# WATER STORAGE

# IN

# MONTANA

A REPORT SUBMITTED TO THE

FIFTY-NINTH MONTANA LEGISLATURE

OFFICE OF THE GOVERNOR

PURSUANT TO
MONTANA CODE ANNOTATED, SEC. 85-1-704 (1991)

JANUARY 2005

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## EXECUTIVE SUMMARY

Montana law requires the Governor to submit a report on water storage to the Legislature each regular session. The Governor's Report on Water Storage in Montana prioritizes new rehabilitation and construction projects and summarizes rehabilitation and repair projects occurring during the previous two years. Appendix I contains MCA 85-1-703 Water Storage Policy.

For this biennium, the Department of Natural Resources and Conservation (DNRC) will be requesting Renewable Resource Grant and Loan (RRGL) grants for a feasibility study for the rehabilitation of Frenchman's Dam and for the installation of rip rap at the Martinsdale North Dam. Funding from the Water Storage Special Revenue Account and the Hydropower Earnings Account are being requested for rehabilitation projects for Nilan North Dam, Painted Rocks Dam and Ruby Dam (pre-construction engineering). RRGL grant applications have been submitted for repairs to the Deadman's Basin Supply Canal and Martinsdale Outlet Canal Drop Structures.

Several rehabilitation projects on non-state owned dams are in the planning stages, including Dry Fork Dam, a privately owned dam in Blaine County; Doney Lake Dam, a privately owned dam located in Powell County; and Basin Creek Dams One and Two, municipal water supply dams owned by the City of Butte. Major embankment rehabilitation is being planned for Lake Frances East Dam, owned by the Pondera Canal Company. A variety of funding sources will be used to finance construction including RRGL grants and loans.

In the last biennium, DNRC received a RRGL Program grant and a loan for the rehabilitation of the North Fork Smith River Dam. Additional funding for the project was requested as a biennial appropriation from the Water Storage Special Revenue Account. Engineering design on the dam is currently underway, with construction planned for fall 2005. Last biennium, rehabilitation was completed on state-owned projects Bair Dam and Nevada Creek Dam. Both of these projects were funded using a combination of RRGL grants and loans, as well as appropriations from the Water Storage Special Revenue Account and the Hydropower Earnings Account. The water user associations are responsible for repayment of the RRGL loans.

The Department of Fish Wildlife and Parks is preparing for the rehabilitation of Park Lake Dam, located in Jefferson County. Funding has been provided through proceeds from fishing license fees by the Legislature in 2001 and 2003. Design is nearly complete, and construction will begin in the spring of 2005. The Department of Corrections received a RRGL grant in the last biennium for the rehabilitation of Upper Taylor Dam, located on the State Prison Ranch in Powell County. Construction is currently underway. The U.S. Bureau of Reclamation will complete the replacement of control gate seals to Fresno Dam on the Milk River in 2005 using RRGL funding obtained in 2003.

Non state-owned projects completed over the past two years include the City of Missoula's South Hills Stormwater Retention Ponds, and repair to the outlet structure on Lake Frances North Dam. Several projects are currently under construction or design, including Georgetown Lake Dam owned by Granite County; Canyon Creek Lake, owned by the Canyon Creek Irrigation District; Lower Willow Creek Dam, owned by the Lower Willow Creek Irrigation District; and Mill Lake Dam, owned by the Mill Creek Irrigation District. Several small privately owned dams with little or no public benefits are also in the planning stage.

This report also provides a section on the state-owned and operated hydropower operations at the Broadwater Project on the upper Missouri River. As a result of NorthWestern Corporation's bankruptcy, the Department was not paid for energy and capacity for the entire month of August and two weeks of September 2003. If NorthWestern makes full payment, the project will realize net income of roughly $100,000 for the fiscal year 2004.

Reservoirs across the state have been drafted heavily over the past several years due to demand for water during the ongoing drought cycle. Below average mountain snow pack and seasonal precipitation have resulted in record low inflows at most projects statewide. Even if average or above average precipitation occurs, it is expected to take two or more years for a number of reservoirs to recover average storage contents.

A copy of the Governor's Report on Water Storage in Montana 2005 that includes links to photographs of subject projects can be found at:
http://www.dnrc.mt.gov/wrd/home.htm

# I. INTRODUCTION

The Office of the Governor is required by statute to submit a report on water storage to the legislature each regular session. The Governor's Report on Water Storage in Montana reviews state water storage policy and statutory criteria used for prioritization of proposed projects; identifies water storage projects proposed for development, including the rehabilitation of existing projects and progress on new projects; and summarizes water storage projects in progress during the previous two years. The focus of this report is on projects that are partially or fully funded by the state. Projects that are regulated by the state with outside funding sources are also included. The federal government has a number of ongoing projects, primarily considered as maintenance, that are not included in the report. The report includes a table summarizing the prioritized projects and a map (see Figure 1) indicating each project type and its location. Information of water storage policy and statutory criteria can be found in Appendix I.

**Water Storage Project Classification and Terminology**

It is important that the reader have a basic understanding of some principles and terms related to dam safety classification used in this report. Standards used by the State of Montana classify a dam spillway as *unsafe* if it would be unable to route the maximum inflow design flood or if the dam's structural integrity has become compromised since construction. A dam is classified as *high-hazard* if its failure has the potential for loss of human life, regardless of its current structural condition.

The state's highest priority for repair and rehabilitation is assigned to dams classified as high-hazard and considered unsafe. The high-hazard classification should not be confused with an assessment of a dam's structural integrity or condition. Almost all of the water storage projects addressed in the Governor's Report are classified as high-hazard, and will remain classified as high-hazard following the completion of any ongoing or proposed work.

*Repair* of a project most often refers to scheduled or emergency action taken to resume dam function to original design capacity or at a reduced, but safe level. *Rehabilitation* involves upgrading existing projects to comply with or exceed current design standards and often includes repair work. Design standards have evolved considerably since the construction of most of the state's dams and repair alone may not bring a facility up to current design standards. The storage capacity of a project is sometimes increased during rehabilitation, especially if enlargement is determined to be a cost-effective alternative. In many cases, the potential of adding hydropower generation capacity to a project is also considered.

The DNRC State Water Projects Bureau is responsible for the operations and maintenance of 24 state-owned water storage projects across the state. Over the past 10 years, DNRC has transferred ownership of several water storage projects to water user associations, which has served to reduce the liability of the state for the projects it owned formerly.

DNRC is responsible for maintaining 250 miles of major irrigation canals associated with ten state-owned projects. The canals are integral components of the various water projects and deliver water to water users served by the respective projects. Many were constructed in the 1930s and 1940s and are in unsafe condition due to severe structural deficiencies. The Canal Operations Program is responsible for identifying and correcting operational deficiencies on state-owned canals.

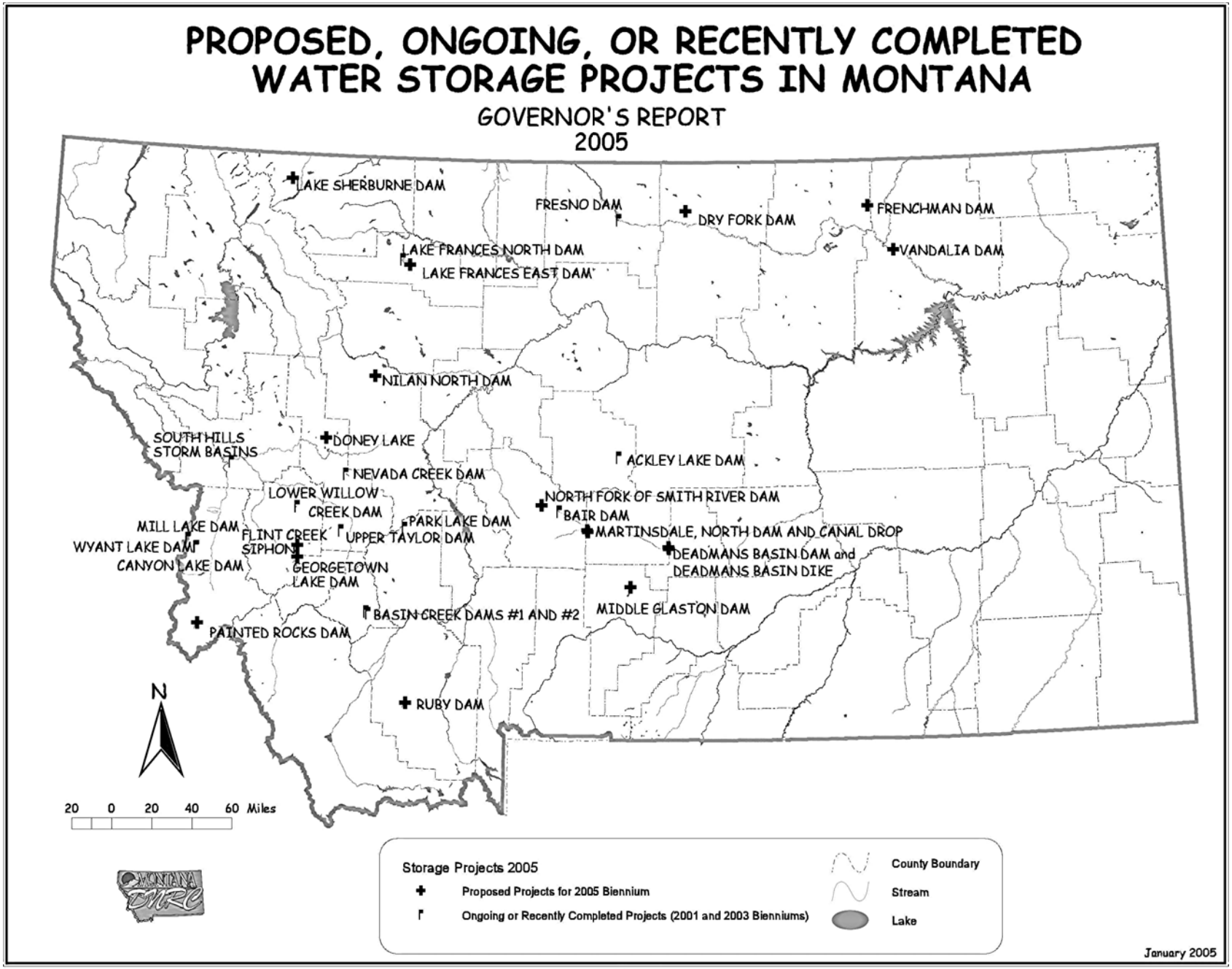
PROPOSED, ONGOING, OR RECENTLY COMPLETED
WATER STORAGE PROJECTS IN MONTANA
GOVERNOR'S REPORT
2005
LAKE SHERBURNE DAM
FRESNO DAM
DRY FORK DAM
FRENCHMAN DAM
VANDALIA DAM
LAKE FRANCES NORTH DAM
LAKE FRANCES EAST DAM
NILAN NORTH DAM
SOUTH HILLS STORM BASINS
DONEY LAKE
ACKLEY LAKE DAM
NEVADA CREEK DAM
LOWER WILLOW CREEK DAM
NORTH FORK OF SMITH RIVER DAM
BAIR DAM
MILL LAKE DAM
WYANT LAKE DAM
CANYON LAKE DAM
FLINT CREEK SIPHON
UPPER TAYLOR DAM
PARK LAKE DAM
MARTINSDALE, NORTH DAM AND CANAL DROP
DEADMANS BASIN DAM and DEADMANS BASIN DIKE
GEORGETOWN LAKE DAM
MIDDLE GLASTON DAM
BASIN CREEK DAMS #1 AND #2
PAINTED ROCKS DAM
RUBY DAM
N
20 0 20 40 60 Miles
Storage Projects 2005
Proposed Projects for 2005 Biennium
Ongoing or Recently Completed Projects (2001 and 2003 Bienniums)
County Boundary
Stream
Lake
January 2005

