



## Section 5. Risk Assessment

### 5.15 Crop 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 crop failure hazard.
- FEMA and USDA disaster declarations for New Jersey are now included in the previous occurrences section of this hazard profile.
- Potential change in climate and its impacts on the crop failure hazard are discussed.
- A vulnerability assessment has been completed and directly follows the hazard profile.
- The consequence analysis for crop failure events is now located in Section 9 of this Plan Update.

#### 5.15.1 Profile

##### Hazard Description

Crop failure is defined as the complete or near-complete loss of a marketable crop on a farm. Unfavorable weather conditions and pest infestation can both lead to the damaging or destroying of fruits and vegetables, and lowering crop yields. New Jersey farmers lose \$290 million each year from direct crop loss or damage caused by agricultural pests, or the costs to control those pests (New Jersey Department of Agriculture [NJDA] Date Unknown).

The New Jersey agricultural industry is the third-largest industry within the State with records showing over \$1 billion in revenue. The industry as a whole is supported by over 10,000 farms statewide producing over 100 species of fruits and vegetables. Additionally, New Jersey is in the top ten producers of blueberries, cranberries, peaches, tomatoes, peppers, snap beans, spinach, and squash in the United States. These agricultural crops are processed and shipped annually throughout the northeast and beyond, with many products reaching global suppliers (Keep it Green 2013).

The agricultural industry within New Jersey is vulnerable to a variety of different hazards. They include but are not limited to flood, drought, wind, fire, and other severe weather events. In addition, threats such as disease outbreaks (whether natural or intentional) and pest infestation endanger the crop population within the State. Over the past decades, New Jersey has experienced significant drought as well as flooding, both of which proved to have an adverse effect on the crop production within the State, leading to disaster declarations and in certain instances federal financial aid.

In addition to the top crops noted above, New Jersey is a major producer of asparagus, bell peppers, eggplant, endive, cabbage, and lettuce. The most valuable fruit crops in New Jersey are blueberries and cranberries; as noted above, New Jersey is a leading producer in the United States. Apples, peaches, and strawberries are also important crops. Leading field crops are soybeans, corn, and wheat (NETSTATE 2013).

Half of the major insect pests in the United States have been introduced from foreign countries. Approximately 1,065 to 1,118 plants species, nearly 62% of plant species in New Jersey, have been introduced from continents other than North America. When non-native insects and plants are accidentally transported into the United States, they often arrive without natural enemies that can control their populations. Pests are



adaptable and build resistance to pesticides. However, pest damage can be controlled through the use of biological and chemical methods. The U.S. Department of Agriculture (USDA) estimates that the average cost to control agricultural pests is approximately 34% of a farmer's variable crop production costs (NJDA Date Unknown).

### **Location**

---

The regions of agricultural industry within the State are determined by the product being grown. The southern region topography, combined with soil composition, supports the development of fruits such as peaches, grapes, cranberries and blueberries; and more than 40 vegetable crops that include tomatoes, bell peppers, sweet corn, cucumbers, herbs, as well as soybeans. The northern region supports the development of other products such as corn, grapes, and apples. The majority of the farming communities within the State can be found outside the urban regions with the highest concentration located to the northwestern and southern regions of the State. Figure 5.15-1 illustrates the acres of cropland by county.

### **Extent**

---

As stated below in the Previous Occurrences and Losses section, New Jersey farmers have historically been impacted by losses caused by insects and pests, weather-related incidents, and disease outbreaks. These hazards continue to have the potential to result in crop damage and complete crop loss. The impact and severity of each will vary by the cause of loss and/or failure. For a description of the extent for each of the hazards which may cause crop failure, see Section 5.4 (Drought), Section 5.6 (Flood), Section 5.8 (Hurricane), Section 5.10 (Severe Weather), Section 5.13 (Animal Disease), and Section 5.21 (Pandemic).

