



Section 5. Risk Assessment

5.18 Fishing Failure

2014 Plan Update Changes

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, severity, warning time and secondary impacts of the fishing failure hazard.
- Potential change in climate and its impacts on the fishing failure hazard are discussed.
- A vulnerability assessment has been completed and directly follows the hazard profile.
- The consequence analysis for fishing failure events is now located in Section 9 of this Plan Update.

5.18.1 Profile

Hazard Description

Fishing failure in New Jersey could be disastrous to the State's fishing industry, economy, and coastal communities. A fishing failure could occur for many different reasons including: over fishing, disease, changing migration patterns, or climate change.

- Overfishing is the taking of wildlife from the sea at rates too high for fished species to replace themselves. It is the result of growing demand for seafood, combined with poor management of fisheries and the development of new, more effective fishing techniques.
- Diseases are a known contributor to population level declines in wild fish populations. They are often a result of compromised environmental conditions.
- Migrating fish may encounter altered ecosystems and barriers that impact their ability to survive and predation from other species may also have an impact.
- Changes in climate could affect the distribution and migration of more than 1,000 species of commercial fish and shellfish around the world.

New Jersey Sea Grant Consortium indicates that for centuries, New Jersey's coastal communities along the Atlantic Ocean have relied on fishing as a source of food, employment, and tourism. The loss of any portion of this industry would be detrimental to the State, specifically the coastal communities. New Jersey's fishery and aquaculture resources contribute more than \$1 billion annually to the State's economy.

For over 300 years, commercial fishing has been a livelihood for fishermen. Seafood landed by New Jersey fishermen is shipped to seafood markets around the world. New Jersey commercial fisheries include over 100 different species of finfish and shellfish, the most economically important being sea scallops, surf clams, Atlantic mackerel, hard clams, blue crabs, ocean quahogs, fluke, monkfish, Atlantic herring, and American lobster. New Jersey is home to six major fishing ports; Atlantic City, Barnegat Light, Bedford, Cape May, Point Pleasant, and Port Norris. Four of these rank in the top 50 ports in the United States in terms of economic value. The economic benefits associated with the commercial fishing industry extend beyond the industry itself and can provide direct and indirect economic support to other waterfront industries and surrounding communities. Increasing competition for the State's coastal resources is threatening the industry's viability and is creating challenges that the industry must work to overcome.



In 2009, there were 2,500 fishermen in the New Jersey commercial fleet, 109 seafood processors, and wholesalers employed 1,500 people. Commercial fisherman in the Mid-Atlantic Region landed 696 million pounds of finfish and shellfish, earning \$435 million in landings revenue. Landings revenue was dominated by sea scallops (\$162 million) and blue crab (\$85 million). Virginia and New Jersey had the highest landings revenue in the region in 2009, \$153 million and \$149 million, respectively. In terms of pounds landed, Virginia had the highest landings at 426 million pounds, followed by New Jersey at 162 million pounds and Maryland at 68 million pounds. The Mid Atlantic Region's seafood industry generated 407 in employment impacts in Delaware, 15,000 in Maryland, 38,000 in New Jersey, 44,000 in New York, and 19,000 in Virginia. New Jersey generated the largest impacts across the three other impact categories, generating \$5.8 billion in sales, \$1.3 million in income, and \$2.1 billion in value added impacts (NOAA Fisheries 2009).

According to preliminary data provided by NOAA, in 2011, New Jersey fisherman landed approximately 133 million pounds of seafood. This was a decrease from 2010's total of 162 million pounds; however, the value was up from \$177.9 million to \$195.2 million. These numbers differ from the National Marine Fisheries Service database that indicated New Jersey's commercial fishing fleet landed 176 million pounds of fish and shellfish with a value of \$214 million. It was estimated that these landings generated \$1 billion of economic activity (DiDomenico 2011).

As per NJDA, aquaculture is the farming of aquatic organisms such as fish, shellfish, and plants. Shellfish production, primarily hard clams and oysters, account for the majority of aquaculture that takes place in New Jersey. New Jersey currently has over 160 licensed aquatic farmers who produce a variety of finfish and shellfish for food, ornamental fish and plants for water gardens, and sport fish for stocking and fee fishing operations. New Jersey Sea Grant Consortium states that New Jersey ranks fifth in hard clam production. The majority of oyster culture is conducted in the Delaware Bay; however, commercial oyster culture is also common along the Atlantic coast. According to the 2007 National Agricultural Statistics Survey, total aquaculture sales were over \$6.6 million (USDA 2007).

