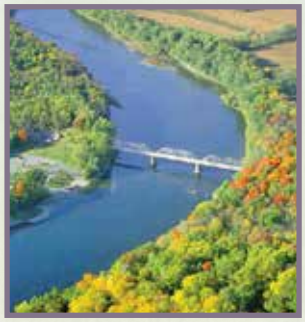
WILD AND SCENIC RIVER VALUES WORKSHOP

NATIONAL PARK SERVICE • U.S. DEPARTMENT OF THE INTERIOR



Wild and Scenic Rivers Act

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Overview

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 USC 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, or recreational values in a free-flowing condition for the enjoyment of present and future generations. The act is notable for safeguarding the special character of these rivers, while also recognizing the potential for their appropriate use and development. It encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection.

It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dams and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes. (Wild and Scenic Rivers Act, October 2, 1968)

Rivers may be designated by Congress or, if certain requirements are met, the Secretary of the Interior. Each river is administered by either a federal or state agency. Designated segments need not include the entire river and may include tributaries. Rivers may be managed through a partnership with communities, special councils, and state governments. For federally administered rivers, the designated boundaries generally average one-quarter mile on either bank in order to protect river-related values.

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River Classification

Rivers are classified as *wild, scenic, or recreational.*

Wild River Areas – Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic River Areas – Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational River Areas – Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Regardless of classification, each river in the national system is administered with the goal of protecting and enhancing the values that caused it to be designated.

The act purposefully strives to balance dam and other construction at appropriate sections of rivers with permanent protection for some of the country's most outstanding free-flowing rivers. To accomplish this, it prohibits federal support for actions such as the construction of dams or other instream activities that would harm the river's free-flowing condition, water quality, or outstanding resource values. However, designation does not affect existing water rights or the existing jurisdiction of states and the federal government over waters as determined by established principles of law.

As of August 2015, the national system protects 12,709 miles of 208 rivers in 40 states and the Commonwealth of Puerto Rico; this is a little more than one-quarter of one percent of the nation's rivers. By comparison, more than 75,000 large dams across the country have modified at least 600,000 miles, or about 17%, of American rivers.

Interagency Wild and Scenic Rivers Council

In April 1995, heads of the Bureau of Land Management, National Park Service, US Fish and Wildlife Service, and US Forest Service signed the Interagency Wild and Scenic Rivers Coordinating Council Charter.

The overriding goal of the council is to improve interagency coordination and consistency in administering the Wild and Scenic Rivers Act, thereby improving service to the American public and enhancing protection of important river resources. The council addresses a broad range of issues, from management concerns on rivers presently in the national system to potential additions listed on the Nationwide Rivers Inventory, from state designations to the provision of technical assistance to other governments and nonprofit organizations.

The council consists of representatives of the four wild and scenic rivers administering agencies—the Bureau of Land Management, National Park Service, US Fish and Wildlife Service, and US Forest Service. Other federal agencies with river interests have key contacts and participate in discussions affecting their interests.

For more information about the National Wild and Scenic Rivers System or the Interagency Wild and Scenic Rivers Council, please visit www.rivers.gov.

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Wild and Scenic River Values Planning

The Planning Process

One process used to develop "wild and scenic river values publications" for wild and scenic rivers includes three major steps: pre-workshop assignments, a three-day workshop, and post-workshop efforts. The total time to complete the process is about nine months. Please note that there are other suitable processes for identification of the outstandingly remarkable values (ORVs) for a particular river, and this document provides guidance for just one method out of many.

Wild and scenic river values are the building blocks for many other wild and scenic river planning and management decisions that require detailed information about the wild and scenic river's values. For example, without clearly defining the values, it's difficult to effectively accomplish the following planning and management actions, many of which are mandatory for wild and scenic river management:

- prepare a comprehensive river management plan
- establish boundaries
- make determinations under section 7(a)
- develop a resource monitoring plan
- address user capacity
- pursue a federal reserved water right
- grant easements or rights-of-way affecting the wild and scenic river
- manage mining or mineral leasing within the river's boundaries
- lease land acquired within the wild and scenic river area
- develop a land acquisition plan

Pre-workshop

Preparation begins about two months before the workshop. Participants are asked to complete a series of technical specialist report forms in order to gather, review, and summarize as much background information as possible about the river's potential outstandingly remarkable values, free-flowing condition, and water quality. Working on these reports in advance of the workshop gives specialists an opportunity to review existing documentation and articulate their own understanding of the river's values. This allows for much more in-depth and productive discussions during the workshop. In the end, these technical specialist reports provide the basis for the wild and scenic river values publications.

Workshop

The purpose of the workshop is to bring together an interdisciplinary team to define free-flowing condition, water quality, and ORVs of the wild and scenic river; evaluate and describe each ORV by river segment; identify river-related issues; and identify stakeholders. At the end of the workshop, initial drafts of each of these components will be complete.

Post-workshop

After the workshop, the project team prepares a draft report that summarizes the outcomes from the workshop. The report includes all of the components that are used to develop the publications, as well as the evaluation criteria and results used to determine ORVs by river segment. Workshop participants have an opportunity to review the report and offer refinements to the content. The project team then finalizes the workshop report and uses the content to draft the wild and scenic river values publications. The draft publication is reviewed by the participants and then finalized by the project team before it is submitted to the superintendent and regional director for approval. The publication is then printed and distributed to the park and regional office for future use.

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Elements of a Wild And Scenic River Values Publication

The wild and scenic river values publication includes the following elements.

Outstandingly Remarkable Values

Outstandingly remarkable values are defined by the Wild and Scenic Rivers Act as the characteristics that make a river worthy of special protection. Thus, the foundation for wild and scenic river management is a clearly defined set of ORVs. ORVs for a designated river can include any combination of the following: scenery, recreation, geology, fish, wildlife, prehistory, history, or other values (including, but not limited to, hydrology, paleontology, and botany resources). In order to be assessed as outstandingly remarkable, a value must be river-related or dependent, and unique, rare, or exemplary feature that is significant at a comparative regional or national scale.

Free-Flowing Condition and Water Quality

In addition to ORVs, the free-flowing condition and water quality of the river is also integral to its designated status. Because all wild and scenic rivers are free-flowing rivers whose water quality must be protected and enhanced, descriptions of these two values are included as part of the wild and scenic river values publication.

Managers of every wild and scenic river—even those with no apparent water-related issues or conflicts—are encouraged to have baseline inventories and some level of ongoing monitoring of streamflow and water quality. Valid and reliable baseline information is the foundation for effective water resource management decisions and is essential to the development of successful strategies to protect and enhance water resource values. In particular, long-term flow records are an invaluable tool in developing the necessary information to support instream flows to protect ORVs and water quality. Partnerships with local, state, and federal agencies can be very helpful in gathering baseline information.

The most important baseline information for the management of free-flowing condition and water quality within a wild and scenic river is a narrative description of these characteristics that made it a worthy addition to the national system and how these characteristics affect the river's outstandingly remarkable values.

Detailed guidance for documenting wild and scenic river water quantity and quality, as developed by the Interagency Wild and Scenic River Coordinating Council, is available at http://www.rivers.gov/documents/water.pdf.

Free-flowing Condition

Section 16(b) of the Wild and Scenic Rivers Act defines free-flowing as "existing or flowing in a natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. The existence, however, of low dams, diversion works and other minor structures at the time any river is proposed for inclusion in the national wild and scenic rivers system shall not automatically bar its consideration for such inclusion: Provided, that this shall not be construed to authorize, intend, or encourage future construction of such structures in components of the national wild and scenic rivers system."

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The presence of impoundments above and/or below the segment (including those that may regulate flow within the segment), and existing minor dams or diversion structures within the study area, do not necessarily render a river segment ineligible. There are segments in the national system that are downstream from major dams or are located between dams.

Because free-flowing condition focuses on the modification of the waterway, it is useful to develop inventories of structures along each segment of the designated river. Therefore, maps showing dams, diversions, head-gates, bridges, culverts, rip-rap, gabion structures, levees, roads, railroads, and pipelines are very useful. In addition, it is useful to present a list of past/current stream gage and water quality stations (local, state, and federal). This list should note the agency responsible for the gage/station, location, period of record, summary of flow statistics, and general description of water quality data collected. This information is essential to understanding and protecting the river's flow regime (frequency, duration, magnitude, timing, and rate of change) and water quality in the future. Monthly and annual flow hydrographs can be developed from streamflow data and can be used to understand how other river-related values are affected by flows. Historic flow data can be critical to identifying flow regimes necessary to protect channel and floodplain processes that are important to ORVs.

