THE DEVELOPMENT OF FISHERY COMPARTMENTS AND POPULATION RATE COEFFICIENTS FOR USE IN RESERVOIR ECOSYSTEM MODELING

ARMY ENGINEER WATERWAYS EXPERIMENT
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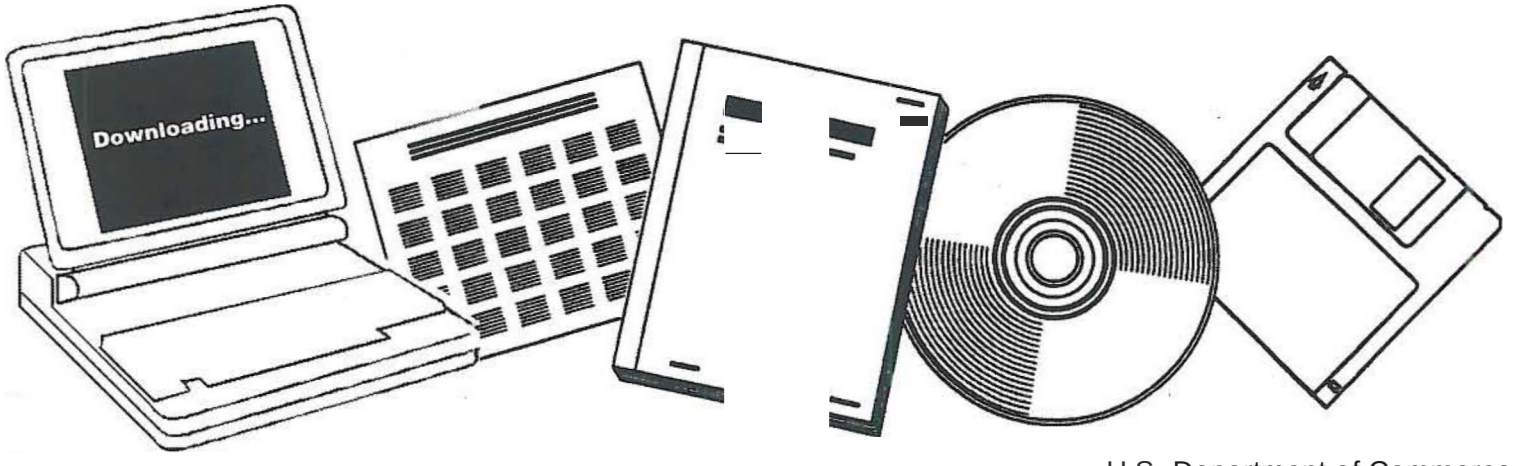

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by

George R. Leidy, Robert M. Jenkins

USDI Fish and Wildlife Service
National Reservoir Research Program
Fayetteville, Arkansas

June 1977

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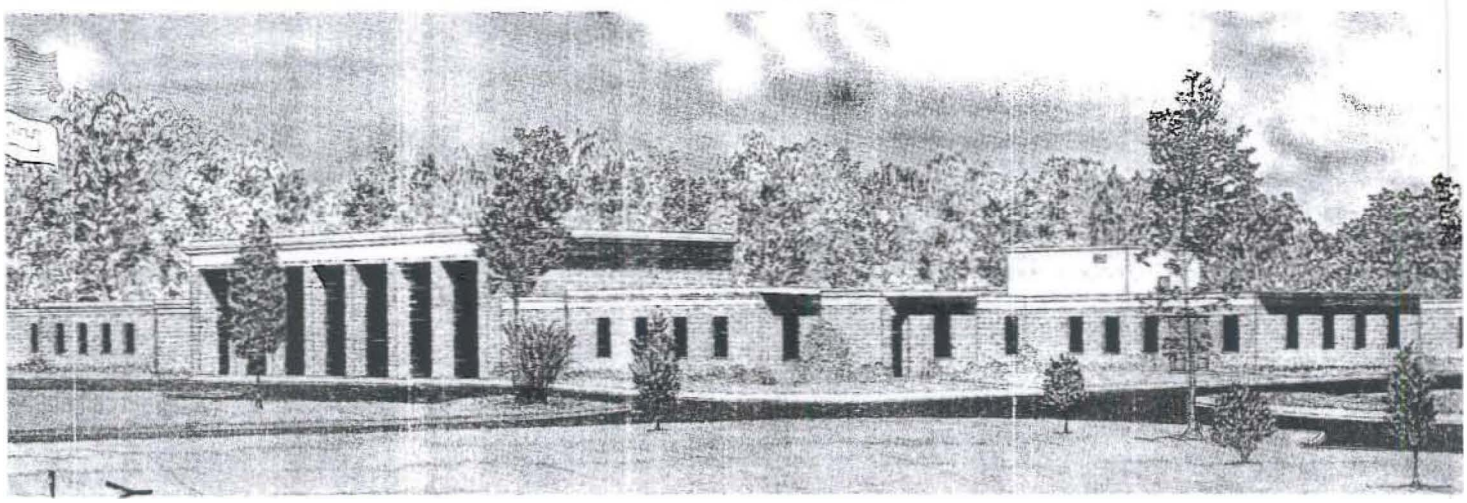

