

**State Engineer's
26th Annual Report on Dam Safety
to the
Colorado General Assembly
Water Year 2009-10**



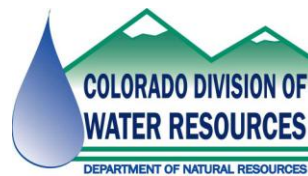
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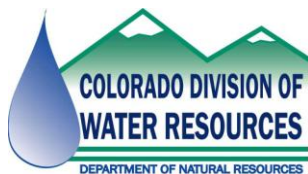
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**For
Water Year 2009-10**

January 2010

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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, 2009 through October 31, 2010 (WY 2009-10) 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 1,937 dams of jurisdictional size. Of these, about 1,819 are non-federal dams. Of the non-federal dams, approximately 621 (318 High Hazard and 303 Significant Hazard), or about 34 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 2009-10, 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 2009-10. 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 2009-10, the State Engineer's Office approved one plan for a new dam and 33 plans for alteration, modification, or enlargement of existing dams. Hydrology studies for seven 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 \$35.9 million. The decrease in new dam construction is contributed to the current economy of the nation.

During WY 2009-10, a total of 513 dam safety inspections and 180 construction inspections were conducted by dam safety engineers for a total of 693 inspections. In addition, 99 follow-up inspections were performed. At the conclusion of this reporting period, there are a total of 176 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, 3 High Hazard; 3

Significant Hazard; 10 Low Hazard structures dams were restricted amounting to a total of 2,602 acre-feet of storage restricted. This reporting period showed a slight increase in the number of dams on the restricted list and the storage volume of the restrictions increased by approximately 1,455 acre-feet.

The Dam Safety Branch has been able to acquire and maintain a nearly 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 2009-10 in addition to the dam safety activities previously mentioned:

1. A total of 11 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. Colorado, in March, hosted 20 engineers from Beijing, China with the China Ministry of Water Resources. The Ministry is the national authority for various water affairs, water management and dam safety and construction. The Chinese delegation was interested in learning about dam safety risk and inspection methods, safety and performance monitoring, construction management, dam maintenance, and new technology and materials used in the design and construction of dams. Staff members of the Colorado Division of Water Resources provided presentations on statute authority, performance of dam safety inspections, design review and construction issues of dams, and water administration in

Colorado. A presentation of the design and construction of the new 200-foot high Rueter-Hess Dam under construction in the south metro area of Denver was also made and a dam site visit was made to observe the construction. The exchange of information between the two agencies was beneficial to all parties and several lively discussions occurred concerning the foundation grouting program for the Rueter-Hess dam and the need for air-entrainment in concrete.

10. 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.
11. 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.
12. Paul Perri, Design Review Engineer for the Dam Safety Branch is continues to serve as a voting member representing DWR on the National Committee on Levee Safety (NCLS). The committee is currently gathering comments from stakeholder across the nation by hosting one day informational roundtables in which Paul has participated on several of the roundtables.
13. A committee of dam safety engineers from within the Branch was assembled to perform a literature review of the current state-of-the-practice, research available methods, and develop a guidance document for use within the Branch and for engineers working on dam safety issues in Colorado. The "Guidelines for Dam Breach Analysis" was developed and adopted on February 10, 2010.
14. A committee of dam safety engineers from within the Branch was assembled to provide a technical guide for dam safety engineers and the engineering community to determine appropriate hazards for new and existing dams within the State of Colorado. The "Guidelines for Hazard Classification" was developed and adopted on November 15, 2010.
15. Several of the Dam Safety Engineers are in the process of developing a series of 2-day technical workshops for dam owners, dam designers, and other interested dam safety professionals. The subject matter for the workshops are Spillway Hydrology and Hazard Classification. The dates and locations of the workshops are: March 15 – 16, 2011 Grand Junction; April 5 – 6, 2011 Loveland; April 19 – 20, 2011 Colorado Springs.

In addition to yearly program goals of inspections and design reviews, the following are additional branch goals for WY 2010-11:

- 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 through the EAP Assistance Program.
- Continue to evaluate the inclusion of risk-based methods in the dam safety program.
- Continue to communicate and educate the public on dam safety.

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.

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, 2009 through October 31, 2010 (WY 2009-10) 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:

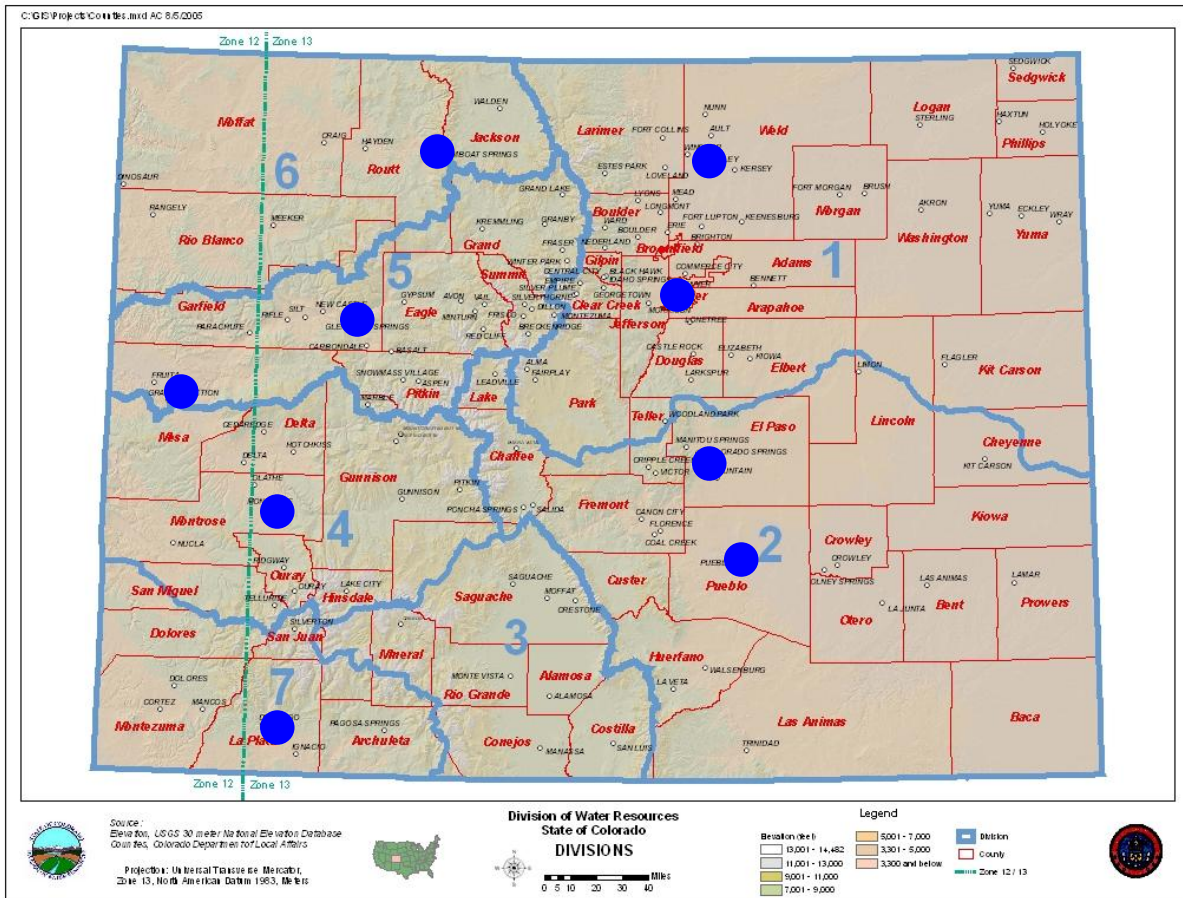
1. To protect the public, the Dam Safety Branch shall determine the amount of water that is safe to impound in reservoirs of the state in accordance with State Statutes.
2. To protect the public from failure of dams, the Dam Safety Branch shall review and recommend approval of plans and specifications 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 Assistant State Engineer for Public Safety and consists of a 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.

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.



Empire Dam, Division 1

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.

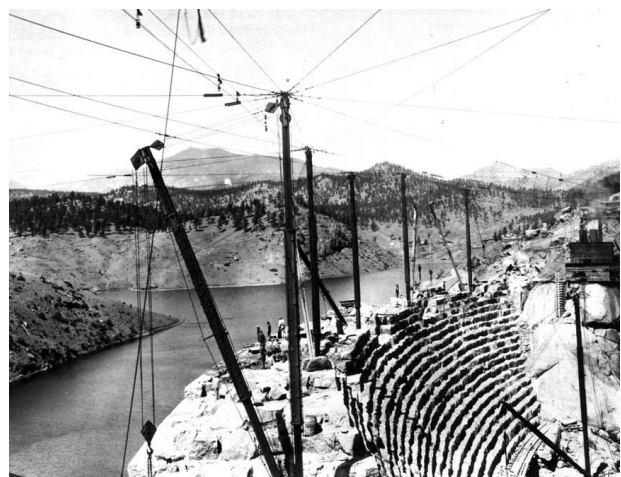
In recent years, a pilot program was developed to set forth the standards and procedures to reevaluate the frequency of inspections for High and Significant Hazard dams based on the Risk Based Profiling System (RBPS) results. Further discussion of this pilot program and the RBPS are presented later in this report.