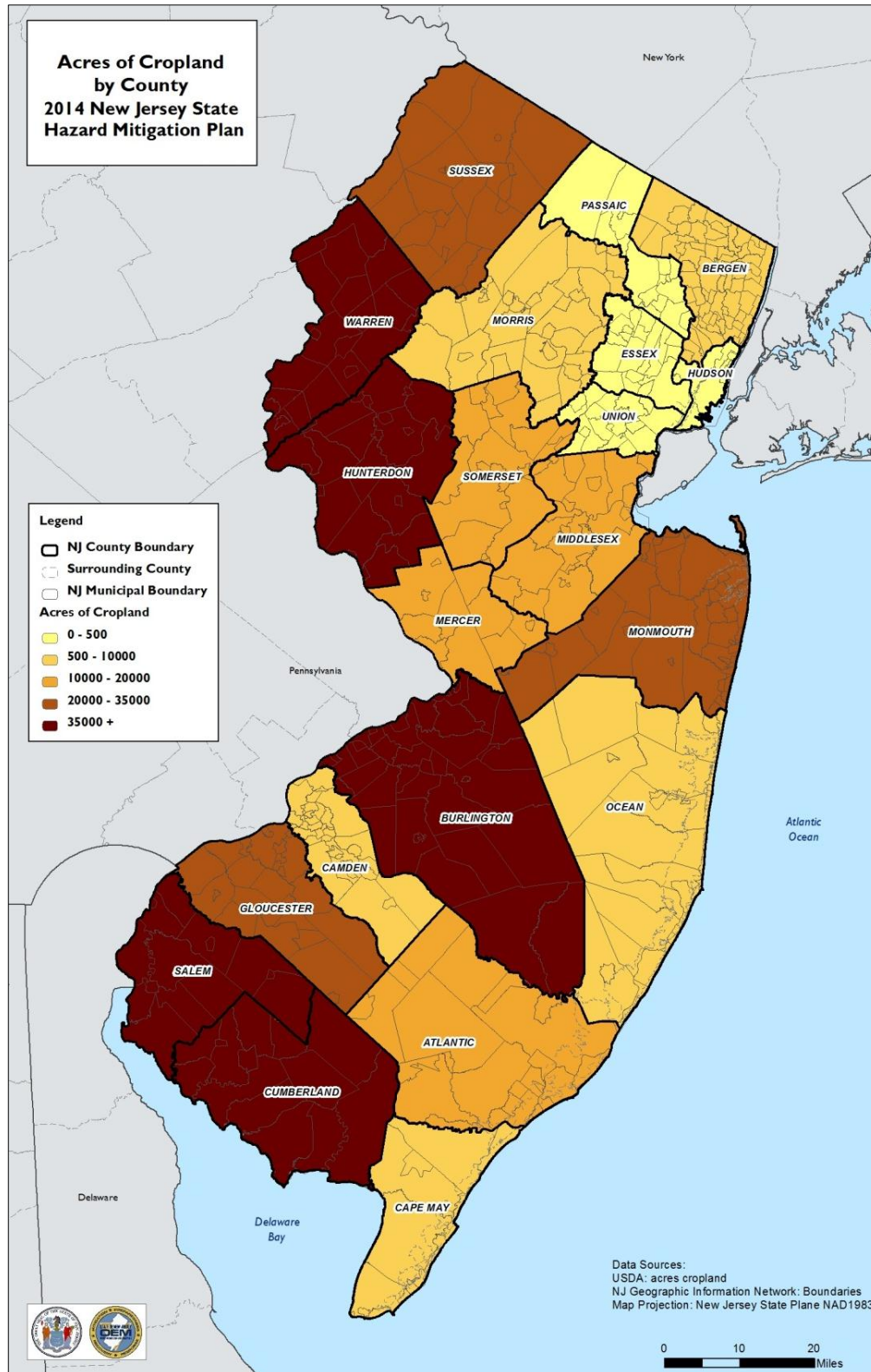
### **Previous Occurrences and Losses**

---

Annually, New Jersey farmers are impacted by incidents that result in a loss of crops. These incidents include loss caused by insects and pests, weather-related incidents, and disease outbreaks. The 2011 State Plan did not discuss specific crop failure events; however, this 2014 Plan update includes information regarding incidents of crop failure that occurred in the State from January 1, 2010 to December 31, 2012. Table 5.15-1 lists major crop failure events in the State over the past five years, but does not include all incidents.



