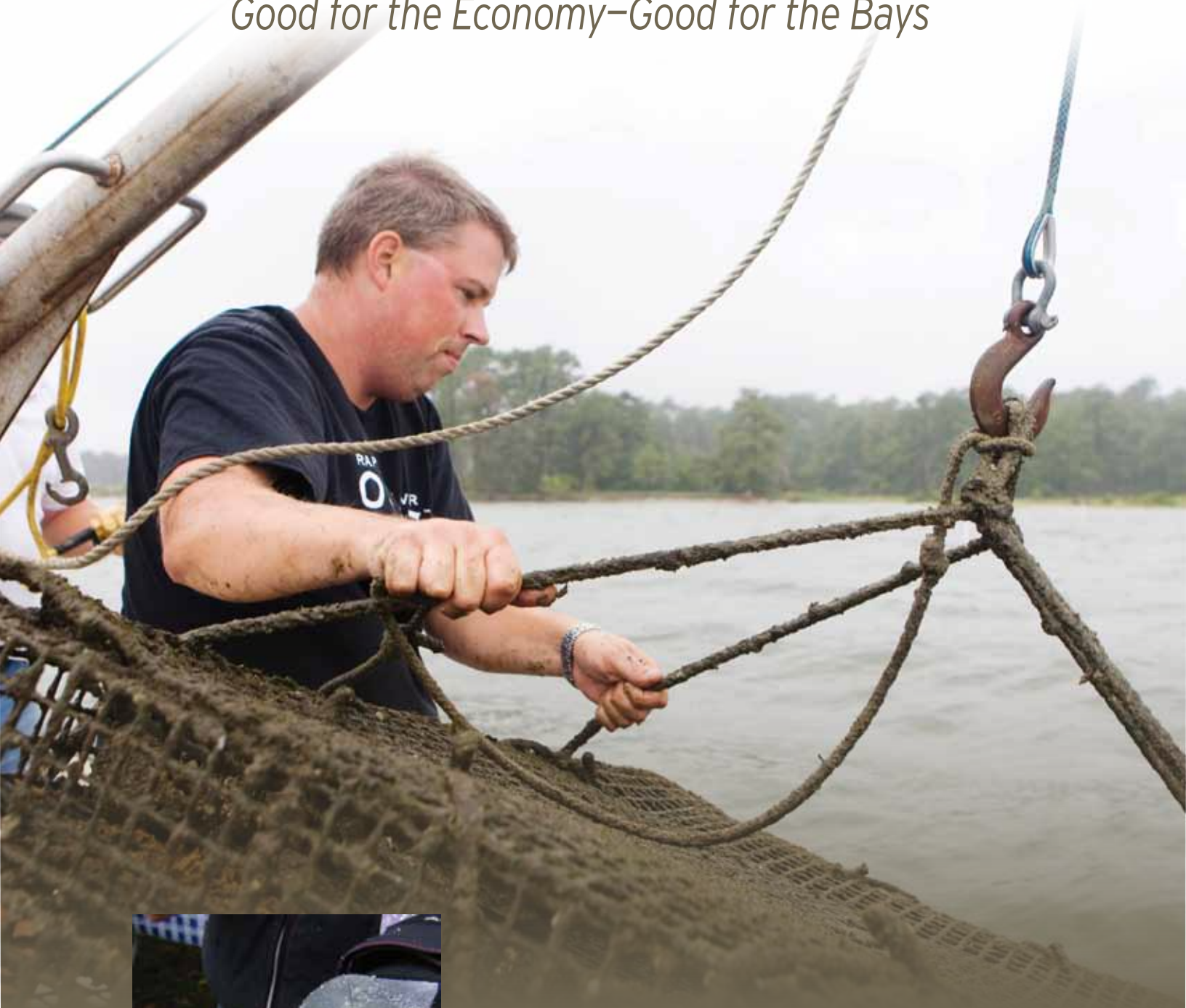


Shellfish Aquaculture on the Inland Bays

Good for the Economy—Good for the Bays



“Delaware waters are a native habitat for oysters. Despite decades of decline, oysters do have a new future in Delaware. With science and good management, oyster production can be and should be encouraged and nurtured to resume its place as an important food crop, much the same as peaches, lima beans and chickens are now identified with our state.”

