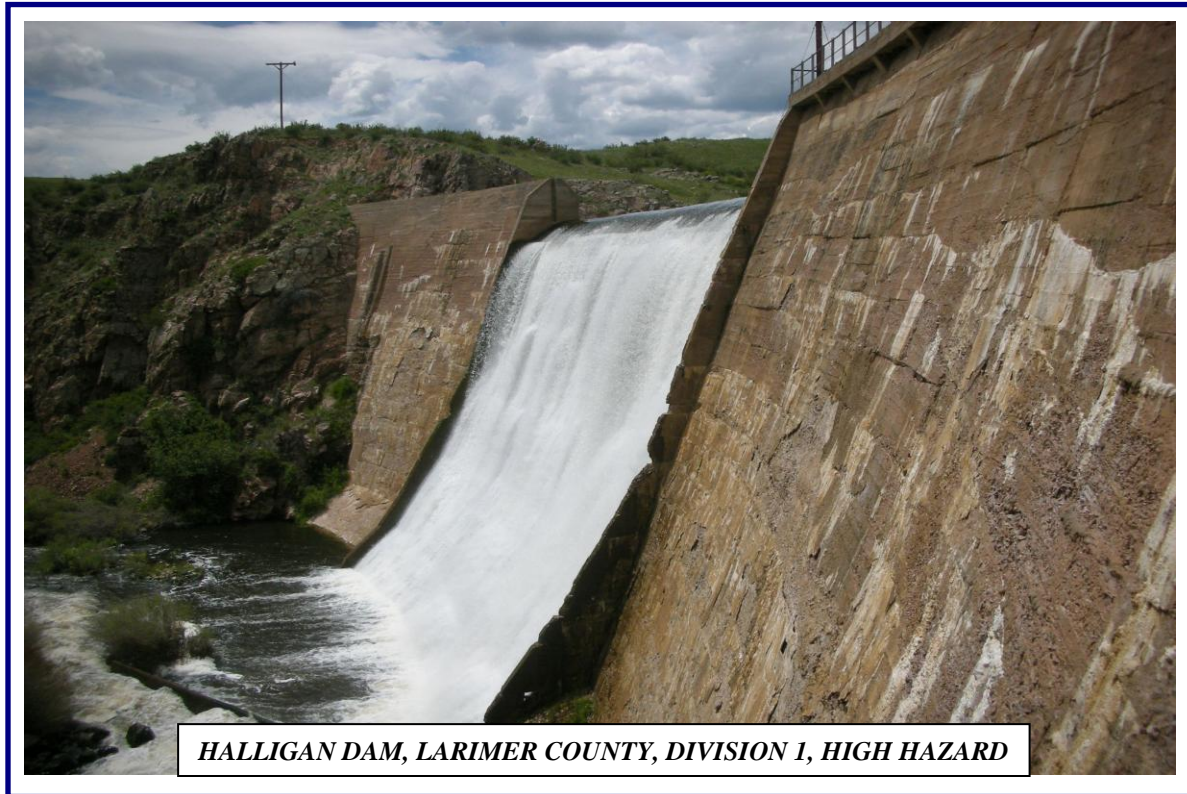


**State Engineer's
25th Annual Report on Dam Safety
to the
Colorado General Assembly
Water Year 2008-09**



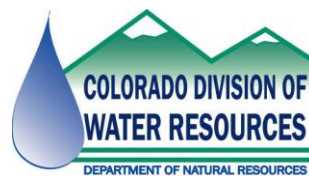
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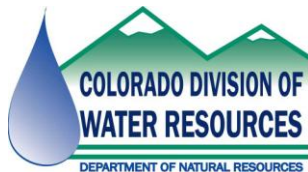
**State Engineer's
25th Annual Report on Dam Safety
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**For
Water Year 2008-09**

May 2010

Prepared by

**Colorado Division of Water Resources
Office of the State Engineer**



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EXECUTIVE SUMMARY

This report is submitted in compliance with Section 37-87-114.4, C.R.S., concerning the dam safety activities of the State Engineer and the Colorado Division of Water Resources relating to Sections 37-87-105 to 37-87-114, C.R.S. The reporting period for this report is from November 1, 2008 through October 31, 2009 (WY 2008-09) to better represent the dam safety activities over a full calendar year.

The mission of the Colorado Division of Water Resources' Dam Safety Branch is to prevent the loss of life and property damage and protect against the loss of water supplies due to the failure of dams in Colorado. The Dam Safety Branch accomplishes that mission primarily through Safety Evaluations of Existing Dams (SEED) to determine the safe storage levels of reservoirs within the state. Additional program tools include a comprehensive set of regulations, policies, and procedures for the design, construction, and maintenance of dams; the safe operation of reservoirs; and emergency preparedness planning.

The Dam Safety Branch is managed by the State Engineer in accordance with Title 37, Article 87 of Colorado Revised Statute (C.R.S.) and the Livestock Water Tank Act, Title 35, Article 49 of C.R.S. The program is implemented by the State Engineer through the Dam Safety Branch and Water Division field offices. The Colorado Dam Safety Branch oversees a total of about 2,900 dams with 1,930 dams of jurisdictional size. Of these, about 1,802 are non-federal dams. Of the non-federal dams, approximately 614 (310 High Hazard and 304 Significant Hazard), or about 35 percent of the total non-federal dams are classified as dams that, in the event of a failure, would be expected to cause loss of life and/or significant property damage within the flood plain areas below the dams.

For WY 2008-09, the Dam Safety Branch accomplished a number of the goals and objectives identified in the past annual report. Through the diligent field observations of dam safety engineers statewide, several near-failure incidents were acted upon in time to diffuse potentially dangerous situations and possible loss of life. As a direct result of these actions, no loss of life or significant property damage occurred in Colorado in WY 2008-09. This is attributed to the increased awareness and responsibility of the dam owners for their dams, including emergency action planning and to the enforcement of the regulations, policies, and procedures by the Division of Water Resources.

During WY 2008-09, the State Engineer's Office approved one plan for a new dam and 31 plans for alteration, modification, or enlargement of existing dams. Hydrology studies for five dams were also approved for determination of the inflow design flood for spillway adequacy or design. The estimated cost of construction for the submitted plans was over \$103.7 million.

During WY 2008-09, a total of 533 dam safety inspections and 159 construction inspections were conducted by dam safety engineers for a total of 692 inspections. In addition, 122 follow-up inspections were performed. At the conclusion of this reporting period, there are a total of 168 dams restricted from full storage due to inadequate spillways and various structural deficiencies such as significant leakage, cracking and sliding of embankments. The restrictions provide risk reduction for the public and environment until the deficiencies identified are corrected. Although many dams were repaired and removed from the restricted list within the last year, a number of dams were also added to the restricted list. More specifically, 2 High Hazard; 4 Significant Hazard; 16 Low Hazard structures dams were restricted amounting to a

total of 2,602 acre-feet of storage restricted. This reporting period showed a slight decrease in the number of dams on the restricted list by three dams and the storage volume of the restrictions increased by approximately 2,436 acre-feet.

The Dam Safety Branch has been able to acquire and maintain a full staff of experienced professional engineers, and has adequate statutes, regulations, policies, and procedures to implement and carry out the program. The Dam Safety Engineers continue to participate in vital state and national dam safety and security activities.

The following is a brief summary of Branch activities during WY 2008 - 09 in addition to the dam safety activities previously mentioned:

1. A total of 13 dam incidents occurred this reporting period requiring emergency responses and investigations by the Dam Safety Branch.
2. The Dam Safety Branch engineers attended several technical trainings and seminars to maintain a high level of expertise in the area of dam design, hydraulic analyses, and emergency action planning.
3. Several dam safety engineers presented technical papers on engineering studies and procedures at national and regional conferences.
4. The dam safety branch continues to educate dam owners on dam safety and the importance of emergency action plans. Currently all high hazard dams and 98 percent of significant hazard dams have Emergency Actions Plan in place.
5. The dams database (DAMS) has been updated and upgraded this water year. Recent upgrades to DAMS provides the dam safety engineers with access to the database while in the field and the ability to prepare safety inspection reports remotely and upload the reports to the database. This system is used to update the National Inventory of Dams (NATDAM or NID) periodically when requested by the U.S. Army Corps of Engineers.
6. A number of publications are available at no cost on the Dam Safety web page at <http://water.state.co.us/damsafety/dams.asp>. The documents are in a variety of common formats including Microsoft Word and Adobe Acrobat PDF.
7. The Risk Based Profiling Score continues to show positive results and has allowed the dam safety engineers the ability to more efficiently allocate resources to those dams determined to present the greatest risk to public safety.
8. Several dam safety engineers participated in several EAP tabletop exercises for federal and non-federal dams throughout Colorado.
9. Paul Perri, Design Review Engineer, is participating in several plenary meetings on the revisions to the Colorado Water Conservation Board (CWCB) Floodplain Rules and Regulations. Paul provided insight to the activities and recommendations that the National Committee on Levee Safety as it relates to the proposed revisions to the Floodplain Rules and Regulations.
10. Bill McCormick, Dam Safety Engineer from Division 2 was presented with Professional of Year for DWR. Most notable Bill provided the Colorado Department of Emergency Management with an evaluation of the potential impacts of a breach of the Leadville Mine Drainage Tunnel near Leadville, CO.

11. As an Association of Dam Safety Officials Board member, Mark Haynes participated in the American Society of Civil Engineers (ASCE) Policy week in Washington D.C. Mark visited the offices of Senators Udall and Bennet, and Representatives Salazar, Markey, and Coffman to bring attention to the condition of our nation's infrastructure and to encourage support for the Dam Rehabilitation and Repair Act. ASCE recently completed a 2009 report card on the nation's infrastructure, where the condition's of the nations dams was given a "D". The state of Colorado's local section of ASCE also prepared a report for the infrastructure within Colorado and the dams in the state was given a grade of "B". This grade can be attributed to the dedication and effectiveness of the dam safety engineers.
12. Mark Haynes, Chief of the Dam Safety Branch continues to serve as one of eight state representatives on the Dam Sector committee of the Department of Homeland Security (DHS) Government Coordination Council (GCC). The GCC is a diverse federal, state, local, and tribal interests to develop and identify collaborative strategies that advance critical infrastructure protection and security.
13. Paul Perri, Design Review Engineer is currently serving as a voting member representing DWR on the National Committee on Levee Safety (NCLS). In January 2009, the NCLS released *Recommendations for a National Levee Safety Program*. Among the twenty recommendations, Recommendation 14 – Design and Delegate Program Responsibilities to States to assist states and local governments develop effective levee safety programs focused on continual and periodic inspections, emergency evacuation, mitigation, public involvement and risk communication/awareness will need to be addressed and possibly incorporated into the dam safety program in the near future.
14. In addition to yearly program goals of inspections and design reviews, the following are additional branch goals for WY 2009 - 10:
 - Continue to perform dam owner training by conducting one-day workshops at various locations throughout the state.
 - Expand the Division of Water Resources Dam Safety Branch's involvement in National Dam Safety and Security activities.
 - Update or establish Memorandums of Understanding (MOUs) with FERC, BLM, and DOW.
 - Review and update current policy and guidance documents.
 - Update the Owners Dam Safety Manual.
 - Update the Design Review Guide to be consistent with the 2007 Rules and Regulations.
 - Continue to provide professional training of branch personnel.
 - Improve coordination and communication of personnel within the program and Division Offices.
 - Continue efforts in communicating and educating dam owners in the need to maintain and update their Emergency Action Plans.
 - Continue to evaluate the inclusion of risk-based methods in the dam safety program.
 - Continue to communicate and educate the public on dam safety.
 - Develop technical workshops on Spillway Hydraulics, Dam Hazard Classification, and Emergency Action Planning

1.0 INTRODUCTION

1.1 Program Mission

The mission of the Colorado Dam Safety Branch is to prevent the loss of life and property damage, determine the safe storage levels of reservoirs, and protect the state's water supplies from the failure of dams through the effective and efficient use of available resources. The Dam Safety Branch's program is firmly grounded in the use of periodic field observation of existing dams by highly qualified licensed professional engineers. The field observations, combined with engineering analyses form a basis for determining the safe storage levels of reservoirs within the state. Additional program tools include a comprehensive set of regulations, policies, and procedures for the design, construction, inspection, and maintenance of dams; the safe operation of reservoirs, emergency preparedness planning and emergency response. In the event a dam is found to be unsafe, the risk of adverse consequences due to failure of the dam is reduced by restricting the storage in the reservoir to a safe level. Plans for new dams in Colorado must be approved prior to construction. A comprehensive review and approval process ensures the highest possible standards are met with regard to public safety. The Dam Safety Branch is managed by the State Engineer in accordance with Title 37, Article 87 of Colorado Revised Statute (C.R.S.) and the Livestock Water Tank Act, Title 35, Article 49 of C.R.S. The "Rules and Regulations for Dam Safety and Dam Construction" and "Standard Specifications for Livestock Water Tanks and Erosion Control Dams" establish the procedures and requirements of the State Engineer in the implementation of these statutes.



**Cheesman Dam, Jefferson County
High Hazard**

1.2 Report Purpose

This report is submitted in compliance with Section 37-87-114.4, C.R.S., concerning the dam safety activities of the State Engineer and the Colorado Division of Water Resources relating to Sections 37-87-105 to 37-87-114, C.R.S. The reporting period for this report is from November 1, 2008 through October 31, 2009 (WY 2008-09) to better represent the dam safety activities over a full calendar year.

2.0 BRANCH OVERVIEW

2.1 Goals and Objectives

The Dam Safety Branch is responsible for the approximately 2,900 jurisdictional and non-jurisdictional dams within the state. To effectively and efficiently allocate available resources, the Dam Safety Branch concentrates on the jurisdictional dams and reservoirs as defined in Section 37-87-105, C.R.S., as "*Dams that are greater than ten feet high as measured at the spillway, that impound a reservoir with twenty acres or more in surface area, or one hundred acre-feet or more in reservoir capacity at the high water line qualify as Jurisdictional.*"

Both jurisdictional and non-jurisdictional dams are classified as to the estimated downstream consequences as a result of the failure of a dam absent of flooding conditions. Table 1 describes the State of Colorado Dam Hazard Classifications for jurisdictional and non-jurisdictional dams as stated in the 2007 edition of the Rules and Regulations for Dam Safety and Dam Construction.

TABLE 1
STATE OF COLORADO DAM HAZARD CLASSIFICATIONS

Classification	Definition
High	Loss of human life is expected to result from failure of the dam.
Significant	Significant damage is expected to occur, but no loss of human life is expected from the failure of the dam.
Low	Loss of human life is not expected and significant damage to structures and public facilities is not expected to result from failure of the dam.
No Public Hazard (NPH)	No loss of human life is expected and damage will occur only to the dam owner's property will result from failure of the dam.

