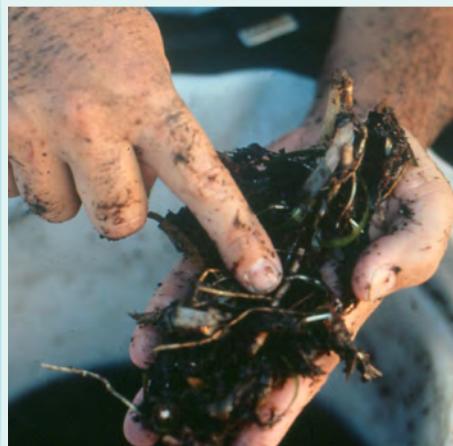


Gulf of Mexico Program

Seagrass Status and Trends in the Northern Gulf of Mexico: 1940–2002



Scientific Investigations Report 2006-5287
U.S. Environmental Protection Agency 855-R-04-003

Cover: Background, seagrass through surface of water (Tommy Michot, U.S. Geological Survey). Left, seagrass sampling (Tommy Michot, U.S. Geological Survey). Center, oblique aerial photograph of seagrass (Tommy Michot, U.S. Geological Survey). Right, manatees in seagrass habitat (Sirenia Project, U.S. Geological Survey).

Seagrass Status and Trends in the Northern Gulf of Mexico: 1940–2002

Edited by L. Handley, D. Altsman, and R. DeMay

Scientific Investigations Report 2006–5287

U.S. Environmental Protection Agency 855-R-04-003

**U.S. Department of the Interior
U.S. Geological Survey**

U.S. Department of the Interior
DIRK KEMPTHORNE, Secretary

U.S. Geological Survey
Mark D. Myers, Director

U.S. Geological Survey, Reston, Virginia: 2007

For product and ordering information:

World Wide Web: <http://www.usgs.gov/pubprod>

Telephone: 1-888-ASK-USGS

For more information on the USGS--the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment:

World Wide Web: <http://www.usgs.gov>

Telephone: 1-888-ASK-USGS

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Although this report is in the public domain, permission must be secured from the individual copyright owners to reproduce any copyrighted materials contained within this report.

Suggested citation:

Handley, L., Altsman, D., and DeMay, R., eds., 2007, Seagrass Status and Trends in the Northern Gulf of Mexico: 1940-2002: U.S. Geological Survey Scientific Investigations Report 2006-5287 and U.S. Environmental Protection Agency 855-R-04-003, 267 p.

Preface

The Gulf of Mexico Program (GMP) is a network of citizens dedicated to promoting the economic health of the region by managing and protecting the gulf's resources. Although administered by the U.S. Environmental Protection Agency (EPA), the GMP engages many organizations across the Gulf of Mexico coastal region to implement and lead restoration and conservation projects that are environmentally and economically sound. The GMP includes representatives from State and Federal agencies, nonprofit organizations, the scientific community, business and industry, and an organized citizens group. These members are appointed by the five State governors along the gulf coast. The GMP focuses on three ecological issues: (1) public health, (2) excess nutrient enrichment, and (3) habitat degradation and loss, including the introduction of nonindigenous species.

The GMP has long recognized that seagrasses, estuaries, and coastal wetlands are vital in providing food and shelter for plants and animals, improving water quality, sediment filtration, and flood and erosion control. In 1999, the GMP's Habitat Focus Team set a goal to restore, enhance, or protect 20,000 acres of important coastal habitats of the gulf by 2009. The Habitat Team, recognizing that seagrass beds are some of the most productive habitats in nearshore waters, set a goal to produce this summary report on gulfwide seagrass status and trends. The purpose of the summary report is to provide current baseline information on the status of seagrasses in the Gulf of Mexico.

To produce this report, the GMP's Habitat Team formed a subcommittee, consisting of over 30 gulf coast seagrass scientists and environmental managers. Committee members provided data on seagrass maps, seagrass status and trends, causes of change in seagrass acreage, monitoring activities, and restoration efforts important to seagrass areas along the gulf coast. The U.S. Geological Survey's (USGS) National Wetlands Research Center provided extensive support in the production of data, maps, writing, and editing for this summary.

