Control - PR

Ecosystem Initiatives Advisory Services

January 5, 2005

Dr. Bill Hogarth
Administrator
National Marine Fisheries Service
1315 East-West Highway,
Silver Spring, MD 20910

Dear Dr. Hogarth,

I have been following the political, public, and scientific discussions dealing with the east coast oyster resource. I feel that the oyster used to serve a number of very important purposes in the coastal ecology and it has been of great economic value.

I am distressed by the slow and disorganized effort to restore the Chesapeake Bay's ecosystem. The current condition and efforts to restore the Bay remind me of my work on the lower Great Lakes in the 1960s.

The effort to restore the eastern oyster has not had much success for a number of different reasons. Although restoration is still very viable Maryland is looking at a unilateral "quick fix" to resolve low oyster abundance by introducing the Asian oyster.

The current very low abundance of the eastern oyster, coupled with its stressed environment seems to require action to protect the species. Therefore, I have prepared a Petition to list the eastern oyster as a threatened or endangered species (2 copies enclosed). Additional copies can be obtained from my web page.

Sincerely,

Dieter Busch

W.- Dieter N. Busch

Enclosures

cc Steven A. Williams, Director, USFWS
Congressman Wayne Gilchrest

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PETITION TO LIST THE EASTERN OYSTER (*CRASSOSTREA VIRGINICA*) AS A THREATENED OR ENDANGERED SPECIES UNDER THE ENDANGERED SPECIES ACT OF 1973

SUBMITTED JANUARY 5, 2005

By
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NOAA Fisheries (or the USFWS for other species) must use the following criteria to determine if a species should be listed as endangered or threatened because **of any** of the following five factors[1]:

- present or threatened destruction, modification, or curtailment of its habitat or range;
- overutilization for commercial, recreational, scientific, or educational purposes;
- disease or predation;
- inadequacy of existing regulatory mechanisms;
- other natural or manmade factors affecting its continued existence.

The ESA requires that listing decisions be based solely on the best scientific and commercial data available. It prohibits the consideration of economic impacts in making species listing decisions.

When NOAA Fisheries receives a petition, the agency must do the following:

- Within 90 days, NOAA Fisheries decides if the petition presents enough information to warrant listing the species
- If listing is warranted, NOAA Fisheries conducts a status review of the species, requesting public input through a notice in the Federal Register.
- Within one year of receiving the petition, NOAA Fisheries announces their decision whether or not to propose listing the species with a notice in the Federal Register.
- If proposed, NOAA Fisheries then accepts and considers public comment on the proposed listing.
- Within one year of the proposed listing, NOAA Fisheries determines whether or not to list the species. If so, NOAA Fisheries publishes the final listing decision in the Federal Register, including the effective date of listing.

[1] http://www.nmfs.noaa.gov/pr/species/

Conclusion as to need to list the eastern oyster

The eastern oyster (*Crassostrea virginica*) needs to be listed as threatened or endangered species because of the historic failure to protect its habitats from numerous, documented anthropogenic stresses, resulting in a well documented crash of the population (Appendix 1). The living resources management agencies (LRMAs) have had information on the catastrophic declines (Fig. 1 for Atlantic Coast Landings and Fig. 2 for Chesapeake Bay Landings). The LRMAs have chosen to only address the decline by increasing harvest restrictions instead of using their advisory authority under the Fish and Wildlife Coordination Act, the National Environmental Policy Act, and the Magnuson-Stevens Fishery Conservation and Management Act to force improvements and restoration in the quality and quantity of the degraded habitats.

In order to help understand the complexity of the problem facing the survival of the eastern oyster, an analogy is provided. Whereas historically the oyster created high-rise reefs[2] or "communities/condominiums" (up to 50 ft. high), washed by clean, nutritious waters of various levels of salinity, much of the current remnant stock is trying to survive in single layers, often in muck or "like in a temporary tent city," washed by dirty water, frequently low in oxygen, and with little variations in salinity. These unsuitable conditions have encouraged low survival of their wild progeny or hatchery seedings due to excessive mortality caused by diseases, predation, siltation and, in some micro habitats, periodic low levels of oxygen.

Now on top of its current precarious existence, the eastern oyster is to face an exotic competitor that may also hybridize with the remnants of the eastern oyster population[3], pushing this species over the edge. Therefore, the eastern oyster needs protection of the Endangered Species Act and the required follow-up of a serious and focused effort to restore the health of its habitat and the abundance of the oyster.

Details per the Criteria and Justification

<u>Present or threatened destruction, modification, or curtailment of its habitat or range</u>:

The physical, chemical, and biological conditions of the eastern oyster's habitat have been severely degraded. The sediment load from shore side and watershed erosion has smothered many historical reefs; dredging of shipping channels and harbors has destroyed reefs as has shell mining. These structural changes have changed water flow patterns. Furthermore, although freshwater inflow into the estuaries fluctuates annually due to variations in precipitation patterns, the overall inflow has been reduced by consumptive water withdrawal

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[2] McCormick-Ray, M.G. 1998. Oyster Reefs in 1878 Seascape Pattern – Winslow Revisited. Estuaries. Vol. 21, No. 4B, 784-800.
[3] Kennedy, V.S., R.I.E. Newell, and A.F. Eble. The <u>Eastern Oyster, *Crassostrea virginica*</u>. Maryland Sea Grant, College Park, MD

and also by damming many of the rivers.[4] Excessive nutrients from point and non-point sources frequently overload the estuaries and toxic chemicals and endocrine disrupters are discharged into the watersheds (see Appendix 2). Productive oyster reefs have been greatly reduced in area, size, elevation, and complexity.[5] These generalizations of the habitat problems are documented by the failures of Maryland and Virginia to meet the required water quality standards (Fig. 2). In fact, two recent law suits have been filed to force environmental compliance. In one suit EPA is suing the Washington Suburban Sanitary Commission for not preventing raw sewage flows into Maryland waterways.[6] In the other one, EPA is being sued by the Chesapeake Bay Foundation for not enforcing Total Maximum Daily Loads until 2011.[7]

The critical impact on the eastern oyster is that although harvest efficiency has greatly improved and been promoted by the LRMAs in the past 125 years, annual Atlantic coastal landings of eastern oyster have been decreasing to less than 2 percent of their recorded historic abundance (Fig. 1). And, the harvest from the Chesapeake Bay has decreased to 0.2 percent of its recorded historic abundance (Fig. 2), a near extinction level.

Overutilization for commercial, recreational, scientific, or educational purposes:

The Chesapeake Bay harvest in 2003 was 0.2 percent of the recorded historic high (Fig. 2) and the US Atlantic coast total was equal to 2 percent of its recorded historic high (Fig. 1). The LRMAs for the Chesapeake Bay appear to prefer to identify disease as the major contributor[8]. These agencies also identify the 1950 to 1981 period as unusually stable, however, a closer examination of Fig 2 indicates that harvest levels have decreased in steps: 1950-1961, 1962-1981, a slide from 1982 to 1993, a slight rebound to 1999, and a crash to 2003. Harvest may not have outpaced the production which has been severely restricted by degraded and lost habitat;[9] however, harvest was carried out on a severely depleted resource.

The eastern oyster has faced similar problems along the US Atlantic coast. Fig 1 provides the overall annual landings data; the harvest in 2003 was down to less than 2 percent of the harvest in the late 1880s-90s (Table 1).[10] A step-down periodicity is also identifiable in these data (Fig. 3) and, it seems to give credibility to the management concept known as "slipping baseline syndrome." It implies that when each respective lower level of abundance has been the norm for an extended period, this reduced level is accepted and expected.

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[4] Busch, W.-D.N., S.J. Lary, and C.M. Castiglione. 1998. Evaluating Stream habitat for diadromous Fish in Atlantic Coast Watersheds: a Preliminary Assessment. In *Habitat Hotline Atlantic*, Issue No. 27, ASMFC, Washington, DC pp 1-3.

[5] Hargis, Jr. W. J. 1992. A brief review of the status of oyster populations, oyster reefs and their ecological importance with suggestions for restoration of both. Habitat/Ecology 67 p.

[6] Craig, T. 2004. EPA sues WSSC over sewage flo into MD waters. Washington Post, 11/19/2004; Page B04.

[7] Blankenship, K. 2004. CBF files suit against EPA over Clean Water Act enforcement. Chesapeake Bay Foundation, Annapolis, MD.

[8] Jensen, W.P. and J. Travelstead. 1992. Disease, not management, led to oyster declines. Bay Journal, December 1992.

[9] Goldsborough, W.J. 1993. CBF scientist says oysters' plight is more than disease. Bay Journal, Jan/Feb. 1993

[10] Lyles, C. H. 1969. Historical Catch Statistics – Shellfish. Bureau of Commercial Fisheries, DOI, Washington, DC. C.F.S. No. 5007.

Disease or predation:

Two protozoan diseases have stressed the eastern oyster population, especially in the Chesapeake Bay. MSX is caused by *Haplosporidium nelsoni* and Derma is caused by *Perkinsus marinus*. Salinity levels appear to be one of the critical elements supporting or limiting the active expansion of these diseases. Salinity levels are changed by freshwater inflow, which is directly related to river flows/precipitation minus water withdrawal for consumptive use. Since consumptive uses continue to increase, river water supplies will always be less now than comparable historic levels.

Predation levels have probably not increased from historically levels. They may have even decreased due to the changes in the aquatic community structure and decreases in potential predator abundance.

