Ohio Disasters

Presenter Name: Richard J. Kotapish GISP

Title: GIS Director

Organization: Lake County, Ohio

2009 Ohio GIS Conference

September 16-18, 2009

Crowne Plaza North Hotel

Columbus, Ohio

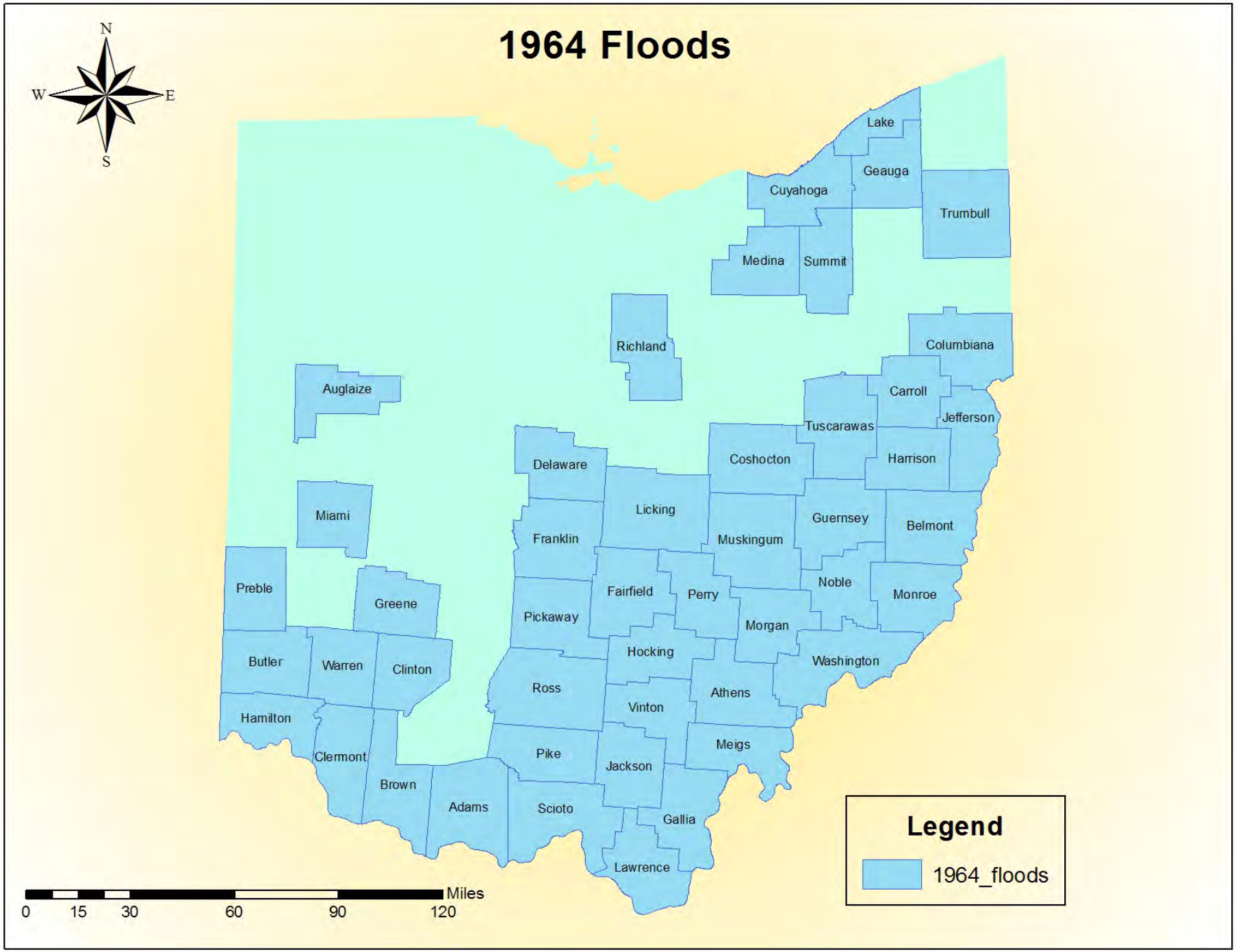
Ohio's Many Disasters

Should I be interested in the International Charter? Yes!

There have been 47 Ohio Presidential Disaster Declarations since 1964

(Includes all FEMA Major and Emergency Declarations)

1964 Floods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Tuscarawas
Coshocton
Harrison
Delaware
Licking
Guernsey
Belmont
Miami
Franklin
Muskingum
Noble
Monroe
Preble
Greene
Fairfield
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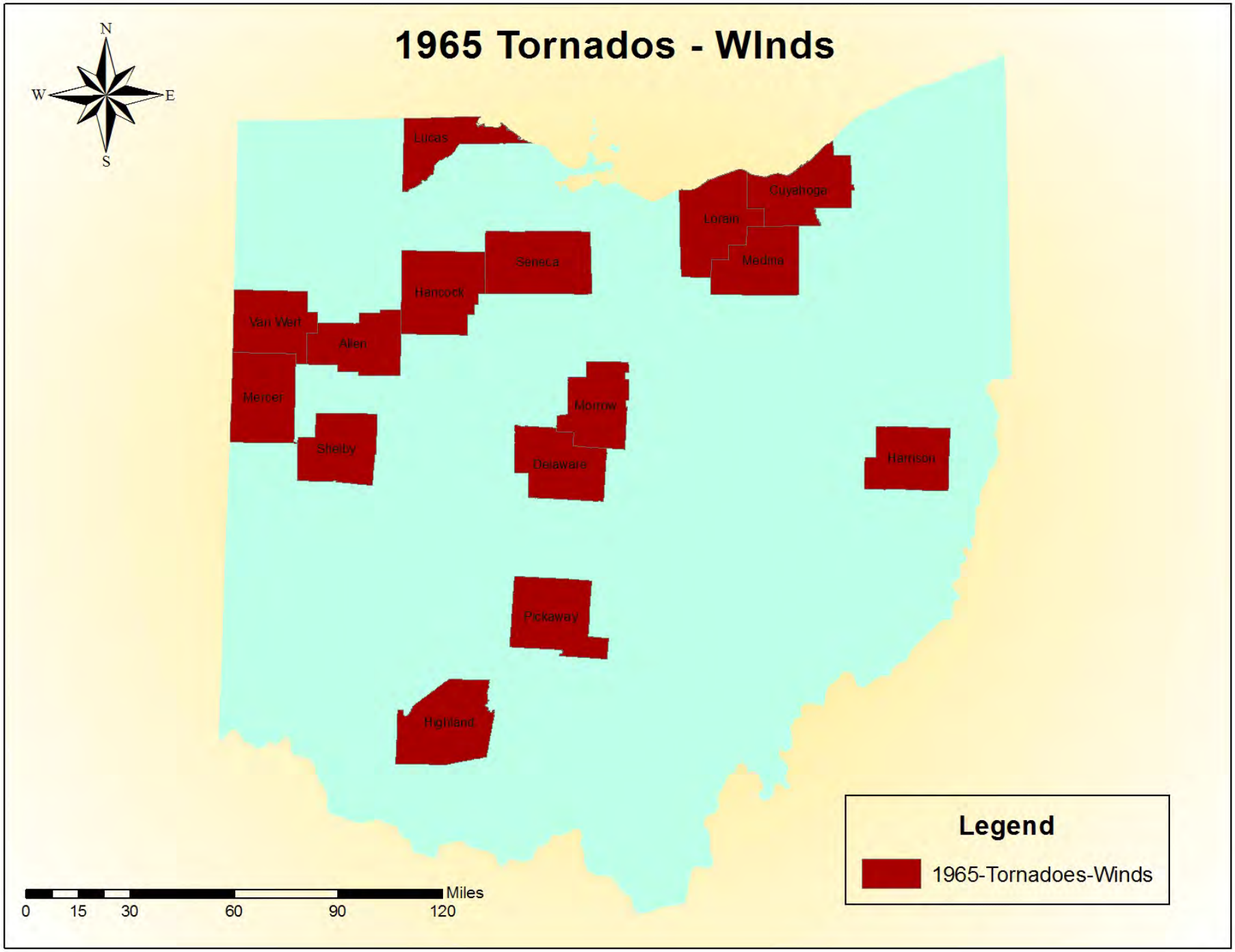
1964_floods

1965 Tornados - WInds



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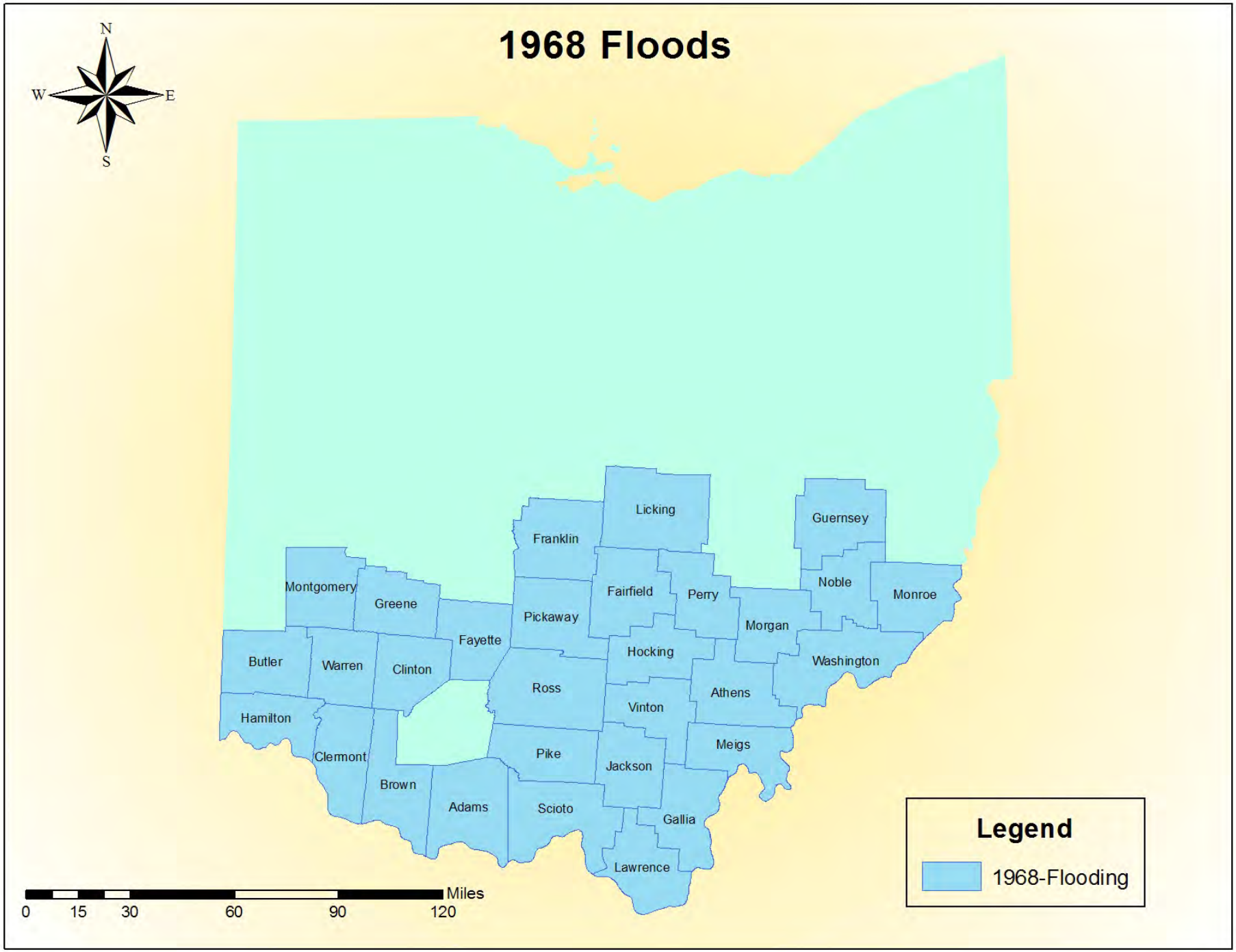
1968 Floods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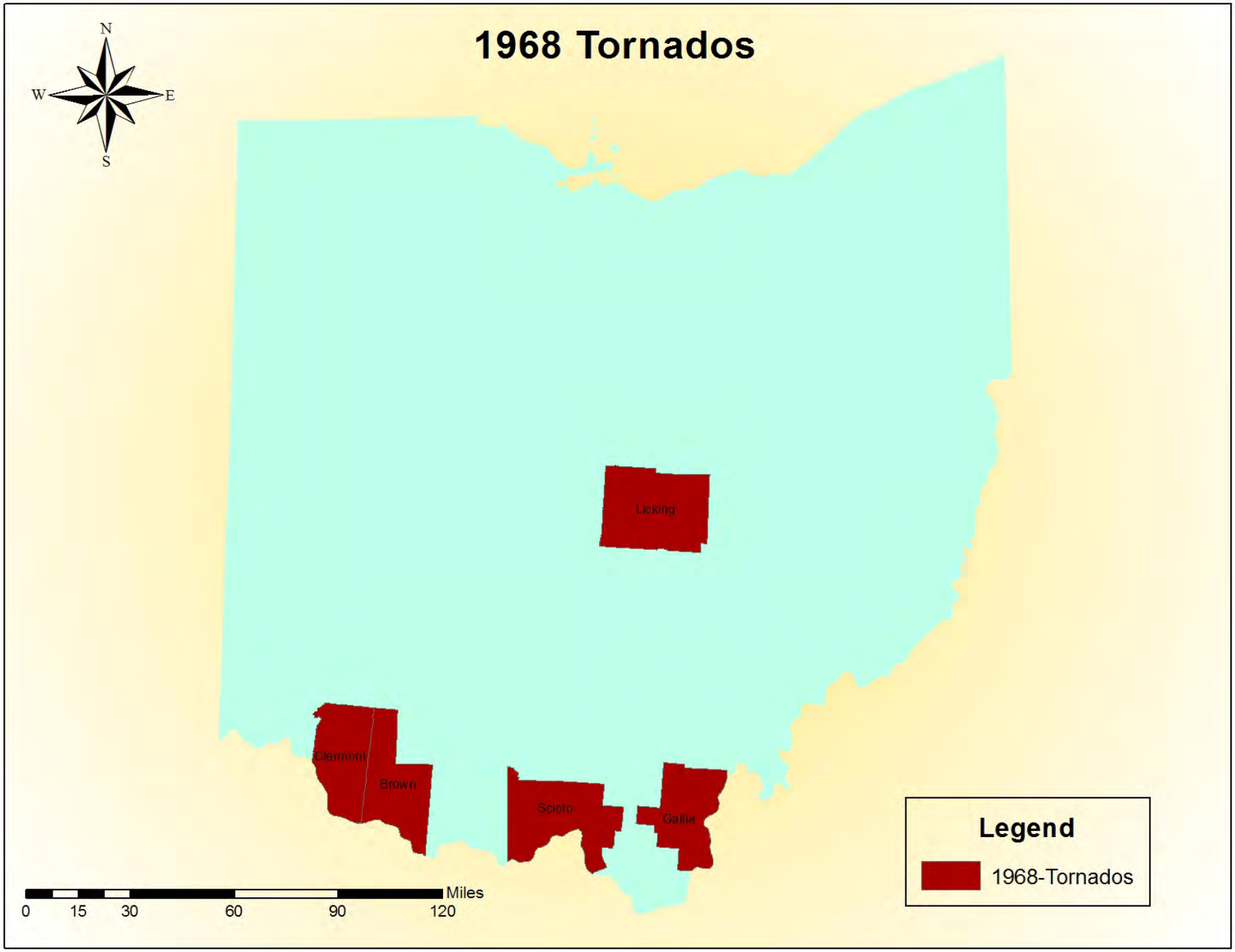
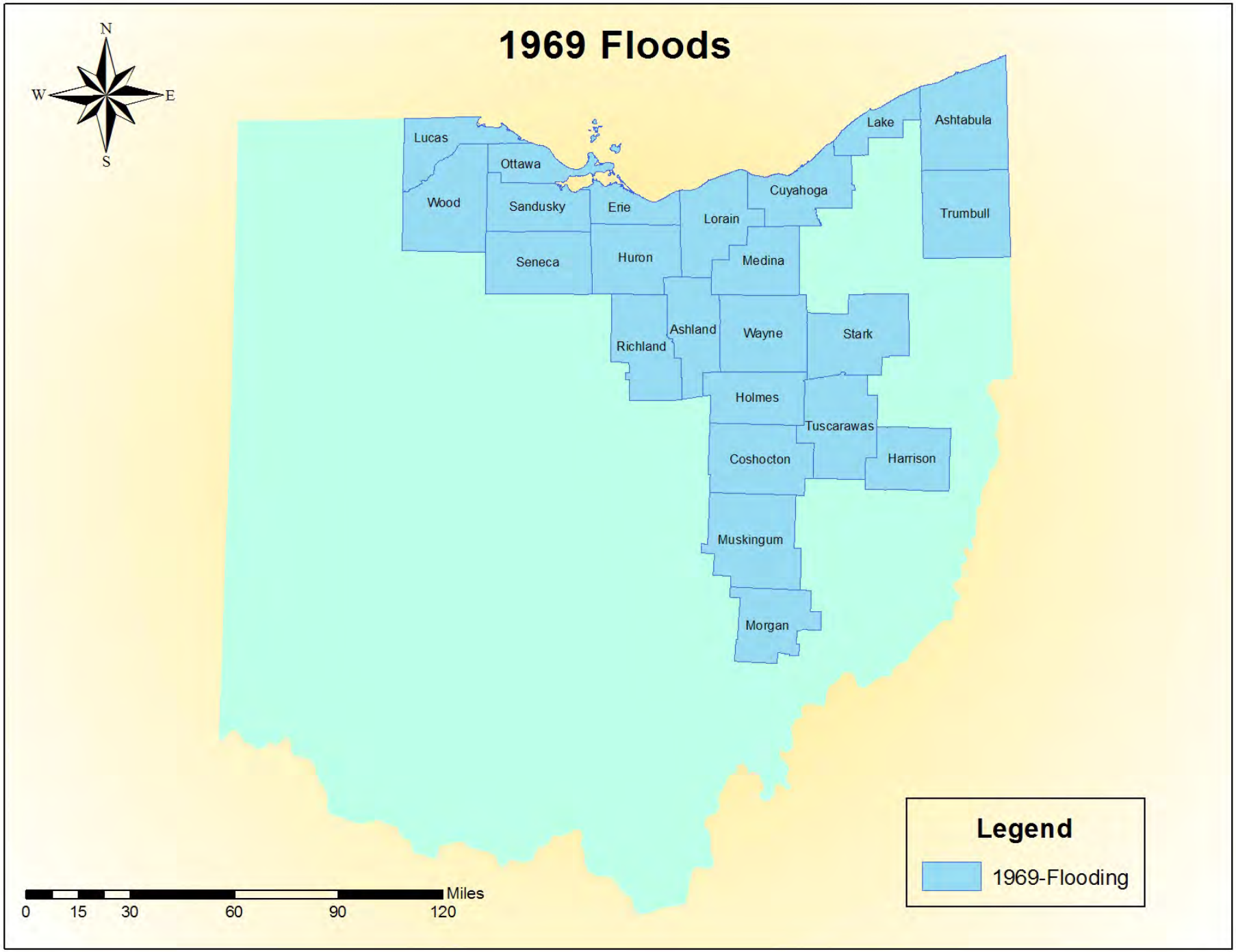
1968 Tornados



