Governor's Upper Yellowstone River Task Force
Annual Report
2000

Governor's Upper Yellowstone River Task Force
Annual Report
2000

Governor's Upper Yellowstone River Task Force
5242 Highway 89 South
Livingston, Montana 59047
Phone: 406.222.3701; Fax: 406.222.8538
Email: noble@ycsi.net

Cover Photo: Fish Populations Study research team testing data collection equipment, summer 2000.

Table of Contents

Governor's Upper Yellowstone River Task Force

5242 Highway 89 South
Livingston, Montana 59047

Dear Governor Martz: January 1, 2001

It is my pleasure to both formally introduce the Governor's Upper Yellowstone River Task Force to you, as well as to inform you about our activities in 2000. Required by executive order, annual reports from the Task Force provide a vital communication link to the Governor's office. Governor Racicot appointed the Task Force on November 5, 1997 as a structured non-regulatory organization to address problems arising from the large Yellowstone River floods of 1996 and 1997. We were reappointed to a second consecutive term from June 28, 1999 to June 28, 2001.

Simultaneously, the US Congress directed the US Army Corps of Engineers (Corps) to develop a Special Area Management Plan (SAMP) and to assess the long-term effects of bank stabilization projects on the upper Yellowstone River. The Corps has fully coordinated with the Task Force throughout this entire process. In fact, much of the data collected in the Task Force Cumulative Effects Investigation will form the basis for the Corps SAMP. In a continued show of support, Congress recently appropriated an additional $650,000 to allow for the completion of both investigations.

The Task Force focused on approving research proposals and securing study funding in 2000. Given our overall project timeline (see page 15 of this report), it was crucial that all of the studies be funded and actively collecting data no later than spring 2001. I am pleased to report that we were successful in this endeavor. All of our biophysical and socio-economic study teams are either well into their data collection activities or are scheduled to begin in early 2001. Data collection requirements vary from one to three field seasons, depending on the study.

The positive strides that the Task Force has taken to date are due in large part to strong partnerships and effective collaborations with many people. Increasing numbers of local citizens are getting involved in the process. State, federal, and local agencies sit on the Task Force and provide thoughtful insight to that same process. The Montana Departments of Environmental Quality, and Natural Resources and Conservation have been lead agencies assisting in this effort. Federal agencies—specifically, the Natural Resources Conservation Service, Environmental Protection Agency, and Corps—have gone out of their way to help the Task Force and have greatly contributed to our success.

As our final action, the Task Force will make river corridor management recommendations based on our scientific investigations of the upper Yellowstone River. We are confident that our data will be valid and defensible because our Technical Advisory Committee has screened all of the studies, which were then approved by the Task Force. We are confident that our recommendations will have public support because local citizens attend our meetings and always provide us with their insights. Finally, we have confidence that our recommendations will have practical application because state and federal regulatory agencies have been partners throughout the whole process.

As was stated previously, the Task Force tenure ends on June 28, 2001. It is our sincere hope that you will extend our appointment as a Task Force, so that we may finish our Yellowstone River investigation and develop our recommendations. We intend to finish by the end of 2003.

Developing and implementing the Cumulative Effects Investigation in the Upper Yellowstone River Basin has been a learning process for our community. It is no small undertaking for the local residents or governmental agencies involved. One thing we have discovered over these past few years is that when we all work together on a complex issue, we all learn from each other. The Task Force looks forward to working and learning with you as well.

Best regards,

John Bailey, Chair
Governor's Upper Yellowstone River Task Force

Governor's Upper Yellowstone River Task Force

2000 Annual Report

The *2000 Annual Report* is the third in a series of yearly reports produced by the Governor's Upper Yellowstone River Task Force (here after referred to as the Task Force). The purpose of the report is to provide Montana's Governor and the general public with information on Task Force activities and accomplishments over the past year.

Having completed a year of extensive data collection on the upper Yellowstone River, the main focus of this year's report is (1) to summarize our investigations and the informational products being created under Task Force sponsorship, and (2) to provide work projections for 2001. In addition, we report on several research components (socio-economic, wildlife, fisheries, and land use) that have advanced from the conceptual stage into the research stage during this past year.

Past accomplishments of the Task Force and our overall goals are also briefly described in this report. Detailed information on previous Task Force activities may be found in our *1998 Annual Report* and *1999 Annual Report*, which are available upon request.

In order to minimize repetition and the length of this report, we have used acronyms for commonly used phrases or agency titles. To assist readers unfamiliar with these terms, we have provided a list of acronyms and their definitions in *Appendix A*.

Task Force History

Like many environmentally driven issues, a natural disaster demonstrated to many Montanans the need for a more comprehensive and consolidated planning effort for the upper Yellowstone River. For Park County, that event was the combination of back-to-back, near 100-year floods in 1996 and 1997. Anxieties were high in local communities, citizens and municipalities stood to lose valuable property, and many attempted to remedy the problem through bank stabilization and other channel modification projects. These actions only added to citizens' concerns, which were conveyed to Governor Marc Racicot and ultimately led to his creation of the Task Force through Executive Order No.19-97 on November 5, 1997. After completion of the initial, 19-month term in June 1999, the Office of the Governor officially continued the existence of the Task Force for two more years through Executive Order No. 8-99. (See *Appendices B* and *C* to review executive orders.)

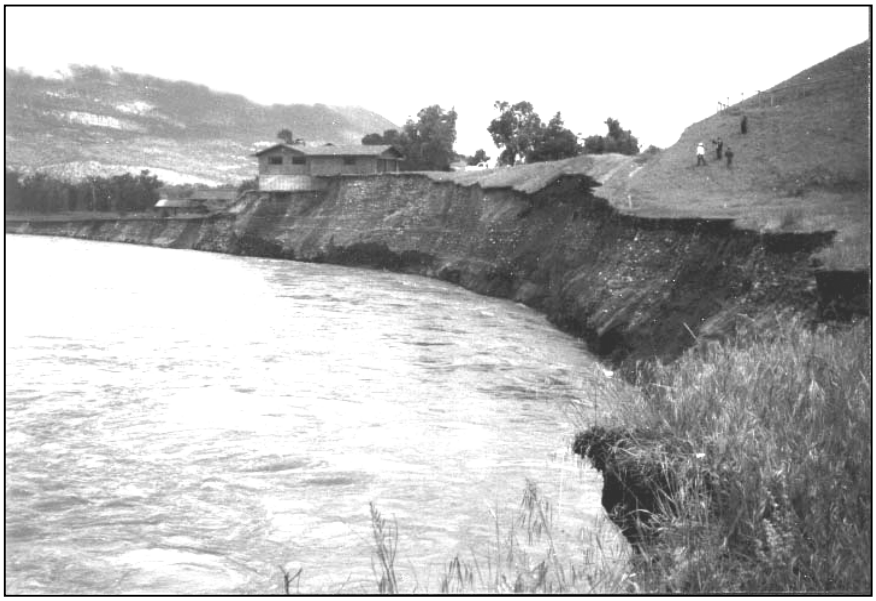


Photo 1. House lost to high water in 1997.

Our Purpose

The Task Force, as is charged by the Governor, functions as a structured non-regulatory organization that involves citizens, communities, and governmental agencies. The purpose of the Task Force is to provide a forum for the discussion of issues that effect the Upper Yellowstone River Basin, particularly, to bring together landowners, sportsmen and sportswomen, and community leaders to develop a shared understanding of the issues and competing values and uses that impact the upper Yellowstone River. Further, the Task Force is directed to (1) bring together many diverse groups, who have an interest in the upper Yellowstone River, and (2) ensure that future projects affecting the river are planned and conducted in a manner that will preserve the integrity, beauty, values, and function of the upper Yellowstone River for Montanans now and in the future.

The overall goal of the Task Force is to develop a set of publicly-supported river corridor management recommendations that address potential adverse cumulative effects of river channel modification, flood plain development, and natural events on the human community and riparian ecosystem.

Who We Are

The Task Force is made up of a wide cross section of local area citizens, and local, state, and federal agency representatives. Individually, we represent specific constituencies within the local community; yet together, we form a "balanced table" of diverse groups strongly concerned about the natural and economic resources in the basin.

The Task Force was developed in the true spirit of partnership and collaboration. We have worked to raise awareness of environmental issues. We have encouraged members of the community to get involved in Task Force activities and to express their views when warranted.

By design, the Task Force was set up to have community participants function in a leadership role (see *Appendix D* for ground rules). The 12 voting Task Force members represent the following interests: local businesses, property owners, ranchers, the angling community, conservation group(s), Park County, City of Livingston, and Park Conservation District. The eight non-voting Task Force members represent the following governmental agencies: Montana Department of Environmental Quality, Montana Department of Natural Resources and Conservation, Montana Department of Transportation, Montana Fish Wildlife and Parks, National Park Service (Yellowstone National Park), US Army Corps of Engineers, and US Forest Service. Our agency partners provide technical knowledge and assistance, in addition to their regulatory and land management input.

From the beginning, the Task Force recognized the need to consolidate efforts along the Yellowstone River, and to avoid data duplication. The make up of the Task Force is testament to the power of seating concerned citizens groups and governmental agencies as collaborative investigators and decision makers. Having many of the interested parties and agencies charged with regulation of river resources represented on the Task Force, has streamlined much of our research and outreach efforts thus far. In addition, and perhaps more importantly, we are not producing a study that will simply sit on a shelf. Quite the opposite is our intent. By giving regulatory agencies a voice in the process, we are allowing our management recommendations to have practical regulatory application.

The Community Is Our Partner

Over the past three years, the Task Force has worked to accomplish our mission in a consensus-building manner, which stresses education, cooperation, broad-based community involvement, and voluntary participation. Through monthly meetings and educational activities we have strived to reach out to the community, provided an opportunity for the public to participate in the process, and provided a forum for individuals and groups to express their views openly and in the spirit of teamwork.

Information gathered by the Task Force belongs to everyone. Upon completion, all survey results, maps, and other resource data will be available for the public's use and may be viewed or acquired by visiting or contacting the Task Force office or the Park Conservation District.

Science-Based Approach to Watershed Assessment

As an initial step, the Task Force has set in motion an interdisciplinary study effort to assess the cumulative effects of bank stabilization, channel modification, and natural events on the physical, biological, and cultural attributes of the upper Yellowstone River. This scientific data will help us achieve our overall goal of developing a set of river corridor management recommendations that have practical application for federal, state, and local regulatory agencies. The Task Force sponsored investigation is a collaborative, comprehensive, and cost effective way to provide useful information that regulatory agencies, landowners, and the interested public need to facilitate improved management of the river and flood plain.

Currently, the Task Force is conducting the research phase of the project. Our project time line and associated research strategy calls for collection and analysis of baseline information in the Upper Yellowstone River Study Area for the next few years; each study requires an initial one to two years of baseline data collection and a similar period of time for data analysis and synthesis. The project synthesis phase will provide the insight and understanding (for example, physical and biological models) necessary to link information from the individual research components into an integrated analysis of the cumulative effects of bank stabilization.

The final project phase will be to develop management recommendations based on this integrated understanding of the upper Yellowstone River. As we enter the final phase of the project, timely and intelligible dissemination of relevant data and information to the Task Force and public becomes paramount. Educating the public, as well as Task Force members, landowners, and regulatory agencies, is an important aspect of the development of river management recommendations. As results become available, our focus will shift to (1) presenting and explaining those results, (2) identifying management recommendations based on those results, and (3) exploring and analyzing the possible effects of those recommendations on the long-term health of the river and the human community that depends on it.

Our final action as a Task Force will be to present river management recommendations to Montana's Governor. It is our intent that with defensible science as a foundation for recommendations and with ongoing input and review from the local community and regulatory agency partners, our recommendations will have public support and practical application in the Upper Yellowstone River Basin.

Task Force Voting Member Profiles

John Bailey, Chair, Fly Fishing Business Owner
John is the owner of the internationally renowned Dan Bailey's Fly Shop in downtown Livingston. Born and raised in Paradise Valley, John has been fishing the upper Yellowstone River for more than 40 years. His home is located on a lagoon along the Yellowstone River.

Mike Atwood, Vice Chair, Natural Resource Industry Representative
Mike Atwood has worked with natural resource and land management issues for more than 20 years with emphasis in forestry, large forest land acquisitions, and management. Mike and wife, Toni, own property and a vacation home along the Yellowstone River south of the Emigrant bridge.

Roy Aserlind, Emeritus Professor, University of Wisconsin—Madison
Roy grew up in Livingston, and has owned a home on Ninth Street Island for 30 years, where he and his wife, Margot, now live the year around.

Michelle Goodwine, CRS, ABR, GSI; President of the Montana Association of REALTORS®. Michelle has worked as a REALTOR® for 13 years and owns Coldwell Banker Maverick Realty. Michelle and her husband, Bob, are Livingston natives and live north of town on the Yellowstone River.

Dave Haug, Park Conservation District Supervisor
The Haug family has been farming and ranching in Park and Sweetgrass Counties for three generations, since the turn of the century. As a Supervisor for the Park Conservation District, Dave's Board issues 310 permits on the Yellowstone River; he is also a member of the City/County Planning Board and a board member of the Livingston Ditch Association, which uses water from the Yellowstone. Currently, his family farms and manages timber on their property in the Upper Yellowstone River Study Area.

Tom Lane, local property owner along the Yellowstone River
Long time residents of the Livingston area, the Lane family owns and operates cattle ranches throughout the state of Montana. Tom's family business includes a large operation and land holding along the upper Yellowstone River. Tom was the recipient of the 1999 Conservation Farmer/Rancher of the Year award from the Meagher County Conservation District.

Jerry O'Hair, local property owner along the Yellowstone River
O'Hair family members are fourth generation Paradise Valley residents. Jerry owns and operates a working cattle ranch that adjoins the upper Yellowstone River for approximately three miles. The internationally famous Armstrong Spring Creek is also located on his ranch.

Brant Oswald, Conservation Group(s) Representative
Brant is a licensed Montana outfitter and co-manager of the Yellowstone Angler, a fly fishing shop in Livingston. He has served on the Board of Directors of both the Joe Brooks Chapter (Livingston) of Trout Unlimited and the Park County Environmental Council.

Rod Siring, local property owner along the Yellowstone River
Rod was born and raised in Montana, and he and his wife have spent the last 32 years in Park County. Rod is a retired Park Electric Cooperative manager, where he worked for 30 years. He enjoys fishing and boating on the Yellowstone.

Bob Wiltshire, Angling Community Representative
For more than 20 years, Bob has been closely involved with the fishery of the Yellowstone River. Employed by the Federation of Fly Fishers, Bob has 15 years of outfitting experience, a background in fishery management, is a frequent lecturer about fisheries issues, and contributes angling articles to a number of publications.

Ellen Woodbury, Park County Planner
Ellen has been the Park County Planning Director and Floodplain Administrator since 1992. She was nominated by the Park County Commissioners to represent the County on the Task Force. Ellen graduated from Montana State University and attended graduate school at Western Illinois University in Macomb, Illinois.

Jim Woodhull, City of Livingston Planner
Born and raised in Livingston, Jim has been with the Livingston City Planning Office since graduating from Montana State University, Bozeman in 1992.

Task Force Non-Voting Member Profiles

Photo 2. Task Force meeting, July 18, 2000.

Stuart Lehman, Section Supervisor, Watershed Management Section
Montana Department of Environmental Quality
Planning, Prevention, and Assistance Division
Helena Montana

John Logan, District Ranger
US Forest Service, Gallatin National Forest
Gardiner Ranger District,
Gardiner Montana

Terri Marceron, District Ranger
US Forest Service, Gallatin National Forest
Livingston Ranger District,
Livingston Montana

Tom Olliff, Chief, Branch of Natural Resources
National Park Service, Yellowstone National Park
Mammoth Wyoming

Laurence Siroky, Water Operations Bureau Chief
Montana Department of Natural Resources and Conservation
Flood Plain Program, Water Resources Division
Helena Montana

Allan Steinle, Montana State Program Manager
US Army Corps of Engineers, Regulatory Branch
Helena Montana

Stan Sternberg, Environmental Program Manager
Environmental Services
Montana Department of Transportation
Helena Montana

Joel Tohtz, Fisheries Biologist
Montana Fish, Wildlife, and Parks
Livingston Montana

Liz Galli-Noble, Task Force Coordinator
Livingston Montana

Technical Advisory Committee

A guiding principle leading toward development of channel and flood plain management recommendations by the Task Force is the development, integration, and use of sound scientific investigation and information on riverine processes in the Upper Yellowstone River Study Area. In order to make that happen, the Task Force appointed a Technical Advisory Committee (TAC) in 1998. TAC members are listed below in *Table 1* and their professional profiles are found in *Appendix E*. This committee's role is to assist the Task Force by offering scientific guidance, developing an integrated research program, and evaluating research proposals and results. It will also take the lead in initial synthesis and interpretation of information for the Task Force.

Table 1. 2000 Technical Advisory Committee Members

Name	Profession / Title	Agency / Affiliation
Dr. Duncan Patten, Chair	Riparian Ecologist	Montana State University
Tim Bryggman	Economist	Montana DNRC
Chuck Dalby	Hydrologist	Montana DNRC
Mike Gilbert	Environmental Resources Specialist	US Army Corps of Engineers
Tom Hallin	Professional Surveyor	Private Survey Business
Rob Hazlewood	Wildlife Biologist	US Fish and Wildlife Service
Jim Robinson	Geologist	Montana DNRC
Dr. Greg Schildwachter	Wildlife Biologist	Intermountain Forest Association
Brad Shepard	Fisheries Biologist	American Fisheries Society
Allan Steinle	Environmental Resources Specialist	US Army Corps of Engineers

The TAC is designed to provide recommendations to the Task Force, when requested, based on the results of the scientific investigations. The TAC is given both broad direction and specific missions by the Task Force, and has the flexibility to determine how best to accomplish its job. The TAC has no authority to make policy decisions or recommendations on behalf of the Task Force; rather, its role is to work as directed by the Task Force to ensure that (1) the right questions are asked, (2) the best approach and methods are used to answer questions, (3) the data collected are objective, defensible, and trustworthy, and (4) the answers provided are understandable and relevant.