Inadequacy of existing regulatory mechanisms:

The Living Resource Management Agencies have attempted to manage the eastern oyster resource mostly through harvest restriction. Enhancement efforts have also been tried such as restoring potential reef areas and increasing the abundance of the progeny by seeding/stocking and by limited substrate improvements. Also, the public has been invited to participate in oyster culture by use of suspended gages. The expected positive impact on the overall abundance and distribution of the eastern oyster has not been very significant. This is mostly likely because the lead state and federal environmental and living resources management agencies have not reversed or prevented the severe habitat loss and degradation.[11] Even in the recent past, since the enactment of the Fish and Wildlife Coordination Act, the National Environmental Policy Act, and the Magnuson-Stevens Fishery Conservation and Management Act, the LRMAs have not been proactive in providing detailed water quality and physical habitat goals to the environmental enforcement agencies. In fact, the LRMAs have had little focus or funding to develop such information. If such data were available the LRMAs would be in a better position to force the environmental action agencies (i.e., COE, EPA and state equivalents) to address the needs of the living resources.

The recent and ongoing management failures (1950-2003) by the LRMAs are demonstrated by the recent and ongoing decline in the abundance of the eastern oyster (Fig. 4). And, the failures of the environmental agencies to restore a healthy aquatic environment are demonstrated in part by Fig. 5.

Other natural or manmade factors affecting its continued existence:

The most critical new concern is the potential introduction of the exotic Asian oyster, *Crassostrea ariakensis*. Accidental or purposeful introduction of exotic species have generally caused many more problems than benefits and usually can not be reversed. In this

[11] Matuszeski, B. 1992. Time, and patience, is running out on oyster management. Bay Journal, Oct. 1992.

specific case, the introduction of the Asian oyster may result in the extinction of the eastern oyster from competition and hybridization.

The expectation that unilateral action by one state to stock an exotic species will not impact out-of-state areas is not supported by the history of movement and transfers of exotics, including shellfish. Natural movement and transfer by shipping (ballast or attached) will most likely distribute an exotic throughout the host areas suitable range.

Extinction of the eastern oyster may be the outcome of such an introduction even if the Asian oyster can not establish a viable self-sustaining population because of its susceptibility to polydora (a native worm) and the introduction of diseases or activation of dormant diseases. See Appendixes 4 and 5 for concerns about the potential introduction.

Additional Applicable Literature

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Allen, S.K.. P.M. Gaffney, J. Scarpa. and D. Bushek. 1993. Inviable hybrids of *Crassostrea virginica* with *C. rivularis* and *C. gigas*. Aquaculture 113:269-289.

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Newell, R.I.E. 1988. Ecological Changes in Chesapeake Bay: Are They the Result of Overharvesting the American Oyster (*Crassostrea virginica)*? Horn Pt. Environ. Lab., Un. Of Maryland, Cambridge, MD. 11pp.

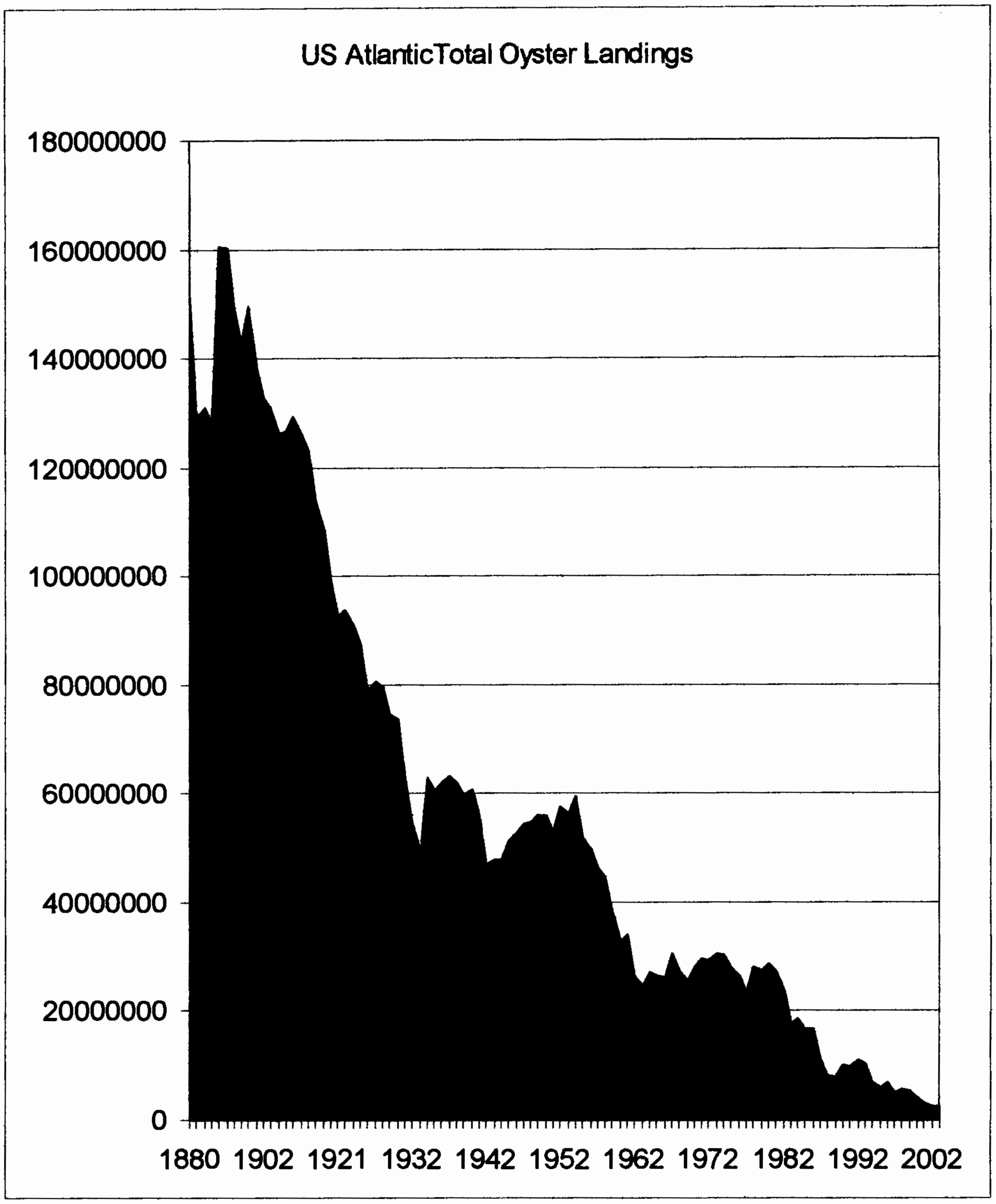


Figure 1. Reported commercial harvest, by year and in pounds landed

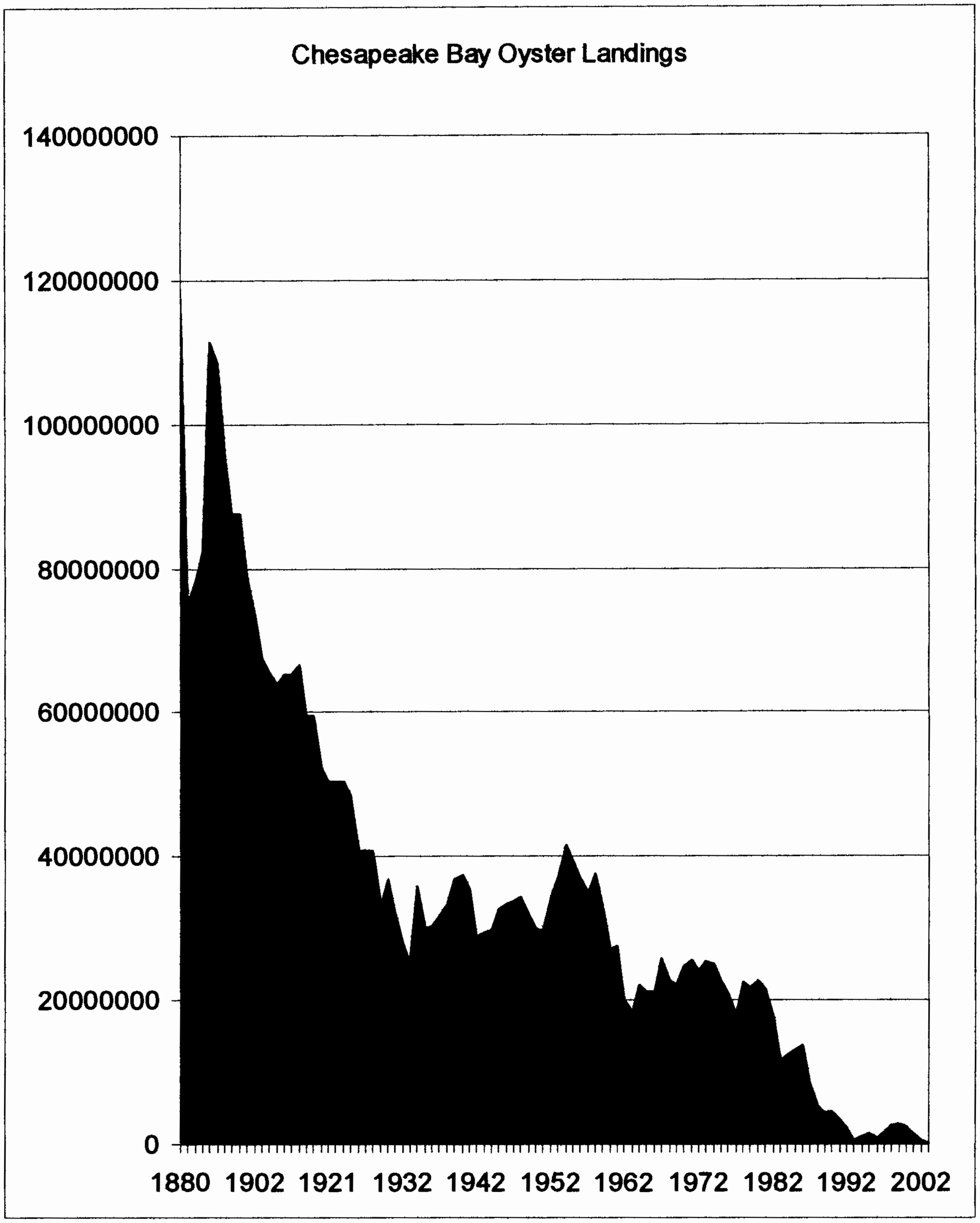


Figure 2. Reported commercial harvest, by year and in pounds landed.

