Center for Emergency Management and Homeland Security

Arizona State University

SPATIAL HAZARD EVENTS AND LOSSES DATABASE FOR THE UNITED STATES (SHELDUS™)
DATA DESCRIPTION

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I. About SHELDUS Version 23.0

SHELDUS Version 23.0 was launched on February 19, 2025. The database covers the period from January 1960 to December 2023. SHELDUS is a county-level hazard data set for the U.S. and covers natural hazards such thunderstorms, hurricanes, floods, wildfires, and tornados as well as perils such as flash floods, heavy rainfall, etc. The database contains information on the date of an event, affected location (county and state) and the direct losses caused by the event (property and crop losses, injuries, and fatalities) as well as insured crop losses (indemnity payments by the U.S. Department of Agriculture). Insured crop losses cover the period from January 1989 to December 2023. The database contains loss information for Puerto Rico, Guam, and other U.S. territories from 2000 through 2023. SHELDUS is updated annually.

SHELDUS can be searched for the following hazard types:

1. Avalanche
2. Coastal
3. Drought
4. Earthquake
5. Flood
6. Fog
7. Hail
8. Heat
9. Hurricane/Tropical Storm
10. Landslide
11. Lightning
12. Severe Thunderstorm
13. Tornado
14. Tsunami/Seiche
15. Volcano
16. Wildfire
17. Wind
18. Winter Weather

SHELDUS can now be searched by perils:

1. Air Stagnation
2. Air Turbulence
3. Airburst
4. Animal Incident
5. Ashfall
6. Asian Soybean Rust
7. Avalanche – Debris
8. Avalanche – Snow
9. Bacterial Disease
10. Blizzard
11. Cloudburst

12. Coastal Storm
13. Cold Wave
14. Collision
15. Cyclone – Extratropical
16. Cyclone – Subtropical
17. Cyclone – Unspecified
18. Dam Failure
19. Debris Flow
20. Derecho
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22. Downburst
23. Dust Devil
24. Dust Storm
25. Electrical Storm
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27. Erosion – Coastal
28. Erosion – Lakeshore
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30. Expansive Soil
31. Fire – Brush
32. Fire – following Earthquake
33. Fire – Forest
34. Fire – Grass
35. Fire – St Elmo's
36. Fire – Tornado
37. Flood – Coastal
38. Flood – Flash
39. Flood – Ice Jam
40. Flood – Lakeshore
41. Flood – Lowland
42. Flood – Riverine
43. Flood – Rural
44. Flood – Small Stream
45. Flood – Snowmelt
46. Flood – Tidal
47. Flood – Urban
48. Freeze
49. Freezing Fog
50. Freezing Rain
51. Freezing Spray
52. Frost
53. Fungal Disease
54. Funnel
55. Geomagnetic Storm

56. Glacial Lake Outburst
57. Glaze
58. Gustnado
59. Heat Wave
60. High Seas
61. Hyperthermia
62. Hypothermia
63. Ice
64. Ice Breakup
65. Impact
66. Insect Infestation
67. Lahar
68. Landslide following Earthquake
69. Landslide – Slump
70. Lava Flow
71. Liquefaction
72. Macroburst
73. Marine Incident
74. Mass Movement
75. Microburst
76. Mud Flow
77. Mudslide
78. Myotoxin
79. Nor'easter
80. Parasitic Disease
81. Pressure – Change
82. Pressure – High
83. Pressure – Low
84. Prion Disease
85. Pyroclastic Flow
86. Radio Disturbance
87. Rain
88. Rip Current
89. Rip Tide
90. Rock Slide
91. Rockfall
92. Salinity
93. Sandstorm
94. Seiche
95. Shockwave
96. Sinkhole
97. Sleet
98. Smog
99. Smoke

100. Snow
101. Snow – Drifting
102. Snow – Lake Effect
103. Snow – Slide
104. Snow – Squall
105. Space Weather
106. Storm Surge
107. Storm – Convective
108. Storm – Frontal
109. Storm – Midlatitude
110. Storm – Winter
111. Subsidence
112. Surf
113. Swell
114. Temperature – High
115. Temperature – Low
116. Tidal Wave
117. Tide – High
118. Tide – Low
119. Tide – Rip
120. Tropical Depression
121. Tropical Storm
122. Viral Disease
123. Vog
124. Water Damage
125. Waterspout
126. Wave Action
127. Wave – Rogue
128. Wave – Sneaker
129. Wet Spells
130. Wind Chill
131. Wind – Chinook
132. Wind – Gale
133. Wind – Gust
134. Wind – Santa Ana
135. Wind – Squall
136. Wind – Tornadic
137. Wind – Vortex
138. Wintry Mix
139. Tsunami

II. About the Raw Data Download/Output

Depending on your selected type of search (e.g., *Location and Date*, *Named Events,* etc.) during your data query, your raw data download may not include some all of the fields listed below.

