**Lincoln Trail Region Hazards**

The geographic location of the Lincoln Trail Region makes it vulnerable to variety of natural hazard events that have the potential to threaten life and property. The following list of natural hazard events is inclusive; not all of these hazards impact this region, but all are profiled in this chapter.

- **Flooding**
- **Tornados**
- **Severe Thunderstorms**
- **Severe Winter Storms**
- **Lightning**
- **Hail**
- **Landslides**
- **Karst/Sinkhole Topography**
- **Subsidence**
- **Drought**
- **Wildfire**
- **Dam Safety**
- **Earthquakes**
- **Hurricanes**
- **Tsunamis**

Some of these hazard events are interrelated; severe thunderstorms can cause flooding and include lightning, they can also produce hail, high winds and tornados. This chapter provides the characteristics and potential impacts associated with each of these events. Those hazards that affect the Lincoln Trail Region are identified along with their associated potential risks. Historical data is used to determine which events the region is vulnerable to, and the level of associated potential risk. The degree of risk is dependent upon the reliability and accuracy of the data collected.

## 3.3 Risk Assessment

All sections of the risk assessment were developed utilizing the best available data in the Lincoln Trail Region. Lincoln Trail staff used GIS resources to assess the physical impact that specific natural hazard events have on the region. When GIS information was not available or applicable, research data and local historic records, such as those obtained from regional emergency management offices, the media, insurance records, and the knowledge of local officials and residents, were used. Research sources include, but are not limited to the following:

- The National Oceanic and Atmospheric Administration (NOAA)
- The Kentucky Energy and Environment Cabinet
- US Geological Survey (USGS)
- National Severe Storms Laboratory

- FEMA
- Kentucky Office of Emergency Management
- Kentucky Geological Survey
- National Center for Environmental Information (NCEI)

### Table 3.3.1 - Hazard Maps by Jurisdiction

| *JURISDICTION* | *MAP TYPE* | | | | | |
|---|---|---|---|---|---|---|
| | *FLOODING* | *TORNADO* | *LANDSLIDE* | *KARST* | *EARTHQUAKE* | *RISK* |
| **BRECKINRIDGE** | Y | Y | Y | Y | Y | Y |
| CLOVERPORT | Y | Y | Y | Y | NA | Y |
| HARDINSBURG | Y | Y | Y | Y | NA | Y |
| IRVINGTON | Y | NA | NA | Y | NA | Y |
| **GRAYSON** | Y | Y | Y | Y | Y | Y |
| CANEYVILLE | Y | Y | Y | NA | NA | Y |
| CLARKSON | Y | Y | NA | Y | NA | Y |
| LEITCHFIELD | Y | Y | Y | Y | NA | Y |
| **HARDIN** | Y | Y | Y | Y | Y | Y |
| ELIZABETHTOWN | Y | Y | Y | Y | NA | Y |
| RADCLIFF | Y | Y | Y | Y | NA | Y |
| SONORA | Y | NA | NA | Y | NA | Y |
| UPTON | Y | NA | NA | Y | NA | Y |
| VINE GROVE | Y | Y | Y | Y | NA | Y |
| WEST POINT | Y | NA | Y | Y | NA | Y |
| **LARUE** | Y | Y | Y | Y | Y | Y |
| HODGENVILLE | Y | Y | Y | Y | NA | Y |
| **MARION** | Y | Y | Y | Y | Y | Y |
| BRADFORDSVILLE | Y | Y | Y | NA | NA | Y |
| LEBANON | Y | Y | Y | Y | NA | Y |
| LORETTO | Y | NA | Y | Y | NA | Y |
| RAYWICK | Y | NA | Y | NA | NA | Y |
| **MEADE** | Y | Y | Y | Y | Y | Y |
| BRANDENBURG | Y | Y | Y | Y | NA | Y |
| EKRON | Y | NA | NA | Y | NA | Y |
| MULDRAUGH | NA | NA | NA | Y | NA | Y |
| **NELSON** | Y | Y | Y | Y | Y | Y |
| BARDSTOWN | Y | Y | Y | Y | NA | Y |
| BLOOMFIELD | Y | NA | Y | NA | NA | Y |
| FAIRFIELD | Y | NA | NA | NA | NA | Y |
| NEW HAVEN | Y | Y | Y | NA | NA | Y |
| **WASHINGTON** | Y | Y | Y | Y | Y | Y |
| MACKVILLE | Y | NA | Y | NA | NA | Y |
| SPRINGFIELD | Y | Y | Y | NA | NA | Y |
| WILLISBURG | Y | Y | Y | NA | NA | Y |

Y = Map Available
NA = Not Applicable

### 3.3.1 Identifying Hazards

The Lincoln Trail Region encompasses an area of 3,342 square miles and is vulnerable to several natural hazard events. The events outlined in Table 3.3.1.1 have a 100% chance of occurring in any given year within this region, and cost the area an average of $134,000 per event. Due to the size of the region, events may be more prevalent in one portion of the area than in others. This phenomenon makes it imperative to include as many research sources as possible, and to look at mitigation strategies appropriate for every jurisdiction within the region. The events listed below were identified using information from local emergency management offices and review of local past disasters in addition to those listed.

**Table 3.3.1.1 Lincoln Trail Region Significant Hazard Events**

| Hazard | How Identified | Reason Identified |
|---|---|---|
| Thunderstorm Wind<br>Total Cost-$74,457,996.00<br>Number of Events-1,679<br>48-60-years | Media Coverage<br>Insurance Records<br>SHELDUS<br>National Center for Environmental Information (NCEI) | Historic Regional Significance (Affects all Jurisdictions) |
| Floods<br>Total Cost-$132,991,112.0<br>Number of Events-423<br>48-60-years | Public Input<br>Insurance Records<br>FIRM/DFIRM Maps<br>SHELDUS<br>National Center for Environmental Information (NCEI) | Historic Regional Significance (Affects all Jurisdictions)<br>Presence of Waterways<br>Presence of Flood Prone Areas |
| Hail<br>Total Cost-$130,364,632.0<br>Number of Events-563<br>48-60-years | Media Coverage<br>Insurance Records<br>SHELDUS<br>National Center for Environmental Information (NCEI) | Historic Regional Significance (Affects all Jurisdictions) |
| Lightning<br>Total Cost-$3,765,207.00<br>Number of Events-271<br>48-60-years | Media Coverage<br>Insurance Records<br>SHELDUS<br>National Center for Environmental Information (NCEI) | Historic Regional Significance (Affects all Jurisdictions |
| Snow & Ice<br>Total Cost-$16,342,589.00<br>Number of Events-320<br>48-60-years | Community Input<br>Media Coverage<br>National Center for Environmental Information (NCEI) | Historic Regional Significance (Affects all Jurisdictions |

| | | |
|---|---|---|
| Tornado<br>Total Cost-$93,649,450.00<br>Number of Events-113<br>48-60-years | Public Input<br>Insurance Records<br>FEMA Data<br>Wind Zone Maps<br>SHELDUS<br>National Center for Environmental Information (NCEI) | High Wind Risk Area<br>Historic Regional Significance (Affects all Jurisdictions |
| Earthquake<br>Total Cost-NA<br>Number of Events-6<br>235-years | National Center for Environmental Information (NCEI)<br>Media Coverage | Media Coverage<br>NEIC |
| Total Number of Events<br>3,375 | | |

Table 3.3.1.2 profiles natural hazards that can affect this region, but which historically, have not posed a significant risk to the area. Most of these hazards do not pose a significant threat to this region, but cannot be overlooked. Most have either no reports of past occurrence and/or an adverse impact on local communities.

**Table 3.3.1.2 Lincoln Trail Region Hazard Events With Negligible Risk**

| Hazard | How Identified | Reason Identified |
|---|---|---|
| Landslides<br>(road slides) | Local Input<br>Hazard Areas Identified by KY Geological Survey | Topographic Maps Show Significant Potential Regional Impact |
| Karst/Sinkhole & Subsidence Topography | USGS & KGS<br>Topographic Maps<br>Local Input | Topographic Maps Indicate High Risk of Development |
| Drought & Heat | KY Mesonet Data<br>Local Input<br>National Center for Environmental Information (NCEI) | Rural Area With Potential for Economic Impact |
| Wildfires | Public Input<br>National Center for Environmental Information (NCEI) | Area Prone to Grass/Brush Fires |
| Earthquakes | Historic Data<br>Media Coverage<br>USGS & KGS | Peak Ground Acceleration Maps (PGA Maps) |
| Dam Safety | KY Energy & Environment Cabinet | No Significant Historic Data |
| Tsunamis | Historic Data | No Historic Data |

| | | |
|---|---|---|
| Hurricanes | Media Coverage<br>National Center for Environmental Information (NCEI) | Little Historic Data |

### 3.3.2 Profiling Hazard Events

This section provides a profile of each hazard identified in the Lincoln Trail Region. This part of the Lincoln Trail Regional Hazard Mitigation Plan provides the following information based on the best data available:

1. A description of each hazard identified within the planning area and the impact that each hazard has on the area.
2. The historical background of each identified hazard in the planning area and the probability of it occurring again.
3. Maps indicating the locations and areas within the region impacted by Hazard events.

Lincoln Trail staff used GIS resources to assess the physical and economic impact of certain natural disasters on the region. In situations where GIS data was not available, state websites and local records were used to give plan reviewers a more comprehensive understanding of past hazard events. Local records included county emergency management records, media, local officials, community members and the historical knowledge of subcommittee members. Credible websites accessed and cited throughout the plan include the Kentucky State Climatology Center, the Spatial Hazard Events and Losses Database for the United States (SHELDUS), the National Center for Environmental Information (NCEI), FEMA's Hazard Mapping website, the Kentucky Geological Survey (KGS), the United States Geologic Survey (USGS), and Kentucky MESONET centers. In addition, leaders from regional educational institutions, business, emergency management, and first response agencies were contacted and involved with the planning process per 44 CFR §201.6(b)(2).

As subcommittees reviewed the best available data gathered, several gaps were identified. In order to project a more accurate and comprehensive record of past hazard events, researching public input and local records played a significant role in augmenting the data. The consensus of subcommittee reviewers is that some local data is not being forwarded to all interested parties. In particular, property damage estimates are not accurately calculated. To bridge this void, local and regional insurance estimates were gathered from providers in the region and incorporated into the plan.

One goal of the Lincoln Trail Regional Mitigation Committee, is to capture new data with every update, that will be useful in preparing future proposals and in developing local environmental and economic plans. All information in this regional plan is dated, and

should be easily discernable from the original data. The plan should guide community development, improve regional resiliency and preparedness, and enhance quality of life throughout the Lincoln Trail Region.

**Review:** The Lincoln Trail Region has a documented history of several different types of Hazards with various impacts. The impact of these hazards is measured by both the frequency of occurrence and by the cost of the event; both economic and social. This section is focused on the types and frequency of hazards in the Lincoln Trail Region. The costs of events will be addressed in section 3.3.4, and will focus on the potential losses that may be incurred with a future event. The following tables provide an analytical review of documented hazard events in the Lincoln Trail Region. For planning purposes, the historic frequencies will be used in subsequent vulnerability analysis. The tables are presented for each county including incorporated and unincorporated areas and for the region as a whole.

### Table 3.3.2.1 - Summary of Hazard Events and Cost by County

BRECKINRIDGE

| Hazard | Number of Events in Historic Record | Number of Years in Historic Record | Number of Events in Past 10 Years | Number of Events in Past 20 Years | Number of Events in Past 50 Years | Historic Recurrence Interval (years) | Historic Frequency % chance/year | Past 10 Year Record Frequency Per Year | Past 20 Year Record Frequency Per Year | Past 50 Year Record Frequency Per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | 206 | 54.5 | 53 | 95 | 195 | 0.26 | 377.98% | 5.3 | 4.75 | 3.9 |
| Floods[1, 3] | 53 | 48.5 | 13 | 31 | 53 | 0.92 | 109.28% | 1.3 | 1.55 | 1.06 |
| Hail[1,3] | 77 | 51.5 | 36 | 52 | 74 | 0.67 | 149.51% | 3.60 | 2.60 | 1.48 |
| Lightning[1,3] | 25 | 54.5 | 0 | 0 | 21 | 2.18 | 45.87% | 0 | 0 | 0.42 |
| Snow & Ice[1] | 40 | 54.5 | 14 | 20 | 35 | 1.36 | 73.39% | 1.4 | 1 | 0.7 |
| Tornado[1] | 16 | 54.5 | 7 | 10 | 15 | 3.41 | 29.36% | 0.7 | 0.5 | 0.3 |
| Earthquake[2] | 0 | 235 | 0 | 0 | 0 | 0.00 | 0.00% | 0.00 | 0.00 | 0.00 |

| Hazard | Total Cost | Number Events | Number Years | Total Loss of Life | Total Injuries | Average Cost Per Year | Average Cost Per Event | Average Loss of Life Per Year | Average Loss of Life Per Event | Average Injuries Per Year | Average Injuries Per Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | $1,211,803 | 206 | 54.5 | 0.25 | 2.21 | $22,235 | $5,883 | 0.00 | 0.00 | 0.04 | 0.01 |
| Floods[1, 3] | $7,801,684 | 53 | 48.5 | 2.09 | 0.11 | $160,859 | $147,202 | 0.04 | 0.04 | 0.00 | 0.00 |
| Hail[1, 3] | $4,925,750 | 77 | 51.5 | 0.01 | 0.52 | $95,646 | $63,971 | 0.00 | 0.00 | 0.01 | 0.01 |
| Lightning[1,3] | $289,285 | 25 | 54.5 | 0.04 | 0.36 | $5,308 | $11,571 | 0.00 | 0.00 | 0.01 | 0.01 |
| Snow & Ice[1] | $1,411,082 | 40 | 54.5 | 0.31 | 1.83 | $25,891 | $35,277 | 0.01 | 0.01 | 0.03 | 0.05 |
| Tornado[1,3] | $5,185,260 | 16 | 54.5 | 1.09 | 20.00 | $95,142 | $324,079 | 0.02 | 0.07 | 0.37 | 1.25 |
| Earthquake[2] | | 0 | 235 | No Information Available | | | | | | | |

## GRAYSON

| Hazard | Number of Events in Historic Record | Number of Years in Historic Record | Number of Events in Past 10 Years | Number of Events in Past 20 Years | Number of Events in Past 50 Years | Historic Recurrence Interval (years) | Historic Frequency % chance/year | Past 10 Year Record Frequency Per Year | Past 20 Year Record Frequency Per Year | Past 50 Year Record Frequency Per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | 196 | 56.5 | 41 | 78 | 185 | 0.29 | 346.90% | 4.1 | 3.9 | 3.7 |
| Floods[1, 3] | 46 | 48.5 | 12 | 26 | 46 | 1.05 | 94.85% | 1.2 | 1.3 | 0.92 |
| Hail[1, 3] | 84 | 50.5 | 34 | 54 | 82 | 0.60 | 166.34% | 3.40 | 2.70 | 1.64 |
| Lightning[1,3] | 31 | 54.5 | 1 | 1 | 26 | 1.76 | 56.88% | 0.1 | 0.05 | 0.52 |
| Snow & Ice[1] | 42 | 54.5 | 15 | 21 | 38 | 1.30 | 77.06% | 1.5 | 1.05 | 0.76 |
| Tornado[1,3] | 15 | 55.5 | 5 | 6 | 10 | 3.70 | 27.03% | 0.5 | 0.3 | 0.2 |
| Earthquake[2] | 0 | 235 | 0 | 0 | 0 | 0.00 | 0.00% | 0.00 | 0.00 | 0.00 |

| Hazard | Total Cost | Number Events | Number Years | Total Loss of Life | Total Injuries | Average Cost Per Year | Average Cost Per Event | Average Loss of Life Per Year | Average Loss of Life Per Event | Average Injuries Per Year | Average Injuries Per Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | $1,215,287 | 196 | 56.5 | 0.25 | 6.62 | $21,510 | $6,200 | 0.00 | 0.00 | 0.12 | 0.03 |
| Floods[1, 3] | $8,185,065 | 46 | 48.5 | 0.04 | 0.11 | $168,764 | $177,936 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hail[1, 3] | $2,438,935 | 84 | 50.5 | 0.01 | 0.5 | $48,296 | $29,035 | 0.00 | 0.00 | 0.01 | 0.01 |
| Lightning[1,3] | $423,574 | 31 | 54.5 | 0.04 | 2.36 | $7,772 | $13,664 | 0.00 | 0.00 | 0.04 | 0.08 |
| Snow & Ice[1] | $1,981,398 | 42 | 54.5 | 0.29 | 3.41 | $36,356 | $47,176 | 0.01 | 0.01 | 0.06 | 0.08 |
| Tornado[1,3] | $56,483,213 | 15 | 55.5 | 3.00 | 23.09 | $1,017,716 | $3,765,548 | 0.05 | 0.20 | 0.42 | 1.54 |
| Earthquake[2] | | 0 | 235 | No Information Available | | | | | | | |

## HARDIN

| Hazard | Number of Events in Historic Record | Number of Years in Historic Record | Number of Events in Past 10 Years | Number of Events in Past 20 Years | Number of Events in Past 50 Years | Historic Recurrence Interval (years) | Historic Frequency % chance/year | Past 10 Year Record Frequency Per Year | Past 20 Year Record Frequency Per Year | Past 50 Year Record Frequency Per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | 300 | 58.5 | 70 | 139 | 285 | 0.20 | 512.82% | 7 | 6.95 | 5.7 |
| Floods[1, 3] | 69 | 48.5 | 23 | 44 | 69 | 0.70 | 142.27% | 2.3 | 2.2 | 1.38 |
| Hail[1, 3] | 95 | 51.5 | 33 | 54 | 92 | 0.54 | 184.47% | 3.30 | 2.70 | 1.84 |
| Lightning[1,3] | 34 | 54.5 | 2 | 3 | 29 | 1.60 | 62.39% | 0.2 | 0.15 | 0.58 |
| Snow & Ice[1] | 45 | 54.5 | 17 | 23 | 41 | 1.21 | 82.57% | 1.7 | 1.15 | 0.82 |
| Tornado[1,3] | 24 | 54.5 | 8 | 11 | 21 | 2.27 | 44.04% | 0.8 | 0.55 | 0.42 |
| Earthquake[2] | 1 | 235 | 0 | 1 | 1 | 235.00 | 0.43% | 0.00 | 0.05 | 0.02 |

| Hazard | Total Cost | Number Events | Number Years | Total Loss of Life | Total Injuries | Average Cost Per Year | Average Cost Per Event | Average Loss of Life Per Year | Average Loss of Life Per Event | Average Injuries Per Year | Average Injuries Per Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | $64,735,949 | 300 | 58.5 | 4.45 | 133.17 | $1,106,597 | $215,786 | 0.08 | 0.01 | 2.28 | 0.44 |
| Floods[1, 3] | $47,893,889 | 69 | 48.5 | 2.17 | 0.11 | $987,503 | $694,114 | 0.04 | 0.03 | 0.00 | 0.00 |
| Hail[1, 3] | $26,768,252 | 95 | 51.5 | 0.01 | 0.52 | $519,772 | $281,771 | 0.00 | 0.00 | 0.01 | 0.01 |
| Lightning[1,3] | $869,962 | 34 | 54.5 | 1.11 | 2.36 | $15,963 | $25,587 | 0.02 | 0.03 | 0.04 | 0.07 |
| Snow & Ice[1] | $2,792,155 | 45 | 54.5 | 0.29 | 3.47 | $51,232 | $62,048 | 0.01 | 0.01 | 0.06 | 0.08 |
| Tornado[1,3] | $16,118,723 | 24 | 54.5 | 2.00 | 73.09 | $295,756 | $671,613 | 0.04 | 0.08 | 1.34 | 3.05 |
| Earthquake[2] | | 1 | 235 | No Information Available | | | | | | | |

## LARUE

| Hazard | Number of Events in Historic Record | Number of Years in Historic Record | Number of Events in Past 10 Years | Number of Events in Past 20 Years | Number of Events in Past 50 Years | Historic Recurrence Interval (years) | Historic Frequency % chance/year | Past 10 Year Record Frequency Per Year | Past 20 Year Record Frequency Per Year | Past 50 Year Record Frequency Per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | 193 | 54.5 | 36 | 64 | 176 | 0.28 | 354.13% | 3.6 | 3.2 | 3.52 |
| Floods[1, 3] | 37 | 48.5 | 8 | 15 | 37 | 1.31 | 76.29% | 0.8 | 0.75 | 0.74 |
| Hail[1, 3] | 59 | 58.5 | 20 | 23 | 54 | 0.99 | 100.85% | 2.00 | 1.15 | 1.08 |
| Lightning[1,3] | 33 | 54.5 | 0 | 0 | 26 | 1.65 | 60.55% | 0 | 0 | 0.52 |
| Snow & Ice[1] | 38 | 54.5 | 12 | 17 | 34 | 1.43 | 69.72% | 1.2 | 0.85 | 0.68 |
| Tornado[1,3] | 11 | 62.5 | 4 | 6 | 9 | 5.68 | 17.60% | 0.4 | 0.3 | 0.18 |
| Earthquake[2] | 1 | 235 | 0 | 0 | 1 | 235.00 | 0.43% | 0.00 | 0.00 | 0.02 |

| Hazard | Total Cost | Number Events | Number Years | Total Loss of Life | Total Injuries | Average Cost Per Year | Average Cost Per Event | Average Loss of Life Per Year | Average Loss of Life Per Event | Average Injuries Per Year | Average Injuries Per Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | $1,509,787 | 193 | 54.5 | 1.32 | 11.6 | $27,703 | $7,823 | 0.02 | 0.01 | 0.21 | 0.06 |
| Floods[1, 3] | $8,067,971 | 37 | 48.5 | 0.17 | 0.11 | $166,350 | $218,053 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hail[1, 3] | $1,969,355 | 59 | 58.5 | 0.06 | 0.56 | $33,664 | $33,379 | 0.00 | 0.00 | 0.01 | 0.01 |
| Lightning[1,3] | $61,022 | 33 | 54.5 | 0 | 0 | $1,120 | $1,849 | 0.00 | 0.00 | 0.00 | 0.00 |
| Snow & Ice[1] | $1,050,662 | 38 | 54.5 | 0.29 | 3.36 | $19,278 | $27,649 | 0.01 | 0.01 | 0.06 | 0.09 |
| Tornado[1,3] | $5,110,111 | 11 | 62.5 | 0.00 | 19.12 | $81,762 | $464,556 | 0.00 | 0.00 | 0.31 | 1.74 |
| Earthquake[2] | | 1 | 235 | No Information Available | | | | | | | |

## MARION

| Hazard | Number of Events in Historic Record | Number of Years in Historic Record | Number of Events in Past 10 Years | Number of Events in Past 20 Years | Number of Events in Past 50 Years | Historic Recurrence Interval (years) | Historic Frequency % chance/year | Past 10 Year Record Frequency Per Year | Past 20 Year Record Frequency Per Year | Past 50 Year Record Frequency Per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | 180 | 54.5 | 22 | 55 | 62 | 0.30 | 330.28% | 2.2 | 2.75 | 1.24 |
| Floods[1, 3] | 44 | 48.5 | 9 | 19 | 44 | 1.10 | 90.72% | 0.9 | 0.95 | 0.88 |
| Hail[1, 3] | 58 | 53.5 | 11 | 18 | 50 | 0.92 | 108.41% | 1.10 | 0.90 | 1.00 |
| Lightning[1,3] | 35 | 54.5 | 0 | 0 | 27 | 1.56 | 64.22% | 0 | 0 | 0.54 |
| Snow & Ice[1] | 32 | 54.5 | 7 | 11 | 28 | 1.70 | 58.72% | 0.7 | 0.55 | 0.56 |
| Tornado[1,3] | 11 | 54.5 | 2 | 4 | 8 | 4.95 | 20.18% | 0.2 | 0.2 | 0.16 |
| Earthquake[2] | 0 | 235 | 0 | 0 | 0 | 0.00 | 0.00% | 0.00 | 0.00 | 0.00 |

| Hazard | Total Cost | Number Events | Number Years | Total Loss of Life | Total Injuries | Average Cost Per Year | Average Cost Per Event | Average Loss of Life Per Year | Average Loss of Life Per Event | Average Injuries Per Year | Average Injuries Per Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | $1,247,735 | 180 | 54.5 | 0.24 | 1.63 | $22,894 | $6,932 | 0.00 | 0.00 | 0.03 | 0.01 |
| Floods[1, 3] | $9,740,835 | 44 | 48.5 | 0.31 | 2.54 | $200,842 | $221,383 | 0.01 | 0.01 | 0.05 | 0.06 |
| Hail[1, 3] | $35,497,179 | 58 | 53.5 | 0.06 | 2.56 | $663,499 | $612,020 | 0.00 | 0.00 | 0.05 | 0.04 |
| Lightning[1,3] | $154,253 | 35 | 54.5 | 0.14 | 0.39 | $2,830 | $4,407 | 0.00 | 0.00 | 0.01 | 0.01 |
| Snow & Ice[1] | $2,681,555 | 32 | 54.5 | 0.29 | 3.36 | $49,203 | $83,799 | 0.01 | 0.01 | 0.06 | 0.11 |
| Tornado[1,3] | $735,833 | 11 | 54.5 | 0.00 | 4.15 | $13,502 | $66,894 | 0.00 | 0.00 | 0.08 | 0.38 |
| Earthquake[2] | | 0 | 235 | No Information Available | | | | | | | |

## MEADE

| Hazard | Number of Events in Historic Record | Number of Years in Historic Record | Number of Events in Past 10 Years | Number of Events in Past 20 Years | Number of Events in Past 50 Years | Historic Recurrence Interval (years) | Historic Frequency % chance/year | Past 10 Year Record Frequency Per Year | Past 20 Year Record Frequency Per Year | Past 50 Year Record Frequency Per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | 208 | 55.5 | 46 | 84 | 196 | 0.27 | 374.77% | 4.6 | 4.2 | 3.92 |
| Floods[1, 3] | 42 | 48.5 | 8 | 19 | 42 | 1.15 | 86.60% | 0.8 | 0.95 | 0.84 |
| Hail[1, 3] | 68 | 59.5 | 20 | 40 | 63 | 0.88 | 114.29% | 2.00 | 2.00 | 1.26 |
| Lightning[1,3] | 28 | 54.5 | 0 | 0 | 24 | 1.95 | 51.38% | 0 | 0 | 0.48 |
| Snow & Ice[1] | 40 | 54.5 | 15 | 19 | 36 | 1.36 | 73.39% | 1.5 | 0.95 | 0.72 |
| Tornado[1,3] | 12 | 54.5 | 5 | 7 | 10 | 4.54 | 22.02% | 0.5 | 0.35 | 0.2 |
| Earthquake[2] | 4 | 235 | 1 | 4 | 4 | 58.75 | 1.70% | 0.10 | 0.20 | 0.08 |

| Hazard | Total Cost | Number Events | Number Years | Total Loss of Life | Total Injuries | Average Cost Per Year | Average Cost Per Event | Average Loss of Life Per Year | Average Loss of Life Per Event | Average Injuries Per Year | Average Injuries Per Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | $1,679,733 | 208 | 55.5 | 3.45 | 46.26 | $30,265 | $8,076 | 0.06 | 0.02 | 0.83 | 0.22 |
| Floods[1, 3] | $7,284,005 | 42 | 48.5 | 1.14 | 0.11 | $150,186 | $173,429 | 0.02 | 0.03 | 0.00 | 0.00 |
| Hail[1, 3] | $25,032,572 | 68 | 59.5 | 0.01 | 2.52 | $420,715 | $368,126 | 0.00 | 0.00 | 0.04 | 0.04 |
| Lightning[1,3] | $129,715 | 28 | 54.5 | 0 | 0 | $2,380 | $4,633 | 0.00 | 0.00 | 0.00 | 0.00 |
| Snow & Ice[1] | $1,420,840 | 40 | 54.5 | 0.29 | 1.81 | $26,070 | $35,521 | 0.01 | 0.01 | 0.03 | 0.05 |
| Tornado[1,3] | $6,142,325 | 12 | 54.5 | 31.00 | 267.09 | $112,703 | $511,860 | 0.57 | 2.58 | 4.90 | 22.26 |
| Earthquake[2] | | 4 | 235 | No Information Available | | | | | | | |