The following goals of the program have been identified:

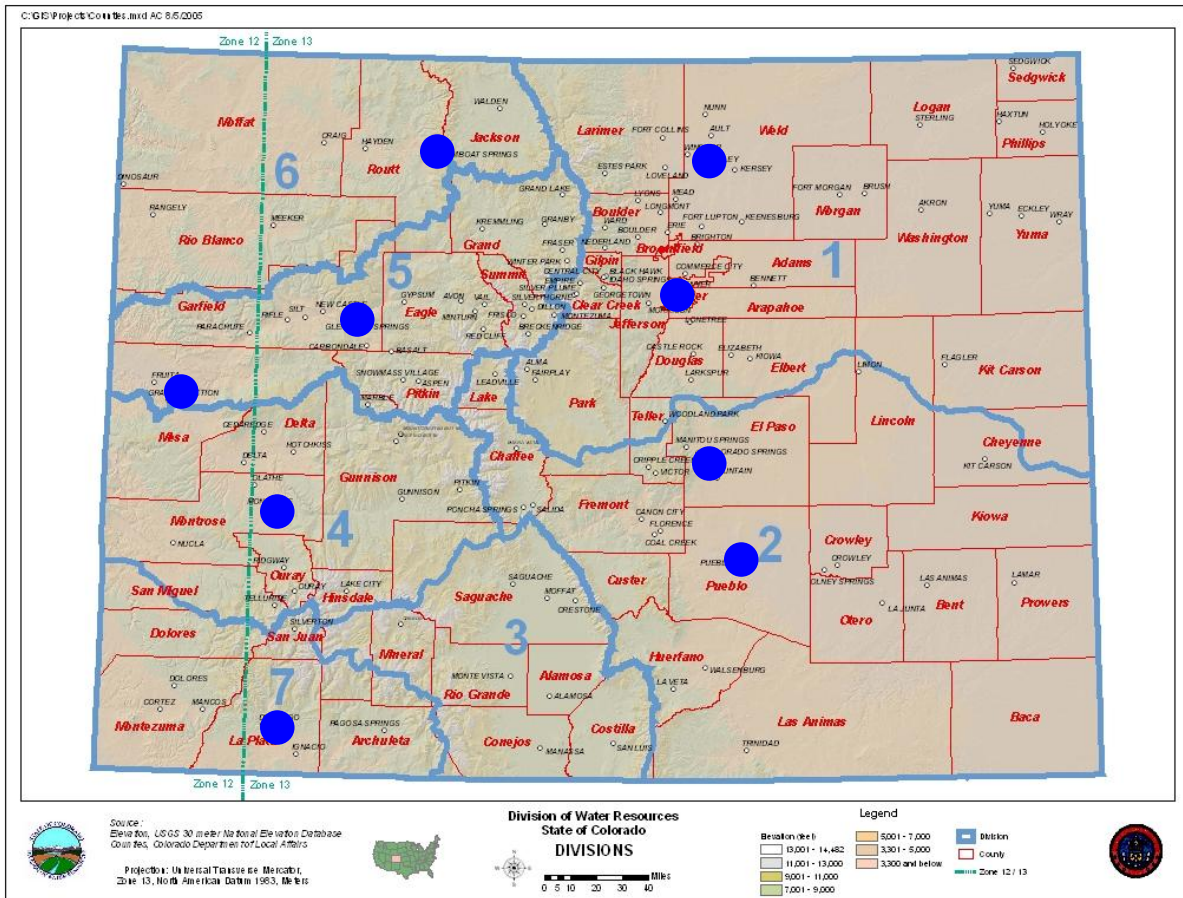
1. To protect the public, the Dam Safety Branch shall determine the amount of water that is safe to impound in reservoirs of the state in accordance with State Statutes.
2. To protect the public from failure of dams, the Dam Safety Branch shall review and recommend approval of plans and specifications for the construction, modification and repairs of dams, in accordance with the current Rules and Regulations for Dam Safety and Dam Construction, implemented on January 1, 2007.
3. To reduce the risk of dam failure and adverse consequences and to more efficiently and effectively use the available resources within the program, the Dam Safety Branch shall implement and utilize a risk-based approach to prioritize the jurisdictional dams within the program.
4. To improve the functions of the Branch and to meet the public information needs, the Dam Safety Branch shall maintain a data information system.
5. To improve the technical proficiency of the Branch, the Division of Water Resources shall provide for training and professional development of the Branch personnel.
6. To improve the Dam Safety Branch, to participate in the development of national policies on dam safety, and to take advantage of the continuing education and information available, to accomplish this the state shall be a full voting member of the Association of State Dam Safety Officials (ASDSO).

2.2 Organization

The State Engineer, through the Dam Safety Branch and the Division Engineers' offices, executes the Colorado Dam Safety Program. The Branch is overseen by the Deputy State Engineer and consists of a branch chief, dam safety engineers, and design review engineers. Starting in the mid-1980s, the Dam Safety Branch was decentralized from the Denver office to enable a statewide presence. Dam safety engineers were transferred from the Denver office to the Division offices throughout the state. Dam safety engineers were located in Greeley, Pueblo, Durango, Montrose, Glenwood Springs, and Steamboat Springs. This allowed a more even distribution of dam safety engineers and allowed the engineers to be in close proximity to the dams they are assigned to regulate. The process of relocating dam safety engineers to the Division offices took until approximately the mid 1990s. After several years of working with the newly decentralized Dam Safety Branch, the need for additional strategic positioning of dam safety engineers within the state was identified. Between 2003 and 2005, two dam safety engineers were relocated to field offices in Grand Junction and Colorado Springs. Figure 1 shows the current distribution of dam safety and design review engineers within the state.

Figure 1

Map of Colorado Showing Locations of Dam Safety Branch Personnel



Dam safety engineers are responsible for execution of the program in their geographic area. The design review engineers and branch chief have responsibilities throughout the state and are located in Denver. A summary of the branch organization and personnel organizational chart are included in Appendix A.

Interagency coordination occurs as necessary. A Memorandum of Understanding has been executed with the Colorado Division of Wildlife (DOW) regarding the responsibilities of each agency in carrying out the safety inspection of DOW dams. The DOW is performing safety inspections of DOW-owned low hazard dams.

The Colorado Water Conservation Board (CWCB) construction fund is available to assist owners with the repair of their dams. The Dam Safety Branch closely coordinates the review, approval, and final acceptance of CWCB funded dam construction and/or rehabilitation projects.

2.3 Roles and Responsibilities

The branch chief has program-wide responsibility for formulating the goals of the program, recommending policies for implementing the rules and regulations, preparing procedures for carrying out the policies, providing technical guidelines for conduct of the work, communication, training, and coordination. The branch chief directly supervises the Design Review and Construction Inspection Unit activities and Denver-based dam safety engineers.

The dam safety engineers' principal duties are to:

1. Respond to emergency situations.
2. Conduct dam safety field inspections of existing dams which provide the basis for determining the safe storage level of the reservoir.
3. Review the adequacy of spillways under the rules.
4. Set the safe storage level of reservoirs based in part on the results of field inspections and spillway adequacy reviews.
5. Review and recommend changes to dam hazard classifications.
6. Enforce the requirement for emergency action planning.
7. Assist dam owners in developing their Emergency Action Plans (EAP).
8. Provide design review and construction inspection of repairs and alterations when necessary.
9. Investigate complaints on the safety of dams.

Safety Evaluations of Existing Dams (SEED) field inspections are performed periodically with the frequency of inspections determined by the hazard classification. High Hazard dams are inspected annually, Significant Hazard dams are inspected every other year, Low Hazard dams are inspected every six years, and No Public Hazard (NPH) dams do not have a set inspection frequency. NPH dams are typically only inspected at the owner's request or in the event of a specific event such as a complaint or for a hazard classification review. In recent years, a pilot program was developed to set forth the standards and procedures to reevaluate the frequency of inspections for High and Significant Hazard dams based on the Risk Based Profiling System (RBPS) results. Further discussion of this pilot program and the RBPS are presented later in this report.



**South Platte Dam, Douglas County
High Hazard**

Dam safety engineers also investigate dams constructed in violation of Section 37-87-105 (1) and (4), C.R.S., and conduct training on the inspection of dams for Division personnel, dam owners, interested agencies, engineers, and the public. In addition, they review and approve Livestock Water-tank and Erosion Control Dam applications and do other related work as assigned.

The design review engineer's primary duties are to review the design and construction documents for the construction, alteration, modification, repair, and enlargement of reservoirs or dams in accordance with Section 37-87-105, C.R.S. This involves comprehensive engineering reviews of the design and construction documents prepared by registered

professional engineers experienced in the design and construction of dams. The reviews determine the adequacy of the design, compliance with the applicable state statutes, the current Rules and Regulations for Dam Safety and Dam Construction, and industry standards. The design review engineer recommends approval of the project for construction to the State Engineer once all conditions have been met. Design review engineers also perform periodic inspections during dam construction to assure compliance with the approved plans and specifications and to evaluate proposed change orders. Upon successful completion of the projects, the design review engineer recommends to the State Engineer issuance of orders to allow water storage. Design review engineers also provide dam related technical assistance to other state agencies such as the Department of Health, the Division of Wildlife, Oil and Gas Conservation Commission, the Division of Minerals and Geology, the state's joint review process with the Department of Natural Resources, and the Division Engineers' offices, and perform other related work as required.

2.4 Summary of Colorado Dams

Currently, the Dam Safety Branch oversees a total of approximately 2,900 dams within Colorado. Of these, 1,930 are considered jurisdictional dams, of which about 1,802 are non-federal dams. Of the non-federal dams, approximately 614 (310 High Hazard and 304 Significant Hazard) or about 35 percent of the total non-federal dams in Colorado are classified as dams that, in the event of a failure, would be expected to cause loss of life and/or significant property damage. Table 2 summarizes the distribution of dams by water division and hazard classification in Colorado.



**Martin Dam, Huerfano County
High Hazard**

TABLE 2
SUMMARY OF DAMS BY HAZARD CLASSIFICATION AND WATER DIVISION

HAZARD CLASS	WATER DIVISION							NON FEDERAL DAMS	FEDERAL DAMS	TOTAL
	1	2	3	4	5	6	7			
High	154	42	12	31	40	13	18	310	42	352
Significant	121	50	15	38	48	13	19	304	13	317
Low	425	94	29	152	111	110	52	936	62	998
NPH	51	97	16	5	25	13	8	215	11	226
TOTAL	751	310	81	244	239	159	104	1802	128	1930

3.0 BRANCH ACCOMPLISHMENTS

3.1 Dam Safety Branch Staff

In November 2008, Division 2 Dam Safety Engineer Mike Graber retired after 32 years of state service. In August 2009, Mark Perry was selected to fill the vacant Division 2 Dam Safety Engineer position. Prior to Mark's employment with DWR, he was a Geotechnical Engineering with the Dam and Levee Embankment Levee Section of the U.S. Army Corps of Engineers (USACE). During his employment with USACE, he performed groundwater and seepage modeling and slope stability analyses for levee and dam embankments. Mark brings valuable experience and skills to the Dam Safety Branch.

In December 2008, Scott Cuthbertson was selected to fill the Assistant State Engineer for Public Safety, formerly the Deputy State Engineer position occupied by Jack Byers, who retired in July of 2008. Scott's previous position with DWR was as the Assistant Division Engineer in Division 1 in water administration. Scott brings valuable leadership and management skills to the Dam Safety Branch.

John Redding, Dam Safety Engineer, P.E. I in the Denver Office, left the branch in July 2009 to pursue other opportunities.

3.2 Dam Safety Inspections

Each dam safety engineer's highest priority is to perform periodic field SEED of the dams in their territory of responsibility. Dams rarely fail without first showing visible signs of distress, which, when detected by a highly educated and trained eye, can be the difference between a catastrophic failure and prompt corrective action. Regular visual observation is, therefore, the most important tool available to each dam safety engineer.



**Empire Dam, Weld County
High Hazard**

The statutes specify that dam safety inspections consist not only of field inspections of the dam and appurtenant structures, but also include the review of previous inspection reports, drawings, and periodic monitoring reports provided by dam owners. This review of each dam safety inspection also includes an evaluation of the adequacy of the spillway, a review of the current hazard classification, and a review of the Emergency Action Plan (EAP) for High and Significant hazard dams. Spillways for all dams are required to be able to pass the appropriate inflow design flood. The determination of the appropriate inflow design flood for a given dam is based on the size and hazard classification of the dam.

The hazard classification review accounts for changes in the development of the flood plain below the dam. Recent suburban development below once rural dams may result in the potential for increased property damage or likely loss of life in the event of a dam failure. An increased hazard classification results in more diligence on the part of the dam safety engineer and dam owner, and may result in requiring safety modifications to the dam. EAPs are required for High and Significant Hazard dams due to the increased potential for loss of life and/or property damage in the event of a dam failure. EAPs must be kept up to date to be effective and yearly reviews and updates are normally appropriate. Periodic internal inspection of the outlet works and an annual evaluation of dam instrumentation monitoring



**Smith Dam, Costilla County
High Hazard**

data are also part of the workload as required by the regulations. Large diameter outlets can be inspected by man-entry using confined space procedures. Small diameter outlets are typically inspected by remote methods using video cameras designed for that purpose. The video inspection of outlets is the responsibility of the dam owner, with review of the videotape or DVD provided being performed by the dam safety engineers.

The findings of the dam safety inspection are documented in a report that rates the condition of the dam and appurtenant structures based on the field observations and document reviews. A copy of the Dam Safety Inspection Report Form is shown in Appendix B. During WY 2008 – 09, a total of 533 dam safety inspections and 122 follow-up inspections were performed.

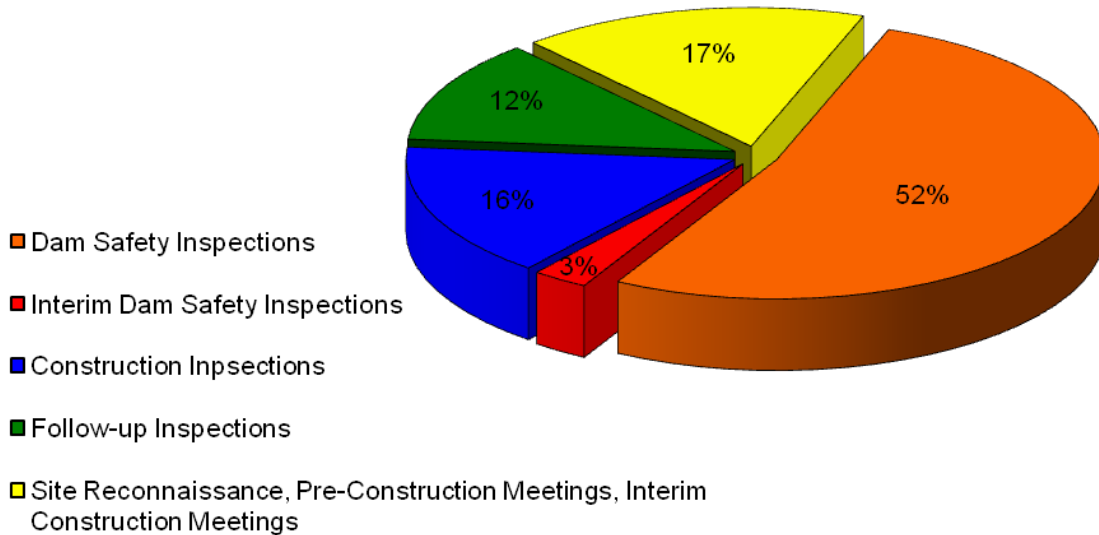
The overall condition of the dam and reservoir is rated according to the categories defined in Table 3 for full storage and a recommendation is made for the safe storage level of the reservoir.

TABLE 3
OVERALL DAM CONDITON RATING DEFINITIONS

OVERALL CONDITIONS	DEFINITION
SATISFACTORY	The safety inspection indicates no conditions that appear to threaten the safety of the dam, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.
CONDITIONALLY SATISFACTORY	The safety inspection indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen, could lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.
UNSATISFACTORY	The safety inspection indicates definite signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which could lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

The report also identifies repair and maintenance work the owner should perform to extend the useful life of the structure through normal annual activities. For items requiring more than a normal level of maintenance, and any engineering and monitoring requirements that are deemed necessary to assure the safety of the dam, the dam safety engineer may require the owner hire a Colorado licensed professional engineer to design and direct the work. Figure 2 shows a breakdown of the different field activities performed by the dam safety engineers during this reporting year.

FIGURE 2
 November 2008 through October 2009
 Dam Safety Inspections, Construction Inspections
 and Other Field Activities Breakdown



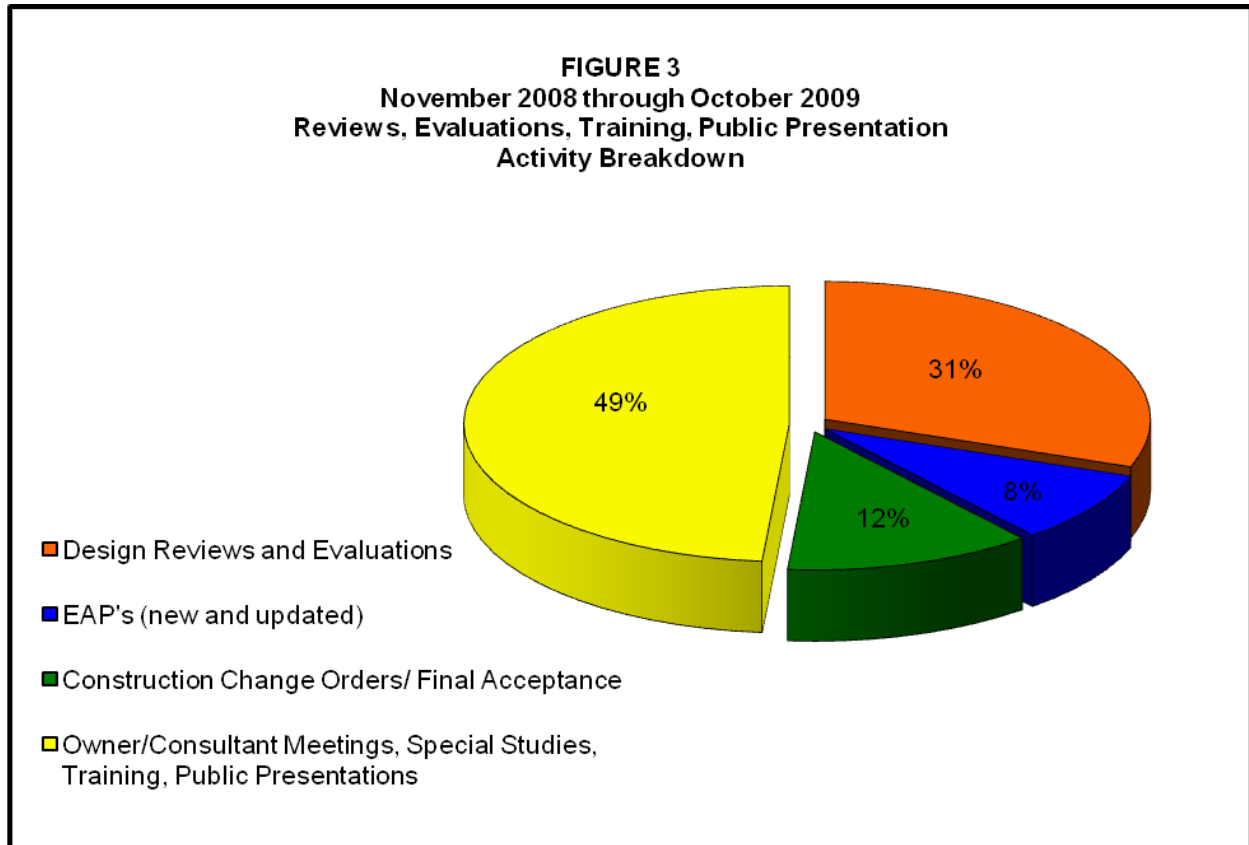
As shown previously in Table 2, over half of the jurisdictional dams in Colorado fall within the Low Hazard classification and are, therefore, only inspected every six years. In order to maintain a high level of confidence regarding the condition of these dams between regular inspections, water commissioners within the various water districts are often tasked to observe the condition of Low Hazard dams. Dam safety engineers and water commissioners both spend much of their time working in the field. This cooperative working arrangement allows efficient use of the water commissioners' field time when they are near jurisdictional dams as part of their regular water administration duties. They are also dispatched as needed to make specific observations and report on the condition of dams at critical times, such as during runoff season or following storms. A sample water commissioner observation report form is shown in Appendix C.