Column	*Data Format*	*Description*
CountyName	Text	Name of County
County_FIPS	Text	5-digit Federal Information Processing Standard code (FIPS), which uniquely identifies counties and county equivalents in the U.S.
CropDmg	Currency	Direct damage to crop in U.S. dollars (in current year dollars); no decimal places
CropDmg(Adj)	Currency	Direct damage to crop in adjusted U.S. dollars (selected base year); 2 decimal places
CropDmgDuration	Integer	Length of the event expressed in number of days with crop damage
CropDmgPerCapita	Currency	Direct damage to crop in adjusted U.S. dollars (base: most recent inflation year in SHELDUS) divided by annual county population; per capita calculations are based on current county population at the time of the event; 6 decimal places
CropIndemnityPayment	Currency	Insured amount of the crop loss paid for the designated peril (in current year dollars); no decimal places
CropIndemnityPayment(Adj)	Currency	Insured amount of the crop loss paid for the designated peril in adjusted U.S. dollars (selected base year); 2 decimal places
CropIndemnityPaymentPerCapita	Currency	Insured amount of the crop loss paid for the designated peril in adjusted U.S. dollars (base: most recent inflation year in SHELDUS) divided by annual county population; per capita calculations are based on current county population at the time of the event; 2 decimal places
EndDate	Date	Date when the event ended (mm/dd/yyyy)
EventName	Text	Named Billion Dollar Disaster; record belongs to a large-scale, high impact event that was named according to NDCD's Billion-Dollar Weather and Climate Disasters (see https://www.ncdc.noaa.gov/billions/events)
Fatalities	Number	Count of people directly killed by the event
FatalitiesDuration	Integer	Length of the event expressed in number of days with fatalities
FatalitiesPerCapita	Number	Count of people killed/divided by the annual county population; per capita calculations are based on current county population at the time of the event; 2 decimal places

Column	*Data Format*	*Description*
GLIDE	Integer	Global Disaster Identifier Number; record belongs to a large-scale, high impact event as identified by the Global Disaster Identifier Number (see www.glidenumber.net)
Hazard	Text	Classification of the event into one or more of the 18 SHELDUS hazard types
Injuries	Number	Count of people injured directly by the event
InjuriesDuration	Integer	Length of the event expressed in number of days with injuries
InjuriesPerCapita	Number	Count of people injured/divided by the annual county population; per capita calculations are based on current county population at the time of the event; 2 decimal places
Location	Text	Location information as provided by the data source; generally below the county level
Month	Integer	Month during which the event occurred, values range from 1 to 12
PDD (*only available when using the "Search by PDD" option***)**	Integer	Presidential Disaster Declaration Numbers and names along with temporal parameters are based on the FEMA Open Data – Disaster Declaration Summary table; (see https://www.fema.gov/openfema#)
PropertyDmg	Currency	Direct damage to property in U.S. dollars (in current year dollars); no decimal places
PropertyDmg(Adj)	Currency	Direct damage to property in adjusted U.S. dollars (selected base year); 2 decimal places
PropertyDmgDuration	Integer	Length of the event expressed in number of days with property damage
PropertyDmgPerCapita	Currency	Direct damage to property in adjusted U.S. dollars (base: most recent inflation year in SHELDUS) divided by annual county population; per capita calculations are based on current population at the time of the event; 2 decimal places
Quarter	Integer	Annual quarter during which the event occurred, values range from 1 to 12
Remarks	Text	Peril and/or verbatim hazard description according to the original data source
StartDate	Date	Date when the event began (mm/dd/yyyy)
StateName	Text	State Postal Code
Year	Integer	Year during which the event occurred

III. About the Aggregated Data Download/Output

Depending on levels of aggregation selected during your data query, your aggregation download may not include some (or all) of the fields listed below.

Column	*Data Format*	*Description*
CropDmg	Currency	Damage to crop in U.S. dollars (current year); no decimal places
CropDmg(Adj)	Currency	Damage to crop in adjusted U.S. dollars (selected base year); 2 decimal places
CropDmgPerCapita	Currency	Damage to crop in adjusted U.S. dollars (base: most recent inflation year in SHELDUS) divided by annual county population; per capita calculations are based on current population at the time of the event; 6 decimal places
Crop_Dmg_Duration	Integer	Length of events with a crop loss expressed in number of days
CountyName	Text	Name of County
County FIPS	Text	5-digit Federal Information Processing Standard code (FIPS), which uniquely identifies counties and county equivalents in the U.S.
Duration_Days	Integer	Length of events with a loss expressed in number of days
Fatalities	Number	Count of people killed
FatalitiesPerCapita	Number	Count of people killed/divided by the annual county population; per capita calculations are based on current population at the time of the event; 6 decimal places
Fatalities_Duration	Integer	Length of events with fatalities expressed in number of days
Hazard	Text	Hazard type according to one of the 18 SHELDUS hazard types
Injuries	Number	Count of people injured
InjuriesPerCapita	Number	Count of people injured/divided by the annual county population; per capita calculations are based on current population at the time of the event; 6 decimal places
Injuries_Duration	Integer	Length of events with injuries expressed in number of days
Month	Integer	Month of a given year when the aggregated events occurred (1=January, 2=February, etc.)
PropertyDmg	Currency	Damage to property in U.S. dollars (current year); no decimal places