Lastly, *Seagrass Habitat in the Northern Gulf of Mexico: Degradation, Conservation, and Restoration of a Valuable Resource*, written in lay terms and developed for the general public, legislators, and Gulf of Mexico stakeholders, is meant to be a companion to this summary report. For example, nomenclature of seagrasses in the summary report follows this outreach document. Additional information will be available on the USGS National Wetlands Research Center's Web site at <http://www.nwrc.usgs.gov> and the GMP Web site at <http://www.epa.gov/gmpo/>.

Acknowledgments

The U.S. Geological Survey, National Wetlands Research Center, and the U.S. Environmental Protection Agency, Gulf of Mexico Program partnership would like to thank the following scientists and environmental managers for reviewing the Gulf of Mexico seagrass status and trends. Your dedication, time, and expertise are greatly appreciated.

Ron Boustany, U.S. Department of Agriculture, Natural Resources Conservation Service

Dr. Ken Dunton, University of Texas

Dr. Steve Jordan, U.S. Environmental Protection Agency

Dr. Michael Lewis, U.S. Environmental Protection Agency

Randy Roach, U.S. Fish and Wildlife Service

Frank Sargent, Florida Department of Environmental Protection, Southwest Florida Water Management District

Dr. Judy Stout, University of South Alabama

Dr. Sandy Wyllie-Echeverria, University of Washington

Dr. Judy Stout, University of South Alabama

Captain David Yeager, Mobile Bay National Estuary Program

Personnel from the USGS National Wetlands Research Center who played a key role in the production of this document included

Pete Bourgeois, cartography

Helena Schaefer, peer review coordination

Blaire Hutchison, data compilation

Contents

Preface	iii
Acknowledgments	iv

Abstract	1
Introduction	1
References Cited	6

Statewide Summary for Texas

Background	7
Statewide Status and Trends Data	9
Galveston Bay System	9
Texas Coastal Bend Region	9
Laguna Madre System	11
Causes of Change	11
Natural Process Changes	11
Human-induced Changes	11
Gaps in Data Coverage	12
Bay Systems Lacking Inventories	12
Data Limitations and Future Needs	12
Overview of Seagrass Restoration Efforts	13
Seagrass Conservation Plan and Resource Management Needs	13
Overview of Monitoring, Restoration, and Enhancement Opportunities	13
Monitoring for Seagrass Ecosystem Health	13
References Cited	14

Galveston Bay System

Background	17
Scope of Area	17
Methodology Employed To Determine and Document Current Status	17
Methodology Employed To Analyze Historical Trends	19
Status and Trends	19
Upper Galveston Bay and Trinity Bay	19
West Galveston Bay	21
Christmas Bay	21
Causes of Change	21
Upper Galveston-Trinity Bays	21
West Galveston Bay	23
Christmas Bay System	24
Species Information	24
Monitoring for Seagrass Health	24

Mapping and Monitoring Needs	25
Restoration and Enhancement Opportunities	25
References Cited	26

Laguna Madre

Background	29
Scope of Area	29
Methodology Employed To Determine and Document Current Status	29
Methodology Employed To Analyze Historical Trends	31
Status and Trends	31
Lower Laguna Madre	31
Upper Laguna Madre	33
Laguna Madre as a Whole	36
Causes of Change	36
Lower Laguna Madre	36
Upper Laguna Madre	37
Monitoring for Seagrass Health.....	38
Mapping and Monitoring Needs	38
Restoration and Enhancement Opportunities.....	39
Acknowledgments.....	39
References Cited	40

Texas Coastal Bend

Background	41
Scope of Area	41
Redfish Bay	41
Harbor Island	43
Mustang Island	43
Nueces Bay	43
Methodology Employed To Determine and Document Current Status	43
Classification Scheme	43
Methodology Employed To Analyze Historical Trends	45
Status and Trends	46
System Summary	46
Status Summary	46
Trends Summary	46
Causes of Change	52
Redfish Bay	52
Harbor Island	54
Mustang Island	54
Nueces Bay	54
Species Information	55
Monitoring for Seagrass Health	55
Mapping and Monitoring Needs	56
Restoration and Enhancement Opportunities	56