—Edwin Kee, Delaware Secretary of Agriculture

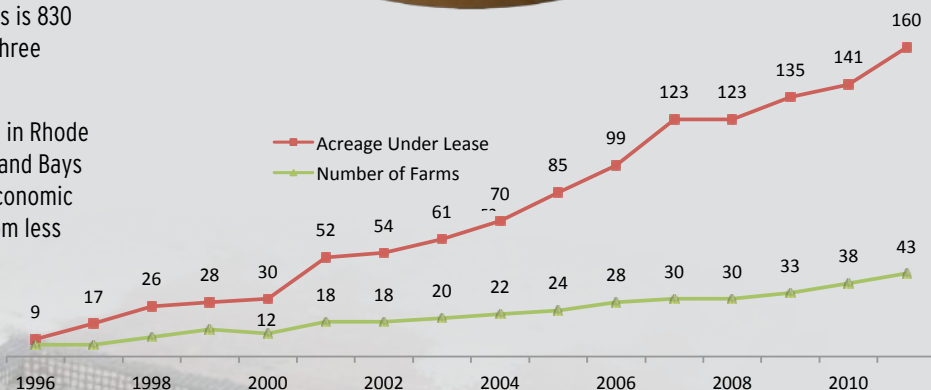
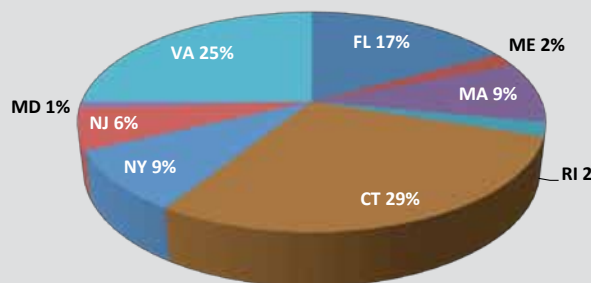
The Delaware Center for the Inland Bays, in response to citizen interest, convened a diverse group of stakeholders to form a Shellfish Aquaculture Tiger Team to consider the opportunities and challenges of allowing commercial shellfish aquaculture in Delaware's Inland Bays. This summary uses published information to estimate the benefits of shellfish aquaculture at a scale applicable to Indian River, Rehoboth, and Little Assawoman Bays. The focus is on oyster aquaculture, as there is more data available for oysters than other shellfish operations. Delaware is the only coastal state with no commercial shellfish aquaculture. Our findings suggest that shellfish aquaculture has the potential to be a new multi-million dollar industry in Sussex County while improving the water quality and habitat of the Bays.

Economic Benefits

- Give Delaware a share of the lucrative and expanding East Coast shellfish aquaculture business, currently valued at \$119 million.^{3,8}
- In the Mid-Atlantic region, it is documented that the value of spin-off jobs, support industries, and employment related benefits bring added economic value of about two and a half times the gross income of the aquaculture itself.⁸
- A single acre of oyster aquaculture has been found to provide an annual gross income ranging from \$15,000-\$70,000. Variables such as numbers of oysters, market price, types of harvesting equipment, product marketing, and effort influence gross income.¹
- A single acre of leased oyster aquaculture bottom in Rhode Island yields an average annual tax-reported income of \$17,445.¹
- The preliminary estimate of suitable shellfish aquaculture lease area in Rehoboth, Indian River, and Little Assawoman Bays is 830 acres which represents 2.7% of the total acreage of the three Inland Bays.
- Based on 160 acres, the number of acres currently leased in Rhode Island, gross income from shellfish aquaculture in the Inland Bays has the potential to range from \$2.4-\$11.2 million. Total economic impact has the potential to range from \$6-\$28 million from less than 1% of the total surface area of the Inland Bays.

Percentage of Shellfish Aquaculture Industry Value by State (\$119 Million)

The East Coast states harvest about \$119 million worth of cultured shellfish; 38% oysters, 61% clams and 1 percent mussels. Coast-wide production is growing at about 10% a year, with most of that increase coming from oysters grown in Virginia and New England.⁸



Rhode Island Shellfish Aquaculture Lease Area and Number of Farms over Time

160 acres of leased aquaculture ground established 84 full and part time jobs, and \$2.5 million in gross revenue in Rhode Island in 2011.¹





Environmental Benefits

- Excess nutrients have severely polluted the Inland Bays, degrading fish and wildlife habitat and contributing to the loss of important eelgrass habitat because light cannot penetrate the water column due to overgrowth of algae. One adult oyster can filter 20-50 gallons of water per day, helping to clear the water by removing nutrients that feed algae by consuming them or depositing them into the Bay bottom.²
- One acre of leased bottom can produce approximately 750,000 oysters that can filter 15-40 million gallons of water per day. 160 acres, such as that currently leased in Rhode Island, could filter 9%-22.5% of the total volume of water in the Inland Bays each day.
- One adult oyster contains 0.5 grams of nitrogen and 0.16 grams of phosphorous in its tissue and shell. When the oyster is removed from the water through harvest, the nutrients in their tissue go with them.^{5,9,10} Some nutrients from oysters eaten in the watershed may re-enter the Bays in wastewater.
- One acre of leased bottom is estimated to remove 689 pounds of nitrogen and 89 pounds of phosphorus from the Bays per year (assuming a three-year harvest cycle). To put this in perspective, 160 acres would remove 94% of the measured annual nitrogen to Herring Creek (a major Bay tributary), and would remove the equivalent of the total annual load of phosphorus to Guinea, Pepper, and Herring Creeks combined.¹¹
- Each year, an adult oyster can also cause 0.75 grams of nitrogen to be buried and removed from the water through conversion to nitrogen gas.^{7,10}
- Aquaculture improves habitat for aquatic life. A recent study done in the Inland Bays demonstrated that aquaculture gear provided habitat for 49 species of fish and invertebrates.⁴



