

# **Watershed Management in the Greater Yellowstone Area: An Interagency Strategy**

2006 Update

Greater Yellowstone Area Hydrology Subcommittee

Beaverhead-Deerlodge National Forest  
Bridger-Teton National Forest  
Caribou-Targhee National Forest  
Custer National Forest  
Gallatin National Forest  
Grand Teton National Park  
John D. Rockefeller Jr. Memorial Parkway  
Shoshone National Forest  
Yellowstone National Park



Photo courtesy of Susan Marsh, YNP

## Introduction

Water resources and watershed protection are a significant part of the history of the Greater Yellowstone Area (GYA)<sup>1</sup>. Protection of water and the catchments from which it is derived remains critical to the environmental integrity and economics of the GYA and downstream areas.

The GYA includes the headwaters of the Gallatin, Madison, Yellowstone, Clarks Fork, Wind/Bighorn, Snake and Green Rivers. These headwaters are significant source areas to the much larger Mississippi, Columbia and Colorado River basins. As the twenty-one counties of the GYA distinguish themselves as some of the faster growing areas in the United States, water resources of the GYA will realize unprecedented importance and pressure to satisfy human needs. Thus, water may very well be the most valuable natural resource in the Greater Yellowstone Area.

Watershed resources have been a management priority on public lands in the GYA for many years. In 1990, an ad hoc group of professional hydrologists formed a subcommittee<sup>2</sup> to coordinate watershed management across GYA federal units and serve as technical advisors to the Greater Yellowstone Coordinating Committee (GYCC)<sup>3</sup>. In 2002, GYH presented a document titled *Watershed Management Strategy for the Greater Yellowstone Area* to provide GYCC with guidance on effective stewardship of watersheds and aquatic ecosystems within the GYA. The strategy was consistent with the President's Clean Water Action Plan, USDA Forest Service Natural Resource Agenda, and USDI Park Service Natural Resource Challenge, as well as with strategic plans developed by both agencies in response to the Government Performance and Results Act. The strategy was designed to be dynamic, adaptive and updated accordingly.

In early 2006, GYH decided to update the original strategy to identify current issues, revise the original strategies, and provides recommended action items. This document is that update. The original strategy remains pertinent as it provides important context and background information for the update. This update builds on the original work by focusing on four issues GYH believe are most important to effective stewardship of watersheds in the GYA. It is intended to help GYCC stay informed on these issues as they advance the conservation of the GYA. The update also provides guidance and further identifies opportunities for coordination among GYH.

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<sup>1</sup> The Greater Yellowstone Area is shown in figure 1. It comprises Yellowstone and Grand Teton National Parks and the six National Forests: Caribou-Targhee, Beaverhead-Deerlodge, Gallatin, Custer, Shoshone, and Bridger-Teton. National Wildlife Refuges and Bureau of Land Management lands, as well as private property, are also important components of the GYA.

<sup>2</sup> Titled Greater Yellowstone Hydrologists (GYH), the subcommittee consists of hydrologists from the USDI Park Service and Bureau of Land Management and the USDA Forest Service.

<sup>3</sup> The Greater Yellowstone Coordinating Committee consists of superintendents and forest supervisors from the units identified in footnote 1.

## Issues

Healthy watersheds operate in dynamic equilibrium, meaning soil and water quality, flow regimes, and aquatic and riparian habitats vary within a certain range of conditions.

Extreme natural disturbance events, e.g., catastrophic wildfire or floods, can disrupt the dynamic equilibrium of a watershed, but then recovery begins. Poor land management decisions and activities, e.g., excessive road construction, water diversions, and timber harvest or overgrazing, can also disrupt this dynamic equilibrium.

Laws and regulations direct federal land managers to maintain equilibrium conditions and to restore watershed function within degraded drainages. A key role of GYA agencies is managing disturbances while sustaining watershed health. If runoff and sediment regimes, soil and channel conditions, water quality, and aquatic and riparian habitats are maintained between extreme natural events, and good land management decisions are made, watershed health is conserved.