Over the past two years, coordination and consistency between study components (particularly with respect to stratification and selection of sampling and detailed mapping sites) has been achieved through oversight by the TAC. In 2000, the TAC specifically focused on coordinating research study timelines, product delivery, and communications for the following on-going investigations: geomorphology, riparian vegetation, hydrology/hydraulics, fish populations, and land use. Also a top priority, the TAC worked on the development of research proposals for the wildlife assessment, fish habitat study, and socio-economic assessment, all of which were still in the conceptual stage at the beginning of 2000.

In addition to study management, members of the TAC have provided the Task Force with a readily available scientific sounding board. TAC members have attended all eleven Task Force meetings in 2000, giving study updates and answering research-related questions. The TAC also formally met on several occasions in 2000 to address: GIS coverages and meta data, overall project strategy and timeline, data synthesis, data dissemination, topographic mapping, the appointment of additional TAC members, and public education and outreach (workshops, presentations).

In early 2000, Tim Bryggman (an economist with Montana DNRC) was appointed to the TAC in order to assist the Task Force in the development of a socio-economic assessment of the Study Area. Upon request from a specially appointed Socio-Economic Subcommittee, he produced a broad economic analysis of Park County and presented his findings at the July18 Task Force meeting (see page 31 for study details).

Upper Yellowstone River Study Area

The Upper Yellowstone River Basin—also termed the Upper Yellowstone River Study Area— is defined for the purpose of the Task Force as that reach of river (including its tributaries), beginning at the Yellowstone National Park boundary at Gardiner, Montana and extending downstream to the bridge crossing at Springdale, Montana. Flanked by the Crazy and Bridger Mountain Ranges to the north, the Absaroka Mountain Range to the east, the Gallatin Mountain Range to the west, and Yellowstone National Park to the south, approximately 80 miles of the Yellowstone River flows within this 2,930 square-mile basin (see *Map 1*).

The Upper Yellowstone River Basin represents a significant and valuable natural and economic resource for local area residents, citizens of Montana, and our nation as a whole. This unique ecosystem houses the Yellowstone River (the longest free flowing river in the lower 48 states), Yellowstone National Park, the Absaroka-Beartooth Wilderness Area, large populations of diverse wildlife, and viable and varied fish populations. It is home to more than 15,000 Montana residents and is visited by more than one million tourists each year.

The upper Yellowstone River, and its continued health, is essential to the local and regional economy. Park County, which makes up 2,667 square miles of this watershed, is largely supported by industries that rely heavily on the continued long-term health and well being of the Yellowstone River. Ranchers and farmers depend on the river to provide the elements necessary to sustain successful agricultural operations. They in turn provide the open space, wildlife and fish habitat, and scenic views that are enjoyed by the many visitors to the area.

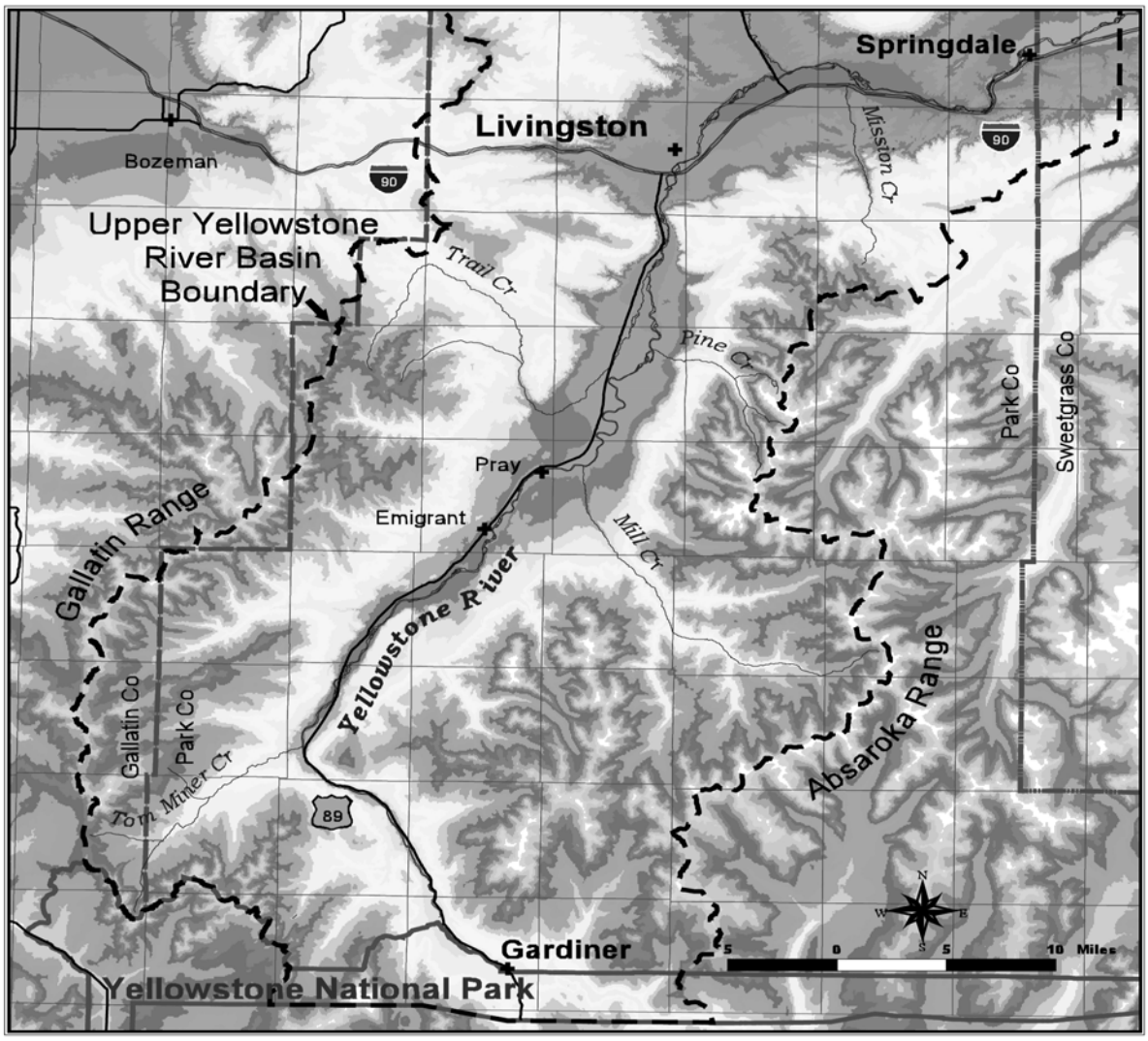
Located in south central Montana, the upper Yellowstone River meanders through the heart of Park County. Park County is Montana's 12th most populous county. The city of Livingston is the county seat and the state's 11th largest city with approximately 8,500 residents. Most of Livingston's residents are directly affected by changes in the Yellowstone River, as it literally dissects the city from south to north. Channel modification has occurred with varying intensity throughout the Study Area. Relatively little channel modification has occurred between Gardiner and Mill Creek. A moderate amount of channel alteration has occurred between Mill Creek and Carters Bridge, and from Mission Creek to Springdale. The most intensive activity has occurred in the reach from Carters Bridge to Mission Creek.

The section of Yellowstone River within the Study Area is considered to be a priority watershed for restoration and water-quality plan development by several agencies. A multi-agency advisory group led by the Montana DEQ and DNRC has identified the upper Yellowstone River as a Category 1-A watershed. Category 1-A watersheds have immediate restoration needs with one or more agency designations as a priority area, coupled with the existence of a local group (that is, the Task Force) that has identified technical assistance or funding needs[1]. Further, the 1998 §303 (d) list assigned the upper Yellowstone River a low priority for water-quality restoration plan and associated Total Maximum Daily Load (TMDL) development. That designation has been elevated, and in the 2000 Draft Revised §303 (d) list, the main stem of the upper Yellowstone River and three of its tributaries were assigned a high priority for plan development[2].

---

1 Source: October 1, 1998. *Assessment of Montana's Watershed Resource Needs; Clean Water Action Plan*. Montana Unified Assessment Work Group; subcommittee of the Montana Watershed Coordinator Council.

2 The federal Clean Water Act section §303 (d) requires all states to compile a list of water quality limited water bodies, in need for Total Maximum Daily Load development. The list must be updated every four years and the Environmental Protection Agency and Montana Department of Environmental Quality are the monitoring authorities.



Map 1. Upper Yellowstone River Study Area

Cumulative Effects Investigation

Overview

The Task Force Cumulative Effects Investigation is considered to be a pilot project for the Yellowstone River. This is not an investigation that will help solve just one management or pollution problem; rather, it will provide information upon which countless management decisions will be based. Baseline data on the seven major components of this river system (described below) will provide information to a wide array of river users and managers for years to come. This investigation could become a "bench mark" study and protocol for many other western river studies.

The overall goal of the Task Force is to develop a set of publicly-supported river corridor management recommendations that address potential adverse cumulative effects of river channel modification, flood plain development, and natural events on the human community and riparian ecosystem. Development of management recommendations will involve identification and evaluation of the River's natural and economic resources, in five major phases:

I. Resource data collection, analysis, and mapping.
II. Resource condition assessment.
III. Development and evaluation of management options.
IV. Selection of preferred options to achieve goals and objectives.
V. Preparation of management recommendations.

Guiding principles that stay consistent through all these phases are:

1. Science Led Effort
   Provide complete and comprehensive scientific data, which will allow for better understanding of the issues, resources, and uses that affect the integrity of the Upper Yellowstone River Study Area.

2. Investigate Issues Specific to Upper Yellowstone River Corridor and Watershed
   Help explain how and why key elements of the watershed and river corridor (natural and human-induced) have changed over time.

3. Develop Recommendations that have Practical Application
   Provide the Task Force and regulatory agencies with the information and analytical techniques necessary to evaluate river channel and flood plain problems and proposed solutions.

Integrated Project Design

In 1998, the Task Force TAC developed an interdisciplinary study design (see *Figure 1*) to assess the cumulative effects of bank stabilization, natural, and other channel modification on the physical, biological, and cultural attributes of the upper Yellowstone River. The investigation consists of seven interrelated research components:

1. Watershed Conditions and Land Use
2. Topographic Mapping and Geomorphology
3. Hydrology and Hydraulics
4. Riparian Vegetation
5. Fish Habitat and Populations
6. Wildlife Habitat and Populations
7. Socio-Economic

The seven biophysical and social components, shown above, form a cascade in which the attributes of each successive (or parallel) component are affected by processes and interactions within or between previous components. This hierarchical relationship is illustrated in the integrated project design (*Figure 1*) and project timeline (see *Figure 2*).

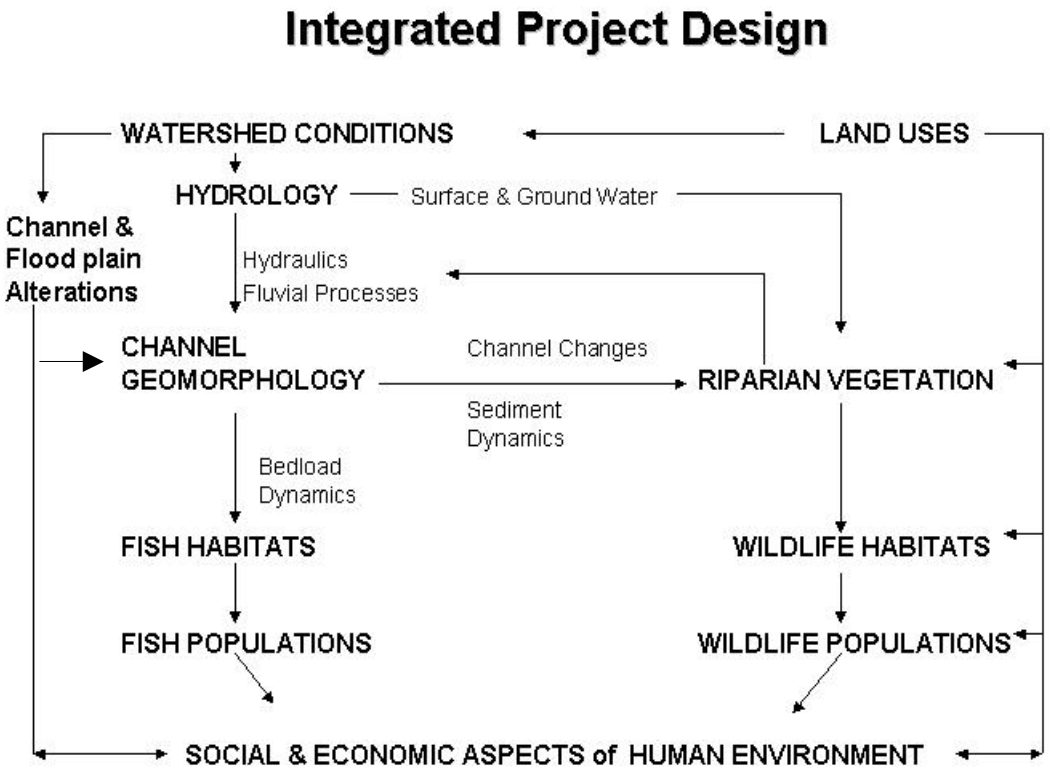


Figure 1. Integrated Project Design for the Upper Yellowstone River Cumulative Effects Study
This conceptual model, developed by the Task Force Technical Advisory Committee, shows the links amongst the seven interrelated components in the upper Yellowstone River investigation.

For example, data collected for Component 1 will be used to describe the overall physical and biological setting of the Upper Yellowstone River Watershed; analysis of information collected at several points in time provides a basis for describing how watershed conditions and land uses may have changed over time. At the next level of analysis, historical information and model-based predictions from the geomorphic and hydraulic process analysis (Components 2 and 3) will set the stage and partially determine potential impacts of channel modification(s) on physical channel characteristics and riparian vegetation (Component 4). Estimated changes in channel morphology, hydraulics, and riparian vegetation will, in turn, drive predictions of effects on fish and wildlife habitat and populations (Components 5 and 6). Ultimately, estimates of cumulative effects on channel and flood plain resources will be used to assess socio-economic effects on local stakeholders (Component 7).

Realistic physically and biologically based scenarios will be developed for analysis with TAC and Task Force oversight. These scenarios will provide the basis for analyzing the cumulative effects of different types and levels of bank stabilization and flood plain modification on the physical and biological environment. In this manner, scientifically sound predictions, of how the river and its resources will likely change in response to a particular channel modification or series of modifications, will be developed. These analyses will then be used as a basis to develop river corridor management recommendations.

Brief Research Update

As of December 31, 2000, the seven research components are in various stages of progress (see the next section, *Research Component Status Report,* for specific details):

(1) Watershed conditions and land use, Component 1, is made up of four independent studies, three of which have been completed and one that is more than 50 percent completed.

(2) Field data collection for Components 2, 3, and 4 (topographic mapping /geomorphology, hydrology/hydraulics, and riparian vegetation studies) was initiated in late 1999 and continued through 2000. These studies are 30, 60, and 50 percent completed, respectively.

(3) Component 5 consists of the fish population study and fish habitat study. The fish populations study team completed an extensive literature review in early 2000 and began collecting field data in August. They plan to collect data during all seasons of the year in 2001. The fish habitat study did not receive funding until December 2000. Researchers plan to begin fieldwork in spring 2001.

(4) The wildlife study proposal, Component 6, was rewritten in 2000. A wildlife literature review was also conducted during this period. Funding for this study was also secured in December 2000; therefore, wildlife data collection is planned for spring 2001.

(5) Throughout the entire year 2000, a Task Force subcommittee worked to develop the Socio-Economic Assessment, Component 7. The overall study has been split into two phases: Phase I led by the Task Force, and Phase II led by the Corps. A request for proposals for Phase I was advertised in November/December 2000 and a contractor will be selected in February 2001. The Corps plans to put out an RFP for Phase II in early 2001.