Figure 5.15-1. Cropland in New Jersey



Source: USDA Agricultural Census 2007



Table 5.15-1. Crop Failure Events in New Jersey, 2008-2012

| Date(s) of Event           | Event Type      | Counties Impacted   | Description  |
|----------------------------|-----------------|---|--|
| 2008                       | Severe Weather  | N/A   | Ten counties were designated as disaster areas following a continuous stretch of adverse weather that impacted the agricultural industry.  |
| May – September 2010       | Drought         | Burlington, Hunterdon, Mercer, Sussex, Warren   | Small businesses in the State were eligible for federal disaster loans from the SBA for financial loss due to ongoing drought. The declaration made small businesses, small agricultural cooperatives, and nurseries eligible for loans through the Economic Injury Disaster Loan.   |
| June – September 2010      | Drought         | Statewide   | Cranberry vines at a bog in Eagleswood (Ocean County) were dry and brittle from the lack of precipitation. Crops were dying in other parts of the State because of dry conditions. A farmer in Hopewell lost 75 acres of corn from heat and drought. Water restrictions were reported throughout the State. A total of 16 counties (Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Salem, Somerset, Sussex, and Warren) were declared to be natural disaster areas by the USDA because of drought and heat conditions. |
| August 12, 2010            | Lightning       | Salem   | \$1,000 in crop damage   |
| June 9, 2011               | Hail            | Atlantic  | A line of severe thunderstorms moved through New Jersey. The storms brought ping-pong ball-sized hail to Atlantic County, damaging young plants on farms. The hail caused approximately \$10,000 in crop damage.   |
| August 27-30, 2011         | Hurricane Irene | Statewide   | Hurricane Irene caused damage to many crops across the State. Farmers saw spotty damage to sweet corn, tomatoes, peppers, cucumbers, potatoes, and squash. At a farm in Hillsborough (Somerset County), a farmer lost one-third of their pumpkin crop.   |
| June 28 – November 8, 2012 | Extreme Weather | Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Monmouth, Morris, Ocean, Passaic, Salem, Sussex, Warren | Crop losses caused by the combined effects of drought, high winds, hail, excessive heat, excessive rain, flash flooding, Superstorm Sandy, a snowstorm, and a Nor'easter led to several counties being designated as disaster areas by the USDA.   |
| July 18, 2012              | Lightning       | Sussex  | \$5,000 in crop damage   |
| July 28, 2012              | Severe Storm    | Mercer, Middlesex   | \$50,000 in crop damage  |

Source: Drought Impact Report 2013; NOAA-NCDC 2013; Atlantic Press 2012

Note:

N/A Not Available  
 SBA U.S. Small Business Administration  
 NCDC National Climatic Data Center

NOAA National Oceanic and Atmospheric Administration  
 USDA U.S. Department of Agriculture



## Federal Disasters (FEMA and USDA)

---

### USDA Declarations

Agriculture-related drought disasters are quite common. Approximately one-half to two-thirds of the counties in the United States have been designated as disaster areas in each of the past several years. The Secretary of Agriculture is authorized to designate counties as disaster areas. Producers suffering losses in or near counties designated as disaster areas are eligible for emergency loans.

The Farm Service Agency provides assistance for natural disaster losses resulting from drought, flood, fire, freeze, tornadoes, pest infestation, and other event disasters.

Table 5.15-2 presents USDA-declared drought and excessive heat events impacting the State. Figure 5.15-2 displays these disasters by County.

### FEMA Disaster Declarations

Between 1954 and 2012, FEMA did not declare any crop failure-related disasters (DR) or emergencies (EM) in the State of New Jersey (FEMA 2013).