Column	*Data Format*	*Description*
PropertyDmg(Adj)	Currency	Damage to property in adjusted U.S. dollars (selected base year); 2 decimal places
PropertyDmgPerCapita	Currency	Damage to property in adjusted U.S. dollars (base: most recent inflation year in SHELDUS) divided by annual county population; per capita calculations are based on current population at the time of the event; 6 decimal places
Property_Dmg_Duration	Integer	Length of events with a property loss expressed in number of days
Quarter	Integer	Quarter of a given year when the aggregated events occurred (1=January-March, 2=April-June, etc.)
Records	Integer	Count of the underlying raw data records that were used to generate the aggregated loss values Note: When selecting aggregation by hazard type, the sum of values in the RECORDS column will be higher than the actual number of underlying raw data records. In cases, where the loss was caused by multiple but different hazard types (e.g., flooding and wind), the record will be both counted in the Flood and Wind category.
StateName	Text	Name of State
Year	Date	Year when the aggregated events occurred

IV. SHELDUS Data Sources

1. Avalanche
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
2. Coastal
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
3. Drought
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and

digital data imports since 2000

4. Earthquakes
    a. Stover, Carl W. and Jerry L. Coffman, 1993. Seismicity of the United States, 1568-1989 (revised). U.S. Geological Survey Professional Paper 1527, Washington, D.C.: U.S. Government Printing Office, 418 p.
    b. National Centers for Environmental Information (formerly National Geophysical Data Center), Global Significant Earthquake Database https://www.ngdc.noaa.gov/hazard/earthqk.shtml
5. Flood
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
6. Fog
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
7. Hail
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
8. Heat
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
9. Hurricane/Tropical Storm
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
10. Landslide
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
    b. United States Geological Survey Landslide News & Info, http://landslides.usgs.gov/recent/

c. United States Department of Agriculture Cost Estimating Guide for Road Construction, http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5279284.pdf
d. National Aeronautics and Space Administration Global Landslide Catalog, http://ojo-streamer.herokuapp.com/
e. Oregon Department of Geology and Mineral Industries Statewide Landslide Information Layer for Oregon, http://www.oregongeology.org/slido/index.html
f. Media reports

11. Lightning
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
12. Severe Thunderstorm
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
13. Tornado
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
14. Tsunami/Seiche
    a. National Centers for Environmental Information (formerly National Geophysical Data Center), Global Historical Tsunami Events and Runups https://www.ngdc.noaa.gov/hazard/tsu.shtml
15. Volcanic Events
    a. Blong, RJ 1984. Volcanic Hazards: A Source Book on the Effects of Eruptions. Academic Press.
    b. National Center for Environmental Information (formerly National Geophysical Data Center), Significant Volcanic Eruptions Database https://www.ngdc.noaa.gov/hazard/volcano.shtml
16. Wildfire
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
17. Wind
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena,

http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000

18. Winter Weather
    a. National Centers for Environmental Information (formerly National Climatic Data Center), Storm Data and Unusual Weather Phenomena, http://www.ncdc.noaa.gov/IPS/sd/sd.html; hard copies for 1960-1999 and digital data imports since 2000
19. Named Disasters
    a. National Centers for Environmental Information (formerly National climatic Data Center), Billion Dollar Weather and Climate Disasters https://www.ncdc.noaa.gov/billions/events
    SHELDUS includes only those events greater than $1billion or with a significant number of fatalities. Billion dollar events of $1billion, i.e. events that just made the NCEI loss modelling threshold, are generally excluded.
20. GLIDE Number (Global Disaster Identifier Number)
    a. www.GLIDEnumber.net
21. PDD Number (Presidential Disaster Declaration)
    a. FEMA Open Data – Disaster Declaration Summary table; https://www.fema.gov/openfema#
22. Inflation Adjustments
    a. U.S. Bureau of Labor Statistics, http://data.bls.gov/cgi-bin/cpicalc.pl
23. Annual County Population Counts
    a. U.S. Census Bureau
24. Crop Indemnity Payments
    a. U.S. Department of Agriculture, http://www.rma.usda.gov/data/cause.html

Information on NCEI's (formerly NCDC) Storm Data Preparation

Directive NWSPD10-16 describes the National Weather Service's process in estimating losses from meteorological and hydrological events. Please download the directive *HERE*. See below some important estimation facts quoted directly from the guidance document:

1. On fatalities and injuries: *The determination of direct versus indirect causes of weather-related fatalities or injuries is one of the most difficult aspects of Storm Data preparation. Determining whether a fatality or injury was direct or indirect has to be examined on a case-by-case basis. It is impossible to include all possible cases in this Directive. The preparer should include the word "indirect" in all references to indirect fatalities or injuries in the event narrative.*
2. On loss estimation: *Property damage estimates should be entered as actual dollar amounts, if a reasonably accurate estimate from an insurance company or other qualified individual is available. If this estimate is not available, then the preparer has two choices: either check the "no information available" box, or make an estimate. The exception is for flood events. The Storm Data preparer must enter monetary damage*