Dam safety engineers review the reports and observations of the water commissioners to determine if additional work is warranted or necessary on their part. Efficient use of the water commissioners' field time and observational abilities allows the Dam Safety Branch to allocate this important resource to maintain a consistent level of public safety at all times.

For inspections of federally-owned dams that the State Engineer's Office does not typically participate in, the reports prepared by the federal agencies are received and reviewed in accordance with Memoranda of Understanding (MOU) between the Dam Safety Branch and the various federal agencies.

3.3 Design Review and Construction Inspection

A summary of the activities related to Design Review and Construction inspection November 2008 through October 2009 is shown in Figure 3.



The State Engineer's Office approved plans for seven for new dams and 32 plans for alterations, modifications, enlargements or breaching of existing dams. The estimated cost of construction for the approved plans was \$103,700,000. Fees collected for the examination and filing of the submitted design and construction documents was \$45,730. Also, during this reporting period, seven hydrology studies were reviewed and approved along with one special study.

A complete listing of the plans submitted for review and approval are contained in Appendix D. In order to expedite the approval of repair plans for dams, the dam safety engineers located in the division offices review plans and specifications and perform the construction inspections on selected projects.

Construction inspections are important to assure that the approved plans are being followed and to assure changed conditions encountered during construction do not jeopardize the safety of the design. The construction site visits are typically preceded by a review of the file and history of performance. In addition, coordination with the dam owner, owner's engineer, division staff, and other interested parties is made so they also have an opportunity to take part in the inspection. During the WY 2008-09 a total of 159 construction inspections were conducted by the Dam Safety Branch.

Upon completion of construction, the dam owner’s design engineer submits copies of the “As-Constructed” plans and completion documents showing any changes made during construction. These plans and documents are reviewed by the engineer who monitored the construction for completeness before being accepted for filing. The superseded plans are disposed of and the “As-Constructed” plans serve as the public record as required by the statutes.

Section 37-87-114.5, C.R.S., exempts certain structures from the State Engineer’s approval. These are structures not designed or operated for the purposes of storing water, and include: mill tailing impoundments permitted under Article 32 or Article 33 of title 34, C.R.S. (Minerals or Coal Mines), uranium mill tailing and liquid impoundment structures permitted under Article 11 of Title 25 of C.R.S., siltation structures permitted under Article 33 of Title 34, C.R.S. (Coal Mines), and structures that only store water below the natural surface of the ground. Owners of small size dams that do not meet the jurisdiction size category of the State Engineer are required to submit a Notice of Intent to Construct a Non-Jurisdictional Water Impoundment Structure to the State Engineer 45 days prior to beginning construction under Section 37-87-125, C.R.S.

3.4 Dam Safety Incidents

3.4.1 Park Creek #2 Dam

Park Creek Dam #2 is classified as Minor size, Low Hazard Dam and is located in Division 1. On Monday, January 12, Jeremy Franz, Division 1 Dam Safety Engineer, received a call from the owner’s engineer explaining that the contractor cut a small trench through the crest of the dam to start lowering the water surface of the reservoir so that they could start work on removing the outlet conduit. The contractor reportedly cut a 2 to 4 foot-wide trench through the crest near the left abutment. Eventually, the depth of the trench reached about 7’ allowing about 2’ depth of flow through the breach (the dam provides 5’ of freeboard). Shortly after this small breach was cut, the flow of water began eroding the breach rapidly. The breach grew to a size of approximately 25’ wide by 20’ deep with near-vertical side-walls (see photo). This resulted in loss of nearly all the water in the reservoir. The owner is in the process of submitting design documents for the repair of the dam.



**Park Creek # 2 Dam, Larimer County
Low Hazard**

3.4.2 Non-Jurisdictional Dam Breach in Division 1 District 2



Non-Roster Dam, Weld County

On February 6, 2009 John Batka, Division 1 Dam Safety Engineer, identified a small dam that had recently breached. The breach occurred late in 2008 as a result of vandalism of the upstream reservoir's outlet gate resulting in the draining of a portion of the reservoir into the dam below. The owner plans to repair the damage and restore the dam back to original condition.

3.4.3 Smith Dam

Smith Dam is classified as a Large size, Significant Hazard Dam in Division 3. On April 21 2009, Matt Gavin, Division 3/7 Dam Safety Engineer, was notified by a DWR Water Commissioner that Smith Dam had sustained considerable wave damage during a recent wind storm. On April 22, Mr. Gavin performed a site visit to assess the damage and found that the dam had sustained erosion that penetrated into the seepage control portion of the embankment. As a result, a storage restriction of two feet below the spillway crest was recommended to prevent further damage, which could threaten the safety of the structure. Plans for rehabilitation of the upstream slope are currently being prepared by the Owners' consultant. In addition to the upstream slope rehabilitation, the Owners' consultant is also preparing plans for the rehabilitation of the upstream outlet gate, which should alleviate the pressurized conditions in the outlet, a long-standing dam safety concern for this facility. It is the Owners' intent to address these deficiencies in the fall of 2009.



**Smith Dam, Costilla County
High Hazard**

3.4.4 Park Center L & W #5 Dam

Park Center L & W #5 Dam is classified as a Minor size, Low Hazard Dam in Division 2. The dam about 18 feet in height has a normal storage volume of 57 acre-feet. On April 22, 2009, the Colorado Springs Field office of the Dam Safety Branch received a call from the manager of the Park Center Water District, the owner of the dam. The owner indicated that they had a problem at their dam, the dam was leaking and the seepage was cloud. The owner was in the process of lowering the reservoir with pumps with a capacity of 1,500 gpm. Bill McCormick, Division 1/ 2 Dam Safety Engineer, requested that they get some pea gravel material and filter fabric delivered to the site for use in stabilizing the loss of fines from the seep. After Mr. McCormick investigated the seepage area it was decided to use the available materials and construct a drainage blanket on top of the seep area to stabilize the downstream slope of the dam and control the seepage and minimize the loss of embankment materials. Placement of the material in combination with lowering of the reservoir water level the seepage had been reduced by approximately half of the original observation in a short period of time. The owner is in the process of submitting design documents for the repair of the dam.



**Park Center L&W # 5 Dam, Fremont County
Low Hazard**

3.4.5 Dixon Dam

Dixon Dam is classified as a Small size, Low Hazard Dam in Division 1. The dam is about 8.6 feet in high and impounds approximately 207 acre-feet. on May 20th, 2009 the Greeley field office received a call from the President of the Eagle Lake Association indicated that a sinkhole was found over the outlet of dam the night before and that he sinkhole had apparently increased in size overnight. Jeremy Franz, Dam Safety Engineer in Division 1 investigated the situation and determined that the sink hole was above the spillway conduit near the left abutment. Mr. Franz recommended that the owner take proper steps to lower the reservoir to a safe operating level. The owner informed Mr. Franz that to his knowledge the reservoir did not have a low-level outlet. The owner is in the process of turning off the inlet to the reservoir and submitting design documents for the repair of the dam.



**Dixon Dam, Larimer County
Low Hazard**

3.4.6 Beaver Park Dam

Beaver Park Dam is classified as a Large size, High Hazard Dam in Division 7. The dam has a jurisdictional height of 85 feet and a normal storage pool of 4,758 acre feet and is owned by the Colorado Division of Wildlife (DOW). On June 10, 2009, Matt Gavin, Dam Safety Engineer for Division 7, discovered during an annual inspection that the outlet gate chamber had suffered significant damage as a result of routine operation during spring runoff. Thanks to the timely discovery of the problem, additional damage to the gate chamber was avoided, and the design of repairs to correct the problem were initiated on an emergency basis. Repairs were completed in November 2009.



**Beaver Park Dam, Rio Grande County
High Hazard**

3.4.7 Jerry Creek # 2



**Jerry Creek # 2 Dam, Mesa County
High Hazard**

Jerry Creek #2 is classified as a Large Size, High Hazard Dam. The dam has a jurisdictional height of 150 feet and a normal storage pool of 7,634 acre-feet. On June 17, 2009, Garrett Jackson, Division 4/5 Dam Safety Engineer received a phone call from the owner explaining that he observed water seeping into the service spillway through some of the construction joints and other cracks in the spillway concrete wall and upon further observation seepage was observed coming out of the ground on the right side of the spillway along the Dike 1 embankment. Mr. Jackson recommended that the reservoir be lowered a minimum of 1 to 2 feet. Upon lowering the reservoir 0.3 feet, the seepage stopped. The owner's engineer is in the process of developing a design to control the seepage.

3.4.8 Lone Cone Dam

Lone Cone Dam is classified as a Large size, High Hazard Dam located in San Miguel County. The dam has a jurisdictional height of 27 feet and a normal storage pool of 1,840 acre-feet. On May 26, 2009 Jason Ward, Dam Safety Engineer for Division 4 received a phone call from the President of the Lone Cone Ditch and Reservoir Company explaining they have a problem with the outlet gate on the dam. To provide water to downstream users, the owner discharged about 25 cfs through the emergency spillway. On May 28, 2009, the owner removed debris and rocks that apparently blocked the outlet and flows returned to normal.

3.4.9 Gurley Dam

Gurley Dam is a Large size, High Hazard Dam located in Division 4. The dam has a jurisdictional height of about 87 feet and a normal storage pool of 10,039 acre-feet. On April 27, 2009 Jason Ward, Division 4 Dam Safety Engineer received a phone call from the president of the Farmers Water Development Company. He indicated a small embankment slide had occurred at the bottom of the 2008 slope failure repair. He further explained that the slide appears to be top soil only. Observations by Mr. Ward indicated that the slide was minor in nature and did not appear to be a result of seepage related. Mr. Ward asked the owner to continue to monitor the embankment for additional signs of sliding.



**Gurley Dam, San Miguel County
High Hazard**

3.4.10 Womack #2/3 Dam



**Womack #2/3 Dam, Delta County
Low Hazard**

Womack #2/3 Dam is a small size, Low Hazard Dam located in Delta County. The dam has a jurisdictional height of 15 feet and a normal storage pool of 109 acre-feet. On May 14, 2009 Jason Ward Division 4 dam safety engineer received a phone call from Water Commissioner Jim Boyd explaining that the snow blockage in the emergency spillway that was previously identified by Mr. Ward in a site visit on May 8, 2009 had breached causing a wave of water to be released causing erosion damage in the downstream feeder ditches and in the discharge channel below the Womack #5 spillway. Mr. Ward informed the owner that timely clearing of the snowpack in the spillway to facilitate spring runoff flows is critical.

3.4.11 Lower Cabin Creek Dam



**Lower Cabin Creek Dam,
Clear Creek County
High Hazard**

Lower Cabin Creek is classified as a Small size, High Hazard Dam located in Division 1. The dam has a jurisdictional height of 80 feet and a normal storage pool of 1,988 acre-feet. On August 20, 2009 John Batka, Division 1 Dam Safety Engineer received a call from Randy Rhodes with Xcel Energy explaining that the hillside adjacent to the reservoir near the left abutment has shown signs of sliding and as a precaution the reservoir pool of Lower Cabin Creek was being lowered to a level approximately 13 feet below the emergency spillway. Mr. Rhodes further explained that the Colorado Department of Transportation, the Federal Highway Administration, and the owner's engineer are on site assessing the situation. Paul Perri, Design Review Engineer in the Denver office visited the site on August 21, 2009 to observe the situation. The owner's engineer recommended that the reservoir be further lowered to a storage level of about 250 acre-feet to minimize the impact of a landslide-caused wave in the reservoir.

3.4.12 Wing Lower Pond Dam

Wing Lower Pond is a non-roster dam located in Garfield County. The dam is considered non-jurisdictional and impounds a small volume of water. On May 9, 2009 John Blair, Division 5 Dam Safety Engineer was contacted by Water Commissioner Brian Epstein explaining that the Wing Lower Pond was overtopping and could possibly fail. Mr. Blair visited the site to observe the condition of the dam. Mr. Blair observed about 0.2 feet of water flowing over the top of the dam with significant erosion occurring on the downstream slope of the dam progressing upstream. The owner was informed of the situation by Mr. Blair via certified mail on May 11, 2009, where the recommendation was made that the owner fully opens the outlet gate and to excavate a temporary emergency spillway to convey inflows and minimize the overtopping potential.



**Wing Lower Pond Dam
Garfield County
Non-Jurisdictional Dam**

3.4.13 Totten Dam

Totten Dam is a Small size, High Hazard Dam located near the City of Cortez in Montezuma County in Division 7. The dam has a jurisdictional height of 35 feet and a normal storage pool volume 3,302 acre-feet. In the fall of 2007, Matt Gavin Division 3/7 Dam Safety Engineer discovered significant transverse cracking in the upper portion of the dam embankment. In 2009, additional cracking was discovered and at the direction of the State Engineer's Office, the owners prepared plans to conduct exploratory excavations into the embankment to determine the extent and severity of the cracking. Exploratory excavations conducted in September of 2009 revealed that transverse cracks extended deep into the embankment in at least one location. As a result of the exploratory excavations, a storage restriction of 5 feet below spill was imposed on Totten Dam. Presently, Mr. Gavin is working with the Owner's staff engineer to prepare plans for additional engineering and soils investigations, which are intended to pinpoint the cause of the cracks.