Increasing demands on the natural resources of the GYA have the potential to negatively affect equilibrium conditions, which could not only impact water resources locally within the GYA but for many miles downstream. To ensure these conditions do not develop, interagency cooperation at the watershed scale is paramount to protect water supplies and water rights, water quality, and watershed, riparian area, and geomorphic integrity. To that end, GYH believes the following issues are the most important in the GYA at the present time.

- 1 - Interagency cooperation on a watershed scale
- 2 - Watershed, riparian area, and geomorphic integrity
- 3 - Water quality protection and enhancement
- 4 - Water supply and water rights

### ***Issue 1 - Interagency cooperation on a watershed scale***

Riverine ecosystems and their watersheds are multidimensional, including a longitudinal (upstream to downstream) element, a lateral (floodplains to uplands) component, a vertical (subsurface to riparian) aspect, and a temporal feature (Williams et al 1997). In recognition of the multi-dimensional nature of watersheds and that federal land management decisions can affect local or regional economies, federal land management entities published a *Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management* (UFP) in 2000. This inter-agency policy provides a foundation to help ensure that Federal land and resource management activities meet the goals of the Clean Water Act and that the Federal government serves as a model for water quality stewardship. GYH and GYCC recognize the value of cross-boundary cooperation and collaboration and believe UFP is a good model to follow. To that end, it is important that Park Service, Forest Service, Fish and Wildlife Service, Bureau of Land Management, state agencies, conservation districts, watershed groups, and private land owners be involved in watershed management in the GYA.

## ***Issue 2 - Watershed, riparian area, and geomorphic integrity***

The goal of watershed conservation is to sustain and restore watershed, riparian area, and geomorphic integrity. Land and stream types, and their dynamic equilibrium ranges, vary within and among landscapes due to variations in climate and geology. This variation must be taken into account as pressures on water resources and watersheds in the GYA increase. Dynamic equilibrium ranges can be defined by sampling reference land and stream types across the landscape and by comparing non-reference conditions with their representative reference counterparts.

Land management activities and uses have the potential to significantly affect sediment loading and transport, particularly because they are directly influenced by stream discharge. Riparian vegetation is a key component in overall stream/aquatic health and function. While there have been numerous efforts to characterize riparian communities and condition within the GYA, little work has been conducted to integrate this information with stream systems. To fully protect riparian area values such integration is critical.

Fundamental questions underlie water supply and water quality issues in the GYA. Meiman and Schmidt (1994) identified three key questions for which answers are vital to understanding watershed disturbances regimes and recovery processes. These key questions are particularly relevant to water resource pressures in the GYA.

- ❖ What type of streamflow regime is needed to maintain instream and riparian values for different channel types?
- ❖ What are the consequences of changed flow regimes to on-site and downstream channel functions and values?
- ❖ How are instream flow needs affected by water diversions and land-use activities?

Wohl (2000) identified four fundamental mountain river physical process topics for which current understanding is limited and much field data is needed.

- ❖ What is the distribution of velocity and shear stress, the sources of flow resistance, the forms of turbulence, and the interactions between turbulent flow and channel boundaries?
- ❖ How do we measure and predict particle entrainment under highly spatially and temporally variable conditions, the impact of limitations in sediment supply on entrainment and transport, and the stability or persistence of the coarse bed-surface layer and of bed forms?
- ❖ How does channel morphology vary as a function of potential human-induced controls?
- ❖ How does the channel longitudinal profile develop over geologic timescales relative to correlation with potential controls?

To begin developing answers to some of these needs, the original strategy recommended development of stream health reference conditions for the GYA. GYCC pursued this recommendation by funding a team to field-inventory reference aquatic conditions on a variety of functioning landscapes and then develop relationships to describe reference

conditions for physical and biological components of the aquatic system. A database has been developed and peer-reviewed publications that summarize the data have been presented at scientific conferences and are presently in print. Past efforts provide a great start to understanding GYA stream systems; additional work will further those benefits.