amounts for flood events, even if it is a "guesstimate." The U.S. Army Corps of Engineers requires the NWS to provide monetary damage amounts (property and/or crop) resulting from any flood event. The Storm Data preparer is encouraged to make a good faith attempt to obtain or estimate the damage. Property damage estimates are very important for many users and should be obtained if at all possible. Estimates can be obtained from emergency managers, U.S. Geological Survey, U.S. Army Corps of Engineers, power utility companies, and newspaper articles.[..] The Storm Data preparer should use the table in Appendix B entitled Property Damage Estimates in determining monetary losses. This table would allow the preparer to estimate monetary amounts for damaged objects when timely communication is not possible with emergency managers or insurance adjusters just prior to Storm Data submission. It is suggested that the Storm Data preparer, in conjunction with local emergency managers, insurance adjusters, utility company representatives, and the U.S. Army Corps of Engineers, enhance the table to more accurately reflect values typically found in the local CWA. Typically, damage refers to damage inflicted to private property (structure s, objects, vegetation) as well as public infrastructure and facilities. [..] Crop damage information may be obtained from reliable sources, such as the U.S. Department of Agriculture (USDA), the county/parish agricultural extension agent, the state department of agriculture, crop insurance agencies, or any other reliable authority. Crop damage amounts may be obtained from the USDA or other similar agencies.

3. On Storm Data sources: *Some information appearing in Storm Data may be provided by or gathered from sources outside the National Weather Service (NWS), such as the media, law enforcement and/or other government agencies, private companies, individuals, etc. An effort is made to use the best available information, but because of time and resource constraints, information from these sources may be unverified by the NWS. Accordingly, the NWS does not guarantee the accuracy or validity of the information.*

Information on USDA's Indemnity Payments

Indemnity information dates back to January 1989 and is currently unavailable for any prior years. See below some important facts quoted directly from the USDA RMA website (http://www.rma.usda.gov/):

1. On how the Federal crop insurance program works: *Federal Crop Insurance Corporation (FCIC) programs are administered by the Risk Management Agency (RMA), which underwrites crop insurance policies for hundreds of crops and livestock in the United States. Crop insurance policies are sold and serviced by* private *insurance companies. (..) RMA provides policies for more than 100 crops. (This number would be much higher if every insurance plan available for the crops insured in every county were counted.) RMA also conducts studies to determine the feasibility of insuring many other crops and is conducting pilot programs for some new crop policies in selected states and counties. Federal crop insurance policies typically consist of the Common Crop Insurance Policy, the specific crop provisions, and the policy endorsements and special provisions.*

2. On the indemnity amount: *The total amount of the loss for the designated peril.*

V. SHELDUS Raw Data Manipulation

1. Losses reported as a range
   Whenever the original data source reports a loss estimate as a range, SHELDUS uses the lower bound of the range. For example, All NCEI (formerly NCDC) Storm Data estimates prior to 1994/95 were reported in logarithmic categories ($<50, $50-500, $500-5,000, $5,000-50,000, $50,000-500,000, $500,000-$5 Million, $5 Million-50 Million, $50 Million to 500 Million, $500 Million to 5 Billion). For example, for an event with a loss range of $5,000-$50,000, SHELDUS will return an event with a loss of $5,000.
2. Losses for landslide events
   Loss estimates were obtained from 2015 NWSI 10-1605 Storm Data, unless noted. If there was no basis for the loss amount, **$99** was entered as the property loss, with a note saying the loss amounts were unknown.

Category	*Type*	*From*	*To*	*Based On/Source*
Trees	Tree limb (large) downed	$230	$920	
	Tree destroyed	$575	$1,725	
	Tree on house w/o house damage	$1,750	$7,025	
	Tree on house w/ house damage	$3,500	$8,630	
Power Lines	Power lines downed	$850	$2,300	
	Small transformers	$1,150	$3,450	
	Regular size power pole cost	$350	$1,150	
	Large power pole cost	$850	$1,725	
	Labor cost for pole replacement	$5,000	$172,500	
	Large transmission	$46,000	$92,075	
Roofs	Minor roof damage repair	$2,300	$5,755	
	Major roof damage (truss/roof replace)	$17,250	$34,000	
	Damaged gutters/downspouts	$115	$345	
	Replace brick chimney	$2,300	$5,750	
Buildings	Awning damaged	$285	$1,150	
	Window broken	$230	$1,150	
	Covered porch destroyed	$5,750	$17,250	
	Replace siding, one side average house	$2,300	$5,750	
	1-car garage destroyed	$6,900	$17,250	
	2-car garage destroyed	$17,250	$34,500	
	House destroyed	Value of house + belongings		Use Zillow to estimate house value