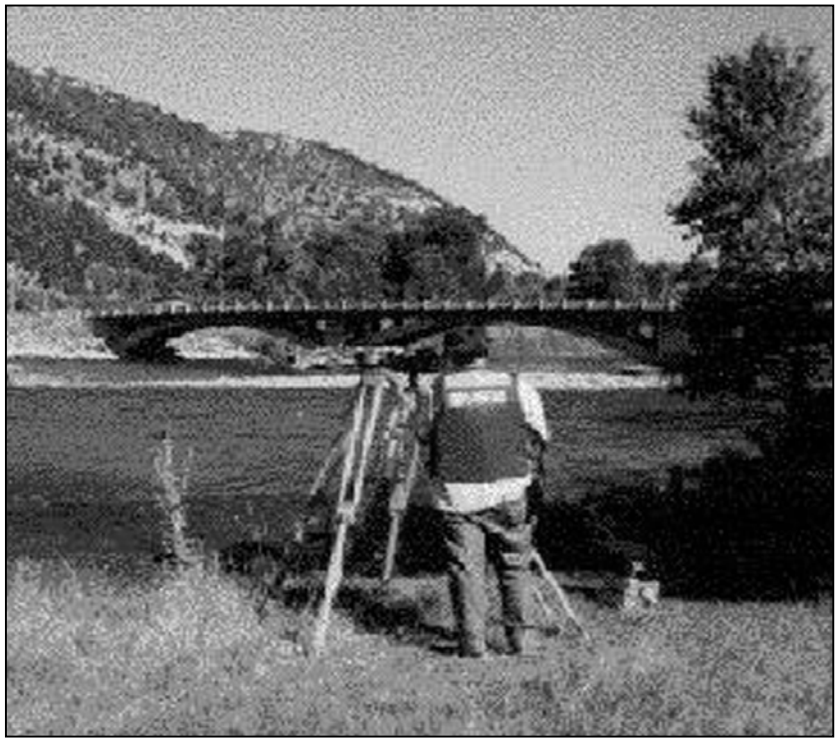
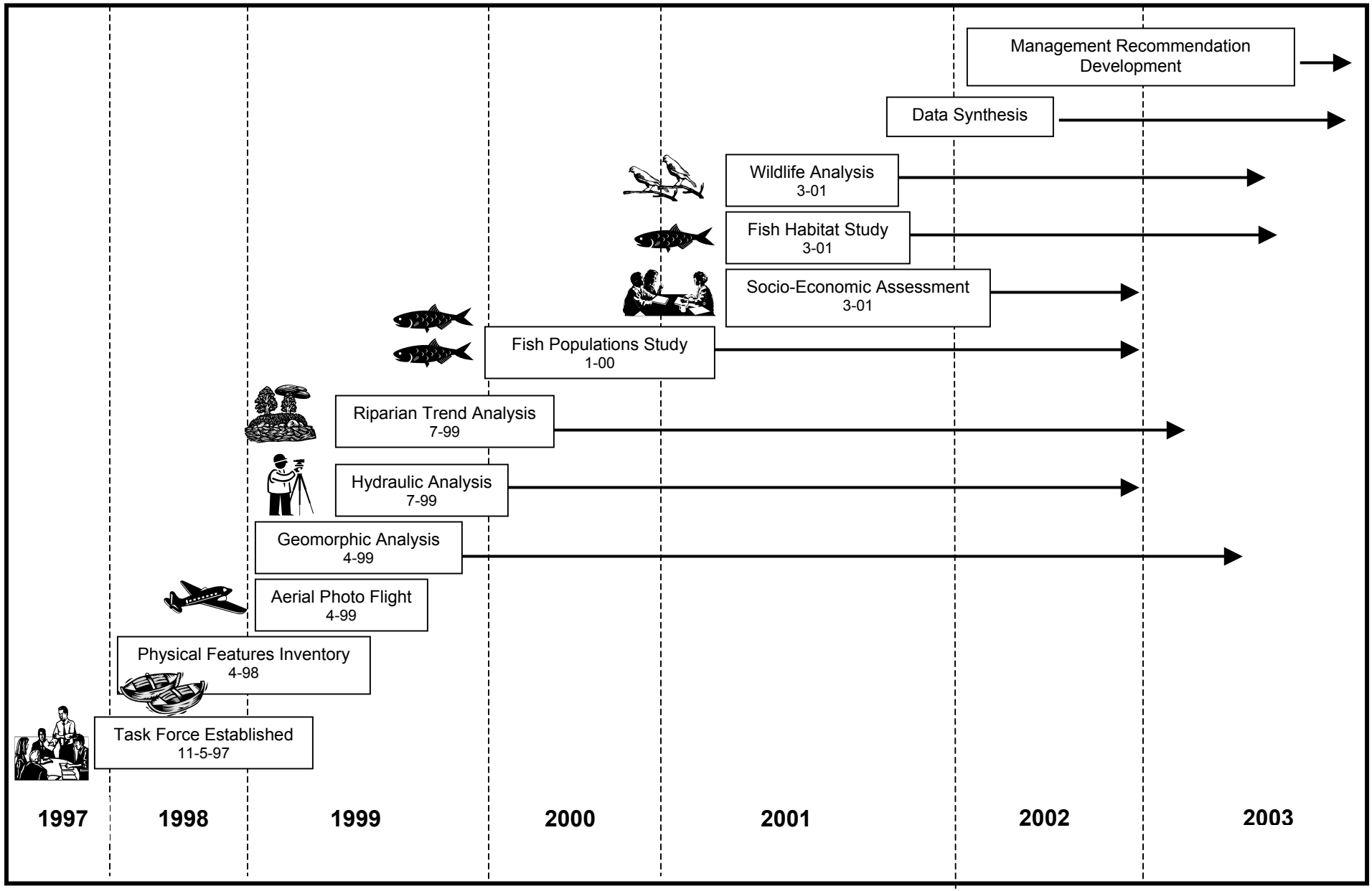


Photo 3. USGS research team conducting cross-sectional surveys upstream from Carters Bridge.

Figure 2. Governor's Upper Yellowstone River Task Force Research Time Line.



Research Component Status Report, 2000

Seven Research Components of the Cumulative Effectives Investigation:

1. **WATERSHED CONDITIONS AND LAND USE**
   - **A. Yellowstone River Physical Features Inventory**
   - **B. Aerial Photography**
   - **C. Riparian/Wetlands/Land Use Mapping or Natural Resources Inventory**
   - **D. Watershed Land Use Assessment**

2. **TOPOGRAPHIC MAPPING AND GEOMORPHIC ANALYSIS**
   - **A. Topographic Mapping**
   - **B. Geomorphic Analysis**

3. **HYDROLOGY AND HYDRAULIC ANALYSIS**

4. **RIPARIAN TREND ANALYSIS (RIPARIAN VEGETATION)**

5. **FISHERIES ANALYSIS**
   - **A. Fish Populations Study**
   - **B. Fish Habitat Study**

6. **WILDLIFE ANALYSIS**

7. **SOCIO-ECONOMIC ANALYSIS**
   - **A. Broad Economic Analysis**
   - **B. Socio-Economic Assessment**

---

1. WATERSHED CONDITIONS AND LAND USE

1A. Yellowstone River Physical Features Inventory

Title: Yellowstone River Physical Features Inventory–Gardiner to Springdale

Principal Investigators: Thomas Pick (Water Quality Specialist)
NRCS/Montana DEQ, Helena Montana

Other Participants: Task Force members, Montana FWP, US Forest Service, Montana DNRC, Montana Department of Transportation, US Army Corps of Engineers, and local area outfitters and consulting firms.

Goal: Compare the degree of change in specific physical features within the upper Yellowstone River corridor from past (1987) to current (1998) conditions.

Completion Date: 1998.

Product: Hard copy or electronic published document *Yellowstone River Physical Features Inventory–Gardiner to Springdale*.

The physical features inventory was conducted as a first step in understanding cause and effect relationships in the Upper Yellowstone River Study Area. The results of this inventory have served as a prioritization tool to guide further data acquisition and analysis efforts by the Task Force. You may view the physical features inventory in an interactive application by visiting this Natural Resources Information System web site: http://nris.state.mt.us/webap/document/user.html .

1B. Aerial Photography

Photo 4. 1:6000-scale aerial photo of Interstate 90 Bridge crossing the Yellowstone River.

On April 11, 1999, low-flow (1,500 cubic feet per second) aerial photos of the upper Yellowstone River corridor were flown for the Task Force. The river corridor was flown at three scales: 1:6000, 1:8000, and 1:24000. Stretches of the river with greater channel complexity and/or more development in the flood plain were flown closer to the ground (1:6000- and 1:8000-scale), in order to show greater detail. These photos are the basis for two mapping projects: orthophoto quad maps and topographic maps, which are described in detail in the *Topographic Mapping and Geomorphic Analysis* section.

Completion Date: Fall 1999.

Product: 1:6000, 1:8000, and 1:24000 aerial photos.

1C. Riparian/Wetlands/Land Use Mapping

Title: Riparian, Wetlands, and Land Use Mapping for the Yellowstone River Corridor: Gardiner to Springdale, Montana

Principal Investigator: Chuck Elliott (Regional Coordinator)
US Fish and Wildlife Service, National Wetlands Inventory, Denver Colorado

Other Participants: US Army Corps of Engineers
Omaha District, Omaha Nebraska

Goal: Document land use and land cover within the Upper Yellowstone River Study Area corridor.

Objectives:

1. Document current baseline conditions.
2. Assist in impact assessment and alternatives analyses for Task Force and interagency needs.
3. Serve as supporting data for other environmental investigations.
4. Provide a basis for future monitoring as needed.

Progress: Color infrared photography (1:24,000) was acquired in August 1999 for the Gardiner to Springdale river corridor. Draft photo-interpretation was completed in winter 1999/2000. Ground truthing of this information and quality control were conducted by the USFWS in conjunction with interagency personnel from May 7 to 10, 2000. Final photo-interpretation was completed on October 20, 2000. These data were submitted to the National Wetlands Inventory (NWI) national office for digitization. The target date for completion of digitization is January 19, 2001. The Corps will then compile these data for interagency and Task Force use. Data will also be available for downloading via the NWI Center in Saint Petersburg, Florida (visit http://www.nwi.fws.gov/ for additional information).

Completion Date: March 15, 2001.

Product: 1:24000-scale riparian, wetlands, land cover data themes.

1D. Watershed Land Use Assessment

Title: Upper Yellowstone River Watershed Land Use Assessment

Principal Investigators: Thomas Pick (Water Quality Specialist)
NRCS/Montana DEQ, Helena Montana

Doug Harrison (State Resource Inventory Specialist)
NRCS, State Office, Bozeman Montana

Dr. Richard Aspinall (Director)
Geographic Information and Analysis Center, Montana State University
Bozeman Montana

Goal: Depict past and present land use in the Upper Yellowstone River Study Area, and evaluate the relationship between watershed function and land uses/land use change, as appropriate.

Objectives:

1. Depict (spatial and quantitative) present (1999) land uses in the study area.
2. Depict (spatial and quantitative) past (circa 1970s) land uses.
3. Analyze temporal, spatial, and quantitative land use changes.
4. Provide resource management evaluations (as appropriate) related to land use change and watershed function.
5. Serve as an integral data layer for incorporation with other components of the investigation.

Analysis Study Methods
Aerial photos and satellite imagery will be processed to characterize land use classifications. Image analysis software will be used to perform an unsupervised classification of satellite data sets (gray scale) with limited field verification.

Data cluster sets developed through this process will undergo a ground truth process to recognize the signature of selected land use categories [NRCS National Resources Inventory (NRI)]. Ground truthing will require field visits with GPS units to verify actual land use in selected locations using a standard protocol of 50 points per classification. 1976 orthophoto quads (USGS) may require ancillary photo interpretation to identify land use classifications prior to image processing. Final classification (present time) will require ground truth verification of accuracy as a final step. The following are the NRI land cover/use categories recommended for the assessment:

Cropland
Cropland (irrigated, non-irrigated)
Hayland (irrigated, non-irrigated)
Other cropland (summer fallow, cropland not planted)
Pastureland (irrigated, non-irrigated)
Other Farmland (ranch headquarters, feedlots, CRP)
Urban and Built-up (large build-up > 10 acres, small build-up < 10 acres)
Barren Land (bare exposed rock, gravel pits, river wash, permanent snow/ice)
Non-stocked Forest Land (burned, harvested)
Stocked Forest Land
Rangeland
Rural Built-up
Permanent Open Water
Transportation

Data sets will be evaluated for change using GIS software (ArcView®).

Analysis, Evaluation, and Results
NRCS staff specialists will summarize, evaluate, and prepare comments (as appropriate) based on professional interpretation. The compiled data will be evaluated with respect to the following aspects of watershed integrity: hydrologic function, water quality, soil characterization, and upland wildlife habitat. Interpretation of land cover/use quality will not be performed under this assessment. A draft report will be prepared for the Task Force and TAC review, prior to finalization.

Examples of land use analysis map and tabular data products are:

- extent of land cover/use categories by time period
- changes in extent over time
- spatial distribution of land cover/use categories
- spatial distribution change over time
- median farm or ranch size
- numbers of farms and ranches
- number of dwellings
- relative proximity of land cover/use categories to river and physical features of the river
- spatial distribution of land cover/use categories relative to soil runoff potential, soil leaching potential, and sediment runoff potential.

Progress: Satellite data and images were purchased and processed by NRCS and GIAC in mid 2000. Soil layers were digitized. Accuracy of coverages was verified using field ground truthing. More than 350 data points were ground-truthed during the period August through November 2000 by NRCS crews.

Future Work: In 2001, we will (1) complete cluster analysis and map production, (2) develop and run GIS analytic models, and (3) prepare maps, tables, and draft report.

Projected Completion Date: 2001.

Product: Land use maps of the Study Area. Final report and presentation to the Task Force.

2. TOPOGRAPHIC MAPPING AND GEOMORPHIC ANALYSIS

2A. Topographic Mapping

Title: Topographic Mapping of the Upper Yellowstone River Channel and Floodplain from Gardiner to Springdale, Montana

Principal Investigators: Mike Gilbert (Biologist)
US Army Corps of Engineers, Omaha Nebraska

Chuck Dalby (Hydrologist) and Jim Robinson (Geologist)
Water Management Bureau, Montana DNRC, Helena Montana

Other Participants: Don Patterson (Land Surveyor)
Region 1 Engineering, US Forest Service, Missoula Montana

Goal: Acquire ground-controlled aerial photos suitable for topographic and orthographic mapping of the contemporary upper Yellowstone River channel and flood plain; prepare digital orthophotos and topographic maps suitable for flood plain and other resource delineation.

Objectives:

1. Establish horizontal and vertical control for aerial photography.
2. Acquire low-flow, 'leaf off', 1:24000 scale aerial photography for the channel from Gardiner to Springdale for use in orthophoto preparation.
3. Acquire low-flow, 'leaf off' , large scale (1:6000 or 1:8000 scale) aerial photography for the channel from Point of Rocks to Mission Creek for use in preparing one- and two-foot contour maps of the channel and flood plain.
4. Prepare orthophotos and contour maps using digital photogrammetric methods.

Progress: Topographic mapping of the river channel and flood plain provides the basic framework for describing contemporary river channel and flood plain resources, evaluating historic channel changes, hydraulic flood plain delineation, and monitoring future channel change. Contemporary topographic mapping, at small (1:24000) and large (1:6000 to 1:8000) scales, are being accomplished using photogrammetric methods and aerial photos obtained on April 11, 1999.

The US Forest Service completed preparation of 1:12000-scale orthophoto coverage of the Study Area (Gardiner to Springdale) in November 2000.

Future Work: Funding for topographic mapping became available in 2000 through the Corps. Due to time constraints and the need to acquire the mapping as quickly as possible, it was decided in November 2000 to seek a private vendor for the work.

Projected Completion Date: The 1:12000 digital orthophotos from source black and white 1:24000 photos have been completed. The targeted completion date for topographic mapping is unknown; the Corps is currently finalizing contract negotiations with a private vendor to conduct that mapping.

Products: Digital orthophotos of the Study Area (Gardiner to Springdale) were completed in December 2000. Digital topographic maps of the river and flood plain from Point of Rocks to Mission Creek are currently outstanding.

2B. Geomorphic Analysis

Title: Historical Channel Changes and Geomorphology of the Upper Yellowstone River

Principal Investigators: Chuck Dalby (Hydrologist) and Jim Robinson (Geologist)
Water Management Bureau, Montana DNRC, Helena Montana

Other Participants: Dave Amman, Larry Dolan, and Mike Roberts (Hydrologists)
Dr. Jane Horton (GIS/Range Management)
Water Resources Division, Montana DNRC, Helena Montana

Dr. Michael Merigliano and Mary Louise Polzin (Riparian Ecologists)
University of Montana, School of Forestry, Missoula Montana

Goal: Develop a quantitative framework for evaluating historic river channel changes and the physical effect that historic channel modification (for example, bank stabilization measures) may have had on the river and flood plain; also provide a partial basis for estimating the potential cumulative effect of contemporary river management alternatives.

Objectives:

1. Channel and flood plain mapping.
2. Geomorphic channel description and classification.
3. Mapping and analysis of historical channel changes.
4. Geomorphic analysis of historic channel processes and cumulative effects of hydromodification.

Progress: The project will map the contemporary river channel and flood plain, delineate historic river channel changes, and examine the relationship between historic channel modifications (for example, levees and bank stabilization) and channel changes. Information will be used to assess cumulative effects of channel modifications on physical attributes (channel geometry, plan pattern, bed-material characteristics) of the upper Yellowstone River from Gardiner to Springdale.

Data collection for Objectives 1 (channel mapping) and 2 (geomorphic classification) was initiated in September 1999 and will continue through 2001. Geomorphic classification of the upper Yellowstone River provides a framework for understanding the relationship between the form and condition of the channel and the physical and biological processes that shape and maintain its bed, banks, and island complexes. Geomorphic classification also gives a basis for identifying homogeneous channel segments, assessing relative vertical and lateral channel stability, and identifying geomorphic strata from which representative samples can be extracted for further detailed study.

