University of Wisconsin	A. D. Hasler R. J. Altpeter C. C. Watson J. A. Hoopes J. J. Magnuson R. V. Thurston	USDI-OWRR	7/69-6/70
19	Combined Cooling and Bio-Treatment of Beet-Sugar Factory Condenser Water Effluent	School of Engineering Colorado State University	G. O. Lof	USDI-OWRR	
20	Relationship of Temperature to Guideline Levels of Toxicants Listed in Columbia River Water Quality Standards	Pacific Northwest Water Laboratory	G. R. Bouck G. A. Chapman	FWQA	1/70-5/70
21	Thermal Shock of Juvenile Salmonids	Water Temperature Laboratory	T. H. Blahn	FWQA	2 years
22	Thermal Tolerance of Juvenile Salmonids in Relation to Nitrogen Saturation	Water Temperature Laboratory	R. J. McConnell W. Parente	FWQA	1 year
23	Thermal Tolerance of Non-Salmonids	Water Temperature Laboratory	T. H. Blahn	BCF	2 years
24	Thermal Tolerance of Zooplankton of the Lower Columbia River	Water Temperature Laboratory	Shirley Clark	BCF	3 years

BIO-EFFECTS

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
25	Physiological Effect of Temperature Increase on Anadromous Fish of the Lower Columbia River	Water Temperature Laboratory	Water Temperature Laboratory	HCF	1 year
26	Performance of Thermally Shocked Young Salmonids	Aquatic Ecology Laboratory	C. C. Coutant E. G. Tangen C. O'Malley	AEC	2 years
27	Effect of Temperature Changes on Gas Bubble Disease of Salmonids	Aquatic Ecology Laboratory and Columbia River Dam Sites	M. P. Fujihara M. Schneider W. J. Clarke J. L. Armantrout	AEC	1969 and continuing
28	Effect of Thermal Shock From Effluent Discharge on Young Salmonids	Columbia River	C. C. Coutant C. D. Becker E. F. Prentice	AEC	1968 and continuing
29	Temperature Tolerances of Adult Salmonids	Aquatic Ecology Laboratory	C. C. Coutant R. G. Genoway E. G. Tangen	AEC	3 years
30	Effects of Modifications on the Columbia River Ecosystem, Thermal Modifications	Aquatic Ecology Laboratory and Columbia River	C. C. Coutant C. D. Becker W. L. Templeton	AEC	1966 and continuing
31	Effect of Temperature as a Contributing Agent on <u>C. columnaris</u> , <u>D. salmonis</u> and <u>A. salmonicida</u> Fish Disease	Aquatic Ecology Laboratory and Columbia and Snake River	M. P. Fujihara R. E. Nakatani W. J. Clarke J. L. Armantrout	AEC	1959 and continuing
32	Effects of Increased Temperatures on Survival and Growth of Juvenile Steelhead	Aquatic Ecology Laboratory	P. A. Olson R. E. Nakatani M. P. Fujihara E. G. Tangen C. O'Malley	AEC	2 years
33	Temperature Tolerance of Aquatic Insects	Aquatic Ecology Laboratory	C. D. Becker	AEC	1970 and continuing
34	Temperature Tolerances of Local Fish Species	Aquatic Ecology Laboratory	C. C. Coutant C. D. Becker R. G. Genoway C. O'Malley E. G. Tangen	AEC	1970 and continuing
35	Simulation of Adult Salmon Migration Through Elevated Temperature and the Effects on Gametes and Progeny	Oregon Fish Commission Salmon Hatchery Bonneville, Oregon	G. R. Bouck D. G. Stevens P. W. Schneider, II	FWQA	3 years
36	Tissue Enzyme Studies	Pacific Northwest Water Laboratory	G. R. Bouck P. W. Schneider, II Janet Jacobson	FWQA	3 years

BIO-EFFECTS

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
37	Automated Determination of Primary Productivity	Biospherics Research, Inc.	G. M. Levin	AEC-FWQA	
38	Connecticut River Microbiology, (Pre- and Post-Operational Study in Vicinity of Connecticut Yankee Atomic Power Co. Plant)	East Haddam, Connecticut including approximately a 2 mile stretch of the Connecticut River	J. D. Buck	FWQA	5 years
39	The Effects of Water Current on Growth of the Bay Scallop, <u>Aequipecten irradians</u> (Lamarck)	Newport Estuary	J. D. Costlow, Jr. W. Kirby-Smith	North Carolina Board of Science and Technology	1 year
40	A Study on Entrainment Mortalities	University of Rhode Island	N. Marshall	NSF	Open
41	Effects of Temperature on Metabolism of Trout	Ecology Center Utah State University	R. H. Kramer	BSF and WL	5 years
42	Effects of Temperature on White-Fish Development	Ecology Center Utah State University	R. H. Kramer	FWQA	3 years
43	Effects of Temperature on Drift Organisms	Temple Fork and Green River, Utah	R. H. Kramer	BSF and WL; NSF	3 years
44	Growth and Production Rates of Genetic Types of Rainbow Trout	Uintah Basin, Utah	C. B. Stalnaker	BCF	3 years
45	Study to Determine the Ability of Warm Water Fish to Live in an Environment, Heated by Thermal Discharges	North Anna River, Virginia	Unknown	Virginia Electric and Power Company	Planned
46	Adult Salmon Behavior in Rivers	Lower and Middle Columbia and Snake Rivers	J. H. Johnson	BCF	1954 and continuing indefinitely
47	Thermal Tolerance of Juvenile Salmonids	Water Temperature Laboratory	T. H. Blahm	FWQA	3 years
48	Adult Fish Passage	Fisheries-Engineering Research Laboratory North Bonneville, Washington	C. R. Weaver	BCF	4 years
49	Estuarine Ecosystems and High Temperature	North Carolina State University	J. E. Hobbie	USDI-OWR?	
50	The Effects of Heated Waste Waters Upon Microbial Communities	Department of Biology Virginia Polytechnic Institute	J. Cairns R. A. Paterson	USDI-OWRR, Virginia State Government, Virginia Polytechnic Institute	3 years
51	Ecological Responses of Fishes and Fish-Food Organisms to Heated Effluent: Case Study of Lake Monona, Wisconsin	Lake Monona, Wisconsin	J. J. Magnuson	USDI-OWRR University of Wisconsin Wisconsin State Government	3 years