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, 1,937 are considered jurisdictional dams, of which about 1,819 are non-federal dams. Of the non-federal dams, approximately 621 (318 High Hazard and 303 Significant Hazard) or about 34 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.



Cheesman Dam Construction – Circa 1905

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	156	43	12	34	42	13	18	318	41	359
Significant	121	50	15	35	51	13	18	303	13	316
Low	425	99	29	158	106	110	54	981	59	1040
NPH	54	97	16	3	25	14	8	217	5	222
TOTAL	756	289	72	230	224	150	98	1819	118	1937

3.0 BRANCH ACCOMPLISHMENTS

3.1 Dam Safety Branch Staff

In June 2010, Division 1 and 2 Dam Safety Engineer Bill McCormick left the branch to take a position with Colorado Division of Wildlife Dam Operation Engineer. John Hunyadi was hired to fill the vacancy in Divisions 1 and 2. John Hunyadi has spent the last 10 years working as a geotechnical design engineer on projects across the country, focused in the Rocky Mountain Region. During the last 6 years, he managed the engineering and construction services group at Kleinfelder in Colorado Springs working on a variety of project types, with an emphasis on geotechnical investigation, design, and construction oversight of dams and slope stabilization projects.



Strontia Springs Dam, Division 1

3.2 Dam Safety Inspections

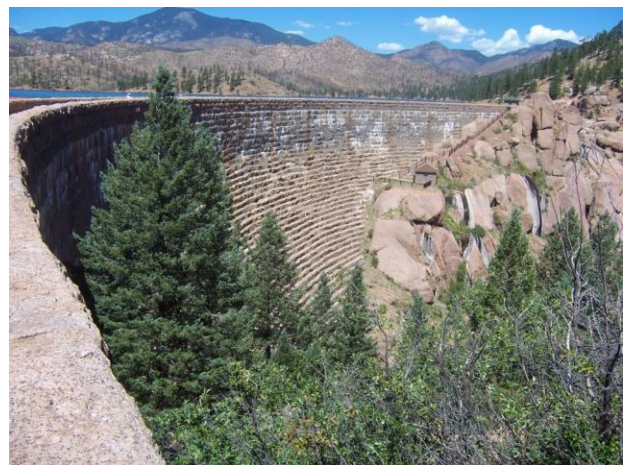
Each dam safety engineer's highest priority is to perform periodic field SEED of the dams in their territory of responsibility. Dams rarely fail without first showing visible signs of distress, which, when detected by a highly educated and trained eye, can be the difference between a catastrophic failure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



Horse Creek Dam, Division 1

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 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.



Cheesman Dam, Division 1

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 2009–10, a total of 513 dam safety inspections and 99 follow-up inspections were performed.

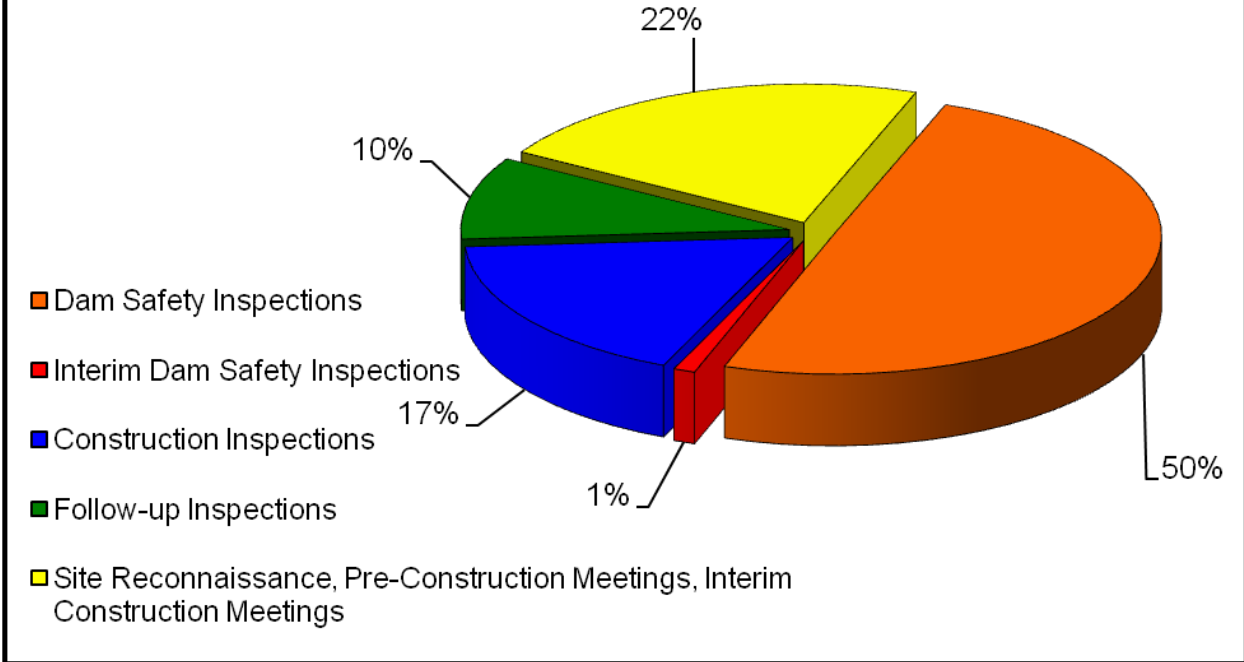
The overall condition of the dam and reservoir is rated according to the categories defined in Table 3 for full storage and a recommendation is made for the safe storage level of the reservoir.

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 2009 through October 2010
Dam Safety Inspections, Construction Inspections
and Other Field Activities Breakdown



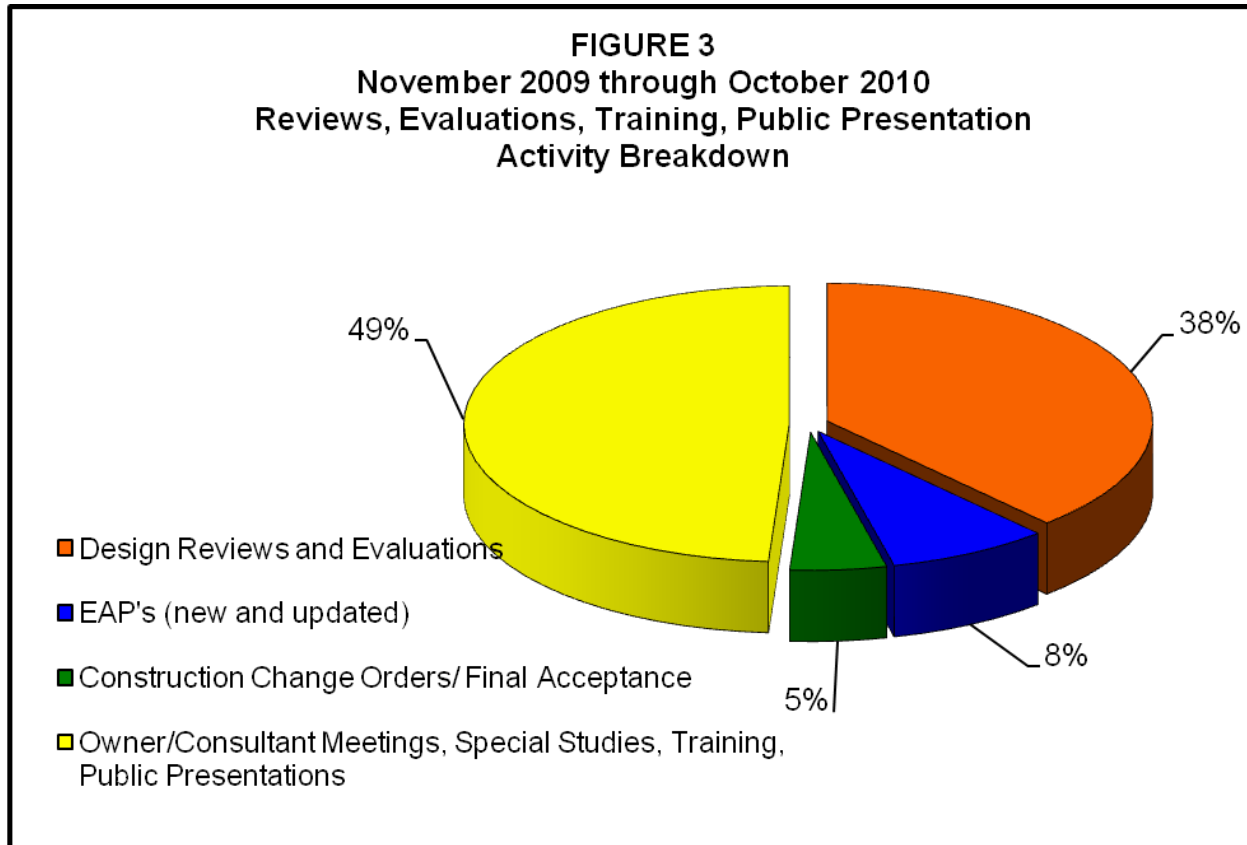
As shown previously in Table 2, over half of the jurisdictional dams in Colorado fall within the Low Hazard classification and are, therefore, only inspected every six years. In order to maintain a high level of confidence regarding the condition of these dams between regular inspections, water commissioners 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 2009 through October 2010 is shown in Figure 3.



