

## **Appendix E. Flood Hazard Identification Study**

# **Flood Hazard Identification Study Southeastern Association of Governments**

**By:**  
**United States Army Corps of Engineers  
Utah Division of Emergency Services and Homeland  
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### **Introduction**

The US Army Corps of Engineers Sacramento District completed this flood hazard identification study through a contract with the seven Associations of Governments. Funding was provided under the USACE Planning Assistance to States Program (Section 22). The intent of the study is to aid in detailing natural hazards associated with fluvial process for entities within each AOG currently unmapped as part of the National Flood Insurance Program or mapped as D zone areas.

### **Acknowledgements**

The following agencies aided in preparation, interpretation, and completion of this flood hazard investigation study.

Utah Associations of Governments  
Southeastern Association of Governments  
Sacramento District Corps of Engineers  
Utah Division of Emergency Services and Homeland Security

### **Scope of Work**

This study will evaluate and identify areas with a high flood hazard and identify potential mitigation solutions. The areas evaluated in this study include the four unincorporated counties of Carbon, Emery, Grand, and San Juan. Municipalities within the four counties were studied if they met the following criteria:

1. Jurisdiction has not been mapped by FEMA,
2. Jurisdiction mapped by FEMA as a Zone D, area of undetermined flood hazard.

Fluvial hazards within the cities and towns of: Scofield, Clawson, Elmo, Castle Valley, and Blanding were studied.

### **Description of the Study Area**

The Southeastern Utah Association of local Governments encompasses much of the Southeastern corner of Utah, including the Counties of Carbon, Emery, Grand, and San Juan. The Southeastern Association of Governments is at the heart of a region known as Canyon County, which is part of the Colorado Plateau Physiographic province. The Colorado Plateau province is known for its colorful landscape of high desert plateaus and extreme elevation differences between deep river gorges and high mountain peaks.

The main waterways through this region include the San Rafael River, Green, Dolores, San Juan River and the mighty Colorado River, which flows southwesterly into Lake Powell and is the main river drainage in this area. The Colorado River's two main tributaries are the Green River fed by the Dolores and San Juan River. This area has an abundance of small canyons and dry washes, which run in response to precipitation and produce localized flooding.

### **Discussion, Data, and Observations**

Data presented in this study are from the following sources:

- Carbon County Emergency Operations Plan
- Emery County Emergency Operations Plan
- Grand County Emergency Operations Plan
- San Juan County Emergency Operations Plan
- US Army Corps of Engineers Reconnaissance Report for Flood Control Mill Creek at Moab, Utah
- US Army Corps of Engineers Flood Damage Prevention Study Along Mill Creek at Moab, Utah
- Southeast Colorado River Basin Plan October 2000
- West Colorado River Basin Plan August 2000

In addition to incorporating existing studies and plans completed in the area, this flood hazard study also contains information from technical experts familiar with the study area. The mitigation projects are purely suggested actions, which based on past experience, will reduce or eliminate the identified fluvial hazard. These mitigation recommendations in no way represent the only measure to attain fluvial mitigation. In many cases the proposed or best solution is simply avoidance. This method of mitigation is implemented through the use of zoning, and represents in most cases the lowest cost mitigation measure.

### **Need For Additional Research**

Additional research should be conducted resulting in better maps for communities currently mapped as a FEMA Zone D, unmapped communities, and communities with outdated Flood Insurance Rate Maps. Communities would benefit from knowing peak flows and stages on tributaries of concern.

### **Disclaimer**

The information provided in this study was developed from a number of sources including:

- Past USACE studies done within the region and drainage basins,
- Personal knowledge,
- Limited onsite visits,
- Map interpolations,
- Current GIS work.

Even though care was taken to ensure a measure of correctness and field checks were performed on the information and data gathered, it is important to note this flood hazard study is presented “as is”. The United States Army Corps of Engineers, Division of Emergency Service and Homeland Security, or any other agency assisting in completion of this study cannot accept any responsibilities for errors, omissions, or accuracy. There are no warranties, which accompany this product. Users are cautioned to field verify information provided in this product before making any decisions. In no way does the mapping presented in this study take the place of a regulatory FEMA Flood Insurance Rate Map (FIRM), or replace any flood hazard identification product developed by FEMA / National Flood Insurance Program (NFIP).

### **How Communities Where Ranked**

The communities within this study were ranked based on a committee’s evaluation. The evaluation committee consisted of the:

- Utah State Floodplain Program Manager
- Utah State Hazard Mitigation Officer,
- Natural Hazard Mitigation Planner,
- U.S. Army Corp of Engineers,
- State Earthquake Program Manager.