BIO-EFFECTS

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
52	Thermal Tolerance of Juvenile Salmonids in Relation to Nitrogen Saturation	Laboratory of Seattle and in Columbia River	R. J. McConnell W. Parents	FWQA	2 years
53	Thermoculture of Channel Catfish (<u>Ictalurus punctatus</u>)	Hanford Reservation, Washington	C. W. Long	Submitted to DBM-AEC	Proposed
54	Laboratory and On-Site Studies to Determine Effect of Temperature and Chlorine Residuals on Fish and Invertebrates, the Relationships of Varying Temperature and Chlorine Residuals and the Effects, if any, of Plant Operation on Fisherman Success	Laboratory and On-Site, Massachusetts	Marine Fisheries Division	Canal Electric Company	4 years
55	Largemouth Bass Reproductive Study-Research	Texas-Dingell-Johnson Project, San Antonio Area	K. W. Gholson	Texas-Dingell	6 years
56	Effects of Rapid Temperature Changes on Freshwater Drum	Ohio Cooperative Fishery Unit	M. E. Sisk	Ohio State University	Unknown
57	Acclimatization and Utilization of the Threadfin Shad	Montrose Wildlife Area and Blind Pony Wildlife Area, Missouri	W. D. Hanson	State of Missouri	Unknown
58	Effects of Heater Water Discharge on Fish Growth	Thomas Hill Reservoir 4500 Acre Impoundment	T. H. Roush	University of Missouri	Unknown
59	Effects of Temperature on Marine Organisms	Sandy Hook Marine Laboratory	D. W. Bridges	Plymouth County Electric Company or Canal Electric Company	1 year
60	Effects of Thermal Additions on Some Marine Organisms of the Cape Cod Canal	Sandy Hook Marine Laboratory, Cape Cod, Massachusetts	J. Pearce	Plymouth County Electric Company or Canal Electric Company	2 years
61	Effects of Thermal Additions on Marine Ecosystems	Sandy Hook Marine Laboratory, Atlantic Coast Zone	Pacheco J. Pearce Olla Arnold	AEC	1 year
62	The Influence of Temperature and Photoperiod on Growth Food, Consumption, and Food Conversion of Blue Catfish <u>Ictalurus furcatus</u> (Lesueur)	Department of Zoology University of Arkansas	Raj. V. Kilambi	Arkansas Game and Fish Commission	Active
63	The Effect of Various Temperature Increases on Larva by Investigating the Possible Beneficial Uses of Increased Water Temperature in Bays with Reduced Circulation Potentials	Tomales Bay, California	E. H. Smith	FWQA, Private	Active

BIO-EFFECTS

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
64	The Tolerance of the Striped Killifish, <u>Fundulus majalis</u> , to Different Temperature, Salinity, and Oxygen Combinations	Lewes, Delaware	F. C. Daiber	Delaware Game and Fish Commission	3 years
65	Biology of the Menhaden in the Delaware Bay Region (Shore Zone Fish Survey in Rehoboth and Indian River Bays)	Rehoboth and Indian River in Southern Delaware	K. S. Price	University of Delaware Research Foundation	3 years
66	The Physiological Ecology of Macro Algae from Rehoboth and Indian River Bays, Delaware	Rehoboth and Indian River Bays in Southern Delaware	J. E. Taylor	University of Delaware Research Foundation	2 years
67	Biologically Allowable Thermal Limits	Tropical West Atlantic	Anitra Thornhaug	FWQA	2 years
68	The Effects of Controlled Environmental Factors on the Development of Estuarine and Oceanic Crustacea	New Port Estuary, Offshore North Carolina Waters	C. G. Bookhout J. D. Costlow, Jr.	NSF	3 years
69	An Ecological Study of South Biscayne Bay in the Vicinity of Turkey Point	Turkey Point, Biscayne Bay, Dale County, Florida	R. G. Bader	AEC	3 years
70	Effects of Temperature on Aquatic Life	Tennessee Valley Authority System	M. A. Churchill T. A. Wotalik	TVA	7/68 and continuing
71	Restoration, Propagation, and Management of Marine Algae	Coastal Area, Southern California	W. J. North	NSF	2/69 and continuing
72	Study of the Effects of Thermal Pollution on Crassostrea virginica in the Patuxent River Estuary	Hallowing Point Station, Patuxent River, Maryland	W. H. Roosenburg	BCF	11/67 and continuing
73	Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities	Laboratory, Field Studies at Chalk Point, Patuxent River Estuary, Maryland	J. A. Mihursky R. G. Stross E. C. Keller, Jr.	USDI-OWRR	7/68 and continuing
74	Migratory Response of Adult Salmon to Water Temperature	Fisheries-Engineering Research Laboratory	J. R. Gauley C. R. Weaver C. S. Thompson	C. of E.	7/68 and continuing
75	Coastal and Estuarine Resource Development	Mobile Field Laboratory Manchester, Washington; Port Orford, Oregon; Netarts Bay, Oregon	T. Joyner C. Novotny C. Mahnen R. C. Clark	BCF, Northwest Utilities, AEC	3 years
76	Effects of Industrial Expansion on the Aquatic Environment of Estuarine Areas	BCF Biological Laboratory	T. H. Blahn G. R. Snyder R. J. McConnell	BCF	7/68 and continuing
77	Fish Behavior and Physiology	BCF Biological Laboratory	A. B. Groves J. L. Mighell K. Niggol J. G. Vanderwalker	BCF	3 years

BIO-EFFECTS

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
78	Ecological Effects of Environmental and Low Level Pollution Stresses	Marine Science Institute University of Texas	D. E. Wohlschlag	NSF	10/67 and continuing
79	Sensitivity of Benthic Microflora to Pollution Gradients	(1) Long Island Sound Adjacent to Millstone Point Nuclear Power Plant (2) Estuarine Areas of Point Judith Pond and Pettagus- scutt River	N. Marshall D. M. Skauen	FWQA	3 years
80	The Insect Order Plecoptera as a Biological Index of Fresh Water Quality in Rhode Island	Unspecified Stream system in Rhode Island	T. W. Kerr	State of Rhode Island	7/67 and continuing
81	Effects of Thermal and Other Forms of Pollution of Some Anadromous Fishes	School of Agriculture Rutgers, The State University	J. R. Westman M. E. Chittenden	USDI-OWNR; Other	7/68 and continuing
82	Effects of Water Temperature and/or Dissolved Oxygen Requirements on Selected Mollusks	Graduate School University of Michigan	H. van der Schalie E. Berry	FWQA	5 years
83	Effects of D. C. Temperature and Potential Toxicants Upon Selected Macroinvertebrates (Emphasizing Non-Arthropods)	National Water Quality Laboratory	M. J. Inlay J. W. Arthur	FWQA	7/67 and continuing
84	Effects of Temperature on Maturation, Embryonic Development and Condition of Fry in Yellow Perch-Lake Herring Smelt and Walleye	National Water Quality Laboratory	B. R. Jones J. H. McCormick	FWQA	10/67 and continuing
85	Effect of Heated Water Discharge from Ipalco's Petersburg Plant on the Waters of White River, Indiana	Just Below Junction of East and West Fork White River, Pike County	A. F. Agnew M. A. Proffitt D. G. Frey	Indiana University; AEC; Indianapolis Power and Light Company	7/68 and continuing
86	A Study of the Rate and Pattern of Shad Migration in the Connecticut River Utilizing Sonic Tracking Apparatus	Lower Section of the Connecticut River	W. Leggett	Connecticut Board of Fish and Game; HCF; Connecticut Yankee Atomic Power Company	2 years

