



5.15 CROP FAILURE

SECTION 5.15 CROP FAILURE

5.15.1 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).

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 9,000 farms statewide producing over 100 species of fruits and vegetables. Additionally, out of all states, New Jersey ranks top in production and sale of nursery, greenhouse, floriculture and sod commodities as well as fruit, tree nuts and berry commodities (USDA, 2012). Looking at specific crops, 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. Apples, peaches, and strawberries are also important crops. Leading field crops are soybeans, corn, and wheat (NETSTATE, 2013). These agricultural products are processed and shipped annually throughout the northeast and beyond, with many products reaching global suppliers (Keep it Green, 2013).

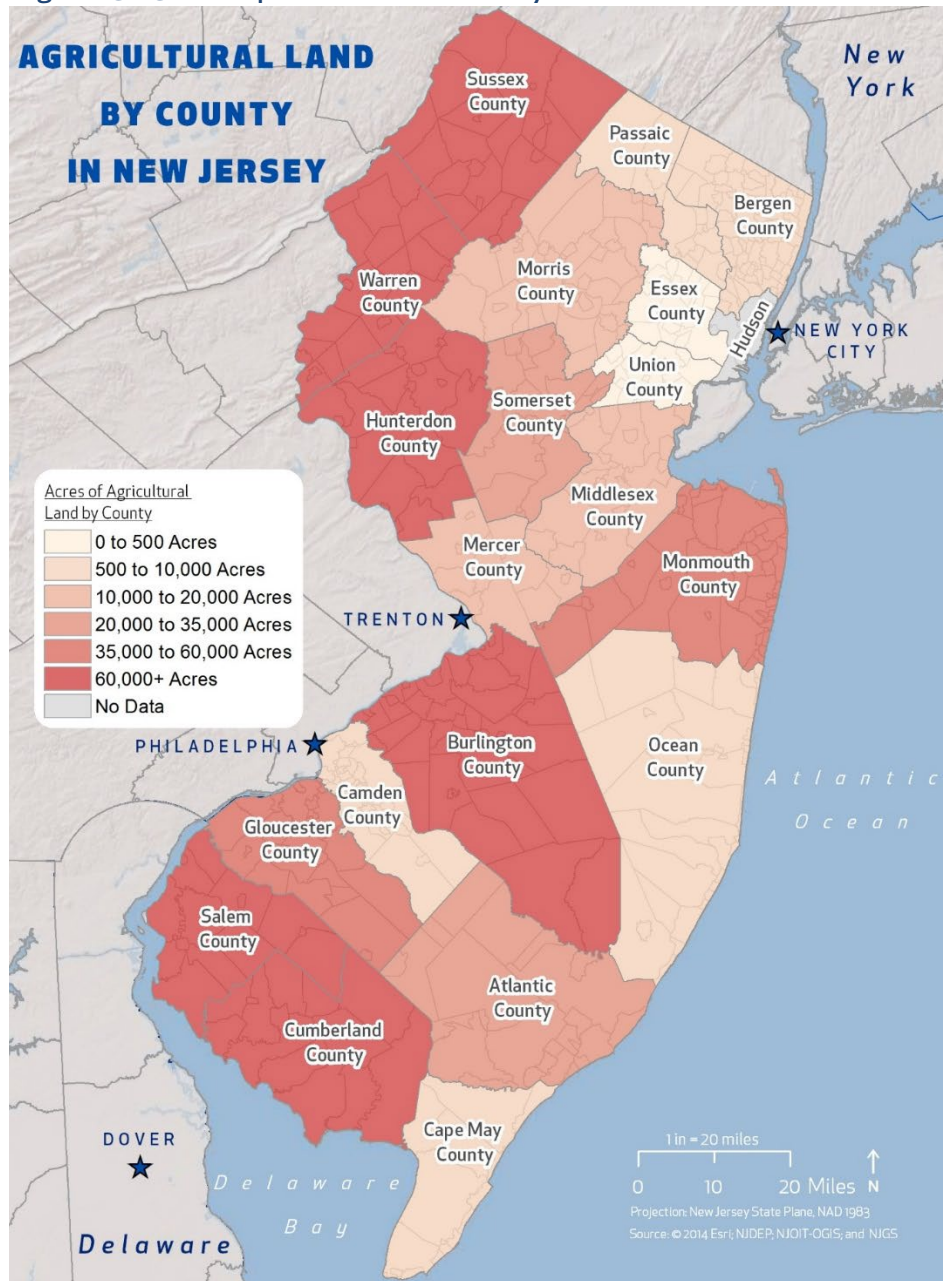
The agricultural industry within New Jersey is vulnerable to a variety of different hazards. They include but are not limited to flood, drought, wind, fire, and other severe weather events. In addition, threats such as disease outbreaks (whether natural or intentional) and pest infestation endanger the 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.