**Totten Dam
Montezuma County,
High Hazard**

3.5 Reservoir Storage Restrictions



**Pine Brook Dam, Boulder County
High Hazard**

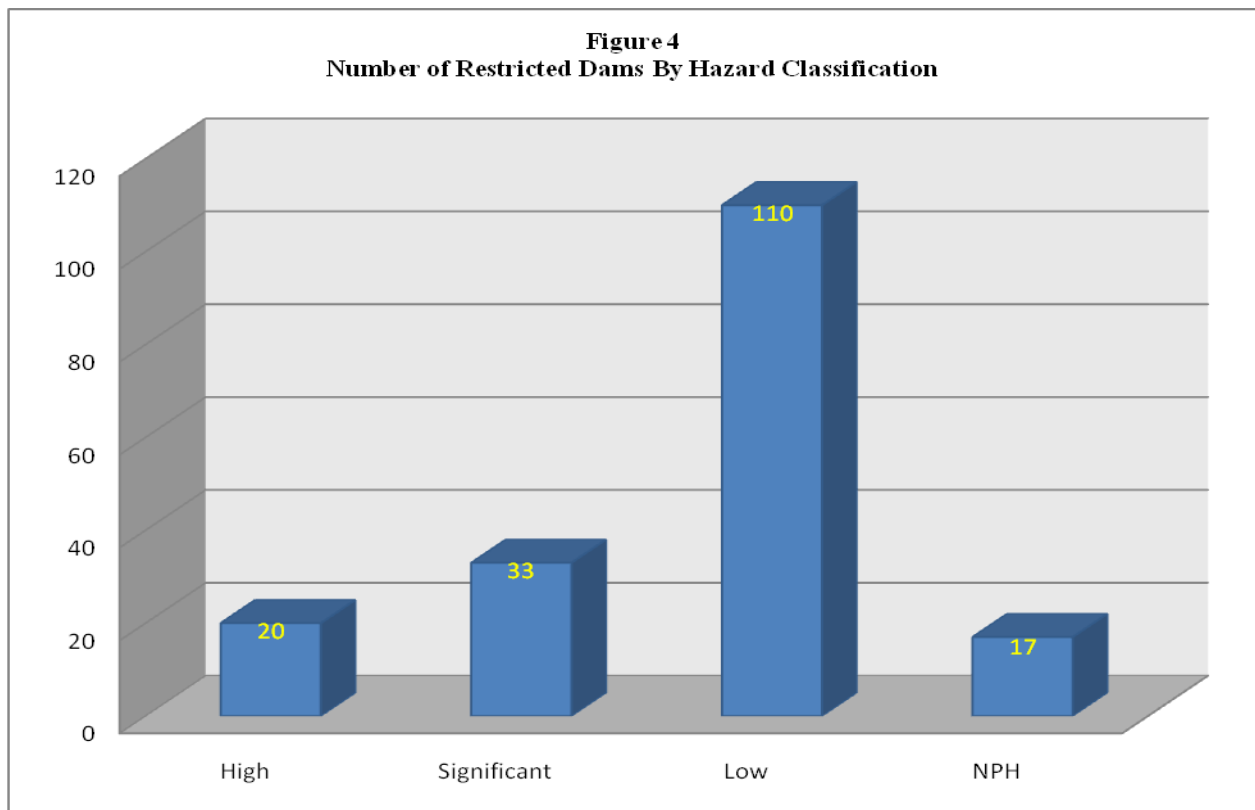
If a dam safety inspection reveals that the overall conditions of a dam are unsafe, an order is written by the State Engineer restricting the storage of the reservoir to a safe level. Restriction letters are accompanied by orders to rehabilitate the dam to make it safe for full storage or to breach the dam. In the event the owner fails to comply with an order to make the dam safe, a breach order is issued to remove the hazard created by the dam and reservoir. If the findings are conditionally satisfactory, full storage is recommended contingent on appropriate monitoring and repair being provided by the owner. In the event that conditions of any dam or reservoir are so unsafe as to not permit the time to issue or enforce a restriction,

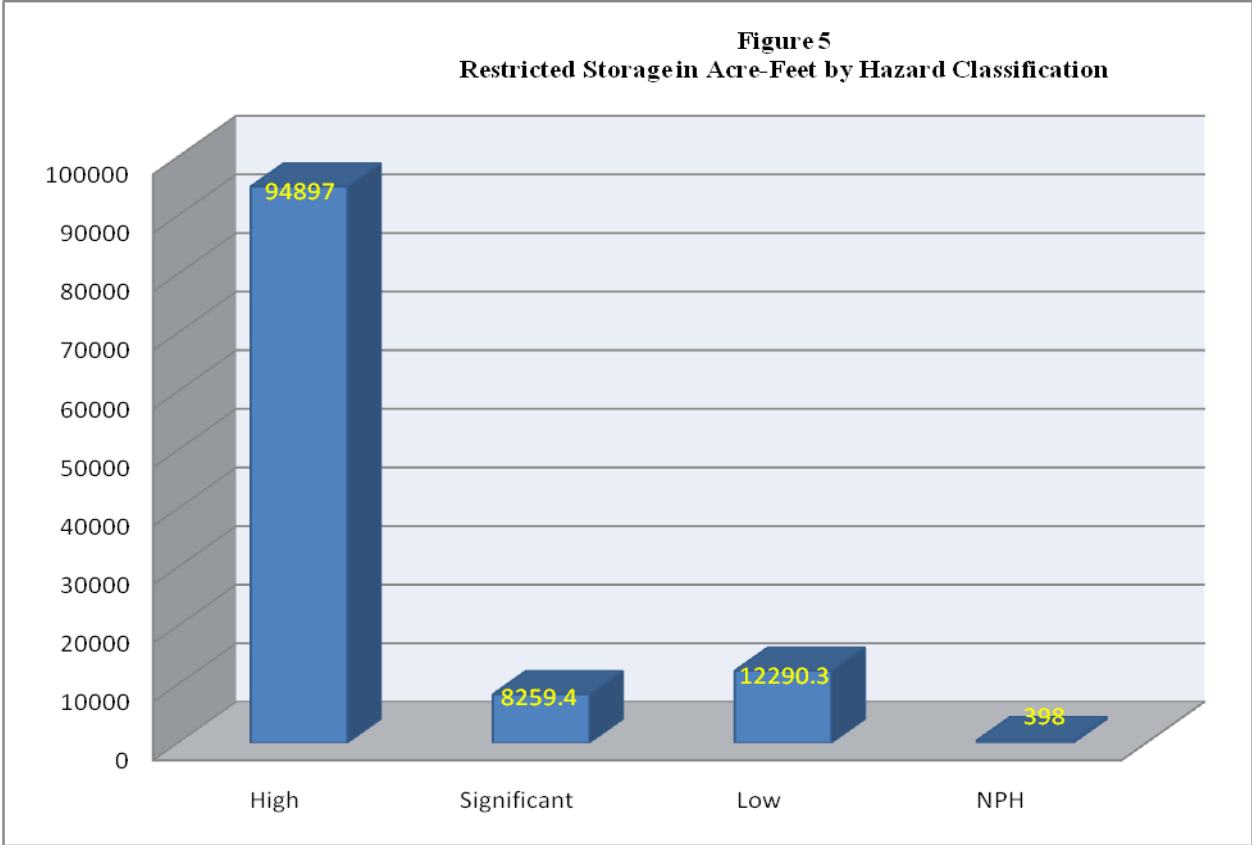
or a dam is threatened by a large flood, the State Engineer may immediately employ remedial measures to protect the public safety. An emergency dam repair cash fund is provided under the CWCB construction fund per Section 37-87-122.5, C.R.S.

At the conclusion of this reporting period, there were total of 22 additional dams restricted from full storage due to inadequate spillways and various structural deficiencies such as significant leakage, cracking and sliding of embankments. Figure 4 shows a chart of the number of reservoirs restricted around the state by hazard classification.

The total volume of storage lost due to storage restrictions is 115,845 acre-feet. Figure 5 presents a chart of the lost volume of reservoir storage due to reservoir restrictions around the state in each of the hazard classifications.

A storage restriction on dams provides risk reduction for the public and environment until the problems are corrected. The owners are responsible for following the restricted operating levels and the restrictions are enforced by the Division Engineers. A complete list of the restricted reservoirs at the end of the reporting period is included in Appendix E. Although many dams were repaired and removed from the restricted list within the last year, a number of dams were also added to the list during the same time period. The change in the restriction from the same time last year resulted in a slight increase in the number of dams on the restricted list by one dam and the volume of the storage restrictions decreased by approximately 1,805 acre-feet.





3.6 Staff Training

A critical element in the Dam Safety Branch is the continued training of our personnel to maintain a high level of technical competency, to keep up with changing technology, to develop additional management and communication skills, and to keep abreast of changes in the development of dam safety programs across the country. The following training opportunities were achieved this year:

November

A branch meeting was held in Denver, CO to discuss on-going branch activities. Topics discussed during the meeting identification of two committees to develop guidance documents on development of dam breach parameters and evaluation of Dam Hazard Classification. Jeremy Franz conducted a GIS training workshop.

January

Mark Haynes and Bill McCormick attended the Western States Dam Safety Forum in San Francisco, CA.

February

John Redding and Jason Ward attended Dam Safety Workshop #16 on Emergency Action Planning in Emmitsburg, PA.

April

A branch meeting was held in Denver, CO. Topics discussed during the meeting results and review of the draft guidance documents on the development of dam breach parameters and evaluation of Dam Hazard Classification.



**Eagle Park Dam, Eagle County
High Hazard**

May

Mark Haynes, Bill McCormick, Matt Gavin, and Garrett Jackson attended the Western Regional ASDSO Conference held in Cour d'Alene, Idaho. Mark Haynes also attended various ASDSO business meetings as the State Representative during the conference.

July

Mark Haynes, Bill McCormick, and Greg Hammer attended the FERC Design of an Emergency Action Plan held in Denver, CO.

September

Jeremy Franz attended the Colorado Association of State Floodplain Managers annual conference held in Crested Butte, CO.

Mark Haynes, Greg Hammer, Garrett Jackson, Jason Ward, and Paul Perri attended the ASDSO Annual Conference. Mark Haynes attended various meetings as a Board of Directors member and as the state representative. Paul Perri was recognized by ASDSO for his participation on the National Committee on Levee Safety (NCLS) and participated in a session as an ASDSO levee committee member and for NCLS committee.

3.7 Presentations

This year, the Dam Safety Branch presented various topics to different audiences. These presentations include:

- Mark Haynes, Paul Perri and Garrett Jackson presented a Dam Safety Workshop for the Natural Resources Conservation Service.
- Bill McCormick with assistance from Mark Haynes presented two Dam Safety Workshops in Colorado Springs for the City of Colorado Springs, Colorado State Parks, Colorado Division of Wildlife, and Division of Water Resources.



**Crowlane No. 2 Dam, Larimer County
High Hazard**

- Paul Perri presented at the Colorado Water Conservation Board meeting and the local chapter of the American Society of Civil Engineers on the activities of the National Levee Safety Committee.
 - Mark Haynes participated in the Ditch and Reservoir Company Alliance Workshop on Owner's Guide to Dam Safety, and Operation and Maintenance held in Pueblo, CO.
 - Jeremy Franz and John Batka presented on dam safety issues at the Ditch and Reservoir Owner Workshop in Greeley, CO.
- At the Western Regional ASDSO conference in Coeur d' Alene, Idaho, Bill McCormick presented a paper on hydrology analyses for dams in series, Garrett Jackson presented a paper on hydrologic procedures for dam safety, and Matt Gavin presented a paper on the flood hazard evaluation for a landslide along the San Juan River near Pagosa Springs, CO.
 - Paul Perri participated on a panel discussion on flood risk the National Flood Hazards Conference in Broomfield, CO.
 - Bill McCormick presented on the Extreme Precipitation Analysis Tool (EPAT) via teleconference to various federal agencies including U.S. Army Corps of Engineers, National Weather Service, National Regulatory Commission, and the National Resource Conservation Service.
 - Paul Perri participated in a forum discussion on levee safety at the National Flood Hazards Conference.
 - At the ADSO Annual Conference in Hollywood, Florida, Mark Haynes participated in a soapbox presentation on private dams on federal lands and the Second Annual Dam Security Forum and Paul Perri participated on a panel discussion discussing levees.

3.8 Emergency Action Plans

Emergency preparedness for incidents at dams that jeopardize the public safety, including the failure of dams, has become an integral part of dam safety programs across the nation. The entire federal dam owning/regulating agencies and most states require that plans be formulated in order to detect incidents at dams, give adequate warning, and maintain preparedness in the event of a dam failure. Colorado has been actively involved in this area since 1981, ultimately requiring that Emergency Action Plans (EAPs) be prepared for High Hazard and Significant Hazard dams as part of the regulations for dam safety adopted in September 1988. The revised Rules and Regulations clearly define standards in which EAPs are to be prepared and maintained. As a result of the revised EAP requirements in the 2007 *Rules and Regulations for*

Dam Safety and Dam Construction, The Guideline on Preparing an Emergency Action Plan (EAP) and the sample EAP developed in 2008 has provided dam owners with guidance and a format for developing or updating EAPs. A sample EAP in Microsoft Word format was also developed that assists dam owners in assembling an EAP. Both documents are located on the Dam Safety Branch website: <http://water.state.co.us/damsafety/dams.asp>. Although all High Hazard dams have such a plan, much work is still needed to update, maintain, and exercise the plans annually. The Dam safety engineers work closely with dam owners to update EAPs in an efficient and effective manner.



**Ritschard Dam, Grand County
High Hazard**

Approximately 98 percent of Significant Hazard dams have EAPs on file. The owners of Significant Hazard dams that do not have a plan have been notified of the requirement to prepare them. The dam safety engineers continue to assist dam owners in the preparation of their EAPs. In some cases, we have prepared the plans for the owners.

The Dam Safety Branch will be hosting a series of education seminars on developing and exercising EAPs. This outreach program will be developed using Federal Emergency Management Agency (FEMA) dam safety grant funds.

3.9 Dam Safety Data Management Systems

The dams database (DAMS) has been updated and upgraded this water year. While the main database is kept on a computer server in Denver, the dam safety engineers can access and update the data for their divisions through network connections. Recent upgrades to DAMS provides the dam safety engineers with access to the database while in the field and the ability to prepare safety inspection reports remotely and upload the reports to the database. The Dam Safety Branch's capability to maintain the database and analyze dams was enhanced by the receipt of computer hardware and software for the Denver office and the division offices under the auspices of the National Dam Safety Program Assistance grants. This system is used to update the National Inventory of Dams (NATDAM or NID) periodically when requested by the U.S. Army Corps of Engineers.

3.10 Publications/Internet

A number of publications are available at no cost on the Dam Safety web page at <http://water.state.co.us/damsafety/dams.asp>. The documents are in a variety of common formats including Microsoft Word and Adobe Acrobat PDF. Documents available include the Revised Rules and Regulations for Dam Safety and Dam Construction, Project Review Guide, application forms, sample plans, Livestock and Erosion Control Dam Permits, and Notice to Construct a nonjurisdictional Water Impoundment Structure, and the Guide to Construction and Administration of Dams in Colorado.

3.11 Risk-Based Approach



**Cucharas Dam, Huerfano County
High Hazard**

In the late 1990s, the Dam Safety Branch embarked on a program to utilize Risk-Based methods to rank dams according to potential failure modes and consequences. An Intergovernmental Agreement between the Bureau of Reclamation (USBR) and the Dam Safety Branch was issued to allow the USBR to revise their Risk-Based Profiling System (RBPS) to meet the needs of the Colorado Dam Safety Branch. The goal of the Colorado RBPS program was to develop a relatively simple (to the user) software tool to quickly rank the relative condition of High Hazard and Significant Hazard dams in the state. The rankings would then be used to more efficiently allocate resources to those dams determined to present the greatest risk to public safety.

The inspection frequency of all High and Significant Hazard dams was based on the summation of the Static and Operation and Maintenance scores and as presented in the Table 4.

**TABLE 4
INSPECTION FREQUENCIES FOR HIGH AND SIGNIFICANT HAZARD DAMS**

RBPS Scores	High Hazard	Significant Hazard	Restricted Dams
> 135	Each Year	Each Year	Each Year
76 to 135	Each Year	Every Two Years	Each Year
51 to 75	Every Two Years	Every Three Years	Each Year
0 to 50	Every Three Years	Every Three Years	Each Year

Results on the effectiveness of the program is positive and has allowed resources by the dam safety engineers to work more closely with dam owners on a variety of activities, like updating EAPs and developing outreach and education programs as it relates to dam safety. Continued revisions to the program during this reporting period further enhanced the effectiveness of the program.

3.12 Federal Energy Regulatory Commission Non-Federal Dams

This year, several dam safety engineers participated in the Federal Energy Regulatory EAP tabletop exercise was conducted for the following dams regulated by FERC or other federal dams and was attended by personnel of the Dam Safety Branch:

- Barker Dam – FERC regulated in Division 1
- Dillon Dam – FERC regulated in Division 1
- Cherry Creek Dam – U.S. Army Corps of Engineers regulated in Division 1

An EAP functional exercise was performed for Dillon Dam. A functional exercise brings together all first responders, municipalities, and regulatory agencies in a mock scenario involving an incident with the dam work through the actions that would be taken that would be impacted as a result of a dam failure.



**Bull Canal, Weld County
High Hazard**

Mark Haynes, Paul Perri and John Redding participated in EAP Table top exercises for the City of Aurora owned dams which all reside in Division 1 and include:

- Senac Dam
- Quincy Dam
- Aurora Rampart Dam
- Spinney Mountain Dam
- Jefferson Lake Dam

In the past, the Branch has performed safety inspections of dams that are also regulated by FERC. In accordance with an agreement (since a formal MOU was not completed) with them, they were to furnish copies of their reports for branch records. More recently, the Branch had curtailed participation in FERC-regulated dams in accordance with a 1998 State of Colorado internal audit. However, during a recent review of the agreement and procedures for administration of FERC-regulated dams, the need for a change in the current policy was identified. It was determined that the Dam Safety Branch does not regularly receive copies of FERC safety inspection reports. Further, it was clarified that unlike USBR and USCOE dams, the FERC does not own the dams they regulate and, in most cases, the dams are owned by Colorado based entities. To ensure the safety of the citizens of Colorado, it was determined that Dam Safety Branch engineers would resume performing dam safety inspection of FERC-regulated dams in Colorado. Policy Memorandum No. 06-02 modifies recommendation #3 of the 1998 legislative audit resuming inspections on non-federal dams that are regulated by FERC.

