

FLOOD / DAM FAILURE ANNEX R

R1. Purpose, Situation, and Assumptions

R1.1 Purpose

The purpose of this Flood / Dam Failure Hazard-Specific Annex is to guide and coordinate agencies and organizations during threats and incidents of flooding and dam failure within Park County. Floods and dam failures can threaten lives and property and requires coordination between response organizations for effective operations. General incident management principles and disaster and emergency processes should be applied to any flood or dam failure incident, but this annex provides additional information specific to these types of incidents.

R1.2 Situation Overview

The primary flood threats in Park County, the City of Livingston, and the Town of Clyde Park are along the rivers and streams, in low-lying areas or depressions from rapid rainfall or snowmelt, and downstream of dams. Park County has many rivers and streams, but the most flood-prone include the Yellowstone River, Shields River, and Fleshman Creek. Floodwaters can result from overall high precipitation levels (rain and/or snow), rapid snowmelt, heavy thunderstorms, ice jams, conditions upstream, or dam failure. Park County and the City of Livingston have a history of extensive flood problems, usually from snowmelt in the higher elevations. Ninth Street Island just outside of Livingston is an inhabited river island where residences and infrastructure are repetitively threatened by flood. Flash floods can occur almost anywhere, but areas near wildfire burn areas and canyon draws are more vulnerable.

The Yellowstone River in Park County is approximately 84 miles long, running from the Yellowstone Park boundary through the Paradise Valley and Livingston to Springdale. The Yellowstone has two river gauges in Park County at Corwin Springs and near Livingston at Carter's Bridge.

The flood stage for the Yellowstone River is 11 feet at Corwin Springs. At 11 feet, brushland and adjacent prairie are in flood. At 12 feet, waters reach trailers along the river. In 1918, this location crested at 11.5 feet. In 1996, this location crested at 10.92 feet. (National Weather Service, 2011)

The flood stage for the Yellowstone River is 9 feet at Carter's Bridge. At 9 feet, some minor overflow occurs along the lowest areas throughout the reach of the river and across the road to Ninth Street Island. At 9.21 feet, the roads to Mill Creek, Cinnabar Basin, and Trail Creek are covered with water with water reaching some homes on Ninth Street Island and a few farms. In 1997, this location crested at 10.72 feet. (National Weather Service, 2011)

The Shields River in Park County is approximately 44 miles long, running from the north end of the county by Wilsall to the Yellowstone River. Flood stage is 5.5 feet at the gauge 7 miles northeast of Livingston. In 1948, this location crested at 7.39 feet. (National Weather Service, 2011)

Most dams are classified based on the potential hazard to life and property should the dam suddenly fail. Note the hazard rating is not an indicator of the condition of the dam or its probability of failure. Definitions are as follows:

- **Low Hazard Potential:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner’s property.
- **Significant Hazard Potential:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.
- **High Hazard Potential:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

Source: Federal Guidelines for Dam Safety, Hazard Potential Classification System for Dams, Federal Emergency Management Agency, April 2004.

Park County has 24 dams – 1 high hazard, 4 significant hazard, and 19 low hazard. Table R1.2A shows the high and significant hazard dams in Park County. Some dams have Emergency Action Plans (EAPs). These EAPs usually include a notification scheme which interfaces with that of the county and includes notification of a limited number of key personnel should a breach or other disaster appear to be possible. Although not particularly likely, seismic activity, poor maintenance, overwhelming flow conditions, and terrorist activities can all lead to the catastrophic failure of a dam.

Table R1.2A High and Significant Dams in Park County

Dam Name	Water Body	Hazard	Owner	EAP?
Cottonwood Dam	Cottonwood Creek	High	State of Montana	Yes
Arthun Dam	Tributary of Antelope Creek	Significant	Len Arthun	Unknown
Kaiser Dam	Tributary of Muddy Creek	Significant	Park Swandal	Unknown
Nauharodney Dam Crazy Mountain Dam	Hammond Creek	Significant	Crazy Mountain Ranch	Yes
Lower O’Halloran Dam	Looking Glass Creek	Significant	Loyce O’Halloran	Unknown

Source: National Inventory of Dams, US Army Corps of Engineers.

Possible flood and dam failure losses include:

- Flooded roadways.
- Road, bridge, and culvert losses.
- Water and sewer system losses.
- Electric and telephone service disruptions.
- Railroad losses.
- Structure and contents losses, including critical facilities.

- Business losses.
- Crop and livestock losses.
- Deaths and injuries.

R1.3 Planning Assumptions

- Flash flooding and dam failure may occur without warning.
- The geographic extent of flood and dam failure impacts may range from localized at a single site to an entire river stretch to locations countywide including areas not typically prone to flooding or along waterways.
- The duration of floodwaters may range from hours to days.
- Extreme impacts, more than have been seen in Park County historically, are possible, especially from dam failure.

R2. Concept of Operations

Flood forecasts, advisories, watches, and warnings are provided by the National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS). The local National Weather Service office is in Billings. Flood conditions may or may not be preceded by some type of watch or warning. Table R2A lists the various flood products that may be issued. The NWS will cancel the watches and warnings once the threat has passed.