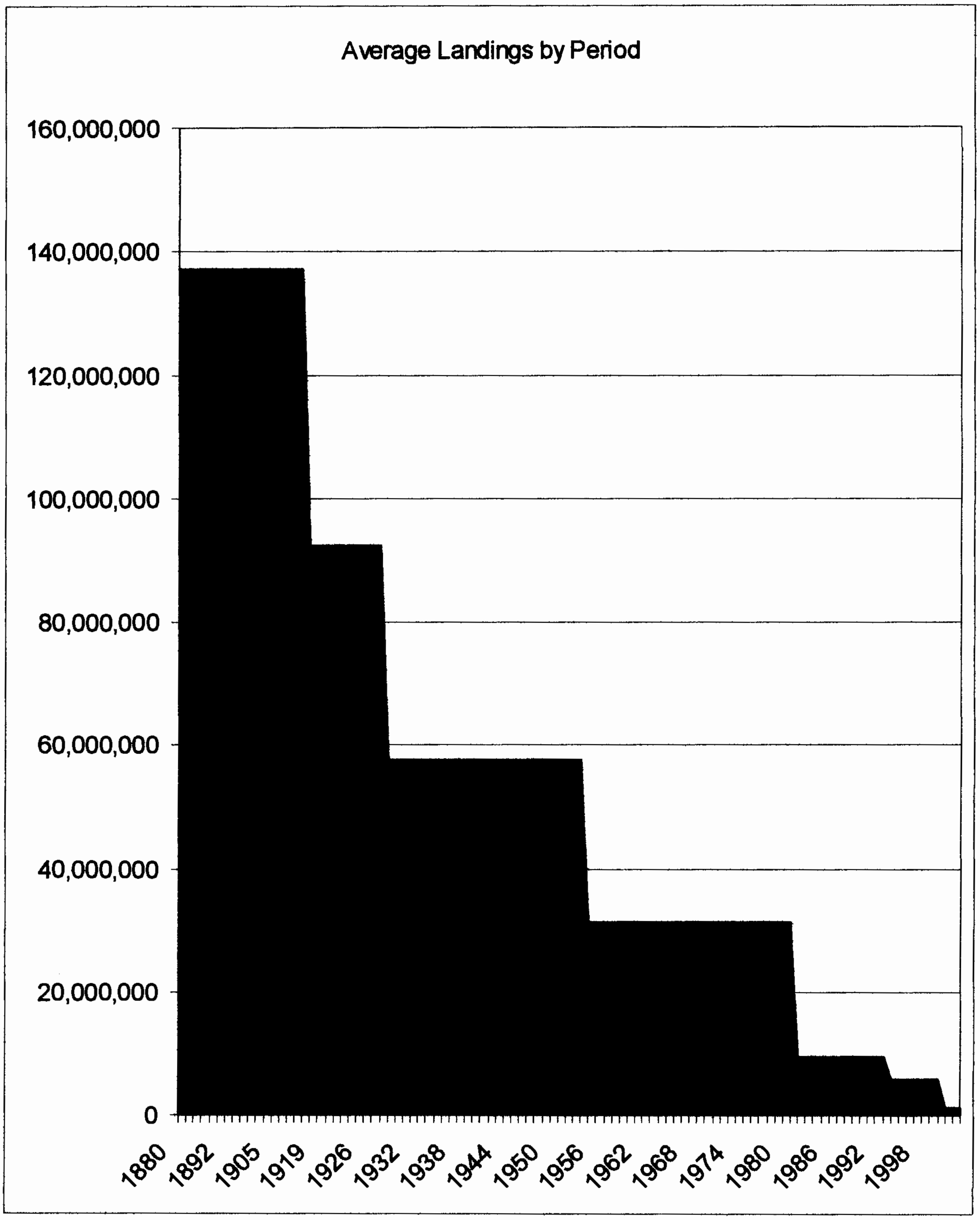


Fig. 3. US Atlantic Landings of Eastern Oyster – presented by periods of "stability"

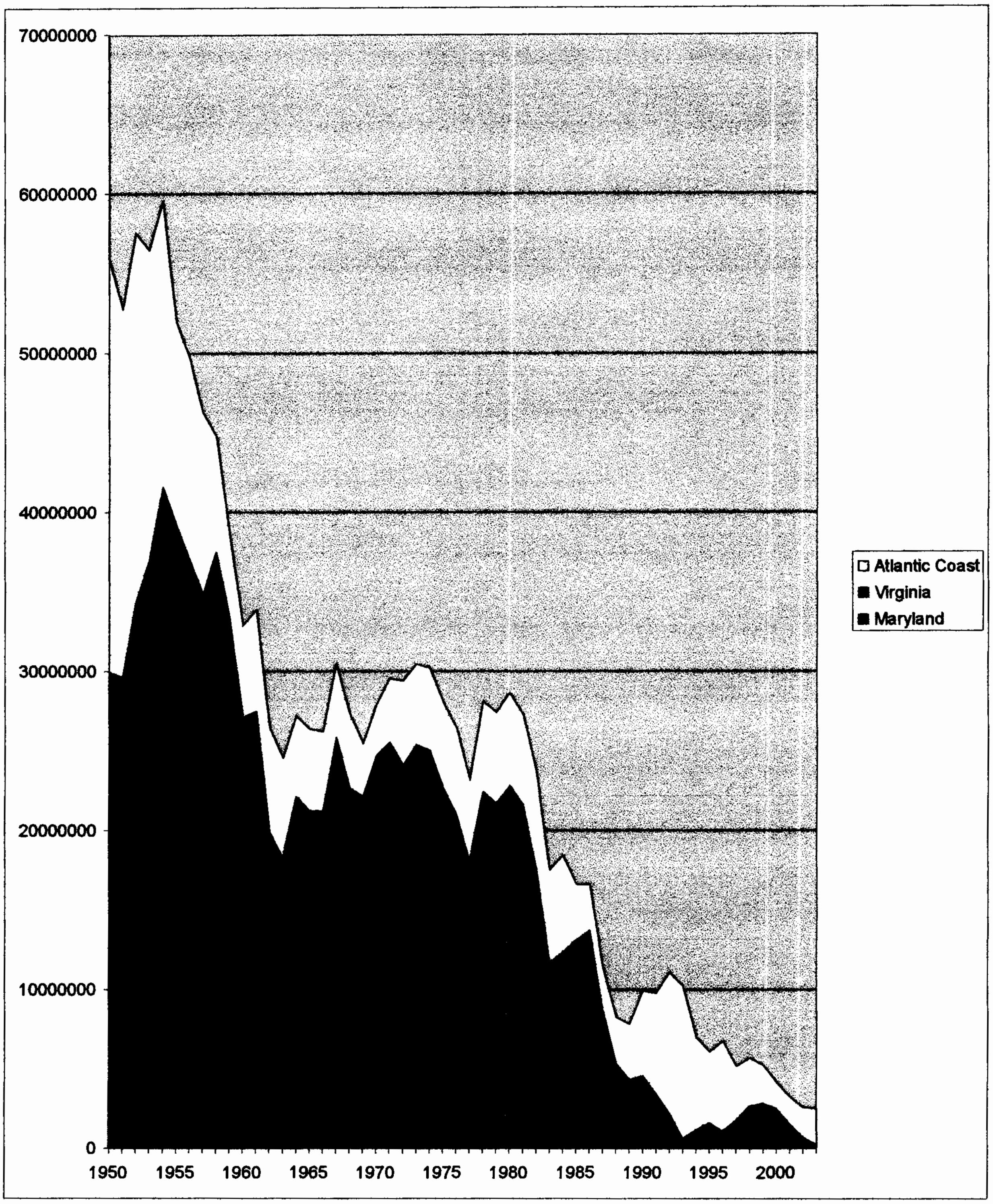


Figure 4. Commercial harvest by Virginia and Maryland (Chesapeake Bay) and the US Atlantic coast, by year and in pounds.

Portions of the Chesapeake Bay and its tidal rivers are listed under the Clean Water Act as "impaired waters" largely because of low dissolved oxygen levels and other problems related to nutrient pollution.

This "listing" requires the development of a clean-up plan for the Bay by 2011

(Copied from a presentation by the CB Program).

Note: Representation of 303(d) listed waters for nutrient and/or sediment water quality impairments for illustrative purposes only. For exact 303(d) listings contact EPA (http://www.epa.gov/owow/tmdl/).