**Table 5.15-2. USDA Drought-Related Disaster Declarations (2011to 2013)**

| Incident Period                  | Event Type   | USDA Designation Number | Counties Included in Disaster   | Losses / Impacts |
|----------------------------------|--|-------------------------|---|------------------|
| August 14-September 15, 2011     | Hurricane, Tropical Storm Lee, Excessive Rain, and Flooding  | S3219                   | Warren  | Not available    |
| March 1, 2012 – Continuing       | Frosts and Freezes   | S3249                   | Bergen, Passaic, Sussex   | Not available    |
| March 26-April 8, 2012           | Frosts, Freezes, High Winds, and Hail  | S3251                   | Bergen, Passaic, Sussex   | Not available    |
| June 2012 – Continuing           | Drought, Excessive Heat  | S3427                   | Passaic, Sussex   | Not available    |
| June 28, 2012 – November 9, 2012 | Drought, High Winds, Hail, Excessive Heat, Excessive Rain, Flash Flood, Hurricane Sandy, Snowstorm, and Nor’Easter | S3487                   | Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Monmouth, Morris, Ocean, Passaic, Salem, Sussex, Warren | Not available    |
| May 1, 2013 – Continuing         | Excessive Rain and Related Flooding, High Winds, and Hail  | S3593                   | Passaic, Sussex   | Not available    |

