

Water Supply and Distribution

By Rich Moy
DWRBC

01/13/2004

Introduction

Objectives:

- Montana's Water Supply
- Montana's Water Uses
- History of Water Development
- Changing Federal Policy for Storage
- Montana's Water Storage Statute and Policy
- Identify Opportunities and Limitations for Storage in MT's River Basins
- Address Efficiency of Water Use and Water Banking

01/13/2004

MT's Water Supply

- An acre-foot of water is the amount that would cover 1 acre to a depth of 1 foot or a football field to a depth of one foot
- 15.5 million acre-feet enter MT
- 27.6 million acre-feet originate in MT
- 43.1 million acre-feet leave MT

01/13/2004

Average Annual Flow by Basin

Missouri River Basin

- Inflow into MT 1.0 maf/year
- Originating in MT 6.4 maf/year
- Outflow from MT 7.4 maf/year

Yellowstone River Basin

- Inflow into MT 6.2 maf/year
- Originating in MT 3.0 maf/year
- Outflow from MT 9.2 maf/year

01/13/2004

Average Annual Flow by Basin (cont.)

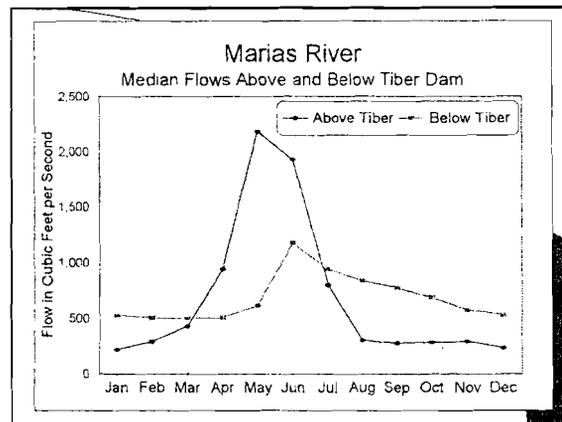
Kootenai River Basin

- Inflow into MT 8.1 maf/year
- Originate in MT 2.1 maf/year
- Outflow from MT 10.3 maf/year

Clark Fork River Basin (includes Flathead)

- Inflow into MT .9 maf/year
- Originate in MT 14.3 maf/year
- Outflow from MT 15.2 maf/year

01/13/2004



Montana is "Water Rich and Water Poor"

- Precipitation varies from 8 to 14 inches per year in semi-arid eastern MT.
- Precipitation varies from 14 to 22 inches in the valleys, but can exceed 75 inches per year in high mountains of western MT.
- According to national climatologists, the West appears to be warming, especially in summer and winter.

01/13/2004 7

Water Use (diverted) 1980 values

□ Irrigation	15.4 maf/yr	97.6%
□ Municipal	157,000 af/yr	1.0%
□ Thermoelectric	106,000 af/yr	0.7%
□ Industry	63,000 af/yr	0.4%
□ Livestock	28,000 af/yr	0.2%
□ Rural Domestic	17,000 af/yr	0.1%

01/13/2004 8

Water Use (depletion) 1980 values

Irrigation	3.2 maf/yr	96.4%
Municipal	58,000 af/yr	1.7%
Livestock	28,000 af/yr	0.8%
Rural Domestic	17,000 af/yr	0.5%
Industry	9,000 af/yr	0.3%
Thermoelectric	9,000 af/yr	0.3%
Reservoir Evaporation	3.9 maf/yr	

01/13/2004 9

Instream Water Uses Missouri River Basin (Average annual flow is 7.4 maf/yr)

- Hydropower Water Rights
 - Morony Dam 7.3 maf/yr
 - Fort Peck Dam 11.7 maf/yr (20,000 cfs for power generation)
- BLM Federally Reserved Water Rights
 - Wild and Scenic River Stretch 5.42 maf/yr
- Instream Reservations (DFWP)
 - Downstream of Fort Peck Dam 3.75 maf/yr

01/13/2004 10

Other Water Facts

- MT ranks 7th among states in total acres irrigated (2.6 million).
- MT has 67 reservoirs that store more than 5,000 af; totaling 38,533,000 maf/yr.
- MT's largest reservoir is Fort Peck (19 maf).
- Water from Triple Divide Peak in Glacier National Park sends water into three oceans: Atlantic, Pacific, and Arctic.