This committee researched each of the twenty-nine counties and all 269 incorporated areas within the State of Utah. Each jurisdiction was assigned one of five ratings: Very High, High, Moderate, Low, or Not Rated. These ratings in no way reflect actual flood threat. The ratings were assigned based on the following variables:

- Perceived flood threat based on topography, past flooding occurrences, and experience of committee members.
- Participation in the National Flood Insurance Program (NFIP).

- Past studies included, but not limited to, regulatory FEMA/NFIP Flood Insurance Studies (FIS), other flood studies, and reconnaissance reports.
- Population growth within the jurisdiction.
- If the community is mapped by FEMA/National Flood Insurance Program (NFIP), and type of map which identifies high, moderate and low flood threats

Ratings were used to set the scope of work for each community within this study. Information on excluded communities was added where available.

### **A Word about Wildfires**

Almost every year several communities around the state are flooded and/or affected by post burn debris flows. Wildfire damaged watersheds have conditions which increase the potential for debris flows which may damage structures and infrastructure in the impacted area. Overall, the heightened risk associated with alluvial fans is always of concern. Post fire revegetation and stabilization efforts in many cases do not alleviate the threat due to flooding and debris flow.

### **A Word About Dams**

Dams are a critical support function for water managers in the State and also act as a flood control measure. If a dam remains stable, does not get overtopped, or is not impaired as the result of an earthquake, then, at a minimum, they do provide incidental flood control. If not then they can add to the flood threat. There are 124 dams within South Eastern AOG of those 15 have received a high hazard rating by Utah Division of Water Rights Dam Safety section. The State Dam Safety Section has developed a hazard rating system for all non-federal dams in Utah. Downstream uses, size, height, volume, and incremental risk/damage assessments are a variable used to assign dam safety classification. Using the hazard ratings systems developed by the State Dam Safety Section, dams are placed into one of three classifications high, moderate, and low. Dams receiving a low rating would have insignificant property loss due to dam failure. Moderate hazard dams would cause significant property loss in the event of a breach. High hazard dams would cause a possible loss of life in the event of a rupture. The frequency of dam inspection is designated based on hazard rating with the Division of Water Rights inspecting high-hazard dams annually, moderate hazard dams biannually, and low-hazard dams every five years.

### **Carbon County**

- Grassy Trail
- Scofield

### **Emery County**

- Millsite
- Huntington North
- Cleveland

- Joes Valley
- Electric Lake
- Miller Flat

**Grand County**

- Tusher Canyon Detention
- White Canyon Retention

**San Juan County**

- Blanding City NO. 4
- Recapture Creek
- Kens Lake
- Lloyds Lake
- Starvation Canyon

## Carbon County

COUNTY	CITY/TOWN	POPULATION	STATE MAP LOCATION	NFIP STATUS*	THREAT (or NSFHA-eligible)
Carbon	Unincorporated	6488		D-490032 - 12/3/93	Price River and Tribbs
Carbon	East Carbon	1393	F7	490225A - 5/1/86(L)	
Carbon	Helper	2025	F6	490034 - 3/1/79	
Carbon	Price	8402	F6	D-490036 - 12/3/93	
Carbon	<b>Scofield</b>	44	F6	<b>Not Participating</b>	Pleasant Valley (Mud) Creek
Carbon	Sunnyside	404	F7	490205 - 9/29/78	
Carbon	Wellington	1666	F6	490037 - (NSFHA)	

\* D = Detailed Study Report and Map Prepared.

## Carbon County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flash Flood Carbon	August 6, 1901	Winter Quarters West of Scofield	2 deaths Property damage	NOAA
Flash Flood Carbon	August 16, 1928	Lost Creek	1 death	NOAA
Flash Flood Carbon	July 29, 1937	Price	1 death 3 injuries	Boulder rolls through house.
Flood Carbon	September 12, 1939	Wellington	Flood damage to roads and homes.	
Flood Carbon	September 13, 1940	Price/Helper	Homes and farmlands flooded. US 50 in Price blocked by slide. Main rail lines	Flooding along Price and Willow Creek.