Another valuable piece of information is a record/listing of current upstream diversions, uses, and water rights. River managers should monitor upstream appropriations and/or new water uses and diversions to assess whether changing flows are impacting ORVs and water quality. This information will be useful in determining the need to seek a federal reserved water right under section 13(c) of the Wild and Scenic Rivers Act.

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Water Quality

Congress declared its intent to protect the water quality of rivers added to the National Wild and Scenic Rivers System in section 1(b) of the act. Congress further specified that the river-administering agencies cooperate with the US Environmental Protection Agency (EPA) and state water pollution control agencies to eliminate or diminish water pollution (section 12(c)). The act, however, does not reassign EPA and/or state responsibility for implementation of the Clean Water Act to the river-administering agency.

River-administering agencies use a variety of approaches to protect or enhance water quality including, but not limited to: developing a cooperative water quality plan with the Environmental Protection Agency and state agencies; securing cooperative funding to assess or remediate problems; and providing technical assistance to landowners and communities, often through local conservation districts.

A description of a designated river's water quality should include a summary of baseline water quality data. Monitoring should focus on physical, chemical, and biological water quality attributes that lead to designation. This information will serve as a baseline for protection and enhancement in the future. The description should include any segments or tributaries that are impaired and listed on the state 303(d) list and describe any existing or anticipated threats to water quality. Particular attention should be paid to the relationship between water quality and the river's ORVs. For example, primary contact recreation such as swimming and whitewater boating may be part of a recreational ORV, water color or clarity may contribute to the scenic ORV, and cold, well-oxygentated water maybe crucial to a fishery ORV. Parameters that typically would be measured include conductivity, dissolved solids, suspended solids, dissolved oxygen, fecal coliform, turbidity, and temperature. The description should also include any existing or anticipated threats to water quality.

Optional Components

River-Related Issues

Identifying a comprehensive list of issues facing the wild and scenic river may help river managers prioritize management efforts during future compliance actions. Issues are sorted into both broad and site-specific issues. Site-specific issues can also be denoted on a map of the river and river segments to help inform river managers.

River-Related Stakeholders

Input and involvement from these stakeholders and partners is essential for effective management of the rivers.

Outstandingly Remarkable Values

The following guidance for defining ORVs is primarily sourced from the Interagency Wild and Scenic River Coordinating Council's "The Wild & Scenic River Study Process" (1999), available online at http://www.rivers.gov/documents/study-process.pdf. This guidance is intended to set minimum thresholds to establish ORVs and are illustrative but not all-inclusive.

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Outstandingly remarkable values are defined by the Wild and Scenic Rivers Act as the characteristics that make a river worthy of special protection. Thus, the foundation for wild and scenic river management is a clearly defined set of ORVs. There are a variety of methods to determine whether certain tangible river-related resources are so unique, rare, or exemplary as to make them outstandingly remarkable. The determination that a river area contains ORVs is a professional judgment on the part of the interdisciplinary study team, based on objective, scientific analysis. Input from organizations and individuals familiar with specific river resources should be sought and documented as part of the process.

In order to be assessed as outstandingly remarkable, a river-related value must be a unique, rare, or exemplary feature that is significant at a comparative regional or national scale. Dictionary definitions of the words "unique" and "rare" indicate that such a value would be one that is a conspicuous example from among a number of similar values that are themselves uncommon or extraordinary. One possible procedure would be to list all of the river's special values and then assess whether they are unique, rare, or exemplary within the state, physiographic province, ecoregion, or other area of comparison (the scale of comparison is not fixed, and should be defined as that which serves as a basis for meaningful comparative analysis). Only one such value is needed for eligibility (IWSRCC 1999).

The area, region or scale of comparison is not fixed, and should be defined as that which serves as a basis for meaningful comparative analysis; it may vary depending on the value being considered. Typically, a "region" is defined on the scale of an administrative unit, a portion of a state, or an appropriately scaled physiographic or hydrologic unit (IWSRCC 1999).

While the spectrum of resources that may be considered is broad, all values should be directly river-related. That is, they should:

1. Be located in the river or on its immediate shorelands (generally within 1/4 mile on either side of the river);
2. Contribute substantially to the functioning of the river ecosystem; and/or
3. Owe their location or existence to the presence of the river (IWSRCC 1999).

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ORVs for a designated or study river can include any combination of the following: scenery, recreation, geology, fish, wildlife, culture, history, or other similar values (including, but not limited to, hydrology, paleontology, and botany resources). Following are examples of criteria that can be used to describe whether each river-related value meets minimum requirements for significance with the region of comparison. These criteria may be modified to make them more meaningful in the area of comparison, and additional criteria may be included (IWSRCC 1999).

1. **Scenery:** These rivers have elements such as landform, vegetation, water, color, contrast and related factors that result in landscapes or attractions that are rare, unique, or exemplary. When analyzing scenic values, seasonality of flow variations, ice and snow cover, and vegetation can also be considered, along with the impact of human development on the landscape. Scenery and visual attractions may be highly diverse over different parts of the river or river segment.
2. **Recreation:** High quality recreational opportunities attract, or have the potential to attract, visitors from or beyond the region; or the recreational opportunities are unique, rare, or exemplary within the region. Additionally rivers may provide highly valued settings and opportunities for healthy, active outdoor activities for people close to where they live. Others may uniquely connect communities, support or diversify local economies and provide needed access to open space and the outdoors. River-related recreation can include a wide-range of settings from highly social to opportunities for solitude.

   Activities may include, but are not limited to, sightseeing, wildlife observation, camping, photography, hiking, fishing, hunting, boating, and interpretive opportunities. The river may provide a setting for national or regional events.
3. **Geology:** Wild and scenic rivers that have geologic outstandingly remarkable values include features, processes, or phenomenon that are rare, unique, or exemplary to the geographic region. The geologic feature(s) in the river corridor may be in an unusually active stage of development, represent a textbook example of geologic processes, or represent a unique or rare combination of geologic features (erosional, cave formation, volcanic, glacial, or other geologic structures).
4. **Fish:** A river's fish outstandingly remarkable value may be judged on the relative merits of fish populations, diversity, habitat, or a combination of these river-related conditions.
   a. ***Population:*** The river is nationally or regionally an important producer of resident and/or migratory fish species. Of particular significance are a diversity of fish species or the presence of wild stocks and/or federal or state listed (or candidate) threatened, endangered, or species of conservation concern.
   b. ***Habitat:*** The river provides uniquely diverse or exceptionally high quality habitat for fish species indigenous to the region of comparison. Of particular significance is habitat for wild stocks and/or federal or state listed (or candidate) threatened, endangered, or species of conservation concern.

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5. **Wildlife:** Wildlife values may be judged on the relative merits of wildlife populations, habitat, or a combination of these conditions. Common species that use the river, but are not river dependent, do not rise to the level of an ORV.
   a. ***Populations:*** The river, or area within the river corridor, contains nationally or regionally important populations of indigenous wildlife species. Of particular significance are species diversity, species considered to be unique, and/or populations of federal or state listed (or candidate) threatened or endangered or species of conservation concern.
   b. ***Habitat:*** The river, or area within the river corridor, provides uniquely diverse or exceptionally high quality habitat for wildlife of national or regional significance, and/or may provide unique habitat for federal or state listed (or candidate) threatened, endangered, or species of conservation concern. The river or riparian area may provide critical habitat connectivity for migratory species or for wildlife that utilizes a variety of habitat types during different life stages.
6. **Cultural[1]:** The river corridor contains evidence of significant river-related occupation and use (e.g., pre-contact sites, ceremonial area, fishing area, sacred religious sites), by Native Americans in the past or at present. Site integrity may enhance education and interpretation significance (e.g., sites that are unmodified and retain their original character; important sites or river crossings; features that are in excellent condition). Sites or features currently listed in or eligible for listing in the National Register of Historic Places, particularly in abundance such as Archeological Districts and Cultural Landscapes, and National Historic Landmarks, contribute to the value.
7. **Historic[1]:** Sites or features are associated with historically significant river-related events, activity (e.g., major railroad sites, early settlement), or are associated with exceptional or important people (e.g., John Wesley Powell, Brigham Young). A historic site or feature, in most cases, is at least 50 years old. Site integrity may enhance education and interpretation significance. The presence of exceptional examples of river-related structure architecture from a significant period of history, sites that are unmodified and retain their original character, or features that are exceptional examples within the region are also relevant considerations. Sites or features that are currently listed in or eligible for listing in the National Register of Historic Places, particularly in abundance such as Historic Districts and designated as National Historic Landmarks contribute to the value.
8. **Other Similar Values:** While no specific national evaluation guidelines have been developed for the "other similar values" category, assessments of additional river-related values consistent with the foregoing guidance may be developed—including, but not limited to, hydrology, paleontology, ecology, and botany resources.