Figure 1.

## II. WATER STORAGE PROJECTS PRIORITIZED

One of the requirements of the water storage report is to prioritize storage projects proposals for the upcoming biennium. After careful evaluation of the nature and extent of deficiencies, potential for loss of life downstream, and economic impact should the project fail; the following suggested prioritization has been developed:

1. **North Fork of the Smith River Rehabilitation** (Meagher)
2. **Ruby Dam Rehabilitation** (Madison)
3. **Lake Frances East Dam Rehabilitation** (Pondera)
4. **Flint Creek Siphon Repair** (Granite)
5. **Deadman's Basin Reservoir Supply Canal Repairs** (Wheatland)
6. **Painted Rocks Gate and Spillway Engineering Assessment** (Ravalli)
7. **Doney Lake Dam Rehabilitation** (Powell)
8. **Martinsdale North Dam Rip Rap Installation** (Wheatland)
9. **Frenchman Dam Rehabilitation Feasibility Study** (Phillips)
10. **Martinsdale Canal Drop Structures** (Wheatland)
11. **Vandalia Dam Rehabilitation Phase III** (Valley)
12. **Nilan North Dam Outlet Repair** (Lewis & Clark)
13. **Middle Glasston Reservoir Feasibility Analysis** (Sweet Grass)
14. **Lake Sherburne Dam Outlet Works Rehabilitation** (Glacier)
15. **Dry Fork Dam Rehabilitation** (Blaine)

A detailed discussion on the basis of the prioritization is presented in Section III of this report.

Projects sponsors/owners include state government, local government, private organizations and private individuals. As a result, a variety of funding sources are used to finance work to storage projects. Table 1 lists storage project proposals for the 2005 Biennium in order of priority, and tabulates funding sources. Dams classified as high-hazard that are in unsafe condition receive first preference for use of funds from the state's Water Storage Special Revenue Account (Section 85-1-631 MCA). Additionally, revenue received from the state's Hydropower Earnings Account is used to pay for repair and rehabilitation of state-owned water projects.

The Montana Renewable Resource Grant and Loan (RRGL) Program provides funding for resource-related projects that conserve, manage, develop, or initiate the beneficial use of a renewable resource. The $4M RRGL available for grants this biennium would be depleted, should the proposals ranked 40$^{th}$ and higher (cut-off mark) be selected for funding. Dams owned by private individuals and organizations with public benefits are eligible for $5,000 grants from the RRGL private grant and loan program to assist with repair costs. Matching federal funds and substantial private contributions are also used to help fund rehabilitation costs.

Over the past biennium, several projects were completed. Other previously funded projects may still be under construction. Table 2 lists ongoing or recently completed storage projects and cites applicable sources of funding.

**Table 1. 2005 Biennium Water Storage Project Proposals Prioritized**

| **Storage Project Name** (County) *Applicant / Owner* | **RRGL Grant Rank/Amount Requested** | **Water Storage Special Revenue Account** | **RRGL Loan** | **Other (Funding source)** |
|---|---|---|---|---|
| **1.) North Fork Smith River Dam Rehabilitation** (Meagher County) *Dept. of Natural Resources & Conservation (DNRC)* | | $260,000 | | See Table 2 |
| **2) Ruby Dam Rehabilitation** **(**Madison County) *DNRC* | | $214,600 | | Hydropower Earnings $70,000 |
| 3) Lake Frances East Dam Rehabilitation **(Pondera County)** *Pondera County Canal Company* | | | Application pending | |
| **4) Flint Creek Siphon Repair** (Granite County) *DNRC* | | | | DNRC – Pursuing Federal grants Water users will contribute |
| **5) Deadman's Basin Reservoir Supply Canal Drop Structure Repairs** (Wheatland County) *DNRC* | RRGL Rank 6 $100,000 | | | Deadman's Basin Water Users, $50,000 |
| 6) **Painted Rocks Gate and Spillway Engineering Assessment** (Ravalli County) *DNRC* | | | | Hydropower Earnings $104,000 |
| **7) Doney Lake Dam Rehabilitation** (Powell County) *Murphy Ranches* | | | | US Fish Wildlife Service grant and in kind services from Ducks Unlimited |
| 8) **Martinsdale North Dam Rip Rap Installation** (Wheatland County) *DNRC* | RRGL Rank 12 $100,000 | | $80,340 | $28,598 – DNRC in-kind services |
| **9) Frenchman Dam Rehabilitation** (Phillips County) *DNRC* | RRGL Rank 11 $100,000 | | | $65,400 – DNRC in-kind services |
| 10) **Martinsdale Canal Drop Structures Rehabilitation** (Wheatland County) *DNRC* | RRGL Rank 26 $100,000 | | | $28,080 – DNRC in-kind services |
| **11) Vandalia Dam Rehabilitation Phase III** (Valley County) *Glasgow Irrigation District* | RRGL Rank 38 $100,000 | | | Glasgow Irrigation District $21,337 |
| **12) Nilan North Dam Outlet Repairs** (Lewis & Clark County) *DNRC* | | $70,000 | | |
| **13) Middle Glasston Reservoir Feasibility Analysis** (Sweet Grass County) *Sweet Grass County CD* | RRGL Rank 47 $85,000 | | | Sweet Grass CD - $2,000 Landowners - $7,000 |
| **14) Lake Sherburne Dam Outlet Works Rehabilitation** (Glacier County) *Milk River Joint Board of Control* | RRGL Rank 56 $100,000 | | | MRJBC - $5,750 District O&M $18,800 |
| **15) Dry Fork Dam Spillway Improvements** (Blaine County) *Blaine County Conservation District* | $100,000 (Not recommended for funding) | | | |

**Table 2. Recently Completed or On-Going Water Storage Projects (2001, 2003 Biennium)**

| **Storage Project Name**<br>(County)<br>*Applicant / Owner* | **RRGL Grant Awarded 2003, 2001 Biennium** | **Water Storage Special Revenue Account** | **RRGL Loan** | **Other (Funding source)** |
|---|---|---|---|---|
| **North Fork Smith River Dam Rehabilitation**<br>(Meagher County)<br>*Dept. of Natural Resources and Conservation (DNRC)* | $100,000<br>(2003) | $300,000 | $425,000<br>(2003) | |
| **Upper Taylor Dam Rehabilitation**<br>(Powell County)<br>*Montana Dept of Corrections (MDOC)* | $80,000<br>(2003) | | | MDOC $ 23,449, plus in-kind services |
| **Bair Dam Rehabilitation**<br>(Meagher County) *DNRC Complete* | $100,000<br>(2001) | | $988,772<br>(2001) | $900K Hydropower Earnings Account |
| **Nevada Creek Dam Rehabilitation Phase II**<br>(Powell County) *DNRC - Complete* | | $500,000 (2003) | $494,041<br>(2001) | $1M – Hydropower Earnings Account (2003) |
| **Ackley Lake Dam Seepage Repair**<br>(Judith Basin County) *DNRC* | | Funding package not final | | Ackley Lake Water Users Assoc.<br>$5,000 in-kind services |
| **Painted Rocks Dam Repairs**<br>**(**Ravalli County) *DNRC* | | | | $8,591 – PRWUA<br>$12,887 - FWP |
| **Park Lake Dam Rehabilitation**<br>(Jefferson County)<br>*MT. Dept of Fish, Wildlife* and *Parks* | | | | $210,000 – 2001 Legislature<br>$500,000 – 2003 Legislature<br>Fishing license funds |
| **Wyant Lake Dam Rehabilitation**<br>(Ravalli County) | $100,000<br>(2001) | | | Canyon Creek Irrigation District $20,000 |
| **Mill Lake Dam Rehabilitation**<br>(Ravalli County)<br>Mill Creek Irrigation District | $100,000<br>(2003) | | $472,000<br>(2003) | Mill Creek I.D.<br>$290,487 (spec.)<br>Mill Creek I.D.<br>$98,315 (in kind)<br>Mill Creek I.D.<br>$25,498 (O&M) |
| **Lower Willow Creek Exploration/Repair**<br>(Granite County)<br>*Lower Willow Creek Irrigation. District* | $100,000<br>(2001) | | $150,000<br>(2001) | NRCS $650,000 |
| **Basin Creek #1 and #2 Dam Rehabilitation**<br>(Butte Silver Bow)<br>*County of Butte-Silver Bow* | | | | Natural Resources Damage Funds<br>$503K<br>Butte- Silver Bow $303K |
| **Canyon Lake Dam Rehabilitation**<br>(Ravalli County)<br>*Canyon Creek Irrigation District* | $100,000<br>(2001) | | | Canyon Creek Irrigation District<br>$50,000 - $340,000 in-kind services, loans, assessments |
| **South Hills Stormwater Retention Dams**<br>(Missoula County) *City of Missoula* | | | | $398,393 (2001) FEMA & match. |
| **Lake Frances North Dam**<br>(Pondera County) *Pondera County Canal Co.* | | | | $5000 – private grant and loan program; remainder privately funded |
| **Dam Seepage Monitoring Program**<br>*DNRC* | $100,000<br>(2001, 2003) | | | |
| **Georgetown Dam Repair**<br>(Granite County) *Granite County* | | | | 100% funded by Granite County |
| **Fresno Dam Repair**<br>(Hill County)<br>*Chinook Division Joint Board of Control* | $100,000<br>(2003) | | | |

