



2014-2015 Year-in-Review

National Dam Safety Program

FEMA P-1073 / July 2016



FEMA



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Cover Photo: Fort Collins, CO - Image of what is left of Little Deer Lake dam in Big Elk Meadows following the Colorado flood in 2013.

Source: FEMA

Reviewing 2014 and 2015

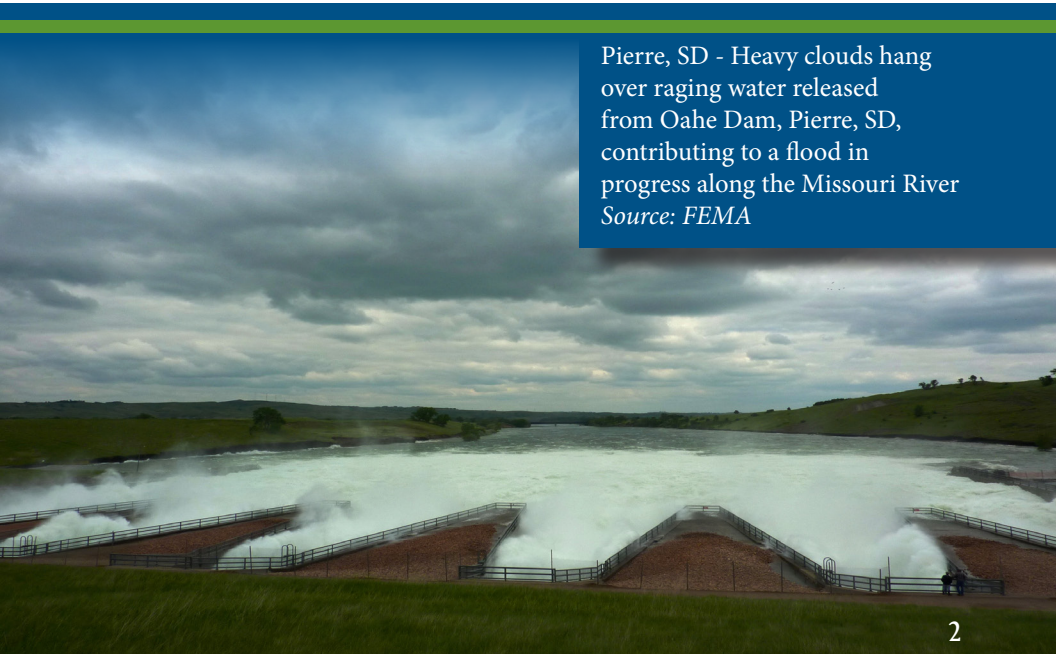
Maintenance is an unfortunate but healthy byproduct of achievement. As a diverse Nation, the United States has undertaken colossal endeavors that have beggared belief in humankind's possibility. The Federal Emergency Management Agency (FEMA) National Dam Safety Program (NDSP), first authorized in 1996 and recently re-authorized in 2014 by the Water Resources Reform and Development Act, has been tasked with maintaining and improving the Nation's dam infrastructure welfare. While not every dam ranks high on the public attention scale, every dam is an engineering feat that benefits the lives of those within its proximity.

Traditionally, the NDSP releases an annual Year-in-Review report. The document is a compilation of the past two years: Fiscal Years (FY)14 and FY15. The review serves as a report out to the public regarding the current status of Dam Safety Program elements. This includes State assistance, research, training, and the alignment of the NDSP within the emergency management and resilience frameworks. FEMA NDSP plays an important role in safeguarding the United States while reducing risk, promoting benefits, and enhancing community security of dams. This document highlights the accomplishments that have come to fruition through these efforts.

FY14 and FY15 were both banner years, continuing the upwards trend in the sustainability of our dam safety infrastructure.

Fortifying the States Together

The country's complex dam inventory composition means the task is too large for any one group. Twenty-two Federal organizations partake in dam safety efforts nationwide alongside the lead agency, FEMA. Collectively, they make up the Interagency Committee On Dam Safety (ICODS) and work together on multiple levels. Different partners have their own areas of responsibility, thus ensuring that every dam demographic is accounted for. While maintaining the dams in their areas of responsibility, the agencies also collaborate through committees, research, and by sharing training material. These ventures mean dam safety sector employees are well-trained and in-the-know regarding how to employ the most recent update to technical guidance. The discussion prompted through annual meetings with the National Dam Safety Review Board (NDSRB) and ICODS members also ensures that the NDSP and all of its components are on the same page.