[1]Not all listed/eligible resources equate to an ORV, but will still be afforded protections under cultural and historic resource protection laws.

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BEST PRACTICES FOR A OUTSTANDINGLY REMARKABLE VALUES

- **ORVs must be river-related.**
  - » Is it located in the river or on its shorelands (generally within one-quarter mile on either side of the river)?
  - » Does it contribute substantially to the function of the river ecosystem?
  - » Does it owe its location or existence to the presence of the river?
- **ORVs must be rare, unique, or exemplary in a regional or national context.**
  - » Is it a conspicuous example from among a number of similar values on a regional or national scale that are themselves uncommon or extraordinary?
  - » A region of comparison should be defined for each ORV as appropriate. Regions should not be so large as to unreasonably restrict ORVs to those that are truly nationally significant, nor so small that most river resources would qualify as exemplary in some way.
- **ORVs must be defined for individually designated river segments.**
  - » Are there tangible resources associated with the ORV within the river segment?
  - » How does the ORV vary by river segment?
  - » Is the ORV located within a portion of a segment or span across multiple segments?
- **ORVs must be accurate, specific, and descriptive.**
  - » Does the ORV definition clearly articulate an aspect of the river's national significance and importance to the public?
- **ORVs must be defensible.**
  - » Is the ORV definition based on existing documentation or professional observations by subject matter experts?

OUTSTANDINGLY REMARKABLE VALUES SESSION

Part 1: Broad ORV Descriptions

Exercise 1 (large group): Confirm the river segments and review the ORV categories and best practices.

Exercise 2 (small groups): Each small group will be assigned an ORV category. Each group will develop a broad statement that describes their assigned ORV for the entire designated river.

Exercise 3 (large group): Reconvene as a large group and report out developed broad ORV statement. Discuss the statements as a group.

Examples of Outstandingly Remarkable Values—Broad Descriptions

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Scenic ORVs

From Missouri National Recreational River

The Missouri River is the artery of America's heartland, coursing its way through the scenic landscapes of the Great Plains to the Eastern Deciduous Forest. The Missouri National Recreational River is a 100-mile stretch that represents a vestige of the untamed west. The recreational river provides a unique perspective on one of the greatest waterways in America through a contrast of natural textures and colors, rural farmsteads, meandering channels, shifting sandbars, and sheer chalkstone bluffs.

To this day, visitors can experience one of the largest rivers in our country where the natural sounds of water and wildlife still dominate. The river provides visitors with unique opportunities to gaze upon the starry heavens or perhaps witness the power of a thunderous storm as it sweeps across the prairie.

The variety of scenery along the Missouri River evokes the stories of our past. As described in the journals of the Lewis and Clark Expedition, the river retains a semblance of the original western landscape, which has long inspired generations of artists. Spirit Mound, Old Baldy, and Fort Randall are a few of the scenic features that not only provide visual contrast to the rolling, grass-covered hills, farmlands, and woodlands, but bring to mind the powerful influence of the Missouri River on the rich history of the area.

From Rio Grande Wild and Scenic River

The Rio Grande and its tributaries are set within one of the most dramatic and storied landscapes in the West—from stunning narrow and deep canyons, verdant riparian vegetation, striking cliffs, to long and unobstructed views. Sheer cliffs define the landscape where exceptionally rugged canyons meet the sky with unparalleled beauty and the unsurpassed ability to inspire and impress. Remarkable exposures of geologic processes are on display throughout the river course as Cretaceous features express themselves as uplifts, faults, rapids, and spectacular formations. The dynamic history and culture of the region also become apparent as ruins and evidence of those who came before dot the landscape. The Rio Grande can be enjoyed throughout all four seasons. Each season brings distinct, different, and dramatic combinations of weather, light, and water to the area. Exceptionally clear, dark night skies can be enjoyed all year.

Recreational ORVs

From Rio Grande Wild and Scenic River

The Rio Grande Wild and Scenic River provides a variety of recreational opportunities that allow visitors to experience a spectacular river corridor as it carves its way through the Chihuahuan Desert. Colorful, expansive landscapes give way to vault-like canyons that carry travelers through time and space, providing world-class year-around boating, hiking, camping, wildlife viewing, photography, and natural springs. Visitors can enjoy and experience rare desert flora and fauna, solitude, natural sounds, and amazing night skies in a remote and dramatic landscape that is largely wild and undeveloped. The river corridor also includes an international port of entry and a chance for visitors to observe and experience unique prehistoric, historic, and modern cultures along the US/Mexican border. In addition, visitors travel from all over the world to observe an unparalleled diversity of bird species, including some that are found nowhere else in the United States.

From Virgin Wild and Scenic River

Exceptional recreational opportunities exist along the Virgin River and its tributaries, providing visitors from around the world with a chance to develop personal and lasting connections with the river within some of the most unique water-carved desert canyons in the region. The dramatic setting dominated by scenic grandeur contribute to a spectrum of river-related experiences—from the self-reliant adventure of canyoneering or hiking and backpacking through narrow river and creek channels, to enjoying photography and other artistic pursuits, viewing scenery, or camping along the river. For generations, the striking contrast of heat and water, stone and gardens have drawn people to this unique desert river and its tributaries. The region of comparison for the Recreation ORV is the portion of the Colorado Plateau that lies in southwestern Utah west of the Green and Colorado Rivers.

Recreational experts considered that to qualify as having an outstandingly remarkable recreational value, a segment must have river-related or river-dependent recreational activities. Activity occurs within river or immediate shore lands within corridor and/or owes its existence to the river and its various characteristics. Also the recreational experience must be rare, unique, or exemplary.

Geologic ORVs

From Virgin Wild and Scenic River

The Virgin River and its tributaries are uniquely situated along the western margin of the Colorado Plateau where the recent history of tectonic activity and erosional downcutting has resulted in a labyrinth of deep walled sandstone canyons, volcanic phenomena, and widespread exposures of brilliantly colored sedimentary deposits. Unique geologic features include Navajo sandstone exposures, a remnant of the world's largest sand dune desert, river-carved canyons forming the world's tallest sandstone cliffs, narrow slot canyons, hanging waterfalls, springs and seeps, and accelerated erosion processes. This dynamic geologic system creates a diverse landscape of channels, canyons, and springs that support a variety of ecological communities, including hanging gardens, desert fish, and other aquatic species. The geology of Virgin River and its tributaries offer world-class opportunities for canyoneering, rock climbing, hiking, and wilderness experiences.

From Delaware River Basin

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The Delaware River traverses the Glaciated Appalachian Plateau Region, the Valley and Ridge Physiographic Province, and the Piedmont Physiographic Province of the Mid-Atlantic Region. The designated wild and scenic portions of the river system contain a high degree of diverse geological formations that are easily accessible to the public. These features provide evidence of earth's evolution over an approximately billion-year timespan and the influence of many major events in the geologic history of eastern North America. These events include folding and faulting during Appalachian mountain building and the assembly of the supercontinent Pangaea, separation of Pangaea to form the Atlantic Ocean, erosional and depositional forces, volcanic activity, and the extent of ice age glaciers in the region. The terminal moraine (maximum extent) of the Wisconsinan Glacier (the most recent ice age glacier) began its retreat northward 20,000 years ago. The terminal moraine is a significant feature that crosses the river system.

Overall, the geologic processes and features of the Delaware River Valley support stable, mature, and complex biological communities. This resilient, healthy river ecosystem includes a variety of micro-climates and habitats that support regionally rare plant and animal communities and optimal riverine macroinvertebrate and fish habitat. The outstandingly remarkable geologic value of the Delaware River is further exemplified by its scientific importance. The river's complex geologic processes and formations provide geologists with a nearly complete record of fluvial deposition through the Holocene. However, debates remain among scientists about how the geology of the river has changed over time, furthering the need for ongoing investigations.

From Aniakchak Wild River

Originating in the heart of an active volcano, the Aniakchak River owes its existence to a catastrophic breach of the 30-square-mile caldera that drained the crater's lake in a matter of hours. This landscape-altering flood occurred 2,000 years ago, and smaller-scale geologic events, such as rock falls and periodic flooding, continue to shape the course of the upper reaches of the river. The river contains impressive flood deposits including extremely large boulders in the upper portion. This upper section has one of the steepest gradients of any floatable river, dropping at more than 75 feet per mile. Exposed fossils exist along the river corridor in sedimentary rock dating back to the Cretaceous period and beyond. These paleontological resources range from dinosaur footprints to marine and terrestrial fossils that provide biological records spanning millions of years.