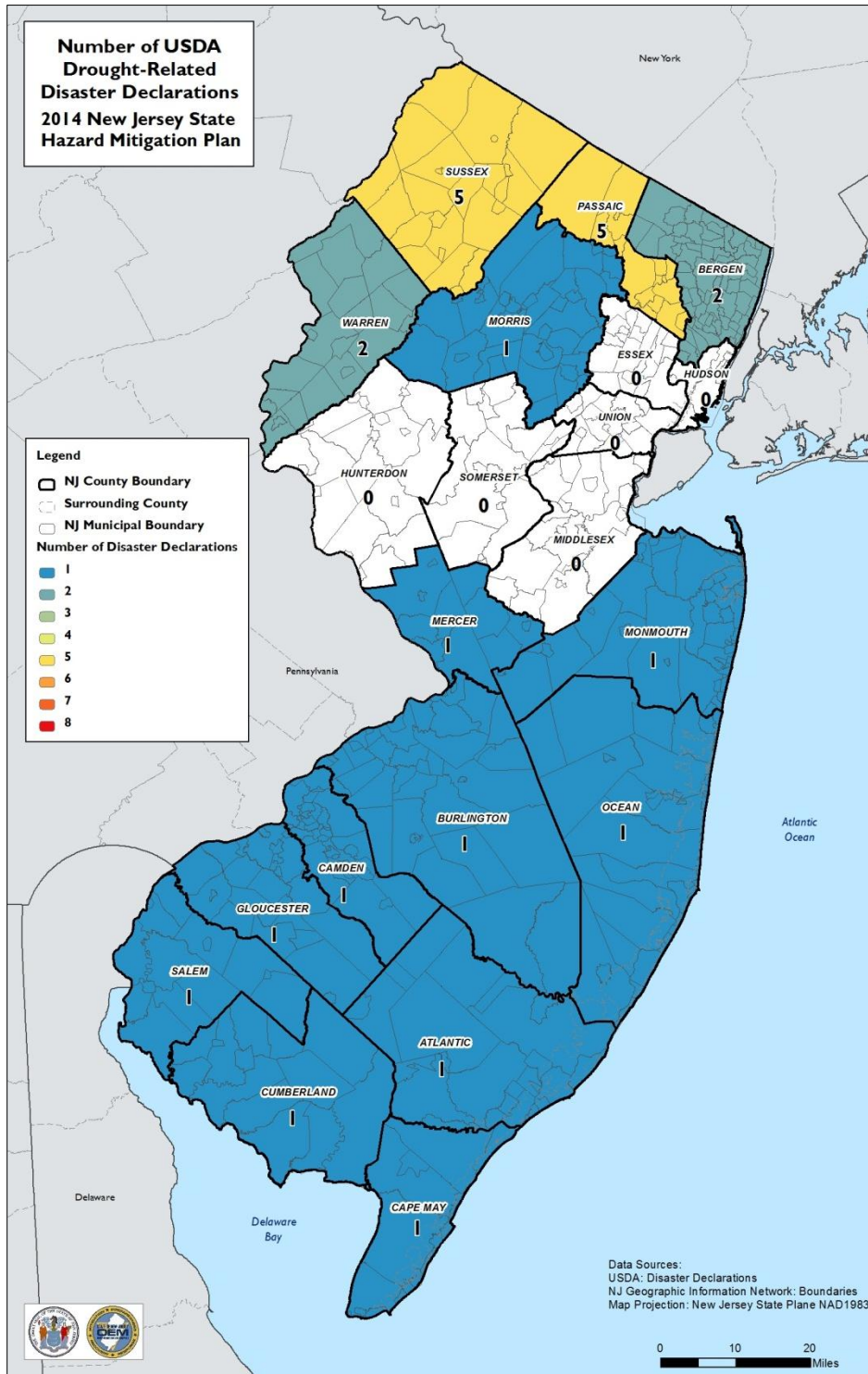
Source: USDA 2013

Notes:

S Secretarial National Disaster Determination  
 USDA U.S. Department of Agriculture



Figure 5.15-2. USDA Drought-Related Disaster Declarations (2011to 2013)



Source: USDA 2013



### **Probability of Future Occurrences**

Based on the nature of the growing process, the susceptibility of crops to hazards is unavoidable. The likelihood of future loss is great based on losses that have been recorded in the past.

### **Severity**

Drought and crop failure in the United States could spike world food prices and have serious implications for countries like Mexico, China, Central America, and India. These countries rely heavily on imports of these crops for human consumption as well as animal feed (The Center for Climate and Security 2012).

### **Warning Time**

Warning time for crop loss can be divided into weather-related warnings and pathogen/pest forecasts. Adverse weather such as high winds, hail, and other severe storms generally occur with a few minutes to hours of warning times. The possibility of these conditions are generally known a few days in advance, and general weather pattern trends can be predicted prior to a particular season, but the duration of the event is unknown.

Disease and pest conditions are an annual threat for the agricultural industry, and are predictable to a degree. Farmers generally know the types of recurring pests to plan for prior to each growing season. Additionally, disease outbreaks are planned for annually, with the exception of new disease introductions. Farmers have been successful in fending off many of the diseases presented annually, based on the known threat.

### **Secondary Hazards**

Crop losses within the State present secondary impacts on New Jersey's economy. As the State's third-largest industry, the economy relies on the stability within the agricultural industry to sustain jobs, tax bases, and programs. The catastrophic loss of any significant part of the farming market will present dire consequences to the State's economic stability.

Additionally, the loss of the agricultural industry as a whole would pose a significant threat to the availability of food to the residential populations. While New Jersey produce has been noted as being recognized globally, many communities rely heavily on locally grown produce for human consumption. This loss would lead to an elevated price in the cost of food and ultimately to a food shortage within the State.

### **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.

Large-scale crop failures may become more common as a result of climate change. More extreme weather events are predicted to occur, and these events may lead to more crop failures (University of Leeds 2010).

Agriculture within the State of New Jersey relies on the climate conditions found within the State to thrive. Changes in these conditions may have adverse impacts on the growing cycles and yields. The increase in temperature generally creates an advanced growing season forcing crops to mature at a faster rate. This rate does not allow for the same crop yield as found during normal conditions (U.S. Environmental Protection Agency [USEPA] 2012).

Changes in precipitation may have an adverse impact on crop development. Too much rain produces flooding, which may prevent the growth of certain crops and may introduce disease and fungi that impact plants. Additionally, lack of precipitation may also prevent proper growth.



### 5.15.2 Vulnerability Assessment

This section discusses New Jersey’s vulnerability, in a qualitative nature, to the crop 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 Emergency Management Accreditation Program (EMAP) standards. This section addresses assessing vulnerability and estimating potential losses by jurisdiction and to State facilities.

#### Assessing Vulnerability by Jurisdiction

New Jersey is one of the top 10 producers of blueberries, cranberries, peaches, tomatoes, peppers, snap beans, spinach, and squash in the country. These and other agricultural crops are processed and shipped annually throughout the northeastern United States and beyond; with many products reaching global suppliers (Keep it Green, 2013).