## NELSON

| Hazard | Number of Events in Historic Record | Number of Years in Historic Record | Number of Events in Past 10 Years | Number of Events in Past 20 Years | Number of Events in Past 50 Years | Historic Recurrence Interval (years) | Historic Frequency % chance/year | Past 10 Year Record Frequency Per Year | Past 20 Year Record Frequency Per Year | Past 50 Year Record Frequency Per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | 228 | 54.5 | 45 | 51 | 210 | 0.24 | 418.35% | 4.5 | 2.55 | 4.2 |
| Floods[1, 3] | 93 | 48.5 | 34 | 67 | 93 | 0.52 | 191.75% | 3.4 | 3.35 | 1.86 |
| Hail[1, 3] | 71 | 53.5 | 22 | 39 | 64 | 0.75 | 132.71% | 2.20 | 1.95 | 1.28 |
| Lightning[1,3] | 41 | 54.5 | 1 | 5 | 34 | 1.33 | 75.23% | 0.1 | 0.25 | 0.68 |
| Snow & Ice[1] | 41 | 54.5 | 13 | 18 | 37 | 1.33 | 75.23% | 1.3 | 0.9 | 0.74 |
| Tornado[1,3] | 13 | 54.5 | 2 | 3 | 13 | 4.19 | 23.85% | 0.2 | 0.15 | 0.26 |
| Earthquake[2] | 0 | 235 | 0 | 0 | 0 | 0.00 | 0.00% | 0.00 | 0.00 | 0.00 |

| Hazard | Total Cost | Number Events | Number Years | Total Loss of Life | Total Injuries | Average Cost Per Year | Average Cost Per Event | Average Loss of Life Per Year | Average Loss of Life Per Event | Average Injuries Per Year | Average Injuries Per Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | $1,404,130 | 228 | 54.5 | 0.3 | 12.58 | $25,764 | $6,158 | 0.01 | 0.00 | 0.23 | 0.06 |
| Floods[1, 3] | $35,033,005 | 93 | 48.5 | 3.17 | 2.11 | $722,330 | $376,699 | 0.07 | 0.03 | 0.04 | 0.02 |
| Hail[1, 3] | $22,857,556 | 71 | 53.5 | 0.06 | 1.56 | $427,244 | $321,937 | 0.00 | 0.00 | 0.03 | 0.02 |
| Lightning[1,3] | $907,717 | 41 | 54.5 | 2.12 | 2.34 | $16,655 | $22,139 | 0.04 | 0.05 | 0.04 | 0.06 |
| Snow & Ice[1] | $2,307,155 | 41 | 54.5 | 1.29 | 3.47 | $42,333 | $56,272 | 0.02 | 0.03 | 0.06 | 0.08 |
| Tornado[1,3] | $2,033,978 | 13 | 54.5 | 1.00 | 28.15 | $37,321 | $156,460 | 0.02 | 0.08 | 0.52 | 2.17 |
| Earthquake[2] | | 0 | 235 | No Information Available | | | | | | | |

## WASHINGTON

| Hazard | Number of Events in Historic Record | Number of Years in Historic Record | Number of Events in Past 10 Years | Number of Events in Past 20 Years | Number of Events in Past 50 Years | Historic Recurrence Interval (years) | Historic Frequency % chance/year | Past 10 Year Record Frequency Per Year | Past 20 Year Record Frequency Per Year | Past 50 Year Record Frequency Per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | 168 | 54.5 | 18 | 45 | 150 | 0.32 | 308.26% | 1.8 | 2.25 | 3 |
| Floods[1, 3] | 39 | 48.5 | 4 | 12 | 39 | 1.24 | 80.41% | 0.4 | 0.6 | 0.78 |
| Hail[1, 3] | 51 | 53.5 | 11 | 18 | 44 | 1.05 | 95.33% | 1.10 | 0.90 | 0.88 |
| Lightning[1,3] | 36 | 54.5 | 0 | 0 | 29 | 1.51 | 66.06% | 0 | 0 | 0.58 |
| Snow & Ice[1] | 42 | 54.5 | 10 | 14 | 34 | 1.30 | 77.06% | 1 | 0.7 | 0.68 |
| Tornado[1,3] | 11 | 54.5 | 5 | 7 | 11 | 4.95 | 20.18% | 0.5 | 0.35 | 0.22 |
| Earthquake[2] | 0 | 235 | 0 | 0 | 0 | 0.00 | 0.00% | 0.00 | 0.00 | 0.00 |

| Hazard | Total Cost | Number Events | Number Years | Total Loss of Life | Total Injuries | Average Cost Per Year | Average Cost Per Event | Average Loss of Life Per Year | Average Loss of Life Per Event | Average Injuries Per Year | Average Injuries Per Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1] | $1,453,572 | 168 | 54.5 | 0.22 | 3.58 | $26,671 | $8,652 | 0.00 | 0.00 | 0.07 | 0.02 |
| Floods[1, 3] | $8,984,658 | 39 | 48.5 | 0.17 | 0.11 | $185,251 | $230,376 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hail[1, 3] | $10,875,034 | 51 | 53.5 | 0.06 | 3.56 | $203,272 | $213,236 | 0.00 | 0.00 | 0.07 | 0.07 |
| Lightning[1,3] | $223,179 | 36 | 54.5 | 0.12 | 0.34 | $4,095 | $6,199 | 0.00 | 0.00 | 0.01 | 0.01 |
| Snow & Ice[1] | $2,697,743 | 42 | 54.5 | 0.37 | 3.48 | $49,500 | $64,232 | 0.01 | 0.01 | 0.06 | 0.08 |
| Tornado[1,3] | $1,840,007 | 11 | 54.5 | 0.00 | 5.15 | $33,762 | $167,273 | 0.00 | 0.00 | 0.09 | 0.47 |
| Earthquake[2] | | 0 | 235 | No Information Available | | | | | | | |

## LINCOLN TRAIL REGION

| Hazard | Number of Events in Historic Record | Number of Years in Historic Record | Number of Events in Past 10 Years | Number of Events in Past 20 Years | Number of Events in Past 50 Years | Historic Recurrence Interval (years) | Historic Frequency % chance/year | Past 10 Year Record Frequency Per Year | Past 20 Year Record Frequency Per Year | Past 50 Year Record Frequency Per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1,4] | 1679 | 58.5 | 331 | 611 | 1459 | 0.03 | 2870.09% | 33.1 | 30.55 | 29.18 |
| Floods[1,4] | 423 | 48.5 | 111 | 233 | 423 | 0.11 | 872.16% | 11.1 | 11.65 | 8.46 |
| Hail[1,4] | 563 | 50.5 | 187 | 298 | 523 | 0.12 | 848.15% | 17.40 | 11.40 | 8.94 |
| Lightning | 263 | 49 | 4 | 9 | 216 | 0.19 | 536.73% | 0.4 | 0.45 | 4.32 |
| Snow & Ice[1,4] | 320 | 54.5 | 103 | 143 | 283 | 0.17 | 587.16% | 10.3 | 7.15 | 5.66 |
| Tornado[1,4] | 113 | 56 | 38 | 54 | 97 | 0.49 | 203.15% | 3.8 | 2.7 | 1.94 |
| Earthquake[2] | 6 | 235 | 1 | 5 | 6 | 39.17 | 2.55% | 0.10 | 0.25 | 0.12 |

| Hazard | Total Cost | Number Events | Number Years | Total Loss of Life | Total Injuries | Average Cost Per Year | Average Cost Per Event | Average Loss of Life Per Year | Average Loss of Life Per Event | Average Injuries Per Year | Average Injuries Per Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Thunderstorm Wind[1,4] | $74,457,996 | 1679 | 58.5 | 10.48 | 217.65 | $1,272,786 | $44,347 | 0.18 | 0.01 | 3.72 | 0.13 |
| Floods[1,4] | $132,991,112 | 423 | 48.5 | 9.26 | 5.31 | $2,742,085 | $314,400 | 0.19 | 0.02 | 0.11 | 0.01 |
| Hail[1,4] | $130,364,632 | 563 | 59.5 | 0.28 | 12.3 | $2,414,160 | 284638.94 | 0.01 | 0.00 | 0.23 | 0.03 |
| Lightning | $3,765,207 | 271 | 54.5 | 5.57 | 11.15 | $69,086 | $13,894 | 0.10 | 0.02 | 0.20 | 0.04 |
| Snow & Ice[1,4] | $16,342,589 | 320 | 54.5 | 3.42 | 24.19 | $299,864 | $51,071 | 0.06 | 0.01 | 0.44 | 0.08 |
| Tornado[1,4] | $93,649,450 | 113 | 56 | 38.09 | 439.84 | $1,683,586 | $828,756 | 0.68 | 0.34 | 7.91 | 3.89 |
| Earthquake[2] | | 6 | 235 | No Information Available | | | | | | | |

*NOTE: The historic frequency of a hazard event over a given period of time determines the historic recurrence interval. For example: If there have been 10 Thunderstorm events in the County in the past 5 years, statistically, that would average two events a year. Realize that from a statistical standpoint, there are several variables to consider. 1) Accurate hazard history data and collection are crucial to an accurate recurrence interval and frequency. 2) Data collection and accuracy has been much better in the past 20 years (NCDC & NEIC weather records). 3) It is important to include all significant recorded hazard events that will include periodic updates to this table.*

*The values in the preceding tables should be considered low. More events have occurred than are documented by the sources used in these tables.*

*1. Compilation of SHELDUS, NCDC & NEIC, SHELDUS Data Base, Hazard Research Lab, University of South Carolina, 2009. Dates 1960-2009. National Climate Data Center (NCDC), NOAA & National Weather Service, various ranges 1950-2009. National Environmental Information Center (NEIC) July 1 2009 - June 30 2015.*

*2. USGS & National Earthquake Information Center (NEIC) Databases, "USGS/NEIC 1973-Sept. 9, 2015" & "Eastern, Central and Mountain States of U.S., 1534 - 1986".*

*3. Includes cumulative reports of claims filed from various insurance providers.*

*4. Consolidated based on review of repeated events in individual counties.*

### 3.3.2.1 Flooding

## I. Background

**Definition:** "An overflow of water onto lands that are used or usable by man and not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river, stream, lake, or ocean."
(Water Science Glossary of Terms; http://ga.water.usgs.gov/edu/dictionary.html)

A **Flood,** as defined by the National Flood Insurance Program (NFIP) is: "A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (at least one of which is your property) from:

- Overflow of inland or tidal waters,
- Unusual and rapid accumulation or runoff of surface waters from any source, or
- A mudflow

Or, it can be a collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood."

**Description**
A flood is a natural event around rivers and streams. Excessive water from snowmelt, rainfall, or a storm surge accumulates and overflows onto the banks and adjacent floodplains. **Floodplains** are lowlands, adjacent to rivers, lakes, and oceans that are subject to recurring floods. Over nine million U.S. households are located in floodplains.

Flooding is caused in a variety of ways. Winter or spring rains, coupled with melting snows, can fill river basins too quickly. Torrential rains from decaying hurricanes or other tropical systems can also produce river flooding.

During the 20th century, flooding was the leading cause of property damage and loss of life of all natural disasters in the United States. Most U.S. communities have experienced some kind of flooding due to spring rains, heavy thunderstorms, or winter snow thaws. Floods can be either slow or fast rising, but generally develop over a period of days. Hundreds of floods occur each year, making it one of the most common hazards in all U.S. states.

In most years, 75% of all Federal disaster declarations involve flooding either in part or exclusively. Flooding claims an average of 140 lives per year and is responsible for more annual property damage than any other type of weather hazard according to the National Severe Storms Laboratory.

**Factors that determine flooding severity and/or exacerbate the effects of floods:**

- Rainfall Intensity and Duration
- Large amounts of rain over a short time can result in Flash Flooding
- Small amounts of rain can cause flooding where soil is saturated

- Small amounts of rain can cause flooding if concentrated in an area of impermeable surfaces
- Topography and Ground Cover
- Water runoff is greater in areas of steep slopes and little vegetation
- Development without adequate elevation or Flood Proofing
- Storm Sewer or Sinkhole backup
- Debris or Obstructions

The frequency of flooding depends on the climate, soil, and channel slope. In regions without prolonged periods of below-freezing temperatures, floods usually occur in the season with the highest precipitation.

**Types of Flooding:**
While floods can be the result of numerous naturally occurring and manmade factors, all floods can be defined as the accumulation of too much water, in too little time, within a specific area. Types of floods include regional, river or riverine, flashfloods, urban, ice-jam, storm surge, dam or levee failure, and debris, landslide, and mudflow.

**Regional Flooding**
Seasonal, regional flooding can occur when winter or spring rains, coupled with melting snow, fill river basins with too much water too quickly. Frozen ground further reduces water infiltration into the soil and causes runoff. Extended wet periods, at any time during the year, can result in saturated soils and exacerbates runoff into streams and rivers until their water containment capabilities are exceeded.

**River or Riverine Floods**
River/riverine flooding occurs when a high volume of water from a river or similar body of water occurs over a period of time too long to be considered a flash flood.

The spillway at Rough River Lake April 27 2011 Falls of Rough, Ky. - Heavy rains in the area caused Rough River Lake to reach a record pool causing water to run into the spillway for the first time since the dam became operational in 1961. *Image: US Army Corps of Engineers photo by Mike Lush*

**Flash Floods**
Flash floods are the result of quickly rising waters that occur as the result of heavy rains over

the period of a few hours or less. Flash flooding can occur within several seconds to several hours, and with little warning. Flash floods are deadly because they produce rapid increases in water volume that often has swift velocities.

Several factors can contribute to flash flooding including rainfall intensity, rainfall duration, surface conditions, topography, and the slope of the receiving basin. Urban areas are more susceptible to flash flooding since a great percentage of the surface area is composed of impervious surfaces such as roads, roofs and parking lots causing rapid runoff of water. They can also be caused by ice jams on rivers in conjunction with a winter or spring thaw, or even a dam break. Flash flooding is characterized by the rapid and constant influx of water that caused a treacherous overflow with volume and velocity sufficient to sweep vehicles away, roll boulders onto roadways, uproot trees, level buildings, and sweep bridges off of their piers.

**Urban Flooding**

As land is developed from fields and woodlands into roads, parking lots and built environments, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of a basin. Heavy rainfall collects and flows faster on impervious surfaces such as asphalt and concrete. Water falls from the clouds and moves along the surface and into streams at a much faster rate in urban areas. Adding a built environment into hydrologic systems can result in floodwaters rising very quickly and moving extremely swiftly. During periods of urban flooding, streets can become rapidly moving rivers and basements can fill with water. Often, storm drains become clogged with debris causing additional, localized flooding.

**Most People are Unaware that**:

- 80% of deaths due to flooding occur in vehicles. Most happen when drivers try to navigate through floodwaters.
- Just 6 inches of rapidly moving floodwater can knock a person down.
- It only takes 2 feet of water to float a large vehicle.
- One-third of all flooded roads and bridges are so damaged by water, that any vehicle trying to cross stands only a 50% chance of making it to the other side.
- 95% of people killed in a flash flood try to outrun rapidly moving water rather than seeking higher grounds.

**Ice-Jam Floods**

Ice-jam floods can occur when rivers become totally or partially frozen. A rise in stream stage will break up a totally frozen river and create ice flows that can pile up on channel obstructions such as shallow riffles, log jams, or bridge piers. The jammed ice creates a dam across the channel that water and ice cannot breach. The mixture can then rise rapidly and overflow the channel banks. Flooding then moves downstream when the ice dam fails, and the water stored behind the dam is released. At this juncture, the flood takes on the characteristics of a flash flood, with the added danger of ice flows gaining velocity. Such flooding can seriously damage structures in its path.

**Storm-Surge Floods**
Storm-surge flooding occurs when water is pushed up onto otherwise dry land by onshore winds. Friction between the water and the moving air creates drag that, depending on the distance of the water (fetch) and the velocity of the wind, can pile water up to depths greater than twenty feet. Intense, low-pressure systems and hurricanes can create storm-surge flooding. Storm surge is unquestionably the most dangerous part of a hurricane when pounding waves create very hazardous flood currents.

**Dam and Levee Failure floods**
Dam failures are potentially the worst flood events. Dam failure is usually the result of neglect, poor design, or structure damage caused by a major event such as an earthquake. When a dam fails, an immense volume of water is sent speeding downstream, destroying everything in its path. Dams and levees are designed and built for flood protection and are usually engineered to withstand a flood with a calculated risk of occurrence. For example, a dam or levee may be designed to contain a flood at one location on a stream that has a certain probability of occurring in any given year. If a larger flood occurs, that structure will be overtopped. If a dam or levee is overtopped, it could result in the structure being washed out and the water behind it becomes a flash flood. A failed dam or levee can create a flood that is catastrophic to life and property due to the tremendous energy of the water that is released.

**Debris and Landslide Floods**
Debris and landslide flooding occurs when the accumulation of debris, mud, rocks, and logs in a channel form a temporary dam. Flooding occurs upstream as water becomes trapped behind the temporary dam and quickly becomes a flash flood as water breaches the dam and rapidly washes away. Landslides can also create large waves on lakes or embayments and can be deadly.

Most loss of life occurs when people are swept away by flood currents, while most property damage results from inundation by sediment-laden water. Floodwaters have the potential to be an extremely destructive force. Lateral forces can demolish buildings while erosion can undermine bridge foundations and footings that can lead to collapse of structures.

**Flood Facts**
- Most flood related deaths are due to flash floods. The national, 30-year average for flood related deaths in the U.S. is 94 according to the National Weather Service (NWS).
- Fifty percent of all flash-flood fatalities are vehicle related.
- Most homeowner insurance policies do not cover floodwater damage.
- Estimated property damage in the U.S. in 2013 and 2014 was over $3 billion each year according to the National Weather Service. Over the last 30 years, the average annual flood damage estimate was $7.96 billion.

**Common Terms**:

**100-Year Flood Plain**: An area with a 1% chance of flooding in any given year. This is also known as the Base Flood level.

**500-Year Flood Plain**: An area with a 0.2% chance of flooding in any given year.

**Base Flood**: A flood that has a 1% chance of being equaled or exceeded in any given year. In this respect, it is also the regulatory standard for the "100-yeard flood." The base flood is the national standard used by the National Flood Insurance Program (NFIP) and all federal agencies for the purpose of requiring the purchase of flood insurance and the regulation of new development. Base Flood Elevations (BFEs) are usually shown on Flood Insurance Rate Maps (FIRMs)(DFIRMs).

**Floodplain**: A floodplain is an area of land adjacent to a river, stream, lake, estuary, or other body of water that is subject to flooding. This area of land, if left undisturbed, serves the purpose of storing excess floodwater. A floodplain has two sections, the floodway and the flood fringe.

**Floodway**: The NFIP defines floodway as "the channel of a river or other watercourse and adjacent land areas that must be reserved, in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot." The floodway carries the majority of floodwater downstream and is usually the area where water velocity and force is greatest. NFIP regulations require the floodway be kept open and free from any development or construction that would obstruct or divert floodwaters onto other properties. Floodways are not mapped for all rivers and streams, but are generally mapped in developed areas.

**Flood Fringe**: The flood fringe is the area of a floodplain outside of the floodway. The land area outside of a floodway is subject to inundation by regular flooding.

**Annual Flooding**: Annual flooding occurs far more frequently than indicated by the term "100-year flood." Over time, a structure located within a 100-year floodplain is at a much greater risk than indicated by the time frame of 100-year.

**History of Flooding in Kentucky**

As of May, 2013, Kentucky had declared fifty-six major disasters since 1953 according to FEMA's website. That is the eighth highest in the United States. Of Kentucky's 56 major disaster declarations, most were due to flooding. While Kentucky ranks 8$^{th}$ overall for major disaster declarations, it ranks 5$^{th}$ for flooding declarations. Flooding in Kentucky occurs almost every year, and it is not unusual for several flooding events to occur in any given year.

| An Overview of Kentucky Water and Water Events |
|---|
| 13 = Number of Major Basins in Kentucky<br><br>40 to 50 Inches = Average Rainfall<br>Maximum Rainfall occurs in Winter and Spring<br>Minimum Rainfall occurs in Late Summer and Fall<br><br>89,431 = Miles of Rivers and Streams in the Commonwealth<br>637,000 = Acres of Wetlands<br>18 = Number of Reservoirs over 1000 acres in Size<br>228,385 = Acres of Publicly owned Lakes and Reservoirs |

Significant Kentucky floods, resulting in declarations, occurred in 1973, 1975, 1977, 1978, 1982, 1984, three in 1989, 1991, 1997, 1998, 2000, 2001, 2002, 2003, 2004, 2007, 2008, 2009, 2010, 2011, 2012, 2014, and 2015. The flooding in 1997 involved disaster declarations in 101, Kentucky Counties. The two types of flooding most common in Kentucky are *flash floods* and *river basin* or riverine floods.

**Flash Flooding**: Resulting from excessive rainfall in a short amount of time, flash flooding occurs in the entire state, but is more common in Eastern Kentucky due to the region's mountainous terrain, narrow gorges, and numerous streams and riverbeds. Flash floods can occur at any time of the year, but are more prevalent during the spring and summer months.

**River Basin Flooding**: River basin flooding is common along Kentucky's major streams such as the Kentucky, Green, Licking, Ohio and Mississippi Rivers. It is most likely to occur during late winter and early spring and seriously affects the major Kentucky cities of Frankfort, Louisville, Owensboro and Paducah. Every two to three years, serious flooding occurs along one or more of Kentucky's major streams and it is not uncommon for flooding to occur several years in succession.

Aerial photo of Rough River Lake 29 April 2011. On April 30 Rough River Lake pool is recoreded at 524.7ft, a new record. *Image: US Army Corps of Engineers*

## II. Profile

The Lincoln Trail Area Development District is bordered on the north in part by the Ohio River. Numerous rivers and streams crisscross the region including Rough River, Nolin River, Beech Fork, Rolling Fork, Chaplin River, Salt River, Clover Creek, Sinking Creek and Otter Creek. These waterways and their tributaries drain an immediate area of 4,600 square miles. Since the Lincoln Trail Region consists of only 3,342 square miles, the potential for flooding is obvious.

Historically, flooding has occurred on all of these waterways. Ohio River flooding in the towns of West Point, Brandenburg, and Cloverport has resulted in tremendous property damage and loss of life. Localized flooding resulting in property damage and loss of life has also occurred on most other major streams within the region and has affected the communities of Fredericktown, Bradfordsville and New Haven.

Bradfordsville: South Rolling Fork flooding KY 49, March 2015. *Photo Courtesy: David Edelen.*

Several flood control projects have been completed within the region, over the years. Most have been construction projects initiated by the U.S. Corps of Engineers and USDA on the Ohio, Rough and Nolin River systems and their tributaries. Local projects have also been completed to deal with storm water runoff and bank erosion issues.

Based on FEMA DFIRM data from 2007 – 2012, 6.23 square miles of land or 0.2% of the Lincoln Trail Region lies in a 500-year floodplain and 256.68 square miles of land or 7.6% of the area lies within a 100-year floodplain. Since approval of the original plan in 2005 all of the eight Lincoln Trail counties have gone through the map modernization program of the floodplains.

DFIRM versions

| | | |
|---|---|---|
| Breckinridge (8/4/2008) | Grayson (9/19/2012) | Hardin (8/16/2007) |
| LaRue (1/16/2009) | Marion (1/6/2010) | Meade (7/18/2010) |
| Nelson (5/24/2011) | Washington (2/17/2010) | |

Overview of the Kentucky Floodplain Management Program

| | |
|---|---|
| Number of Kentucky communities that Participate in the National Flood Insurance Program | 114 out of 120 counties<br>372 cities out of 422 |
| Number of Lincoln Trail communities that Participate in the National Flood Insurance Program | 8 out of 8 counties<br>18 out of 27 cities |
| Presidential flood declarations between 2005 And April of 2015 | 14 |
| Presidential flood declaration between 1970 and 2004 | 26 |

*Source: FEMA.gov and the Kentucky Office of Emergency Management*

Table 3.3.2.1.1 lists repetitive losses across the Lincoln Trail region between January 1, 1978 and February 28, 2015 as a result of flooding events. It should be noted that the claims reported to the National Flood Insurance Program (NFIP) may not be the only assistance available to property owners. Flood assistance is also available from FEMA and other state or federal agencies as a result of a disaster declaration.

**Table 3.3.2.1.1 - Repetitive Losses**

| Jurisdiction | Number of Repetitive Losses | Number of Closed Losses | Total Payments |
|---|---|---|---|
| Breckinridge County | 2 | 2 | $131,776.08 |
| City of Cloverport | 15 | 12 | $87,993.59 |
| City of Irvington | 4 | 4 | $27,373.18 |
| Grayson County | 1 | 0 | $0 |
| City of Caneyville | 1 | 0 | $0 |
| Hardin County | 89 | 70 | $1,623,486.27 |
| City of Elizabethtown | 49 | 33 | $305,618.01 |
| City of Radcliff | 16 | 12 | $309,225.46 |
| City of Vine Grove | 2 | 2 | $23,071.02 |
| City of West Point | 161 | 147 | $2,147,578.67 |
| LaRue County | 21 | 20 | $203,045.28 |
| Marion County | 6 | 4 | $100,125.44 |
| City of Bradfordsville | 1 | 1 | $32,000.00 |
| City of Lebanon | 14 | 12 | $176,997.42 |
| Meade County | 4 | 2 | $30,701.94 |
| City of Brandenburg | 3 | 3 | $161,330.46 |

| | | | |
|---|---|---|---|
| Nelson County | 53 | 46 | $1,350,575.90 |
| City of Bardstown | 7 | 7 | $90,663.15 |
| City of Bloomfield | 2 | 2 | $1,883.24 |
| City of New Haven | 23 | 20 | $472,456.97 |
| Washington County | 11 | 10 | $396,666.11 |
| City of Springfield | 10 | 10 | $172,515.39 |
| *Source: http://bsa.nfipstat.fema.gov/reports/1040.htm From 1/1/1978-2/28/2015* | | | |

The National Flood Insurance Program (NFIP) defines a repetitive loss (RL) as any insurable building for which two or more claims of $1,000.00 were paid by the NFIP within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by NFIP. Currently, there are over 122,000 RL properties nationwide. The National Flood Insurance Reform Act of 2004 recognized repetitive loss as a significant problem. The Act also defined severe repetitive loss (SRL) as "a single family property consisting of 1 to 4 residences that is covered under flood insurance by the NFIP and has incurred flood related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000.00 and with the cumulative amount of such claims payments exceeding $20,000.00; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property." Currently, there are approximately 6,000 properties nationwide, meeting the definition of SRL.

| **Table 3.3.2.1.2** | |
|---|---|
| **Flood or Flash Flood Related Disaster Declarations In Lincoln Trail Region** | |
| **Declaration Date and Number** | **Lincoln Trail Counties Included in the Declaration** |
| 2-5-2008 #1746 | Hardin and Meade Counties (Assistance to Individuals and Households) Hardin, Meade and Grayson Counties (Public Assistance) |
| 2-26-2009 #1818 | Breckinridge, Grayson, Hardin, LaRue, Marion, Meade, Nelson, and Washington Counties (Public Assistance) |
| 5-29-2009 #1841 | Grayson County (Public Assistance) |
| 5-11-2010 #1912 | Breckinridge and Grayson Counties (Public Assistance), Hardin County (Individual Assistance) LaRue, Marion, Meade and Washington Counties (Public and Individual Assistance) |
| 05-04-2011 #1976 | Breckinridge, Grayson, Marion, Meade, Nelson and Washington Counties (Public Assistance) Hardin County (Individual Assistance) |
| 04-30-2015 #4216 | Washington County (Public Assistance) |
| *Source: www.fema.gov/disasters/grid/state-tribal-government* | |

In 1973 Congress made the purchase of Flood Insurance mandatory for many properties. Lending institutions could not increase, extend or renew funds secured by real estate located in a flood hazard area, unless the property was covered under the NFIP.