1969 Floods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Wayne
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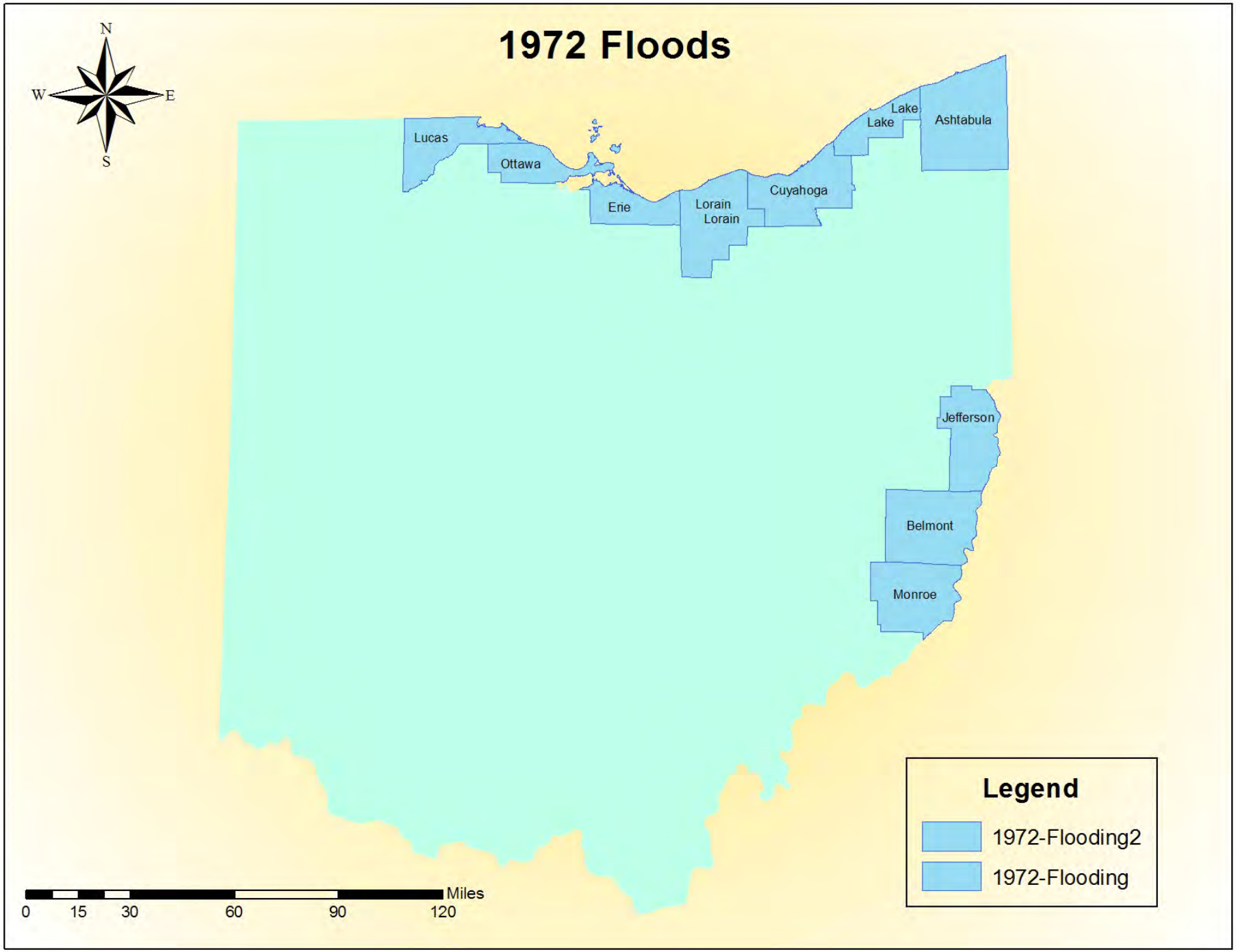
1972 Floods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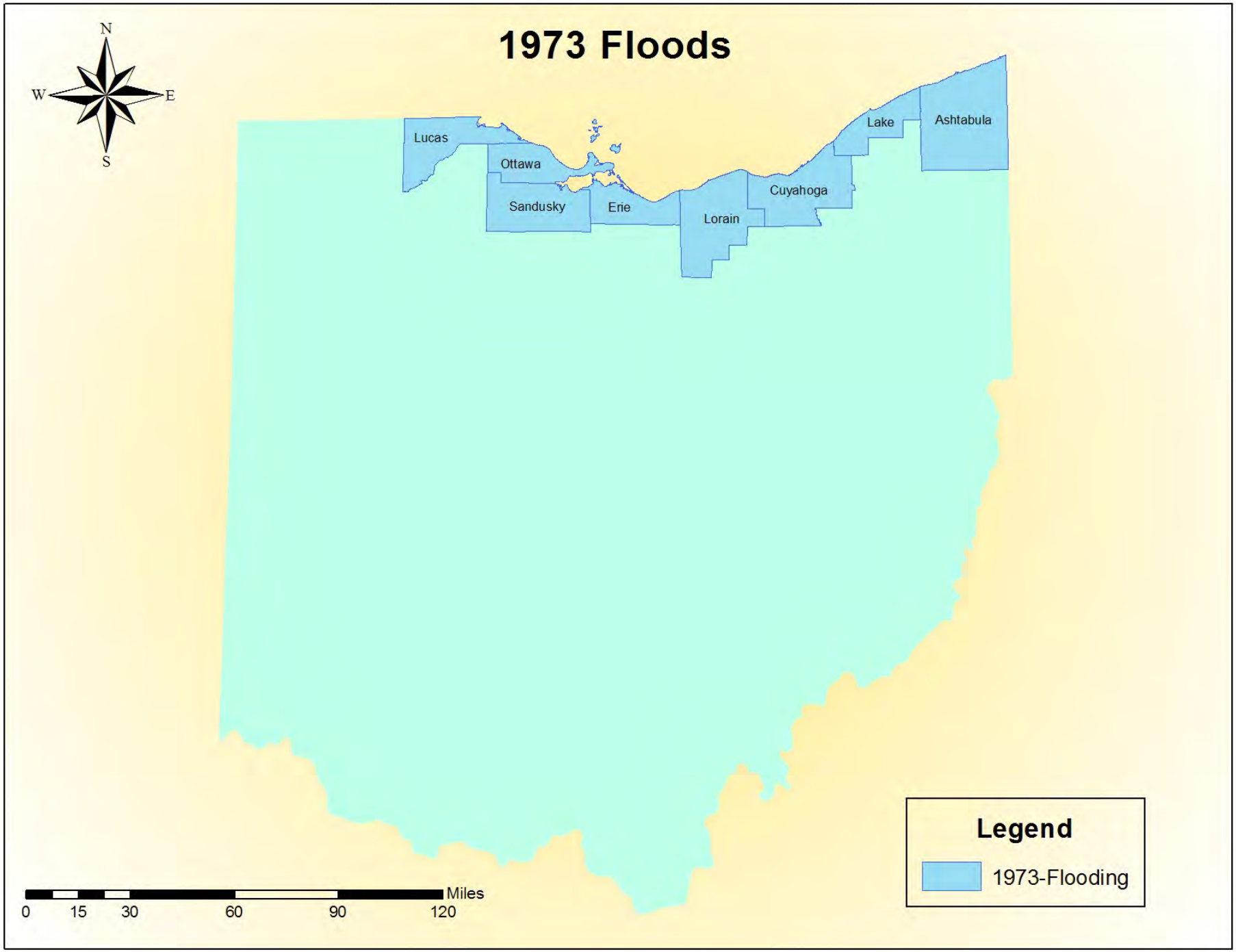
1973 Floods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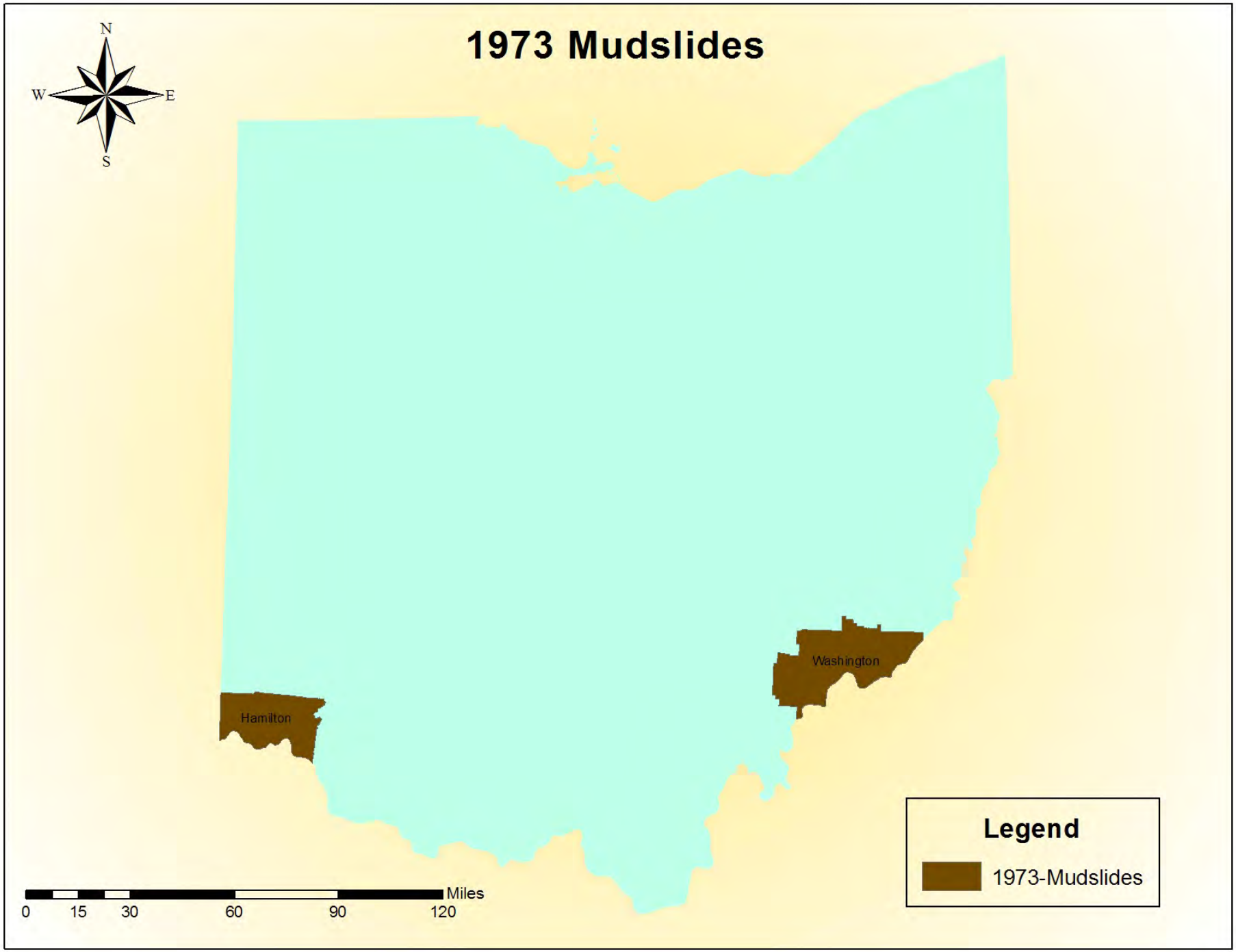
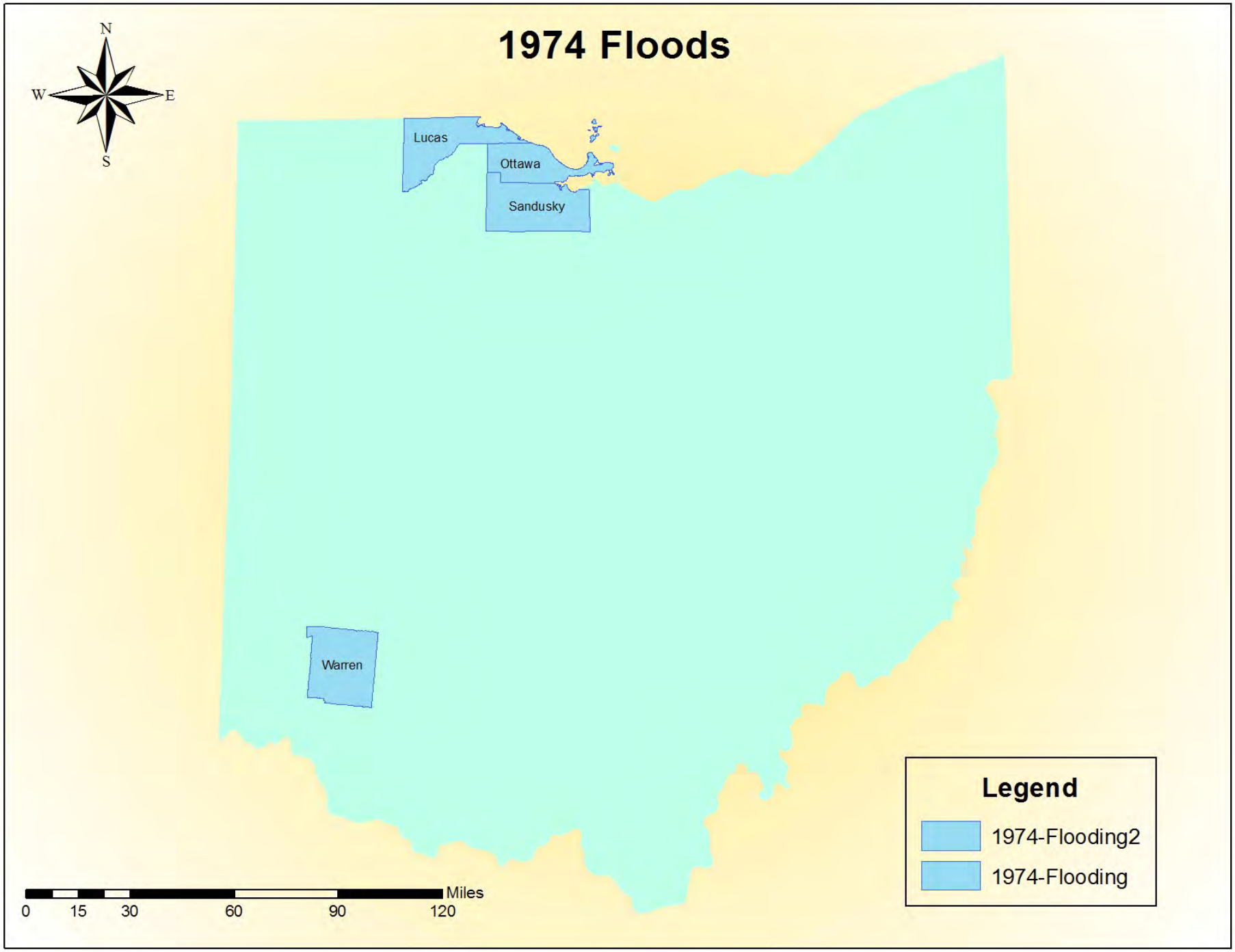
1973 Mudslides



1974 Floods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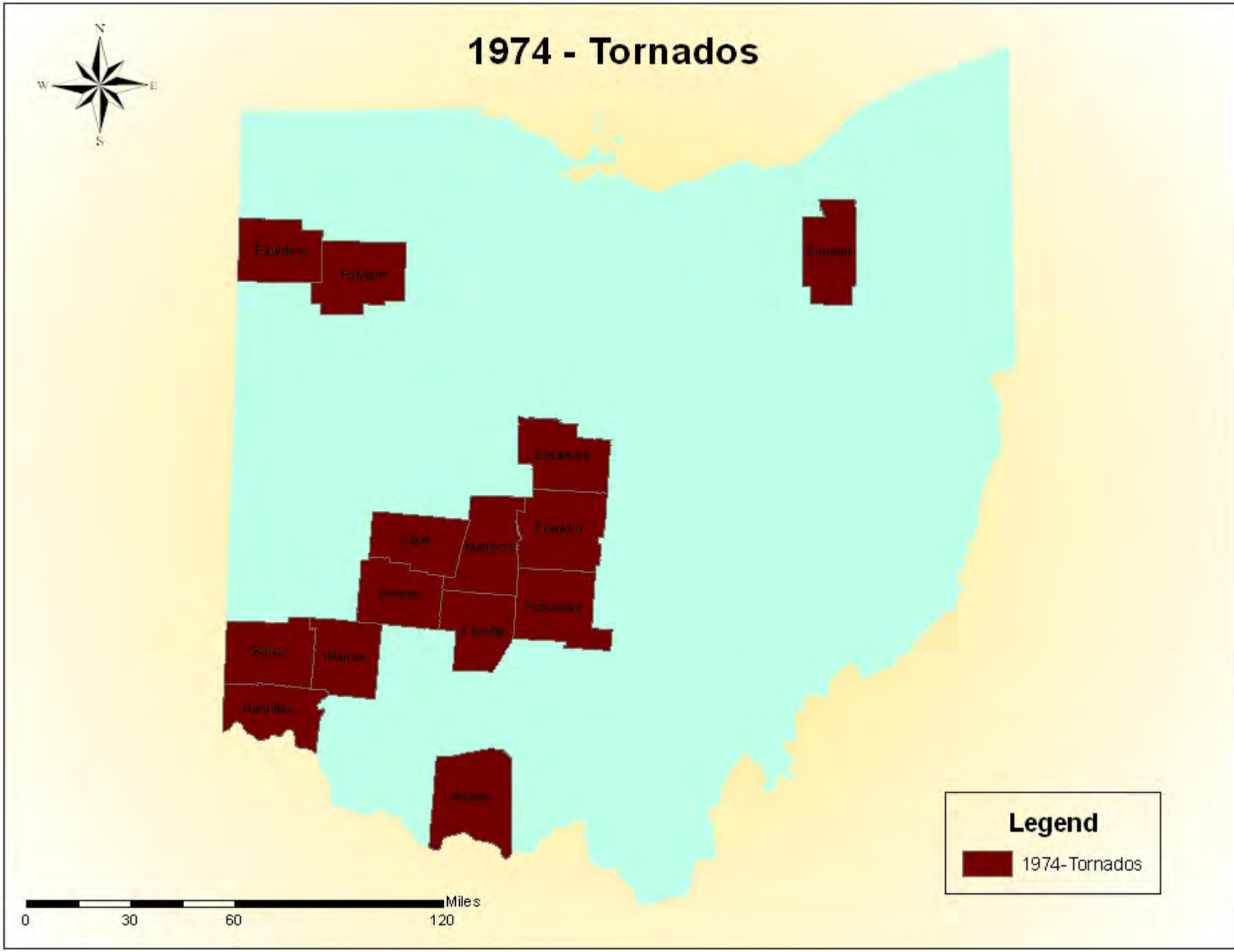
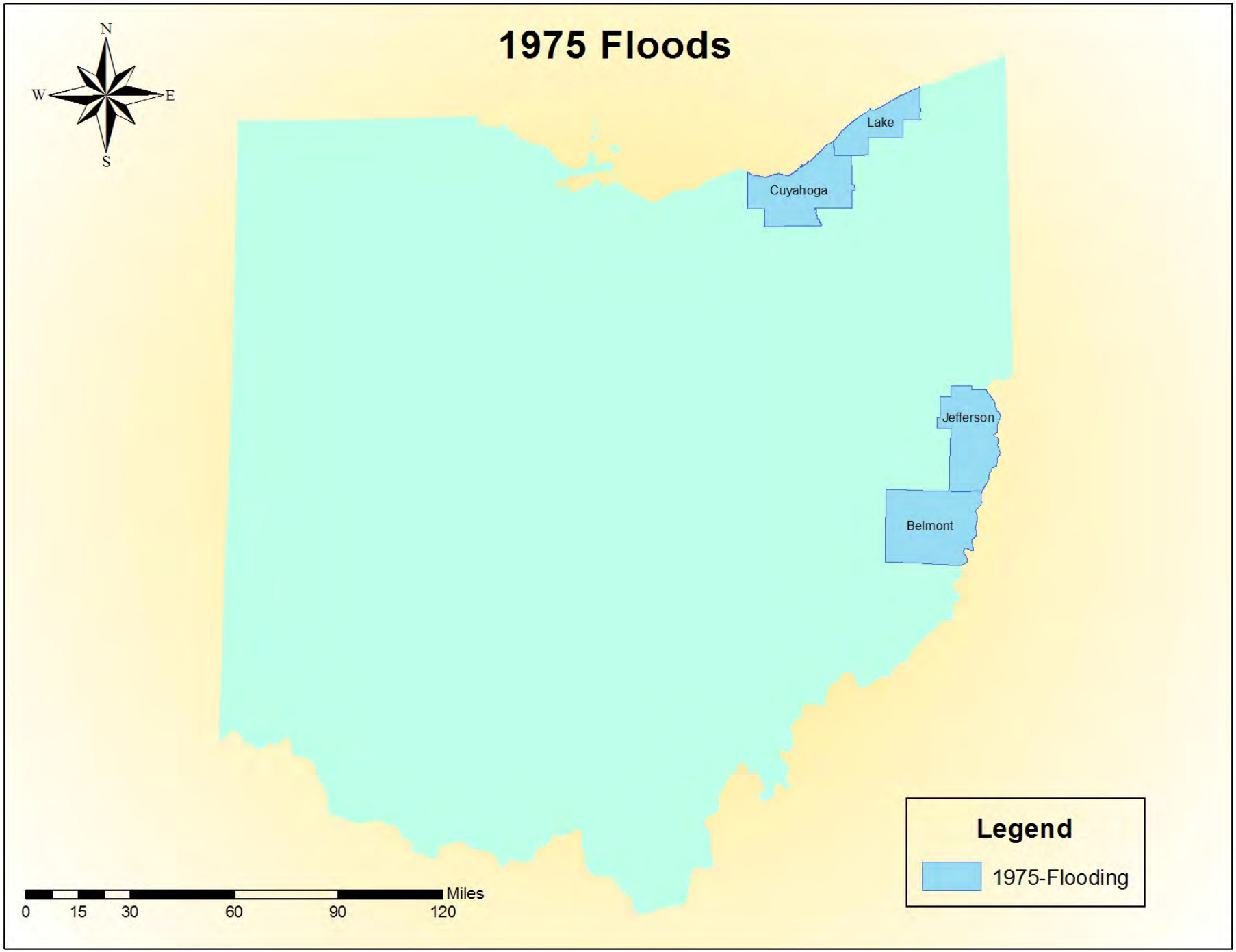
1974 - Tornados



Xenia Tornado 1974

1975 Floods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1978 Blizzard

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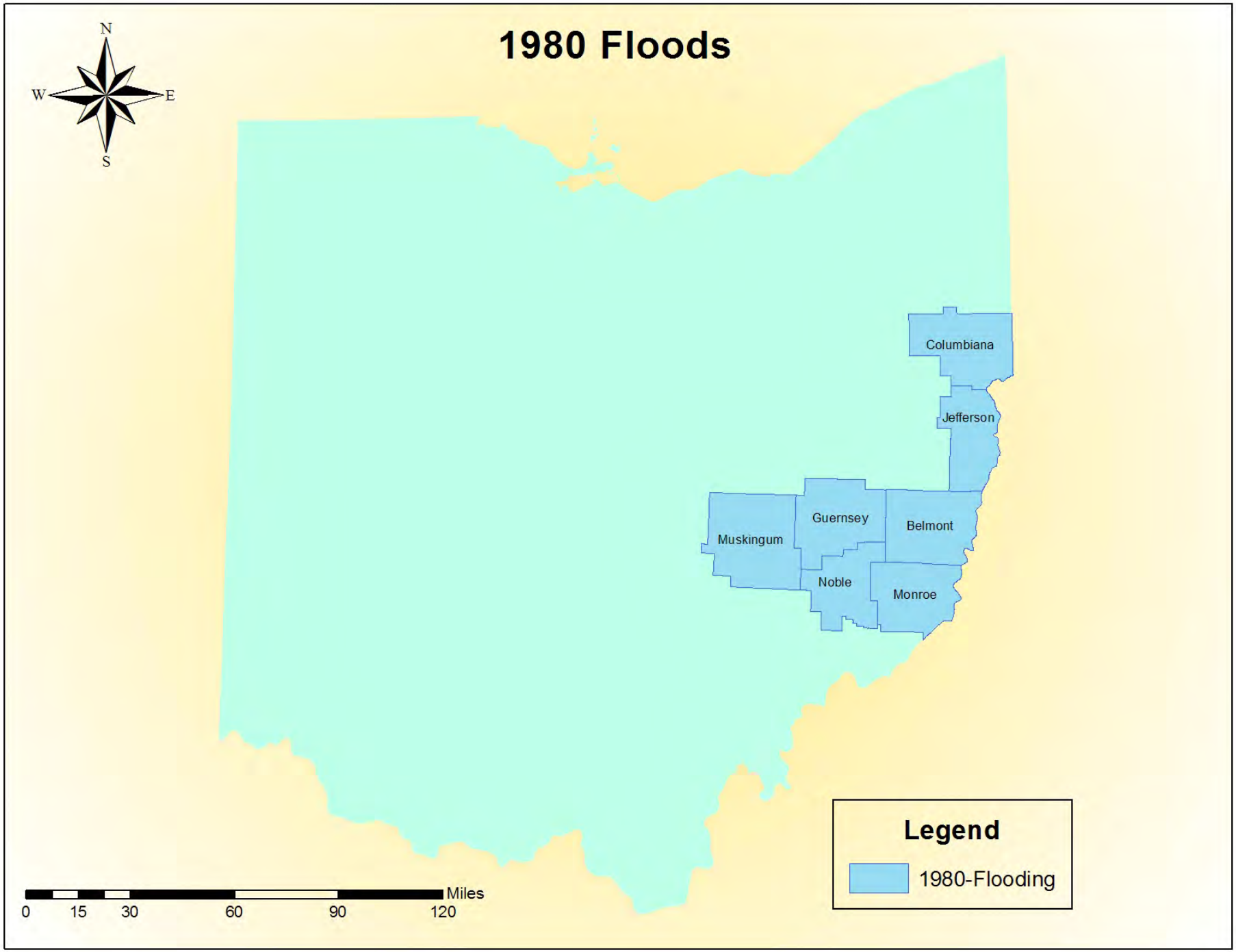
TOWNSHIP

1980 Floods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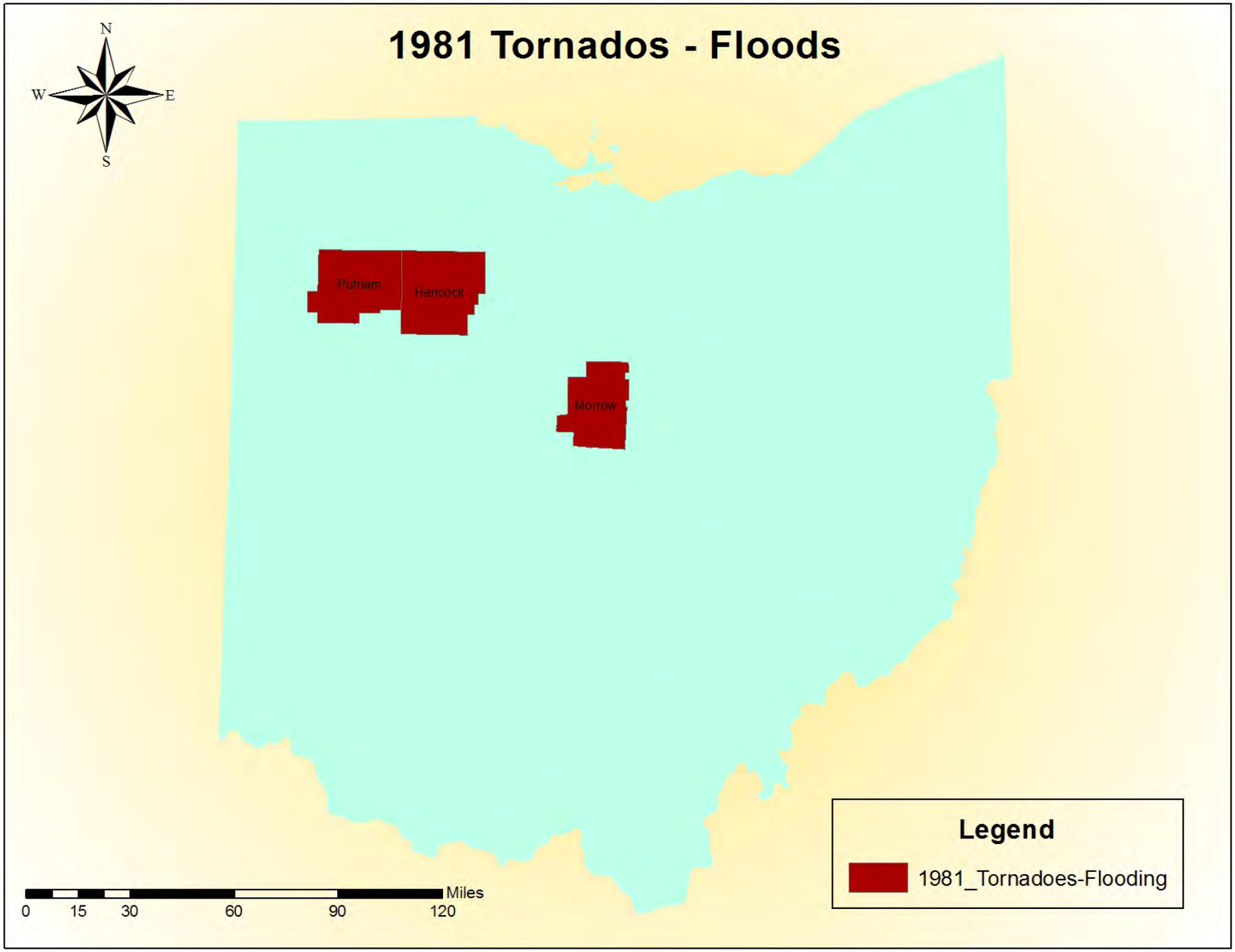
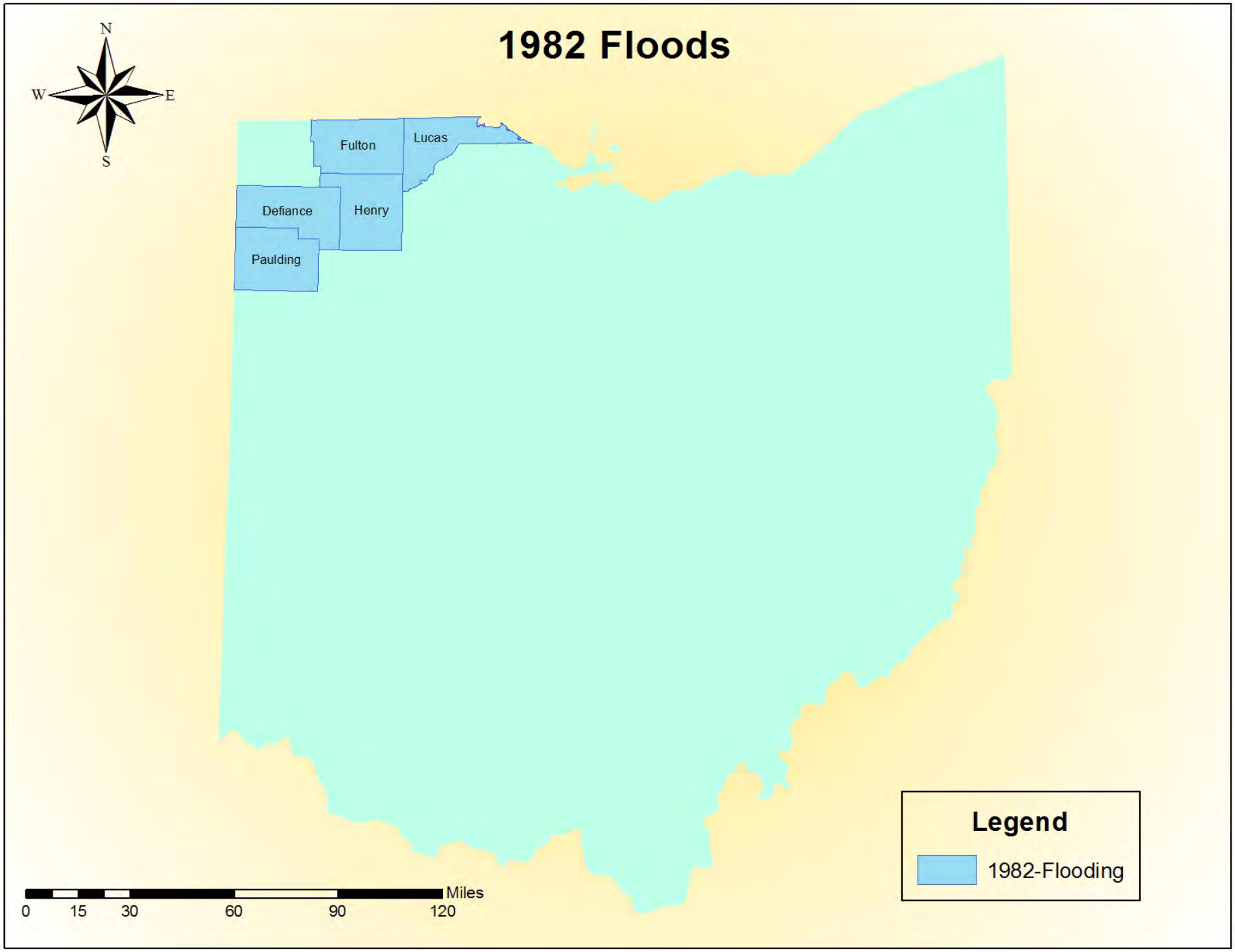
1981 Tornados - Floods