Pierre, SD - Heavy clouds hang over raging water released from Oahe Dam, Pierre, SD, contributing to a flood in progress along the Missouri River
Source: FEMA

The National Dam Safety Program

Top Joint Ventures in 2014 and 2015

National Dam Safety Review Board

The NDSRB advises FEMA's Administrator in setting National dam safety priorities and considers the effects of national policy issues affecting dam safety. NDSRB members include representatives from FEMA, the Chair of the Board and the ICODS representatives from four federal agencies (U.S. Departments of Agriculture, Commerce, Homeland Security, and Interior), five state dam safety officials, and one member from the private sector.

Interagency Committee on Dam Safety

ICODS was founded in 1980 to encourage the establishment and maintenance of effective Federal programs, policies, and guidelines to enhance dam safety and security. ICODS serves as the permanent forum for the coordination of Federal activities in dam safety and security. FEMA also chairs ICODS.

National Dam Safety Awareness Day

In FY14 and FY15, the NDSP participated in and supported National Dam Safety Awareness Day (NDSAD). On or around May 31 of each year, NDSAD seeks to promote individual and community responsibility and best practices for dam safety, raise awareness of the benefits dams offer, and highlight steps that can be taken to prevent future catastrophic dam failures.

From May 30 to June 1, 2014, special events were hosted throughout Johnstown, Pennsylvania, including at the Johnstown Flood Museum, Peoples Natural Gas Park, and Johnstown Flood National Memorial. Event highlights included a presentation of a requiem, a commemoration ceremony for when the flood hit

Johnstown 125 years prior, a luminaria at the dam site, a path of the Flood Historic Half-Marathon, and a Community Day at Peoples Natural Gas Park. David Miller and Doug Bellomo represented FEMA and other state, local, and representatives from the Association of State Dam Safety Officials (ASDSO) spoke at the 2014 Anniversary NDSAD event.

FEMA also prepared a two-part video showcasing remarks made at the 2014 Anniversary NDSAD event. In 2015, FEMA concentrated its efforts on producing usable templates for future instances of NDSAD. FEMA also designed and built the resource page <http://engineeringstrongersafer.net/national-dam-safety-awareness-day/>. The website acts as a repository of engineering information, a litany of best practices that can be used by professionals everywhere to design a safer tomorrow.

Both years' NDSAD success has laid a path forward for the coming years. The NDSP strengthened its stakeholder relationships initiated during the planning and execution of the events, and expanded the campaign to all states and a larger number of other relevant stakeholder organizations.



Johnstown, PA - Tom Woosley (ASDSO) speaking at the 125th anniversary of the Johnstown Flood and 2014 National Dam Safety Awareness Day. Source: FEMA

Training the Dam Sector

Planning an event such as the NDSAD each year takes time and an educated work force. Moreover, maintaining the Nation's inventory of dams requires experts situated across the country. Despite the fact that there will always be people eager to fill these technical roles, this requires a dedicated expansion of our knowledgebase. This is best exemplified by FEMA's continued commitment in the fields of research and training. Research efforts ensure a continuum of enhancement to dam safety and risk management practices. Figuring out, and discovering, where and how emerging technological applications can fit into the framework of dam safety best practices means that dam owners will always have the tools required to strengthen their property. In turn, the courses, webinars, tools, and publications that spawn from these research efforts ensure that these new practices can be used instead of being published and left in dust.

The Classroom

A large portion of the NDSP's mission is accomplished in the lecture hall. Whether online or in person, dam safety-related training seminars and workshops provide the formative foundation that secures National interests. Therefore, FY14 and FY15 were packed full with different curriculum options provided by FEMA and partner organizations such as the Nuclear Regulatory Commission (NRC), United States Army Corps of Engineers (USACE), ASDSO, Mine Safety and Health Administration (MSHA). Listed below are some of the highlights.

Training in 2014

The first was an example of the training offered by FEMA's Emergency Management Institute and the last four examples are a portion of a dam safety training series that were offered by the United States Fish and Wildlife Service (USFWS):

February 19-20, 2014, at FEMA's Emergency Management Institute in Emmitsburg, MD

National Dam Safety Program Technical Seminar #21: Current and Available Guidelines, Tools, and Resources for Dam Design, Evaluation, Remediation, Operation, and Maintenance

The presentations and papers from this seminar covered a range of topics regarding the collective resources of FEMA NDSP and its partners.

