



The National Dam Safety Program

Biennial Report to the United States Congress,
Fiscal Years 2014–2015

*FEMA P-1067
August 3, 2016*



Homeland
Security

Federal Emergency Management Agency

Message from the Administrator

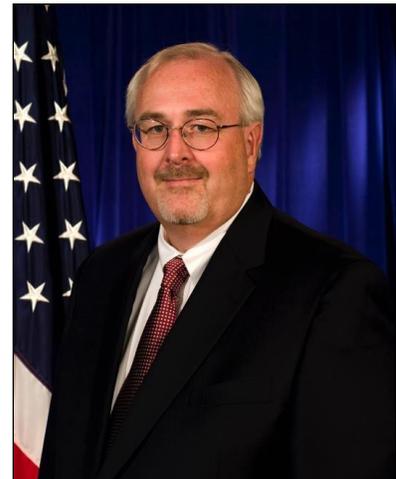
August 3, 2016

I am pleased to submit the following report, “The National Dam Safety Program Biennial Report to the United States Congress, Fiscal Years 2014 to 2015.”

The Federal Emergency Management Agency prepared this document pursuant to section 10 of the National Dam Safety Act (NDSA) codified at 33 U.S.C. § 467h. (The NDSA was enacted under Section 215 of the Water Resources Development Act of 1996, Pub. L. No. 104-303).

Pursuant to congressional requirements, this report is being provided to the following Members of Congress:

- The Honorable Jim Inhofe, Chairman, Environment and Public Works Committee, United States Senate
- The Honorable Barbara Boxer, Ranking Member, Environment and Public Works Committee, United States Senate
- The Honorable David Vitter, Chairman, Transportation and Infrastructure Subcommittee, Environment and Public Works Committee, United States Senate
- The Honorable Barbara Boxer, Ranking Member, Transportation and Infrastructure Subcommittee, Environment and Public Works Committee, United States Senate
- The Honorable William Shuster, Chairman, Transportation and Infrastructure Committee, United States House of Representatives
- The Honorable Peter A. DeFazio, Ranking Member, Transportation and Infrastructure Committee, United States House of Representatives
- The Honorable Lou Barletta, Chairman, Economic Development, Public Buildings, and Emergency Management Subcommittee, Transportation and Infrastructure Committee, United States House of Representatives
- The Honorable André Carson, Ranking Member, Economic Development, Public Buildings, and Emergency Management Subcommittee, Transportation and Infrastructure Committee, United States House of Representatives



Inquiries relating to this report may be directed to me at (202) 646-3900, or to the Agency's Deputy Associate Administrator for Mitigation, Roy E. Wright, at (202) 646-2781.

Sincerely,

A handwritten signature in blue ink, appearing to read 'W. Craig Fugate', with a long horizontal flourish extending to the right.

W. Craig Fugate
FEMA Administrator
DHS/FEMA

Executive Summary

The American imagination is fueled with images of the grandiose, and dams are no exception. However, the majority of dams in the United States are not behemoths that attract tourists from around the world. The majority go unnoticed. A hiker might march past a low-lying dam while remaining completely unaware of what it is or its role in the area. In fact, the hiker might think it is a man-made creek or a levee. That same person could then journey to the edge of the Black Mountains, look down, and marvel at the scale of the Hoover Dam. Dams come in all shapes and sizes, and they all play important roles ranging from generating electricity to supplying water for agriculture. Given these important roles, it is incumbent upon the Federal Government to have a robust dam safety program.

An inspection was performed on Buffalo Creek Dam on February 22, 1972. It was determined that the coal slurry impoundment dam was in satisfactory shape. The mining towns located in Logan County, West Virginia, suffered in the aftermath of that inspection when the dam burst four days later. It unleashed a 30 ft. high wall of water followed by 132 million gallons of wastewater; the surrounding areas were beset by the flood water. Tragically, 125 people lost their lives during these events. Never in recent U.S. history were the potential repercussions of aging infrastructure and lack of specialized oversight made more apparent than by the Buffalo Creek Dam disaster.

This tragic failure was a prelude to a number of federal actions which prompted President Jimmy Carter to create the Federal Emergency Management Agency (FEMA) in 1979 and Congress to pass Public Law 104-303 to provide the country with a legislatively mandated National Dam Safety Program (NDSP) in 1996 (see Figure 1).

NDSP's inception was prompted by the need to "reduce the risk of life and property from dam failure in the United States through the establishment and maintenance of an effective NDSP to bring together the expertise and resources of the federal and non-federal communities in achieving national dam safety hazard reduction." Under the auspices of the Executive and Legislative Branches of Government, NDSP secures the Nation's dam infrastructure through state assistance funds, emergency action planning, training, public outreach, researching, and creating new guidance regarding the maintenance and construction of dams.

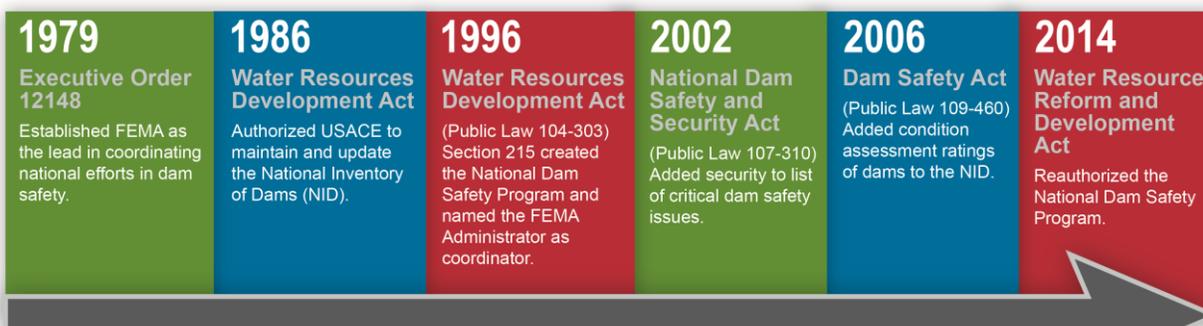


Figure 1 - Timeline of legislation creating and authorizing the NDSP

Since that day more than 40 years ago, the Federal Government has worked to protect Americans from dam failure through NDSP and tangible progress continues to be realized. There is a constant string of variables that impact and change the landscape of dam safety every day. The continued and constantly improving efforts of FEMA's dam safety wardens help safeguard dam infrastructure. Dam safety stewardship, led by FEMA, is a coalition of federal, state, local, tribal and territorial partners united in a common purpose to encourage individual and community responsibility for dam safety.

NDSP was reauthorized in May 2014 as part of the Water Resources Reform and Development Act (WRRDA). The NDSP is modest in size and budget—with a maximum authorization of \$13.4 million annually. This money is distributed to varying degrees, with the intent of maximizing output of training, technical assistance, research funding, public awareness, and support to states through incentivized grant awards that encourage improved dam safety and public awareness. These funds are used to support the program, and thus are not available to repair any dams. The money is authorized towards the proactive improvement of dam safety, by advancing the approach rather than being reactive to actual consequences of dam failures.

All goals and objective from the NDSP strategic plan have been met for the reporting period. The following is a sample list of the many accomplishments and improvements the Program has seen in FY14 and FY15:

- For 2014, 24 states reported 90 percent or more of their state-regulated high hazard potential dams had an existing EAP. In fact, many states had increases of several hundred to several thousand percent.
- The national average for the inspection of existing state-regulated high hazard potential dams has remained relatively steady during the reporting period from 1998 to 2014, as inspection of existing dams has been a state priority. States reported completion of 98 percent of scheduled inspections for high hazard potential dams in 2014.
- Seven federal agencies have implemented risk practices in policy and process and are using risk to make dam safety decisions.
- Turning planning into action, a number of Federal agencies reported positive accounts of dam incidents in which EAPs were activated and proved to be satisfactory in effectively managing the risk associated with the event.

Throughout this document, activities performed that were related to accomplishing an overall goal or a specific objective have been noted. The goals and objectives include:

- **Goal 1: Reduce the likelihood of dam failures**
 - Objective 1: Assess all high and significant hazard potential dams for the risks they pose to life, property and the environment.
 - Objective 2: Reduce the number of deficient dams in the United States.
 - Objective 3: Learn from the dam failures in the United States and worldwide to improve dam safety programs.
 - Objective 4: Support effective federal and state dam safety programs.

- **Goal 2: Reduce the potential consequences resulting from dam failures.**
 - Objective 5: Promote a program of Emergency Action Plan (EAP) implementation, compliance and exercise for all high and significant hazard potential dams in the United States.
 - Objective 6: Improve consequence evaluation for dams nationwide.
- **Goal 3: Promote public awareness of the benefits and risks related to dams.**
 - Objective 7: Convey the risk posed by dams to motivate and effect change.
 - Objective 8: Convey the important and unique roles of federal and state dam safety programs in keeping Americans safe from dam failures.
- **Goal 4: Promote research and training for state dam safety and other professionals.**
 - Objective 9: Establish and implement a national course of study for state dam safety professionals.
 - Objective 10: Improve the awareness and understanding of dam risks for other professionals with roles in dam risk management.
 - Objective 11: Promote understanding of the knowledge and techniques needed to safely evaluate, operate, maintain, design, and construct dams.
- **Goal 5: Align relevant federal programs to improve dam safety.**
 - Objective 12: Leverage the resources, capabilities, and authorities of the federal partners to promote the mission, goals, and objectives of the NDSP and to achieve greater efficiencies.



The National Dam Safety Program Biennial Report to the United States Congress, Fiscal Years 2014 to 2015

Table of Contents

Message from the Administrator	i
Executive Summary	iii
I. Legislative Requirement.....	1
II. Background	2
III. Results and Analysis	3
Progress on Implementation of the Federal Guidelines for Dam Safety	3
The Mission is Ours: Summaries from Key NDSP Partners	17
Federal Agency Dam-Related Activities	25
Related Programs	75
Conclusion	81
IV. Appendix.....	83
Acronyms.....	83

I. Legislative Requirement

This document responds to the reporting requirement set forth in Section 10(b) of the National Dam Safety Program Act (codified at 33 U.S.C. 467h):

(b) BIENNIAL REPORTS. -- Not later than 90 days after the end of each odd-numbered fiscal year, the Administrator shall submit a report to Congress that:

- (1) describes the status of the Program;*
- (2) describes the progress achieved by Federal agencies during the 2 preceding fiscal years in implementing the Federal Guidelines for Dam Safety;*
- (3) describes the progress achieved in dam safety by States participating in the Program; and*
- (4) includes any recommendations for legislative and other action that the Administrator considers necessary.*

II. Background

The first federal legislation for dam safety, the National Dam Inspection Act (P.L. 92-367), was enacted in 1972 and codified under Title 33 United State Code, Chapter 9, Subchapter VII. This act authorized the Secretary of the Army to inspect dams across the country, to create the National Inventory of Dams (NID) and to provide recommendations for a national program for the inspection and regulation for the safety of dams.

In 1979, the Federal Guidelines for Dam Safety (Guidelines) were prepared by the ad hoc Interagency Committee on Dam Safety (ICODS) of the Federal Coordinating Council for Science Engineering and Technology. In 1979, a Presidential Memorandum required the head of each federal dam safety agency to implement the Guidelines.

FEMA was created by Presidential Reorganization Plan No. 3 of 1978. However, Executive Order 12127, dated March 31, 1979, actually began implementing the operation of FEMA on April 1, 1979, by transferring various key functions and offices from various organizations to FEMA and abolishing those offices in the originating organizations in agreement with the Reorganization plan. Executive Order 12148, Federal Emergency Management, dated July 20, 1979, continued to transfer or reassign key functions, offices and established key responsibilities and delegations to the FEMA Director, among other items. One of the new responsibilities given to FEMA was the responsibility for coordinating federal dam safety activities.

The action of the Executive Branch was followed in 1986 by federal legislation to address dam safety, the Water Resources Act of 1986. Title XII of this legislation authorized the state assistance program, the establishment of a National Dam Safety Review Board (NDSRB), research and training programs, and funds to maintain and update the NID. Despite this recognition, there was no legislatively mandated NDSP until 1996, when Congress enacted Public Law 104-303.

In 1996, the National Dam Safety Program Act, included within the Water Resources Development Act (P.L. 104-303), was passed with the Director of FEMA designated as the Administrator of the NDSP. This act authorized the formation of the NDSRB, financial assistance (in the form of grants) to state dam safety programs, and funding for maintaining the NID, research, and training related to dam safety. The act calls for FEMA to provide education to the public, to dam owners, and others about the need for strong dam safety programs, nationally and locally, and to coordinate partnerships among all stakeholders within the dam safety community to enhance dam safety. The NDSP was reauthorized in 2002 under the National Dam Safety and Security Act, in 2006 and again in 2014 under WRRDA, Public Law 113-121.

The purpose of the NDSP is to “reduce the risks to life and property from dam failure in the United States through the establishment and maintenance of an effective national dam safety program to bring together the expertise and resources of the federal and non-federal communities in achieving national dam safety hazard reduction” (33 U.S.C. § 467).

III. Results and Analysis

Progress on Implementation of the Federal Guidelines for Dam Safety

A. Organization, Administration, and Staffing

FEMA's NDSP plays a pivotal role in understanding the complex nature of FEMA's core competencies related to dam risk management. The organization and skillsets in the NDSP yield positive impacts to all levels of government, non-profits, academia, the private sector, trade organizations, dam safety officials, dam owners, planners, and decision makers.

At the headquarters level, there is currently one full-time employee (FTE) that performs the role as the NDSP Manager. In the regions, there are no FTE dam safety positions. Rather, the delegated points of contact are required to manage their dam safety responsibilities in addition to other FEMA programs. Region II's position is currently vacant.

B. Dam Safety Training Activities¹

A key element in FEMA's dam safety strategy is training. FEMA NDSP and its federal, state, local, tribal and territorial partners all offer a wide range of training to people who work in the dam sector through traditional and digital means.² Whether through online or classroom training, the knowledge that is necessary to improve the Nation's infrastructure is readily available at little or no cost. Organizations ranging from the Department of Labor's (DOL) Mine Safety and Health Administration (MSHA) to FEMA's Emergency Management Institute (EMI) provided the learning sessions required to make ideas surrounding dam safety a reality. Throughout FY14 and FY15, training opportunities were offered internationally, on the Internet, and within U.S. classrooms (see Figure 2).

¹ ASDSO = Association of State Dam Safety Officials; DHS = Department of Homeland Security; EMI = FEMA's Emergency Management Institute; MSHA = Mine Safety and Health Administration; NDSP = National Dam Safety Program; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service.

² This initiative aligns with Goal 4, Objectives 9 and 11 of the NDSP Strategic Plan.

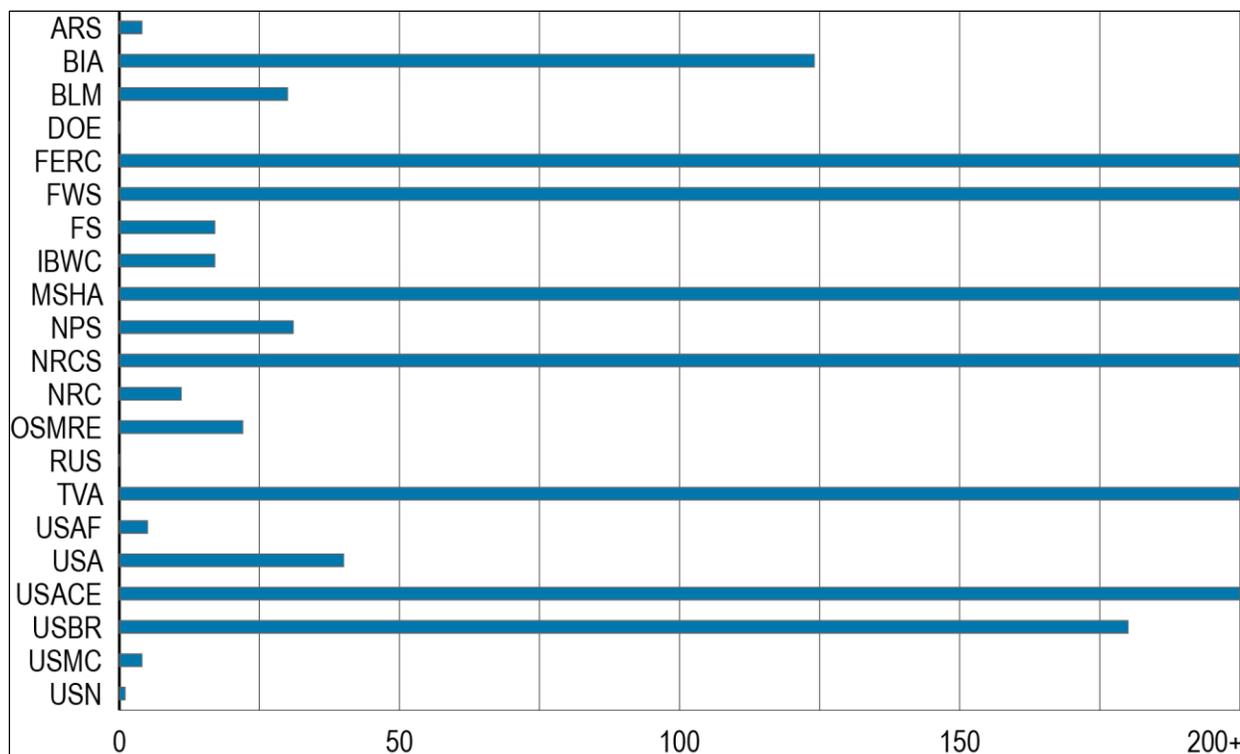


Figure 2 – Number of personnel that attended training events.

C. Dam Inventories

The NDSP is very much the sum of its parts. FEMA NDSP leads the initiative, researches the subject, and provides funding to states.³ The National Dam Inspection Act of 1972 (33 U.S.C. § 467) authorized the U.S. Army Corps of Engineers (USACE) to inventory dams in the United States. USACE published the initial NID in 1975 and updated it, as resources permitted, over the next 10 years. The Water Resources Development Act of 1986 authorized USACE to maintain and periodically publish an updated NID, while reauthorizing the NID and providing a dedicated funding source. USACE also began working closely with FEMA and state regulatory offices to obtain more accurate and complete information. The Dam Safety and Security Act of 2002 reauthorized the NDSP and included the maintenance and update of the NID by USACE. The Dam Safety Act of 2006 and National Dam Safety Program Act of 2014 reauthorized the maintenance and update of the NID. The goal of the NID is to include all dams in the United States that meet at least one of the following criteria:

- High hazard potential classification – loss of one human life is likely if the dam fails;
- Significant hazard potential classification – no probable loss of human life but possible economic loss, environmental damage, disruption of lifeline facilities, or impact on other concerns if the dam fails;
- Equal to or more than 25 feet tall and more than 15 acre-feet in storage capacity; or,

³ This aligns with Goal 5, Objective 12 of the NDSP Strategic Plan.

- More than 6 feet tall and equal to or more than 50 acre-feet storage capacity.

USACE maintains the NID by periodically collecting dam characteristics from 49 states (Alabama currently has no dam safety legislation or formal dam safety program), Puerto Rico, and 17 federal agencies. USACE has developed a web-based application that allows state and federal agencies to map their local database fields and values to NID database fields and values. For the 2015 NID update, agencies are using this new tool to submit their updated information to the NID. USACE then resolves duplicate and conflicting data from the 68 data sources to obtain the most complete, accurate, and updated NID. Today, the NID consists of 70 database fields that describe the physical and regulatory aspects of a dam.

USACE completed its most recent update to the NID in Fiscal Year (FY) 2013. The update captures more accurate and more comprehensive data on existing dams, changes in existing dams, and new dams. As the update process continues, the quality of information at all levels in the Nation's dam safety community continues to improve. State inspections and data sharing among state and federal agencies verify or amend existing data and identify or provide missing information. This approach leverages the economic advantages of a partnership effort, fosters cooperation among state and federal agencies, and strengthens government and non-government risk management and decision-making at the state, local, and national levels. Since the authorization and implementation of the NDSP, it has become increasingly clear that additional information is required to support dam safety. These data needs include:

- Documenting the condition of the Nation's dams;
- Tracking the existence and progress of dam safety programs; and,
- Supporting dam safety professionals responsible for evaluating and maintaining the safety of dams in the United States. At the same time, this dam safety information must be safeguarded while remaining available to appropriate supporting agencies.

USACE has strengthened security controls and procedures following unauthorized attempts to access databases that house publicly accessible and for official use only dam safety information. Changes have also been made to allow easier access for the public to view the unrestricted NID information. Federal, state, local, tribal and territorial agencies have a responsibility to balance the availability of critical infrastructure information that will assist with making informed decisions about risk while safeguarding information that could be used by those seeking to do harm.

D. Grant Assistance to the States

The primary purpose of the NDSP is to provide financial assistance to the states to strengthen their dam safety programs. The states use NDSP funds for the following types of activities:

- Dam safety training for state personnel.
- Increase in the number of dam inspections.
- Increase in the submittal and testing of EAPs.
- A timely review and issuance of permits.
- Improve coordination with state emergency preparedness officials.
- Identify dams in need of repair or removal.

- Conduct dam safety awareness workshops and creation of dam safety videos and other outreach materials.

During the reporting period of FY14–15, NDSP awarded a total of \$7,575,055 and \$7,042,935 (respectively) in grant funding to the states.

E. Dam Safety Research

Research is critical to the national agenda for dam safety. Traditionally, research funding under the NDSP has addressed a cross-section of issues and needs, all in support of making dams in the United States safer. The NDSP did not allocate funding to the research budget during the reporting period.

F. Public Awareness and Outreach

The 2014 Reauthorization of the NDSP: SEC. 11 notes:

The Administrator, in consultation with the other federal agencies, state, and local governments, dam owners, the emergency management community, the private sector, non-governmental organizations and associations, institutions of higher education, and any other appropriate entities shall, subject to the availability of appropriations, carry out a nationwide public awareness and outreach initiative to assist the public in preparing for, mitigating, responding to, and recovering from dam incidents.⁴

Given this charge, the NDSP sought to find a common thread and leverage ongoing FEMA and DHS activities and priorities to create well defined strategic communication workplan to guide the Programs efforts. Figure 3 outlines the process that was utilized to find the linkages and develop the plan.

The initial plan has been completed and will be implemented. This plan will be used to establish performance measures and as a means of tracking outcomes, while simultaneously allowing the NDSP to assess efforts on a regular basis and inform future development of strategic goals.

Planning for National Dam Safety Awareness Day 2014 began in early January 2014. Using a previous year’s event that focused on Lake Needwood Dam in Rockville, Maryland, as a starting point, the Planning Team developed an ‘Ideas Paper,’ which established the framework for the 2014 event. Overall, the National Dam Safety Awareness Day 2014 was successful. FEMA coordinated with numerous key stakeholders, associations, and other federal agencies to pilot a more concise National Dam

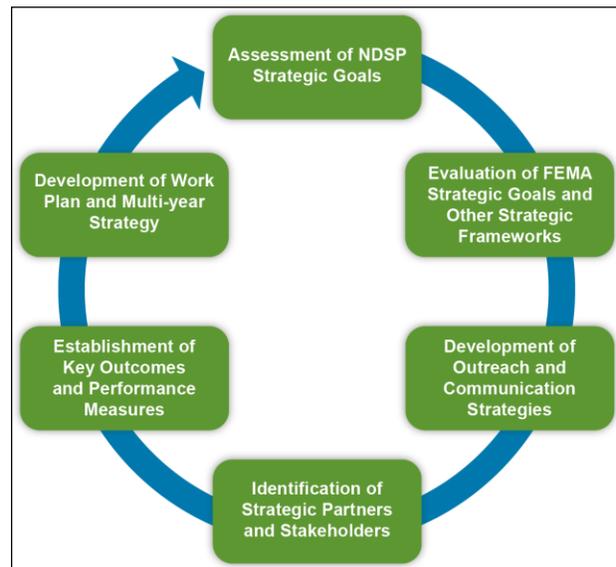


Figure 3 – The NDSP strategic outreach process

⁴ This aligns with Goal 3, Objectives 7 and 8 of the NDSP Strategic Plan.

Safety Awareness Day messaging campaign throughout the Nation. To ensure consistent message delivery, the planning team prepared a number of templated materials (e.g., press release, talking points, suggested web content, event planning checklist, invitation letter, and National Dam Safety Awareness Day ideas for kids) that pilot communities could tailor and use for their own one-day events. The National Dam Safety Review Board (NDSRB) Communications and Outreach Workgroup provided important feedback in the development of these materials.

Planning for future events includes building upon the stakeholder relationships initiated during the planning and execution of the 2014 event, and to expand the focused campaign to all states and a larger number of other relevant stakeholder organizations.

Key National Dam Safety Awareness Day 2014 Participants

- ASDSO
- FEMA
- NRCS
- USACE
- The States of California, Colorado, Florida, Kansas, Louisiana, Michigan, Missouri, New Hampshire, Ohio, Oregon, Pennsylvania, Texas, Virginia, and Washington
- Online news outlets such as Blackanthem Military News, Community Common, Defense Video and Imagery Distribution System, Columbus Dispatch, Guidry News, HydroWorld, and the Washington Department of Ecology blog ECOconnect

From May 30 to June 1, 2014, special events were hosted throughout Johnstown, Pennsylvania, including 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 National Dam Safety Awareness Day event.

FEMA also prepared a two-part video showcasing remarks made at the 2014 Anniversary National Dam Safety Awareness Day event.⁵

G. Publications and Resources

To encourage individual and community responsibility for dam safety, NDSP coordinates partnerships through two federal organizations, the NDSRB and the ICODS. It is through these partnerships that the NDSP is able to leverage resources and subject matter expertise to produce technical manuals and guidelines each year. The following is a summary of the NDSP publications that were produced during FY14 and FY15:

⁵ The National Dam Safety Awareness Day/125th Anniversary of the Johnstown Flood, Part 1 is available for viewing at www.fema.gov/media-library/assets/videos/96423. Part 2 is also available online at www.fema.gov/media-library/assets/videos/96430.

