Interstate Shellfish Sanitation Conference

ANALYSIS
CLASSIFIED SHELLFISH WATERS
1985-2005

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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 surveys of states in 2003 and 2005, and discusses the extent to which this data can be used in time series analyses with the earlier Register. The 2003 and 2005 data presented in the report was generated from individual state survey forms.

The 2003 and 2005 Surveys 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) was developed, promoted and 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. The Interstate Shellfish Sanitation Conference, National Oceanic & Atmospheric Administration, Environmental Protection Agency and Food and Drug Administration continue to explore further development of this system.

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

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*** (1000 Acres) ** Corrected due to errors in compilation *** Corrected based on updated State information**

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** *(79)***	**10,362** *(73)*	**10,560** *(71)*	**10,685** *(75)*	**11,402** *(68)*		
Total Harvest Limited	**2,090** *(21)*	**3,738** *(27)*	**4,232** *(29)*	**3,533** *(25)*	**5,435** *(32)*		
Conditionally Approved	88 *(1)*	410 *(3)*	387 *(3)*	587 *(4)*	1,463 *(9)*		
Restricted	na	30 *(<1)*	34 *(<1)*	55 *(1)*	637 *(4)*		
Conditionally Restricted	na	na	na	na	na		
Prohibited	2,002 *(20)*	3,298 *(23)*	3,811 *(26)*	2,891 *(20)*	3,335 *(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* and the 2003 and 2005 reports 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" 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.

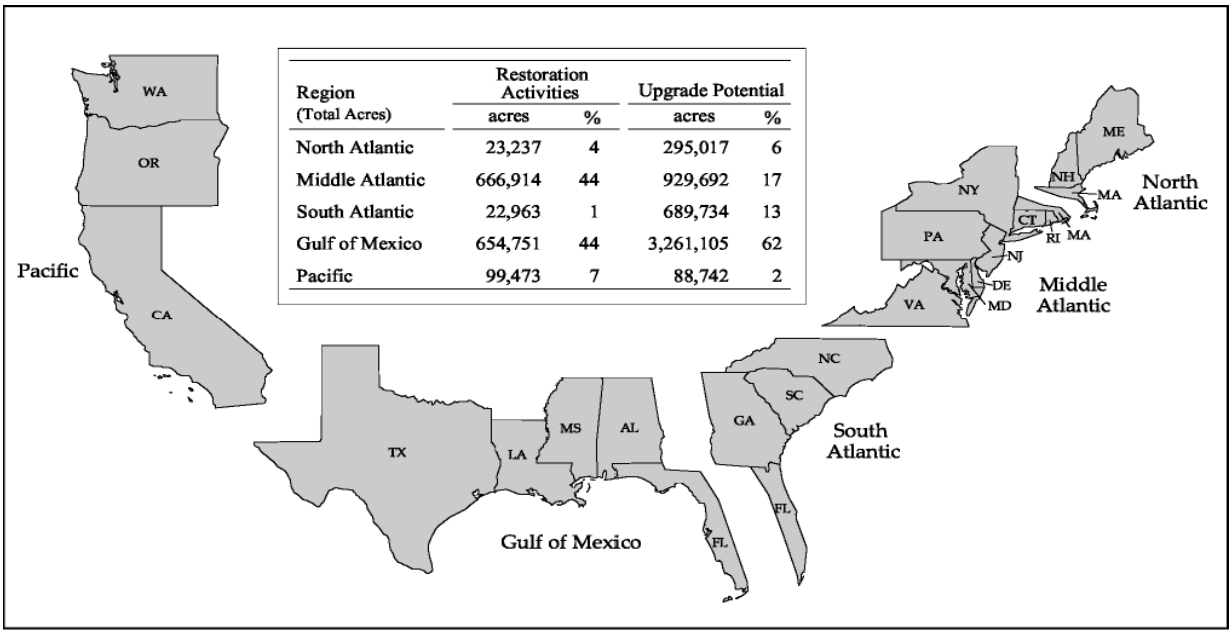
Conditionally Approved Waters - Growing waters meeting approved classification standards under predictable conditions. These waters are open to harvest when water quality standards are met, and are closed at other times. Fecal coliform standards are the same as for Approved (see above).