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Fish ORVs

From Snake River Headwaters

The Snake River Headwaters provides a unique fishery for the Yellowstone and Snake River cutthroat trout, which are both nationally significant. The headwaters also contain a diverse community of other native aquatic species including regionally significant populations of northern leatherside chub, bluehead sucker, and western pearlshell mussel. Spawning, rearing, and adult habitats are characterized by excellent water quality, high connectivity between the mainstem of the Snake River and its tributaries, few natural or man-made barriers, and a diverse and abundant macroinvertebrate community supporting naturally reproducing and genetically pure populations of native fish.

From Alagnak Wild River

Aquatic habitat along the Alagnak is outstanding, based in part on the effect of its headwater lakes in moderating high flows. This is the only location in the Bristol Bay region where a lake-fed river has such high gradient with abundant habitat provided by multiple channels flowing between numerous small vegetated islands. Fish diversity is also outstanding, including five species of Pacific salmon and numerous freshwater species.

Wildlife / Ecological ORVs

From Alagnak Wild River

The Alagnak's wildlife habitat is exemplary of Bristol Bay rivers. The river's channel complexity and gradient provide outstanding and diverse aquatic and riparian habitat for healthy populations of brown bear, shorebirds, waterfowl, moose, and other river-dependent species.

From Snake River Headwaters

The Snake River Headwaters occur within the largest intact ecosystem in the lower 48 states, where natural processes such as fire, flooding, plant succession, wildlife migration, and predator-prey dynamics shape the landscape and its biota. A full complement of native plant and wildlife species is exhibited, significant at both a regional and national scale. Plant species diversity is high with numerous distinct riparian plant communities, including species assemblages that are unique to the region. Several nationally important wildlife populations depend upon these riparian environments, including the Jackson elk herd (the largest in the world), grizzly bear and gray wolf populations of the Yellowstone ecosystem (the southern-most in North America), the tri-state trumpeter swan population (the largest in the lower 48 states), and recovered bald eagle and peregrine falcon populations.

All native species are present, and no nonnative birds, mammals, reptiles, or amphibians are known to use the river corridors. Four of North America's largest carnivores (grizzly and black bears, wolves, and cougars) freely interact with seven native ungulates (mule and white-tailed deer, moose, bison, elk, pronghorn, and bighorn sheep) in a dynamic system rivaled by few places on earth. The diversity and abundance of wildlife in this assemblage is recognized worldwide and is the primary reason people visit the parks. All of the native wildlife are part of self-sustaining populations, and the river courses and associated habitats are critical to this sustainability.

Cultural ORVs

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From Saint Croix National Scenic Riverway

The continuum of human occupation along the Saint Croix and Namekagon Rivers encompasses diverse cultures and uses. People have lived along the rivers for at least 12 millennia, since the final retreat of the glaciers at the end of the most recent Ice Age, taking advantage of the abundant natural resources. Cultural themes include Native American heritage, fur trade, logging, and recreation/conservation.

As a connecting route between the Mississippi River and Lake Superior these rivers served as a Native American trade route and an area with a wealth of natural resources. Mound sites, campsites, tool making sites, quarries, wild rice processing areas, rock art, and village sites offer evidence of the seasonal and complex nature of life along the rivers prior to European contact. Some areas remain important cultural sites to American Indian tribes for religious and traditional activities. Wild rice and sturgeon are resources of particular importance. The route maintained its importance to fur traders and explorers.

Beginning in the late 1600s, Europeans came to the area to exploit the fur resources. European fur traders traveled the rivers to trade, primarily with the Dakota and Ojibwe. Evidence of these interactions includes fur posts, portages, and campsites.

With the 1837 treaty that opened the area to settlement by European Americans, and the decline of the fur trade, logging became the primary economic driver. Because of the extensive pine forests in this large watershed, logging occurred for a period of 75 years, longer than any other area in the region. The Saint Croix Triangle Lumbering area was important to the development of the State of Minnesota, and supplied lumber to build the Midwest. The remains of logging camps, dams, other water control structures, saw mills, boom sites, and river towns help tell the story of this era.

The Saint Croix and Namekagon rivers have been used for recreation since the late 1800s. Transportation improvements, including enhancements to river navigation, railroads, and roads, were essential to the continued growth and expansion of the settlement of the river valley. Numerous visitors arrived by railroad and steamboat. With the invention of cars and accompanying roads, recreational use exploded. Recreational sites include: cabins, houses, state parks, scenic overlooks, landings, ferries, and bridges. The history of riverway protection dates back to the creation of State Parks in the 1890s to preserve recreational access and scenic beauty. This was reaffirmed with a lawsuit in 1954 to prevent a hydropower dam from being added to the Namekagon, and ultimately to the designation of the riverway as a National Wild and Scenic River in 1968, and its expansion in 1972 and 1976. Designation finalized the shift from the harvesting, exploiting, and manipulating of river resources to appreciation of the scenic beauty, wildlife habitat, and a wide range of recreational opportunities. With designation, additional lawsuits have set important precedents about implementation of the Wild and Scenic Rivers Act.

Photo credit: Riegel Collection

Photo credit: Lundin Historic Collection

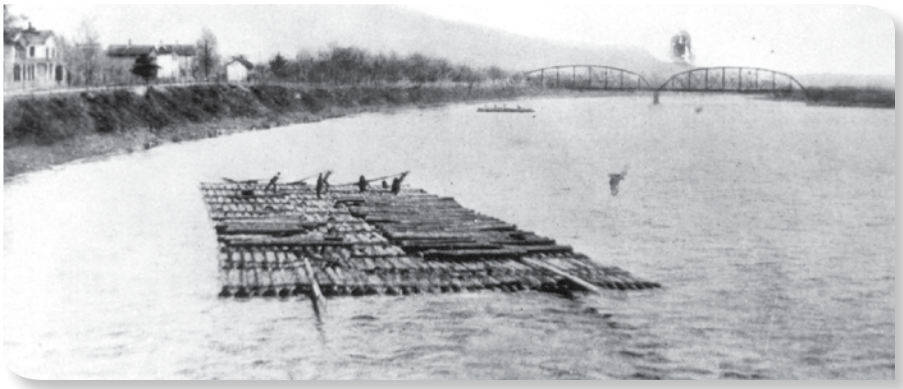
NOTES

From Delaware River Basin (Musconetcong Wild and Scenic River)

Human settlement in the Musconetcong River corridor has been traced back 12,000 years during the Paleo-Indian occupation of the area and the retreat of the Wisconsin glacier. Evidence of human habitation has been found at the Plenge site, along the lower Musconetcong River corridor. This site was one of only two major Paleo-Indian archeological site excavations in New Jersey and is considered to be one of the most important in the northeastern United States.

Subsistence agriculture took root in the lower Musconetcong valley at the dawn of the 18th century. The fertile limestone valley was rapidly cleared for cropland—subsistence agriculture gradually evolved into commercial grain and dairy farming. Villages sprang up around the many grist mills and iron forges built along the Musconetcong River. Outstanding historic features can be found in the river-related villages of Stanhope Borough, Waterloo Village, Asbury, and Finesville, and many others. Many of the features of these villages are listed in the National Register of Historic Places.

Colonists constructed dams beginning in the 1750s to power the engines of commerce, creating economic activity that contributed to the prosperity of settlements along the river. The Morris canal, constructed in the 1840s, intersected the river at Saxton Falls, accelerating the growth of industry in northeastern New Jersey and giving rise to employment in the large coastal cities. The canal is a national historic landmark. At least 18 designated and eligible historic sites and districts associated with the river enhance the historic character of the designated segment of the Musconetcong. Beginning in the early 18th century and continuing today, paper mills harnessed the river's power and flushed processed effluent downstream into the Delaware.



OUTSTANDINGLY REMARKABLE VALUES SESSION

Part 2: Evaluation Criteria and Evaluate River Segments

Exercise 1 (small groups): As a small group, first work to revise broad ORV statement according to large group discussion. Then, review example evaluation criteria and develop evaluation criteria to use as a basis for evaluating your group's assigned ORV by river segment.

Exercise 2 (large group): Reconvene as a large group and report out developed evaluation criteria for each ORV small group. Discuss the criteria as a group.