- FEMA P-1010: Geospatial Dam Break, Rapid EAP Consequences, www.fema.gov/media-library/assets/documents/98037
- FEMA P-1014: Technical Manual: Overtopping protection for dams, www.fema.gov/media-library-data/1408041514180-eafe6bb16fb5e586076b2ea94b36c57e/FEMAP-1014-Overtopping_Brochure.pdf
- FEMA P-1015: Technical Manual: Overtopping Protection for Dams DVD, www.fema.gov/media-library/assets/documents/97888
- FEMA P-1016: Selecting Analytic Tools for Concrete Dams Address Key Events Along Potential Failure Mode Paths, www.fema.gov/media-library/assets/documents/101840
- FEMA P-1025: Federal Guidelines for Dam Safety Risk Management, www.fema.gov/zh-hans/media-library/assets/documents/101958
- FEMA P-1032: Evaluation and Monitoring of Seepage and Internal Erosion, www.fema.gov/media-library/assets/documents/107639
- Assessing the Consequences for Dam Failures, Under Review
 - Although the production of this publication occurred in FY14, it is currently being reviewed and finalized. This document is for communities to help with emergency planning. It provides guidance on how to assess the consequences associated with a dam failure.⁶

2014 State Dam Safety Program Performance⁷⁸

State dam safety programs regulate 78 percent of the 87,000 dams listed in the NID. State dam safety programs inspect existing dams, oversee remediation of deficient dams, and work with local officials and dam owners on emergency preparedness. States provide annual program performance information on key metrics such as having an EAP, inspections of existing dams, remediation, staffing and budgets, while ASDSO and USACE compile the information for state and national trends.

National EAP Completion Percentage for States

The percentage of high hazard potential dams nationally with an EAP increased from 32 to 75 percent from 1998 to 2014. Nearly every state has shown improvement in the number of EAPs for high hazard potential dams with no state showing a significant decrease. Many states had increases of several hundred to several thousand percent. In 2014, 24 states reported having high hazard potential dams with an EAP at 90 percent or greater, an increase from 9 states in 1998.

National Inspection Completion Percentage for State

The national average for the inspection of existing state-regulated high hazard potential dams has remained relatively steady during the reporting period from 1998 to 2014, as inspection of

⁶ This aligns with Goal 2, Objective 6 of the NDSP Strategic Plan.

⁷ This aligns with Goal 2, Objective 5 of the NDSP Strategic Plan.

⁸ This aligns with Goal 2, Objective 5 of the NDSP Strategic Plan.

existing dams has been a state priority. States reported completion of 98 percent of scheduled inspections for high hazard potential dams in 2014. Inspection percentages may vary above and below 100 percent for any given year based on a state’s inspection frequency and scheduling (e.g., a state with an inspection frequency of every two years might inspect more than half of the dams in the first year, or greater than 100 percent, in order to take advantage of their close proximity).

National Percentage of State Identification of Deficient High Hazard Potential Dams

In 2009, the NID began collecting condition rating data on high hazard potential dams. Those with poor or unsatisfactory ratings were considered in need of remediation. For the 2013 NID update, 76 percent of state-regulated high hazard potential dams were rated. States voluntarily submitted this data and the number of dams not rated continued to decrease. From 2009 to 2013, there was a 28 percent increase (34 to 62 percent) in dams with either a satisfactory or fair rating. The percentage of dams with condition ratings of poor and unsatisfactory (those in need of remediation) increased from 7 to 15 percent as more dams were rated.

State Success Stories – Four Cases⁹

North Carolina

North Carolina, struggling for years to increase the number of EAPs for high and significant hazard potential dams, passed the Coal Ash Management Act of 2014 requiring EAPs. With this new authority, the state continued its efforts to increase the number of dams with an EAP. Consequently, the number of high hazard potential dams increased by more than 400 dams, up from 100 dams in 1999 (see Figure 4). The fact that the NDSP has made it a national goal to assist states in improving the number of EAPs for dams has assisted in motivating state leaders to commit to this change.

Ohio

Ohio’s Dam Safety Program recently completed the sixth and final year of an outreach program for dam owners and local officials. The focus of the program was to increase the awareness of dam owners and local officials on several key dam safety related topics, including the importance of EAPs. This goal was accomplished by holding a meeting at the county level to which all state-regulated dam owners in the county were invited as well as the county’s local officials. The local officials consisted of county Emergency Managers, Soil and Water Conservation District staff, county planners, police, fire, health department, floodplain managers, and the planning commission. As

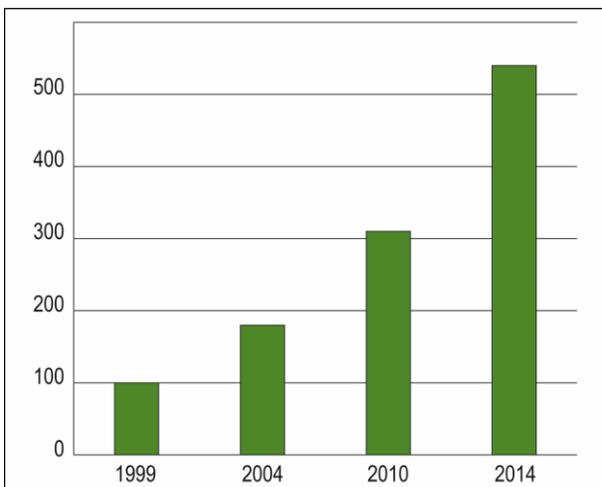


Figure 4 – Number of North Carolina state-regulated high hazard potential dams with an EAP

⁹ This aligns with Goal 1, Objective 4 of the NDSP Strategic Plan.

part of the program, 96 local meetings were held with more than 1,700 attendees. The state considered the project to be successful in reaching out to many dam owners and local officials and educating them on dam safety issues and concerns. From 2010 to 2015, the percentage of state-regulated high hazard potential dams with an EAP increased from 59 percent in 2010 to 72 percent in 2014. The number of state-regulated significant hazard potential dams with an EAP increased from 31 percent in 2010 to 48 percent in 2014.

Texas

For the last seven years, Texas used the NDSP state-assistance grant funds to increase the number of inspections and EAPs for high hazard potential dams. In 2004, a small number of staff conducted only 65 inspections. To increase dam inspections, the state used NDSP grant funds to contract with consultants and the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) to inspect high and significant hazard dams. The state dam safety program has now received state funds to hire staff to help maintain the number of inspections. In 2010 and 2011, the state conducted 290 and 251 inspections of state-regulated high hazard potential dams, respectively. In 2015, Texas continued to maintain their required inspection frequency and inspected 94 percent of the state-regulated high hazard potential dams that were due for inspection that year. In 2008, only 17 percent of state-regulated high hazard potential dams had an EAP. In 2009, Texas passed rules requiring EAPs for all high and significant hazard potential dams and used NDSP grant funds to retain a consultant to perform simplified breach studies for use in EAPs. As a result, in 2015, more than 80 percent of the state-regulated high hazard potential dams have an EAP. NDSP grant funds have also enabled the state to host workshops on EAPs and distribute mailings.

Kentucky

In Kentucky, 95 percent of the state-regulated high hazard potential dams did not have condition assessments and 68 percent of the state-regulated high hazard potential dams did not have EAPs. To mitigate this situation, the Kentucky Dam Safety Program used FY13 NDSP grant funding to help inspect every state-regulated high hazard potential dam and perform a condition assessment of the dam. Each inspection included a report to the dam owner indicating deficiencies and providing a plan of action for the dam owners to address those deficiencies. In implementing a plan of action, a dam owner can mitigate the risk associated with the dam. The Kentucky Dam Safety Program also made use of advanced/enhanced modeling tools including DSAT-DSS-WISE-Lite, Geo-Dam-BREACH, BOSS Dam-break, and HEC-RAS 1-D to delineate dam breach inundation mapping for 117 state-regulated high hazard potential dams. These inundation maps, combined with previously mapped breach areas, were used to develop 138 EAPs. Inundation maps can also be used to communicate risk of dam failure to downstream communities. As a result of these efforts, 166 state-regulated high hazard potential dams were inspected in FY13. The Kentucky Dam Safety Program has now rated 100 percent of the state-regulated high hazard potential dams for condition assessment. Moreover, they have either full or simplified EAPs for 77 percent of the state-regulated high hazard potential dams, compared to only eight percent in 2010.

Application of ICODS Technical Guidance: Identifying Dam Status and Implementing EAPs

A large part of ensuring dam safety is knowing the status and circumstances of any given dam. It is not enough to be aware that a dam is structurally sound for the time being, the dams must be constantly assessed to ensure they are being properly cared for. Dam assessment allows for the establishment of an inventory of needs. For dams that are considered healthy, the development of EAPs creates a contingency plan to protect life and property in the future. For the dams that are not currently in good standing, the discovery of those unsatisfactory conditions helps establish a platform for moving forward. The platform that developed from the aforementioned information went into the development of the NDSP Strategic Plan.

State-regulated dam inspections increased¹⁰.

Formal inspections include a review to determine whether the dam meets current accepted design criteria and practices. The inspection should include a review of all pertinent documents including instrumentation, operation, maintenance and, to the degree necessary, documentation on investigation, design, and construction. The inspection should also verify that operating and emergency response instructions are available and understood, instrumentation is adequate, and data are assessed to ensure that structures are performing as designed. Intermediate inspections include a thorough field inspection of the dam and appurtenant structures and a review of the records of inspections made at and following the last formal inspection.

Based on state dam safety legislation, 16 states inspect high hazard potential dams every year, 18 states inspect every 2 years, 5 states inspect every 3 years, 1 state inspects every 4 years, 9 states inspect every 5 years, and 1 state every 6 years.

Figure 5 shows the percentage of state-regulated high hazard potential dams that were inspected of the total number that were due for inspection from 2006 to 2014. Inspection percentages may vary above and below 100 percent for any given year based on a state’s inspection frequency and scheduling. In 2014, the national inspection percentage was 98 percent, and in 52 percent of the states those inspections were formal. Therefore, in 2014, of the inspections performed on state-regulated high hazard potential dams, 75 percent of those inspections were formal. Figure 6 and Table 1 show the percentage of the state-regulated high hazard potential dams that were inspected of the total number of state-regulated high hazard potential dams due for inspection in 2014.

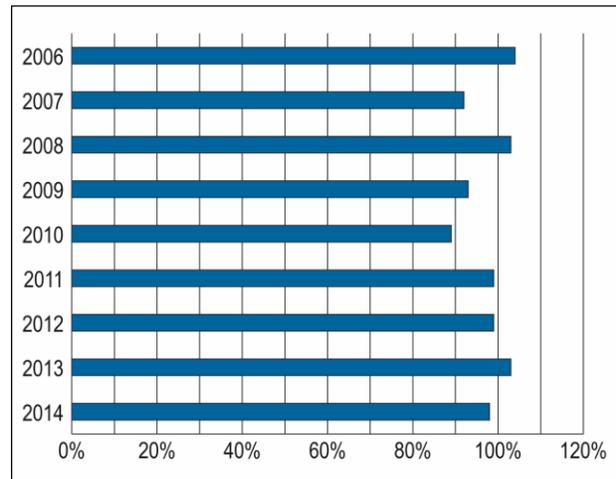


Figure 5 – National inspection percentage calculated from the total number of state-regulated high hazard potential dams scheduled and inspected

¹⁰ This aligns with Goal 1, Objective 1 of the NDSP Strategic Plan.

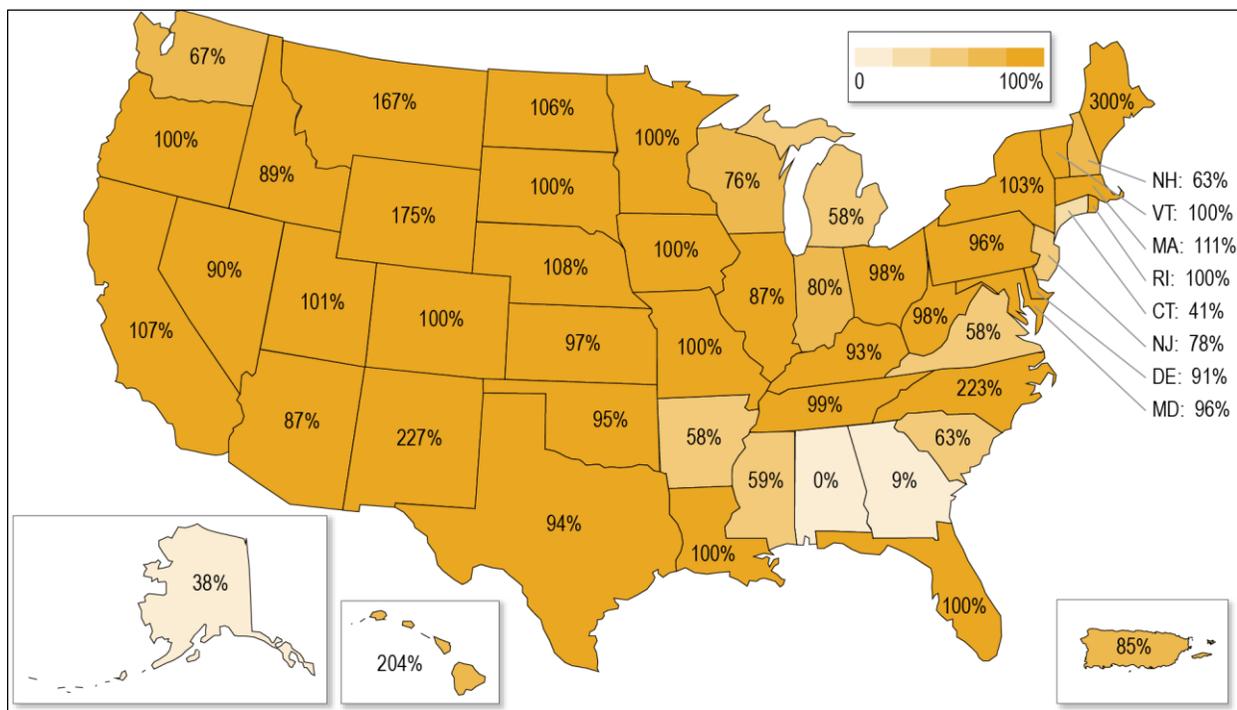


Figure 6 (above) and Table 1 (below) – The percentage of state-regulated high hazard potential dams that were inspected of the total number of state-regulated high hazard potential dams that were due for inspection in 2014

State	HHP Dams Inspected	State	HHP Dams Inspected	State	HHP Dams Inspected
Alabama	0%	Louisiana	100%	Ohio	98%
Alaska	38%	Maine	300%	Oklahoma	95%
Arizona	87%	Maryland	96%	Oregon	100%
Arkansas	58%	Massachusetts	111%	Pennsylvania	96%
California	107%	Michigan	58%	Puerto Rico	85%
Colorado	100%	Minnesota	100%	Rhode Island	100%
Connecticut	41%	Mississippi	59%	South Carolina	63%
Delaware	91%	Missouri	100%	South Dakota	100%
Florida	100%	Montana	167%	Tennessee	99%
Georgia	9%	Nebraska	108%	Texas	94%
Hawaii	204%	Nevada	90%	Utah	101%
Idaho	89%	New Hampshire	63%	Vermont	100%
Illinois	87%	New Jersey	78%	Virginia	58%
Indiana	80%	New Mexico	227%	Washington	67%
Iowa	100%	New York	103%	West Virginia	98%
Kansas	97%	North Carolina	223%	Wisconsin	76%
Kentucky	93%	North Dakota	106%	Wyoming	175%

Source: 2015 State Dam Safety Program Performance Information Summary for the Reporting Year 2014

HHP = high-hazard potential

Inspection percentages for a particular state may vary above and below 100% for any given year based on a state's inspection frequency and scheduling due (e.g., a state with an inspection frequency of every two years might inspect more than half of the dams in the first year, or greater than 100%, in order to take advantage of their close proximity).

Based on state dam safety legislation, 3 states inspect significant hazard potential dams every year, 7 states inspect every 2 years, 11 states inspect every 3 years, 6 states inspect every 4 years, 17 states inspect every 5 years, 1 state every 6 years, and 1 state every 10 years. Two states do not have any significant hazard classifications under their regulatory authority. Figure 7 shows the percentage of state-regulated significant hazard potential dams that were inspected of the total number that were due for inspection from 2006 to 2014.

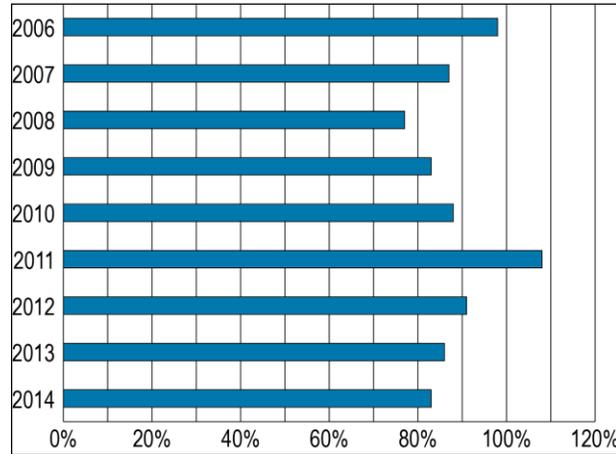


Figure 7 – Percentage of state-regulated significant hazard potential dams inspected

*Understanding of remediation needs improved by condition reporting of dams*¹¹. The 2010

NID reported 66 percent of state-regulated high hazard potential dams included a condition assessment and the 2013 NID reported 76 percent of state-regulated high hazard potential dams included a condition assessment. Figure 8 shows the number of state-regulated high hazard potential dams remediated compared to those in need of remediation between 1999 and 2014. In 2013, data collection included the number of state-regulated high hazard potential dams that have used other risk reduction measures, such as reservoir restrictions, early warning systems, or plans for emergency reservoir drawdown.

The NDSP Strategic Plan Goal 2 addresses the second component of the risk equation, the consequences of a dam failure. The most common consequences are loss of human life, injuries and damage to property. Emergency action planning, particularly for the dams that pose the greatest risk, is one of the cornerstones of Goal 2. Equally important are the ongoing efforts of the NDSP to improve the consequence evaluation of dam failure.

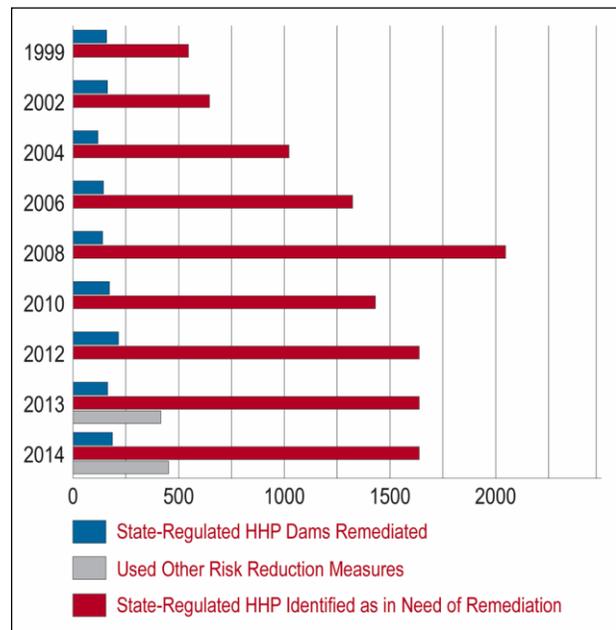


Figure 8 – State-regulated high hazard potential dams remediated compared to dams in need of remediation

¹¹ This aligns with Goal 1, Objective 2 of the NDSP Strategic Plan.

EAPs for state-regulated high and significant hazard potential dams increased¹². Today, approximately 75 percent of all state-regulated high hazard potential dams have an existing EAP, a significant improvement since 1998 when states participating in the NDSP began to receive grant funding (see Figures 9 and 11).

Nine states do not have the authority to require a dam owner of a high hazard potential dam to prepare an EAP: Alabama, California, Florida, Georgia, Indiana, Iowa, Kentucky, Vermont, and Wyoming.

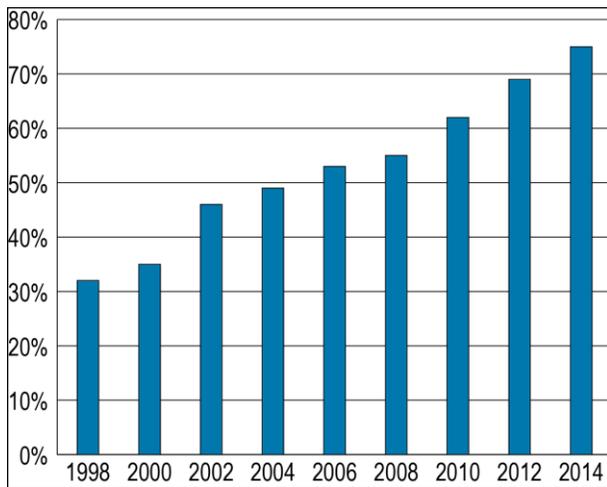


Figure 9 – Percentage of state-regulated high hazard potential dams with an EAP

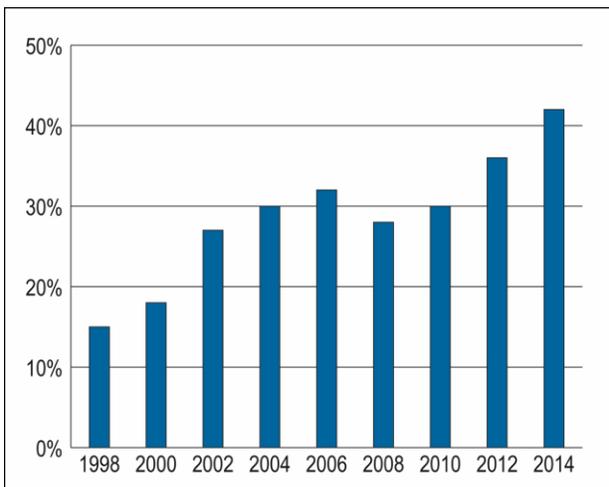


Figure 10 – EAP completion percentage for state-regulated significant hazard potential dams

For 2014, 24 states reported 90 percent or more of their state-regulated high hazard potential dams had an existing EAP. In the last five years, six states have increased the number of EAPs for state-regulated high hazard potential dams more than 50 percent. Eight states have increased EAPs from 20 to 49 percent, and sixteen states have seen a smaller increase at less than 20 percent. Fifteen states have decreased their EAP completion percentage due to an increase in the number of state-regulated high hazard potential dams (see Figures 12 and 13).

Nineteen states do not have the authority to require a dam owner of a significant hazard potential dam to prepare an EAP. For 2014, 14 states reported 70 percent or more of their state-regulated significant hazard potential dams had an existing EAP (see Figure 10).

¹² This aligns with Goal 2, Objective 5 of the NDSP Strategic Plan.