Restricted Waters - Growing waters from which shellfish may be harvested only if they are relayed or depurated 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.



Region (Total Acres)	Restoration Activities		Upgrade Potential	
	acres	%	acres	%
North Atlantic	23,237	4	295,017	6
Middle Atlantic	666,914	44	929,692	17
South Atlantic	22,963	1	689,734	13
Gulf of Mexico	654,751	44	3,261,105	62
Pacific	99,473	7	88,742	2

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 total acreage from 1990 to 2005 is a result of the interpretations of what constitutes estuarine waters and the inconsistent inclusion of offshore waters.

2005 Classified Shellfish Acres

ISSC queried each state regarding state classified acres in 2005. All shellfish producing States provided classified acreage information. The results are a compilation of the classification acreage reported by the States. Figure 1 & 2, Pages 11 & 12 include graphs of classification change since 1985. The 2005 data shows an increase in Approved acreage and Conditionally Approved acreage. The increase in Conditionally Approved continues a trend that began in the 1990 data.

States were requested to provide explanations regarding growing waters classified as prohibited. States indicated acreages that were classified prohibited as a result of actual bacteriological water quality and acreage that were administratively classified as prohibited due to the presence of actual pollution sources such as waste treatment plants and marinas. Most of the acreages classified as prohibited do not exhibit bacteriological or chemical contaminants consistent with the prohibited classification. Five States do not use the restricted classification and all waters meeting the restricted classification are included in the prohibited category.

SURVEY OF CLASSIFIED WATERS
1990-2005
(Values for 1990-1995 were obtained from the 1995 NOAA Shellfish Register)
(Values for 2003 were from ISSC 2003 Report Entitled Analysis Classified Shellfish Waters 1985-2003)
UNITED STATES TOTALS (1,000 acres)

CLASSIFICATION/YEAR			TOTAL*	ESTUARINE*	OFFSHORE*
Approved					
1990			12304	10865	1439
1995			14853	9575	5276
2003			14117**	13218**	899**
2005			14379	13505	874
Conditionally Approved					
1990			1571	1571	0
1995			1695	1695	0
2003			4622**	4616**	6
2005			4787	4781	6
Restricted					
1990			463	463	0
1995			2106	2082	25
2003			1135**	1135**	0
2005 [1]			1159	1159	0
Conditionally Restricted					
1990			0	0	0
1995			119	42	77
2003			128	128	0
2005			116	116	0
Prohibited					
1990			4364	4259	105
1995			2801	2282	521
2003	Basis for Prohibited Classification	Water Quality	1162**	1123**	39**
		Adjacent to Potential Pollution Sources	1809**	1770**	39
2005[1]	Basis for Prohibited Classification	Water Quality	1131***	1105***	26***
		Adjacent to Potential Pollution Sources	2022***	1967***	55***
Total Classified					
1990			18702	17157	1544
1995			21574	15273	6303
2003			22973**	21990**	983**
2005			23594***	22633***	961***
Total Unclassified					
1990			3951	3950	1
1995			3200	1995	1205
2003			1703**	1700**	3**
2005			1550	1547	3

[1] Five reporting States do not use the restricted classification. This increases the acreage in the prohibited classification.
* (1000 Acres) ** Corrected due to errors in compilation *** Corrected based on updated State information

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.