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## III. JUSTIFICATION FOR 2005 BIENNIUM PROJECT PROPOSAL PRIORITIZATION

The following rehabilitation projects are prioritized by DNRC according to the criteria identified by Sec. 85-1-704 (4) (MCA) listed in Appendix I of this report. It should be noted that the Renewable Resource Grant and Loan Program (RRGL), administered by DNRC, independently ranks project proposals, based upon another set of criteria. A number of the projects addressed in this report are seeking partial funding from the RRGL Program.

### 1) North Fork Smith River Dam Rehabilitation (see photos)

The North Fork of the Smith River Dam is located approximately 10 miles east of White Sulphur Springs in Meagher County. The dam, built in 1936, is classified as high-hazard, meaning that loss of human life could occur if the dam were to fail. The reservoir provides irrigation water to the North Fork Smith River Water Users Association and is a popular recreation area.

The existing spillway on the North Fork of the Smith Dam is inadequate, both in capacity and condition, based upon spillway standards established by the Montana Dam Safety Program. Inadequate capacity of the dam spillway could cause floodwater to overtop the earthen dam if a significant precipitation event occurs in the headwaters of the basin or at the project site. Should the dam fail from such an event, the results would be devastating, both in loss of life and property.

Rehabilitation will include replacing the existing spillway, adding an emergency spillway, raising the dam crest to increase the margin of safety at full pool, and installing filters and drains to control and collect seepage. The estimated total cost of the project at the feasibility stage is approximately $825,000, not including the DNRC in-kind contribution. DNRC received a grant in the amount of $100,000 in 2003 and requested a loan in the amount of $425,000 for the Project. Additionally, a biennial appropriation of $300,000 for the project is requested from the Water Storage Account.

HKM Engineering of Billings was selected in the spring of 2004 as the project contractor following a review of the proposals submitted. A contract was also awarded for topographic and boundary surveying. The construction phase of the rehabilitation project, which includes installation of a new spillway, outlet terminal structure, and drain system is tentatively scheduled to begin in 2005, pending the availability of funds. The rehabilitation of North Fork of the Smith River Dam will bring the project into full compliance with Montana Dam Safety regulations. The proposal meets criteria 3 (a) (b) and (c) of the water storage statute.

### 2) Ruby Dam Rehabilitation (Pre-Construction Engineering) (see photos)

Ruby Dam is a state-owned water storage project constructed in 1938. The dam is located in Madison County, about seven miles south of the Town of Alder. The dam is 111 feet in height and can impound 37,612 acre-feet of water at full pool. The Ruby Water Users Association operates and maintains the dam.

The spillway is in extremely poor structural condition, and may not be able to safely accommodate the inflow design flood required for a dam of its size and hazard classification. Major structural concrete replacement is required to correct the deficiencies. The dam is classified as high hazard

under the Montana Dam Safety Act, which means its failure could cause loss of life. As a state-owned project, the responsibility and liability for this structure rests with the State of Montana.

Rehabilitation would be accomplished in two major phases, pre-construction engineering, and final engineering design and construction. The funding in this request will be used to contract with an engineering firm to complete the pre-construction engineering phase. The engineering will establish the basis for funding and carrying out the actual rehabilitation construction stage.

This project is in need of major rehabilitation. Pre-construction engineering is necessary to examine the dam and spillway and determine the most economical rehabilitation alternative. A preferred alternative and cost estimate for rehabilitating this project will be developed and selected forming the basis for the next step of construction. Rehabilitation will greatly reduce the deficiencies, and thus exposure to liability, inherent in this state-owned structure. The proposal meets criteria 3 (a) (b) and (c) of the water storage statute.

**3) Lake Frances East Dam Rehabilitation** (see photos)

Lake Frances is located in Pondera County, near the Town of Valier. The North and East dams, measuring twenty and sixty feet in height, create the reservoir. The Pondera County Canal and Reservoir Company owns both dams, which were constructed in 1908-1909. Storage capacity is 105,000 acre-feet, which is considered large for a privately owned dam. The water has many benefits, including irrigation, municipal use by the City of Conrad, and for recreation by the general public. Both dams are classified as high hazard since the failure of either structure presents the potential to cause loss of life and property damage.

The outlet works on the East Dam have been slowly deteriorating over time. In 2002, an extensive grouting program was conducted to seal voids in the earthen embankment. It is believed that slow piping of material into the outlet conduit caused the voids. In 2003, the outlet conduit and gate tower were cored to evaluate the condition of the concrete. It was determined that the concrete had deteriorated to the point where the only remaining alternative to ensure continued safe operation of the dam was to replace the entire outlet works.

The cost of excavating both the dam embankment and foundation is prohibitive for the Pondera Canal Company, which is currently in the process of evaluating funding alternatives. The company is considering changing its organizational structure to become eligible for an RRGL grant. A dam rehabilitation funding bill now before Congress may provide access to funding for the necessary engineering and construction. The proposal meets criteria 3 (a) (b) and (c) of the water storage statute.

**4) The Flint Creek Siphon Repair**

The Flint Creek Siphon is a 54 -inch diameter, 4,056 foot-long steel underground pipe constructed in 1938 and owned by DNRC. The pipeline is an integral part of system including five canals that stretch more than forty-five miles, and irrigate over 25,000 acres of land.

Water stored in East Fork of Rock Creek Reservoir is diverted, below the dam, over a divide to the Flint Creek drainage, where it is used for irrigating lands between Philipsburg and Drummond. The project sustains fish, wildlife, agricultural production, and recreation in the Philipsburg Valley. The rupture of this main artery during the peak period of irrigation could cause catastrophic consequences to the ranchers and farmers who rely upon this system.

The metal substrate of the siphon has greatly corroded in the 66 years since its installation. The siphon burst in June 2001, causing the structure to be shut down, drained, and welded for repair. More corrosion holes have been found and repaired since the temporary closure in 2001. Consequently, the DNRC is taking steps toward replacing the siphon.

Work to be done involves leak repairs and metal treatment to extend the lifespan of the pipe. DNRC continues to monitor the siphon after another corrosion hole was found and repaired in the spring of 2004. DNRC is pursuing federal grant opportunities for this important repair project to match with funding provided by the water users association. The repair of the Flint Creek Siphon will meet the criteria set forth in the water storage statute under section 3) (b) and (c).

**5) Deadman's Basin Reservoir Supply Canal Repairs** (New RRGL – Rank 6) (see photos)

Deadman's Basin Reservoir is a state-owned off-stream storage reservoir located in Wheatland County, approximately 20 miles east of Harlowton. The reservoir, which is capable of storing 76,900 acre-feet of water, serves as an important source of irrigation water, supplies municipal water to the towns of Ryegate and Melstone, and is a popular recreation site for the boating, hunting, and fishing public.

The supply canal from the Musselshell River is 11.5 miles long and is the only source of water for the reservoir. DNRC is requesting a Renewable Resource grant in the amount of $100,000 to fund engineering, and a $50,000 loan to undertake a canal-lining project. The proposal is currently ranked 6$^{th}$ in the RRGL Program ranking summary.

The engineering analysis would contemplate: 1) The structural integrity of, and the hazards posed by the deteriorating embankment dams and large concrete structures integral to the canal; 2) the cost to repair or replace the high-risk embankment dams and associated structures; 3) methods of optimizing the hydraulics of the supply canal so that additional water can be captured and stored in the reservoir, and; 4) the cost of constructing an operations and maintenance road that would travel the length of the supply canal.

The canal-lining project would undertake the installation of a special liner in order to mitigate the excessive losses of water on the most pervious reach of the canal. The proposal meets criteria 3 (a), (b), and (c) of the water storage statute.

**6) Painted Rocks Gate and Spillway Engineering Assessment** (Pre-Construction Engineering) (see photos)

Painted Rocks Dam is a state-owned water storage project constructed in 1938. The dam is located in Ravalli County, about thirty miles southwest of Darby. The dam is 143 feet tall and impounds 32,362 acre-feet of water at full pool. DNRC's Water Resources Division, Missoula Regional Office, operates the dam. Stored water is used for agricultural irrigation and in-stream flow enhancement for the Bitterroot River fishery resource. The reservoir is also a popular recreation area.

The condition of the dam's spillway concrete is unknown. The steep angle of the spillway chute makes it very difficult and dangerous to inspect. Furthermore, the spillway's tapered chute may be unable to safely route inflow from the design flood required for a dam of its size and hazard classification. The dam is classified as high hazard pursuant the Montana Dam Safety Act, meaning its failure could cause loss of life. As a state-owned project, responsibility for this structure and the liability inherent with it lies with the State of Montana.