Below you will find the presentation list from the seminar:

Presentation	Presenter(s)
Seminar Introduction and Overview	Jay Stateler, P.E.
Federal Emergency Management Agency	John "Bud" Plisich
Association of State Dam Safety Officials	Jon Garton, P.E.; Sarah McCubbin-Cain
United States Society on Dams (USSD) and International Commission on Large Dams (ICOLD)	Jay Stateler, P.E.
Centre for Engineering Advancement Through Technological Innovation (CEATI)	Gus Tjoumas, P.E.
American Society of Civil Engineers (ASCE)	Betsy Kulamer
U.S. Army Corps of Engineers – Part 1	Daniel Rodriguez
U.S. Army Corps of Engineers – Part 2	Daniel Rodriguez
Bureau of Reclamation (USBR)	Jay Stateler, P.E.
National Resources Conservation Service (NRCS)	Stephen Durgin, P.E.; Thomas Brown; James Moore, Sr., P.E.
Federal Energy Regulatory Commission (FERC)	Eric Gross, P.E.

Tennessee Valley Authority (TVA)	Matthew Pruchnik, P.E.
National Weather Service (NWS) – Part 1	Victor Hom
U.S. Geological Survey (USGS) – Water Data and Related Tools	Gary Fisher (Retired)
Department of Homeland Security (DHS)	Gary Fellows, PMP
National Institute of Standards (NIST)	Kevin Stine
National Weather Service – Part 2	Geoff Bonnin
American Society for Testing and Materials (ASTM)	Scott Orthey; Mark Axelman; Jim Thomas
Canadian Dam Association (CDA)	Tony Bennett, P.E.
Perspectives of a Research Librarian	Theresa Calcagno
U.S. Forest Service (USFS)	Charles Showers, P.E.
Dam Breach Toolbox – State of Colorado	Jeremy Franz, P.E.; Jason P. Ward, Ph.D., P.E.
Embankment Dam Reference Toolbox (EDRT)	Michael Hand

Online- January 22, 2014

Dam Safety Training Webinar #1 – Everything You Should Know About the USFWS Dam Safety Program

This was the first of a series of Dam Safety webinars sponsored by the USFWS Dam Safety Program. In this first webinar, attendees learned about the USFWS Dam Safety Program, inventory dams and why they matter, and types of dams and their features. This webinar was intended for USFWS personnel involved with management, administration, permitting, design, construction, operation, or maintenance of dams, dikes, levees, and water control structures.

Online- February 19, 2014

Dam Safety Training Webinar #2 - Inspecting and Maintaining Dams: The Good, The Bad and the Ugly, Part 1

In this second webinar, attendees learned about the importance of inspecting and maintaining dams, tools to perform better dam inspections, and items to look for when inspecting embankment dams. The webinar also included information on how dams and their appurtenant structures should be maintained. This webinar was intended for USFWS personnel involved with management, inspection, operation, or maintenance of dams, dikes, levees, and water control structures.

Online- March 26, 2014

Dam Safety Training Webinar #3 - Inspecting and Maintaining Dams: The Good, The Bad and the Ugly, Part 2

This third webinar was Part 2 of “Inspecting and Maintaining Dams” and covered inspection and maintenance of concrete dams, spillways, and outlet works. The webinar focused on tools that can assist in performing better inspections of these features as well as items to look for during the inspection. This webinar was intended for USFWS personnel involved with management, inspection, operation, or maintenance of dams, dikes, levees, and water control structures.



Online- April 23, 2014

Dam Safety Training Webinar #4 - Inspecting and Maintaining Dams: Instrumentation, Drainage Systems and Filters, and Relief Wells

This fourth webinar covered dam instrumentation, drainage systems and filters, and relief wells. The webinar focused on why dams have these features, what various instrumentation readings mean, and how these features should be inspected, monitored, and maintained. The webinar was intended for USFWS personnel involved with management, inspection, operation, or maintenance of dams, dikes, levees, and water control structures.

Training in 2015

The following list of training sessions were offered by ASDSO in 2015, a National leader in dam safety that operates within the National framework of the NDSP. ASDSO supports the NDSP by advancing many of the objectives within the National Dam Safety Program Act such as providing dam safety training and coordinating research. The second example training session was offered through the MSHA. The goal of MSHA's Dam Safety Program is to help ensure the safety of the numerous dams constructed and operated by the mining industry.