### ***Issue 3 - Water quality protection and enhancement***

The protection and enhancement of water quality is fundamental to providing effective stewardship of watersheds and aquatic systems. Compliance with water quality standards, along with close cooperation with the EPA, state agencies, and other interested parties, is of increasing importance as states perform water quality assessments, e.g., 305(b)/303(d) reports, sub-basin assessments and watershed assessments, and identify total maximum daily loads for impaired waterbodies. Water quality effects of National Environmental Policy Act decisions are increasingly scrutinized by special interest groups, particularly related to fuels treatment, timber harvest, road construction, livestock grazing, and mineral development projects.

Water quality protection and enhancement is a fundamental stewardship responsibility of GYCC and is central to all land management activities. The original GYA water strategy recognized that transportation systems and livestock grazing are major concerns within watersheds identified as having low or moderate geomorphic and water quality integrity. Within the GYA, available road maintenance funds are considerably less than annual maintenance needs, making efforts to reduce maintenance backlogs difficult. Considerable efforts are being made to update allotment management plans, but some grazing allotments are currently managed with outdated plans, are overstocked or have poor livestock distribution, and generally lack adequate administration and monitoring. Interdisciplinary participation is very important as managers address water quality issues in the GYA.

### ***Issue 4 - Water supply and water rights***

Population increase, drought, and climate change all point toward the potential for increased demand on a finite supply of freshwater in the west. According to *Water Availability for the Western United States- Key Scientific Challenges* (Anderson and Woosley 2005), the five fastest growing states for the period 1990-2000, are just west and south of GYA. They are Idaho (#5), Utah, Colorado, Arizona and Nevada (#1). Nationwide, total water use has dropped and leveled off from a peak in the 1980s, but Idaho, Wyoming and Montana continue to lead the nation for per capita total water use (surface and groundwater, including irrigation). Data for the period 1971-2000 suggest that much of the area in and around GYA is in a declining precipitation trend (5 to 20%). Although stream flow withdrawal and reservoir storage capacity in western states appears to be static or increasing, groundwater levels in aquifers in and around major western population centers have consistently and steadily dropped over the last 40-50 years.

Climate change is expected to continue, and likely accelerate, for the foreseeable future. The American West is likely to warm more than the worldwide average (3-10°F) with regional climate models suggesting temperature increases could be 4-13°F by the end of the century (Western States Water Council 2006). Hydrologic and climatic processes that could accompany this warming include: less snow pack, earlier snowmelt, more frequent

flood events, receding glaciers, higher evapo-transpiration rates, more frequent/intense/longer droughts, more frequent/intense wildfires, and reduced summer/fall stream flows and groundwater levels.

The State of Montana has authority to control or close river basins and groundwater aquifers to certain types of new water appropriations because of water availability or contamination problems, or a concern for protecting existing water rights. Within GYA there is one existing basin closure related to water availability problems and protection of existing water rights; Rock Creek drainage on the Beartooth District, Custer National Forest. The State of Montana will not accept any applications for new appropriations of consumptive use between June 1 and September 30 within this basin. Other closures exist around Yellowstone National Park, but they are either related to maintaining natural resources for the park and Red Rock Lake National Wildlife Reservation, or do not restrict new appropriations for consumptive use.

The State of Idaho issued a number of moratoriums on new water appropriations for various basins in southern and central Idaho, and in particular the Snake River basin. Although this moratorium has expired, new applications are still not being approved for most of the eastern Snake River basin (Laprevote, 2006).