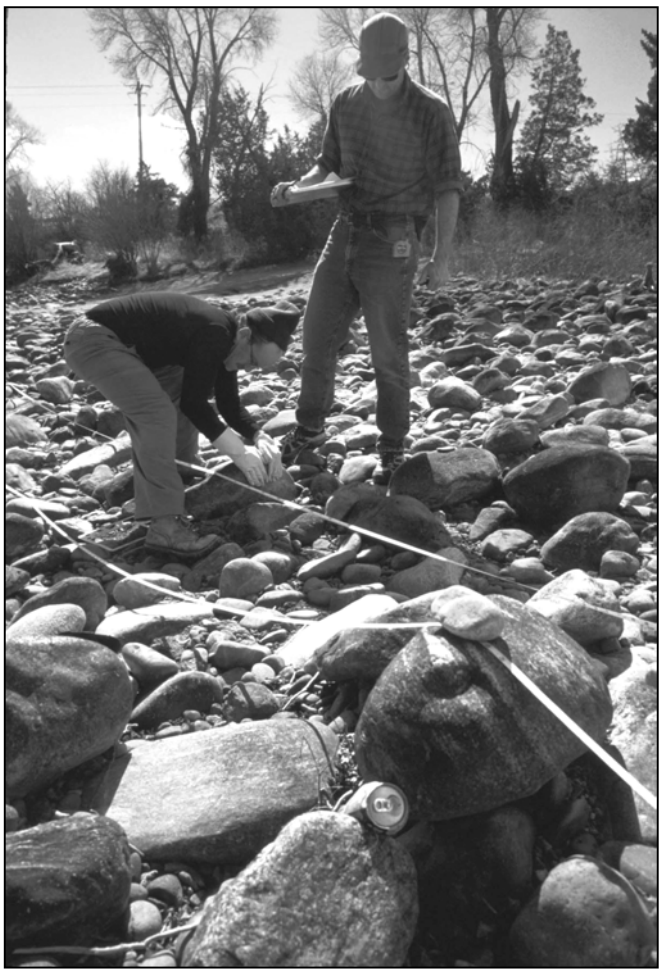


Photo 5. Geomorphology research team conducting bed and bank material characterization, spring 2000.

Fieldwork for reconnaissance-level, channel classification of the channel from Point of Rocks to Springdale was completed and the Rosgen, Montgomery-Buffington, and Nanson-Croke channel classifications are being applied in cooperation with other investigators. Field data includes information on bed-material size distribution, channel slope, pool–riffle location and spacing, bank material, sediment sources, large-woody debris, and recent channel changes (that is, since 4-11-99 photos were flown). Data are being reduced and transferred to the 1:12000-scale orthophoto base.

Data collection for Objective 3 (channel changes) was initiated and ArcView/ArcInfo coverages of channel and flood plain features (for example, channel, gravel bars) are being digitized for the study area using 1950s and 1980s editions of USGS topographic maps. Comparable features will be digitized from the 1999 orthophoto coverage to provide a contemporary map of channel features for comparison 1950s and 1980s maps.

Future Work: In 2001, we will continue work on Objectives 1, 2, and 3. Reconnaissance-level channel classification will be completed and work will begin on detailed channel classification; once the digital topographic mapping is completed additional fieldwork will be conducted. Reconnaissance-level assessment of historic channel changes (1950 to 1999) will be completed and detailed mapping of historic channel changes at selected locations will be initiated.

Projected Completion Date: 2003.

Products: A series of interim project reports will be prepared to convey project results, to other investigators and the public, as the project progresses. The reports will be summarized into an overall completion report at the project's end. In addition to these reports, specific GIS map work products will be developed and are listed below. All spatial information (for example, topographic maps and interpretive maps) will be available in digital ArcInfo/ArcView or AutoCAD 2000/LDD2 formats.

GIS Map Products

(1) Reconnaissance-level fluvial geomorphology and channel classification of the upper Yellowstone River from Gardiner to Springdale Montana.

This GIS product consists of several themes (map layers) delineating physical channel features (for example, channel, gravel bars) and geomorphic channel classification (1:24000- to 1:12000-scale).

(2) Reconnaissance-level historical channel changes of the upper Yellowstone River from Gardiner to Springdale, 1948 to1999.

This GIS product consists of several themes that delineate channel features (for example, channel, gravel bars) in the study area at successive points in time (1948, 1977 or 1980, and 1999) and describe lateral channel changes (1:24000-scale)

(3) Fluvial geomorphology and channel characteristics of the upper Yellowstone River from Point of Rocks to Mission Creek.

This GIS product consists of several themes (map layers) that describe the fluvial geomorphology of the river and flood plain (1:6000- to 1:8000-scale).

(4) Historic channel changes of selected reaches of the upper Yellowstone River: Point of Rocks to Mission Creek.

This GIS product consists of several themes that describe historic channel changes based on photogrammetric mapping of historic aerial photos and selected channel segments of interest.

Photo 6. Geomorphology research team conducting bed and bank material characterization (pebble counts), summer 2000.

3. HYDROLOGY AND HYDRAULIC ANALYSIS

Title: Analysis of Hydraulic Characteristics, Flood Plain Delineation, and Sediment-Transport Investigations for the Upper Yellowstone River from near Gardiner to Mission Creek in Park County, Montana

Principal Investigators: Steve Holnbeck (Hydraulic Engineer), Chuck Parrett (Supervisory Hydrologist)
US Geological Survey, Water Resources Division
Montana District Office, Helena Montana

Other Participants: Dave R. Johnson (Senior Hydrologic Technician). Other staff within the Montana District as required, and USGS technical experts outside the District on a consultation basis.

Goal: Analyze the potential effects of river management and bank stabilization alternatives on sediment load, channel geometry, streambed profiles, and water surface elevations.

Objectives:

1. Obtain channel geometry data at approximately 140 cross sections for the reach from Point of Rocks to the mouth of Mission Creek.
2. Delineate 100-year flood limits from Gardiner to Springdale. For the reach from Point of Rocks to Mission Creek, delineate the 100-year flood plain and floodway, and 500-year flood plain.
3. Perform hydraulic and sediment-transport modeling to estimate relative changes in channel geometry, streambed profiles, and water surface elevations resulting from different sediment loads and water discharges.

Progress: River cross-section surveying is essentially completed. Suspended and bed sediment sampling is essentially completed. High-flow, medium-flow, and low-flow water-surface profiles have been completed.

Future Work: The scope of project has been revised somewhat because of the unavailability of detailed topographic mapping. The USGS will delineate flood limits from just below Carter Bridge to Gardiner. We also will complete flood plain portions of stream cross sections for the reach from Carter Bridge to Pine Creek Bridge, the area where sediment-transport modeling was conducted. Sediment-transport modeling will be undertaken in FY 2001. Flood plain mapping will begin as soon as detailed topographic mapping of the flood plain becomes available. Some additional river cross sections may be required, based on initial calibration of the hydraulic model.

Projected Completion Date: All aspects of the USGS contribution are to be completed in FY 2003.

Products: Two USGS Water-Resources Investigations Reports will be published. One will be a map report showing flood limits and a hydraulic floodway. One will describe the sediment-transport modeling for the Carter Bridge to Pine Creek Bridge stream reach.

Photo 7. USGS research team collecting sediment load data.

4. RIPARIAN TREND ANALYSIS

Title: Temporal Patterns of Channel Migration, Fluvial Events, and Associated Vegetation Along the Yellowstone River, Montana

Principal Investigators: Dr. Michael Merigliano (Riparian Ecologist)
University of Montana, School of Forestry, Missoula Montana

Other Participants: Mary Louise Polzin, John Corkery
University of Montana, School of Forestry, Missoula Montana

Goal: Determine relationship between fluvial geomorphic processes and flood plain vegetation.

Objectives:

1. Determine flood plain turnover rate and stratify by geomorphic setting. Incorporate Hydrogeomorphic Model (HGM) data and methods where appropriate.
2. Relate the magnitude and frequency of flow events to flood plain erosion and deposition (turnover) and associated cottonwood patches.
3. Incorporate the influence of ice drives on vegetation and flood plain dynamics.
4. Characterize the age distribution of the forest along the study area and cottonwood patches that comprise the forest.
5. Assess cottonwood longevity and limitations (that is, clearing, natural mortality, and flood plain erosion).
6. Create maps of channel migration history and existing flood plain vegetation.
7. Use information on historic changes and hydraulic and geomorphic factors to evaluate cumulative effects of bank stabilization projects.

Progress: Tree aging was the dominant task for fieldwork, which began in June and extended into late August 2000. About three hundred trees were aged. All of the cores are mounted and prepared for counting, and about three-quarters of them have been counted. Cottonwood tree ages serves as a clock for the age of the flood plain. We concentrated on the braided reaches above Livingston, where we completed eight sample sections. Each section is 183.65 acres and includes the flood plain and wetted channel.

Describing the riparian vegetation for wildlife habitat purposes was another activity this summer. About 90 percent of the sample areas aged (see above) was mapped and described. The upper, terrace confined reach from Point of Rocks to Mallard Rest was observed for possible mapping. This area is relatively simple and a map is probably not necessary.

We obtained about 20 historic photographs dating from 1971 to the early 1920s. Some of these have been retaken or the sites visited. Smokey conditions and logistics prevented retaking all of them. Most of the photo points (where the photographer stood) and scenes have been located in general to begin gaining landowner access for photography next year.

Some reconnaissance work relating understory shrub species composition to soil texture was done. There is an apparent relationship, but more detailed work is needed to bear this out. This is not a specific task in the scope of work, but is related to the wildlife component. Shrubs are important for bird habitat and the potential for the Yellowstone flood plain is related to hydrology, climate, and soils.

Future Work: Age mapping and sample design for the age-structure sampling are the primary tasks for this winter. More tree aging is slated for next year; we hope to get three more sample sections in the braided reach. Other sampling will be in more confined reaches.

Most tree aging will be for flood plain aging, while some will be for determining the age structure of cottonwood stands themselves. Typically, cottonwood patches are even-aged (nearly all trees establish at once on a flood plain surface, usually after a large flood). Some stands appear to be uneven aged due to sprouting and an unknown process. The spatial arrangement and age of trees should provide for determining what that process is. The vegetation mapping will continue in new sample areas, and will be adapted as needed for the wildlife study. So far, what has been done for the wildlife study is still useable even though the potential investigator has changed. As the wildlife study progresses and if soil and plant relations become important, we could pursue the plant:soil relations further. More historic photos are available and these will be ordered and retaken along with the ones at hand.

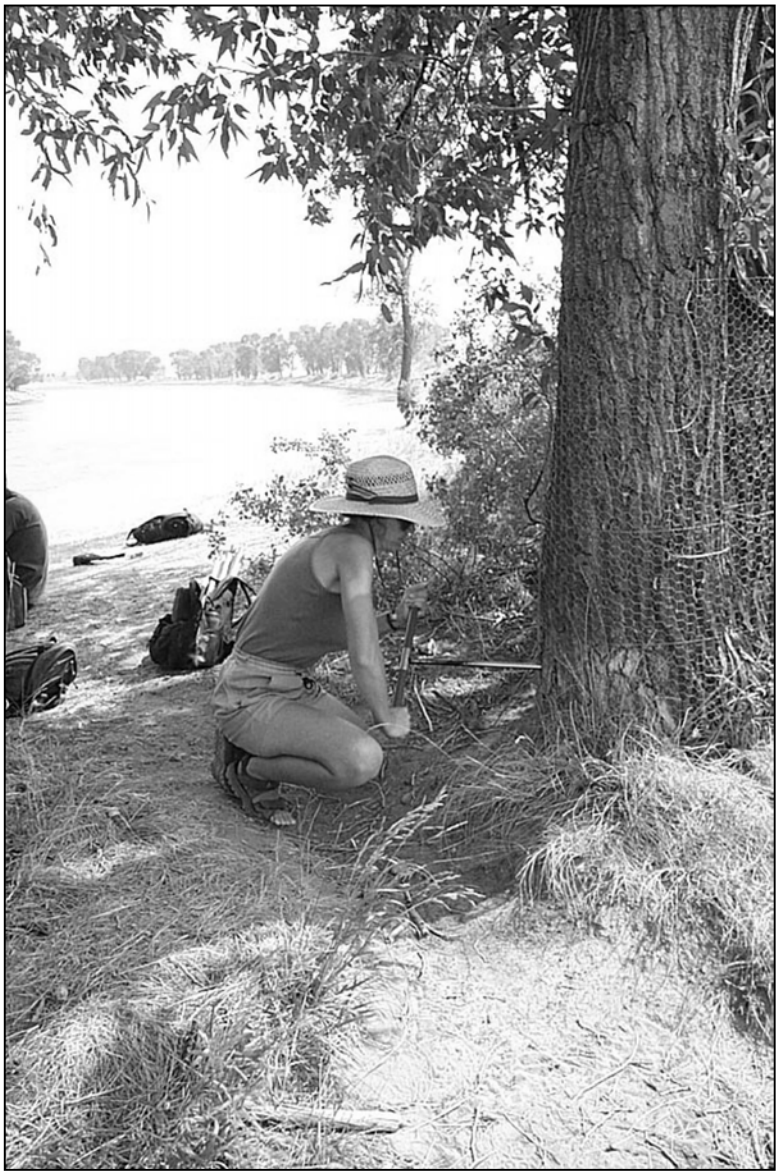


Photo 8. Riparian Trend Analysis team member collecting cottonwood tree cores, summer 2000.

Projected Completion Date: Most of the aging should be completed in summer 2001 with analysis ongoing until December 2001. We should have foundation information and a preliminary model by this time, but thorough integration with all other studies and adapting results for permitting purposes extend beyond 2001.

Products:

1. Maps showing existing vegetation and cottonwood patch age classes.

2. Age distribution of cottonwood forest.

3. Flood plain turnover rates (based on a decay curve of flood plain age by area derived from #2 for lower reaches below Emigrant). The upper reaches may not have an extensive true flood plain and the turnover concept will be modified accordingly.

4. The relation between flow events and cottonwood establishment, and the influence of ice drives.

5. Data (field maps and notes) on existing vegetation community types, and wildlife habitat variables (to be determined). This depends on the wildlife study, which is still in development.

6. Assessment of cumulative effects of bank stabilization projects incorporating the results of hydraulic modeling and flood plain dynamics. The frame of reference will be the channel migration rate and associated cottonwood forest age distribution under conditions as close to natural as possible.

5. FISHERIES ANALYSIS

5A. Fish Populations Study

Title: Comparative Use of Modified and Natural Habitats of the Upper Yellowstone River by Juvenile Salmonids

Principal Investigators: Dr. Alexander V. Zale (Assistant Unit Leader)
Montana Cooperative Fisheries Research Unit, US Geological Survey
Montana State University, Department of Biology, Bozeman Montana

Thomas E. McMahon (Professor of Fisheries Management)
Montana State University, Department of Biology, Bozeman Montana

Other Participants: Adam Craig (Graduate Research Assistant)
Montana Cooperative Fisheries Research Unit, US Geological Survey
Montana State University, Department of Biology, Bozeman Montana

Montana Department of Fish, Wildlife and Parks

Goal: Estimate to what extent bank stabilization, flow deflection, and flow confinement structures have changed aquatic habitat use by juvenile salmonids in the Yellowstone River.

Objectives:

1. Conduct a literature review and associated consultations of experts to summarize pertinent research and to guide the development of a sampling program using appropriate capture methodologies to assess fish abundances in habitats of the Yellowstone River at appropriate times of the year.
2. Compare seasonal use of altered and analogous unaltered main-channel margins (bank habitats) by juvenile salmonids.
3. Assess juvenile fish use of lateral side channels to determine the effects of disconnecting them from the main channel.

Progress: After completing a literature review in summer 2000, we began preliminary sampling. Our goal was to establish the most efficient sampling methods and study design. Our efforts were successful, and we developed a sampling methodology that we believe will achieve our research objectives. Routine sampling of juvenile fish populations began in fall 2000 and ceased after winter conditions caused the river banks to freeze.

Future Work: Routine sampling will recommence once the river banks are free of ice in 2001.

Projected Completion Date: 2002.

Products: Final report and presentation to the Task Force.

Photo 9. Fish Populations Study team electro-shocking fish.

5B. Fish Habitat Study

Title: Effects of Channel Modification on Fish Habitat in the Upper Yellowstone River

Principal Investigators: Lee Ischinger (Section Leader, Stream and Riparian Ecology)
US Geological Survey—Biological Resource Division, Fort Collins Colorado

Other Participants: Zack Bowen (Fisheries Biologist)
Ken Bovee (Hydrologist)
Jim Terrell (Fish and Wildlife Biologist)
Terry Waddle (Hydrologist)
US Geological Survey, Fort Collins Colorado

Goal: Determine whether certain types of channel modification are potentially more detrimental to fish populations than others.

Objectives:

1. Quantify the relative severity of impacts of different types of channel modifications.
2. Identify potential linkages between critical habitat types and fish populations. Such knowledge may help guide regulatory agencies and riparian landowners toward management practices that meet the dual objectives of protecting property and minimizing impacts to fisheries.
3. Provide baseline data for evaluating future changes in the river corridor.

Study Overview

This study will intensively examine relatively compact sites (generally less than 1 kilometer) affected by different types of modification (including no modification) within the reach from Carters Bridge to Mission Creek. In this study, the unaltered reaches will serve as experimental controls. Treatments will consist of sites affected by various types of channel modification.

Two-dimensional habitat maps will be developed for the entire segment from Carter Bridge to the confluence of Mission Creek (approximately 11 kilometers) for the same range of flows examined in the Fish Populations investigation. It may be necessary to expand the segment slightly above Carters Bridge to capture a sufficient sample of unaltered channel. Therefore, time and cost estimates are based on an aggregate mapping length of 15 kilometers.

Habitat map development will entail bathymetric data collection, two-dimensional hydraulic modeling, and geospatial mapping. Physical data requirements of the hydraulic model include a three dimensional bathymetric map of each study site, a bed material map, and certain flow-related boundary conditions. We will employ global positioning system (GPS) and standard surveying techniques to establish elevation control and standard stream gaging techniques to determine discharge. We will obtain planform locations using GPS, depths by hydroacoustic sounding, and bed material types by post processing and analysis of hydroacoustic signals. In addition, we will delineate locations of large structural cover features (for example, tree snags and undercut banks) for inclusion in the habitat maps. For areas above the water surface we will incorporate the 1:6000 scale-digitized photogrammetry data being developed by the Corps in cooperation with the DNRC and USGS (Montana District). By combining overbank topography and in-channel bathymetry in a single bed file, accurate quantification of off-channel habitat (such as, overflow channels on flood plains and tributary mouths) is made possible. This is particularly important when quantifying fish habitat availability under flood conditions. These simulations may also be useful to other study components and will be made available to other investigators in this project.