01/13/2004 11

Water Development Era (1900 - 1970)

- First Irrigation and hydropower projects in MT were private (Big Ditch in Billings - 1883 & Black Eagle Dam - 1890).
- Many of MPC's hydropower dams on the Missouri were built between 1883 and 1928 with large instream water rights for generating electricity.
- Over half of the privately-owned projects were constructed before 1900.

01/13/2004 12

Bureau of Reclamation

- U.S. Congress realized that to settle the semi-arid West, water had to be stored in the spring and diverted to the land.
- Reclamation Services was created in 1902 (Predecessor to U.S. Bureau of Reclamation).
- Reclamation built numerous projects in MT 1907-1939 (i.e. Nelsen, 1915; Shurburne, 1921; Gibson, 1929; Fresno, 1939).
- These projects were vital for irrigated crop and cattle production.

01/13/2004

13

Montana Water Conservation Board

- Created in 1933 to built water storage projects.
- Conservation Board built 181 projects with 141 of these with storage of 438, 014 acre-feet. (the larger reservoirs include: Tongue, Painted Rocks, Deadman Basin, Hylite, Nevada Creek, Cooney, and East Fork of Red Creek).
- Projects were funded:
 - 47% state appropriations;
 - 33% federal grants; and
 - 20% federal loans that were reduced.
- The Conservation Board was dissolved in 1972 and became the State Water Project Bureau of DNRC.

01/13/2004

14

U.S. Soil Conservation Service (Natural Resource Conservation Service)

- SCS was created in 1935 to provided technical and financial assistance in the management of soil and water.
- Helped construct over 3,000 stock ponds and small irrigation reservoirs.
- Projects funded under P.L. 566 were limited to 100 af (Newlon Dam in the Smith River Basin and Wildcat Creek Dam in Flint Creek drainage).
- Last storage project funded under this law was in 1969.
- Today, the Natural Resource Conservation Service primary focus is on improving local and basin wide water management.

01/13/2004

15

Era of Large Federal Storage Projects

- 1944 Flood Control Act. (Missouri River Basin Pick-Sloan Program)
 - Projects built under this program include: Canyon Ferry Reservoir (1949), Tiber Dam (1952), Helena Reservoir Dam (1957) Clark Canyon Dam (1961) and Yellowstone Dam (1969).
 - MT was entitled to 936,000 acres of new irrigation under P-S program, but only able to develop 45,000 acres.
 - All other P-S irrigation projects have been deauthorized.
- Columbia Basin Projects: Hungry Horse (1948) and Libby Dam (1968)

01/13/2004

16

Changing Federal Policy on Storage

- In late 1960s, strong perception in U.S. Congress that the West has been reclaimed and there was no further need for more large federal water projects.
- Few new large federal projects have been built after 1970 in the West and none in MT.
- By 1970, the federal focus was on implementing conservation, improving water management, and addressing the deteriorating condition of existing facilities, water quality, and the environment.
- The Bureau of Reclamation initiated a new strategy summer entitled "Water 2025."

01/13/2004

17

"Water 2025"

(Preventing Crises and Conflict in the West)

- The Bureau has based the strategy on five realities in the West:
 - Explosive population growth
 - Water shortages exist
 - Water shortages result in conflicts
 - Aging water facilities limit options
 - Crisis management is not effective
- \$11 million has been allocated to implement this strategy.

01/13/2004

18

“Water 2025”

(Preventing Crises and Conflict in the West)

- According to Water 2025, the Bureau of Reclamation will:
 - Focus on water starved areas of the country (i.e. especially population centers);
 - Stretch or increase water supplies to satisfy the demands of growing populations and protecting the environment, while strengthening regional, tribal and local economies;
 - Provide added environmental benefits to many watersheds, rivers, and streams;
 - Minimize water crises in critical watersheds by improving the environment, and addressing the effects of drought; and
 - Provide a balanced, practical approach to water management for the next century.