1982 Floods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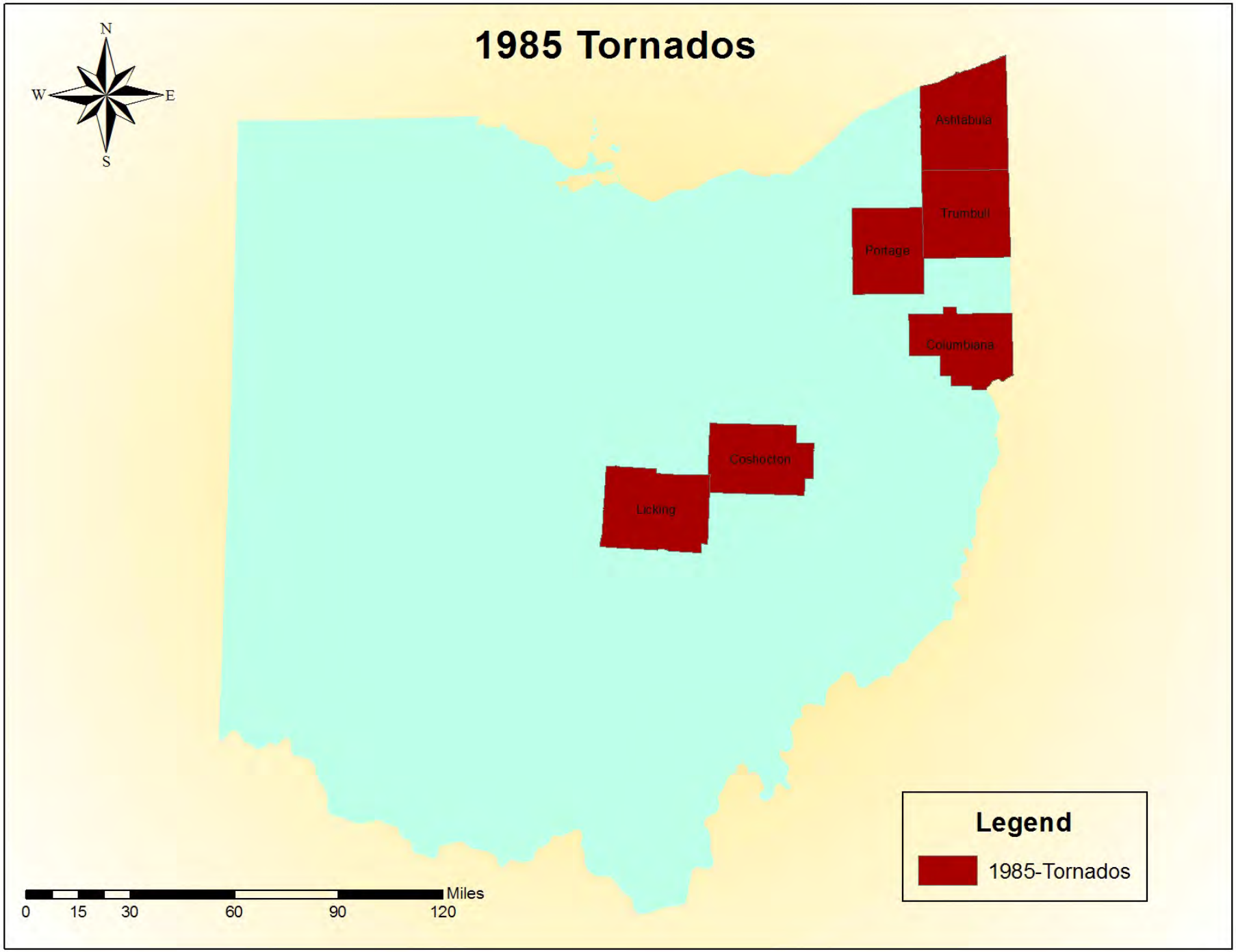
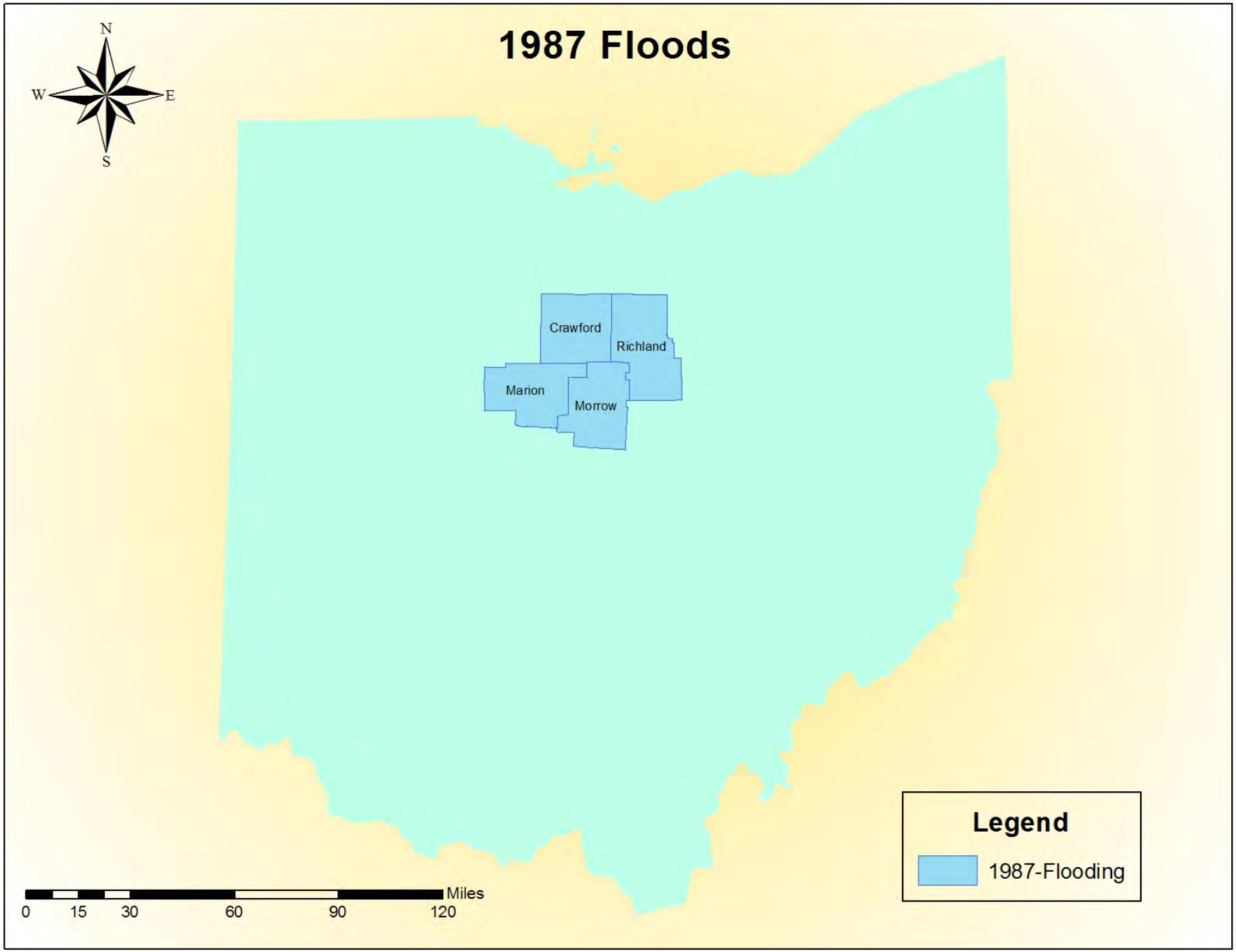
1985 Tornados



1987 Floods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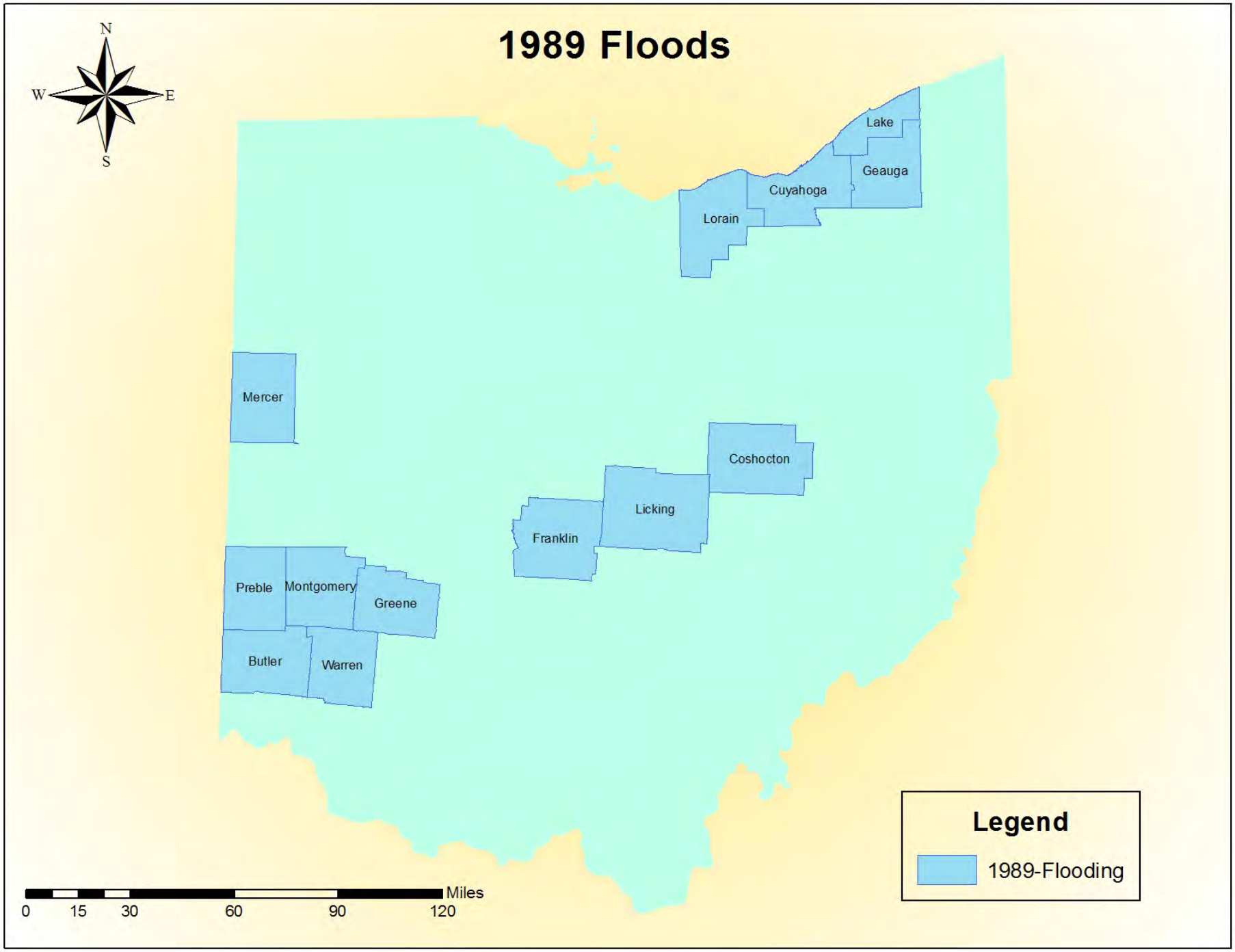
1989 Floods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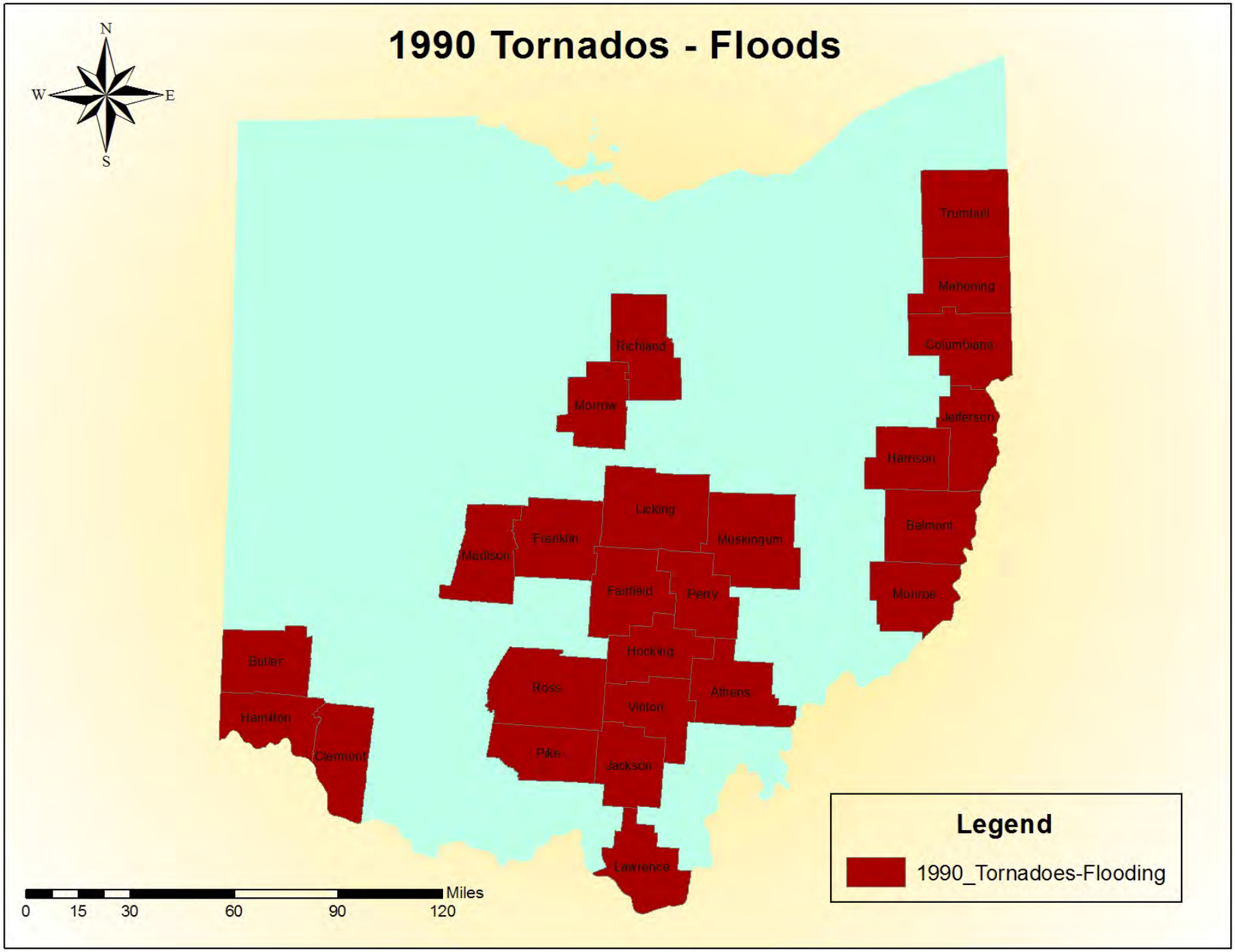
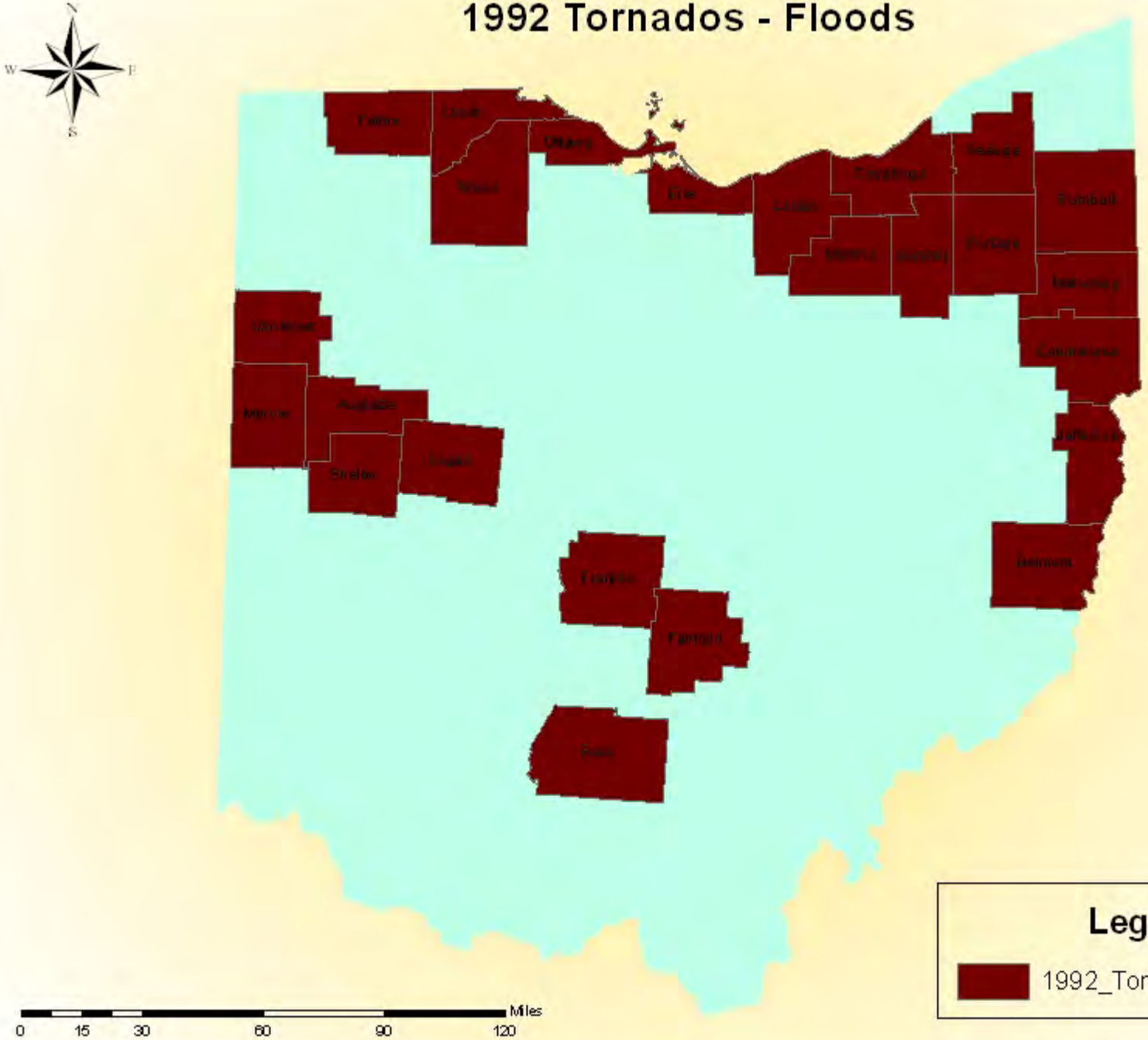
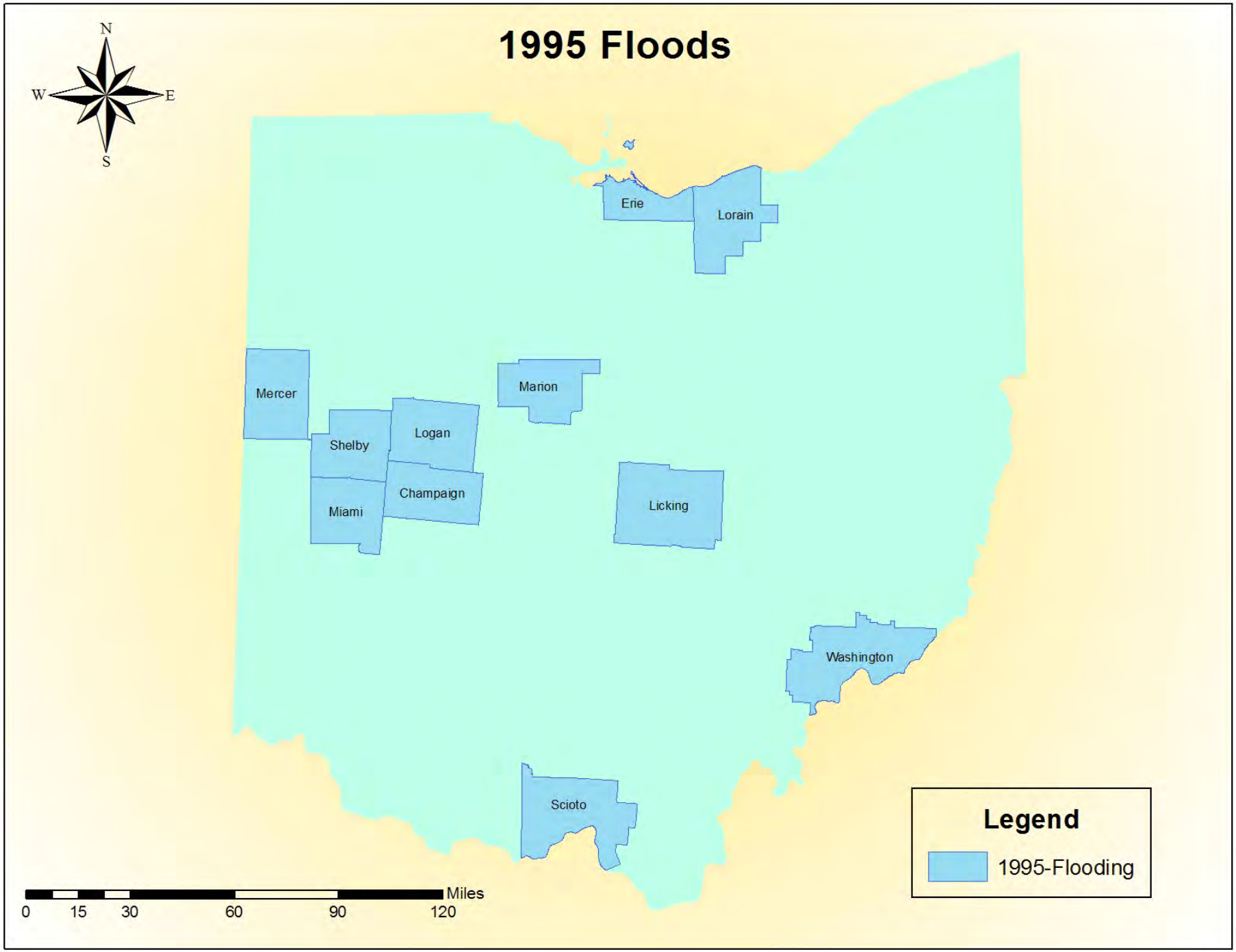
1990 Tornados - Floods