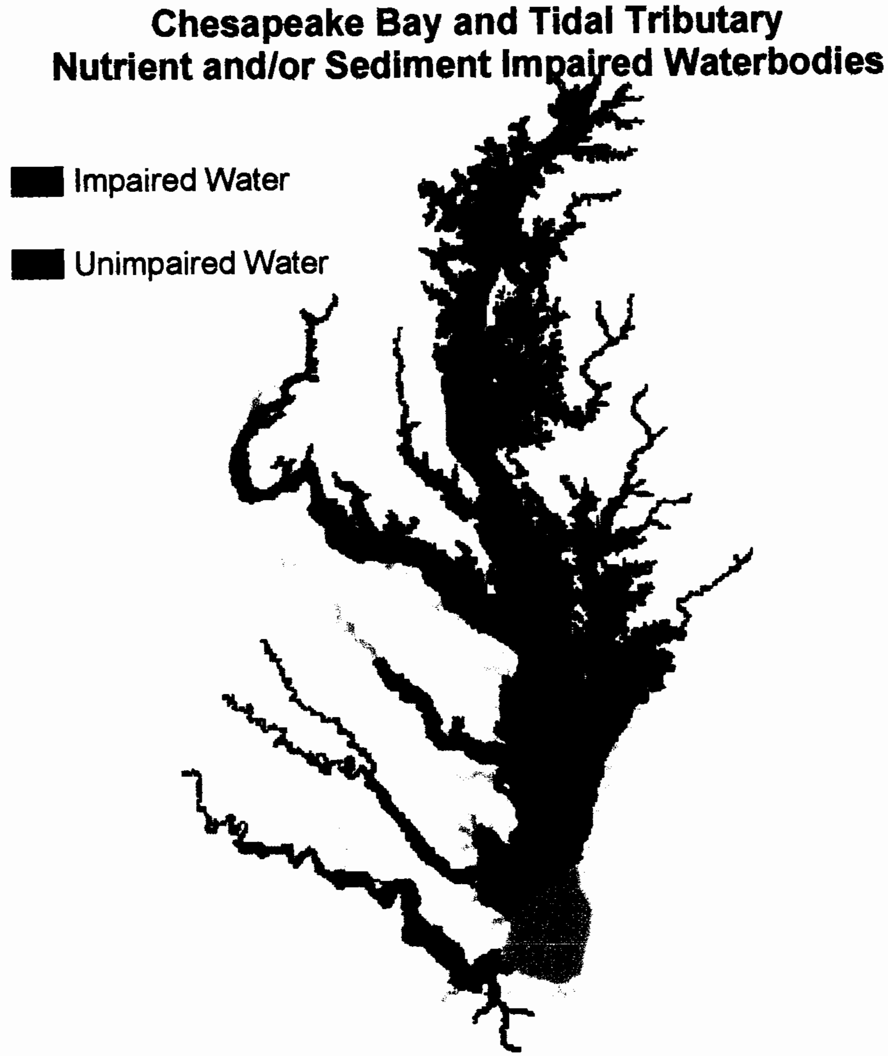


Figure 5. Representation of Chesapeake Bay water quality in 2002

Table 1. Historic Reported Landings of Eastern Oyster (if no record for a region, an estimate was calculated by averaging the previous record with the next available)[12]

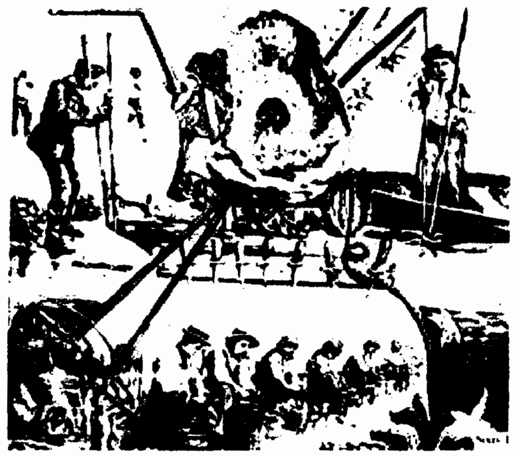
Year	New England	Mid Atlantic	Chesapeake	South Atlantic	Total
1880	3860435	28397182	117404600	1569800	151232017
1887	13129363	39275388	74699700	1973899	129078350
1888	12655415	37871183	78474700*	1999284	131000582
1889	12520862	26576831	82249700	6653757	128001150
1890	14169096*	29102375	111304600	6017544	160593615
1891	14169096*	30428402	108397400	7258013*	160252911
1892	15817329	29777459*	95967300	7258013*	148820101
1897	17496457*	29126516	87463050*	8498482	142584505
1898	19175585	30630687*	87463050*	12153131*	149422453
1901	14773178*	32134858	78958800	12153131*	138019967
1902	10370771	33279965	73195100*	15807780	132653616
1904	12395373*	33279965	67431400	17738800*	130845538
1905	14419974	28236038*	65707150*	17738800*	126101962
1908	19700941	23192110	63982900	19669820	126545771
1910	26629071	29254361*	65299950*	8029532	129212914
1911	19458939*	35316611	65299950*	6005597*	126081097
1912	19458939*	30868420*	66617000	6005597*	122949956
1918	19458939*	30868420*	59466500*	3981662	113775521
1919	12288806	30868420*	59466500*	5936991*	108560717
1920	9883296*	30868420*	52316000	5936991*	99004707
1921	9883296*	26420228	50349300*	5936991*	92589815
1923	9883296*	25673240*	50349300*	7892320	93798156
1924	7477785	25673240*	50349300*	7298747*	90799072
1925	6046710*	25673240*	48382600	7298747*	87401297
1926	6046710*	24926251	40760500*	7298747*	79032208
1927	6046710*	27069978*	40760500*	6705174	80582362
1928	4615635	27069978*	40760500*	7070792	79516905
1929	5957262	29213705	33138400	6404204	74713571
1930	9431968	21516320	36723800	5895739	73567827
1931	4066363	21546401	32310800	4690762	62614326
1932	7386432	15026476	27889600	4600974	54903482
1933	5157280	13932819	25152600	4935737*	49178436
1934	7580740*	14371760*	35786100	5270500	63009100
1935	10004200	14810700	29901000	5827500*	60543400
1936	10709800*	14714050*	30313800	6384500	62122150
1937	11415400	14617400	31715700	5454200	63202700
1938	8637300	16144100	33412300	3644700	61838400
1939	7805500	11653900	36846600	3333200	59639200
1940	5990200	13983200	37457100	3366600	60797100
1941	4423450*	13044400*	35438600	3094200*	56000650
1942	2856700	12105600	28722000	3094200*	46778500
1943	2808100	12676500	29284500*	3094200*	47863300

[12] Lyles, C. H. 1969. Historical Catch Statistics – Shellfish. Bureau of Commercial Fisheries, DOI, Washington, DC. C.F.S. No. 5007.

1944	1856200	13124800	29847000	3094200*	47922200
1945	2478100	13553300	32569900	2821800	51423100
1946	2050000	14648600*	33355100	2927650*	52981350
1947	2125100	15743900	33730300	2927650*	54526950
1948	1651500	15790300	34402600	2927650*	54772050
1949	4003900	17411400	31776700	2927650*	56119650

Harvest data for 1950 through 2003 were obtained from NOAA at:
http://www.st.nmfs.gov/st1/commercial/landings/annual_landings.html

The Life and Times of Chesapeake Oysters



Our beloved, beleaguered bivalve may be the last best hope to bring back the Bay.

Five years ago, New Bay Times began publishing, dubbing itself the newspaper committed to the Chesapeake.

But over the years, we've come to realize, nobody is more committed to Chesapeake Bay than oysters.

We've always revered oysters for their good taste. Now we know oysters are far more than tasty.

"Because they play such a key role in the ecosystem, oysters are known by ecologists as keystone species," says Bill Goldsborough, senior scientist at the Chesapeake Bay Foundation and board member of the Oyster Recovery Partnership.

The very water of the Bay is purified by oysters as they feed and filter microscopic algae from the water. In the 19th century, oysters filtered the entire Bay's waters in seven days. That job takes today's oysters a whole year. Even so, in prime summer condition, an adult oyster filters 50 gallons of water a day. In addition, oysters' reef communities are home to many other plants and animals.

So efficient are oysters that their recovery is viewed by many as the only sure-fire way to clean up the Bay.

That's why, in celebrating five years of New Bay Times, we could think of no better recipient of our birthday gift than that beloved, beleaguered bivalve.

Our birthday gift to the Bay is to add as many dollars as we're able to oyster recovery. We're donating the money raised at our Bivalve Birthday Bash to the Oyster Recovery Partnership, a nonprofit co-venture of watermen, scientists and environmentalists. We hope you'll join us to celebrate and swell the pot.

Each $1,000 we raise will buy 10 seeded bags of 100 oysters each. These New Bay Times oysters will be ours and yours. They'll belong to all 40,000 weekly readers of New Bay Times.

Read along in the future - and perhaps join us - as we prepare the seed bags for our oysters. Learn how we plant those oysters in the South and Severn Rivers. Follow our oysters from spat to maturity. Some day next summer we will wish them well as they graduate from protected sanctuaries to mature life as part of an oyster reef. For millennia, oysters have been part of our culture and heritage, as this New Bay Times special report shows.

5,500 BC: Shells of Ancient History

Chesapeake Bay oysters have been enjoyed at least this long, witness oyster shell mounds at the encampments of Native Marylanders as far back as the Golden Age of Greece.

As we go to press, news comes of a Native American village newly unearthed at London Town House and Garden in Edgewater. Tipping off archaeologists was a bed of oysters 10 inches thick. Reading the evidence of pottery shards, Anne Arundel County archaeologist Al Luckenbach dates the settlement to Woodland Indians, who flourished from 1200 a.d. to the European settlement.

Chesapeake is derived from a Native American word meaning "the great shellfish Bay."

1607: A Very Goodly Bay

English explorer Captain John Smith sees the Bay and pronounces it good.

1650: Humans Take Their Toll

Picture a plate-sized roasted oyster wading in home-churned butter. This was life in 17th century Maryland, when oysters were huge. Even then, the appetites of colonists took a measurable toll on oysters.

Archaeologist Henry Michael Miller found that intensity of harvesting led to smaller oysters. In the late 1600s, the population of St. Mary's City peaked at about 250 people. From 1645 to 1695, just 50 years, the oysters that Miller uncovered declined in size by 50 percent.