The dam control outlet gates have a history of poor performance and often cannot be closed to allow access to the outlet for inspection. Regulating low flows during fall, winter, and early spring is also very difficult due to the poor performance of the gates. Last year, DNRC was only able to reduce the flows to 66 cubic feet per second due to the immobility of the gates. Fortunately, this rate of flow was approximately equal to the reservoir inflow throughout the winter, allowing DNRC to maintain the proper storage level.

The outlet control gates for this project are in need of major rehabilitation. The results of the engineering analysis will determine the proper course of action for problems associated with the dam's spillway. Rehabilitation is accomplished in two major phases, pre-construction engineering, and final engineering design and construction. Pre-construction engineering is necessary to determine the most economical rehabilitation alternative. A preferred alternative and cost estimate for rehabilitating this project will be selected, forming the basis for the next step of construction.

DNRC is requesting $104,000 from the Hyropower Earnings Account to contract with a private engineering firm to complete the pre-construction engineering phase. The engineering will establish the basis for funding and carrying out the actual rehabilitation construction phase. Rehabilitation will greatly reduce the liability inherent in this state-owned structure. The proposal meets criteria 3 (a) (b) and (c) of the water storage statute.

**7) Doney Lake Dam Rehabilitation** (see photos)

Doney Lake is located in Powell County, approximately five miles northeast of Ovando, Montana. Murphy Ranches, Inc. owns and maintains the dam and operates the reservoir for wildlife and irrigation purposes. Doney Lake is a natural wetland that had been converted to use as irrigation water storage by the construction of a ditch and earthen embankment. The lake covers 79 surface acres with a maximum depth of eight feet and a capacity of 206 acre-feet at normal operating pool.

Doney Lake is sustained by natural springs and provides excellent brood rearing habitat for over 17 species of waterfowl. The Doney Lake wetland complex is frequently used by grizzly bears for spring and fall foraging among its associated berry producing shrubs. Access to Doney Lake by the general public is by foot or horseback only for bird watching, hiking, and hunting.

Doney Lake Dam is classified as a high hazard dam due its size and the potential for loss of life downstream in the event of failure. Past inspections identified several serious problems with the dam. The reservoir lacks adequate spillway capacity and the outlet conduit shows signs of deterioration, indicating that it is very near the end of its useful life.

The U.S. Fish and Wildlife Service has provided a grant for the rehabilitation of Doney Lake Dam due to its importance from a wildlife habitat perspective. Ducks Unlimited has also agreed to provide engineering services and oversee construction. Design is currently underway and construction is planned for the spring of 2005. The proposal meets criteria 3 (a),(b), and (c) of the water storage statute.

**8) Martinsdale North Dam Rip Rap Installation** (New RRGL – Rank 12) (see photos)

Martinsdale Reservoir is an off-stream storage project owned by DNRC and capable of storing 23,348 acre-feet of water. The reservoir is located about 2.5 miles southeast of the Town of Martinsdale. Water from the reservoir is used primarily for irrigation water supply, but is also used for water-based recreation. The reservoir, completed in 1939, includes two earthen embankment dams, East Dam and North Dam. The dams are classified as high hazard because of the potential for loss of life below the dams, should either dam fail.

The outlet works is located through the North Dam near the right abutment. It consists of an intake structure, a 60-inch diameter reinforced concrete pipe tunnel, a dry tower with an operating gate and an emergency gate, and an outlet structure. The inlet to the outlet conduit has a recurring problem with plugging. The inlet structure became plugged in 1989, 2000, 2001, and 2002.

The most serious incidence occurred in September 2000. The plug was eventually removed by water jet cleaning of the outlet conduit from the downstream side of the outlet conduit, and pumping water into the inlet tower. About 200 cubic yards of sand, silt and gravel was removed from the outlet conduit and intake structure. Since 2000, $95,573 has been spent unplugging the conduit and excavating sediment from around the intake structure.

The blockage on the inlet tower and the upstream portion of the conduit is caused by wave erosion of sand and cobble material from the right abutment. The project plan is to place riprap on the right abutment slope above the intake structure to stabilize and armor this slope from wave erosion and eliminate continued plugging of the intake structure.

The total project budget is estimated to cost approximately $208,938. DNRC is requesting a Renewable Resource grant in the amount of $100,000 to help pay for a portion of the project cost. The remaining portion will be paid for by the Upper Musselshell Water Users Association. The proposal meets criteria 3 (a) (b) and (c) of the water storage statute.

**9) Frenchman Dam Rehabilitation** (New RRGL – Rank 11) (see photos)

Frenchman Dam is located about 22 miles north of Saco, in Phillips County. The project is situated on Frenchman Creek, a tributary of the Milk River. The drainage area of the project encompasses 2,460 square miles. The DNRC-owned non-high hazard dam is operated and maintained by the Frenchman Water Users Association. The dam is 44 feet in height and 2,100 feet long, with a dike on the west end that is eight feet tall and 1,000 feet long.

The original earth fill dam was completed in 1951. The dam failed on April 15, 1952 due to very high stream flows resulting from rapid snowmelt and a very rapid filling of the reservoir. The dam was reconstructed in 1952-1953 with a larger spillway and revisions to the seepage cutoff. Annual dam safety inspections have revealed voids that developed over time beneath the spillway.

Temporary repairs have been made to avert additional erosion. Cracking and spalling concrete and deteriorating and offset joints are evidence of the declining operational condition of the spillway. The storage capacity of the reservoir has been reduced by about 50 percent due to years of sediment accumulation.

DNRC's State Water Projects Bureau and the Frenchman Water Users Association are proposing a feasibility study to evaluate the known problems at Frenchman Dam while incorporating an investigation to further identify other potential problems. The feasibility study would also identify and outline mitigation and rehabilitation alternatives for the project, including the potential to increase the storage capacity and spillway improvement or replacement options.

The funding from this request would be used to help pay for flood hydrology analysis, water availability evaluations, drilling, and installation of seepage monitoring wells. DNRC is requesting an RRGL Program grant in the amount of $100,000. The State Water Projects Bureau will assume a lead role in project management, contributing in-kind technical services amounting to approximately $65,000. The estimated cost of the feasibility program is approximately $165,000. The proposal meets criteria 3 (a), (b), and (c) of the water storage statute.

**10) Martinsdale Outlet Canal Drop Structures Rehabilitation** (New RRGL – Rank 26) (see photos)

Martinsdale Reservoir is a 23,438 acre-foot off-stream reservoir owned by DNRC and completed in 1939. The project, located about 2.5 miles southeast of the town of Martinsdale, includes two earthen embankment dams, East Dam and North Dam.

Martinsdale Reservoir provides irrigation water to 53 ranches covering 30,658 acres. The dams are classified, as high hazard because of the potential for loss of life below the dams, should either dam fail. The subject canal delivers water from Martinsdale Reservoir to the Musselshell River.

The existing concrete drop structures and control sections are deteriorating and are at risk of collapse. DNRC is requesting a $100,000 grant to rehabilitate three failing drop structures. The structural deficiencies of the three drop structures would be remediated, and the exposed surfaces would be capped with new protective concrete. The proposal meets criteria 3 (b) and (c) of the water storage statute.

**11) Vandalia Dam Rehabilitation Phase III** (New RRGL – Rank 38)

Vandalia Diversion Dam is located on the Milk River, about three miles west of Vandalia, in Valley County. The project is owned by the U.S. Bureau of Reclamation and operated by the Glasgow Irrigation District. The dam diverts water into Vandalia Main Canal for irrigation of land in the vicinity of the towns of Vandalia, Tampico, Glasgow, and Nashua.

The dam has been in continuous use since it was constructed in 1917. The Glasgow Irrigation District (GID) and the US Bureau of Reclamation have performed regular maintenance and safety inspections over the years. An engineering analysis of the structure, recently completed by a consulting firm, led to recommendations for repairs in several phases. The project proposed will be the third phase of a long-range plan for complete rehabilitation of the structure.

The struts and walkways have undergone damage over the years, mainly from freeze-thaw cycles. Further, due to the lack of protection from floating debris, the struts and walkways have sustained damage from large trees and other debris washed into the upstream side of the dam during high flow turbulence. Some of the struts and walkways have completely been demolished by ice flows.

The primary goal of the project is to preserve the integrity and increase the service life of Vandalia Diversion Dam. A secondary goal is to conserve the water resources available to GID. Reduction of losses due to seepage and spilling will increase usable supply for district members and other upstream users. The objective of the project is to rehabilitate the struts and walkways of Vandalia Diversion Dam.

The project (Phase III) is the next step toward complete rehabilitation of Vandalia Diversion Dam. The selected alternative is to replace the struts and walkways with concrete members cast in place. This alternative provided economic savings and will extend the service of the dam beyond that of replacing the deteriorated members with steel. GID is requesting an RRGL grant of $100,000 and is proposing it provide in-kind services for matching funds of $21,337, for a total package cost of $121,337.

The project ensures the future availability of water for the GID and increases the efficiency of water used. The project will decrease long-term operation and maintenance costs to the district. GID also installed water-monitoring equipment last spring, so that all releases are measured. The dam provides storage of runoff and return flows in the river system during the irrigation season. The capability to utilize these flows reduces the demand on stored water upstream.

The project provides fishermen with the opportunity to catch northern pike, walleye, sauger, and smallmouth bass. Paddlefish, a species of special concern in Montana, has also been documented to migrate upstream from the Missouri River to this point.

GID will contract with an engineer and construction company to complete the project. GID will be responsible for administration of the project. The GID Board of Commissioners, the project manager, and an engineer will provide project management. GID staff will provide administrative support, bookkeeping, and recordkeeping. The proposal meets criteria 3 (b) and (c) of the water storage statute.