1992 Tornados - Floods



1995 Floods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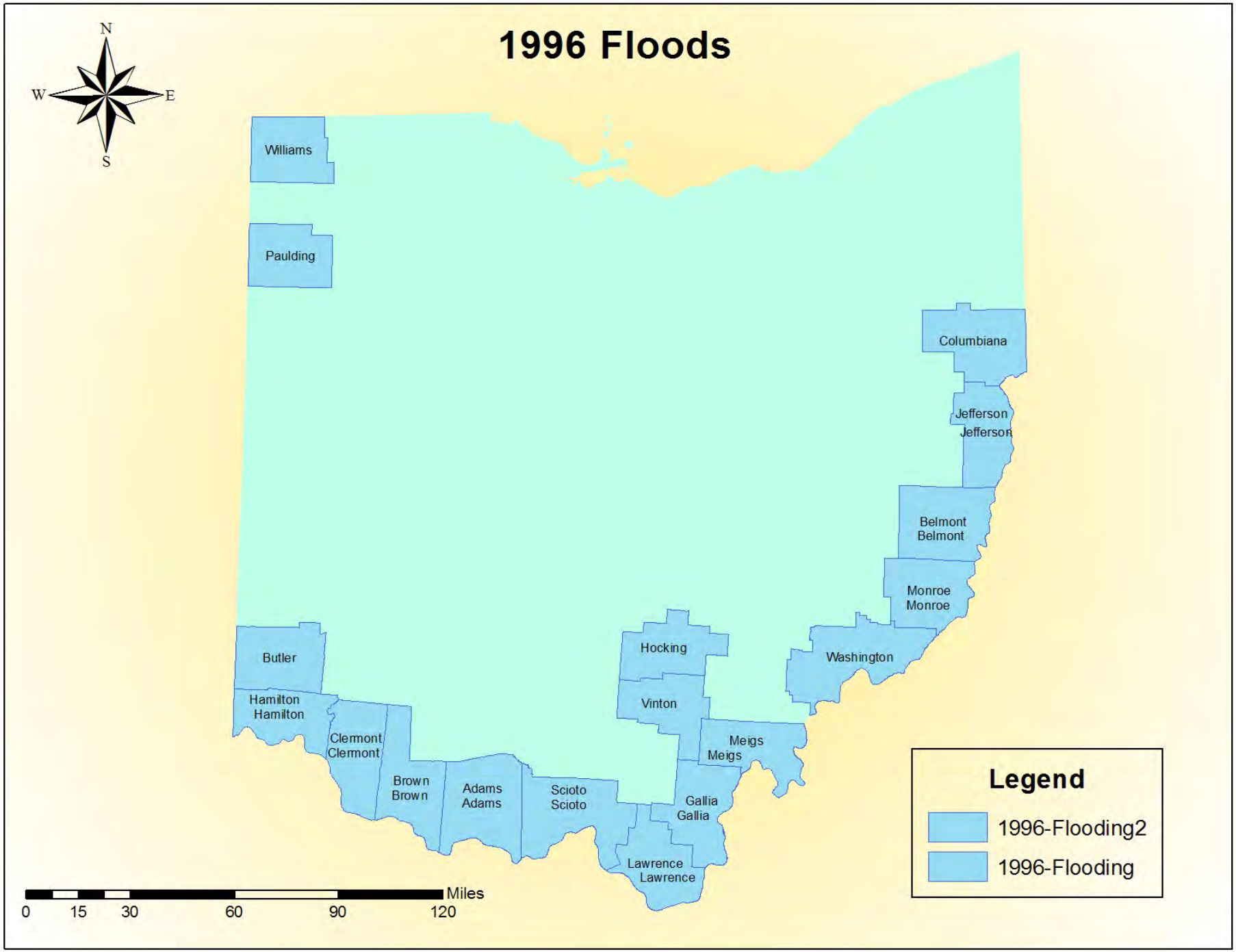
1996 Floods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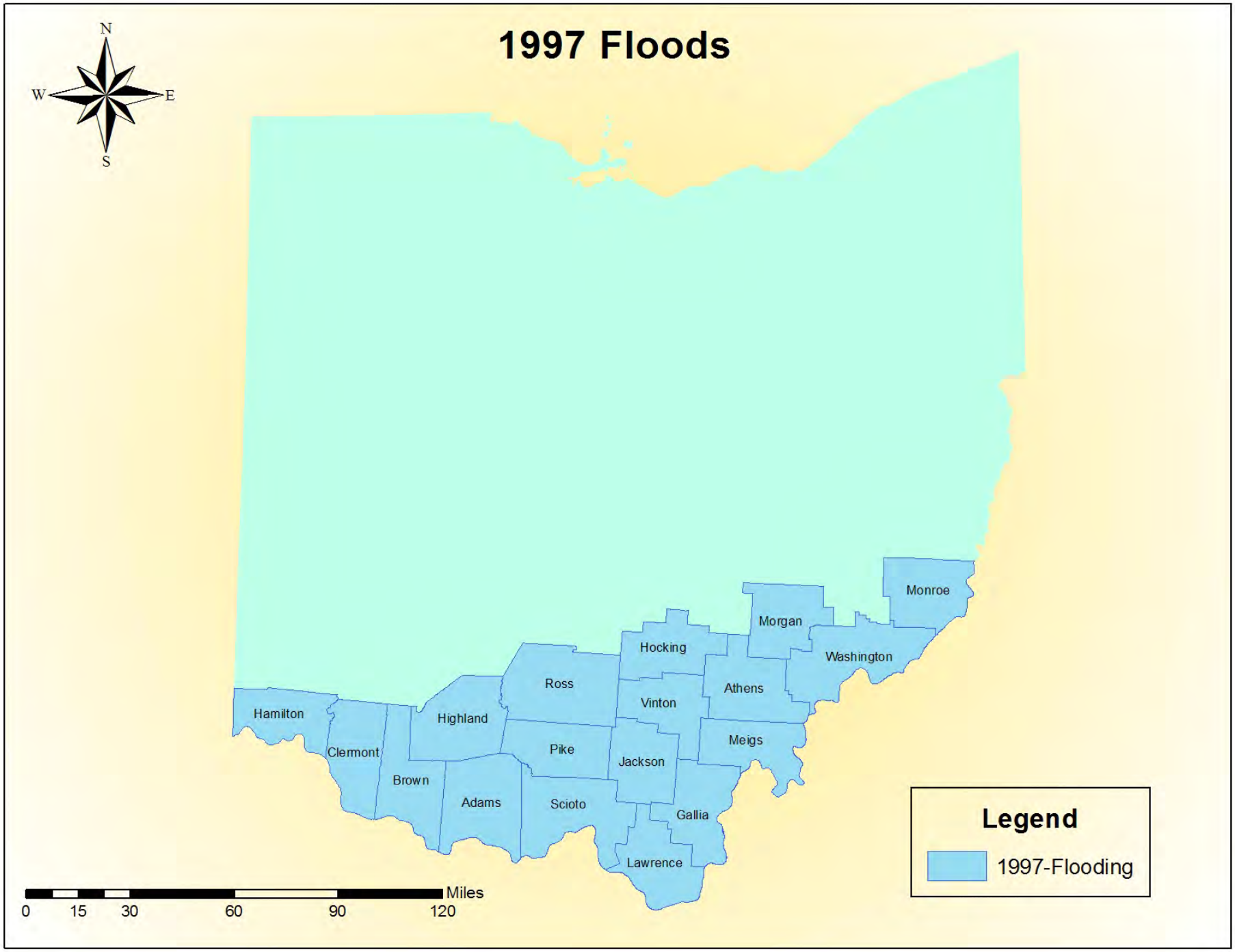
1997 Floods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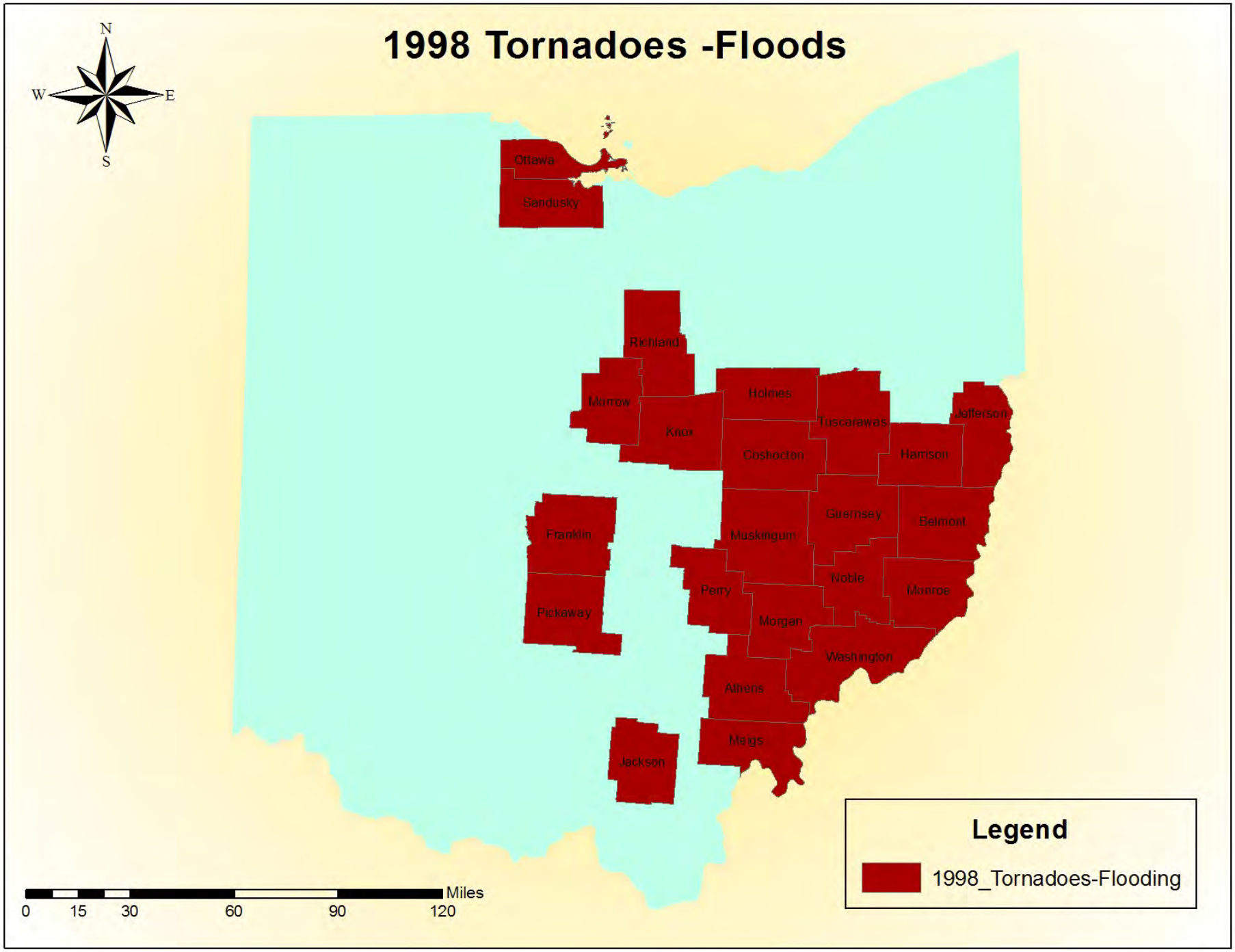
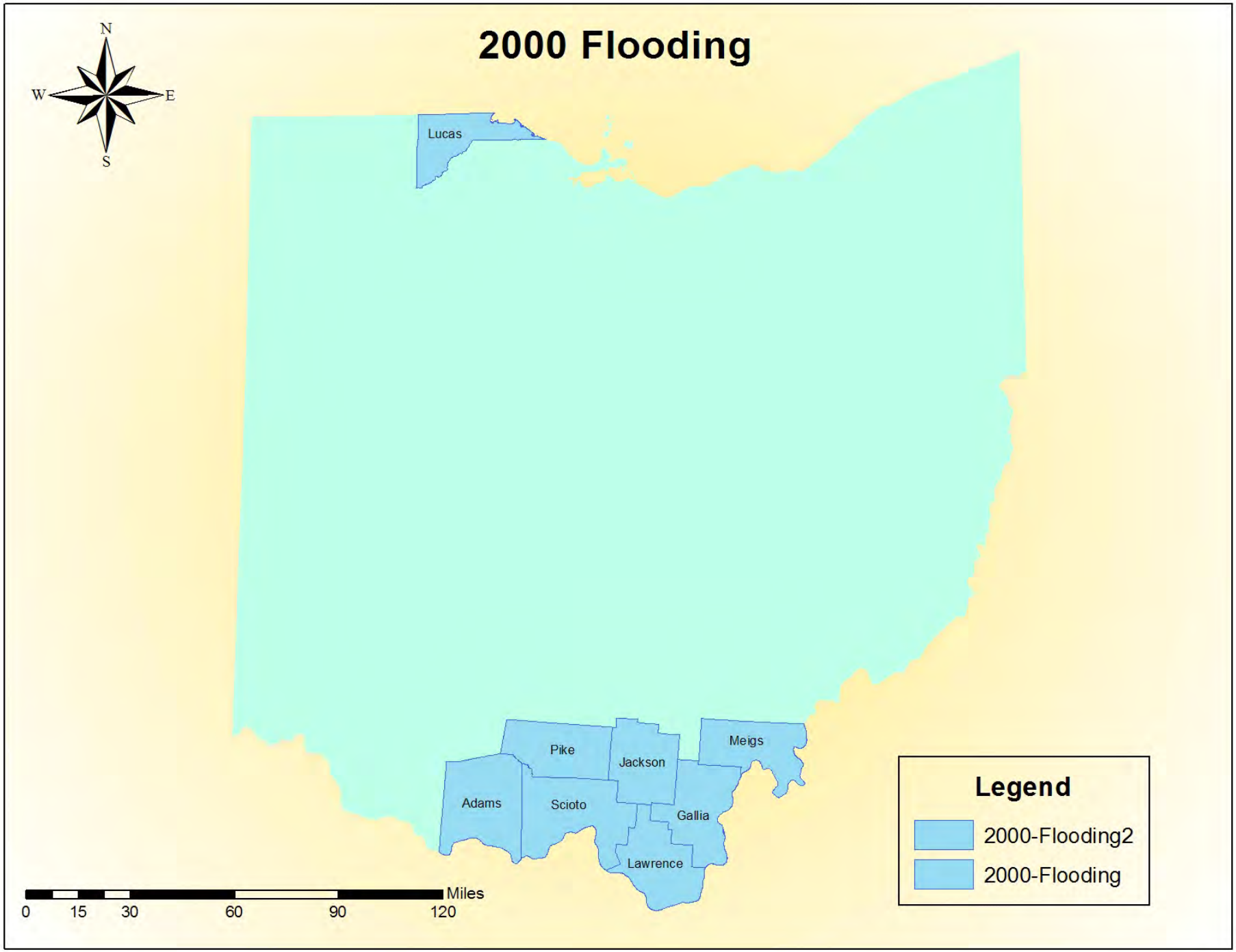
1998 Tornadoes -Floods



2000 Flooding



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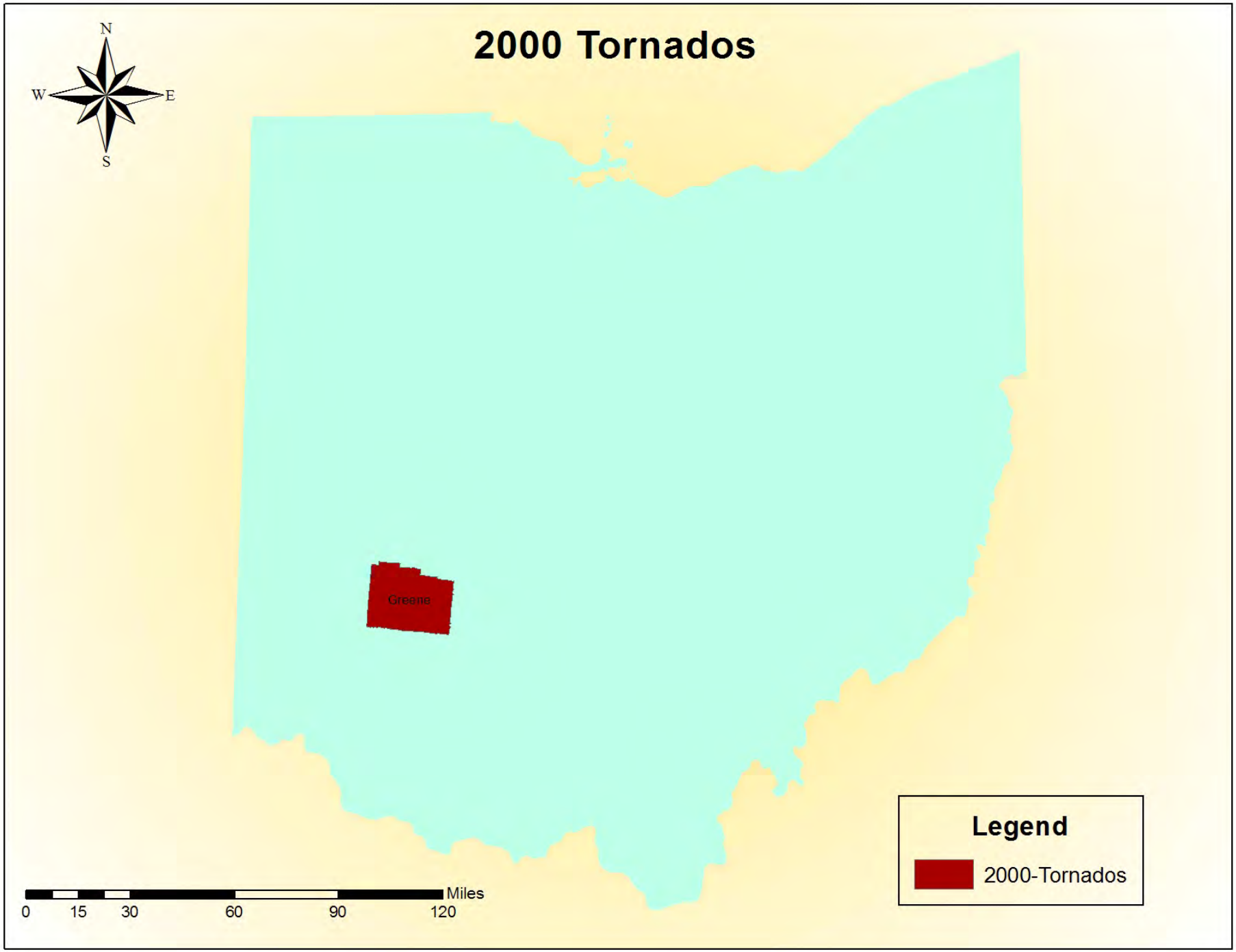
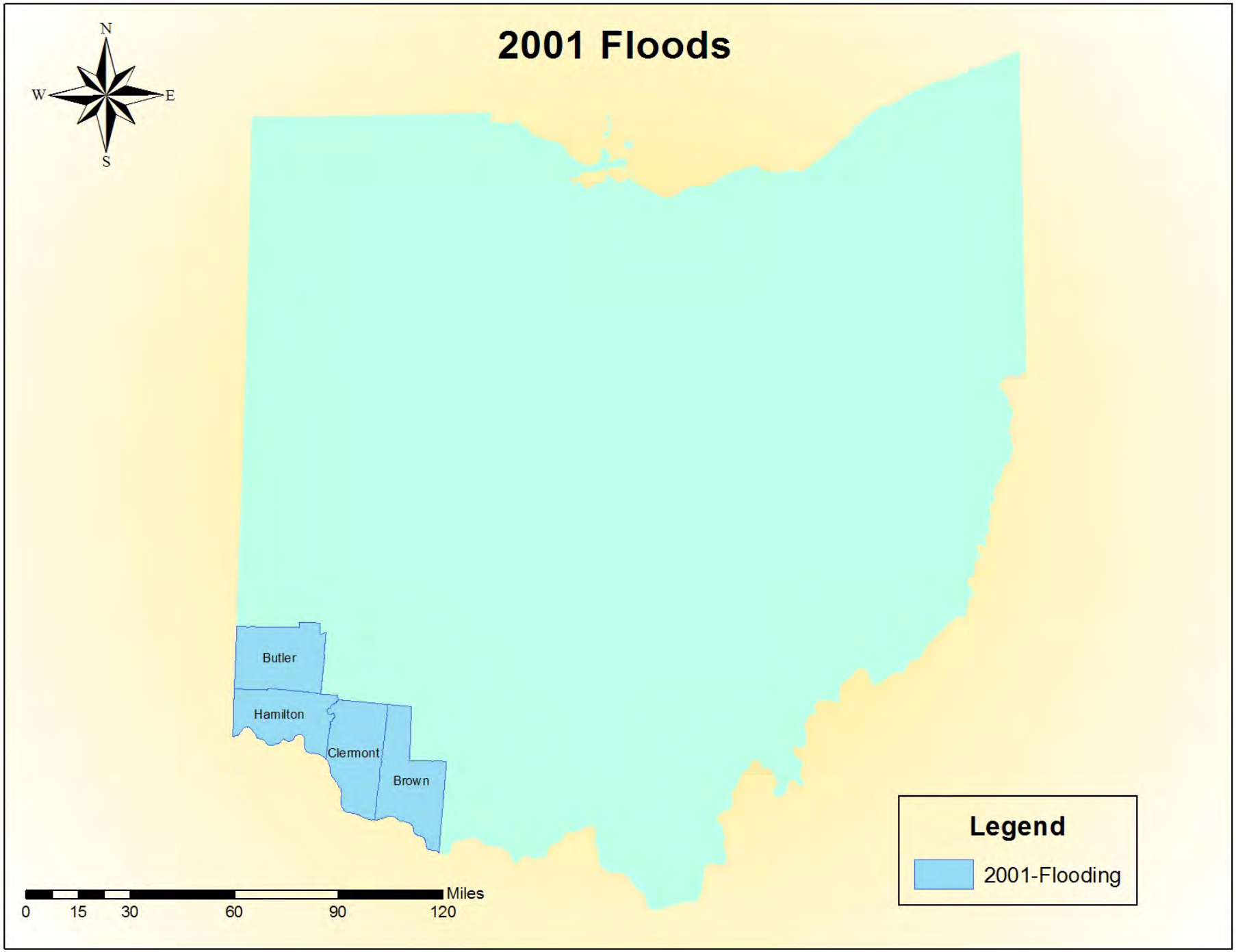


2001 Floods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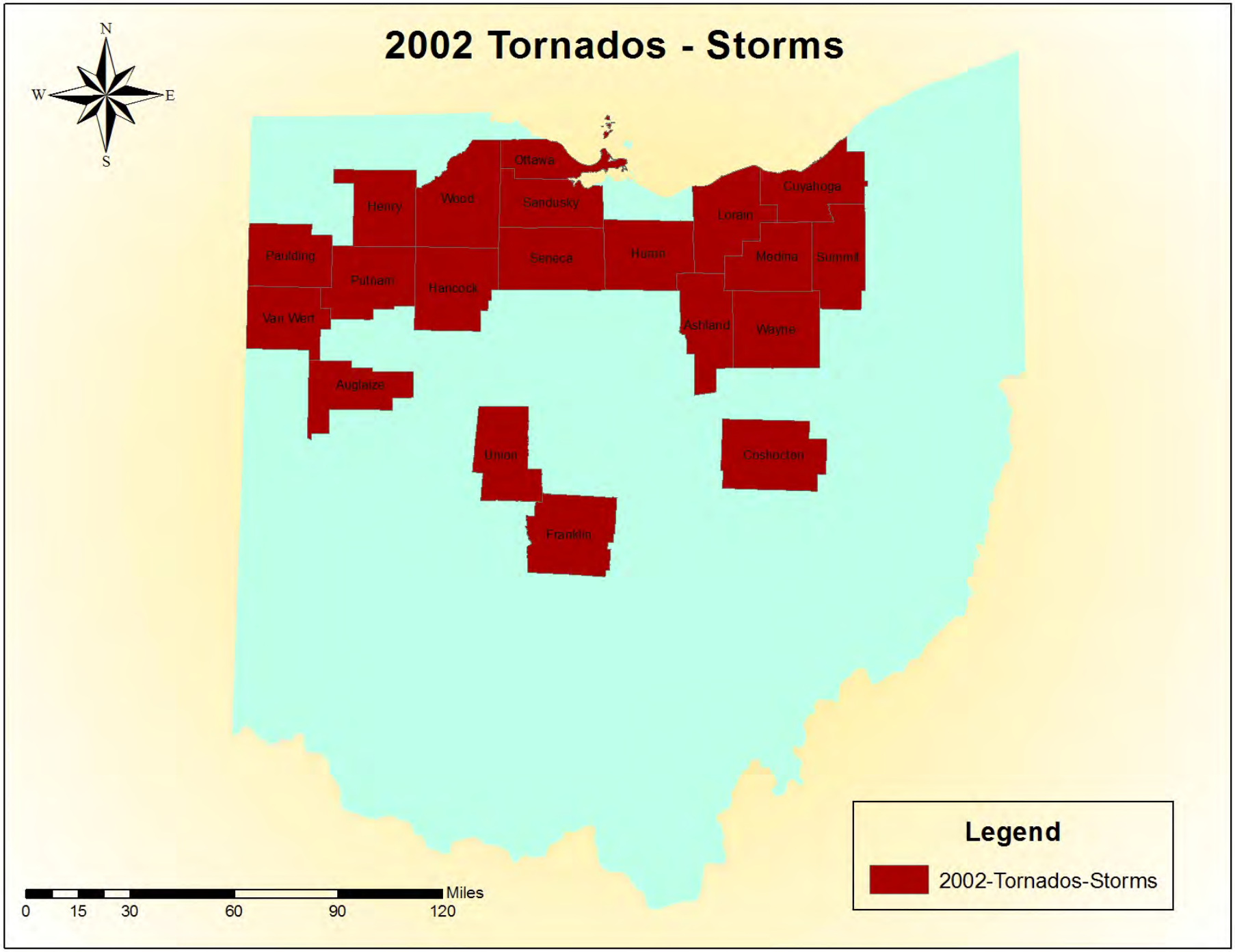
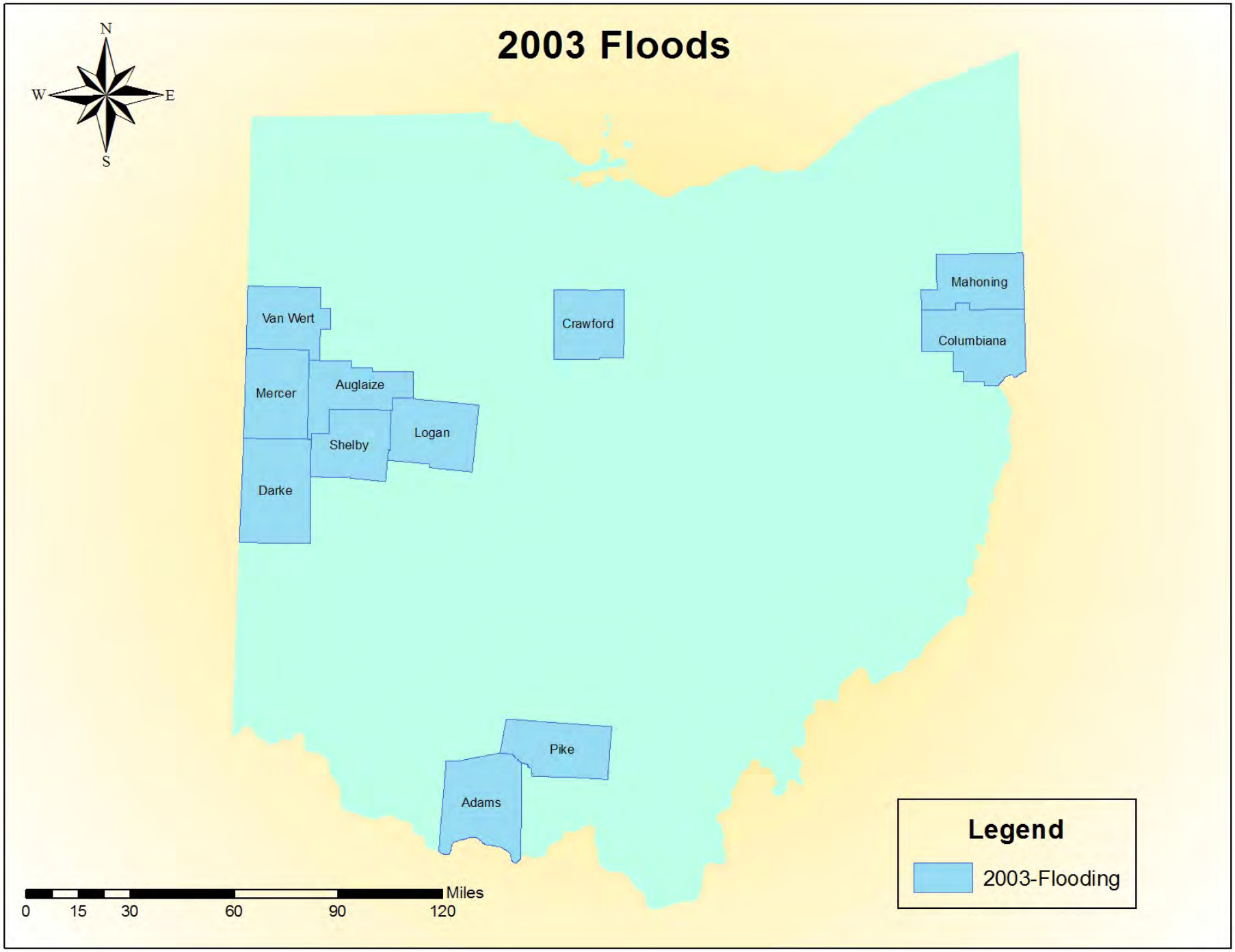
2002 Tornados - Storms



