

**MISSOURI-MADISON RIVER FUND
RECREATION PROJECT**

APPLICATION FORM 2008

Project Name: **Reconstruction of Roe River Bridge**

Reservoir or River Segment: **Rainbow Reservoir, Missouri River, Great Falls Area**

County: **Cascade**

Site Name and/or Legal Location: **Giant Springs State Park, T21N, R4E, Section 33**

Applicant Name: **Roger Semler**

Position (if applicable): **Region 4 Parks Manager**

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Project Sponsors:

If the applicant is not a representative of the U.S. Forest Service; Bureau of Land Management; Montana Fish, Wildlife & Parks; or Madison, Gallatin, Broadwater, Chouteau, Lewis and Clark, or Cascade Counties, the applicant will need a project sponsor. Sponsors can include any of the above or PPL Montana or the Bureau of Reclamation. Project sponsors serve on Missouri-Madison Regional Working Groups. See page 1-9 of the Comprehensive Recreation Plan for a list of 2007 members of the Regional Working Groups (www.apleco.com/mmcrp.asp).

Project Sponsor Name N/A

Position (if applicable) _____

Address _____

Telephone # _____

E-mail Address _____

| | <u>Financial Support</u> |
|----------------------------------------------|--------------------------|
| Total Project Cost: | \$ 80,000 |
| Applicant Contributions: | \$ 40,000 |
| Other Contributions (Please list by source): | |
| _____ | \$ _____ |
| _____ | \$ _____ |
| _____ | \$ _____ |

PPL Montana Match Request: \$20,000

River Fund Request: \$20,000

Proposed Project Period: Summer 2009

Please note: Document all in-kind support and contributed services from project partners under Scoring Criterion #1 on page 3.

Has this project been previously submitted for funding consideration by the River Fund Board, either as a separate project or part of another project? ___ Yes ___ **X** No. If "Yes," please identify which years the application was submitted and, if the project was previously funded, list the amount funded by year.

MISSOURI-MADISON RIVER FUND RECREATION PROJECT

Project Name: Reconstruct Roe River Bridge

Project Description:

Giant Springs State Park is located on Rainbow Reservoir on the Missouri River at river mile 2108; the park is on land originally donated to the City of Great Falls by Montana Power Company. This project is being initiated to reconstruct the historic Roe River Bridge in the park.

The concrete Roe River Bridge was constructed in 1932-33 as a replacement for the wooden bridge originally in place. The Works Project Administration (WPA) constructed this bridge as well as other features at the park as part of the first major development of the area as a recreation site. The bridge provides access to Roe Island where an ADA accessible fishing station is located. Use of the fishing station is heavy throughout the year; as it provides excellent access to the waters of Rainbow Reservoir. The historic features and Giant Springs State Park have been deemed eligible for listing on the National Register of Historic Places.

When the bridge was built, the water level in Rainbow Reservoir did not affect the bridge and the entire structure sat on dry land (see historic photo contained in Attachment B). In subsequent years, the height of Rainbow Dam located downstream of Giant Springs was raised, causing the waters of Rainbow Reservoir to back up into the Roe River. This resulted in the bridge abutments and lower portions of the bridge being submerged in water. Fluctuations in the reservoir levels can easily be seen on the bridge as they raise and lower. During high water periods such as those seen in May-June 2008, the water level rises well above the abutments and almost to the apex of the arch span (see Attachment B). The bridge has also been impacted by the addition of block railings, as well as age.

In 2007, Seivert & Seivert Cultural Resource Consultants conducted a cultural and architectural study of the eight historic features in the park for FWP. This study determined that the Roe River Bridge is in a state of failure, and recommended reconstruction of the bridge (Attachment A). This study was reviewed by the State Historic Preservation Office (SHPO) and concurrence received (letter from Pete Brown, SHPO, to Paul Valle FWP dated May 15, 2007).

The project being proposed for consideration as a River Fund grant is to remove the existing structure and replace it with new structure that retains the historical character of the original feature. The new bridge will also be designed to enhance compliance with the Americans with Disabilities Act (ADA). Modern materials will be used to better withstand the elements and provide required structural strength.

