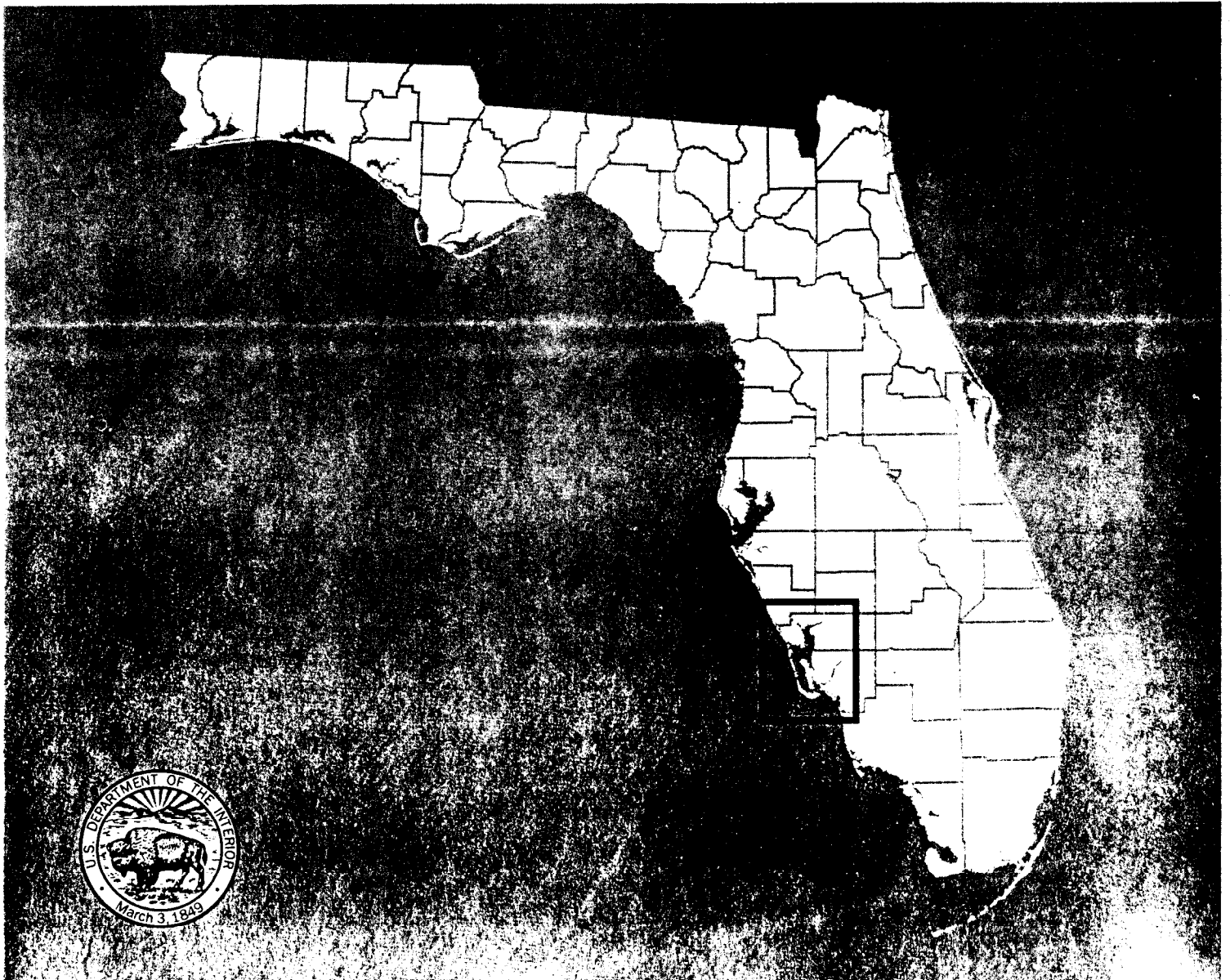


Salinity Distribution and Variation with Freshwater Inflow and Tide, and Potential Changes in Salinity due to Altered Freshwater Inflow in the Charlotte Harbor Estuarine System, Florida