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The results of analyses designed to develop model fishery compartments and associated fish population rate coefficients on a regional basis for use in reservoir ecosystem modeling are presented. Emphasis is directed toward development of regional rate coefficients for the United States corresponding to major geographical drainage areas. Fishery data will be incorporated in the reservoir ecosystem model currently being developed by personnel of the Environmental Effects Laboratory, U. S. Army Engineer Waterways Experiment Station.

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cont. Known physical, chemical, and fishery conditions in 187 Corps of Engineers (CE) impoundments larger than 500 acres are described. Multivariable equations are presented that allow estimation of standing crop and sport fish harvest in CE reservoirs.

The development of fishery compartments and population rate coefficient is described. Five fish compartments and their corresponding food compartments were developed to describe the feeding of reservoir fish populations. The fish compartments are piscivores, planktivores, benthos feeders, detritivores, and fish that feed on terrestrial food sources. The five food compartments corresponding to these fish compartments are, respectively, prey fishes, zooplankton, benthos, organic detritus, and terrestrial organisms. Fish biomass is proportioned among these compartments on a regional basis.

The relations among fishery compartments and to other fish population parameters were investigated. Where applicable, regional rate coefficients were developed for fish production, reproduction, recruitment, growth, mortality, and sport and commercial harvest.

Data were also reviewed and summarized on the ecological growth and assimilation efficiencies of fish, food consumption rates, respiration rates, temperature tolerances, half-saturation constants for growth, and chemical composition. Text and appendices detail the results of these various studies.

PREFACE

The work described in this report was performed under cooperative agreement No. WES-76-2, between the U. S. Army Engineer Waterways Experiment Station (WES), Environmental Effects Laboratory (EEL), Vicksburg, Mississippi, and the U. S. Department of the Interior, Fish and Wildlife Service, National Reservoir Research Program (NRRP), Fayetteville, Arkansas, signed 3 November 1975. The research was funded through the Civil Works Environmental Impact Research Program, Office, Chief of Engineers (aCE).

The research was conducted and the report written by Mr. G. R. Leidy and Mr. R. M. Jenkins of the NRRP. The efforts of Mrs. J. A. Bilbrey for typing and proofing the text, tables, figures, and appendices of this report are acknowledged.

Dr. K. W. Thornton, Ecosystem Research and Simulation Division (ERSD), EEL, was the Contract Monitor and was responsible for the performance of the agreement. The study was under the supervision of Mr. D. L. Robey, Chief, Ecosystem Modeling Branch, ERSD, and Dr. R. L. Eley, Chief, ERSD, and the general supervision of Dr. J. Harrison, Chief, EEL. The aCE TeChnical Monitor was Mr. John Bushman.

Commanders and Directors of WES during the study and preparation of this report were COL G. H. Hilt, CE, and COL J. L. Cannon, CEo Technical Director was Mr. F. R. Brown.

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CONVERSION FACTORS, U.S. TO METRIC (51)
UNITS OF MEASUREMENT

U.S. customary unit.s of measurement used in this paper can be converted to metric (5r) units as follows:

Multiply	By	To Obtain
inches	25.4	**millimeters**
feet	0.3048	**meters**
miles	1.609344	**kilometers**
square miles	2.58999	**square kilometers**
acres	0.40468	**hectares**
acres	0.0040468	**square kilometers**
acre-feet	1.234	**megalitres***
pounds	453.5923	**grams**
pounds per acre	1.120851	**kilograms per hectare**

*** 1 megalitre - 106 litres = 1000 cubic meters.**