ASDSO Training

Classroom Training	# of Attendees
FY15	
Interactive Preparedness: Emergency Action Planning For Dam and Levee Safety. February 4–5, 2015.	34
Dam Failure Incidents and Lessons Learned. March 3–5, 2015.	35
Plans and Specifications Review and Construction Inspections For Dams, Levees And Ancillary Structures. May 5–6, 2015.	33
Conduits, Valves, and Gates. June 2–3, 2015.	36
Soil Mechanics for Earth Dam Design And Analysis. June 22–23, 2015.	57
Inspection and Assessment of Dams (NRCS-sponsored). August 11–13, 2015.	51
FY15	
Introduction to Public Safety Risk Evaluation and Treatment for Dams and Levees. January 13, 2015.	266
Introduction to Hydrologic Modeling Using Geospatial Information. February 10, 2015.	371
Designing Slope Protection for Dams and Levees. March 10, 2015.	386
Seismic Stability Evaluation for Earth Dams. April 7, 2015.	286
Event Tree Principles and Applications for Dam Safety Risk Assessment. May 11, 2015.	207
Waterproofing Systems for Dams. June 9, 2015.	185

Annual MSHA Dam Safety Training

MSHA offers an annual training session in Beckley, WV. It was offered in May of 2015. The course introduced the student to the general safety considerations for the design, construction, maintenance, and inspection of dams and waste piles. Course contents included: Typical Geotechnical Investigations, Foundation Analysis, Breakthrough Potential Analysis, Stability Analysis and Safety Factors, Hydrologic and Hydraulic Considerations, Construction Monitoring, Identification of Deficiencies, General Methods of Remediation, and Applicable Regulations.

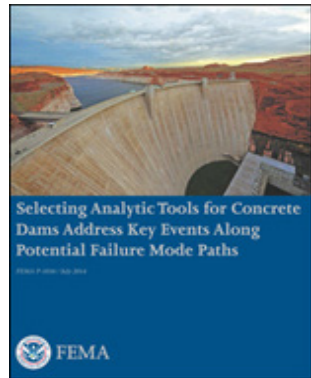


Library Dues

2014

[Selecting Analytic Tools for Concrete Dams Address Key Events Along Potential Failure Mode Paths \(FEMA P-1016\)](#)

NDSP purposed this document to stress the importance of understanding the sequences of events leading to failure of concrete dams and selecting analysis methods that address these specific events. The selected analysis method may range from straightforward to complex, depending on the potential failure mode being analyzed. It is stressed that a less complex analysis with less uncertainty is the preferred strategy. Included in this report and the appendices are examples of this process. These examples are not intended to be a complete listing of concrete dam potential failure modes. Each dam is unique and has its own issues; therefore, it is important for the engineer to understand the potential failure modes and sequences of events that enable them.



[Technical Manual: Overtopping Protection for Dams Brochure DVD \(FEMA P-1014 and P-1015\)](#)

NDSP sponsored the development of a technical manual, in conjunction with the Bureau of Reclamation, to collect and disseminate useful and relevant information regarding the design, construction, and performance of overtopping protection alternatives for embankment and concrete dams. Inadequate spillway capacity is a common problem with many dams. Thousands of dams throughout North America have been

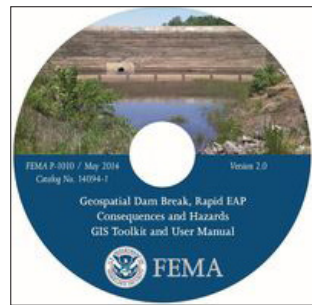
FEMA National Dam Safety Program

determined to have inadequate spillway capacity and would be overtopped during the inflow design flood. Dam failure from overtopping can lead to a potential for loss of life and significant downstream damages. Thus, new design approaches have been developed that may allow for the dam to be safely overtopped. The design and construction of overtopping protection for dams is increasingly being viewed as a viable alternative to larger spillways as developing watersheds or changing hydrology produce higher peak flows.



Geospatial Dam Break, Rapid EAP, Consequence and Hazards GIS Toolkit and User Manual

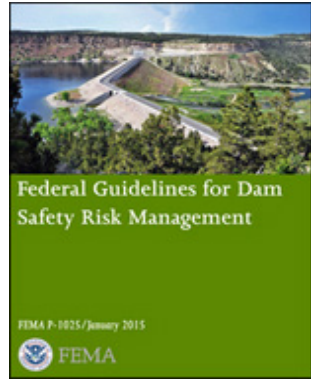
Targeted towards dam safety officials across America, this DVD has a suite of ArcGIS tools designed to support the development of simplified dam break studies; Risk Mapping; Assessment and Planning (Risk MAP) datasets; loss of life assessments; EAPs; and EAP map panel creation. This version of GeoDam-BREACH can be used for various workflows including: Simplified Dam Break Studies, Risk MAP Datasets, Loss of Life Assessment, EAP Map Panel Creation, and EAP Development.