LIMNOLOGICAL EFFECTS

87	Feasibility Study of Water Resource Pollutant Identification by Digital Computer Analysis of Remote Infrared Sensor Spectral Intensities	Piedmont Area of South Carolina	B. E. Gilliland	South Carolina State Government	Unknown
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LIMNOLOGICAL EFFECTS

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
88	The Evaluation of Environmental Alteration by Thermal Loading and Acid Pollution in the Cooling Reservoir of the Steam-Electric Station	Thomas Hill Reservoir, Central, Missouri	A. Witt	USDI-OWRR, University of Missouri	7/67 and continuing
89	Study of Temperature Effects in Cooling Water Lake	Southwest Research Institute	H. C. McKee	Southwest Research Institute	7/68 and continuing
90	Effects of Heated Water in a Tidal Estuary	Patuxent River Estuary, Chesapeake Bay	R. L. Cory	USDI-OWRR-Geological Survey	7/68 and continuing
91	Water Quality Alteration Through Acid and Heat Pollution in a 1500 Acre Reservoir	1500 Acre Reservoir	R. S. Campbell J. Whitley E. R. Bresina	USDI-OWRR	6/66 and continuing
92	Oceanographic Investigation of the Inshore Waters of the North Pacific	Nearshore Waters of Washington, Oregon, and Northern California	W. C. Renfro	FWQA	2 years
93	Chemical, Physical, and Biological Water Quality Factors Under Utah Conditions	Logan, Utah	J. M. Neuhold	USDI-OWRR	1965 to present
94	Electric Power Production and the Aquatic Environment	University of Wisconsin	J. J. Magnuson T. Giesen	NRP; University of Wisconsin	Proposed
95	Limnological Survey of Lower Columbia River	Seven Stations from Above the Willamette River to Puget Island on the Columbia River	S. Clark	BCF	3 years
96	Prediction of Environmental Conditions in John Day Reservoir, Columbia River	McNary Reservoir	G. R. Snyder A. Novotny	BCF	1965-1968
97	Hydrologic, Geologic and Seismologic Research Related to Waste Management Environmental Safety and Facility Sites	Hydrologic Studies at Washington, D. C. and Water Resource Division in Oregon, Idaho (NRTS), S. C. (SRP); (B) Research on Engineering Geology at Menlo Park, Cal.; (C) Earthquake at Menlo Park	Geological Survey, U.S.	AEC	3/28/56 and continuing
98	Caloric-An Investigation of Heat Release Patterns Associated with Present and Planned Lake-shore Electrical Power Plants	Cornell Aeronautical Laboratory, Inc., and Field Studies at a Selected Lake	G. J. Neumann T. R. Sundaram D. H. Bock C. C. Easterbrook K. R. Piech	United Engineers and Constructors, Inc.	7/67 and continuing
99	The Role of Mixing in Maintaining Stratified Flow	School of Engineering, University of Minnesota	E. Silberman H. Stefan F. R. Schiefel	FWQA	1/68 and continuing

LIMNOLOGICAL EFFECTS

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
100	Effects of Reactor Effluent on Quality of Columbia River Water	Columbia River, Battelle Memorial Institute	R. T. Jaske J. F. Honstead	AEC	7/68 and continuing
101	A Reconnaissance Study of the Chesapeake Bay	Regional Planning Council	P. R. Farragut A. P. Owynn	Housing and Urban Development Department	7/68 and continuing
102	Improvement of Quality of Water Resources by a Three-Fold Attack: Absorption, Sedimentation and Mixing	College of Engineering University of Maryland	W. A. Wockenfuss R. B. Beckmann J. A. E. John L. E. Otis	USDI-OWRR, Others	4 years
103	Studies on the Effects of Waste Heat Discharge from Nuclear Power Plant Into Large Bodies of Water	Tetra Tech., Inc.	B. Le Mahaut	FWQA	1 year
104	Effects of Thermal Loading on the Water-Balance of Roxboro Lake, N. C.	Roxboro Lake, N. C.	J. F. Turner, Jr.	U. S. Geological Survey, North Carolina Department of Water and Air Resources	12 years
105	Interfacial Effects in Fluid Flow with Density Stratification	Iowa City, Iowa	E. O. Macagno	Iowa Institute of Hydraulic Science and NSF	2 years
106	Turbulent Mixing of Density Stratified Liquid	Iowa City, Iowa	C. Farrell	Office of Naval Research	2 years
107	River Flow Under Ice	Iowa City, Iowa, Cedar River near Mississippi River at Muscatine, Iowa	J. F. Kennedy W. W. Sayre	C. of E., Rock Island District	2 years
108	Dynamics of Ice Covered Streams	Iowa City, Iowa	J. F. Kennedy	NSF	3 years
109	Dispersion of Water Pollutants in Curvilinear Flow	Iowa City, Iowa	E. O. Macagno W. W. Sayre	FWQA	4 years
110	Mixing and Transfer Processes for Heated Effluents in Open Channel Flow	Iowa City, Iowa	W. W. Sayre	NSF	2 years
111	Beach Processes in the Inshore and Foreshore Zones	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	C. C. Mei	Coastal Engineering Research Center, C. of E.	Active
112	Natural Mixing and Transfer Processes for Thermal Loads in Streams	Iowa City, Iowa	W. Sayre	USDI-OWRR	4 years

