



Interstate Shellfish Sanitation Conference

ANALYSIS CLASSIFIED SHELLFISH WATERS 1985-2003

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Introduction

This report describes a series of "Shellfish Registers" published between 1966 - 1995, which included information and specific data on the number of acres classified for harvest of molluscan shellfish. This report also presents acreage data from a survey of states in 2003, and discusses the extent to which this data can be used in time series analyses with the earlier Register. The 2003 data presented in the report was generated from the individual state survey forms.

The 2003 Survey did not attempt to collect the details of information which are used to describe and support the shellfish harvesting classifications. The "Shellfish Information Management System" (SIMS) is being populated to include the detailed information associated with classification. SIMS has been designed to provide a management tool for State and Federal Shellfish Control Programs, and is intended to replace the need for periodic intensive data collection.

Background

The classified shellfish waters of the United States have been used as a barometer of water quality since 1966. The inventory of acreages, referred to as the Register, was produced approximately every five years between 1966 and 1995 by several Federal agencies. Based upon an original concept developed by the U.S. Public Health Service, the Register was a compilation of the acreage of U.S. classified shellfish waters collected and analyzed for trends. The primary responsibility for the shellfish acreage inventory has been transferred several times. The responsible parties in chronological order include (1) U.S. Public Health Service; (2) Environmental Protection Agency (EPA); (3) Food and Drug Administration (FDA); and (4) the Interagency Task Force on Shellfish Growing Waters.

The classified shellfish areas were drawn on nautical charts and measured by planimeter to determine acreage. A dot grid sampling technique was used to measure Louisiana waters. At five-year intervals, the responsible Federal agency visited each state and classification lines were modified to reflect changes. The differences in acreages from the 1995 Register to present were measured and noted. The table is a breakdown of early inventories:

CLASSIFICATION TRENDS (1,000 acres)						
	1966	1971	1974	1980	1985	
TOTAL	10,190	14,100	14,792	14,218	16,837	
Approved for Harvest	8,100	10,362	10,560	10,685	11,402	
	(79)**	(73)	(71)	(75)	(68)	
Total Harvest Limited	2,090	3,738	4,232	3,533	5,435	
	(21)	(27)	(29)	(25)	(32)	
<i>Conditionally Approved</i>	88	410	387	587	1,463	
	(1)	(3)	(3)	(4)	(9)	
<i>Restricted</i>	na	30	34	55	637	
		(<1)	(<1)	(1)	(4)	
<i>Conditionally Restricted</i>	na	na	na	na	na	
<i>Prohibited</i>	2,002	3,298	3,811	2,891	3,335	
	(20)	(23)	(26)	(20)	(20)	

In 1985, the National Oceanic and Atmospheric Administration (NOAA) / National Marine Fisheries Service (NMFS) assumed the major responsibility for the project with assistance from the U.S. Public Health Service/FDA. In 1990, NOAA National Ocean Service (NOS) assumed responsibility for the Shellfish Register. The mission of NOS is to conduct and support research, monitoring, assessment, and technical assistance to people managing coastal ecosystems and society's use of them. There was a change in direction when NOS took over the major responsibility for the project, changes that ultimately affect its use as an analysis of trends. Subsequent regional reports [[The Quality of Shellfish Growing Waters in the Gulf of Mexico](#)

(1988), The Quality of Shellfish Growing Waters on the East Coast of the United States (1989) and The Quality of Shellfish Growing Waters on the West Coast of the United States (1990)], focused on state funding, sources of pollution and landings data as well as classified acreage, trends in resource availability and background information on shellfish-borne disease.

One of the first efforts by NOS was to aggregate all shellfish areas into the National Estuarine Inventory and produce a report of that aggregation. Although NOS tried to prepare a digital database of the coastline and the shellfish areas for the 1990 process, the digital work was not complete and several techniques were used to measure areas. Alaska, Louisiana and some discrete shellfish areas were digitized or measured using an automated planimeter (NOS Geographer's office). For some areas, particularly the offshore areas added since 1985, acreage was estimated.