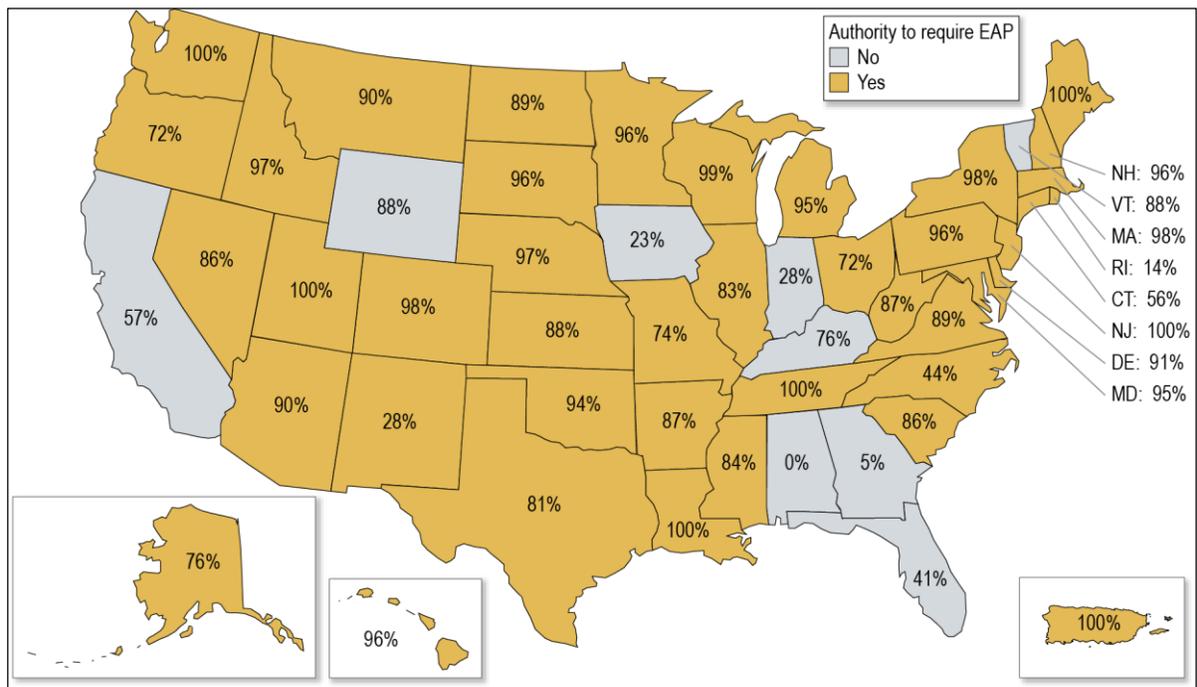


Figure 11 – Percentage of state-regulated high hazard potential dams with an EAP and the states with and without the authority to require the dam owners to prepare an EAP



Figure 12 – EAP implementation and increases in EAPs for state-regulated high hazard potential dams for reporting years 2006 (top) and 2014 (bottom)

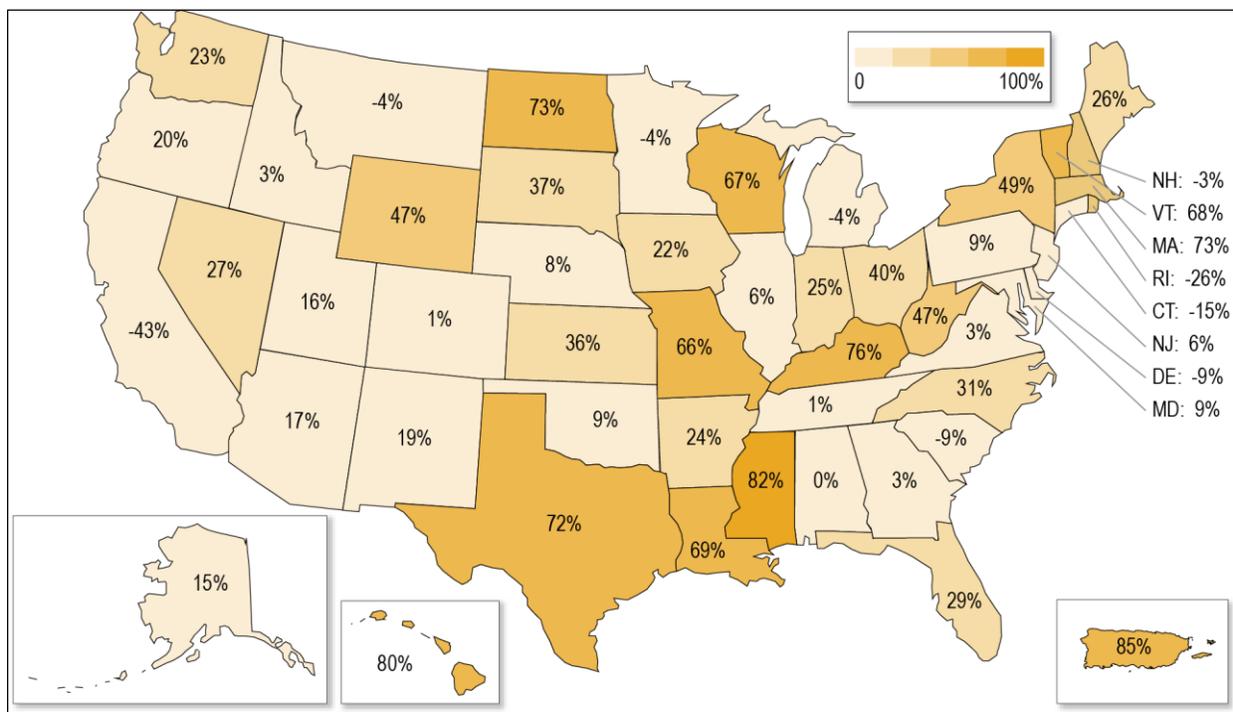


Figure 13 – Changes in EAP since 2006 for state-regulated high hazard potential dams

The Mission is Ours: Summaries from Key NDSP Partners^{13 14}

U.S. Department of Agriculture

Agricultural Research Service – The U.S. Department of Agriculture’s (USDA) Agricultural Research Service (ARS) conducts research in support of USDA and partners with the NRCS in developing the technology required for the design, construction, maintenance, rehabilitation, and safety of the dams constructed with USDA assistance.¹⁵

ARS has responsibility for a single, high hazard dam located at the Southern Plains Research Station in Woodward, Oklahoma. The Woodward location conducts research on sustaining and enhancing Southern Plains rangelands and pastures. The water contained by the dam is used for irrigation and production agriculture. Lands adjacent to the impoundment are owned by the city and local property owners. Contracting with an architecture and engineering firm to complete an assessment of the dam is underway. Additionally, the EAP for the dam is being updated. Work

¹³ This aligns with Goal 5, Objective 12 of the NDSP Strategic Plan.

¹⁴ A summary of each agency is listed below. More detailed information about each program can be found in the Federal Agencies Dam-Related Activities section.

¹⁵ The NP211 Action Plan can be found at www.ars.usda.gov/research/programs/programs.htm?np_code=211&docid=17585 and ARS NP211 program reports are available at www.ars.usda.gov/research/programs/programs.htm?np_code=211&docid=17587.

is also being conducted to update the agency's official 'policy and procedures' regarding dam safety.

Forest Service – The Forest Service (FS) is responsible for dams owned throughout nine regions, in which there are 154 national forests, 20 national grasslands and one prairie encompassing 193 million acres. In addition, it is responsible for the regulation of Special Use (permitted) dams and Ditch Bill easement dams on FS land not regulated by other federal or state agencies. The FS participates in dam safety activities on USDA easement dams in a number of regions.

The FS owns dams constituting many designs, including concrete arch, concrete gravity, timber cribbing and even steel. However, embankment dams made of either earth or rock fill constitute over 80 percent of the dams. While the Forest Service's highest FS-owned dam is 140 feet in height, 90 percent of the dams are equal to or less than 50 feet in height. About 80 percent have normal reservoir storage less than 500 acre feet. Recreation, wildlife, and fire are the primary purposes for the dams. Dam ages range from 6 to over 100 years old; over half are 50 years old or greater and 80 percent are older than 30 years.

Natural Resources Conservation Service – The NRCS designs, finances, and constructs dams under its technical and financial assistance programs for individuals, groups, organizations, and governmental units for water storage, sediment detention, and flood protection. NRCS assumed all of the programs of the former Soil Conservation Service in the 1994 USDA reorganization. NRCS provided technical assistance for over 29,000 dams and provided financial assistance for approximately 12,000 of these dams. NRCS maintains a staff of engineers skilled in all aspects of planning, design, construction, operation, and maintenance of dams. In 2015, NRCS implemented DamWatch, a web-based tool that provides real-time monitoring of potential threats to dams such as rainfall events and seismic activity.

NRCS actively participates in the technical activities of the ICODS, ASDSO, United States Society on Dams, and the NDSRB.

Rural Utilities Service – The Rural Utilities Service (RUS) is the successor agency to the Rural Electrification Administration and includes certain programs that were formerly a part of the Farmers Home Administration and the Rural Development Administration. RUS has three major divisions—the Electric Program, the Telecommunications Program, and Water and Environmental Program. The Electric Program and Water and Environmental Program provide financial assistance for projects which may include dams. The Telecommunications Program does not finance dams.

Any RUS-financed dam must be designed by a professional engineer registered in the state where the dam is located. This professional engineer is responsible for ensuring that the dam is properly designed and will apply a professional engineering seal to the plans, drawings, and other design documents. This professional engineer is also responsible for verifying that the dam is constructed in accordance with the design. The borrower (owner of the dam) is responsible for obtaining and complying with state permit requirements for construction and operation of a dam, and for proper operation and maintenance, including dam safety.

Department of Defense

U.S. Air Force – The USAF is currently reporting the status of forty dams.

- One dam at Buckley AFB, which had been programmed for removal, has been added back to the inventory until the dam removal project is complete.
- Three dams located at the U.S. Air Force Academy (USAFA) and two of the dams located at Arnold AFB in Tennessee are classified as high hazard potential.
- Two dams at USAFA were recently reclassified from significant to high hazard potential due to the potential for loss of life downstream.
- Two dams located at the USAFA and one dam at Joint Base McGuire-Dix-Lakehurst (JBMDL) are classified as having a significant hazard potential.
- All of the dams identified as high or significant hazard potential are in satisfactory condition.
- Thirty-two of the dams are classified as low hazard potential and pose insignificant downstream risk. The four dams that are in poor condition are low hazard dams and projects have been programmed to mitigate the deficiencies. However, because of the low consequence of failure, these programmed projects receive a low funding priority.

USAF dams are designed primarily for flood control, recreation, and water supply. USAF dams are routinely inspected and maintained using the policies and procedures established for the maintenance and repair of USAF real property. At the installation level, all dam maintenance and/or repair projects compete for funding with the other O&M facility requirements.

U.S. Army – The Department of the Army, Assistant Chief of Staff for Installation Management (ACSIM) provides oversight to the Installation Management Command (IMCOM) and Army Command garrisons to assure they are aware of their responsibilities. ACSIM is responsible for the Army policy on dam safety, maintenance, operation, and minor repair of Army dams. The policy is addressed in Chapter 7 of Army Regulation 420-1, “Army Facility Management.” The Commander, IMCOM, is the Army Dam Safety Officer for dams that are either on Army garrisons or controlled by Army garrisons. The IMCOM provides technical support and training to Army garrisons and implements policy. The IMCOM and Army garrisons have responsibility for meeting federal laws and guidelines.

U.S. Army Corps of Engineers – The USACE has a diverse inventory of 709 dams in 44 states. The dams provide a variety of project purposes including navigation, flood risk management, water supply, irrigation, hydropower, recreation, environmental, and a combination of these purposes. USACE dams are constructed from a wide range of materials including concrete, rock, earth fill, and a combination of these materials. The dams vary in age from more than 100 years old to less than 10 years old. Approximately 95 percent of USACE dams are more than 30 years old and more than half are more than 50 years old. Most have not been filled to their maximum design event. Historically, USACE projects avoid \$8 of damages for each \$1 invested. USACE is the number one United States hydropower producer at 25 percent of the national capacity. On average, 600 million tons of cargo moves on inland waterways. To support this traffic, USACE maintains 12,000 miles of inland waterways. Along these waterways, USACE operates and maintains 236 navigation lock chambers at 192 sites.

U.S. Marine Corps – Headquarters Marine Corps is responsible for the following relative to ensuring the adequacy of the dam safety program:

- Establish an inspection program for all dams on Marine Corps installations to include formal and special inspection programs.
- Develop and implement Marine Corps dam safety and inspection policy.
- Program and resource to ensure the safe design, construction, operation, and inspection of Marine Corps Dams.
- Establish and appoint a dam safety officer.

This is the first time the Marine Corps is reporting separately from the Navy. A dam safety officer has been established at the Headquarters and designation and training of dam safety officers has occurred at Marine Corps installations where reported dams exist.

U.S. Navy – The Commander Navy Installations Command (CNIC) continues their responsibility for both ownership and funding requirements for dams under their jurisdiction. Furthermore, USACE continues in the role as execution agent for performing periodic inspections, dam break analyses, hydraulic and hydrology surveys, and provides support in development of EAPs when required. USACE Norfolk District has been designated as primary point of contact for this effort. Naval Facilities Engineering Command has responsibility as the technical liaison between CNIC and USACE. There have been 18 candidate dams under the Navy jurisdiction for formal dam safety inspection during this reporting period. One dam (Lake Norconian Dam in Norco, California) is a double structure dam holding back the same body of water, thus the Navy formally inspects 18 dams, though only 17 are listed in the NID.

Department of Energy

Department of Energy – In the FY12–13 progress report, the Department of Energy (DOE) reported that 12 water impoundment structures under its jurisdiction met the federal definition of a dam. There are no changes from the last report. Of these 12 dams, two are defined as having high hydrological hazard potential, and one is defined as having significant hydrological hazard potential. The remaining nine are defined as having low hydrological hazard potential.

The number and hydrological hazard potential classification of DOE dams in each geographical location are as follows:

- Oak Ridge (Tennessee) has one dam; one dam has hydrological high or significant hazard potential, and none have hydrological low hazard potential.
- Rocky Flats (Colorado) has three dams; none have hydrological high or significant hazard potential, and three have hydrological low hazard potential.
- Savannah River (Georgia and South Carolina) has eight dams; two have hydrological high or significant hazard potential, and six have hydrological low hazard potential.

There have been no significant changes in DOE contractor staff responsible for the operation of DOE-owned dams or in the dam safety program during this reporting period.

Federal Energy Regulatory Commission – The Federal Power Act authorizes the Federal Energy Regulatory Commission (FERC) to issue licenses to individuals, corporations, states, and municipalities to construct, operate, and maintain dams, water conduits, reservoirs, powerhouses, transmission lines, or other project works necessary for the development of non-federal hydroelectric projects located (a) on navigable streams, (b) on public lands of the United States, (c) at any government dam, or (d) on streams over which the Congress has jurisdiction under the Commerce Clause of the Constitution. FERC regulates both the construction and operational phase of a hydropower project. Dam safety is a critical part of the FERC’s hydropower program and receives top priority. Before projects are constructed, the FERC staff reviews and approves the designs, plans, and specifications of dams, powerhouses, and other structures. During construction, FERC staff engineers frequently inspect a project, and once construction is complete, FERC engineers continue to inspect it on a regular basis.

Department of the Interior

Bureau of Indian Affairs – The Bureau of Indian Affairs (BIA) is responsible for 910 dams on Indian reservations, of which 136 are considered high and significant hazard. The BIA Safety of Dams Program works with Indian tribes to maintain the high and significant hazard dams. The BIA is responsible for all dams on Indian lands in accordance with the Indian Dam Safety Act of 1994 (Public Law 103-302).

Bureau of Land Management – The Bureau of Land Management (BLM) owns 11 high hazard dams on BLM lands. BLM owns approximately 700 low hazard dams and additionally maintains an inventory of approximately 544 private dams (dams owned by others but located on BLM lands). Since the last reporting period, BLM has continued to verify the existence and locations of private dams on BLM land. BLM participated in the ICODS Non-Federal Dams on Federal Lands Task Group, which recently issued a bulletin on the best practices for managing non-federal dams on federal land. BLM’s dam safety program is in conformance with the Guidelines; DM 753 (Department of the Interior Manual 753), FEMA 64 (Emergency Action Plans), and FEMA 333 (Downstream Hazard Classification).

Bureau of Reclamation – The mission of the Bureau of Reclamation (USBR) is “to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.” Through the Reclamation Act of 1902 and subsequent legislation, USBR is authorized to operate as a federal water resource management and development agency in the 17 Western States. The USBR inventory currently consists of 474 dams located throughout the West. Approximately 80 percent of these dams are more than 50 years old. As structures age, the verification of their continued satisfactory performance receives increased attention from USBR’s Dam Safety Program.

Fish and Wildlife Service – The Fish and Wildlife Service Coordination Act of 1934 (U.S.C. 661-666) granted the authority to the U.S. Fish and Wildlife Service (FWS) to operate facilities associated with fish and wildlife conservation. FWS dams are located on national wildlife refuges, waterfowl production areas, national fish hatcheries and, in some cases, on private land through easement agreements with FWS. The dams help to fulfill the FWS’s mission in

preserving and enhancing the Nation’s fish and wildlife resources. FWS is the owner of the dams; therefore, the agency is responsible for their safety.

FWS has been reevaluating hazard classification potential for many small dams classified as high or significant hazard using FEMA 333. The use of two-dimensional modeling software and dramatically improved digital elevation data has provided FWS with the opportunity to better define dam failure flooding characteristics such as flood depth and velocity as well as rate of rise and arrival time. This enabled FWS to re-evaluate the probability of loss of life from either a “sunny day” failure of a flood-induced failure by more accurately identifying “lethal flooding.” FWS has confidently re-classified more than 12 dams from high or significant to low hazard as a result of this new technology and insisting on accurately defining dambreak flood characteristics.

National Park Service – The National Park Service (NPS) Dam and Levee Safety Program is responsible for the management of the risks of all hydraulic structures which could affect NPS parks including all dams, levees, and canals. A limited budget required the program to put off lower priority repairs of low hazard dams.

Office of Surface Mining Reclamation and Enforcement – The Office of Surface Mining Reclamation and Enforcement (OSMRE), through a nationwide regulatory program, ensures that coal mining activities are being conducted in a manner that protects citizens and the environment, restores the land to beneficial use following mining, and mitigates the effects of past mining by pursuing reclamation of abandoned mine lands. These duties are performed under the Surface Mining Control and Reclamation Act (SMCRA). There are three types of programs under SMCRA that implement its provisions—Federal Programs, approved state programs, and the Indian Lands Program.

OSMRE’s Dam Safety Program ensures that dams under the OSMRE’s regulatory authority (Federal Programs and the Indian Lands Program) do not present unacceptable risks to public safety, property, and the environment.

Department of Labor

Mine Safety and Health Administration – The purpose of the DOL’s MSHA is to prevent death, disease, and injury from mining and to promote safe and healthful workplaces for miners. The Federal Mine Safety and Health Act of 1977 (Mine Act) provides that MSHA shall inspect each surface mine at least two times a year and each underground mine at least four times a year to determine compliance with health and safety standards or with any citation, order, or decision issued under the Mine Act and whether an imminent danger exists.

The primary responsibility for ensuring dams at mining operations are designed, constructed, maintained, and operated safely lies with the mine operator. As a regulator, MSHA develops standards and conducts plan reviews, inspections, and investigations to ensure mine operators are complying with the standards.

Department of State

International Boundary and Water Commission – The International Boundary and Water Commission (IBWC), composed of a U.S. section and a Mexican section, is charged with

carrying out the provisions of a number of treaties between the United States and Mexico. Among its responsibilities, the IBWC has jurisdictions over two large international storage dams (Amistad and Falcon), and four international diversion dams (International, Anzalduas, Retamal, and Morelos) on the Rio Grande and Colorado Rivers. Additionally, the U.S. section is responsible for the annual maintenance of American Diversion Dam, and five sediment control and flood control dams (Broad, Crow, Green, Berrenda, and Jaralosa) owned by the Caballo Soil and Water Conservation District. These dams are not fully international.

Any negative impact, due to sequestration and budget by continuing resolution, on the execution and compliance with the Guidelines in the agency's dam safety program was minimized due to the fact that the dam safety budget program had carryover funds from previous years. This budgeting allowed for the appropriation of significant funds in dealing with major deficiencies at both of the IBWC's two large international storage dams (Amistad and Falcon). Without these carryover funds in the program, sequestration and budget by continuing resolution would have negatively impacted the IBWC's dam safety program.

Due to the aging of the dams, additional resources will be required for the operation and maintenance of these dams. As noted in the 2012 Joint Technical Advisory 5-Year Inspection Report, current operations and maintenance (O&M) staff needs to be increased in size and skill set to meet the challenges of operating and maintaining both of the IBWC's two large international dams.

Nuclear Regulatory Commission

The U.S. Nuclear Regulatory Commission (NRC) was created as an independent federal agency to regulate and license civilian nuclear facilities and use of nuclear materials and to conduct research in support of licensing and the regulatory process. The NRC has regulatory authority over (1) uranium mill tailings dams, (2) storage water pond dams at in-situ leach uranium mining facilities, and (3) those dams integral to the operation of licensed facilities, or the possession and use of licensed material, that pose a radiological safety-related hazard should they fail. Exceptions to dams in the third category are (a) dams that are submerged in other impoundments (e.g., to provide an ultimate heat sink) and, therefore, do not pose flooding threats, or (b) dams that are regulated by other federal agencies (e.g., USACE, FERC, and Tennessee Valley Authority (TVA)). No changes in dam safety responsibilities have occurred during this reporting period. Budgeting by continuing resolution has not affected the execution or efficiency of risk reduction efforts or compliance with the Guidelines.

Tennessee Valley Authority

The TVA is a federal agency and instrumentality of the United States, organized under the TVA Act of 1933, as amended. Since 1999, TVA has funded all of its operations almost entirely from the sale of electricity and power-system financings.

TVA is self-regulating with respect to dam safety, and maintains a suite of procedures to ensure that structures within its jurisdiction are designed, constructed, operated, and maintained as safely and reliably as practicable, and in accordance with the substantive provisions of the

Guidelines. In most cases, TVA has complete responsibility for the planning, design, construction, operation, and maintenance of its dams.

TVA receives no appropriations from Congress.

The FY14 President's Budget did provide for a strategic review of TVA's finances, including the possible divestiture of TVA. Decreased revenue caused by lower consumer demand for power has decreased the funding available for operations and maintenance activities associated with TVA's regulating dams. TVA has undertaken a reorganization and budgetary challenge to address this financial situation. In addition, TVA is implementing a Risk Informed Decision Making program for prioritizing dam safety in an effort to most efficiently reduce dam safety risk with limited resources. The FY15 President's Budget recognized the significant steps TVA has taken to improve its financial performance into the future.

Federal Agency Dam-Related Activities

A Presidential Memorandum on October 4, 1979, directed the Federal agencies that own or regulate dams to adopt and implement the *Federal Guidelines for Dam Safety (Guidelines)* (FEMA, 1979), which was issued by the ad hoc ICODS, and directed the heads of these agencies to submit progress reports to the Administrator of FEMA. Since the initial reports in 1980, the Administrator of FEMA has solicited follow-up progress reports from the agencies every 2 years.

Since the *Guidelines* were published, all of the Federal agencies responsible for dams (the ICODS agencies) have been implementing to varying degrees the provisions of the *Guidelines*, sharing resources whenever possible to achieve results in dam safety and developing strategies to address diminishing resources and decreases in staffing levels. Some Federal agencies also maintain comprehensive research and development and training programs.

For assessment purposes, FEMA supplies the ICODS agencies each reporting cycle with a format to ensure completeness and uniformity among responses. Using the format, the ICODS agencies supply a brief description of their dam safety responsibilities, followed by a report on their progress in complying with the areas that are covered by the *Guidelines*:

- Organization, administration, and staffing
- Independent reviews
- Dam inventories
- Inspection programs
- Dam safety rehabilitation programs
- Management effectiveness reviews
- Dam safety training
- Dam failures and remedial actions
- Emergency action planning
- Research and development and special initiatives
- State dam safety agency involvement
- Public Outreach
- Public concerns
- Non-Federal Dams on Federal Lands
- Additional Observations

The progress that has been made by the ICODS agencies during this reporting period in the areas specified in the *Guidelines* is described in the following subsections. More detail and background information can be found via the raw data provided by the agencies, found at:

www.fema.gov/media-library/assets/documents/116117

Organization, Administration, and Staffing

Activities related to organization, administration, and staffing during the reporting period are as follows:

Department of Agriculture

- **ARS** – Under the direction of the ARS Dam Safety Officer, one ARS staff, having research expertise in dams, devotes approximately 10 percent of their time to coordinate inspections, EAPs, and to review the SOW for the Woodward Dam assessment. The majority these activities are conducted collaboratively with the assistance of the USDA-NRCS and the Oklahoma Conservation Commission.

In FY15, an architecture and engineering (A-E) firm was contracted to conduct an assessment and formal inspection of the Woodward Dam. An EAP was developed in cooperation with the Oklahoma Conservation Commission and the USDA-NRCS Oklahoma State Office with an update of the EAP to be completed in 2015. The Woodward Dam will be included in the USDA-NRCS Pilot DamWatch Program, a dam-monitoring tool that enables dam owners and dam safety professionals to proactively monitor, in real-time, their valuable infrastructure.

- **FS** – FS reported a goal to reduce the number of program managers at the national level. Present plans will eliminate the position of National Dams Program Manager and shift these duties to an assistant facilities engineer under a National Facilities Program Manager. FS has its own challenges with their dam safety program and staffing within each region due to the region’s uniqueness in aerial extent, number of dams, number of states within the region, as well as skill sets at the Forest and Regional level. Common themes to address these challenges include use of contractors, working with other local, state and federal government dam safety organizations, as well as sharing of FS personnel to help across regional boundaries.
- **NRCS** – NRCS has not reported changes in agency organization or administration affecting dam safety activities since the previous report. NRCS dam engineering expertise and staffing levels have generally declined over the past decades with overall decreases in federal dam design and construction activity. NRCS installed 1,262 new NID-size dams in 1965; 206 in 1990; 138 in 2000; and 2 in 2012. NRCS established a National Design, Construction and Soil Mechanics Center (NDCSMC) in 2000 and this staff has become a significant internal resource of dam expertise.

NRCS does not have staff specifically dedicated to dam engineering or dam safety activity. However, the total number of engineers (Series 810 & 890) and engineering technicians (Series 802 & 809) working in NRCS has remained constant the last two years.

- **RUS** – RUS reports their dam safety organization and staff are adequate to comply with the Federal Guidelines for Dam Safety. Rural Development field offices administer and support the RUS Water and Waste Loans and Grants. These offices are responsible for the agency interactions with the applicants and borrowers. The Rural Development field offices are generally co-located with the field offices of NRCS and the Farm Service Agency.

Department of Defense

- **USAF** – The USAF reported a loss of three technical staff members in FTE positions since the last reporting of October 1, 2013.

- **U.S. Army** – The Army had an addition of one technical FTE and one other type of staffing.
- **USACE** – Administrative FTEs are not specifically tracked since USACE administrative staff members support multiple programs. USACE has reported an addition of 49 administrative/clerical support staff, 15 technical support staff and 86 other support staff. USACE has approximately 560 FTEs.
- **USMC** – The USMC recently initiated this dam safety program. They do not have any FTEs at any installation dedicated to this dam safety program. Newly appointed and trained Dam Safety Officers have this requirement as an additional duty to their position. The only staffing change is the identification of Dam Safety Officers at Marine Corps Installations where dams exist, and a Dam Safety Officer at Headquarters Marine Corps. This does not represent an increase in staffing, but rather an assignment of an official duty relative to dam safety.
- **U.S. Navy** – The Navy reports no additions or losses to staffing since the last report.

Department of Energy

- **DOE** – The DOE reports that each field location has several DOE and contractor individuals involved with dam safety. The staffing is considered adequate. There have been no changes.
- **FERC** – As of October 1, 2013, there were 125 technical and support staff in the FERC Division of Dam Safety and Inspections (D2S1); there has been an addition of 7 technical and support staff.

Department of the Interior

- **BIA** – BIA reports their administration and personnel to include one BIA Safety of Dams (SOD) Officer and seven other support staff, including five engineers and two Emergency Specialists at headquarters, and a SOD Officer at each of eight Regional Offices responsible for regional SOD activities. The Regional Directors, Agency Superintendents, and Project Engineers and Managers have the responsibility for properly implementing the Guidelines, Departmental Manual, Secretarial Orders and Directives, along with BIA policies related to dams under jurisdiction.
- **BLM** – BLM reports the loss of dam safety staff through retirements and attrition, however, add that it should not have a significant impact on BLM's dam safety program. The loss of staff will be addressed through contracting engineering services and the use of the National Operations Center staff.
- **FWS** – FWS has reported an addition of four FTEs in technical positions. There have been no changes that impact actions.
- **NPS** – NPS reported no staff change since the last report. There is still one dam safety officer and part time staff in each of six NPS regions.
- **OSMRE** – OSMRE neither owns nor operates SMCRA dams. OSMRE reports no additions or losses to staffing since the last report of 29 FTEs.