Pressures to augment water supplies within GYA have resulted in efforts to persuade land managers to increase water yield through activities such as harvesting timber, building more water storage on public lands, cloud seeding, or permitting more diversions. For example the Big Hole Watershed Committee hired a consulting firm to investigate the impacts of upland vegetation change on water availability and identify water management alternatives to increase instream flows. Wyoming passed legislation to use its powers to enter national forests to harvest timber for water yield increase. Although it is unclear how demands for water in and adjacent to GYA will influence future water quantity or uses, it is likely that withdrawals from river systems and aquifers by larger population centers below GYA will continue to increase. Because there is a lack of incentives for water conservation on lands downstream of GYA, there will be continued pressure on GYCC to increase water quantities from public lands, which may be contrary to management goals for resource protection.

In 2002, concerns over on-going drought and water supplies prompted Regional Foresters in Regions 2 and 4 to provide written direction to Forest Supervisors (USDA Forest Service 2002, 2002a) concerning water yield augmentation. Both letters are similar, but the Region 4 letter includes an enclosure titled *National Forest Water Yield Augmentation- Limited Opportunities Due to Operational Realities*. That document provides a good summary of the science, opportunities, limitations and consequences of water yield augmentation on forested lands.

Concerning state water law, recent court cases have diminished or threaten to further diminish, the ability of federal land management agencies to manage and protect water uses on federal lands. The Montana water court ruled in BLM Case 40E-A, that exclusive use, dominion or control of water is not required to appropriate private rights on BLM land. Case 41G-190 on Forest Service land is similar to the BLM case, but still pending. The Fifth Judicial District of the State of Idaho will rule on Case 39576 (Joyce Livestock) to determine whether title to the water right vests in the permittee who owns and grazes

the cattle, or the United States who owns and administers the land. Given these judicial opinions and potentially similar future case rulings, it is imperative that agency water rights are current and correct and all appropriate uses are claimed through the states water rights adjudication processes.

## **Recommended actions**

To address the issues discussed above GYH recommends the following actions are pursued and implemented over time. Some items will need to be implemented sequentially, while others can be implemented concurrently.

### ***Issue 1 - Interagency cooperation on a watershed scale***

- Use GYH as a forum to share technology, expertise, and information across agency boundaries. Specifically, create a list of widely used references for hydrologic evaluations, share inventory and monitoring data across administrative boundaries, and create a list of subject matter experts (hydrology, soils, aquatics) in the GYA.
- Identify potential partners and funding sources. Specifically, invite BLM, EPA and state DEQs to join GYH and engage, as necessary, local conservation districts and local watershed groups. Also, develop a list of potential funding sources for watershed projects available to GYA units.
- Identify cooperative watershed planning and restoration opportunities. Specifically, identify shared 4<sup>th</sup>-level watershed hydrologic unit boundaries and develop out year projects for potential funding.

### ***Issue 2 - Watershed, riparian area, and geomorphic integrity***

- Better define the relationship between physical stream health and riparian vegetation health in the GYA. Pursue building such a relationship by correlating stream type with plant community type.
- Better define stream discharge/sediment transport relationships in the GYA. Coordinate sediment/discharge databases, identify additional streams, timeframes, protocols, and funding sources for improved GYA information. Develop sediment rating curves for bedload and suspended sediment discharge.
- Because the GYA is headwaters to many of the Nation's river basins, sponsor a headwaters conference with a watershed science theme that focuses on the importance of watershed health in the GYA. Such a conference could further advance the conservation of water resources in the GYA by bringing together leading scientists working in the field of wildland watershed management.