Table R2A NOAA / NWS Flood Products

<i>Type</i>	<i>Level</i>	<i>Criteria / Definition</i>
Hydrologic	Outlook	Provides long lead time information about flood potential or water supply conditions.
Flood	Watch	Identifies areas where there is a risk of flooding, but flooding is not certain.
Flood	Warning	Warns of floods developing more than 6 hours after causative event. May provide information on forecast stream levels and describe impacts of past flooding at forecast levels.
Flash Flood	Warning	Warns of rapidly developing flooding occurring within 6 hours of the causative event.
Flood / Flash Flood	Statement	Updates or expands information in the previously issued warning.

Source: National Weather Service Hydrologic Information Center website, Explanation of Statements Issued by Local Offices, 2011.

The decision points that follow are the responsibility of incident management. Note that not all decision points may be necessary and some decision points may be combined during rapidly escalating situations.

- *Decision Point: A hydrologic outlook is issued containing a moderate or high probability of flood conditions.*

Since flooding is not occurring, but is probable in the upcoming days or weeks, initial preparations should begin. Agencies and organizations should raise the awareness level of employees/members and consider the following:

- Will many employees/members be on vacation or otherwise unavailable?
- Will equipment and/or vehicles be out of service for non-critical maintenance or service or should service be expedited?
- Are supply stocks for items such as sand bags, pumps, or fuel low?

Awareness and ensuring adequate supplies and equipment are available are usually the most important elements in this phase.

- *Decision Point: A flood watch is issued.*

Preparations for the event should begin and may include, depending on forecasted levels, the following:

- Modification of work schedules to ensure adequate staffing levels throughout the event, especially if expected to occur over a weekend or holiday period.
- Vehicle and equipment preparations to allow for rapid and sustained deployment.
- Supply purchases needed to sustain operations throughout the event.
- Designation of individuals to monitor conditions in flood prone locations.
- Notification of local officials of the potential for flooding.
- Consideration of an Evacuation Advisory or Warning for those in known hazard areas, such as Ninth Street Island. (See the [Population Protection](#) and [Warning](#) Annexes for additional information.)

- *Decision Point: A flood or flash flood warning is issued or flood conditions are occurring.*

Weather forecasting is not a perfect science, so flooding may occur without warning, or conversely, a warning may be issued and the expected conditions do not occur or occur with less severity. Situational awareness by monitoring conditions throughout the county and in neighboring jurisdictions is important to operations. As conditions dictate, initiate response operations, such as ordering evacuations, closing roadways and flooded areas, or sandbagging public or critical property. Note: Local policy is that sandbags are not provided to individuals. Individuals are encouraged to obtain and manage their own sandbagging needs. Continue to monitor, maintain operations, communicate with partner organizations and the public, and make changes to staffing levels, as needed. Accurate personnel and equipment records must be maintained for possible reimbursement requests should the event escalate to the disaster or emergency level. See the [Population Protection](#), [Public Information](#), and [Warning](#) Annexes for additional information on these functions.

- *Decision Point: An event or conditions are occurring that might threaten the integrity of a dam or impacts downstream are possible.*

When a dam incident occurs that doesn't immediately threaten lives and property downstream, an Incident Commander and/or Incident Management Team should be established to:

- Assess the situation.
- Secure areas that would likely be threatened first with little warning, such as the dam itself and immediately downstream.
- Provide timely, accurate information to the public.

When assessing the situation, the following questions may be asked of the dam owners/operators or other subject matter experts:

- What conditions have created the concern?
- What is the probability of catastrophic failure?
- Will water releases be significantly higher than usual? If so, how high?
- What are the expected impacts downstream and upstream?

Once the situation is assessed, appropriate protective measures may be taken to prepare for the impacts, including the development of public information, and warning, if necessary, of those that may be impacted. See the [Public Information Annex](#) and [Warning Annex](#) for additional information on these functions. If escalation of the incident seems probable, preparations for future actions, such as the development of incident action plans, putting additional resources on alert, and preparing warning messages and methods should be considered.

- *Decision Point: Dam failure is imminent or occurring with impacts downstream likely.*

When dam failure is imminent or occurring and lives are threatened, warning of those in the hazard area is an immediate priority. See the [Warning Annex](#) for additional information. In addition to warning messages distributed by local officials, a Flash Flood Warning would likely be issued by the National Weather Service in Billings.

If evacuation of the threatened area is ordered and/or recommended, please refer to the [Population Protection Annex](#) and [Shelter / Mass Care Annex](#) for additional information on those functions.

Once the warning function is completed and protective actions have been taken, monitoring and reporting of the situation should be continued, and public information should be provided at regular intervals. See the [Public Information Annex](#) for additional information. Once floodwaters have receded, damage assessment and recovery efforts can begin or continue.