- **USBR** – No changes have been made regarding the organization and administration of USBR’s Dam Safety Program since last reporting period. USBR’s Technical Service Center, located in Denver, Colorado, provides technical assistance for all of USBR and serves as the center of expertise for dam design, analysis, and construction. The number of FTEs employed within USBR is well over 5,000. USBR has implemented a workforce capability planning process that uses a strategic planning approach to match staff resources with future program needs.

Department of State

- **IBWC** – IBWC reports no additions or losses to staffing since the last report of 10 FTEs.

Nuclear Regulatory Commission

- **NRC** – NRC reports no additions or losses to staffing since the last report of 1 FTE.

Tennessee Valley Authority

- **TVA** – During TVA's reorganization in 2014–2015, the Policy and Oversight group was dissolved, and the Dam Safety Governance & Oversight DSG&O workgroup moved to a Strategic Business Unit: Dam Safety, housed within the new Safety, River Management, & Environment organization. The restructuring moved the DSG&O group closer to the organization housing all of TVA's high hazard potential dams, and centralizing dam safety functions for TVA's river dams.

While the total number of DSG&O staff has been reduced, the critical governance and oversight functions have been maintained, while some accountabilities have been transferred to the asset-owning organizations within TVA. TVA maintains an adequate, experienced staff of all disciplines and maintains a management-employee administered progression program.

Independent Reviews

Activities related to independent reviews during the reporting period are as follows:

Department of Agriculture

- **ARS** – Operation and maintenance of the dam is the responsibility of the research leader of the Southern Plains Field Station Research Unit, Stacey Gunter. An independent consultant has been contracted in FY15 to complete an assessment of the dam, which will include a dam inspection and alternatives and cost estimates for dam rehabilitation. Previous inspections have been provided in-kind by the USDA-NRCS Oklahoma staff.
- **FS** – The Forest Service conducts independent reviews in a number of different ways across the regions depending on the region’s expertise and resources available. Region 1 and Region 4 cooperate with the states and FERC to review rehabilitation/modification plans. Region 2 and Region 3 collaborate with USBR for Screening Level Risk Assessments (SLRAs), hazard classifications and safety inspections. Region 8 utilizes State Dam Safety Departments and the NRCS. Region 9 has a number of IDIQ contracts with A-E firms for review and design. Several regions have used USACE.

All regions conducted functional assistance trips during FY13–15. These trips included Operation and Maintenance (O&M) inspections, site assessments for construction, construction monitoring, incident evaluation, post fire structural analyses, assessments of burnt watersheds upstream of dams, and installation of early warning systems. Independent reviews are also conducted within FS, between regions or within regions.

- **NRCS** – NRCS policy requires an independent review for the design of dams with a high hazard potential classification, a drainage area greater than 40 square miles, or a height greater than 50 feet. Dams designed by an NRCS state staff or multi-state staff undergo an independent review by another qualified NRCS staff. Dams designed by private engineering firms undergo an independent review by a qualified NRCS staff. Other federal agencies occasionally review NRCS designs. State regulatory agencies customarily review NRCS designs.
 - NRCS conducted 455 design, construction, and operation reviews.
 - Other federal agencies conducted 13 design, construction, and operation reviews.
 - State agencies conducted 220 design, construction, and operation reviews.
 - Ten independent consultants conducted 455 design, construction, and operation reviews.
- **RUS** – When requested, NRCS provides technical and administrative review assistance related to the safety aspects of dam design, construction, operation, and maintenance.

Department of Defense

- **USAF** – The USAF does not use outside consultants or other agencies to perform an independent review of the broader USAF dam safety program. Arnold AFB and JBMDL each contract with USACE to perform dam inspections and assist with development of emergency action plans. At the USAFA, design and construction reviews are completed by the State of Colorado and independent consultants (typically URS/AECOM). Independent consultants have prepared all design drawings and specifications. At JBMDL, review of dam design and construction permits is done by the New Jersey Department of Environmental Protection Bureau of Dam Safety & Flood Control
- **USACE** – USACE has established an accountable, comprehensive, life-cycle review strategy for Civil Works products with a seamless process for review of all Civil Works projects from initial planning through design, construction, and Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R). The procedures are detailed in engineer circular (EC) 1165-2-214. The EC also addresses OMB peer review requirements under the "Information Quality Act" and the Final Information Quality Bulletin for Peer Review by the Office of Management and Budget (referred to as the "OMB Peer Review Bulletin"). It also provides guidance for the implementation of both Sections 2034 and 2035 of the WRDA of 2007 (P.L. 110-114).

Reviews are scalable and concurrent with normal business processes. Depending on the particular circumstances, reviews may be managed entirely within USACE or in various combinations with external parties. In cases requiring the most independence, the management of the review is performed by an organization other than USACE and

involves independent experts. All civil works planning, engineering, and O&M products undergo review. All products undergo District Quality Control/Quality Assurance. Subsets of these work products undergo Agency Technical Review (ATR). Smaller subsets of the ATR group undergo one or both types of Independent External Peer Review (IEPR).

- **USMC** – Independent review of the inspection reports is conducted by the Norfolk District USACE to ensure any operational issues are identified, recorded, and addressed.

Department of Energy

- **FERC** – The procedures and policies of the FERC's Dam Safety Program include the review and monitoring of all phases of project development to ensure that licensees carry out their responsibilities. FERC's staff independently reviews and evaluates the safety of dams under the FERC's jurisdiction during the design and construction phases, and ensures that existing dams are properly operated and maintained. Within the definitions contained in the Federal Guidelines, these staff reviews are considered external from those done by the licensee/owner and, therefore, are consistent with the intent stated in the Guidelines. To supplement the external review of staff, the terms and conditions of the license for major unconstructed projects require the licensee to engage an independent qualified Board of Consultants, approved by FERC, to review the design and construction of the project. In addition to the above, when the Commission licenses a non-federal hydropower development at a federal dam, the design and construction of the licensed hydropower facility (that will be an integral part of or that could affect the structural integrity or operation of the federal project) is also subject to the review and approval of the federal agency that owns the dam in order to provide the federal agency the opportunity to review the effects on the federal structure(s).

Part 12, Subpart D, of the FERC's regulations requires inspection and evaluation every five years by an independent consultant of licensed or exempted dams that exceed 32.8 feet (10 meters) in height, have a reservoir with a gross storage capacity of 2,000 acre-feet or more, or have a high downstream hazard potential. The inspection is performed by a qualified consultant retained by the licensee and approved by staff. FERC's regulations require that the results of the inspection and evaluation be submitted in a report to the Regional Engineer.

Department of the Interior

- **BIA** – Independent technical reviews of analyses and designs for all dam modifications are completed by consultants and in-house engineers, consultants, or by SOD Officers at various Regional Offices.
- **BLM** – USBR is responsible for conducting Independent Oversight Reviews within the Department of the Interior. The reviews are conducted every 5 years. BLM's most recent review was in December 2014. BLM Montana has completed 75 condition assessments in FY14 and FY15. Those condition assessments were completed by an independent consultant and reviewed by the Montana BLM Safety of Dams Engineer. In Oregon, BLM's Safety of Dams Coordinator performed an independent review for the Rock Creek Dam Standard Operating Procedures.

- **FWS** – For large rehabilitation projects, FWS obtains an independent design review from the USBR or one of our A-E consulting engineers. FWS does not seek independent reviews of construction or operations, except through formal programmatic peer reviews performed by USBR every five years.
- **OSMRE** – OSMRE is a regulatory agency and, as such, is responsible for reviews of design, construction, and operation of privately owned SMCRA-dams. The regulatory authority ensures that the dam remains in the "as-designed" condition through construction and operation inspections. There are not federal regulations requiring SMCRA permittees to conduct independent reviews for their dams.
- **USBR** – All USBR design and analysis work is subjected to a peer review process whereby products are reviewed by experienced senior-level technical staff. USBR also performs construction inspection, management and materials testing during construction to ensure that the construction contractors carry out the construction as specified.

Independent review of design and construction of modifications to existing dams and associated structures is accomplished using independent Consultant Review Boards. Reviews of each existing high and significant hazard facility are performed through the comprehensive and periodic facility reviews. USBR staff that are not associated with the day-to-day operations of the dams perform these reviews and verify compliance with the dam's Standing Operating Procedures and USBR dam safety requirements (see Inspection Programs). Annual reports that summarize dam safety related issues, activities, and accomplishments are prepared by each area office.

Department of Labor

- **MSHA** – Before a coal mine operator can build a dam that meets or exceeds the size or hazard potential criteria set forth in MSHA's safety standards, an engineering design plan must be submitted to and approved by MSHA (30 CFR §77.216). Submitted design plans are reviewed by trained and experienced engineers located either in a district enforcement office or in MSHA's Technical Support office to ensure they are consistent with current, prudent engineering practice. State agencies also review design plans for dams associated with coal mines. MSHA and the states often communicate during the technical reviews and typically are in agreement on the review issues. Typically, the states will not approve a design plan until MSHA has completed its review and issued an approval.

MSHA standards (30 CFR §56.20010 and §57.20010) do not require design plans for dams at metal and nonmetal mines to be submitted to MSHA. State agencies also regulate dams at metal and nonmetal mines. MSHA confers with the state agencies as needed to ensure the safety of dams at these operations.

Department of State

- **IBWC** – Independent reviews of all major design, construction, or operation considerations are normally performed through a contract by the Dam Safety Technical Divisions of the following U.S. Government agencies: 1) USACE, and/or 2) USBR. These independent reviews are often bi-national in nature involving technical representatives from the following Mexico Governmental Agencies: 1) Mexico's

National Water Commission (Comision Nacional del Agua (CONAGUA)), and/or 2) Mexico's Federal Electric Commission (Comision Federal De Electricidad (CFE)).

Additional independent reviews may occur involving private sector consultants of each respective country. The specifics of the hiring of independent or bi-national consultants is delegated to each Section of the IBWC as determined by IBWC and as required by the respective laws and directives of each country.

During this reporting period a panel of bi-national expert consultants was convened to review the Dam Safety Modification Study for Amistad Dam, to include further investigations needed for the whole dam. The bi-national expert panel consisted of USACE, USBR, CONAGUA, CFE, and consultants hired by the USACE for the U.S. Section of IBWC.

Nuclear Regulatory Commission

- **NRC** – Since the NRC is a regulatory agency, it does not own dams and, consequently, any NRC reviews of an NRC-licensed facility are independent. During the current reporting period, the NRC continued to use the technical assistance of FERC to assist with dam safety inspections at NRC-licensed facilities. From the standpoint of the dam owner (the NRC licensee), these are considered to be independent reviews.

Tennessee Valley Authority

- **TVA** – TVA maintains a Dam Safety Independent Review Board (IRB) for the purposes of obtaining programmatic and technical expertise, guidance, and recommendations in the areas of design, construction, operation, and maintenance of dam safety structures. Currently, the IRB consists of six members who meet periodically to evaluate and provide recommendations on major projects, initiatives, and engineering methods. During the reporting period, the IRB provided an array of programmatic and technical expertise, guidance, and recommendations. The following is a sample of those projects and initiatives:
 - Coal Combustion Products Dams – Instrumentation and Monitoring Program
 - Cherokee, Douglas, Watts Bar, Fort Loudoun, and Tellico Dams – Modifications for Nuclear Licensing
 - Pickwick Dam – Seismic Stability Analysis, Interim Risk Reduction Measures, and Remediation
 - Wilson Main Lock – Lower Land Wall Gate Block Rehabilitation Project
 - Earth Embankment and Concrete Dam Breach Parameters
 - TVA Guidelines for Drilling and Sampling in Dams
 - TVA initiated a program of biennial external reviews on its Dam Safety Program, beginning in FY 2015. The first of these reviews was conducted by ASDSO, and focused on the Dam Safety Surveillance (Inspections and Instrumentation & Monitoring) Programs for all high and significant hazard dams at TVA, which includes river dams and coal combustion products (CCP) impoundments.

Dam Inventories

Activities related to dam inventories during the reporting period are as follows:

Department of Agriculture

- **ARS** – ARS has a complete inventory of dams, which includes one high-hazard potential dam. This inventory has been provided to the USACE for the NID update. ARS's inventory has 100 percent coverage for condition assessments.
- **FS** – The FS inventory database contains a Facility Condition Index that relates the deferred maintenance to the replacement value and rates an asset good, fair, or poor. Discussions are ongoing within the FS dams community concerning adding the NID condition assessment to the inventory. Individual units have conducted condition assessments on their own and filed results in the unit's individual files. No dams have a current condition assessment in the FS inventory. Of the FS-owned high-hazard and significant-hazard potential dams, 100 percent have a Facility Condition Index in the FS inventory.
- **NRCS** – NRCS has a complete inventory of dams, which includes 2,480 high hazard potential dams; 2,178 significant hazard potential dams; and 24,497 low hazard potential dams, for a total of 29,155 dams. This inventory has been provided to the USACE for the NID update. NRCS's inventory has 100 percent coverage for condition assessments.
- **Rural Utilities Service** – Many of the dams financed by RUS are under the jurisdiction of FERC or NRC dam safety programs or included in the NRCS inventory. In order to avoid double counting these dams, these dams have not been included in the data provided. The ten remaining dams are under the jurisdiction of the state in which they are located. Currently, NRCS includes the RUS Water & Environmental Programs dams in its inventory. RUS Water & Environmental Programs is continuously updating and verifying information on dams financed with Water and Waste Loans and Grants for updating the NID. This information update and verification is accomplished with the assistance of NRCS and reported via the NRCS database.

Department of Defense

- **USAF** – The USAF is reporting 40 dams under its jurisdiction, an increase of 1 dam since the last reporting period. This inventory has been provided to the USACE for the NID update. USAF's inventory has 100 percent coverage for condition assessments.
- **U.S. Army** – The Army is reporting 240 dams under its jurisdiction. Two dams were removed since the last report. This inventory has been provided to the USACE for the NID update. The Army's inventory has 100 percent coverage for condition assessments.
- **USACE** – USACE has a complete inventory of dams, which includes 511 high hazard potential dams, 151 significant hazard potential dams, and 47 low hazard potential dams, for a total of 709 dams. USACE inventory has 100 percent coverage for condition assessments. Seven dams have been reclassified for their downstream hazard potential classification.

- **USMC** – The USMC has a complete inventory of dams, which includes 3 high hazard potential dams and 4 low hazard potential dams, for a total of 7 dams. This inventory has been provided to the USACE for the NID update. USMC’s inventory has 100 percent coverage for condition assessments.
- **U.S. Navy** – The Navy has a complete inventory of dams, which includes 3 high hazard potential dams, 2 significant hazard potential dams and 12 low hazard potential dams, for a total of 17 dams. This inventory has been provided to the USACE for the NID update. Navy is in the process of implementing condition assessments for their dams.

Department of Energy

- **DOE** – The DOE dam inventory is current and complete. The inventory is updated as soon as conditions warrant. All dams are included in the NID, and updated DOE information is included each time the NID is revised. There were no changes since the last reporting period. No dam has been unclassified or under-classified relative to its defined hydrological hazard potential.
- **FERC** – FERC has a complete inventory of dams, which includes 815 high hazard potential dams, 178 significant hazard potential dams and 1532 low hazard potential dams, for a total of 2525 dams. This inventory has been provided to the USACE for the NID update. FERC’s inventory has 100 percent coverage for condition assessments.

Department of the Interior

- **BIA** – BIA has a complete inventory of dams, which includes 93 high hazard potential dams, 43 significant hazard potential dams and 774 low hazard potential dams, for a total of 910 dams. This inventory has been provided to the USACE for the NID update. BIA’s inventory has 100 percent coverage for condition assessments.
- **BLM** – BLM has a complete inventory of dams, which includes 11 high hazard potential dams and 700 low hazard potential dams, for a total of 711 dams. Ten dams were removed from their inventory during the reporting period. This inventory has been provided to the USACE for the NID update. BLM’s inventory has 80 percent coverage for condition assessments.
- **FWS** – The FWS is continuing to investigate dams that appear as “owned by the FWS” on the NID or are listed in the NID as “non-federal dams on FWS land” to complete the FWS inventory. FWS currently has 15 high hazard potential dams, 2 significant hazard potential dams, and 323 low hazard potential dams, for a total of 340 dams. Since the last reporting period, 2 significant hazard potential dams and 50 low hazard potential dams have been removed from FWS’s inventory. The following dams have been reclassified: 9 reclassified from significant to high hazard potential; 3 reclassified from low to high; 1 reclassified from significant to low.
- **NPS** – NPS has a complete inventory of dams, which includes 14 high hazard potential dams, 7 significant hazard potential dams and 39 low hazard potential dams, for a total of 60 dams. NPS conducts risk assessments, not condition assessments for their dam inventory.

- **OSMRE** – OSMRE has a complete inventory of dams, which includes 10 high hazard potential dams, 11 significant hazard dams and 48 low hazard potential dams, for a total of 69 dams.
- **USBR** – USBR maintains a current, comprehensive inventory of dams that reflects the status of each dam and categorizes the associated risk. USBR has 474 dams. Of these, 366 are rated as high or significant hazard potential dams. One dam was removed from USBR inventory due to not meeting the definition of a dam per the Federal Guidelines.

Department of Labor

- **MSHA** – There are 1,779 dams listed in the MSHA inventory. MSHA is in the process of updating the NID with condition.

Department of State

- **IBWC** – IBWC has a complete inventory of dams, which includes 3 high hazard potential dams, 2 significant hazard potential dams and 2 low hazard potential dams, for a total of 7 dams. This inventory has been provided to the USACE for the NID update. IBWC’s inventory has 100 percent coverage for condition assessments.

Nuclear Regulatory Commission

- **NRC** – NRC has a complete inventory of dams, which includes 9 low hazard potential dams. This inventory has been provided to the USACE for the NID update. NRC’s inventory has 100 percent coverage for condition assessments.

Tennessee Valley Authority

- **TVA** – TVA has a complete inventory of dams, which includes 75 high hazard potential dams, 31 significant hazard potential dams and 22 low hazard potential dams, for a total of 128 dams. This inventory has been provided to the USACE for the NID update. Each dam on the inventory that has a high or significant hazard potential classification has been through some form of condition assessment.

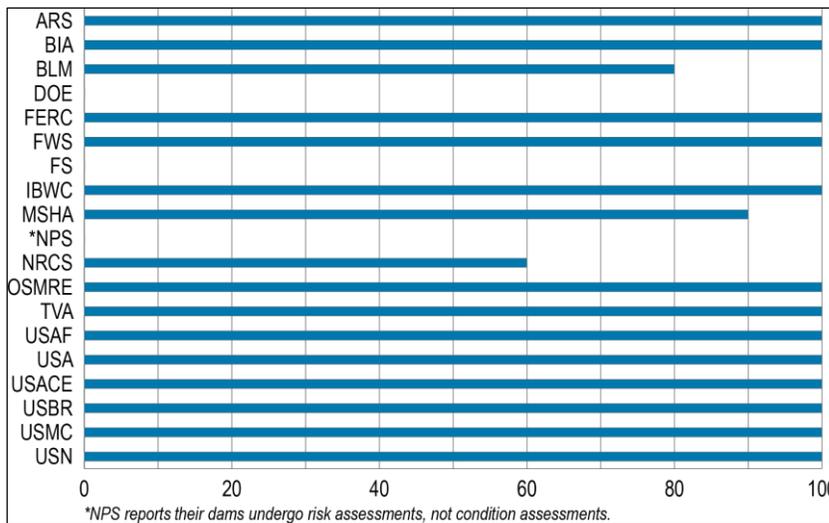


Figure 14 – Percentage of High Hazard Potential Dams with a Condition Assessment

Inspection Programs

Activities related to inspection programs during the reporting period are as follows:

Department of Agriculture

- **ARS** – ARS reports that given their single dam is classified as a high hazard dam, the inspection of the dam is expected to recur annually as required by the Oklahoma Water Resources Board. ARS reports that it does not have any personnel qualified to perform dam inspections. Through collaborative efforts, USDA-NRCS has provided inspections of the dam over a period of years. In FY15, an A-E firm was contracted to complete a dam assessment, which includes a dam inspection. The assessment is ongoing, and is expected to provide alternatives and cost estimates for the dam rehabilitation.
- **FS** – FS, for the most part, performs their own inspections. There are some Forests and Regions that utilize the NRCS, SDS Agencies, and USBR to conduct the inspections. FS performs a mix of types of inspections for each classification but typically high and significant are intermediate and low are informal. FS reported two dam reclassifications for the worse stating that both dams were high hazard with one starting a rehabilitation contracts. The reservoir for the other high hazard dam is being lowered.

Regarding staffing issues, FS reported that many of the individual units lack experience to conduct inspections on high and significant hazard potential dams. Regional Geotechnical/Dams/Dam Safety/Materials Engineers work within the Director's staff and usually serve as the sole regional dam safety resource, dam safety program manager, technical resource, and coordinator (local, state, federal). Regional Dam Engineers are shared over two Regions in 6 out of the 9 Regions and have multiple program responsibilities to prioritize in addition to dam safety; however, they provide on-the-job training where possible when visiting sites.

As soon as practicable, addressing all dam safety deficiencies identified during inspections that pose a threat to human life or property and, when these deficiencies cannot be addressed promptly, requiring that operational actions be taken to reduce risk to human life and property, such as imposing reservoir restrictions, closing administrative and recreational facilities located within the dam inundation zone, or draining the reservoir.

- **NRCS** – NRCS policy encourages state agencies to assume responsibility for routine inspection of existing NRCS-assisted dams. NRCS provides technical assistance for routine inspections as resources permit and as requested by the dam owner. Hundreds of various organizations do formal inspections of NRCS-assisted dams. These organizations range from state agencies conducting formal inspections, local project sponsors conducting intermediate inspections, or walkover O&M inspections by non-engineers. Inspection frequency varies, depending on sponsor and program authorization. NRCS works with project sponsor to address issues identified.
- **RUS** – RUS does not own, operate, or regulate any of the dams it finances. The owners of these dams are responsible for the proper operation, maintenance, and inspection of these facilities. The owners of the dams are subject to all state requirements regarding inspection, maintenance, and operation.

Department of Defense

- **USAF** – The USAF reports that they are in the process of developing a Dam Safety Facility Criteria to provide consistent dam safety criteria across all USAF installations implementing the Federal Guidelines. The USAF performs some inspections with in-house personnel, particularly at installations with small, low hazard potential dams. USAFA conducts their dam risk assessments annually using in-house contractor engineers, and according to following Colorado Department of Water Resources requirements and in conjunction with the Colorado Department of Water Resources representatives. Arnold AFB and JBMDL dams are inspected by USACE. Formal inspections occur on high and significant hazard dams while intermediate inspections occur on low hazard dams. The USAF recorded 2 reclassifications including 1 change for the better and 1 for the worse due to the age and condition of the downstream timber bulkhead. In the event of a critical finding, installation personnel take necessary actions to correct the deficiency.
- **U.S. Army** – The Army reports that Engineer Research and Development Center and USACE perform their formal dam inspections across all different hazard potentials. This reporting period, 85 inspections were performed. The Army recorded 47 reclassifications with all turning for the worse. The Garrison Dam Safety Officer and IMCOM are notified immediately upon any observation of critical findings. IMCOM then notifies its chain of command and the chain of command over the owner of the critically rated dam for immediate response/action.
- **USACE** – USACE performs 5-year interval formal inspections and annual intermediate inspections for all hazard potentials. Informal inspections are not scheduled but occur as opportunity presents with other activities at the dams. USACE reported 226 inspections this reporting period across their dams. USACE also reports that their staffing is experienced, but is limited and sufficient. In addition, USACE dams recorded 44 reclassifications including 34 changes for the better and 10 for the worse. Upon an inspection with critical findings, USACE has actions tailored based upon an understanding of the risks, and the source of the risks. Actions may include risk assessment, interim risk reduction measures such as lowering pool, permanent repairs, and risk communication to stakeholders and potentially affected public.
- **USMC** – Until very recently, the USMC did not have any staff that were specifically trained in dam safety. USMC reports that training is a staffing problem with conducting inspections this reporting period. USMC relies on USACE for expertise in formal inspections of dams. USACE performs the inspections on all USMC owned dams on a 3-year cycle. Marine Corps Installation personnel have recently been trained to perform intermediate inspections on dams on a 2-year cycle, and informal inspections of dams on a periodic basis as conditions warrant.

When critical findings occur which require repair or restoration of the physical plant are identified and entered into our work management system (MAXIMO based) for corrective action. Small scopes of work are prioritized and scheduled at the installation level, while larger scopes of work are developed into a project for execution and funding at the HQMC level.

- **U.S. Navy** – The Navy conducted 9 formal inspections across various dams with no changes in classification. USACE performs their inspections when needed. When there are critical findings, local installation public works departments create service requests to correct the deficiencies.

Department of Energy

- **DOE** – DOE uses operating contractors to perform frequent, formal, routine inspections of DOE dams. Private consultant services are commissioned by the field sites in coordination with the DOE Headquarters dam safety coordinator. Inspections are performed annually on dams that have been defined as having a high or significant hydrological hazard potential and every other year on dams with a defined hydrological low hazard potential. In the event of a critical finding, local DOE site offices take corrective actions, as appropriate.
- **FERC** – FERC reports that all constructed and operating projects are subject to inspection by the staff. All licensed and exempted projects that are classified as high and significant hazard potential are inspected annually by staff to ensure that they are being operated in a safe condition, with proper maintenance, and to determine if any dam safety issues exist; that unauthorized modifications have not been made to the projects; and that projects are being operated efficiently in compliance with the terms of the license or exemption. These periodic inspections are considered to be intermediate inspections as defined by the Federal Guidelines. In addition, low hazard potential licensed and exempted projects are inspected every 3 years.

In the event of a critical finding, FERC provides comments and recommendations to the licensee following the inspection. FERC will then require a plan and schedule to be provided in order to further address the critical findings through studies, analyses, and/or remediation. If a finding is highly critical, FERC has the authority to immediately require risk reduction measures, which often includes reservoir drawdowns.