**12) Nilan North Dam Outlet Repairs** (see photos)

Nilan Reservoir North Dam is a state-owned dam located about seven miles west of Augusta in northern Lewis and Clark County. The dam was constructed in 1952, and is classified as high-hazard, which means there may be loss of life if the dam were to fail. The reservoir provides 10,090 acre-feet of irrigation water to the Nilan Water Users Association, and is a popular recreation area.

The outlet structure at the North Dam is structurally in very poor condition. The structure has deteriorated to the point that additional small repairs and patching are no longer economical or feasible. The accelerating deterioration is primarily a function of continuous freeze-thaw damage and resulting severe cracking. There is also a considerable amount of seepage that exits in the location of the outlet. Uncontrolled seepage along the side of the conduit could cause material to be removed from the dam embankment resulting in failure of the dam.

The repair work at the North Dam would include replacing the outlet structure and installing filters and drains at the outlet terminal structure to control and collect seepage. The proposed drain installation would encircle the end of the conduit to safely discharge seepage water that finds its way to the conduit. Funding of $70,000 will be requested for the repairs as a biennial appropriation and would come from the Water Storage Special Revenue Account.

The rehabilitation will provide a safe outlet structure at the North Dam, and will control seepage at the dam. The repairs and improvements will enhance the longevity of the dam, and promote effective water conservation. The proposal meets criteria 3 (a), (b), and (c) of the water storage statute.

**13) Middle Glasston Reservoir Feasibility Analysis** (New RRGL – Rank 47)

The Sweet Grass Conservation District (SGCD) proposes an engineering analysis to determine the feasibility of constructing a new dam with off-stream storage reservoir 14 miles north of Big Timber, in Sweet Grass County. If constructed, the new dam would provide storage for approximately 1,500 acre-feet of water to augment late-summer flows in Sweet Grass Creek, a highly appropriated and seasonally dewatered stream that is tributary to the Yellowstone River.

The location of the proposed reservoir lies in a drainage northeast of Lower Glasston Reservoir, draining to Sweet Grass Creek. If constructed, the reservoir would provide benefits not only to irrigators, but recreational benefits to the public. Stored water would be used to supplement late-season low stream flows and to cool high water temperatures detrimental to Sweet Grass Creek as a trout fishery during most summers.

The reservoir would be located adjacent to existing Lower and Upper Glasston reservoirs. These facilities have historically provided late-summer flows to Otter Creek, leaving Sweet Grass Creek drainage seriously dewatered most years. If constructed, the dam and reservoir would provide 1,500 acre-feet of usable storage in eight out of ten years, enhance irrigation benefits, and preserve fish and wildlife habitat within the Sweet Grass Creek drainage each year.

The proposed preliminary engineering analysis would evaluate the feasibility of the new dam and storage reservoir. Technical issues such as surface water hydrology, geotechnical investigation, and

conceptual design would be addressed by the engineering analysis. A financial analysis with preliminary cost estimates, and an analysis of environmental impacts will be developed for each of the three sites under consideration.

SGCD would be responsible for the administrative management of the study proposed. SGCD would also select and contract with an engineering consultant to conduct the study through the statutorily required qualifications-based selection process.

Coordination among the various agencies that would be stakeholders in the project will also be necessary, and potentially include DNRC, Fish, Wildlife and Parks, Montana Bureau of Mines and Geology, and the Natural Resources Conservation Service. Local organizations and governments will also be involved during the course of the study and development of the project. Sweet Grass County Conservation District proposes contributions of $9,000 ($2,000 CD; Landowners - $7,000) and securing a RRGL Grant in the amount of $85,000, currently ranked 47th among the proposals. The proposed Middle Glasston dam and reservoir meet Section 85-1-704, part 2) (a through j) and part (4) (c ) Prioritization of water storage projects.

**14) Lake Sherburne Dam Outlet Works Rehabilitation** (New RRGL – Rank 56) (see photos)

Lake Sherburne Dam is located six miles west of the Town of Babb, adjacent to Glacier National Park on Swiftcurrent Creek, a tributary to the Saint Mary River. The dam and reservoir, completed in 1921, are part of the Milk River Irrigation Project owned and operated by the Bureau of Reclamation. The reservoir, capable of storing 69,000 acre-feet, is a major storage component for the Milk River Project that serves eight irrigation districts irrigating 110,306 acres, nine municipalities, and Bowdoin National Wildlife Refuge.

The concrete outlet works conduits that carry releases through the dam have deteriorated significantly since they were last repaired in the early 1960s. Deterioration has occurred due to freeze-thaw action, abrasion, and cavitation. The outlet was inspected and cleaned of debris in 2001. Sediment, stones, and rocks were removed from the outlet works structure and the approach channel. In addition, the trash rack, which prevents large rocks from passing through the outlet works, was rehabilitated. Reclamation has indicated that cleaning and inspection process will continue on a regular basis.

The project goal is to preserve the dam for long-term use by restoring the concrete outlet works to its original condition. The proposed project will remove deteriorated concrete from inside the outlet conduits and place new concrete to restore the original shape. The main components of the project include preparing specifications and bids for the project, removal of the unsound concrete, installation of anchors to tie the new concrete floor into the existing walls, and pouring of replacement concrete.

The Milk River Joint Board of Control and Reclamation is requesting a $100,000 RRGL grant and will manage the project. The management plan assigns Reclamation for professional and technical activities, with the associated costs to be reimbursed by the water users. Reclamation's costs were not included in the financial plan. The water users are providing supplemental funding of $18,800 and $5,750 of in-kind services for the proposed rehabilitation of the outlet works.

The budget strategy provided in the application does not include all of the anticipated costs. The technical and professional costs will be paid out of existing operations and assessments. The primary

benefit of this project is to maintain Lake Sherburne Dam as a viable component of the Milk River Irrigation Project. The proposed project would mitigate the adverse impacts associated with the potential loss of this important water supply.

**15) Dry Fork Dam Rehabilitation** (New RRGL – unranked) (see photos)

Dry Fork Dam is a privately owned facility located eight miles north of Chinook in Blaine County. The project is used for irrigation and is open to the public for recreation. Dry Fork Reservoir can store about 5,000 acre-feet of water, making it average in size for a privately owned dam. Dry Fork Dam is classified as a high hazard dam.

The spillway of Dry Fork Dam is grossly undersized. It is expected that at least three lives would be lost if the dam failed. The dam owner has agreed to make the dam safe in 2005, and the renewal of its Dam Safety Operations Permit is conditioned on the provision of a spillway with adequate capacity.

Since a pumping system from Battle Creek is no longer used, the dam is seldom filled. Therefore, downstream residents also benefit from flood storage. The Blaine County Conservation District applied for a RRGL grant of $100,000 on behalf of the dam owner. Since it was not recommended for funding, an alternative funding source will need to be developed.

Rehabilitating Dry Fork Dam would provide a safe storage facility in compliance with Montana Dam Safety standards. The proposal meets criteria 3 (a) (b) and (c) of the water storage statute.

## IV. ON-GOING OR RECENTLY COMPLETED REPAIR OR REHABILITATION PROJECTS (2001, 2003 Biennium)

### State-Owned Rehabilitation and Repair Projects

This section contains current information concerning state owned projects that were in progress when reported in the 2003 Governor's Report on Water Storage, or were started during the past two years. Some projects have been completed during the last two years, while work on others is expected to continue into the next biennium.

### Upper Taylor Dam Rehabilitation (see photos)

Upper Taylor Dam is located in the Montana State Prison west of the City of Deer Lodge. The Montana Department of Corrections owns and operates Upper Taylor Dam. The dam is 40 feet in height and holds 300 acre-feet of water. The dam is used for irrigation by the State Prison Ranch.

The problems with the dam are two-fold. First, the principal and emergency spillways are grossly undersized. It is estimated that the loss of 20 lives, in the northwest section of the City of Deer Lodge, could be expected if the dam were to fail. Furthermore, the corrugated metal outlet pipe has reached the end of its design life. Significant corrosion of the outlet pipe could lead to failure of the entire dam.

The Department of Corrections submitted an application for a grant to the Renewable Resource Program for the 2001 legislative session for engineering services to develop a rehabilitation design for Upper Taylor Dam. An additional RRGL grant of $80,000 was awarded in 2003 for construction the project. Cash and significant in-kind services were provided by Corrections for the project.

In 2003, the Department of Corrections received a RRGL grant to fund one-third of the needed cost for repair. The remaining two-thirds of the necessary funding will come from proprietary State Prison Ranch funds and machinery and labor provided by the Job Corps as part of a training program. The work includes the addition of an enlarged, rock-lined emergency spillway and slip lining of the current outlet pipe. Construction is currently underway.

### Bair Dam Rehabilitation (see photos)

Bair Dam is an earth fill structure located on the North Fork of the Musselshell River in Meagher County, approximately one mile upstream of the Town of Checkerboard. The dam and reservoir are owned by DNRC and managed by the State Water Projects Bureau. The Upper Musselshell Water Users Association has operated the dam since 1940.

The dam was constructed in 1939 and is 102 feet tall, with a concrete chute spillway and a gated, reinforced concrete outlet conduit. The normal storage capacity of the reservoir is 7,200 acre-feet. The dam is a high-hazard structure, which means that its failure could cause loss of life.

Bair Dam suffered from several deficiencies, including significant structural deterioration, and it had been determined that it could not safely route the required inflow design flood for a dam of its size and hazard classification. DNRC contracted final design for the rehabilitation projects in two phases.

Phase I part of the rehabilitation was completed in early 2002 and Phase II of the rehabilitation was completed in December 2002. Warranty work and reclamation was completed in the summers of 2003 and 2004. Bair Dam is now in full compliance with construction standards for high hazard dams developed by authority of the Montana Dam Safety Act.