The project expanded to include analyses of trends in classification as they might relate to water quality, sources of pollution affecting classification and other data, which were expanded with each inventory of classified shellfish waters

In 1990, the inventory of classified shellfish waters was incorporated into The National Estuarine Inventory (NEI), a project that defines the nation's estuarine resource base and develops a national assessment capability. Over 120 estuaries were included. These estuaries represent over 90 percent of the estuarine surface water and freshwater inflow to the coastal regions and organized spatially by an estuarine drainage area (EDA)—the land and water area of a watershed that directly affects the estuary. Descriptive and analytical information for the NEI include physical and hydrologic characteristics, distribution and abundance of selected fishes and invertebrates, trends in human population, building permits, coastal recreation, coastal wetlands, eutrophication conditions, organic and inorganic pollutants in fish tissues and sediments, point and nonpoint pollution for

selected pollutants, and pesticide use. Analytical topics include relative susceptibility to nutrient discharges, structure and variability of salinity, habitat suitability modeling, and socioeconomic assessments.

In 1995, the major changes to the project include the newly digitized coastline (NOAA) and digital records of every classified shellfish area in the contiguous US. There were other small, yet sometimes significant, changes in the classified acreages in each state. The offshore waters (that are capable of supporting molluscan shellfish) were added to the digitized map base. For the *1995 Register*, information was collected on the status of 4,230 individual shellfish-growing areas, located in 122 estuarine and 98 non-estuarine areas in the 21 coastal states. This information included: name of the growing area, location, spatial extent, classification and relative abundance, and in cases where there is a harvest-limited classification, the basis for the classification, the pollution sources contributing to the classification and their relative importance, a rating of the possibility of upgrading the classification, and any ongoing restoration efforts occurring at the site. The information on each location includes the state, the number of the NOAA nautical chart on which the location appears, and the spatial extent as shown on the nautical chart. Once digitized into a geographic information system (GIS) each area's acreage was calculated.

Six classifications were recorded in the *Register* (see gray box). Note that in this report, “harvest-limited” refers to the sum of shellfish-growing waters that are classified as conditionally approved, restricted, conditionally restricted, or prohibited. All of the classifications used in the *Register* are defined in the *NSSP Guide for the Control of Molluscan Shellfish* except for the unclassified designation that in past *Registers* was called “non-shellfish non-productive” (NSNP). The term NSNP was changed to “unclassified” in this updated *Register* because, while these areas are not actively surveyed and managed at this time, they may contain productive shellfish resources.

Growing Water Classifications

Approved Waters - Growing waters from which shellfish may be harvested for direct marketing. Fecal coliform median or geometric mean most probable number (MPN) does not exceed 14 per 100 ml, and not more than 10 percent of the samples exceed an MPN of 43 per 100 ml.

Conditionally Approved Waters - Growing waters meeting approved classification standards under predictable conditions. These waters are open to harvest when water quality standards are met, and are closed at other times. Fecal coliform standards are the same as for Approved (see above).

Restricted Waters - Growing waters from which shellfish may be harvested only if they are relayed or deperated before direct marketing. Fecal coliform median or geometric mean MPN does not exceed 88 per 100 ml, and not more than 10 percent of the samples exceed an MPN of 260 per 100 ml.

Conditionally Restricted - Growing waters do not meet the criteria for restricted waters if subjected to intermittent microbiological pollution, but may be harvested if shellfish are subjected to a suitable purification process. Fecal coliform standards are the same as for Restricted Waters (see above).

Prohibited Waters - Growing waters from which shellfish may not be harvested for marketing under any conditions.

Unclassified Waters - Growing waters that are part of a state's shellfish program but are inactive, i.e., there is no harvesting, and the state does not conduct any water quality monitoring or maintain a sanitary survey.

1995 Project Results

In 1995, 4,230 individual shellfish-growing areas containing 24.8 million acres of estuarine and non-estuarine waters were classified in 21 coastal states. (Note: These numbers include 141 areas, containing 3.2 million acres, designated as unclassified). This represents an increase of 2.1 million acres and 1,058 shellfish-growing areas compared to the *1990 Register*. The increase was due primarily to the rise in the number of states classifying non-estuarine waters. In the *1990 Register* only Maine, Massachusetts, New Jersey and California classified areas in non-estuarine waters. In the *1995 Register*, every state except Alabama reported classified areas in non-estuarine waters.