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 (USDA).

5.15.2 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.

Figure 5.15-1 Cropland in New Jersey



Source: USDA Agricultural Census 2007

Location of Invasive Pests

Invasive pest species have had a significant impact on agriculture across New Jersey. Invasive pests to New Jersey include the Hemlock Woolly Adelgid, Mexican Bean Beetles, Scale, Tarnished Plant Bugs, Mile-a-Minute Weed, Purple Loosestrife, the Gypsy Moth and the Emerald Ash Borer.

Hemlock Woolly Adelgid is a small sap sucking insect that is originally from Asia. Many hemlock trees in New Jersey have been killed by the Hemlock Woolly Adelgid.

Mexican Bean Beetles eat soy bean plants, which is a crop grown in New Jersey. Since 1980 there has been a parasitic wasp released into New Jersey soy bean fields to control this pest.

Scale insects suck the sap from stems and leaves, killing the trees they feed on. In New Jersey many landscapes are prone to impacts of Scale.

Tarnished Plant Bugs feed on many plants including forage crops, small grains, stone fruit, strawberries and vegetables. Their feeding can damage fruit and reduce crop yields.

Mile-a-Minute Weed are the biggest threat to stream bank and roadside plants. However, they can also be a problem in agricultural areas including Christmas tree farms and reforestation seedling plantations.

Purple Loosestrife threatens the New Jersey wetlands by displacing plants essential to wildlife for food and cover. Beetles to control the pest have been released in 16 of New Jersey's 21 counties.

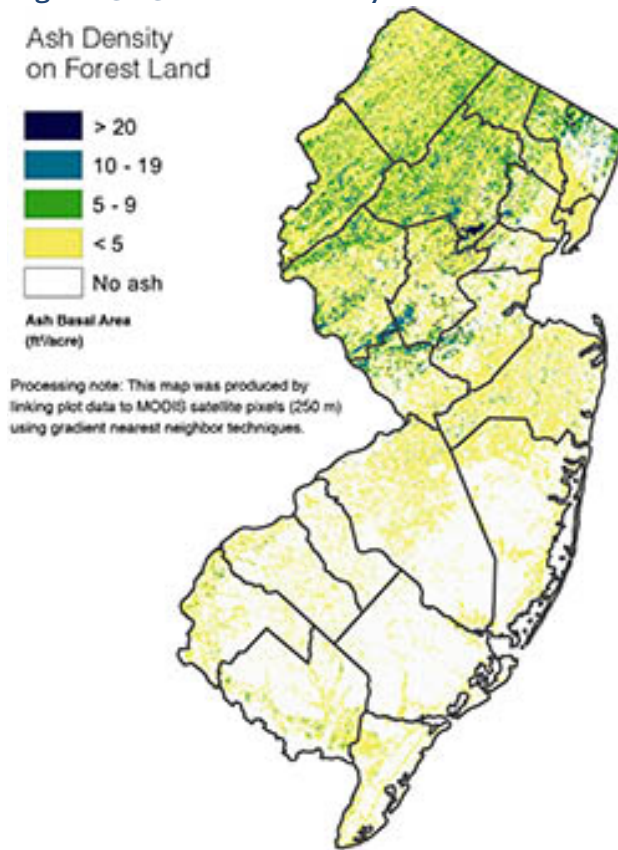
The Spotted Lanternfly, which is native to China, India, Vietnam and East Asia, feeds on plants using their sucking and piercing mouthparts to extract plant sap. New Jersey Department of Agriculture and United States Department of Agriculture personnel have confirmed the sighting of the spotted lanternfly in Hunterdon County in August 2018. Hunterdon joins Mercer and Warren Counties where the Spotted Lanternfly has been confirmed in New Jersey.