4.0 OTHER ACTIVITIES



**Rueter-Hess Dam, Douglas County
High Hazard**

4.1 Extreme Precipitation Analysis Tool

Funded by the Dam Safety Branch NDSP grant and the CWCB, the Extreme Precipitation Analysis Tool (EPAT) for the West and East (down to Elevation 5,500) slope continues to be a useful tool that the Dam Safety Branch uses to analyze extreme precipitation events. The Dam Safety Branch is in the process of developing a scope of work to further enhance the EPAT tool.

4.2 Colorado Water Conservation Board Revised Floodplain Rules and Regulations Advisory Committee

Paul Perri participated in several plenary meetings on the revisions to the Colorado Water Conservation Board (CWCB) Flood Plain Rules and Regulations. Paul provided insight to the activities and recommendations that the National Committee on Levee Safety as it relates to the proposed revisions to the Flood Plain Rules and Regulations.

4.3 Bill McCormick – DWR Professional of the Year

Bill McCormick was presented with Professional of the Year for DWR. Over the WY 2008-09, Bill provided the Colorado Department of Emergency Management with an evaluation of the potential impacts of a breach of the Leadville Mine Drainage Tunnel near Leadville, CO. Bill was also instrumental in coordinating an intensive branch-wide evaluation of the EPAT tool. Bill continually provides assistance without hesitation to the public and DNR as well as completing his day to day duties as Dam Safety Engineer for Division 1 and 2.



**Park Creek Dam, Larimer County
High Hazard**

5.0 COORDINATION WITH NATIONAL PROGRAMS

5.1 Association of State Dam Safety Officials

All of the dam safety engineers in the Dam Safety Branch are members of the Association of State Dam Safety Officials (ASDSO) and actively participate in its programs, presenting papers, serving on task groups and committees, and taking advantage of ASDSO-sponsored training opportunities.

The purpose of ASDSO is to provide a forum for the exchange of ideas and experiences on dam safety issues, foster interstate cooperation, provide information and assistance to dam safety programs, provide representation of state interests before Congress and federal agencies for dam safety, and to improve the efficiency and effectiveness of the state dam safety program. Mark Haynes, Chief of the Dam Safety Branch is the state's representative to ASDSO, and also serves on the Board of Directors of ASDSO.

As a Board member, Mark Haynes participated in the American Society of Civil Engineers (ASCE) Policy week in Washington D.C. Mark visited the offices of Senators Udall and Bennet, and Representatives Salazar, Markey, and Coffman to bring attention to the condition of our nation's infrastructure and to encourage support for the Dam Rehabilitation and Repair Act. ASCE recently completed a 2009 report card on the nation's infrastructure, where the condition's of the nations dams was given a "D". The state of Colorado's local section of ASCE also prepared a report for the infrastructure within Colorado and the dams in the state was given a grade of "B". This grade can be attributed to the dedication and effectiveness of the dam safety engineers.

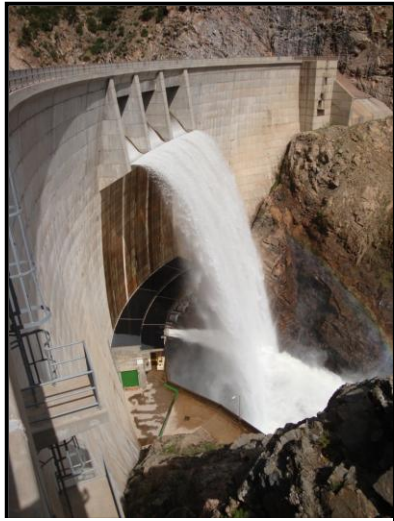


ASCE Policy Week in Washington D.C. - Representative John Salazar (Center) and Mark Haynes (Right) met during the event to discuss dam rehabilitation issues.

5.2 Government Coordinating Council (GCC)

Mark Haynes continues to serve as one of eight state representatives on the Dam Sector committee of the Department of Homeland Security (DHS) Government Coordination Council (GCC). The purpose of the GCC is to bring together a diverse federal, state, local, and tribal interests to develop and identify collaborative strategies that advance critical infrastructure protection and security. Participation on the GCC will include reviewing ongoing initiatives and discuss relevant issues as they relate to security and protection of state-regulated Dams Sector assets. In addition, participation will also involve the organizing, coordinating and facilitating a series of technical training meetings and workshops to provide valuable educational and professional development as it relates to dam security issues.

5.3 National Committee on Levee Safety



**Strontia Springs Dam
Jefferson County,
High Hazard**

Paul Perri, Design Review Engineer for the Dam Safety Branch is currently serving as a voting member representing DWR on the National Committee on Levee Safety (NCLS). In January 2009, the NCLS released *Recommendations for a National Levee Safety Program*. These recommendations were developed over a three month period (October 2008 – January 2009). Among the twenty recommendations, Recommendation 14 – Design and Delegate Program Responsibilities to States to assist states and local governments develop effective levee safety programs focused on continual and periodic inspections, emergency evacuation, mitigation, public involvement and risk communication/awareness will need to be addressed and possibly incorporated into the dam safety program in the near future.

5.4 Federal Dam Safety Programs

5.4.1 General

Routine inspections of federal dams by dam safety engineers have been curtailed in accordance with a 1998 legislative audit recommendation. The branch, however, participates in the evaluation of the safety of some federal dams for special issues and performance problem evaluations, in accordance with the procedure for obtaining approval to participate in these activities and inspections. During this reporting period, participation in these safety inspections was minimal and was primarily used to maintain communication between the dam safety branch and the various federal agencies.

5.4.2 Memoranda of Understandings

Memorandums of Understanding (MOU) have been executed with the U.S. Bureau of Reclamation (USBR), the U.S. Bureau of Land Management, and the Air Force Academy (AFA) relating to dam safety activities in Colorado. An MOU is also in development for the Fort Carson Army installation. The MOUs provide for the exchange of safety-related information of dams under each agency's jurisdiction.

An MOU is also being updated with the U.S. Forest Service, Rocky Mountain Region, to provide coordination of mutual responsibilities for dam safety and their Travel Management Plan for the National Forests. This is necessary to provide access to private dams located within the forests. MOUs are being pursued with the other federal agencies such as the U.S. Army Corps of Engineers (USCOE) to assure that the dams under their jurisdiction are being maintained in a safe condition and to coordinate activities and exchange of information and data.

6.0 FISCAL RESPONSIBILITY

6.1 Use of Appropriated Funds

Dam safety personal service expenditures for fiscal year 2008-09 were approximately \$1,650,000.

With the passage of the National Dam Safety Program Act (NDSP), PL 104-303, and its subsequent funding, Colorado has applied for and received assistance grants each year since 1998. An additional grant was approved for 2008. These funds are used to provide advanced training to the Dam Safety Branch personnel in the fields of dam safety and risk analysis. Additional training is provided under the technical seminar provisions of the Act. The grant funds are also used to acquire emergency communication equipment, upgrade computers, and purchase engineering computer software programs and other equipment. Future grants may be available each year under the Act, subject to appropriations.

6.2 Receipt of Funds Generated by Filing Fees

Fees collected by the State Engineer and deposited in the General Fund for dam safety amounted to \$45,700 for filing plans and specifications during the period.

7.0 ENFORCEMENT ORDERS, PROCEEDINGS, AND LEGISLATION

No enforcement orders or proceedings on dam safety were issued or conducted during the period. Also, no legislation affecting dam safety was enacted during the period.

8.0 SUMMARY OF WY 2009 -10 DAM SAFETY BRANCH GOALS

In addition to yearly program goals of inspections and design reviews, the following are additional branch goals for WY 2009 - 10:

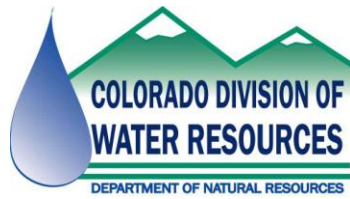
1. Continue to perform dam owner training by conducting one-day workshops at various locations throughout the state.
2. Expand the Division of Water Resources Dam Safety Branch's involvement in National Dam Safety and Security activities.
3. Update or establish Memorandums of Understanding (MOUs) with FERC, BLM, and DOW.
4. Review and update current policy and guidance documents.
5. Update the Owners Dam Safety Manual.
6. Update the Design Review Guide to be consistent with the 2007 Rules and Regulations.
7. Continue to provide professional training of branch personnel.
8. Improve coordination and communication of personnel within the program and Division Offices.
9. Continue efforts in communicating and educating dam owners in the need to maintain and update their Emergency Action Plans.
10. Continue to evaluate the inclusion of risk-based methods in the dam safety program.
11. Continue to communicate and educate the public on dam safety.
12. Develop technical workshops on Spillway Hydraulics, Dam Hazard Classification, and Emergency Action Planning.

APPENDIX A

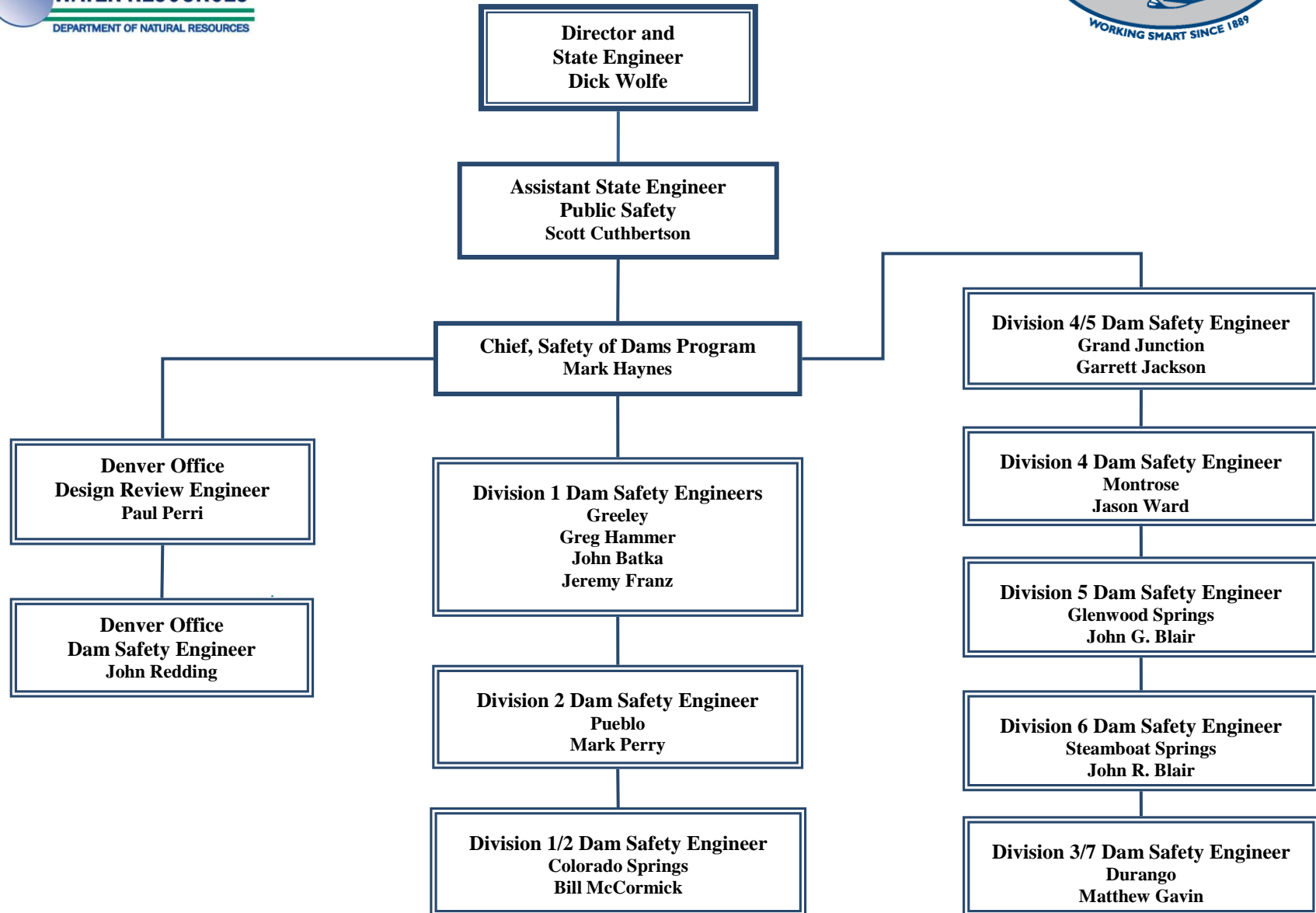
DAM SAFETY BRANCH ORGANIZATION AND PERSONNEL

APPENDIX A
DAM SAFETY BRANCH ORGANIZATION AND PERSONNEL

NAME	LOCATION	GRADE	TITLE	RESPONSIBILITY
Scott Cuthbertson	Denver	PE IV	Assistant State Engineer	Oversight of Colorado Dam Safety Branch Program,
Mark Haynes	Denver	PE III	Branch Chief, Dam Safety Branch	Oversight of Safety Evaluations of Existing Dams and Design Review and Construction Inspection Activities; ASDSO State Representative and board member, national Dam Safety Review Board, Government Coordination and Security Council,
Paul Perri	Denver	PE II	Design Review/Const. Inspect. Engineer	Engineering review of design documents and construction inspection
Jeremy Franz	Greeley	PE II	Dam Safety Engineer	Safety Evaluations of existing Dams in Water Division 1
John Batka	Greeley	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 1
Greg Hammer	Greeley	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 1
Bill McCormick	Colorado Springs	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Divisions 1 and 2
Mark Perry	Pueblo	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 2
Matt Gavin	Durango	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Divisions 3 and 7
Jason Ward	Montrose	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 4
John G. Blair	Glenwood Springs	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 5
Garrett Jackson	Grand Junction	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Divisions 4 and 5, and review of design documents on the Western Slope
John R. Blair	Steamboat Springs	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 6
John Redding	Denver	PE I	Dam Safety Engineer	Safety Evaluations of Existing Low Hazard Dams in Division 1, assistance to Dam Safety Engineers



COLORADO DIVISION OF WATER RESOURCES SAFETY OF DAMS PROGRAM ORGANIZATIONAL CHART



APPENDIX B

DAM SAFETY ENGINEER DAM SAFETY INSPECTION REPORT FORM

ENGINEERS INSPECTION REPORT

INSPECTOR:

OFFICE OF THE STATE ENGINEER - DIVISION OF WATER RESOURCES - DAM SAFETY BRANCH

1313 SHERMAN STREET, ROOM 818, DENVER, CO 80203, (303) 866-3581

DAM NAME: 	T: 	R: 	S: 	COUNTY: 	DATE OF INSPECTION:
DAM ID: 	YR Compl: 	DAM HEIGHT(FT): 	SPILLWAY WIDTH(FT): 		PREVIOUS INSPECTION:
CLASS: 		DAM LENGTH(FT): 	SPILLWAY CAPACITY(CFS): 		CAPACITY(AF):
DIV: 	WD: 	CRESTWIDTH(FT): 	FREEBOARD (FT): 		SURFACE AREA(AC):
EPP: 	8/5/2002	CRESTELEV(FT): 	DRAINAGE AREA (AC.): 		OUTLET INSPECTED:

CURRENT RESTRICTION

OWNER: 	CONTACT NAME:
ADDRESS: 	CONTACT PHONE:

INSPECTION PARTY: _____
 REPRESENTING: _____

FIELD CONDITIONS OBSERVED	WATER LEVEL: BELOW DAM CREST _____ FT. Above Spillway _____ FT.	GAGE ROD READING _____
	GROUND MOISTURE CONDITION: DRY <input type="checkbox"/> WET <input type="checkbox"/> SNOWCOVER <input type="checkbox"/> OTHER <input type="checkbox"/>	