The State Engineer's Office approved plans for one for new dams and 33 plans for alterations, modifications, enlargements or breaching of existing dams. The estimated cost of construction for the approved plans was \$35,920,724.00. Fees collected for the examination and filing of the submitted design and construction documents was \$55,475. Also, during this reporting period, seven hydrology studies were reviewed and approved.

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 also 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 2009-10 a total of 180 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 Beaver Dam, Division 4

Beaver Dam is classified as a Small size, High Hazard Dam and is located in Gunnison County. In July, during an annual SEED inspection Division 4 Dam Safety Engineer Jason Ward observed a sinkhole in an area near the emergency spillway at the right abutment. A design to repair the sinkhole was submitted in August and repairs were made in October.



Beaver Park Dam, Division 3

3.4.2 Cedar Mesa Dam, Division 4

Cedar Mesa is classified as a Small size, High Hazard Dam and is located in Delta County. In August, during an annual SEED inspection Division 4 Dam Safety Engineer Jason Ward observed a sinkhole approximately five feet below the emergency spillway crest. Design to repair the sinkhole was submitted and approved and the sinkhole was repaired in September.



Cedar Mesa Dam, Division 4

3.4.3 Youngs Creek #1/2 Dam , Division 4

Youngs Creek #1/#2 Dam is classified as a Small size, Significant Hazard Dam and is located in Delta County. In August, during an annual SEED inspection Division 4 Dam Safety Engineer Jason Ward observed a sinkhole approximately 100 feet upstream of the dam along the left reservoir bank. The sinkhole was investigated by pouring dye colored water into the sinkhole to attempt to identify an exit point. No exit point of the dye colored water was observed. The owner will continue to observe the condition of the sinkhole and notify Jason of any changed conditions.



Youngs Creek #1/2 Dam, Division 4

3.4.4 Leon Park Dam, Division 4

Leon Park Dam is classified as a Small size, Low Hazard Dam and is located in Mesa County. In August, during a routine SEED inspection Division 4 Dam Safety Engineer Jason Ward observed a partial failure of the exiting wooden outlet conduit. Jason recommended a zero storage restriction on the reservoir in which the State Engineer imposed.



Leon Park Dam, Division 4

3.4.5 Beaver Park Dam, Division 3

Beaver Park Dam is classified as a Large size, High Hazard Dam and is located in Rio Grande County. In May, during an annual SEED inspection Division 3 & 7 Dam Safety Engineer Matt Gavin observed a sinkhole on the downstream bench below the rock and earth fill berm that was placed on top of the dam to provide additional freeboard. The sinkhole is located near the left abutment of the dam. The Division of Wildlife, owner of the dam, has retained an engineer to investigate the cause of the sinkhole. Matt recommended a 20 foot (below the crest of the emergency spillway) storage restriction in which the State Engineer imposed.



Beaver Park Dam, Division 3

3.4.6 Ryan Gulch Reservoir, Division 1

Ryan Gulch Reservoir Dam is classified as a Small size, Significant Hazard Dam and is located in Larimer County. In November 2009, Division 1 Dam Safety Engineer John Batka observed water flowing around the end of the spillway control wall causing erosion of the abutment due to settlement/poor construction of the control wall. Reservoir water level is to be held 3-ft below the spillway crest until repairs are made. Repairs were made in March 2010.

3.4.7 Garrett Fish Pond #2, Division 5

Garrett Fish Pond #2 is a non-jurisdictional non roster structure located in Grand County. In June 2010, Dam Safety Engineer John R. Blair observed the overtopping of the Garrett Fish Pond #2 Dam as a result of the Fraser River overtopping its banks resulting in excessive flow in the reservoir causing the overtopping of the dam embankment. The dam owner was notified and a plan to repair the dam was proposed.

3.4.8 South Gray Dam, Division 1

South Gray Dam is a Small size, Significant Hazard Dam and is located in Larimer County. In May 2010, Dam Safety Engineer Jeremy Franz observed a sinkhole over the existing toe drain system. The owner agreed to lower the reservoir until repairs could be made to the toe drain system.



South Gray Dam, Division 1

3.4.9 Illegal Dam Failure, Division 2

In April 2010, Dam Safety Engineer Mark Perry was notified that a dam had failed near Beulah, Colorado. The dam was a non-roster structure and Mark Perry provided documentation to the owner on the requirements of the State of Colorado as it pertains to Dam Safety and Dam Construction.



Illegal dam failure, Division 2

3.4.10 Mountain Home Dam, Division 3

In July 2010, Dam Safety Engineer Mark Perry responded to a call from the owner of Mountain Home Dam, a Large size, High Hazard dam located in Costilla County. The owner report turbid flows from the main outlet of the dam. As a result of observations made in the field and discussions with the owner it was determined that the turbid water was the result of a thunderstorm and subsequent runoff carrying sediment was the cause.



Mountain Home Dam, Division 3

3.4.11 Trujillo Meadows Dam, Division 7

In the spring of 2010, Dam Safety Engineer Matt Gavin observed two sinkholes downstream of the crest in the emergency spillway. The sinkholes were located on the right side of the channel. To avoid additional discharges in to the sinkhole the owner has proposed to place a dike around the sinkholes until further investigations and a proposed method of repair can be accomplished. The sinkholes were subsequently excavated, re-compacted with low permeable fill material and a PVC liner was placed over the area.