2003 Floods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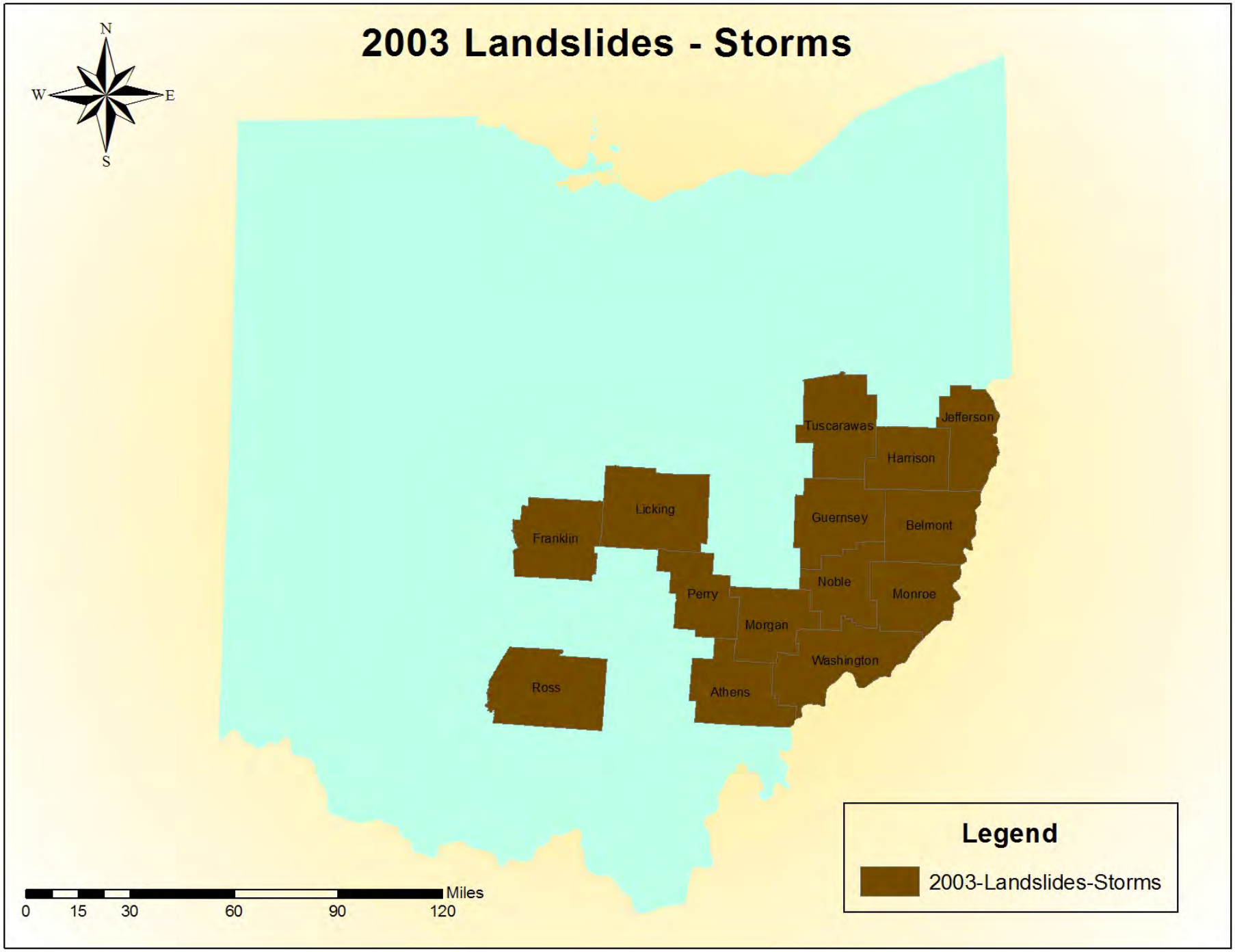
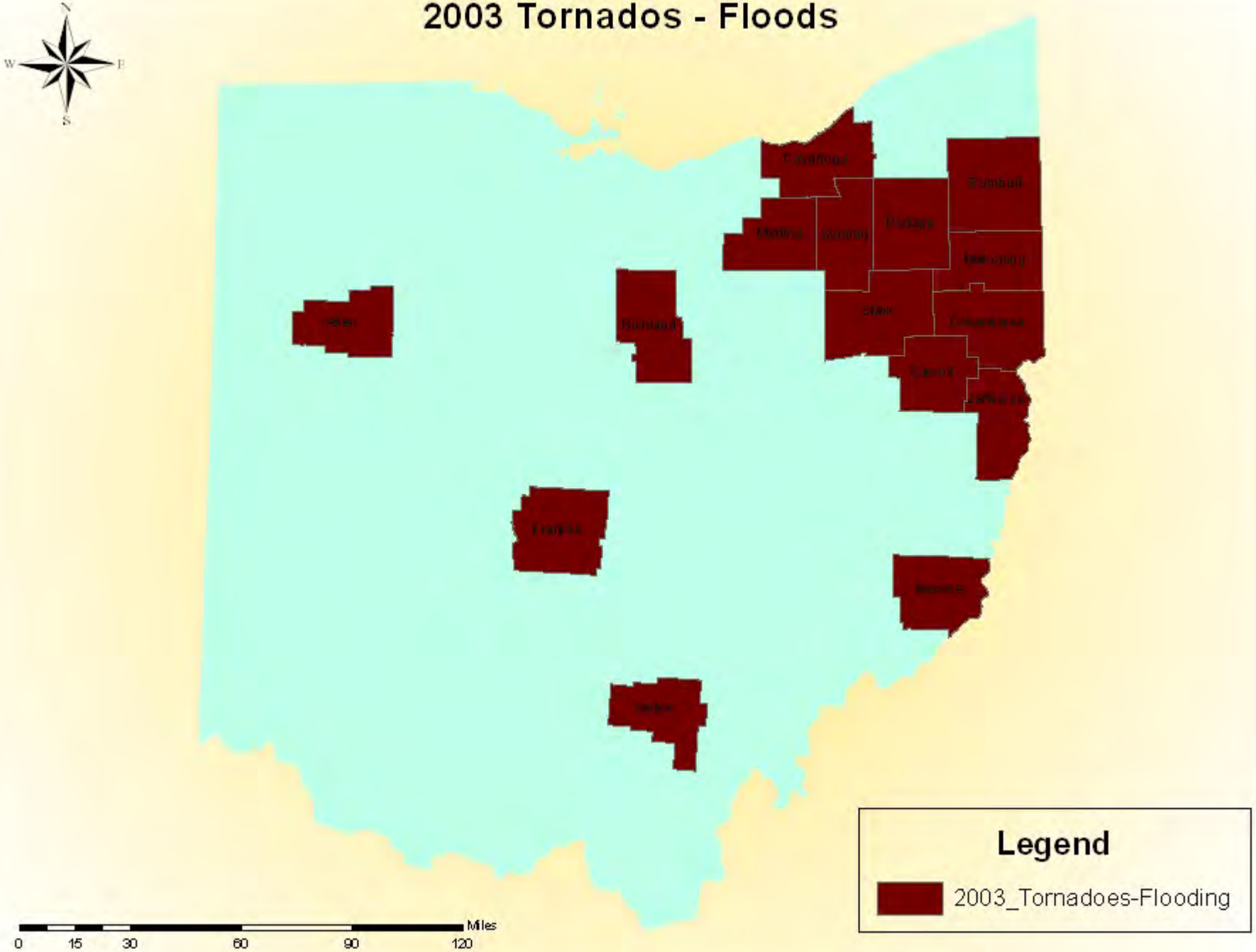
2003 Ice - Snow

2003 Ice - Snow

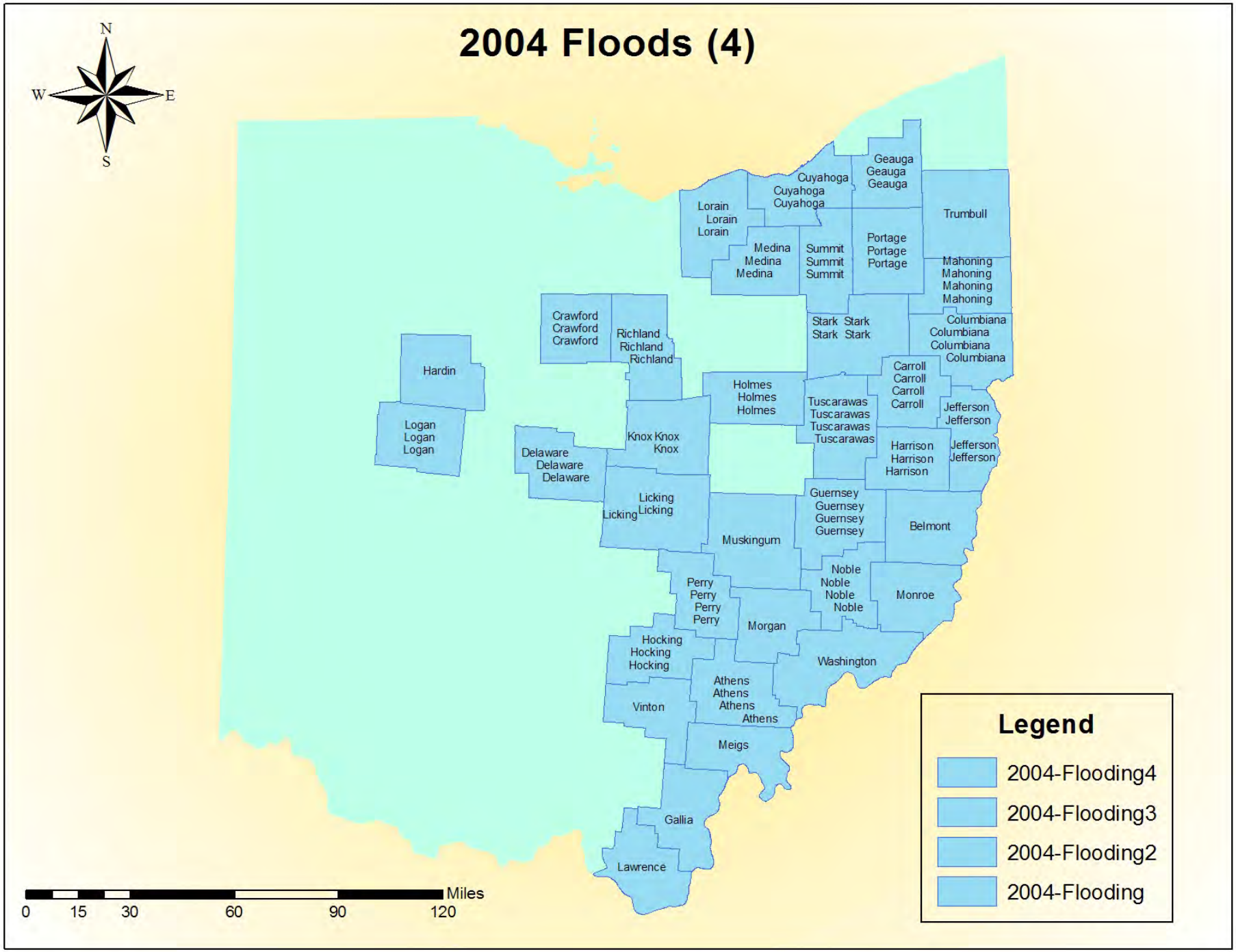
2003 Landslides - Storms



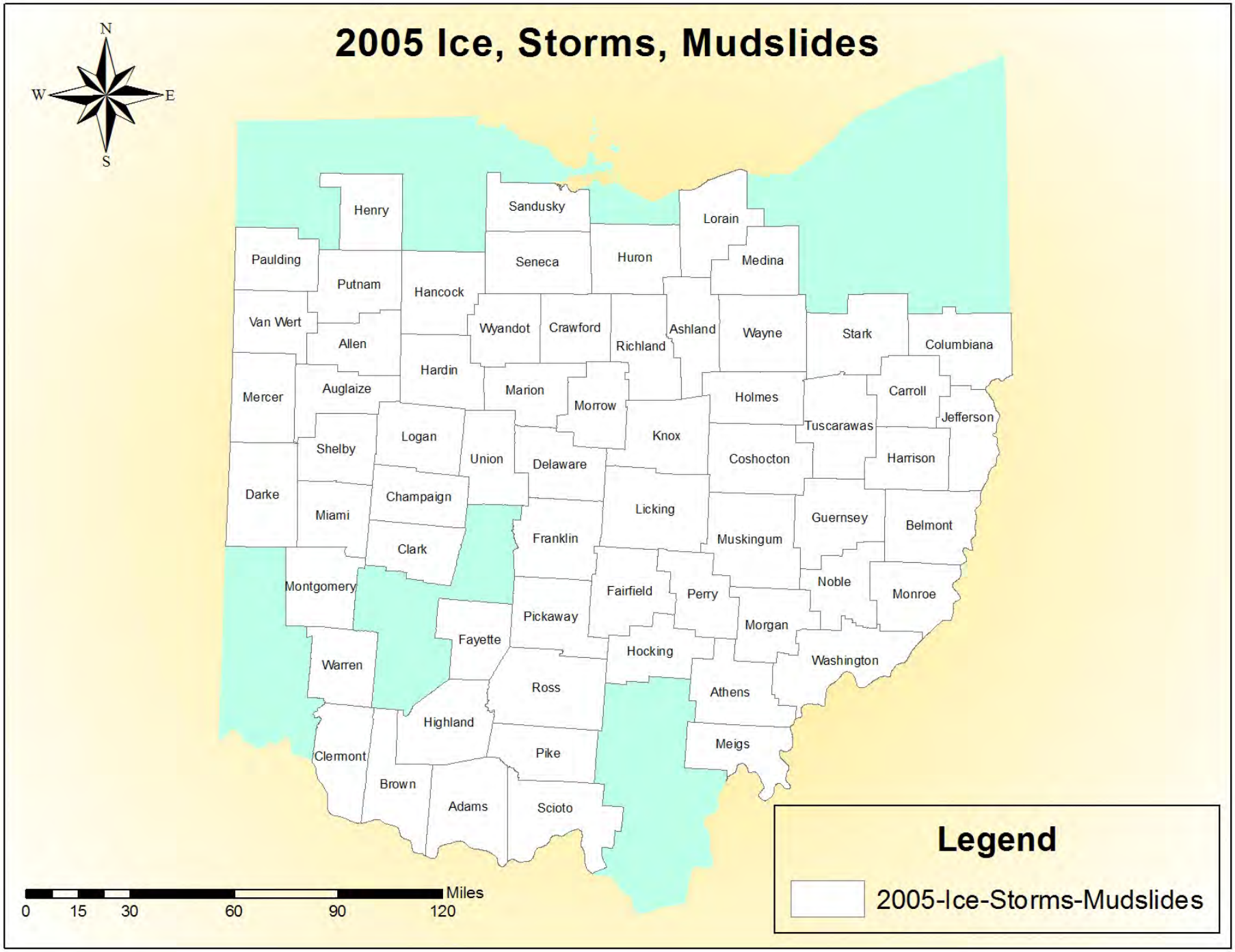
2003 Tornados - Floods



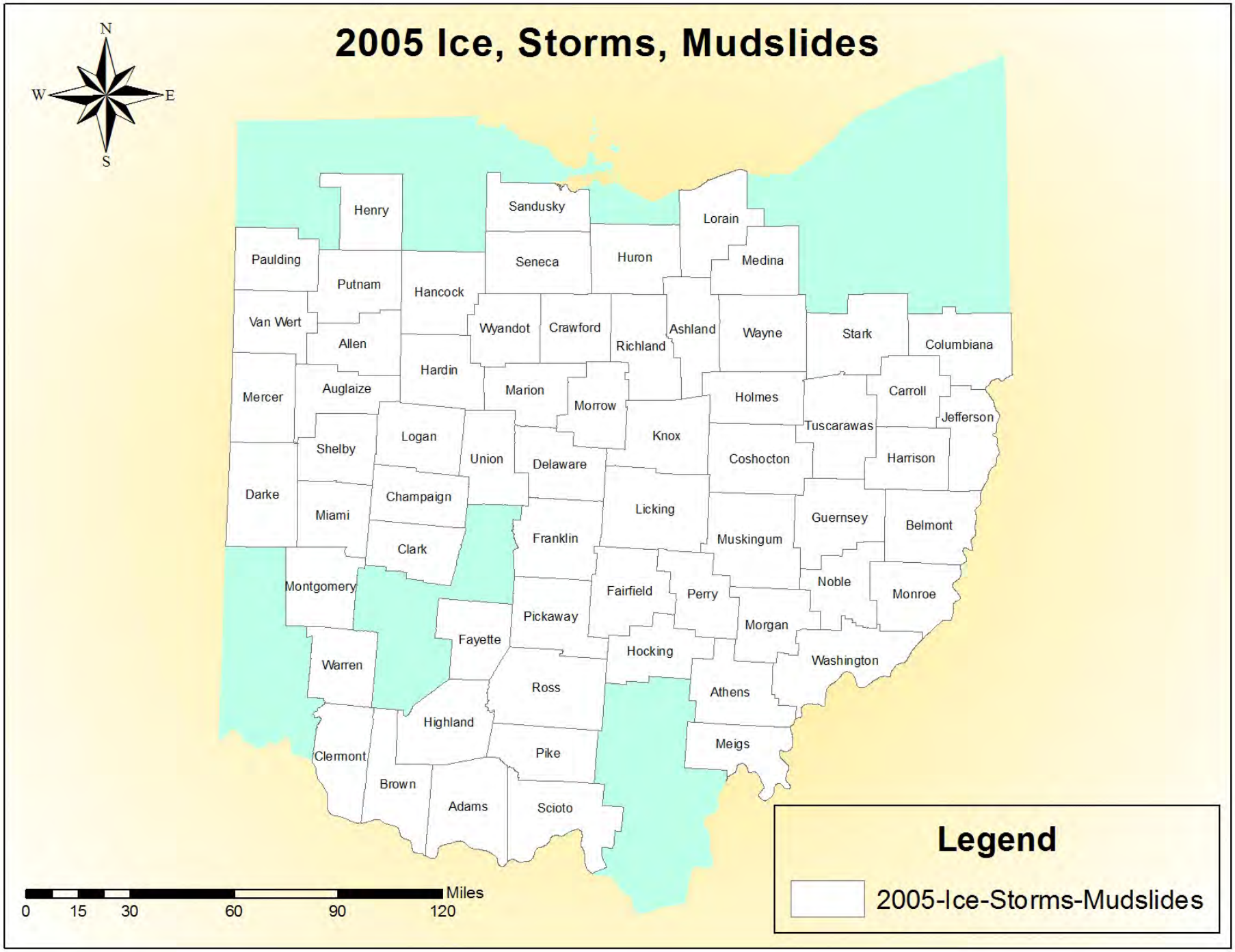
2004 Floods (4)