			covered by rocks and mud. \$10,000 in damage to Helper	
Flood Carbon	August 5, 1942	Helper	Damage to roads, homes, rail lines, mines and bridges. Heavy damage along Price River. \$75,000 in damages. Canyon Street Bridge destroyed. Several hundred feet of railroad washed out in Spring Canyon	
Flood Carbon	August 5, 1947	Sunnyside	Flash flood one death	
Flash Flood Carbon	August 5, 1948	Sunnyside	1 death	Body found in debris
Flood Carbon	July 17, 1953	Price	Damage to homes and streets.	Source Willow Creek Canyon
Flood Carbon	July 5, 1961	Price	Damage to homes, streets, and Carbon High School.	
Flood Carbon	July 28, 1968	Spring Glen/Kenilworth	Extensive damage to homes, autos, and roads.	Spring glen water line and main street damaged
Flood Carbon Presidential	1983	County Wide	Server economic loss due to Thistle	Source Price River

			landslide. Carbon County had direct losses of \$7 million. Damage to roads, golf courses, water and sewer lines, and culverts	
Flash Flood Carbon	May 13, 1984	Clear Creek	One death and three homes and four garages damaged	

(All dollar values for given are for year of disaster)

## Unincorporated Carbon County

### Carbon County Flood Mitigation Goals -

#### Goal 1 Reduce Risk of Potential Flooding

**Unincorporated Carbon County – Problem Identification:** Almost 1/3 of the county's population lives in the unincorporated county – many surrounding the Price area. The Price River and its tributaries represent the major flood threats to development. The major reservoir in the county is Scofield.

**Objective:** Minimize future flood damage in the unincorporated County

**Action:** Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county laws to include these is minimal and the benefits substantial (although there will be a small percentage of the population that will oppose any zoning or other changes in the laws for that matter).

**Timeframe:**

**Funding:**

**Estimated Cost:** Minimal – almost nothing.

**Staff:**

**Scofield – Problem Identification:** Located just south of Scofield Reservoir, the town is one of the smallest incorporated communities in the state and does not participate in the NFIP. There appears to be a significant flood threat from Pleasant Valley (Mud) Creek and its tributaries.

**Objective:** Minimize future flood damage in Scofield.

**Alternative Action:** Given the relatively few number of existing structures, flood proofing may be a viable alternative – especially for those structures with a history of being flooded.

**Timeframe:**

**Funding:**

**Estimated Cost:** \$10k - \$30k for the average home to flood proof.

**Staff:**

**Alternative Action:** A structural mitigation project for this community could be a levee from the confluence of Winter Quarters Canyon Creek extending north to the end of development near the city limit – a channel distance of about 3,000 ft (levee length of about 1 mile)

**Timeframe:**

**Funding:**

**Estimated Cost:** The preliminary cost for the levee project would be about \$250,000.

**Staff:**

**Alternative Action:** An alternate project could consist of zoning of the flood prone area to insure that all new developments are sited as far away from the channels as possible (or at least constructed so as to be higher in elevation than the flood threat). This however, would do nothing to protect existing development.

**Timeframe:**

**Funding:**

**Estimated Cost:** minimal.

**Staff:**

## Emery County

COUNTY	CITY/TOWN	POPULATION	STATE MAP LOCATION	NFIP STATUS*	THREAT (or NSFHA-eligible)
Emery	Unincorporated	1846		490058 - (NSFHA)	
Emery	Castle Dale	1657	G6	D-490059 - 5/1/80	
Emery	<b>Clawson</b>	153	G6	<b>Not Participating</b>	Unnamed drainage
Emery	Cleveland	508	G6	490196A - 7/12/77	
Emery	<b>Elmo</b>	368	G6	<b>Not Participating</b>	NSFHA-Eligible (Timothy Creek)
Emery	Emery	308	G5	490060 - (NSFHA)	
Emery	Ferron	1623	G6	490061 - (NSFHA)	
Emery	Green River	868	G7	490062 - 3/18/86(M)	
Emery	Huntington	2131	G5	490063 - (NSFHA)	
Emery	Orangeville	1398	G6	490064 - 3/1//79	

\* D = Detailed Study Report and Map Prepared.

## Emery County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flash Flood Emery	August 4, 1900	Orangeville	1 death	
Flash Flood Emery	July 29, 1936	Ferron	1 death	
Flood Emery	September 29, 1951	Emery	Damage to fences, posts, gates and bailed hay. Flooding along highway 10.	Hail storm
Flood Emery	August 26, 1952	Castle Dale	One death	Source Buckhorn Wash
Flood Emery	July 19, 1957	Castle Dale	Damage to Buckhorn Flat	