2015

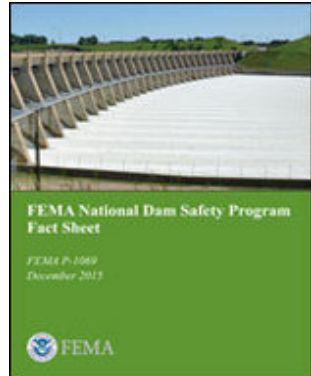
Federal Guidelines for Dam Safety Risk Management (FEMA P-1025)

This document provides guidelines for implementing risk-informed decision making in a dam safety program. The intended audience is Federal agencies that own or regulate dams. The guidelines could also be applied to non-Federally owned or regulated dams that can impact Federally owned or regulated facilities; however, this would require the cooperation and involvement of the non-Federal dam owner.



National Dam Safety Program: Dam Safety in the U.S. (FEMA P-1069)

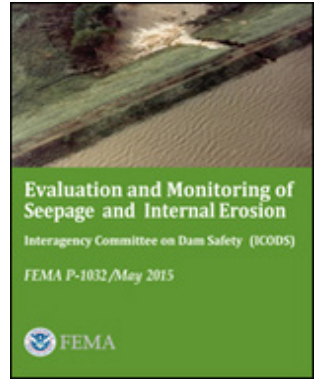
The Fact Sheet elaborates on how, as the lead Federal agency for the NDSP, FEMA is responsible for coordinating efforts to secure the safety of dams throughout the United States. NDSP makes Federal funds available to the states, which are primarily responsible for protecting the public from dam failures of non-Federal dams, and pursuing initiatives that enhance the safety of dams posing the greatest risk to people and property.



Evaluation and Monitoring of Seepage and Internal Erosion (FEMA P-1032)

Internal erosion occurring at Federal (and non-Federal) embankment dams and levees poses a threat of failure and potential risk to public safety.

This document presents a summary of current Federal practices for monitoring and measuring seepage, identifying potential failure modes related to internal erosion, assessing risk related to internal erosion, and remediating internal erosion. While research continues into these processes, this document attempts to present the best understanding based on current Federal agency practice. Hence, recent or new, unproven technologies are not discussed.



Providing Country-Wide Support

State Activity

The central purpose behind the establishment of FEMA NDSP is to provide states with financial assistance. State Assistance Grants add to the money each individual state already has earmarked for dam-related purposes. This cash injection strengthens any dam safety-related activity the states might take. Often times, these activities include:

- Training for state personnel;
- Increased number of dam inspections;
- Outreach activity;
- A rise in the submittal and testing numbers for EAPs;
- Identification of dams that need to be repaired or removed;
- Rise in number of dam safety awareness workshops hosted and the creation of dam safety videos and other outreach materials.

State Spotting: State Assistance Grant Success in Ohio

For a handful of years now, Ohio has made a concerted effort to improve its dam safety structure by increasing the awareness of regulated dam owners and local officials on key dam safety topics. FY14 and FY15 marked the fifth and sixth year of Ohio's six-year agenda. These two years were particularly noteworthy for their part in progressing the State's infrastructural improvements. County by county, meeting invitations were sent out to the target audience: a mix of dam owners, county emergency managers, soil and water conservation district staff, county planners, police, fire and health departments, floodplain managers, and planning commissioners. Prior to each county's meeting, a pre-planning meeting was held by staff from the local soil and water Conservation District and the County Emergency Management Agency Director.

The input extracted from these meetings was then used to inform and plot out the main meetings for each county. While this information shaped certain aspects of each meeting, attendees state-wide received training on the following topics:

- An overview of the Dam Safety Program;
- Safe operation, proper maintenance, and regular inspection of dams;
- Liability due to dam failures;
- Dam Safety emergency preparedness and response;
- Meeting attendees were provided a variety of educational materials:
 - Maps showing the locations of dams,
 - Sample EAPs for dams, and
 - FEMA publications and Dam Safety fact sheets on a variety of dam safety topics.