### ***Issue 3 - Water quality protection and enhancement***

- Utilize the GYA Inland West Watershed Initiative, in concert with other water quality information such as state water quality assessments, to identify, prioritize, and implement water quality protection and enhancement needs within the GYA. Each unit should prioritize its watershed improvement needs by sixth-level

- watershed hydrologic unit, with identification of the necessary projects required to move those watersheds toward fully functional condition.
- Closely collaborate with the Departments of Environmental Quality in Montana, Idaho, and Wyoming in preparation of watershed and TMDL plans. Each unit should ensure that plans identify and provide management direction to resolve water quality issues.
  - Monitor water quality impacts of management activities through best management practices (BMPs) implementation and effectiveness monitoring for specific projects (timber activities, grazing allotments, mining, and other projects important to GYA units).
  - Actively collaborate with range management programs to refine the use of annual livestock grazing indicators, i.e., stream bank alteration, forage utilization, woody browse, and stubble height, in order to achieve desired conditions. Continue to share information regarding the development and use of annual livestock grazing indicators among GYA units.
  - Using interdisciplinary teams, develop standards, long-term indicators, and desired future condition statements for use in allotment management plans (AMPs).
  - Collaborate with engineering programs to disconnect roads and trails (both motorized and non-motorized) from streams where road drainage is allowing sediment to enter streams. Decommission or obliterate excess (unnecessary) roads.
  - Design adequate relocations for roads and trails that encroach on streams or cause either sediment or channel configuration problems.
  - Integrate fisheries/aquatics, watershed, and engineering specialists to identify and resolve barriers to aquatic organism passage. Design new or replacement crossing structures to pass flood flows and to maintain channel function through the structure.

#### ***Issue 4 - Water supply and water rights***

- Ensure agencies are engaged with state water right adjudication processes at all agency levels. Know and use state water right laws and procedures including filings, objections and abandonment in order to defend legitimate beneficial use rights in headwater areas.
- Ensure agency water rights are current and correct. Use appropriate procedures to file for or correct water rights where necessary.
- Incorporate appropriate water right clauses in special use permits to protect USFS, NPS, BLM, and USFWS interests and instream beneficial uses.
- Ensure water rights, water uses and water transmission facilities are incorporated into land management planning decisions.



- Compile existing research concerning vegetative manipulation and streamflow augmentation for the northern and central Rocky Mountains. Provide a peer reviewed document summarizing research findings and pros/cons to GYCC for consistency in discussions with public/local governments. Coordinate with the Forest Service Stream Systems Technology Center for development of the peer reviewed document.
- Prepare a communication/presentation for agency line officers on the importance of ensuring proper water right filings for agency use and special use permits and challenging water rights applications that directly conflict with agency goals and missions. Consider a version of the BLM water rights workshop presented in Billings, MT, June 2004.

## Summary

Healthy watersheds in the Greater Yellowstone Area are critical to environmental integrity and area economics. The Greater Yellowstone Coordinating Committee recognizes the importance of watershed health and has developed a strategy for management of water resources within its purview. The strategy focuses on four key issues relevant to land management at the present time – water supply and water rights; water quality protection and enhancement; watershed, riparian area, and geomorphic integrity; and interagency cooperation on a watershed scale. Within the strategy and these four issues, GYCC and one of its sub-committees, the Greater Yellowstone Hydrologists, have identified numerous actions items to be pursued over time. Implementation of the action items will allow for effective stewardship of watersheds and aquatic ecosystems by creating a forum for communicating and addressing watershed management information and issues, and coordinating watershed management activities between states and federal agencies in the GYA.

## References

BLM website on water laws: <http://www.blm.gov/nstc/WaterLaws/> This website reviews the water laws of eleven western states (Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, and Wyoming). Special attention is paid to the states' water rights systems, the application processes, groundwater regulations, the general adjudication processes, and the states' instream flow programs. Where information is available, comment is made on how the states handle federal reserved water rights and on other BLM specific information.