A geographic information system (GIS) will be used to assemble the different data layers and transform field bathymetric data into a finite element mesh for flow simulation. We will use a finite element, depth averaged two-dimensional (2-D) hydrodynamic model to simulate depths and velocities over a range of discharges at each site. There are several advantages of using the 2-D approach in this study. The habitat models will be far more accurate in complex channels, which are not represented well with one-

dimensional hydraulic models. The 2-D models will provide a more detailed and realistic depiction of the velocity distribution in the channel and on the floodplain. Similar accuracy may be achieved with a one-dimensional (1-D) model, but at the expense of a tremendous amount of empirical data collection, which would probably be cost-prohibitive. Two-dimensional models can depict the flow patterns around islands, gravel bars, and obstructions (such as jetties) as vectors. This depiction enables investigators to identify the formation of eddies or currents impinging on erodible banks. It is virtually impossible to achieve the same type of results in complex channels with a 1-D model. Polygonal features such as off-channel backwaters can be described more accurately in 2-D. Perhaps the most important product of the 2-D model, however, is that it results in a picture of what the site looks like at different discharges.

As part of the Fish Populations Study, MTCFRU is proposing to sample fish populations seasonally at numerous sites within the Carters Bridge to Boulder Road segment. Included in the fish population data will be such information as habitat use, relative abundance, and age structure of trout, mountain whitefish, dace, and suckers. This information will be key to the determination of critical habitat types. Relative abundance data alone may help delineate critical habitat types. The seasonal sampling regime may be used to account for fish movement from site to site. If fish movement can be related to the appearance or disappearance of certain habitat types, supporting evidence may be provided regarding the importance of those habitats.

Habitat maps for each of the MTCFRU sampling locations will be constructed for 8 to 12 discharges, encompassing the same range of discharges examined under the Fish Populations Study. Maps for the same discharges that were present during fish sampling will be included. Generalized habitat suitability criteria developed through the MTCFRU literature review will be used to define habitat classes based on depth, velocity, substrate, and cover. Once habitat maps have been developed for the entire segment, site maps corresponding to the MTCFRU sampling sites can be parsed from the segment map. A spatial pattern analysis using the FRAGSTATS program will be performed on each site map. FRAGSTATS produces a plethora of spatial statistics such as class area, mean patch size, interspersion, and habitat diversity. We will coordinate with MTCFRU to select the appropriate metrics for this analysis.

Relationships between relative abundance of the target species or other biological metrics and site-specific habitat characteristics will be analyzed cooperatively with MTCRFU. Our goal will be to identify key habitat features that are associated with various population attributes. We will employ habitat time series analysis in this step as well, but we will confine the analysis to the most recent five-year period. We assume that the events shaping the age structure and relative abundance of fishes will have occurred during this most recent time period. Once these key habitat features have been identified, they will be used to describe the relative impacts of different channel modification activities. These relative impacts will also be analyzed by habitat time series. However, under the Fish Habitat Study, we propose to sample year-types from the period of record rather than using the entire record. This will result in a comparison of habitat characteristics between control and treatment under the hydrologic conditions of a dry year, a normal water supply, or a wet year, for example.

Progress: As of December 2000, the USGS-BRD and Corps are finalizing an interagency agreement for accomplishment of this study. The principal investigators are prepared to commence coordination with the TAC upon transfer of funds. The target for involvement is February 2001.

Future Work: Coordination, scoping, and acquisition of existing data sets from cooperators will be accomplished during winter/spring 2000-2001. Fieldwork will be conducted during summer 2001.

Projected Completion Date: September 30, 2002.

Products: A GIS database: habitat maps, photos, and fish sampling data. A project completion report detailing the findings of this work.

6. WILDLIFE ANALYSIS

Title: Riparian Habitat Dynamics and Wildlife along the Upper Yellowstone River

Principal Investigators: Dr. Andrew Hansen (Associate Professor of Ecology)
Dr. Jay Rotella (Ecology Department Head, Associate Professor)
Montana State University, Bozeman Montana

Objectives:

1. Estimate the current spatial distribution of abundance of individual bird species and community diversity in riparian forest habitats along the upper Yellowstone River.
2. Determine the accuracy of the estimates of bird abundance and diversity.
3. Quantify the relative influence of channel characteristics (geomorphology and hydrology) and riparian vegetation (structure, composition, and spatial pattern), on bird species abundances and community diversity.
4. Estimate change in bird abundances and community diversity from 1950 to 2000 based on channel characteristics and riparian vegetation.
5. Estimate the relative importance of current riparian forests for wildlife in the context of the upper Yellowstone Watershed.

Goal: This study will consider the cumulative effects of riparian habitat dynamics on riparian avifauna, often used as indicators of habitat integrity for wildlife.

The study will take advantage of the extensive research that the Investigators have conducted on birds and vegetation in the neighboring Gallatin, Madison, and Henry's Fork Watersheds. Over the past six years, field surveys of birds, shrubs, and trees have been done at more than 100 sites across a range of cover types and elevations. Statistical models were then used to map the abundance of species over these watersheds based on cover type, parent material and elevation. In the proposed study, the statistical models for birds will be applied to the Yellowstone watershed and then field surveys will be used to quantify the accuracy of the predictions.

The study will focus on birds because:

1. Resources will not allow adequate sampling of all vertebrate species,
2. Birds can be sampled more cost effectively than other vertebrate species,
3. The large number of bird species that can be sampled (>100 species) allows this group to be good indicators of how habitat changes are likely to influence other vertebrate groups.

Methods:

Objectives 1 and 2. Current bird distribution and validation.
Statistical models developed for riparian forest bird species in the Gallatin, Madison, and Henry's Fork watersheds will be use to predict bird species abundances (for >50 species) in the Yellowstone Study Area. Point counts of bird abundance will be conducted at 25 sites in the study area during each of two breeding seasons. The results of the field surveys will be used to validate and, if necessary, improve, the habitat functions. Bald eagle breeding and winter distributions will also be mapped based primarily on data from previous studies.

Objective 3. Influence of channel, vegetation, and land use on birds.
The extent to which bird species abundances vary with channel and vegetation characteristics will be determined by statistical analysis. Data on the current distribution of the predictor variables will be obtained from the other studies of hydrology and riparian vegetation being conducted in the study area.

Multiple regression and mixed models will be used to evaluate the relationships between birds and the predictor variables. Mixed models evaluate the relationship between a response variable and fixed and random predictor variables. Fixed variables are those that meet the assumptions of independence. Random variables are not assumed to be independent; hence the method is attractive when samples are spatially or temporally correlated. We have found in previous analyses of biodiversity that samples close

in space or measured repeatedly over time are correlated. Hence we will control for this correlation by considering spatial location and time periods as random variables.

Models based on channel, vegetation, and land use variables will be evaluated and "best" models selected based on Akaike's Information Criterion and parsimony. The results will reveal the relative strength of each of these classes of predictor variables in explaining variation in bird species. We will also use the results to better extrapolate bird species abundances over riparian forests in the study area based on channel and vegetation characteristics.

Objective 4. Bird change: 1950 to 2000.
The habitat functions generated above will also be used to predict change in bird abundance at decadal intervals from 1950 to 2000, based on change in the predictor variables. The results will reveal the trajectories in species abundances over time and will provide important information for future floodplain, riparian, and channel management decisions.

Objective 5. Watershed context.
An important criterion for evaluating bank stabilization and other channel characteristics is the importance of riparian vegetation along the river in the context of the entire Yellowstone watershed. We will use the habitat functions developed in previous studies and in this study to map bird distributions over the upper Yellowstone watershed from riparian habitats up in elevation to subalpine habitats. We will analyze these maps to determine what percentage of each bird species population is present in riparian forest along the Yellowstone River.

Progress: The Task Force approved the wildlife proposal in December 2000.

Future Work: The study will be conducted over a two-year period starting in January 2001. Data collection will be accomplished from May to July 2001 and 2002 at 25 sample sites within the Study Area.

Projected Completion Date: December 2002.

Products: Final report. Final presentation to the Task Force.

Photo 10. Upper Yellowstone River flood plain.

7. SOCIO-ECONOMIC ANALYSIS

7A. Broad Economic Analysis

Title: Economic Analysis of the Upper Yellowstone River Study Area

Principal Investigator: Tim Bryggman (Economist)
Water Management Bureau, Montana DNRC, Helena Montana

The Socio-Economic Subcommittee, initiated a preliminary effort to collect and analyze data that would be useful in developing a socio-economic portrait of the study area. The results of this effort were presented to the Task Force on July 18, 2000. Some of the findings included:

Population—The population of the study area (15,982) can be characterized as growing steadily—due largely to immigration—but at a declining rate, becoming increasingly rural, and aging.

Housing—The number and percentage of housing units for seasonal and recreational use have been increasing at rates greater than those for the entire state.

Educational Attainment—The percentages of high school and college graduates in the study area have increased over the last thirty years and are comparable to those of the entire state.

Employment—Generally, the unemployment rate exceeded the state rate from 1970 to 1990, but has been lower than the unemployment rate for the entire state during the 1990s. Employment has been increasing in construction and retail trade and decreasing in government and among farm and non-farm proprietors. Compared to the rest of the state, employment is proportionately greater in services and retail trade and less in government. The vast majority of Park County workers work within the county and the number of workers commuting between Gallatin and Park Counties are about equal.

Income—Median household income is less than that for the state and is declining in real terms. Per capita income is less than that for the state, ranks 28th among Montana's 56 counties, and is increasing in real terms at a rate slower than for the entire state. The number of families below the poverty line is comparable to the state level and is increasing at a slower rate than that of the state. The percentage of households headed by females is comparable to the state level although the percentage is significantly higher in Livingston. The percentage is increasing rapidly in Park County outside of Livingston. The study area relies less on labor and more on dividends, interest, rent and retirement for income than the rest of the state by about seven percent. Earnings are derived less from federal and state government and more from services compared to the rest of the state. Construction and manufacturing are the most rapidly growing sources of earnings; mining is declining most rapidly. Park County ranks 36th for wages and lags behind the state average by $4,000. Sectors providing the highest average wages are mining and federal government; sectors providing the lowest average wages are retail trade and services.

Business Establishments—Two-thirds of business establishments in the study area employ fewer than five workers, and five businesses employ more than one hundred. Services and retail trade are the sectors with the largest number of business establishments.

Agriculture—The top commodities in the county are cattle and hay. Of the $24 million in cash receipts in 1997, $18 million was for livestock. Park County ranked 25th each for total cash receipts and for livestock sales. In the 1990s, the number of farms increased and the number of total and irrigated acres decreased.

Public Services and Finances—The total taxable value of property in Park County is $29 million, half of which is derived from residential property. Of the $12.7 million in taxes levied, 40 percent was directed toward local schools.

Tourism and Recreation—In 1995, one-third of Montana's 3.4 million visitors passed through and spent

$25 million in Livingston. Visits to Yellowstone National Park's north entrance averaged over one half million between 1988 and 1999. Fishing pressure in 1997 exceeded 56,000 angling days, nearly two-thirds by Montana residents.

Projected Completion Date: Spring 2001.

Product: Final report.

7B. Socio-Economic Assessment

On November 15, 2000, the Task Force Socio-Economic Subcommittee (with full Task Force approval) advertised a Request For Proposal (RFP) to develop a socio-economic assessment for the upper Yellowstone River in conjunction with the overall cumulative effects study. The intent of this assessment is to inform the Task Force about economic, social, and cultural conditions and trends, and provide information useful in defining important policy, regulatory, and management issues.

Objectives:

1. Develop an economic portrait for the study area.
2. Provide a social assessment of the study area.
3. Identify trends in economic and social values and conditions.

This assessment will be accomplished by:

- Developing an understanding of the interactions between people and land uses, particularly the agriculture, recreation, scenic, and cultural dimensions relative to past and proposed resource management.
- Identify stakeholders, their concerns, and needs.
- Describing the people who either live or have an interest in the watershed.
- The final study draft will be presented to the Task Force, agency partners, and the general public.
- At a minimum the assessment should address:
  - Population characteristics
  - Community and institutional structures
  - Political and social resources
  - Individual and family changes
  - Community resources
- Contractors should seek to use both qualitative methods and quantitative methods to provide thorough assessment.

Overview of Socio-Economic Assessment Phases I and II:
The overall Socio-Economic Assessment will be approached in two phases. Phase I will be conducted by the Task Force. Phase II will be conducted by the Corps. The two phases provide distinctly different products and have different focuses. They are, however, linked and Phase II will build upon information gathered in Phase I. The data collected in Phase I will be presented and packaged in a format that allows for a logical progression into Phase II.

Phase I: Socio-Economic Foundation

Step 1 Description of Socio-Economic Environmental Setting:
The first step is to assemble pertinent data and information that will enable a description of the environmental setting to be articulated in terms of various selected economic factors. The final selection of these factors is expected to be a collaborative effort with the various federal, state, and local agencies and the Task Force. A description of the socio-economic environmental setting should take into consideration such factors as population characteristics, community and institutional structures, political and social resources, individual and family changes, community resources, environmental impacts, and emerging trends.

Step 2 Identification of Vital Socio-Economic Factors:
The purpose of this step is to identify socio-economic factors that represent vital elements relative to the human environment within the study area and river corridor. This would involve public meetings, surveys, and other activities that will (a) assess stakeholder issues, (b) solicit public input, and (c) analyze the data collected.

Phase II: Cumulative Effects of Bank Stabilization Projects

The Corps adds a fourth objective to the assessment, which is to:
Assess direct and indirect cumulative effects caused by the aggregate past, present, and reasonably foreseeable future proposed actions created or contributed to by bank stabilization projects.

With regard to socio-economics, the Corps has a narrower focus than the Task Force. The Corps is primarily concerned with impacts to the river corridor and flood plain (including environmental, aquatic, wildlife and riparian impacts) caused by bank stabilization. The Corps is charged with following the NEPA process in coming to some conclusions regarding a Special Area Management Plan (SAMP) for the upper Yellowstone River.

Areas of special concern to the Corps are changing land use and bank stabilization projects, and how they have been impacted by growth in the area; and how that in turn is impacting the Yellowstone River flood plain and related aquatic and riparian environments. A related social concern is land ownership, particularly individual owner rights to use the land, versus the interest of the public in the overall physical/biological health of the Yellowstone River.

The two-part RFP would allow the Corps to do the more in-depth work with regard to bank stabilization and the analysis of the impacts of various bank stabilization scenarios on any identified vital environmental and socio-economic issues.

Financial Statement

As is stated in Executive Orders 19-97 and 8-99 (see *Appendices B* and *C*) the Task Force is directed "... to seek or encourage others to seek grants, funds or other cooperative arrangements to implement recommendations of the Task Force… ." As we have done in 1998 and 1999, the Task Force has actively pursued funding for the upper Yellowstone River assessment in 2000. We have been successful in securing funding to continue supporting our Task Force Coordinator, in addition to funding portions of the cumulative effects studies.

Table 2 summarizes our project budget status, as of December 31, 2000. The table shows all costs associated with the primary components of our project, from their initiation to the development of management recommendations. In addition, this summary table also shows projected or estimated costs for future project actions.

The Task Force benefits greatly from strong partnerships with a wide array of organizations and agencies. Many community members; local, state, and federal governmental agencies; and academics have generously donated technical support and assistance in each and every phase of project development and implementation. The $735,962 in-kind and match total shown in *Tables 2* and *3* (more than 33 percent of our entire project budget) illustrates just how monumental these contributions have been and will continue to be for the Task Force. Further, those tables include only documented contributions; many local citizens and technical experts have donated hundreds of hours to the project informally, without documentation. We can do little more than to give them our sincere thanks and recognize their efforts in this report. Finally, *Tables 4a* and *4b*, address secured and pending sources of funding, respectively.

Table 2. Governor's Upper Yellowstone River Task Force Budget Summary

This table summarizes real and estimated (**) costs associated with Task Force activities from inception to management recommendation development. The overall project involves three project components: (1) Project Coordination and Administration, (2) Baseline Data Acquisition, and (3) Data Synthesis and Recommendation Development.