Trujillo Meadows Dam, Division 3

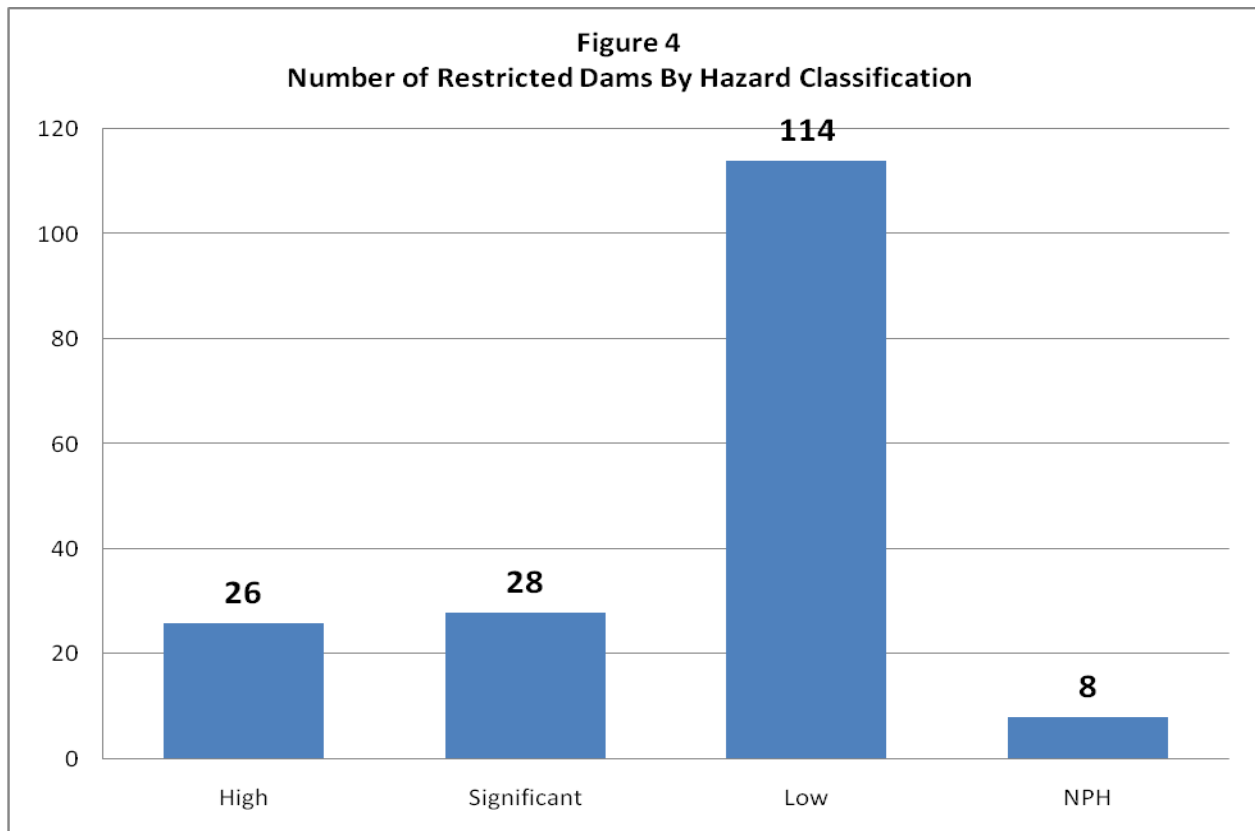
3.5 Reservoir Storage Restrictions

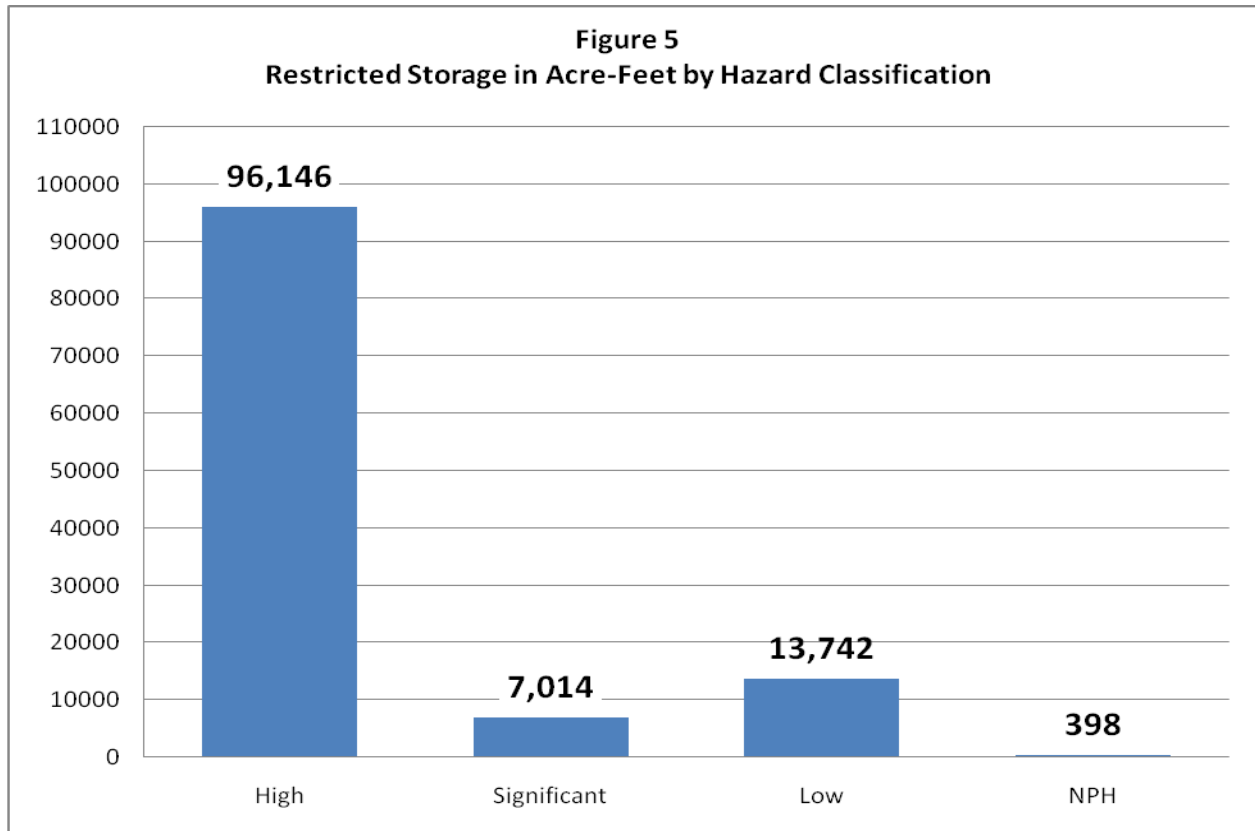
If a dam safety inspection reveals that the overall conditions of a dam are unsafe, an order is written by the State Engineer restricting the storage of the reservoir to a safe level. Restriction letters are accompanied by orders to rehabilitate the dam to make it safe for full storage or to breach the 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 CWCBC construction fund per Section 37-87-122.5, C.R.S.

At the conclusion of this reporting period, there were total of 16 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 117,300 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 decrease in the number of dams on the restricted list by four dams and the volume of the storage restrictions increased by approximately 1,455 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 three day branch meeting was attended by all dam safety engineers along with dam safety personnel with the Division of Wildlife in Frisco, Colorado.

February

Matt Gavin and Mark Haynes attended a FEMA Technical Seminar on Risk Management in Emmitsburg, Maryland.



Cheesman Dam Construction – Circa 1925

March

Jeremy Franz, John Batka, and Jason Ward attended Earth School sponsored by the U.S. Bureau of Reclamation in Lakewood, Colorado.

A three day branch meeting was attended by all dam safety engineers along with dam safety personnel with the Division of Wildlife in Buena Vista, Colorado.

May

Mark Perry attended Safety Evaluation of Existing Dams (SEED) training sponsored by the U.S. Bureau of Reclamation in Lakewood, Colorado.

June

John Batka and Mark Perry attended an ASDSO Technical Seminar on Emergency Action Plans in Nebraska City, Nebraska.

Jeremy Fran and Garrett Jackson attended an ASCE Unsteady Flow HEC-RAS training seminar in New Orleans, Louisiana.

September

Mark Haynes, Jeremy Franz, John Batka, Jason Ward, and Bill McCormick attended the ASDSO Annual Conference in Seattle, Washington. Mark Haynes participated in several meetings as State Representative and as a member of the Board of Directors.

3.7 Presentations

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

- In February 2010, Mark Haynes presented at the FEMA Technical Seminar on Risk Management in Emmitsburg, Maryland.
- In April 2010, Mark Perry, Bill McCormick, and Mark Haynes hosted a one day dam owner training in Pueblo, CO. Over 50 people attended this training.
- Several dam owner training were held across the state by various dam safety engineers with over 150 attendees.
- Several dam safety engineers participated as session moderators at ASDSO conferences.

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.

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

non-jurisdictional Water Impoundment Structure, and the Guide to Construction and Administration of Dams in Colorado.

3.11 Risk-Based Approach

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 Commission EAP functional exercise performed for Gross Dam located in Boulder County, Colorado. 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. Also, with the U.S Army Corps of Engineers, Mark Haynes and Mark Perry, dam safety engineer in our Pueblo office participated in a periodic inspection and Probable Failure Modes Analysis for John Martin Dam located in Bent County, Colorado. Mark Haynes also participated with the U.S Army Corps of Engineers in the tabletop exercise of the Emergency Action Plan and periodic inspection of Cherry Creek Dam.

Mark Perry also participated in the periodic inspection of the Holly, Colorado levee system.

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

4.1 Host to the China Ministry of Water Resources

Colorado, in March, hosted 20 engineers from Beijing, China with the China Ministry of Water Resources. The Ministry is the national authority for various water affairs, water management and dam safety and construction. The Chinese delegation was interested in learning about dam safety risk and inspection methods, safety and performance monitoring, construction management, dam maintenance, and new technology and materials used in the design and construction of dams. Staff members of the Colorado Division of Water Resources provided presentations on statute authority, performance of dam safety inspections, design review and construction issues of dams, and water administration in Colorado. A presentation of the design and construction of the new 200-foot high Rueter-Hess Dam under construction in the south metro area of Denver was also made and a dam site visit was made to observe the construction. The exchange of information between the two agencies was beneficial to all parties and several lively discussions occurred concerning the foundation grouting program for the Rueter-Hess dam and the need for air-entrainment in concrete.

4.2 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.



Chinese Ministry of Water Resources at Rueter-Hess construction site

4.3 Guidelines for Dam Breach Analysis

A committee of dam safety engineers from within the Branch was assembled to perform a literature review of the current state-of-the-practice, research available methods, and develop a guidance document for use within the Branch and for engineers working on dam safety issues in Colorado.

The purpose of this guidance document is to develop a generalized approach for breach analysis to establish consistency throughout the Branch. The procedures and analytical models described herein are intended to serve as a “dam breach toolbox.” It remains incumbent on the engineer to select the appropriate level and type of analysis based on sound engineering judgment. It is further acknowledged that the development of dam breach analysis techniques is rapidly evolving, and that the recommendations herein are not an exhaustive account of the means and methods available to engineers working in this field. The guidelines were adopted on February 10, 2010.

4.4 Guidelines for Hazard Classification

This guidance document was envisioned to provide a technical guide for dam safety engineers and the engineering community involved with the design of dams and safety evaluation of existing dams under the Colorado Revised Statutes and the "Rules and Regulations for Dam Safety and Dam Construction (DWR, 2007)". The considerations and guidelines were intended to establish consistency in the analysis and review of dam safety projects in Colorado. The Hazard Classification Guidelines should not be considered a design standard, but should be adopted for determining the hazard classification for each specific project and provide justification for the applicable design requirements and standards contained in the Rules. The State Engineer will make the final determination of the appropriate hazard classification for a given dam. The guidelines were adopted on November 15, 2010.

4.5 Technical Workshops

Several of the Dam Safety Engineers are in the process of developing a series of 2-day technical workshops for dam owners, dam designers, and other interested dam safety professionals. The subject matter for the workshops are Spillway Hydrology and Hazard Classification. The dates and locations of the workshops are: March 15 – 16, 2011 Grand Junction; April 5 – 6, 2011 Loveland; April 19 – 20 Colorado Springs.

4.6 Emergency Action Plan Assistance Program

To satisfy the intent of the FY 09 FEMA National Dam Safety Grant Fund given to state dam safety programs the Dam Safety Branch developed an Emergency Action Plan assistance program to provide owners with funding to update the inundation mapping for inclusion in Emergency Action Plans. Dam safety engineers across the state are in the process of identifying deficient inundation maps for High and Significant Hazard dams and contacting owners to see if there is an interest in participating in the program. This program will generate updated EAPs and inundation mapping that is critical to effectively responding to an emergency.

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.



Mark Haynes with Sen. Michael Bennet

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.

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.



Stratton Dam, Division 2

5.3 National Committee on Levee Safety

Paul Perri, Design Review Engineer for the Dam Safety Branch is continues to serve as a voting member representing DWR on the National Committee on Levee Safety (NCLS). The committee is currently gathering comments from stakeholder across the nation by hosting one day informational roundtables in which Paul has participated on several of the roundtables.