In addition to salt-water fisheries, the State is home to pristine recreational cold-water fisheries supporting large populations of freshwater fish. These fisheries can be found throughout the State, with the highest concentration in the northwestern region. New Jersey is also home to some of the oldest operating trout hatcheries dating back to the mid-1800s. Combined, these facilities support a statewide trout management program that stocks approximately 600,000 fish into cold-water fisheries throughout the State (Wildlife 2013).

Location

The Garden State Seafood Association states that there are six major commercial fishing ports on New Jersey's coastline and a number of smaller ports on Delaware, Barnegat and Raritan Bays. The major ports include, but not limited to: Bedford, Point Pleasant, Barnegat Light, Atlantic City, and Cape May (Figure 5.18-1). With the exception of Atlantic City, each supports a number of inshore and offshore fisheries. The Atlantic City fleet is exclusively dedicated to the surf clam/ocean quahog fishery.



Figure 5.18-1. Major Commercial Fishing Ports in New Jersey



Source: Garden State Seafood Association

The Garden State Seafood Association indicates that one of the benefits of New Jersey's small size is the access to major transportation routes. Newark Airport and Port Newark/Elizabeth are within easy, same-day reach of each of New Jersey's commercial fishing ports.

In addition, New Jersey is home to a pristine cold-water trout fishery that covers all counties throughout the State. This fishery is home to native trout as well as New Jersey-grown and stocked fish, and provides public access for recreational fishers seeking freshwater fishing.

Extent

New Jersey is home to a variety of fish species, including 93 freshwater species and over 330 marine species. The effects of a fishing failure on the public of New Jersey could be potentially great. In the event of a fishing failure, food supplies could be interrupted and the public could experience a rise in overall food prices. Also, a widespread failure due to contamination by a toxic pollutant, foreign agent, or a biological organism could create doubts about the safety of the food supply.

The economic conditions of the State could be greatly impacted by a fishing failure. New Jersey's fishery and aquaculture resources contribute more than \$1 billion annually to the State's economy. According to the USDA 2007 Agricultural Census for New Jersey, aquaculture contributes over \$6 million to the agricultural industry. The economic benefits associated with the commercial fishing industry extend beyond the industry and can provide direct economic support to other waterfront industries and surrounding communities. New Jersey's economy is somewhat dependent on the fishing industry, but the impacts could be severe on coastal towns that rely on the fishing industry. The tourism industry may also be impacted by a fishing failure.

Previous Occurrences and Losses

The 2011 State Plan did not discuss specific fishing failure events. For this Plan Update, fishing failure events that occurred in the State from January 1, 2010 to December 31, 2012 will be discussed further; however, the descriptions do not include all incidents.



Superstorm Sandy – 2012

Superstorm Sandy caused severe flooding that mandated statewide closures of waters where shellfish are produced. This prohibited growers from harvesting their products. Re-openings of these growing areas occurred in stages over the past few months. Shellfish hatcheries sustained considerable damage from Sandy, including the destruction of and damage to equipment and the working waterfront, inhibiting them from producing seed for farms around the State. The six hatcheries and nurseries that were impacted supply 90% of the seed to clam farmers.

Two clam hatcheries in the Borough of Tuckerton (Ocean County) were completely destroyed and suffered a disproportionate amount of damage because of the amount of seed they supply. These facilities produced between 30% and 40% of New Jersey's clam seed. These hatcheries experienced nearly a 100% loss, including building, foundation, equipment, outside raceways, and product. Operators have been forced to rebuild temporary structures in other locations to salvage some seed production capacity. According to the NJDA, property damage to these hatcheries included the hatchery buildings' foundations, bulkheads, raceways (where clams are grown to a certain size before farmers take them onto their leases), and equipment losses, totaling a \$1 million loss. Product loss included clam seed that would otherwise be sold to clam farms, totaling \$10,000 in losses.