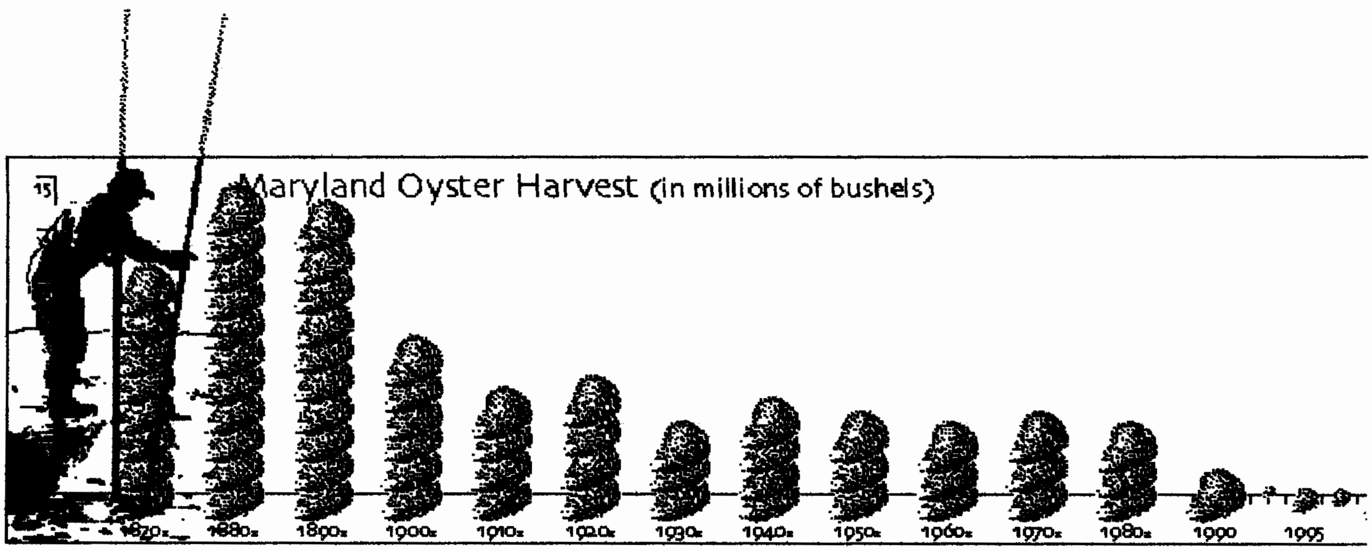
When the capital moved to Annapolis in 1695, so did many of the people. The size of St. Mary's oysters increased.

Miller dug through old rubbish pits, cellars and even toilets while working on his doctorate in the 1980s.

In Anne Arundel County, research by Jim Gibb and Anson Hines has showed that oysters were harvested at five to six years of age - about twice as old as those taken from the Chesapeake today. Their research at the Smithsonian Pier site showed, too, that people didn't worry about oyster seasons. From the condition of the shells, over half the oysters seem to have been harvested in warmer months.

Overall, Gibb and Anson concluded from oysters that the late 17th century Chesapeake was a stable, mature marine environment. These waters "allowed the oysters to proliferate and provide a reliable source of food for the area's human inhabitants," they wrote.

It wouldn't stay that way.



Early 1800s: Others Eye Our Bounty

Already, New England and New York have nearly harvested their way through their oyster beds. Commercial oystering turns to Chesapeake Bay, with visiting oystermen stimulating local competition. Within a decade, Maryland becomes the East Coast's largest oyster purveyor.

1808: That Damnable Dredge Appears

New Englanders introduce the dredge to Chesapeake oystering. A dredge is a net basket supported on a metal frame dragged by a long rope behind a boat across the Bay floor. The dredge bar is often toothed to dislodge oysters, which are set into their reefs like stone.

The efficiency of the dredge was formidable. By 1820, dredging was forbidden by the Maryland legislature. So were competing watermen from neighboring states.

1850: A City Built on Oysters

It may be a glitzy string of shops and restaurants now, but Baltimore's Inner Harbor was once a cannery row - a strip of packing plants where oysters were shucked, steamed and canned. In the 1800s, the demand for canned oysters made Baltimore the canning center of the nation.

As Chesapeake oysters filled the gap left by declining New England oysters, Baltimore rose as an industrial power. Soon cluttering the waterfront were houses where men, women and children shucked and pickled oysters. Two technological leaps made Baltimore the world's largest oyster supplier.

In 1830, the B&O railroad opened, enabling Baltimore to supply the expanding Midwest with oysters. In the 1840s, the canning process was developed. Previously, oysters had been sold raw or pickled. But now oysters could be sterilized with heat and then sealed in tin cans. The new method made the product safe, tasty and portable.

Wherever the iron horse went, populations and prosperity usually followed. During the Gold Rush, for instance, Baltimore was the Pacific Coast's primary oyster supplier.

When the Civil War struck, the oyster market crashed. Watermen made more money smuggling than oyster farming. But after the War, as the nation enjoyed an economic boom and consumers could again ask for and receive their oysters, the industry rebounded.

So great was the demand, that Oyster City - as Baltimore was called then - was producing five million bushels of oysters annually, employing thousands of freed slaves and immigrants.

But by the end of the century, Baltimore's canneries began to close. High volume sales had encouraged high volume farming, and the Chesapeake's oyster population was falling. Once again the demand for oysters had overwhelmed the supply.

1865: Oyster Pirates on the Prowl

Dredging is again legalized, opening the way to the great oyster boom of the 1880s. Meanwhile, oystering enters what author Paula Johnson calls an "era of general mayhem" as oyster pirates pursued by oyster police indulged in every kind of lawlessness, including shanghaied crews "paid off by the boom."

Johnson quotes a Fish and Wildlife inspector who, in 1887, described "a general scramble carried on in 700 boats by 5,600 daring and unscrupulous men, who regard neither the laws of God nor man."

The 700-vessel oyster fleet was made up of bugeyes, pungies, schooners and sloops.

1880: Abundance Unimagined

In 1885, Chesapeake Bay's oyster harvest climbed to its highest point as 15 million bushels of oysters were taken from Bay waters. In this heyday, Chesapeake oysters traveled as far inland as Chicago and St. Louis, and many a Midwesterner grew up with a taste for raw oysters.

To satisfy the appetites of half the nation, the Chesapeake oystering industry boomed. One of the oyster houses springing up to meet that demand was J.C. Lore & Sons in Solomons. In Lore's history you can follow the rising and falling curve of oyster fortunes. Its story is well preserved at Calvert Marine Museum at Solomons Island in the very building where oysters were shucked and shipped for nearly a century.

Technology kept pace with demand. Charles L. Marsh, a blacksmith in Solomons, patented mechanical tongs to enable watermen to reach deep into virgin oyster beds.

"The difference in catch between my tongs and the old tongs is perfectly astonishing," Marsh wrote in 1890. Patent tongs could produce a catch of 30 to 100 bushels a day while an oysterman working by hand with shaft tongs could bring up only eight to 25 bushels. The rake-like tongs were raised by a hand crank and later a motorized winch.

Decorative arts kept pace, too: the best families ate their oysters from oyster plates, molded to the shape of six oysters and often decorated to resemble the real thing - even to the pea crab.

1890s: Skipjacks Signal Sinking Stores

As the frenzy continued, new tools reached farther to keep up the harvest. Thus was developed the skipjack to give watermen smaller and cheaper boats able to work both shallow and deep water with a small crew of three or four men. Dredging was the only purpose of these two-sail, single-masted, V-bottomed boats.

Today, perhaps three dozen remain in working condition, and as late as 1993, 14 skipjacks dredged for oysters, taking advantage of the 1865 law allowing dredges to be pulled only by boats under sail.

Today many of the remaining skipjacks berth at the neighboring Eastern Shore ports of St. Michaels and Tilghman Island. You can see several at Chesapeake Bay Maritime Museum, including the Rosie Parks, dredging license 19, built in 1955. At Tilghman wharves, where skipjacks tie up among the other workboats, you can go out on the Bay on a skipjack cruise.

At NBT's Bivalve Birthday Bash, you can bid on a cruise for 20 aboard Chesapeake Bay Foundation's skipjack Stanley Norman.

1906: Bay Beds Mapped

Surveyor Charles Yates finds 769 natural oyster bars covering 215,845 Bay acres.

'20s-'50s: More Mechanization

Patent tongs now are run by motorized winches. By the '30s, Chesapeake Bay's oyster fleet switches from sail to gas. But the sailing fleet keeps a special advantage: Only a ship under sail can dredge for oysters.

In 1958, two Calvert countians - William Edward Barrett, a waterman, and T. Rayner Wilson, a blacksmith - adapt the technology of the day, hydraulic power, to tonging for oysters. An oysterman using hydraulic tongs can double the efficiency of a patent tonger - and quadruple the efficiency of a hand tonger.

1942: Seeds of Change

As wild oysters can no longer support human demand, oyster farming begins. Seed is moved from productive reefs to jump-start poorer locations or, in later years, areas ravaged by Dermo or MSX.

1998's natural spawn has been extraordinary, up from about 1,000 spat per bushel to 2,500. A whopping 400,000 bushels of that spat-rich shell will be raised from the Eastern Bay and Choptank River to seed poorer beds this spring, at a cost of half a million dollars.

1950s: Twin Perilous Prowlers

In 1954, a protozoan parasite named Dermo appears in Chesapeake Bay. Nastily suited to the Bay's estuarine environment, it kills every oyster it touches. Dermo can wipe out a bed in three years.

In 1960, Dermo's deadly cousin, MSX moves in from Delaware Bay. It kills oysters very efficiently, wherever it finds waters salty enough for its taste - usually no higher in Chesapeake Bay than the Wye River.

Both diseases stalk Chesapeake Bay, combining with pollution, human population pressures and nearly two centuries of heavy harvests, laying oysters low. Dermo and MSX have caused losses of up to 90 percent. Both appear here to stay.

Today's battle against the diseases is a strategic one, carried out by moving young oysters out of the salty areas where seed sets well but where disease also thrives into less salty northern areas.

Scientists studying the diseases at every level hold out hope of breeding disease-resistant stock with which to reseed ravaged beds. Each new advance in knowledge can be translated to a step in action. For example, knowing that Dermo peaks in June points the way to better plans for replanting oyster seed.

1960s: Man-made Beds

Appetite and technology have undercut oysters, reducing the reefs that have supported countless generations of oysters - not to mention affording free housing for all manner of minuscule marine life. Reefs have been replenished since the 1880s, but now Department of Natural Resources begins a systematic rebuilding program on 18 reefs throughout Chesapeake Bay, using concrete, tires, rock, stone, fiberglass, and just about anything else that will sink as well as shell from shucked oysters.