The Gypsy Moth and the Emerald Ash Borer are two invasive pest species that have caused the most significant losses to New Jersey agriculture. The gypsy moth is the most destructive forest insect pest to infest New Jersey's forests. Repeated defoliation by the gypsy moth represents a serious threat to New Jersey woodland and shade tree resources. The Emerald Ash Borer is a major threat to new Jersey Trees as well, and many counties have been impacted by infestations (New Jersey Department of Agriculture, 2018).

The Emerald Ash Borer was discovered in New Jersey in May 2014 in Somerset County. Through February 28, 2018, emerald ash borer has been found in New Jersey in Bergen, Burlington, Camden, Essex, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Somerset, Sussex and Warren counties (NJDA, 2018).

More locations are prone to impacts of EAB infestations. Approximately 9% of the State's total forested area, or 24.7 million ash trees, are susceptible to an EAB infestation. Most of the ash is concentrated in the north-western part of the state. In addition, ash has been commonly planted as street trees and on private properties in many cities and towns. Trees infested with EAB on public and private lands in urban areas will pose the greatest danger where falling branches have the potential to hit people, structures, or cars. Figure 5.15-2 illustrates the location of ash density on forest land that could be prone to infestation and Figure 5.15-3 shows where EAB has been detected in New Jersey (NJDA, 2018).

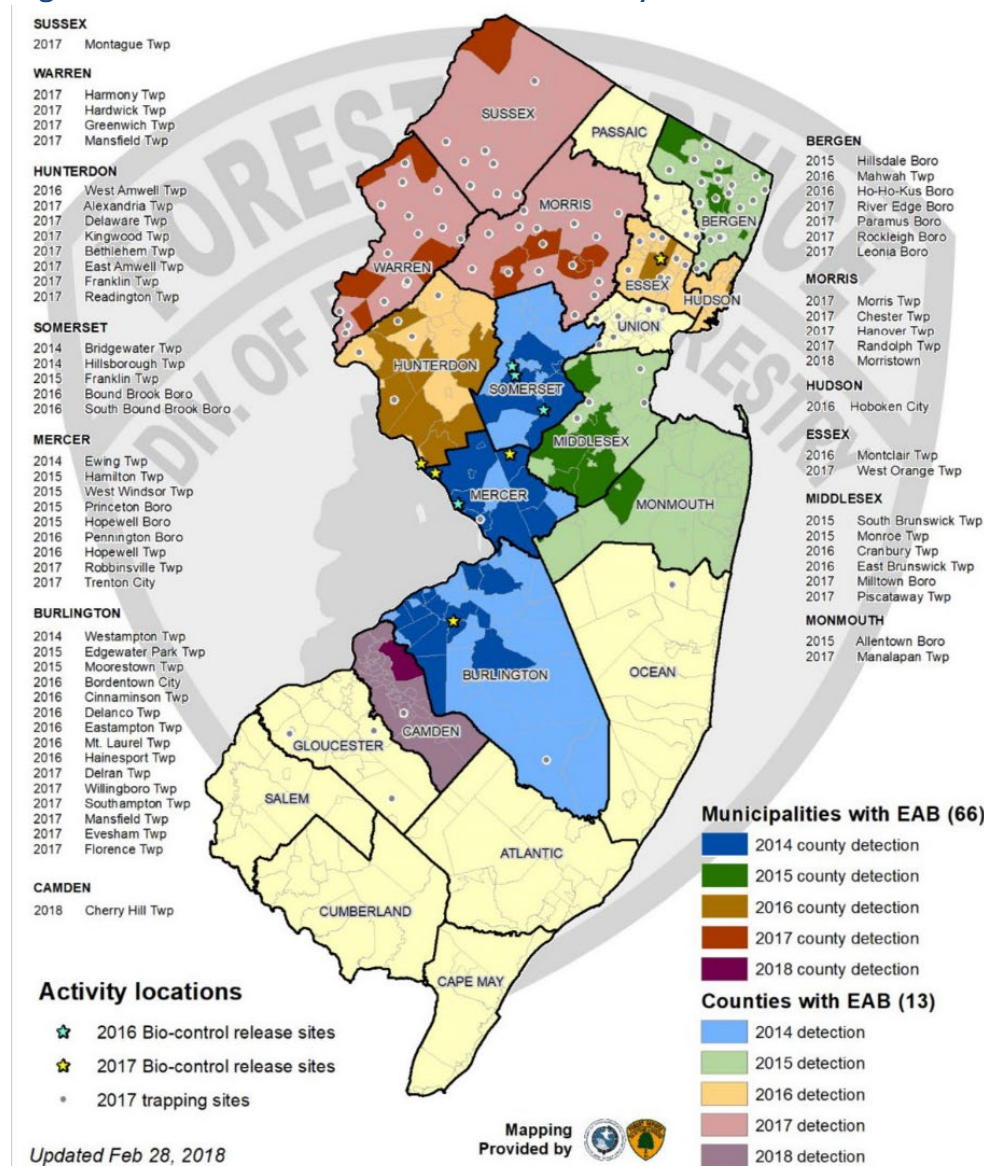
Figure 5.15-2 Ash Density on Forest Land in New Jersey