Department of the Interior

- **BIA** – BIA has determined that future dam comprehensive examinations and periodic examinations will be performed on a five-year alternating schedule. This schedule, along with the current annual inspections and extensive dam monitoring program, has been determined to maintain the required level of risk reduction and will result in a program savings of over \$2 million, which will be reallocated to the reduction of overall dam safety risk.

Critical findings of the inspections may result in an expedited action, which is an immediate action to mitigate the consequences of an identified high-risk failure mode. The response may include installation of engineering work stations, reservoir restrictions, increased monitoring, and in severe instances, a breach of the facility to reduce the risk of an incident or failure that may result in serious downstream impacts including possible loss of life. The interim expedited action and mitigation is a short-term reduction in risk until resources are available to effectively correct the potential failure mode or deficiency.

- **BLM** – BLM uses its Facility Asset Management System as its official record to track dam inventory. BLM reports that some states have been deficient in reporting actual work performed, and in some cases inspections have not been performed on low hazard dams. Intermediate inspections are conducted on all types of dams. BLM reported 72 inspections during this reporting period with 67 dams having to be reclassified. Seven dams changed for the better and 60 dams had changes for the worse.

BLM reports that many states were not able to accomplish inspections on low hazard dams due to a lack of staff but quality, experience, and training were not factors. If BLM discovered a critical finding emergency maintenance action would be taken. Actions would be taken to stabilize the dam, lower the operating water level, or breach the embankment and take the dam out of operation. Emergency repairs are conducted as required.

- **USBR** – USBR reports that formal inspections, referred to within USBR as comprehensive reviews (CRs), are conducted every 8 years. The CR is conducted by a team under the combined direction of the respective Regional Director and Chief of Dam Safety Office led by a senior-level technical staff specialist and includes other specialists. USBR has several types of intermediate inspections. The periodic facility review is conducted every 8 years midway between CRs. These reviews are conducted by individuals organized under the respective Regional Director who are independent of the day-to-day operational responsibility. Special inspections are also conducted at USBR as necessary. Special examinations are often performed after earthquakes and during flood events that place the dam under unusual loads.

Annual site inspections (informal inspections) are conducted every year in which formal or intermediate inspections are not conducted. In an 8-year facility review cycle, there would be 6 informal examinations. During FY14 and FY15, there would be on average 486 inspections conducted on high and significant hazard dams not including any special or inaccessible feature inspections. It is estimated that on average during, there were 22 inspections of low hazard dams as well.

In accordance with critical findings, FWS findings from facility reviews are documented in a review report. Issues requiring action are itemized in the form of Safety of Dams or Operation and Maintenance recommendations. Inspection results and recommendations are formally presented to the individuals delegated with decision-making authority for the Dam Safety Office, the regional office, and the area office. Critical recommendations are prioritized for action based upon the Dam Safety Priority Rating (DSPR) for the facility.

- **FWS** – FWS has formal inspections every 6 years for high and significant hazard dams, every 3 years for intermediate dams and an annual checklist inspection by regional dam safety officer. Low hazard dams are inspected every 6 years. FWS conducted 134 total inspections during the reporting period. FWS reports 5 reclassifications of their dams, including 3 changes for the better and 2 changes for the worse. Formal and intermediate inspections of high, significant, and low hazard dams are performed by FWS A-E consulting firms (Gannett Fleming, URS Corp. and W.W. Wheeler). Annual checklist inspections (informal) of high and significant hazard dams are performed by the Regional Dam Safety Officers (RDSOs) each year in which there is not a formal or intermediate

inspection being conducted. Some low hazard dam inspections are performed by FWS engineers. There has been turnover in the FWS regional engineering offices resulting in new RDSOs, often with little or no dam safety experience. FWS attempts to provide training to the new RDSOs in inspections, emergency preparedness, and rehabilitation design. The RDSOs conduct the annual checklist inspections of high and significant hazard dams.

FWS reviews and confirms critical findings, perhaps with additional field visit(s) to the dam, followed by an assessment of the urgency of the findings and takes appropriate action including implementing the EAP, lowering the reservoir level, or other interim risk reduction measures. Once any emergency has been stabilized, the dam safety program would develop a plan of action including critical timelines to perform additional analyses, develop remedial plans, design plans, and seek funding to complete the analyses, design, and construction. Timelines reflect the estimated risk and urgency of the needed remediation.

- **NPS** – NPS reports that their dams are inspected every other year if there are no concerns and had 53 inspections during the reporting period. NPS conducts their own inspections. Formal inspections are done on high hazard potential dams, intermediate inspections are done on significant hazard and low hazard potential dams. NPS had no dams reclassified as the NPS uses dam risk assessment rather than condition assessment. Since the last reporting period, the NPS has adopted the use of the DSPR to summarize overall risk. For the high hazard NPS dams, 11 dams have a DSPR rating of 4 (low to moderate priority) and two dams have a DSPR rating of 3 (moderate to high priority). This reporting period there were no critical findings requiring action.
- **OSMRE** – OSMRE ensures that dam inspections are conducted and reports that frequencies of inspections are dictated by dam size and hazard classification. Dependent on criteria, MSHA also participates in dam inspections. Inspections are conducted during construction, operation, and closure. During construction, inspections are more frequent. For impoundments that fall under certain MSHA criteria, impoundments are inspected weekly or as otherwise determined by an MSHA District Manager. For impoundments that are not captured via MSHA's inspection requirements, MSHA regulations require quarterly inspections. OSMRE regulations also require all impoundments have an annual recertification that must be conducted by a professional engineer or, under certain circumstances, a professional land surveyor and must be certified by the professional ensuring that the impoundment has been constructed and/or maintained as designed and in accordance with the approved plan. The certified report must be delivered to OSMRE so that it can be reviewed for compliance.

OSMRE, upon identification of a deficiency in a dam, according to the approved design and maintenance plan, will issue a Notice of Violation and can issue an Imminent Harm Cessation of Operation Order in the event of a critical issue. OSMRE can stop the permittee's operation until the dam is brought back into "as-designed" specifications. Any deficiency identified that poses a safety risk is immediately brought to the attention of the appropriate Regional Director.

Department of Labor

- **MSHA** – MSHA reports that with dams at coal mines, a qualified person designated by the mine operator conducts dam inspections and monitors instruments at intervals not exceeding seven days. In addition to the weekly inspections, the mine operator submits an annual report by a registered professional engineer certifying that all construction, operation, and maintenance have been in accordance with the approved design plan. MSHA also conducts dam inspections for hazardous conditions and compliance with standards as part of a complete mine inspection. MSHA inspects dams associated with underground mines at least four times per year and those at surface mines and facilities at least twice per year.

MSHA's *Coal Mine Impoundment Inspection and Plan Review Handbook* lists MSHA inspection requirements for dams as follows:

- High hazard potential dams shall be inspected at least quarterly regardless of the type of mine with which they are associated. These inspections should be conducted by an impoundment specialist. Impoundment specialists have advanced training and experience in the field of dam safety,
- Significant hazard potential dams are inspected according to the type of mine with which they are associated. At least two of the inspections will preferably be conducted by impoundment specialists,
- High hazard potential dams should be inspected during periods of significant rainfall/snowmelt or after seismic activity, and;
- Critical construction activity (defined in the handbook) at high and significant hazard potential dams shall be inspected by an impoundment specialist.

Dams at metal and nonmetal mines have a mine operator conduct regular inspections of a dam if its failure will create a hazard. The specific time interval for a regular inspection is not defined by MSHA. MSHA does not track the number or frequency of inspections performed by metal and nonmetal mine operators. MSHA's goal is that high hazard potential dams at metal and nonmetal mines be inspected once a year by a specialist. MSHA may conduct a more thorough investigation using their Office of Technical Support. In all cases, the mine operator will be notified of the potential problem and be required to investigate and correct any conditions. Mine operators typically use consulting engineers to perform all of their work related to dams.

Department of State

- **IBWC** – IBWC performs weekly inspections with field office personnel, annual inspections with in-house engineering technicians/engineers, and formal 5-year bi-national inspections using USACE and CONAGUA engineers from Mexico City. Five-year inspections of the dams were completed in 2011 and 2012 with the next 5-year inspections due in 2016 and 2017. If there is a critical finding that is urgent, unsafe or potentially unsafe, IBWC takes immediate action to fund the studies/repairs needed to reduce the risk.

Nuclear Regulatory Commission

- **NRC** – NRC reports no changes in reclassifications of their dams, as all dams regulated by the NRC are low hazard potential. Dams at nuclear power plants are inspected by the NRC/FERC every 2 years and dams at uranium tailing mills are inspected every 3 years. These inspections are in addition to the inspections performed by the dam owner/operator. In the event of a critical finding, the NRC discusses the issue with the owner/operator to ensure the licensee remains in compliance with the applicable regulations. NRC licensees must maintain their dams in a condition such that they can perform their intended safety function.

Tennessee Valley Authority

- **TVA** – TVA reports 14 reclassifications of their dams including 13 changes for the better and 1 change for the worse. TVA believes necessary action for the safety of the dam and the affected area surrounding the dam is the most important. Secondly, that the dam Asset Owner (AO) notifies the Dam Safety Officer as soon as possible of critical or significant findings no later than 24 hours after time of discovery. TVA also reports that AOs also notify the responsible engineer/manager and, as appropriate, the Plant Environmental Scientist. The AO then determines the next steps and documents the action plan in TVA's work management system and/or corrective action program, secure funding, and implement repair work as necessary. If additional resources or investigations are warranted, external contract engineering firms are utilized. For major issues and repairs, TVA consults with its independent external review board. If a major project is required for repairs, TVA Project Management processes are used to implement.

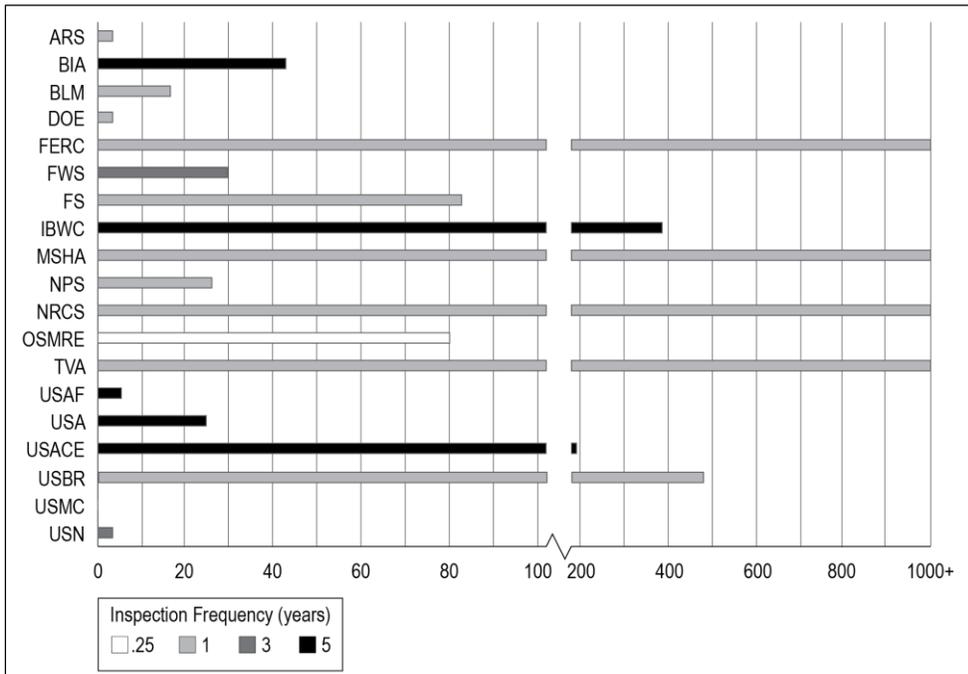


Figure 15 – Number of High Hazard Potential Dams Inspected

Dam Safety Rehabilitation Programs

Activities related to dam safety rehabilitation programs during the reporting period are as follows:

Department of Agriculture

- **FS** – FS completed the Love Lake Dam rehabilitation project and has 18 planned. Hume Lake Dam, Valentine Lake, Houston Dam, Skitty Creek Dam, and Knutson Dam are in progress.
- **NRCS** – NRCS completed construction of seven rehabilitation projects. Examples of recently completed rehabilitation projects include the Silver Lake Flat dam in Utah and the Pohick 8 dam in Virginia. There is one ongoing modification during this reporting period.

Department of Defense

- **USAF** – The USAF has completed two dam rehabilitation projects that include Arnold AFB in Tennessee and JBMDL in New Jersey. An enhanced monitoring program is in planning for the Kettle Creek Diversion Dam. The USGS has been engaged to install a stream flow gauging station on Kettle Creek prior to entering the reservoir.
- **U.S. Army** – The Army has one completed dam rehabilitation project and has one ongoing dam safety modification.
- **USACE** – USACE has completed one dam rehabilitation project this reporting period and is continuing efforts of 15 ongoing dam safety modifications. All 16 rehabilitation projects total \$8.3 billion.
- **USMC** – The USMC has two upcoming dam safety modifications totaling \$7.4 million.
- **U.S. Navy** – The Navy has one planned dam rehabilitation project during this period totaling \$600 million.

Department of Energy

- **FERC** – FERC completed 61 dam safety modifications at a cost of \$331 million. In addition, 33 planned dam safety modifications are ongoing or under review.

Department of the Interior

- **BIA** – BIA completed three dam safety modifications with an approximate total cost of \$24 million and has seven ongoing planned modifications with an approximate total cost of \$31.5 million.
- **BLM** – BLM completed four dam safety modifications during this reporting period and have nine planned ongoing modifications. The total cost for completed and planned rehabilitations totals approximately \$5.9 million.
- **FWS** – FWS completed the Crab Orchard Dam in Illinois and has planned one rehabilitation modification dam in California.
- **NPS** – NPS has five planned ongoing dam modifications totaling approximately \$3 million.

- **USBR** – USBR completed four dam safety modifications during this period with a total approximate cost of \$84 million and 16 planned ongoing modifications during this reporting period with a total approximate cost of \$1.5 billion.

Department of Labor

- **MSHA** – All dams under MSHA jurisdiction are owned by mining companies and constructed by these companies or their contractors. The goal of MSHA is to ensure that the dams are designed, constructed, and maintained in accordance with current, prudent engineering practice. MSHA does not maintain data on the cost of repair because dams within MSHA’s jurisdiction are privately, rather than publicly, owned. All responsibility for the cost of repair lies with the mining company.

Tennessee Valley Authority

- **TVA** – TVA completed a total of six rehabilitation projects and have seven planned. Dams that are in need of remediation—but where construction has not yet been completed—have used other methods of risk reduction including reservoir restriction, early warning systems, temporary flood wall construction, supplemental EAPs, and stock piled materials to install a temporary flood wall.

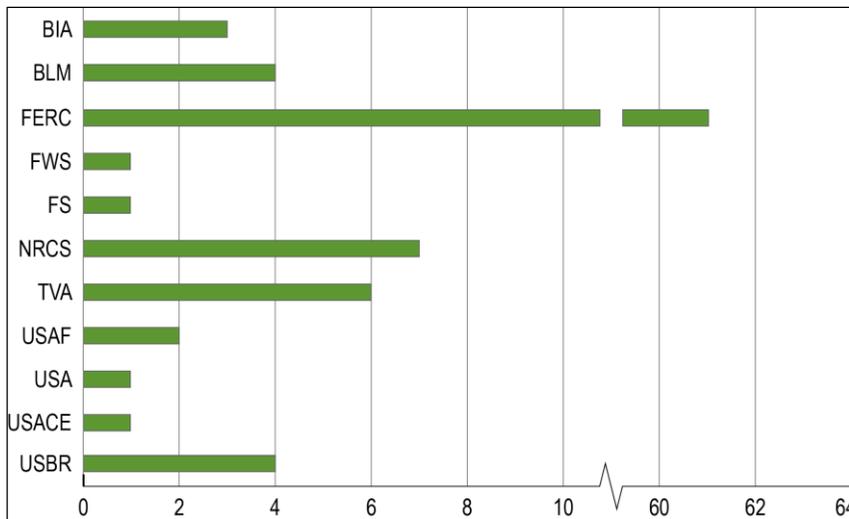


Figure 16 – Number of High Hazard Potential Dams Rehabilitated

Management Effectiveness Reviews

Activities related to management effectiveness reviews during the reporting period are as follows:

Department of Agriculture

- **ARS** has conducted an internal review with regards to its activities regarding dam safety. As a result of the review, ARS is contracting with an A-E firm to complete an assessment of the Woodward Dam in FY15.

Department of Defense

The DoD Inspector General conducted an audit during this reporting period (Report No. DODIG-2015-062, "DOD Needs Dam Safety Inspection Policy to Enable Services to Detect Conditions That Could Lead to Dam Failure"). The audit objective was to determine whether DoD dam safety inspections adequately assessed the operations, maintenance, and structural stability of dams to mitigate public safety risks.

- **USACE** – USACE underwent an IEPR of its Dam Safety Program's policies, procedures, and performance to assess how well it is implementing the Federal Guidelines and executing its dam safety mission. The full report is viewable at: [www.usace.army.mil/Portals/2/docs/civilworks/dam safety/2013 DamSafety IEPR.pdf](http://www.usace.army.mil/Portals/2/docs/civilworks/dam%20safety/2013_DamSafety_IEPR.pdf). USACE division offices also review district dam safety programs on a periodic basis. The IEPR provided 26 comments and associated recommendations. Response actions are prioritized per the ranking provided by the review panel and are being implemented as funding permits. Many actions will be phased, such as updating guidance first, then revising associated procedures, followed by training to aid implementation.

USACE division offices also review district dam safety programs on a periodic basis. Findings include periodic inspection report completion beyond the required 90-day period, greater detail needed for review documentation, scrutiny on reviewer independence and inspector experience, and delay in completion of EAP updates and exercises. Progress of the dam safety program is being tracked using Dam Safety Program Management Tools.

Department of Energy

- **FERC** – The FERC Division of Dam Safety and Inspections conducted two Summary Management Reviews as mandated by the Federal Managers' Financial Integrity Act, which requires the establishment and maintenance of a management control program. On July 11, 2014, and May 21, 2015, Assurance Memorandums were forwarded to the Chairman, the FERC through the Director, Office of Energy Projects attesting that the Division of Dam Safety and Inspections was able to meet their management goals and objectives, there were no obstacles or funding shortfalls impacting the ability to accomplish its mission and there were no reportable problems requiring the attention of higher management.

Department of the Interior

- **BIA** – BIA had a representative from AECOM, USBR and an independent contractor complete an Independent Oversight Review (IOR) of the program from June 1–2, 2015. The recommendations from this report are still pending.
- **FWS** – FWS and OSMRE are currently conducting an IOR via USBR though a contract with ASDSO, however, the report is still in draft at the time of this reporting.
- **NPS** – NPS also had USBR conduct an IOR, which rendered 21 recommendations. Importantly, the recommendation to elevate the program within the NPS has been accomplished. In June 2015, the program was moved to the Construction Program Management Division and now has one less reporting level in NPS. Another

recommendation for increasing the budget is under consideration by NPS administration. The recommendation for an additional FTE has not been yet addressed.

- **USBR** – Utilizing an in-house developed Facility Reliability Rating system, USBR assessed the reliability/condition of its high and significant hazard dams. The Facility Reliability Rating is intended to provide an outcome-oriented performance measure for Government Performance and Results Act reporting purposes, as well as a tool for use in evaluating where necessary future funding/resources should be directed to certain dams. Ratings are based on a set of weighted criteria to evaluate operations, maintenance, and management factors/activities that affect the reliability or condition of these dams.

USBR's Dam Safety Officer also provides an annual review of dam safety activities. The Dam Safety Officer convenes an Independent Review Panel consisting of dam safety experts from outside of USBR to review USBR's overall Dam Safety Program and related activities. The Independent Review Panel develops findings and recommendations for improvements in the program. They also review progress and accomplishment of previous recommendations for improvement. The Dam Safety Officer provides an annual Program Evaluation Report to the Commissioner that includes formal recommendations based on the Dam Safety Officer and Independent Review Panel findings.

Department of Labor

- **MSHA** – A dam safety-specific accountability review was not conducted during the reporting period. MSHA has an accountability program that focuses on following standard operating procedures. These procedures contain appropriate administrative controls including detailed tracking requirements. These procedures cover inspections, technical review of engineering plans, report issuance, performance of field investigations to provide technical assistance, and preparation and presentation of technical training. These procedures have not changed during this reporting period.

The Dam Safety Officer prepares a report for the Assistant Secretary summarizing the status of the MSHA Dam Safety Program and providing an assessment of the program's operation. An annual questionnaire is sent to each program area involved in the Dam Safety Program as well as each district office to obtain information needed to prepare the report. The Dam Safety Officer also has frequent discussions with the program areas on issues affecting the Dam Safety Program.

Tennessee Valley Authority

- **TVA** – TVA's Operational & Regulatory Assurance group conducted two reviews on the TVA Dam Safety Program within the reporting period. The group evaluated the effectiveness of the Dam Safety Independent Review Board process, and the adequacy of governance and oversight for the Dam Safety Program. The Operational & Regulatory Assurance reviews on the TVA Dam Safety Program and Independent Review Board identified a number of opportunities for continuous improvement, most of which were administrative in nature, and all of which were scheduled to be addressed by the end of the reporting period.

DSG&O also conducts assessments consisting of monthly, quarterly, and annual reports of dam safety activities and asset owner implementation performance.

Dam Safety Training

Activities related to dam safety training during the reporting period are as follows:

Department of Agriculture

- **ARS** – ARS offered one web-based training opportunity titled “Stepped Chute Design for Embankment Dams.” Approximately 250 people attended virtually for the two total training hours that was developed and presented by an ARS Supervisory Civil Engineer.
- **FS** – FS held three training opportunities that were held both physically and virtually, and 14 people attended the 32 training hours. The agency hosted and was the trainer for two of the opportunities while the third opportunity was developed in-house and posted online.
- **NRCS** – NRCS hosted a total of 40 different training events. They ranged from being held virtually, in the classroom, at workshops, and at conferences. These 40 opportunities afforded NRCS the opportunity to be trainer, presenter, lead, provider, conductor, creator, presenter, participant, and support.

Department of Defense

- **USAF** – The USAF held an event titled “Training of Engineering and Operational Staff” that was attended by two people for a total of 40 hours. The USAF’s role during the event was as leader.
- **U.S. Army** – The Army hosted one classroom event called “ATIP Dam Safety Class.” Approximately 47 people were in attendance for 48 hours, which was administrated by the safety class.
- **USACE** – USACE held five events: three in the classroom and two others. Approximately 1,302 people attended the 124 training hours. USACE was the leader/instructor in each situation.
- **USMC** – The USMC hosted 4 people during an event titled “DAM SAFETY.” Held in a classroom for 128 training hours, Headquarters USMC funded the travel, per diem, and class expenses for the 4 employees trained by USACE.

Department of Energy

- **FERC** – FERC hosted 14 workshops and 260 people between them. FERC was the lead in each training event.

Department of the Interior

- **BIA** – BIA supported three workshops and one conference that saw approximately 438 people attend for a total of 138 training hours.
- **BLM** – BLM traditionally hosts one event titled “Comprehensive CAs of Dams” in a classroom setting. There were zero attendees during the usually offered 24 training

hours. This course was not held during the reporting period due to lack of attendees but traditionally it has been offered annually.

- **FWS** – FWS held 15 events that hosted around 540 people. FWS and Gannett Fleming provided these training opportunities to employees, other DOI agencies, and other selected guests (e.g., Maryland Dam Safety Program).
- **NPS** – NPS held one event titled “Dam Tender Training.” It was a workshop that hosted 40 people for 12 hours. The training was developed by USBR.
- **OSMRE** – OSMRE held two conferences for 5 and 3 attendees in 2015 and 2016, respectively. USBR developed the event and subsequent materials; USBR also organizes and hosts an annual Dam Safety Training Course for Bureaus within DOI that own, operate, maintain or permit dams.
- **USBR** – USBR hosted a mixture of eight conferences, workshops, classrooms, and web-based/virtual sessions. These events hosted 1,260 people.

Department of Labor

- **MSHA** – MSHA hosted six events during 2015 and 2016. The agency provides and organized all the training for each event. MSHA provides training to mine operators, engineering consultants, and others to meet MSHA's requirement that a qualified person conduct inspections of dams.

Department of State

- **IBWC** – IBWC hosted one workshop titled “IBWC Bi-national Annual Flood Workshop for 2014/2015.” Eighty people attended the 32 training hours. The purpose was to provide joint training to field office personnel from both Sections of IBWC on flood operations.

Dam Incident and Remedial Actions

Activities related to dam incidents and remedial actions during the reporting period are as follows:

Department of Agriculture

- **FS** – During the reporting period, FS experienced two flooding events (Major, Mitchell, and Sheridan Dams and at Cook Lake Dam), one spillway overflow incident (McClellan Dam) and one spillway failure (Parker Dam). For the flooding events, the dams were monitored during the event and inspected after and no major damage occurred. The McClellan Dam spillway overflow resulted in no concerns or issues from a dam safety standpoint, while the Parker Dam engineered breach of the spillway resulted in a redesign.
- **NRCS** – NRCS had 81 dam incidents resulting from multiple issues to include seepage, auxiliary spillway erosion, damage to principal spillway conduits, gate cavitation, damage to drain pipes, plunge basin erosion, failed principal spillway outlet, etc. The reservoir was drawn down and an emergency filter was placed over the seepage exit point. Investigations have verified erosion occurring within the epikarst beneath the dam.

A tabletop exercise was conducted with participation by local emergency management agencies. Repairs are planned.