**Nevada Creek Dam Rehabilitation Phase II** (see photos)

Nevada Creek Dam is located on Nevada Creek in Powell County, adjacent to State Highway 141, between the towns of Avon and Helmville. Nevada Creek is a major tributary of the Blackfoot River. The project is owned by DNRC and managed by the State Water Projects Bureau. The Nevada Creek Water Users Association has operated the dam since 1939.

The project consists of an earth fill dam, 105 feet in height, with a concrete chute spillway and a gated, reinforced concrete outlet conduit. The original construction was completed in 1938. The normal storage of the reservoir is 11,200 acre-feet. The dam is a high-hazard structure, which means that its failure could cause loss of human life.

Nevada Creek Dam suffered from several deficiencies and couldn't safely route the required inflow design flood for a dam of its size and hazard classification. The spillway was in extremely poor condition, with severe concrete deterioration in the spillway floor and walls. Also, uncontrolled seepage flows of up to 500 gallons per minute exited at the toe of the dam, threatening the stability of the structure.

A phased approach was used for construction. Completion of Nevada Creek Phase I occurred in December of 2002. Construction included an outlet extension, materials processing, stability berm, drain system, and dewatering wells. Nevada Creek Phase II included a new concrete spillway and was completed in January of 2004. The reclamation phase, which included final grading and reseeding of all disturbed areas, was completed in September 2004.

The total cost of the rehabilitation project was $2M. The rehabilitation of Nevada Creek Dam brought the project into full compliance with Montana Dam Safety regulations.

**Ackley Lake Dam Seepage Repair** (see photos)

Ackley Lake Reservoir is owned by the DNRC, with daily operations and maintenance the responsibility of the Ackley Lake Water Users Association. The Reservoir is located in Judith Basin County, approximately 10 miles south of Hobson. The dam and canal system was constructed by the State Water Conservation Board in 1938. Water from the reservoir is used for irrigation, recreation, and the regulation of stream flows.

A seepage area located downstream from the toe of the dam has been observed for many years. Standing and flowing water occur at this location in an amount that varies depending upon the level

of the reservoir. On June 22, 2004, a 2-inch diameter hole was discovered, discharging a white clayey material. On June 25, 2004 a sand and gravel filter blanket was placed over the area to prevent any further erosion and enlargement of the hole.

The State Water Projects Bureau installed two investigative relief wells and five monitoring wells in November 2004. The additional wells will provide information required to design the repair of the dam, and the two relief wells will reduce some of the high foundation pressures. It is likely that reservoir pool level restrictions will be necessary until the dam is repaired. Monitoring is ongoing.

**Painted Rocks Dam Repairs** (see photos)

Painted Rocks Dam and Reservoir are owned by the DNRC and used for irrigation, recreation and flood control. The dam is located in Ravalli County, approximately 30 miles southwest of Darby. The reservoir storage capacity at maximum capacity is 32,362 acre-feet. The State Water Conservation Board constructed the dam in 1939 with funds from the Public Works Administration. The dam is classified as a high-hazard structure, which means that its failure could cause loss of life.

The dam spillway log boom broke during spring runoff in 2003. It was also determined that potentially serious public safety hazard existed due to unrestricted access by the public to the spillway. The log boom was replaced in the spring of 2004 at a cost of $21,000 using a match provided by the Painted Rocks Water Users Association and FWP. A fence to prevent public access to the spillway was installed in August 2004 at a cost of $5,000.

Additional work, proposed for 2005, includes the installation of safety improvements to the gate hoist mechanism, and the refurbishment of one of the gates to allow for conduit inspections and control of reservoir releases prior to rehabilitating the dam. The gate hoist repairs are estimated to cost $15,000, and the gate refurbishment is estimated to cost $50,000. The Painted Rocks Water Users Association and FWP will provide funding for the repairs.

**Park Lake Dam Rehabilitation**

Park Lake Dam is an off stream reservoir owned by Montana Fish, Wildlife, and Parks (FWP) located in Jefferson County, south of Helena. The dam was built in 1871-1872 to raise the level of the existing mountain lake as part of the Park Ditch Project, which supplied water to mining operations in the gulches above the City of Helena.

The reservoir and its immediate area are owned by FWP and the U.S. Forest Service and are used extensively for recreation, as well as a fishery water supply. The reservoir has a storage capacity of 389 acre-feet at the principal spillway crest and a capacity of 701 acre-feet at the dam crest. Water is diverted from Lump Gulch to the reservoir by a 1.2-mile long supply canal. Recent inspections have revealed deterioration of the main dam embankment occurring over the years.

It was determined that the most cost effective form of rehabilitation was to completely reconstruct the embankment. Reconstructing the embankment would also eliminate concerns with stability of the dam should there be another seismic event in the area. In addition to rebuilding the embankment, repair of the spillway culvert is necessary.

The reservoir is currently being lowered in anticipation of construction. Construction will begin in July 2005. Upon completion of the project, the dam will be exchanged with property currently owned by the U.S. Forest Service in Alberton Gorge. Funding for the rehabilitation will come from fishing license funds approved for Park Lake Dam repairs by the 57th legislature ($210,000) and fishing license funds for FWP dam repairs approved by the 58th legislature ($500,000).

**Seepage Monitoring of State-Owned Dams**

DNRC manages several state-owned high-hazard dams that did not have adequate seepage control systems. These earth-filled dams were built 40 to 80 years ago and have no provisions for control or monitoring of seepage. Today, earth-filled dams are generally designed with seepage control structures to control water movement through the dam. Seepage-monitoring programs at state-owned projects enable DNRC to determine the severity and extent of dam seepage, and whether the integrity of a particular dam is in jeopardy.

Up to 2002, DNRC had installed seepage monitoring devices in all but four of its 22 high hazard, earthen-embankment dams. In 2002, the State Water Projects Bureau submitted an application and received a Renewable Resource Grant for $97,646 to establish a seepage-monitoring program at the remaining four DNRC earthen dams that lacked monitoring infrastructures (Painted Rocks, Cataract, Willow Creek, and Yellow Water dams). Installation of the monitoring wells is now complete and regular monitoring schedules have been implemented. Laboratory test work of soils collected from the monitor well drilling during the fall of 2004 will be completed by spring 2005.

The latest RRGL grant-supported monitoring well installations complete the establishment of the Bureau's Seepage Monitoring Program. However, the program monitoring is considered perpetual. Should seepage problems be identified at any of the dams, additional monitoring devices or seepage control structures may be warranted.

Public safety is not the only justification for implementation of a dam seepage-monitoring program. In the event of dam-related litigation, monitoring records provide critical evidence demonstrating that a dam was operated and maintained in a conscientious manner. Finally, maintaining a dam seepage-monitoring program demonstrates that a certain standard of care is exercised by dam owners and regulators on behalf of the public.

## Non-state owned Rehabilitation and Repair Projects

### Wyant Lake Dam Rehabilitation (see photos)

Wyant Lake Dam is located on Canyon Creek in the Selway-Bitterroot Wilderness about 15 miles west of the Town of Hamilton. The dam was originally constructed in 1910 and is managed by the Canyon Creek Lake Water Users. Wyant Lake Dam is situated in a mountain canyon, upstream of Canyon Creek Lake Dam, also managed by the Canyon Creek Lake Water Users.

Over time, the embankment and outlet works have deteriorated. Additionally, the dam is insufficient to contain the flood required by the U.S. Forest Service for a high-hazard dam. The project had been delayed by continued negotiations with the Forest Service for access to a restricted use Wilderness Area to perform construction.

The Canyon Creek Irrigation District received an RRGL grant in the amount of $100,000 in 2003 that was used to coordinate the disposition of Wyant Lake Dam with the rehabilitation of neighboring Canyon Creek Lake Dam during the fall of 2004. The district agreed to an arrangement that provided for the breach and cessation of use of Wyant Dam and lake and the pooling of available funds to complete the rehabilitation of Canyon Creek Lake Dam, which included an increase of storage capacity to compensate for the loss of Wyant Lake Dam.

### Canyon Creek Lake Dam Rehabilitation (see photos)

Canyon Lake Dam is a high mountain dam in the Selway-Bitterroot Wilderness west of Hamilton. The dam was constructed in 1891. The dam is owned and operated by the Canyon Creek Irrigation District. Canyon Lake Dam had numerous deficiencies. With time and use, portions of the dam had deteriorated, and episodic flood events had damaged the dam. Access to the dam has been by trail, but the trail has deteriorated over time. The dam is classified high hazard by the U.S. Forest Service.

Canyon Creek Irrigation District received a Renewable Resources Program grant in 1993 for the design and construction of improvements to the dam, and another RRGL grant in 2001, when the project was ranked 5th of 62 applications. The project had been delayed by continued negotiations with the Forest Service for access to perform construction. In addition, a large influx of population in the area in recent years, with resulting subdivision of land, has resulted in great difficulty in the organization of water users.

The goals of the project were to upgrade the dam to comply with current dam safety standards and to ensure an adequate and timely supply of irrigation water to the district. The project was completed in the fall of 2004. Improvements include increased storage capacity, increased spillway capacity, and repair and improvements to the outlet works. This work was integrated with the breaching of Wyant Lake Dam, another earthen dam upstream, but within the same storage basin as Canyon Lake Dam and its reservoir.

**Mill Lake Dam Rehabilitation**

Mill Lake Dam is located in the Selway-Bitterroot Wilderness area and is located approximately fifteen miles west of the Town of Hamilton. The dam is owned by the Mill Creek Irrigation District, regulated by the U.S. Forest Service, and stores water used for irrigation. The dam, built in 1908, is an unsafe, high hazard dam in need of rehabilitation to meet U.S. Forest Service dam safety standards.

Mill Lake Dam is experiencing excessive seepage around the outlet pipe and embankment. In addition, the spillway is unable to convey the Probable Maximum Flood, which is a requirement of the U.S. Forest Service, which manages the wilderness area. Repairs to this dam are challenging due to Forest Service restrictions regarding activities permitted within wilderness areas.