Scoring Criteria

1. *Project involves collaboration with other agencies or organizations.*

FWP Parks Division has approved a Major Maintenance project for FY 2009 to provide approximately ½ of the funding needed to reconstruct this bridge. FWP will also provide in-kind labor for design and engineering, as well as project administration. FWP will consult with Seivert & Seivert and SHPO as needed to ensure adherence to historical and cultural requirements. FWP has already committed a great deal of staff time and funding within the environmental assessment phases, and administering the cultural study conducted by Seivert & Seivert.

2. *Project responds to a clearly identified need.*

Giant Springs State Park is the most visited state park with over 235,000 visitors in 2007. Many of these visitors utilize the Roe River Bridge to access Roe Island for fishing, or to access the nearby larger historic arch bridge as part of the circulation pattern established by early planners of the park.

Seivert & Seivert have determined that the bridge is in a state of failure and have recommended reconstruction (see attached report). Absence of the Roe River Bridge would negatively affect overall visitor experience, and make access for those with disabilities more difficult because visitors would need to access the area using the larger bridge, which is not ADA accessible.

3. Project provides a benefit to public recreation in the Project Area and addresses specific issues and goals of the Missouri-Madison Comprehensive Recreation Plan (CRP).

This project would directly address and enhance the following goals in the 2005 Missouri-Madison Comprehensive Recreation Management Plan:

Goal: To provide safe and well-managed recreation sites and dispersed use areas that provide enjoyable user experiences across a spectrum of opportunities and seasons.

Goal: Continue to improve and expand recreation opportunities that offer universal accessibility.

Goal: To maintain or proactively increase public safety for recreationists in the Project area.

Goal: To promote responsible user behavior that protects natural, cultural, and social resources in the Project area.

4. Project is for operation and maintenance of an existing recreation site.

The Roe River Bridge is one of the primary site features constructed at Giant Springs in the 1930's as part of the overall development of the park. The bridge has continued to serve as a vital component in the visitor circulation pattern to permit viewing and enjoyment of the Springs and Roe River. The bridge has also served as a primary access route to reach the Missouri River and accessible fishing station on Roe Island. The proposed project would serve to maintain this historical use pattern and enhance accessibility.

5. Project supports or protects other resources and is consistent with or supports resource plans in the Project Area.

The historic concrete features constructed at Giant Springs by the Works Project Administration were designed to allow visitors to view the Springs and Roe River from safe and durable routes. Without the bridges, viewing platform, and rock walls, the sensitive resources of the Springs and Roe River would have deteriorated rapidly due to the high visitation and recreational use. These features continue to provide protection of these resources, and are part of a historical landscape where the bridges, platforms, walls, and walkways are utilized by visitors in their enjoyment of the park. If any of these components were to be removed, or deemed unusable due to safety concerns, the circulation patterns would be disrupted and potentially lead to negative impacts on the resources.

This project would address the goal of Historic Preservation as listed in the Park Management Plan for Giant Springs State Park: "Identify and record cultural and historic sites, encourage the prioritization and preservation of important sites within the planning area, and coordinate information-sharing among the various landowners and land managers in the planning area."

The bridge provides important access to the Missouri River for fishing, wildlife viewing, photography, picnicking, and provides a venue for educational programs conducted by park naturalists.

ATTACHMENT A
Reconstruction of Roe River Bridge
Excerpt from Seivert & Seivert Report

SITE FEATURE 4: Concrete Bridge spanning the Roe River.

Constructed: 1933¹.

Builder: Contracted - contractor unknown²

Designer: Thomas Lease; (future park superintendent³).

STATUS: The bridge is an Historic Site Feature within a potentially eligible Historic District as determined by previous studies⁴ with concurrence by the Montana State Historic Preservation Office.



PROCEEDURAL ALTERNATIVES:

As a Historic Feature in a Potentially Eligible Historic District, any work undertaken on the bridge must be done in compliance with ***“The Secretary Of The Interior’s Standards For The Treatment Of Historic Properties”*** as administered by the United States Department Of Interior.