Participation: The Lincoln Trail area has seen a 25% increase in the number of NFIP policies since 2009 and a 70% overall increase since 2004. Through conversations with local insurance providers and floodplain managers it was determined the increase is a result of new flood mapping in some areas and increased emphasis on the National Flood Insurance Program.

Non-participation: Jurisdictions not actively participating in the NFIP have deemed it unnecessary to do so, due to the absence of identified flood prone areas within their boundaries. These include:
Clarkson, Which sits on a ridge and only has an edge of their corporate boundary in a mapped flood plain, no structures within the floodplain and no history of loss.
Sonora, Which only has an edge of their corporate boundary in a mapped flood plain, no structures within the floodplain and no history of loss.
Upton, Which has no flood plains in mapped section. LaRue County section has not been mapped. It has no streams and no history of loss.
Loretto, Which sits on a ridge and has no flood plain, and no history of loss.
Ekron, Has no flood plain, no streams and no history of loss.
Muldraugh, Which sits on a ridge and has no steams, no flood plain, and no history of loss.
Fairfield, Has no flood plain and no history of loss.
Mackville, Which sits on a ridge, has no flood plain, and no history of loss.
Willisburg, Which sits on a ridge, has no flood plain, and no history of loss.
Fairfield, Has no flood plain and no history of loss
All this is illustrated in the Table 3.3.2.1.3 and the subsequent maps included in this plan.

## Table 3.3.2.1.3 - NFIP and Mapping Summary

| Jurisdiction | Affected by 100/500 year floodplain | Flood area mapped by FEMA | Map Status Date | NFIP Participant | Total # of Active Policies as of 2004 | Total # of Active Policies as of 2009 | Total # of Active Policies as of 6/30/2015 | Annual Written Premium In Force 6/30/2015 |
|---|---|---|---|---|---|---|---|---|
| **Breckinridge** | **Yes** | **Yes** | **8/4/2008** | **YES** | **8** | **19** | **30** | **$15,185** |
| -Cloverport | Yes | Yes | | YES | 13 | 19 | 12 | $8,078 |
| -Hardinsburg | Yes | Yes | | YES | 0 | 0 | 1 | $315 |
| -Irvington | No | Yes | | YES | 3 | 1 | 1 | $547 |
| **Grayson** | **Yes** | **Yes** | **9/19/2012** | **YES** | **2** | **14** | **15** | **$6,343** |
| -Caneyville | Yes | Yes | | YES | 1 | 1 | 3 | $3,544 |
| -Clarkson | Yes | Yes | | NO | 0 | 0 | 0 | |
| -Leitchfield | Yes | Yes | | YES | 1 | 0 | 0 | |
| **Hardin** | **Yes** | **Yes** | **8/16/2007** | **YES** | **46** | **97** | **154** | **$75,063** |
| -Elizabethtown | Yes | Yes | | YES | 30 | 113 | 161 | $143,119 |
| -Radcliff | Yes | Yes | | YES | 21 | 29 | 30 | $13,695 |
| -Sonora | Yes | Yes | | NO | 0 | 0 | 0 | |
| -Upton | No | Partial | | NO | 0 | 0 | 0 | |
| -Vine Grove | Yes | Yes | | YES | 7 | 16 | 29 | $19,033 |
| -West Point | Yes | Yes | | YES | 176 | 159 | 145 | $131,137 |
| **LaRue** | **Yes** | **Yes** | **1/16/2009** | **YES** | **12** | **13** | **13** | **$5,560** |
| -Hodgenville | Yes | Yes | | YES | 2 | 9 | 4 | $1,788 |
| **Marion** | **Yes** | **Yes** | **1/6/2010** | **YES** | **6** | **10** | **19** | **$9,597** |
| -Bradfordsville | Yes | Yes | | YES | 1 | 2 | 4 | $1,648 |
| -Lebanon | Yes | Yes | | YES | 2 | 2 | 6 | $1,921 |
| -Loretto | No | Yes | | NO | 0 | 0 | 0 | |
| -Raywick | Yes | Yes | | YES | 0 | 0 | 0 | |
| **Meade** | **Yes** | **Yes** | **7/18/2011** | **YES** | **8** | **12** | **20** | **$9,160** |
| -Brandenburg | Yes | Yes | | YES | 1 | 2 | 3 | $1,932 |
| -Ekron | No | Yes | | NO | 7 | 0 | 0 | |
| -Muldraugh | No | Yes | | NO | 0 | 0 | 0 | |
| **Nelson** | **Yes** | **Yes** | **5/24/2011** | **YES** | **47** | **38** | **31** | **$22,352** |
| -Bardstown | Yes | Yes | | YES | 6 | 5 | 5 | $2,038 |
| -Bloomfield | Yes | Yes | | YES | 7 | 12 | 21 | $19,756 |
| -Fairfield | No | Yes | | NO | 0 | 0 | 0 | |
| -New Haven | Yes | Yes | | YES | 21 | 19 | 25 | $17,118 |
| **Washington** | **Yes** | **Yes** | **2/17/2010** | **YES** | **10** | **9** | **15** | **$7,703** |
| -Mackville | No | Yes | | NO | 0 | 0 | 0 | |
| -Springfield | Yes | Yes | | YES | 7 | 4 | 9 | $14,529 |
| -Willisburg | No | Yes | | NO | 0 | 0 | 0 | |

*Original Source: http://www.fema.gov/nfip/10110309.html*
*Source of 2009 Update: http://bsa.nfipstat.com/reports/1040.html & http://bsa.nfipstat.com/reports/1011.html*
*Source of 2015 Update: http://bsa.nfipstat.fema.gov/reports/reports.html*

**Table 3.3.2.1.4 - Claims Summary**

| Jurisdiction | Total # of Claims Between | Total # of Claims Between | Total # of Claims | Total # of Crop Claims Between | Total # of Crop Claims Between | Total # of Crop Claims | Total Payments Between | Total Payments Between | Total Payments Between |
|---|---|---|---|---|---|---|---|---|---|
| | 1978 & 2004 | 2004 & 2009 | 2010 - 6/30/2015 | 1978 & 2004 | 2004 & 2009 | 2010 - 6/30/2015 | 1978 & 2004 | 2004 & 2009 | 2010 - 6/30/2015 |
| **Breckinridge** | **0** | **0** | **3** | **0** | **0** | **1** | **0** | **0** | **$131,776** |
| -Cloverport | 8 | 2 | 5 | 3 | 0 | 0 | $50,421 | $8,215 | $29,358 |
| -Hardinsburg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| -Irvington | 2 | 2 | 0 | 0 | 0 | 0 | $13,093 | $14,280 | $0 |
| **Grayson** | **0** | **0** | **1** | **0** | **0** | **1** | **0** | **0** | $0 |
| -Caneyville | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | $0 |
| -Clarkson | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| -Leitchfield | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| **Hardin** | **39** | **18** | **34** | **5** | **5** | **10** | **$594,850** | **$249,568** | **$818,046** |
| -Elizabethtown | 13 | 22 | 15 | 5 | 5 | 7 | $43,632 | $208,835 | $53,151 |
| -Radcliff | 2 | 6 | 8 | 1 | 1 | 2 | $35,245 | $18,104 | $255,876 |
| -Sonora | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| -Upton | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| -Vine Grove | 0 | 2 | 0 | 0 | 0 | 0 | 0 | $23,071 | $0 |
| -West Point | 134 | 2 | 35 | 11 | 0 | 4 | $1,595,810 | $6,841 | $699,619 |
| **LaRue** | **16** | **0** | **5** | **1** | **0** | **0** | **$61,371** | **0** | **$141,674** |
| -Hodgenville | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| **Marion** | **2** | **0** | **4** | **1** | **0** | **1** | **$3,768** | **0** | **$96,357** |
| -Bradfordsville | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | $32,000 |
| -Lebanon | 14 | 0 | 0 | 2 | 0 | 0 | $176,997 | 0 | $0 |
| -Loretto | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| -Raywick | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| **Meade** | **0** | **2** | **2** | **0** | **1** | **1** | **0** | **$7,642** | **$23,060** |
| -Brandenburg | 3 | 0 | 0 | 0 | 0 | 0 | $161,330 | 0 | $0 |
| -Ekron | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| -Muldraugh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| **Nelson** | **36** | **0** | **17** | **4** | **0** | **3** | **$760,866** | **0** | **$589,710** |
| -Bardstown | 4 | 0 | 3 | 0 | 0 | 0 | $71,909 | 0 | $18,754 |
| -Bloomfield | 2 | 0 | 0 | 0 | 0 | 0 | $1,882 | 0 | $1 |
| -Fairfield | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| -New Haven | 13 | 0 | 10 | 2 | 0 | 1 | $97,751 | 0 | $374,706 |
| **Washington** | **3** | **1** | **7** | **0** | **0** | **1** | **$76,627** | **$48,123** | **$271,916** |
| -Mackville | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |
| -Springfield | 6 | 0 | 4 | 0 | 0 | 0 | $95,651 | 0 | $76,864 |
| -Willisburg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $0 |

*Original Source: http://www.fema.gov/nfip/10110309.html*
*Source of 2009 Update: http://bsa.nfipstat.com/reports/1040.html & http://bsa.nfipstat.com/reports/1011.html*
*Source of 2015 Update: http://bsa.nfipstat.fema.gov/reports/reports.html*

## III. Analysis

To identify flooding as a threat to the Lincoln Trail Region, the types of floods and their causes were analyzed; areas of vulnerability were determined; historical data was researched; and maps were created to identify the vulnerable areas. The Sources for this information include FEMA, the National Center for Environmental Information (NCEI), the Kentucky Climatic Data Center, the National Weather Service, the National Flood Insurance Program, and the Atlas of Kentucky.

One date that will stand out in the history of the Lincoln Trail Region, is March 1997. Ninety-two counties in Kentucky and 14 counties in southern Indiana were declared disaster areas. Tens of thousands of people were evacuated from their homes, with total damage across the region estimated at $400,000,000. In the small city of West Point in Hardin County, it was estimated that 85% of the city was under water leaving residents devastated and property destroyed.

The following tables outline the history of flooding events that have been recorded in a given county/jurisdiction within the Lincoln Trail region since 1967. The impact, of these flooding events, is documented by the number of lives lost, individual injuries reported, and the estimated cost of property and crop damage. This information was reported to the Spatial Hazard Events and Losses Databases for the United States (SHELDUS) and later the National Climate Data Center (NCDC) and was subsequently rolled into the National Centers for Environmental Information (NCEI) database. For the original, plan data was only available through 2003. The 2010 update provided data thru 30 June 2009. This update shows only individual events for the period 1 July 2009 through 30 June 2015. The summary tables, 3.3.2.1.5 & 3.3.2.1.6 show data for the entire period covered by the various sources. Note that there are many variations in recording the locations of the events over time. In the past this was typically done at a county level. More recently, nearest place names have been used. Because of this, the records in the summation tables that pertain to individual incorporated areas should not be considered all encompassing.

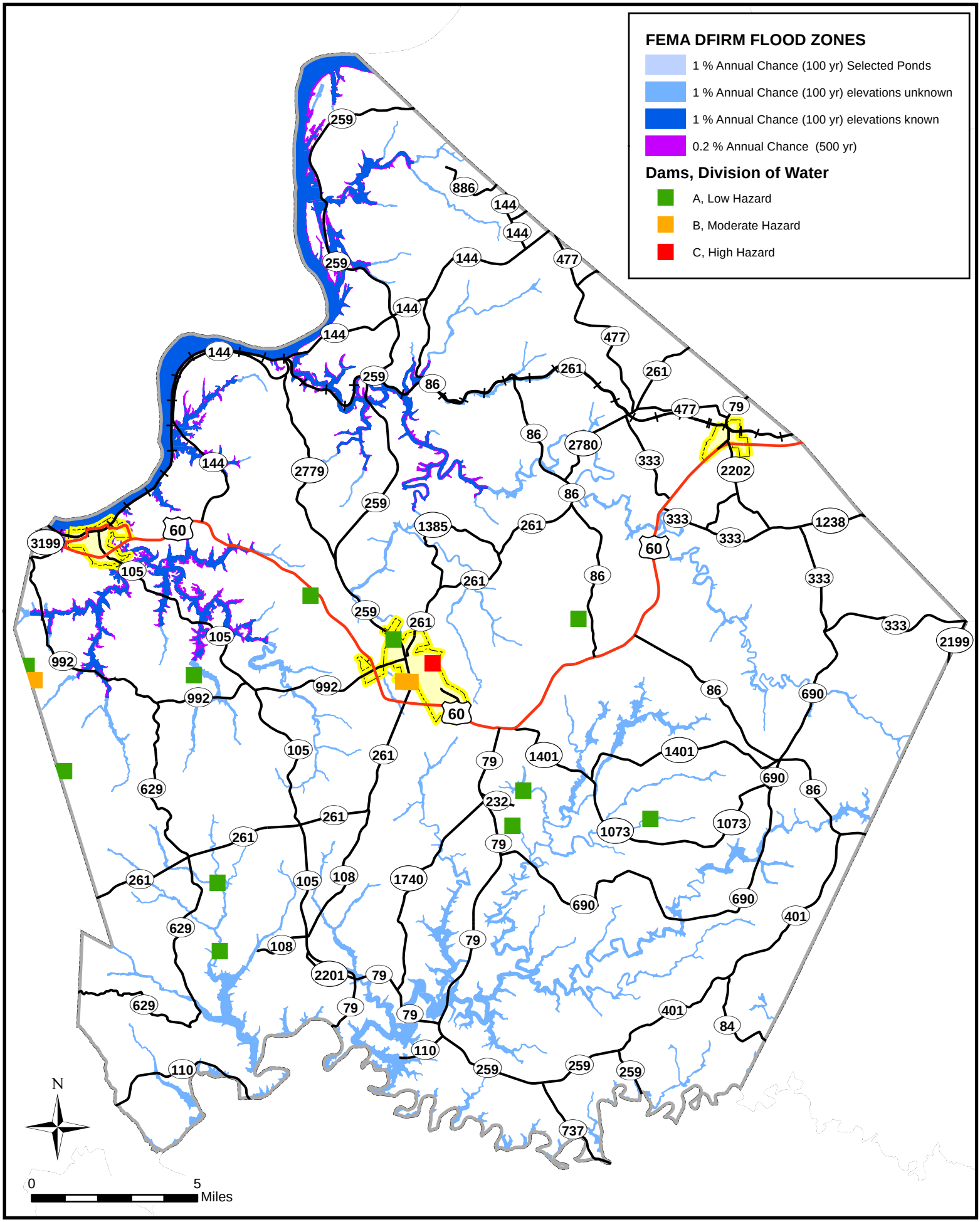
**Table 3.3.2.1.5 - County Specific Data – Flooding, *Source: NCEI***

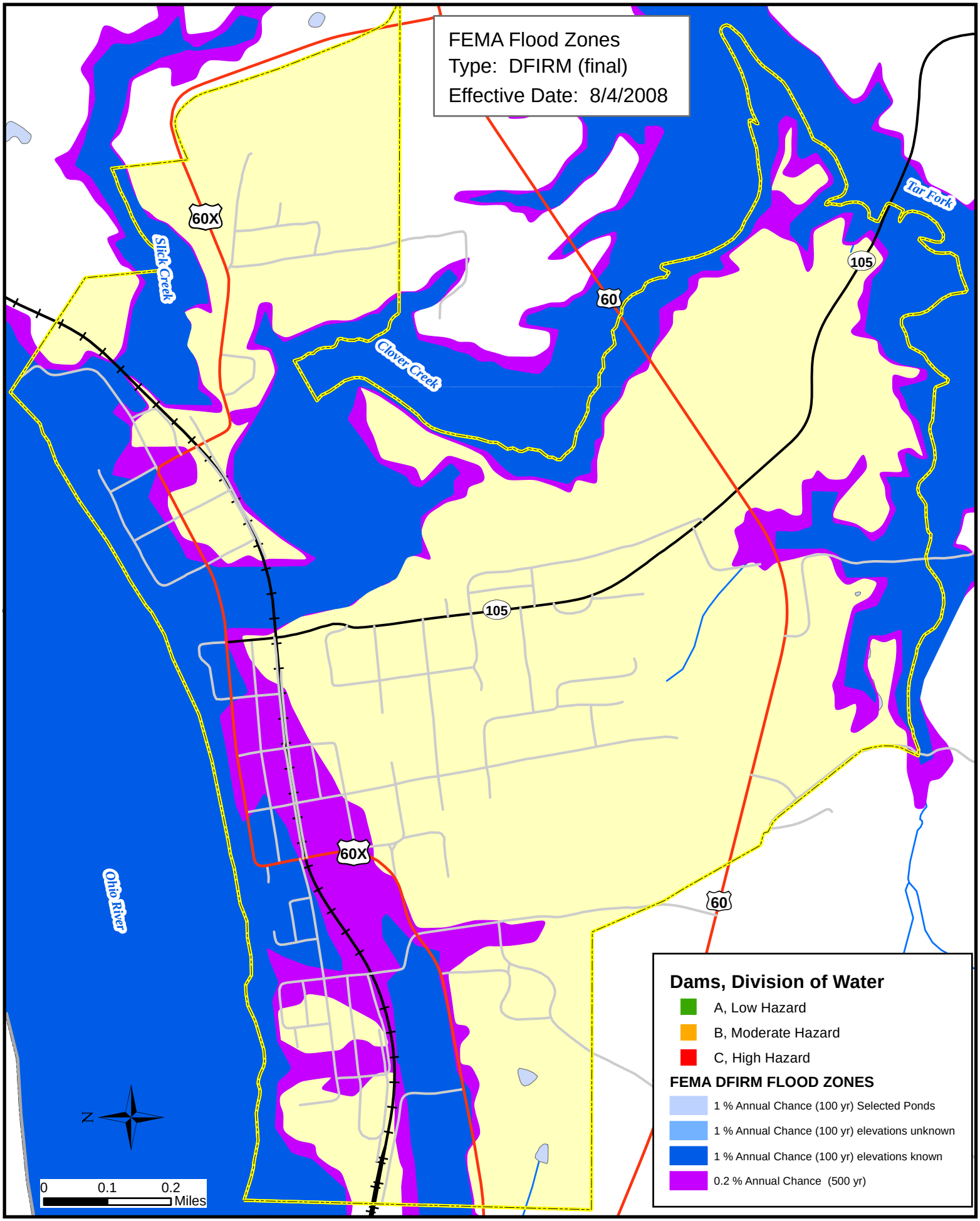
BRECKINRIDGE

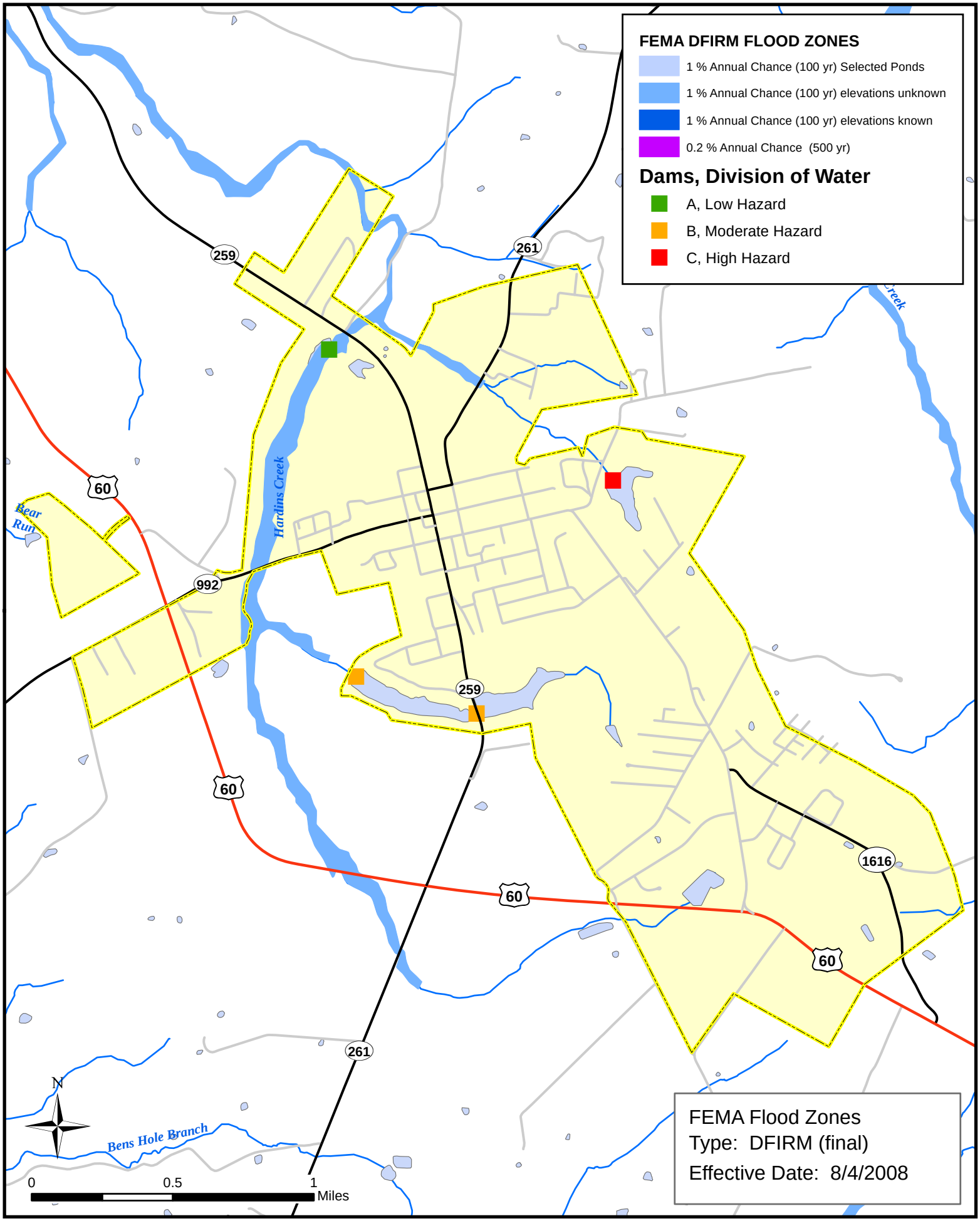
45 FLOOD/FLASHFLOOD event(s) were recorded between 1967 and 6/30/2009 by SHELDUS and the NCDC.

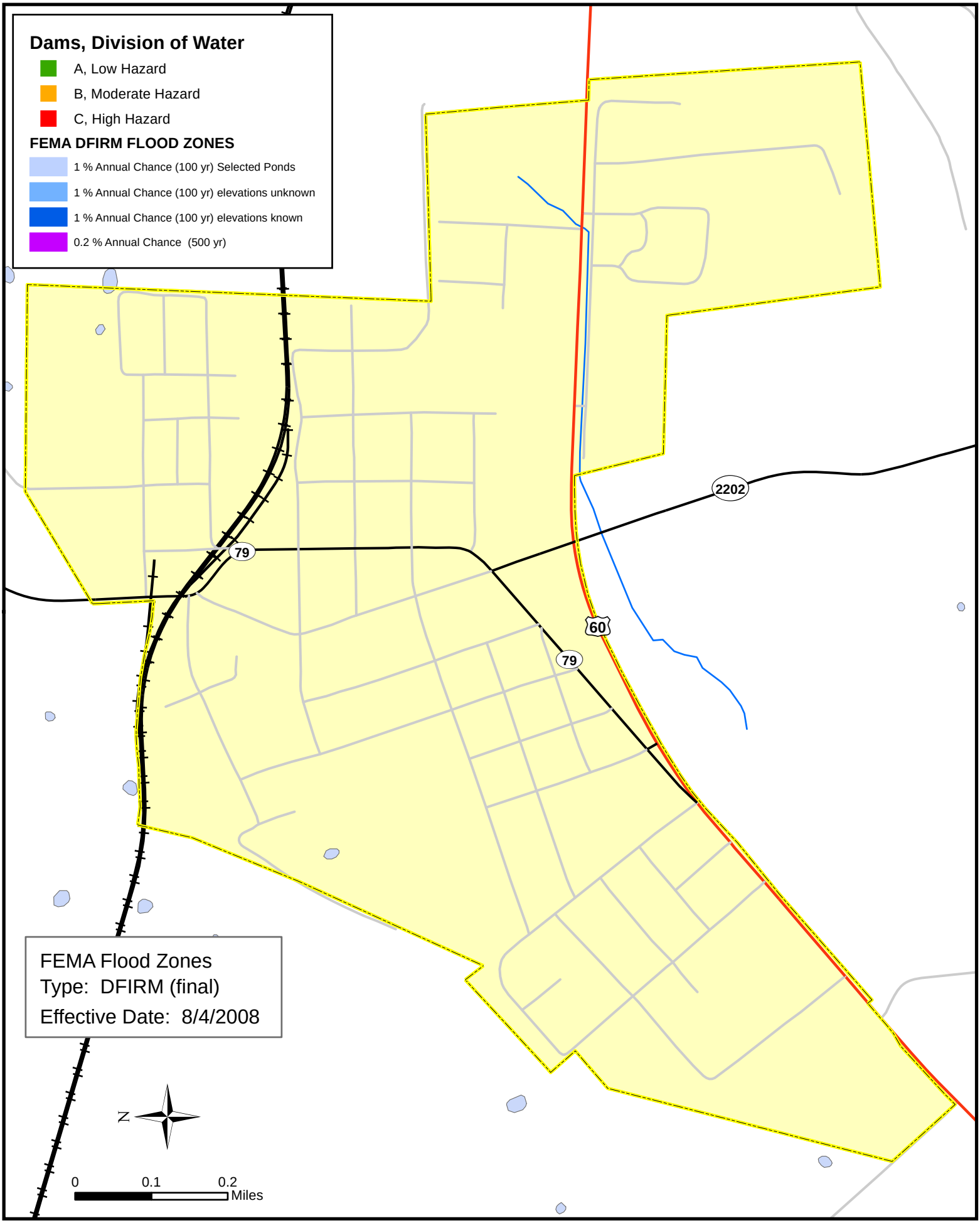
There have been an additional 8 FLOOD/FLASHFLOOD events recorded from 7/1/2009 through 6/30/2015 in NCEI.

| LOCATION | DATE | DEATHS DIRECT | INJURIES DIRECT | PROPERTY DAMAGE ($) | CROP DAMAGE ($) |
|---|---|---|---|---|---|
| WEBSTER | 5/2/2010 | 0 | 0 | 0 | 0 |
| CORNERS | 4/23/2011 | 0 | 0 | 0 | 0 |
| BIG SPG | 4/24/2011 | 0 | 0 | 0 | 0 |
| IRVINGTON | 12/21/2013 | 0 | 0 | 0 | 0 |
| MYSTIC | 12/22/2013 | 0 | 0 | 0 | 0 |
| BRECKINRIDGE | 3/4/2015 | 0 | 0 | 0 | 0 |
| BRECKINRIDGE | 4/3/2015 | 0 | 0 | 0 | 0 |
| BRECKINRIDGE | 4/7/2015 | 0 | 0 | 0 | 0 |


FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
N
0
5
Miles


FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 8/4/2008
60X
Slick Creek
Clover Creek
60
105
Tar Fork
105
60X
Ohio River
60
N
0 0.1 0.2
Miles
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)


FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
259
261
60
992
1616
Hardins Creek
Bear Run
Bens Hole Branch
N
0
0.5
1
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 8/4/2008


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
2202
79
60
79
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 8/4/2008
N
0
0.1
0.2
Miles

GRAYSON

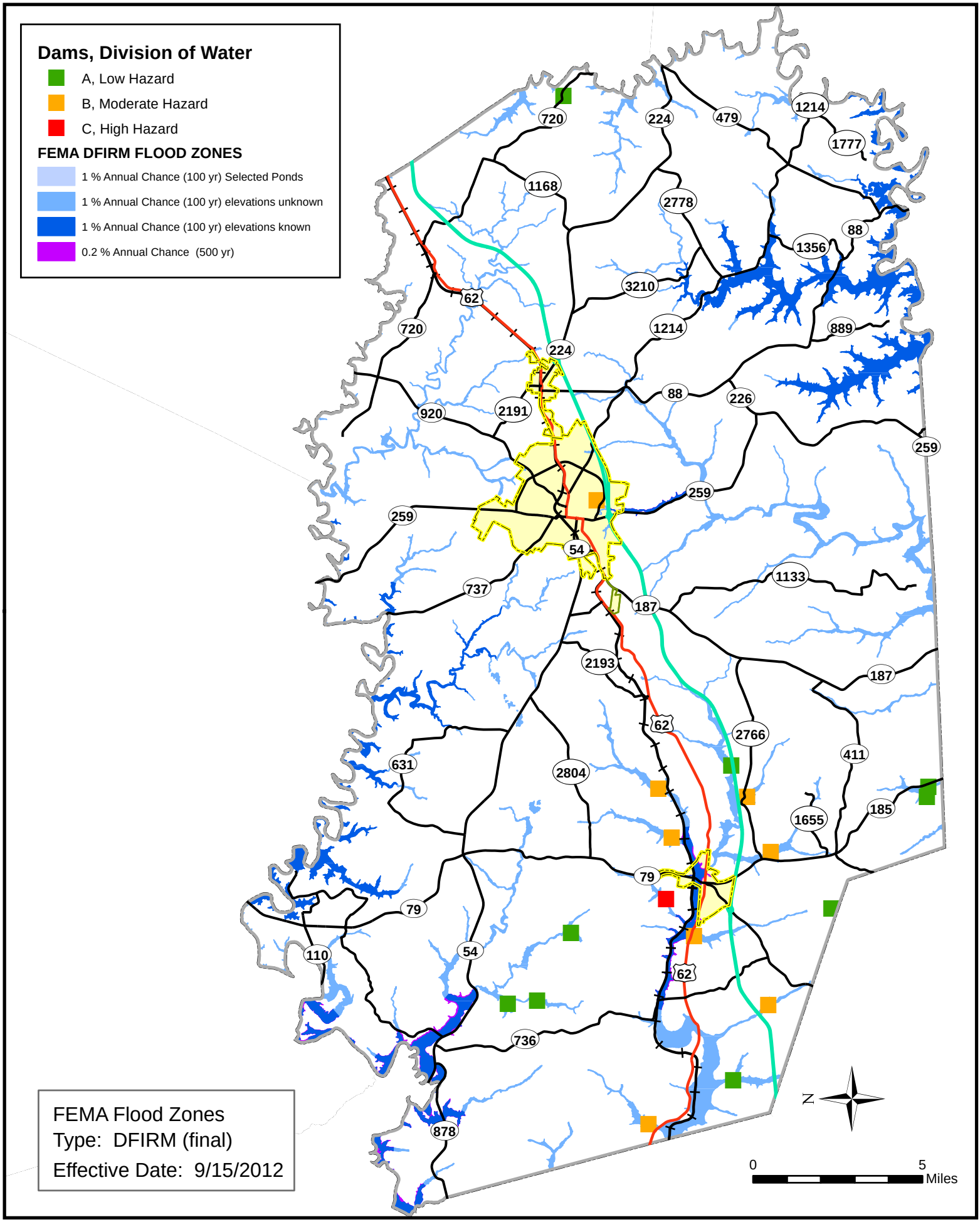
41 FLOOD/FLASHFLOOD event(s) were recorded between 1967 and 6/30/2009 by SHELDUS and the NCDC.