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Basin closures: [http://dnrc.mt.gov/wrd/water\\_rts/default.asp#nai](http://dnrc.mt.gov/wrd/water_rts/default.asp#nai)

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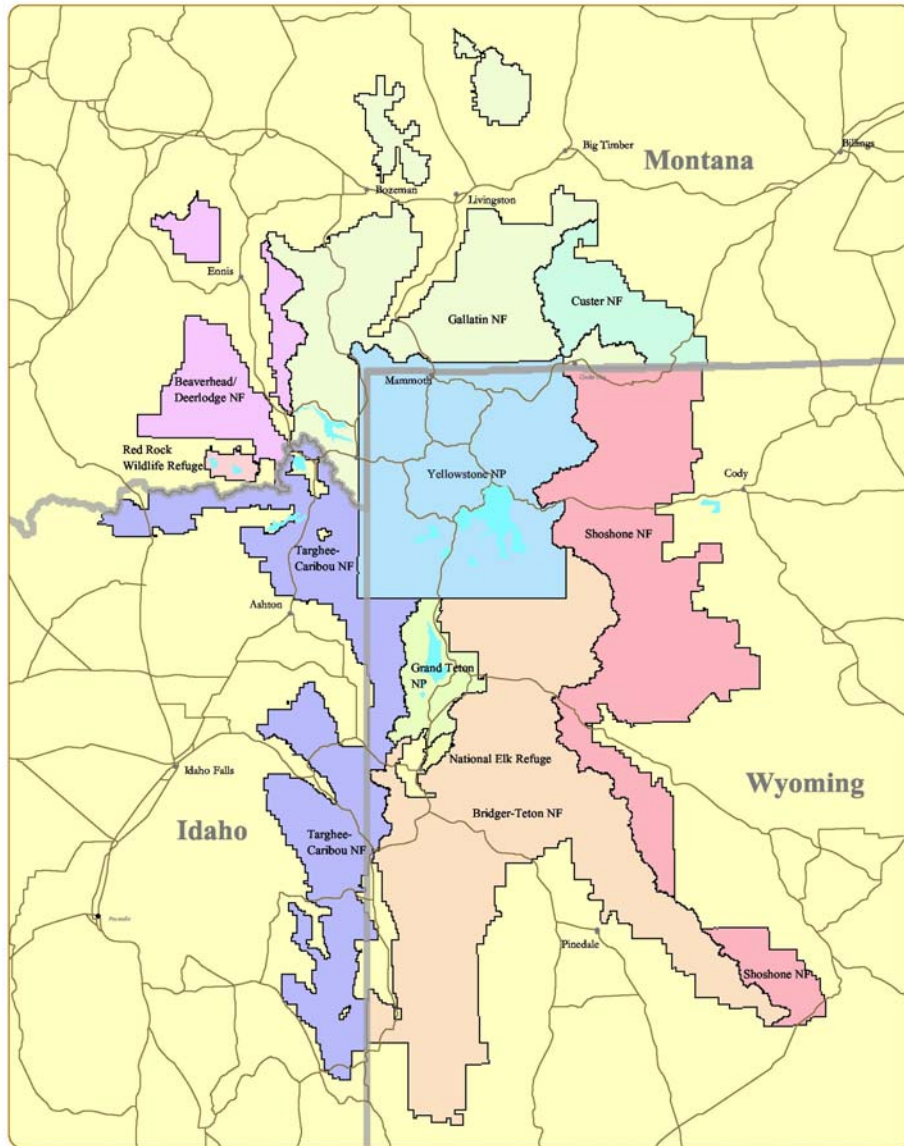
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### The Greater Yellowstone Area: Major Federal Administrative Units



| Legend  |                    |
|---|--------------------|
| <span style="color: cyan;">■</span> Major Lakes   | NF National Forest |
| <span style="color: black;">●</span> Major Towns  | NP National Park   |
| <span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Major Roads       |                    |
| <span style="border-bottom: 1px dashed black; width: 20px; display: inline-block;"></span> State Boundaries |                    |

1:2,300,000  
0 5 10 20 Miles

This map was made from spatial data provided by the Greater Yellowstone Coordinating Committee and the Gallatin National Forest. Map by H. Shovic, Oct. 26, 2004. Version 2.0 ggagycadministrativeUnitsv2\_85x11.mxd



Figure 1.