Category	*Type*	*From*	*To*	*Based On/Source*
	Mobile home destroyed	$28,780	$57,500	
	Small shed destroyed	$575	$1,725	
	Small pole barn destroyed	$11,500	$34,500	
	Large pole barn destroyed	$28,775	$86,300	
	House basement flooded (minor)	$1,150	$11,500	
	House basement flooded (major)	$11,500	$28,775	
	Electrical damage from lightning	$2,875	$8,630	
	General house damage	10% of house value		Adjust to year
	Average foundation repair	$3,772	$10,000	HomeAdvisor, 2015 dollars
Vehicles	Windshield replace	$285	$1,150	
	Minor hail damage	$1,150	$3,450	
	Major hail damage	$2,875	$17,250	
	Car destroyed	Value of car		Adjust to year
	Semi-trailer overturned	$8,630	$17,250	
	General car damage	20% of car value		
Agriculture	Crop damage	Crop value/acre * acreage		
	Small grain bin destroyed	$8,630	$17,250	
	Large grain bin destroyed	$23,015	$57,500	
	Cow killed	$1,730	$3,450	
	Veal calf	$50	$75	
	Center pivot irrigation system destroyed	$28,775	$57,500	
	General yard damage	$500		Current year
Infrastructure	County road culvert washed out	$2,875	$57,500	
	County bridge washed out	$28,775	$86,300	
	State-federal bridge washed out	$287,750	$863,000	
	General bridge damage	$5,000		Current year
	Paving cost	$120,000/lane mile for 2-lane roads	$502,000/lane mile for 4-lane roads	Ohio DOT, 1998 dollars
	Guardrail	$50/linear foot		NASDAQ
	Concrete median barrier	$43/ft; $226,180/mi	$72/ft; $378,720/mi	WSDOT, 2014 dollars
	Clay levee	$4,000/ft		
	Regular levee	$60/ft		
	Retaining wall	$100/sq ft		US DOT Federal Highway Administration
	Chain-link fence	$3/ft	$6/ft	Cost Helper, 2009 dollars

3. Losses output as per capita values.
   Economic losses (i.e. property and crop losses) of an event are first adjusted for inflation to $2018 and then divided by the current population of a county at the time of the event (year). Human losses (i.e. injuries and fatalities) are divided by the current county population at the time of the event (year) to arrive at per capita values for the event. Every record in SHELDUS includes associated per capita calculations. These per capita figures are then utilized for any aggregations. No state or U.S. population figures are utilized per capita calculations during the aggregation process. All per capita estimates are based on the annual county population at the time of the event.
   Note: The US Census does not calculate annual estimates for US territories. SHELDUS adopts this approach and does not calculate annual estimates for intercensal years. For Rose Island, American Samoa (population: 0) and Northern Island, Commonwealth of the Northern Mariana Islands (population: 0 since 2010), we assume a population of 1 to allow for per county capita calculations.
4. Events reported for a region and not a singular county.
   SHELDUS distributes the losses for multi-county events equally across the involved counties—this applies also to injuries and fatalities. If there is detailed information on the location of fatalities and injuries, SHELDUS will reflect this and will not distribute the losses equally.
   For example, if hurricane damage of $1 million was reported for County A and County B together, SHELDUS will show a loss of $500,000 for County A as well as a loss of $500,000 for County B.
5. Losses reported by NWS public forecast zones instead of county name.
   SHELDUS resolves the forecast zone and translates it into county location. SHELDUS has recreated historic NWS forecast zone information and can accurately resolve forecast zones and changes in zone definitions and boundaries over time. If multiple counties belong to a forecast zone, losses will be distributed equally as outlined under #2.
6. Losses reported for counties that no longer exist.
   SHELDUS georeferences losses according to the geography at the time of the event. SHELDUS has recreated changes in naming conventions and county zone boundaries. All losses that occurred in a historic county are marked with (*). The following historic counties exist in SHELDUS:

County Name	State	FIPS	Deletion Year	Geographic Match†
***Princess Anne**	VA	51810	1963	51151
***Ormsby**	NV	32510	1969	32510
***Lynn Canal-Icy Straits**	AK	02282	1970	02220
***Palmer-Wasilla-Talkeetna**	AK	02170	1970	02170
***Nansemond**	VA	51123	1972	51800
***Washabaugh**	SD	46131	1979	46071

County Name	State	FIPS	Deletion Year	Geographic Match†
***Kuskokwim**	AK	02160	1980	02050
***Prince of Wales**	AK	02200	1980	02198
***Skagway-Yakutat**	AK	02230	1980	02230
***Seward**	AK	02122	1980	02122
***Valdez-Chitna-Whittier**	AK	02260	1980	02063
***Upper Yukon**	AK	02250	1980	02290
***Cordova-McCarthy**	AK	02065	1980	02063
***Ketchikan**	AK	02130	1980	02130
***Kenai-Cook Inlet**	AK	02120	1980	02122
***Barrow**	AK	02040	1980	02185
***Outer Ketchikan**	AK	02190	1980	02130
***Angoon**	AK	02030	1980	No losses recorded for 02030
***Kobuk**	AK	02140	1986	02130
***Aleutians Islands**	AK	02013	1987	No losses recorded for 02013
***Skagway-Yakutat-Angoon**	AK	02231	1992	-
***South Boston**	VA	51083	1995	51780
***Dade**	FL	12025	1997	12086
***Yellowstone National Park**	MT	30113	1997	30067
***Clifton Forge**	VA	51560	2001	51005
***Skagway-Hoonah-Angoon**	AK	02232	2007	02105
***Prince of Wales-Outer Ketchikan**	AK	02201	2008	02198
***Wrangell-Petersburg**	AK	02280	2008	Split between 02195 and 02275
***Bedford City**	VA	51515	2013	51019
***Shannon**	SD	46113	2015	46102
***Wade Hampton**	AK	02270	2015	02158
***Valdez Cordova**	AK	02261	2019	02063

† *Geographic matching is only performed for mapping purposes (e.g., SHELDUS on ArcGIS Online or other mapped loss products generated by CEMHS). SHELDUS data downloads are not matched to a specific geography. Historic counties will appear in the download with a leading *as shown above. End users determine the treatment of historic county losses.*

7. Insured crop losses reported by month only.
   Whenever the original data source reports an indemnity payment by month only, SHELDUS assigns a time range spanning the entire month meaning the begin date of an event is reported as the first day of the month and the end date of the event is reported as the last day of the month.