Exercise 3 (small groups): As a small group, first work to revise the ORV evaluation criteria according to large group discussion. Then, use revised criteria to evaluate the ORV by each river segment in blank evaluation matrix. Take notes on rationale for decisions regarding each river segment.

Exercise 4 (large group): Reconvene as a large group and report out on ORV evaluation results. Discuss the results as a group.

Examples of Outstandingly Remarkable Value Evaluations

Please note: *These examples have been shortened from originals. Additionally, it is at the discretion of the river manager to determine what criteria to use when evaluating river segments for ORVs.*

Example: Missouri National Recreational River – Scenic Values

River Segment	ORV Evaluation Criteria: Scenic Values		
	Idyllic Rural Landscapes	Outstanding Scenic Vistas	Dramatic Landforms
Missouri River (39-Mile District) Fort Randall Dam to Choteau Creek (RM 880-852)	Very little rural development	Overlook from Fort Randall Dam Ability to view both sides of the river, narrower floodplain Dark night skies are present and provide excellent opportunities for star gazing	Old Baldy Undulating topography Narrower floodplain Chalkstone bluffs
Missouri River (39-Mile District) Choteau Creek to Running Water (RM 852-840)	Rolling hills and ranches	Scenic vistas at the confluence with the Niobrara River overlooking extensive braided channels both upstream and downstream along the Missouri River and along the Niobrara Chief Standing Bear Bridge and Overlook that provide sweeping views of the river Dark night skies are present and provide excellent opportunities for star gazing	Impressive bluffs alternating with rolling hills on both sides of river

These can be either quantitative or qualitative in nature, and may use different metrics, as shown in the examples below.

Natural Vegetation	Abundant, Diverse Wildlife	Natural River Features	River Related	Rare, Unique, or Exemplary	ORV Determination
Grasslands dominate both sides of river segment	Bald eagle nesting, national wildlife refuge provide habitat for diverse species, major flyway for high concentrations of sandhill cranes, geese, and others	Other smaller islands within river channel	Yes	Yes	ORV
Grasslands dominate both sides of river segment	Extensive wetland area along river upstream from Lewis and Clark Lake to near the confluence with Niobrara – provides habitat for waterfowl and other bird life Piping plovers and least terns can be seen along the river	Sanctuary Island and numerous smaller islands within river channel Extensive braided river channels	Yes	Yes	ORV

Example: Delaware River Basin – Recreational Values

River Segment	ORV Category: Recreation		
	Outstanding access and quality nature experiences for all. (Ability to accommodate everyone from beginners to veterans. Opportunities to introduce people to the great outdoors.) **(Presence or Absence)**	**Variety of recreation opportunities (fishing, hunting, boating canoeing, hiking, and passive forms of recreation)** **(Presence or Absence)**	**Outstanding Scenery** **(Presence or Absence)**
Upper Delaware River From the confluence of the East and West Branches (below Hancock, NY) to the existing railroad bridge immediately downstream of Cherry Island in the vicinity of Sparrow Bush, NY (73.4 miles)	Present • Variable river character, from large slow moving eddies to more challenging riffles and rapids, providing a variety of opportunities • Access points approx. every 4 to 5 miles • Access is clearly identified and marked • Large number of liveries that provide all the equipment needed to paddle the river	Present • Boating (mostly nonmotorized, canoes, kayaks, tubes, drift boats), warm and cold-water fisheries, hiking opportunities, scenic touring, birding (especially bald eagle observation and education). Waterfowl and big and small game hunting opportunities. • Public and private camping opportunities along the river	Present • The relatively narrow, deep, steeper sloped valley (compared with other river valleys in the region) of the Upper Delaware River provides surface variation and a diversity of foreground and background views. Because much of it has been less conducive to settlement, agriculture, and other human activities, the relatively undeveloped landscape remains in a much more wild and scenic state.

Example: Rio Grande Wild and Scenic River – Geologic Values

River Segment	Evaluation Criteria	
	Outstanding examples of geologic processes or features	**Opportunities to view and study long geologic history/strata**
SEGMENT 2	• Plunging recumbent anticline cut through by river • Southernmost exposure of Rocky Mountains (Laramide)	Cross-section of all of Cretaceous formations visible
SEGMENT 3	• Views of Mariscal Mountain and San Vicente anticline	
SEGMENT 4	• Eastern edge of southern extension of Basin and Range/ Rio Grande Rift • Effects of two orogenies • Deep, steep-walled canyon • Spires, pinnacles • Rock shelters • Minor karst features and associated mineralization	Exposures of Cretaceous formations
SEGMENT 5	• Igneous sills – most eastern exposure of Basin and Range faulting that creates dramatic walls, temples and buttes	Addition of Tertiary basalt. Cross-section of all of Cretaceous formations accessible.

Opportunities to experience a sense of remoteness or serenity (Presence or Absence)	Wildlife Experiences (Outstanding wildlife viewing, and birding) (Presence of Absence)	River Related / Dependent (Required)	Rare, Unique, or Exemplary (Required)	Determination (Need presence in 3 of 5 categories)
Present • North of Calicoon, opportunities to experience a sense of remoteness are available • Narrowsburg south to Lackawaxen opportunities to experience a sense of remoteness are available	Present • Throughout the river corridor, visitors can view a variety of wildlife. Eagle viewing is especially exceptional in the winter months • Common to see blue herons, red-tailed hawks, osprey, deer, turkey, and black bears • The confluence with the Lackawaxen is especially popular for bald eagle viewing year-round	Yes	Yes	**ORV**

Contribution of geologically-controlled springs and tributaries	River Related / Dependent	Rare, Unique, or Exemplary	Determination
Tight Squeeze Rapids caused by rock fall	River dependent	Rare, southernmost exposure is unique, and folding is exemplary	ORV
Numerous thermal springs Tornillo Creek	River dependent		Not an ORV
	River dependent	Exposures are exemplary, erosion features are rare	ORV
Numerous thermal springs. Maravillas Creek – largest contributor of springs	River dependent	Exposures are exemplary	ORV

Example: Snake River Headwaters – Fish Values

Information regarding each of these criteria was collected for all 7 segments and analyzed to determine the aggregate value of the resource in each segment. The regional significance of the designated segments was determined by comparing them to other rivers within the Greater Yellowstone Ecosystem.

River Segment	Fish ORV Criteria	
	Species of Concern	Diversity of Native Species
Lewis River (wild segment)	0 – No native fish; only Brown trout; historically fishless	0 – historically fishless; no native; brown trout
Lewis River (scenic segment)	Upper Reach – 0 – no species of concern Lower Reach – 4 – Snake River and Yellowstone cutthroat trout	Upper Reach – 0 – No native fish Lower Reach – 2 – A few native species – need data
Snake River (wild segment)	4 – Snake River and Yellowstone cutthroat trout, and western pearlshell mussel present	4 – 9 species present
Snake River (scenic segment)	4 – Snake River cutthroat trout, and bluehead sucker	4 – 10 species present
Pacific Creek (scenic segment)	4 – Snake River cutthroat trout and n. leatherside chub present	4 – 10 species present

The upper Lewis River (wild segment and upper portion of the scenic segment) was historically fishless and currently contains only nonnative brown trout. There are no native fish species in this segment, and therefore no natural reproduction of native fish occurs.

Example: Virgin River – Wildlife Values

Main Segment or Tributary Segment	Wildlife Criteria
	ORV Values
North Fork Virgin above Temple of Sinawava, Orderville Canyon	These segments are home to the endemic Zion snail (*Physella zionis*), also known as wet rock physa, is found in some of the most exceptional hanging gardens. This rare snail is of national significance as it is only found in Zion National Park along the Virgin River and its tributaries.
East Fork Virgin River and Shunes Creek	Desert bighorn sheep are listed as a sensitive species across the multi-state region. Lambing grounds are concentrated along this river segment and are exceptionally productive. Research opportunities due to this population's success are regionally significant.
North Fork Virgin above the Temple, North Fork Virgin below the Temple, East Fork Virgin, North Creek, Taylor Creek, and La Verkin Creek	The federally threatened Mexican spotted owl breeds in all of the designated river corridors at the highest density in the region and state. As primary nesting habitat, the river corridors provide the core of the designated critical habitat identified in the recovery plan for this species. After more than 20 years of monitoring, a storehouse of data on Zion's owl population provides the best opportunity for owl research regionwide.

A matrix was used to record and display findings, using a scale of 0–4, with a '3' indicating one of only a few this segment in the region (defined as the Greater Yellowstone Ecosystem [GYE]), and a '4' indicating the most significant value in the region. Segments were found to have a fish ORV if they rated '4' for one or more criteria.