01/13/2004 19

Governor Schwinden's Water Storage Task Force

- The 1988 Task Force reviewed the history and status of water storage in Montana:
 - The history of water storage in MT
 - The condition of existing storage facilities
 - The economics of water storage development
 - The role of water availability in development
 - Environmental constraints to water storage, and
 - Dam safety requirements

01/13/2004 20

Task Force Recommendations

Montana will need to:

- Develop criteria for analyzing and comparing which water storage projects should receive funding;
- Create ways to finance new water storage projects;
- Establish a long-term commitment to the operation and maintenance of existing storage projects;
- Address the need to repair and rehabilitate existing water storage facilities;
- Consider expanding existing water storage projects.
- Consider reallocating storage uses; and
- Improve the accuracy, completeness and accessibility of water storage data.

01/13/2004 21

State Water Plan on Water Storage (1991)

- Water storage was broken down into three areas: policy, financing and regulations.
- Each area was addressed by a committee consisting of 14 to 16 members representing elected officials, government agencies, and beneficiaries.
- Each committee worked for 12 months to understand the issues and to develop recommendations.
- There were number of opportunities for public involvement.
- Based on their recommendations, a Water Storage Policy Act was introduced by Governor Stephens and passed in 1991.

01/13/2004 22

Water Storage Regulation Committee

- Mike Zimmerman, MPC, Chair,
- Rodger Foster, Morrison and Maierle
- Don Hedges, MT Ass. of CD
- Senator Matt Himsel
- Steve Pollock, Blackfeet Tribe
- Ron Russell, U.S. Forest Service
- Bob Schroeder, MT Ass. of CD
- Mary Gail Sullivan, MPC
- Ole Ueland, Resource Conservation District Council
- Jim Wempner, Rancher
- Jim Belsey, Trout Unlimited
- Janet Ellis, MT Audubon Council
- Dick Montgomery, EPA
- Lawrence Siroky, DNRC

01/13/2004 23

Water Storage Policy Committee

- Dueane Calvin, MT Water Resources Ass., Chair
- Tom Beck, Rancher
- Don Marble, Attorney from Chester
- Larry Gruel, MPC
- Allan Rustad, MT Ass. of CD
- Jim Follensbee, Central MT Power Coop
- Richard Opper, Northern Lights Institute
- Kathy Hadley, National Center for Appropriate Technology
- Clayton Matt, Confederated Salish and Kootenai Tribes
- Ted Dodge, Headwaters RC&D
- Jerry Sorenson, Lake County Planner
- Earl Reinsel, U.S Forest Service
- Larry Peterman, MT DFWP
- Mark O'Keefe, Citizen
- Albert Engel, citizen

01/13/2004 24

Water Storage Financing Committee

- Lorents Grosfield, Board of DNRC, Chair
- Bruce Beattie, Agricultural Economics, MSU
- Dick Gooby, State Dir. SCS
- Chase Hibbard, Rancher
- Jerry Nypen, Greenfields Irrigation District
- Ray Wadsworth, MT Rural Water Systems, Inc.
- Bill Wright, MT Farm Bureau
- Derwood Mercer, USBR
- Dick Shirk, WAPA
- Calvin Wilson, Northern Cheyenne Tribes
- Bob Morgan, Water Development Bureau, DNRC
- George Algard, Ducks Unlimited
- Rob Brooks, DFWP
- David Ewer, Investment Division, Dept of Commerce
- Jack Hutchison, Fishing Outfitter
- Bill Cain, Trout Unlimited

01/13/2004

25

State Water Plan Advisory Council

- Jess Kilgore, MT Stockgrowers Assn.
Senator Jack Galt
- Dueane Calvin, MT Water Resources Assn.
- Mike Zimmerman, MPC
- Lorents Grosfield, Board of DNRC
- Byron Bayers, County Commissioner and Rancher
- Stan Bradshaw, Trout Unlimited
- Ed Azure, Fort Belknap Tribes
- James Wedeward, USBR
- Glen Marx, Governor Stephen's Natural Resource Policy Advisory
- Chris Risbrudt, US Forest Service
- K.Cool, Dir. DFWP
- Don Pizzini, Dir. DHES
- Senator Ester Bengtson
- Brian Kahn, State Dir., The Nature Conservancy

01/13/2004

26

Water Storage Act

- One comprehensive bill was introduced at the request of Governor Stephens.
- In determining the best solution for a particular water management problem, the state shall:
 - Define the problem;
 - Identify all options to solve the problem;
 - Determine whether water is physically and legally available, and
 - Select the option that is most technically, financially, economically, politically, legally and environmentally feasible.