Component / Task	Costs and Appropriated Funding (Dollars)			
	Grant Funding	Match or In-Kind Contribution	Other Funding Sources	Total
Project Coordination and Administration[1]				
Park Conservation District Administration (8/10%)	24,000 (RDGP) 2,944 (319 #1) 4,268 (319 #2) *4,000 (319 #3)	0	0	35,212
Task Force Administration (office, materials) and Task Force Coordinator (all duties)	22,500 (RDGP) 37,056 (319 #1) 53,732 (319 #2) *40,000 (319 #3)	42,999 (TF) 16,000 (State) 33,333 (DNRC)	** 120,000	365,620
Technical Support / Overall Project Strategy	0	0	59,000 (Corps)	59,000
Subtotal	**188,500**	**92,332**	**179,000**	**459,832**
Baseline Data Acquisition[2]				
Physical Features Inventory	2,100 (WPA)	1,200 (PCD) 8,000 (NRCS)	25,700 (Corps) 7,015 (TF/State) 7,000 (NRCS)	51,015
Aerial Photography	10,000 (HB223)	11,060 (TF)	4,500 (State)	25,560
Geomorphology and Historic Channel Changes and Topographic Mapping	49,700 (RDGP)	172,670 (DNRC)	157,000 (Corps)	379,370
Hydraulic Analysis	108,250 (RDGP)	168,250 (USGS)	60,000 (MDT) 6,500 (Corps)	343,000
Riparian/Wetlands/Land Use Mapping (NWI)	0	19,500 (USFWS)	58,916 (Corps)	78,416
Riparian Trend Analysis	94,993 (RDGP) 6,500 (HB223)	0	** 14,407	115,900
Fisheries Analysis Fish Populations Study Fish Habitat Study	 0 0	 0 205,000 (USGS)	 97,536 (Corps) 200,000 (Corps)	 97,536 405,000
Watershed Land Use Assessment	10,000 (WPA)	40,000 (NRCS) 7,950 (GIAC)	0	57,950
Wildlife Analysis	0	10,000 (USFWS)	100,000 (Corps)	110,000

Table 2 continued

Component / Task	Costs and Appropriated Funding (Dollars)			
	Grant Funding	Match or In-Kind Contribution	Other Funding Sources	Total
Socio-Economic Assessment	0	0	** 100,000 (Corps)	** 100,000
Subtotal	**281,543**	**643,630**	**838,574**	**1,763,747**
Data Synthesis and Recommendation Development[3]				
Synthesis of Data, All Studies				
Management Option Development				
Management Recommendation Development				
Subtotal	**?**	**?**	**?**	**?**
Total Project Costs	**470,043**	**735,962**	**1,017,574**	**2,223,579**

[1] Budget projections for this component are based on a four-year project duration beginning July 1, 1999.
[2] Baseline Data Acquisition component initiated in 1999 and targeted for conclusion in 2002.
[3] Synthesizing data from all of the studies will begin in 2001, as results from preliminary studies are available. This process will provide the basis for management recommendation development. Costs associated with these activities are unknown at present.

** = Estimated cost of activity.
* = Pending funding source.
State = contributions from Montana DEQ, MDT, FWP.
RDGP = Reclamation and Development Grant Program
WPA = DNRC Watershed Planning and Assistance Grant
DNRC = Department of Natural Resources and Conservation
MDT = Montana Department of Transportation
USFWS = US Fish Wildlife Service
Corps = US Army Corps of Engineers
PCD = Park Conservation District
319 = DEQ Section 319 Water Quality Grant
HB223 = DNRC House Bill 223 Grant
NWI = National Wetland Inventory
USGS = US Geological Survey
NRCS = Natural Resources Conservation Service
GIAC = Geographic Information Analysis Center
TF = Task Force

Table 3. Governor's Upper Yellowstone River Task Force In-Kind and Match Contributions
This table lists documented in-kind and match contributions made in support of the Upper Yellowstone River Cumulative Effects Investigation to date (December 31, 2000).

Contributor	Estimated Contribution (Dollars)	Study/Activity
Geographic Information and Analysis Center, MSU	7,950	Watershed Land Use Assessment
Park Conservation District	1,200	Physical Features Inventory
Montana State Agencies DEQ, FWP, MDT	16,000	Coordination/Education/Administration
Montana DNRC	33,333	Coordination/Education/Administration
	172,670	Geomorphic Analysis
NRCS	8,000	Physical Features Inventory
	40,000	Watershed Land Use Assessment
Task Force	42,999	Project Coordination and Administration
	11,060	Aerial Photos
US Fish and Wildlife Service	19,500	Riparian/Wetlands/Land Use Mapping
	10,000	Wildlife Analysis
USGS, Biological Resources Division	205,000	Fish Habitat Study
USGS, Montana District	168,250	Hydraulic Analysis
Total In-Kind Contribution	**735,962**	

Table 4a. Governor's Upper Yellowstone River Task Force Secured Funding Summary.
This table illustrates secured funding by source (grant or agency), and how much of that funding has been spent to date (December 31, 2000).

Source	Activity/Study	Date Completed	Total Funding Allocated (Dollars)	Funding Spent (Dollars)
Watershed Assistance Grant Montana DNRC	Coordination Initial Assessment	6-30-99	2,100	2,100
HB 223 Conservation District Grant Montana DNRC	Aerial Photography	7-30-99	10,000	10,000
Riparian/Wetlands Education Grant Montana DNRC	Hydrologic Response to the 1988 Fires Workshop	6-30-00	1,000	960.99
Section 319 Water Quality Grant (#1) Montana DEQ	Task Force Coordinator	9-30-00	40,000	40,000
Quick Response Funding Program US Fish and Wildlife Service	Literature Search and Species Prioritization (USGS-BRD)	12-15-00	10,000	10,000
Task Force Start-Up Grant Montana DEQ	Aerial Photography Task Force Administration	NA	49,138.00	25,537.83
Reclamation Development Grant Program (RDGP) 1999 Montana State Legislature		NA	299,443	170,273.68
	Geomorphic Analysis (DNRC)		49,700	
	Hydraulic Analysis (USGS)		108,250	
	Riparian Trend Analysis (U of M)		94,993	
	Task Force Project Coordination		22,500	
	Grant Administration (PCD)		24,000	
US Army Corps of Engineers Budget Allocation: Fiscal Year 1999 = 372,000 Fiscal Year 2001 = 650,000	Physical Features Inventory	NA	25,700	125,500 Approximately
	Hydrology Start-Up		6,500	
	Riparian/Wetlands/Land Use Ma		31,008	
	Fisheries Analysis			
	Fish Populations Study		97,536	
	Fish Habitat Study		200,000	
	Topographic Mapping		157,000	
	Wildlife Assessment		100,000	
	Socio-Economic Assessment		100,000	

Table 4a continued

Source	Activity/Study	Date Completed	Total Funding Allocated (Dollars)	Funding Spent (Dollars)
Section 319 Water Quality Grant (#2) Montana DEQ	Task Force Coordinator and Office	NA	58,000	7,404.66
Local Government Start-up Grant Program Environmental Systems Research Institute (ESRI)	GIS Software, Arc View program for Task Force Office	NA	5,000 Estimated value	NA
HB 223 Conservation District Grant Montana DNRC	Riparian Trend Analysis	NA	6,500	0
Watershed Planning Assistance Grant DNRC	Watershed Land Use Assessment	NA	10,000	6,517.03

Table 4b. Governor's Upper Yellowstone River Task Force Pending Sources of Funding.
This table illustrates sources of funding that were applied for in 2000 and are still pending as of December 31, 2000.

Source	Activity/Study	Total Funding Requested (Dollars)
Section 319 Water Quality Grant (#3) Montana DEQ	Task Force Coordinator and Coordination of Cumulative Effects Investigation	44,000
Federal Unified Watershed Approach Program Bureau of Land Management	Non funded studies Data Synthesis	NA

Collaboration and Partnerships

Partnerships and Contributions

The Task Force takes very seriously our charge to establish partnerships and to provide enhanced communication amongst the diverse groups who are concerned about the upper Yellowstone River. We have continued to expand our partner base every year for the past three years, and presently collaborate with more than 200 individuals and 40 organizations.

Community-led, private/government collaborations such as our assessment of the upper Yellowstone River provide an ideal approach to watershed management, especially in times when cost efficiency is vital. Diverse groups have come together to work as a team, and to share information and resources. Community members are empowered and given an opportunity to be a part of the management of their watershed. Simultaneously, regulatory agencies and academics work alongside local citizens, helping to guide the process in a scientifically sound and realistic fashion. Ultimately, management recommendations will be understood and supported by the community, and have practical application for regulatory agencies.

Perhaps our most important cooperators in this endeavor are the landowners within the Upper Yellowstone River Basin. We could not accomplish a scientifically based investigation without their support and trust. It has been landowner cooperation and assistance that has made this past year so successful. More than 250 private landowners have allowed four Task Force research teams to access their property and to collect data this past year. Three teams collected data in the river corridor, while the land use study team sampled areas throughout the entire watershed. The vast majority of those sample sites were on private property. Providing that access has allowed the Task Force to collect defensible baseline data that accurately represents the entire Study Area.

Significant contributions have also been made by partner agencies within the Task Force structure. A summary of those contributions is shown in *Tables 2* and *3* in the previous section. Additional examples that further demonstrate these positive and cost-effective partnerships include:

US Army Corps of Engineers (Corps)— At the request of the Montana congressional delegation, Congress directed $320,000 in FY 1999 expenditures for the Corps to develop a Special Area Management Plan (SAMP) for the upper Yellowstone River. Specific language within the appropriations stated that as part of the SAMP, the Corps would assess the long-term effects of bank stabilization, fully coordinate with the Task Force, and potentially conclude the process with a general permit. In a further show of support for the project, the Montana delegation helped to direct an additional $650,000 in Congressional expenditures to the Corps in FY 2001. This money will be allocated toward technical studies, data synthesis, cumulative effects analyses, and support to the Task Force in the development of river corridor management recommendations.

The Corps has supported the Task Force and served as a cooperating agency for federal/state technical studies over the past three years. Members of the Corps' staff serve as an ex-officio member of the Task Force, as members of the TAC, and as research team members. In 2000, the Corps provided crucial technical assistance in the development of the Socio-Economic Assessment RFP.

In addition to their active research role, the Corps has provided or will shortly provide funding for the following activities:

Physical Features Inventory	Geomorphology Study / Topographic Mapping
Hydrology Analysis	Fish Habitat Study
NWI Wetland Mapping	Wildlife Assessment
Fish Populations Study	Socio-Economic Assessment

Natural Resources Conservation Service (NRCS)— The NRCS has greatly contributed to the Task Force effort over the past three years. The agency provided technical assistance and funding for the Yellowstone River Physical Features Inventory. The NRSC has also provided office space and operations support to the Task Force Coordinator. In 2000, the agency developed, provided technical support (project manager, field crews, and GIS expertise), and funded 80 percent of the Watershed Land Use Assessment.

Montana Department of Environmental Quality (DEQ)— The DEQ has played an integral support role to the Task Force effort from the beginning. A DEQ representative sits on the Task Force as an ex-officio member, and DEQ staff provide technical support as a major in-kind contribution to the project. Most importantly, the DEQ has been an invaluable source of funding for Task Force project administration and coordination: (1) Start-up Grant of $49,000, (2) 319 Grant #1 of $40,000 to support the Task Force Coordinator position, (3) 319 Grant #2 to continue funding the Coordinator, and (3) potentially, 319 Grant #3 to provide funding for the Coordinator and development of management recommendations.

Montana Department of Natural Resources and Conservation (DNRC)— The DNRC has made significant contributions to the Cumulative Effects Investigation since our inception in 1997. In addition to providing an ex-officio representative, DNRC has provided direct administrative and technical assistance in the form research leadership, coordination services, grant writing, and project management. The DNRC also staffs two positions on the TAC and is providing more than $200,000 in match and in-kind contributions to the overall project effort. The Task Force has been the recipient of several grants through the DNRC: (1) RDGP for $299,940, (2) HB223 Grant for $6,500, and (3) Watershed Planning and Assistance Grant of $10,000.

Montana Department of Transportation (MDT)— An MDT representative sits on the Task Force as an ex-officio member. The MDT provided funding for the1998 aerial photos used in the Physical Features Inventory. They also provided $60,000 of research funding to the Hydrology Study in 2000, which subsequently freed up funding for the Riparian Trend Analysis.

Park Conservation District (District)—A District representative sits on the Task Force as a voting member. The District functions as administrative support for the Task Force. All of our grants and contracting are sponsored by, and processed through, the District. The Task Force Coordinator is employed and co-supervised by the District Board, and the Task Force office is housed within the District.

Related Investigations in the Upper Yellowstone

The Task Force Cumulative Effects Investigation is a comprehensive, broad-scale, river corridor assessment, and pilot project. No other similar projects that duplicate this effort are being conducted in the watershed. Other investigations within the Upper Yellowstone River Study Area that have relevance to our project are briefly outlined below:

US Geological Survey (USGS)
The USGS, Montana District, has collected channel survey and hydraulic data on the upper Yellowstone River at the highway bridge upstream from Emigrant as part of an ongoing investigation of bridge-scour processes. The USGS also operates long-term streamflow-gaging stations on the upper Yellowstone River at Yellowstone Lake outlet, Corwin Springs, and Livingston.

The USGS is currently conducting a component of the National Water Quality Assessment (NAWQA) in the Yellowstone River Basin. The long-term goals of the NAWQA program are to describe the status and trends in the quality of a large, representative part of the nation's surface- and ground-water resources, and to provide a sound, scientific understanding of the primary factors affecting the quality of these resources. The Yellowstone River Basin is one of a set of NAWQA studies started in 1997 by the USGS. Planning, study design, and analysis of existing data occurred in 1997 and 1998. Starting in 1999, groundwater, surface water, and biological data are being collected intensively for three years. A low-intensity phase will follow for six years, during which time water quality will be monitored. This cycle will be repeated starting in 2007. This combination of high- and low-intensity monitoring phases allows examination of trends in water quality over time.

The USGS Biological Resources Division (in cooperation with the Montana Power Company and US Bureau of Reclamation) is nearing completion of an investigation of riparian vegetation and channel processes along the upper Missouri River in Montana. An extension of this work has been incorporated in the Riparian Trend Analysis of the Cumulative Effects Investigation.

Park County
Now in their second year of the study, Park County received grant funding to conduct an investigation on impacts of non-point source pollution on water resources in the Paradise Valley. The primary goal of the study is to develop an understanding of the physical hydrogeology of both the surface-water and ground-water systems in the Paradise Valley with enough detail to develop scientifically sound predictions of the impacts of future land use changes and development. The study will focus on the spring creek, Emigrant to Pray, and Glastonbury areas.

Natural Resource Conservation Service (NRCS)
The NRCS has conducted a flood-plain management study on a 21-mile segment of the Yellowstone River in Sweetgrass County (from Bridge School to Greycliff Bridge). The printing of a final report and maps is yet to be completed. The NRCS is actively pursuing flood plain conservation easements along the Yellowstone River and currently has two applications. The agency also conducted informational forums explaining both financial and technical assistance that is available to landowners along the Yellowstone.

Greater Yellowstone Coalition (GYC)

The GYC is developing a flood plain management report using 1999 digital orthophotos generated through the Task Force Cumulative Effects Investigation. One component of the Coalition's report identifies flood plain structures along sections of the river, and integrates that information with the digitized orthophotos. That data will be transmitted to the MSU Geographic Information and Analysis Center for development of GIS data layers. A final report is expected in 2001.

US Army Corps of Engineers (Corps)

The Omaha District of the Corps' (Regulatory Branch) involvement in the upper Yellowstone River studies is based upon the Congressional authorization to assess the long-term effects of bank stabilization. The Corps regulatory planning mechanism to accomplish this task, as recognized by Congress, is a SAMP. The SAMP process allows the Corps to assess all permitting issues in a river corridor or watershed context, as opposed to evaluating permits individually on a case-by-case basis. Given recent court decisions, this is particularly significant to landowners or other entities contemplating bank stabilization on the Yellowstone River.

In *Montana Council of Trout Unlimited et al (plaintiffs) v. United States Army Corps of Engineers (defendant)*, the United States District Court (Billings Division) granted the plaintiffs motion for summary judgment and directed the Corps to re-open the 14 permits challenged (seven of those permits are within the Upper Yellowstone River Study Area). The court directed the Corps to reevaluate the cumulative impact portions of permit decision documents and determine whether or not an environmental impact statement needs to be completed for each project. The Corps is currently reevaluating the permits to comply with the court order.

By using the SAMP as a proactive planning tool, the potential for future lawsuits will hopefully diminish. The SAMP goals and objectives are consistent with the Task Force's charter under Executive Order 19-97 to develop a forum for comprehensive planning. The Task Force will play a lead role in developing recommendations for future river corridor management recommendations, which the SAMP must ultimately embody.

All recommendations or determinations will be based upon the technical studies and cumulative effects analysis in consultation with the public forum provided by the Task Force. In this manner, procedural and substantive compliance with environmental regulations can be achieved.

In a separate but related action, the Corps' wetland research program at the Waterways Experiment Station (Vicksburg, Mississippi) provided funding to the University of Montana and NRCS to conduct a riverine functional assessment case study. Methods involve use of hydrogeomorphic-based models to determine river "condition" based on landscape, vegetation, soils, hydrology, and disturbance measures. The methodology is being evaluated in the context of the data synthesis requirements necessary for cumulative effects analysis. Results of this case study will be coordinated with the TAC.

Photo 11. NRCS and University of Montana researchers collecting HGM data.

Federal Emergency Management Agency (FEMA)
FEMA awarded a grant to Park County to investigate and repair flood damage in the Ninth Street Island/Siebeck Island area of Livingston. A channel survey and hydraulic investigation (from Carters Bridge to the KPRK radio station) was conducted by Allied Engineering of Bozeman. Additional hydraulic analysis, using the Allied Engineering channel-survey data, are being performed by the Corps and that work will be incorporated into the Cumulative Effects Investigation.

Yellowstone Ecosystems Studies Remote Sensing Study
Funded by the US Environmental Protection Agency and conducted by Yellowstone Ecosystems Studies, this multi-year study is designed to use remote sensing to measure indicators of riparian and steam "health" to gauge overall watershed health.

Montana Natural Heritage Program (MNHP)
Beginning in 1997 and now in its final phase, the Wyoming and Montana Natural Heritage Programs began assembling information on biodiversity features (rare and sensitive species and outstanding natural communities) in the Upper Yellowstone Watershed. This information was reviewed for reliability and coverage, and data gaps and validation needs were identified. The information is being summarized, key species and locations identified, and ecologically significant sites mapped.

In addition, in 1999, the MNHP began surveying and documenting outstanding and high-quality wetlands in the Upper Yellowstone Watershed. Modeled after wetland surveys done in the Flathead Watershed, upper Yellowstone sites are rated for "ecological significance"—types of wetland plant communities present, their quality and condition, presence of rare or sensitive species, and condition of surrounding landscape in relation to wetland integrity. Both projects are scheduled for completion in spring of 2001.