Propeller Scar Restoration	56
Designation of State Scientific Areas	56
Signage and Boater Education Activities	57
Seagrass Restoration Through Beneficial Use Projects	57
Coastal Bend Bays and Estuaries Program Outreach Strategies	57
References Cited	58

Statewide Summary for Louisiana

Background	60
Statewide Status and Trends	60
Reference Cited	60

Chandeleur Islands

Background	62
Scope of Area	62
Methodology Employed To Determine and Document Current Status	62
Methodology Employed To Analyze Historical Trends	64
Status and Trends	64
Causes of Change	64
Species Information	66
Monitoring for Seagrass Health	66
Mapping and Monitoring Needs	66
Restoration and Enhancement Opportunities	71
References Cited	71

Statewide Summary for Mississippi

Background	72
Statewide Status and Trends	72
Causes of Change Statewide	72
Gaps in Data Coverage	74
Overview of Seagrass Restoration Efforts	74
Overview of Monitoring, Restoration, and Enhancement Opportunities	74
References Cited	74

Mississippi Sound and the Gulf Islands

Background	76
Scope of Area	78
Methodology Employed To Determine and Document Current Status	78
Methodology Employed To Analyze Historical Trends	80
Status and Trends	80
Causes of Change	80
Seagrass Health	83
Species Information	84
Monitoring, Restoration, and Enhancement Opportunities	84
References Cited	84

Statewide Summary for Alabama

Background	86
Natural Environment	86
Context of Human Influences	88
Scope of Area	90
Historical Documentation	90
Statewide Status and Trends.....	90
Historical Surveys	90
Methodology Employed To Determine and Document Current Status	91
Current Status and Changes	91
Causes of Change	93
Seagrass Health	93
Species Information	93
Monitoring, Restoration, and Enhancement Opportunities	94
References Cited	94

Statewide Summary for Florida

Background	98
Species Information	98
Scope of Area	100
Methods Used To Determine Current Status of Seagrasses in the State of Florida	100
Status and Trends	100
Causes of Change	105
Mapping and Monitoring Problems and Information Needs	107
Data Problems	107
Monitoring Needs.....	109
Assessment, Protection, Recovery, and Restoration Opportunities	109
Acknowledgments	111
References	111

Perdido Bay

Background	114
Scope of Area	116
Upper Perdido Bay	116
Middle Perdido Bay.....	116
Lower Perdido Bay	116
Methodology Employed To Document Current Status	116
Methodology Employed To Analyze Historical Trends	118
Status and Trends	118
Upper Perdido Bay	118
Middle Perdido Bay	118
Lower Perdido Bay	118
Entire Study Area	118
Causes of Change	124
Upper/Middle Perdido Bay	124

Lower Perdido Bay	124
Species Information	124
Monitoring for Seagrass Health	125
Mapping and Monitoring Needs	125
Restoration and Enhancement Opportunities	125
References	126
Oral and Written Communication	126

Pensacola Bay

Background	128
Scope of Area	128
Escambia Bay	130
East Bay	130
Pensacola Bay	130
Big Lagoon	130
Santa Rosa Sound	130
Methodology Employed To Determine and Document Current Status	130
Methodology for Historical Trend Mapping	132
Status and Trends	132
Escambia Bay	132
East Bay	134
Pensacola Bay	134
Big Lagoon and Santa Rosa Sound	134
Causes of Change	134
Species Information	136
Monitoring for Seagrass Health	136
Epiphytic Coverage	138
Water-quality Monitoring	138
Light-attenuation Monitoring	138
Mapping and Monitoring Needs	138
Restoration and Enhancement Opportunities	140
References Cited	140

Choctawhatchee Bay

Background	142
Scope of Area	144
Western Choctawhatchee Bay	144
Middle Choctawhatchee Bay	146
Eastern Choctawhatchee Bay	146
Methodology Employed To Determine and Document Current Status	146
Methodology Employed To Analyze Historical Trends	146
Status and Trends	147
Western Choctawhatchee Bay	147
Middle Choctawhatchee Bay	148
Eastern Choctawhatchee Bay	148