Source: USDA Forest Service, New Jersey's Forest, 2008

Similar locations in New Jersey are also prone to infestation of the gypsy moth. The New Jersey Department of Agriculture promotes an integrated pest management approach, which encourages natural controls to reduce gypsy moth feeding and subsequent tree loss. Each year this program maps gypsy moth defoliation, gypsy moth spray blocks and more, indicating locations threatened by the gypsy moth. This [link](#) provides the 2018 ArcGIS Online version of this map (NJDA, 2018).

Figure 5.15-3 EAB Detections in New Jersey

Source: www.emeraldasherborer.nj.gov

5.15.3 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).

5.15.4 PREVIOUS OCCURRENCES AND LOSSES

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 5.15-1 presents USDA-declared drought and excessive heat events impacting the State. Figure 5.15-4 displays these disasters by County.

Table 5.15-1 USDA Crop Failure Related Disaster Declarations (2011 to 2017)

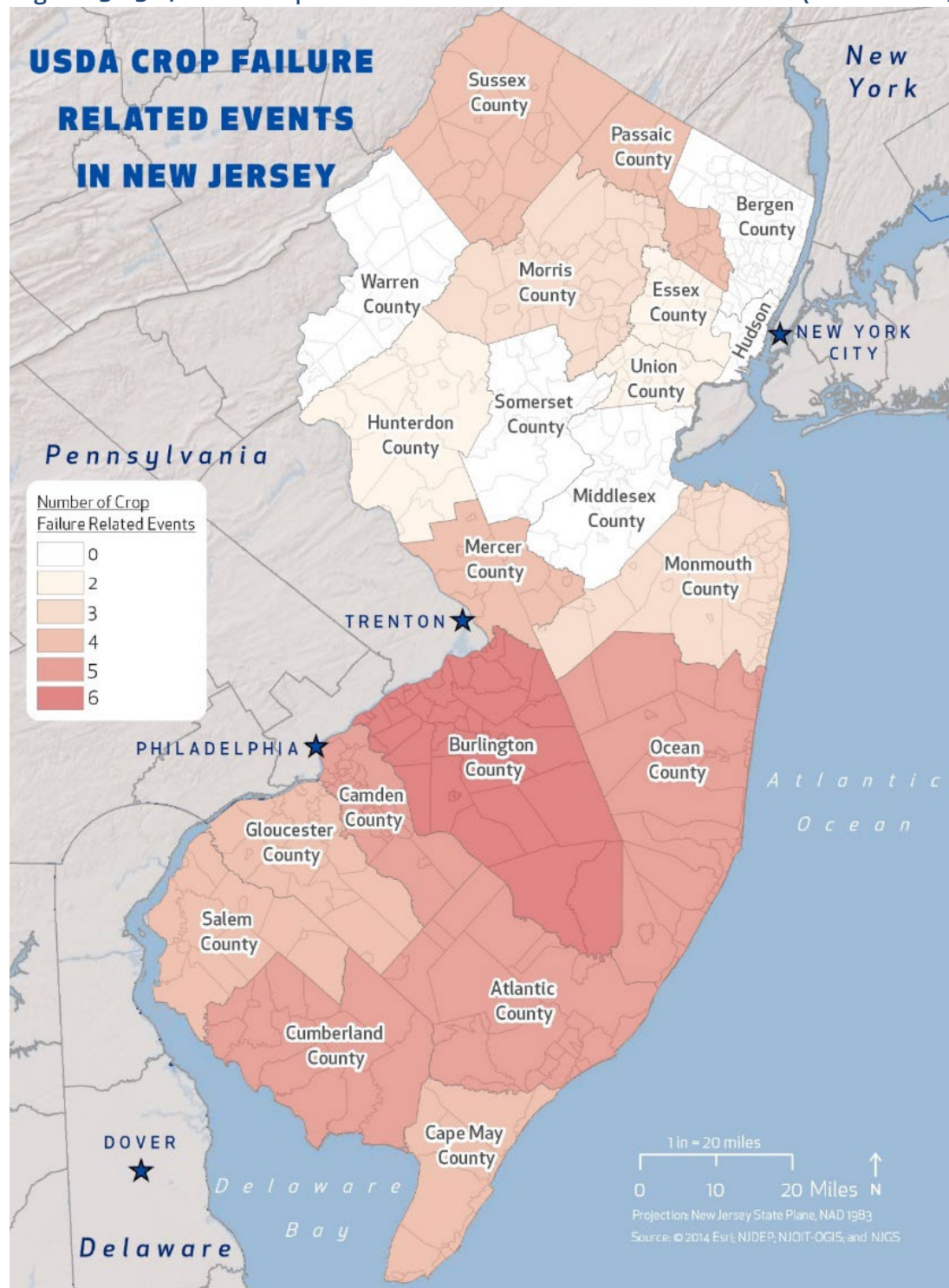
Incident Period	Event Type	USDA Designation Number	Counties Included in Disaster
August 14-September 15, 2011	Hurricane, Tropical Storm Lee, Excessive Rain, and Flooding	S3219	Warren
March 1, 2012 – Continuing	Frosts and Freezes	S3249	Bergen, Passaic, Sussex
March 26-April 8, 2012	Frosts, Freezes, High Winds, and Hail	S3251	Bergen, Passaic, Sussex
June 2012 – Continuing	Drought, Excessive Heat	S3427	Passaic, Sussex
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
May 1 – September 24, 2013	Excessive Rain and Related Flooding, High Winds, and Hail	S3593	Passaic, Sussex
May 22, 2014	Excessive Rain and Related Flooding, High Winds, and Hail	S3712	Atlantic, Camden, Cape May, Cumberland, Gloucester, Salem
August 15 2014	Drought	S3759	Passaic, Sussex
April 1, 2015 to September 29, 2015	Drought, Heat, Excessive Heat, High Temperature	S3930	Atlantic, Burlington, Camden, Essex, Cumberland, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union and Warren