Department of Defense

- **U.S. Army** – The Army had three incidents during the reporting period. The Saunders Spring Dam had several holes and animal burrows on the slopes, which caused erosion on the upstream and downstream slopes. As a result, the animal holes were filled and trees 50 feet past toe of slope groin to groin were removed. The Upper Douglas Dam saw erosion on the upstream and downstream and resulted in the placement of slopes fabric and rip/rap on the upper face of the dam, as well as obstructions to prevent vehicle access to the face of the dam and removal of trees 50 feet past toe of slope. Wilcox Lake Dam had heavy vegetation and resulted in the removal of trees and brush as well as the placement of fabric and rip/rap on the upper face of the dam.
- **USACE** – During the reporting period, USACE endured three dam incidents. The EAP was activated, emergency officials notified, the pool was lowered, and designs for repair are currently underway for the Lewisville Dam due to a shallow slope slide on the upstream face of the dam (no breach or release of pool). An overtopping, which led to a breach, occurred at the Cumberland Levee (along Lake Texoma reservoir rim). As a result, the EAP was activated, emergency officials were notified, and repair options are being evaluated. Moreover, there was a deformation of the spillway gate strut arm at the Howard Hanson Dam that led to a climbing inspection, structural analysis, and monitoring and communication with the potentially affected public and emergency responders.

Department of Energy

- **FERC** – Two FERC dams had incidents. The Wanapum Dam's concrete spillway monolith fully cracked and began to rotate downstream which resulted in the reservoir being drawn down to a safe level and the entire spillway section being post-tensioned and interior drainage features installed. Additionally, the borings near the toe of the Cannonsville Dam encountered high artesian pressure and were not properly backfilled, which resulted in uncontrolled seepage from the boreholes, which began producing turbidity. To remediate the situation, the drawdown was initiated, and relief wells installed and pumped upstream of the borings in order to filter the seepage. Once the seepage was under control, the original boring locations were compaction grouted to properly reseal the impervious blanket layer that had been penetrated.

Department of the Interior

- **BIA** – There were 12 reported dam incidents at BIA during the reporting period. The incidents resulted from a number of issues to include high water near overtopping and flooding downstream, rapidly increasing reservoir levels, gushing water from an abandoned diversion construction outlet pipe, all of which led to EAP activation.
- **BLM** – BLM reported five dam incidents including a piping instance during first filling that led to an investigation, report and redesign; an overtopping caused by high drainage area runoff that resulted in a post incident report; two breaches (one resulted in funding and contracting repair while the second resulted in no further action); and an impending

failure caused by piping around outlet works. Immediate remediation included unclogging the corrugated metal pipe, and there are plans to rebuild the embankment when funding is acquired.

- **NPS** – Widespread flooding prompted an incident exam at the Chickasaw Dams; it was determined that the existing dam issues were not worsened as a result of the flooding.
- **USBR** – The only USBR dam incident took place at Steinaker, where there was an upstream slope failure. That resulted in an investigation of the changes in movement, implementation of reservoir operational changes, and initiation of a corrective action study.

Tennessee Valley Authority

- **TVA** – TVA reported two incidents during the reporting period. A sinkhole was identified in the parking lot below the toe of Boone Dam’s right embankment dam, and a week later muddy discharge was found in the tailrace below the units. The reservoir was drawn down and an emergency filter was placed over the seepage exit point. Investigations have verified erosion occurred within the epikarst beneath the dam. A tabletop exercise was conducted with participation by local emergency management agencies and repairs are planned. Similarly, recent geotechnical investigations and analysis of Pickwick Dam indicate that portions of the south embankment do not meet current post earthquake criteria. As a result, the annual drawdown of the pool to winter levels was accelerated. The downstream public were notified and offered free weather radios to ensure availability to potential warnings given by the National Weather Service with regard to dam failure. An early warning system has also been installed and remediation options are currently being vetted. The pool returned to normal operations after implementation of the early warning system.

Emergency Action Planning

Activities related to emergency action planning during the reporting period are as follows:

Department of Agriculture

- **ARS** – ARS reports the EAP for the Woodward Dam includes coordination with the Woodward City/County Emergency Manager in a case of emergency. Although the state of Oklahoma doesn’t have jurisdiction over federally owned dams, the Oklahoma Water Resources Board dam safety office has been provided a copy of the EAP as a matter of courtesy. The EAP is currently being updated. Once updates are complete, the updated EAP will be provided to both local and state officials.
- **FS** – The Forest Service direction does not require EAPs for significant hazard dams. At the present time, implementing EAPs for significant hazard dams will be a decision dependent on individual dam circumstances and available resources. FS coordinates with state and local offices of emergency management on EAP preparations. FS has four ongoing contracts using NRCS IDIQ contracts to update EAPs and associated inundation maps for 31 high hazard potential dams. These contracts are updating an additional five inundation maps. Contract completion is FY16.

- **NRCS** – NRCS has no authority to require the development of EAPs on existing dams, but does have current policy to require development of plans before providing technical or financial assistance on high hazard dams. Although more EAPs are implemented by owners of NRCS-assisted dams every year, there are still more than 1,000 NRCS-assisted high hazard potential dams without an EAP. NRCS collaborated with ASDSO to develop a sample EAP for small embankment dams. NRCS used this information to amend the NRCS National Operation and Maintenance Manual widely used by the NRCS, state dam safety agencies, and local sponsors and owners to develop new and update old EAPs. NRCS trains NRCS, state dam safety agency, other federal and state agency personnel, dam owners, and engineering consultants using this information.
- **RUS** – RUS does not own, operate, or regulate any of the dams it finances. The owners of these dams are responsible for the proper operation, maintenance, and inspection of these facilities. The owners of the dams are subject to all state requirements regarding inspection, maintenance, and operation.

Department of Defense

- **USAF** – USAF reported that EAPs for all deficient high and significant hazard dams are currently being written and will be finalized by the end of 2015. The USAFA closely coordinates all aspects of the Dam Safety program with the State of Colorado’s Division of Water Resources. During preparation of reports and designs, the Division of Water Resources is provided draft copies of the various efforts and is encouraged to comment on the findings and recommendations. They participate in design review meetings and charrettes. All plans and specifications for construction or reconstruction of jurisdictional structures at USAFA are reviewed and signed by the State of Colorado prior to construction. After construction is complete, they receive and record the redlined drawings.

USAFA EAPs are prepared following the Colorado Division of Water Resources guidelines. They are provided to the Division of Water Resources for their review and filing. The Division of Water Resources, Colorado Department of Homeland Security and Emergency Management, Colorado Department of Transportation, Colorado State Patrol, Colorado Springs Office of Emergency Management, and El Paso County Office of Emergency Management participated in a February 2015 Kettle Creek Diversion Dam Seminar. The JBMDL EAP is updated after a change in personnel/telephone number, or after the completion of a scheduled exercise review, which revealed required changes. This EAP will be shared with local officials and the County Emergency Operations Center will be provided with the Notification Flowchart.

- **U.S. Army** – The Army reports that it always encourages state and local agencies to participate if interested.
- **USACE** – USACE coordinates with state and local officials during dam emergency exercises and actual high water events. USACE has both a plan and advance coordination with local and state emergency management officials that are critical in facilitating a timely response to an emergency. The 3 significant hazard potential dams without EAPs are in caretaker status until funding becomes available to develop an EAP.

- **USMC** – The USMC reports the recent initiation of a formal dam safety program; there has been no known effort regarding coordination with state and local governments. As the USMC moves in development of this program, especially the EAPs, coordination with local and/or state agencies will be paramount.
- **U.S. Navy** – The Navy reports no involvement with EAP work.

Department of Energy

- **DOE** – The DOE reports EAPs have been prepared and approved for all three DOE dams that are defined as having high or significant hydrological hazard potential.
- **FERC** – FERC issued revised EAP guidelines in 2015 to promote national consistency with the “Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners, FEMA Mitigation Directorate 64,” which was updated in 2013. All dam owners are required to have EAP documents that follow the established federal and FERC formats.

FERC encourages dam owners to develop EAP exercises that include active participation by upstream and downstream dam owners. FERC-regulated dams and non-FERC-regulated dams would be included. A widened approach for coordination will optimize the time and effort required by the local response agencies and encourage non-FERC-regulated dam owners to participate in an EAP exercise for the first time and provide opportunities for state dam safety officials to participate and test dams under state regulation.

Department of the Interior

- **BIA** – BIA plans to implement EAPs for dams when construction is completed and finished. To encourage involvement, BIA invites state and local governments to their exercises and facilities preparedness planning efforts.
- **BLM** – BLM reports that in Montana, all EAP exercises include the local Disaster and Emergency Services coordinator as the incident lead. The Montana Department of Natural Resources and Conservation Safety of Dams regional engineers are included in the exercises and have up-to-date copies of the EAPs. When the EAPs are exercised, the mayor (if a town is affected), county commissioners, county sheriff, county road foreman, the National Weather Service, and all local government officials are included in the exercise and are given up-to-date copies of the EAPs.

In Oregon, BLM meets annually with the Oregon Water Resources Department about the Dam Safety Program. Local agencies are invited to participate in tabletop exercises. The EAP that is under development in Nevada is being coordinated with local governments. Directives and Standards were updated to include annual coordination activities with downstream jurisdictions and other agencies.

- **FWS** – FWS sent invitations to their EAP exercises (Periodic Test) to the state dam safety official and to emergency management agencies, local police, sheriff, etc. FWS solicited comments on the EAP during the exercise, and provide for written comments 30 days after the exercise as well as requesting comments from important organizations that play a role in the implementation of the EAP if they do not attend the exercise.

- **NPS** – NPS reports inviting state and local representatives to their EAP exercises.
- **OSMRE** – OSMRE is a regulatory agency and cannot write EAPs for owners of private dams. OSMRE does not require exercises to be conducted. However, OSMRE requires that Hazard Response Plans be written when a hazard is recognized. OSMRE has recognized the need to update its regulations and is currently working to strengthen their stance by developing federal regulations that will not only require an EAP in accordance with FEMA 64, but will also have annual update and functional testing requirements.

Current proposed federal rulemaking requires EAPs be developed and submitted to the regulatory authority for all significant and high hazard SMCRA dams within 6 months of the rule being published in the federal registration. It is estimated that the rule will be finalized during 2017.

Department of Labor

- **MSHA** – MSHA policy states that mine operators should develop and maintain EAPs to be consistent with current, prudent engineering practice and the Federal Guidelines. However, MSHA does not require an EAP. Many dams under MSHA jurisdiction are required to have EAPs by state regulations. MSHA recognizes the benefits of EAPs and will continue to encourage mine operators to develop EAPs for high hazard potential dams. Occasionally, MSHA has participated in tabletop exercises involving testing of emergency action plans.

Department of State

- **IBWC** – In FY15, the IBWC continued their annual Flood Emergency Workshops with participation of both Sections of IBWC and the participation of the National Weather Service. Workshops were held for Amistad, and Lower Rio Grande Flood Control Project for FY14 and FY15. U.S. Area Operations Managers made annual personal contacts with various county, city, and federal agencies to inform them of our potential flood assistance in times of emergencies. The last tabletop exercise was conducted at each site in 2011 with local elected officials and state and federal agency representatives.

Nuclear Regulatory Commission

- **NRC** – NRC reports no involvement with EAP work.

Tennessee Valley Authority

- **TVA** – EAPs are developed through annual engagement with emergency management agencies and other external emergency response partners. TVA holds face-to-face meetings with county emergency management agencies where a CCP or river dam is located. EAPs are reviewed and emergency resources, expectations, and roles and responsibilities are discussed. TVA invites state and local emergency management agencies and other stakeholders to dam safety EAP exercises.
- In 2015, the River Dam Asset Owner engaged in emergency action planning by including meetings with state and local emergency management agencies and the local National Weather Service offices associated with Boone and Pickwick Dams. Feedback was sought from state and local emergency management agencies, seeking to better

understand the specific attributes of each region, incorporating improvements (TEENS, predetermined Incident Command Post locations at each dam, and updated inundation mapping), using the latest technology to provide the best product and keep stakeholders' interest, offering dam tours during tabletop exercises, and keeping counties informed of issues in their area.

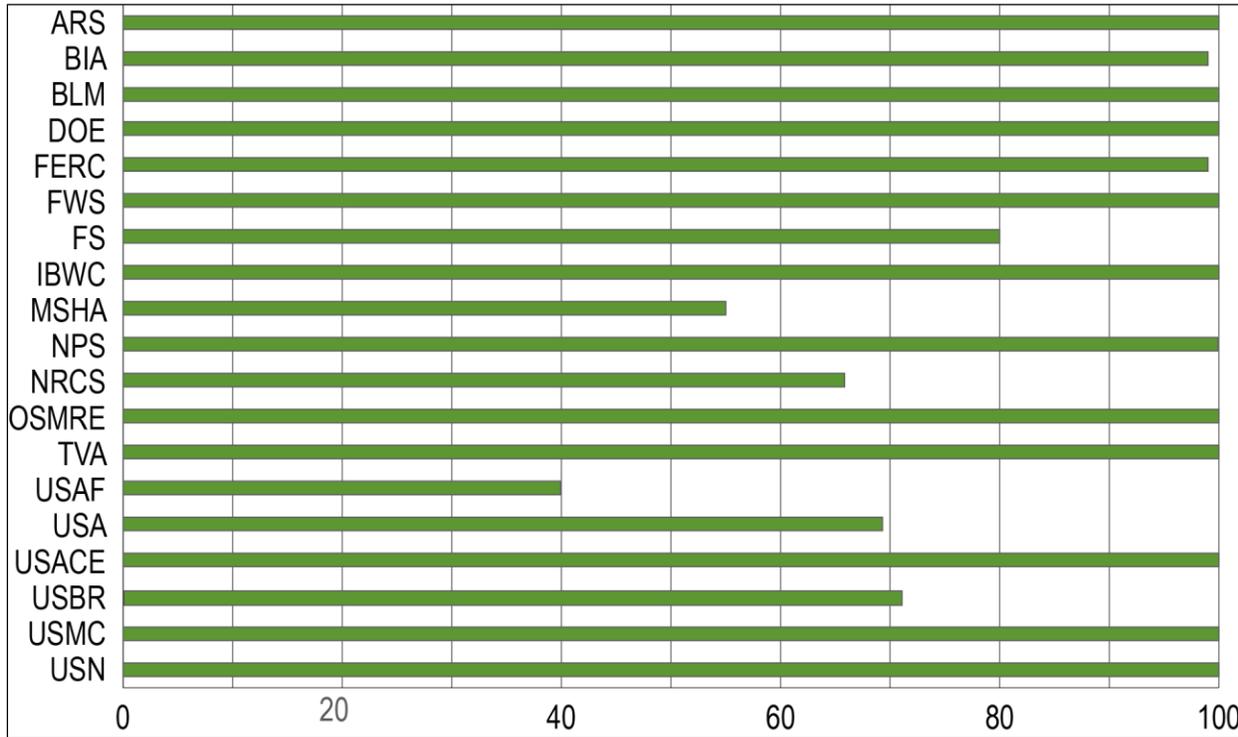


Figure 17 – Percentage of High Hazard Potential Dams with an EAP

Research and Development and Special Initiatives

Activities related to research and development (R&D) and special initiatives during the reporting period are as follows:

Department of Agriculture

- **ARS** – ARS has ongoing research programs focused on dam rehabilitation and dam safety. During the reporting period, scientists have:
 - Conducted research on the impact that step heights and slopes of stepped chutes have on air entrainment, energy dissipation, flow depth (both clear-water and bulked), splash height, and stilling basin design and downstream rock apron,
 - Conducted initial studies to further validate relationships for determining training wall heights necessary to contain flow within converging stepped,
 - Enhanced WinDAM B, a computational tool to predict the timing and discharge flood hydrograph from overtopping failure of earthen embankment dams to include algorithms to predict erosion processes and rates of internal erosion resulting in embankment failures,

- Conducted research on measuring recent sedimentation in lakes, establishing a relationship between earthen levee erosion and wave impact energy, and evaluating impairment of earthen levees for irrigation reservoirs,
 - Provided enhancements to the Geographical Information System Decision Support System for Water Infrastructural Security (DSS-WISE), an integrated decision support system that combines dam/levee breach technology,
 - Developed a breach model, CCHE2D-EB for simulating cohesive embankment breach due to overtopping,
 - Developed advanced geophysical screening tools to delineate and classify compromised locations in the interior of dams, and;
 - Conducted research on the development of acoustic techniques for measuring the influence of grass root structure on the mechanical behavior of soils.
- **FS** – FS reported the creation of an online training module as a companion to FEMA P-911, *The Pocket Safety Guide for Dams*, though the Missoula Technology and Design Center. The University of California at Los Angeles is conducting a Terrestrial Lidar baseline deformation evaluation and an Echo Impact/Thermal IR evaluation to detect voids in concrete on the Hume Lake dam in Region 5.
 - **NRCS & ARS** – NRCS and ARS report the continuation of a major, long-term R&D effort to model erosion processes in earth spillways during flood flows and on embankment dams during overtopping flows. The latest ARS-developed earth spillway erosion models are being incorporated into existing NRCS SITES design software. Various versions of SITES have been distributed and presented at many recent ASDSO conferences.
 - **RUS** – RUS reported no special initiatives during the reporting period.

Department of Defense

- **USAF** – USAF reported no special initiatives during the reporting period.
- **U.S. Army** – The Army at Fort Knox responded that Lower Douglas Dam has an ongoing observation well monitoring program from a previous slide that was repaired. Fort Drum responded that additional measures to update EAPs would be established. Additional personnel will remain certified.
- **USACE** – The USACE Civil Works R&D program directly supports the established business programs and strategic direction of the Civil Works Program including topics of methodologies for monitoring, inspecting, nondestructive testing, and condition assessment of steel and concrete components; evaluation and quantification of failure modes in earth structures resulting from internal and external erosion; improved modeling of hydraulic impacts; and evaluation of multiple facets of our aging infrastructure. Internal research efforts include USACE working with the Dam Safety Interest Group of the Centre of Energy Advancements through Technological Innovation to share research efforts for dam safety with other dam owners around the world.

USACE reports a transition to a risk informed dam safety program leading to the creation of tools for risk assessment. The Modeling, Mapping and Consequences Production Center (MMC) provides hydrologic modeling, consequence estimates, and flood inundation mapping for dams and levees. The MMC supports risk assessments, prioritization, and management decisions for dam safety. USACE has also improved the communication of its findings with those most affected by changes in the operation of USACE dams.

- **U.S. Marine Corps** – USMC reports HQMC designation of a Dam Safety Officer at the Headquarters and identified the Dam Safety Officers at MCB Quantico, VA, and MCB Camp Pendleton CA, the two Marine Corps installations that have inventoried and reportable dams. HQMC issued Dam Safety Inspection Guidance and funded four employees to attend the USACE DAM SAFETY course in December 2014.
- **U.S. Navy** – The Navy reported no special initiatives during the reporting period.

Department of Energy

- **FERC** – As a regulatory agency, FERC is limited in the extent of actual research and development activity it can initiate and fund. Research activities are generally carried out by the federal agencies that own and operate dams, as well as coalitions of private owners such as Electric Power Research Institute and Edison Electric Institute. FERC is active in participating, funding, and co-funding important dam safety research that will benefit the owners of non-federal hydropower projects. Staff participates in the Interagency Research Coordination Conference. FERC staff participates and provides technical expertise to numerous research task forces and committees as well as guidelines and technical criteria development efforts sponsored by federal and private, non-profit organizations, groups and committees. It is anticipated that this research will provide dam owners the capability to assess the susceptibility of their dams to damage from overtopping flood flows. FERC continues to be a founding sponsor and contributor of the National Performance of Dams Program.

FERC has been an active participant in the Centre of Energy Advancements through Technological Innovation. This organization brings electrical utility industry professionals together through focused interest groups and collaborative projects, to identify and address technical issues that are critical to their organizations. Several ongoing research projects are directly related to FERC dam safety mission and as such, FERC is actively assisting in helping to develop these guidelines. FERC has provided staff to help on NDSRB initiatives in regards to new technical manuals that have been developed.

Department of the Interior

- **BIA** – BIA is completing a geodatabase with pertinent information of BIA dams in identifying physical characteristics of dams and the downstream channel slope that will establish threshold flooding values below the dams and the size of flood which would likely cause lethal flooding. BIA has also developed and implemented a dam tender training course.
- **BLM** – BLM reported no special initiatives during the reporting period.

- **FWS** – FWS is completing a draft study, using the historical records of dam failures in the U.S., to identify physical characteristics of dams and the downstream channel slope that will establish threshold values below which a dam failure is unlikely to cause lethal flooding.
- **NPS** – In cooperation with USBR, NPS developed and implemented a day-and-a-half dam tender training course. NPS further implemented a NPS/HDR-developed screening-level risk assessment product for low and significant hazard dams. In addition, NPS has developed more simplified Emergency Preparedness Plans for significant hazard dams.
- **OSMRE** – The *Impoundment Breakthrough Potential Oversight Review* is working through a random sampling of each state's impoundments to determine the levels of risk that currently exist with respect to SMCRA impoundment potential to breakthrough into abandoned underground coal mines in OSMRE's Appalachian Region. The *Blasting Effects on Refuse Impoundment Structures* study intended to install geophones, stress gauges, etc., on coal slurry dams while blasting is being performed in the vicinity. The objective is to examine how compacted coarse coal refuse reacts at different ground vibration frequency and amplitudes.

OSMRE's *Compaction Study* examines achieved compaction with field density testing and laboratory material testing. The *Geotechnical Properties and Flow Behavior of Coal Refuse under Static and Impact Loading-Millions of Tons of Coal* project studied the geotechnical properties and flow behavior of coal waste slurry under static and impact loading. The influence of important parameters such as water content, particle size distribution, viscosity, and magnitude of static and impact loading on the material's ability to flow was investigated.

- **USBR** – USBR reports many R&D initiatives including: (1) NDSP research workgroup activities, (2) enterprise architecture reduce dam safety risk modernization, (3) special initiatives to implement risk analysis and risk assessment techniques, and (4) technology development projects.

Department of Labor

- **MSHA** – MSHA reported no special initiatives during the reporting period.

Department of State

- **IBWC** – IBWC reported no special initiatives during the reporting period.

Nuclear Regulatory Commission

- **NRC** – NRC is completing hazard reevaluation reviews of all of its existing operating nuclear power plant sites as part of its response to the accident at Fukushima in 2011. At some NRC-regulated power plant sites in the U.S., reviews include reevaluation of hazards from failure of upstream dams. NRC works closely with several government agencies to complete these reviews.

NRC, through the USBR, evaluated the technical adequacy and applicability of the publication, "Xu, Y., and L. Zhang (2009), *Breaching Parameters for Earth and Rockfill Dams*, Journal of Geotechnical and Geo-Environmental Engineering, 135(12), 1957-

1970,” for regulatory use by NRC. This publication discusses a new dam breach regression model for earthen and rockfill dams that has not been widely applied in regulatory applications. This effort was completed in 2014: Wahl, Tony L. (2014), “Evaluation of Erodibility-Based Embankment Dam Breach Equations”, Hydraulic Laboratory Report HL-2014-02, U.S. Dept. of the Interior, Bureau of Reclamation, Technical Service Center, Denver, CO.

The NRC has initiated another contract with the USBR to evaluate erosion processes in embankment dams to better understand the magnitude and timing of the flood wave that nuclear power plant sites may see in the event of an upstream dam failure.

Tennessee Valley Authority

- **TVA** – TVA is a member of the Centre of Energy Advancements through Technological Innovation, which brings electrical utility industry professionals from around the world together through focused interest groups which perform collaborative projects to identify and address technical issues that are critical to their organizations. TVA participates in the Dam Safety Interest Group.

TVA participated in the development of the Centre of Energy Advancements through Technological Innovation’s Dam Safety Maturity Matrix, and was one of the first organizations to use the tool to evaluate its Dam Safety Program and develop a gap closure plan to bring the program to the desired level of maturity. DSG&O is currently in the process of developing a weighting structure to use with the Maturity Matrix to establish a measurable and trackable score for the maturity of the River Dam Safety Program.

TVA participates in Joint Federal Dam Safety Risk Management meetings with the USBR, USACE, and FERC to meet the following objectives: (1) develop joint risk methodology documents, (2) develop consistent risk policies, (3) develop similar methods to communicate risk, (4) focus on risk-informed decision making, and (5) develop professionalism and technical competency.

TVA also has a current initiative that involves working collaboratively with the USACE to provide assistance and knowledge transfer for development of processes and procedures to be used operationally for the risk informed decision management system. TVA held a seismic workshop involving industry experts to develop an internal guidance document on techniques for evaluating liquefaction and post-peak shear strength, and to identify gaps in the current state of practice.

TVA's Coal Combustion Product Impoundment Asset Owner has engaged in several initiatives over the reporting period: (1) implemented a new instrumentation and monitoring risk management tool, (2) implemented an intelligent compaction program, (3) partnered with the electric power research institute for CCP research, (4) initiated a best management practices drilling method for obtaining CCP material properties.

TVA completed a special initiative to update river system dam inundation maps by combining dated hydrologic models into a single HEC-RAS model to improve accuracy, provide counties with Geographic Information Systems (GIS) layers for emergency preparedness, and improve consequence analysis abilities. A team from various TVA

organizations formed to develop a GIS framework for implementation at all river system dams.

State Dam Safety Agency Involvement

Activities related to state dam safety (SDS) agency involvement during the reporting period are as follows:

Department of Agriculture

- **ARS** – ARS provided technical information and publications to state agencies upon request with regards to technology transfer of its research results regarding dams. ARS's only dam is located in Oklahoma. Although Oklahoma does not have jurisdiction over federally owned dams, the Oklahoma Water Resources Board Dam Safety Office has been notified out of courtesy of the dam's change in hazard classification following the last inspection. The EAP for the dam is currently being updated. Once edits are complete, the EAP will be provided to the Oklahoma Water Resources Board.
- **FS** – FS reported that due to the small staff associated with dam safety, SDS involvement is a crucial component of the FS dam safety mission. Most Regions have cooperative relationships with states in their region. Region 1 cooperates with the state of Montana on Dam Owner Workshops. Regions 2 and 3 have cooperative relationships with all the states in their regions. In region-3, New Mexico Game & Fish provided funds during FY14 for survey and bathymetric data collection of Canjilon Lake dams at the Carson National Forest. Region 5 has cooperative relationships with state and federal dam regulatory entities with interest in the Pacific Region.