Unless the seepage can be mitigated, the water users could be restricted severely in future water usage. The district plans on improving the spillway capacity, controlling erosion at the spillway, repairing the outlet, and improving the dam embankment to safely control seepage.

Mill Creek Irrigation District received a grant of $100,000 and a loan of $472,000 through the Renewable Resource Grant and Loan Program in 2003. An additional $414,300 came from the irrigation district. Preliminary engineering has been completed and design is in progress for a rehabilitation project to be bid in 2005. Mill Lake Dam is an unsafe, high hazard dam in need of rehabilitation to meet standards of the U.S. Forest Service.

**Lower Willow Creek Dam Exploration / Repair**

Lower Willow Creek Dam is located in Granite County near Hall, Montana. The dam is owned by the Lower Willow Creek Irrigation District and stored water is used for both irrigation and recreation. The Natural Resources Conservation Service (NRCS) provided the original design and construction of the dam. NRCS continues to provide engineering services to the irrigation district.

For the past several years, sediment has been appearing in seepage along the left side of the dam. Funds appropriated during the 2001 biennium were used to install monitor wells to determine the source of the sediment and seepage. It was decided that the best approach to remediation was to grout the foundation using wells for access. The grouting began in September 2004 and was completed in December 2004. The effectiveness of the grouting efforts will not be known until the spring of 2005, when the reservoir refills.

**Basin Creek Dams #1 and #2 Rehabilitation** (see photos)

Basin Creek Dams are located above the city of Butte, in Silver Bow County. They are used to supply municipal water to the City of Butte. The dams were built in the late 1800's and early 1900's. Butte purchased the dams in the early 1990's. The City of Butte depends on these dams, classified as high hazard, for a large portion of their drinking water. A large portion of south Butte would be inundated if either dam were to fail.

No major site improvements have been completed on either dam since initial construction. The emergency spillway on each dam must be expanded and rehabilitated to allow them to safely pass large storm events. Basin Creek Dam #1 requires several other upgrades.

The City of Butte applied for grant funds available from the Department of Justice under the Natural Resource Damage Claim (NRD) program obtaining $503,006. The city-county government of Butte-Silver Bow was able to contribute $303,006 of its own resources for this rehabilitation.

In the summer of 2004, Butte-Silver Bow hired HKM Engineering of Billings for the repair design and to oversee construction. Plans are underway to rehabilitate the outlet on Basin #1 during the winter of 2005. The remaining repairs on Basin #1 and Basin #2 will be completed in the summer of 2005. When complete, the rehabilitation of the Basin Creek Dams will bring the projects into compliance with requirements of the Montana Dam Safety Program.

**South Hills Storm Water Retention Dams** (see photos)

The South Hills Storm Water Retention Dams are located in the City of Missoula. The City of Missoula owns the pond embankments. The dams are only seven feet in height, but they hold 84 acre-feet of water. Since failure of the dams would result in floodwaters inundating homes and businesses immediately downstream, the embankments are classified high hazard.

Construction of the dams was part of a larger flood hazard mitigation project to protect nearby homes from flooding along Pattee Creek. Engineering and construction were funded using a combination of Federal Emergency Management Agency (FEMA) Hazard Mitigation Grants, as well as local match funding.

Construction of the dams has allowed for the neighborhood to be classified as outside the 100-year floodplain of Pattee Creek. The construction of the dams was completed in the summer of 2003. The remaining portion of the flood control project was completed in the summer of 2004.

**Lake Frances North Dam Repair**

Lake Frances is located in Pondera County, near the Town of Valier. The North and East dams measuring twenty and sixty feet in height create the reservoir. The Pondera County Canal and Reservoir Company owns both dams. Storage is 105,000 acre-feet, which is considered large for a privately owned dam in Montana. Lake Frances water is used for irrigation, for municipal use by the City of Conrad, and by the public for recreation the water. Both dams were constructed in 1908-1909, and have deteriorated over time.

The concrete on the North Dam was extremely weathered and two of the three outlets were inoperable. Morrison-Maierle of Helena was hired to design the repair and oversee its construction. The initial phase of construction was completed in the winter of 2004. The second phase of construction will be completed early in 2005. The majority of the repair was funded using canal company resources. The canal company also received a $5,000 grant from the Renewable Resource private grants and loan program.

**Georgetown Lake Dam Repair**

Georgetown Lake Dam, also known as Flint Creek Dam, is a 44.5-foot tall earth and rock fill dam with a stone masonry core. Average storage for the reservoir is about 31,040 acre-feet. The dam was built in 1901 and underwent reconstruction and a raise in height in the early 1980s. The dam, owned by Granite County, has a water right for hydropower generation, and also supports irrigation, stock watering and recreation. Granite County operates the dam so that the lake level is maintained for recreational uses.

To address deficiencies in an emergency spillway outlet pipe, plans were developed in the summer of 2004 to line the pipe and add a new gate. Construction is currently underway.

**Fresno Dam Gate Seal Replacement**

Fresno Reservoir and Dam is a U.S. Bureau of Reclamation storage project on the Milk River located about 12 miles west of the City of Havre, in Hill County. The 20-mile long reservoir is capable of holding over 80,000 acre-feet of water used primarily for irrigation, but also as a popular fishing and boating destination. Fresno Dam is classified as a high hazard dam since its failure has the potential to take human lives. The Chinook Division of the Milk River Joint Board of Control manages the distribution of water among the contracted users.

Inspections by Reclamation in recent years revealed that the aging dam gate seals were leaking, causing a steady uncontrolled release of stored water. DNRC, working with the water users and Reclamation, was successful in obtaining an RRGL grant for $100,000 in 2003 for the replacement of the dam gate seals.

Reclamation contracted with a construction firm for the installation of the dam gate seals in 2004 and the work is planned for completion in 2005. When complete, the project will allow better management and conservation of the water stored in Fresno Reservoir.

## V. HYDROPOWER PROGRAM

The Hydropower Program administers the development and operation of hydropower facilities on state-owned water projects. To date, one hydropower facility, the Broadwater Power Project near Toston, has been built. With a maximum capacity of 10 megawatts, the project began generating power in June 1989. DNRC owns and operates the facility and has a contract to sell the power to NorthWestern Energy.

Earned revenues are used to pay for rehabilitating other state-owned water projects. The main purpose of these funds is to help in the maintenance and repair of state-owned water projects, which include 24 storage facilities designated as high hazard dams, and 250 miles of irrigation canals. Most of these large projects were completed in the 1930s and 1940s and have significant needs. In a 1980 U.S. Army Corps of Engineers' statewide inspection, many of these dams were classified as unsafe due to spillway capacities that are inadequate, according to federal guidelines.

In a year of average rainfall and snow melt runoff, the facility is capable of generating roughly 56 million kilowatt-hours of electricity and earns roughly $3.5 million in revenue from energy and capacity sales. After debt payments and operating expenses, approximately $1.3 million is available to rehabilitate state-owned dams. A statutory appropriation of $500,000 per biennium is also available to fund emergency repairs and maintain an emergency repairs fund.

Hydropower earnings totaling approximately $167,000 are used for the annual partial repayment of the no-interest loan that the State received from the Northern Cheyenne Tribe for the Tongue River Dam Rehabilitation Project. DNRC received spending authority for up to $3.1 million of hydropower earnings for the FY 2002-2003 biennium for the rehabilitation of Bair and Nevada Creek Dams, and $1 million for FY 2004 for the rehabilitation of Nevada Creek-Phase II.

Missouri River flows at the Toston Dam from July 2003 through June 2004 were well below average, frequently fluctuating between 40 – 60 percent of average. The low flows severely reduced energy generation to 65 percent of predicted average annual production, but downtime was minimal, totaling 223 hours for the entire fiscal year.

As a result of NorthWestern Corporation's bankruptcy, the Department was not paid for energy and capacity for the entire month of August and two weeks of September 2003. NorthWestern made payment in November 2004, when the corporation emerged from bankruptcy.

The drought, underpayment by NorthWestern, and a high bond reallocation cost contributed to a small loss for the fiscal year of $48,680. With NorthWestern's full payment, the project will realize a net positive income for the year of roughly $100,000. Statistics concerning the Broadwater Power Project during FY04 are shown in the revenue table, as follows:

| REVENUE TABLE<br><br>Broadwater-Missouri Power Project in FY 2004 | |
|---|---|
| Operating availability | 97.5% |
| Gross energy generation | 36,841,279 kilowatt-hours |
| Gross revenue from sales | $2,416,032 |
| Investment income | $34,234 |
| Operating costs | ($370,221) |
| Bond Costs | ($2,128,725) |
| **NET REVENUE** | **($48,680)** |

**Recent Accomplishments at Broadwater Project**

Improvements to the computer automated control system are ongoing in a continued commitment to better manage reservoir and tail water flow levels. The new trash rake machine, installed in the spring of 2002, is performing exceptionally well and has increased the plant's overall efficiency. As a result, the facility is generating at a higher power level for a given river flow, thereby increasing revenues from power sales.

The machine has a useful life of 20 years or more, and the department should realize a payback on its investment in five to seven years. An engineering firm has completed a preliminary design study of alternatives for rehabilitating the spillway bridge structure to address dam safety and worker safety concerns.

## VI. MONTANA RESERVOIR CONTENTS

Reservoirs across the state have been drafted heavily over the past several years due to demand for water during the ongoing drought cycle. Below average mountain snow pack and seasonal precipitation have resulted in record low inflows at a number of projects statewide. It is expected to take two or more years for a number of reservoirs to recover average storage contents, even if average or above average precipitation occurs.

Table 3, U.S. Bureau of Reclamation Reservoirs, November 1, 2004 and Table 4, State Water Projects Bureau - Reservoir Content Report, November 31, 2004, provide the current status of storage for the large storage projects of the state.