LIMNOLOGICAL EFFECTS

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
113	Dispersion in Porous Media in Pumping and Recharge Operations	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	D. R. F. Harleman L. W. Gelhar	FWQA	Active
114	Wave Forces on Offshore Structures	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	D. R. F. Harleman	Shell Development Company	Completed
115	Single and Two-Phase Flow Between Concentric Rotating Cylinders	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	A. T. Ippen L. W. Gelhar	NSF	Active
116	Tidal, Salinity, and Sedimentation Problems in Lake Maracaibo Channel, Venezuela	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	A. T. Ippen R. H. Cross, III	M.I.T. Inter-American Program in Civil Engineering; in collaboration with the Instituto Nacional de Canalizaciones and the Universidad del Zulia, in Venezuela	Active
117	Turbulence Structure of Flow in Rough Porous Conduits	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	L. W. Gelhar A. T. Ippen	NSF	Active
118	Surface Wave Studies	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	C. C. Mei A. T. Ippen	Office of Naval Research	Active
119	Tidal Computations in Estuaries and Canals	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	D. R. F. Harleman	Tidal Hydraulics Committee, C. of E.	Completed
120	Salinity Intrusion in Estuaries	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	D. R. F. Harleman A. T. Ippen	Laboratory Project and Tidal Hydraulics Committee, C. of E.	Active
121	Operational and Research Uses of Radar in Hydrology	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	P. S. Eagleson	National Severe Storms Laboratory, FSSA	Active

LIMNOLOGICAL EFFECTS

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
122	Application of Laser to Sediment Concentration	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	A. T. Ippen B. B. Sharp	Water Resources and Hydrodynamics Laboratory and M. I. T.	Active
123	The Absolute Concentration of Suspended Sediment in Turbulent Streams	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	A. T. Ippen	Water Resources and Hydrodynamics Laboratory and M.I.T.	Active
124	Comparative Scour Patterns for Air and Water Jets	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	A. T. Ippen	Water Resources and Hydrodynamics Laboratory and M.I.T.	Active
125	Water Wave Interaction with Coastal Structures	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	R. H. Cross, III	Coastal Engineering Research Center, C. of E.	Active
126	Long Island Groundwater Hydrology	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	L. W. Gullhar D. R. F. Harleman	New York State Board of Health	Active
127	Effects of Topography on Earthquakes or Storm-Generated Water Waves	Water Resources and Hydrodynamic Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	C. C. Mei A. T. Ippen	NSF	Active
128	Hydrographic Studies Report; The Piscataqua River at Newington, New Hampshire	Newington, New Hampshire on the Piscataqua River		Public Service Company of New Hampshire	Completed
129	Transport Phenomena in Porous Media	Oregon State University Water Resources Research Laboratory	L. L. Boersma	State of Oregon	Indefinitely
130	Investigation of the Effect of Which Reduction of Cooling Reservoir Volume Would Have on Temperature of the Reservoir	Virginia Artificial Lake on North Anna River	F. L. Parker	Virginia Electric and Power Company	Unknown

COMBINATION AND GENERAL

131	Environmental Monitoring Program	Mississippi River Vicinity	Northern States Power Company	Northern States Power Company	Pre- and Post-Operational
132	Radiation Monitoring Program	Monticello, Minnesota	Department of Health, Minnesota	Northern States Power Company	1970 and continuing

COMBINATION AND GENERAL

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
133	Estuarine and Coastal Pollution Studies	Potter Cove, Prudence Island, Rhode Island	J. L. Veerber	P.H.S.	1964 and continuing
134	Dardanella Reservoir, Illinois Bayou, Embayment Background Survey	Pope County, Arkansas	C. B. Sinclair	Arkansas Power and Light Company	10 years
135	The Hydrology and Ecology of the North Shore of Massachusetts Bay	In the Mouth of the Saugus and Pine Rivers, Massachusetts	N. W. Riser	OWRR	1967 and continuing
136	Survey of the Hydrography, Sediments, Plankton, Benthos and the Commercially Important Plants and Animals, Including Finfish, in the Montseag Bay-Back River Area	Sheepscot Estuary, Maine	D. Dean B. J. McAlice J. D. McLeave R. L. Vallas	Maine Yankee Power Company	5 years
137	An Ecological-Environmental Study of the Anelote River Estuary and Adjacent Gulf of Mexico	Anelote River Estuary (Florida)	H. J. Humm	Florida Power Corporation	Minimum of 6 years
138	Ecological and Physical Oceanographic Field Survey at the Scattergood Power Plant	Los Angeles, California	Bendix Marine Advisors, Inc.	Los Angeles Department of Water and Power	In Progress (1970)
139	Monitoring Device Designed to Measure the Effects of Discharges from the Pennsylvania Power and Light Company Generating Plant	Chillisqueague Creek in Montour County, Pennsylvania	D. G. Barlarik	Commonwealth of Pennsylvania, Department of Health	One year
140	Pre-impoundment Ecological Study of Benthic Fauna and Water Quality in the North Anna River	North Anna River-36 miles and tributaries, Louisa County, Virginia	G. M. Simmons	USDI-OWRR	3 years
141	Environmental Quality Study-Thermal Discharges	New River (Glen Lyn Power Station) Virginia	Virginia Water Control Board	Appalachian Power Company	Proposed
142	Interspecies Relationships of Fish in Lake Michigan	Indiana Water of Lake Michigan	T. McComish	Indiana Department of Natural Resources, BCF	3 years with possibility of extension
143	Mississippi River Pool 14, Thermal Pollution Study	Pool 14, Mississippi River	L. L. Dunham	Illinois Department of Conservation	2 years before operation, 2 years after operation
144	Heat Diffusion Study; and the Physical and Biological Oceanographic Environment off Ormond Beach, Ventura County, California (Power Plant Discharge Sites)	Oxnard, California	Bendix Marine Advisors, Inc.	Southern California Edison Company	1968 and continuing

COMBINATION AND GENERAL

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
145	Site Meteorology Program	Crystal River, Florida	Florida Power Corporation	Florida Power Corporation	Unknown
146	Marine Ecological Program	Crystal River, Florida and St. Petersburg Laboratory	R. M. Ingle E. A. Joyce, Jr.	Marine Research Laboratory, Florida, Department of Natural Resources	Unknown
147	Marine Thermal Plume Program	Crystal River, Florida	K. L. Carder	Florida Power Corporation	Unknown
148	Belews Creek Cooling Reservoir	North Central Piedmont of North Carolina	J. H. Cornell	North Carolina Wildlife Resources Commission	Unknown
149	Effects of Heated Water Discharge and Mine Drainage on a 1500-Acre Reservoir	Reservoir	E. A. Brexine	University of Missouri	Unknown
150	Thermal Pollution and its Implications for the Coal Industry - A Survey of the State of Knowledge	Travelers Research Center, Incorporated	P. B. Cheney J. D. Kangos D. J. Pelton	National Coal Policy Conference, Incorporated	5/68 and continuing