Many SDS agencies provide technical assistance and support primarily to non-federal dams on FS lands providing the non-federal owner a low cost option that enables them to comply with scheduled inspections and maintenance. In most instances, SDS laws have been written to give the regulating SDS agency jurisdictional authority over non-federal dams on federal lands in their respective states.

- **NRCS** – NRCS reported that their policy is to support and complement strong SDS programs, and to establish working arrangements in each state. Headquarters NRCS and ASDSO are in the process of signing a new Memorandum of Understanding (MOU) to regularly exchange information on dam safety activities, provide data to the National Performance of Dams Program, maintain data in the NID, and share research or technology.

The majority of NRCS states work closely with their state agencies and meet routinely to discuss issues and exchange information. NRCS has MOUs with dam safety agencies in 28 states to coordinate on dam safety activities. Most NRCS states continue to meet with a range of state agencies to discuss NRCS aging watershed issues and recent rehabilitation authorities. The NRCS is requesting input from the SDS agencies to assist with the prioritization of dams needing a rehabilitation assessment. An assessment is the first step in the process to determine the need and feasibility to rehabilitate a dam.

- **RUS** – RUS report regulations for approval of financial assistance require that the owner's facility design comply with applicable state regulatory requirements, including dam safety programs.

Department of Defense

- **U.S. Air Force** – The USAFA has executed a MOU with the State of Colorado Division of Water Resources that governs the operation and inspection of its Jurisdictional Dams. The MOU places the responsibility of inspecting and operating the Jurisdictional Dams with the USAFA representatives. Every 5 years, a formal inspection of all structures with State Department of Water Resources representatives is required. Informal inspections with the Department of Water Resources representatives occur on more frequent, but random, intervals.
 - Arnold AFB: The Tennessee Department of Environmental & Conservation monitors the minimum flow of the Elk River Dam to control potential harmful changes to the environment of aquatic life. The TVA works with the Arnold AFB Emergency Management Group to coordinate EAPs.
 - JBMDL is in close contact with the State of New Jersey to coordinate required inspections. New Jersey State and local officials are notified of dam repairs/rehabilitation/construction work.
- **U.S. Army** – West Point responded that New York State Department of Environmental Conservation Dams Safety has recently conducted a site visit to three of their dams: Lake Fredrick, Mine Lake Dam, and Stilwell Dam. In addition, the New York State Dam Safety personnel have made several visits to the Mine Lake Dam construction site.
- **U.S. Army Corps of Engineers** – USACE Districts report that they invite SDS officials to participate in formal periodic inspections. District dam safety personnel have responded to state requests for assistance during emergencies and to other requests for technical assistance. States with dam safety programs are very involved in the design and construction of USACE dams that will be turned over to local sponsors for operation and maintenance. The state dam safety officers review all design documents for these projects and make inspections during construction.

USACE is working on plans to turn over operation of the Portugués Dam to the local sponsor, the Puerto Rico Department of Natural and Environment Resources, which is expected to begin operating the dam in late 2015. USACE is also working closely with ASDSO, the states, U.S. territories, FEMA, and the other federal agencies to update and improve the NID.

- **U.S. Marine Corps** – USMC reported no SDS involvement during the reporting period.
- **U.S. Navy** – The Navy reports local installations communicate with state agencies and when requested, provide inspection report data.

Department of Energy

- **FERC** – FERC reports a regular coordination of dam safety inspections, reviews, and training with a multitude of individuals. The FERC dam safety program maintains a

strong collaborative and cooperative relationship with all SDS agencies. SDS officials are invited to attend all FERC dam safety inspections. All inspection reports and dam safety information is available to the SDS offices upon request. Upon request, FERC has provided dam safety technical assistance to SDS offices on specific state projects.

Department of the Interior

- **BIA** – BIA reports that the Federal Government has a unique relationship with the Native American Nations through the Department, especially through the BIA. States do not generally have any authority over Native Americans without the individual Tribes giving specific authority. The BIA has full responsibility for implementing the SOD Program on Indian Reservations. States are included when appropriate and in consultation with the Tribes involved.
- **BLM** – BLM reports SDS cooperative relationships vary state by state.
 - Montana BLM works closely with the Safety of Dams Section of the Department of Natural Resources and Conservation of the State of Montana and includes them in all EAP updates, exercises, incidents, and coordination of condition assessments on some of the permitted dams. BLM attends all state sponsored training sessions that are within the BLM budget.
 - In Utah, there is no formal agreement in place but since the State of Utah has primacy over all water related facilities and structures, the state performs inspections on all BLM hazard rated dams and include deficiencies and recommended corrective actions. The local BLM District Engineer typically accompanies the State of Utah on dam inspection activities.
 - The Idaho Department of Water Resources controls all water rights within the state, maintaining inventories and inspection, risk assessment, and EAP responsibility on all dams. This includes dams on BLM land that are permitted through rights of way to others. BLM self-inspects its own low hazard dams or accompanies the Idaho Department of Water Resources on BLM-owned dam inspections as available.
 - The New Mexico Office of the State Engineer, Dam Safety Bureau has jurisdiction on the permitted dams located on BLM land and provides BLM New Mexico with the inspection reports. BLM also participates in the New Mexico Watershed and Dam Owners Coalition Workshop that includes many of the permitted dam authorization holders.
 - In Oregon, the Oregon Water Resources Department inspects all permitted dams on BLM lands. They also hold a biennial Dam Safety Conference and annual meeting with the federal partners whom manage dams within the state. The Oregon Water Resources Department is the agency who provides NID numbers for any dams we have.
 - The State of Nevada performs inspections on BLM owned and non-federal dams.

- **FWS** – FWS reported continued invitations to SDS officials to the inspections and provided a copy of all Inspection Reports to the SDS Officer. FWS continues to coordinate with the SDS official on state criteria and FWS design documents for rehabilitation of high and significant hazard dams. FWS continues to invite state and local emergency responders to the EAP exercises and seeks state review and comments on important engineering investigations such a hazard classification re-evaluation.
- **NPS** – NPS reports cooperating with the State of California for the management of risks of the four privately owned dams in Sequoia National Park.
- **OSMRE** – OSMRE has incorporated SDS involvement in multiple ways, including State Regulatory Programs. Specifically, these state regulatory programs must include:
 - Laws providing the state with the authority to regulate coal exploration and surface coal mining and reclamation operations in a manner consistent with SMCRA,
 - State regulations and policies consistent with the federal regulations implementing SMCRA,
 - Plans for implementation, maintenance, and enforcement of an effective permit system,
 - A process for coordinating the review and issuance of SMCRA permits with any other federal or state permitting requirements applicable to the proposed operations,
 - A program to assist small operators in the preparation of permit applications, to the extent federal funds are available for this purpose,
 - A program for the training, examination, and certification of persons engaged in the use of explosives in surface coal mining operations,
 - Sanctions for violations of state laws, regulations, or permit conditions,
 - A process for the designation of areas as unsuitable for surface coal mining operations, and;
 - Sufficient administrative and technical personnel and funding to operate the regulatory program.

Through OSMRE, the Secretary of the Interior reviews the proposed state program to determine its consistency with the Act and the regulatory program established by the Secretary. The public and other federal agencies also have the opportunity to review each state program. States must amend their programs to maintain consistency with revised federal statutes and regulations. OSMRE reviews and processes all proposed amendments in a manner generally analogous to the procedure that applies to the review of initial state program submissions.

OSMRE also included State Regulatory Program Funding which, subject to appropriation, primacy states receive an annual grant for up to 50 percent of the costs of administering their regulatory programs, with 100 percent reimbursement for the costs of

regulating coal mining on federal lands. OSMRE's SDS involvement also includes oversight of State Regulatory Programs as it assumes a monitoring role following approval of a state regulatory program. That role includes both programmatic evaluations and inspections of individual mine sites. SMCRA requires that OSMRE make such inspections as necessary to evaluate the administration of approved state programs. As a general guideline, the directive provides that ten percent of all oversight inspections should be independent inspections.

OSMRE provides extensive training to the states to assist them in implementing their approved programs. OSMRE-state teams jointly develop and revise course offerings to meet state needs and improve state capabilities on a continuing basis. The courses offered by OSMRE represent a rare opportunity to either obtain needed training within the state or to interface with other individuals in the same line of work but with different practical experience.

OSMRE provides technical and financial support in the areas of data processing and computer technology, especially in terms of analysis of permit application data. It represents a significant cost savings to states by allowing them to share expensive software.

OSMRE directly regulates surface coal mining and reclamation activities through Federal Regulatory Programs for Non-Federal Lands on non-federal, non-Indian lands within a state if the state does not adopt its own program. OSMRE currently operates federal programs in 12 states: Arizona, California, Georgia, Idaho, Massachusetts, Michigan, North Carolina, Oregon, Rhode Island, South Dakota, Tennessee, and Washington. Tennessee has active coal mining.

On federal lands, SMCRA requires the Secretary to establish and implement a federal regulatory program applicable to all surface coal mining and reclamation operations taking place on federal lands. Through cooperative agreements, the Secretary may delegate the administration of most surface coal mining requirements for the federal lands program to states with an approved regulatory program. Currently, the Secretary has entered into cooperative agreements with 14 states: Alabama, Colorado, Illinois, Indiana, Kentucky, Montana, New Mexico, North Dakota, Ohio, Oklahoma, Utah, Virginia, West Virginia, and Wyoming.

On Indian Lands, OSMRE directly regulates all surface coal mining and reclamation operations, with tribal input and assistance. Indian tribes may apply for and obtain primacy for the regulation, in whole or in part, of surface coal mining and reclamation operations on reservation land under the jurisdiction of the tribe. After obtaining primacy, the tribe may apply for grants to receive reimbursement for 100 percent of the cost of regulating mines on Indian lands.

- **USBR** – USBR reports continued strong working relationships with SDS agencies. USBR has MOUs with each of the 17 Western States where USBR has facilities. Meetings between USBR and the states are conducted as needed. State representatives may also participate with USBR staff on dam safety inspections. States have participated with USBR on specific issues associated with individual structures, such as issues associated with modifications, reservoir restrictions, and environmental concerns.

Department of Labor

- **MSHA** – MSHA interacts and cooperates with all states when dams are regulated by both agencies. MSHA communicates information related to inspections, incidents, and plan reviews.

Department of State

- **IBWC** – Due to the international character of the dams under the jurisdiction of the IBWC, there is no relationship with any state agency for such activities as inspections, training, or inventories. U.S. and Mexican Sections that the USACE and CONAGUA engineers are the joint technical advisors for these international dams and would perform the 5-year dam safety inspections. All the international dams under IBWC's jurisdiction have been entered into the NID.

Nuclear Regulatory Commission

- **NRC** – NRC maintains a liaison with the dam safety agencies in various states to avoid duplicated effort and inventory data. Since all dams associated with a nuclear power plant are not necessarily related to radiological safety, the NRC and the states coordinated to ascertain that no dams are excluded from the NID. At this time, the NRC has no direct relationship with the various states in terms of training or the performance of inspections.

Tennessee Valley Authority

- **TVA** – TVA's Dam Safety Program maintains cooperative relationships with counties, states, and other response partners that are located in the vicinity of the dams and inundation zones. These entities are considered partners and receive revised EAPs annually. During the annual face-to-face delivery of the EAP, contact information is confirmed, EAP orientation is presented, and the opportunity to discuss questions and suggestions is provided. In addition to maintaining current EAPs, TVA conducts exercises to ensure the effectiveness of the plans. The counties, states, and other response partners participate in these events, which include seminars, drills, tabletops, and functional exercises.

Public Outreach

Activities related to public outreach during the reporting period are as follows:

Department of Agriculture

- **ARS** – ARS reported that an updated EAP will be provided to the Woodward City/County Emergency Manager and the Oklahoma Water Resources Board Dam Safety Office.
- **FS** – FS reports that Region 1 cooperates with the State of Montana on Dam Owner Workshops. FS also reports that the decision to remove Incline Lake Dam (Region 5) from service generated significant public and media interest. FS did question and answer sessions conducted to explain the FS reasoning to remove, FS policy, inundation model results, and other factors that contributed to the decision. In addition, FS reported that the rehabilitation of Hume Lake dam (Region 5) generated considerable interest from stakeholders given its significant recreation value as it was a water source for the Hume

Lake Christian camp. Planning for the rehabilitation effort was closely coordinated with local stakeholders and the local media.

As part of the Cove Lake Dam (Region 8) EAP process, the District Ranger, in coordination with Public Affairs and the Logan County EMS, performed a door-to-door visit to those residents within the Inundation Area. Residents were given a brochure with a description of the dam, the dam classification and hazard potential, and safety plan. Lastly, FS reported that in Region 9, a press release and public meetings were conducted concerning the reclassification of Crane Lake to a high hazard potential dam and the subsequent effort to lower the lake.

- **NRCS** – NRCS developed and released the DamWatch dam monitoring tool for NRCS employees, project sponsors, and state dam safety officials. The deployment of DamWatch included an announcement by USDA Secretary Tom Vilsack and NRCS Chief Jason Weller. NRCS also distributed several news releases related to the deployment of DamWatch nationally and within states. NRCS also participated with the public and many activities related to Dam Safety Awareness Day in 2014 and 2015. NRCS conducted scoping efforts with the public regarding the rehabilitation of several dams.
- **RUS** – RUS has nothing to report on any risk communication and public outreach/awareness activities associated with their dam safety program.

Department of Defense

- **USAF** – USAF has nothing to report on any risk communication and public outreach/awareness activities associated with their dam safety program.
- **U.S. Army** – The Army has nothing to report on any risk communication and public outreach/awareness activities associated with their dam safety program.
- **USACE** – USACE provides risk information on a project basis to affected stakeholders and the public. USACE believes that an informed and engaged public that better understands risk can contribute to the evaluation of risk reduction options, as well as take appropriate personal actions for their safety.
- **USMC** – The USMC has nothing to report on any risk communication and public outreach/awareness activities associated with their dam safety program.
- **U.S. Navy** – The Navy has nothing to report on any risk communication and public outreach/awareness activities associated with their dam safety program.

Department of Energy

- **DOE** – DOE has nothing to report on any risk communication and public outreach/awareness activities associated with their dam safety program.
- **FERC** – FERC reports that their dam safety program works closely with the Office of External Affairs whenever there are dam safety issues requiring public outreach at a project. During major dam safety incidents, FERC often puts project information on their website and updates as the project progresses.

Department of the Interior

- **BIA** – BIA reports that local officials are invited to attend and participate in the EAP exercises. During BIA’s EAP exercises, the staff reaches out and communicates with the local community and public. In addition, BIA staff makes awareness activities which are associated with the BIA’s dam safety program. BIA reports that dam risk issues are always communicated with the public at risk and the local communities.
- **BLM** – BLM reports that local officials are invited to attend and participate in the EAP exercises. BLM ensures that the National Weather Service is notified when any dam safety incident occurs.
- **FWS** – FWS reports that there are currently no public outreach or awareness activities beyond the EAP exercise program.
- **NPS** – NPS reports communication regularly with parks and that dam risk issues are also communicated with the public at risk.
- **OSMRE** – OSMRE reports that SMCRA permits are required prior to commencing surface coal mining operations. During the permitting process the public has access to the permit files and can provide public comment. Secondly, OSMRE has a process whereby a citizen can file a formal complaint against a permit and the complaint can include impounding structures. A citizen complaint can be received by OSMRE staff or it can be submitted through OSMRE's website. The citizen complaints are investigated through OSMRE's enforcement process.
- **USBR** – USBR reports that issues have been raised concerning the need for the modification and the amount of non-construction costs, such as the cost of the engineering design and analysis, environmental analysis, mitigation, construction management, and project approval process. USBR also reports that the downstream public continues to be less organized and less vocal in support of corrective actions than the entities responsible for repayment. At the same time, USBR also reports water user organizations continue to become more knowledgeable and request more detailed and technical information associated with proposed remediation actions. Lastly, USBR reports that some water user groups retain the services of independent engineering and technical consultants to advise them on complex dam safety issues.

Department of Labor

- **MSHA** – MSHA developed a dam safety web page during the reporting period. The page provides information relative to dam safety program contacts, MSHA safety standards, and reference and policy documents.

Department of State

- **IBWC** – IBWC reports that Quarterly Citizens Forum meetings at each field office are held where various issues are discussed with public.

Nuclear Regulatory Commission

- **NRC** – NRC has nothing to report on any risk communication and public outreach/awareness activities associated with their dam safety program.

Tennessee Valley Authority

- **TVA** – TVA reported that they have historically communicated potential flooding risk information about their dams with local emergency management officials and participated in readiness exercises and drills. With the implementation of the dam safety risk informed decision-making process within TVA, communication of risk is becoming a focus of the organization both internally and externally. Dam safety risks are currently estimated based on available engineering information and potential consequences, and dam safety actions to reduce risks and assign urgency are informed by these estimates. Assessing the risk for dam safety involves communicating the risk to those responsible for making decisions to take action, and to stakeholders who share in the risk consequences. TVA regularly participates in National Dam Safety Awareness activities, which perform information outreach to the local communities about the benefits and risks of dams in the community.

TVA uses ads, news releases, and media alerts, along with stakeholder notifications and public meetings, to keep the public informed of dam safety issues and risk. TVA provides dam safety program and issue information to the public on a case-by-case basis. In this reporting period, TVA has conducted the following public outreach activities:

- Public outreach for the Pickwick dam issue includes media releases, media events, and community briefings. TVA also sent flyers of information with vouchers for free weather radios to impacted downstream residents,
- Public outreach for the Boone dam issue includes media releases, media events, town hall meetings, and frequent status updates on the TVA website, and;
- Provided media releases for TVA Dam Safety's Heath Check (stability analyses) program.

Public Concerns

Activities related to public concerns during the reporting period are as follows:

Department of Agriculture

- **FS** – FS's decision to remove Incline Lake Dam (Region 5) from service generated significant public and media interest. Question and answer sessions were conducted to explain the FS's reasoning to remove, FS policy, inundation model results, and other factors that contributed to the decision. Similarly, the rehabilitation of Hume Lake dam (Region 5) generated considerable interest from stakeholders given its significant recreation value. It is also a water source for Hume Lake Christian camp. Planning for the rehabilitation effort was closely coordinated with local stakeholders and the local media.

Lake Mary Dam, a federal dam and water source for Mammoth Lake, CA, retains water and increases storage. The additional storage is a water right for the Mammoth Community Water District, who maintains gates in the Lake Mary dam spillway to store the water. Consequently, the dam does not pass the required design flood. Discussions are currently underway with the Mammoth Community Water District to correct the issue.

- **NRCS** – The partnership nature of NRCS programs in working with private landowners and local sponsors assures adequate procedures for early assimilation of public views into dam planning, construction, and operation.

Several NRCS states have noted strained relationships with project sponsors and watershed districts that have acquired land rights for approved project dams, but are waiting federal funding to begin construction. NRCS estimates that the unfunded federal commitment for new dam construction exceeds \$2 billion. NRCS frequently receives concerns from project sponsors regarding funding for the rehabilitation of dams.

- **RUS** – RUS complies with the National Environmental Policy Act and its requirements for involving the public in review of major federal actions. The public is given the opportunity to participate in the RUS decision-making process by reviewing and commenting on the environmental considerations of each action. RUS also invites public involvement through the rule making procedures used in conjunction with promulgating its regulations, including the regulations regarding dam safety. In addition, for Water and Waste Programs, public notice of the intent to file an application for funding with the agency is required by 7 CFR 1780.19.

Department of Defense

- **USACE** – USACE is proactive in making the public aware of deficiencies, interim measures to reduce risks, and the status of study and repair efforts. Studies are being conducted to determine where project modifications are appropriate. In order to reduce the greatest amount of risk within a constrained budget, USACE completed a portfolio risk assessment. The results of this effort have helped prioritize future work. All USACE projects having dam safety deficiencies have been the subject of public meetings to inform those impacted. An Environmental Impact Statement or Environmental Assessment is prepared, as appropriate, with complete National Environmental Policy Act documentation and is included with dam safety reports. Any recommended alternative has been fully coordinated with outside agencies and any other appropriate resource agency/group.
- **U.S. Navy** – The Indiana Department of Natural Resources requested information on the Greenwood Lake Dam, Crane, Indiana, in February, 2014, asking for a status update. They noted that an extension of Interstate Highway 69 would likely increase the population in the vicinity of Crane, Indiana, and that they wished to know who had jurisdiction over the lake and dam. The Navy advised the Indiana Department of Natural Resources of the Navy jurisdiction, offering to include the state in formal dam inspection activities.

Department of Energy

- **FERC** – There were some inquiries and complaints received from the public following natural flood events involving FERC dams. In most cases, the public was interested in whether the dam contributed to the downstream or upstream flood levels experienced during the flooding.

Following each flood event, Part 12 regulations require a report from the dam owner on the operation of the dam during the flood event. That report, information collected

during a special staff inspection, and independent staff analysis usually form the basis for a staff investigation and conclusions on the operation of the dam. The results of the investigation are available to the interested public through the FERC's Critical Energy Infrastructure Information procedure.

Many FERC projects have public concerns tied to the operation of the project as there are many competing interests involving environmental issues, reservoir levels, recreational issues, etc., that pop up on numerous projects every year. FERC addresses these issues on a case-by-case basis by enforcing the conditions of the license for the project.

Department of the Interior

- **USBR** – USBR continues to consider dam safety activities to be Federal actions, and accordingly, provides opportunities to the public for information and involvement. Public involvement can occur at any time but is generally emphasized during modification corrective action alternatives development and the National Environmental Policy Act process.

The USBR Manual includes requirements for the notification and participation of project beneficiaries in dam safety modification projects. Project beneficiaries are notified of USBR's intent to pursue modification activities and are invited to participate in the process of developing and implementing corrective actions. USBR has received a range of public responses to dam safety activities. The USBR Safety of Dams Act Amendments of 1984, Public Law 98-404, requires 15 percent reimbursement of the cost of dam modifications by project beneficiaries. This reimbursement responsibility sometimes results in difficult negotiations for repayment contracts.

Tennessee Valley Authority

- **TVA** – TVA's plans to close its CCR impoundments or the newly issued CCR Rule may prompt public attention concerning potential groundwater impacts associated with the impoundments. A new unilateral order issued by the Tennessee Department of Environment and Conservation will require TVA to develop Risk Assessments that outline potential environmental impacts. The Risk Assessments could lead to additional public concerns, which, while they may not be directly related to dam safety, may still be associated with the public's perception of the safety of the impoundments.

TVA dams have been modified to meet current design criteria, are being modified to meet current design criteria, or are being evaluated to see if they meet current design criteria and to address major maintenance issues. Within this reporting period, TVA has addressed public concerns regarding the following:

- Geotechnical exploration programs at several dams,
- Probable Maximum Flood Modification Projects at Cherokee, Watts Bar, Fort Loudoun, Tellico, and Douglas Dams,
- Pickwick Dam seismic stability issue,
- Boone Dam seepage issue, and;
- Chickamauga Dam and Lock concrete growth issue.

Non-Federal Dams on Federal Lands

Activities related to non-federal dams on federal lands during the reporting period are as follows:

Department of Agriculture

- **ARS** – ARS has nothing to report about non-federal dams on federal lands. ARS recorded 0 for the number of significant and high hazard potential dams.
- **FS** – Non-federal dams on FS lands fall under special use authorization, ditch bill easement, easement, or FERC and most are regulated by state dam safety agencies and/or FERC. The FS dam safety engineers do not administer non-federal dam permits but provide technical assistance upon request from the permit administrators. Approximately 70 percent of FS's 302 high hazard dams have EAPs in place. SDS agencies and FERC regulate the safety of the majority of these dams.

These dams are inspected according to the SDS policies and FERC dam safety policies. The FS has no authority to regulate easement dams that existed on the lands prior to the FS. Most of these dams are regulated by SDS agencies. There is a small percentage of these dams that exist in states that do not regulate non-federal dams on federal lands. The FS tries to work with these dam owners. Two Regions are working on agreements with their respective states. Region 2 is working on an agreement with Colorado, and Region 5 is working on an agreement with California.

- **NRCS** – NRCS reports providing technical assistance for approximately 200 non-federal NID-size dams on federal land. The non-federal owners of these dams are responsible for coordinating all actions, activities, and permits with responsible federal land agencies.
- **RUS** – RUS has nothing to report about non-federal dams on federal lands. RUS recorded 0 for the number of significant and high hazard potential dams.

Department of Defense

- **USAF** – The USAF has nothing to report about non-federal dams on federal lands. The USAF recorded 0 for the number of significant and high hazard potential dams.
- **U.S. Army** – The Army reported two non-federal dams identified on IMCOM property. Smoots Pond dam at Fort A P Hill, and Alpina Pond dam at Fort Drum. Neither are significant or high hazard potential dams.
- **USACE** – USACE has nothing to report about non-federal dams on federal lands. USACE recorded 0 for the number of significant and high hazard potential dams.
- **U.S. Marine Corps** – The USMC has nothing to report about non-federal dams on federal lands. The USMC recorded 0 for the number of significant and high hazard potential dams.
- **U.S. Navy** – The Navy has nothing to report about non-federal dams on federal lands. The Navy recorded 0 for the number of significant and high hazard potential dams.

Department of Energy

- **DOE** – DOE has nothing to report about non-federal dams on federal lands. DOE recorded 0 for the number of significant and high hazard potential dams.

- **FERC** – FERC has nothing to report about non-federal dams on federal lands. FERC recorded 0 for the number of significant and high hazard potential dams.

Department of the Interior

- **BIA** – BIA has nothing to report about non-federal dams on federal lands. BIA recorded 0 for the number of significant and high hazard potential dams.
- **BLM** – BLM reported 124 high hazard potential dams. The number of high hazard potential dams with EAPs is unknown. However, BLM continues to improve communication with states on the management of non-owned dams.
- **FWS** – The NID includes over 5,000 non-federally owned dams that are identified as being on federal agency land (or property). There is one non-federally owned dam on FWS land and it is neither a significant nor high hazard dam; however, it does not have an EAP. The SDS Program inspects the dam every six years.