DIRECTIONS: MARK AN X FOR CONDITIONS FOUND AND UNDERLINE WORDS THAT APPLY

	Problems Noted	GOOD	ACCEPTABLE	POOR	Observed
UPSTREAM SLOPE	PROBLEMS NOTED <input type="checkbox"/> (0) NONE <input type="checkbox"/> (1) RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED <input type="checkbox"/> (2) WAVE EROSION - WITH SCARPS <input type="checkbox"/> (3) CRACKS WITH DISPLACEMENT <input type="checkbox"/> (4) SINKHOLE <input type="checkbox"/> (5) APPEARS TOO STEEP <input type="checkbox"/> (6) DEPRESSIONS OR BULGES <input type="checkbox"/> (7) SLIDES <input type="checkbox"/> (8) CONCRETE FACING - HOLES, CRACKS, DISPLACED, UNDERMINED <input type="checkbox"/> (9) OTHER _____	G O O D	A C C E P T A B L E	P O O R	G O O D
CREST	PROBLEMS NOTED <input type="checkbox"/> (10) NONE <input type="checkbox"/> (11) RUTS OR PUDDLES <input type="checkbox"/> (12) EROSION <input type="checkbox"/> (13) CRACKS - WITH DISPLACEMENT <input type="checkbox"/> (14) SINKHOLES <input type="checkbox"/> (15) NOT WIDE ENOUGH <input type="checkbox"/> (16) LOW AREA <input type="checkbox"/> (17) MISALIGNMENT <input type="checkbox"/> (18) IMPROPER SURFACE DRAINAGE <input type="checkbox"/> (19) OTHER _____	G O O D	A C C E P T A B L E	P O O R	G O O D
DOWNSTREAM SLOPE	PROBLEMS NOTED <input type="checkbox"/> (20) NONE <input type="checkbox"/> (21) LIVESTOCK DAMAGE <input type="checkbox"/> (22) EROSION OR GULLIES <input type="checkbox"/> (23) CRACKS - WITH DISPLACEMENT <input type="checkbox"/> (24) SINKHOLE <input type="checkbox"/> (25) APPEARS TOO STEEP <input type="checkbox"/> (26) DEPRESSIONS OR BULGES <input type="checkbox"/> (27) SLIDE <input type="checkbox"/> (28) SOFT AREAS <input type="checkbox"/> (29) OTHER _____	G O O D	A C C E P T A B L E	P O O R	G O O D
SEEPAGE	PROBLEMS NOTED <input type="checkbox"/> (30) NONE <input type="checkbox"/> (31) SATURATED EMBANKMENT AREA <input type="checkbox"/> (32) SEEPAGE EXITS ON EMBANKMENT <input type="checkbox"/> (33) SEEPAGE EXITS AT POINT SOURCE <input type="checkbox"/> (34) SEEPAGE AREA AT TOE <input type="checkbox"/> (35) FLOW ADJACENT TO OUTLET <input type="checkbox"/> (36) SEEPAGE INCREASED / MUDDY DRAIN OUTFALLS SEEN <input type="checkbox"/> No <input type="checkbox"/> Yes Show location of drains on sketch and indicate <input type="checkbox"/> (37) FLOW INCREASED / MUDDY <input type="checkbox"/> (38) DRAIN DRY / OBSTRUCTED <input type="checkbox"/> (39) OTHER _____	G O O D	A C C E P T A B L E	P O O R	G O O D
OUTLET	PROBLEMS NOTED <input type="checkbox"/> (40) NONE <input type="checkbox"/> (41) NO OUTLET FOUND <input type="checkbox"/> (42) POOR OPERATING ACCESS <input type="checkbox"/> (43) INOPERABLE <input type="checkbox"/> (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED <input type="checkbox"/> (45) OUTLET OPERATED DURING INSPECTION <input type="checkbox"/> YES <input type="checkbox"/> NO INTERIOR INSPECTED <input type="checkbox"/> (120) NO <input type="checkbox"/> (121) YES <input type="checkbox"/> (46) CONDUIT DETERIORATED OR COLLAPSED <input type="checkbox"/> (47) JOINTS DISPLACED <input type="checkbox"/> (48) VALVE LEAKAGE <input type="checkbox"/> (49) OTHER _____	G O O D	A C C E P T A B L E	P O O R	G O O D
SPILLWAY	PROBLEMS NOTED <input type="checkbox"/> (50) NONE <input type="checkbox"/> (51) NO EMERGENCY SPILLWAY FOUND <input type="checkbox"/> (52) EROSION WITH BACKCUTTING <input type="checkbox"/> (53) CRACK - WITH DISPLACEMENT <input type="checkbox"/> (54) APPEARS TO BE STRUCTURALLY INADEQUATE <input type="checkbox"/> (55) APPEARS TOO SMALL <input type="checkbox"/> (56) INADEQUATE FREEBOARD <input type="checkbox"/> (57) FLOW OBSTRUCTED <input type="checkbox"/> (58) CONCRETE DETERIORATED / UNDERMINED <input type="checkbox"/> (59) OTHER _____	G O O D	A C C E P T A B L E	P O O R	G O O D

See Guidelines on Back of this Sheet

MONITORING	EXISTING INSTRUMENTATION FOUND <input type="checkbox"/> (110) NONE <input type="checkbox"/> (111) GAGE ROD <input type="checkbox"/> (112) PIEZOMETERS <input type="checkbox"/> (113) SEEPAGE WEIRS / FLUMES	MONITORING
	<input type="checkbox"/> (114) SURVEY MONUMENTS <input type="checkbox"/> (115) OTHER _____	
MONITORING OF INSTRUMENTATION <input type="checkbox"/> (116) NO <input type="checkbox"/> (117) YES PERIODIC INSPECTIONS BY: <input type="checkbox"/> (118) OWNER <input type="checkbox"/> (119) ENGINEER		GOOD ACCEPTABLE POOR

MAINTENANCE AND REPAIR	PROBLEMS NOTED: <input type="checkbox"/> (60) NONE <input type="checkbox"/> (61) ACCESS ROAD NEEDS MAINTENANCE <input type="checkbox"/> (62) CATTLE DAMAGE	MAINTENANCE AND REPAIR
	<input type="checkbox"/> (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE <input type="checkbox"/> (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE	
<input type="checkbox"/> (65) RODENT ACTIVITY ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE <input type="checkbox"/> (66) DETERIORATED CONCRETE - FACING, OUTLET SPILLWAY		GOOD ACCEPTABLE POOR
<input type="checkbox"/> (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE <input type="checkbox"/> (68) OTHER _____		

OVERALL CONDITIONS	<p>Based on this Safety Inspection and recent file review, the overall condition is determined to be:</p> <input type="checkbox"/> (71) SATISFACTORY <input type="checkbox"/> (72) CONDITIONALLY SATISFACTORY <input type="checkbox"/> (73) UNSATISFACTORY	OVERALL CONDITIONS
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<p>The State Engineer, by providing this dam safety inspection report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of this dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.</p>	ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM
	<p>MAINTENANCE - MINOR REPAIR - MONITORING</p> <input type="checkbox"/> (80) PROVIDE ADDITIONAL RIPRAP: _____ <input type="checkbox"/> (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE _____ <input type="checkbox"/> (82) CLEAR TREES AND/OR BRUSH FROM: _____ <input type="checkbox"/> (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES: _____ <input type="checkbox"/> (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE: _____ <input type="checkbox"/> (85) PROVIDE SURFACE DRAINAGE FOR: _____ <input type="checkbox"/> (86) MONITOR: _____ <input type="checkbox"/> (87) DEVELOP AND SUBMIT AN EMERGENCY PREPAREDNESS PLAN: _____ <input type="checkbox"/> (88) OTHER _____ <input type="checkbox"/> (89) OTHER _____
	<p>ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO: (Plans and Specifications must be approved by State Engineer prior to construction)</p> <input type="checkbox"/> (90) PREPARE PLANS AND SPECIFICATIONS FOR REHABILITATION OF THE DAM: _____ <input type="checkbox"/> (91) PREPARE AS-BUILT DRAWINGS OF: _____ <input type="checkbox"/> (92) PERFORM A GEOTECHNICAL INVESTIGATION TO EVALUATE THE STABILITY OF THE DAM: _____ <input type="checkbox"/> (93) PERFORM A HYDROLOGIC STUDY TO DETERMINE REQUIRED SPILLWAY SIZE: _____ <input type="checkbox"/> (94) PREPARE PLANS AND SPECIFICATIONS FOR AN ADEQUATE SPILLWAY: _____ <input type="checkbox"/> (95) SET UP A MONITORING SYSTEM INCLUDING WORK SHEETS, REDUCED DATA AND GRAPHED RESULTS: _____ <input type="checkbox"/> (96) PERFORM AN INTERNAL INSPECTION OF THE OUTLET: _____ <input type="checkbox"/> (97) OTHER: _____ <input type="checkbox"/> (98) OTHER: _____ <input type="checkbox"/> (99) OTHER: _____

SAFE STORAGE LEVEL RECOMMENDED AS A RESULT OF THIS INSPECTION									
<input type="checkbox"/> (101) FULL STORAGE <input type="checkbox"/> (102) CONDITIONAL FULL STORAGE <input type="checkbox"/> (103) RECOMMENDED RESTRICTION <input type="checkbox"/> (104) CONTINUE EXISTING RESTRICTION	<p style="text-align:center;">RESTRICTED LEVEL OFFICIAL ORDER TO FOLLOW</p> <div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">}</div> <table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; width: 40px; height: 20px;"></td> <td style="padding: 2px;">FT. BELOW DAM CREST</td> </tr> <tr> <td style="border: 1px solid black; width: 40px; height: 20px;"></td> <td style="padding: 2px;">FT. BELOW SPILLWAY CREST</td> </tr> <tr> <td style="border: 1px solid black; width: 40px; height: 20px;"></td> <td style="padding: 2px;">FT. GAGE HEIGHT</td> </tr> <tr> <td style="border: 1px solid black; width: 40px; height: 20px;"></td> <td style="padding: 2px;">NO STORAGE-MAINTAIN OUTLET FULLY OPEN</td> </tr> </table> </div>		FT. BELOW DAM CREST		FT. BELOW SPILLWAY CREST		FT. GAGE HEIGHT		NO STORAGE-MAINTAIN OUTLET FULLY OPEN
	FT. BELOW DAM CREST								
	FT. BELOW SPILLWAY CREST								
	FT. GAGE HEIGHT								
	NO STORAGE-MAINTAIN OUTLET FULLY OPEN								
REASON FOR RESTRICTION _____	_____								
ACTIONS REQUIRED FOR CONDITIONAL FULL STORAGE OR CONTINUED STORAGE AT THE RESTRICTED LEVEL:									

GUIDELINES FOR DETERMINING CONDITIONS

CONDITIONS OBSERVED - APPLIES TO UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, OUTLET, SPILLWAY

GOOD

In general, this part of the structure has a near new appearance, and conditions observed in this area do not appear to threaten the safety of the dam.

ACCEPTABLE

Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new condition. Conditions in this area do not currently appear to threaten the safety of the dam.

POOR

Conditions observed in this area appear to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO SEEPAGE

GOOD

No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.

ACCEPTABLE

Some seepage exists at areas other than the drain outfalls, or other designed drains. No unexplained increase in seepage. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.

POOR

Seepage conditions observed appear to threaten the safety of the dam. Examples:

- 1) Designed drain or seepage flows have increased without increase in reservoir level.
- 2) Drain or seepage flows contain sediment, i.e., muddy water or particles in jar samples.
- 3) Widespread seepage, concentrated seepage, or ponding appears to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO MONITORING

GOOD

Monitoring includes movement surveys and leakage measurements for all dams, and piezometer readings for Class I dams. Instrumentation is in reliable, working condition. A plan for monitoring the instrumentation and analyzing results by the owner's engineer is in effect. Periodic inspections by owner's engineer.

ACCEPTABLE

Monitoring includes movement surveys and leakage measurements for Class I & II dams; leakage measurements for Class III dams. Instrumentation is in serviceable condition. A plan for monitoring instrumentation is in effect by owner. Periodic inspections by owner or representative. OR, NO MONITORING REQUIRED.

POOR

All instrumentation and monitoring described under "ACCEPTABLE" here for each class of dam, are not provided, or required periodic readings are not being made, or unexplained changes in readings are not reacted to by the owner.

CONDITIONS OBSERVED - APPLIES TO MAINTENANCE AND REPAIR

GOOD

Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.

ACCEPTABLE

Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are required.

POOR

Dam does not appear to receive adequate maintenance. One or more items needing maintenance or repair has begun to threaten the safety of the dam.

OVERALL CONDITIONS

SATISFACTORY

The safety inspection indicates no conditions that appear to threaten the safety of the dam, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.

CONDITIONALLY SATISFACTORY

The safety inspection indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen, could lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.

UNSATISFACTORY

The safety inspection indicates definite signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which could lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

SAFE STORAGE LEVEL

FULL STORAGE

Dam may be used to full capacity with no conditions attached.

CONDITIONAL FULL STORAGE

Dam may be used to full storage if certain monitoring, maintenance, or operational conditions are met.

RESTRICTION

Dam may not be used to full capacity, but must be operated at some reduced level in the interest of public safety.

CLASSIFICATION OF DAMS

CLASS I

Class I - Loss of human life is expected in the event of failure of the dam, while the reservoir is at the high water line.

CLASS II

Class II - Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.

CLASS III

Class III - Loss of human life is not expected, and damage to improved property is expected to be small, in the event of failure of the dam while the reservoir is at high water line.

Class IV - No loss of life or damage to improved property, or loss of downstream resource is expected in the event of failure of the dam while the reservoir is at the high water line.

APPENDIX C

WATER COMMISSIONER DAM OBSERVATION REPORT FORM

WATER COMMISSIONER • DAM OBSERVATION REPORT • OFFICE OF THE STATE ENGINEER

DIVISION OF WATER RESOURCES • DAM SAFETY BRANCH

1313 SHERMAN STREET, ROOM 818, DENVER, CO 80203, (303) 866-3681

FIELD CONDITIONS OBSERVED WATER LEVEL: BELOW DAM CREST _____ FT., BELOW SPILLWAY _____ FT., GAGE ROD READING _____
 GROUND MOISTURE CONDITION: DRY _____ WET _____ SNOWCOVER _____ OTHER _____

DIRECTIONS: MARK AN X FOR CONDITIONS FOUND AND UNDERLINE WORDS THAT APPLY.

UPSTREAM SLOPE	PROBLEMS NOTED: <input type="checkbox"/> (0) NONE <input type="checkbox"/> (1) RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED <input type="checkbox"/> (2) WAVE EROSION-WITH SCARPS <input type="checkbox"/> (3) CRACKSWITH DISPLACEMENT <input type="checkbox"/> (4) SINKHOLE (5) APPEARS TO STEEP <input type="checkbox"/> (6) DEPRESSIONS OR BULGES (7) SLIDES <input type="checkbox"/> (8) CONCRETE FACING-HOLES, CRACKS, DISPLACED, UNDERMINED <input type="checkbox"/> (9) OTHER _____
CREST	PROBLEMS NOTED: <input type="checkbox"/> (10) NONE <input type="checkbox"/> (11) RUTS OR PUDDLES <input type="checkbox"/> (12) EROSION <input type="checkbox"/> (13) CRACKS - WITH DISPLACEMENT <input type="checkbox"/> (14) SINKHOLES <input type="checkbox"/> (15) NOT WIDE ENOUGH <input type="checkbox"/> (16) LOW AREA <input type="checkbox"/> (17) MISALIGNMENT <input type="checkbox"/> (18) IMPROPER SURFACE DRAINAGE <input type="checkbox"/> (19) OTHER _____
DOWNSTREAM SLOPE	PROBLEMS NOTED: <input type="checkbox"/> (20) NONE <input type="checkbox"/> (21) LIVESTOCK DAMAGE <input type="checkbox"/> (22) EROSION OR GULLIES <input type="checkbox"/> (23) CRACKS - WITH DISPLACEMENT <input type="checkbox"/> (24) SINKHOLE <input type="checkbox"/> (25) APPEARS TOO STEEP <input type="checkbox"/> (26) DEPRESSION OR BULGES <input type="checkbox"/> (27) SLIDE <input type="checkbox"/> (28) SOFT AREAS <input type="checkbox"/> (29) OTHER _____
SEEPAGE	PROBLEMS NOTED: <input type="checkbox"/> (30) NONE <input type="checkbox"/> (31) SATURATED EMBANKMENT AREA <input type="checkbox"/> (32) SEEPAGE EXITS ON EMBANKMENT <input type="checkbox"/> (33) SEEPAGE EXITS AT POINT SOURCE <input type="checkbox"/> (34) SEEPAGE AREA AT TOE <input type="checkbox"/> (35) FLOW ADJACENT TO OUTLET <input type="checkbox"/> (36) SEEPAGE INCREASED/MUDDY DRAIN OUTPALL SEEN ___ No ___ Yes <input type="checkbox"/> (37) FLOW INCREASED/MUDDY (38) DRAIN DRY/OBSTRUCTED <input type="checkbox"/> (39) OTHER _____
OUTLET	PROBLEMS NOTED: <input type="checkbox"/> (40) NONE <input type="checkbox"/> (41) NO OUTLET FOUND <input type="checkbox"/> (42) POOR OPERATING ACCESS <input type="checkbox"/> (43) INOPERABLE <input type="checkbox"/> (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED (45) OUTLET OPERATED DURING INSPECTION? <input type="checkbox"/> YES <input type="checkbox"/> NO INTERIOR INSPECTED <input type="checkbox"/> (120) NO <input type="checkbox"/> (121) YES <input type="checkbox"/> (46) CONDUIT DETERIORATED OR COLLAPSED <input type="checkbox"/> (47) JOINTS DISPLACED <input type="checkbox"/> (48) VALVE LEAKAGE <input type="checkbox"/> (49) OTHER _____
SPILLWAY	PROBLEMS NOTED: <input type="checkbox"/> (50) NONE <input type="checkbox"/> (51) NO EMERGENCY SPILLWAY FOUND <input type="checkbox"/> (52) EROSION-WITH BACKCUTTING <input type="checkbox"/> (53) CRACK - WITH DISPLACEMENT <input type="checkbox"/> (54) APPEARS TO BE STRUCTURALLY INADEQUATE <input type="checkbox"/> (55) APPEARS TOO SMALL <input type="checkbox"/> (56) INADEQUATE FREEBOARD <input type="checkbox"/> (57) FLOW OBSTRUCTED <input type="checkbox"/> (58) CONCRETE DETERIORATED/UNDERMINED <input type="checkbox"/> (59) OTHER _____
MAINTENANCE	PROBLEMS NOTED: <input type="checkbox"/> (60) NONE <input type="checkbox"/> (61) ACCESS ROAD NEEDS MAINTENANCE <input type="checkbox"/> (62) CATTLE DAMAGE <input type="checkbox"/> (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE <input type="checkbox"/> (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE <input type="checkbox"/> (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE <input type="checkbox"/> (68) OTHER _____