Yellowstone River Conservation District Council (YRCDC)
The YRCDC was formed in 1999 out of a concern for the Yellowstone River corridor by the adjacent conservation districts. The Council's purpose is to provide local leadership, assistance, and guidance for the wise use and conservation of the Yellowstone's Rivers natural resources. They have developed the following shared vision with the Yellowstone River Conservation Forum: a healthy river and riparian system capable of sustaining the needs of Montana citizens and communities. Representatives from each of the ten conservation districts adjacent to the river, and the MACD president are voting members of the Council. YRCDC work is focused in four areas: (1) bank stabilization, 310 permit issues; (2) irrigation water impacts, availability and reservations; (3) livestock, grazing, farming issues; and (4) water quality and stream impairment.

The Council has focused on the following activities in the past year: working with the Corps on initial scoping for full Yellowstone River cumulative effects study, aerial mapping and physical features project, and hosted an interagency Yellowstone River Roundtable. The Task Force has offered our assistance to the YRCDC and coordinated with them on many occasions this past year.

Yellowstone River Conservation Forum (Forum)
The Forum is composed of non-governmental organizations dedicated to the conservation of the Yellowstone River and preserving its free flowing values for the state and the nation. The Forum is an independent, informal network of 13 confirmed member conservation groups, which formed to improve communication among and between conservation organizations and all stakeholders concerned about

the Yellowstone River. In 2000, the Forum developed a strong alliance and shared goals with the YRCDC (described above).

While the information gained from the above-listed studies may augment the scientific investigation instigated by the Task Force, none of these other studies duplicate our effort. All technical work endorsed by the Task Force is reviewed and approved by the TAC, which has broad knowledge and ongoing involvement in research undertaken throughout the Yellowstone River Basin.

As our project goals mature and expand, the Task Force has become aware of other potential research and educational partnerships. Numerous other agencies and organizations are doing highly focused research throughout the Yellowstone River Basin. Since our broad-based assessment of the upper river corridor could find that information valuable, we will continue to seek opportunities to collaborate with appropriate, scientifically sound studies.

In the past year, other resource advisory groups, for example the YRCDC, have benefited from our experience and adopted portions of our project design (Physical Features Inventory, river aerial photography, and establishing a technical advisory committee) into their river study strategies. We are encouraged that our data is already in demand and we are doing everything we can to make it available to those in need. Preliminary, raw, hydrologic data (cross sectional surveys) has been utilized by regulatory agencies for local conservation projects. Several Park County projects are also awaiting the release of topographic mapping data, in particular the orthophoto maps of the river corridor.

Photo 12. The “weeping wall” on the upper Yellowstone River.

Coordinator Activities, Outreach, and Education

The Task Force has matured a great deal in the past few years, but perhaps our greatest growth has occurred in 2000. Much of that progress can be attributed to enhanced communication and better project coordination.

The scope of the Cumulative Effects Investigation has broadened steadily and the number of interested parties has increased dramatically since our inception. By mid-1999, it had become apparent to the Task Force that a point person for overall project coordination was needed and a coordinator was hired. This past year has proven our decision to be a wise one. Our Coordinator, Liz Galli-Noble, has accomplished a great deal in a short period of time, most importantly: (1) enhancing communication amongst a multitude of project partners, (2) providing much-needed day-to-day coordination of our technical investigations, (3) fostering greater public outreach and education, and (4) managing Task Force finances and helping to secure funding for our research studies.

As of December 2000, much of our study funding has been secured, and all research teams are scheduled to collect or analyze data in 2001. Consequently, the Coordinator will soon begin to play a new role; she will work with the Task Force and TAC to move the Cumulative Effects Investigation from its present data collection phase toward data synthesis and the develop river management recommendations. A key aspect of this work will be public outreach and education, and reporting technical study results to all interested parties. In addition to securing access to private lands for study teams, these outreach activities will become the Coordinator's main focus as study results become available in as early as mid-2001.

Landowner Permission

Because the vast majority of land adjoining the upper Yellowstone River is privately owned, the Task Force takes very seriously the need to inform the public of our investigations and actions along the river. In 2000, we contacted approximately 250 private landowners asking permission to access their property to collect data for four investigative studies. Most of those contacts were by phone, although more than 100 permission letters were also sent out. Securing access to collect data was the main purpose for these communications; however, we also used the opportunity (1) to inform property owners about specific study objectives and timelines, (2) to educate them about our overall Cumulative Effects Investigation, and (3) as a community outreach effort, which allowed them the opportunity to ask questions about the Task Force or comment on our river corridor effort.

Obtaining landowner permission will remain a major undertaking for the Task Force in 2001, because four of our study teams will potentially need access to private property to collect data.

Workshops and Tours

Wildfire Workshop—The Task Force received many requests to focus the first of our 2000 educational workshops on the topic of fire, and specifically the effects of the 1988 fires on the Upper Yellowstone River Basin. In response to that request, we sponsored a wildland fire workshop, while also reviewing basic principles of riverine hydrology and fire/forest ecology. The purpose of the workshop, entitled *Hydrologic Response to the 1988 Fires in the Upper Yellowstone River Basin,* was to improve the knowledge base of local area residents related to issues involving the Upper Yellowstone River Watershed. Educational workshops provide a platform for invited guest speakers to

share their knowledge, experiences, and research data on issues of particular interest to Task Force members and the public. The Task Force and Park Conservation District worked collaboratively in hosting this event and received a Riparian/Wetlands Educational Grant to help fund the workshop.

The workshop was held on May 13, 2000, from 9:30 am to 3:00 pm at the Lincoln School in Livingston Montana. There were 26 participants. Six presenters covered the following topics at the workshop:

John Bailey, Task Force Chair	Greeting, Opening Statement
Chuck Dalby, DNRC	Workshop Overview, Presenter Introductions
Ward McCaughey, USFS/Rocky Mountain Research Station	Forest and Fire Ecology
Roy Renkin, Yellowstone National Park	The 1988 Fires
Mark Story, USFS	Forest Hydrology, Fires, and Runoff
Phil Farnes, MSU/Snowcap Hydrology	Effects of 1988 Fires on Yellowstone River Runoff

The response to each presenter, and the workshop overall, was overwhelmingly positive. The *Questions and Discussion* sessions following each presentation were stimulating for both the public and Task Force participants. Lunch was provided by the Task Force, at which time additional educational materials were reviewed and further discussion was encouraged.

2001 Workshop Planning—The Task Force had planned to host a second educational workshop with assistance from the Montana Watercourse in the summer of 2000. Unfortunately, due to severe drought conditions and wildfires throughout the state, the workshop was postponed. We returned to workshop planning in December 2000, and are preparing to host two educational workshops in early 2001. These workshops will be specifically targeted to property owners within the watershed and the local citizenry, as a forum to inform them about the Task Force mission and our research studies.

Yellowstone Tours—The Task Force hosted six river tours in 2000 for a wide range of interest groups and agency partners. The Task Force Chair, John Bailey, and other Task Force members donated a great deal of time and energy to make these events informative, visually revealing, and pleasant for our guests. Tour groups included: Senator Max Baucus and Assistant Secretary Westphal (Civil Works for the Corps), General Strock and the Corps Portland District, Corps Omaha Office, EPA Denver Office, Watershed Coordinators from EPA Region 8, and Project WET Teachers Tour.

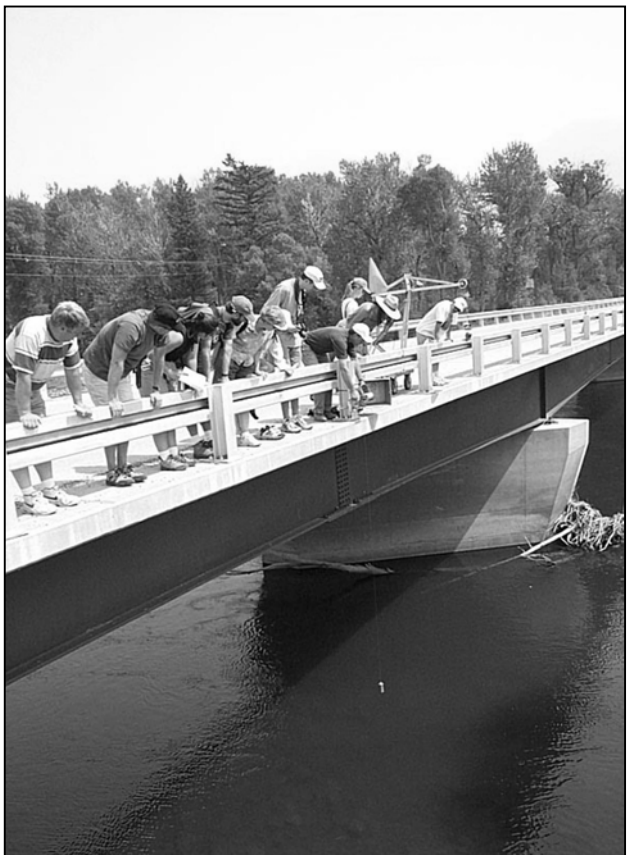


Photo 13. USGS researchers demonstrate sediment-load sampling equipment to participants of the Project WET Teacher's Tour.

Community Outreach

The Task Force was invited to do nine formal presentations on the Upper Yellowstone Cumulative Effects Investigation in 2000. Our Coordinator, with the help of study team leaders and TAC members, gave presentations to the following groups: Great Falls Conservation Council, USGS NAWQA Conference, Montana Native Plant Society, Federation of Fly Fishers, NRCS Yellowstone Public Information Forum, Livingston Business Women, Livingston Rotary Club, *Changing Landscapes of Rural America* Conference, and the Yellowstone Roundtable.

Photo 14. EPA and Corps staff tour the upper Yellowstone River with the Task Force Chair.

Looking Ahead to 2001

The Task Force has experienced a very active and productive year in 2000. We have gotten over the major hurdle of designing, approving, and funding our cumulative effects studies. Now we begin the real challenge, pulling together our comprehensive research data and formulating management recommendations.

2001 will be a year of patience, synthesis, and education. We will have to be patient and allow sufficient time for sound scientific data to be collected. We will start the difficult task of bringing together a great deal of independent data and synthesizing it into usable models for management. And finally, we will need to listen to the public, respond to their views, and educate them and ourselves along the way.

In the past three years, all Task Force members and regulatory agencies have remained strongly committed to this effort. Collaborations have grown stronger and trust has been built. The Task Force looks forward to what promises to be our most productive year yet. We thank former Governor Racicot for his support throughout this journey and welcome Governor Martz as our new executive.

Photo 15. Mallards Rest.

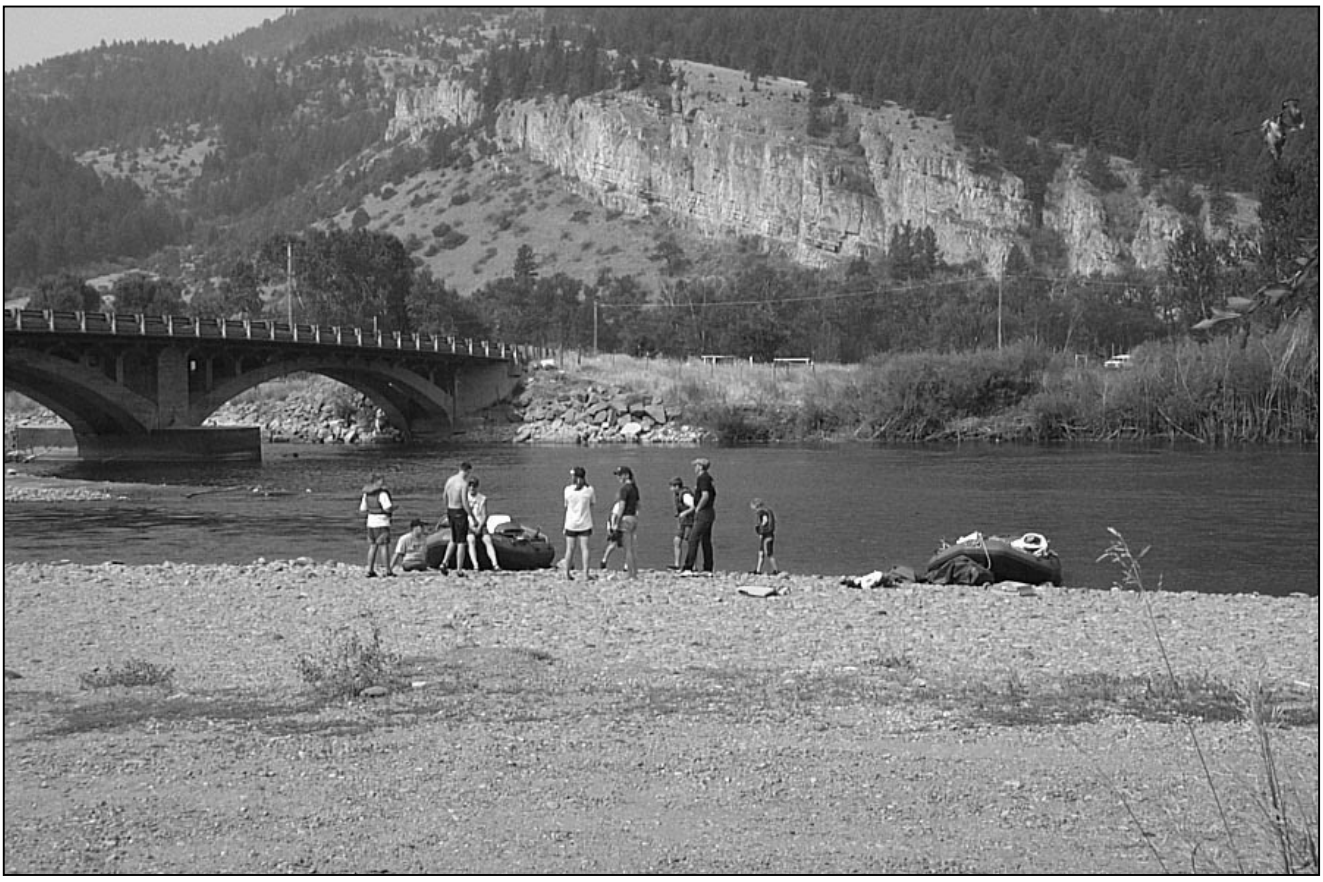


Photo 16. Recreating on the upper Yellowstone River; floaters taking-out at Carters Bridge access.

Appendices

Appendix A. Acronyms

Task Force	Governor's Upper Yellowstone River Task Force
BLM	Bureau of Land Management
Corps / COE	US Army Corps of Engineers
DEQ	Montana Department of Environmental Quality
District / PCD	Park Conservation District
DNRC	Montana Department of Natural Resources and Conservation
DNRC—CARDD	Conservation and Resource Development Division
DNRC—WMB	Water Management Bureau
DNRC—WRD	Water Resources Division
EPA	Environmental Protection Agency
ESRI®	Environmental Systems Research Institute, Inc.
Forum	Yellowstone River Conservation Forum
FWP	Montana Department of Fish, Wildlife and Parks
FY	Fiscal Year
GIAC	Geographic Information and Analysis Center, Montana State University
GIS	Geographic Information Systems
GPS	Global Positioning System
GYC	Greater Yellowstone Coalition
GYE	Greater Yellowstone Ecosystem
HB 223	House Bill 223 Grant (DNRC)
MDT / DOT	Montana Department of Transportation
MSU	Montana State University
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRIS	Natural Resources Information System
NWI	National Wetland Inventory (USFWS)
RDGP	Reclamation and Development Grant Program (DNRC)
RFP	Request For Proposal
SAMP	Special Area Management Plan
TAC	Technical Advisory Committee
TNC	The Nature Conservancy
U of M	University of Montana
USDA	US Department of Agriculture
USDI	US Department of the Interior
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
USGS—BRD	USGS—Biological Resources Division
WPA	Watershed Planning and Assistance Grant (DNRC)
YNP	Yellowstone National Park
YRCDC / Council	Yellowstone River Conservation District Council
319 Grant	Section 319 Water Quality Grant (DEQ)

Appendix B. Governor's Executive Order No. 19-97

State of Montana
Office of the Governor

Executive Order No. 19-97

EXECUTIVE ORDER ESTABLISHING THE
GOVERNOR'S UPPER YELLOWSTONE RIVER TASK FORCE

WHEREAS, the upper Yellowstone River and its tributaries, herein defined as that reach of the river (including tributaries) beginning at the Yellowstone Park boundary and extending downstream to the bridge crossing the river at Springdale, is a national treasure; and

WHEREAS, the recreational opportunities provided by the river provide significant contributions to Montana's economy; and

WHEREAS, the river is essential to Montanans who live along it, providing water for agricultural, domestic and commercial purposes; and

WHEREAS, the extreme floods of 1996 and 1997 have created hardships for communities and Montana citizens who live adjacent to the river, causing damage to property and stream banks, as well as some nationally-renowned spring creeks in Paradise Valley; and

WHEREAS, previous decades of work done along the river for purposes of flood control, construction of transportation

corridors and other purposes have altered the natural flood plain of the river, with the potential to exacerbate damage to private and public property and fish habitat; and

WHEREAS, there is a need for a more comprehensive planning effort involving citizens, communities, and government agencies that have an interest in the upper Yellowstone River to ensure that future projects that affect the river are planned and conducted in a manner that will preserve the integrity, beauty, values, and function of the upper Yellowstone River for Montanans now and in the future.