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 2009-10 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 2010. 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 \$55,475 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 2010-11 DAM SAFETY BRANCH GOALS

In addition to yearly program goals of inspections and design reviews, the following are additional branch goals for WY 2010-11:

1. Expand the Division of Water Resources Dam Safety Branch's involvement in National Dam Safety and Security activities.
2. Update or establish Memorandums of Understanding (MOUs) with FERC, BLM, and DOW.
3. Review and update current policy and guidance documents.
4. Update the Owners Dam Safety Manual.
5. Update the Design Review Guide to be consistent with the 2007 Rules and Regulations.
6. Continue to provide professional training of branch personnel.
7. Improve coordination and communication of personnel within the program and Division Offices.
8. Continue efforts in communicating and educating dam owners in the need to maintain and update their Emergency Action Plans through the EAP Assistance Program.
9. Continue to evaluate the inclusion of risk-based methods in the dam safety program.
10. Continue to communicate and educate the public on dam safety.

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
John Hunyadi	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
Vacant	Steamboat Springs	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 6

APPENDIX B

DAM SAFETY ENGINEER DAM SAFETY INSPECTION REPORT FORM

ENGINEER'S 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): _____ NORMAL STORAGE (AF): _____
DIV: _____ WD: _____ CRESTWIDTH(FT): _____ FREEBOARD (FT): _____ SURFACE AREA(AC): _____
EAP: _____ CRESTELEV(FT): _____ DRAINAGE AREA (AC.): _____ OUTLET INSPECTED: _____

CURRENT RESTRICTION: -- NONE --

OWNER: _____ OWNER REP.: _____
ADDRESS: _____ CONTACT NAME: _____
CONTACT PHONE: _____

INSPECTION PARTY: _____
REPRESENTING: _____

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

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

UPSTREAM SLOPE

PROBLEMS NOTED: (0) NONE (1) RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED (2) WAVE EROSION - WITH SCARPS
 (3) CRACKS WITH DISPLACEMENT (4) SINKHOLE (5) APPEARS TOO STEEP (6) DEPRESSIONS OR BULGES (7) SLIDES
 (8) CONCRETE FACING - HOLES, CRACKS, DISPLACED, UNDERMINED (9) OTHER _____

CONDITIONS OBSERVED: Good Acceptable Poor

CREST

PROBLEMS NOTED: (10) NONE (11) RUTS OR PUDDLES (12) EROSION (13) CRACKS - WITH DISPLACEMENT (14) SINKHOLES
 (15) NOT WIDE ENOUGH (16) LOW AREA (17) MISALIGNMENT (18) IMPROPER SURFACE DRAINAGE (19) OTHER _____

CONDITIONS OBSERVED: Good Acceptable Poor

DOWNSTREAM SLOPE

PROBLEMS NOTED: (20) NONE (21) LIVESTOCK DAMAGE (22) EROSION OR GULLIES (23) CRACKS - WITH DISPLACEMENT (24) SINKHOLE
 (25) APPEARS TOO STEEP (26) DEPRESSIONS OR BULGES (27) SLIDE (28) SOFT AREAS (29) OTHER _____

CONDITIONS OBSERVED: Good Acceptable Poor

SEEPAGE

PROBLEMS NOTED: (30) NONE (31) SATURATED EMBANKMENT AREA (32) SEEPAGE EXITS ON EMBANKMENT
 (33) SEEPAGE EXITS AT POINT SOURCE (34) SEEPAGE AREA AT TOE (35) FLOW ADJACENT TO OUTLET (36) SEEPAGE INCREASED / MUDDY
DRAIN OUTFALLS SEEN No Yes Show location of drains on sketch and indicate amount and quality of discharge. (37) FLOW INCREASED / MUDDY (38) DRAIN DRY / OBSTRUCTED
 (39) OTHER _____

CONDITIONS OBSERVED: Good Acceptable Poor

OUTLET

PROBLEMS NOTED: (40) NONE (41) NO OUTLET FOUND (42) POOR OPERATING ACCESS (43) INOPERABLE
 (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED (45) OUTLET OPERATED DURING INSPECTION YES NO
INTERIOR INSPECTED (120) NO (121) YES (46) CONDUIT DETERIORATED OR COLLAPSED (47) JOINTS DISPLACED (48) VALVE LEAKAGE
 (49) OTHER _____

CONDITIONS OBSERVED: Good Acceptable Poor

SPILLWAY

PROBLEMS NOTED: (50) NONE (51) NO EMERGENCY SPILLWAY FOUND (52) EROSION WITH BACKCUTTING (53) CRACK - WITH DISPLACEMENT
 (54) APPEARS TO BE STRUCTURALLY INADEQUATE (55) APPEARS TOO SMALL (56) INADEQUATE FREEBOARD (57) FLOW OBSTRUCTED
 (58) CONCRETE DETERIORATED / UNDERMINED (59) OTHER

CONDITIONS OBSERVED: Good Acceptable Poor

MONITORING

EXISTING INSTRUMENTATION FOUND (110) NONE (111) GAGE ROD (112) PIEZOMETERS (113) SEEPAGE WEIRS / FLUMES
 (114) SURVEY MONUMENTS (115) OTHER
MONITORING OF INSTRUMENTATION (116) NO (117) YES PERIODIC INSPECTIONS BY: (118) OWNER (119) ENGINEER

CONDITIONS OBSERVED: Good Acceptable Poor

MAINTENANCE AND REPAIRS

PROBLEMS NOTED: (60) NONE (61) ACCESS ROAD NEEDS MAINTENANCE (62) CATTLE DAMAGE
 (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE
 (65) RODENT ACTIVITY ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE (66) DETERIORATED CONCRETE - FACING, OUTLET, SPILLWAY
 (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE (68) OTHER

CONDITIONS OBSERVED: Good Acceptable Poor

Go to next page for Overall Conditions and Items Requiring Actions

OVERALL CONDITIONS

Based on this Safety Inspection and recent file review, the overall condition is determined to be:

- (71) SATISFACTORY
 (72) CONDITIONALLY SATISFACTORY
 (73) UNSATISFACTORY

ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM

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.

MAINTENANCE - MINOR REPAIR - MONITORING

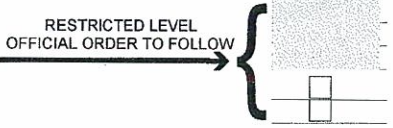
- (80) PROVIDE ADDITIONAL RIPRAP: _____
- (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE: _____
- (82) CLEAR TREES AND/OR BRUSH FROM: _____
- (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES: _____
- (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE: _____
- (85) PROVIDE SURFACE DRAINAGE FOR: _____
- (86) MONITOR: _____
- (87) DEVELOP AND SUBMIT AN EMERGENCY ACTION PLAN: _____
- (88) OTHER: _____
- (89) OTHER: _____

ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO: (Plans and Specifications must be approved by State Engineer prior to construction.)

- (90) PREPARE PLANS AND SPECIFICATIONS FOR REHABILITATION OF THE DAM: _____
- (91) PREPARE AS -BUILT DRAWINGS OF: _____
- (92) PERFORM A GEOTECHNICAL INVESTIGATION TO EVALUATE THE STABILITY OF THE DAM: _____
- (93) PERFORM A HYDROLOGIC STUDY TO DETERMINE REQUIRED SPILLWAY SIZE: _____
- (94) PREPARE PLANS AND SPECIFICATIONS FOR AN ADEQUATE SPILLWAY: _____
- (95) SET UP A MONITORING SYSTEM INCLUDING WORK SHEETS, REDUCED DATA AND GRAPHED RESULTS: _____
- (96) PERFORM AN INTERNAL INSPECTION OF THE OUTLET: _____
- (97) OTHER: _____
- (98) OTHER: _____
- (99) OTHER: _____

SAFE STORAGE LEVEL: RECOMMENDED AS A RESULT OF THIS INSPECTION

- (101) FULL STORAGE
- (102) CONDITIONAL FULL STORAGE
- (103) RECOMMENDED RESTRICTION
- (104) CONTINUE EXISTING RESTRICTION



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: _____

Engineer's Signature _____
 Owner's Signature _____
 OWNER/OWNER'S REPRESENTATIVE
 DATE: ____/____/____

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 11 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.

HAZARD CLASSIFICATION OF DAMS

CLASS High hazard

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

CLASS Significant hazard

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 Low hazard

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 fine.