			road and roads east and south of town	
Flood Emery	August 8, 1957	Castle Dale/Orangeville	Damage to streets, homes, and crops	
Flood Emery	August 25, 1961	Moore	Damage to farms and Emery Canal	Muddy Creek overflowed.
Flood Emery	September 21, 1962	Woodside	Flash flood caused damage to highway 6 and a large section of railroad track	Source Saleratus Wash
Flood Emery	August 1, 1964	Orangeville	Estimated \$17,500 in damage to farmlands, roads, and canals	Source Cottonwood Creek
Flood Emery	July 25, 1965	Emery	Farms, bridges, and irrigations facilities	Source Ivie Creek
Flood Emery	August 25, 1965	Huntington	City water works damaged	Source Little Bear Creek Canyon into Huntington Creek
Flood Emery	May 25, 1967	Orangeville	Clipper Canal, homes and sections of Highway 59.	
Flood Emery	July 17, 1967	Green River	Farms, bridges, and crops damage outside of town	
Flood Emery	July 23, 1967	Ferron	Dutch Flat Canal, roads, and construction	Source Straight Hollow and Dutch Flat

			projects damaged	
Flood Emery	August 8, 1967	Ferron	Dutch Flat Canal, roads, and Ferrion Watershed project	
Flood Emery	July 30, 1968	Ferron	City culinary water system damaged. Highway 10 flooded and damaged, irrigation flumes across Dry Wash destroyed	Source Molen Seeps Wash and Dry Wash
Flood Emery	August 1, 1968	Ferron	Farmlands and roads damaged as well as business establishments along North Canal.	
Flood Emery	September 9, 1969	Huntington	Irrigations systems and crops destroyed \$20,000 in damage	Storm occurred over Huntington Canyon
Flood Emery Presidential	June 1983	County Wide	Limited damage to bridges and roads	Source Ferron Creek, Cottonwood Creek, Huntington Creek, and Price River. Limited damage due to sparse population.

(All dollar values for given are for year of disaster)

### Unincorporated Emery County

## **Emery County Flood Mitigation Goals -**

### **Goal 1 Reduce Risk of Potential Flooding**

**Unincorporated Emery County – Problem Identification:** Less than 20 percent of Emery county’s population lives in the unincorporated county. The Green River and San Rafael Tributaries represent the major flood threats to development. There are a number of lakes/reservoirs in the in the northwest part of the county including Electric and Deseret Lakes, Huntington, Miller’s Flat, Joes Valley, and Millsite Reservoirs.

**Objective:** Minimize future flood damage in the unincorporated County

**Action:** Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county laws to include these is minimal and the benefits substantial (although there will be a small percentage of the population that will oppose any zoning or other changes in the laws for that matter).

**Timeframe:**

**Funding:**

**Estimated Cost:** Minimal – almost nothing.

**Staff:**

**Clawson – Problem Identification:** This small community, northeast of Ferron, does not participate in the NFIP. It does face a moderate threat from the drainage to the southeast (parallel to State Road 10).

**Objective:** Minimize future flood damage in Clawson.

**Alternative Action:** Given the relatively few number of existing structures, floodproofing may be a viable alternative – especially for those structures with a history of being flooded.

**Timeframe:**

**Funding:**

**Estimated Cost:** \$10k - \$30k for the average home to floodproof.

**Staff:**

**Alternative Action:** A structural mitigation project for this community could be a levee from the southwest corner of Clawson extending north to the northern end

of development near the northern city limit – a channel distance/levee length of about 3,000 ft.

**Timeframe:**

**Funding:**

**Estimated Cost:** The preliminary cost for the levee project would be about \$150,000.

**Staff:**

**Elmo – Problem Identification:** This small community, northeast of Cleveland in northern Emery County, also does not participate in the NFIP. There is a relatively minor threat from Timothy Creek. Because the creek is incised and not within the incorporated town limits it could be a NSFHA-Eligible community.

**Objective:** Minimize future flood damage in Elmo.

**Action:** Identify Elmo as a NSFHA-eligible community (pending evaluation of flood history and evidence of past flooding).

**Timeframe:**

**Funding:**

**Estimated Cost:** Minimal

**Staff:**

## Grand County

COUNTY	CITY/TOWN	POPULATION	STATE MAP LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
Grand	Unincorporated	3357		NITP - 10/6/81	
Grand	Castle Valley	349	H8	Not Participating	Castle Creek and Tribs
Grand	Moab	4779	H8	490072 - 6/4/80	

### Grand County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flash Flood Grand	October 7, 1896	Mill Creek near Moab	1 death	
Flood Grand	August 28, 1939	Moab	\$ 5,000 in damage to homes businesses, streets, and powerhouse	Source Mill Creek
Flood Grand	August 31, 1939	Cisco	One death	Source Diamond Creek
Flood Grand	July 23, 1953	Moab	Damage to movie production set at Fishers Towers	
Flood Grand	August 6, 1957	Moab	Severed culinary water line across Mill Creek, several thousand dollars in damage to property and crops	
Flood Grand	August 29, 1957	Moab/ Thompson	Streets and highway flooding	
Flood Grand	June 29, 1962	Moab	Damage to homes in Walker	City park flooded

			Subdivision.	
Flood Grand	August 8, 1963	Moab	Sewer, water, street damage. Several hundred acres of land covered in silt	Source Mill and Pack Creeks
Flood Grand	October 15, 1965	Moab	Culvert, roads, and bridge damage. Approximately \$1,500.	Mill and Pack Creeks
Flood Grand	June 5, 1967	Moab	Flooded main street, damaged homes, business establishments, apartments, and closed U.S. 160.	
Flood Grand	August 17, 1968	Moab	Approximately \$50,000 in damage to homes and businesses.	