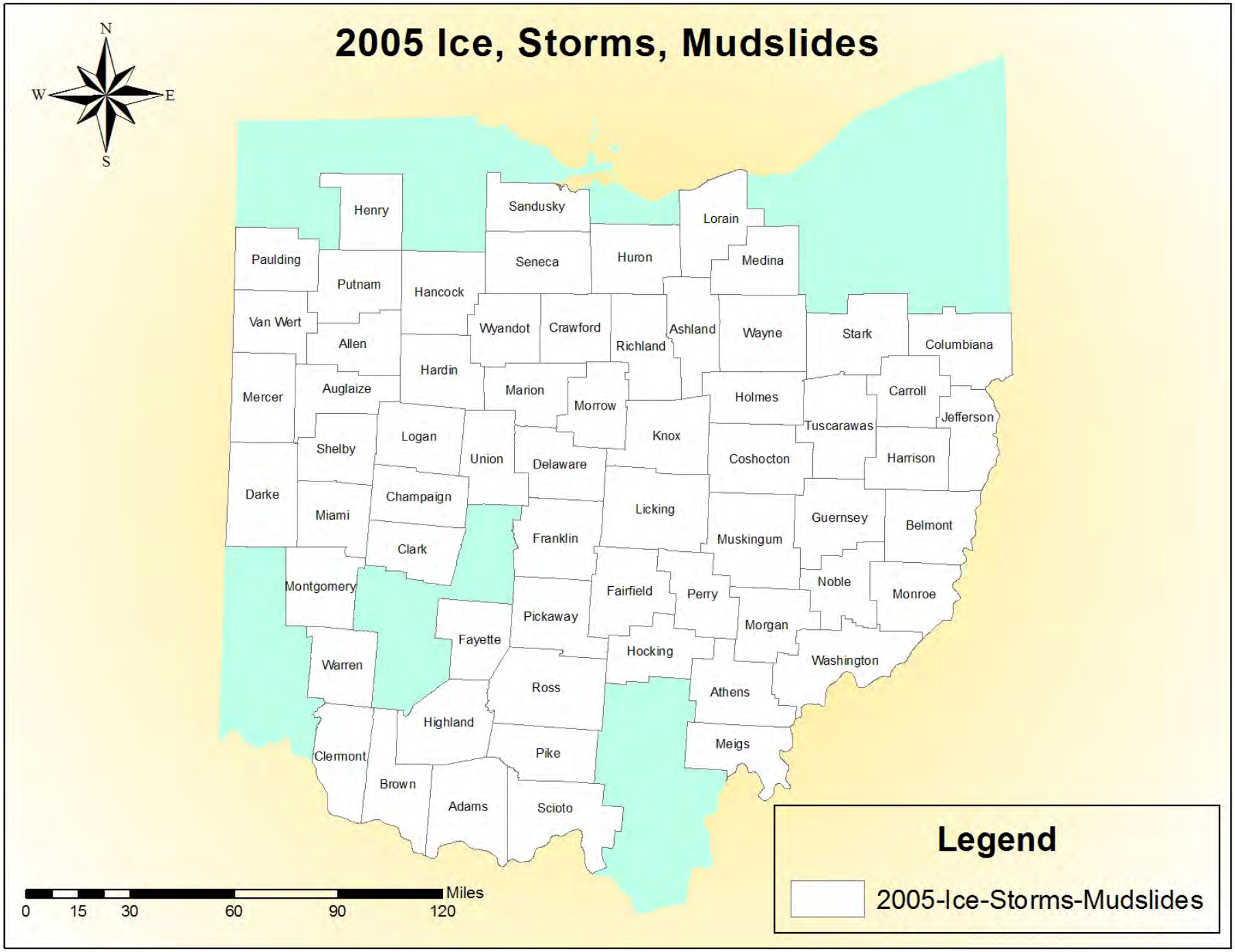
2005 Ice, Storms, Mudslides



2005 Ice, Storms, Mudslides

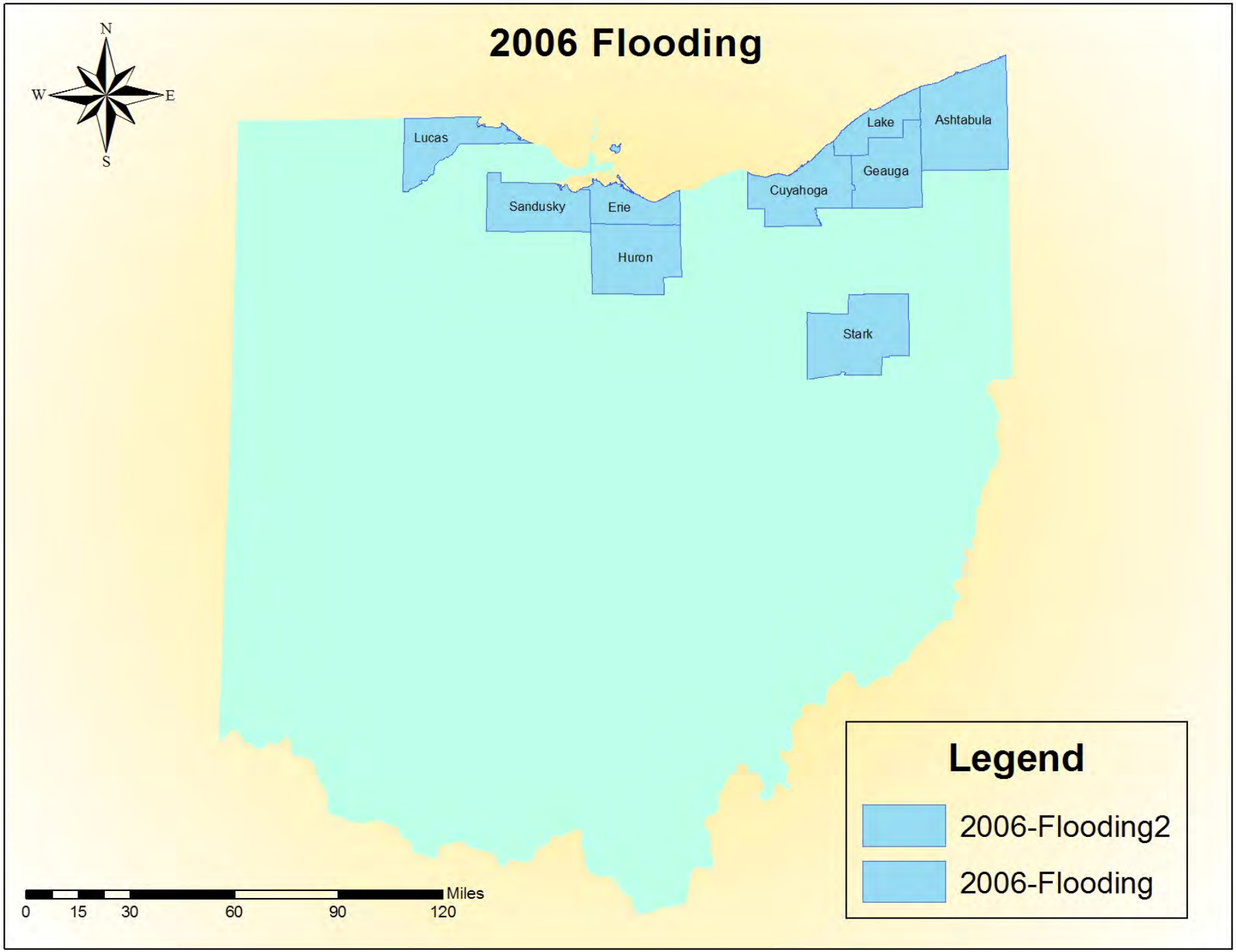


2005 Ice, Storms, Mudslides

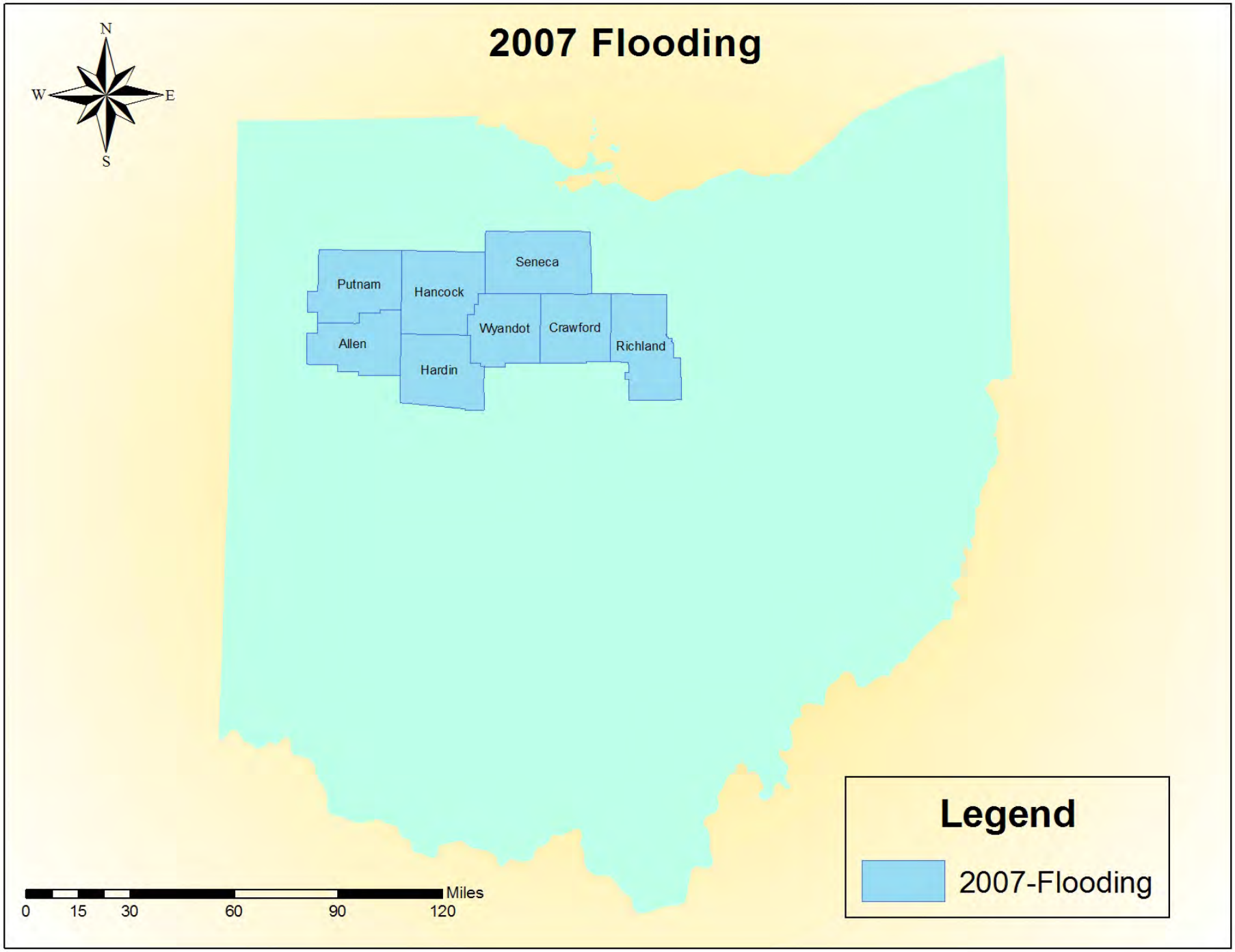


2005 Snowstorm

2006 Flooding



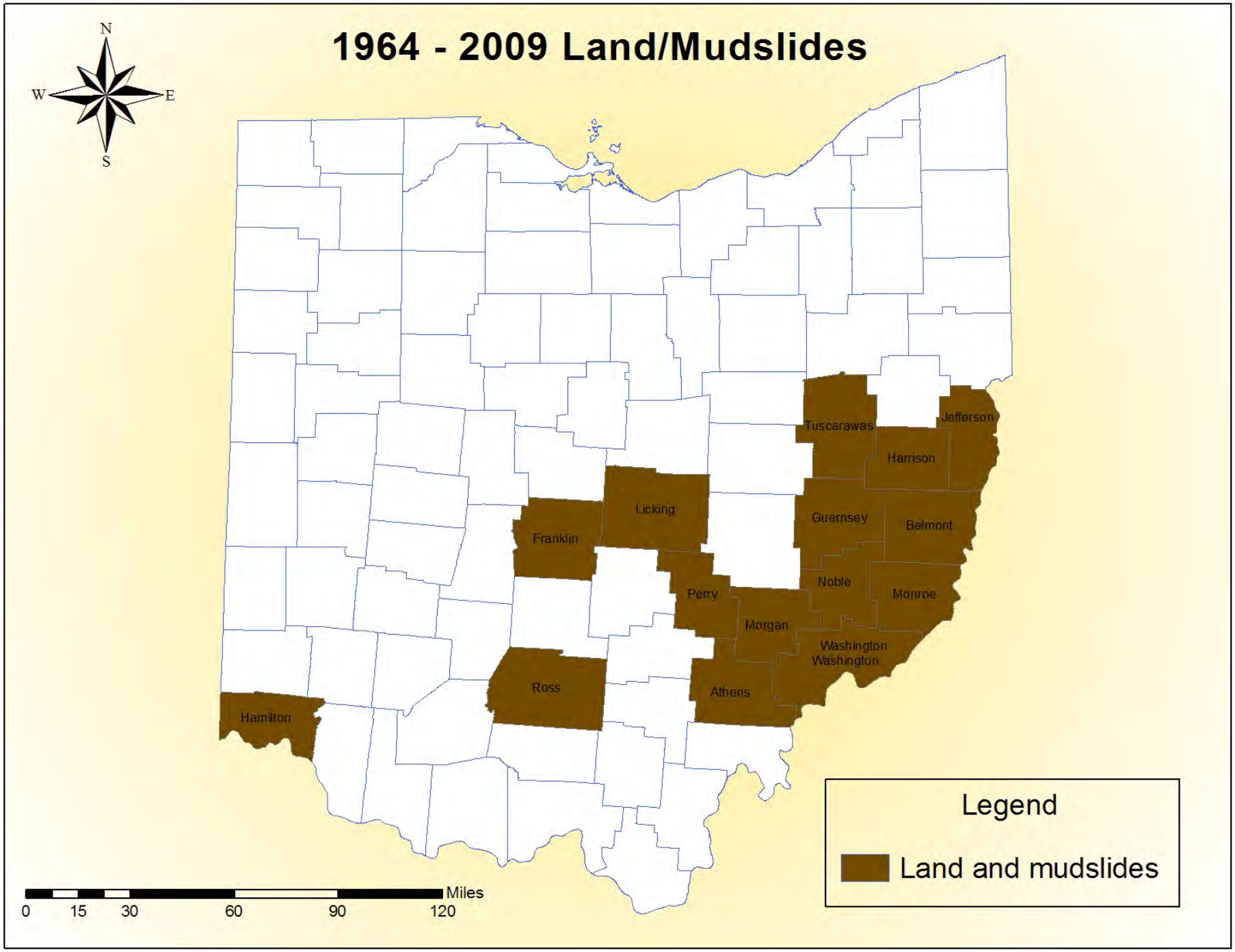
2007 Flooding



2008 Snowstorm

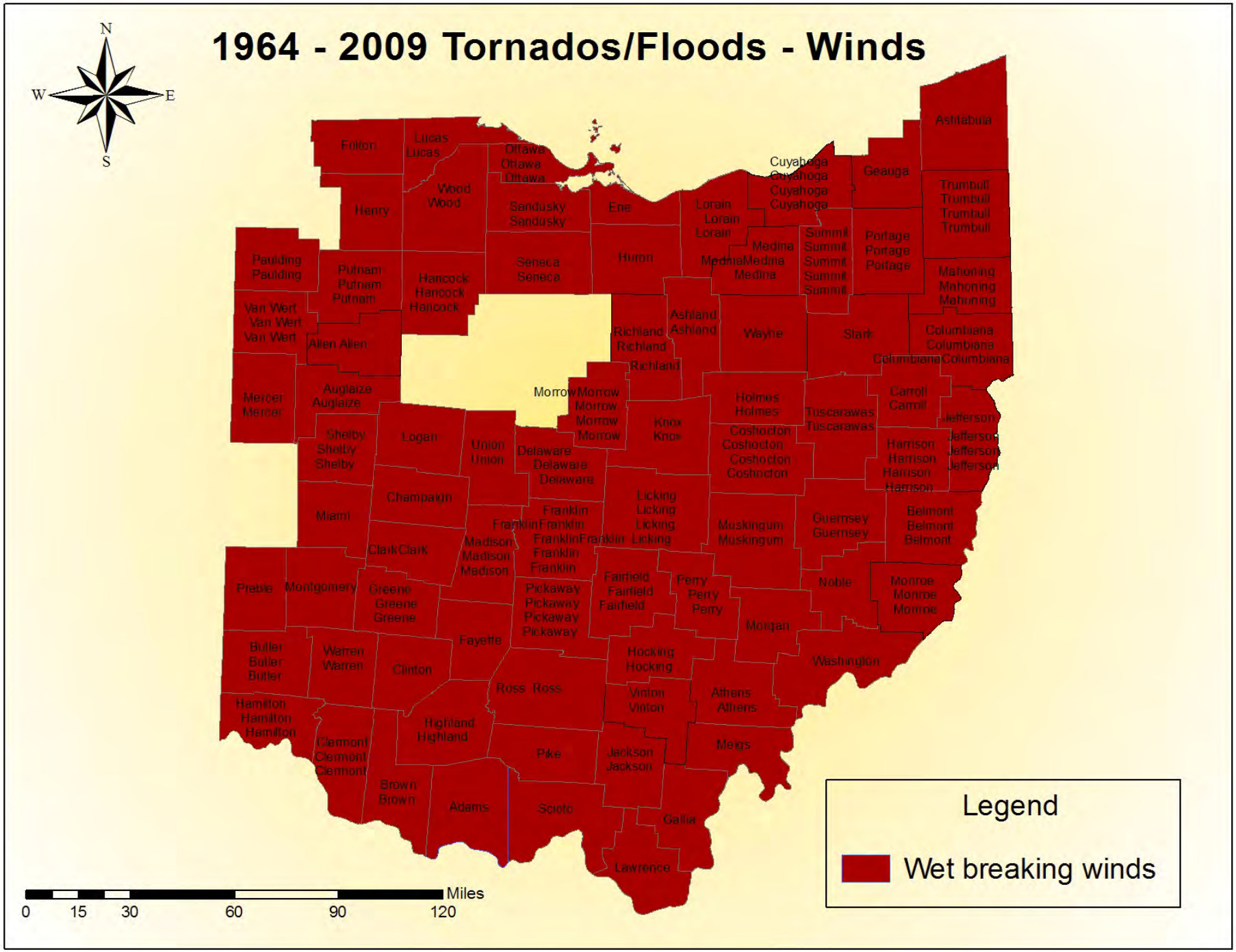
2008 Windstorm

1964 - 2009 Land/Mudslides

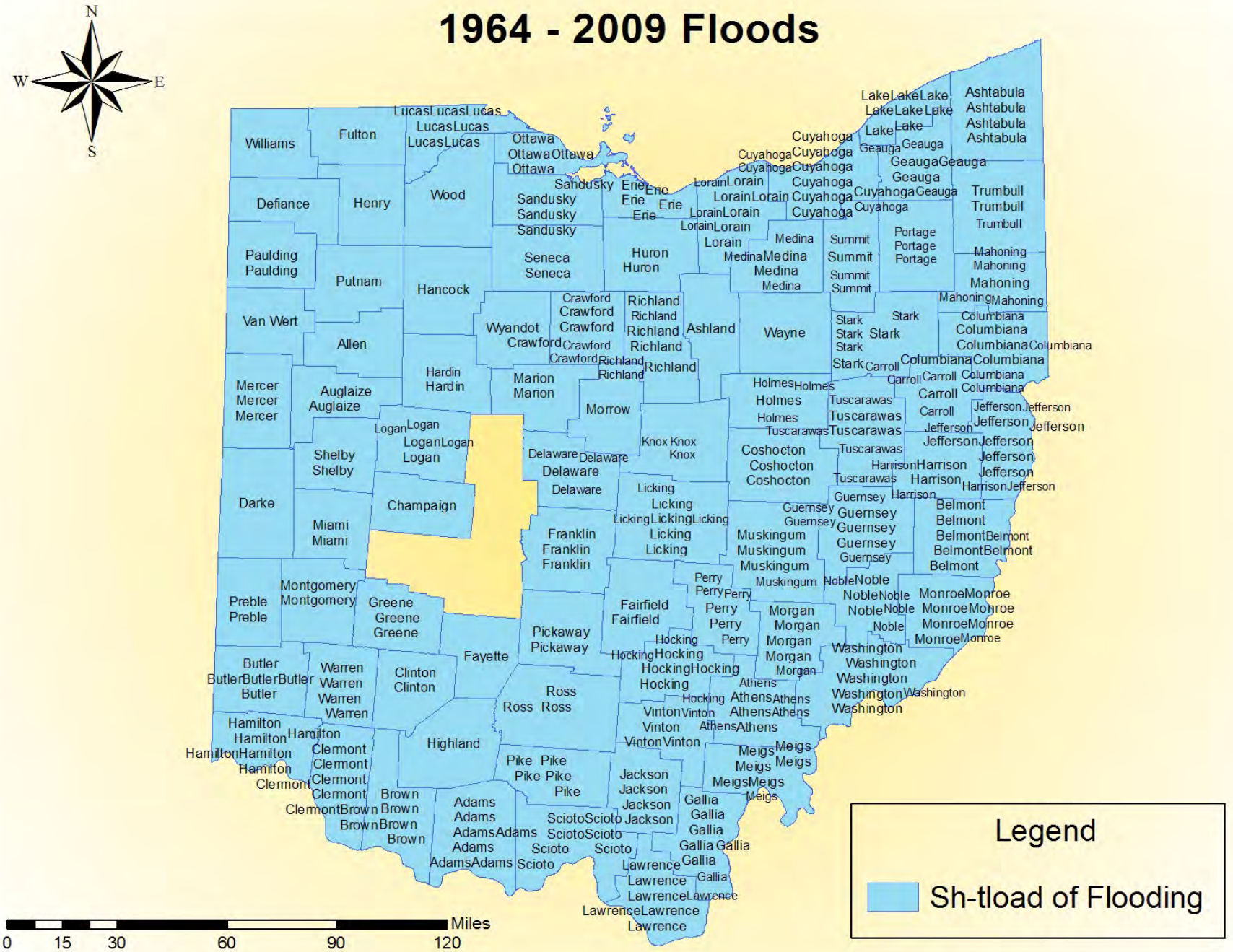


1964 - 2009 Snow - Ice

1964 - 2009 Tornados/Floods - Winds



1964 - 2009 Floods



Legend

Sh-tload of Flooding

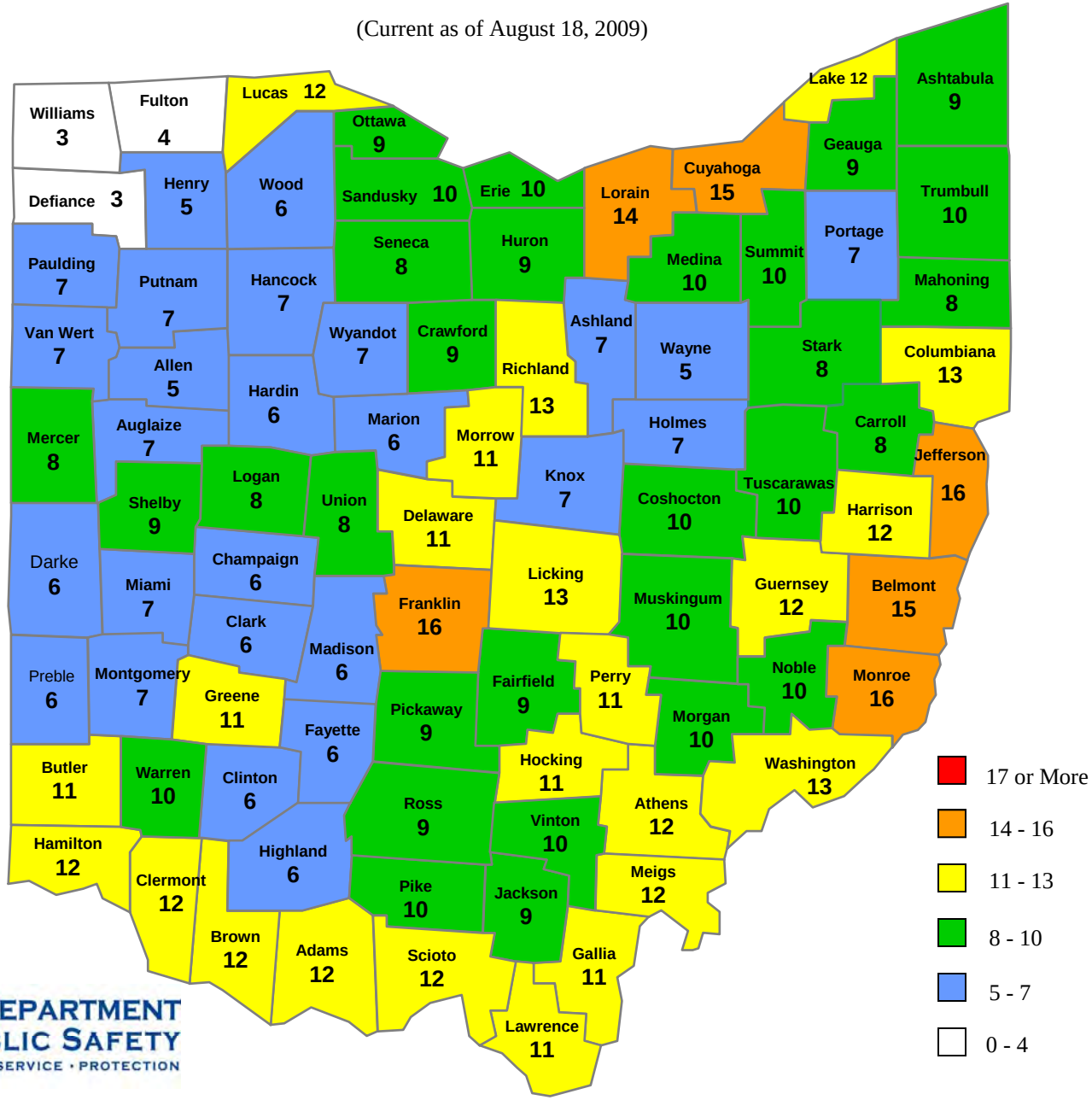
Miles

0 15 30 60 90 120

OHIO PRESIDENTIAL DISASTER DECLARATIONS

(Includes all FEMA Major and Emergency Declarations from 1964 – 2009)

(Current as of August 18, 2009)



OHIO DEPARTMENT OF PUBLIC SAFETY
EDUCATION · SERVICE · PROTECTION

International Charter Space and Major Disasters

Presented by:
Richard J. Kotapish, GISP
Director, GIS Department
Lake County, Ohio

Slides provided by
the International Charter

Purpose

An International agreement among Space Agencies to support with space-based data and information, relief efforts in the event of emergencies caused by major disasters.

Charter History

- Following the UNISPACE III conference held in Vienna, Austria in June 1999.
- ESA and CNES initiated the International Charter in July 1999.
- CSA (Canadian Space Agency) signed the Charter on October 20, 2000.
- Charter implementation by identifying and creating a number of functional units and preparing the necessary policies and plans.
- Charter declared operational as of November 1, 2000 after formal rehearsals and qualification tests.
- First activation of the Charter: Slovenian landslide November 11, 2000.

ERS and ENVISAT

SPOT

RADARSAT

POES, GOES

IRS

Charter History

- The US National Oceanic and Atmospheric Administration (NOAA), and the Indian Space Research Organization (ISRO) became members in September 2001.
- In July 2003, Argentina (CONAE) joined the Charter.
- Detailed operational procedures established and kept under document configuration control.
- In 2005, the Japanese Space Agency (JAXA) joined the Charter in February, the United States Geological Survey (USGS) in April as part of the US membership, and the Disaster Monitoring Constellation (DMC) Consortium in November.
- The China National Space Administration (CNSA) joined the Charter in May 2007.
- Two hundred and fourteen (214) disasters covered to date in various parts of the world.

SAC-C

ALOS

Landsat

ALSAT
BILSAT
NigeriaSat
UK-DMC
TopSat

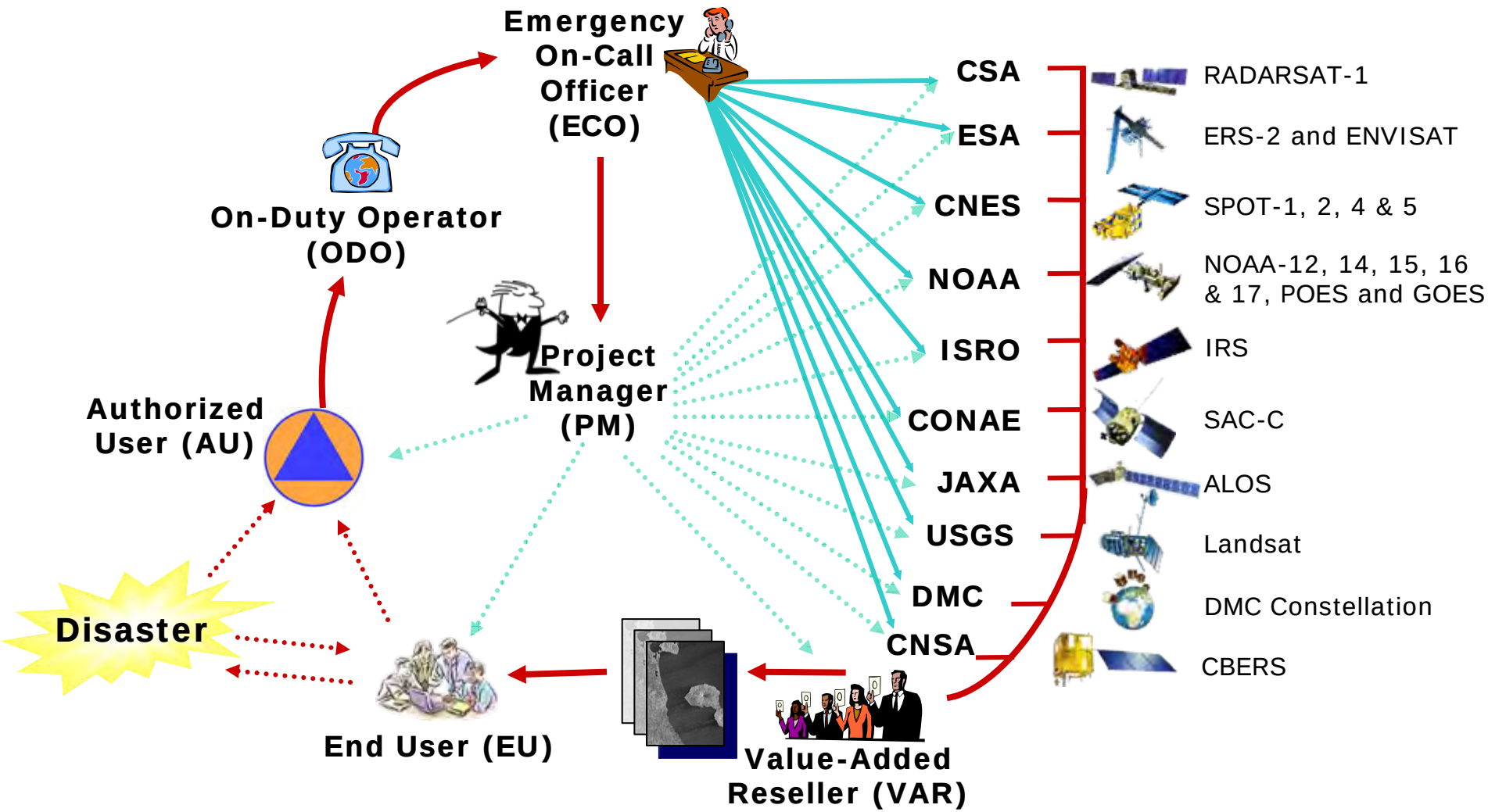
CBERS

Charter Member Agencies

Charter Functional Units

- **Authorized Users (AUs)**
- **On-Duty Operator (ODO)**
- **Emergency on-Call Officer (ECO)**
- **Project Manager (PM)**
- **Data processing and distribution facilities**
- **Value-Added Resellers (VARs)**

Charter Operational Loop



AU: Authorized User

Authorized users are normally Civil Protection Agencies

- Only an AU can request a Charter activation.
- UNOOSA and UNOSAT have the capability to request an activation for other UN agencies.
- United States : Brenda Jones, USGS Center for Earth Resources Observation and Science (EROS)

Activation Criteria

These requests should not be accepted:

1. **Non emergency situations** :

   Oil spill monitoring operations

   Ice monitoring operations except for specific event

2. **Emergencies falling out of Charter scope** :

   War or armed conflicts

   Humanitarian actions not linked to a specific disaster

   Search and rescue support not linked to a specific disaster

Activation Criteria

3. **Emergencies with doubtful/no benefit from space assets**

   Droughts

   Routine epidemiological outbreaks

4. **Calls beyond emergency period**

   As a rule of thumb, a Charter activation occurring more than 10 days after the actual crisis start should be rejected.