Class NPH hazard - 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			
	GOOD	ACCEPTABLE	POOR
UPSTREAM SLOPE			
CREST			
DOWNSTREAM SLOPE			
SEEPAGE			
OUTLET			
SPILLWAY			
MAINTENANCE			

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 2009 – 10
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

<i>Dam Name</i>	<i>DAMID</i>	<i>Construction No.</i>	<i>Construction Type</i>	<i>Approval Date</i>
CHEESMAN	800102	C-1310A	Modification	25-Nov-09
OLD DILLON	360117	C-1955	Enlargement	8-Dec-09
WILLIAMS FORK	510127	C-0799F	Modification	9-Dec-09
MARTIN LAKE	160218	C-1434A	Modification	27-Jan-10
MCKELVIE #1	720209	C-0851A	Repair	25-Feb-10
MITCHELL #1	30221	C-1649A	Repair	26-Mar-10
WILLOW SPRINGS #1	90204	C-1081A	Repair	26-Mar-10
FREDERICK	55319	C-0894E	Modification	13-Apr-10
HIGH PARK LAKE	620109	C-0717A	Modification	28-Apr-10
PLATTE CANYON	80228	C-1474C	Modification	29-Apr-10
WILLIAMS FORK	510127	C-0799G	Modification	30-Apr-10
BERTHOUD	40103	C-0996A	Modification	19-May-10
SUMMITVILLE TAILINGS	210103	C-1245B	Enlargement	11-Jun-10
LAKE ANN	380117	C-0632B	Repair	23-Jul-10
BARRETT #2, UPPER	290120	C-0345A	Modification	30-Aug-10
TOWN CENTER	780109	C-1379B	Repair	31-Aug-10
EAGLE PARK RESERVOIR	370103	C-1106H	Modification	31-Aug-10
FOOTHILLS	50124	C-0066F	Modification	16-Sep-10
METROZ PARK, LOWER	200133	C-0570A	Repair	16-Sep-10
MILTON LAKE	20304	C-1471H	Modification	16-Sep-10
TRUJILLO MEADOWS	220103	C-0722F	Modification	16-Sep-10
ISH #3 (MAIN DAM)	40131	C-0014D	Repair	27-Sep-10
PARK	400425	C-0364B	Modification	27-Sep-10
WADLEY #2	20338	C-1769A	Modification	27-Sep-10
D.D. & E. WISE	440117	C-0427B	Repair	4-Oct-10
CEDAR MESA	400135	C-1419E	Repair	6-Oct-10
JONES #2	530116	C-1327A	Repair	7-Oct-10
WELSH	370113	C-1976	Repair	7-Oct-10
UPPER STAGE STOP	230318	C-1982	Modification	20-Oct-10
BONNER POND	300150	C-1985	Repair	25-Oct-10
BAXTER	400701	C-1986	Repair	25-Oct-10
CHAMBERS RESERVOIR	80451	C-1967	New	29-Oct-10
BEAVER	400115	C-0830E	Modification	29-Oct-10

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	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
010506	1	RIVERSIDE	GH 33.55 FT.	no spillway; 33.55 is max decree	33.5	5/9/1984	0
030107	1	BLACK HOLLOW	4.2 FT. SPILLWAY	INADEQUATE SPILLWAY	31	10/22/1997	999
040208	1	RIST - BENSON	Restricted to Below Gage Height 10	Seepage at Toe and on Embankment	10	7/5/2005	160
075311	1	SMITH	2.0 SPILLWAY	SEEPAGE		6/7/2010	200
080327	1	SKEEL	5.0 Feet Below Spillway Crest	Poor Condition, seepage		11/2/2007	75
090204	1	WILLOW SPRINGS #1	2.0 FEET BELOW SPILLWAY	CONTINUAL EROSION AND DENSE vegetation	16	5/12/2008	16
230102	1	ANTERO	GH 18 FT.	STAB. BERM CONST. & NEW INSTR. Monitoring	18	2/4/1986	6500
640104	1	JULESBURG #4	GH 24 FT. FOR 90 DAYS, THEN GH 23 FT.	CONDITION OF OUTLET, EXCESSIVE Seepage	24	5/2/1995	6964
640108	1	PREWITT	GH 26.5 FT.	NO SPWY & EXCESSIVE SEEPAGE	26.5	8/23/1990	2531
640212	1	JULESBURG #1	GH 24 FOR 90 DAYS THEN GH 23	EXCESSIVE SEEPAGE	24	5/2/1995	
640213	1	JULESBURG #1A	GH 24 FOR 90 DAYS THEN GH 23	EXCESSIVE SEEPAGE	24	5/2/1995	
640214	1	JULESBURG #2	GH 24 FOR 90 DAYS THEN GH 23	EXCESSIVE SEEPAGE	24	5/2/1995	
640215	1	JULESBURG #3	GH 24 FOR 90 DAYS THEN GH 23	EXCESSIVE SEEPAGE	24	5/2/1995	
010115	2	BIJOU #2 DAM #1	GH 16; not > GH 15 for more than 30 days	scarping, seepage, no spillway	16	6/1/1993	2400
010505	2	PROSPECT	GH 35.5.	maintenance & monitoring issues	35.5	4/15/1981	588
020322	2	SIGNAL #1	5.0 CREST	CONCENTRATED SPG Area & Questionable Cond of outlet	0	6/21/1993	60
020411	2	NISSEN #2	2.0 FEET BELOW SPILLWAY CREST	RELAXED TO ALLOW WATER STORAGE Through winter		10/7/2009	50
030122	2	CURTIS LAKE	GH 10 FT.	CREST, SLOPE, EXT. SEEP. AREA BELOW d/s toe	10	7/2/1985	397
030129	2	EATON - LAW	5 Feet below Spillway Crest	Deteriorated Outlet Works and subsidence		6/23/2008	300
030138	2	GRAY #3	NO STORAGE	SINKHOLE OVER OUTLET	0	5/27/1997	100
030301	2	NORTH POUDBRE # 4	GH 17 FT.	POOR U/S FACE, GENERAL CONDITION	17	4/17/1984	562
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	34

DIVISION 1 State of Colorado - Dam Safety Branch Listing of Dams Under Storage Restriction Orders

DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
050308	2	UNION	GH 28.0	spillway design based on GH=28.0	28	12/6/1977	0
070126	2	DEWEY NO. 1	3.0 CREST(NW)	POOR CONDITION	0	11/19/1990	15
090115	2	HARRIMAN	GH 19 FT.	EXCESSIVE SEEPAGE	19	11/12/1992	300
010104	3	ADAMS & BUNKER #3	6.0 CREST	INADEQUATE FREEBOARD, SEEPAGE	0	5/22/1975	150
010132	3	LINDIES LAKE	3 ft below top of headwall	provide minimum freeboard		5/6/1998	0
010138	3	DOVER	10.0 FT. CREST	POOR CONDITION		6/27/1996	60
010419	3	D.A. LORD #4	2.0 SPILLWAY	INADEQUATE SPILLWAY	0	9/19/1980	400
010612	3	NO NAME 1-1 #1	10 FT. CREST	SCOUR OF D/S SLOPE DUE TO FAILURE OF OUTLET		11/2/2000	100
010709	3	JOLLY JOHN	NO STORAGE	SCOUR HOLE FROM OUTLET	0	10/27/2000	297
010716	3	HOWARDS LAKE	3.0 FT. SPILLWAY	EROSION OF DAM AND CREST		6/3/1998	50
020113	3	CARLIN	5.0 CREST	NO SPILLWAY	0	7/29/1986	0
020115	3	LOWER CHURCH LAKE	3.0 FT CREST	INADEQUATE SPILLWAY		6/22/1999	0
020119	3	COLE	NO STORAGE	POOR CONDITION	0	6/30/1994	95
020314	3	NORTH STAR	5.0 BELOW DAM CREST	SINKHOLE ON DOWNSTREAM SLOPE		2/11/2003	
020333	3	THOMPSON	5.0 CREST	INADEQUATE FREEBOARD, GENERALLY Poor condition	0	10/7/1987	30
020606	3	MOWER	5 FEET BELOW LOWEST POINT OF DAM	CONTINUAL DETERIORATION OF DAM crest		6/27/2007	24
020615	3	HAVANA STREET DAM	NO STORAGE	NO SPILLWAY	0	6/17/1987	0
030108	3	BOX ELDER #2	3.0 FT. SPILLWAY	EXCESSIVE SEEPAGE	6.5	8/8/1989	49
030128	3	DRY CREEK	GH 11.5 FT.	DETERIORATION, SEEPAGE, INAD SW	11.5	1/17/1996	150
030214	3	LAW, JOHN	3.0 CREST	INADEQUATE SPILLWAY AND freeboard	11	6/22/1987	45
030220	3	MATTINGLY	2.0 FT. SPILLWAY	EROSION/3-5 FT. SCARP ON U/S FACE		10/23/1997	99
030225	3	MOUNTAIN SUPPLY # 1	10 FT. CREST	POOR CONDITION	5	11/5/1997	500

DIVISION 1 State of Colorado - Dam Safety Branch Listing of Dams Under Storage Restriction Orders

DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
030226	3	MOUNTAIN SUPPLY # 2	10 FT. CREST	POOR CONDITION	5	11/5/1997	300
030227	3	MOUNTAIN SUPPLY # 6	3.0 CREST	NO SPILLWAY		10/19/2000	120
030229	3	MOUNTAIN SUPPLY # 8	NO STORAGE	POOR CONDITION	0	10/3/1978	643
030309	3	PARK CREEK #2	Zero Storage Restriction	Inoperable Outlet - Dam Breached by owner	0	1/23/2009	97
030510	3	DIXON	ONE FOOT BELOW INVERT OF SPILLWAY pipe	SINKHOLE OVER SPILLWAY PIPE & inoperable outlet		6/2/2009	38
030512	3	RIST CANYON	3.0 CREST	SEEPAGE, INADEQUATE SPILLWAY	0	4/19/1983	33
045234	3	IDE AND STARBIRD #1	3.0 CREST	POOR MN, ERODED U/S FACE, QUES. Spillway	0	7/3/1985	0
050132	3	HIGHLAND	3.0 BELOW TOP OF CONCRETE WALL AT	NO SPILLWAY outlet	0	11/26/1990	0
050206	3	KNOUTH	NO STORAGE	NEVER COMPLETED DAM	0	12/24/1985	204
050212	3	LITTLE GEM	10.0 CREST	EROSION ON U/S SLOPE & CRST, TREES on u/s slope	0	10/11/1985	60
050304	3	SWEDE	5.0 CREST	EMBANKMENT SEEPAGE & INADEQUATE freeboard	0	11/14/1986	75
060306	3	VARSITY POND	1 FT. SPILLWAY	SEEPAGE/SPILLWAY		8/31/1999	1
060314	3	HODGSON-HARRIS	ZERO STORAGE	CONTINUAL DETERIORATION	0	7/8/2009	119
070202	3	KELLY	FIVE FEET BELOW DAM CREST	ABANDON FACILITY AND NO maintenance		7/7/2008	50
080101	3	ALLIS	15.0 CREST	SLOUGHING, SEEPAGE	0	8/25/1992	50
080105	3	BAIRD #1	7.0 CREST	SEVERE BEAVER ACTIVITY, PLUGGED outlet	0	1/8/1990	25
080306	3	WAKEMAN	NO STORAGE	SPILLWAY EROSION		10/17/1994	110
080422	3	RAINBOW FALLS #5	9.0 CREST	INADEQUATE SPILLWAY	0	9/11/1985	25
080424	3	GERLITS	NO STORAGE	DAM PARTIALLY BREACHED DUE TO overtopping	0	11/13/1984	10
080445	3	FREDERICKSON LAKE	5 FEET BELOW DAM CREST	Continual Deterioration of Dam and structures	0	4/6/2009	5
230312	3	WIND	5.5 CREST	SATURATED D/S SLOPE	0	9/20/1985	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	68

DIVISION 1 State of Colorado - Dam Safety Branch Listing of Dams Under Storage Restriction Orders

DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
650121	3	DUCK	4.0 SPILLWAY	NARROW CREST, STEEP SLOPES	0	3/23/1987	15
650123	3	HANSHAW	5.0 CREST	seepage, slide, overall poor	0	7/7/1987	12
800139	3	GREEN VALLEY RETENTION	Zero Storage	Scarp at Outlet, PoorCondition Inoperable Gate	0	1/28/2008	10
080110	4	CANTRILL	NO STORAGE	NO SPILLWAY, INOPERABLE OUTLET	0	10/22/1987	37
080321	4	QUICK	NO STORAGE	NO SPILLWAY, INOPERABLE OUTLET	0	10/22/1987	64
020109	N	BRIGHT VIEW #1	7.0 CREST	INOP. OUTLET, INADEQUATE Freeboard	0	9/30/1985	17

TOTAL NUMBER OF DAMS AFFECTED 72

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION

26,491 af

DIVISION 2 State of Colorado - Dam Safety Branch Listing of Dams Under Storage Restriction Orders

DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
100459	1	STRATTON	Gage Height 10 Feet	Outlet Not Modified to Allow No Storage	10	1/28/2008	32
160108	1	CUCHARAS #5	GH 100 FT.	POOR OVERALL CON. EMBKMT. HISTY. Mvmt	100	7/21/1988	33000
670236	1	TWO BUTTES	GH 20 FT., ~35 ft below the dam crest	HYDRAULICALLY INADEQUATE SPILLWAY	20	1/24/1983	31465
100402	2	VALLEY NO. 2	NO STORAGE	INOPERABLE OUTLET, OBSTRUCTED spillway	0	9/21/2000	185
180206	2	APISHAPA	22.0 CREST	SPILLWAY, OUTLET SILTED IN	0	2/18/1994	260
100309	3	VALLEY NO. 1	15.0 CREST	INOPERABLE OUTLET & BLOKCKED Spillway	0	12/27/1984	50
120136	3	PARK CENTER L & W #2	BREACH ORDER	SLOPE FAILURE CONTINUES TO WORSEN		11/6/2009	32
120201	3	PARK CENTER L & W #8	ZERO STORAGE	POOR CONDITION OF DAM AND SPILLWAY	0	11/6/2009	26
120202	3	PARK CENTER L & W #10	GH 7 FT.	EXTENSIVE CRACKING ON THE CREST	7	10/2/1974	48
120240	3	GILLETT RESERVOIR	ZERO STORAGE, MAINTAIN BREACH	BREACHED DAM	0	11/18/2006	12
150116	3	OCCHIATO #1	10 FEET CREST	SLIDE		9/16/1999	3
160229	3	MILL LAKE	9-ft below crest in order to make the dam NJ	Poor condition		5/15/1985	
170118	3	CUDAHY #1	5.0 FT. BELOW DAM CREST	INADEQUATE FREEBOARD AND inoperable outlet		7/15/1985	900
170217	3	SWINK #1	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	500
170218	3	SWINK #2	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	600
170219	3	SWINK #5	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	750
170220	3	SWINK #6	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	650
170222	3	TIMPAS #3	10.0 CREST	IN DISREPAIR, ABANDONED	0	4/21/1986	500
180207	3	SEVEN LAKES	7.0 CREST	DILAPIDATED CONDITION OF DAM	0	5/6/1987	1200
160135	4	CLARK #1	8.0 CREST	ERODED UPSTREAM SLOPE	0	2/16/1994	80
100215	N	MODERN WOODMEN OF AMER. #2	NO STORAGE	INADEQUATE SPILLWAY, POOR REPAIR	0	8/12/1983	85

TOTAL NUMBER OF DAMS AFFECTED 21 VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION 70,378 af

DIVISION 3 State of Colorado - Dam Safety Branch Listing of Dams Under Storage Restriction Orders

DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
200102	1	BEAVER PARK	20 FEET BELOW SPILLWAY CREST	SINKHOLE LEFT ABUTMENT AREA	62.3	5/7/2010	1700
200110	1	CONTINENTAL	GH 64.5	LEAKAGE	64.5	8/1/1995	7679
210102	1	TERRACE	7.0 SPILLWAY	DETERIORATED SPILLWAY	117	7/18/1984	2000
200114	2	FUCHS	3 Feet Below Service Spillway Crest	Stability concerns and lack of maintenance	14	12/22/2008	73.4
220103	2	TRUJILLO MEADOWS	1 foot below spillway crest	Excessive Seepage	23.6	8/25/2004	69
350109	2	Upper Zapata Lake	0.5-ft above the gated outlet pipe invert	Seepage at d/s toe and saturation of hillside		8/18/2010	
240101	3	EASTDALE #1	1.3 feet below spillway crest	Erosion of upstream slope	23	7/1/2004	420
250103	3	BYLER	ZERO STORAGE	ILLEGAL CONSTRUCTED DAM		12/23/2008	6
260101	3	SAGUACHE	Zero storage	General neglect, inoperable U/S gate	0	6/28/2004	450

TOTAL NUMBER OF DAMS AFFECTED 9

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION 12397.4 af

DIVISION 4 State of Colorado - Dam Safety Branch Listing of Dams Under Storage Restriction Orders

DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
400536	1	WEIR AND JOHNSON	CONDITIONAL TEMPORARY RECINDING OF Restriction			11/4/2009	0
410107	1	GARNET MESA	1 FOOT BELOW SPILLWAY CREST	INADEQUATE SPILLWAY		2/5/2010	128
420120	2	GRAND MESA #1	5 FEET BELOW SPILLWAY	EMBANKMENT REPAIR AND SPILLWAY enlarged	15	9/11/2009	180
590113	2	MERIDIAN LAKE PARK #1	2.0 SPILLWAY (PRIN SPWY LOWERED)	SEVERE EROSION OF THE EMERGENCY spillway	0	6/4/1987	10
630104	2	CASTO	2 FEET BELOW SPILLWAY CREST	AWAITING COMPLETION DOCUMENTS		1/13/2010	200
400208	3	COLE #5	1.1 FT BELOW EMERGENCY SPILLWAY crest GH 16.4	ENLARGED RESERVOIR WITHOUT SEO approval	16.4	10/2/2008	19.1
400212	3	CYPHER #1	4.0 BELOW EMERGENCY SPILLWAY Crest	STUDY DAM UNSTABLE AT FULL reservoir		4/26/2010	18
400219	3	DON MEEK #1	7-ft below the spillway crest	Beaver activity, inoperable outlet gate		8/25/2004	23
400330	3	KNOX	FULL STORAGE FROM 4/1 TO 8/15 IF monitored	EXCESSIVE SEEPAGE AT TOE AND ON embankment	17	1/8/1988	0
400332	3	LEON PARK	Zero Storage	Sloughing U/S Slope & Deteriorated Outlet works	0	8/9/2010	110
400405	3	LONE STAR #1	30.0 CREST	UNAPPROVED plans, poor construction	0	7/31/1996	0
400419	3	OASIS	3 FEET BELOW NORMAL WATER SURFACE	UNCONTROLLED SEEPAGE		9/30/2003	40
400508	3	RYAN	ZERO STORAGE	POOR CONDITION OF OUTLET WORKS		11/9/2004	60
400522	3	TODD	10.0 CREST	6FT ELEVATION DIFF ALONG CREST with no spillway	0	10/19/1984	112
400524	3	TRIO	8.0 SPILLWAY	SLIDE ON DOWNSTREAM SLOPE	14	1/11/1989	75
400619	3	LONE STAR #2	10.0 CREST	CONSTRUCTION WITHOUT APPROVED plans and specs	0	6/2/1988	0
400705	3	WEBSTER #1	NO STORAGE	POORLY CONSTRUCTED	0	5/6/1987	15
400706	3	WEBSTER #2	ZERO STORAGE			5/6/1987	
400707	3	WEBSTER #3	NO STORAGE	POORLY CONSTRUCTED	0	5/6/1987	15
400712	3	GLORIA	3 FEET BELOW DAM CREST	NO SPILLWAY, EXCESSIVE SEEPAGE, no freeboard		6/7/2010	6
410201	3	COFFEY RESERVOIR	NO STORAGE	CONDITION, CONST. w/o appr plans	0	7/21/1988	90
410202	3	MOCK #1	9.0 CREST(AFTER 60 DAYS FULL)	BUILT WITHOUT APPROVED PLANS & seepage	0	4/26/1989	0