01/13/2004

27

Water Storage Act (Cont.)

- Submit the Governor's Report on Water Storage to each legislative session. The report must contain:
 - A list of water storage project priorities.
 - An implementation strategy for each priority project that identifies the actions need to develop the project.
 - A progress report on the development of the prioritized projects.
- DNRC is required to used 10 different criteria to prioritize projects.
- DNRC has submitted storage reports since 1993.

01/13/2004

28

Water Storage Act (Cont.)

- Created a Water Storage Account (85-1-631)
 - Provides loans and grants for water storage (\$500,000)
 - Priority to use the account:
 - First: Existing high hazards dams that are unsafe
 - Second: Projects that improve or expand existing water storage; and
 - Third: planning and construction of new water storage projects.

01/13/2004

29

2001 Water Storage Report

- Prioritized 11 projects for funding Under RRGL Program. Ten of the projects are for rehabilitation.
- One new storage project is being studied in the Big Hole.
- Funding for these projects comes primarily from RRGL Program, Toston hydropower earnings for state-owned projects, local water users, and NRCS.
- Examples:
 - Lower Willow Creek in the Flint Creek Drainage obtained a \$100,000 RRLG grant and \$1,350,000 loan and \$3 million from NRCS for construction.
 - State-owned Bair Dam obtained a \$100,000 RRLG grant, \$988,772 loan and \$1,300,000 from hydropower earnings.

01/13/2004

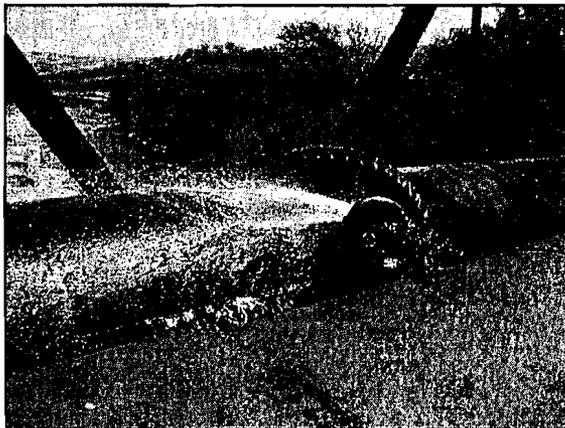
30

Rehabilitation of the St. Mary Federal Facilities

- The St. Mary system includes the diversion dam on the River, large gravity siphons and 35 miles of canals to the Milk River.
- This federal system is the life blood of the H. Line and provides irrigation, municipal and recreational water to the entire Milk River Basin.
- The State has determined that the rehabilitation of the system is high priority as the system is almost 100 years old and in need of repair.
- St. Mary water provides 90 % of the flows in the Milk River during dry years and about 70 % in average years.
- The cost to rehabilitate the system to its designed capacity of 100 cfs could be as high as \$100 million.
- The USBR has said it does not have the funds, but is willing to assist the state.

01/13/2004

31



Broadwater Hydropower Project

- The irrigation project was constructed by the MT Water Conservation Board in 1940.
- DNRC added hydropower to the project in 1989 with a rated capacity of 10 MW.
- Federal law (PURPA) requires that the power price be set at the avoided costs—the cost to bring a new power facility on line in 1989.
- Power Purchase agreement went to MPC and extends to 2024. It is now held by Northwestern.

01/13/2004

34

Broadwater Hydropower Project (Cont.)