The final local meeting was held on May 20, 2015. It was the 96th meeting, and marked the complete coverage for all of Ohio's 88 counties. The pre-planning meetings provided multiple lessons learned. Specifically, multiple requests from dam owners clarified the need for a "Fill-in-the-Blank" EAP format. The implementation of said format has led to a deluge of new submittals and approvals for many EAPs. Ohio's six-year initiative has been successful in reaching out to many dam owners and local officials while educating them on dam safety issues and concerns. During this time span, the number of high hazard dam EAPs has increased from 217 to 362 while the number of significant hazard dam EAPs increased from 168 to 260.

State Advocates

While FEMA NDSP guides dam safety policy on the Federal level, there is no prime directive that gives NDSP the power of enforcement. In lieu of that power, it is faulty to assume the newest information about engineering standards and technologies will trickle down the proper straits of communication, and successfully be implemented on all levels of dam ownership. This absence will increase the likelihood for a catastrophe. The same information that is being propagated by the Federal Government to save lives and reduce the impact on people's wallets might not even reach its intended audience. To increase the likelihood that pertinent data will reach dam owners everywhere, state organizations exist to help shore up our Nation's infrastructure.

Preventing dam disasters and working toward a future where all dams are safe is the reason the ASDSO exists. ASDSO pursues a cohesive National approach to dam safety, which includes raising awareness, providing technical training, establishing forums for information exchange, facilitating financing for dam safety activities, and supporting its 3,000 plus members. ASDSO's role as the primary advocate for state dam safety programs continues to be of critical importance.

While ASDSO has made significant strides in improving the safety of dams in the U.S., the dynamics of the operating environment is continually evolving. External factors play a significant role in how ASDSO considers targeting its efforts. Important factors in today's environment include;

- Continuation of and changes in the, NDSP and its intersection with Federal infrastructure security, flood risk, and emergency management policies and programs.
- Support from Federal and state policymakers and appropriators for dam safety programs.

- The evolution of levee safety.
- The evolution of infrastructure protection/security.
- The ever-changing economic climate.
- The perception and awareness of dams and dam safety by the general public, environmental activists and the media.
- Concerns about public safety around dams.
- Growing interest by the engineering community in setting National technical dam standards.
- Increased interest in dam safety and changes in strategic direction of other non-governmental organizations that have typically not been involved in dam safety issues.
- Increased interest in rehabilitating the U.S. infrastructure.

ASDSO is a National leader in dam safety and operates within the National framework of the NDSP. ASDSO supports the NDSP by advancing many of the objectives within the act such as providing dam safety training, collecting and analyzing state dam safety program performance data, improving communication among policymakers and technical experts, updating the Model State Dam Safety Program and assisting states in utilizing the guidelines, coordination between safety and security goals, promoting dam safety awareness and other important aspects. ASDSO is also the conduit to the states and works closely with NDSRB members, including both state representatives and Federal agencies to ensure the NDSP continues to be an effective program.

ASDSO continues to work to ensure the reauthorization and full appropriation of the National Dam Safety Program Act, including full appropriation at the authorized funding levels. ASDSO was proud to be an important advocate for the Act when it was reauthorized in May of 2014.

Here is a snapshot of ASDSO achievements between FY14 and FY15:

- Completed peer reviews for the TVA, the USBR and the five bureaus within the Department of Interior.
- Collected and analyzed state program performance data produced state-by-state performance reports.
- Completed 14 surveys on technical topics of interest to state dam safety programs.
- Completed two booklets in a series entitled, *Living Near Dams*, which can be viewed at www.livingneardams.org.
- Held five dam owner outreach workshops in conjunction with state dam safety programs.
- Supported the release of the FEMA-sponsored [Dam Failures Lessons Learned Website](#).
- Trained over 5,000 dam safety engineers and other stakeholders through conferences and classroom and web-based technical courses.
- Created a guideline on dam failure investigations.

Trending Upward

The capacity for our Nation to withstand devastation, natural or otherwise, and recover from it can only be measured against the backdrop of an actual event. Hurricanes, storms, tornadoes, floods, and human involvement are not disasters. Disasters are defined by the capacity, or lack thereof, of a community to stand and rally against these uncontrollable elements. If a dam failure is the result of a natural occurrence, the failure is the disaster and not the weather pattern. The NDSP continues to cast the Nation's dam infrastructure in progressively stronger molds. It is only through this proactivity that we can rest somewhat assured that our communities are safe.



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