Natural Reproduction	**Habitat Quality**	**Determination**
0 – no native fish reproduction; only browns	3 – good habitat; used primarily by brown trout	Not an ORV
Upper Reach – 0 - No nat. reproduction Lower Reach – 1 – limited nat. reproduction – more data	Upper Reach – 2 – habitat typical of GYE Lower Reach – 2 – habitat typical of GYE	ORV (lower reach only below waterfall)
4 – nat. reproduction present	2 – typical of region	ORV
4 – nat. reproduction present	Upper Reach – abv. Pacific Creek – 2 – typical of region Lower Reach – below Pacific Creek – 4 – nat. significant for SR cuts	ORV
3 – nat. reproduction present	3 – regionally significant	ORV

There are a variety of high-quality habitat types typical of the Greater Yellowstone Ecosystem. Due to the lack of native fish species within this segment, fish is not considered an ORV.

River Related	**Wildlife populations**	**Habitat**	**Scientific importance**
●	●	●	●
●	●	●	●
●	●	●	●

Example: Delaware River Basin – Ecological Values

River Segment	Ecological ORV Evaluation		
	Ecological "End Points" (Must have ONE "High")		**Ecological "Building Blocks" (Must have TWO "M" or "H")**
	Threatened and Endangered Species and Rare Plant Communities (see Note #1)	**Integrity of Ecological Communities**	**Key link for migratory fishes (see Note #2)**
	0 – Nonexistent **Low** – No federally listed species or globally rare plant comm.; Only Limited State-listed **Mod.** – Moderate numbers or extents of T&E and/or rare plants **High** – Numerous T&E or rare plant communities; or critical habitat (and presence) for one or more	**0** – Lack of native ecological structure; dysfunction of ecological system **Low** – Limited native ecological structure and/or function **Mod**. – Moderate native ecological structure and/or function **High** – Strong complement of native species and functioning of ecological system	**0** – Not linked; obstructed **Low** – Limited access for migratory fishes to and/ or above segment **Mod.** – Moderate migration access to and/ or above segment **High** – Full, unobstructed access for all migratory fishes to and above segment
Upper Delaware River From the confluence of the East and West Branches (below Hancock, NY) to the existing railroad bridge immediately downstream of Cherry Island in the vicinity of Sparrow Bush, NY (73.4 miles)	**High** • DWM present (Fed.); with sizeable population • Several state T&E species such as bridle shiner, brook floater mussel, threadfoot, • Rare plant communities: ice scour, bitternut hickory lowland woodland, • High quality wintering habitat for bald eagles and increasingly important breeding habitat • Good osprey foraging habitat (NJ-T)	**High** • Relatively intact riparian plant communities • Diverse and healthy native aquatic plant • Healthy populations of macroinvertebrates • Full complement and extraordinary abundance of freshwater mussels • High quality migratory fish assemblage • High quality aquatic insect assemblage	**High** • Full, unobstructed access for the full assemblage of migratory fishes to and above segment. Migratory fish species include the American shad, American eel, sea lamprey, striped bass, blueback herring, and alewife

Integrity of in-channel, floodplain, and riparian habitat (physical condition of hydro-connectivity, structure, and function)	**Water Quality**	**River Related / Dependent**	**Rare, Unique, or Exemplary**	**Determination**
0 – Nonexistent **Low** – Limited Floodplain connectivity; low quality in-channel and riparian habitat **Mod**. – Moderate Floodplain connectivity; moderate in-channel and riparian habitat **High** – Floodplain connectivity; high quality in-channel and riparian habitat	**0** – Toxic or Anaerobic conditions **Low** – Low quality that may limit ecological health **Mod**. – Moderate quality **High** – High quality			
High • Floodplain connectivity is good in most areas of the segment, which allow periodic flooding • Minimal road grades and a railroad grade in places disconnect some sections of river from floodplain. • In-channel conditions are good, with an abundance of riffles, runs, and pools with unembedded, clean gravel and lack of fine sediments/silt. • Riparian habitat is good but more limited by geology (narrow), such as entrenched channels.	**High** • Exceptional water quality: high dissolved oxygen, low nutrients and base ions • Low turbidity/high clarity • Only limited threats from agricultural nonpoint source flows (during storm events)	**YES**	**YES** • **Exemplary** for high water quality and integrity of ecological communities (EPA uses it as a "reference reach"), for full complement of freshwater mussels, and exceptional wintering habitat for bald eagles • **Unique** migratory fish connectivity, and size of freshwater network (both the value of the mainstem and its critical link to the upstream network)	**ORV**

Example: Saint Croix National Scenic Riverway – Cultural Values

River Segment	Cultural ORV Evaluation		
	National Designation: • **National Historic Landmarks (All NHLs give Cultural ORV status) – 3** • **National Register of Historic Places (listed or eligible) Archeological or Cultural District or related sites in close proximity – 2** • **Individual(s) National Register of Historic Places (listed or eligible) sites – evaluate under Historic Preservation Laws and Regional Context – 1** • **No designation – 0**	**Significant Cultural Themes:** Region of comparison was used to identify significant themes and resources. Four cultural themes were determined to be river related and significant to the history of the Saint Croix Riverway. The designated significant cultural themes are: • **Fur Trade (Present)** • **Logging (Present)** • **Recreation/Conservation (Present)** • **Native American Heritage (Present)** Other themes considered, but not included, were: settlement, ethnic immigration, industrial development (e.g., button industry, hydro power) agricultural development and famous people.	**Interpretive Value** (the ability to help illustrate the significant themes): • **Tells the whole story – 3** • **Portion of the story with tangible resources – 2** • **Limited story integrity – 1** • **Story better told elsewhere – 0**
Namekagon River: **Nam Dam to Hayward**	An archeological district will be recommended for the logging water control features found here and in other sections. There are other individual logging sites that help "tell" the story in this segment. – 2	Logging – 21 separate archeological areas with 1 or more features connected to the logging era; some remnant features visible; ruins of log slides, sluiceway, cobble dam and other water control features.	2–3*
	Historic marker placed by WI Hist Soc.- Limited integrity – 0	Fur Trade – Turtle Portage	1–2
	Multiple Eligible archeological sites that enhance each other – 2	Native American Heritage – associated archeological sites – village, mounds; wild rice	2
	Farmhouse, barn, partially intact landscape – potentially eligible – 0–1	Recreation/Conservation – Sigurd Olson's ties to Namekagon, father-in-law, Urenholdt (Father of Forestry in WI) refused to cut trees	0–1
Namekagon River: **Hayward to Trego**	Water control features likely eligible as district – 2*	Logging – multiple sites, river modification, camps, dams, slides	2–3*
	Unknown; Historic marker placed by WI Historical Society for portage – ?	Native American Heritage – Lac Courte Oreilles Portage; Fort archeological site; Sturgeon, wild rice.	2

**The logging story when all of the river segments are combined comes very close to, or does tell the "whole" story. The individual segments tell a part of the story with the water control features a subset of the logging story likely to be determined*

Significant Theme • Yes – 1 • No – 0	Traditional Cultural Use (enhances the interpretive and cultural value if it is still culturally important to recognized groups of people): • Yes – 1 • No – 0	River Related / Dependent (located within ¼ mile on either side of the river, and owe their location or existence to the presence of the river)	Rare, Unique, or Exemplary (informed by best professional judgment in consideration of national designation, interpretive value, significant cultural theme, and traditional use criteria)	Determination (must be river related/ dependent; rare, unique, or exemplary; and a minimum of four points from the other special criteria)
Yes–1	No–0	Yes	Potentially exemplary assemblage of logging water control features	Likely YES - The initial recommendation for an archeological district has not been forwarded to the SHPO. Further work is needed, not likely to be completed until 2016, but MWAC supports. **5–6 points**
Yes–1	No–0	Yes	No	NO 2-3 points
Yes–1	Yes–1	Yes	Exemplary assortment of archeological sites and wild rice - Tribally important to Mille Lacs	YES **5–6 points**
Yes–1	No–0	Yes/No	No	NO 2–3 points
Yes–1	No–0	Yes	Potentially exemplary assemblage	Likely YES - See segment above **5–6 points**
Yes–1	Yes–1	Yes	Rare- portage; Exemplary/Tribally important Mille Lacs/GLIFWC – sturgeon, wild rice	YES **4–5? points**

a historic district of water control features. The logging story that the entire riverway resources can tell is a unique opportunity for interpretation, protection, and enhancement.