Each year, DNR spends about $1 million to drop oyster shell to the bottom of the Bay in hopes that new oysters will bed down.

1975: Hatched with Help

It used to be that anybody who ate oysters knew to eat them only in the "R" months, September thru April. That's because oysters were otherwise occupied from May through August. Summer is spawning season. If you want to eat some oysters next year, in spawning season oysters are well left alone in their beds.

Nowadays, an oyster can't even spawn in private. Certainly some still do, but assuring oyster reproduction today is a managed business that goes on in hatcheries. In Maryland's three oyster hatcheries - at Deal Island and Cambridge at the University of Maryland Center for Environmental Studies' Horn Point Hatchery on the Eastern Shore and Piney Point on the Western - millions upon millions of oyster larvae are raised each year from vast flows of seed.

To make all that seed, mature oysters are brought to a hatchery and tricked by warm bath of regional waters into a spawning frenzy. If conditions are right, a chain reaction occurs and oyster after oyster spawns in synchrony. With a single healthy female normally releasing 25 to 35 million eggs, no wonder oysters are said to have aphrodisiac powers. A healthy oyster population can spawn several times a year.

Good thing, because it's a long way from seed to spat. Even in hatcheries, 350 million fertilized eggs will yield only 75 to 100 million larvae. In turn, no more than 10 percent of those free-swimmers will successfully settle down into the sedentary life of a spat. Once settled on their "clutch," oysters in a healthful environment can grow to one inch in a month or two. They harden as they grow, so little oysters are soon safely sent to nurseries. Holding firm to their shell clutch and packaged in mesh bags, they mature in sheltered waters in rivers or the Bay from which they'll be replanted in natural waters in hopes of a good harvest.

1978: Retired to Museums

J.C. Lore & Sons ends business after 90 years in Solomons. Signaling another stage in the decline of Bay oystering as a sustainable fishery, the old oyster house becomes part of Calvert Marine Museum.

1980s: Saving the Bay

In 1984, the Chesapeake Bay Program pledges to "restore the Chesapeake Bay to the conditions that existed in mid-century." In unprecedented cooperation, the governments of Maryland, Virginia, Pennsylvania and Washington, D.C. - plus many federal agencies - respond to a 1993 EPA study proving Bay not unable to cleanse itself infinitely of the effects of use and abuse.

1989, oysters are fit into the clean-up puzzle, as Roger Newell of the University of Maryland's Horn Point Environmental Laboratory documents their enormous filtering capacity.

In 1993, after a year of study, the Maryland Oyster Roundtable officially concludes that oysters have important ecological as well as economic value.

1985: Oysters' Champion Eater

Tommy "Muskrat" Greene, of Deale, who died in 1994 of an aneurysm, took on all comers in his prime and set world records acknowledged by the Guinness Book until eating milestones were removed as a category.

He ate 300 oysters in one minute, five seconds in front of television cameras at Happy Harbor in Deale.

1990s: Scraping Bottom

Despite a much diminished fishery, oystermen still work the Bay and sell their catch to oyster houses on both shores, where shucking continues in much the same way as it has for a century or more. From October to March, tongers and divers work the chilly, sometimes frigid, Bay, scraping their bushels from depleted beds - often just before Dermo or MSX finishes them off. Oyster boats pull up at the docks of such oyster houses as Harrison's on Tilghman Island on the Eastern Shore or Warren Denton Seafood in Broomes Island on the Patuxent River.

Oysters are moved by conveyor belts into shucking rooms, where shuckers standing in a line take their knives to hundreds, sometimes thousands, of oysters a day. And just as in the old days, the oysters are washed, jarred or canned, iced and shipped across America. Just as in the old days, the oyster-shell mounds grow. Instead of paving roads, improving gardens or setting a foundation for towns, since the 1960s, almost all that shell is replanted.

Mid-1990s: Victory Gardens

Foster families will rear some of the nursery-raised seed oysters.

Throughout the decade, bags of three-quarter-inch seedlings have been fostered out to grow in oyster gardens.

In 1994, for example, Pleasure Cove Yacht & Beach Club on Podickery Point set out 10,000 spat (photo at right). Over the years, the ideas has spread. Last summer, Chesapeake Bay Foundation began recruiting oyster gardeners to further restoration.

"We're providing a way people can help the Bay, and they love it," says Bill Goldsborough, senior Foundation scientist.

The oysters are tended weekly through wintery Bay waters, nestled in floating beds made of coated wire mesh boxes suspended from a frame of PVC tubing.

A year later, if the crop succeeds, each bed produces 2,000 two-inch oysters to be replanted in Chesapeake Bay.

"Get hundreds of people on a given tributary over years, and you'll see a difference," says Goldsborough.

1998: Turning the Tide

From the Maryland Oyster Roundtable Action Plan, the Oyster Recover Partnership was born.

"In our first year, we decided on hands-on activities, providing labor to ensure that oysters got from tanks out to growing sites," says Partnership Director Robert Pfeiffer.

In its three-year history, the Partnership has planted millions of diesease-free oysters in the Severn, Patuxent and Choptank Rivers. Last year, working with University of Maryland's Horn Point Laboratory's expertise and larvae, the Partnership extended its plantings to Dorchester and Talbot Counties.

"In total last year, we handled about 22 million oysters," said Pfeiffer.

This summer, the Partnership wants both to do more and to "get the word out to the public."

Now, dear reader, that you've got the word, we invite you to take part. First, come to NBT's Birthday Bivalve Bash with money to bid on good times, good goods, good services to help plant more oysters. Next, join in the planting. We'll let you know when and where our oysters' time comes.

Finally, Pfeiffer promises "an actual accounting of where the money went and what it did. Those oysters will become a regular point of our monitoring,"

To learn more, visit the museums where Chesapeake Bay's oyster history is preserved:

- *Calvert Marine Museum in Solomons Island. Open daily 10-5. $5 w/age discounts: 410/326-2042. The extensive oyster collection of this museum is documented in Working the Water, The Commercial Fisheries of Maryland's Patuxent River (1988), edited by Paula J. Johnson.*
- *Baltimore Museum of Industry, 1415 Key Highway, Baltimore. From Memorial Day to Labor Day, open Wed. 7-9, Thurs.-Sat. noon-5 and Sun. 10-5. $4 w/discounts: 410/727-4808.*
- *Chesapeake Bay Maritime Museum in St. Michael's (open daily 9-5 in spring and 6 in summer: 410/745-2916 ($7 w/discounts) · www. cbmm.org*

Thanks to these museums and Bob Pfeiffer at the Oyster Recovery Partnership for information and many illustrations.

Reporting and other photos by Sandra Martin with Steve Armstrong, Carol Glover, Bob Hall, Alex Knoll and Bill Lambrecht.

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Source: http://www.grida.no/geo/geo3/english/346.htm

In 1998, more than 60 per cent of US coastal rivers and bays were moderately to severely degraded by nutrient contamination, and nitrogen was found to be the single greatest environmental threat in some 'trouble' spots on the Atlantic coast (NOAA 1998b, Howarth and others 2000). The US Clean Water Act and the 1972 Coastal Zone Management Act directed states to develop management plans for non-point contamination sources and provided funding and incentives to implement them (NRC 2000). The 1987 US National Estuary Program aims to minimize regional nutrient contamination (see box).

Chesapeake Bay

The 1987 Chesapeake Bay Program was set up under the US National Estuary Program. It is a federal-state-local partnership to reduce nitrogen and phosphorus loading to the Bay by 40 per cent. This region has a population of more than 15 million people, and important commercial fish and shellfish harvests, and is a major stopover for migratory birds. By the late 1990s, only the phosphorus reduction goal had been met. Progress in reducing nutrients is being hampered by population growth and development.

Nutrient enrichment is probably a contributing factor in the recent dramatic increase in the intensity, frequency and spatial extent of algal blooms or red tides, causing increased economic losses and health impacts. The number of coastal and estuarine locations in the United States with major recurring incidents of Harmful Algal Blooms (HABs) doubled between 1972 and 1995 (US Senate 1997).

The impacts of HABs can include human illness and death from eating contaminated fish or shellfish, mass mortalities of wild and farmed fish, and changes in marine food webs. In response to incidents of human illness from contaminated shellfish, both Canada and the United States have developed testing and water quality programs to identify phytoplankton toxins and to provide information about them to the public.

Ocean acts in both countries (1997 in Canada and 2000 in the United States) establish frameworks for improving the stewardship of North America's coastal and ocean waters (EC 1999). Since 1996, the North American Commission for Environmental Cooperation has been facilitating regional implementation of the Global Program of Action for the Protection of the Marine Environment from Land-based Activities in North America (CEC 2000b).

As yet, there is no regional strategy to address nutrient loading in North America's coastal waters, and coordination among the various agencies responsible for their management is inadequate (NRC 2000). Evidence suggests that the situation can be reversed, but the need remains for increased political action and changes in the activities in the watersheds and airsheds that feed coastal streams and rivers.

Sources of Nonpoint Chemical Pollution and How They End Up in the Bay

The Chesapeake Bay has supported a wide range of human activities, fisheries, and wildlife populations over the centuries. The Bay is an important economic resource for the regional area and serves as a shipping center with two major port complexes connected by extensive transportation networks to inland areas. The availability of transportation networks promoted the extensive growth and activity in surrounding areas. The development of fishing, shipbuilding, agriculture, steel-making, paper manufacturing, and chemical production created a prime area for residents and tourists. The Bay area quickly turned into a thriving recreational area for boating, sportfishing, and hunting. However, the increase in economic activity resulted in a decrease in the quality of the nation's largest estuary. Unfortunately, the continual growth in population and development of the Bay area, will cause even greater damage to the Bay's ecosystem.