RECOMMENDED PRESERVATION TREATMENT: The recommended treatment for Site Feature #4 (Roe River Bridge) is the **Reconstruction** classification as outlined in the “Secretary’s Standards”.

JUSTIFICATION: The upper portion of the bridge (deck and railings) was installed in the 1970's without consideration to the historic appearance of the bridge, and is showing evidence of some deterioration; particularly at the railings. The lower part of the bridge (structural arch) is original to 1933 but is deteriorated to the point of being unsound. Unfortunately, the deterioration has advanced to include primary reinforcement within the supporting ribs and cannot be supplemented in place. If the ribs could be removed without damage they could be re-built and reinstalled but it is unlikely that they could be removed without damage or breakage given the seriousness of their condition.

CONDITION:

- Concrete – 1933 structure (below deck)

The American Concrete Institute was founded in 1904; the Portland Cement Foundation was established in 1916; in 1917 the U. S. Bureau of Standards and the American Society for Testing materials established a standard formula for Portland Cement ; pre-stressed concrete was developed in 1927; in 1917 the City of Great Falls adopted a building code that references Portland Cement; and by 1914 only (12) plants in the United States reported any production of Natural Cements. Without documentation, but as evidenced by the state of the building industry in 1928, the conclusion is that the structure of the bridge is probably constructed with Portland Cement. Proportioning of mixes was also well established by 1928 as were the procedures for testing both the product and its component parts.

The concrete structure is very likely similar to what we would cast today although it may have been of a slightly lower strength (on the order of 2500 PSI) and it would not have contained additives to accelerate setting, or have had the plasticizers that are being used with greater frequency in today’s construction market. Air-

Rehabilitation of Bridges, Walkways, and Site Features
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entraining was not perfected until the 1940's so the 1933 concrete probably does not benefit from the added durability of entrained air.

The structure of this bridge is identical to the (4) spans of the adjacent walking bridge that is used for viewing of the spring. The supporting structure consists of (2) arched ribs (13" in width) that are located on either side of the walkway and are joined by the deck surface acting as a one-way concrete slab. Conceptually it is similar to a contemporary twin-T profile with the T's arched. The deck and ribs were monolithically cast. There are no known drawings of the feature and construction details of the bridge are limited to what we can glean from historic photographs. Based on the photos and on-site examination it appears that the only reinforcing in the structure consists of steel angles, channels, or tubing that were formed in the shape of an arch at the bottom of the ribs; and straight angles, channels, or tubing installed along the top of the ribs at the intersection of the deck surface. The top and bottom reinforcement was connected by angle struts in the form of truss webs along the plane of each rib. (Historic Photo attached).

The arch is very flat and preliminary analysis indicates that, due to the shallowness of the arch, significant tensile stresses can occur at the bottom of each rib.

The concrete ribs exhibit significant spalling near the waterline at both springlines of the arch when viewed from the shore. This is attributed to water and freezing actions in the manner of bridge piers and abutments. In February 2007 FWP personnel and the author conducted an underside inspection of the bridge structure. The construction described above was confirmed during that inspection. The inspection further revealed that large sections of the concrete cover over the bottom reinforcing had spalled off, areas that had not spalled were badly cracked and ready to spall, and that the exposed tensile reinforcing at the bottom of the ribs was severely corroded and in some instances partially missing. Exposed reinforcing that is remaining is badly delaminated (lamellar delamination) and it fragmented when touched.

This single span bridge over the Roe River is in much worse condition than the (4) companion spans at the viewing bridge feature. This is attributed to the added weight from the deck overlay and cementitious railing that was added in the 1970's; the added weight opened the flexural cracks at the bottom of the ribs slightly and moisture more easily accessed the reinforcing. All deterioration appears to be water related; no evidence was found indicating material failure or chemical action causing deterioration of the bridge.

1975 Concrete (above deck):

The 1975 concrete is in good condition; the bridge deck does not show significant cracking and the surface is sound and serviceable. Estimated properties for the 1975 bridge deck would be 4000 PSI air-entrained concrete.

■ CMU Railing – condition unknown

The Concrete Masonry Units (CMU) used for the railing have been parged with stucco and can not be visually inspected; based on circa 1975 construction knowledge, it is speculated that the CMU is standard weight block (ASTM) and that it is grouted full. The railing and deck were added in 1975 and the design engineer was Wenzel & Co. of Great Falls⁵. The reinforcing pattern of the overlay and railing is as indicated on the attached drawing.

■ Stucco skim coat – poor

Visually, the stucco applied over the CMU railing appears to be typical cementitious stucco circa 1975. Based on visual observation and research of stuccoing practices around 1975 it is believed that the stucco was placed directly on the CMU substrate without lath, is 5/8" +/- in thickness, and is a mixture of Portland Cement, sand, water, and lime (limited). The specified mixture for the stucco may exist in the FWP records due to the relative newness of the application. The stucco has cracked at nearly every CMU joint and the cracks are very vulnerable to additional water infiltration at this time. The systematic crack pattern suggests that the initial application did not bond to the joint mortar to the same extent as to the more porous face shell of the CMU. The stucco in its current state is not beyond repair; however, because of the seriousness of the structural

failure of the bridge supports and since there is no historic basis for the design of the current railing it is not recommended to repair the CMU railing.

OTHER CONSIDERATIONS:

Access across the bridge for mobility impaired must be maintained. The South (inland) access to the bridge would be improved for ADA access by reducing the slope of the walkway approaching the bridge deck, or, elevating the South end of the bridge feature. Although the bridge is wide enough for a single wheelchair it does not meet code for passing widths. Since this portion of the park is heavily used increasing the width (approx. 1') for passing purposes should be considered.

Based on historic photographs, it is possible to reconstruct the appearance of the 1933 railing. The 1933 railing did not meet current code requirements for height or spacing of intermediate railings. It is recommended that a new railing design be incorporated that is compatible with the appearance of the historic design and that is in compliance with code safety requirements.

In compliance with the State Antiquities Act, FWP policy, and Department Of Interior Standards any work undertaken adjacent to the bridge must be done with sensitivity for archaeological values that may exist at the site.

MAINTENANCE STRATEGIES INVESTIGATED

1. No action alternative: This alternative is not realistic; **the lower portions of this bridge are in a state of failure.**
2. Rehabilitation alternative: The tension reinforcing steel is compromised (or missing) to the extent that it cannot be considered as contributing anything to structural strength. Tensile reinforcing can be reintroduced into beams and girders by the use of carbon rods that are cut into sound concrete and re-embedded. This requires a specialty contractor from out of the region; this application is also complicated by the extremely low headroom for working and it is not known if there is adequate room for equipment to perform the embedment work. For safety, the bridge would have to be shored during these procedures. This alternative was not considered due to the low probability of success, high costs to perform specialty construction, and unknowns associated with executing the work.
3. Reconstruction alternative: This alternative was considered to have the greatest likelihood of success and is the recommended strategy.

Reconstruction is defined as the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location.

Except as noted for the railings below, the appearance, design, dimensions, and geometry of the 1933 bridge are known from historic photographs and from field measurements on-site. 1933 is selected as the date of significance for the bridge because it was the year of construction for the bridge, the companion viewing bridge, and extensive improvements to Roe Island. The companion viewing bridge continues to exhibit its 1933 origins, and Roe Island was increased in size and made permanent by the 1933 work. Access to and use of Roe Island is an established pattern of public usage of Giant Springs State Park that began during the late 20's – early 30's period. Prior to the construction of the Fish Hatchery structure (and based on photo-documentation) Roe Island existed as only a spit of sand at the outlet of the nation's 2nd shortest river. It is primarily a man-made island. Nevertheless, it can be documented that from 1932 to the present (75 years) Roe Island has been an accessible part of the park.