**TABLE 3. Storage Contents - U.S. Bureau of Reclamation Reservoirs, December 1, 2004**

| U.S. Bureau of Reclamation Reservoirs (1) | | | | | | |
|---|---|---|---|---|---|---|
| Reservoir | Drainage | December 1, 2004 | | | Year Ago (12/01/03) | |
| | | Contents (ac-ft) | % of Avg. (2) | % of Capacity | Contents (ac-ft) | % Of Avg. |
| Clark Canyon (4) | Beaverhead | 36,200 | 27 | 21 | 71,400 | 45 |
| Canyon Ferry | Missouri | 1,409,700 | 81 | 75 | 1,669,400 | 114 |
| Gibson | Sun | 27,100 | 79 | 28 | 82,000 | 153 |
| Lake Elwell | Marias | 756,700 | 99 | 78 | 833,900 | 113 |
| Sherburne | St. Mary & Milk | 30,400 | 194 | 45 | 19,200 | 91 |
| Fresno (3) | Milk | 40,600 | 105 | 44 | 87,400 | 124 |
| Nelson | Milk | 62,100 | 106 | 79 | 74,900 | 124 |
| Bighorn Lake (4) | Bighorn | 738,300 | 76 | 69 | 624,000 | 76 |
| Hungry Horse | South Fork Flathead | 3,036,300 | 304 | 88 | 2,799,800 | 101 |

Notes
(1) Information provided by U.S. Bureau of Reclamation (USBR).
(2) Percent of 1971-2000 average storage.
(3) Fresno average storage revised according to results of 1999 sediment study.
(4) Third lowest end-of- November storage of record.

# MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

## WATER RESOURCES DIVISION - STATE WATER PROJECTS BUREAU

### TABLE 4. RESERVOIR CONTENTS REPORT

**November 30, 2004**

All Contents in Acre-Feet

| RESERVOIR | CAPACITY (Useable Contents) | CONTENTS | | | | % CAPACITY | % AVERAGE | READING | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE Period of Record | Last Year 11/30/2003 | Last Month 10/31/2004 | Present 11/30/2004 | Present 11/30/2004 | 11/30/2004 | Date | MID OCTOBER DATA |
| ACKLEY | 5,815 | 3,450 | 1,160 | 2,240 | 2,240 | 39 | 65 | 11/30/04 | |
| BAIR | 7,005 | 3,190 | 1,030 | 1,610 | 1,850 | 26 | 58 | 12/1/04 | 1,210 AF on 10/4/04; 10/31 Stor Est'd |
| CATARACT | 1,478 | 393 | | 350 | 385 | 26 | 98 | 11/30/04 | 11/30 Storage Est'd; 346 AF measured on 11/16. |
| COONEY | * 28,140 | 17,170 | 16,400 | 16,110 | 18,690 | 66 | 109 | 11/30/04 | 14,190 AF on 10/19/04 |
| COTTONWOOD | 1,900 | 540 | | 540 | 540 | 28 | 100 | 11/30/04 | 10/31 AND 11/30 Stor Est'd |
| DEADMAN'S BASIN | 72,220 | 36,440 | 10,910 | 8,890 | 9,940 | 14 | 27 | 12/1/04 | 8,888 AF on 11/3/04 |
| E.F. ROCK CREEK | * 16,043 | 6,580 | 4,170 | 3,640 | 3,760 | 23 | 57 | 11/30/04 | 11/30 Stor Est'd; 3,620 AF on 10/26/04 |
| FRENCHMAN | 3,752 | 2,510 | 143 | 2,625 | 3,050 | 81 | 122 | 12/1/04 | 1,800 AF on 10/19 |
| MARTINSDALE | 23,112 | 8,740 | 2,600 | 2,340 | 2,300 | 10 | 26 | 12/1/04 | |
| MIDDLE CREEK | * 10,184 | 5,650 | 5,310 | 6,470 | 6,270 | 62 | 111 | 11/27/04 | 6,540 AF on 10/27/04 |
| NEVADA CREEK | * 11,152 | 4,220 | 3,200 | 2,430 | 2,850 | 26 | 68 | 11/30/04 | 2,710 AF on 11/16/04 |
| NILAN | 10,092 | 5,500 | 4,430 | 3,430 | 3,760 | 37 | 68 | 11/30/04 | |
| N.FK. SMITH RIVER | * 11,406 | 5,290 | 3,900 | 5,310 | 5,470 | 48 | 103 | 12/1/04 | 4,990 AF on 10/4; 5,350 AF on 11/3/04 |
| RUBY RIVER | * 36,633 | 15,915 | 11,730 | 10,750 | 13,360 | 36 | 84 | 11/30/04 | 13,540 AF on 12/2 |
| TONGUE RIVER | * 79,071 | 32,930 | 43,950 | 31,670 | 34,650 | 44 | 105 | 11/30/04 | |
| W.F. BITTERROOT | 31,706 | 10,306 | 6,480 | 5,940 | 6,090 | 19 | 59 | 11/30/04 | 11/30/04 Stor Est'd |
| WILLOW CREEK | 17,731 | 7,778 | | 9,210 | 9,210 | 52 | 118 | 11/30/04 | 11/30/04 Stor Est'd |
| YELLOWATER | 3842 | 1,110 | | 144 | 170 | 4 | 15 | 11/30/04 | 11/30 Stor Est'd |

* Note: Ruby River capacity reflects capacity at concrete crest elevation; capacity at top of flashboards is 37,612 A.F.
* Note: Middle Creek capacity reflects capacity after 1993 dam rehabilitation; prior capacity was 8,027 A.F.. Average storage shown is for post rehabilitation data.
* Note: Tongue River capacity reflects capacity after 1999 dam rehabilitation; prior capacity was 68,040 A.F.. Average storage is post rehabilitation data.
* Note: Cooney capacity reflects capacity after 1982 dam rehabilitation; prior capacity was 24,195 A.F.. Average storage shown is for post rehabilitation data.
* Note: NFK Smith capacity reflects capacity at top of flashboards; capacity at concrete crest elevation is 10,698 A.F.
* Note: Nevada Creek Reservoir Capacity reflects live storage capacity survey conducted in year 2000. Prior live storage capacity documented as 12,723 AF.

## APPENDIX I

### I. Water Storage Policy and Statutory Criteria

The 1991 Montana Legislature passed into law a policy to define when water storage is the best solution for solving specific water problems. When storage is determined to be the best alternative, the policy identifies criteria to use in ranking state-funded projects. (Sections 85-1-701-704 MCA).

85-1-703. Water storage policy
*(1) The legislature recognizes that water resources needs are growing, existing water facilities are aging and in need of repair, and new water storage projects have become more difficult to complete. Other types of actions will be needed to solve many emerging problems, but if storage is the best way to meet growing water needs and solve problems, it should be actively pursued.*

*(2) In determining the best solution for a particular water management problem, the state shall:*
*a .carefully define the problem;*
*b. identify all options to solve the problem, including water storage;*
*c. determine whether water is physically and legally available to solve the problem; and*
*d. select the option that best meets the following criteria:*
*i. technical feasibility*
*ii. financial feasibility*
*iii . economic feasibility*
*iv. political feasibility*
*v. legal feasibility, and*
*vi. environmental feasibility*
Water Storage Project Prioritization Policy

The statute calls for this report to the legislature and describes its requirements. The statute also identifies different criteria to be used to prioritize new water storage projects, storage rehabilitation projects, and budget priorities for the allocation of state water storage development funds. Section 85-1-704 Prioritization of water storage projects - governor's report, states:

*(1) The governor shall submit to each regular session of the legislature a report identifying specific water storage projects proposed for development, including the rehabilitation of existing projects and new project proposals. The report must contain:*
*a) a list of water storage project priorities;*
*b) an implementation strategy for each priority project that identifies the resources (including specific budget requests), government actions, and other actions needed to accomplish the project;*
*c) a progress report on the development of water storage projects during the previous 2 years.*
*(2) In setting priorities among new water storage projects, the governor shall consider whether a project:*
*a) solves a severe water problem;*
*b) provides multiple uses and benefits;*
*c) provides for public uses;*

*d) shows strong evidence of broad citizen support;*
*e) is able to obtain non-state sources of funding;*
*f) protects and seeks to enhance social, ecological, cultural, aesthetic values;*
*g) improves local and state economic development;*
*h) could resolve Indian and federal reserved water rights issues;*
*I) supports water conservation activities; and*
*j) promotes the use of water reserved under Montana law.*
*(3) In setting priorities among water storage rehabilitation projects, the governor shall consider whether the project:*
*a) is needed to protect public safety;*
*b) has impacts if not repaired or rehabilitated; and*
*c) accomplishes the goals listed in subsection (2)(a) through (2)(j).*
*(4) In establishing budget priorities for the allocation of state storage development funds:*
*a) First preference must be given to projects that resolve threats to life and property posed by high-hazard facilities that are in an unsafe condition;*
*b) Second preference must be given to projects that improve or expand existing water storage facilities; and*
*c) Third preference must be given to the planning and construction of new water storage facilities.*

**Renewable Resource Grant and Loan Program**

The Montana Renewable Resource Grant and Loan (RRGL) Program conducts a review of water project proposals prior to each legislative session. Resource-related projects that conserve, manage, develop, or initiate the beneficial use of a renewable resource are eligible. Grant applications for water storage-related proposals receive a high priority. The RRGL program ranks projects that promote water storage priorities established by the State Water Plan and the Montana Legislature through the water storage statute. Funding approved in a previous legislative session to may need re-authorization, since projects can be delayed over a biennium for a variety of reasons.

**Water Storage Special Revenue Account**

Dams classified as high-hazard that are in unsafe condition receive first preference for use of funds from the state's Water Storage Special Revenue Account (Section 85-1-631 MCA). This account was designated by the 1991 Legislature to allocate 25 percent of the grant funds available, or $500,000 each biennium, under the Renewable Resource Grant and Loan (RRGL) program, to be used exclusively for water storage projects.

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