Figure 1

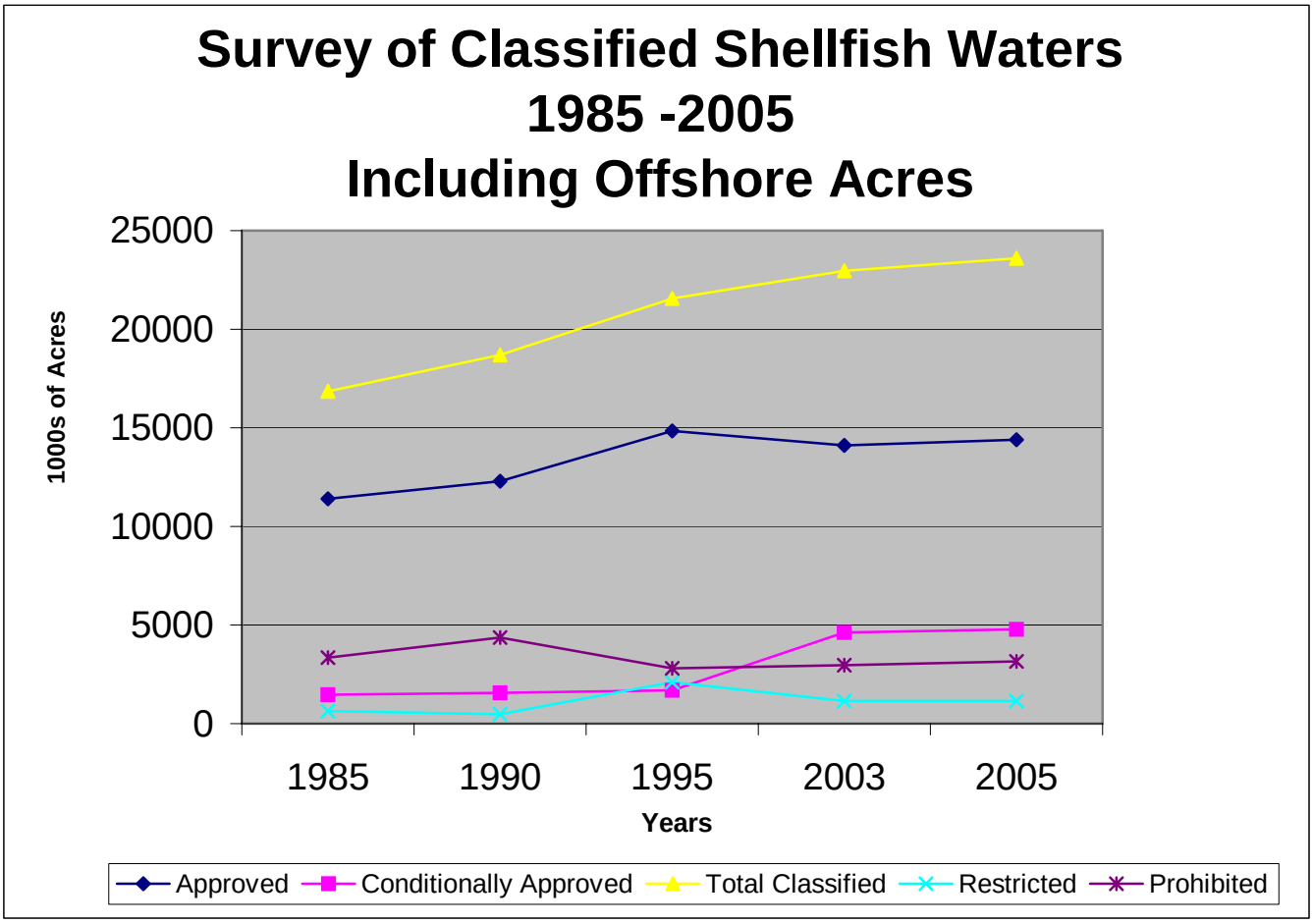
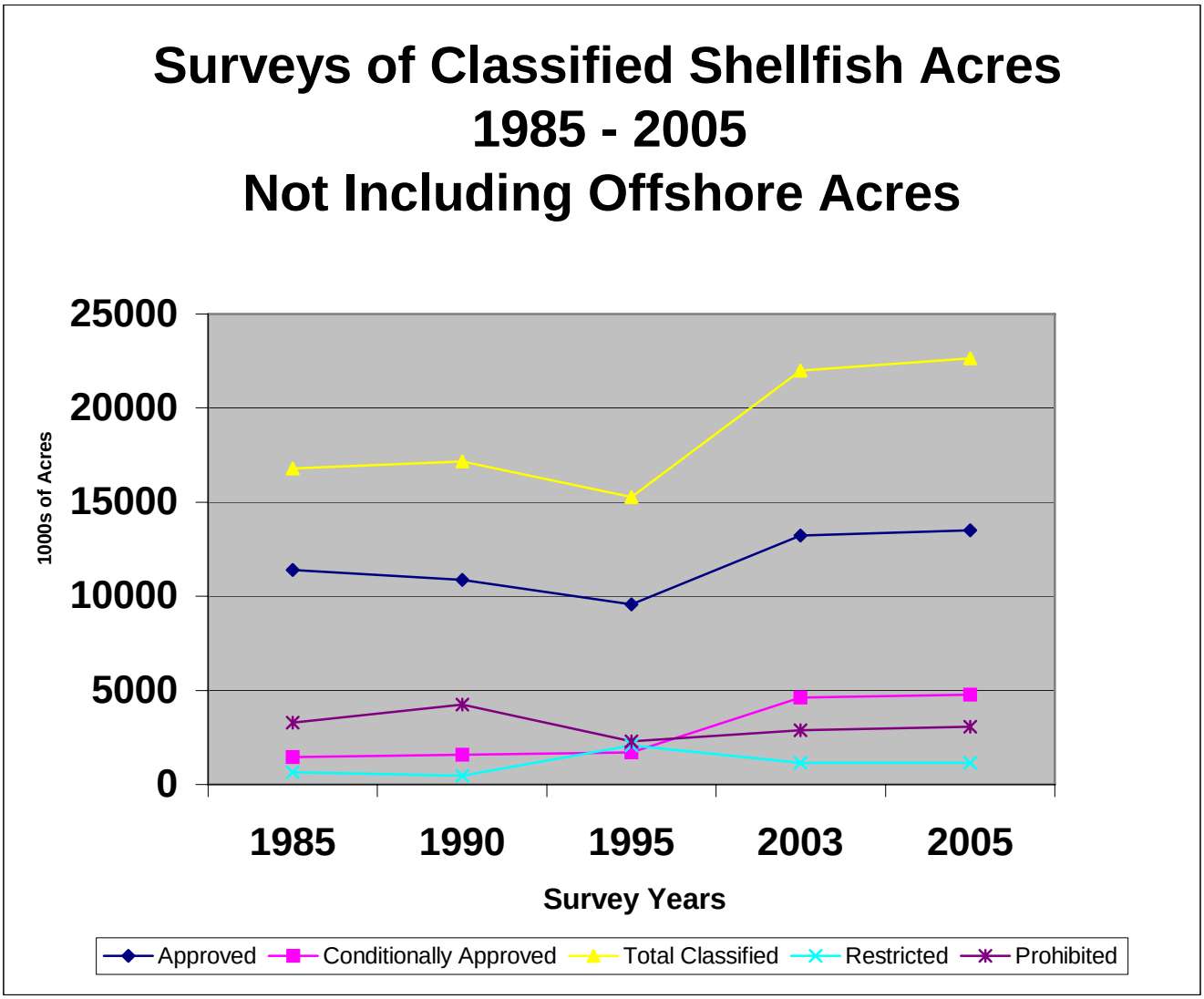


Figure 2


Surveys of Classified Shellfish Acres
1985 - 2005
Not Including Offshore Acres
1000s of Acres
25000
20000
15000
10000
5000
0
1985
1990
1995
2003
2005
Survey Years
Approved
Conditionally Approved
Total Classified
Restricted
Prohibited

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, and 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.