To examine vulnerability by jurisdiction (County), a spatial analysis was conducted and the acreage of cropland and the percentage of farmland that is used to grow crops by county was calculated. These statistics are listed in Table 5.15-3. All counties are vulnerable to the crop-failure hazard; however, eight counties have the greatest acreage of cropland in the State (greater than 25,000 acres in the county) and are thus the most vulnerable (in descending order): Salem, Hunterdon, Burlington, Cumberland, Warren, Gloucester, Sussex, and Monmouth Counties.

Table 5.15-3. Acreage of Cropland Per County

| County       | Number of Farms | Land in Farms(acres) | Cropland (acres) | Percent of Total |
|--------------|-----------------|----------------------|------------------|------------------|
| Atlantic     | 499             | 30,372               | 18,616           | 61.3%            |
| Bergen       | 89              | 1,177                | 561              | 47.7%            |
| Burlington   | 922             | 85,790               | 53,650           | 62.5%            |
| Camden       | 225             | 8,760                | 5,033            | 57.5%            |
| Cape May     | 201             | 7,976                | 4,338            | 54.4%            |
| Cumberland   | 615             | 69,489               | 52,330           | 75.3%            |
| Essex        | 13              | 184                  | 43               | 23.4%            |
| Gloucester   | 669             | 46,662               | 34,709           | 74.4%            |
| Hudson       | N/A             | N/A                  | N/A              | N/A              |
| Hunterdon    | 1,623           | 100,027              | 66,553           | 66.5%            |
| Mercer       | 311             | 21,730               | 15,358           | 70.7%            |
| Middlesex    | 236             | 18,717               | 12,899           | 68.9%            |
| Monmouth     | 932             | 44,130               | 28,008           | 63.5%            |
| Morris       | 422             | 17,028               | 9,280            | 54.5%            |
| Ocean        | 255             | 9,833                | 4,423            | 45.0%            |
| Passaic      | 103             | 1,981                | 419              | 21.2%            |
| Salem        | 756             | 96,530               | 78,055           | 80.9%            |
| Somerset     | 445             | 32,721               | 19,944           | 61.0%            |
| Sussex       | 1,060           | 65,242               | 32,949           | 50.5%            |
| Union        | 15              | 128                  | 65               | 50.8%            |
| Warren       | 933             | 74,975               | 51,464           | 68.6%            |
| <b>Total</b> | <b>10,327</b>   | <b>733,450</b>       | <b>488,697</b>   | <b>66.6%</b>     |

Source: USDA 2007  
Note: N/A = Not applicable.



### Assessing Vulnerability to State Facilities

The New Jersey Department of Corrections Agri-Industries operates six dairy and crop farms, as well as two food and one milk processing plant statewide. These operations supply the Department of Corrections, Human Services, and Military and Veteran’s Affairs, as well as the Juvenile Justice Commission, Distribution Center, and Mercer ARC with upwards of 200 meat, produce, and dairy items. These State facilities are considered the most vulnerable to this hazard.

### Estimating Potential Losses by Jurisdiction

Food and agricultural production is New Jersey’s third largest industry. In 2011, the State generated \$1.12 billion in agricultural sales (Jersey Fresh 2013). Ornamental horticulture and the nursery industry is New Jersey’s leading agriculture sector, closely followed by the fruit and vegetable industries. Nursery products include grass sod and ornamental shrubs (NETSTATE 2013). Table 5.15-4 shows the leading agriculture sectors in New Jersey, along with their total sales for 2011. These total sales represent the potential total loss to the agricultural community. Figure 5.15-3 illustrates the top agricultural products sold per County.