COOLING TOWERS

151	Cooling Tower Study	Illinois Institute of Technology	E. Aynsley	P.H.S.	Unknown
152	Investigation of the Feasibility of Cooling Towers and Refriger- ation Systems for Cooling Purposes as Opposed to Water Cooled Heat Exchanges	Surry Power Station North Anna Station	Unknown	Virginia Electric and Power Company	Unknown
153	Treatment of Selected Internal Kraft Mill Wastes in Cooling Towers	Georgia Kraft Company	R. B. Estridge	FWQA; Georgia Kraft Company	10/67 and continuing
154	Theoretical Evaluation and Development of a Criteria to Determine Inadvertent Weather Modification in the Vicinity of Cooling Towers	E. Bollay Associates	E. Bollay	FWQA	4 months
155	Proposal for an Economic- Engineering Study of Cooling Ponds	Littleton Research Corporation	Littleton Research Corporation	FWQA	12 months
156	Jet Discharge From Water Cooling Towers	Iowa City, Iowa	Jung-tai Lin J. F. Kennedy	The Marley Company	2 years
157	Vermont Yankee Nuclear Power Station Cooling Tower Study	Hinsdale, New Hampshire Vernon, Vermont on the Connecticut River	Unknown	Vermont Yankee Nuclear Power Corporation	Completed

MODELING

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
158	Model Study of Lower Portion of Reservoir to Study Flow Patterns to be Expected with Installation of Nuclear Station	Dardanelle Reservoir, Pope County, Arkansas	Hydro Science Company	Arkansas Power and Light Company	Unknown
159	Hydraulic Models	Estuary	Alden Research Laboratory	Consolidated Edison Company of New York, Incorporated	Unknown
160	Measurement of Thermal Waste Diffusion for Various Arrangements of Intakes and Discharges	James River Model (Hog Island Location)	Pritchard and Carpenter, Consultants	Virginia Electric and Power Company	Unknown
161	Determination of Percentage of Available Tidal Prism Passing Through Condensers	James River Model (Aiken Swamp-Dutch Gap Cutoff Location)	Pritchard and Carpenter, Consultants	Virginia Electric and Power Company	Unknown
162	Oceanographic Factors Affecting the Use of Nuclear Power Sources in or Adjacent to the Sea	Chesapeake Bay	D. W. Pritchard A. Okubo H. H. Carter	AEC	Completion 9/30/71
163	Study to Determine Temperature Profiles and Mixing Patterns by Use of the James River Hydraulic Model Located at Vicksburg, Mississippi	C. of E. Hydraulic Model, at Vicksburg	D. W. Pritchard	Virginia Electric and Power Company	Unknown
164	Mathematical Water Quality Planning Models	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	J. C. Schaake, Jr.	Urban Systems Laboratory and Education Research Center M.I.T.	Active
165	Bogota River Study	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	F. E. Perkins	M.I.T. Inter-American Program in Civil Engineering	Active
166	Management Aspects of Thermal Pollution	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	D. H. Marks	Urban Systems Laboratory M.I.T.	Active
167	Model Study to Determine Temperature Effects of Heated Effluent From Six Proposed Nuclear Power Plants (11 Fossil Plants Simulated in Addition Giving Total of 17 Sites)	Delaware River Model	L. J. Hooper	Philadelphia Electric Company	Unknown

MODELING

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
168	A Problem-Oriented Language for Hydrologic Analysis	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	F. E. Perkins	USDI-OWRR	Active
169	Optimum Linear Synthesis in Urban Hydrology	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	P. S. Eagleson	USDI-OWRR	Active
170	Analysis and Synthesis of Hydrologic Systems	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	P. S. Eagleson	M.I.T. Inter-American Program in Civil Engineering	Active
171	A Real-Time Numerical Model for Estuarine Water Quality Prediction	Water Resources and Hydrodynamics Laboratory, Department of Civil Engineering, Massachusetts Institute of Technology	D. R. F. Harleman	FWQA	Active
172	Predicting Surface Water Temperatures	Department of Civil Engineering	J. C. Ward		3 years
173	Theoretical Study of Proposed Additional Heat Discharge at San Onofre	San Onofre, California	Bendix Marine Advisors, Inc.	Southern California Edison Company	Active
174	Heat and Water Vapor Exchange Between Water Surface and Atmosphere	Cornell University, Ithaca, New York	W. H. Brutsaert	FWQA	2 years
175	Design Data for Intakes and Outfalls for Proposed Single and Double Nuclear Power Plants	Delaware River Model, Mouth of Cohansey River	Pritchard and Carpenter, Consultants	Public Service Electric and Gas Company	Unknown
176	Expected Temperature Distribution for Huntington Beach Plant	Huntington Beach, California	Bendix Marine Advisors, Inc.	Southern California Edison Company	Active
177	Prediction and Control of Thermal Pollution	Massachusetts Institute of Technology, Cambridge, Massachusetts	Unknown	FWQA	2 years
178	Thermal Plume Dispersion	Oregon Coast	J. L. Welty	FWQA	3 years
179	Research on the Physical Aspects of Thermal Pollution	Cornell Aeronautical Laboratory	T. R. Sundaram	FWQA; Cornell Aeronautical Laboratory	12 months
180	Controlling the Location and Dispersion of Thermal Polluting	School of Engineering, Laboratory	C. C. Lomax	USDI-OWRR-Washington State Government-Washington State University	1 year