VI. SHELDUS Aggregated Data Manipulation

1. Aggregation by Geography
    a. State
    All underlying raw data records within a state are summed. The returned loss information are state totals for property losses, crop losses, injuries, and fatalities.

    This information can be additionally broken down

    - by year (or month) to create annual (or monthly) state loss totals; and/or
    - by hazard type to create totals by hazard type for the state.

    b. County
    Losses are summed across all counties within a state and returned as county totals. All underlying raw data records within a county are summed. The returned loss information are county totals for property losses, crop losses, injuries, and fatalities.

    This information can be additionally broken down

    - by year (or month) to create annual (or monthly) county loss totals; and/or
    - by hazard type to create totals by hazard type for each county.

2. Aggregation by Time
    a. Year
    All underlying raw data records within a year are summed. The returned loss information are yearly totals for property losses, crop losses, injuries, and fatalities.

    This information can be additionally broken down

    - by geography (state or county) to create annual state or county loss totals; and/or
    - by hazard type to create annual totals by hazard type.

    b. Month
    All underlying raw data records within a month are summed. The returned loss information are monthly totals for property losses, crop losses, injuries, and fatalities.

    This information can be additionally broken down

- by geography (state or county) to create monthly state or county loss totals; and/or
- by hazard type to create monthly totals by hazard type.

c. Quarter
All underlying raw data records within a quarter are summed. The returned loss information are quarterly totals for property losses, crop losses, injuries, and fatalities.

This information can be additionally broken down

- by geography (state or county) to create quarterly state or county loss totals; and/or
- by hazard type to create quarterly totals by hazard type.

3. Aggregation by Hazard Type
All underlying raw data records are summed across the 18 hazard categories used in SHELDUS. In instances where a raw data event lists multiple hazard types as causal agents, the aggregation will distribute the losses equally among the involved hazards. This categorization of losses may produce hazard types that were not originally select in the database query.

4. Aggregation by Peril
All underlying raw data records are summed across the 100+ peril types used in SHELDUS. In instances where a raw data event lists multiple perils as causal agents, the aggregation will distribute the losses equally among the involved perils. This categorization of losses may produce perils that were not originally select in the database query.

VII. SHELDUS Version History

SHELDUS Version 23.0 (released 2/19/2025 with 981,528 direct loss records and 3,166,955 crop indemnity records): added direct loss estimates as well as crop insurance claims (indemnities) for 2023. The years 2021 and 2022 were fully updated. Minor corrections occurred for years prior. Freely available data encompass all of Arizona (6,556 direct losses; 3,942 crop indemnities), South Carolina (19,860 direct losses; 43,053 crop indemnities), and all drought events nationwide (10,649 direct losses; 948,258 crop indemnities).

SHELDUS Version 22.0 (released 1/15/2024 with 965,785 direct loss records and 3,520,289 crop indemnity records): added direct loss estimates as well as crop insurance claims (indemnities) for 2022. Data updates were made for 2020 and 2021 as well as all earthquake events sourced from NCEI. Freely available data encompass all of Arizona (6,163 direct losses; 3,706 crop

indemnities), South Carolina (19,672 direct losses; 40,403 crop indemnities), and all drought events nationwide (10,515 direct losses; 874,120 crop indemnities).

SHELDUS Version 21.0 (released 2/15/2023 with 951,820 direct loss records and 2,909,147 crop indemnity records): added direct loss estimates as well as crop insurance claims (indemnities) for 2021. Data updates were made to 2018 through 2020. Freely available data encompass all of Arizona (5,613 direct losses; 2,090 crop indemnities), South Carolina (19,493 direct losses; 32,059 crop indemnities), and all drought events nationwide (10,361 direct losses; 844,816 crop indemnities).

SHELDUS Version 20.0 (released 2/1/2022 with 938,781 direct loss records and 2,787,409 crop indemnity records): added direct loss estimates as well as crop insurance claims (indemnities) for 2020. Data updates were made to 2018 and 2019 as well. Freely available data encompass all of Arizona (5,189 direct losses; 1,803 crop indemnities), South Carolina (19,405 direct losses; 30,152 crop indemnities), and all drought events nationwide (10,154 direct losses; 805,581 crop indemnities).

SHELDUS Version 19.0 (released 11/20/2020 with 925,847 direct loss records and 2,502,225 crop indemnity records): Added direct loss estimates as well as crop insurance claims (indemnities) for 2019. Direst losses added for all U.S. territories from 2000 through 2009. Freely available data encompass all of Arizona (4,884 direct losses; 1,610 crop indemnities), South Carolina (19,134 direct losses; 25,360 crop indemnities), and all drought events nationwide (10,009 direct losses; 782,216 crop indemnities). Data updates were made to prior years as well as a full update of NCEI/NCDC data for the time periods 2000 through 2009.