U.S. Geological Survey
Water-Resources Investigations Report 92-4062

Prepared in cooperation with the
Florida Department of Environmental Regulation



Salinity Distribution and Variation with Freshwater Inflow and Tide, and Potential Changes in Salinity due to Altered Freshwater Inflow in the Charlotte Harbor Estuarine System, Florida

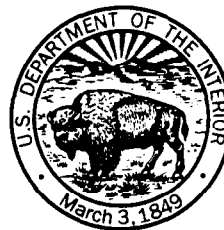
By Yvonne E. Stoker

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 92-4062

Prepared in cooperation with the
FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

Tallahassee, Florida
1992

U.S. DEPARTMENT OF THE INTERIOR
MANUEL LUJAN, JR., Secretary



U.S. GEOLOGICAL SURVEY
DALLAS L. PECK, Director

For additional information,
write to:

District Chief
U.S. Geological Survey
Suite 3015
227 North Bronough Street
Tallahassee, Florida 32301

Copies of this report may be
purchased from:

U.S. Geological Survey
Books and Open-File Reports Section
Federal Center
Box 25425
Denver, Colorado 80225

CONTENTS

Abstract	1
Introduction	1
Purpose and scope	3
Previous studies	4
Acknowledgments	4
Description of the study area and factors affecting salinity variation	4
Freshwater inflow	4
Tide	7
Water density	8
Study methods	8
Salinity distribution in Charlotte Harbor	9
Salinity variations with freshwater inflow and tide	13
Variations with freshwater inflow	14
Tidal Caloosahatchee River	14
Upper Charlotte Harbor	17
Lower Charlotte Harbor	23
Variations with tide	23
Potential salinity changes due to altered freshwater inflow	24
Summary and conclusions	28
Selected references	29

Figure

1. Map showing study area and drainage basins	2
2. Map showing Charlotte Harbor and subarea boundaries	3
3. Map showing depth of the Charlotte Harbor estuarine system	5
4. Graphs showing daily mean discharge and monthly rainfall in the Peace, Myakka, and Caloosahatchee River basins, June 1982 to May 1987	6
5. Sketch showing generalization of highly stratified, partially mixed, and well-mixed salinity patterns in an estuary	8
6. Map showing location of continuous-record salinity stations and selected field measurement sites	10
7. Graph showing period of record at continuous-record salinity stations	11
8. Graph showing daily mean salinity at the continuous-record salinity stations, May 1983 to December 1986	11
9. Boxplot showing distribution of daily mean salinity at the continuous-record salinity stations	12
10. Boxplot showing distribution of salinity at stations in and near Charlotte Harbor, July 9-23, 1986	12
11. Boxplot showing seasonal distribution of daily mean salinity and daily range in salinity	13
12. Map showing tidal Caloosahatchee River	15
13. Graphs showing salinity profiles in the tidal Caloosahatchee River during various freshwater inflow conditions	16
14-17. Maps showing:	
14. Near-surface and near-bottom salinity contours for July 13, 1982	17
15. Near-surface and near-bottom salinity contours for April 2-3, 1987	18
16. Near-surface and near-bottom salinity contours for July 15-17, 1985	18
17. Location of cross sections	19

18. Cross-section showing salinity profiles from Boca Grande to the northern upper harbor during various freshwater inflows **20**
19. Cross-section showing salinity profiles from the west bank to the east bank of the upper harbor during various freshwater inflows **21**
20. Graphs showing vertical profiles of salinity during one complete tidal cycle on July 20-21, 1982 **22**
21. Cross-section showing salinity profiles in Pine Island Sound during various freshwater inflows **23**
22. Cross-section showing salinity profiles in Matlacha Pass and San Carlos Pass during various freshwater inflows **24**
23. Graph showing daily salinity and stage fluctuations during dry season conditions **25**
24. Graph showing daily salinity and stage fluctuations during early wet season conditions **26**
25. Graph showing instantaneous salinity at the submerged continuous-record salinity stations, July 8-22, 1986 **27**

Table

1. Regression equations relating daily mean salinity at selected stations to daily mean discharge **14**