May 28 - July 15, 2015	Excessive rain, flash flooding, high winds, and lightning	S3931	Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Ocean, Salem
July 16, 2015 to September 29, 2015	Drought, Heat, Excessive Heat, High Temperature	S3932	Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Ocean, Salem
April 1, 2016 to September 19, 2016	Combined effects of freeze, excessive heat, and drought	S4071	Atlantic, Burlington, Camden, Cape May, Cumberland, Essex, Gloucester, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Salem, Somerset, Union,
November 15, 2016	Drought	S4114	Sussex
May 1, 2016 to December 10, 2016	Drought, Heat, Excessive Heat, High Temperature, Frost	S4165	Hunterdon, Mercer, Warren, Burlington

Source: USDA, 2017

FEMA Disaster Declarations

Between 1954 and 2017, FEMA did not declare any crop failure-related disasters (DR) or emergencies (EM) in the State of New Jersey (FEMA 2017)

Figure 5.15-4 USDA Crop Failure Related Disaster Declarations (2011 to 2017)



Source: USDA, 2018

5.15.5 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.

5.15.5.1 POTENTIAL EFFECTS OF CLIMATE CHANGE

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, 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.

Invasive pests have had a significant influence on agriculture in New Jersey. Since they are not native to the ecosystem they invade, they may not have any natural predators or controls which allows them to aggressively breed and spread ([National Wildlife Federation](#), 2018). As climate changes, more species will be able to migrate to and live in New Jersey. While the state is home to many plants and pests already, including the gypsy moth and the emerald ash borer, other species will be able to migrate to New Jersey Ecosystems since the climate may be able to accommodate their needs.