Conditions Observed			
UPSTREAM SLOPE	CREST	DOWNSTREAM SLOPE	SEEPAGE
GOOD	GOOD	GOOD	GOOD
ACCEPTABLE	ACCEPTABLE	ACCEPTABLE	ACCEPTABLE
POOR	POOR	POOR	POOR

See Guidelines on Back of this Sheet

The State Engineer, by providing this dam safety observation report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of the dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

DIRECTIONS: ENTER PROBLEM NUMBER () THEN LOCATION DIMENSIONS, DEGREE,

LOCATION OF PROBLEMS & COMMENTS: _____

MAINTENANCE – MINOR REPAIR – MONITORING – ACTION REQUIRED OF OWNER TO IMPROVE THE SAFETY OF THE DAM.

(80) PROVIDE ADDITIONAL RIPRAP: _____

(81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE: _____

(82) CLEAR TREES AND/OR BRUSH FROM _____

(83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES _____

(84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE: _____

(85) PROVIDE SURFACE DRAINAGE FOR: _____

(86) MONITOR: _____

(88) OTHER: _____

(89) OTHER: _____

DAM REQUIRES INSPECTION BY A FIELD ENGINEER

APPENDIX D

WY 08 - 09

**APPROVED PLANS AND SPECIFICATIONS
FOR
NEW DAMS AND ALTERATIONS, ENLARGEMENTS
OR REPAIRS OF EXISTING DAMS**

APPENDIX D
APPROVED PLANS AND SPECIFICATIONS FOR NEW DAMS AND ALTERATIONS
ENLARGEMENTS OR REPAIRS OF EXISTING DAMS

Dam Name	DAMID	Construction No.	Construction Type	Approval Date
DALBO PICEANCE CREEK EVAPORATION POND 1	430__A	C-1920	NEW	02-Nov-07
DALBO PICEANCE CREEK EVAPORATION POND 2	430__B	C-1921	NEW	02-Nov-07
DALBO PICEANCE CREEK EVAPORATION POND 3	430__C	C-1922	NEW	02-Nov-07
HODER RECREATION	805108	C-1074A	REPAIR	05-Nov-07
EMPIRE (EAST EMBANKMENT)	010728	C-0465D	REPAIR	03-Dec-07
CHIEF CREEK #4	650105	C-0771F	REPAIR	24-Jan-08
PLATTE VALLEY RESERVOIR #1	02__A	C-1924	NEW	24-Jan-08
FELLOWS	070131	C-1177B	MODIFICATION	04-Feb-08
LESTER CREEK	580113	C-0968E	REPAIR	13-Feb-08
SOUTH SIDE	040213	C-0155B	REPAIR	29-Feb-08
STONEWALL SPRINGS CENTRAL	14__	C-1927	NEW	14-Mar-08
JAMES TINGLE	23__A	C-1932	NEW	14-Mar-08
HORSESHOE LAKE (SOUTH DAM)	040244	C-0807G	MODIFICATION	16-Apr-08
FOOTHILLS HOLDING POND	080402	C-1574A	MODIFICATION	16-Apr-08
MARSTON LAKE - NORTH DAM	090129	C-0970D	MODIFICATION	16-Apr-08
TRAIL RIDGE MV 1-23 WATER IMPOUNDMENT	390128	C-1947	MODIFICATION	25-Apr-08
SUMMITVILLE TAILINGS	210103	C-1245A	ENLARGEMENT	02-Jun-08
PINE BROOK	060328	C-1878A	MODIFICATION	19-Jun-08
LAKE GRANT	590115	C-1754B	MODIFICATION	24-Jun-08
JOE KING #2	420130	C-0620A	ENLARGEMENT	24-Jun-08
RITSCHARD	500133	C-1725A	REPAIR	11-Jul-08
JUNIATA	420128	C-0661D	ENLARGEMENT	14-Jul-08
MOUNTAIN	230308	C-1934	REPAIR	15-Jul-08
WOODMOOR LAKE	100311	C-1199E	MODIFICATION	28-Jul-08
PDC FRESH WATER PIT	390127	C-1940	BREACH	01-Aug-08
BULL CREEK #4	720115	C-1877	MODIFICATION	11-Aug-08
DEER CREEK #3	620126	C-1939	MODIFICATION	25-Aug-08
LAKE GRACE	100207	C-0242A	MODIFICATION	25-Aug-08
LEO LAKE	100460	C-1931	REPAIR	25-Aug-08
TRUJILLO MEADOWS	220103	C-0722E	MODIFICATION	25-Aug-08
BIG MOLAS LAKE	300138	C-1926	MODIFICATION	27-Aug-08
LAMBERTSON LAKE #3	020645	C-1935	MODIFICATION	22-Sep-08
MESA CREEK #2	720214	C-0622C	REPAIR	22-Sep-08
GURLEY	600108	C-0460D	REPAIR	03-Oct-08
INTERQUEST SOUTH POND A	100461	C-1945	NEW	03-Oct-08
CRAIG #2	630106	C-0607B	REPAIR	09-Oct-08
BULL CANAL (MAIN RESERVOIR)	020607	C-1573C	REPAIR	14-Oct-08
SOUTH SIDE	040213	C-0155C	MODIFICATION	16-Oct-08
PROSPECT	010505	C-1439E	REPAIR	16-Oct-08
HOPKINS	380113	C-0090B	BREACH	17-Oct-08
MESA CREEK #3	720215	C-1218A	REPAIR	22-Oct-08
SIGNAL #2	020323	C-1476A	MODIFICATION	22-Oct-08
7 W GUEST RANCH POND	530209	C-1946	MODIFICATION	30-Oct-08
BEAVER	400115	C-0830D	REPAIR	30-Oct-08

APPENDIX E

**State of Colorado
Dam Safety Branch
Listing of Dams under Storage Restriction Orders**

DIVISION 1

**STATE OF COLORADO - DAM SAFETY
BRANCH LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS**

DAMID	Hazard Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Action Type	Volume Lost
010506	1	RIVERSIDE	GH 33.55 FT.	no spillway; 33.55 is max decree	33.5	5/9/1984	I	0
010728	1	EMPIRE (EAST EMBANKMENT)	Restricted to Gage Height 29.0	Wave Erosion Damage at Full Storage	29	11/16/2007	I	2500
030107	1	BLACK HOLLOW	4.2 FT. SPILLWAY	INADEQUATE SPILLWAY	31	10/22/1997	I	999
040208	1	RIST - BENSON	Restricted to Below Gage Height 10	Seepage at Toe and on Embankment	10	7/5/2005	I	160
060203	1	MARSHALL LAKE	Gage Height 61 or 3 Feet below Spillway	Spillway Construction Protection Crest	61	6/23/2008	I	915
075311	1	SMITH	1.0 SPILLWAY	SEEPAGE	0	1/26/2000	R	100
080327	1	SKEEL	5.0 Feet Below Spillway Crest	Poor Condition, seepage		11/2/2007	R	75
090204	1	WILLOW SPRINGS #1	2.0 FEET BELOW SPILLWAY	CONTINUAL EROSION AND DENSE VEGETATION	16	5/12/2008	R	16
230102	1	ANTERO	GH 18 FT.	STAB. BERM CONST. & NEW INSTR. MONITORING	18	2/4/1986	R	6500
640104	1	JULESBURG #4	GH 24 FT. FOR 90 DAYS, THEN GH 23 FT.	CONDITION OF OUTLET, EXCESSIVE SEEPAGE	24	5/2/1995	R	6964
640108	1	PREWITT	GH 26.5 FT.	NO SPWY & EXCESSIVE SEEPAGE	26.5	8/23/1990	I	2531
010115	2	BIJOU #2 DAM #1	GH 16; not > GH 15 for more than 30 days	scarping, seepage, no spillway	16	6/1/1993	C	2400
010505	2	PROSPECT	GH 35.5.	maintenance & monitoring issues	35.5	4/15/1981	R	588
020322	2	SIGNAL #1	5.0 CREST	CONCENTRATD SPG AREAS&QUESTNBLE COND OF OUTLET	0	6/21/1993	R	60
020411	2	NISSEN #2	1.75 SPILLWAY	LACK OF FREEBOARD		9/11/1995	I	50
030122	2	CURTIS LAKE	GH 10 FT.	CREST, SLOPE, EXT. SEEP. AREA BELOW D/S TOE	10	7/2/1985	I	397
030129	2	EATON - LAW	5 Feet below Spillway Crest	Deteriorated Outlet Works and subsidence		6/23/2008	I	300
030138	2	GRAY #3	NO STORAGE	SINKHOLE OVER OUTLET	0	5/27/1997	I	100
030301	2	NORTH POUDE # 4	GH 17 FT.	POOR U/S FACE, GENERAL CONDITION	17	4/17/1984	R	562
040123	2	FAIRPORT	ZERO STORAGE	POOR CONDITION AND DETERIORATED OUTLET CONDUIT	0	1/3/2007	R	563
050101	2	AKERS & TARR	7.0 CREST OCT. 1 - APRIL 1	SLIDE ON D/S SLOPE, SPGE. IN AREA OF ABAND OTL	0	3/23/1989	R	34
050308	2	UNION	GH 28.0	spillway design based on GH=28.0	28	12/6/1977	C	0
070126	2	DEWEY NO. 1	3.0 CREST(NW)	POOR CONDITION	0	11/19/1990	I	15
090115	2	HARRIMAN	GH 19 FT.	EXCESSIVE SEEPAGE	19	11/12/1992	R	300
010104	3	ADAMS & BUNKER #3	6.0 CREST	INADEQUATE FREEBOARD, SEEPAGE	0	5/22/1975	C	150

DIVISION 1

**STATE OF COLORADO - DAM SAFETY
BRANCH LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS**

DAMID	Hazard Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Action Type	Volume Lost
010132	3	J.B. COOKE	3 ft below top of headwall	provide minimum freeboard		5/6/1998	R	0
010138	3	DOVER	10.0 FT. CREST	POOR CONDITION		6/27/1996	I	60
010419	3	D.A. LORD #4	2.0 SPILLWAY	INADEQUATE SPILLWAY	0	9/19/1980	C	400
010526	3	TROJANOVICH	Zero Storage	Plugged Spillway, Deteriorated Outlet Conduit	0	3/7/2008	I	47
010612	3	NO NAME 1-1 #1	10 FT. CREST	SCOUR OF D/S SLOPE DUE TO FAILURE OF OUTLET		11/2/2000	I	100
010709	3	JOLLY JOHN	NO STORAGE	SCOUR HOLE FROM OUTLET	0	10/27/2000	I	297
010716	3	HOWARDS LAKE	3.0 FT. SPILLWAY	EROSION OF DAM AND CREST		6/3/1998	I	50
020113	3	CARLIN	5.0 CREST	NO SPILLWAY	0	7/29/1986	C	0
020115	3	LOWER CHURCH LAKE	3.0 FT CREST	INADEQUATE SPILLWAY		6/22/1999	I	0
020119	3	COLE	NO STORAGE	POOR CONDITION	0	6/30/1994	I	95
020314	3	NORTH STAR	5.0 BELOW DAM CREST	SINKHOLE ON DOWNSTREAM SLOPE		2/11/2003	R	
020333	3	THOMPSON	5.0 CREST	INADEQUATE FREEBOARD, GENERALLY POOR CONDITION	0	10/7/1987	R	30
020606	3	MOWER	5 FEET BELOW LOWEST POINT OF DAM	CONTINUAL DETERIORATION OF DAM CREST		6/27/2007	R	24
020615	3	HAVANA STREET DAM	NO STORAGE	NO SPILLWAY	0	6/17/1987	C	0
030108	3	BOX ELDER #2	3.0 FT. SPILLWAY	EXCESSIVE SEEPAGE	6.5	8/8/1989	I	49
030128	3	DRY CREEK	GH 11.5 FT.	OUTLET DETERIORATION,SEEPAGE, INAD SW	11.5	1/17/1996	R	150
030214	3	LAW, JOHN	3.0 CREST	INADEQUATE SPILLWAY AND FREEBOARD	11	6/22/1987	C	45
030220	3	MATTINGLY	2.0 FT. SPILLWAY	EROSION/3-5 FT. SCARP ON U/S FACE		10/23/1997	I	99
030225	3	MOUNTAIN SUPPLY # 1	10 FT. CREST	POOR CONDITION	5	11/5/1997	I	500
030226	3	MOUNTAIN SUPPLY # 2	10 FT. CREST	POOR CONDITION	5	11/5/1997	I	300
030227	3	MOUNTAIN SUPPLY # 6	3.0 CREST	NO SPILLWAY		10/19/2000	C	120
030229	3	MOUNTAIN SUPPLY # 8	NO STORAGE	POOR CONDITION	0	10/3/1978	I	643
030512	3	RIST CANYON	3.0 CREST	SEEPAGE, INADEQUATE SPILLWAY	0	4/19/1983	I	33
045234	3	IDE AND STARBIRD #1	3.0 CREST	POOR MN, ERODED U/S FACE, QUES. SPILLWAY	0	7/3/1985	I	0
050132	3	HIGHLAND	3.0 BELOW TOP OF CONCRETE WALL AT	NO SPILLWAY OUTLET	0	11/26/1990	R	0