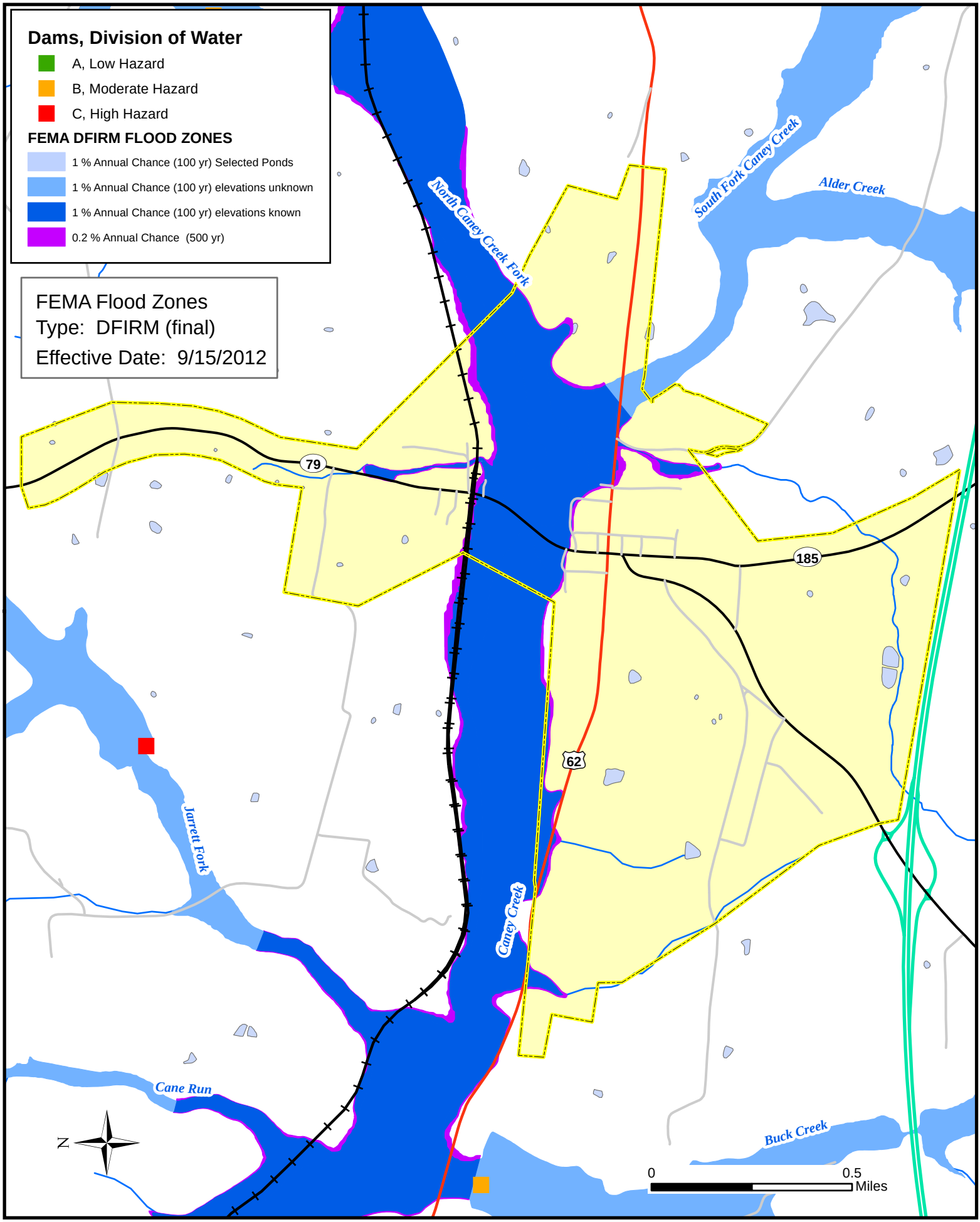
There have been an additional 5 FLOOD/FLASHFLOOD events recorded from 7/1/2009 through 6/30/2015 in NCEI.

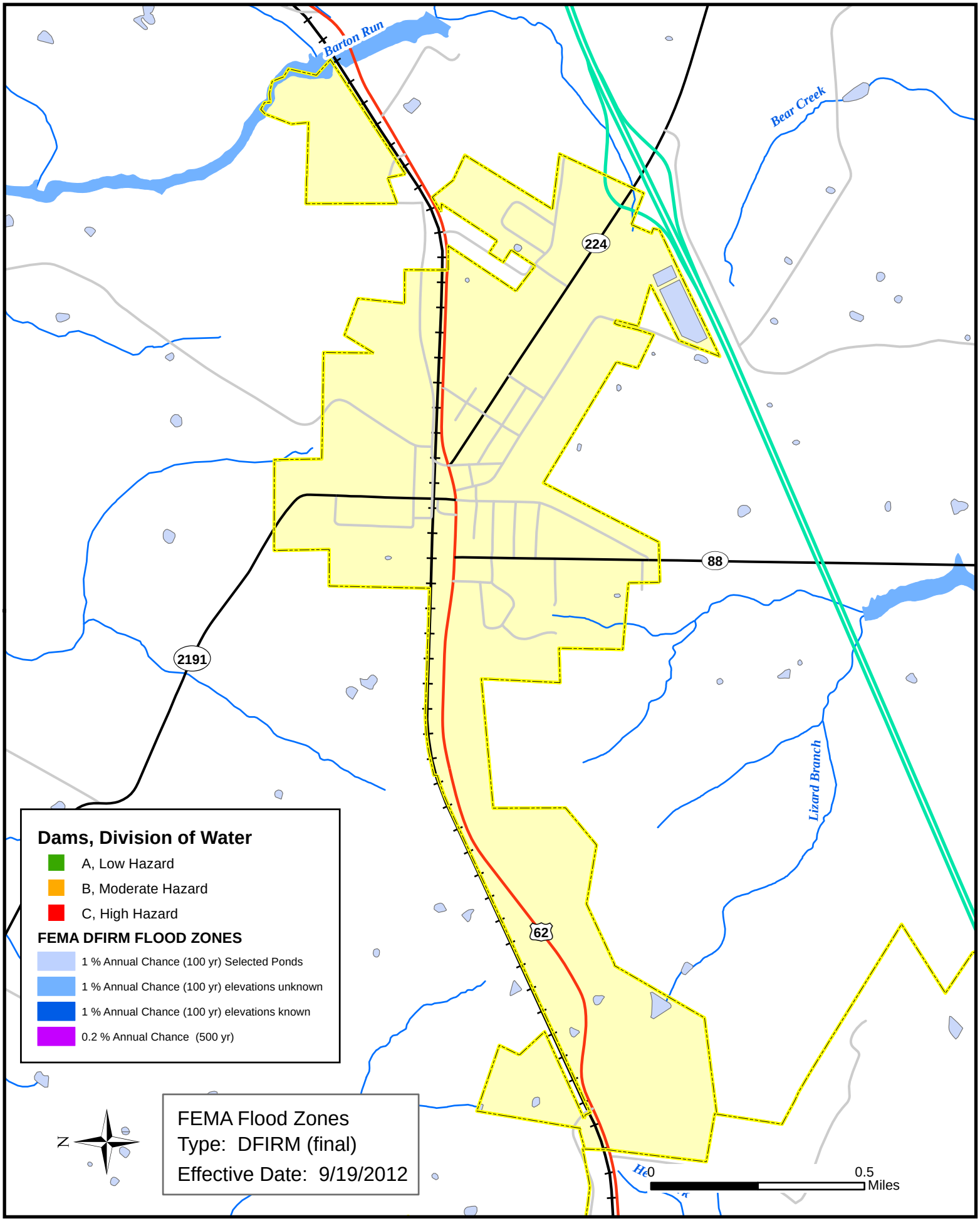
| LOCATION | DATE | DEATHS DIRECT | INJURIES DIRECT | PROPERTY DAMAGE ($) | CROP DAMAGE ($) |
|---|---|---|---|---|---|
| SPRING LICK | 5/2/2010 | 0 | 0 | 0 | 0 |
| SPRING LICK | 7/21/2010 | 0 | 0 | 0 | 0 |
| LEITCHFIELD | 8/12/2010 | 0 | 0 | 0 | 0 |
| READY | 6/27/2011 | 0 | 0 | 5000 | 0 |
| LEITCHFIELD | 12/21/2013 | 0 | 0 | 0 | 0 |

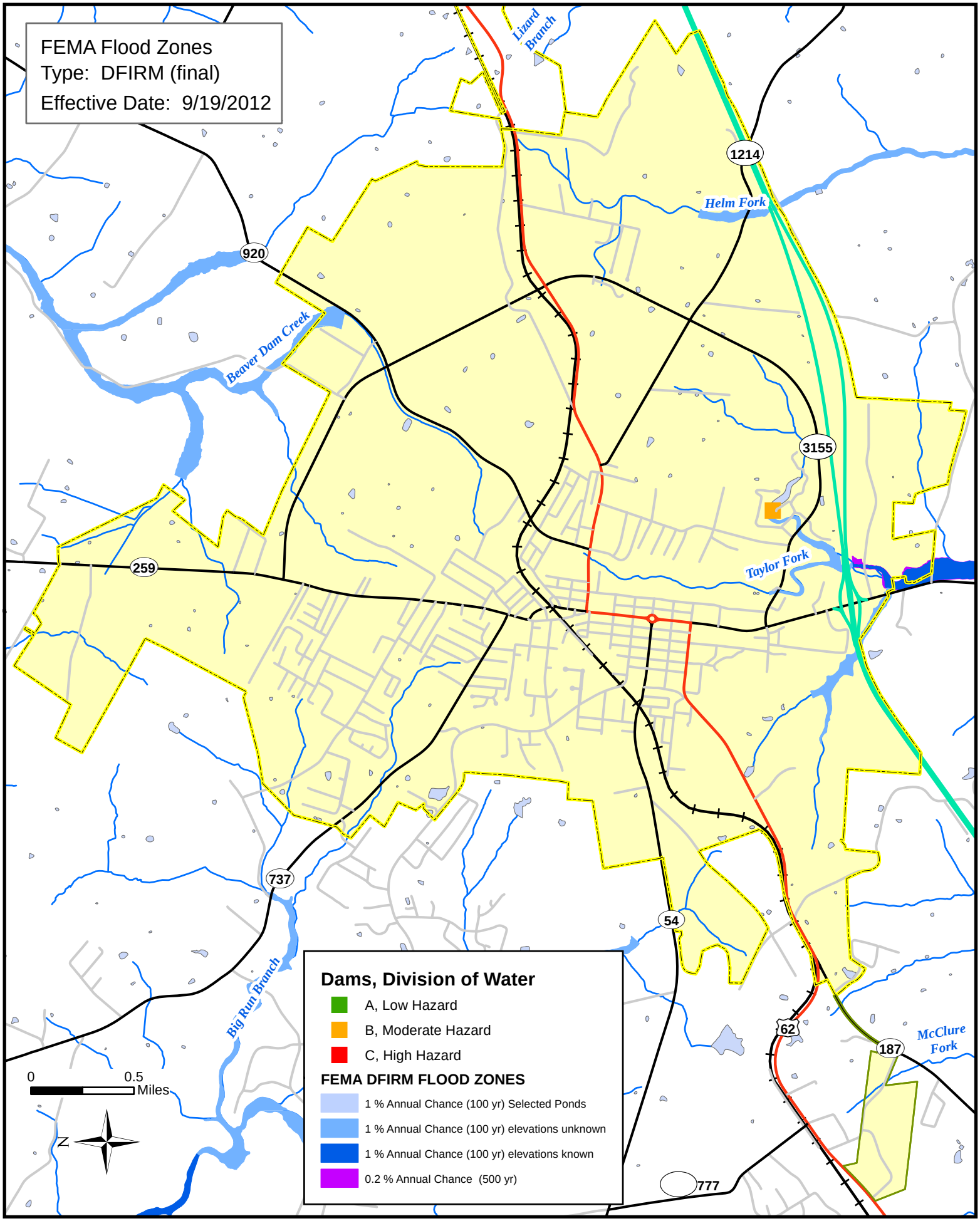
Road Washout in Grayson County, May 8, 2009. *LTADD Archives.*

Flooded cornfield, Grayson County June 15 2009.


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
720
224
479
1214
1777
1168
2778
88
1356
3210
62
720
1214
889
224
88
226
920
2191
259
259
259
54
1133
737
187
2193
187
62
2766
411
631
2804
185
1655
79
79
110
54
62
736
878
N
0
5
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 9/15/2012


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 9/15/2012
North Caney Creek Fork
South Fork Caney Creek
Alder Creek
79
185
62
Jarrett Fork
Caney Creek
Cane Run
Buck Creek
N
0
0.5
Miles


Barton Run
Bear Creek
224
88
2191
62
Lizard Branch
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
N
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 9/19/2012
0
0.5
Miles


FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 9/19/2012
Lizard Branch
1214
Helm Fork
920
Beaver Dam Creek
3155
259
Taylor Fork
737
54
Big Run Branch
62
187
McClure Fork
777
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
0
0.5
Miles
N

HARDIN

53 FLOOD/FLASHFLOOD event(s) were recorded between 1967 and 6/30/2009 by SHELDUS and the NCDC.

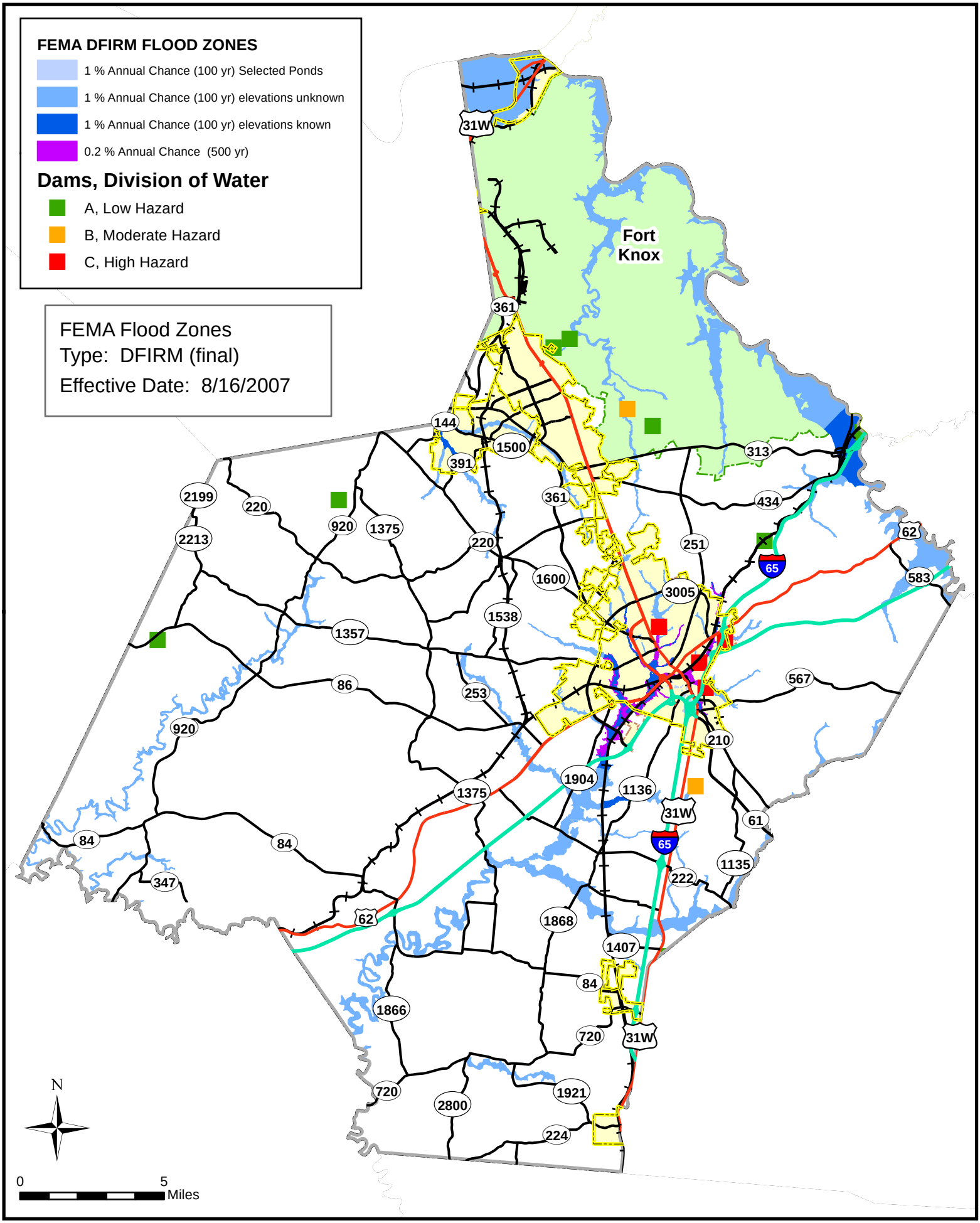
There have been an additional 16 FLOOD/FLASHFLOOD events recorded from 7/1/2009 through 6/30/2015 in NCEI.

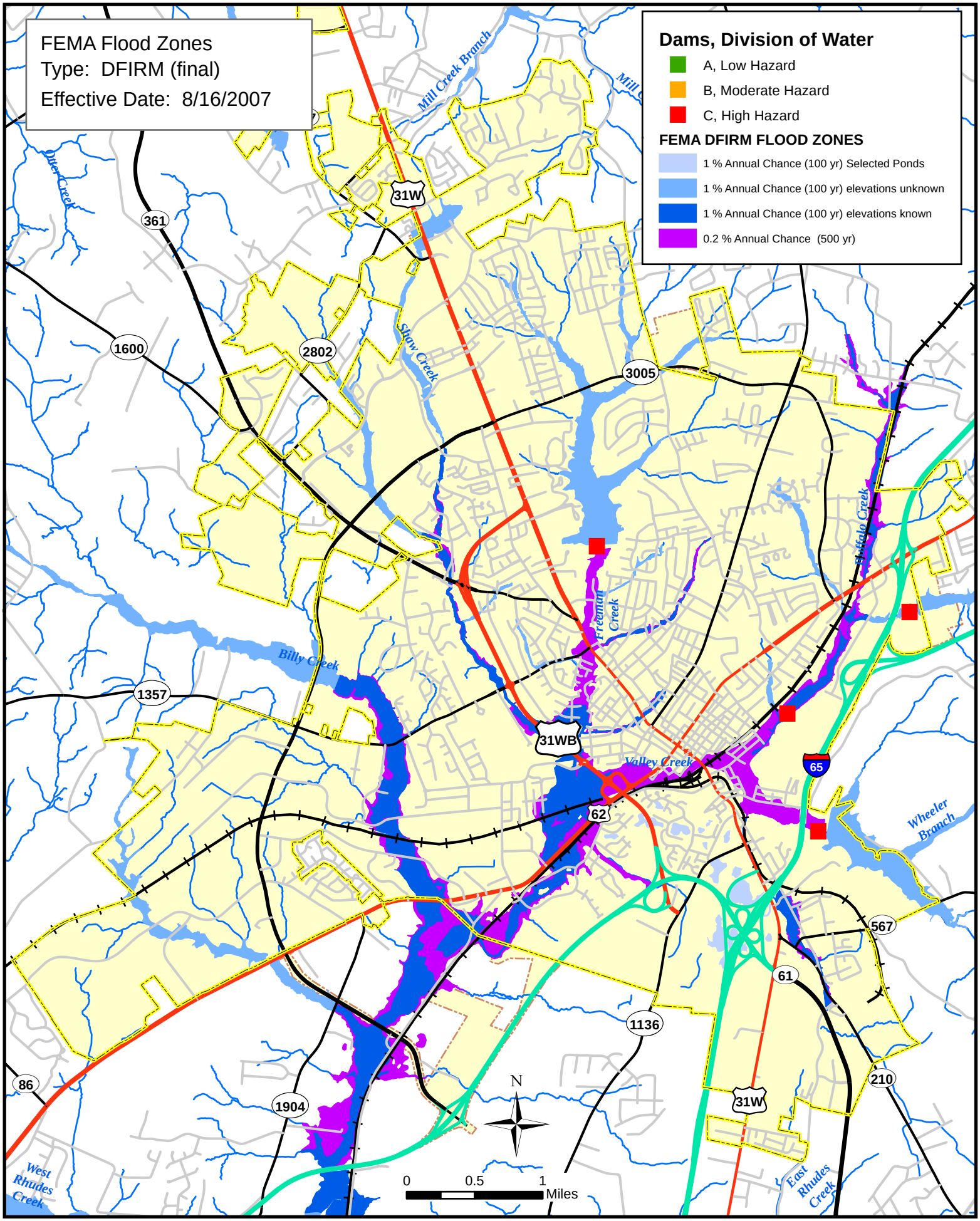
| LOCATION | DATE | DEATHS DIRECT | INJURIES DIRECT | PROPERTY DAMAGE ($) | CROP DAMAGE ($) |
|---|---|---|---|---|---|
| ROGERSVILLE | 9/20/2009 | 0 | 0 | 0 | 0 |
| ELIZABETH TOWN ARPT | 9/20/2009 | 0 | 0 | 0 | 0 |
| TUNNEL HILL | 5/2/2010 | 0 | 0 | 0 | 0 |
| MARTIN BOX | 4/12/2011 | 0 | 0 | 0 | 0 |
| OLD STEPHENSBURG | 4/23/2011 | 0 | 0 | 0 | 0 |
| LONG VIEW | 4/23/2011 | 0 | 0 | 0 | 0 |
| STAR MILLS | 4/27/2011 | 0 | 0 | 0 | 0 |
| ELIZABETH TOWN | 5/3/2011 | 0 | 0 | 0 | 0 |
| ELIZABETH TOWN | 7/24/2011 | 0 | 0 | 0 | 0 |
| RINEYVILLE | 7/24/2011 | 0 | 0 | 0 | 0 |
| ELIZABETH TOWN | 8/5/2012 | 0 | 0 | 0 | 0 |
| RINEYVILLE | 8/5/2012 | 0 | 0 | 0 | 0 |
| CECILIA | 8/5/2012 | 0 | 0 | 0 | 0 |
| MARTIN BOX | 8/5/2012 | 0 | 0 | 5000 | 0 |
| GLENDALE | 12/22/2013 | 0 | 0 | 0 | 0 |
| ELIZABETH TOWN | 8/23/2014 | 0 | 0 | 0 | 0 |

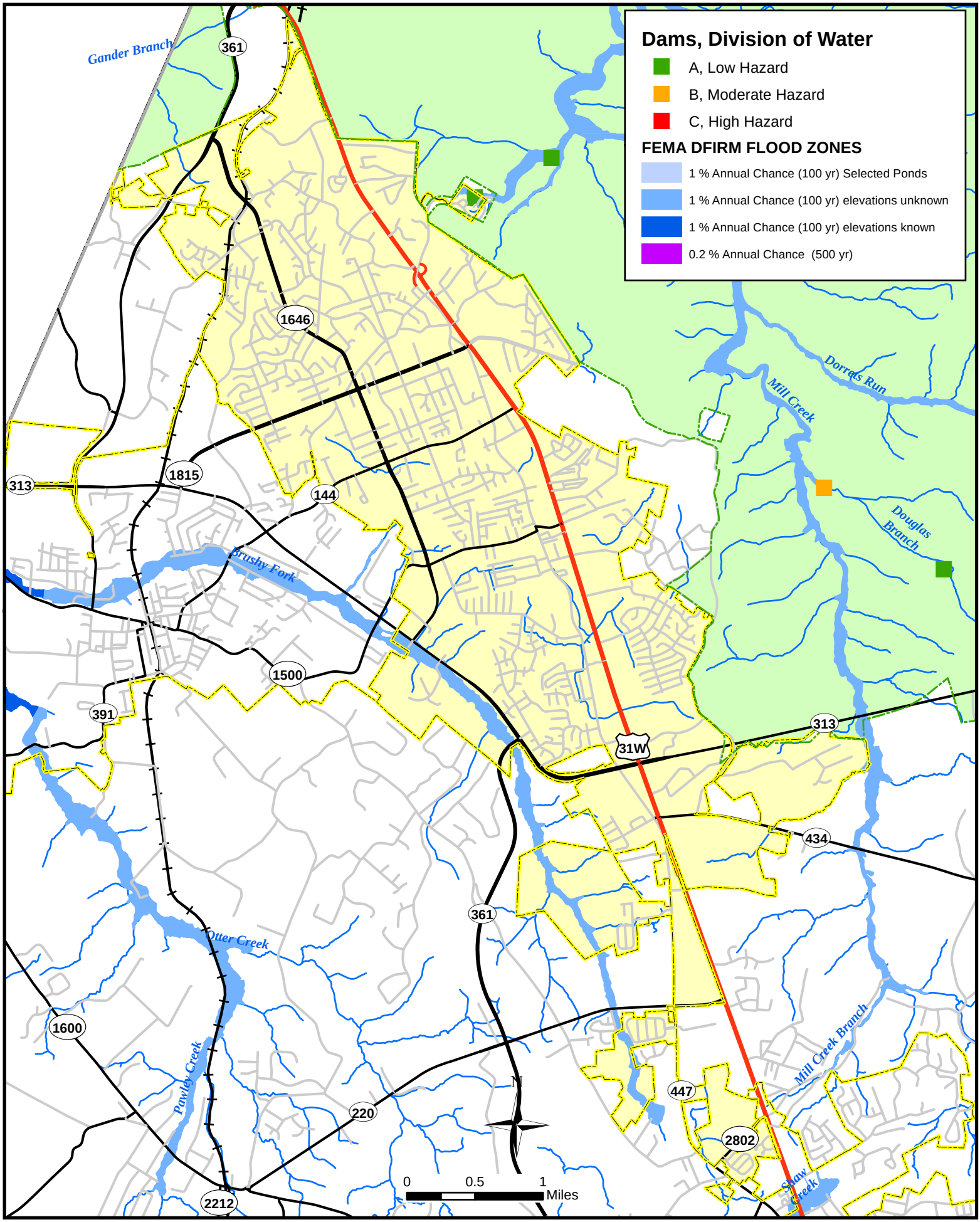
Flood damage in Vine Grove parks, Spring 2008. *Photos courtesy of City of Vine Grove.*