SHELDUS Version 18.1 (released 12/17/2019 with 911,261 direct loss records and 2,486,003 crop indemnity records): Added direct loss estimates as well as crop insurance claims (indemnities) for 2018. Direct losses added for all U.S. territories from 2010 through 2018. Freely available data encompass all of Arizona (4,638 direct losses; 1,565 crop indemnities), South Carolina (TBD direct losses; 24,174 crop indemnities), and all drought events nationwide (TBD direct losses; TBD crop indemnities). Data updates were made to prior years as well as a full update of NCEI/NCDC data for the time periods 2010 through 2017.

SHELDUS Version 18.0 (released 11/18/2019): void

SHELDUS Version 17.0 (released 11/8/2018 with 898,194 direct loss records and 2,446,608 crop indemnity records): Data corrections to events pre-2017. Added direct loss estimates as well as crop insurance claims (indemnities) for 2017. Freely available data encompass South Carolina (18,822 direct losses; 23,649 crop indemnities), Arizona (4,294 direct losses; 1,521 crop indemnities) and all drought events nationwide (11,535 direct losses; 748,636 crop indemnities). Direct losses added for all U.S. territories for 2017.

SHELDUS Version 16.1 (released 5/4/2018): identical to 16.0, database moved to Arizona State University

SHELDUS Version 16.0 (released 11/1/2017 with 879,389 direct loss records and 2,405,597 crop indemnity records): Data corrections to events pre-2016. Added direct loss estimates as well as crop insurance claims (indemnities) for 2016 (12,783 direct and 77,957 insured crop records). Freely available data records for South Carolina (18,624 direct losses, 23,198 insured crop losses) and drought events nationwide (11,205 direct and 725,139 insured crop losses). The logic for how SHELDUS records are associated with PDDs was changed from a manual to a relational approach using FEMA Open Data (PDD).

SHELDUS Version 15.2 (released 11/17/2016 with 870,897 direct loss records and 2,561,882 crop indemnity records): Crop insurance claims (indemnities) paid by the Federal Crop Insurance Corporation (FCIC) administered by USDA's Risk Management Agency added for 1989 through 2015. All drought-related indemnity payments (704,307 records) were made freely available, which brings the freely available drought loss records up to 733,193 records.

SHELDUS Version 15.1 (released 10/6/2016 with 870,779 records): All drought-related records (28,886 records) were made freely available. Correction of records without proper peril identification.

SHELDUS Version 15.0 (released 10/6/2016 with 834,804 records): Loss data added for the year 2015 plus data revisions for 1960 through 2014. Inclusion of landslide loss estimates. Added ability to search by peril class and aggregate by number of days with losses.

SHELDUS Version 14.1 (released 08/2015 with 857,543 records): All loss outputs (injury, fatality, crop, and property) were supplemented with per capita calculations based on county populations at the time of the event.

The table below highlights the difference in data quality between versions 12 and 14. It shows the difference in the number of annual records as well as the difference in economic losses per year. Positive values indicate additions and negative values represent reductions in Version 14 compared to Version 12.

Table 1: Differences between SHELDUS version 12 and 14.

Year	Difference in Record Count (v12/14)	Difference in Total Losses (v12/14)
1960	0	-$79,319
1961	0	-$3,315,551
1962	0	-$166,361,449
1963	0	-$423,578
1964	0	-$107,002
1965	0	$2,794,542
1966	0	$1,826,655
1967	90	$1,063,093,499

Year	Difference in Record Count (v12/14)	Difference in Total Losses (v12/14)
1968	0	-$17,002
1969	0	-$19,349
1970	0	$6,325,146
1971	0	$402,522,806
1972	0	$22,465,369
1973	0	-$19,147,280
1974	0	-$4,185,706
1975	0	$1,514,450
1976	0	$1,040,131
1977	0	-$130,224
1978	57	$12,435,903
1979	0	-$978,262
1980	-27	$619,120,151
1981	0	-$72,271
1982	0	-$6,746,371
1983	0	$990,362
1984	0	-$1
1985	181	$43,316,758
1986	0	-$60,167
1987	45	-$1,091,679
1988	0	$827,141,826
1989	183	$89,915,365
1990	701	-$1,298,761,355
1991	646	-$29,177,654
1992	249	-$86,034,961
1993	4,693	$10,416,129,125
1994	7,505	$295,398,949
1995	2,351	$511,484,778
1996	1,307	$324,716,780
1997	343	-$86,486,272
1998	341	-$49,808,110
1999	117	-$4,267,030
2000	132	$28,370,519
2001	54	-$1,832,011
2002	1	$65,804
2003	286	$1,751,074,173
2004	23	$15,505,630
2005	0	-$545,540
2006	4	-$62,610,572

Year	Difference in Record Count (v12/14)	Difference in Total Losses (v12/14)
2007	2	$80,445,905
2008	-3,312	-$8,586,933
2009	5,169	$2,045,275
2010	-1,021	$2,749,952,912
2011	-4,011	-$3,119
2012	3,164	$285,683,824
2013	16,051	$13,454,507,759
2014	15,626	$649,113,890

SHELDUS Version 14.0 (released 07/2015): Loss data added for the year 2014 plus data revisions for 1960 through 2013.