In 1995, 59 percent (14.8 million acres) of the total classified waters were approved, 7 percent were conditionally approved, 9 percent were restricted, less than 1 percent was conditionally restricted, 11 percent were prohibited, and 13 percent were unclassified. The percentage of harvest-limited acreage was the lowest it had been since the *1980 Register*. Thirty-one percent of all classified waters were harvest limited in 1995, compared to 34 percent in 1990 and 42 percent in 1985.

Encouraging Trends in Classification

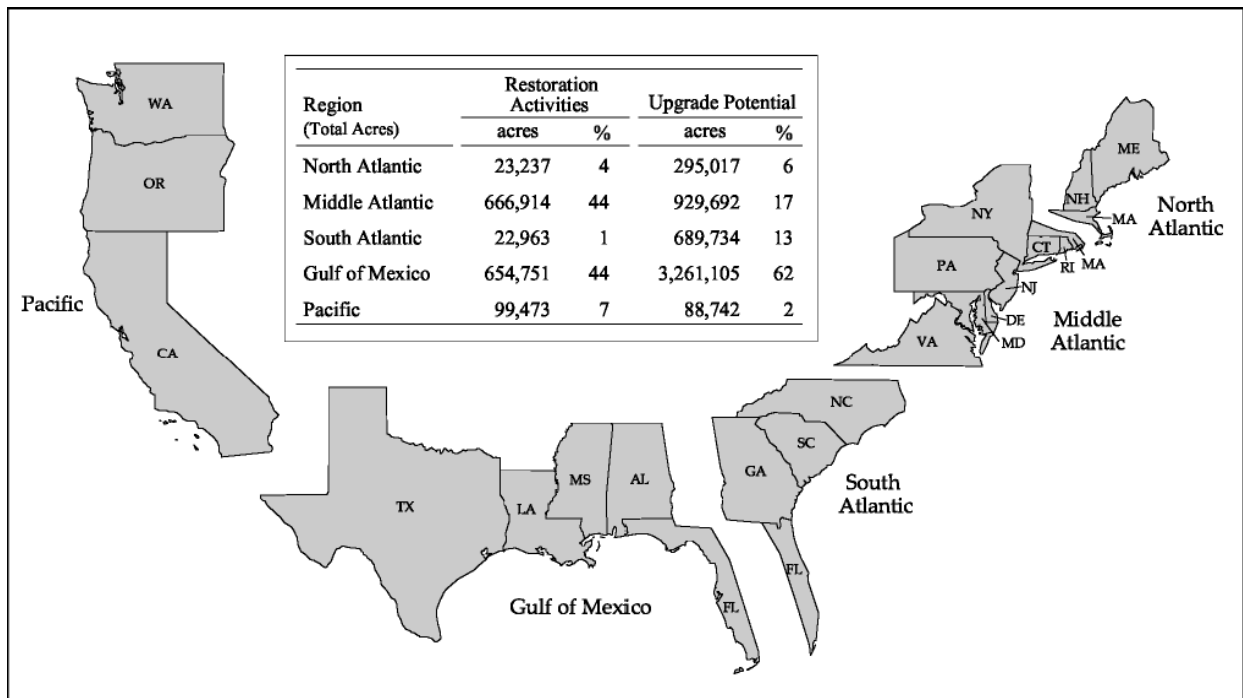
Since the first *Register* was compiled in 1966, the acreage of classified shellfish-growing waters has increased more than twofold, from 10 million to over 24 million acres (including unclassified acres). There has been an increase of 2.1 million acres and 1,058 shellfish-growing areas since the *1990 Register*. This increase is due primarily to the rise in the number of states classifying non-estuarine waters. The total area of approved waters is at an all-time high of 14.8 million acres (59 percent of all classified waters). In addition, there were only 2.8 million acres of prohibited waters (13 percent of all classified waters) reported in 1995. The only *Register* year that had less prohibited acreage was 1966 (2.0 million acres), and the percentage of prohibited waters has never been below 20 percent in any previous *Register*.