5.15.6 IMPACT ANALYSIS

5.15.6.1 SEVERITY AND IMPACT OF WARNING TIME

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

In New Jersey, depending on the severity of an event, the Farm Service Agency has helped the agricultural industry recover from the effects of a disaster. From drought to flood, freeze and tornadoes - FSA was financially responsive to New Jersey producers following natural disasters. Between 2012 and 2016 FSA has provided the following financial assistance to New Jersey Farms.

2012 Disaster Assistance: \$2,488,111

- \$1,332,928 - Non-Insured Crop Disaster Assistance Program (NAP) provides financial assistance to producers of non-insurable crops when low yields, loss of inventory, or prevented planting occurs due to natural disasters.
- \$977,080 - Supplemental Revenue Assistance Payment (SURE) provides benefits for 2008 through 2011 crop year farm revenue losses due to natural disasters. It is the 2008 Farm Bill's successor to prior ad hoc crop disaster programs.
- \$58,519 - Livestock Indemnity Program (LIP) provides partial reimbursements to eligible livestock owners for livestock losses suffered due to a natural disaster or other emergency.
- \$1,554 - Emergency Livestock Assistance Program (ELAP) provides emergency assistance to eligible producers that have livestock losses due to disease, adverse weather or other conditions, including losses due to blizzards and wildfires.
- \$118,030 - Tree Assistance Program (TAP) provides financial assistance to qualifying orchardists and nursery tree growers to replant or rehabilitate eligible trees, bushes and vines damaged by natural disasters

2013 Disaster Assistance: \$1,300,724

- \$482,658 - Non-Insured Crop Disaster Assistance Program (NAP) provides financial assistance to producers of non-insurable crops when low yields, loss of inventory, or prevented planting occurs due to natural disasters.
- \$816,350 - Supplemental Revenue Assistance Payment (SURE) provides benefits for 2008 through 2011 crop year farm revenue losses due to natural disasters. It is the 2008 Farm Bill's successor to prior ad hoc crop disaster programs.
- \$1,716 - Tree Assistance Program for Orchardists and Nursery Tree Growers (TAP) provides financial assistance to replant or rehabilitate eligible trees, bushes and vines damaged by natural disasters.

2014 Disaster Assistance: \$888,165

- \$861,503 - Non-Insured Crop Disaster Assistance Program (NAP) provides financial assistance to producers of non-insurable crops when low yields, loss of inventory, or prevented planting occurs due to natural disasters.
- \$5,640 - Supplemental Revenue Assistance Payment (SURE) provides benefits for 2008 through 2011 crop year farm revenue losses due to natural disasters. It is the 2008 Farm Bill's successor to prior ad hoc crop disaster programs.
- \$16,784 - Tree Assistance Program for Orchardists and Nursery Tree Growers (TAP) provides financial assistance to replant or rehabilitate eligible trees, bushes and vines damaged by natural disasters
- \$4,238 - Livestock Indemnity Program (LIP) provides partial reimbursements to eligible livestock owners for livestock losses suffered due to a natural disaster or other emergency.

2015 Disaster Assistance: \$679.0 thousand

- \$336,634 - Non-Insured Crop Disaster Assistance Program (NAP) provides financial assistance to producers of non-insurable crops when low yields, loss of inventory, or prevented planting occurs due to natural disasters.
- \$176,594 - Tree Assistance Program for Orchardists and Nursery Tree Growers (TAP) provides financial assistance to replant or rehabilitate eligible trees, bushes and vines damaged by natural disasters.
- \$1,508 - Livestock Indemnity Program (LIP) provides partial reimbursements to eligible livestock owners for livestock losses suffered due to a natural disaster or other emergency.
- \$164,301 - Emergency Assistance for Livestock, Honeybees and Farm-Raised Fish Program (ELAP) provides emergency assistance to eligible producers of livestock, honeybees and farm-raised fish that have losses due to disease, adverse weather or other conditions.