NOTES

OUTSTANDINGLY REMARKABLE VALUES SESSION

Part 3: ORV Descriptions for Each River Segment

Exercise 1 (small groups): Within your same ORV breakout group, develop ORV " sub-statements" for each river segment, based on results from the evaluation.

Exercise 2 (large group): Reconvene as a large group and report out a representative ORV "sub-statement." Discuss the statements as a group.

Exercise 3 (small groups): As a small group, work to revise ORV "sub-statements" according to large group discussion.

Examples of Outstandingly Remarkable Values—Segment Descriptions

Scenic ORVs

From Missouri National Recreational River (Choteau Creek to Running Water Segment)

Downstream of Choteau Creek, the landscape transitions from impressive chalkrock bluffs to more open, rolling hills. The river breaks into extensive braided channels and shallows that provide habitat for high concentrations of nesting and migratory birds. Scenic vistas from Niobrara State Park and Chief Standing Bear Bridge Overlook provide sweeping views where the sediment-laden, shallow waters of the Niobrara intertwine with the Missouri River. The pleasant rural landscape along these segments allows visitors to imagine the past unfolding on the grass-covered hills under starry night skies.

From Missouri National Recreational River (Kate Sweeny Bend to Ponca State Park Segment)

Downstream of Choteau Creek, the landscape transitions from impressive chalkrock bluffs to more open, rolling hills. The river breaks into extensive braided channels and shallows that provide habitat for high concentrations of nesting and migratory birds. Scenic vistas from Niobrara State Park and Chief Standing Bear Bridge Overlook provide sweeping views where the sediment-laden, shallow waters of the Niobrara intertwine with the Missouri River. The pleasant rural landscape along these segments allows visitors to imagine the past unfolding on the grass-covered hills under starry night skies.

From Rio Grande Wild and Scenic River (Segment 3)

This segment includes the scenic Hot Springs and San Vicente canyons. Dramatic views into the canyons can be found along a number of trails and overlooks, including Hot Springs Canyon, Rio Grande Village Nature Trail, Boquillas Canyon Trail, and other overlooks along the Boquillas Canyon Road—all of which provide exceptional views of the river and surrounding area. The river reach also provides dramatic views of geologic formations and grand vistas of the Sierra del Carmen, including El Pico. Unique views of historic ruins and structures, such as Solis Farm, Hot Springs Historic Site, Daniels Ranch, Barker Lodge, and the picturesque village of Boquillas can also be found along this stretch of the Rio Grande.

From Rio Grande Wild and Scenic River (Segment 4)

The cliffs forming Boquillas Canyon rise up to form a very dramatic entrance. Once inside, the visitor realizes that Boquillas is a canyon of caves and pouroffs, highly sculpted by the forces of wind and water to create a masterpiece among western canyons. Several large side canyons meet the river in this reach as does the Marufo Vega Trail system, which makes for excellent hiking and overlooks. The river is calm here with only a few minor rapids.

NOTES

Recreational ORVs

From Missouri National Recreational River (Fort Randall Dam to Choteau Creek Segment)

This isolated stretch of the 39-mile segment provides excellent opportunities to hunt and catch a variety of fish species in a natural river setting. Outstanding bird watching, especially bald eagles, is possible within the narrow valley. Limited development and low-use levels provide opportunities for solitude while enjoying the sights and sounds of nature. A visit to historic Fort Randall can take visitors back in time to frontier life.

From Missouri National Recreational River (Niobrara River Segment)

The Niobrara River is a more approachable opportunity for less experienced paddlers, providing shallower and calmer conditions than on the Missouri River. Paddling this segment of the Niobrara River offers visitors the chance to immerse themselves in the lovely pastoral and wild scenery. It also affords the visitor the chance to access sandbars for fishing and wildlife watching without the need for a boat.

From Delaware River Basin (Upper Delaware River Segment)

The Upper Delaware River's close proximity and accessibility attracts visitors from major metropolitan areas along the northeast corridor, including Boston, New York City, Philadelphia, and Washington, DC. The Upper Delaware provides a relatively undeveloped and varied river setting that is ideal for families and recreationists of all levels.

The river corridor offers a wide variety of recreational activities ranging from heavily used accesses at Skinners Falls, Narrowsburg, Mongaup, and Sparrowbush, to opportunities for solitude while hiking or canoeing various other stretches of the river. River reaches from Lordville to Callicoon, and Narrowsburg to Lackawaxen provide some of the most remote and serene experiences along the Upper Delaware.

River activities include canoeing, kayaking, boating, tubing, rafting, SCUBA diving, snorkeling, swimming, and hunting waterfowl. The Upper Delaware's cold water fishery between Hancock and Callicoon attracts anglers from around the world, especially those interested in fly fishing for its world renowned wild trout. This type of fishing experience is seldom found elsewhere in the region.

Experienced commercial outfitters provide canoe, kayak, and raft rentals, as well as transportation between access points. Guided trips are also available. Commercial fishing guides provide guided fishing trips for both warm and cold water fish species. These guides and outfitters provide opportunities for beginners as well as experienced river users to easily explore the river.

NOTES

The mixture of class I and II rapids (Skinners Falls, Staircase, Mongaup, and Butlers Rift) with riffles, runs, and pools offer a varied and quality recreational experience on the river. Beginners to expert boaters alike can find something on the Upper Delaware to challenge their skills and provide an outstanding boating experience.

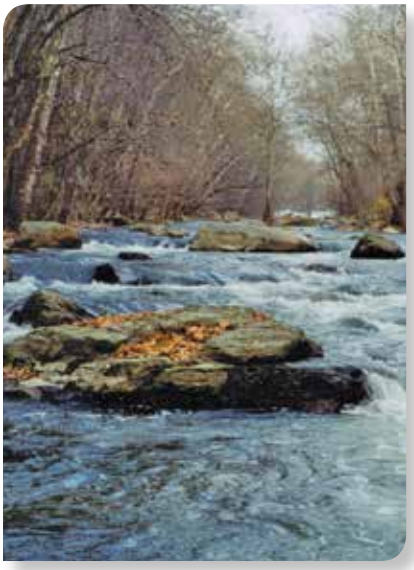
From Delaware River Basin (Tohickon Creek Segment)

Visitors to the Tohickon valley come for the recreational opportunities, which are plentiful in the public lands lining Tohickon Creek. The alternating argillite and shale bands of the underlying geology offer striking visual contrast with the surrounding greenery and unusual rock formations such as Sentinel Rock. Recreational opportunities include fishing, rock climbing, and kayaking.

Tohickon Creek offers some of the best kayaking opportunities in the northeast corridor. During high-flow periods and dam releases, typically quiet Tohickon Creek turns into a raging class 3 and 4 whitewater river. Paddlers from as far away as Maine travel to Tohickon creek to paddle the stretch from Ralph Stover State Park to Point Pleasant.

Geologic ORVs

From Delaware River Basin (Tinicum Creek Segment)



The Tinicum Creek watershed includes an unusual combination of geologic features that express erosional, volcanic, and glacial processes. The creek lies entirely within the Triassic Lowlands of the Piedmont Physiographic Province, and the geology primarily reflects the separation of Pangaea and the formation of the Atlantic Ocean during the Mesozoic era about 200 million years ago. Sedimentary Triassic rocks in this area including the Lockatong, Brunswick, and Stockton, originating when inland valleys were filled with sediment-bearing lakes and rivers. These deposits are 4,000 to 10,000 feet thick. In the Tinicum Creek watershed, the Brunswick red shale and Lockatong argillite are the primary outcroppings.

From Delaware River Basin (Musconetcong River Segment Creek)

The bedrock geology of the Musconetcong watershed has ridges paralleling the river valley and consists primarily of Precambrian metamorphic rocks that contain crystalline gneiss and granites, schist, quartzite, and occasional igneous intrusions. These rocks are not as erodible as the ones found in the river valley. Sedimentary carbonate and shale rocks of Cambrian and Ordovician age underlay the river valley floor from the vicinity of Hackettstown down to Rieglesville. This type of bedrock geology is typical of the New Jersey Highlands.

The terminal moraine of the Wisconsinan Glacier, featured in the upper portion of the Musconetcong watershed, marks the southernmost extent of the most recent ice age glacial period. The geological features of the upper river valley include extensive areas of glacial till, moraines, and stratified drift deposits. South of the terminal moraine, glacial deposits from earlier ice sheets exist in scattered deposits. Also, gravel outwash from the Wisconsin terminal moraine is found in narrow, intermittent belts the length of the Musconetcong River valley down to the Delaware River confluence.