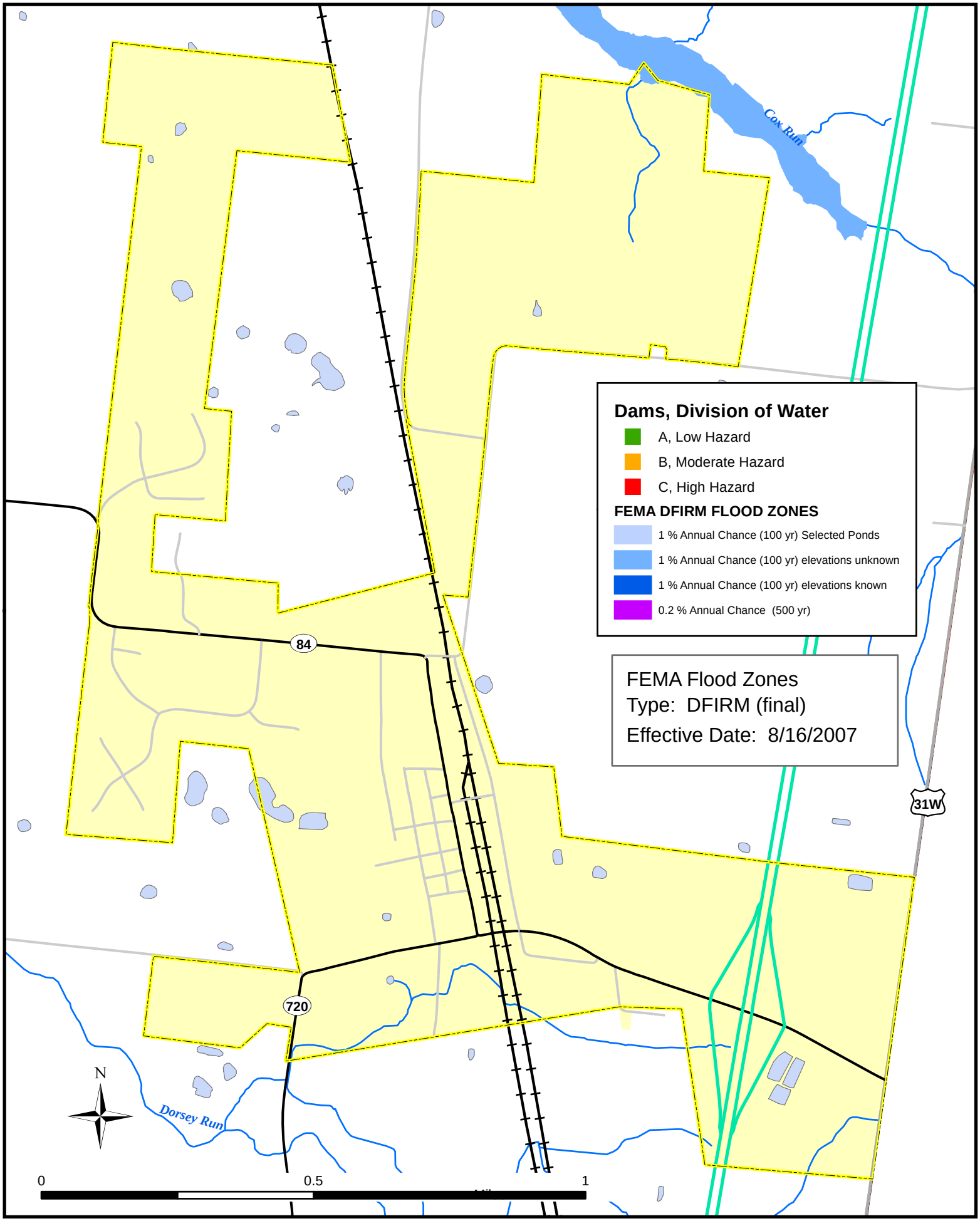
2011 Flooding in Vine Grove - Cars under water. *Photo courtesy of the City of Vine Grove*

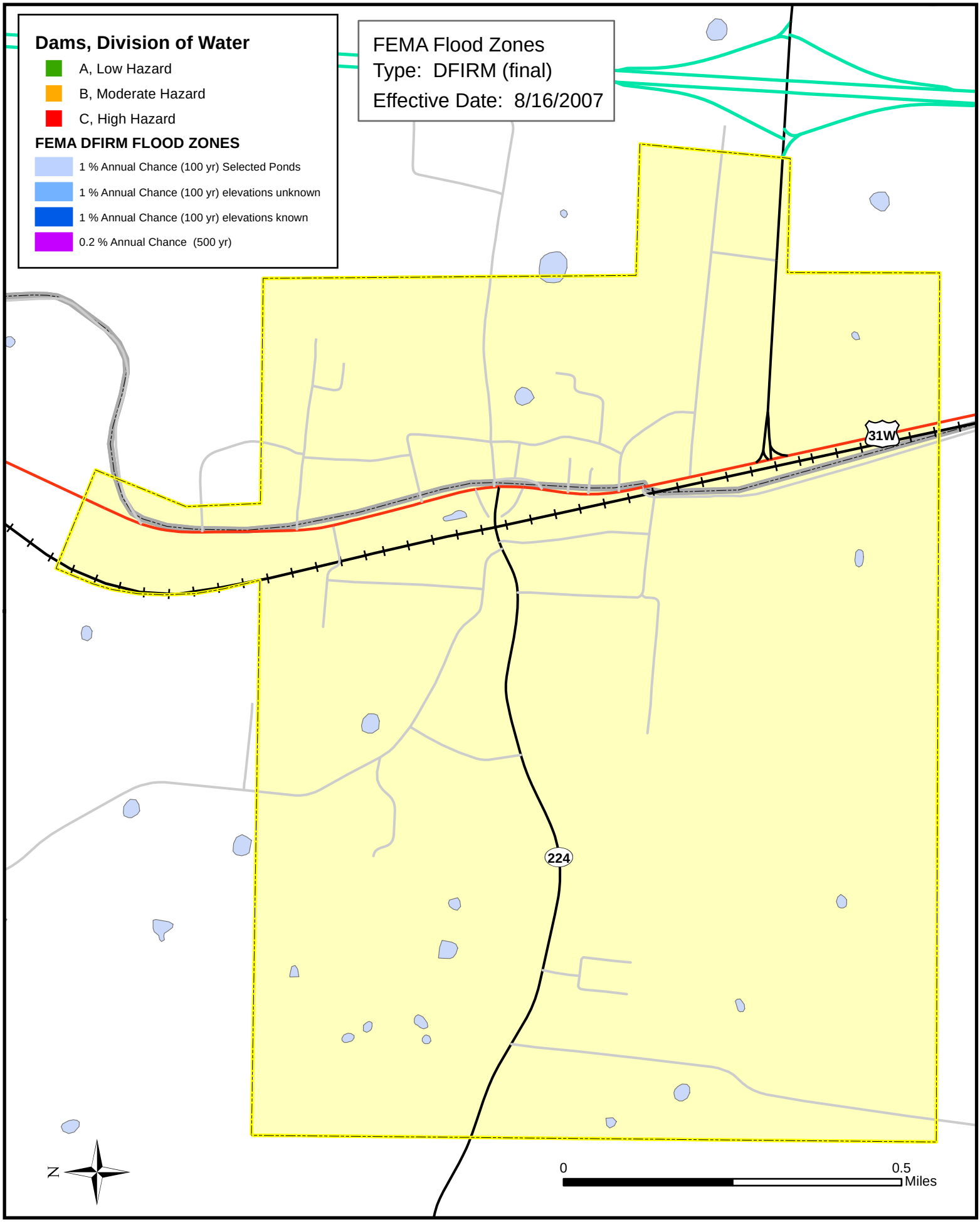
2011 Flooding in Vine Grove - Zoom of previous photo. *Photo courtesy of the City of Vine Grove*

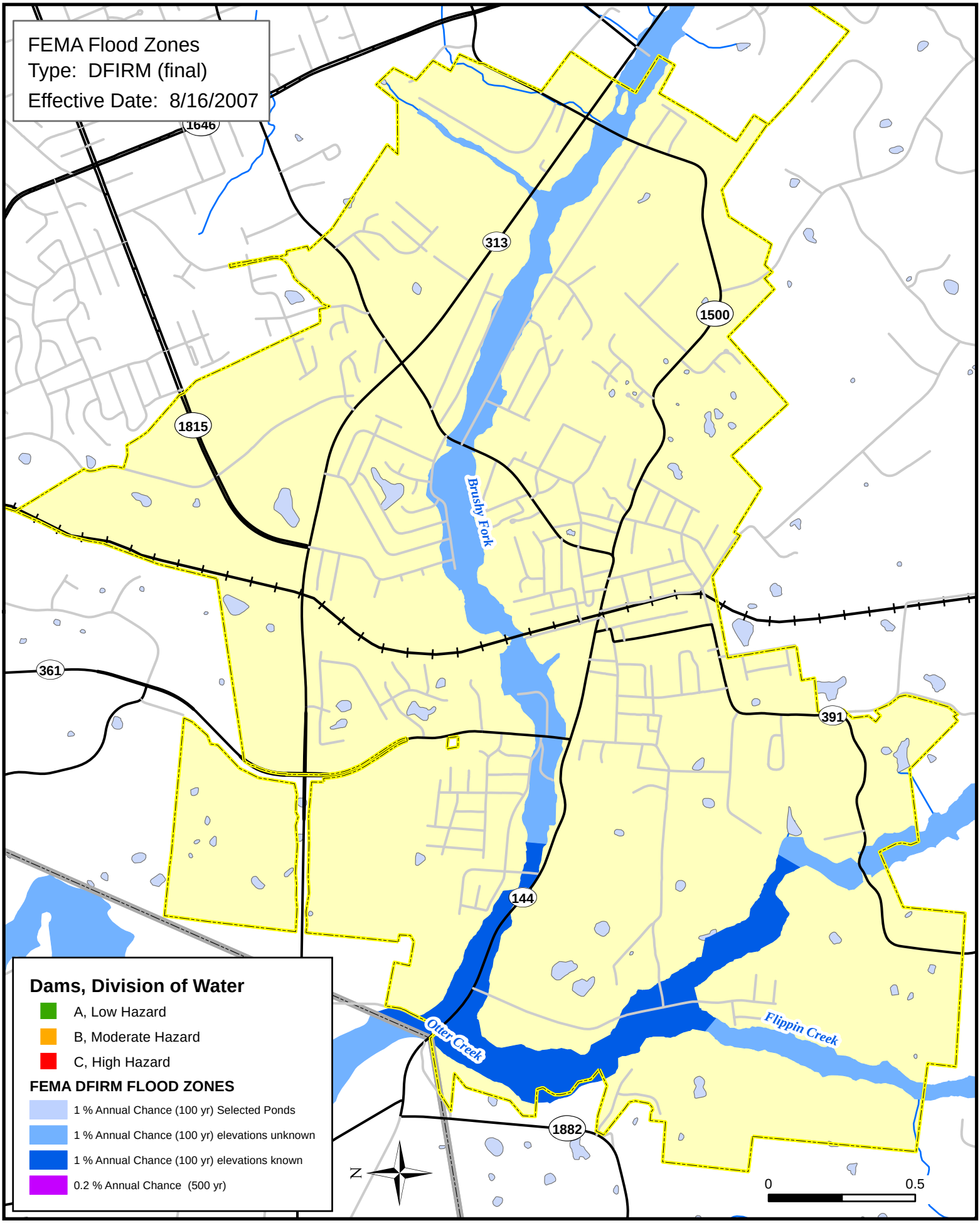

FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 8/16/2007
Fort Knox
31W
361
144
1500
391
313
2199
220
920
1375
2213
361
434
62
251
65
220
1600
583
3005
1538
1357
567
86
253
920
210
1904
1136
1375
31W
61
84
84
65
1135
347
222
62
1868
1407
84
1866
720
31W
720
2800
1921
224
N
0
5
Miles

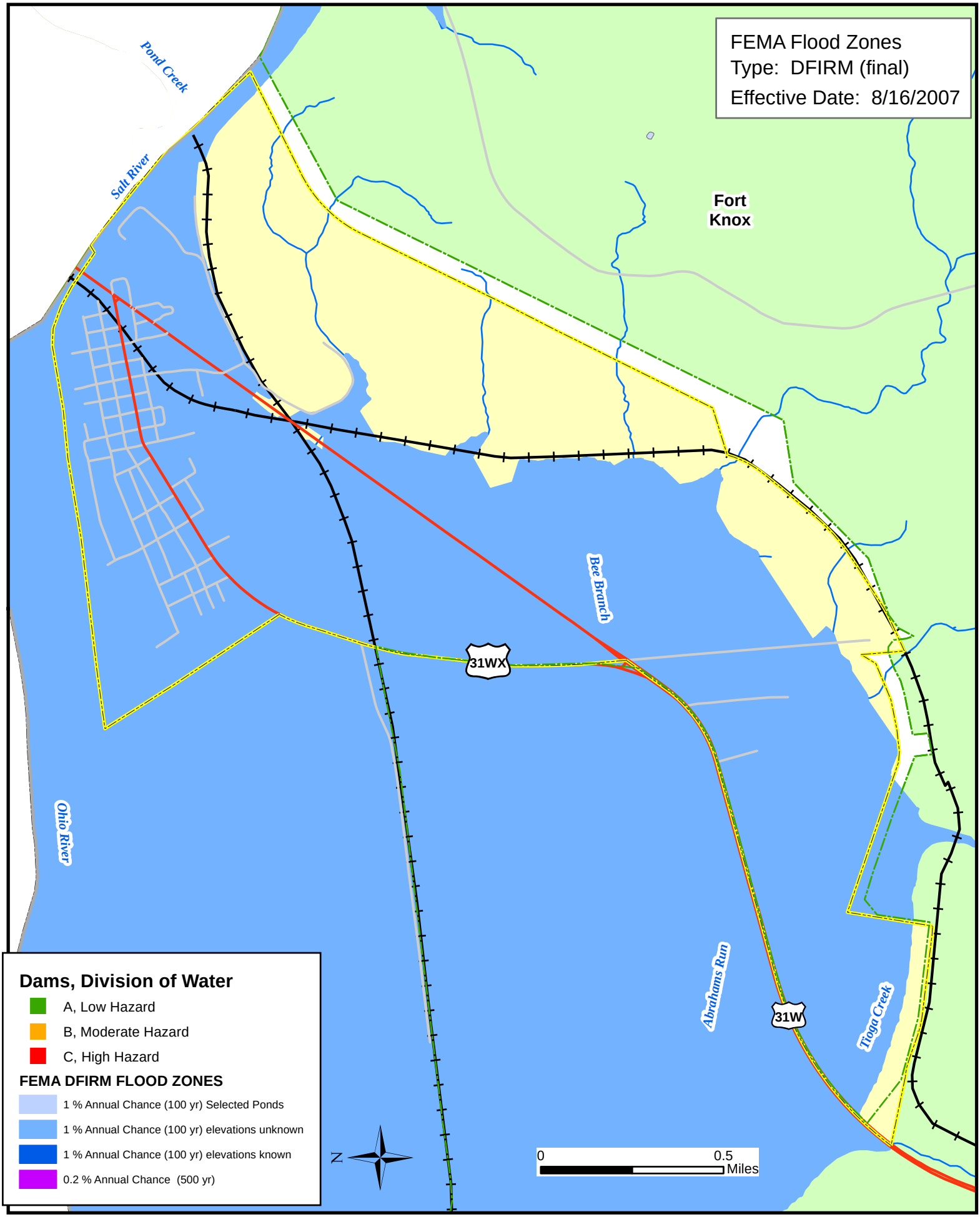

FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 8/16/2007
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
Mill Creek Branch
Otter Creek
Shaw Creek
Freeman Creek
Billy Creek
Valley Creek
Buffalo Creek
Wheeler Branch
West Rhudes Creek
East Rhudes Creek
31W
361
1600
2802
3005
1357
31WB
65
62
567
61
1136
86
1904
210
N
0
0.5
1
Miles


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
Gander Branch
Dorrels Run
Mill Creek
Douglas Branch
Brushy Fork
Otter Creek
Pawley Creek
Mill Creek Branch
Shaw Creek
361
1646
313
1815
144
1500
391
31W
434
1600
220
447
2802
2212
N
0
0.5
1
Miles


Cox Run
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 8/16/2007
84
720
31W
N
Dorsey Run
0
0.5
1


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 8/16/2007
31W
224
N
0
0.5
Miles


FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 8/16/2007
1646
313
1500
1815
Brushy Fork
361
391
144
Otter Creek
Flippin Creek
1882
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
N
0
0.5


FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 8/16/2007
Pond Creek
Salt River
Fort Knox
Bee Branch
31WX
Ohio River
Abrahams Run
31W
Tioga Creek
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
N
0
0.5
Miles

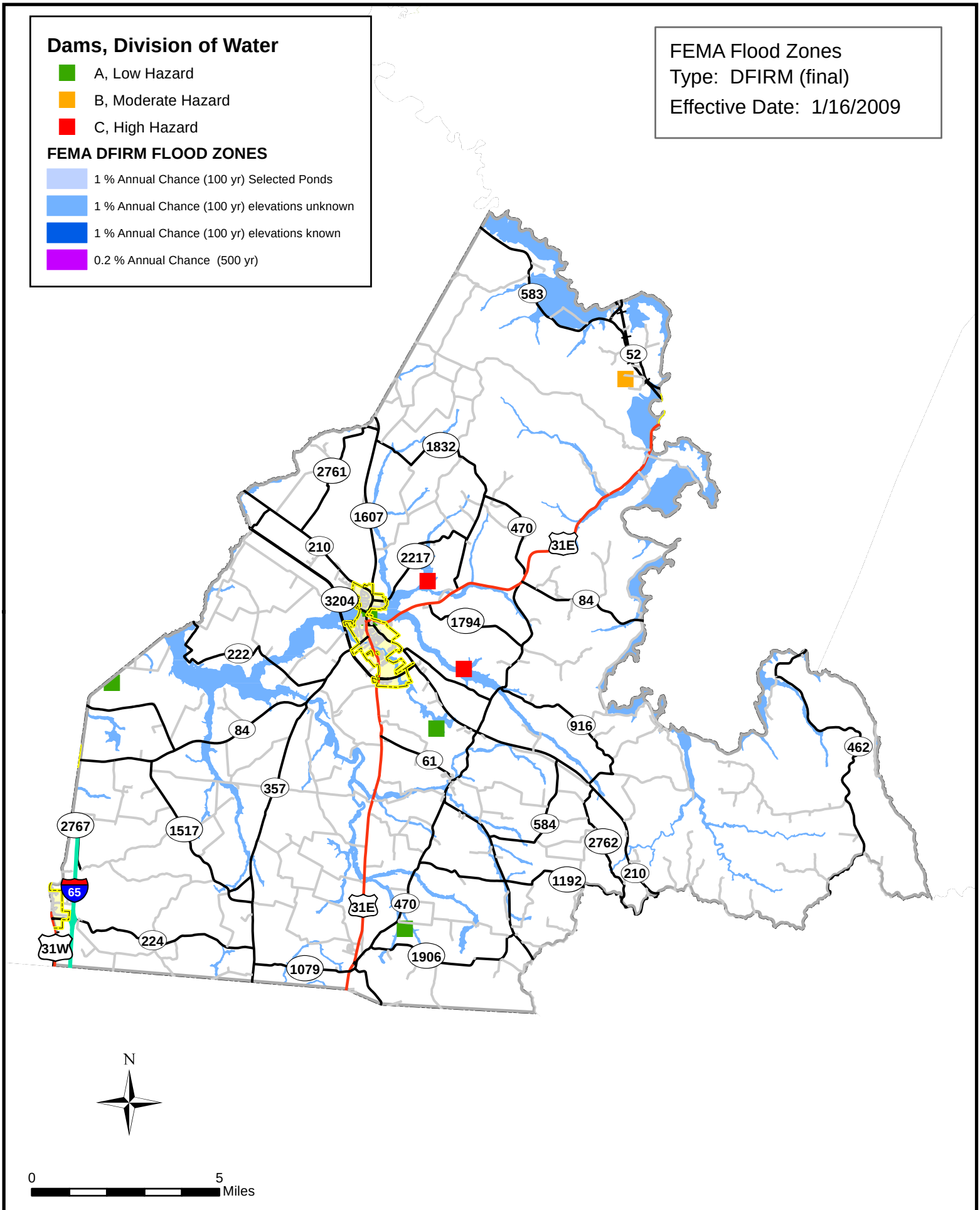
LARUE

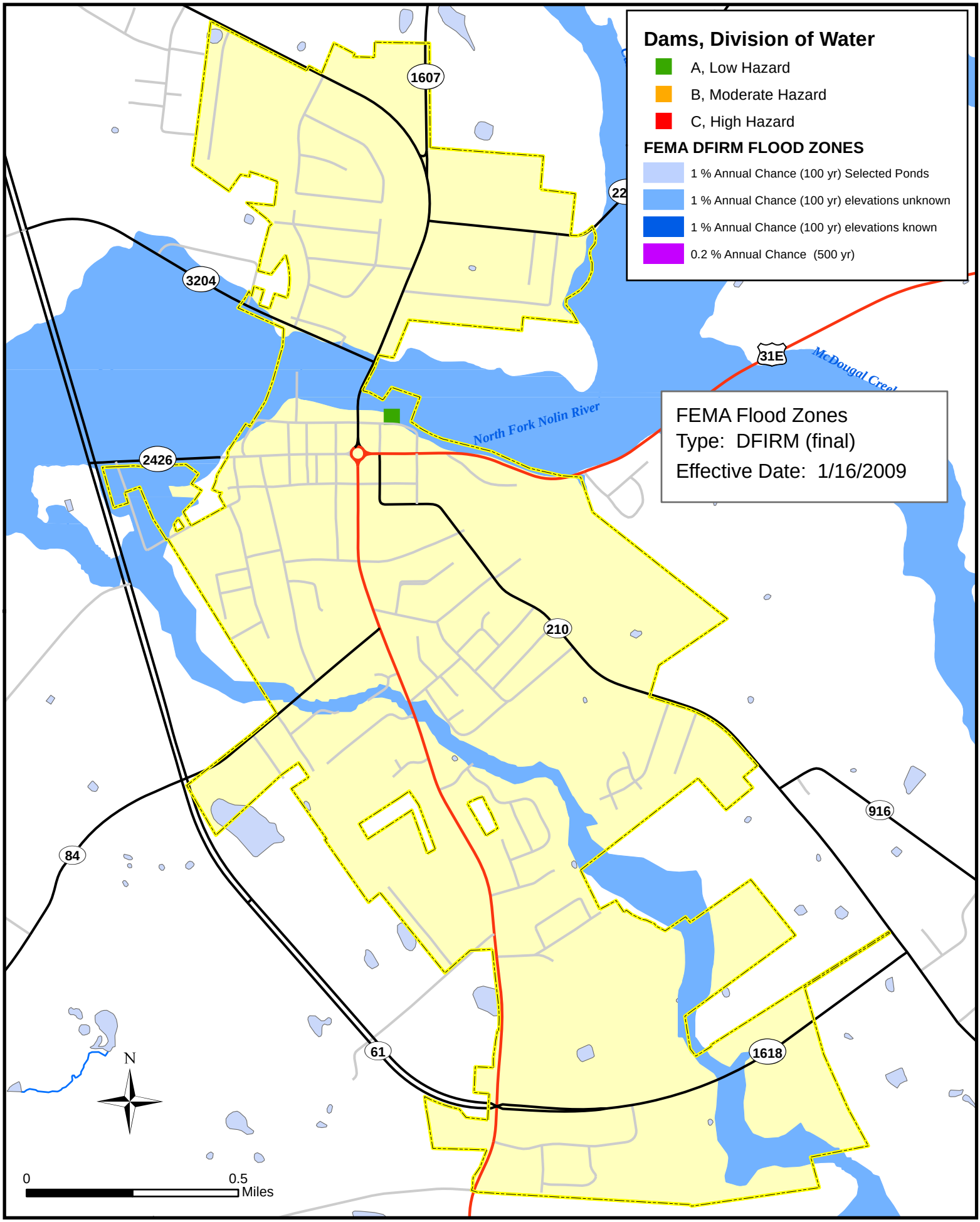
32 FLOOD/FLASHFLOOD event(s) were recorded between 1967 and 6/30/2009 by SHELDUS and the NCDC.