The major concern for the Chesapeake Bay is the amount of nonpoint pollution, because it is harder to control and regulate than point pollution. The majority of nonpoint pollutants are nutrients, which are a result of rainfall draining the land surface and relocating sediment and other constituents to tributaries of the Bay. Relocated nutrients mainly stem from the use of fertilizers for crop and household use. Many agricultural farms implement various fertilizers in their crop rotations in order to increase production values. An over-abundance of fertilizer is often used, due to a lack of planning, and left to drain with the next rainfall. The main nutrients found in these fertilizers are phosphorus and nitrogen, which drain into the bay from leachates. According to EPA's Chesapeake Bay Program, agriculture is the source of more than one third of nitrogen and almost one half of phosphorus.

Since there is a common excess of other dissolved nutrients in the Bay, the phosphate ion usually functions as the limiting nutrient for algal growth. The larger the intake of phosphorus, the more abundant the growth of algae blooms. The decomposition of these blooms prevent sunlight from reaching submerged aquatic vegetation and deplete the level of oxygen in the lower levels of the Bay, causing many cold water fish to live in warmer waters. Phosphates can also find their way into the Bay as a component of human wastes in untreated sewage, hence the need for phosphate removal in wastewater treatment centers. The other main nutrient is nitrogen, whose main source of nitrate ion is the runoff from agricultural lands. Prior research indicated that manure, which absorbed ammonium nitrate, and nitrogen fertilizers were causing the high levels of nitrogen. However, recent studies now suggest that the intensive cultivation of the farm land, even without the use of manure or fertilizer, facilitates the oxidation process of reduced nitrogen to nitrate in decomposed organic matter in the soil by providing aeration and moisture. In addition, direct deposition of nitrogen from the air, in the form of acid rain, is adding to the cumulative effects of nutrient pollution.

In contrast, household use of fertilizers and pesticides may seem minute. Unfortunately no amount of pollutant is too small for the Bay's ecosystem. Household usage of pollutants goes unchecked by wastewater treatment stations because most of the leachates flow off lawns and parking lots into water drains, which flow directly into their corresponding tributaries. These sources of pollution may come from leaking gas tanks, accidental chemical spills, or leaking septic tanks and can be more dangerous than nutrient pollution due to the presence of hydrocarbons and chlorinated solvents. All the sources of nutrient pollution stem from the 64,000 square mile Chesapeake Bay watershed area because the Bay is a complex interactive downstream system.

An example of the effects of a downstream ecosystem can be seen in Table 1, which gives the amount of nutrient loading in the District of Columbia in 1985 for nitrogen and phosphorus. These measurements were based upon D.C.R.A. and DPW Calculations are in pounds per year.

TABLE 1: 1985 Nutrient Loading for District of Columbia

Sources	Nitrogen	Phosphorus
Point Sources Blue Plains	14,099,950	114,610
Combined Sewer Overflows	148,400	36,800
Urban Runoffs	290,000	70,000

Although these nutrient loadings were recorded for the District of Columbia, they have influence the Bay's ecosystem because of their involvement in the watershed area. The continual growth in nutrient uptake in the Bay's watershed will threaten not only the quality of water, but also the habitats for plant and animal life that they contain.

Total Phosphorus and Phosphate Impact on Surface Waters

Phosphate Cycle

Phosphorus occurs naturally in rocks and other mineral deposits. During the natural process of weathering, the rocks gradually release the phosphorus as phosphate ions which are soluble in water and the mineralize phosphate compounds breakdown. Phosphates PO4-3 are formed from this element. Phosphates exist in three forms: orthophosphate, metaphosphate (or polyphosphate) and organically bound phosphate each compound contains phosphorous in a different chemical arrangement. These forms of phosphate occur in living and decaying plant and animal remains, as free ions or weakly chemically bounded in aqueous systems, chemically bounded to sediments and soils, or as mineralized compounds in soil, rocks, and sediments.

Orthophosphate forms are produced by natural processes, but major man-influenced sources include: partially treated and untreated sewage, runoff from agricultural sites, and application of some lawn fertilizers. Orthophosphate is a readily available to the biological community and typically found in very low concentrations in unpolluted waters. Poly forms are used for treating boiler waters and in detergents. In water, they are transform into orthophosphate and available for plant uptake. Organic phosphates is typically estimated by testing for total phosphate. The organic phosphate is the phosphate that is bound or tied up in plant tissue, waste solids, or other organic material. After decomposition, this phosphate can be converted to orthophosphate.

Phosphate rock is commercially available form is called apatite and the phosphate is also present in fossilized bone or bird droppings called guano. Apatite is a family of phosphates containing calcium, iron, chlorine, and several other elements in varying quantities. The most common variety contains fluorine, and fluorapatite is the main constituent in bones and teeth ! Huge quantities of sulfuric acid are used in the conversion of the phosphate rock into a fertilizer product called "super phosphate".

Small amounts of certain condensed phosphates are added to some water supplies during treatment to prevent corrosion and this chemical is used extensively in the treatment of boiler waters. Larger quantities of these compounds can be found in laundering and commercial cleaning fluids. Orthophosphates applied to agricultural or residential lands as fertilizers are carried into the surface water during storm events or snow melt. In addition, storm events can cause the vertical migration of the phosphates into the groundwater system, but because of soils affinity for phosphate, the soil mantle acts as a storage media.

Why Phosphorus Is Important

Phosphorus is one of the key elements necessary for growth of plants and animals and in lake ecosystems it tends to be the growth limiting nutrient and is a backbone of the Kreb's Cycle and DNA. The presence of phosphorus is often scarce in the well-oxygenated lake waters and importantly, the low levels of phosphorus limit the production of freshwater systems (Ricklefs, 1993).Unlike nitrogen, phosphate is retained in the soil by a complex system of biological uptake, absorption, and minerialization. Phosphates are not toxic to people or animals unless they are present in very high levels. Digestive problems could occur from extremely high levels of phosphate. The soluble or bio-available phosphate is then used by plants and animals. The phosphate becomes incorporated into the biological system but the key areas include: ATP, DNA, and RNA. ATP, adenosine triphosphate, which is important in the storage and use of energy and a key stage in the Kreb's Cycle. RNA and DNA are the backbones of life on this planet, via genetics. Therefore the availability of phosphorous is a key factor controlling photosynthesis.

Photosynthesis - KEY Factor At the Base of the Food Chain

Photosynthesis is a complex series of reactions carried out by algae, phytoplankton, and the leaves in plants, which utilize the energy from the sun. The simplified version of this chemical reaction is to utilize carbon dioxide molecules from the air and water molecules and the energy from the sun to produce a simple sugar such as glucose and oxygen molecules as a by product. The simple sugars are then converted into other molecules such as starch, fats, proteins, enzymes, and DNA/RNA, i.e., all of the other molecules in living plants and animals. All of the of a plant or animal is ultimately produced as a result of this photosynthesis reaction. The equation governing photosynthesis is:

Environmental Impact:

Phosphate will stimulate the growth of plankton and aquatic plants which provide food for larger organisms, including: zooplankton, fish, humans, and other mammals. Plankton represent the base of the food chain. Initially, this increased productivity will cause an increase in the fish population and overall biological diversity of the system. But as the phosphate loading continues and there is a build-up of phosphate in the lake or surfacewater ecosystem, the aging process of lake or surface water ecosystem will be accelerated. The overproduction of lake or water body can lead to an imbalance in the nutrient and material cycling process (Ricklefs, 1993). Eutrophication (from the Greek - meaning "well nourished") is enhanced production of primary producers resulting in reduced stability of the ecosystem. Excessive nutrient inputs, usually nitrogen and phosphate, have been shown to be the main cause of eutrophication over the past 30 years. This aging process can result in large fluctuations in the lake water quality and trophic status and in some cases periodic blooms of cyanobacteria.

In situations where eutrophication occurs, the natural cycles become overwhelmed by an excess of one or more of the following: nutrients such as nitrate, phosphate, or organic waste. The excessive inputs, usually a result of human activity and development, appear to cause an imbalance in the "production versus consumption" of living material (biomass) in an ecosystem. The system then reacts by producing more phytoplankton/vegetation than can be consumed by ecosystem. This overproduction can lead to a variety of problems ranging from anoxic waters (through decomposition) to toxic algal blooms and decrease in diversity, food supply and habitat destruction. Eutrophication as a water quality issue has had a high profile since the late 1980s, following the widespread occurrence of blue-green algal blooms in some fresh waters. Some blue-green algae can at times produce toxins, which are harmful to humans, pets and farm animals.

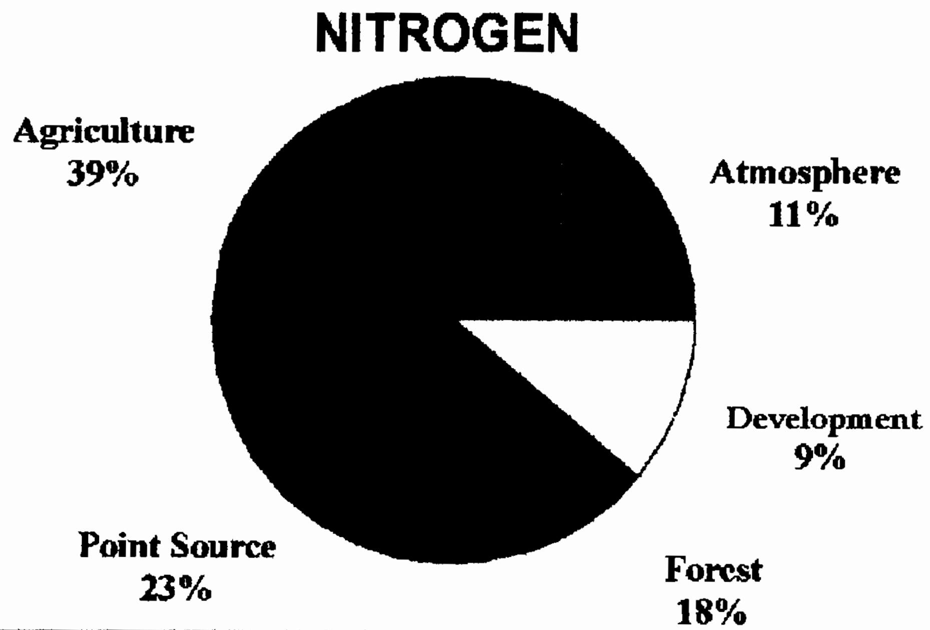
Under **aerobic conditions** (presence of oxygen), the natural cycles may be more or less in balance until an excess of nitrate (nitrogen) and/or phosphate enters the system. At this time the water plants and algae begin to grow more rapidly than normal. As this happens there is also an excess die off of the plants and algae as sunlight is blocked at lower levels. Bacteria try to decompose the organic waste, consuming the oxygen, and releasing more phosphate which is known as "recycling or internal cycling". Some of the phosphate may be precipitated as iron phosphate and stored in the sediment where it can then be released if anoxic conditions develop.