The FWS has policies in place to require owners of non-federal dams on FWS property to perform dam safety activities such as inspections, O&M, repairs and emergency preparedness. However, these policies have not always been enforced during land acquisition proceedings. FWS is currently negotiating with the Colorado Dam Safety Program to complete a MOU.

- **NPS** – NPS reported 6 non-federal high hazard potential dams on federal land with 5 of them having EAPs in place. NPS also has 1 significant hazard potential dam on their agency’s land. NPS also reports that FEMA or states may have initial regulatory authority but the NPS has responsibility to ensure these structures do not harm the park. Most of the dams are inspected every year. NPS is negotiating with the State of California and Southern California Edison for regulation of the Sequoia and Kings Canyon dams. Other dams are fully regulated by the state and/or FERC.
- **OSMRE** – OSMRE has nothing to report about non-federal dams on federal lands. OSMRE recorded 0 for the number of significant and high hazard potential dams.
- **USBR** – USBR has nothing to report about non-federal dams on federal lands. USBR recorded 0 for the number of significant and high hazard potential dams.

Department of State

- **IBWC** – IBWC has nothing to report about non-federal dams on federal lands. IBWC recorded 0 for the number of significant and high hazard potential dams.

Nuclear Regulatory Commission

- **NRC** – NRC has nothing to report about non-federal dams on federal lands. NRC recorded 0 for the number of significant and high hazard potential dams.

Tennessee Valley Authority

- **TVA** – In the FY12–13 Biennial FEMA Report by TVA, TVA reported on 4 additional non-federal dams on federal lands (the West Kentucky Slurry and Freshwater lakes). The lands on which those impoundments are situated was sold to the Heritage Coal Company

(owner of the impoundments) in 2015, therefore, those impoundments no longer sit on federal lands and are thus not included in this report.

TVA reports only two significant hazard potential dams on their agency's land and reports that the agency does not regulate the safety of these dams. The use of land on which the dams sit, and the land submerged by their respective impoundments, is provided by TVA to the State of Tennessee though an easement, while the surrounding land is owned by the State. TVA transferred responsibility for management of the dams to the State at the time of sale. TVA does maintain the right to inspect the dams at any time, and the right to reacquire the property should the State fail to maintain the dams properly or comply with other conditions of the conveyance, as stipulated in the transfer documents.

Additional Observations

Additional observations during the reporting period are as follows:

Department of Agriculture

- **ARS** – ARS has nothing else to report on the NDSP that was not already addressed.
- **FS** – FS reports that one of their biggest challenges of the Dam Safety Program within the FS is the lack of resources. Many regional dam engineers are shared over 2 regions and have multiple program responsibilities other than dam safety. Historically, the FS budget has not included a specific or separate line item for dams or dam safety. Dam operation and maintenance is funded out of the facility budget, this also includes fire, administrative, and other facilities.

Major maintenance or rehabilitation (greater than \$250,000) competes for funding in the FS Capital Improvement Process. Facility budgets have dropped over the past years making the capital improvement process very competitive. Local FS managers distribute funds and personnel resources based upon needs and location conditions. With the increasing age of the dams portion of the infrastructure, there is a need for heightened awareness of potential dam failures and its impacts and consequences.

- **NRCS** – NRCS has nothing else to report on the NDSP that was not already addressed
- **RUS** – RUS has nothing else to report on the NDSP that was not already addressed

Department of Defense

- **USAF** – The USAF has nothing else to report on the NDSP that was not already addressed.
- **U.S. Army** – The Army has nothing else to report on the NDSP that was not already addressed.
- **USACE** – USACE reports that awareness of the current condition of dams, the risks they pose, and the undelivered benefits is critical to understanding the larger infrastructure issues facing the nation. USACE suggests that additional investments in dam rehabilitation will help stem the growth of risks and likelihood of a major dam incident, and enable dams to deliver the multiple benefits originally intended, including the second

and third order effects of economic stability and viability they offer communities. USACE believes that at the current rate of investment, it will take five to six decades to address the safety concerns they know about today, and much longer if the inevitable degradation and risk growth continue.

USACE recommends legislative changes to the NID to improve risk awareness and the accessibility and visualization of data related to dams. Specifically, reauthorization should include increased funding for bringing the NID into a full geospatial platform. USACE also suggest the inclusion of geospatial data on inundation mapping for dams, where available, and that the funding for the NDSP be broken out of the current Fund 90 into a separate line item in FEMA's budget to gain transparency and advocacy by the NDSRB for budgets, appropriations, and expenditures.

USACE also recommends support and funding for the requirements of a National Levee Safety Program, including the direction to study the feasibility of a joint National Dam and Levee Safety Program, and for the implementation of the National Levee Safety Program. USACE views these actions as related to and complimentary of the NDSP.

- **U.S. Marine Corps** – USMC has nothing else to report on the NDSP that was not already addressed.
- **U.S. Navy** – The Navy is publishing a revised policy document for Navy's Dam Safety Program in their Business Management System, planned for publication in the first quarter CY16.

Department of Energy

- **DOE** – DOE has nothing else to report on the NDSP that was not already addressed.
- **FERC** – FERC has nothing else to report on the NDSP that was not already addressed.

Department of the Interior

- **BIA** – BIA reports that their SOD Handbook has been approved and was released on August 22, 2014. The new SOD Handbook replaces the SOD Handbook published in May 2002.
- **BLM** – BLM has nothing else to report on the NDSP that was not already addressed.
- **FWS** – FWS reports that resources for dam safety are extremely lacking as they are for many dam safety programs. The majority of the dams (70 percent) owned by FWS are small, low hazard dams. Many of these impoundments barely qualify as dams based on the current and long-standing definition of a dam. Small impoundments that qualify as dams based on height and/or storage volume obligate the owners as well as some regulators to perform dam safety functions with little likelihood of providing significant dam safety benefits or any genuine risk reduction.

Given the minimal benefits derived from dam safety inspections/evaluations of these very small "dams" and limited resources, the current definition of what constitutes a dam should be assessed by the NDSRB and be either confirmed, or hopefully, revised to reflect genuine risk. This will release owners and regulators from the unnecessary burden

of performing dam safety actions on dams too small to gain benefit commensurate with the level of effort.

- **NPS** – NPS has nothing else to report on the NDSP that was not already addressed
- **OSMRE** – OSMRE has nothing else to report on the NDSP that was not already addressed
- **USBR** – USBR has nothing else to report on the NDSP that was not already addressed.

Department of Labor

- **MSHA** – MSHA has nothing else to report on the NDSP that was not already addressed

Department of State

- **IBWC** – IBWC reports that in reference to security, both Sections of the IBWC work diligently in order to secure their respective projects. IBWC is continuously working to improve the security at each of the IBWC dams along the U.S./Mexico border. Threat analyses and vulnerability assessments have been conducted at Retamal, Anzalduas, International, and American dams this year. There are several additional security enhancement projects projected over the next several years for the Falcon and Amistad facilities. Anzalduas Dam will go through a security enhancement overhaul in FY16. The Anzalduas security enhancements will total roughly \$500,000.

The Safety and Security Division has implemented a safety campaign for the entire agency and has focused on operational safety at all IBWC facilities responsible for operating dams. This campaign includes training, awareness, and inspections of the facilities. The initial inspections and training will be completed prior to FY16. The campaign will continue beyond the end of the year with recurring training and continuous awareness.

Nuclear Regulatory Commission

- **NRC** – NRC reports that as a result of the nuclear accident at the Fukushima site in Japan in 2011, nuclear power plant owners have been reassessing the flooding hazards at their sites. The NRC is currently reviewing these flooding hazard re-evaluations. The NRC is expending approximately 4.2 FTE on this effort (0.1 FTE for Administrative and 4.1 FTE for technical resources). In addition, the NRC is spending approximately 2.6 million contract dollars in support of this effort.

Tennessee Valley Authority

- **TVA** – TVA has nothing else to report on the NDSP that was not already addressed.

Related Programs

Department of Homeland Security Programs and Initiatives

Presidential Policy Directive (PPD)-21, Critical Infrastructure Security and Resilience, advances a national unity of effort to strengthen and maintain secure, functioning and resilient critical infrastructure. PPD-21 establishes national policy on critical infrastructure security and resilience. This is a shared responsibility among the federal, state, local, tribal and territorial entities, and public and private owners and operators of critical infrastructure (herein referred to as “critical infrastructure owners and operators”). This directive also refines and clarifies the critical infrastructure-related functions, roles, and responsibilities across the Federal Government, as well as enhances overall coordination and collaboration. Federal SSAs are responsible for the 16 sectors defined. As such, the Office of Infrastructure Protection (IP) within DHS serves as the Sector Specific Agency (SSA) for the Dams Sector.

The Dams SSA actively collaborates with sector stakeholders (including federal, state, local, tribal and territorial partners) to identify and implement programs that enhance the protection and resilience of dams across the Nation. This collaboration occurs under the auspices of the Critical Infrastructure Partnership Advisory Council (CIPAC). The CIPAC framework provides a forum that allows government and private sector partners to conduct effective information sharing and coordinate a broad spectrum of infrastructure protection activities across all sectors. As part of the CIPAC framework, the Dams Sector Coordinating Council and Government Coordinating Council constitute a focal point for public-private coordination of infrastructure protection efforts for dams and related facilities.

Protective programs and resilience strategies encompass a wide spectrum of efforts, including implementing active or passive countermeasures and improving security protocols, hardening or retrofitting facilities to improve their performance under extreme loadings, implementing cyber-security measures, building operational redundancy, implementing back-up systems to minimize disruptions, implementing consequence-mitigation programs, conducting exercises, enhancing business continuity planning, and designing and planning multi-scenario restoration and recovery procedures. Effective information exchange among owners, regulators, and their associated communities can also contribute to enhancing the protection and resilience of the Dams Sector.

The collaborative partnership among government and non-government entities across the Dams Sector has resulted in the development of a variety of tools and products focused on improving protection and enhancing resilience. For example, sector partners collaborated to develop the Dams Sector-Specific Plan, 2015, which guides and integrates not only the sector’s efforts to secure and strengthen the resilience of the sector, but also the sector’s contributions to national critical infrastructure security and resilience as set forth in PPD-21. In addition to the Dams Sector-Specific Plan, the Dams Sector Security Guidelines, 2015, was developed which consolidates effective industry security practices into a framework to help owners and operators select and implement security activities and measures that reduce risk; improve the protection of personnel, public health, and public safety; and reinforce public confidence. Specifically, the Guidelines outline various strategies and methods to help select and implement security activities and measures appropriate to a facility. Each section of the Guidelines focuses on a distinct

aspect of sector security practices — physical, cyber, personnel, and information — and includes industry recognized best practices and means by which to obtain additional information.

Other important activities have focused on information sharing and outreach efforts. Such as the development of the Dams Sector Information Sharing Resource Guide, 2015, which provides sector and cross-sector partners with information sharing practices, products, tools, and resources that are recognized by the Dams Sector Information Sharing Environment. This document provides pertinent information that will enable effective information exchange between government, public, and private sector partners of the Dams Sector community.

In addition, field delivered courses were offered by the Dams SSA. The instructor-led Dam Security and Protection Technical Seminar (L260) was conducted three times at various locations across the Nation during this reporting cycle. This course provides owners/operators, state dam safety officials, and other sector stakeholders with information pertaining to security, protection and crisis management issues in order to improve understanding of dam-related security and protection concepts. The goals of this seminar were to help integrate security, protection, and resilience strategies into stakeholders' respective risk management strategies, and leverage existing Dams Sector reference materials to provide a depth and breadth of expertise and knowledge regarding dam security and protection.

FEMA and the Dams SSA conducted one instructor led Consequences of Dam Failure Course (L261) during this timeframe, which provides dam owners, professional staff of the dam safety programs, and emergency managers at the local, state, tribal, territorial, and federal levels, as well as dam safety, dam security, and incident management personnel for the private sector, with information needed to define and estimate consequences for dam failure scenarios. The objectives of this course are to help participants with the concepts of how consequence assessment is an important part of risk management strategies, how to establish initial priorities using consequence data, and how consequence estimation plays an important role in emergency preparedness efforts.

To ensure that all dam stakeholders have access to information related to protective programs, sector partners collaborated with the Dams SSA to update a series of handbooks, guides, and associated web-based training modules focused on security awareness, protective measures, and crisis management. Reference documents and training resources are accessible through the Homeland Security Information Network (HSIN)-Critical Sector Dams Portal.

To support the implementation of Executive Order 13636 (Improving Critical Infrastructure Cybersecurity), a Dams Sector Cybersecurity Working Group was established under the direction of the Dams Sector Government and Sector Coordinating Councils. The ongoing activities of this Working Group support the implementation of national policy to effectively integrate both physical and cybersecurity initiatives at the national level as defined by PPD-21 and the Executive Order.

Federal partners work in collaboration to continue research on the vulnerabilities associated with embankment dams (blast impact and mechanical excavation analyses), concrete dams (waterside blast impact), and spillway gate structures (land and water-side blast impact and mechanical analysis). The research also includes designing and testing of risk mitigation measures that can potentially be utilized by sector partners for risk reduction at their assets.

The Dams SSA responded to requests for information and conducted outreach to real world incidents. Comprehensive facility security reviews and exercises resulted in improvements in security posture at critical Dams Sector facilities. Automated alerts from the HSIN keeps sector partners informed of suspicious activities, incidents, and developing threats across the Dams Sector and interdependent sectors.

Federal Emergency Management Agency

In addition to the initiatives set forth directly by FEMA's NDSP, there are a number of programs within FEMA that provide resources and services that support dam hazard risk mitigation, preparedness, response or recovery. The following is a summary of some of those efforts:

Hazard Mitigation Assistance

Hazard Mitigation is any action taken to reduce or eliminate long term risk to people and property from natural disasters. Hazard Mitigation projects may include, but are not limited to, buy-outs, elevations and safe rooms. Currently, FEMA administers three programs that provide funding for eligible mitigation projects that reduce disaster losses and protect life and property from future disaster damage. The three programs are the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the Pre-Disaster Mitigation Program.

Public Assistance Program

The Public Assistance (PA) Program provides grants to state, local, and federally recognized tribal governments and certain private non-profit entities to assist them with their response to and recovery from disasters. Specifically, the program provides assistance for debris removal, emergency protective measures, and permanent restoration of infrastructure. The PA project categories include Category A: debris removal; Category B: emergency protective measures; Category C: roads and bridges; Category D: water control facilities; Category E: public buildings and contents; Category F: public utilities; and Category G: parks, recreational, and other facilities. In FY14, FEMA PA funded 139 dam-related projects out of 43 different disaster declarations located in 28 states. In FY15, FEMA PA funded 51 dam-related projects out of 30 different disaster declarations located in 21 states. In total, 32 states received FEMA PA funds for dam-related projects totaling approximately \$27.5 million federal share from FY14 to FY15. Projects included debris removal on or around dams, inspections of dams, and repair/restoration of dams.

ASDSO Report to the NDSP Biennial Report

The Association of State Dam Safety Officials is a national non-profit organization dedicated to improving dam safety in the U.S. Preventing dam disasters and working toward a future where all dams are safe is the vision of this 30-year old association. ASDSO has made significant achievements through pursuing a cohesive national approach to dam safety, raising awareness, providing technical training, establishing forums for information exchange, facilitating financing for dam safety activities, and supporting its members. ASDSO's role as the primary advocate for state dam safety programs continues to be of critical importance.

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, coordinated research, developing a model state dam safety program, 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. During the last two years, ASDSO has made strides toward its goals. Included is a snapshot of their activities:

Track State Dam Safety Program Improvements and Dam Data

ASDSO continued to collect data from the states from 2013 to 2015. In conjunction with USACE, which houses the NID, state performance data was tracked. This data was analyzed by ASDSO and trend reports were generated.

Each state received a “report card” or “dashboard” analysis of their program performance; comparing the state to nationally agreed-upon measures including number of inspections, number of EAPs on file, and state budgets for dam safety.

Expand Awareness and Educational Campaigns¹⁶

In an effort to bridge the gap between public awareness/education, owner outreach, and legislative advocacy, two new booklets were completed between 2012 and 2014 to focus on extreme rainfall events and their effect on dams and public safety. The series of outreach booklets are called Living Near Dams, and can be accessed in e-book form at www.livingneardams.org.

ASDSO’s training program includes national and regional conferences, classroom courses, and webinars on technical topics. More than 5,000 people have been trained in the past 2 years through ASDSO’s Dam Safety Resource Center. The Resource Center is a one-stop-shop for information on dam safety engineering and related topics. The bibliography holds more than 14,000 records and is searchable on the ASDSO website. Recently, ASDSO has taken on administration of the new, FEMA-funded website on dam failures lessons learned, www.damfailures.org. This website will be a part of the Resource Center. ASDSO houses survey data on state technical criteria and topics of interest to state dam safety programs. More than a dozen surveys are complete and available at the ASDSO website.

Dam Owner Education Program

It is essential that dam owners, especially those owning small, non-federal or non-federally regulated dams, are educated about their responsibilities. One way that ASDSO reaches out to owners is through its workshop program. In FY15, ASDSO continued to increase the number of dam owners trained throughout the U.S.

¹⁶ This aligns with Goal 4, Objective 10 of the NDSP Strategic Plan.

Workshops Held Recently

- April 2014 – Arkansas, South Dakota
- June 2014 – Minnesota
- October 2014 – Georgia
- May 2014 and 2015 – Wisconsin

More information on ASDSO’s activities can be found in their Annual Report for 2014–15.¹⁷

United States Society on Dams

The United States Society on Dams (USSD) is a world class organization dedicated to advancing the role of dam and levee systems and building the community of practice.

USSD, as the United States member of the International Commission on Large Dams, is dedicated to:

- **ADVOCATE:** Champion the role of dam and levee systems in society.
- **EDUCATE:** Be the premier source for technical information about dam and levee systems.
- **COLLABORATE:** Build networks and relationships to strengthen the community of practice.
- **CULTIVATE:** Nurture the growth of the community of practice.

The International Commission on Large Dams (ICOLD) is a non-government International Organization which provides a forum for the exchange of knowledge and experience in dam engineering. ICOLD leads the profession in setting standards and guidelines to ensure that dams are built and operated safely, efficiently, economically, and are environmentally sustainable and socially equitable. The ICOLD membership consists of 96 countries worldwide.

For over 30 years, USSD has served as a partner with the National Dam Safety Program in implementing the program’s goals and objectives. USSD’s 2014-2018 Strategic Plan, which identifies the four Imperatives to advance the Mission of the Society, is aligned with the goals and objectives of the National Dam Safety Program. The leadership of USSD continues to pursue the initiatives and goals identified in the Strategic Plan. Some select accomplishments for each of the four Imperatives during 2015 are summarized below:

- Cooperated with the USBR and USACE to conduct the *Workshop on Best Practices in Dam Safety Risk Assessment*.
- Planned and conducted an annual meeting and conference in Louisville, Kentucky, including focused training in the areas of Risk Assessment Tools Applied to Coal Tailings Dams and Ash Impoundments; Environmental Permitting and Public Acceptance for Dam Projects; Dams on Karstic Foundations; Current Uses of Roller-Compacted Concrete in Dams; and Underwater Investigation and Construction.

¹⁷ www.damsafety.org/media/Documents/PDF/Annual%20Reports/ASDSO%20FY15Annual%20Report.pdf

- Planned and conducted a fall 2015 USSD Workshop Series in Oakland, California, including focused training in the areas of Construction Risk Management and Cost Estimating; Dam Safety Instrumentation; Decommissioning of Dams; and Levee Safety.
- Developed the program for an International Symposium on the Mechanics of Internal Erosion for Dams and Levees to be held August 2016 in Salt Lake City, Utah.
- Developed the program for collaboration with the International Association for Hydro-Environment Engineering and Research (IAHR) for the 6th International Symposium on Hydraulic Structures to be held June 2016 in Portland, Oregon.
- Participated with the Interagency Committee on Dam Safety (ICODS) in a process to update the Federal Guidelines for Dam Safety.

Much of the work and stewardship of USSD is accomplished through the USSD Committees, and all USSD members are encouraged to participate. As committee chairs and members work to advance the USSD Strategic Plan, there are many opportunities for both seasoned experts and young professionals to work side by side in building the community of practice.

Committees organize the technical program for each Annual Meeting and Conference, and for a variety of workshops and symposia throughout the year. Committees prepare reports and papers for publication by USSD, and assist the associated ICOLD technical committees in preparing ICOLD Bulletins.

During 2015, all USSD Committees produced updated Charters, which were approved by the Board of Directors. Each Charter includes Terms of Reference, Responsibilities, Goals and Membership consistent with the USSD Strategic Plan, goals, and objectives. Some select accomplishments of the USSD Committees during 2015 include:

- Published Guidelines for Dam Decommissioning Projects in July 2015, available online at www.ussdams.org/15Decommissioning.pdf.
- Served in committee leadership role for the publication of ICOLD technical bulletin on Global Climate Change related to Dams, Reservoirs, and Related Water Resources
- Established a new committee on Public Safety and Security for Dams, including the implementation of a Public Safety around Dams Recognition Program
- Implemented a specialized Young Professional track at the USSD annual meeting and conference to facilitate engagement of young professionals within the USSD organization and cultivate the growth of the community of practice. Introduced of a sponsorship program to support student participation in USSD activities. Establish Young Professional Vice-Chair positions to all committees to provide opportunities for professional growth and coaching.

Conclusion

While we classify disasters according to their natural or manmade phenomena, the actual disaster is the inability of a community to cope with the effects. Periodically, we have learned this lesson through the harm inflicted upon us by the flooding that leads to a dam failure.

Buffalo Creek Dam taught the country the importance of proper inspection and preparation—that applying the right practices will help bolster the country’s safety and stability. Consequently, FEMA was predicated upon the belief that the United States should prioritize resources to mitigate the effects of such events. However, days after this biennial period ended, flooding ravaged South Carolina. There are 180 state-regulated high hazard potential dams in the state.

From October 1–5, 2015, heavy rainfall over parts of South Carolina resulted in the failure of more than 30 state-regulated dams, one federal dam, two sections of the levee adjacent to the Columbia Canal and many unregulated dams. The October events grimly reminded the Nation that, while substantial progress has been made over a handful of decades, there is still more work to be done and more resources to commit to safeguarding American lives and property.

A Dam Task Force was deployed by FEMA Mitigation in support of recovery efforts. The group was tasked with assessing the dams while leveraging their expertise and providing insights to the State of South Carolina, FEMA HQ, FEMA Region IV and Joint Field Office (JFO) leadership. The Dam Task Force’s deployment opened up the possibility for exploring these neglected topics, and, as such, there are many dam-related lessons that can be learned from this disaster. This is an opportunity to document these failures, and provide recommendations that can inform and enhance recovery efforts in South Carolina and dam risk management activities in other states.

The events in South Carolina are an example of what could happen across the United States and retrospectively allows the NDSP to confirm the sustainability of the dam safety conventions it advocates for and puts into practice moving forward. The major achievements that have been outlined throughout this report have protected the nation and its citizens. However, South Carolina also acts as a stark reminder that resources must be expended to uncover the measures necessary to improve dam coordination, resilience and communication for reducing future dam risks.

While the data from this period are encouraging in many areas, the larger picture of dam safety continues to pose challenges despite the past two years having seen a noticeable increase in the construction and implementation of EAPs. FEMA, as the lead agency for the NDSP, strongly believes that the driving force behind the NDSP is that many Americans are living below structurally deficient, high hazard potential dams; Americans are unaware of the risk; there is no plan in place to evacuate them to safety in the event of a failure; or there is a plan in place but they are not aware of it. FEMA plans to address these challenges through the development and implementation of the following activities:

Improve coordination between the FEMA Regions and State Dam Safety Offices.

Coordinate with communities to ensure dam risk is adequately included in State and local hazard mitigation plans.

Work with other Federal Agencies to improve how dam risk information is shared.

Implement a cohesive strategic outreach and communication effort to advance mission of NDSP in accordance with the Section 11 (Public Awareness and Outreach for Dam Safety) 2014 NDSP Reauthorization.

Develop and deliver products and services targeted to State and local communities that address specific dam risk management challenges. Products and services could include dam breach consequence assessments; identifying high risk dams and support the development of community and Regional preparedness, response, recovery, and mitigation strategies for those risks; evacuation planning; EAP/EOP exercise planning; training on early warning systems; dam owner training and workshops; etc.

Continuing the forward progress made in recent times will ensure that each individual component of the USA's dam inventory will remain an asset to our Nation economically while also safeguarding American lives. Over the next couple of years, NDSP plans to create and implement a risk-informed full-community enterprise approach that ensures the deficiencies stated above are targeted and eliminated.

IV. Appendix

Acronyms

ACSIM	Assistant Chief of Staff for Installation Management
ARS	Agricultural Research Service
ASDSO	Association of State Dam Safety Officials
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CNIC	Commander Navy Installations Command
DHS	Department of Homeland Security
DOE	Department of Energy
DOL	Department of Labor
EAP	Emergency Action Plan
EMI	Emergency Management Institute
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FS	Forest Service
FTE	Full-time Employee
H&H	Hydraulic and Hydrology
IBWC	International Boundary and Water Commission
ICODS	Interagency Council on Dam Safety
IMCOM	Installation Management Command
IP	Office of Infrastructure Protection
MSHA	Mine Safety and Health Administration
NDSP	National Dam Safety Program
NDSRB	National Dam Safety Review Board
NID	National Inventory of Dams
NPS	National Park Service
NRC	Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
O&M	Operations and Maintenance
OSMRE	Office of Surface Mining Reclamation and Enforcement
PA	Public Assistance
PPD	Presidential Policy Directive
RUS	Rural Utilities Service
SMCRA	Surface Mining Control and Reclamation Act
SSA	Sector Specific Agency
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
USAFA	U.S. Air Force Academy
USDA	U.S. Department of Agriculture
WRRDA	Water Resources Reform and Development Act



FEMA

FEMA P-1067
Catalog No. 15235-1