- Average annual revenues* \$3,500,000
 - Allocation of revenues
 - Operation and maintenance costs - 310,000 (9%)
 - Set aside for major repairs - 84,000 (2.4%)
 - Repay annual debt (P & I) on \$26 million bond - 1,880,000 (53.7%)
 - Funds to earmarked account to rehabilitate state-owned projects - 1,220,000 (34.9%)
- (*Assumes average annual runoff)

01/13/2004

35

Use of Toston Power Revenues

- Past use of revenues:
 - Rehabilitate and enlarge Tongue River Dam (unsafe & high hazard) The cost was \$47 million.
 - Emergency Repairs on East Fork of Rock Creek Dam (\$1.9M).
 - Rehabilitate Bair Dam spillway and outlet structure (\$1.4M).
 - Rehabilitate Nevada Creek Dam (\$2.6 M).
- Proposed future uses of revenues:
 - Continue to rehabilitate state-owned projects including: Willow Creek Dam; Flint Creek Siphon; Ruby Dam, Painted Rocks, Cataract Dam, North Fork of the Smith Dam, Frenchman Dam, and pay remaining balance on Tongue River bond (\$10 Million).

01/13/2004

36

Opportunities for New Storage

- Most good storage sites have already been built.
- Remaining sites will cost more to build.
- Biggest limitation is who pays the cost?
- USBR has water reservations for new off-stream storage reservoirs in the Yellowstone Basin:
 - Cedar Ridge, (121,800 af) located near Forsyth
 - Sunday Creek, (539,000 af) located north of Miles City
 - Buffalo Creek, (68,700 af) located in Yellowstone County
- Stored water is available under contract from USBR at Yellowstone, Tiber, and Canyon Ferry reservoirs and Corps of Engineers at Fort Peck, but may not be available in Hungry Horse.

01/17/2004

37

Opportunities for new storage

(cont.)

- Upper Clark Fork, Bitterroot, Blackfoot and Upper Missouri Rivers are closed to new appropriation, but not for storage of high spring flows.
- Biggest limitation to new storage projects is senior hydropower water rights, especially on the Clark Fork basin (including Flathead), and Missouri River at Great Falls.
 - Avista's 50,000 cfs hydropower water right at Nurell Dam on the Lower Clark Fork River with a 1950-1976 priority date.
 - PP&L MT's 7,100 cfs hydropower water right at Holter Dam with a 1918 priority date.

01/13/2004

38

The Balancing Act

- Over the past 100 years, Montana agriculture has done an excellent job of finding ways to develop available water supplies for irrigation.
- Today, many basins are over appropriated and dewatered, especially during drought.
- The value of keeping water instream for hydroelectric generation, recreation, fish and wildlife protection, and water quality dilution was not recognized until the 1970s.
- Providing this balance on preserving minimum instream flows and meeting existing water rights has become a challenge and will only get worse.

01/13/2004

39

Water Use Efficiency

- The key to efficiency is decreasing depletion: by decreasing evaporation or/and plant transpiration.
- Flood irrigation can be very efficient if you consider that return flows go back into the source of supply and can be used over and over again. There are numerous examples such as the Milk and Musselshell River Basins.
- Sprinkler irrigation systems can apply water more efficiently to the crop, but in doing, will increase evapo-transpiration with increased crop yields.

01/13/2004

40

Promoting Efficient Use of Water

- To improve efficiencies:
 - must look at ways to reduce evapo-transpiration rates, and,
 - still protect existing water users from adverse effects.
- Before implementing a change or new use to improve efficiency, it is important to understand:
 - the effects of the use on the surface and groundwater hydrology, and
 - the effects on existing users.

01/13/2004

41

Water Banking

- Can work in some Montana River Basins and should be tried.
- DNRC and USBR would like to try this in the Milk River Basin associated with the USBR irrigation project.
 - USBR holds most of the water rights and issues contracts to the irrigation districts.
 - A irrigation district or district water users can lease contract water water in Fresno Reservoir that can be purchased by another irrigation district or water user.

01/13/2004

42

Summary

- Most good storage sites have projects.
- The cost of new storage is high because of geotechnical, water availability, and/or environmental issues and higher construction costs.
- Many existing storage projects are old and need rehabilitation.
- Who pays? The federal government has not been in the business to pay for new storage for many years. In fact, it is having a difficult time rehabilitating its own projects.
- Improving water efficiencies can happen, but you should understand the effects on the surface and groundwater hydrology and on existing uses.
- Two new irrigation projects are in the planning stages:
 - West Crane: 8,100 acres of sugar beets, malting barley and corn
 - New irrigation project of 20,000 to 40,000 acres from Tiber Reservoir.

01/13/2004

43

Are there any questions?



01/13/2004

44