DIVISION 4 State of Colorado - Dam Safety Branch Listing of Dams Under Storage Restriction Orders

DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
420135	3	REEDER	Zero Storage	EXTENSIVE SEEPAGE, SINKHOLES AND disrepair	0	12/14/2005	299
600105	3	BLUE LAKE #1	5.0 FEET SPILLWAY	POOR CONDITION		11/21/2001	100
600126	3	CUSHMAN	6.0 CREST	OUTLET-INOP. SPWY-INAD. EMB. SEEPS	0	7/29/1975	36
620122	3	FISH CREEK #1	zero storage	stability, seepage, outlet control	0	9/11/2003	85
630103	3	BURG	ZERO STORAGE	DAMAGED OUTLET CONTROLS		9/30/2003	91
630108	3	CASEMENT	2' below existing spillway crest	Inadequate freeboard		8/17/2009	42.2

TOTAL NUMBER OF DAMS AFFECTED 28

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION 1754.3 af

DIVISION 5 State of Colorado - Dam Safety Branch Listing of Dams Under Storage Restriction Orders

DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
380117	1	LAKE ANN	28 FEET BELOW DAM CREST -	POOR CONDITION OF OUTLET conditional		11/17/2009	456
380219	1	POLARIS	16.5 FT BELOW DAM CREST	INADEQ SPWY & FB, BASIN SEEP, POOR foundation	4	11/1/2007	770
720115	1	BULL CREEK #4	3 FEET BELOW EMERGENCY SPILLWAY	POOR CONDITION OF OUTLET AND DAM, SEEPAGE		8/18/2005	71
360135	2	BILLS RANCH LAKE	5 FEET BELOW DAM CREST	SINKHOLES, POOR DAM COND., blocked spillway		7/23/2010	6
370113	2	WELSH	Zero Storage	Seepage, Deteriorated Outlet Conduit	0	7/7/2006	105
380204	2	CHRISTENSON	Zero Storage	Sloughing of Downstream Slope	0	7/6/2005	11
380231	2	VALANA K RESERVOIR NO. 1	ZERO STORAGE	UNAPPROVED SPILLWAY AND POOR condition	0	11/13/2008	19
500113	2	MATHESON	FULL STOR IN SPRING. DRAIN TO GH 30 BY 9/1	MONITORING DEVICE INSTALLED	30	10/30/2002	0
510114	2	LITTLE KING RANCH	GAGE HEIGHT 25 FEET	SINKHOLE AND EXCESSIVE SEEPAGE	25	2/8/2010	900
370116	3	G G LOWER	4.0 CREST	INADEQ FRBD., STABILITY OF d/s slope	0	12/14/1992	7
380121	3	RALSTON #1	ZERO STORAGE	POOR CONDITION OF OUTLET CONDUIT	0	11/17/2009	60
450128	3	R-4 RODREICK RESERVOIR	4 FEET BELOW DAM CREST	ILLEGALLY CONSTRUCTE AND NO spillway		5/26/2009	10
450131	3	RIEGER POND	4.5 FEET BELOW DAM CREST	ILLEGALLY CONSTRUCTED AND NO SPILLWAY		5/26/2009	7
500126	3	MILK CREEK	15.0 CREST (AUG 1 THRU MAY 1)	EXCESSIVE LEAKAGE	0	5/10/1991	56
530114	3	HOLDEN	Zero Gage Height, No Storage	Seepage above serv Spwy on Downstream Slope	0	8/21/2006	31
530116	3	JONES #2	10 FEET BELOW EMERGENCY SPILLWAY	SEEPAGE CONDITION AND VOIDS IN DAM FOUNDATION		12/18/2008	260
530119	3	KELLY	3.5 FT BELOW SERVICE SPILLWAY	INCREASE IN SEEPAGE	96.5	6/29/2006	84
530125	3	NEWTON GULCH	GAGE HEIGHT 21 TO TEST REPAIR WORK	SINKHOLE REPAIRED	21	6/1/2009	339
720136	3	HAWXHURST	Zero Gage Height, No Storage	Hole in Outlet Conduit and Sinkholes	0	8/21/2006	207
720203	3	KENDALL	Zero Storage Restriction	Wave Erosion, Dam Instability & Blocked	0	8/27/2007	61
360117	3	OLD DILLON	ZERO STORAGE	CONTINUAL DETERIORATION OF DAM	0	7/17/2008	46
510129	N	ROCK CREEK	NO STORAGE	DAM BREACHED BY OWNER BUT WANTS TO REPAIR	0	6/28/1989	66

TOTAL NUMBER OF DAMS AFFECTED 22 VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION 3,572 af

DIVISION 6 State of Colorado - Dam Safety Branch Listing of Dams Under Storage Restriction Orders

DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
540104	2	ELK LAKE	A point below the beaver den.	Beaver den, badger holes	30	3/6/2006	100
430205	3	BAXTER	Breach or hire an engineer	Seepage , erosion, crest settling, lack of FB		3/7/2006	50
430212	3	WILSON #3	3.0 SPILLWAY	INOPERABLE OUTLET, INAD SPWY	3	9/30/1989	10
440106	3	BISKUP	ZERO STORAGE	SLIDE AT LEFT ABUTMENT	0	5/29/2008	136
440120	3	DRESCHER	8.0 SPILLWAY	SEEPAGE & INSTABILITY	8	8/1/1988	159
440208	3	SHAFFER	ZERO STORAGE	INOPERABLE OUTLET AND POOR condition of dam		1/15/2009	31
440213	3	FLAT TOP	10 FEET BELOW DAM CREST	CONTINUAL DETERIORATION OF DAM		3/2/2009	75
470308	3	LARSON #1	ZERO STORAGE	SPILLWAY & POOR maintenance		2/8/2010	8
570114	3	LAKE EMRICH	15 FEET BELOW CREST	SLIDES ON DOWNSTREAM SLOPE	0	8/30/1988	330
570124	3	NOFSTGER-ZEIGLER	9 FEET BELOW DAM CREST	POOR CONDITION OF DAM AND seepage		7/14/2009	40
570128	3	SEATON	Zero Storage Restriction	Slide on Downstream Slope & Inoperable outlet	0	8/27/2007	21
570201	3	BROCK	Breach to level of new outlet pipe thru dam	Construction without approved plans.		8/5/2009	5
470310	4	UPPER THREE MILE #1	No Storage, keep gate open.	Illegal Construction Breached through spillway. Lack of maintenance	0	6/29/2006	
570105	N	JB Dawson #1	9 feet below crest.			9/27/1984	49

TOTAL NUMBER OF DAMS AFFECTED 14

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION

1014 af

DIVISION 7 State of Colorado - Dam Safety Branch Listing of Dams Under Storage Restriction Orders

DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Gage ht.	Action date	Volume
320107	1	TOTTEN	5 FEET BELOW EMERGENCY SPILLWAY	CRACKING OF EMBANKMENT crest	8.95	10/7/2009	1000
340203	1	SUMMIT - MAIN DAM	NOT TO EXCEED 1.1 FT BELOW SPILL FOR > 3 weeks	EXCESSIVE SEEPAGE	23.6	6/3/1998	400
690101	2	BELMEAR LAKE	3 Feet Below Spillway Crest	Severe Wave Erosion on Upstream Slope		8/21/2008	90
300140	3	JOHNSON #2	11' Below Crest - Open Outlet	Spillway Obstruction; General Neglect		11/4/2009	54
300144	3	UPPER RAILROAD	5 Feet below Dam Crest	Inadequate Spillway & Unstable d/s slope		9/8/2005	4
300150	3	Bonner Pond Dam	9.0 Feet Below Spillway Crest	Sinkhole on U/S Slope and Inoperable outlet		8/5/2010	27
320202	3	E. G. MERRITT	Zero Storage	Deteriorated Outlet Conduit, Inoperable outlet		6/13/2006	41
340106	3	HURST	NO STORAGE	OUTLET FAILURE	0	3/29/1999	35
340119	3	J. O. SPENCER	NO STORAGE	INOPERABLE OUTLET	0	5/8/2000	16
710104	3	R.B. COPPINGER	Zero Storage	Trans. Cracking of Dam and Obstructed spillway	0	7/23/2010	27

TOTAL NUMBER OF DAMS AFFECTED 10

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION

1694 af