In 1995, 6.7 million acres of shellfish-growing waters were harvest limited. For 72 percent (4.9 million acres) of these waters, the limitation was attributed to water quality. Thirteen percent (873,000 acres) were attributed to administrative decisions, 8 percent (566,000 acres) lacked a compliant sanitary survey, and less than 1 percent (119 acres) were limited for conservation reasons. The state shellfish management personnel did not provide information regarding the basis for harvest limitation [for 13 percent (888,000 acres)].

Restoration

One of the major challenges to state and federal government and shellfish communities is the restoration of shellfish areas. In 1995, state shellfish management personnel reported almost 500 shellfish restoration activities taking place in harvest-limited waters. Restoration of shellfish-growing areas includes activities that improve water quality, restore habitat or enhance shellfish stocks. Some examples of restoration projects are connecting residences with malfunctioning or failing septic systems to a sewage collection system to improve water quality, planting cultch to increase suitable habitat, and releasing hatchery-raised, disease-resistant spat to increase production.

Nineteen of the 21 coastal states were engaged in at least one restoration activity. The Middle Atlantic region led the way with 667,000 acres (44 percent of the national total). New Jersey reported restoration efforts in 287,000 acres (19 percent of national total), followed by Florida with 259,000 acres (17 percent national total), and Louisiana with 173,000 ac (12 percent national total)



Is It Possible To Establish Trends in Classified Shellfish Waters?

The background discusses the major changes that have taken place in the objectives and methods that have been used to compile inventory reports since 1966. However, the classification of shellfish waters is required under the National Shellfish Sanitation Program and the methodology is consistent among all shellfish growing states that form the Interstate Shellfish Sanitation Conference (ISSC). The standards used and laboratory methods are also consistent.

The classification of shellfish-growing waters is based on the National Shellfish Sanitation Program (NSSP), a cooperative effort involving states, the shellfish industry, and the FDA. Since 1983, it has been administered through the ISSC. The ISSC was formed to promote shellfish sanitation, adopt uniform procedures, and develop comprehensive guidelines (*NSSP Guide for the Control of Molluscan Shellfish*) to regulate the harvesting, processing, and shipment of shellfish. The NSSP guidelines require each state to classify shellfish - growing waters by conducting sanitary surveys that: (1) identify actual and potential pollution sources; (2) evaluate hydrology and meteorology affecting pollutant transport; and (3) assess the results of water samples taken for bacteriological and other contaminants. The sanitary survey is the administrative document upon which growing-water classifications are based.

The information contained in the inventory reports since 1966 is consistent because the procedures used to classify shellfish waters have remained relatively uniform. The classifications are based on sanitary surveys, which identify actual or potential pollution sources. All shellfish producing states are members of the ISSC, and follow the NSSP guidelines.

Constraints

There are a number of problems with using the inventory data for trends analysis. One of the differences is in classified acre measurement, ranging from eyeball estimates to those made by planimeter to the digital database developed by NOAA. A brief analysis of the changes from the planimeter process to the digital showed differences from 2 to 10 percent, less variance than expected (personal communication). The major difference in acreage, particularly from 1990 to 1995 and from 1995 to 2003 is a result of the interpretations of what constitutes estuarine waters and the inconsistent inclusion of offshore waters.

2003 Classified Shellfish Acres

ISSC queried each state regarding state classified acres in 2003. The results are a simple snapshot of classifications as provided by state shellfish managers.

**SURVEY OF CLASSIFIED WATERS
1985-2003**

(Values for 1985-1995 were obtained from the 1995 NOAA Shellfish Register)

UNITED STATES TOTALS (1,000 acres)