Farther downstream, the geology is dominated by limestone bedrock formations known as karst. Limestone bedrock within the river corridor is highly soluble compared to other types of bedrock. The dissolving limestone bedrock causes sinkholes, depressions, caves, solution channels, and irregular bedrock surfaces. Karst provides continuous base flows and cool water, making it ideal trout habitat, but highly susceptible to contamination.

The lower portion of the Musconetcong changes dramatically as it cuts through shale to form a deep, narrow gorge. Below the gorge, the river channel is dominated by shale ledges, boulders, and steep gradients before leveling out as it traverses the Delaware River floodplain.

From Rio Grande Wild and Scenic River (River Segment 9A)

This segment exhibits unusual topographic relief, flowing through 1,200-foot-deep Mariscal Canyon that includes a 1,500-foot-high cliff at the mouth of the canyon. There is also a textbook example of a well-exposed Tertiary igneous sill made obvious by dramatic contrasts in color. The Terlingua Fault is found within this reach, characterized by 2,000 feet of displacement and a dipping rock layers that provide an interesting visual illusion for river runners. Other notable features include remarkable calcite crystal formations, numerous pour-offs, and Rockslide Rapid.

From Rio Grande Wild and Scenic River (River Segment 6)

This river segment flows through a limestone canyon that includes the Bullis Fold—a monocline that is at the western edge of Stockton/Edwards Plateau. Other exemplary geologic features include folding and thrust-faulting, indicating that Basin and Range and Laramide deformation is present. This segment contains the most visible thermal springs of the Rio Grande. These are important water sources for lower segments of the river and for river recreation. Rodeo, Madison, Hot Springs, Panther, Reagan, and Palmas rapids are found along this reach. There is also an outstanding example of a geologic fin near the confluence with Tule Creek, and dinosaur footprints have been reported in Segment 6.

Fish ORVs

From Snake River Headwaters (Mainstem of the Snake River, scenic segment)

This segment contains the Snake River cutthroat trout, a nationally significant species of concern, and the bluehead sucker, a regionally significant species of concern. It contains 10 of the 13 historically present species for the Snake Headwaters (Snake River cutthroat trout, bluehead sucker, longnose dace, mottled sculpin, mountain whitefish, Paiute sculpin, redside shiner, speckled dace, Utah chub, and Utah sucker) and 19 of the historically present species for the Greater Yellowstone Ecosystem, which is unique within the region of comparison. There is excellent habitat below Pacific Creek which is regionally and nationally significant. The reach above Pacific Creek contains a variety of high quality habitat types typical of the ecosystem. Fish is considered an outstandingly remarkable value due to the presence of cutthroat trout and other native species, high species diversity, and natural reproduction of native species.

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From Snake River Headwaters (Pacific Creek Segment)

This segment contains the Snake River cutthroat trout, a nationally significant species of concern, and the northern leatherside chub, a regionally significant species of concern. It contains 10 of the 13 historically present species for the Snake Headwaters (Snake River cutthroat trout, northern leatherside chub, longnose dace, mottled sculpin, mountain whitefish, mountain sucker, Paiute sculpin, redside shiner, speckled dace, and Utah sucker) and 19 of the historically present species for the Greater Yellowstone Ecosystem, which is unique within the region of comparison. There are a variety of high quality habitat types typical of the ecosystem. Fish is considered an outstandingly remarkable value due to the presence of Snake River cutthroat trout, high species diversity, natural reproduction of native species, and high quality habitat.

From Alagnak River and Nonvianuk River (Upstream portions above confluence)

The lakes at the headwaters of the Alagnak Wild River stabilize the water flow regime, aiding in the hatching and rearing of salmon. Exemplary, high biomass salmon runs result from this spawning and rearing habitat at the lake outlets. The abundance of salmon eggs, flesh, and outmigrating smolts in turn results in rare aggregations of trout, burbot, and lake trout in the river's headwaters.

From Alagnak River (Downstream portion below confluence with Nonvianuk River)

Due to the volume of flow, high water quality, and abundant habitat, the downstream segment has all freshwater river species present within the region. Species include five Pacific salmon species, rainbow trout, grayling, and lamprey. The sockeye salmon runs are so substantial they support a major commercial fishery. High population numbers of multiple species, especially in the section known as the Braids that acts as a habitat multiplier, support an internationally known sport fishery.

Wildlife / Ecological ORVs

From Virgin Wild and Scenic River (East Fork Virgin River and Shunes Creek Segments)

Desert bighorn sheep are listed as a sensitive species across the multistate region. In the East Fork of the Virgin River and Shunes Creek, the convergence of river-carved cliffs, near-stream vegetation for forage, and proximity of year round water provides one of the few known locations for bighorn sheep lambing in the region. Lambing grounds are concentrated along this river segment, and are exceptionally productive. The productivity of these lambing grounds is critical for the long-term reproductive success of the species, since Virgin River sheep disperse throughout the area and are the source for bighorn populations in much of the region. Research opportunities due to this population's success are regionally significant. Due to the critical lambing grounds, sustainable population, and long-term research opportunities for desert bighorn sheep, an ORV for wildlife was found in the East Fork of the Virgin River and Shunes Creek.

NOTES

From Virgin Wild and Scenic River (North Fork Virgin River above Temple to Sinawava)

The North Fork of the Virgin River above the Temple of Sinawava, along with Orderville Canyon, supports the most exceptional examples of hanging gardens in the region. The gardens are home to 7 species of plants that grow nowhere else in the world. The moist microclimate provided by the river adds to the diversity of plant species in these gardens; which in some cases includes up to 26 species. These gardens also provide habitat for the endemic Zion snail (or wet-rock physa, *Physella zionis*).

From Alagnak River and Nonvianuk River (Upstream portions above confluence)

The outlets of these two lakes provide important brown bear forage opportunities due to the concentrations of sockeye spawning habitat. River-dependent birds, including American dippers, are probably found throughout the river in this section, but their distribution and abundance is poorly understood. These characteristics create a regionally exemplary river-dependent wildlife resource.

From Alagnak River (Downstream portion below confluence with Nonvianuk River)

From the air, the migration of the river's main channel over time is readily apparent. Older channel locations provide high concentrations of riparian habitat, which is important to multiple wildlife species such as moose, waterfowl, shorebirds, beaver, river otter, and bear. The width of this multichannel, braided riparian zone contributes to high populations of river-dependent species such as bald eagle and osprey. The riparian habitat supports highly diverse shorebird and waterfowl assemblages. These characteristics create a regionally exemplary river-dependent wildlife resource.

Photo credit: Ken Kingsly

Snake River Headwaters (Mainstem of the Snake River, wild segment)

The upper Snake River is the most pristine of the Snake River Headwaters due to its remoteness and low human use. With elevations ranging between 6,000 and 10,000 feet, the diversity of plant communities and wildlife within this river corridor is exceptionally high. This remote river segment provides a migration pathway key to ecosystem connectivity and wildlife refugia. Megafauna, such as bears and wolves seeking habitat security, are abundant in this segment, enhancing an already world-class assemblage of wildlife. Numerous thermal features are also present, which influence the assemblage of plants, animals, and invertebrates of the area. This remote, pristine environment offers exceptional opportunities for scientific research.

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Cultural ORVs

From Rio Grande Wild and Scenic River (Segment 1)

This segment of the river has undergone intensive archeological surveys, identifying 101 prehistoric and historic sites in just 17 miles of river along the United States side. This unusual high density exemplifies how important the river is to human settlement. Prehistoric agricultural sites are extremely rare in Big Bend National Park. Sites containing prehistoric ceramics and charred corn suggest that Cases Grandes-Jornado influence extends farther to the southeast into the Big Bend than previously believed. The river corridor therefore represents fertile grounds for future research into this period of human history.

From Rio Grande Wild and Scenic River (Segment 3)

The unusually wide variety of cultural sites along this segment include prehistoric open campsites, rock shelters, historic ranching and farming sites, the communities of San Vicente, Boquillas, and the Hot Springs Resort. This segment also contains the San Vicente Crossing, a major route taken by Comanche/Kiowa raiding parties into northern Mexico. The Spanish Presidio of San Vicente, located immediately on the south side of the Rio Grande at San Vicente, Coahuila, was established in 1773 and was garrisoned until it was abandoned in 1784. In 1789, Juan de Ugalde crossed here pursuing a band of Apaches into the Chisos Mountains. The crossing was also used by several Spanish explorers who traversed Big Bend.

The communities of Boquillas, