

# Yellowstone River Cumulative Effects Study “State of the Study” – Technical Overview SFY 2011

Submitted by the Yellowstone River Technical Advisory Committee  
June 24, 2011



Map: Courtesy of USGS

## I. Biologic Study Components

### *Riparian/Wetlands Plant Communities*

<b>Principal Contact</b>	Warren Kellogg
<b>Supporting Participants</b>	YRCDC, Northern Great Plains Joint Venture, ACOE, MT DNRC
<b>Primary Goal</b>	1) Gain an understanding of the spatial and temporal changes in the riparian and wetland plant community composition and extent along the Yellowstone River, 2) Better understand how the riparian and wetland resources respond to continued human activity, establishing cause-effect relationships if and where possible.
<b>SFY 2011 Accomplishments</b>	<ul style="list-style-type: none"> <li>Revised and merged the riparian and wetland scopes of work.</li> <li>Request for Proposal was issued to complete Tasks #1 and #2. This will be a GIS-based analysis that will document change in the riparian and wetland resources over the last 60 years and describe spatial and temporal patterns and relationships.</li> </ul>
<b>Progress To-Date</b>	<p>Study Completion: 30%; Current Funding Level: 40%</p> <p>In 2007, Warren Kellogg (NRCS) in cooperation with the local CD and landowners initiated a field-based riparian mapping and classification effort in 8 counties along the Yellowstone River. A database was developed for this data. Much of this field data has yet to be entered into the database.</p> <p>There have been multiple projects since 2006 to map current and historic wetland and riparian vegetation along the Yellowstone River. Some preliminary analysis associated with this mapping has also occurred. See reports listed under "Products" below.</p>
<b>SFY 2012 Anticipated Work</b>	Complete the contract on Tasks #1 and #2: GIS-based analysis documenting change in the riparian and wetland resources over the last 60 years and to describe spatial and temporal patterns and relationships. Seek funding to complete Task #3 – public outreach.
<b>Products</b>	<ul style="list-style-type: none"> <li>Yellowstone River Cumulative Effects Study: Invasive Plant Information Summary (2005)</li> <li>Yellowstone River Wetland/Riparian Change Detection Pilot Study – Natural Heritage Program (2006)</li> <li>Yellowstone River Riparian Vegetation Delineation and Fragmentation Metrics Prototype (2007)</li> <li>Yellowstone River Riparian Vegetation Mapping - riparian mapping on 1950s, 1970s, and 2001 aerial photography (2008)</li> <li>Mapping of wetlands and riparian areas for 54 USGS 1:24,000 quads in the Lower Yellowstone River Corridor – Natural Heritage Program (2010)</li> </ul>

### *Fisheries*

<b>Principal Investigators</b>	Robert Bramblett, MSU Alexander Zale, MSU MTCFRU USGS Ann Marie Reinhold, MSU MTCFRU
<b>Supporting Participants</b>	Yellowstone River Conservation District Council (YRCDC), US Army Corps of Engineers, and Montana Fish Wildlife and Parks
<b>Primary Goal</b>	Determine the cumulative effects of bank stabilization on Yellowstone River fish assemblages.

<b>SFY 2011 Accomplishments</b>	Completed second year of fieldwork, preliminary data analyses, and presented results at the annual meetings of the Montana Chapter of the American Water Resources Association and the Montana Chapter of the American Fisheries Society. Presentations documenting progress and results were given to the TAC and YRCDC. A 2010 progress report was completed in December 2010.
<b>Progress To-Date</b>	<p>Study Completion: 50%; Current Funding Level: 100%</p> <ul style="list-style-type: none"> <li>• Fisheries Reconnaissance Project in 2004: The objective of this project was to complete a review of existing fisheries data on the Yellowstone River and to define suitable high and low artificially modified sites for use in the subsequent study that will evaluate the lower Yellowstone River fish assemblage response to anthropogenic alterations.</li> <li>• Fisheries Scope of Work Progress We are currently working towards completing the following objectives. <ol style="list-style-type: none"> <li>1. Determine if fish assemblages differ between non-stabilized and bank-stabilized habitats. We are determining if fish assemblages differ between non-stabilized and bank-stabilized habitats at multiple spatial scales, and determining possible causes of fish assemblage variability by accounting for habitat differences among sites.</li> <li>2. Determine the importance of side channels for fish assemblages during runoff and base flow conditions. We are comparing side channel fish assemblages to mainstem fish assemblages during runoff and base flow conditions to assess habitat use differences between side channels and main channels.</li> <li>3. Determine the cumulative effects of channel alteration on fish assemblages. We are assessing the structural changes to the fish assemblages in bank-stabilized habitats by applying current data from non-stabilized habitats representing conditions prior to channel alteration.</li> </ol> </li> </ul> <p>To date, we have developed a stratified random sampling study design that consists of 32 sites that include a range of geomorphic and anthropogenic variability. We have completed 69% of Objective 1 sampling, and 38% of Objective 2 sampling. We are currently working closely with YRCDC partners to develop historical habitat maps that will be used to complete Objective 3 modeling.</p>
<b>SFY 2012 Anticipated Work</b>	Complete all remaining Objective 1 sampling and 30% of Objective 2 sampling.
<b>Products</b>	<ul style="list-style-type: none"> <li>• Report: Yellowstone River Fish Community Response to Anthropogenic Factors: Preliminary Evaluation for the Cumulative Effects Study (2004)</li> <li>• Progress reports from 2009 and 2010 were completed. A 2011 progress report will be delivered in December 2011. A final report to the TAC and YRCDC will be delivered in December 2013.</li> </ul>

*Avian Communities*

<b>Principal Investigators</b>	Danielle Jones and Andrew Hansen Montana State University - Bozeman, Montana
<b>Supporting Participants</b>	The Nature Conservancy, US Army Corps of Engineers, Yellowstone River corridor landowners, YRCDC
<b>Primary Goal</b>	Provide a general description of breeding bird communities and to explore the factors influencing the distribution and abundance of bird species along the length of the river.
<b>SFY 2011 Accomplishments</b>	Study completed in 2009.

<b>Progress To-Date</b>	<p>Completion: 100%</p> <p>In 2006 and 2007, the YRCDC, in partnership with USCOE sponsored an investigation conducted by faculty and staff at MSU, Bozeman to carry out a survey of birds in selected habitat types along the river. A final report was released in February 2009 which describes the factors influencing community characteristics and the distribution and abundance of breeding birds along a 450 mile section of the Yellowstone River in central and eastern Montana. Birds and vegetation were surveyed within riparian habitats along braided sections of the river in order to describe patterns of bird species richness, bird occurrence, and bird abundance, and to examine the factors influencing bird distribution. Surveys were conducted at over 300 locations in cooperation with 60 private landowners, as well as state and federal government entities. Sixty-four species of birds were recorded in seven different habitat types. Results from this study demonstrate that the riparian corridor provides breeding habitats and resources for many different types of native bird species. The knowledge acquired in this study will provide a more comprehensive understanding of the potential influences of habitat condition on riparian birds, and allow for an assessment of the consequences of management for all wildlife that are dependent upon the unique habitats and resources provided by the Yellowstone River.</p>
<b>SFY 2012 Anticipated Work</b>	None. Study complete.
<b>Product</b>	Final Report: Factors Influencing Riparian Breeding Bird Communities along the Middle and Lower Yellowstone River (Feb 2009).

### *Water Quality*

<b>Principal Contact</b>	Warren Kellogg
<b>Supporting Participants:</b>	MT DEQ, USGS
<b>Primary Goal (Draft)</b>	The purpose of the water quality scope of work is: 1) to determine the highest allowable concentrations of nitrogen and phosphorus which will not cause benthic algae to reach nuisance levels (i.e. recreation, aesthetics, aquatic habitat) and not allow dissolved oxygen concentrations to fall below State water quality standards adversely affecting aquatic life; and 2) determine the relative impacts of heavy metals, bacteria, pesticides, and temperature on the beneficial uses of the Yellowstone River.
<b>SFY 2011 Accomplishments</b>	Worked with Montana DEQ on a draft revision of the water quality scope of work (2/22/2011 draft). The draft scope of work is focused on nutrient modeling. The TAC has provided fish indicator species and dissolved oxygen (DO) tolerance levels to DEQ to input into their Yellowstone River nutrient model.
<b>Progress To-Date</b>	<p>Study Completion: 10%; Current Funding Level: 0%</p> <p>Periodically working with MT DEQ to monitor their progress on TMDL nutrient sampling and modeling on the Yellowstone River. The idea has been to use their efforts for the Yellowstone River cumulative effects water quality study if possible.</p>

<b>SFY 2012 Anticipated Work</b>	Finalize water quality scope of work with help from DEQ and USGS. The scope of work will serve as a guide in determining the need for further work and funding to meet cumulative effects analysis goals.
<b>Products:</b>	Yellowstone River Mainstem, Summary of Existing Data for use in TMDL Planning (2005): Report generated by MT DEQ in consultation with the TAC.

## II. Channel and Floodplain Study Components

### *Hydrology*

<b>Principal Investigators</b>	Doug Clemetson & Roger Kay (USACE) Katherine J. Chase, USGS
<b>Primary Goal</b>	The goal of this study is to develop the hydrologic data necessary to evaluate the water related problems in the Yellowstone River basin. The primary objective of the hydrology analysis is to establish the discharge frequency and flow duration relationships for “unregulated” and “regulated” flows for the Yellowstone River from Park County to the confluence with the Missouri River near Williston, ND.
<b>SFY 2011 Accomplishments</b>	<ul style="list-style-type: none"> <li>• Revised Bighorn Hydrology Report – 15 July 2010</li> <li>• Draft Lower Yellowstone Report– 30 May 2011</li> </ul>
<b>Progress To-Date</b>	Study Completion: 50%; Current Funding Level: 90%  The USGS has calculated hydrologic statistics for the Yellowstone River downstream from the Bighorn River, and for the Tongue and Powder Rivers. Report is undergoing USGS internal review.
<b>SFY 2012 Anticipated Work</b>	The USGS anticipates finishing the hydrologic statistics for the Yellowstone River upstream from the Bighorn River and for the Bighorn River; and for analyzing differences between unregulated and regulated flows.
<b>Products</b>	USGS Scientific Investigations Reports

### *Hydraulics*

<b>Principal Investigator</b>	Laurel Hamilton, hydraulic engineer, USACE
<b>Goal</b>	The proposed hydraulic analyses tasks will provide hydraulic information required to define the current and historic extent of the Yellowstone River floodplain for multiple purposes: identify opportunities to reduce flood damages, determine impacts from human development, and restore environmental features and functions. The secondary purpose is to provide detailed hydraulic data including river stages, velocities, flow depths, and flooded areas in support of the geomorphic and biologic analyses for the study.
<b>FY 2011 Accomplishments</b>	Study Completion: 30%; Current Funding Level: 100% <ul style="list-style-type: none"> <li>• Developed Sweet Grass County RAS Model</li> <li>• Generated Sweet Grass Flood Plain Maps for 100-yr and 500-yr flood events</li> <li>• Began cross section adjustments for the Unregulated Flow RAS Model for Stillwater Co and Yellowstone Co</li> <li>• Revised Hydraulics Scope of Work</li> </ul>

	<ul style="list-style-type: none"> <li>Prepared Scope of Work for consultants to complete modeling and mapping of remaining counties</li> </ul>
<b>FY 2012 Anticipated Work</b>	<ul style="list-style-type: none"> <li>Generate Flood Plain Maps for the 2-yr through 50-yr flood events for Stillwater, Sweet Grass, Yellowstone and Dawson Counties</li> <li>Complete Unregulated Flow modeling for Stillwater, Sweet Grass, Yellowstone and Dawson Counties.</li> <li>Generate Flood Plain Maps for the Unregulated Flow conditions for the 2- yr through 500-yr flood events for Stillwater, Sweet Grass, Yellowstone and Dawson Counties</li> </ul>
<b>Products</b>	<ul style="list-style-type: none"> <li>RAS Model, water surface profiles, and tabular outputs</li> <li>Flood Plain Maps as shape files and depth grids</li> </ul>

### *Geomorphology*

<b>Principal Contact</b>	Karin Boyd and Jim Robinson
<b>Supporting Participants</b>	MT DNRC, US Army Corps of Engineers
<b>Primary Goal</b>	The overall goal of the geomorphology work plan is to assess the fluvial geomorphology of selected reaches of the Yellowstone River to determine how channel behavior is related to both natural processes and human impacts.
<b>SFY 2011 Accomplishments</b>	<ul style="list-style-type: none"> <li>Completion of nine additional Reach Narrative summaries</li> <li>Continued development of Geomorphology Section of CEA database</li> </ul>
<b>Progress To-Date</b>	<p>Study Completion: 75%; Current Funding Level: 75%</p> <p>Progress made to date in support of the Geomorphology Scope of work includes reach classification and characterization , planform change analyses, 100-year inundation modeling, channel migration zone mapping, a timeline development for physical features, an characterization of historic events such as flooding and ice jamming, and education and outreach in support of the channel migration zone maps. This information, as well as the results derived from other scopes of work, has begun to be integrated on a reach scale in the form of reach narratives.</p>
<b>SFY 2012 Anticipated Work</b>	<p>Continue integration of geomorphology-related data into CEA database</p> <p>Continued development of reach narratives</p>
<b>Products</b>	<ul style="list-style-type: none"> <li>Geomorphic Reconnaissance and GIS Development Yellowstone River, Montana (2004)</li> <li>Work Order #3: Geomorphic Parameters and GIS Development, Yellowstone River (2007)</li> <li>Yellowstone River Human Impacts Timeline (2008)</li> <li>Yellowstone River Historic Events Timeline-Flooding, Ice Jams, Bridges and Irrigation Infrastructure (2008)</li> <li>Education and outreach sessions on CMZ maps for all Yellowstone River Conservation Districts (2008)</li> <li>Yellowstone River Channel Migration Zone Mapping Final Report (2009)</li> <li>Statement of Intent for CMZ map applications (2010)</li> <li>Yellowstone River Cumulative Effects Database Reach Narratives Technical Memorandum (2011)</li> </ul>

***Basic Data Acquisition and Topographic Mapping***

<b>Principal Contact:</b>	Jim Robinson (Montana DNRC)
<b>Other Participants:</b>	YRCDC TAC, US Army Corps of Engineers, and Merrick and Surdex as LiDAR data collection and processing contractors.
<b>Primary Goal:</b>	Acquire historic aerial photographs and high resolution digital elevation data (LIDAR) of the Yellowstone River corridor to support hydraulic floodplain modeling, 310 and 404 permit review, land use planning and cumulative effects assessment.
<b>SFY 2011 Accomplishments</b>	N/A
<b>Progress To-Date:</b>	100% Complete Since its inception in 1999, the YRCDC has collected and made available through the Montana State Library's Natural Resource Information System (NRIS) a variety of geographic datasets specific to the Yellowstone River corridor, including historic aerial photography, high accuracy digital elevation models, and digitized plan metric feature datasets, such as a physical features inventory and geomorphic classification of the entire river ( <a href="http://nris.mt.gov/yellowstone">http://nris.mt.gov/yellowstone</a> ). Currently, complete aerial photographic coverage exists of the river corridor from Yellowstone National Park Boundary to the Missouri River confluence near three points in time: 1950/1976/2001; and sporadic coverage dating back to the 1930s. The aerial photography and the LiDAR topographic data is being used by the technical components of the cumulative effects assessment to characterize and evaluate floodplain response to natural and human influences such as climate change, hydrologic alteration, and flood and erosion control structures.
<b>SFY 2012 Anticipated Work</b>	N/A
<b>Products:</b>	Historic orthophoto mosaics of the Yellowstone River Corridor from 1930s, early 1950s, 1976-77, and 2001. LIDAR data collected as of 2005 and 2007. See <a href="http://www.nris.mt.gov/yellowstone">http://www.nris.mt.gov/yellowstone</a> for a list of downloadable GIS data products, as well as the Yellowstone River Internet Map Viewer which can be used to view the data using a web browser such as Internet Explorer or Mozilla Firefox.

**III. Socioeconomic Study Components**

***Yellowstone River Cultural Inventory***

<b>Principal Investigators</b>	Dr. Susan Gilbertz, Montana State University Cristi Horton, Co-Investigator, Tarleton State University Damon Hall, Co-Investigator, Boone & Crockett Fellow, Texas A&M University
<b>Supporting Participants</b>	US Army Corps of Engineers, Yellowstone River corridor landowners, YRCDC.
<b>Primary Goal</b>	Document the variety and intensity of different perspectives and values held by people who share the Yellowstone River.
<b>SFY 2011 Accomplishments</b>	Task completed in 2006.
<b>Progress To-Date</b>	Study Completion: 100%  Between May and November of 2006, 313 individuals participated in the study. They represented agricultural, civic, recreational, or residential interest groups. In addition, individuals from the Crow and the Northern Cheyenne tribes were included.  There were three particular goals associated with the investigation. The first goal was to document

	<p>how the people of the Yellowstone River describe the physical character of the river and how they think the physical processes, such as floods and erosion, should be managed. Within this goal, efforts were made to document participants' views regarding the many different bank stabilization techniques employed by landowners. The second goal was to document the degree to which the riparian zone associated with the river is recognized and valued by the participants. The third goal was to document concerns regarding the management of the river's resources.</p> <p>The Army Corps of Engineers printed 400 copies of the Summary and 250 copies of each segment for distribution by the local conservation districts. The reports can also be found online at <a href="http://www.yellowstonerivercouncil.org/resources.php">http://www.yellowstonerivercouncil.org/resources.php</a></p> <p>Currently, Dr. Gilbertz and YRCDC staff continues to give presentations to the public about the results of the study. Dr. Gilbertz has given over 30 public presentations concerning the findings.</p>
<b>SFY 2012 Anticipated Work</b>	Archiving the cultural inventory with the Western Heritage – See details on the Information Management segment.
<b>Products</b>	Yellowstone River Cultural Inventory - 2006, Part I – V and Overall Summary

### *Economics*

<b>Principal Investigator</b>	Ray Rasker, Headwaters Economics, Bozeman, MT - No Principal Investigator yet selected for overall study. TAC Contact: Burt Williams
<b>Supporting Participants</b>	US Army Corps of Engineers, YRCDC.
<b>Primary Goal</b>	Test the methodology and output of a proprietary analysis approach used by a Bozeman nonprofit company (Headwaters Economics) to analyze economics sectors employing a GIS approach.
<b>SFY 2011 Accomplishments</b>	<p>Pilot contract completed September, 2010. While the contracted output produced interesting visual representations of change in housing patterns the data did not provide all of the parameters needed to assess the use of river resources by residential housing development.</p> <p>TAC utilized the contracted material to refocus its approach to obtaining economic data and analysis that establishes how much of the river resource base each economic sector uses and how the use trends for the sector compare to resource availability. A final revised scope of work is planned for mid-summer 2011.</p>
<b>Progress To-Date</b>	<p>Study Completion: 5%; Current Funding Level: 5%</p> <p>Headwaters Economics pilot study completed. Revised and detailed scope of work for entire economics study being drafted at end of SFY 2011.</p>
<b>SFY 2012 Anticipated Work</b>	<p>Final Scope of Work completed in first Quarter.</p> <p>Decision on contract versus Corps of Engineers in-house preparation of work, and possible funding in Federal FY 2012.</p>
<b>Products</b>	Pilot Study completed 2010: <i>Past, Current and Future Residential Development along the Yellowstone River.</i>

#### IV. Information Management and GIS Services Components

##### *Yellowstone River Cumulative Effects Assessment Database*

<b>Principal Investigators</b>	Karin Boyd, Applied Geomorphology, Inc.; Tony Thatcher, DTM Consulting, Inc.
<b>Supporting Participants</b>	YRCDC TAC and Principal Investigators working on components of the Cumulative Effects Investigation
<b>Primary Goal</b>	Provide a means to communicate information and results of the CEA project to the public, the Council, and investigators working on the project.
<b>SFY 2011 Accomplishments</b>	11 of 88 reaches have been entered into the database - work this year has focused on continued development of the Cumulative Effects Assessment Database for TAC usage.
<b>Progress to Date</b>	Study Completion: 15%; Current Funding Level: 15%  Cumulative Effects Assessment Database – Prototype database complete, Phase II of database completed by December 31, 2010 – 11 reaches prototyped.
<b>SFY 2012 Anticipated Work:</b>	Continued work on populating the CEA database pending available funding.
<b>Product</b>	Microsoft Access Database that allows investigators to store reach-based data and information for each scope of work as it becomes available.

##### *Yellowstone River Internet Map Application Development*

<b>Principal Investigator</b>	Jim Robinson, Montana DNRC
<b>Supporting Participants</b>	Gerry Daumiller, Montana State Library, NRIS, plus numerous principal investigators and contractors working on various components of the Cumulative Effects Investigation.
<b>Primary Goal</b>	Provide a means to communicate geographic information and results (e.g. CMZ and 100-year inundation boundary) to the Yellowstone River Conservation Districts, real estate professionals, the public and investigators working on the CEA project.
<b>SFY 2011 Accomplishments</b>	<ol style="list-style-type: none"> <li>1. Yellowstone River Internet Map Service deployed</li> <li>2. Draft tutorial developed and circulated to YRCDC, RAC and TAC for use and comment.</li> <li>3. Map service for use with Internet browser: <a href="http://gisportal.msl.mt.gov/Yellowstone_River">http://gisportal.msl.mt.gov/Yellowstone_River</a></li> <li>4. For use with ArcGIS: <a href="http://gisportal.msl.mt.gov/arcgis/rest/services/application/Yellowstone_Hydrology/MapServer">http://gisportal.msl.mt.gov/arcgis/rest/services/application/Yellowstone_Hydrology/MapServer</a></li> </ol>
<b>Progress to Date</b>	Study Completion: 100%  Yellowstone River Internet Map Service deployed with accompanying tutorial on how to use it with examples on how to research a particular sites.
<b>SFY 2012 Anticipated Work</b>	If the service proves successful (i.e. it becomes a common source for river/floodplain information), additional layers may be added.
<b>Product</b>	Yellowstone River Internet Map Service (2010 version) with accompanying tutorial dated March, 2011.

### *GIS Data Archive and Clearinghouse Services*

<b>Project Managers</b>	Jim Robinson, Montana DNRC, Evan Hammer, Montana State Library, NRIS
<b>Additional Participants</b>	Gerry Daumiller, Montana State Library, NRIS, plus numerous investigators and contractors working on various components of the Cumulative Effects Investigation.
<b>Primary Goal</b>	Provide permanent data storage and retrieval services (aka data hosting and clearinghouse functions) during the life of the Yellowstone River CEA project, and beyond.
<b>SFY 2011 Accomplishments</b>	For reports and information (downloadable GIS data) pertaining to the Yellowstone River CEA visit the Yellowstone River Corridor Resource Clearinghouse at: <a href="http://nris.mt.gov/yellowstone">http://nris.mt.gov/yellowstone</a> . SFY 2011 saw the addition of the Yellowstone River Riparian Vegetation Mapping Final Report to the Clearinghouse. In addition, data for the Yellowstone River Corridor were added to the National Wetlands Inventory (NWI). NWI data and maps are available from the Montana Natural Heritage Program website at <a href="http://mtnhp.org/nwi/NWI_Status_map.asp">http://mtnhp.org/nwi/NWI_Status_map.asp</a>
<b>Progress to Date</b>	Study Completion: 100% All products authorized by YRCDC have been published.
<b>SFY 2012 Anticipated Work</b>	Work products and data will be published as needed on an ongoing basis.
<b>Products</b>	See <a href="http://nris.mt.gov/yellowstone">http://nris.mt.gov/yellowstone</a> .

### *Yellowstone River Web Site Development*

<b>Project Managers</b>	Nicole Divine McClain, YRCDC; Jim Robinson, DNRC; Gerry Daumiller, Montana State Library, NRIS
<b>Additional Participants</b>	Montana State Library, Natural Resources Information System (NRIS), private contractors (Engine 8, Bunkers Design)
<b>Primary Goal</b>	Provide a means to communicate information and results of the CEA project to the public, the Council, and investigators working on the project.
<b>SFY 2011 Accomplishments</b>	The purpose of the website is to serve as a clearinghouse and to provide query services necessary to transmit products and results to resource managers and the public (external usage). Work this year has focused on developing a new Yellowstone River Conservation District Council website independent of the State of Montana and DNRC, who hosted the previous website for many years. The new website includes links to the Project Management Plan, the 2006 Yellowstone River Cultural Inventory reports and summary, annual reports, position papers and BMP's. It also features a News & Events section that is easily updated by Council staff with meeting notices, minutes, and other timely information. The website also features a photo gallery, email sign-up, and a link to NRIS and the Yellowstone River Internet Map Services for access to maps and data developed by the project.
<b>Progress to Date</b>	Study Completion: 100%  The main website has been completed and is fully-functional.
<b>SFY 2012 Anticipated Work</b>	The website will be updated on an as-needed and ongoing basis.
<b>Product</b>	Yellowstone River Website – <a href="http://www.yellowstonerivercouncil.org">www.yellowstonerivercouncil.org</a>

**Cultural Inventory Archive Services**

<b>Principal Investigators:</b>	Dr. Susan Gilbertz, Montana State University																																																																																																																																																																		
<b>Supporting Participants:</b>	Western Heritage Center--Billings																																																																																																																																																																		
<b>Primary Goal:</b>	To contact each of the 313 participants in the Yellowstone River Cultural Inventory—2006 to see if they are willing to release the original audio-recorded interviews for a public archive to be housed at the Western Heritage Center of Billings.																																																																																																																																																																		
<b>SFY 2011 Accomplishments</b>	See “Progress To-Date” below.																																																																																																																																																																		
<b>Progress To-Date:</b>	<p>Study Completion: 50%; Current Funding Level: 100%</p> <table border="1"> <thead> <tr> <th></th> <th>AG</th> <th></th> <th></th> <th>CIV</th> <th></th> <th></th> <th>REC</th> <th></th> <th></th> <th>RES</th> <th></th> <th></th> <th>NAT AM</th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>I</td> <td>21</td> <td>22</td> <td>95%</td> <td>13</td> <td>14</td> <td>93%</td> <td>14</td> <td>15</td> <td>93%</td> <td>10</td> <td>15</td> <td>67%</td> <td></td> <td></td> <td></td> <td>58</td> <td>88%</td> </tr> <tr> <td>II</td> <td>19</td> <td>22</td> <td>86%</td> <td>13</td> <td>14</td> <td>93%</td> <td>13</td> <td>16</td> <td>81%</td> <td>8</td> <td>11</td> <td>73%</td> <td></td> <td></td> <td></td> <td>53</td> <td>84%</td> </tr> <tr> <td>III</td> <td>11</td> <td>16</td> <td>69%</td> <td>15</td> <td>18</td> <td>83%</td> <td>15</td> <td>16</td> <td>94%</td> <td>12</td> <td>16</td> <td>75%</td> <td></td> <td></td> <td></td> <td>53</td> <td>80%</td> </tr> <tr> <td>IV</td> <td>11</td> <td>12</td> <td>92%</td> <td>10</td> <td>14</td> <td>71%</td> <td>11</td> <td>13</td> <td>85%</td> <td>12</td> <td>15</td> <td>80%</td> <td></td> <td></td> <td></td> <td>44</td> <td>81%</td> </tr> <tr> <td>V</td> <td>9</td> <td>14</td> <td>64%</td> <td>7</td> <td>8</td> <td>88%</td> <td>10</td> <td>16</td> <td>63%</td> <td>11</td> <td>19</td> <td>58%</td> <td></td> <td></td> <td></td> <td>37</td> <td>65%</td> </tr> <tr> <td>NAT AM</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>3</td> <td>7</td> <td></td> <td>3</td> <td>43%</td> </tr> <tr> <td></td> <td>71</td> <td>86</td> <td>83%</td> <td>58</td> <td>68</td> <td>85%</td> <td>63</td> <td>76</td> <td>83%</td> <td>53</td> <td>76</td> <td>70%</td> <td>3</td> <td></td> <td></td> <td>248</td> <td>79.2%</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>248</td> <td></td> </tr> </tbody> </table> <p>Nearly 80% returned, signed releases. 8% said no, 9% unable to find and 4% pending as of May 13, 2011.</p>		AG			CIV			REC			RES			NAT AM					I	21	22	95%	13	14	93%	14	15	93%	10	15	67%				58	88%	II	19	22	86%	13	14	93%	13	16	81%	8	11	73%				53	84%	III	11	16	69%	15	18	83%	15	16	94%	12	16	75%				53	80%	IV	11	12	92%	10	14	71%	11	13	85%	12	15	80%				44	81%	V	9	14	64%	7	8	88%	10	16	63%	11	19	58%				37	65%	NAT AM													3	7		3	43%		71	86	83%	58	68	85%	63	76	83%	53	76	70%	3			248	79.2%																	248	
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<b>SFY 2012 Anticipated Work</b>	The physical transfer and creation of the archive will occur in Summer 2011. Forthcoming product: a public archive of the majority of the original interviews.																																																																																																																																																																		
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**V. Cumulative Effects Analysis**

*Cumulative Effects Analysis*

<b>Principal Managers</b>	Burt Williams (TNC), John Kilpatrick (USGS), Eric Laux (Corps)
<b>Principal Investigators</b>	Warren Kellogg (TAC chair), Jim Robinson (MT DNRC) Karin Boyd (Applied Geomorphology), Tony Thatcher (DTM Consulting)
<b>Supporting Participants</b>	YRCDC, ACOE and TAC
<b>Primary Goal</b>	To develop an interdisciplinary scientific characterization of relationships between human activities and associated river system response, and to use that information to develop recommendations for management practices and actions that will provide sustainability to socioeconomic interests and long-term biological/physical integrity of the river system.
<b>SFY 2011 Accomplishments</b>	See “Progress To-Date” below
<b>Progress To-Date</b>	<p>Study Completion: 10%; Current Funding Level: 10%</p> <p>In FY 2009 the Council and TAC explored the basics of cumulative effects analysis and constructed a table that enumerated what the TAC believes to be the major drivers of the natural Yellowstone River system, including such factors as hydrology, geological context and other</p>

	<p>variables. During FY 2010, the TAC decided to test how two reaches of the river could be described and related back to cumulative effects using data collected thus far in the study. The approach adopted was to create a Cumulative Effects Assessment (CEA) database that compiles available datasets and generates interdisciplinary reports of quantitative output at a reach scale. This output was then compiled into reach-specific narratives that summarize each dataset and examines potential cause and effect relationships within that river segment. The narratives include the identification of reach-specific data gaps and potential restoration opportunities. The initial pilot project consisted of two reaches, and the resulting narratives were summarized in a report by DTM Consulting and Applied Geomorphology, Inc. The TAC collectively reviewed the two river reach narratives, and found that this pilot effort was worthwhile in that it began to shed light on cause and effect relationships within each of the reaches utilizing data from the current CES study and various other sources. This effort also had the added benefit of providing insights and lessons learned on how best create a relational database that will eventually support detailed CES analysis.</p> <p>Because the two river reaches only represented a small slice of the different environments on the river as well as the level and kind of human activity in the river corridor, late in the fiscal year the Council approved an additional nine reaches to be examined in the same way as the pilot reach. That report draft was completed in FY 2011. At this point, 11 reaches have been completed, which represents 12.5% of the total corridor extent.</p> <p>Late in SFY 2011 a sub-group of the TAC met to consider the results of the reach narratives contract as well as the relationship of those reach specific parameters with the overall system drivers work that had been completed earlier. This ongoing discussion is attempting to synthesize large system-wide processes and drivers with the observations made at specific sites along the river.</p> <p>The database in the pilot study currently supports an automated reporting system of basic parameters of the following subject areas:</p> <ul style="list-style-type: none"> <li>• Geomorphology</li> <li>• Cultural Inventory</li> <li>• Hydrology</li> <li>• Hydraulics</li> <li>• Economics</li> <li>• Physical Features</li> <li>• Water Quality</li> <li>• Avian</li> <li>• Fisheries</li> <li>• Riparian</li> <li>• Wetlands</li> </ul> <p>The database is designed to accommodate additional study results as they are completed, and to automatically update the output within the narrative reports.</p>
<b>SFY 2012 Anticipated Work</b>	<p>The TAC sub-group is taking the synthesis work above and presently examining some potential study hypotheses based on river wide processes and drivers. The drivers considered range from broad scale systemic impacts such as flow alterations to site-specific impacts such as floodplain structures. The immediate goal is to determine an initial indication of the direction the detailed CES analysis should take (i.e. which relationships seem most important), and if the individual reach narratives and associated database can serve that process. The TAC is developing hypotheses or questions that can answer how much change is being imposed on natural river conditions and whether or not that change poses significant present or future problems for sustainability of the river system.</p>
<b>Products</b>	