There have been an additional 5 FLOOD/FLASHFLOOD events recorded from 7/1/2009 through 6/30/2015 in NCEI.

| LOCATION | DATE | DEATHS DIRECT | INJURIES DIRECT | PROPERTY DAMAGE ($) | CROP DAMAGE ($) |
|---|---|---|---|---|---|
| GATTON | 5/2/2010 | 0 | 0 | 0 | 0 |
| HODGENVILLE | 4/12/2011 | 0 | 0 | 0 | 0 |
| TANNER | 4/17/2013 | 0 | 0 | 0 | 0 |
| KEMP | 4/3/2014 | 0 | 0 | 0 | 0 |
| LARUE | 3/4/2015 | 0 | 0 | 0 | 0 |

Flooding in Hodgenville. *Photo courtesy of City of Hodgenville.*


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 1/16/2009
583
52
1832
2761
1607
470
31E
210
2217
3204
84
1794
222
916
462
61
357
2767
1517
584
2762
210
1192
65
31E
470
31W
224
1906
1079
N
0
5
Miles


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 1/16/2009
North Fork Nolin River
McDougal Creek
1607
3204
2426
31E
210
916
84
61
1618
N
0
0.5
Miles

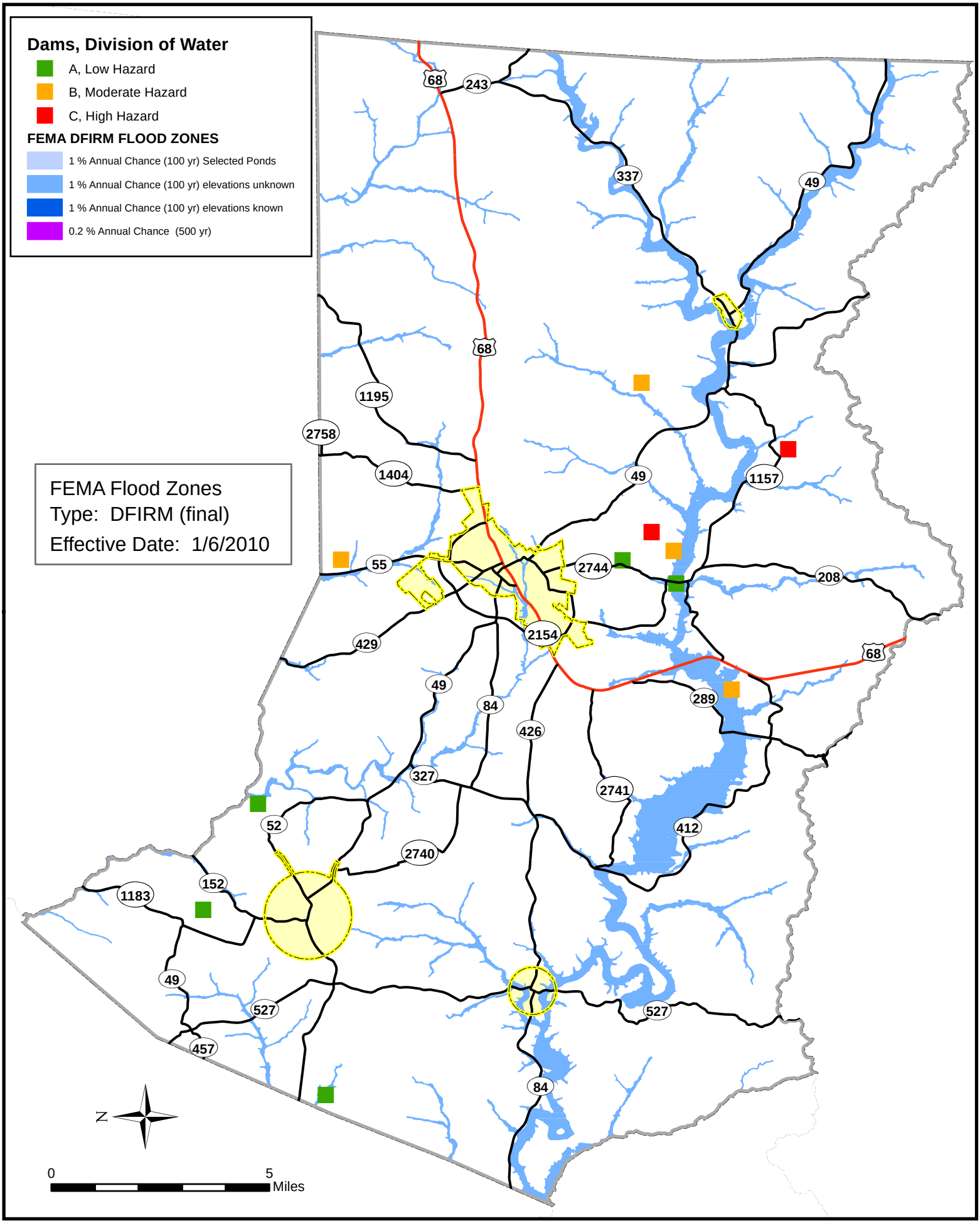
MARION

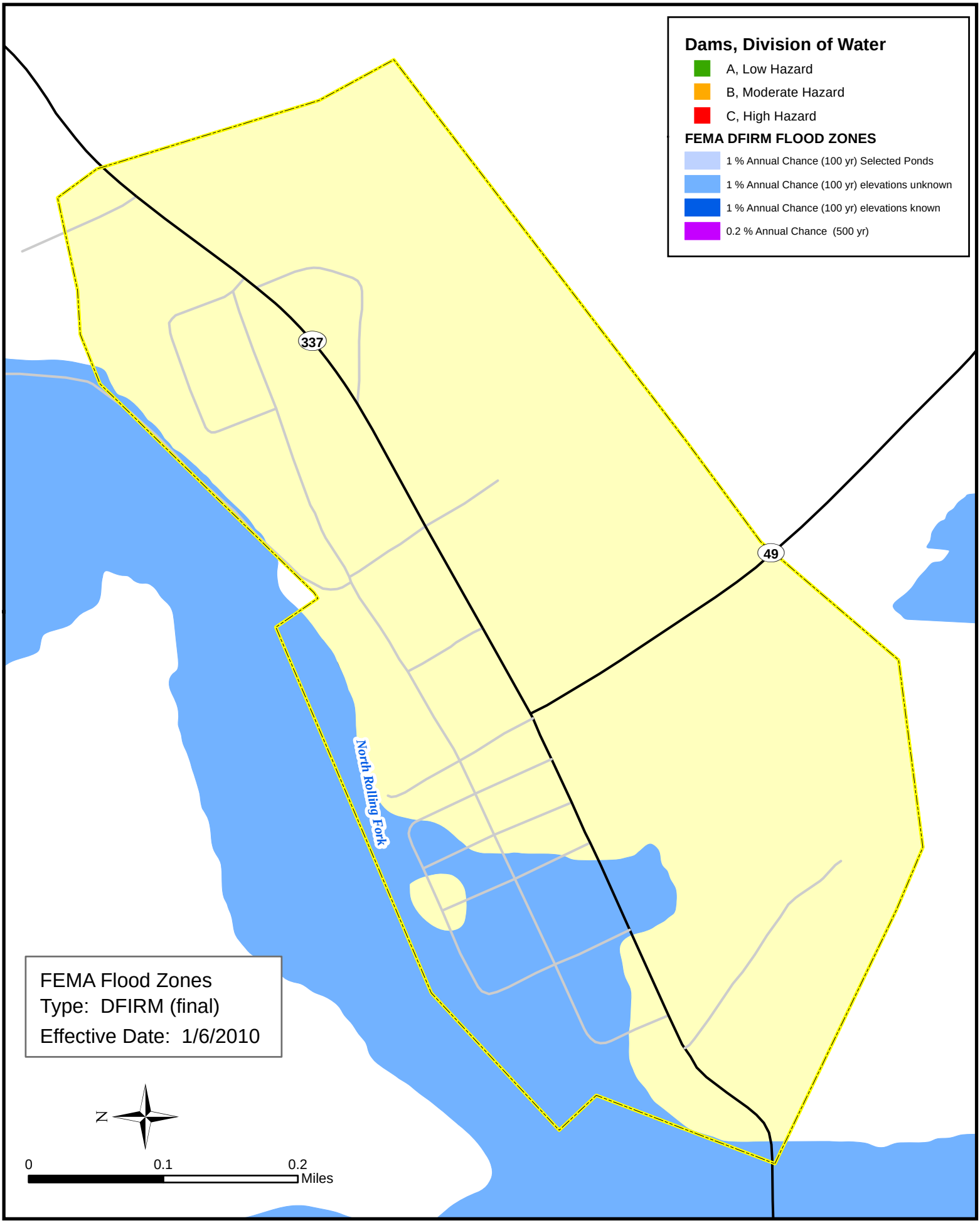
37 FLOOD/FLASHFLOOD event(s) were recorded between 1967 and 6/30/2009 by SHELDUS and the NCDC.

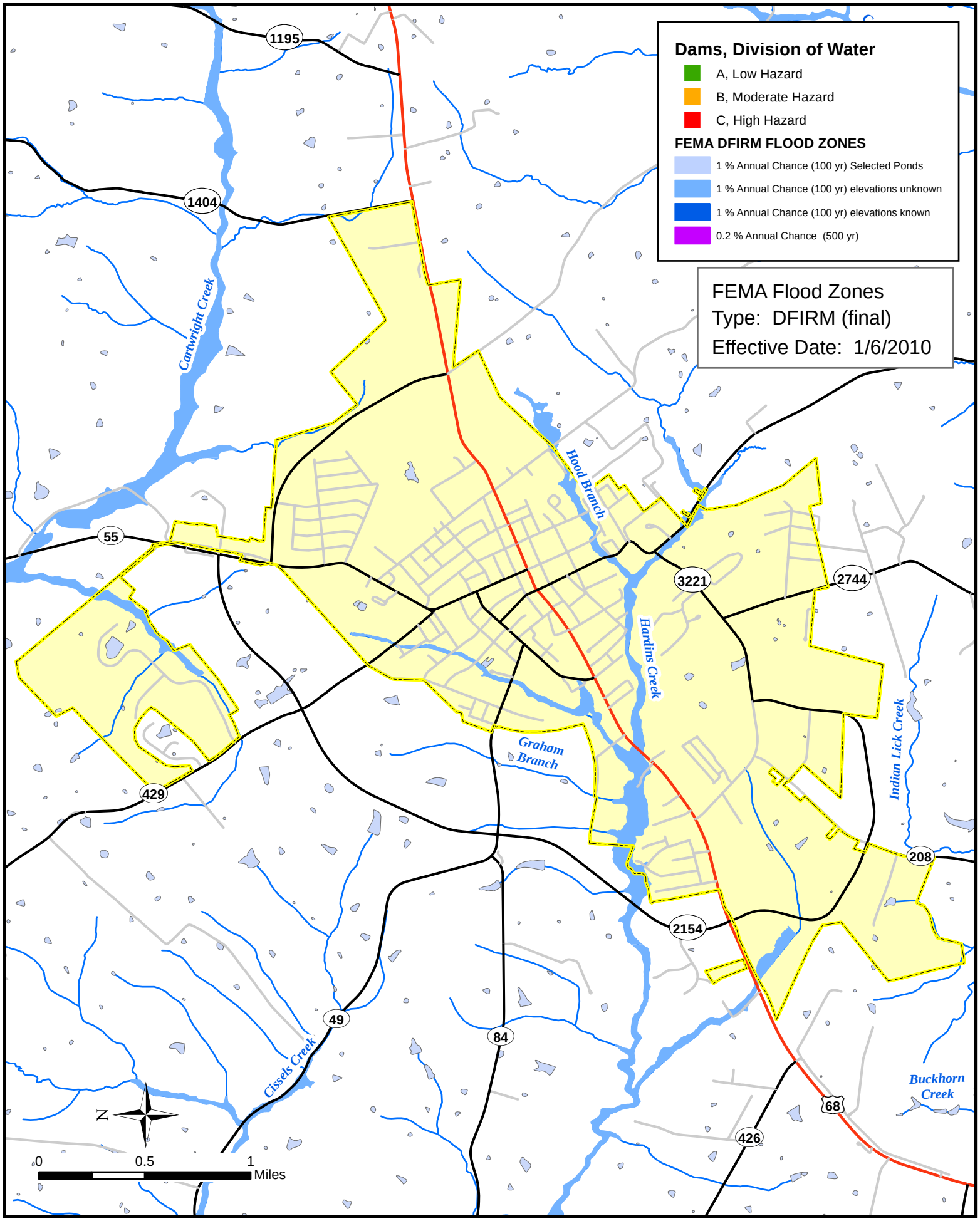
There have been an additional 7 FLOOD/FLASHFLOOD events recorded from 7/1/2009 through 6/30/2015 in NCEI.

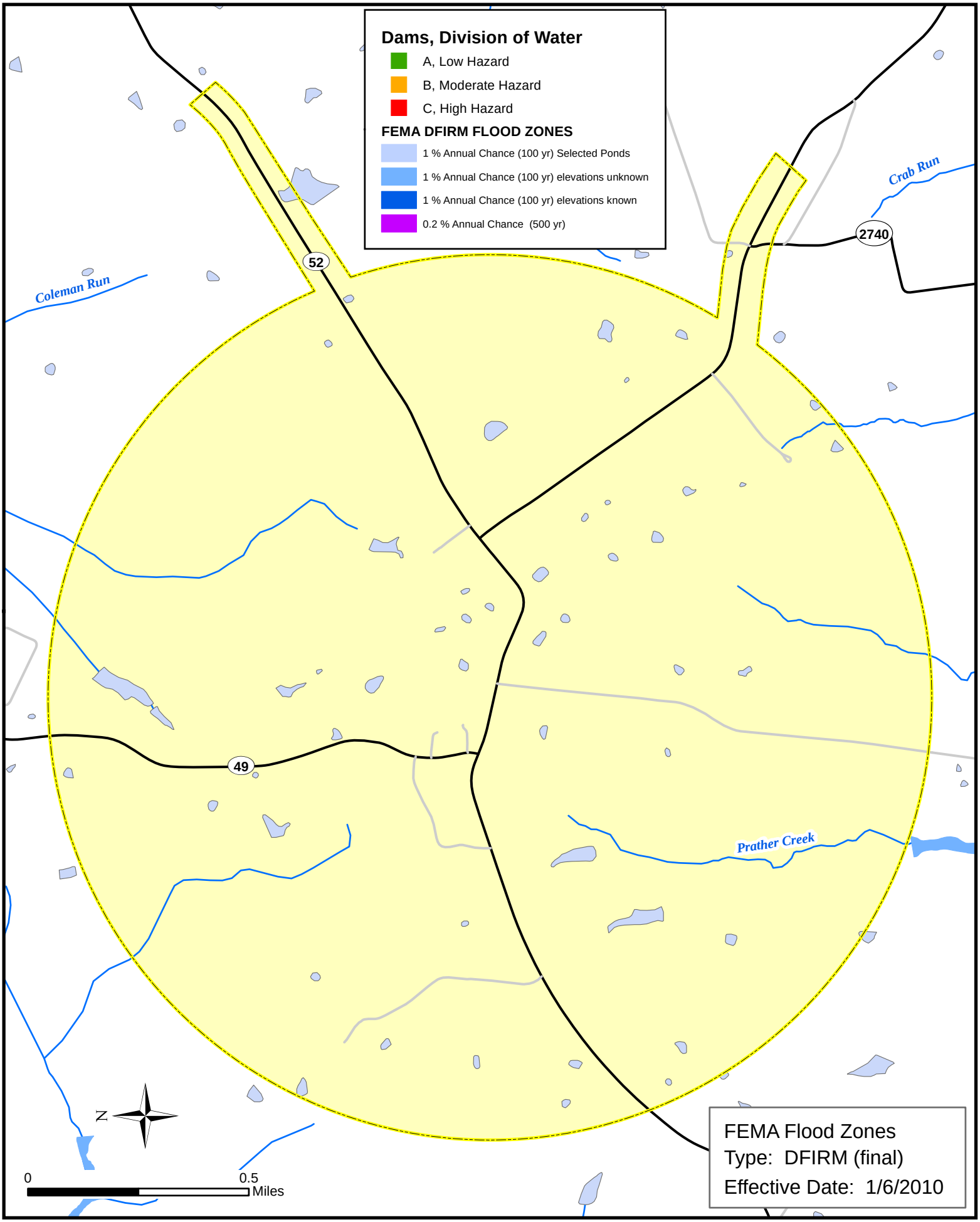
| LOCATION | DATE | DEATHS DIRECT | INJURIES DIRECT | PROPERTY DAMAGE ($) | CROP DAMAGE ($) |
|---|---|---|---|---|---|
| PENICKS | 9/21/2009 | 0 | 0 | 0 | 0 |
| CALVARY | 9/21/2009 | 0 | 0 | 0 | 0 |
| RAYWICK | 5/2/2010 | 0 | 0 | 2000 | 0 |
| CALVARY | 11/28/2011 | 0 | 0 | 0 | 0 |
| LEBANON | 6/17/2013 | 0 | 0 | 20000 | 0 |
| LEBANON | 8/11/2014 | 0 | 0 | 50000 | 0 |
| MARION | 3/4/2015 | 0 | 0 | 0 | 0 |

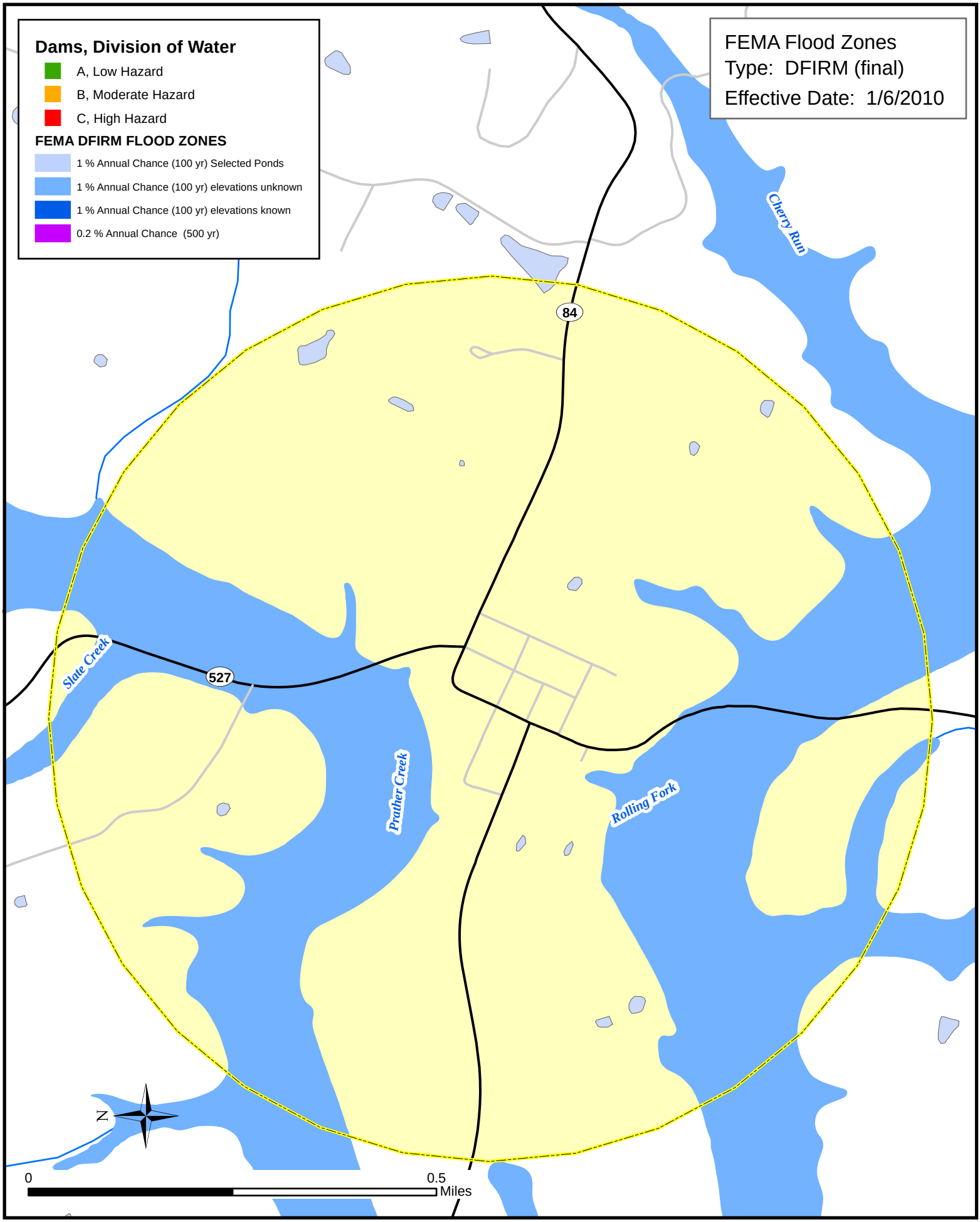

Bradfordsville, North Rolling Fork Flooding, March 2015, *Photo: David Edelen.*


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 1/6/2010
68
243
337
49
68
1195
2758
1404
49
1157
55
2744
208
2154
429
68
49
84
289
426
327
2741
52
412
2740
152
1183
49
527
527
457
84
N
0
5
Miles


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
337
49
North Rolling Fork
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 1/6/2010
N
0
0.1
0.2
Miles


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 1/6/2010
1195
1404
55
429
49
84
2154
208
68
426
3221
2744
Cartwright Creek
Hood Branch
Hardins Creek
Graham Branch
Indian Lick Creek
Cissels Creek
Buckhorn Creek
N
0
0.5
1
Miles


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
Coleman Run
Crab Run
Prather Creek
52
49
2740
N
0
0.5
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 1/6/2010

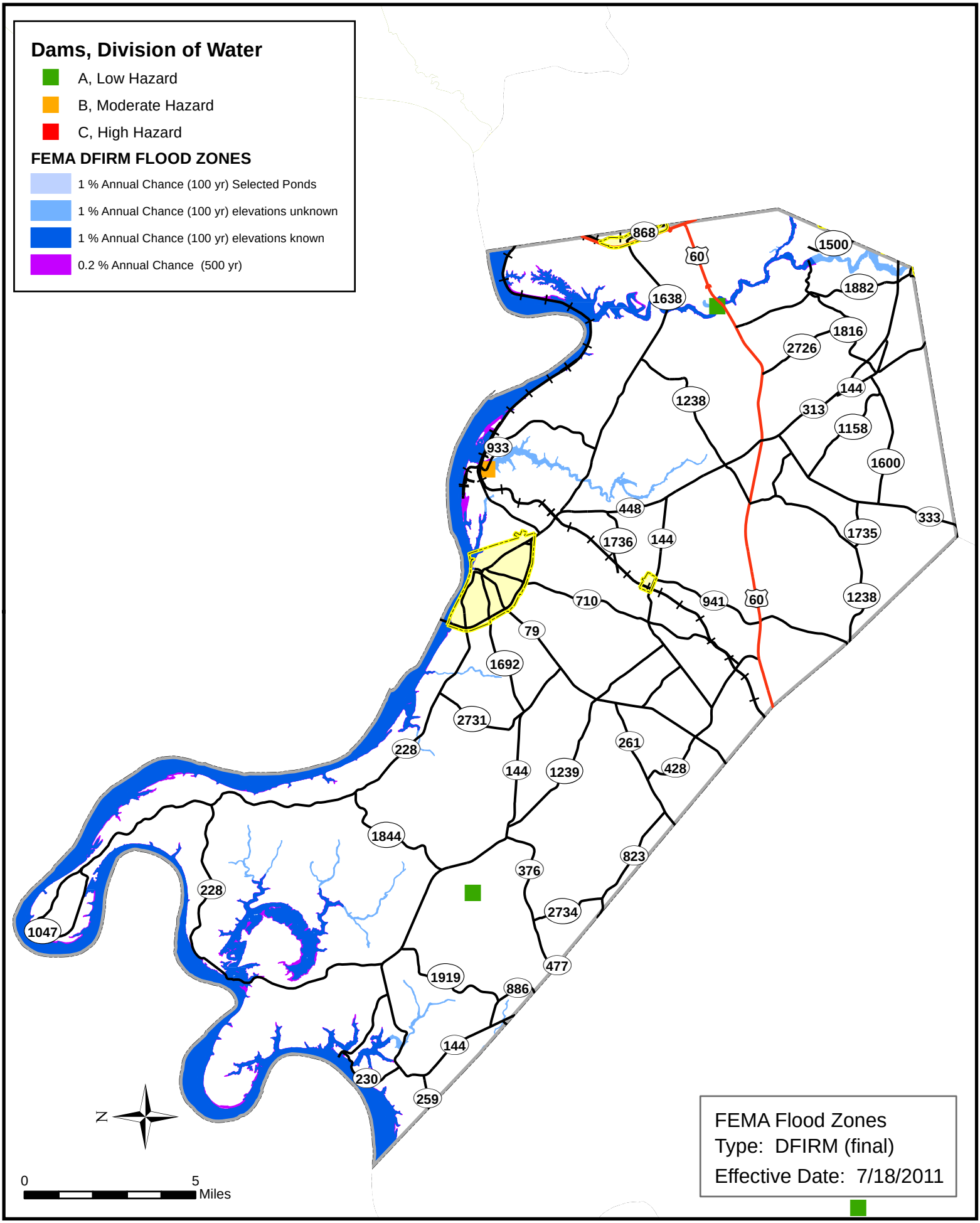

Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 1/6/2010
Cherry Run
84
Slate Creek
527
Prather Creek
Rolling Fork
N
0
0.5
Miles

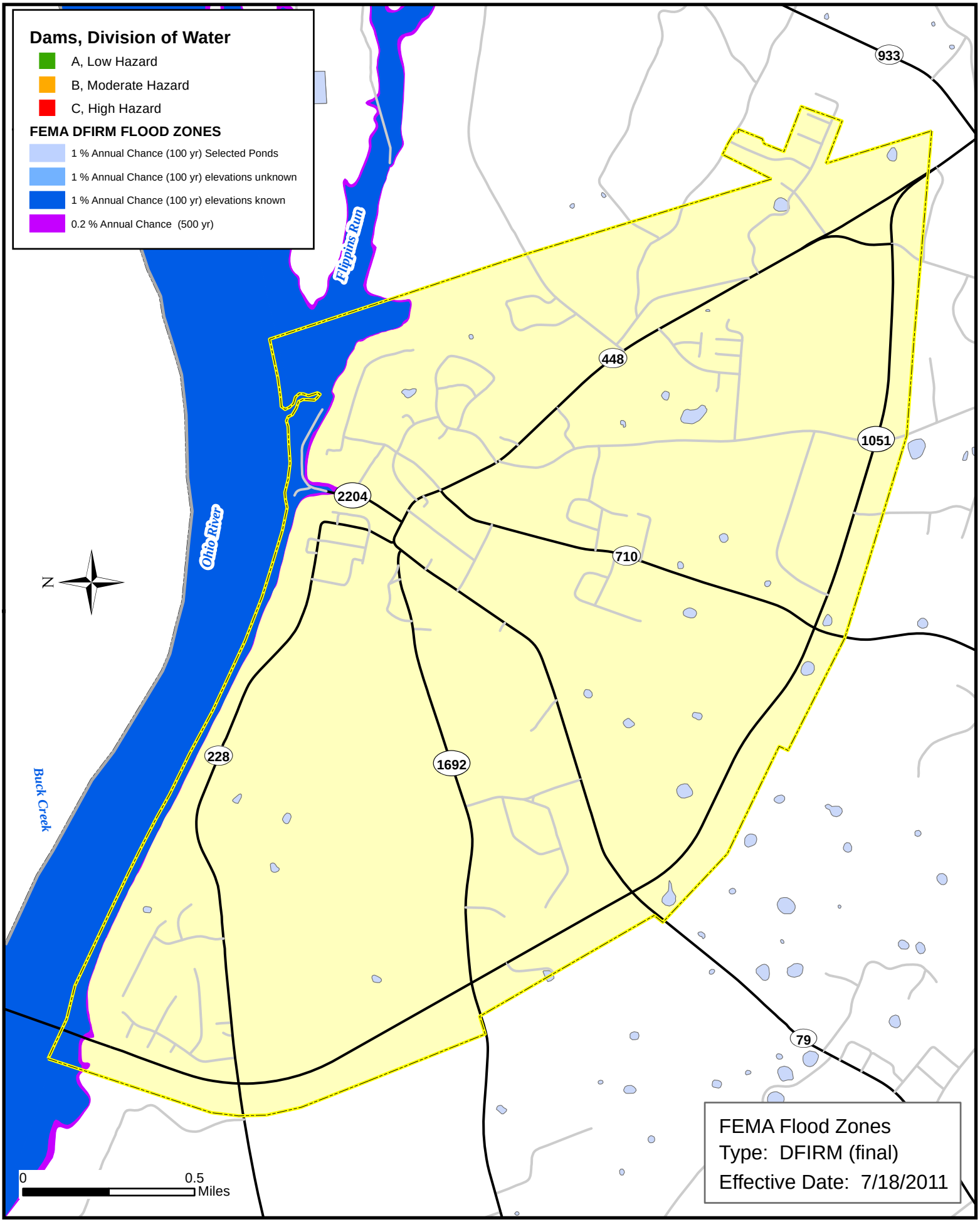
MEADE

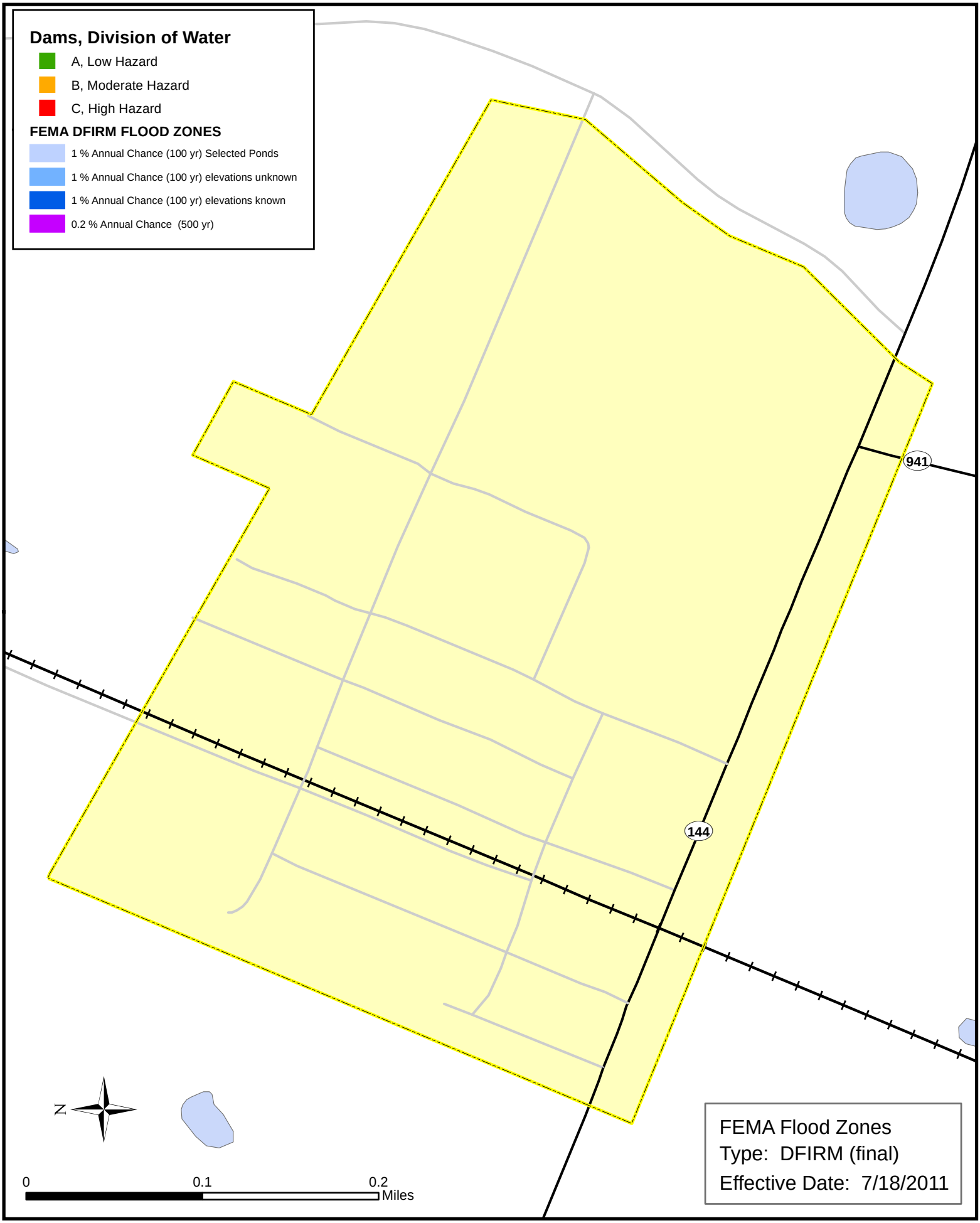
37 FLOOD/FLASHFLOOD event(s) were recorded between 1967 and 6/30/2009 by SHELDUS and the NCDC.