MODELING

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
181	Convective Heat Transfer From Water Surfaces	University of Virginia	J. T. Bearl C. S. Chen	USDI-OWRR-University of Virginia	Proposed
182	Experimental Investigation of Hydraulic Transients and Thermal Waste Dispersion in River-Reservoir-Systems-Phase II	Department of Civil Engineering and Engineering Mechanics, University of Tennessee, Knoxville, Tennessee	B. A. Tschantz W. A. Miller R. L. deJong	USDI-OWRR	Unknown
183	Effects of Filling Hackensack Meadows on Intake Temperature at Three Existing Power Plants	New York Harbor Model-Lower Hackensack River	Pritchard and Carpenter, Consultants	New Jersey Electric and Power Company	Unknown
184	Intake and Outfall Design Data for Proposed Nuclear Station	New York Harbor Model-Raritan Bay at Conasquok Point	Pritchard and Carpenter, Consultants	New Jersey Electric and Power Company	Unknown
185	Analysis of Thermal Pollution Dispersion	Laboratory Work, Rutgers	R. C. Ahlert B. Davidson G. Biguria	USDI-OWRR; Others	4 years
186	Thermal Gradients Associated With Discharge of Heated Effluents	Mississippi State University	A. Shindala	USDI-OWRR	7/69 and continuing
187	Turbulent Mixing in Submerged Fluid Jets	University of Tennessee	F. N. Peebles	USDI-OWRR	? years
188	Turbulent Mixing in Submerged Two-Dimensional Wall Jets	University of Tennessee	C. J. Remenyik C. S. Chu	USDI-OWRR-Others	7/68 and continuing
189	Temperature Distribution in the Vicinity of Waste Heat Discharges	Tennessee Valley Authority; Field Studies, TVA Sites	M. A. Churchill R. B. Samworth	TVA	7/68 and continuing
190	Water Quality Control	Engineering Laboratory, TVA	R. A. Elder	TVA	7/68 and continuing
191	Prediction of the Physical and Biological Environment	USDI-Biological Laboratory Seattle, Washington	G. R. Snyder L. A. Fulton R. F. Raleigh	BCF	3 years
192	Effects on Local Hydraulic and Salinity Conditions From Two Power Generating Stations. (One Fossil - One Nuclear)	Houston Ship Channel Model	Unknown	C. of E.	Unknown
193	Planned-Thermal Study on Effects of Fossil Plant Discharge	Charleston Harbor Model	Unknown	(South Carolina Power and Light Company)	Planned
194	The Prediction of Water Quality Aspects of The Wenatchee River	School of Engineering Washington State University	H. D. Copp	Chelan County Government Washington	7/68 and continuing

MODELING

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
195	Power Production (Temperature Prediction, Density, Currents, Operating Schedules, Multiple Outlets, Dispersion of Cooling Apparatus, Operating Methods)	Pacific Northwest Water Laboratory	B. A. Tichenor A. G. Christianson W. L. Morse	FWQA	7/67 and continuing
196	Thermal Stratification in Reservoirs	Massachusetts Institute of Technology, School of Engineering	D. R. F. Harleman	FWQA	11/68 and continuing
197	Formulation of a General Mathematical Model for the Prediction of Thermal Energy Changes in Impoundments	Water Resources Engineers, Incorporated	G. T. Orlob	FWQA	7/68 and continuing
198	Temperature Prediction Studies Relating to the Development of a Power Reactor Site on the Lower Columbia River	Columbia River	R. T. Jaske	Portland General Electric Company	7/68 and continuing
199	Simulation Modeling of Expected Thermal Generation	Battelle Memorial Institute Pacific Northwest Laboratory	R. T. Jaske	AEC	7/66 and continuing
200	Simulation Modeling of Thermal Effects on Selected River Systems	Battelle Memorial Institute Pacific Northwest Laboratory	R. T. Jaske D. E. Peterson	AEC	7/68 and continuing
201	Estuaries and Shore Studies and Water Surface Investigations	Potomac and Patuxent Estuaries, Cook Inlet, Alaska; Delaware Estuary, Barnegat Bay, N. J.; Connecticut River; Hudson River; Lehigh River; Missouri River; Others	C. Robinove	National Aeronautics and Space Administration	7/67 and continuing
202	Water Physics and Chemistry	Theoretical and Laboratory	C. J. Robinove	National Aeronautics and Space Administration	7/68 and continuing
203	Instrumentation for Lake Cayuga Heat Release Study	Lake Cayuga, Vicinity of Fossil Fuel Plants	D. H. Book J. A. Bruder A. M. Offt R. A. Dunkin	New York State Electric and Gas Corporation	7/67 and continuing
204	Prediction of Environment	Columbia River	G. R. Snyder	BCF	3 years

SURVEYS-ECOLOGICAL

205	Pre- and Post-Operational Ecological Study of the Missouri River to Determine The Effects of Thermal Discharges from Cooper Nuclear Power Station	Missouri River near Brownville, Nebraska	Unknown	State of Nebraska	Active
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SURVEYS-ECOLOGICAL

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
206	Ecological Survey-Fish Population, Rate of Growth, Bottom Ecological Survey	Lake Ontario	J. F. Storr	Rochester Gas and Electric Company	Continuing
207	Pre- and Post-Operational Ecological Study of the Missouri River to Determine The Effects of Thermal Discharges from Ft. Calhoun Nuclear Power Station	Missouri River approximately 19 miles N. W. of Omaha, Nebraska	Unknown	State of Nebraska	Active
208	Ecological Study of the Lower River	Hudson River Estuary	Raytheon Marine Research Laboratories	Consolidated Edison of New York, Inc.	Unknown
209	Ecological Study of the Aquatic Environs of a Proposed Nuclear Power Station	Salt Water	A. Perlmutter	Long Island Lighting Company	Unknown
210	Baseline Study of Flora and Fauna at Proposed Nuclear Site	Ocean, Atlantic	New Hampshire Fish and Game Department	Public Service Company of New Hampshire	Unknown
211	A Study to Determine the Area of Lake Michigan Influenced by the Hot-Water Discharge from the Palisades Park Nuclear Power Station	Southeastern Lake Michigan near South Haven	D. Stone	Consumers Power Corporation	5 years
212	An Ecological Evaluation of Thermal Discharge from the Monroe Power Plant (field thermal effects investigation)	Monroe; River Basin and Western Lake Erie	R. C. Ball	The Detroit Edison Company	4 years
213	Studies of Thermal Pollution in Biscayne Bay	Biscayne Bay, Turkey Point Vicinity	D. C. Tatb C. P. Idyll	FWQA	3 years
214	Ecological Responses of Lake Monona (Dane County, Wisconsin) Fishes to Heated Influent Water	Lake Monona; Dane County, Wisconsin	J. J. Magnuson	Wisconsin Utilities Association	Unknown
215	Statewide Fisheries Management	Lower Truckee River, Nevada	V. K. Johnson	Department of Fish and Game, State of Nevada	1 year
216	An Ecological Study of the Patuxent Estuary	Patuxent Estuary, Vicinity of Chalk Point, Maryland	R. G. Brown	Maryland State Government	Unknown
217	Biological and Related Studies in Lake Michigan at the Site of the Point Beach and the Kewaunee Nuclear Power Plants	Lake Michigan at the Site of the Point Beach and the Kewaunee Nuclear Power Plants	R. Grunewald	Wisconsin Electric Power; Wisconsin Public Service	Unknown