Other hatcheries, as well as clam and oyster growers, have also experienced damage to their facilities and equipment from Sandy's impact. Four hatcheries in Atlantic City sustained minor damage to property and product loss from water closings. Their losses totaled \$100,000 in combined property damage and \$20,000 in product losses. Clam growers with leases in the intertidal areas of Barnegat Bay south through Brigantine and in the Sea Isle area of Cape May County have recorded damage to their predator protection screens and product losses on their leases. Losses totaled \$18,000 in property damage and \$100,000 in product loss. Atlantic Coast Hatcheries lost oyster seed valued at \$1,500. Two oyster growers along the Delaware Bay Cape Shore reported approximately \$16,000 in product losses. An oyster grower in Barnegat Bay reported \$33,000 in property damage and \$66,500 in product loss (NJDA 2013).

Overall, New Jersey's fishing industry sustained between \$77 and \$120 million in losses, which included recreational fishing-related industries, which accounted for more than 80% of all losses (NJDEP 2013).

Probability of Future Occurrences

Based on the location of New Jersey along the eastern seaboard, the likelihood of a fishing failure caused by a weather-related event such as hurricane or Nor'easter is great. While these events are short in duration, the relocation of the aquatic wildlife may have an immediate impact on the fishery. However, recovery usually starts immediately, with a full recovery within a few months. Freshwater impacts from storms pose a greater threat from the modification of streambeds creating a change in living and breeding habitat. While freshwater impacts are generally more severe than those affecting a saltwater fishery, the return of fish begins following the reduction of water levels.

Severity

Complete fishing failure within the State, while unlikely based on the diversity of the State fisheries, could range from a small, localized impact to a statewide industry failure. Events that have the potential to impact at the catastrophic level include the introduction of an invasive species, introduction of an animal-based disease, or a sudden change in climate within the region. Any of these would have an immediate impact on the fish population, leaving a large number of industry employees without work. The loss of the industry as a whole



would provide an economic loss of over \$4 billion and employment for over 5,000 residents, not including the impact to the end users.

Warning Time

Fishing failure in most cases does not present with any available warning. The only exception would be the movement of fish based on an approaching threat such as hurricane or Nor'easter. The majority of fishing failures, outside a storm impact, occur gradually over time and require scientific study to recognize. These studies provide a snapshot of gradual change and thus allow for immediate responses to mitigate future failures.

Secondary Hazards

Secondary hazards associated with fish loss are based on the type of loss associated with the fishery. A loss of fishing ability within the State would have an immediate impact on the thousands of residents relying on the industry for a means of income. Additionally, the global implication of a loss of New Jersey seafood will have an impact on the pricing of seafood nationwide and possibly worldwide.

Based on the reason for fish loss, a secondary impact that may present is a public health concern. Through the introduction of an animal-based disease, a rapid die-off of any of the 100 species of fish will present health considerations caused by large numbers of deceased animals in the water and shore areas.

Finally, the adverse impact from any fish loss would be the reduction of the New Jersey recreation industry. The pristine cold-water fisheries, combined with the 100 miles of fishable shoreline, provide thousands of fishers the opportunity to enjoy New Jersey's natural beauty. These fishers support the State through the purchase of equipment, travel, and lodging in excess of \$1 million annually.

Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

The New Jersey Climate Adaptation Alliance is a network of policymakers, public and private-sector practitioners, academics, non-governmental organizations (NGO), and business leaders aligned to build climate change preparedness in the state of New Jersey. The Alliance is facilitated by Rutgers University, which provides science and technical support, facilitates the Alliance's operations and advances its recommendations. A document titled *Change in New Jersey: Trends and Projections* was developed to identify recommendations for State and local public policy that will be designed to enhance climate change preparedness and resilience in New Jersey (Rutgers 2013).

Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4°F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).



ONJSC indicates that both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970. Southern New Jersey became two inches (5%) wetter late in the 20th century. Average annual precipitation is projected to increase in the region by 5% by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York City Panel on Climate Change [NYCPCC] 2009). In addition, heavy precipitation events have increased in the past 20 years.

The foregoing predicted impacts may affect the distribution and migration of fish, thereby potentially impact fishing productivity, opportunity, and viability. Indeed, the potential for increased severe weather on a fishery or the potential for increased severe weather during open fishing seasons may have an impact on the industry.



5.18.2 Vulnerability Assessment

The following discusses New Jersey's vulnerability, in a qualitative way, to the fishing failure hazard. A consequence analysis for this hazard was also conducted and presented in Section 9. Impacts on the public, responders, continuity of operations, and delivery of services; property, facilities, and infrastructure; and the environment, economic condition of the state, and the public confidence in the State's governance are discussed in Section 9 in accordance with EMAP standards. This section addresses assessing vulnerability and estimating potential losses by jurisdiction and to state facilities.