Recommended treatments for Reconstruction are quoted from the DOI Standards below:

“RECOMMENDED

Replacing in kind--or with substitute material--those portions or features of the structural system that are either extensively deteriorated or are missing when there are surviving prototypes such as cast iron columns, roof rafters or trusses, or sections of loadbearing walls. Substitute material should

convey the same form, design, and overall visual appearance as the historic feature; and, at a minimum, be equal to its loadbearing capabilities.”

“NOT RECOMMENDED

Installing a visible replacement feature that does not convey the same visual appearance, e.g., replacing an exposed wood summer beam with a steel beam.

Using substitute material that does not equal the loadbearing capabilities of the historic material and design or is otherwise physically or chemically incompatible. “

Although the design of the railing at the cantilevered viewing structure immediately over the spring is photo-documented, there are no photographs of railings on either the pedestrian bridge to Roe Island (site feature #4) or the adjacent viewing bridge structures that circumnavigate the river side of Giant Springs. Examination of the 4-span viewing bridge reveals inserts to receive a railing; the pedestrian bridge has been re-decked and no visible evidence remains of original railings or inserts. Speculatively, all bridge spans were designed to have railings added to them, but it is believed that the work was never completed.

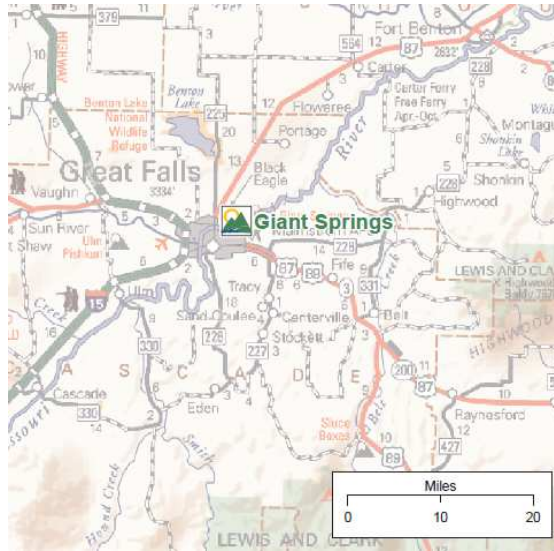
Historically access to Roe Island via the bridge was limited to pedestrian use. The bridge has seen increased usage in recent years and is also used by mobility impaired individuals (as a footnote the fishing platforms on the downstream end of the Island are specifically designed for mobility impaired fishermen). Because of the length of the span and the increases in usage it is recommended that the bridge be widened 12” to permit room for passing of mobility impaired and ambulatory visitors. There is also a demonstrated need for Fish, Wildlife, and Parks to be able to access the island with wheeled equipment for maintenance purposes as well as a need for equipment access during stabilization of the retaining wall around Roe Island. It is believed that the bridge profiles and design can be internally strengthened to accommodate equipment loads and an incremental change in width with no visible change to the outward appearance of the bridge; however, the bridge should only be widened enough to allow small scale equipment to cross onto the island.

The defining architectural characteristics of the historic bridge are the arched profile, the decorative formwork of the ribs, and the (presumed) railing design. In the judgment of the author, the width of the feature could be minimally altered without adversely affecting the defining characteristics and integrity of the proposed reconstruction.

RECOMMENDED ACTION - Specific recommendations for this site feature:

- Reconstruct the bridge including railing designs compatible with the historic railings used at the cantilevered viewing platform.
- Elevate the bridge (slightly) to improve the gradient at the south access for ADA
- Widen the bridge (1’ or less) to allow for mobility impaired to pass safely while on the bridge feature.

ATTACHMENT B



Area Map of Giant Springs State Park



Historic Photo of Roe River Bridge
(Note Depth of Roe River and Abutments out of the Water)



Photo of Seasonal High Water Conditions on Roe River Bridge taken 5/27/08

ATTACHMENT B (CONTINUED)



Photo Showing Spalling of Roe River Bridge – North Side



Photo Showing Spalling of Roe River Bridge – South Side