SHELDUS Version 13.1 (released 09/2014 with 831,182 records): SHELDUS launched as for-pay service. Data aggregation option added to standard raw data download. Significant data corrections to losses that occurred in 1990s.

SHELDUS Version 13.0 (released 06/2014): Loss data added for the year 2013. All data for 2010, 2011, and 2012 were re-imported to correct for inconsistencies in forecast zone-county associations. Significant data corrections to losses that occurred in 1990s.

SHELDUS Version 12.0 (released 08/2013 with 809,990 records): Renaming of version 10.1 to version 12.0

SHELDUS Version 11.0 (no release of a new version): Version 11 skipped to make version number consistent with most current year of loss data available in SHELDUS.

SHELDUS Version 10.1 (released 08/2013): Loss data added for the year 2012.

SHELDUS Version 10.0 (released 08/2012): Loss data added for the year 2011. Loss threshold of $50,000 removed and all events added that caused any property/crop damage, injuries, or fatalities between 1985 and 1989. SHELDUS 10.0 contained every loss causing event between 1960 and 1989 and from 1995 onward as reported by SHELDUS data sources. Between 1990 and 1995, SHELDUS contains only events that caused at least one fatality or more than $50,000 in property or crop damage.

SHELDUS Version 9.0 (released 11/2011): Loss data added for the year 2010. Loss threshold of $50,000 removed and all events added that caused any property/crop damage, injuries, or fatalities between 1980 and 1984. SHELDUS 9.0 contained every loss causing event between 1960 and 1984 and from 1995 onward as reported by SHELDUS data sources. Between 1985 and 1995, SHELDUS contains only events that caused at least one fatality or more than $50,000 in property or crop damage.

SHELDUS Version 8.0 (released 09/2010 with 645,537 records): Loss data added for the year 2009. Loss threshold of $50,000 removed and all events added that caused any property/crop damage, injuries, or fatalities between 1975

and 1979. SHELDUS 8.0 contained every loss causing event between 1960 and 1979 and from 1995 onward as reported by SHELDUS data sources. Between 1980 and 1995, SHELDUS contains only events that caused at least one fatality or more than $50,000 in property or crop damage.

SHELDUS Version 7.0 (released 08/2009): Loss data added for the year 2008. Loss threshold of $50,000 removed and all events added that caused any property/crop damage, injuries, or fatalities between 1960 and 1974. SHELDUS 7.0 contained every loss causing event between 1960 and 1974 and from 1995 onward as reported by SHELDUS data sources. Between 1975 and 1995, SHELDUS contains only events that caused at least one fatality or more than $50,000 in property or crop damage.

SHELDUS Version 6.2 (released 08/2008): Loss data added for the year 2007. Events added from 1960 to present that caused at least one or more fatalities even when the crop or property loss was below $50,000. Events without any human loss were only included when the property or crop losses reached at least $50,000.

SHELDUS Version 6.1 (released 08/2007): Loss data added for the year 2006.

SHELDUS Version 5.1 (released 02/2007): Loss data added for the year 2005. Complete revision of the year 1990. Matching of SHELDUS records to presidential disaster declarations (PDDs), GLIDE numbers, and named major disasters.

SHELDUS Version 4.1 (released 02/2006): Loss data added for August 1, 2004 through May 31, 2005.

SHELDUS Version 3.1 (released 03/2005): Loss data added for January 1, 2001 through July 31, 2004.

SHELDUS Version 2.1 (released 10/2004): Revision of tornado losses from 1960 through 1993 and 1995. Version 2.0 incorrectly overestimated property damage (tenfold) and underestimated crop damage.

SHELDUS Version 2.0 and below (prior to 10/2004): For events that occurred between 1990 and 1995, a loss threshold of $50,000 or higher in either property or crop losses was applied. This threshold equals NCDC's logarithmic category 1 = $5,000 to $50,000). From 1995 onwards, SHELDUS includes all property or crop damage-causing events reported in NCDC's Storm Data publications.

This change in methodology was necessary, since the main source of raw data - the National Climate Date Center (NCDC) - changed its reporting procedures in 1995. During this year both categorical as well as exact dollar losses were reported by NCDC. Thus, the majority of records from 1995 onwards are exact damage figures that have been reported as such by NCDC and that have not undergone any post-processing by SHELDUS (exemption loss distribution of events affecting multiple counties). Additionally, NCDC also improved its spatial reporting system. Instead of reporting affected regions and distributing losses across the affected counties, NCDC moved to reporting losses on a county basis. Thus from

1995-2011, SHELDUS includes EVERY event that caused property or crop damage as reported by NCDC.

VIII. How to Reference SHELDUS

CEMHS, 2025. Spatial Hazard Events and Losses Database for the United States, Version 23.0. [Online Database]. Phoenix, AZ: Center for Emergency Management and Homeland Security, Arizona State University.

IX. Contact Information

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X. Data Sharing and Publication Restrictions

See Terms and Conditions
https://sheldus.asu.edu/SHELDUS/docs/END_USER_LICENSE_AGREEMENT.pdf