There have been an additional 5 FLOOD/FLASHFLOOD events recorded from 7/1/2009 through 6/30/2015 in NCEI.

| LOCATION | DATE | DEATHS DIRECT | INJURIES DIRECT | PROPERTY DAMAGE ($) | CROP DAMAGE ($) |
|---|---|---|---|---|---|
| HAYSVILLE | 5/2/2010 | 0 | 0 | 0 | 0 |
| FLAHERTY | 7/12/2011 | 0 | 0 | 0 | 0 |
| MIDWAY | 7/27/2014 | 0 | 0 | 0 | 20000 |
| BUCK GROVE | 7/27/2014 | 0 | 0 | 0 | 0 |
| MEADE | 4/3/2015 | 0 | 0 | 0 | 0 |


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
868
60
1500
1882
1638
1816
2726
144
1238
313
1158
933
1600
448
333
1735
1736
144
710
941
60
1238
79
1692
2731
228
261
144
1239
428
1844
823
376
228
2734
1047
477
1919
886
144
230
259
N
0
5
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 7/18/2011


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
Flippins Run
Ohio River
Buck Creek
933
448
1051
2204
710
228
1692
79
N
0
0.5
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 7/18/2011

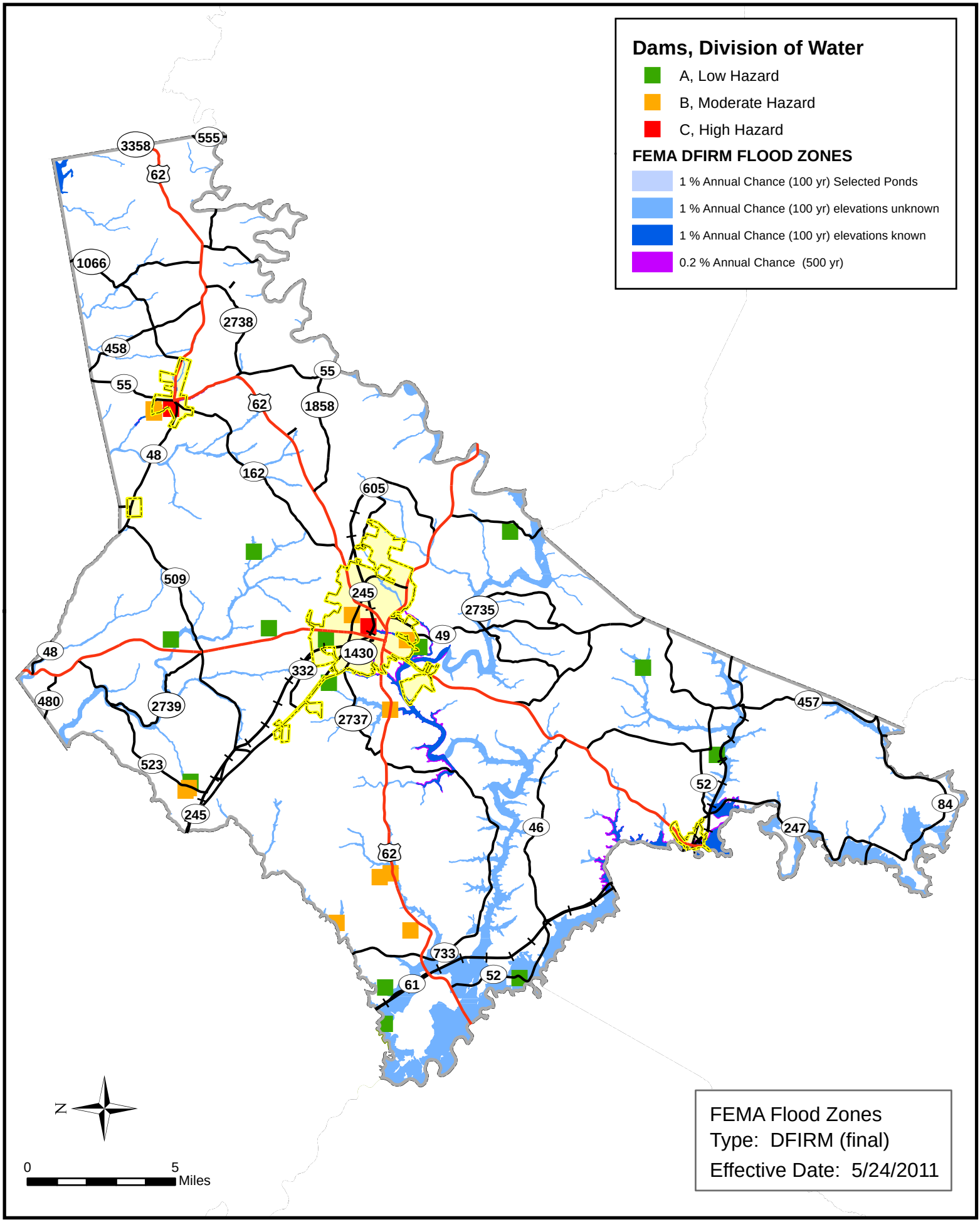

Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
941
144
N
0
0.1
0.2
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 7/18/2011

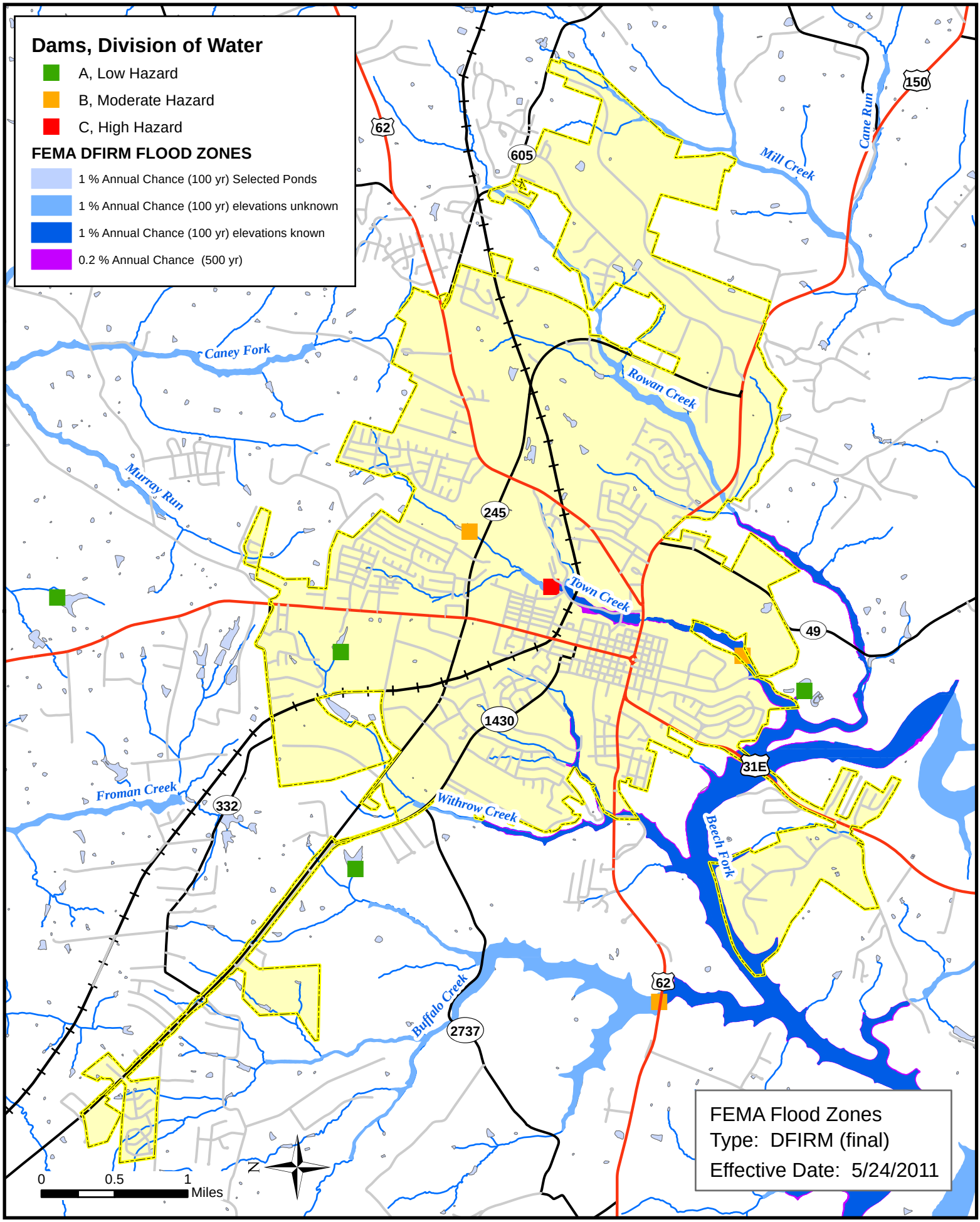
NELSON

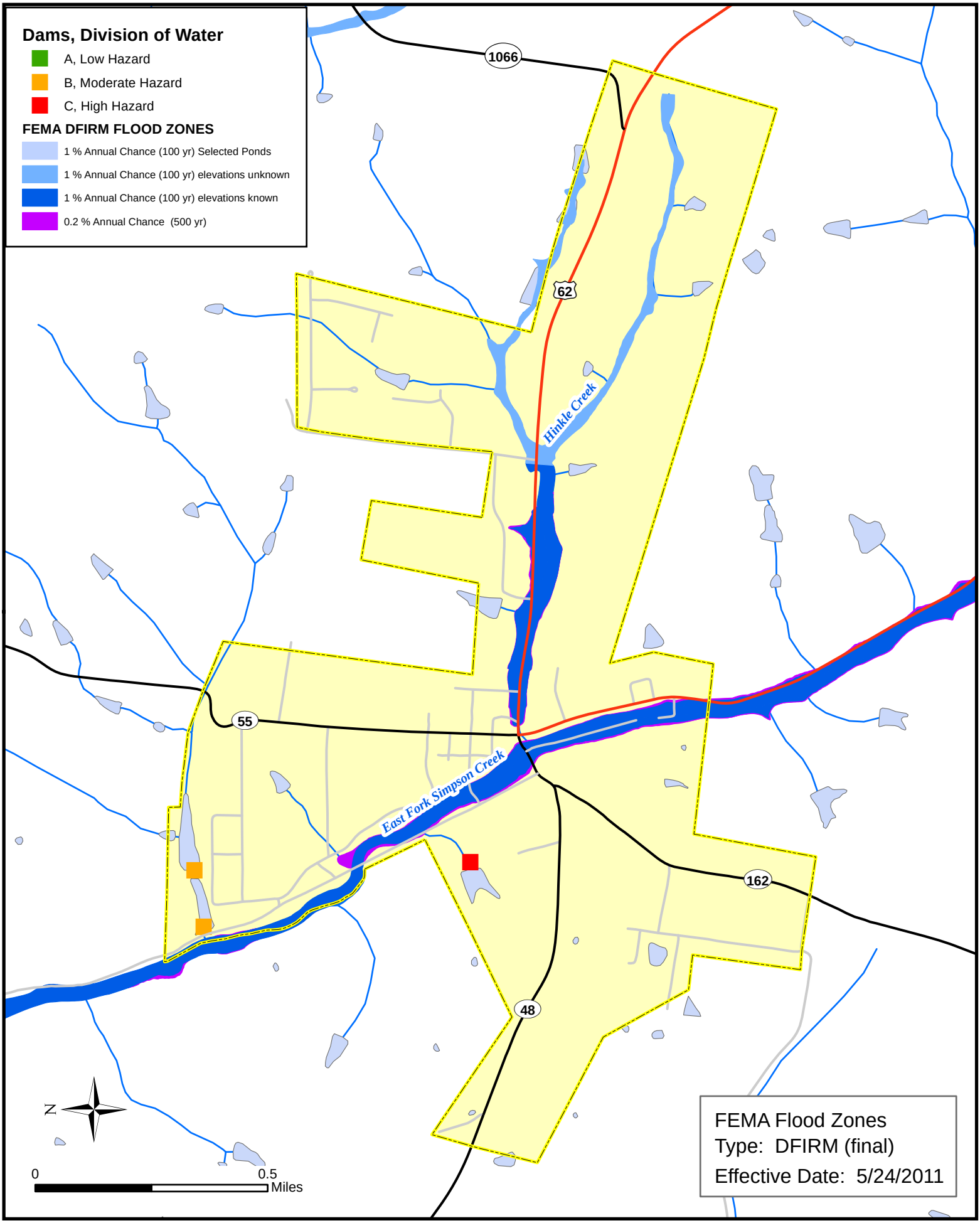
71 FLOOD/FLASHFLOOD event(s) were recorded between 1967 and 6/30/2009 by SHELDUS and the NCDC.

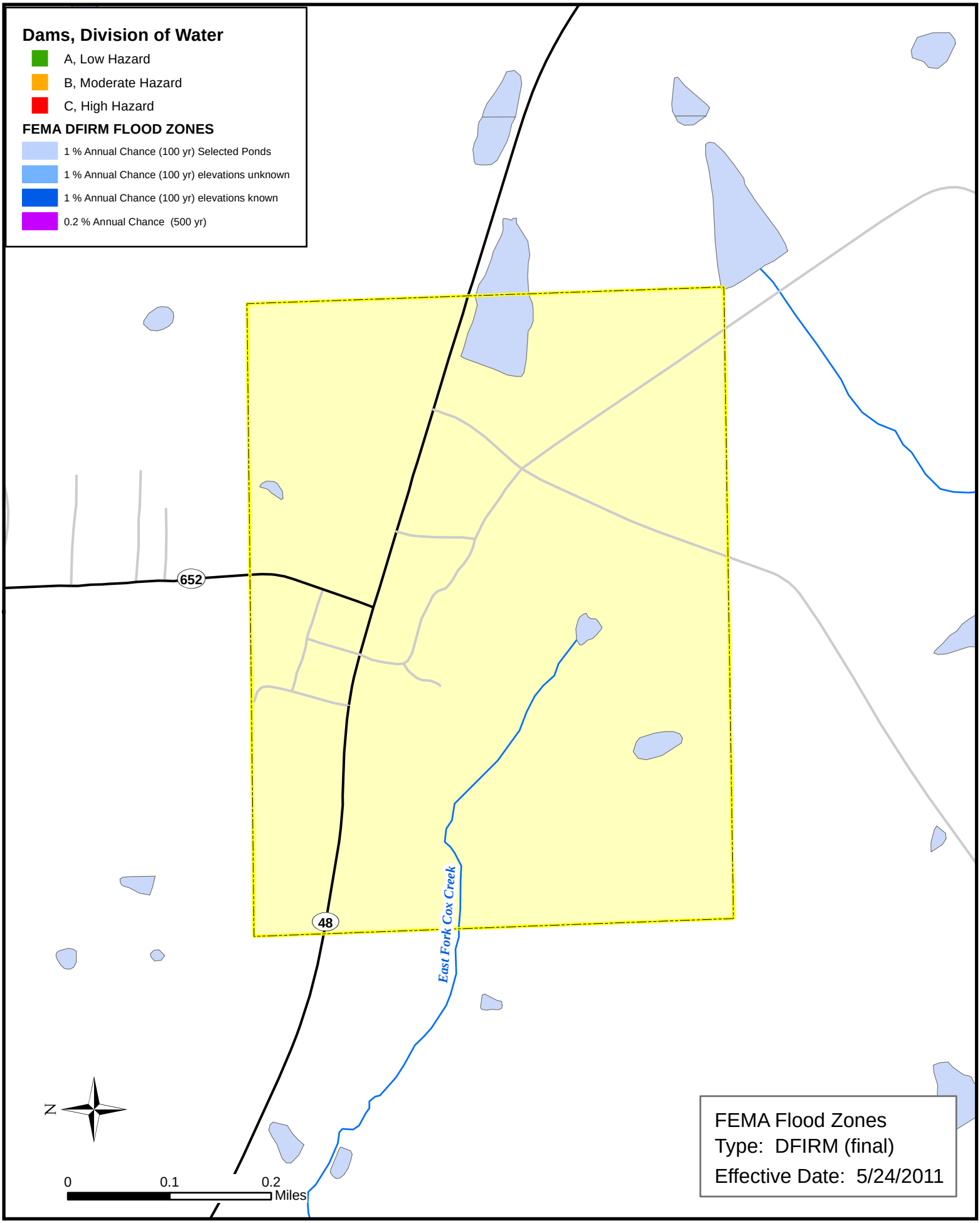
There have been an additional 22 FLOOD/FLASHFLOOD events recorded from 7/1/2009 through 6/30/2015 in NCEI.

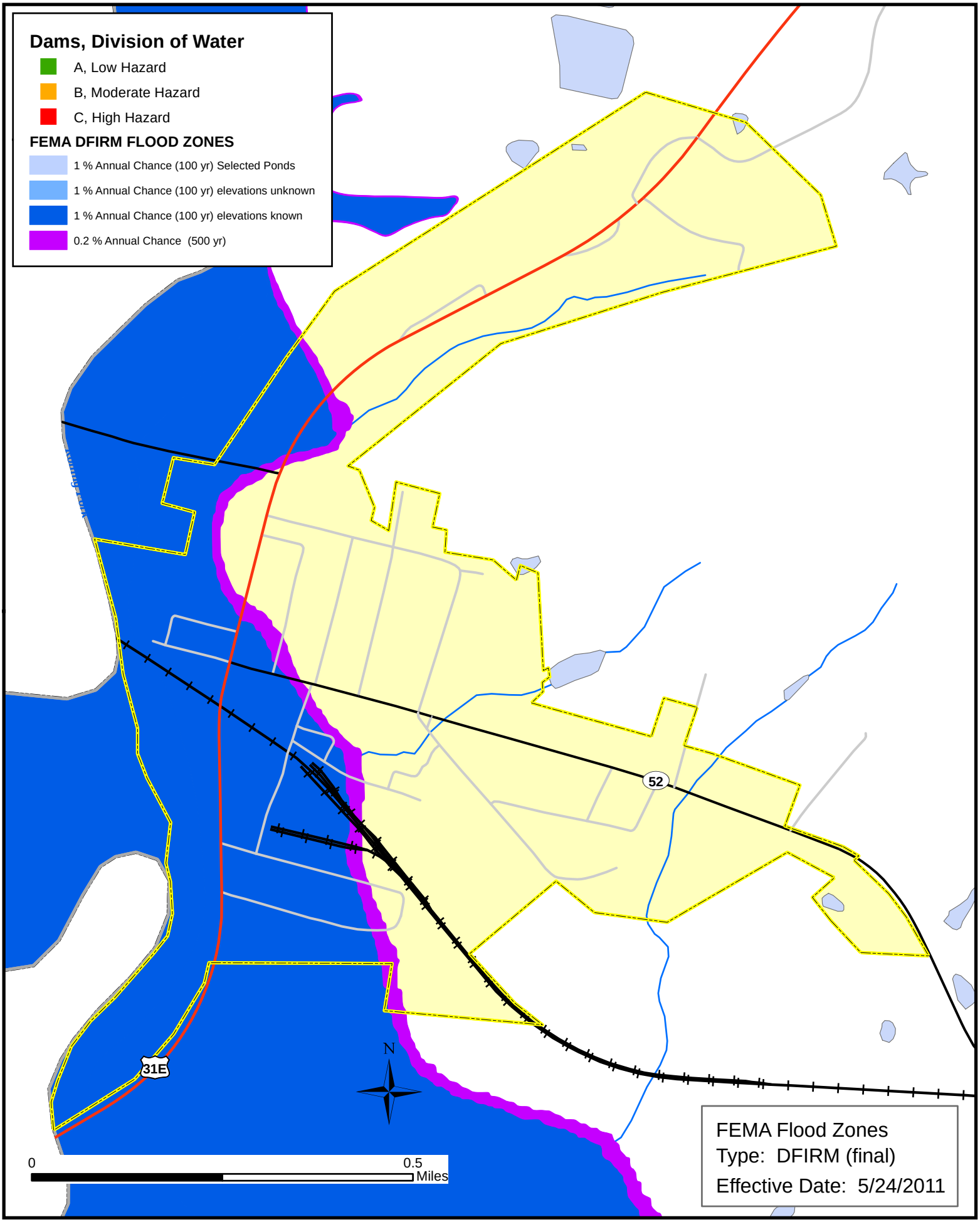
| LOCATION | DATE | DEATHS DIRECT | INJURIES DIRECT | PROPERTY DAMAGE ($) | CROP DAMAGE ($) |
|---|---|---|---|---|---|
| BOSTON | 5/2/2010 | 0 | 0 | 750000 | 0 |
| BOSTON | 3/1/2011 | 0 | 0 | 0 | 0 |
| BOSTON | 3/10/2011 | 0 | 0 | 0 | 0 |
| BOSTON | 4/12/2011 | 0 | 0 | 0 | 0 |
| BOSTON | 4/24/2011 | 0 | 0 | 0 | 0 |
| BOSTON | 5/1/2011 | 0 | 0 | 0 | 0 |
| BOSTON | 5/3/2011 | 0 | 0 | 0 | 0 |
| BOSTON | 11/29/2011 | 0 | 0 | 0 | 0 |
| CULVERTOWN | 11/29/2011 | 0 | 0 | 15000 | 0 |
| BOSTON | 12/1/2011 | 0 | 0 | 0 | 0 |
| BOSTON | 12/7/2011 | 0 | 0 | 0 | 0 |
| BOSTON | 1/15/2013 | 0 | 0 | 0 | 0 |
| BOSTON | 3/20/2013 | 0 | 0 | 0 | 0 |
| BOSTON | 7/6/2013 | 0 | 0 | 0 | 0 |
| GETHSEMANE | 12/21/2013 | 3 | 2 | 15000 | 0 |
| BOSTON | 4/5/2014 | 0 | 0 | 0 | 0 |
| BOSTON | 4/30/2014 | 0 | 0 | 0 | 0 |
| NELSON | 3/5/2015 | 0 | 0 | 0 | 0 |
| NELSON | 3/10/2015 | 0 | 0 | 0 | 0 |
| NELSON | 3/14/2015 | 0 | 0 | 0 | 0 |
| NELSON | 4/4/2015 | 0 | 0 | 0 | 0 |
| NELSON | 4/15/2015 | 0 | 0 | 0 | 0 |


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
3358
555
62
1066
2738
458
55
1858
48
162
605
509
245
2735
49
1430
332
480
2739
2737
457
523
52
84
247
46
733
61
N
0
5
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 5/24/2011


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
62
605
150
Cane Run
Mill Creek
Caney Fork
Rowan Creek
Murray Run
245
Town Creek
49
1430
31E
Froman Creek
332
Withrow Creek
Beech Fork
62
Buffalo Creek
2737
0
0.5
1
Miles
N
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 5/24/2011


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
1066
62
Hinkle Creek
55
East Fork Simpson Creek
162
48
N
0
0.5
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 5/24/2011


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
652
48
East Fork Cox Creek
N
0
0.1
0.2
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 5/24/2011


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
52
31E
N
0
0.5
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 5/24/2011

WASHINGTON

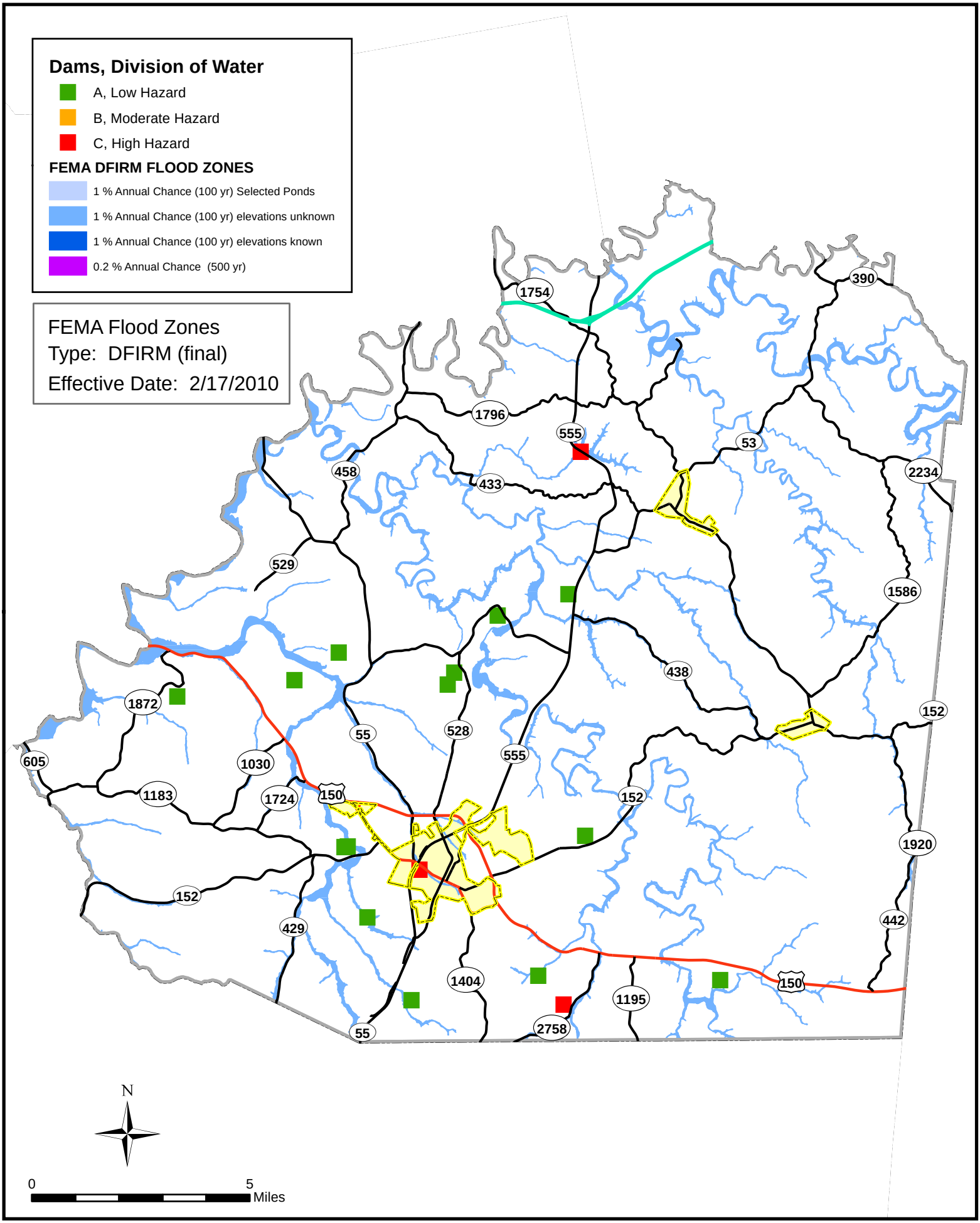
35 FLOOD/FLASHFLOOD event(s) were recorded between 1967 and 6/30/2009 by SHELDUS and the NCDC.