- *Decision Point: A flood event has caused property or infrastructure losses.*

When safe to do so, response organizations can respond to immediate threats to life and property. Actions may include rescues, closing roads and other damaged areas, pumping water out of structures, and providing shelter and/or mass care for those displaced from their homes. See the [Shelter / Mass](#)

[Care Annex](#) for additional information on this function. Depending on the level of response needed, the Park County Emergency Operations Center may be opened.

Losses throughout the communities should be assessed and evaluated for possible disaster and/or emergency declarations. See the [Damage Assessment Annex](#) for additional information on this function. Individuals and organizations may begin clean-up and repairs through the appropriate insurance and disaster claim processes, as applicable.

When public property is damaged, the processes outlined in the [Base Plan, Section 7.1, Finance/Administration](#) should be followed.

Since most homeowners insurance policies do not cover flood damages (unless a separate flood insurance policy is in place), state and/or federal assistance may be needed for disaster recovery. See [Sections 2.5 and 2.6 of the Base Plan](#) for more information on the assistance programs available. Refer to the [Public Information Annex](#) for more information on providing recovery information to the public.

R3. Organization and Assignment of Responsibilities

The responsibilities listed here are specific to this hazard. Note that all entities, whether listed or not, are also responsible for their basic disaster and emergency responsibilities as outlined in the [Base Plan, Section 3.2](#), as applicable.

The following entities are not specific to jurisdiction. Therefore, in an emergency, the jurisdiction(s) affected will have the responsibility for these roles, and other non-affected jurisdictions may also be involved through mutual aid.

Law Enforcement

- Secure and control access to affected areas (i.e. perimeter control, evacuation routes).
- Request or recommend declarations of evacuation, emergency, and/or disaster to the local governing body, as appropriate.

Public Health

- Advise responders on safe drinking water practices, food supplies safe for consumption, and spill clean-up.

Water and Sewer Departments / Districts

- Protect essential water and sewer facilities and infrastructure to the extent possible.

Street and Road Departments

including Montana Department of Transportation

- Mitigate flood losses, if possible.
- Assess damages to roadways and bridges.

Other Entities

- Perform other duties as needed and assigned.

R4. Direction, Control, and Coordination

Incident Command for flood and dam failure incidents will most often be managed through Unified Command as designated by the jurisdiction(s) having authority, usually consisting of the following organizations:

- Law Enforcement
- Disaster and Emergency Services

Additional information on the direction and control function can be found in the [Direction and Control Annex](#) and [Base Plan, Section 4](#).

Dam specific plans for Park County (horizontal coordination) include:

- Cottonwood Dam Emergency Action Plan, State of Montana
- Crazy Mountain / Nauharodney Dam Emergency Action Plan, Crazy Mountain Ranch

Local plans that have been used for flood events (horizontal coordination) include:

- Park County Sheriff’s Office, 9th Street Island Evacuation Plan

R5. Information Collection and Dissemination

R5.1 Information Collection for Planning

Table R5.1A lists the key information needed and possible sources when preparing for and conducting operations during flood and dam failure events.

Table R5.1A Possible Information Sources

<i>Information Type</i>	<i>Source</i>
Dam Conditions	<ul style="list-style-type: none"> – Dam Owner/Operator – Montana DNRC Dam Specialists – Private Engineers
Dam Inundation Areas	<ul style="list-style-type: none"> – Dam Emergency Action Plan – Dam Owner/Operator – GIS Specialists
Local Conditions/Observations	<ul style="list-style-type: none"> – Law Enforcement – Street and Road Departments – Disaster and Emergency Services
River/Stream Levels, Weather Warnings, and Forecasts	<ul style="list-style-type: none"> – National Weather Service, Billings

R5.2 Public Information

Information regarding the public information function can be found in the [Public Information Annex](#).

The following information should be provided to the public, as appropriate:

- Description of current situation
- Anticipated water body rises and/or river levels
- Areas expected to be impacted
- Expected upstream/reservoir impacts (in the case of dam failure)
- Anticipated duration
- Protective actions needed or recommended
- Shelter and mass care information
- Disaster recovery information

R6. Communications

See the [Communications Annex](#) for more details on emergency communications in Park County.

R7. Administration, Finance, and Logistics

R7.1 Finance/Administration

For additional information on the Finance/Administration function, particularly the importance of recordkeeping, see the [Base Plan, Section 7.1](#).

R7.2 Logistics

For additional information on disaster and emergency logistics, see the [Base Plan, Section 7.2](#).

R8. Plan Development and Maintenance

See the [Base Plan, Section 8](#) for additional information on annex development, review, revision, and exercise.

R9. Authorities and References

R9.1 Authorities / References

- Explanation of Statements Issued by Local Offices, National Weather Service Hydrologic Information Center, January 2011.

- Federal Guidelines for Dam Safety, Hazard Potential Classification System for Dams, Federal Emergency Management Agency, April 2004.
- Montana Code Annotated 85-15: Dam Safety Act
- National Inventory of Dams, US Army Corps of Engineers.
- National Weather Service, Advanced Hydrologic Prediction Service, January 2011.

R9.2 Acronyms

See the [Base Plan, Section 9.4](#) for the list of acronyms used in this plan.

R10. Attachments

None.