Photo credit: NOAA

- ¹ Beutel, D. (2011). *Aquaculture in Rhode Island, 2011 Annual Status Report*. Wakefield, RI: Coastal Resources Management Council.
- ² Chesapeake Bay Foundation (2012). *Oyster Fact Sheet*. Annapolis: Chesapeake Bay Foundation.
- ³ East Coast Shellfish Growers Association (2010). *Best Management Practices for the East Coast Shellfish Growers Industry*. East Coast: East Coast Shellfish Growers Association.
- ⁴ Frank P. Merenghi, G. O. (2009). *Floating oyster, Crassostrea virginica Gmelin 1791, aquaculture as habitat for fish and macroinvertebrates in Delaware Inland Bays: the comparative value of oyster clusters and loose shell*. Dover: Del State University.
- ⁵ Hauke Kite-Powell, Porter Hoagland, Di Jin, Dror Angel, Heidi Clark, Kevin Kroeger (2006) *Mitigating the Effects of Excess Nutrients in Coastal Waters through Bivalve Aquaculture and Harvesting*. Final Project Report submitted to The Cooperative Institute for Coastal and Estuarine Environmental Technology.
- ⁶ Newell, R., Jeffrey C. Cornwell, and Michael S. Owens (2002) *Abstracts Influence of simulated bivalve biodeposition and microphytobenthos on sediment nitrogen dynamics: A laboratory study* *Limnol. Oceanogr.*, 47(5), 1367-1379
- ⁷ Newell, R.I. E. 2004. *Ecosystem Influences of Natural and Cultivated Populations of Suspension-Feeding Bivalve Mollusks*. *Journal of Shellfish Research*, Vol. 23, No 1., pp. 51-61.
- ⁸ Rheault, R. 2012. *What is Our Industry Worth?*. East Coast Shellfish Growers Association. June 2012 Newsletter. pp 10.
- ⁹ Rice, M. (1999) *Control of Eutrophication by Bivalves: Filtration of Particulates and Removal of Nitrogen through Harvest of Rapidly Growing Stocks*. *Jour Shellfish Res* 18:275
- ¹⁰ Wilcox, W., 2009. *Shellfish as a Means to Reduce Nitrogen Impacts in Coastal Waters*. Technical Report. University of Massachusetts Boston. 5 p.
- ¹¹ Delaware Department of Natural Resources and Environmental Control (DNREC), 2004. *Total Maximum Daily Load (TMDL) Analysis Little Assawoman Bay and Tributaries of the Indian River, Indian River Bay and Rehoboth Bay, Delaware*. Watershed Assessment Section-Division of Water Resources. December 2004.

Photo credit: Blue Water Sailing

We're underway... The Tiger Team (the Inland Bays Aquaculture planning group) is working on three fronts:

- **The Policy, Permitting and Funding Subcommittee** is reviewing current rules and regulations in the Delaware Code and will propose draft revisions and legislation to permit commercial aquaculture on the Inland Bays for consideration by the State Legislature.
- **The GIS Spatial Planning Subcommittee** is mapping existing uses and activities on the Bays to determine the areas that shellfish aquaculture can occur in balance with other Bay users.
- **The Education and Outreach Committee** is working to inform the public about the economic opportunities that commercial shellfish aquaculture can bring to our community and the ecological benefits it could bring to the Inland Bays; and build support for legislation permitting shellfish aquaculture on the Inland Bays.

As with all new initiatives, the benefits need to be weighed against the costs. The team is meeting monthly to study every aspect of the plan; to identify conflicts, and consider the needs and concerns of those who live on and use the Bays.

There are regulatory and enforcements issues and costs to evaluate, data on native populations of clams as well as the experience of commercial clammers to assess, and navigation and recreation uses to consider. The team is listening to local people who are interested in starting an aquaculture business and inviting specialists in from our neighboring states to get their best advice.

All three committees are working to bring the experience and concerns of all who are interested in this initiative to their deliberations. You are welcome to join in the work.



Want to know more?

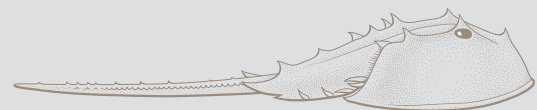
If you would like to see the presentations and read the minutes from past meetings go to inlandbays.org To get on the Tiger Team mailing list, send your email address to: restoration@inlandbays.org

THE TIGER TEAM:

- Delaware Center for the Inland Bays
- DE Sea Grant Marine Advisory Service
- DE Department of Natural Resources and Environmental Control
- DE Department of Agriculture
- Sussex County Economic Development
- Local on the Menu/Farm to Table Program
- Recreational fishing interests
- Commercial clammers
- Future shellfish aquaculturists



"Mr. Clam" clam operation near Massey's Landing in the 1980's.
Photo credit: The Monte family



Delaware Center for the Inland Bays
inlandbays.org