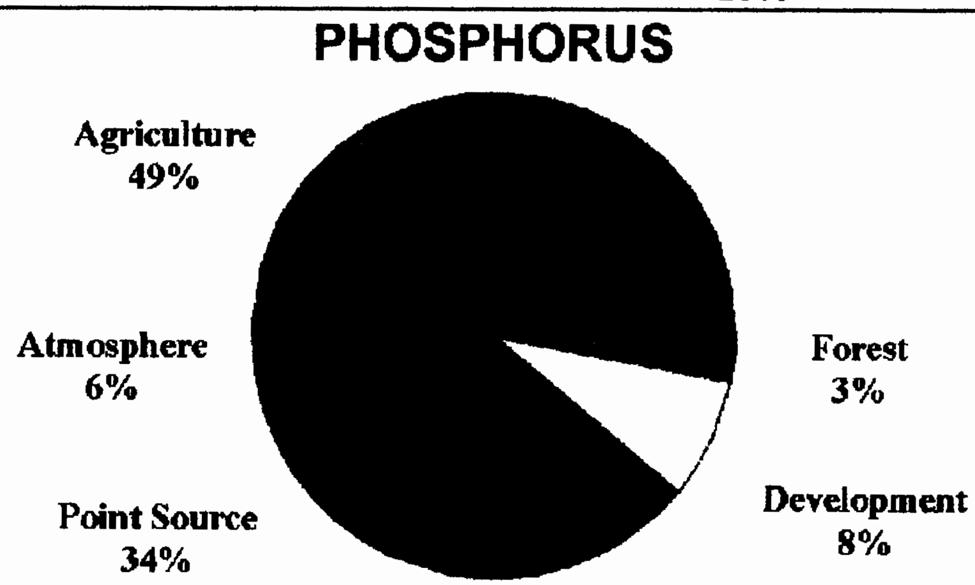
In **anaerobic conditions** (absence of oxygen), as conditions worsen as more phosphates and nitrates may be added to the water, all of the oxygen may be used up by bacteria in trying to decompose all of the waste. Different bacteria continue to carry on decomposition reactions, however the products are drastically different. The carbon is converted to methane gas instead of carbon dioxide, sulfur is converted to hydrogen sulfide gas. Some of the sulfide may be precipitated as iron sulfide. Under anaerobic conditions the iron phosphate precipitates in the sediments may be released from the sediments making the phosphate bioavailable. This is a key component of the growth and decay cycle. The pond, stream, or lake may gradually fill with decaying and partially decomposed plant materials to make a swamp, which is the natural aging process. The problem is that this process has been significantly accelerated.

Non Point Sources of Phosphate

The non-point sources of phosphates include: natural decomposition of rocks and minerals, stormwater runoff, agricultural runoff, erosion and sedimentation, atmospheric deposition, and direct input by animals/wildlife; whereas: point sources may include: wastewater treatment plants and permitted industrial discharges. In general, the non-point source pollution typically is significantly higher than the point sources of pollution. Therefore, the key to sound management is to limit the input from both point and non-point sources of phosphate. The attached graph shows that annual loading of phosphate and nitrogen by source to the Chesapeake Bay.

OVERALL BAY NUTRIENT SOURCES





Plants may not be able to utilize all of the phosphate fertilizer applied, as a consequence, much of it is lost from the land through erosion, since phosphate has a stronger affinity to binding with the soil compared to nitrogen.. The phosphate enters the ecosystem and becomes tied up in the biogeochemical system where it is recycled. The rapid growth of aquatic vegetation and/or increase in the algal population can cause the death and decay of vegetation and aquatic life because of the decrease in dissolved oxygen levels. A large percentage of the phosphate in water is precipitated from the water as iron phosphate or stored in partially decomposed organic material. Through a combination of microbiological action and anoxic conditions, the phosphate may be readily recycled back into the water for further reuse causing the mass of phosphate to build-up in the ecosystem. In deeper environments, the phosphate may be stored in the sediments and then recycled through the natural process of lithophication, uplift, and erosion of rock formations.

Blue Green Algae

Blue green algae (or cyanobacteria) are small single celled prokaryotic (having no nucleus or organelles) microorganisms, only a few microns long. When present in large groups or blooms, these algae appear as a blue-green discoloration in the water. This type of algae is usually found in freshwater and are most common in areas with high levels of nutrients and warm, sunny, and calm conditions. Many blue-greens grow attached on the surface of rocks and stones (epilithic forms), on submerged plants (epiphytic forms) or on the bottom sediments (epipelic forms, or the benthos) of lakes. Some species of blue-green algae produce chemicals that are harmful to both animals and humans. These algal blooms have been linked to health problems ranging from skin irritation to liver damage to death, depending on type and duration of exposure. The livelihood of many fish, shellfish, and livestock has also been endangered through contact with this toxin. In addition to causing animal and human health concerns large amounts of blue-green algae can literally suffocate organisms by depleting water of life-sustaining oxygen by causing hypoxic or anoxic conditions.

Unicellular and filamentous blue-greens are almost invariably present in freshwater lakes frequently forming dense planktonic populations or water blooms in euthrophic (nutrient rich) waters. In temperate lakes there is a characteristic seasonal succession of the bloom-forming species, due apparently to their differing responses to the physical- chemical conditions created by thermal stratification. Usually the filamentous forms (Anabaena species, Aphanizomenon flos-aquae and Gloeotrichia echinulata) develop first soon after the onset of stratification in late spring or early summer, while the unicellular-colonial forms (like Microcystis species) typically bloom in mid-summer or in autumn. The main factors which appear to determine the development of planktonic populations are light, temperature, pH, nutrient concentrations and the presence of organic solutes.

Plan for Asian Oysters Worries Del. and N.J.

States Want Md. to Delay Decision On Introduction of Species Into Bay

By David A. Fahrenthold
Washington Post Staff Writer
Thursday, December 30, 2004; Page B07

Maryland may be rushing crucial research on introducing Asian oysters into the Chesapeake Bay, the states of Delaware and New Jersey said this week, joining several federal agencies in asking that the new species be studied further.

The states issued a statement saying that the Asian oyster is still "a virtual unknown" and could bring diseases or other ecological problems that would spread to their coasts.

—Chesapeake Bay—

- Advocates For Bay To Sue The EPA (The Washington Post, Nov 10, 2004)
- Watermen Tap Oyster Reserve (The Washington Post, Oct 31, 2004)
- Panel Brings Bay Cleanup Cost Into Focus (The Washington Post, Oct 28, 2004)
- Advocates For Bay Churn Waters (The Washington Post, Sep 5, 2004)
- Oyster Project Consumed With Problems (The Washington Post, Aug 25, 2004)
- Recent News

They urged officials in Maryland, where Gov. Robert L. Ehrlich Jr. (R) has been a vocal proponent of the Asian oyster, not to make a decision as scheduled early next year.

"I think their process would benefit from a little more deliberation," said Roy Miller, administrator of fisheries for the Delaware Division of Fish and Wildlife.

Maryland officials responded yesterday that they would not make any moves before they were sure the new oyster is safe.

"We are not going to introduce an oyster that we have questions about," said Secretary of Natural Resources C. Ronald Franks.

The two states' criticism marks a new turn in the saga of *Crassostrea Ariakensis*, a native of Southeast Asia that has recently caused unusual divisions within the staid world of shellfish management.

It has emerged as an issue now because the native oyster -- crucial to filtering the bay's waters and supporting its fleet of watermen -- has almost vanished from the Chesapeake.

Last year's native oyster harvest was about 23,000 bushels, less than 1 percent of the harvest from 30 years ago.

"We're so low that the next stop is zero," said W. Pete Jensen, an official with the Department of Natural Resources.

The Asian oysters are believed to be resistant to the diseases that have killed off native oysters in the Chesapeake. But scientists believe there are many potential problems -- even beyond the dinner-table prospects of an oyster that can resemble an orange portobello mushroom cap.

Scientists point to the havoc caused in the bay ecosystem by other nonnative species: The mute swan and beaverlike nutria chew up crucial grasses, and the toothy northern snakehead in the Potomac River has worried officials.

They worry that the Asian oysters could bring new diseases or adapt to the Chesapeake so well that they squeeze out native species of oysters and clams.

To answer such questions fully might take many years of research, according to reports by the National Academy of Sciences and three federal agencies: the U.S. Fish and Wildlife Service, the Environmental Protection Agency and the National Oceanographic and Atmospheric Administration.

Julie Thompson, a biologist with the Fish and Wildlife Service, said yesterday that the federal agencies were concerned that the Asian oyster would be impossible to remove once released in the wild.

"After it's done, it's going to be irreversible," she said.

Franks said yesterday that all the necessary research has been compressed into a year. That study, performed by the U.S. Army Corps of Engineers, could be finished in the next couple of weeks, he said.

After that, Franks said, the data will be reviewed by a panel of experts appointed by Ehrlich and Virginia Gov. Mark R. Warner (D).

Based on their recommendations, Ehrlich and Warner will decide whether to move forward on the oysters or to request more research, Franks said.

Delaware and New Jersey will not have a say.