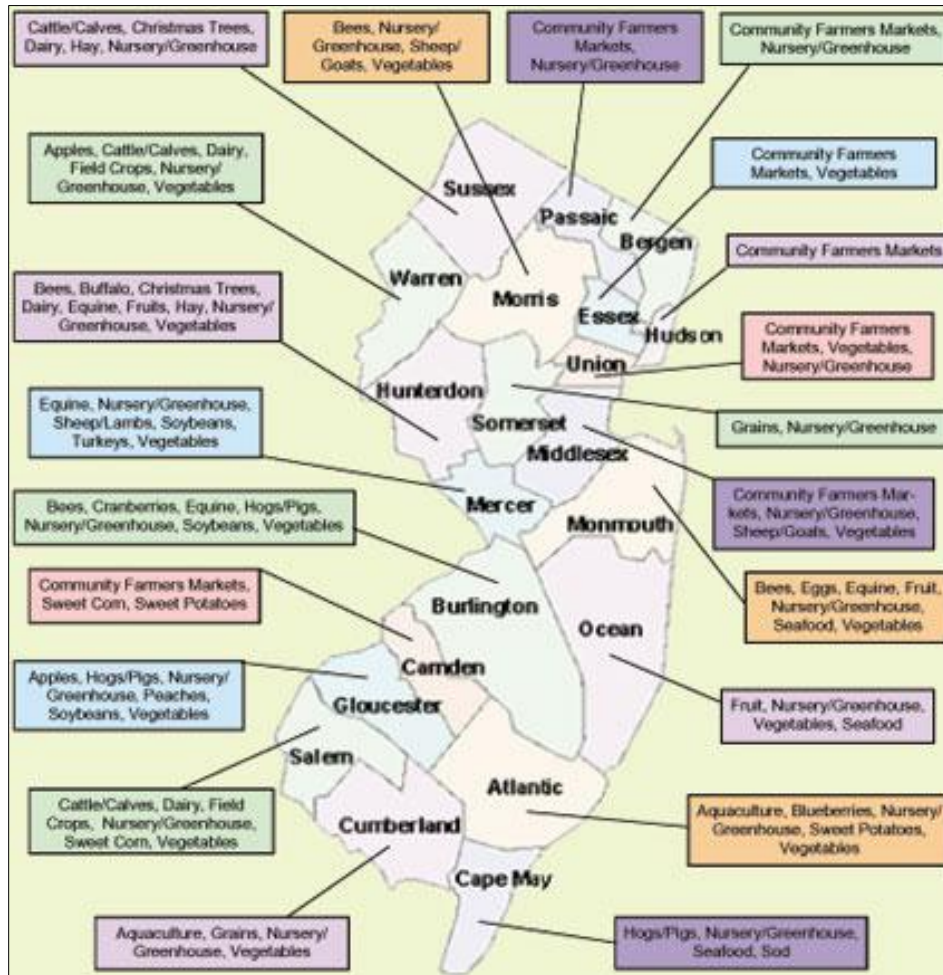
**Table 5.15-4. Leading New Jersey Agriculture Sectors**

| Agriculture Sector     | Total Sales (2011) |
|------------------------|--------------------|
| Nursery/Greenhouse/Sod | \$453.6 million    |
| Fruits and Vegetables  | \$428.8 million    |
| Field Crops            | \$112.2 million    |
| Equine                 | \$46 million       |
| Poultry and Eggs       | \$30.7 million     |
| Dairy                  | \$27.5 million     |

Source: Jersey Fresh 2013



Figure 5.15-3. Top Agricultural Products by County



Source: NJDA 2013

### Estimating Potential Losses to State Facilities

As stated above, the New Jersey Department of Corrections Agri-Industries operates dairy and crop farms, along with food and milk processing plants. Annual revenues total approximately \$11.5 million. These facilities would be heavily impacted by crop failure.

### Environmental Impacts

A crop failure could have a potentially severe impact on the environment if it were due to contamination by a foreign agent or a biological organism. In this event, large swathes of agricultural crop land may have to be abandoned or water sheds may need to be monitored for contamination (NJ HMP 2011). Crop failure can also be the result of drought and severe weather events, such as hurricanes, Nor'Easters, hailstorms, etc. See Sections 5.4 (Drought), Section 5.6 (Flood), Section 5.8 (Hurricane/Tropical Storms), Section 5.9 (Nor'Easter), and Section 5.10 (Severe Weather) for environmental impacts regarding these hazards.