SURVEYS-ECOLOGICAL

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
218	Background Biological Field Information in the Vicinity of Two Creeks	Two Creeks, Wisconsin	Department of Natural Resources	State of Wisconsin, Department of Natural Resources, Division of Environmental Protection	Unknown
219	Laboratory and Field Investigation of the Effects of Thermal Effluents on the Indigenous Flora and Fauna of the James River	James River, Virginia	M. L. Brenner	Virginia Electric and Power Company	4 years
220	Temperature Influence on Ecology of Largemouth Bass in Lake Powell	Lake Powell, Utah	R. H. Kramer	Utah Fish and Game Commission	1969 and continuing
221	The Effects of Thermal Releases on the Ecology of the Merrimack River	Bow, New Hampshire on the Merrimack River	D. A. Normandeau	Public Service Company of New Hampshire	2 years
222	Ecological Studies of the Connecticut River, Vernon, Vermont	Hinsdale, New Hampshire Vernon, Vermont on the Connecticut River	G. W. Starbuck	Vermont Yankee Nuclear Power Corporation	Completed
223	Response of Fish Populations to Heated Effluents	Mid-Wabash River, Indiana and Illinois	J. Gammon	Public Service Company of Indiana	7 years
224	Survey of the Biota of Card Sound	Card Sound, Dade and Monroe Counties, Florida	E. S. Iversen	Florida Power and Light Company	3 months
225	The Effects of Thermal Power Plant Effluent on the Ecology of a Subtropical Mangrove Swamp	Turkey Point Power Plant, Dade County, Florida	R. Nugent	Florida Power and Light Company	2 years
226	Ecology and Distribution of Postlarval Fishes of Southern Biscayne Bay, Florida	Biscayne Bay, Florida	D. P. DeSylva	FWQA	3 years
227	Ecological Study of the Delaware River in the Vicinity of Artificial Island	Delaware River	E. C. Raney	Philadelphia Electric Company	3 years
228	An Analysis of Fish Populations in the Delaware Bay Area	Lower Delaware Bay	F. C. Daiber	Delaware Game and Fish Commission	2 years
229	Benthic Survey of Indian River and Rehoboth Bays, Delaware	Rehoboth and Indian River Bays in Southern Delaware	D. L. Maurer	University of Delaware Research Foundation	3 years
230	Connecticut River Microbiology	East Haddam, Connecticut including approximately a 2 mile stretch of the Connecticut River	J. D. Buck	FWQA	5 years
231	Benthic Diatom Species Composition and Species Diversity as Indicators of Thermal Discharge Effects	Environmental Engineering Laboratory, San Diego State College	W. Wight	San Diego Electric and Gas Company	1968 to present

SURVEYS-ECOLOGICAL

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
232	Pre- and Post-Operational Studies to Determine the Aquatic Environment of the Radioactive Waste and Thermal Discharges	Southeast Lake Michigan near Bridgman	J. C. Ayers H. Whipple	Indiana-Michigan Electric Company	1969 through ?
233	Marine Life of South San Diego Bay and The Ecological Effects of Power Station Cooling Water Discharge	Environmental Engineering Laboratory, San Diego State College	R. F. Ford	San Diego Gas and Electric Company	1968 and continuing
234	Ecological Density Studies of the Distribution of Marine Organisms in the Intertidal Regions of Central California Coast	Central and Northern California	G. L. Chan	College of Marin, County of Marin	3 years
235	The Fishery of Thomas Hill Reservoir	Thomas Hill Reservoir, Missouri	W. D. Hanson	BSF; Oregon State Government	Unknown
236	Prairie Island Fish Study	Red Wing, Minnesota	R. Sternberg	State of Minnesota	Unknown
237	A Study of the Effect of Heated Discharge Water from the Allen S. King Generating Plant of the Northern States Power Company on Fish Populations and Fishing in Lake St. Croix	Stillwater, Minnesota	H. F. Krosch	Northern States Power Company	5 years
238	Effects of Heated Discharges From Nuclear Plants on Fish Population	South Haven, Michigan	M. H. Patriarche	State of Michigan	Unknown
239	Environmental Evaluation of a Nuclear Power Plant	Locus Point and Frantz Theodore Stone Laboratory Lake Erie	R. Tub	State of Ohio	7 years
240	The Determination of Certain Effects of Hydroelectric Thermal Increases on Aquatic Life in Wilkes Reservoir	Northeast Texas	J. F. Toole	Texas-Dingell-Johnson	3 years
241	Effects of Thermal Pollution Upon Lake Norman Fishes	Lake Norman near Charlotte, North Carolina	W. D. Adair	North Carolina Wildlife Resources Commission	3 years
242	Indian Point Plant, Hudson River, Buchanan, New York	Raytheon Marine Research Laboratory, New London, Connecticut	Raytheon Marine Research Laboratories	Consolidated Edison	19 months
243	Four Year Ecological and Radiological Before and After Study of the Effect of Operation of the 650 Mw Pilgrim Nuclear Station	Cape Cod Bay, Massachusetts	Division of Marine Fisheries	Boston Edison Company	4 years

SURVEYS-ECOLOGICAL

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
244	Calico Scallop Fishery and Environmental Studies	Atlantic Ocean East Coast of Florida in Region of Cape Kennedy 10-30 Fathoms	C. J. Sinderman	BCF	1969 to present
245	Florida Bay Ecology Studies	Florida Bay and the Florida Keys	T. J. Costello	BCF	5 years
246	Mississippi River Ecology Associated With Hanted Power Plant Effluent	Mississippi River near Monticello, Minnesota	A. J. Hopwood	USDI-OWRR	Proposed
247	Resident Population Determination	Hooksett-Amoskeag Impoundments and Tributaries, New Hampshire	P. H. Wightman	BSF	3 years
248	Skookumchuck/Hanford Creek Fisheries Investigation	Skookumchuck River and Hanford Creek near Centralia, Washington	E. Finn, Jr.	Pacific Power and Light Company and Washington Water and Power Company	3 years
249	Relationship of Thermal Discharge to Food and Feeding of Juvenile Chinook Salmon	Columbia River	C. D. Becker	AEC	3 years
250	Hanford Chinook Salmon Population Studies	Columbia River	D. G. Watson	AEC	1947 and continuing
251	Sonic Tracking of Adult Salmonids	Columbia River	C. C. Coutant E. F. Prentice J. H. Johnson	AEC, BCF	4 years
252	On Site Timing of Movement of Juvenile Fish at Prescott, Oregon	Columbia River	R. J. McConnell	BCF	3 years
253	Environmental Surveys at San Onofre Nuclear Power Plant Site	San Onofre, California	Bendix Marine Advisors, Incorporated	Southern California Edison Company	1966 and continuing
254	Study of the Physical Oceanography of Waters in the Vicinity of Milet Island and Skagie Bay, Washington	Puget Sound	C. A. Barnes	City of Seattle, Department of Lighting and Snohomish County Public Utility District No. 1	3 years