Causes of Change	148
Western Choctawhatchee Bay	148
Middle Choctawhatchee Bay	150
Eastern Choctawhatchee Bay.....	150
Species Information	150
Western Choctawhatchee Bay	150
Middle and Eastern Choctawhatchee Bay	150
Monitoring for Seagrass Health	151
Mapping and Monitoring Needs	151
Restoration and Enhancement Opportunities	151
References Cited	152

St. Andrew Bay

Background	154
Scope of Area	154
St. Andrew Bay Segment	156
West Bay Segment	156
North Bay Segment	156
East Bay Segment	156
St. Andrew Sound Segment	156
Methodology Employed To Determine and Document Current Status	156
Methodology Employed To Analyze Historical Trends	158
Status and Trends	158
Entire Study Area	158
St. Andrew Bay Segment	158
East Bay Segment	159
North Bay Segment	159
West Bay Segment	159
St. Andrew Sound Segment	159
Causes of Change	160
Entire Study Area	160
St. Andrew Bay Segment	160
East Bay Segment	160
North Bay Segment	165
West Bay Segment	165
St. Andrew Sound Segment	166
Species Information	166
Monitoring for Seagrass Health	166
Mapping and Monitoring Needs	166
Restoration and Enhancement Opportunities	167
References Cited	167

Florida Big Bend

Background	170
Scope of Area	172

Methodology Employed To Determine and Document Current Status	172
Methodology Employed To Analyze Historical Trends	174
Status and Trends	174
Regionwide Mapping Studies	175
Other Subregional Mapping Studies	176
Causes of Change	179
Hydrologic Alteration of Watersheds	179
Nutrient Enrichment of Estuaries and Nearshore Coastal Waters	179
Species Information	180
Monitoring for Seagrass Health	182
Mapping and Monitoring Needs	182
Restoration and Enhancement Opportunities	185
References Cited	185

Tampa Bay and Saint Joseph Sound

Background.....	188
Scope of Area.....	188
Methodology Employed To Determine and Document Current Status.....	188
Methodology Employed To Analyze Historical Trends	190
Status and Trends	190
Tampa Bay	190
Clearwater Harbor and Saint Joseph Sound	192
Causes of Change	192
Monitoring for Seagrass Health	193
Species Information	194
Restoration and Enhancement Opportunities	194
The Tampa Bay Nitrogen Management Strategy	194
Reduction of Seagrass Scarring	202
References	202

Sarasota Bay

Background	206
Scope of Area	206
Methodology Employed To Determine and Document Current Status	206
Status and Trends	208
Upper Sarasota Bay in Manatee County	208
Upper Sarasota Bay in Sarasota County	208
Roberts Bay	208
Little Sarasota Bay	210
Blackburn Bay	210
Causes of Change	210
Monitoring for Seagrass Health	216
Species Information	216
Restoration and Enhancement Opportunities	216
References	217

Charlotte Harbor

Background	218
Scope of Area	218
Methodology Employed To Determine and Document Current Status	221
Southwest Florida Water Management District	223
South Florida Water Management District	223
Methodology Employed To Analyze Historical Trends	224
Status and Trends	233
Causes of Change	233
Monitoring for Seagrass Health	236
Species Information	237
Mapping and Monitoring Needs	237
Restoration and Enhancement Opportunities	238
References	239
Oral and Written Communication	240

Florida Bay

Background	242
Scope of Area	244
Methodology Employed To Analyze Historical Trends	244
Aerial Photography and Interpretation	244
Field Investigations	246
Current Seagrass Change—Florida Bay Fisheries Habitat Assessment Program	246
Methods	246
Status and Trends	249
Restoration Opportunities	249
References Cited	252

Conclusions

Importance of Gulf of Mexico Seagrasses	254
Seagrass Losses	254
Seagrass Decline Leads to Economic and Aesthetic Losses	257
Resource Management and Monitoring	258
Field of Dreams or Empty Meadows: If You Build It, Will They Come?	259
Conservation Is a Necessary and Proactive Management Tool	259
Towards Restoration and Conservation Success	259
References Cited	260

Appendix

Appendix 1	265
References Cited	266