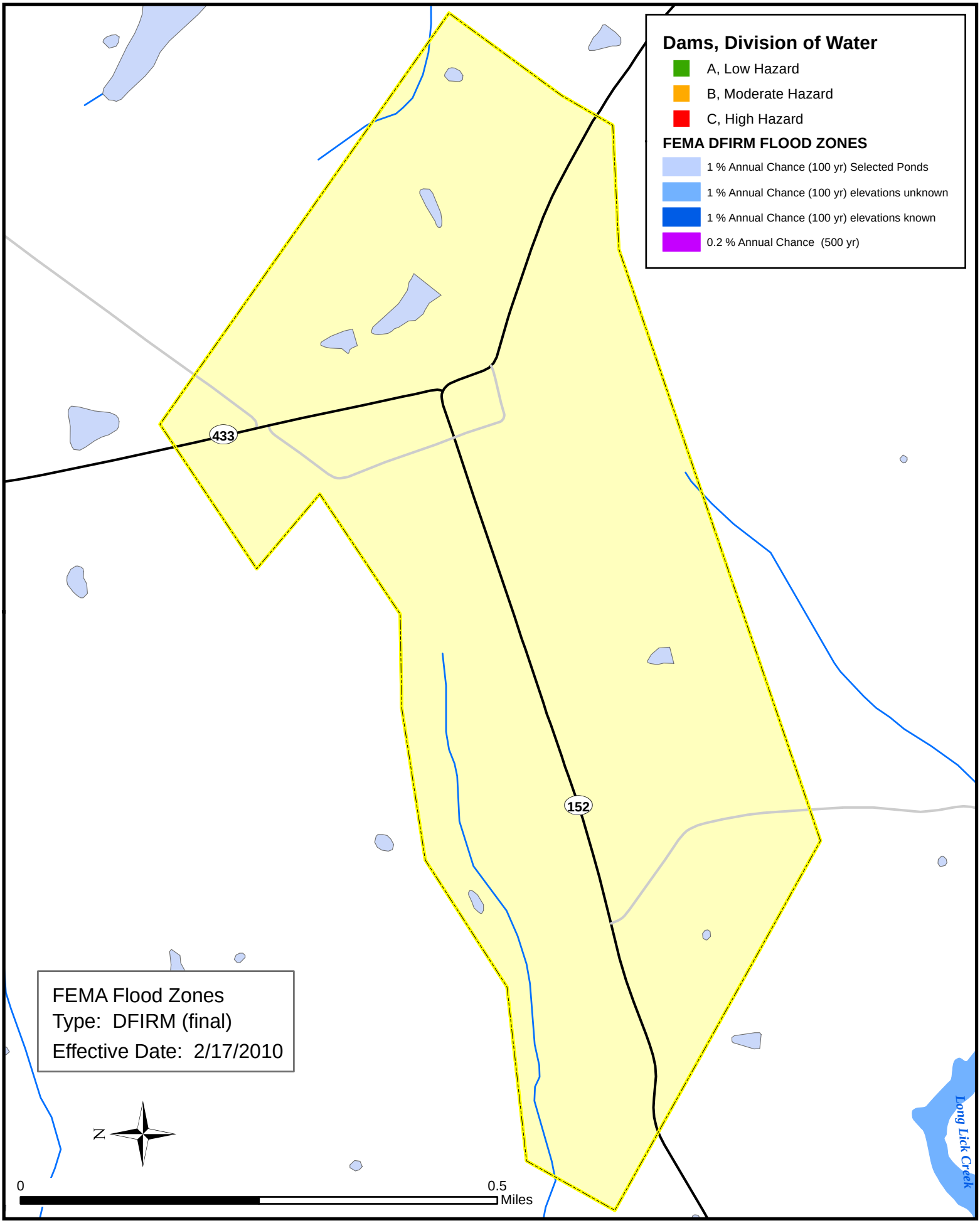
There have been an additional 4 FLOOD/FLASHFLOOD events recorded from 7/1/2009 through 6/30/2015 in NCEI.

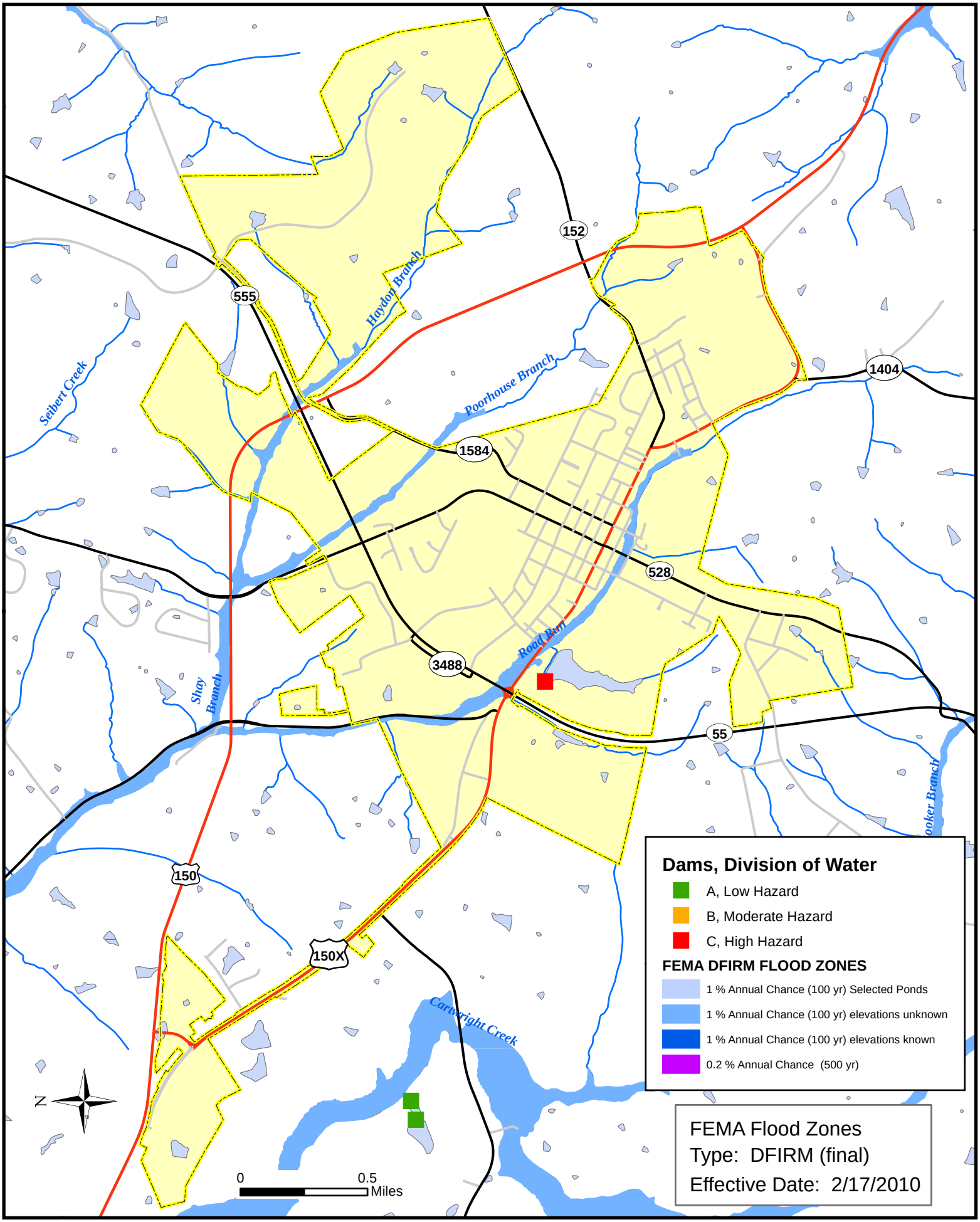
| LOCATION | DATE | DEATHS DIRECT | INJURIES DIRECT | PROPERTY DAMAGE ($) | CROP DAMAGE ($) |
|---|---|---|---|---|---|
| SPRINGFIELD | 5/2/2010 | 0 | 0 | 75000 | 0 |
| SPRINGFIELD | 4/12/2011 | 0 | 0 | 0 | 0 |
| TATHAM SPGS | 7/6/2013 | 0 | 0 | 0 | 0 |
| WASHINGTON | 4/14/2015 | 0 | 0 | 0 | 0 |

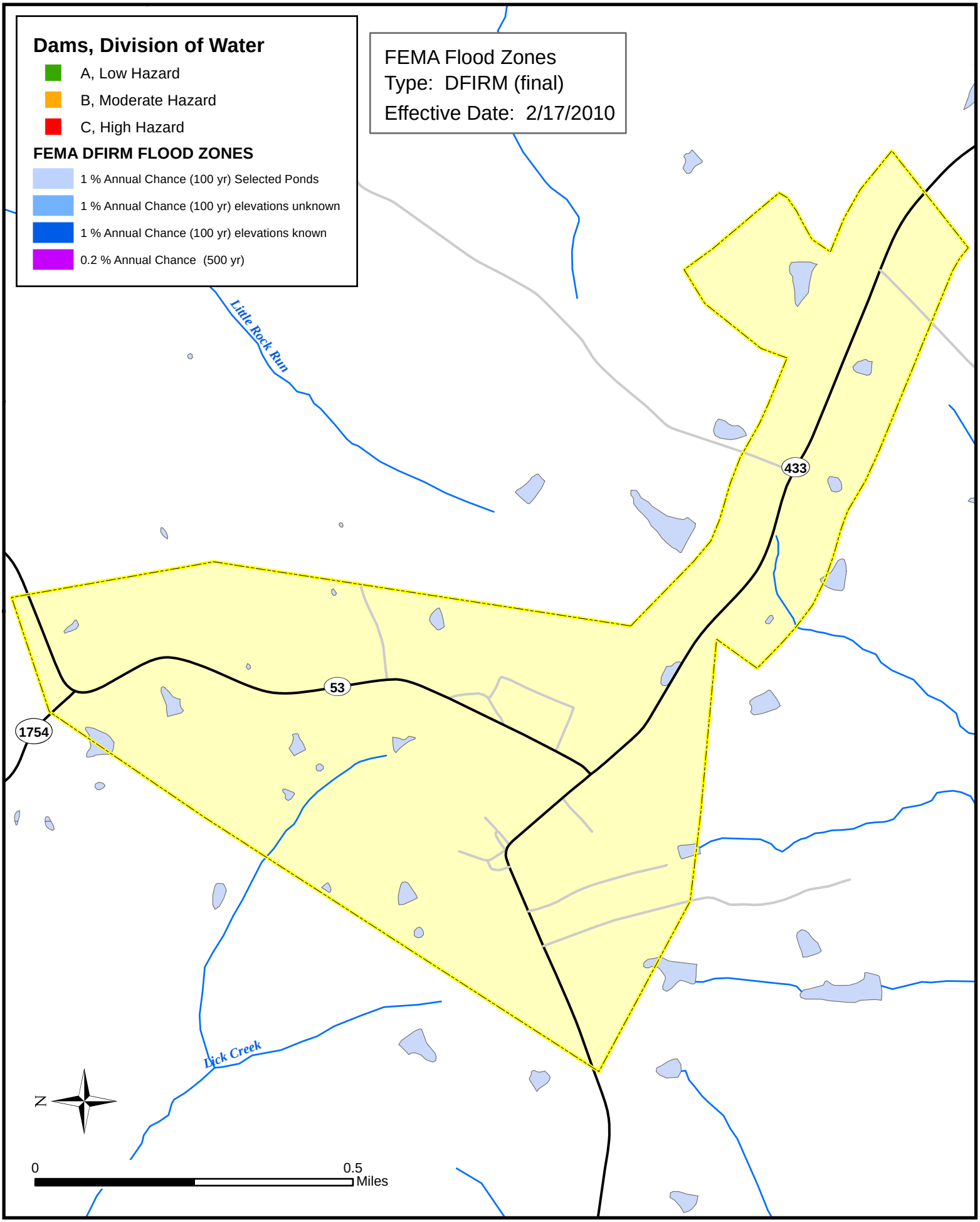
Barn under water, Washington Co. April 2008. *LTADD Archives.*

County road under water near Frederickstown, Washington Co. April 2008. *LTADD Archives.*


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 2/17/2010
1754
390
1796
555
53
458
433
2234
529
1586
438
1872
152
55
528
555
605
1030
1183
1724
150
152
1920
152
442
429
1404
150
1195
55
2758
N
0
5
Miles


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
433
152
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 2/17/2010
N
0
0.5
Miles
Long Lick Creek


152
555
1404
1584
528
3488
55
150
150X
Haydon Branch
Poorhouse Branch
Seibert Creek
Shay Branch
Road Run
Cartwright Creek
Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
N
0
0.5
Miles
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 2/17/2010


Dams, Division of Water
A, Low Hazard
B, Moderate Hazard
C, High Hazard
FEMA DFIRM FLOOD ZONES
1 % Annual Chance (100 yr) Selected Ponds
1 % Annual Chance (100 yr) elevations unknown
1 % Annual Chance (100 yr) elevations known
0.2 % Annual Chance (500 yr)
FEMA Flood Zones
Type: DFIRM (final)
Effective Date: 2/17/2010
Little Rock Run
433
53
1754
Lick Creek
N
0
0.5
Miles

## Table 3.3.2.1.6 - Summary of Flooding Data, Costs

| FLOODS | Total Cost | Number Events | Number Years | Total Loss of Life | Total Injuries | Average Cost Per Year | Average Cost Per Event | Average Loss of Life Per Year | Average Loss of Life Per Event | Average Injuries Per Year | Average Injuries Per Event |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BRECKINRIDGE | $7,801,684 | 53 | 48.5 | 2.09 | 0.11 | $160,859 | $147,202 | 0.04 | 0.04 | 0.00 | 0.00 |
| Cloverport | $0 | 1 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hardinsburg | $0 | 1 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Irvington | $10,000 | 4 | 48.5 | 1 | 0 | $206 | $2,500 | 0.02 | 0.25 | 0.00 | 0.00 |
| GRAYSON | $8,185,065 | 46 | 48.5 | 0.04 | 0.11 | $168,764 | $177,936 | 0.00 | 0.00 | 0.00 | 0.00 |
| Caneyville | $0 | 1 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Clarkson | $0 | 1 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Leitchfield | $0 | 5 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| HARDIN | $47,893,889 | 69 | 48.5 | 2.17 | 0.11 | $987,503 | $694,114 | 0.04 | 0.03 | 0.00 | 0.00 |
| Elizabethtown | $5,130,000 | 11 | 48.5 | 0 | 0 | $105,773 | $466,364 | 0.00 | 0.00 | 0.00 | 0.00 |
| Radcliff | $0 | 1 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sonora | $0 | 1 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Upton | $0 | 0 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Vine Grove | $250,000 | 3 | 48.5 | 0 | 0 | $5,155 | $83,333 | 0.00 | 0.00 | 0.00 | 0.00 |
| West Point | $0 | 0 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| LARUE | $8,067,971 | 37 | 48.5 | 0.17 | 0.11 | $166,350 | $218,053 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hodgenville | $0 | 2 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| MARION | $9,740,835 | 44 | 48.5 | 0.31 | 2.54 | $200,842 | $221,383 | 0.01 | 0.01 | 0.05 | 0.06 |
| Bradfordsville | $0 | 0 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Lebanon | $75,000 | 6 | 48.5 | 0 | 0 | $1,546 | $12,500 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loretto | $0 | 1 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Raywick | $2,000 | 1 | 48.5 | 0 | 0 | $41 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| MEADE | $7,284,005 | 42 | 48.5 | 1.14 | 0.11 | $150,186 | $173,429 | 0.02 | 0.03 | 0.00 | 0.00 |
| Brandenburg | $0 | 5 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ekron | $0 | 0 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Muldraugh | $0 | 0 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| NELSON | $35,033,005 | 93 | 48.5 | 3.17 | 2.11 | $722,330 | $376,699 | 0.07 | 0.03 | 0.04 | 0.02 |
| Bardstown | $2,000 | 4 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bloomfield | $0 | 0 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fairfield | $0 | 0 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| New Haven | $0 | 2 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| WASHINGTON | $8,984,658 | 39 | 48.5 | 0.17 | 0.11 | $185,251 | $230,376 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mackville | $0 | 0 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Springfield | $75,000 | 3 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Willisburg | $0 | 0 | 48.5 | 0 | 0 | $0 | $0 | 0.00 | 0.00 | 0.00 | 0.00 |
| LTADD | $132,991,112 | 423 | 48.5 | 9.26 | 5.31 | $2,742,085 | $314,400 | 0.19 | 0.02 | 0.11 | 0.01 |

*NOTE: The historic frequency of a hazard event over a given period of time determines the historic recurrence interval. For example: If there have been 10 Thunderstorm events in the County in the past 5 years, statistically you could expect that there will be 2 events a year.*

*Realize that from a statistical standpoint, there are several variables to consider. 1) Accurate hazard history data and collection are crucial to an accurate recurrence interval and frequency. 2) Data collection and accuracy has been much better in the past 10-20 years (NCDC weather records). 3) It is important to include all significant recorded hazard events which will include periodic updates to this table.*

*By updating and reviewing this table over time, it may be possible to see if certain types of hazard events are increasing in the past 10-20 years.*

*These values should be considered low. More events that have occurred than are documented by the sources used in this table.*

*All data is compiled at the county level due to extremely limited city specific data, therefore all data and analysis represents incorporated and unincorporated areas inclusively.*

*Compilation of SHELDUS, NCDC & NCEI. 1967- June 30 2015.*

## Table 3.3.2.1.6 - Summary of Flooding Data, Events

| FLOODS | Number of Events in Historic Record | Number of Years in Historic Record | Number of Events in Past 10 Years | Number of Events in Past 20 Years | Number of Events in Past 50 Years | Historic Recurrence Interval (years) | Historic Frequency % chance/year | Past 10 Year Record Frequency Per Year | Past 20 Year Record Frequency Per Year | Past 50 Year Record Frequency Per Year |
|---|---|---|---|---|---|---|---|---|---|---|
| BRECKINRIDGE | 53 | 48.5 | 13 | 31 | 53 | 0.92 | 109.28% | 1.3 | 1.55 | 1.06 |
| Cloverport | 1 | 48.5 | 1 | 1 | 1 | 48.50 | 2.06% | 0.1 | 0.05 | 0.02 |
| Hardinsburg | 1 | 48.5 | 0 | 1 | 1 | 48.50 | 2.06% | 0 | 0.05 | 0.02 |
| Irvington | 4 | 48.5 | 2 | 3 | 4 | 12.13 | 8.25% | 0.2 | 0.15 | 0.08 |
| GRAYSON | 46 | 48.5 | 12 | 26 | 46 | 1.05 | 94.85% | 1.2 | 1.3 | 0.92 |
| Caneyville | 1 | 48.5 | 1 | 1 | 1 | 48.50 | 2.06% | 0.1 | 0.05 | 0.02 |
| Clarkson | 1 | 48.5 | 1 | 1 | 1 | 48.50 | 2.06% | 0.1 | 0.05 | 0.02 |
| Leitchfield | 5 | 48.5 | 2 | 5 | 5 | 9.70 | 10.31% | 0.2 | 0.25 | 0.1 |
| HARDIN | 69 | 48.5 | 23 | 44 | 69 | 0.70 | 142.27% | 2.3 | 2.2 | 1.38 |
| Elizabethtown | 11 | 48.5 | 5 | 9 | 11 | 4.41 | 22.68% | 0.5 | 0.45 | 0.22 |
| Radcliff | 1 | 48.5 | 0 | 1 | 1 | 48.50 | 2.06% | 0 | 0.05 | 0.02 |
| Sonora | 1 | 48.5 | 1 | 1 | 1 | 48.50 | 2.06% | 0.1 | 0.05 | 0.02 |
| Upton | 0 | 48.5 | 0 | 0 | 0 | 0.00 | 0.00% | 0 | 0 | 0 |
| Vine Grove | 3 | 48.5 | 2 | 3 | 3 | 16.17 | 6.19% | 0.2 | 0.15 | 0.06 |
| West Point | 0 | 48.5 | 0 | 0 | 0 | 0.00 | 0.00% | 0 | 0 | 0 |
| LARUE | 37 | 48.5 | 8 | 15 | 37 | 1.31 | 76.29% | 0.8 | 0.75 | 0.74 |
| Hodgenville | 2 | 48.5 | 2 | 2 | 2 | 24.25 | 4.12% | 0.2 | 0.1 | 0.04 |
| MARION | 44 | 48.5 | 9 | 19 | 44 | 1.10 | 90.72% | 0.9 | 0.95 | 0.88 |
| Bradfordsville | 0 | 48.5 | 0 | 0 | 0 | 0.00 | 0.00% | 0 | 0 | 0 |
| Lebanon | 6 | 48.5 | 4 | 5 | 6 | 8.08 | 12.37% | 0.4 | 0.25 | 0.12 |
| Loretto | 1 | 48.5 | 0 | 1 | 1 | 48.50 | 2.06% | 0 | 0.05 | 0.02 |
| Raywick | 1 | 48.5 | 1 | 1 | 1 | 48.50 | 2.06% | 0.1 | 0.05 | 0.02 |
| MEADE | 42 | 48.5 | 8 | 19 | 42 | 1.15 | 86.60% | 0.8 | 0.95 | 0.84 |
| Brandenburg | 5 | 48.5 | 2 | 4 | 5 | 9.70 | 10.31% | 0.2 | 0.2 | 0.1 |
| Ekron | 0 | 48.5 | 0 | 0 | 0 | 0.00 | 0.00% | 0 | 0 | 0 |
| Muldraugh | 0 | 48.5 | 0 | 0 | 0 | 0.00 | 0.00% | 0 | 0 | 0 |
| NELSON | 93 | 48.5 | 34 | 67 | 93 | 0.52 | 191.75% | 3.4 | 3.35 | 1.86 |
| Bardstown | 4 | 48.5 | 1 | 3 | 4 | 12.13 | 8.25% | 0.1 | 0.15 | 0.08 |
| Bloomfield | 0 | 48.5 | 0 | 0 | 0 | 0.00 | 0.00% | 0 | 0 | 0 |
| Fairfield | 0 | 48.5 | 0 | 0 | 0 | 0.00 | 0.00% | 0 | 0 | 0 |
| New Haven | 2 | 48.5 | 1 | 2 | 2 | 24.25 | 4.12% | 0.1 | 0.1 | 0.04 |
| WASHINGTON | 39 | 48.5 | 4 | 12 | 39 | 1.24 | 80.41% | 0.4 | 0.6 | 0.78 |
| Mackville | 0 | 48.5 | 0 | 0 | 0 | 0.00 | 0.00% | 0 | 0 | 0 |
| Springfield | 3 | 48.5 | 2 | 3 | 3 | 16.17 | 6.19% | 0.2 | 0.15 | 0.06 |
| Willisburg | 0 | 48.5 | 0 | 0 | 0 | 0.00 | 0.00% | 0 | 0 | 0 |
| LTADD | 423 | 48.5 | 111 | 233 | 423 | 0.11 | 872.16% | 11.1 | 11.65 | 8.46 |

*NOTE: The historic frequency of a hazard event over a given period of time determines the historic recurrence interval. For example: If there have been 10 Thunderstorm events in the County in the past 5 years, statistically you could expect that there will be 2 events a year.*

*Realize that from a statistical standpoint, there are several variables to consider. 1) Accurate hazard history data and collection are crucial to an accurate recurrence interval and frequency. 2) Data collection and accuracy has been much better in the past 10-20 years (NCDC weather records). 3) It is important to include all significant recorded hazard events which will include periodic updates to this table.*

*By updating and reviewing this table over time, it may be possible to see if certain types of hazard events are increasing in the past 10-20 years.*

*These values should be considered low. More events that have occurred than are documented by the sources used in this table.*

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*Compilation of SHELDUS, NCDC & NCEI. 1967- June 30 2015.*

**Extent**

The extent of flooding in the Lincoln Trail eight-county region is difficult to document. However, on April 30, 2011, the pool at Rough River Lake in Grayson County was recorded at a depth of 524.7 feet, a new record. Grayson County received FEMA assistance in funding two bridge elevation projects under DR-1818-0027 and DR-1818-0153 on Lake Shore Road and on Bloomington Church Road. Widespread flooding in these areas would reach a depth of up to 24 inches and closed these roads for days. Another bridge elevation project was funded in the City of Leitchfield in Grayson County, under DR-1818-0063. Floodwaters reaching depths of twelve to twenty-four inches closed a road there.

In April of 2011, Ohio River flooding affected the City of West Point in Hardin County. On 4/26/2011, the River crested at 61.8 feet, about 6.8 feet above flood stage.

The Rolling Fork River meanders through Hardin County and becomes the boundary between Hardin and Nelson County. The flood stage of the Rolling Fork is thirty-five feet, moderate flooding occurs at forty-two feet with major flooding occurring at forty-five feet. The Rolling Fork often floods rural areas of Hardin County as well as the Boston and New Haven regions of Nelson County. The Chart below documents recent flood stage levels of the Rolling Fork.

| **Table 3.3.2.1.7 - Flood Stages of the Rolling Fork River (Flood Stage = 35')** | |
|---|---|
| **Date** | **Depth in Feet** |
| 12/28/15 | 39.27 feet |
| 7/16/15 | 38.85 feet |
| 3/07/15 | 41.64 feet |
| 5/01/14 | 35.64 feet |
| 4/06/14 | 36.71 feet |
| 2/07/14 | 37.28 feet |
| 7/08/13 | 42.19 feet |
| 3/20/13 | 35.93 feet |
| 1/15/13 | 36.19 feet |
| 12/01/11 | 40.22 feet |
| Source: NOAA | |