SURVEYS-TEMPERATURE AND PHYSICAL

255	Dissipation and Diffusion of Heat in Streams and Lakes	USDI-Water Resources Division	N. Yotsukura	USDI-OWRR	7/68 and continuing
256	An Investigation of Effects of Cooling Water Effluent From a Steam Electric Generation Station on Water Temperature, Stratification, and Chemical Water Quality in Lake Catherine and the Ouachita River Below Rummel Dam, Hot Springs County, Arkansas	Lake Catherine and Ouachita River below Rummel Dam	R. E. Blanz W. E. Keith	Arkansas Power and Light Company and Arkansas Game and Fish Commission	4 years

SURVEYS-TEMPERATURE AND PHYSICAL

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
257	Heat Diffusion Study; and the Physical and Biological Oceanographic Environment off Ormond Beach, Ventura County, California (Power Plant Discharge Site)	Oxnard, California	Bendix Marine Advisors, Incorporated	Southern California Edison Company	1968 and continuing
258	Investigation of the Thermal Patterns in the Vicinity of the Crystal River	Crystal River, Florida	G. J. Neumaier	Florida Power Corporation	7 years
259	Preoperational and Operational Reservoir Monitoring-Browns Ferry Nuclear Plant	67,000 Acres-Wheeler Reservoir From the Browns Ferry Nuclear Plant	G. E. Hall	TVA	Unknown
260	Zion Nuclear Station	Zion, Illinois; Zion Power Station on Lake Michigan	E. Silberman	Harza Engineering Company	Unknown
261	Thermal Effects of New York Harbor and Hudson River Estuary	New York Harbor and Hudson River Estuary	G. S. Posner	New York City	Unknown
262	Temperature Patterns of the Connecticut River	Connecticut River	T. Asarovitz	Power Companies Through Connecticut River Anadromous Fish Program	1 year
263	Thermal Dispersion in Dan River	Dan River, North Carolina	W. L. Meyer	North Carolina Department of Water and Air Resources U. S. Geological Survey	1 year
264	Seawater Intrusion in Estuaries and Sounds in North Carolina-Cape Fear River	Estuaries and Sounds, Cape Fear River, North Carolina	H. B. Wilder	North Carolina Department of Water and Air Resources U. S. Geological Survey	3 years
265	Basic Data and Research on Thermal Pollution	Dan River near Eden, North Carolina; Fenholloway River near Foley, Florida; Holston River near Rogersville, Tennessee; North Platte River near Glenrock, Wyoming; Potomac River near Dickerson, Maryland; Tittabawassee River at Midland, Michigan; West Branch Susquehanna River near Shawville, Pennsylvania; White River near Centerton, Indiana	G. E. Harbeck, Jr.	AEC, U. S. Geological Survey	2 years
266	Montville Station Temperature Survey (Thames River)	Thames River Estuary	W. Owen	Bechtel Corporation	7/67 and continuing
267	Infrared Surface Water Temperature Survey-Barnegat Bay, 1968	Barnegat Bay, New Jersey	T. Asarovitz	Jersey Central Power and Light Company	1 year
268	Survey of Potential Sites on the Yellowstone River From Billings to Sidney, Montana	Yellowstone River, Montana	R. Boland	Montana-Dakota Utilities Plant	Continues Intefinitely

SURVEYS-TEMPERATURE AND PHYSICAL

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator</u>	<u>Sponsor</u>	<u>Duration</u>
269	Monitoring Temperatures Above and Below the Power Plant at Billings	Yellowstone River, Montana	C. Bishop	State of Montana Department of Fish and Game	2 years
270	Thermal and Industrial Pollution-Delaware River	Delaware River From Riegelsville, New Jersey to Milford, New Jersey	B. W. Parker	FWQA	10/67 and continuing
271	Monitoring Water Effluents From a Nuclear Plant	Waters of Lake Ontario Near East Nine Mile Point	E. E. Chemack	State University of New York	Unknown
272	Merrimack River Monitoring Program, January 1, 1970, to December 31, 1970	Merrimack River at Bow, New Hampshire	D. A. Normandeau	Public Service Company of New Hampshire	1 year
273	Environmental Surveys at San Onofre Nuclear Power Plant Site	San Catalina Gulf, Pacific Ocean	Bendix Marine Advisors, Incorporated	Southern California Edison Company	1966 and continuing
274	Monitoring Program Centered Around Future Plant Sites	Yabucoa Bay, Puerto Rico	M. J. Cerame-Vivas	Department of Health and Department of Public Works	Active

SURVEYS-GENERAL

275	Thermal Pollution and its Implications for the Coal Industry-A Survey of the State of Knowledge	Travelers Research Center, Incorporated	P. B. Cheney J. D. Kangas D. J. Pelton	National Coal Policy Conference, Incorporated	5/68 and continuing
276	Engineering and Economic Analysis Cooling Condenser Discharge Waters in Thermal Power Plants	Dynatech Corporation	Dynatech Corporation	FWQA	18 months
277	Seabrook Nuclear Station Unit I. Preliminary Safety Analysis Reports, Vols. I, II, and III	Hampton Harbor Estuary (Brown's River), Seabrook New Hampshire	Unknown	Public Service Company of New Hampshire	Unknown
278	Multiple Objective Analysis of the Proposed Red River Dam, Kentucky	Red River, Kentucky	D. C. Major	Center for Advanced Engineering Studies, Massachusetts Institute of Technology	Active
279	Lake Michigan Environmental Survey	All of Lake Michigan	J. C. Ayers	Consumers Power Company; American Electric Power Service Corporation; Wisconsin Public Service Corporation, Northern Indiana Public Service Company; Wisconsin Electric Power Company	June, 1969 through September, 1970
280	Multiple Objective Analysis of the Big Walnut Project	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	D. C. Major	Joint Water Resources Council Laboratory Project	Active

SURVEYS-GENERAL

<u>No.</u>	<u>Title</u>	<u>Location</u>	<u>Investigator:</u>	<u>Sponsor</u>	<u>Duration</u>
281	Systems Methodology for Water-Resource Planning in a Regional Development Context	Water Resources and Hydrodynamics Laboratory Department of Civil Engineering, Massachusetts Institute of Technology	F. E. Perkins	M.I.T. Inter-American Program in Civil Engineering	Completed
282	Status of Thermal Pollution and Research Needs	Vanderbilt University, School of Engineering	F. L. Parker P. A. Krenkel	FWQ.	1/68 and continuing
283	Engineering Aspects of Thermal Pollution of the Delaware River	Delaware River	L. A. Wenzel	NSF	6/68 and continuing

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