In addition, the duration of a Charter call should be limited to a maximum of 15 days after activation and the request should be rejected if the size of the disaster is not compatible with the resolution of the available satellites.

ODO: On Duty Operator

User Request Form

To be filled by ODO
Call ID

1. Date and time of the call
DATE_____ MONTH (Spell)_____ YEAR_____
TIME_____ LOCAL TIME ZONE_____ UTC TIME

2. Name of the organization and caller
Phone
Fax
Cellular phone
E-mail
to be used for call back

3. Type of disaster
- ☐ flood
- ☐ landslide
- ☐ volcano
- ☐ hurricane
- ☐ fire
- ☐ ice
- ☐ earthquake
- ☐ oil spill
- ☐ other (specify)_____

4. Geographical location
Approximate geographical location and surface extent

Location
From

To

Extent (km2)

5. Co-ordinates

a) by center co-ordinates
Lat..... °.....
Long..... °.....

Maximum radius of 30 Km

b) by upper left co-ordinates
Lat..... °.....
Long..... °.....

Lower right co-ordinates
Lat..... °.....
Long..... °.....
Maximum 60x60 km²

6. Approximate date/time of occurrence or predicted occurrence

7. Additional information on the disaster

8. Additional instructions
(shipping instructions)

To be filled by ODO
Authorized User ☐ Yes ☐ No ☐

Standard Map Product Template (on-going)

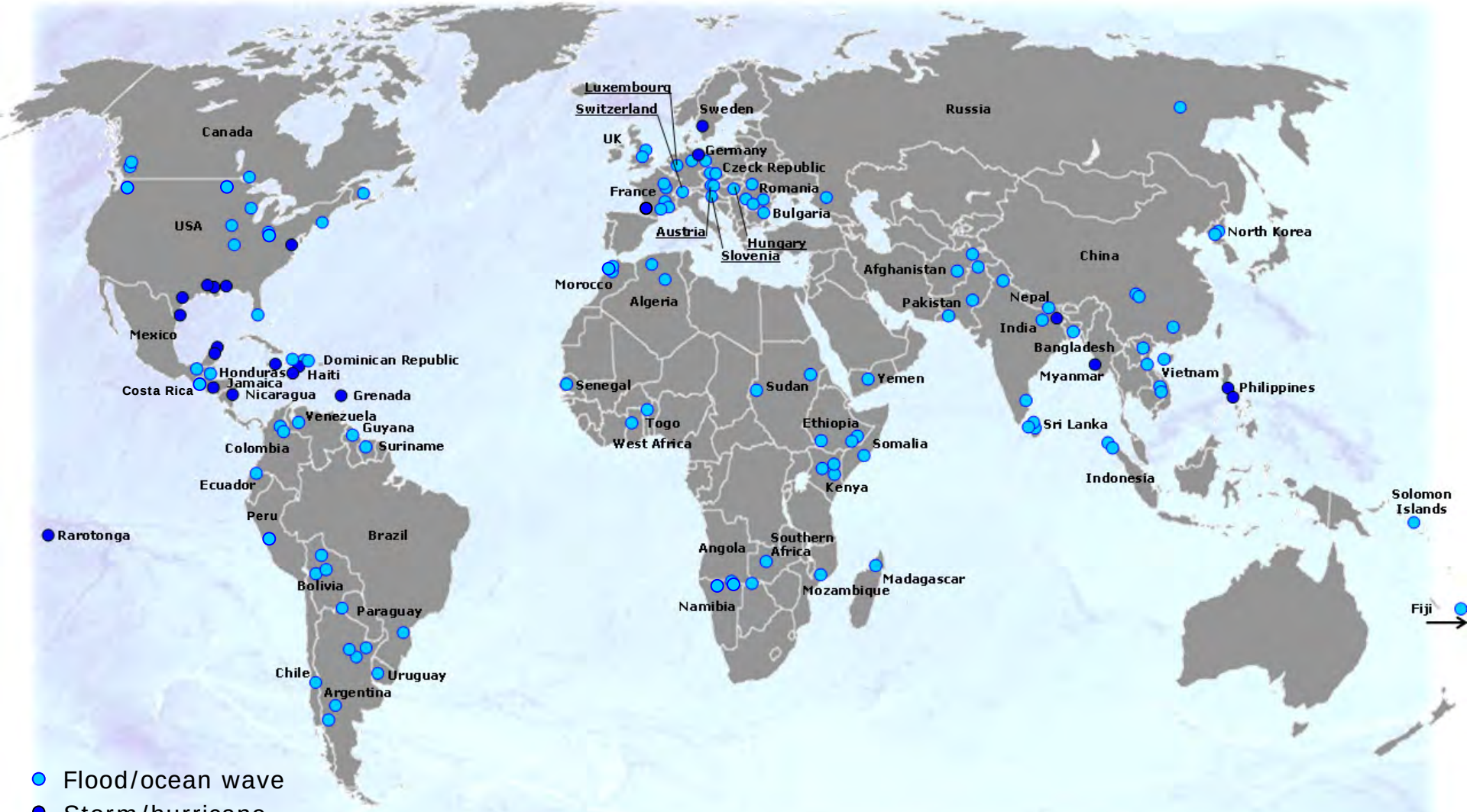
International Charter - Space and Major Disasters
FLOOD EMERGENCY DATABASE TEMPLATE

Agency	Satellite/sensor	Programmed	Archived	Suggested	Comments
CONAE	SAC-C(HSTC)				
	SAC-C (MMRS)				
	SAC-C(HRT)				
CNES	SPOT-1				
	SPOT-2				
	SPOT-3				
	SPOT-4				
	SPOT-5 (HRG)				
	SPOT-5 (HRS)				
	SPOT-5 (Veg)				
	FORMOSAT				
CNSA	CBERS(WFI)				
	CBERS(CCD)				
	CBERS(IMS)				
CSA	RADARSAT-1				
	RADARSAT-2				
DMCii	UK-DMC				
	TopSat				
	Beijing-1				
	NigeriaSat-1				
	Bilsat-1				
	Alsat-1				
ESA	ERS SAR				
	ENVISAT ASAR				
	ENVISAT MERIS				
	PROBA CHRIS				
ISRO	IRS IC/ID/P6 PAN				
	IRS IC/ID/P6 LISS-III				
	IRS IC/ID WiFS				
	IRS P6 AWiFS				
	IRS P4 OCM				
	Cartosat-1				
JAXA	ALOS(PRISM)				
	ALOS(AVNIR-2)				
	ALOS(PALSAR)				
NOAA	POES				
	GOES				
USGS	Landsat-5				
	Landsat-7				
	IKONOS (NGA)				
	Quickbird				
	Worldview				
	GEOEYE-1				
OUTSIDE CHARTER					
USGS					
USAF-EagleVision or SPOT direct	SPOT-1				
	SPOT-2				
	SPOT-3				
	SPOT-4				
	SPOT-5 (HRG)				
	SPOT-5 (HRS)				
	SPOT-5 (Veg)				
	FORMOSAT				
DOD	P-3				
	SCAVIEW				
NASA	ASTER				
DHS					
HSIP Freedom	Elevation data				These need to be properly identified
	NHD				once HSIP Freedom data is rec'd
	Jurisdiction Boundaries				

DRAFT

Activation Distribution

Floods and storms

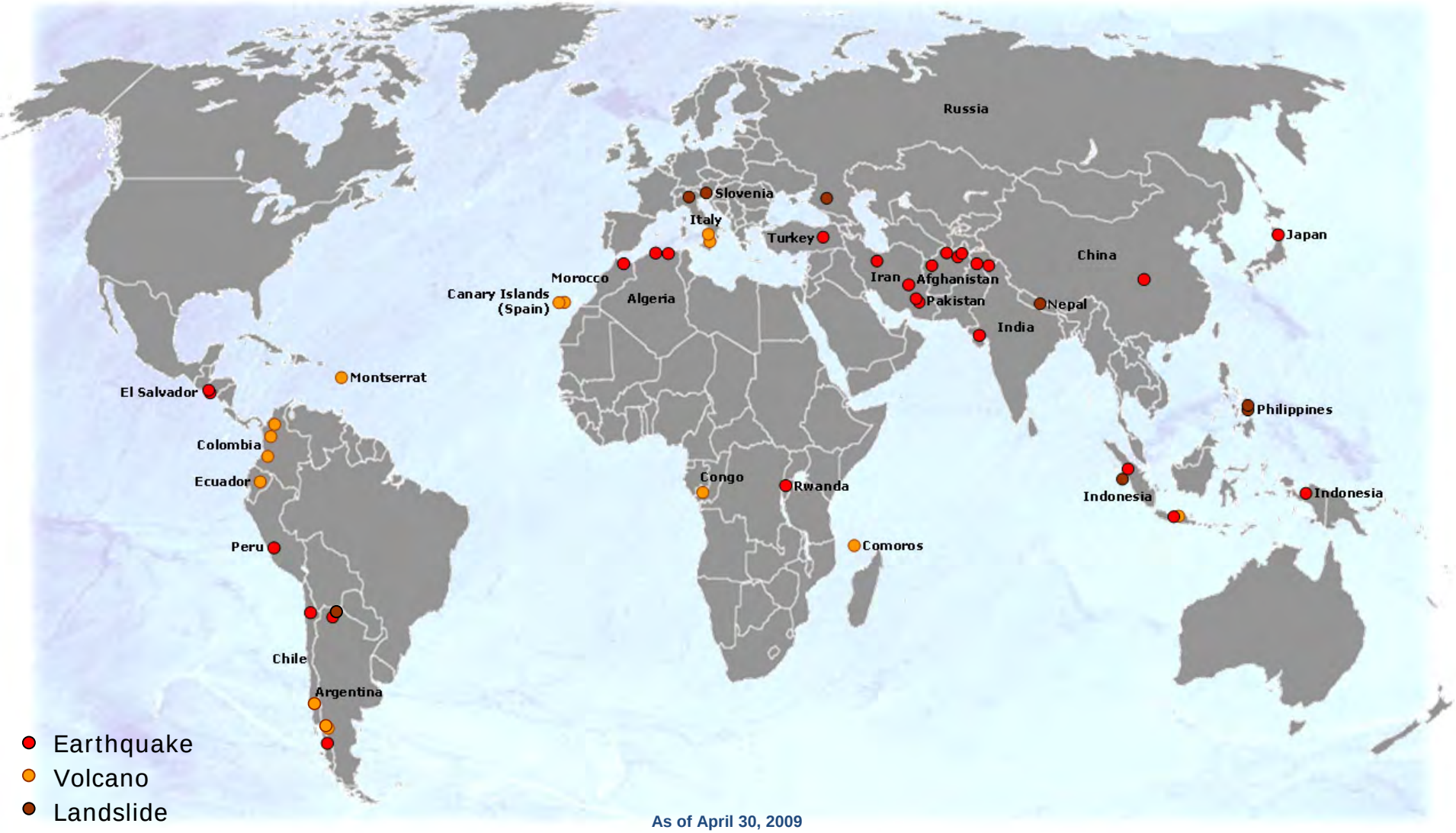


- Flood/ocean wave
- Storm/hurricane

As of April 30, 2009

Activation Distribution

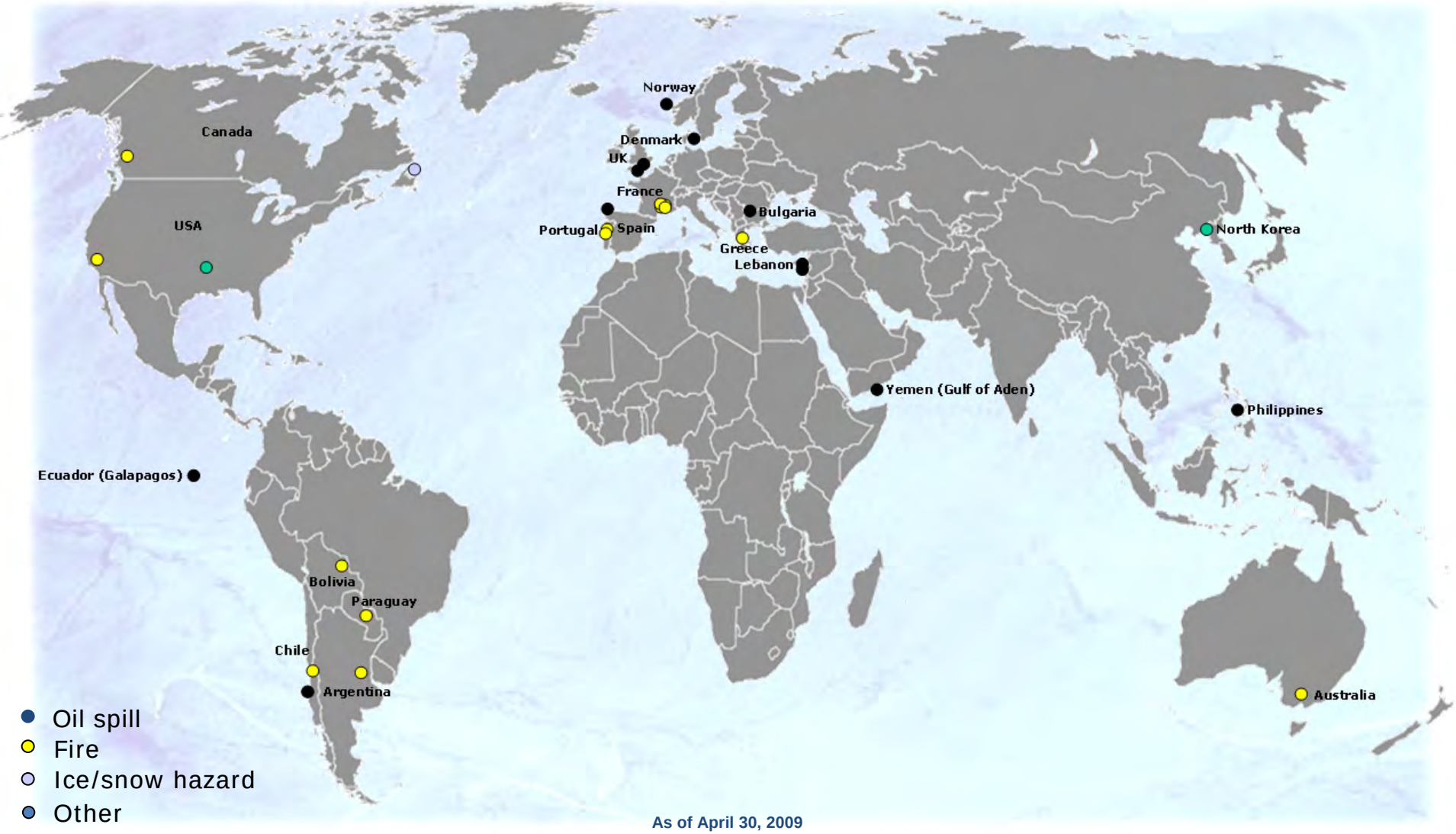
Earthquakes, volcanic eruptions and landslides



As of April 30, 2009

Activation Distribution

Oil spills, forest fires and other hazards



- Oil spill
- Fire
- Ice/snow hazard
- Other

As of April 30, 2009

International Charter "Space and Major Disasters" Satellites

Argentina's Comision Nacional de Actividades Espaciales (CONAE)

SAC-C

Country: Argentina
Satellite: SAC-C

Sensor: HSTC - High Sensitivity Camera (Night View)

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
254 m	Pan	450-520 nm	800 km	

Sensor: MMRS - Multispectral Medium Resolution Scanner

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
175 m	1	480-500 nm	360 km	
	2	540-560 nm		
	3	630-690 nm		
	4	795-835 nm		
	5	1550-1700 nm		

Sensor: HRTC - High Resolution Technological Camera

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
35 m	Pan	400-900 nm	90 km	

Canadian Space Agency (CSA)

RADARSAT-1

Country: Canada
Satellite: RADARSAT-1
Sensor: Advanced radar/C Band/SHH Polarization

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
8m	Fine	15	50 x 50 km	1-3Days
25m	Standard	1	100 x 100 km	
30m	Wide	3	150 x 150 km	
50m	ScanSAR Narrow	2	300 x 300 km	
100m	ScanSAR Wide	2	500 x 500 km	
25m	Extended High	1	75 x 75 km	
35m	Extended Low	1	170 x 170 km	

Centre National d'etudes Spatiales (CNES)

Spot 1,2,3,4,5

FORMOSAT -2

Country: France
Satellite: Spot-1,2,3 (Spot-1, 3 are used for archive data only)
Sensor: HRV (x 2)

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
20m	1	500-590 nm	60 km (120 km)	1-3 Days
	2	610-680 nm		
	3	790-890 nm		
10m	Pan	510-730 nm		

Satellite: Spot 4
Sensor: HRVIR (x 2)

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
20m	1	500-590 nm	60 km (120 km)	1-3 Days
	2	610-690 nm		
	3	790-890 nm		
	SWIR	1580-1750 nm		
10m	2 - Used as Pan	610-680 nm		

Satellite: Spot 5
Sensor: HRG (x 2)

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
10 m	1	500-590 nm	60 km (120 km)	1-3 Days
	2	610-680 nm		
	3	790-890 nm		
20 m	SWIR	1580-1750 nm		
2.5 m -5 m	Pan	490-690 nm		

Satellite: Spot 5
Sensor: HRS

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
10 m	Pan	490-690 nm	120 km	1-3 Days

Satellite: Spot 4, 5
Sensor: VEGETATION

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
1165 m	0	430-470 nm	2250 km	Daily
	2	610-690 nm		
	3	790-890 nm		
	SWIR	1580-1750 nm		

Country: Taiwan
Company: NSPO
Distributor: SPOT-IMAGE
Satellite: FORMOSAT - 2
Sensor: ISTC - High Sensitivity Camera (Night View)

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
8 m	1	450-520 nm	24 km	Daily
	2	520-600 nm		
	3	630-690 nm		
	4	760-890 nm		
2 m	Pan	450-900 nm		

Disaster Monitoring Constellation (DMC)

UK DMC
Beijing-1
Nigeriasat-1
Bilsat-1
Alsat-1

Country: UK (SSTL)
Satellite: UK-DMC
Sensor: DMC

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
32 m	1	520-600 nm	660 km	Daily
	2	630-690 nm		
	3	770-900 nm		

Country: China (BLMIT)
Satellite: Beijing-1
Sensor: DMC +4

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
32 m	1	520-600 nm	600 km	
	2	630-690 nm		
	3	770-900 nm		
4 m	Pan	500-800 nm	24 km	

Country: Nigeria (NASRDA)
Satellite: NigeriaSat-1
Sensor: DMC

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
32 m	1	520-600 nm	600 km	
	2	630-690 nm		
	3	770-900 nm		

Country: Turkey (BILTEN)
Satellite: Bilsat-1
Sensor: DMC

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
26 m	1	520-600 nm	600 km	
	2	630-690 nm		
	3	770-900 nm		
	12 m	Pan	900 km	

Country: Algeria (CNTS)
Satellite: Alsat-1
Sensor: DMC

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
32 m	1	520-600 nm	600 km	
	2	630-690 nm		
	3	770-900 nm		

European Space Agency (ESA)

ERS

ENVISAT

Proba

Country: 17 European members (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Norway, the Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom).

Satellite: ERS
Sensor: AMI SAR (archives since 1991)

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
25 m	C band/VV Polarization		100 km	+/- 12-20 days

Satellite: ENVISAT
Sensor: ASAR

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
	C Band, 5 Polarization modes (VV/HH,VV/HH, HV/HH,VH/HV)			+/- 3-5 Days
25 (image/Wave)			100 km(wave 5km)	
150 m Wide			400 km	
1000 Global			400 km	

Satellite: PROBA
Sensor: CHRIS/Hyperspectral

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
18-36 m	19-63	400-1050 nm	14 km	+/- 7 Days

Satellite: PROBA
Sensor: HRC/High Resolution Camera

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
5 m	Pan		5 km	+/- 7 Days

Indian Space Research Organisation (ISRO)

RESOURCESAT-1

Cartosat-1

Country: India
Satellite: Resourcesat-1 (IRS-P6)
Sensor: LISS-4

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
5.8 m	2	520-590 nm		5 Days
	3	620-680 nm	23 km MSS	
	4	770-860 nm	70 km Pan	

Sensor: LISS-3

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
23.5 m	2	520-590 nm	141 km	24 Days
	3	620-680 nm		
	4	770-860 nm		
	5	1550-1750 nm		

Sensor: AWIFS

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
56 m	2	520-590 nm	140 km	5 Days
	3	620-680 nm		
	4	770-860 nm		
	5	1550-1700 nm		

Satellite: Cartosat-1 (IRS-5

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
2.5 m	Pan	500-850 nm	30 km	5 Days

Japan Aerospace Exploration Agency (JAXA)

ALOS

Country: Japan
Satellite: ALOS
Sensor: PRISM

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
2.5 m	Pan	520-770 nm	35 km (right) 70 km wide	

Sensor: AVNIR-2

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
10 m	1	420-500 nm	70 km	2 Days
	2	520-600 nm		
	3	610-690 nm		
	4	760-890 nm		

Sensor: PALSAR

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
10 m	L Band/HH or VV polarization	Fine(FBS)	70 km	2 Days
20 m	L Band/HH/HV or VV/VH polarization	Fine (FBD)	70 km	
20 m	L Band/HH or VV polarization	Direct Downlink (DIN)	70 km	
100 m	L Band/HH or VV polarization	Scan SAR	250-350 km	
30 m	L Band/HH/HV /VV/VH polarization	Polarimetric	30 km	

National Oceanic and Atomospheric Administration (NOAA)

POES

GOES

Country: United States
Satellite: POES
Sensor: AVHRR/NOAA 7,9,11,12,14

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
1100 m	1	580-680	2048 km	Daily
	2	725-1100 nm		
	3	3550-3930 nm		
	4	10300-11300 nm		
	5	11500-12500 nm		

Satellite: GOES
Sensor: GOES I-M

Spatial Res.	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
1000 m	1	550-750 nm	Full Earth Disc	Daily
4000 m	2	3800-4000 nm		
8000 m	3	6500-7000 nm		
8000 m	4	10200-11200 nm		
8000 m	5	11500-12500 nm		

United States Geological Survey (USGS)

Landsat 7
Landsat 5

QuickBird

IKONOS

GeoEye-1

Country: United States
Satellite: Landsat 7
Sensor: ETM+ Enhanced Thematic Mapper Plus

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
30 m	1	450-520 nm	185 km	16 Days
	2	520-600 nm		
	3	630-690 nm		
	4	760-900 nm		
	5	1550-1750 nm		
60 m	6	10400-12500 nm		
30 m	7	2080-2350 nm		
15 m	8	520-900 nm		

Satellite: Landsat 5
Sensor: TM Thematic Mapper

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
30 m	1	450-520 nm	185 km	16 Days
	2	520-600 nm		
	3	630-690 nm		
	4	760-900 nm		
	5	1550-1750 nm		
120 m	6	10400-12500 nm		
30 m	7	2080-2350 nm		

Company: Digital Globe
Satellite: QuickBird

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
2.4 m	1	450-520 nm	16.5 km	
	2	520-600 nm		
	3	630-690 nm		
	4	760-900 nm		
60 cm	Pan	445-900 nm		

Company: GeoEye
Satellite: IKONOS

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
3.2 m	1	445-516 nm	11 km	1-3 Days
	2	506-595 nm		
	3	632-698 nm		
	4	757-853 nm		
82 m	Pan	450-900 nm		

Company: GeoEye
Satellite: GeoEye 1

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
1.65 m	1	450-520 nm	8 km	<3 Days
	2	520-600 nm		
	3	625-695 nm		
	4	760-900 nm		
41 cm	Pan	450-900 nm	15.2 km	

China National Space Administration (CNSA)

CHRIS

Country: China
Satellite: CBERS
Sensor: Wide Field Imager

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
260 m	1	450-690 nm	890 km	5 Days
	2	770-890 nm		

Sensor: High Resolution CCD Camera

Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
20 m	Pan	510-750 nm	113 km	3 Days
	1	450-520 nm		
	2	520-590 nm		
	3	630-690 nm		
	4	770-890 nm		