2016 Disaster Assistance: \$1.2 million

- \$995,155 - Non-Insured Crop Disaster Assistance Program (NAP) provides financial assistance to producers of non-insurable crops when low yields, loss of inventory, or prevented planting occurs due to natural disasters.
- \$125,133 - Tree Assistance Program for Orchardists and Nursery Tree Growers (TAP) provides financial assistance to replant or rehabilitate eligible trees, bushes and vines damaged by natural disasters.
- \$6,188 - Livestock Indemnity Program (LIP) provides partial reimbursements to eligible livestock owners for livestock losses suffered due to a natural disaster or other emergency.
- \$39,387 - Emergency Assistance for Livestock, Honeybees and Farm-Raised Fish Program (ELAP) provides emergency assistance to eligible producers of livestock, honeybees and farm-raised fish that have losses due to disease, adverse weather or other conditions ([USDA Farm Service Agency](#), 2018).

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.

5.15.6.2 SECONDARY HAZARDS

Crop losses within the State present secondary impacts on New Jersey's economy. The State's 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 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.

5.15.6.3 ENVIRONMENTAL IMPACTS

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.

5.15.7 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.

5.15.7.1 ASSESSING VULNERABILITY BY JURISDICTION

Acreage of cropland and the percentage of farmland that is used to grow crops by county was calculated and can be referenced in Section 4: State Profile, Table 4-8. All counties are vulnerable to the crop-failure hazard. The most vulnerable Counties to crop failure are the ones that have the most cropland. Counties that have over 35,000 acres of cropland are: Sussex, Warren, Hunterdon, Monmouth, Burlington, Gloucester, Salem and Cumberland.

5.15.7.2 ESTIMATING POTENTIAL LOSSES BY JURISDICTION

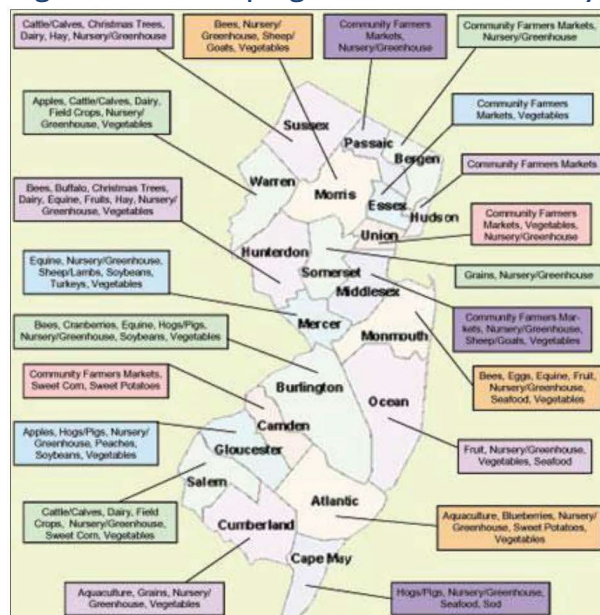
Food and agricultural production is New Jersey's third largest industry. In 2011, the State generated \$1.12 billion in agricultural sales (Jersey Fresh, 2013). Ornamental horticulture and the nursery industry is New Jersey's leading agriculture sector, closely followed by the fruit and vegetable industries. Nursery products include grass sod and ornamental shrubs (NETSTATE 2013). Table 5.15-2 shows the leading agriculture sectors in New Jersey, along with their total sales for 2012. These total sales represent the potential total loss to the agricultural community. Figure 5.15-5 illustrates the top agricultural products sold per County.

Table 5.15-2 Leading New Jersey Agriculture Sectors

Agriculture Sector	Total Sales (2012)
Nursery, Greenhouse, Floriculture and Sod	\$ 405,247,000
Vegetables, Melons, Potatoes and Sweet Potatoes	\$ 191,704,000
Fruit, Tree Nuts and Berries	\$ 145,351,000
Grains, Oilseeds, Dry Beans and Dry Peas	\$ 126,967,000
Poultry and Eggs	\$ 40,081

Source: USDA, 2012

Figure 5.15-5 Top Agricultural Products by County



Source: NJDA 2013

5.15.7.3 ASSESSING VULNERABILITY TO STATE FACILITIES

The New Jersey Department of Corrections Agri-Industries operates six dairy and crop farms, as well as two foods 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 meats, produce, and dairy items. These State facilities are considered the most vulnerable to this hazard.

5.15.7.4 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.