DIVISION 1

**STATE OF COLORADO - DAM SAFETY
BRANCH LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS**

DAMID	Hazard Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Action Type	Volume Lost
050206	3	KNOTH	NO STORAGE	NEVER COMPLETED DAM	0	12/24/1985	I	204
050212	3	LITTLE GEM	10.0 CREST	EROSION ON U/S SLOPE & CRST, TREES ON U/S SLOPE	0	10/11/1985	I	60
050301	3	STEELE BROTHERS #1	4.0 SPILLWAY	SAT. EMBKMT.; INOP. OS.; INAD. FBD; SPWY.REPAR	0	12/1/1987	I	34
050302	3	STEELE BROTHERS #2	3.0 SPILLWAY	TOTAL REHABILITATION REQUIRED	0	11/23/1987	I	14
050304	3	SWEDE	5.0 CREST	EMBANKMENT SEEPAGE & INADEQUATE FREEBOARD	0	11/14/1986	I	75
060306	3	VARSITY POND	1 FT. SPILLWAY	SEEPAGE/SPILLWAY		8/31/1999	I	1
060314	3	HODGSON-HARRIS	6.0 CREST	POOR CONDITION		11/14/1995	I	60
070202	3	KELLY	FIVE FEET BELOW DAM CREST	ABANDON FACILITY AND NO MAINTENANCE		7/7/2008	R	50
080101	3	ALLIS	15.0 CREST	SLOUGHING, SEEPAGE	0	8/25/1992	R	50
080105	3	BAIRD #1	7.0 CREST	SEVERE BEAVER ACTIVITY, PLUGGED OUTLET	0	1/8/1990	I	25
080306	3	WAKEMAN	NO STORAGE	SPILLWAY EROSION		10/17/1994	I	110
080422	3	RAINBOW FALLS #5	9.0 CREST	INADEQUATE SPILLWAY	0	9/11/1985	I	25
080424	3	GERLITS	NO STORAGE	DAM PARTIALLY BREACHED DUE TO OVERTOPPING	0	11/13/1984	I	10
080445	3	FREDERICKSON LAKE	No staff gage present.	Inadequate spillway.	0	8/27/2001	I	
230311	3	SUN	5.0 CREST	SEEPAGE-RESTRICT O 8FT BELOW CREST	0	12/31/1984	R	6
230312	3	WIND	5.5 CREST	SATURATED D/S SLOPE	0	9/20/1985	C	3
480101	3	JOHNSON	4.0 CREST(3.0 CREST IRR. SEASON)	EROS. ON U/S FACE, IMPROPER FB., SEEP/D/S TOE	0	7/18/1994	C	68
650121	3	DUCK	4.0 SPILLWAY	NARROW CREST, STEEP SLOPES	0	3/23/1987	I	15
650123	3	HANSHAW	5.0 CREST	seepage, slide, overall poor	0	7/7/1987	I	12
800139	3	GREEN VALLEY RETENTION	Zero Storage	Scarp at Outlet, PoorCondition Inoperable Gate	0	1/28/2008	I	10
080110	4	CANTRILL	NO STORAGE	NO SPILLWAY, INOPERABLE OUTLET	0	10/22/1987	I	37
080321	4	QUICK	NO STORAGE	NO SPILLWAY, INOPERABLE OUTLET	0	10/22/1987	I	64
020109	N	BRIGHT VIEW #1	7.0 CREST	INOP. OUTLET, INADEQUATE Feeboard	0	9/30/1985	I	17

TOTAL NUMBER OF DAMS AFFECTED: 75

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION: 30,271 AF

DIVISION 2

**STATE OF COLORADO - DAM SAFETY
BRANCH LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS**

DAMID	Hazard Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Action Type	Volume Lost
100459	1	STRATTON	Gage Height 10 Feet	Outlet Not Modified to Allow No Storage	10	1/28/2008	I	32
160108	1	CUCHARAS #5	GH 100 FT.	POOR OVERALL CON. EMBKMT. HISTY. MVMNT	100	7/21/1988	R	33000
670236	1	TWO BUTTES	GH 20 FT.	HYDRAULICALLY INADEQUATE SPILLWAY	20	1/24/1983	I	31465
100402	2	VALLEY NO. 2	NO STORAGE	INOPERABLE OUTLET, OBSTRUCTED SPILLWAY	0	9/21/2000	C	185
180206	2	APISHAPA	22.0 CREST	SPILLWAY, OUTLET SILTED IN	0	2/18/1994	I	260
100131	3	GARDEN OF THE GODS GOLF COURSE	3.0 CREST	NO SPILLWAY	0	5/31/1988	I	0
100309	3	VALLEY NO. 1	15.0 CREST	INOPERABLE OUTLET & BLOCKED SPILLWAY	0	12/27/1984	I	50
120136	3	PARK CENTER L & W #2	8.8 CREST	SLIDE ON DOWNSTREAM SLOPE	0	1/4/1989	R	11
120202	3	PARK CENTER L & W #10	GH 7 FT.	EXTENSIVE CRACKING ON THE CREST	7	10/2/1974	I	48
120240	3	GILLETT RESERVOIR	ZERO STORAGE, MAINTAIN BREACH	BREACHED DAM	0	11/18/2006	I	12
150116	3	OCCHIATO #1	10 FEET CREST	SLIDE		9/16/1999	I	3
170118	3	CUDAHY #1	5.0 FT. BELOW DAM CREST	INADEQUATE FREEBOARD AND INOPERABLE OUTLET		7/15/1985	I	900
170217	3	SWINK #1	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	I	500
170218	3	SWINK #2	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	I	600
170219	3	SWINK #5	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	I	750
170220	3	SWINK #6	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	I	650
170222	3	TIMPAS #3	10.0 CREST	IN DISREPAIR, ABANDONED	0	4/21/1986	I	500
180207	3	SEVEN LAKES	7.0 CREST	DILAPIDATED CONDITION OF DAM	0	5/6/1987	I	1200
160135	4	CLARK #1	8.0 CREST	ERODED UPSTREAM SLOPE	0	2/16/1994	R	80
100215	N	MODERN WOODMEN OF AMER. #2	NO STORAGE	INADEQUATE SPILLWAY, POOR REPAIR	0	8/12/1983	R	85

TOTAL NUMBER OF DAMS AFFECTED: 20

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION: 70,331 AF

DIVISION 3**STATE OF COLORADO - DAM SAFETY
BRANCH LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS**

DAMID	Hazard Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Action Type	Volume Lost
200110	1	CONTINENTAL	GH 64.5	LEAKAGE	64.5	8/1/1995	I	7679
210102	1	TERRACE	7.0 SPILLWAY	DETERIORATED SPILLWAY	117	7/18/1984	I	2000
220103	2	TRUJILLO MEADOWS	1 foot below spillway crest	Excessive Seepage	23.6	8/25/2004	I	69
240101	3	EASTDALE #1	1.3 feet below spillway crest	Erosion of upstream slope	23	7/1/2004	I	420
260101	3	SAGUACHE	Zero storage	General neglect, inoperable U/S gate	0	6/28/2004	I	450

TOTAL NUMBER OF DAMS AFFECTED: 5**VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION: 10,618 AF**

DIVISION 4

**STATE OF COLORADO - DAM SAFETY
BRANCH LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS**

DAMID	Hazard Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Action Type	Volume Lost
400115	1	BEAVER	16 FEET BELOW SPILLWAY	SINKHOLES	60	23-Oct-08	I	651
400112	2	BIG BATTLEMENT	Two feet below emergency spillway crest	Seepage	19	7/28/2008	I	105
400306	2	GRANBY #12	GH 17 FT.	D/S FACE SLIDE DUE TO SEEPAGE	17	10/15/1987	R	0
420116	2	FRUITA #1	20 FT. CREST	SLIDE ON DOWNSTREAM SLOPE		8/12/1998	I	100
420120	2	GRAND MESA #1	8 FT. SPILLWAY	OUTLET WORKS FAILURE	12	12/21/2000	I	300
590113	2	MERIDIAN LAKE PARK #1	2.0 SPILLWAY (PRIN SPWY LOWERED)	SEVERE EROSION OF THE EMERGENCY SPILLWAY	0	6/4/1987	I	10
400208	3	COLE #5	1.1 FT BELOW EMERGENCY SPILLWAY	ENLARGED RESERVOIR WITHOUT SEO APPROVAL	16.4	10/2/2008	I	19.1
400212	3	CYPHER #1	4.0 BELOW DAM CREST	REPAIRS NOT COMPLETED		11/10/2008	R	0
400228	3	ELLA	7-Foot Below Dam Crest	Inadequate Spillway & Overtopping Damage		9/20/2005	I	30
400330	3	KNOX	FULL STORAGE FROM 4/1 TO 8/15 IF	EXCESSIVE SEEPAGE AT TOE AND ON EMBANKMENT	17	1/8/1988	R	0
400405	3	LONE STAR #1	30.0 CREST	CRACKS ON CREST, UNAPPROVED PLANS POOR CONSTRUCTION	0	7/31/1996	R	0
400419	3	OASIS	3 FEET BELOW NORMAL WATER SURFACE	UNCONTROLLED SEEPAGE		9/30/2003	I	40
400508	3	RYAN	ZERO STORAGE	POOR CONDITION OF OUTLET WORKS		11/9/2004	I	60
400522	3	TODD	10.0 CREST	6FT ELEVATION DIFF ALONG CREST WITH NO SPWY	0	10/19/1984	I	112
400524	3	TRIO	8.0 SPILLWAY	SLIDE ON DOWNSTREAM SLOPE	14	1/11/1989	I	75
400619	3	LONE STAR #2	10.0 CREST	CONSTRUCTION WITHOUT APPROVED PLANS & SPECS	0	6/2/1988	C	0
400705	3	WEBSTER #1	NO STORAGE	POORLY CONSTRUCTED	0	5/6/1987	C	15
400707	3	WEBSTER #3	NO STORAGE	POORLY CONSTRUCTED	0	5/6/1987	C	15
410201	3	COFFEY RESERVOIR	NO STORAGE	GENERAL POOR CONDITION, CONST. W/O APPROVED PLANS	0	7/21/1988	C	90
410202	3	MOCK #1	9.0 CREST(AFTER 60 DAYS FULL)	BUILT WITHOUT APPROVED PLANS & SEEPAGE	0	4/26/1989	R	0
420135	3	REEDER	Zero Storage	EXTENSIVE SEEPAGE, SINKHOLES AND DISREPAIR	0	12/14/2005	R	299
600105	3	BLUE LAKE #1	5.0 FEET SPILLWAY	POOR CONDITION		11/21/2001	I	100
600126	3	CUSHMAN	6.0 CREST	OUTLET-INOP. SPWY-INAD. EMB. SEEPS	0	7/29/1975	I	36
620122	3	FISH CREEK #1	zero storage	stability, seepage, outlet control	0	9/11/2003	I	85
630103	3	BURG	ZERO STORAGE	DAMAGED OUTLET CONTROLS		9/30/2003	I	91

TOTAL NUMBER OF DAMS AFFECTED: 25

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION: 2,233.1 AF

DIVISION 5

**STATE OF COLORADO - DAM SAFETY
BRANCH LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS**

DAMID	Hazard Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Action Type	Volume Lost
380219	1	POLARIS	16.5 FT BELOW DAM CREST	INADEQ SPWY & FB, BASIN SEEP, POOR FOUNDATION	4	11/1/2007	R	770
450123	1	ALSBURY	5.5 ft BELOW SPILLWAY, 10.5 ft BELOW	EXCESSIVE SEEPAGE CREST	9055	6/7/2004	I	100
720115	1	BULL CREEK #4	3 FEET BELOW EMERGENCY SPILLWAY	POOR CONDITION OF OUTLET AND DAM, SEEPAGE		8/18/2005	I	71
370113	2	WELSH	Zero Storage	Seepage, Deteriorated Outlet Conduit	0	7/7/2006	I	105
380113	2	HOPKINS	10 feet below crest, 7 feet below spillway	Excessive seepage		11/23/2004	R	55
380204	2	CHRISTENSON	Zero Storage	Sloughing of Downstream Slope	0	7/6/2005	I	11
380209	2	LAZY O RESERVOIR NO 2	ZERO STORAGE	SLOUGH ON U/S SLOPE AND OUTLET PIPE COLLAPSE	0	11/13/2008	I	14
380212	2	FLANNERY	1.0 FT SPILLWAY	SPILLWAY EROSION		9/17/2001	I	20
380217	2	CHRISTINE LAKE	3.5 FT CREST	NO SPILLWAY		5/4/2001	I	10
380231	2	VALANA K RESERVOIR NO. 1	ZERO STORAGE	UNAPPROVED SPILLWAY AND POOR CONDITION	0	11/13/2008	I	19
390127	2	PDC FRESH WATER PIT	Zero Storage	illegally and Poorly Built Dam		10/3/2007	I	16
500113	2	MATHESON	FULL STOR IN SPRING. DRAIN TO GH 30	MONITORING DEVISE INSTALLED BY 9/1	30	10/30/2002	R	0
510114	2	LITTLE KING RANCH	10.0 SPILLWAY	EXCESSIVE SEEPAGE	41	3/7/1978	C	439
530209	2	7 W GUEST RANCH POND	3 FEET BELOW LOWEST POINT ON DAM	INADEQUATE SPILLWAY, POOR CONDITION OF DAM		11/3/2006	I	6
360117	3	OLD DILLON	ZERO STORAGE	CONTINUAL DETERIORATION OF DAM	0	7/17/2008	I	46
370116	3	G G LOWER	4.0 CREST	INADEQ FRBD., STABILITY OF DOWNSTREAM SLOPE	0	12/14/1992	R	7
500126	3	MILK CREEK	15.0 CREST (AUG 1 THRU MAY 1)	EXCESSIVE LEAKAGE	0	5/10/1991	R	56
530114	3	HOLDEN	Zero Gage Height, No Storage	Seepage above serv Spwy on Downstream slope	0	8/21/2006	R	31
530116	3	JONES #2	10 FEET BELOW EMERGENCY SPILLWAY	SEEPAGE CONDITION AND VOIDS IN DAM CREST		12/18/2008	I	260
530119	3	KELLY	3.5 FT BELOW SERVICE SPILLWAY	INCREASE IN SEEPAGE	96.5	6/29/2006	R	84
530125	3	NEWTON GULCH	GAGE HEIGHT 17 TO TEST REPIR WORK	SINKHOLE REPAIRED	17	4/7/2008	R	419
530129	3	STERNER	RELAX 5/1-8/15, 3.0 SPILLWAY	UNCONTROLLED LEAKAGE		8/2/1995	R	71
720117	3	CARPENTER	NO STORAGE	PIPING HOLE		8/23/1994	I	39
720136	3	HAWXHURST	Zero Gage Height, No Storage	Hole in Outlet Conduit and Sinkholes	0	8/21/2006	R	207
720203	3	KENDALL	Zero Storage Restriction	Wave Erosion, Dam Instability & Blocked Spill	0	8/27/2007	I	61
510129	N	ROCK CREEK	NO STORAGE	DAM BREACHED BY OWNER BUT WANTS TO REPAIR	0	6/28/1989	C	66

TOTAL NUMBER OF DAMS AFFECTED: 26

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION: 2,983 AF

DIVISION 6**STATE OF COLORADO - DAM SAFETY
BRANCH LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS**

DAMID	Hazard Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Action Type	Volume Lost
540104	2	ELK LAKE	A point below the beaver den.	Beaver den, badger holes	30	3/6/2006	I	100
430205	3	BAXTER	5.0 FT. SPILLWAY	SEEPAGE, EROSION OF U/S FACE		11/13/1997	I	30
430212	3	WILSON #3	3.0 SPILLWAY	INOPERABLE OUTLET, INAD SPWY	3	9/30/1989	I	10
440106	3	BISKUP	ZERO STORAGE	SLIDE AT LEFT ABUTMENT	0	5/29/2008	R	136
440120	3	DRESCHER	8.0 SPILLWAY	SEEPAGE & INSTABILITY	8	8/1/1988	R	159
440124	3	ELGEN #2	Full Storage	New outlet pipe. Recommend restriction lifted		2/16/1999	R	
440213	3	FLAT TOP	5.0 FT CREST MAIN DAM	BREACHED, BEAVER DAMS, FREEBOARD		8/2/1999	I	50
560107	3	BASSETT #2	5-FEET BELOW SPILLWAY CREST	ILLEGAL DAM, POOR CONDITION		10/21/2002	R	25
570114	3	LAKE EMRICH	15 FEET BELOW CREST	SLIDES ON DOWNSTREAM SLOPE	0	8/30/1988	C	330
570128	3	SEATON	Zero Storage Restriction	Slide on Downstream Slope & Inoperable Outlet	0	8/27/2007	I	21

TOTAL NUMBER OF DAMS AFFECTED: 10**VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION: 861 AF**

DIVISION 7**STATE OF COLORADO - DAM SAFETY
BRANCH LISTING OF DAM,S UNDER STORAGE RESTRICTION ORDERS**

DAMID	Hazard Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Action Type	Volume Lost
300144	3	UPPER RAILROAD	5 Feet below Dam Crest	Inadequate Spillway& Unstable Downstream slope	9/8/2005		I	4
320202	3	E. G. MERRITT	Zero Storage	Deteriorated Outlet Conduit, Inoperable Outlet	6/13/2006		I	41
320209	3	BISHOP	4 Feet Below Dam Crest	Seepage, Inadequate Spillway, Inoperable Outlet	6/13/2006		I	4
340106	3	HURST	NO STORAGE	OUTLET FAILURE	0	3/29/1999	I	35
340109	3	L.A. BAR	3 feet below dam crest	Insufficient freeboard, broken gate operator		11/2/2005	I	10
340119	3	J. O. SPENCER	NO STORAGE	INOPERABLE OUTLET	0	5/8/2000	I	16
340203	1	SUMMIT - MAIN DAM	NOT TO EXCEED 1.1 FT BELOW SPILL FOR	EXCESSIVE SEEPAGE >3 WKS	23.6	6/3/1998	R	400
690101	2	BELMEAR LAKE	3 Feet Below Spillway Crest	Severe Wave Erosion on Upstream Slope		8/21/2008	I	90

TOTAL NUMBER OF DAMS AFFECTED: 7**VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION: 600 AF**