(All dollar values for given are for year of disaster)

## Unincorporated Grand County

### Grand County Flood Mitigation Goals -

#### Goal 1 Reduce Risk of Potential Flooding

**Unincorporated Grand County – Problem Identification:** Home to Arches National Park, 40 percent of all Grand County residents live in unincorporated areas of the county – many in the Moab area, in relative close proximity to the park. The Colorado River and its tributaries represent the major flood threats to development. There are few reservoirs in the county.

**Objective:** Minimize future flood damage in the unincorporated County

**Action:** Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent

(100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county laws to include these is minimal and the benefits substantial (although there will be a small percentage of the population that will oppose any zoning or other changes in the laws for that matter).

**Timeframe:**

**Funding:**

**Estimated Cost:** Minimal – almost nothing.

**Staff:**

**Castle Valley – Problem Identification:** This small community does not participate in the NFIP. A tributary to Castle Creek runs right through the town (and Castle Creek itself on the south side of town).

**Objective:** Minimize future flood damage in Castle Valley

**Alternative Action:** Given the relatively few number of existing structures, flood proofing may be a viable alternative – especially for those structures with a history of being flooded. Zoning to prevent new structures from being built in the floodplain would be very helpful and cost effective.

**Timeframe:**

**Funding:**

**Estimated Cost:** \$10k - \$30k for the average home to flood proof.

**Staff:**

## San Juan County

COUNTY	CITY/TOWN	POPULATION	STATE MAP LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
San Juan	Unincorporated	9293		490109 - (NSFHA)	San Juan River and Tributaries
San Juan	<b>Blanding</b>	3162	J8	<b>Not Participating</b>	NSFHA-Eligible
San Juan	Monticello	1958	I9	490212 - 12/24/76	

## San Juan County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood San Juan	August 17, 1955	Monticello	Homes, businesses destroyed on northeast section of town	
Flood San Juan	August 2, 1956	Monticello	Heavy rains flooded city and some home, a motel suffered approximately \$50,000 in damages	
Flood San Juan	July 31, 1965	Monticello	Johnson Creek road damaged as well as crops and farmland	
Flood San Juan	August 1, 1968	Bluff	Residential property and business damaged approximately \$16,000	
Flash Flood San Juan	September 5, 1970	Four corners area	2 deaths	Cars drove off washed out bridge.

Flash Flood San Juan	September 14, 1996	Black hole of White Canyon	1 death	
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(All dollar values for given are for year of disaster)

## Unincorporated San Juan County

### San Juan County Flood Mitigation Goals -

#### Goal 1 Reduce Risk of Potential Flooding

**Unincorporated San Juan County – Problem Identification:** Note that 65 percent of all residents live in the unincorporated county – one of the highest percentages in the state – many on the Navajo Indian Reservation. The Colorado River tributaries represent the major flood threats to development. There are only a few reservoirs in the county.

**Objective:** Minimize future flood damage in the unincorporated County

**Action:** Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county laws to include these is minimal and the benefits substantial (although there will be a small percentage of the population that will oppose any zoning or other changes in the laws for that matter).

**Timeframe:**

**Funding:**

**Estimated Cost:** Minimal – almost nothing.

**Staff:**

**Blanding:** Although it doesn't participate in the NFIP, Blanding appears to have little flood threat. The closest waterway, Westwater Creek is on the west side of town. If the western incorporated boundary lies at or near the western edge of development, Blanding could be considered a NSFHA-Eligible community since there are no other identifiable flood threats.

**Objective:** Minimize future flood damage in Blanding.

**Action:** Identify Blanding as a NSFHA-eligible community (if a history of minimal flooding is confirmed).

**Timeframe:**

**Funding:**

**Estimated Cost:** Minimal

**Staff:**

**Need For Additional Research**

Additional research should be conducted to better map communities currently mapped as a FEMA Zone D, or currently unmapped communities, and communities with out dated Flood Insurance Rate Maps. Communities would benefit from knowing peak flows and stages on tributaries of concern.