Sensor: Infrared Multispectral Scanner

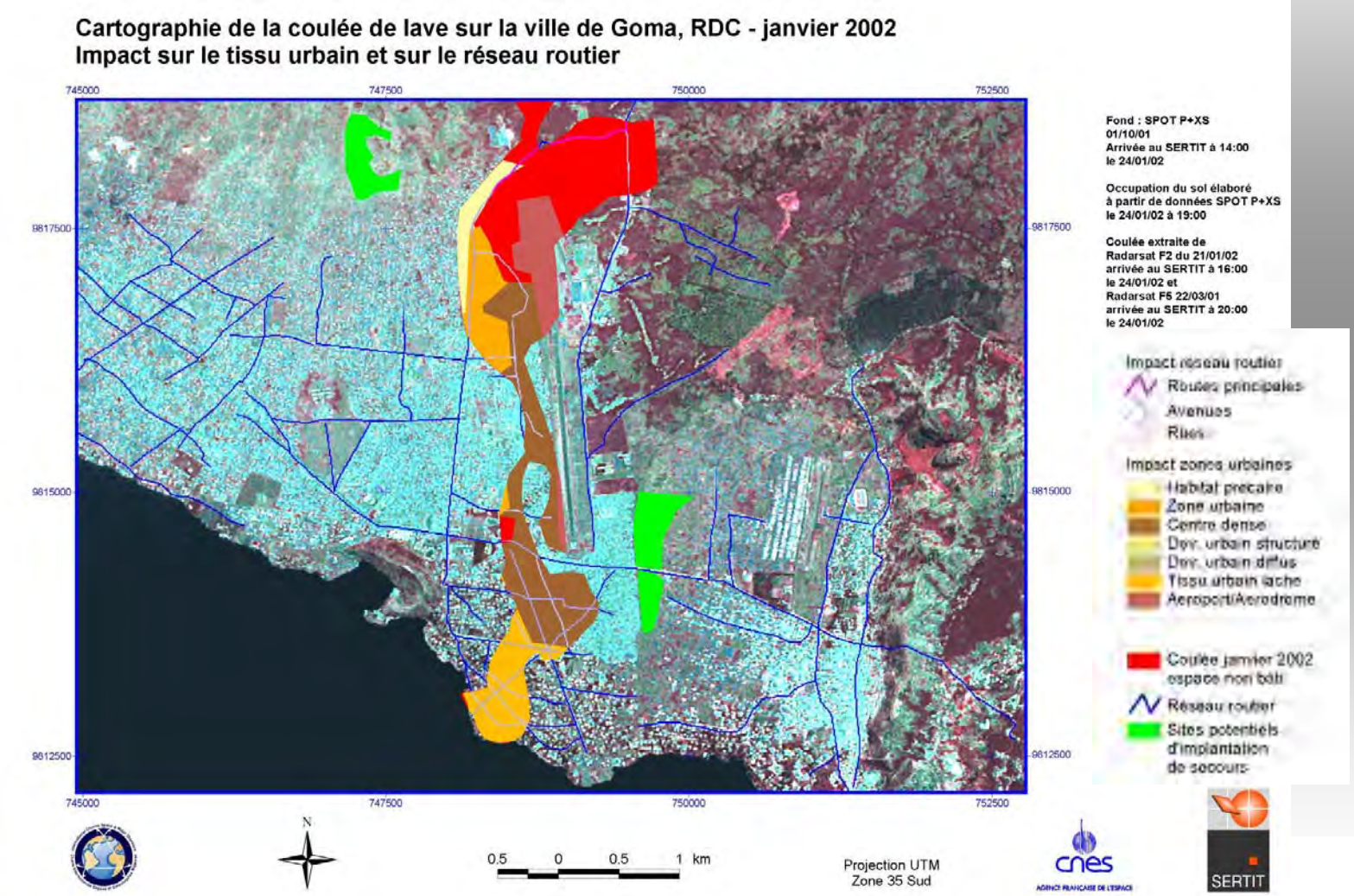
Spatial Res	Spectral Bands /Modes	Spectral Range /No Beams	Swath Width	Revisit Time
80 m	Pan	500-1100 nm	120 km	30 Days
	1	1550-1750 nm		
	2	2080-2350 nm		
	3	10400-12500 nm		

High Resolution USGS Resources

- IKONOS
- Quickbird
- Worldview
- GeoEye -1

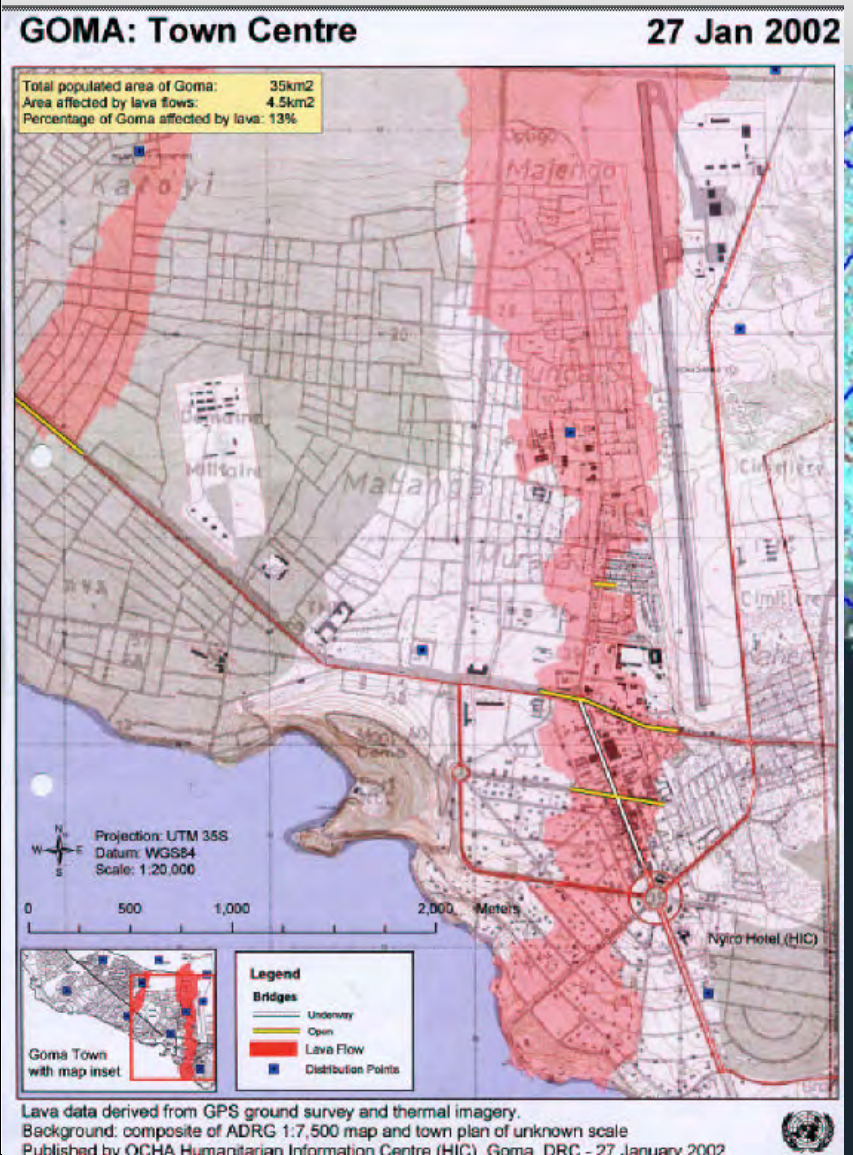
Nyiragongo volcanic eruption, R.D. of Congo

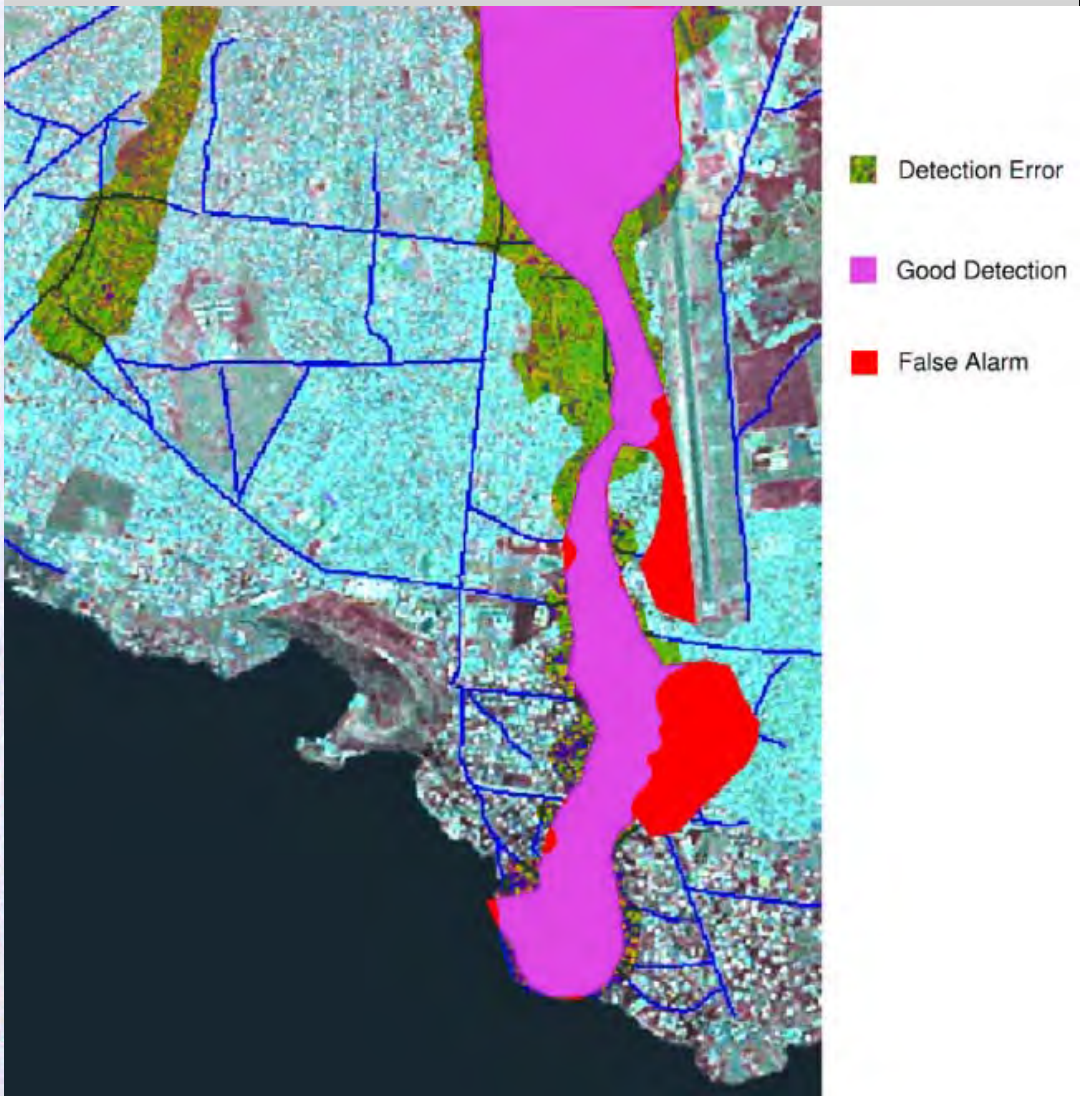
Lava flow mapping over Goma



Nyiragongo volcanic eruption, R.D. of Congo

Validation using ground data





Southern France flood, France

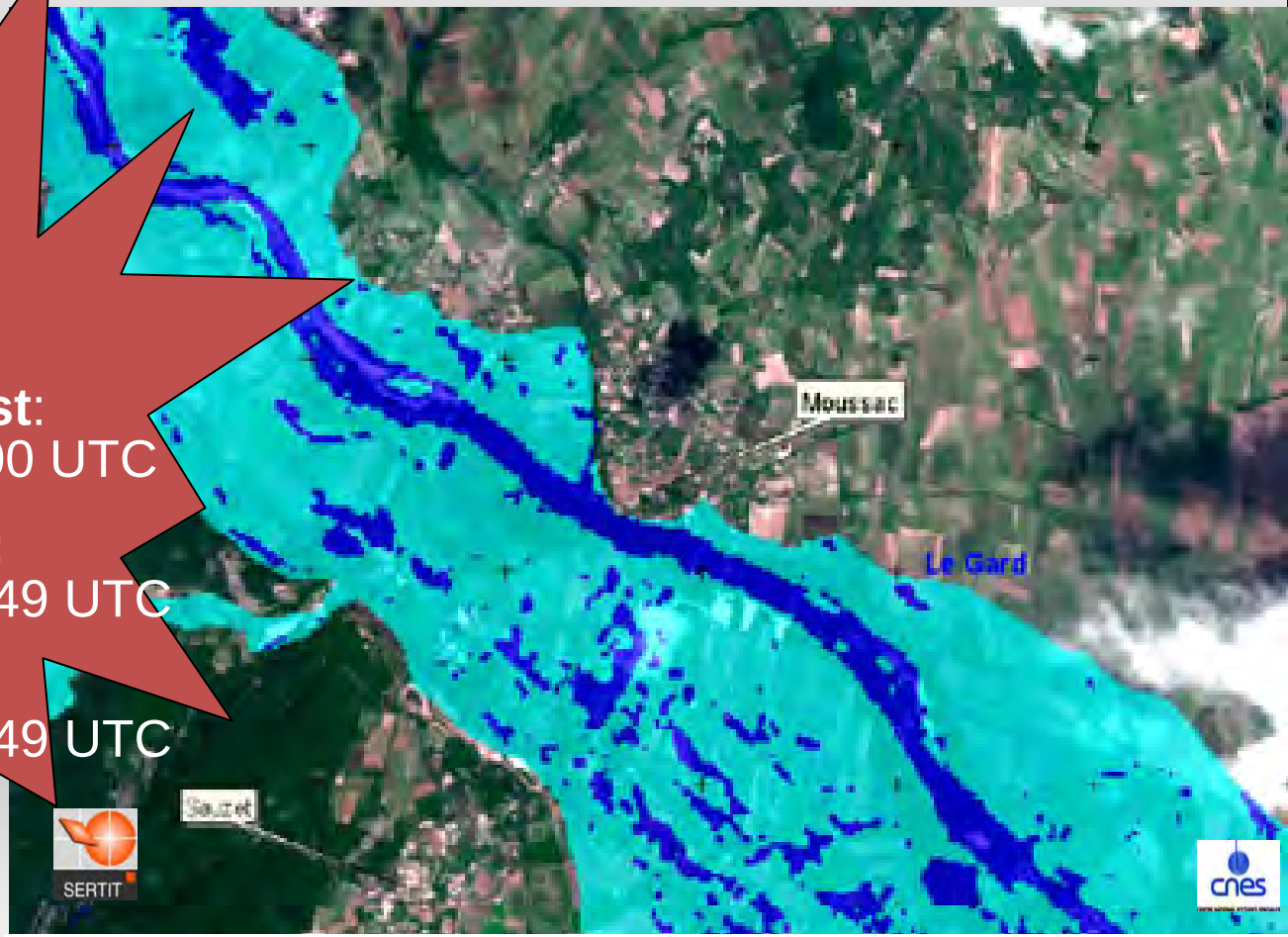
Flood maps of Gard Department

Event:
8/09/2002

Charter request:
9/09/2002 12h00 UTC

Data acquired:
10/09/2002 10:49 UTC

Map provided:
10/09/2002 23:49 UTC

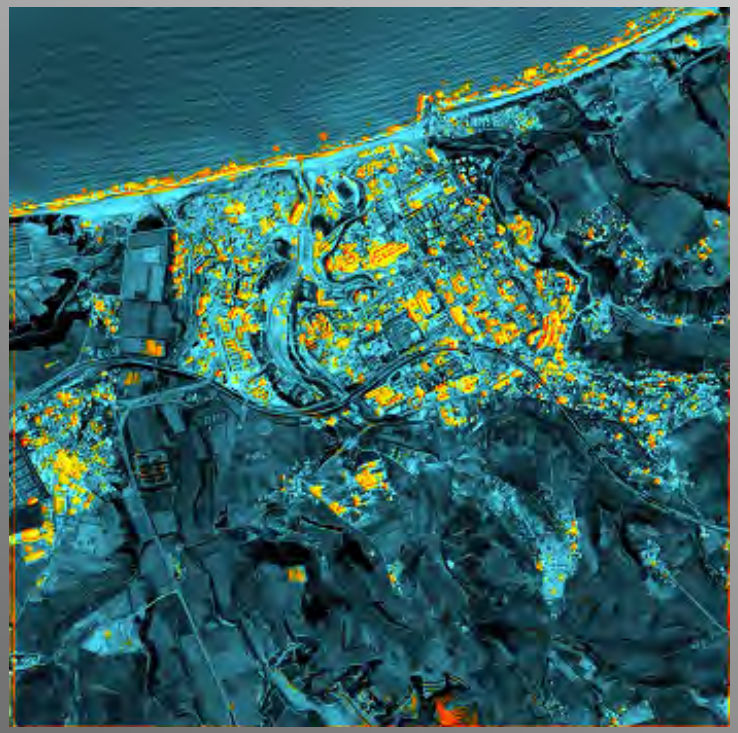


Map produced using SPOT-4 image acquired on September 10th, 10:49 UTC and SPOT-5 archive data

Algiers earthquake, Algeria

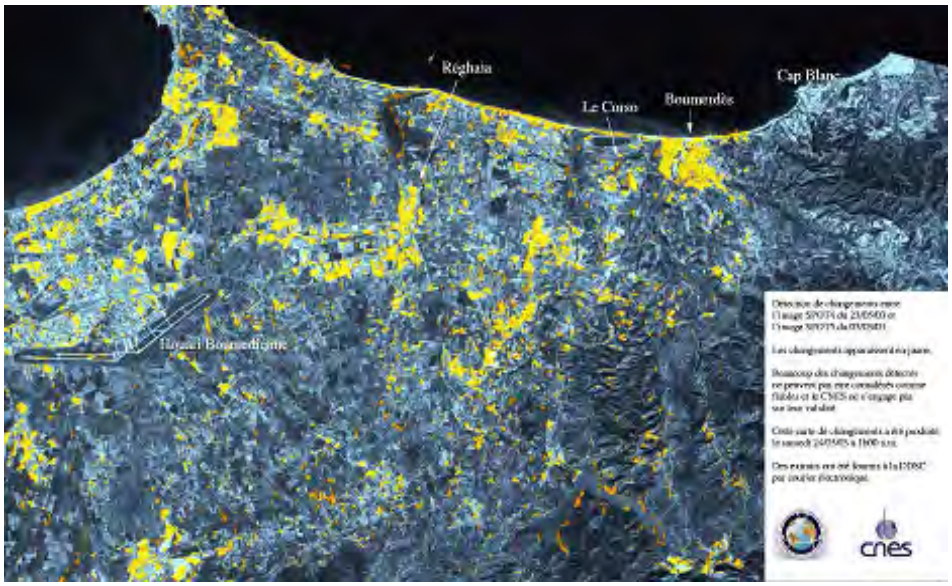
Change maps

Boumerdes Region



Changes appear in yellow

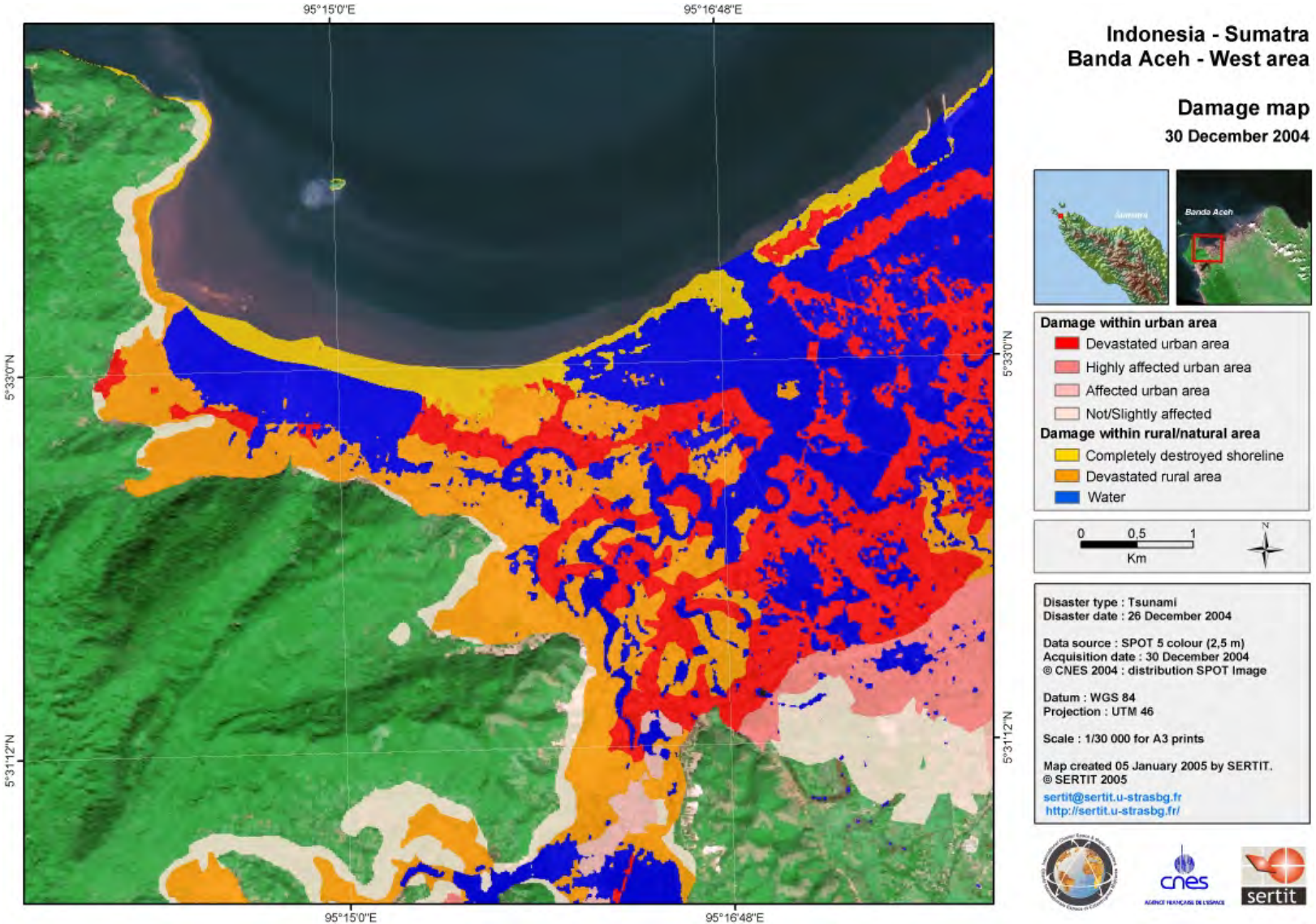
Algiers Region



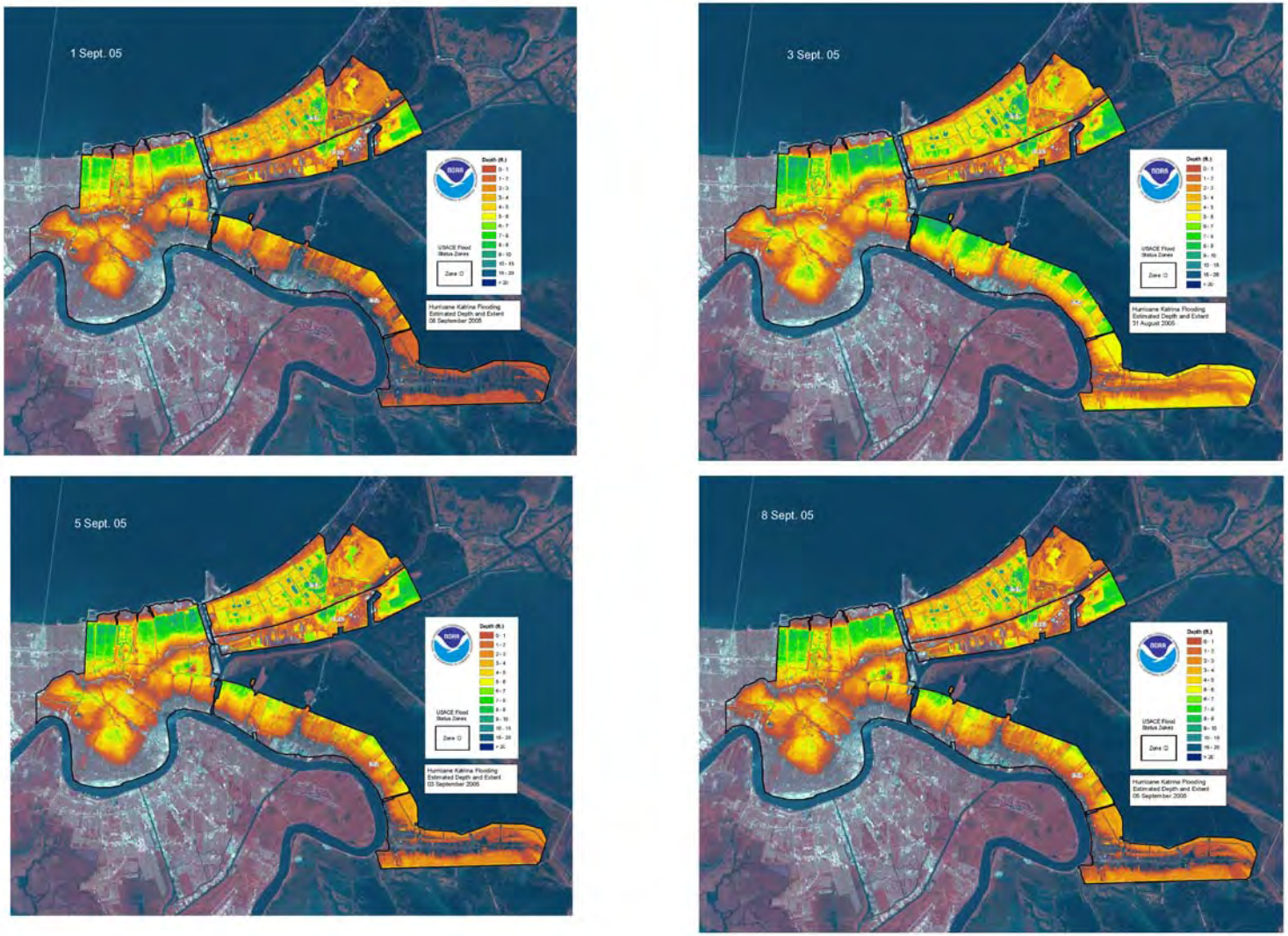
Change detection maps produced using SPOT 4/5 images.

Tsunami, Indonesia

Banda Aceh, West area



Hurricane Katrina, USA

Water depths with RADARSAT-1

New Orleans Flood Depths