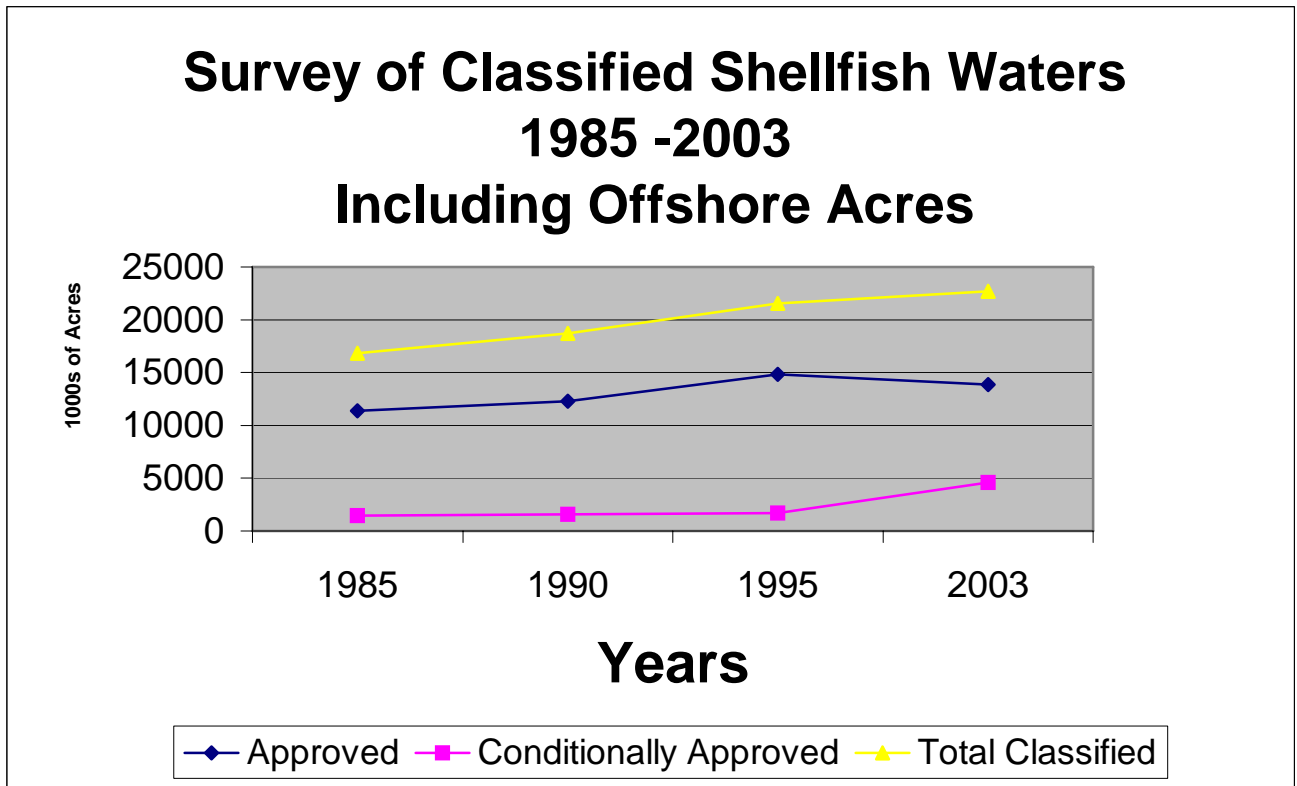
CLASSIFICATION/YEAR		TOTAL*	ESTUARINE*	OFFSHORE*	
Approved					
1985		11402	11402	0	
1990		12304	10865	1439	
1995		14853	9575	5276	
2003 ¹		13885 **	13036 **	849	
Conditionally Approved					
1985		1463	1463	0	
1990		1571	1571	0	
1995		1695	1695	0	
2003 ¹		4622 **	4616 **	6	
Restricted					
1985		637	637	0	
1990		463	463	0	
1995		2106	2082	25	
2003 ¹		1135 **	1135 **	0	
Conditionally Restricted					
1985		0	0	0	
1990		0	0	0	
1995		119	42	77	
2003 ¹		128	128	0	
Prohibited					
1985		3335	3283	52	
1990		4364	4259	105	
1995		2801	2282	521	
2003 ¹	Basis for Prohibited Classification	Water Quality	1098 **	1059 **	39**
		Adjacent to Potential Pollution Sources	1808 **	1769 **	39
Total Classified					
1985		16837	16785	53	
1990		18702	17157	1544	
1995		21574	15273	6303	
2003 ¹		22676 **	21743 **	933 **	
Total Unclassified					
1985		4442	4048	394	
1990		3951	3950	1	
1995		3200	1995	1205	
2003 ¹		1703 **	1700 **	3 **	

* (1000 Acres)