Assessing Vulnerability by Jurisdiction

As noted earlier in this section, the coastal communities along the Atlantic Ocean are home to six major commercial fishing ports, hundreds of recreational fishing access points, and other ports covering over 100 miles of the coast. The six commercial fishing ports include Atlantic City, Barnegat Light, Bedford, Cape May, Point Pleasant, and Port Norris. These commercial fishing ports are located in Atlantic, Cape May, Cumberland, and Ocean Counties. These Counties are considered the most vulnerable to this hazard of concern.

All counties in the State have publicly accessible streams, rivers, lakes, ponds, and reservoirs that provide public places to fish and are thus vulnerable to the fishing failure hazard. A list of both rivers/streams and ponds in each county with a population of desirable fishing species is located on NJDEP's website: http://www.njfishandwildlife.com/fishing_fresh.htm.

Assessing Vulnerability of State Facilities

NJDEP's Division of Fish and Wildlife Bureau of Freshwater Fisheries is responsible for the propagation, protection, and management of the State's freshwater fishery resources as well as promoting their recreational use. The Pequest Trout Hatchery in Oxford and the Charles O. Hayford Hatchery in Hackettstown are both located in Warren County. These hatcheries raise and stock warm-water and cool-water species for stocking water bodies across the State. Additional facilities that support the fishing industry include, but are not limited to fishing ports, fish processing facilities, and commercial fishery support services.

Estimating Potential Losses by Jurisdiction

The economic conditions of the State could be greatly affected by a fishing failure. In total, the New Jersey commercial fishing industry brings in an estimated \$4.5 billion annually from fisheries, aquaculture, and recreational fishing. This is part of a \$50 billion-a-year "Coastal Zone" sector of the State's economy, which employs one out of every six people working in New Jersey. The value of the seafood harvest extends well beyond the industry itself. The effects of a prosperous seafood industry are felt in other waterfront activities such as shipbuilding, maintenance and repair, support services (equipment, fuel, materials, and supplies), and ecotourism. Most importantly, the dollars earned in fishing communities tend to remain in those communities, adding incrementally to the local economy and in turn strengthening the relationship between the industry and its homeport. New Jersey's most valuable fisheries in 2011 were sea scallops (\$142 million), surf clams/ocean quahogs (\$19 million), blue crabs (\$9 million), squid (\$13 million), hard shell clams (\$6 million), menhaden (\$6 million), summer flounder (\$5 million), monkfish (\$4 million), oysters (\$3 million), and lobsters (\$3 million) (DiDomenico 2011).

Recreational fishing within the State of New Jersey supports local economy through the purchase of goods such as equipment, vehicles, lodging, and food. It is estimated that in 2011, over \$1 million were spent in support of recreational fishing within the State of New Jersey with residents of the Garden State spending over



8,000 days fishing versus non-residents spending 1,500 days fishing (2011 National Survey of Fishing, Hunting, & Wildlife Associated Recreation, 2012).

The historic record indicates large impacts to the fishing industry as a result of natural hazard events. As a result of Superstorm Sandy, New Jersey's fishing industry sustained between \$77 million and \$120 million in losses, including recreational fishing-related industries, which accounted for more than 80% of all losses (NJDEP 2013).

Further, a fishing failure could have a potentially severe impact on the environment if the cause of the failure was attributed to contamination by a toxic release, foreign agent, or a biological organism. If a massive fish kill was associated with the event, clean up and recovery could take months and the cost would be quite substantial.

Estimating Potential Losses to State Facilities

The potential losses to state facilities caused by the fishing failure hazard are difficult to quantify. The most direct potential losses of a fish population hazard could be the loss of the State-run Pequest Trout Hatchery in Oxford and the Charles O. Hayford Hatchery in Hackettstown. These hatcheries raise and stock warm-water and cool-water species for stocking water bodies across the State. Further, state facilities that support the main fisheries and ports may not be physically harmed but their mission would be altered if the fisheries industry declined.

Environmental Impacts

A fishing failure could potentially have a severe impact on the environment if it were due to contamination by a toxic release, foreign agent or a biological organism. If a massive fish kill was associated with the event clean up and recovery could take months (NJ State HMP 2011).