NOW THEREFORE, I, MARC RACICOT, Governor of the State of Montana, by virtue of the authority vested in me, do hereby establish the Upper Yellowstone River Task Force.

I. PURPOSE

A. The Upper Yellowstone River Task Force shall:

1. Provide a forum for the discussion of issues that effect the Upper Yellowstone River basin, particularly, to bring together landowners, sportsmen and sportswomen, and community leaders to develop a shared understanding of the issues and competing values and uses that impact the Upper Yellowstone River;

2. meet on a regular basis, the frequency to be determined by Task Force members, for the purpose of encouraging a comprehensive approach to action taken along the Yellowstone River to ensure that its integrity remains intact while balancing the needs of communities and landowners to protect property;

3. seek or encourage others to seek grants, funds or other cooperative arrangements to implement recommendations of the Task Force; and

4. prepare an annual report to the Governor on the progress of the task force.

II. COMPOSITION

The Upper Yellowstone River Task Force shall be composed of no more than 12 voting members including representatives of the following: local businesses, property owners, farmers and ranchers who live along the river, the angling community, a conservation group or groups, Park County, the City of Livingston and the local Conservation District. Representatives of the Army Corps of Engineers, Departments of Natural Resources and Conservation, Environmental Quality, Fish, Wildlife & Parks, and Transportation shall serve as ex-officio members.

III. DURATION

This Task Force shall remain in existence until July 1, 1999 unless extended or terminated by subsequent Executive Order.

This Order is effective immediately.

GIVEN under my hand and the GREAT SEAL of the State of Montana, this 5th day of November, 1997.

MARC RACICOT, Governor

ATTEST:

MIKE COONEY, Secretary of State

Appendix C. Governor's Executive Order No. 8-99

State of Montana
Office of the Governor

Executive Order No. 8-99

EXECUTIVE ORDER CONTINUING THE
GOVERNOR'S UPPER YELLOWSTONE RIVER TASK FORCE

WHEREAS, the upper Yellowstone River and its tributaries, herein defined as that reach of the river (including tributaries) beginning at the Yellowstone Park boundary and extending downstream to the bridge crossing the river at Springdale, is a national treasure; and

WHEREAS, the recreational opportunities provided by the river provide significant contributions to Montana's economy; and

WHEREAS, the river is essential to Montanans who live along it, providing water for agricultural, domestic and commercial purposes; and

WHEREAS, the extreme floods of 1996 and 1997 created hardships for communities and Montana citizens who live adjacent to the river, causing damage to property and stream banks, as well as some nationally-renowned spring creeks in Paradise Valley; and

WHEREAS, previous decades of work done along the river for

purposes of flood control, construction of transportation corridors and other purposes have altered the natural flood plain of the river, with the potential to exacerbate damage to private and public property and fish habitat; and

WHEREAS, there is a need for a more comprehensive planning effort involving citizens, communities, and government agencies that have an interest in the upper Yellowstone River to ensure that future projects that affect the river are planned and conducted in a manner that will preserve the integrity, beauty, values, and function of the upper Yellowstone River for Montanans now and in the future.

NOW THEREFORE, I, MARC RACICOT, Governor of the State of Montana, by virtue of the authority vested in me, do hereby continue the Upper Yellowstone River Task Force.

I. PURPOSE

A. The Upper Yellowstone River Task Force shall:

1. Provide a forum for the discussion of issues that effect the Upper Yellowstone River basin, particularly, to bring together landowners, sportsmen and sportswomen, and community leaders to develop a shared understanding of the issues and competing values and uses that impact the Upper Yellowstone River;

2. meet on a regular basis, the frequency to be determined by Task Force members, for the purpose of

encouraging a comprehensive approach to action taken along the Yellowstone River to ensure that its integrity remains intact while balancing the needs of communities and landowners to protect property;

3. seek or encourage others to seek grants, funds or other cooperative arrangements to implement recommendations of the Task Force; and

4. prepare an annual report to the Governor on the progress of the task force.

II. COMPOSITION

The Upper Yellowstone River Task Force shall be composed of no more than 12 voting members including representatives of the following: local businesses, property owners, farmers and ranchers who live along the river, the angling community, a conservation group or groups, Park County, the City of Livingston and the local Conservation District. Representatives of the Army Corps of Engineers, Departments of Natural Resources and Conservation, Environmental Quality, Fish, Wildlife & Parks, and Transportation shall serve as ex-officio members.

III. DURATION

This Task Force shall remain in existence for two years from the date of effect unless extended or terminated

by subsequent Executive Order.

This Order is effective immediately.

GIVEN under my hand and the GREAT SEAL of the State of Montana, this 28th day of June, 1999.

Marc Racicot

MARC RACICOT, Governor

ATTEST:

Mike Cooney

MIKE COONEY, Secretary of State

Appendix D. Governor's Upper Yellowstone River Task Force Ground Rules

1999 – 2001 Term

Participation

1. The discussions of the Upper Yellowstone River Task Force will include the perspectives of individuals and organizations whose interests may be affected by the recommendations or activities of the Task Force.

   Voting Task Force members represent the following interests:

   - Local businesses
   - Property owners
   - Ranchers
   - Angling community
   - Conservation groups
   - Park County
   - City of Livingston
   - Park Conservation District

   Ex-officio members of the Task Force represent the following government agencies:

   - Montana Department of Environmental Quality
   - Montana Department of Fish, Wildlife and Parks
   - Montana Department of Natural Resources and Conservation
   - Montana Department of Transportation
   - US Army Corps of Engineers
   - National Park Service—Yellowstone National Park
   - US Forest Service—Livingston Ranger District
   - US Forest Service—Gardiner Ranger District

The Task Force will actively encourage the inclusion of a variety of perspectives in the following ways:

a) Members will candidly identify and share their values and interests and will do so as soon as possible.

b) Members will inform their constituency of the activities of the Task Force, seek the advice of their constituency and make every effort to speak for their constituency.

c) The Task Force will invite individuals with perspective not represented by members to discuss their views with the task Force.

d) Task Force meetings will be open to the public. Individuals may request time on the Task Force agenda to discuss their concerns.

e) Notice of meetings will be provided to the news media.

f) A mailing list will be established and, upon request, individuals will receive notices of upcoming meetings and summaries of previous meetings.

g) The Task Force will hold special meetings at different locations, when needed, to share information and gather ideas, comments and concerns about Task Force proposals.

h) The Task Force will periodically prepare a summary of its activities and distribute this summary to the news media and individuals on the mailing list.

i) Task Force members agree to make every effort to attend every meeting. If a member is unable to attend a meeting, he or she may make arrangements for an alternate to attend the meeting, but should ensure that the alternate is fully informed of the issues under consideration and progress to date.

Decisions/Agreements

1. The Task Force will seek consensus agreements regarding policy decisions and recommendations. Consensus is defined as acceptance of an agreement. Members may not agree with all aspects of an agreement; however, they do not disagree enough to warrant opposition to the agreement. When Task force members accept an agreement, they commit themselves to implementing the agreement.

2. Participants who disagree with a proposal are responsible for offering a constructive alternative that seeks to accommodate the interests of all other participants.

3. Business or monetary decisions may be made by a voice vote of a majority (seven voting members) of the Task Force. The Chair may vote.

Communication with the Media

1. The Chair will be the spokesperson for the Task Force in communications with the media.

2. Each participant is free to speak to the media regarding their own view on the work of the Task Force. No participant may characterize the views of other participants expressed in this process to the media or in other forums.

3. With the exception of notices of meetings or events, written statements distributed to the news media will be reviewed by the Task Force.

Roles and Responsibilities

1. The Task Force Chair, will serve as the contact person for the Task Force and liaison with government agencies. The Chair, with the consent of the Task Force, is responsible for conducting and calling meetings, clarifying voting issues and appointing subcommittees, and providing direction to the Task Force Coordinator.

2. The Vice-Chair will assume the duties of the Chair in his absence.

3. The Coordinator will: help the participants design an appropriate process; coordinate pre- and post-meeting logistics; prepare documents to maintain an objective record of the process, including meeting summaries and annual and final reports; distribute agendas and meeting

summaries; encourage everyone to participate; and moderate discussions as needed. The Coordinator is nonpartisan and is not an advocate for any particular interest or outcome.

Technical Advisory Committee

The overall goal of the Technical Advisory Committee (TAC) is to provide recommendations to the Task Force when requested based on the results of the scientific investigations. The TAC is given both broad direction and specific missions by the Task Force, and has the flexibility to determine how best to accomplish its job. The TAC has no authority to make policy decisions or recommendations on behalf of the Task Force; its role is to work as directed by the Task Force to ensure:

- The right questions are asked;
- The best approach and methods are used to answer questions;
- The data collected are objective, defensible and trustworthy; and
- The answers provided are understandable and relevant.

Appendix E. Technical Advisory Committee Profiles

Dr. Duncan Patten, Chairman of the TAC, is Research Professor with the Mountain Research Center at Montana State University, Professor Emeritus of Plant Biology and past director of the Center for Environmental Studies at Arizona State University. Dr. Patten received the AB degree from Amherst College, MS from the University of Massachusetts at Amherst, and PhD from Duke University. His research interests include arid and mountain ecosystems, especially the understanding of ecological processes and restoration of western riparian and wetland ecosystems. He was Senior Scientist of the Bureau of Reclamation's Glen Canyon Environmental Studies, overseeing the research program evaluating effects of operations of Glen Canyon Dam on the Colorado River riverine ecosystem. He is involved with restoration of the Provo River in Utah. Dr. Patten was founding president of the Arizona Riparian Council, and is past-president of the Society of Wetland Scientists. He is a Fellow of the AAAS; has been a member of the National Research Council's Commission on Geoscience, Environment, and Resources Board on Environmental Studies; and has served on and chaired several NAS/NRC committees.

Tim Bryggman is an economist with the Water Resources Division of the Department of Natural Resources and Conservation. He holds a Bachelor's degree in Finance from Santa Clara University and a Master's degree in Economics from the University of Montana. Prior to joining DNRC in 1994, he worked as a database programmer for the Montana Entrepreneurship Center, a Financial Analyst for a research and development firm, and taught high school mathematics as a Peace Corps Volunteer in Liberia, West Africa. As the Division's Economist, he addresses the economic aspects of water issues including uses for agriculture, hydropower, recreation, and flood control as well as indirect socioeconomic impacts.

Chuck Dalby is a hydrologist with the Montana Department of Natural Resources and Conservation (Water Resources Division). His education (BA and MS degrees in geology from University of Montana) emphasized sedimentary and glacial geology, surface-water hydrology, and fluvial geomorphology. Chuck's professional interests are in: watershed management and cumulative effects of land use; measurement and monitoring of sediment transport and channel changes in gravel-bed rivers; application of river-channel classification and historic stability assessment to river-corridor management; design and implementation of channel maintenance flows; and analysis and maintenance of irrigation water quality (salinity and trace elements). Currently he is assisting with the Upper Yellowstone River Cumulative Effects Investigation (Historic Channel Changes and Geomorphology). Other recent projects include: cooperative research (with USGS, MSU, and UM) to determine the downstream fate of geothermal arsenic as it moves through water and irrigated soils of the Upper Missouri Basin; design and implementation of water-quality monitoring to support adaptive management of Madison-Missouri River hydro projects; evaluation of channel changes and stability of the Yellowstone River proximate to the Livingston Ditch; design, monitoring, and implementation of flushing flows to remove fine-sediments sluiced from Ruby Reservoir; and measurement of a sediment budget for Nevada Creek Reservoir.

Mike Gilbert is an Environmental Resources Specialist with the Omaha District, US Army Corps of Engineers. Mr. Gilbert holds a BS, 1977, and MA, 1980, in Biology from the University of Nebraska at Omaha. For the past 23 years, he has worked in the Corps' regulatory program, responsible for regional studies including wetlands inventory, geographic information system applications, and major regulatory actions. He also serves as the Omaha District's wetland specialist, supporting not only the regulatory program, but also natural resources management and Superfund activities. Major emphasis of his work is in wetlands community ecology; focusing on plant community characterization and

dynamics with applications towards wetlands mapping, functional assessment work, impact assessment and mitigation.

Thomas J. Hallin is a Professional Engineer and Land Surveyor. Mr. Hallin received a BS (Mining Engineering) from Montana School of Mines while a Navy V-12 student in 1944 and was subsequently commissioned Ensign (E) USNR from the US Naval Academy. He served as an Engineer Officer on the submarine S-11 and the USS Gratia (AKS-11) in the American and Asiatic theaters and was discharged to the Inactive Reserve in 1946. His subsequent experience includes 1 year as a Mining Engineer for the Northern Pacific Railroad; 14 years as Manager of Construction and Engineering for the Yellowstone Park Company; and 40 years of self-employment on numerous engineering and surveying projects in Montana, including affiliated assignments with communication companies as a consultant in the western United States, Alaska, Hawaii, Jamaica, and Africa. He is also a Fellow Member of the Montana Association of Registered Land Surveyors.

Rob Hazlewood is Senior Staff Biologist with the US Fish and Wildlife Service (USFWS) Ecological Division in Helena, Montana. He received an AA degree in Marine Biology and BS/MS degrees in Wildlife Management from Humboldt State University at Arcata, California. He has 24 years experience as a professional wildlife biologist with special interests in western riparian habitats, wetlands, and avian ecology. He is the USFWS eight-state, Rocky Mountain Region representative on the National Bald Eagle Team and Western Peregrine Falcon Recovery Team.

Jim Robinson is a Water Resources Planner with the Department of Natural Resources. Mr. Robinson received his AB degree in geology at the University of California, Berkeley and his MS in geology from the University of California at Santa Cruz. He has worked for the State of Montana for the past six years: first as an environmental impact specialist analyzing the effects of large-scale mining operations, later as a project coordinator for the Tongue River Dam Project, and currently as a planner assisting watershed groups. Prior to working for the State of Montana, Mr. Robinson was employed by geotechnical and environmental consulting firms. His experience includes management of environmental impact studies for a variety of public and private development proposals, with emphasis on geomorphic and hydrologic effects of flood control and riverine sand and gravel mining operations. His geologic experience includes preparation of construction-related geologic reports such as geologic hazard assessments, soil and foundation investigations, and grading and compaction reports. Mr. Robinson is a registered professional geologist in California.

Dr. Greg Schildwachter is Wildlife Program Manager for the Intermountain Forest Association (IFA), which represents forestry companies in Idaho, Washington, Montana, Wyoming, South Dakota, and Colorado. As IFA's wildlife biologist based in Missoula, Greg oversees projects that promote and sustain forests and wildlife in Montana and Idaho. Greg holds a PhD in Wildlife Biology from the Boone and Crockett Research Program at the University of Montana, where he studied agreements to conserve endangered species on private land. He earned a Master of Science degree at the University of Tennessee, and a Bachelor of Science, Forest Resources, degree at the University of Georgia. Before his fellowship with the Boone and Crockett program, Greg studied at the Political Economy Research Center in Bozeman, Montana, and worked with the Caesar Kleberg Wildlife Research Institute in Kingsville, Texas. He has also worked with the US Fish and Wildlife Service, the Southeastern Cooperative Wildlife Disease Study, and the National Wildlife Federation.

Brad Shepard is a Fishery Biologist for Montana Fish, Wildlife and Parks (FWP), adjunct professor at Montana State University (MSU), and represents the Montana Chapter of the American Fisheries Society (AFS) on the TAC. He received a BS degree in Fish and Wildlife Management from MSU and an MS degree in Fishery Resources from the University of Idaho. He presently is an associate editor of the North American Journal of Fisheries Management, chairs a Westslope Cutthroat Trout Technical

Committee for FWP, and conducts research into the conservation of native fishes and effectiveness of habitat restoration projects for FWP and the Montana Cooperative Fishery Research Unit at MSU. During his 20-year tenure with FWP, Mr. Shepard has been involved with basin-wide studies of fish and their habitats in the upper Flathead River basin; studied and made recommendations regarding reservoir drawdown levels in Libby Reservoir; served as a cooperative Fishery Biologist with FWP and the Beaverhead National Forest, where he studied the effects of land management activities on salmonids; and worked as a Fish Management Biologist in the Upper Yellowstone River Basin. He has served as President of the Montana Chapter of AFS, as chair of the Montana Association of Fish and Wildlife Biologists, and as a member or chair of numerous AFS and FWP committees. He and his family have resided in Livingston since 1990 and they spend lots of time on the Yellowstone River.

Allan Steinle has worked for the US Army Corps of Engineers since 1982, holding positions as a range conservationist at Lake Sakakwea in North Dakota, staff biologist at the Omaha District Office, Park Manager at Lewis and Clark Lake in South Dakota, Regulatory Project Manager in Nebraska, and Regulatory State Program Manager in Montana. Allan's current job involves overseeing the administration of Corps regulatory authorities under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. He moved to Montana in July 1998, after attending college in Arizona, Oregon, and South Dakota. Allan received a BS from Oregon State in Range Management. He is a member of the Society of Wetland Scientists.

Liz Galli-Noble, Task Force Coordinator, is a forester, environmental studies educator, natural resource project manager, and technical writer/editor. She received a BA in History with teaching certification, and did science-based undergraduate studies at the University of Montana. She also received a Master of Forestry degree (honors) from Yale University. Liz has 16 years of experience working in the natural resource management field, both nationally and internationally. She served as a Peace Corps tropical forester and extension agent in Mali, West Africa. Other positions she has held include: technical editor for the Interior Columbia Basin Ecosystem Management Project, environmental educator in urban/inner-city surroundings, forestry researcher, Regional Supervisor for the Montana Conservation Corps, and US Forest Service technician/crew leader/firefighter.

1,000 copies of this public document were printed at an estimated cost of $2.00 per copy, for a total cost of $2,000.