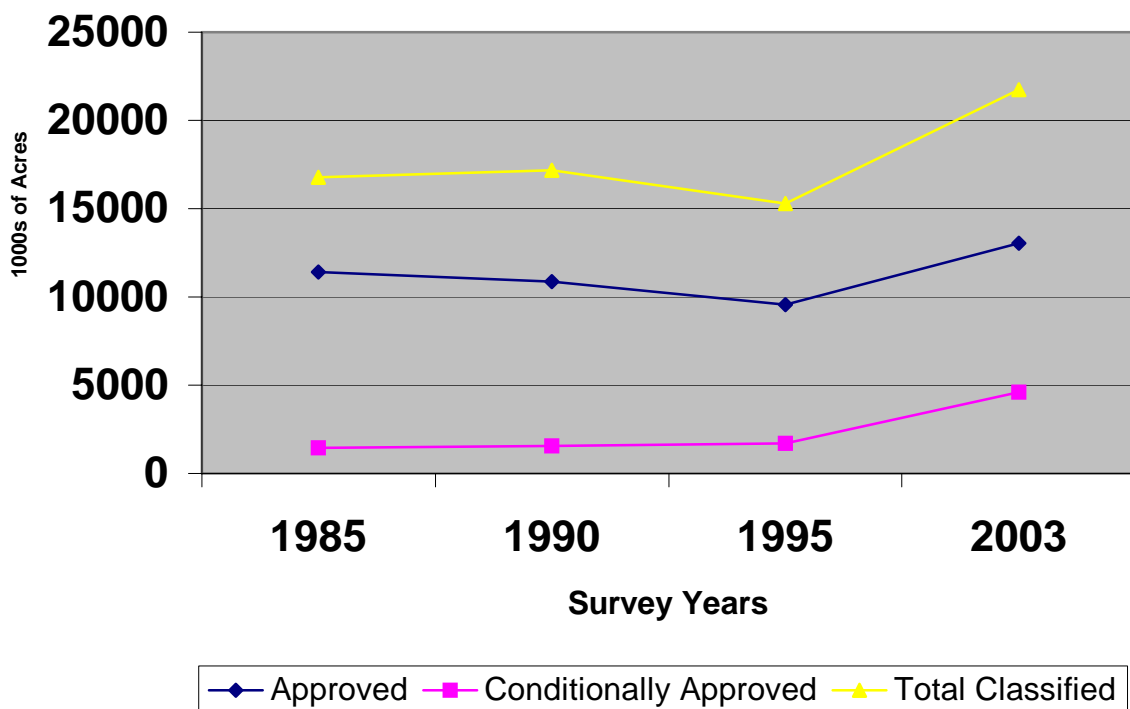
** Corrected due to errors in compilation

¹ Current as of July 2003

Data illustrated in the two charts below indicates a trend of increased acreages of classified waters and an increase in approved waters as compared to harvest limited.



Surveys of Classified Shellfish Acres 1985 - 2003 Not Including Offshore Acres



Discussion

The manipulation of the historic data can improve the accuracy of a trend analysis but an analysis broken down by state and then by classified area provides more definitive information on water quality related trends. For example, Area A could show an increase in conditionally approved acres and similar decrease in approved acres, to evaluate that change information regarding sources of pollution, rainfall events, time of sampling and tidal cycles must be considered. In some cases the conditionally approved status is only during a season when boating or other seasonal activity is heightened. In the case of Area B the decline in prohibited acres relates directly to an increase in restricted or conditionally restricted acres. In this case, the changes might relate to a sanitary survey that upgrades classification to allow standing shellfish stock to be harvested or relayed to an approved area.

In selecting areas for restoration efforts, states often attempt to target pollution sources, which can be identified and remediated areas that need stock enhancement or have potential for aquaculture. An example is Area C where failing septic systems have been replaced by a sewage treatment plant. A small area around the sewage outfall will be downgraded to prohibited, but a much larger acreage could be upgraded to approved status.

These are simple examples applied to individual classified areas. The 1995 inventory of classified shellfish waters can be a starting point for examining impaired waters. The Shellfish Information Management System, under development at NOS/NOAA in cooperation with the ISSC, will assist managers in identifying shellfish areas experiencing decline and those that could be restored/upgraded with pollution reduction activities, best management practices or other mitigation measures.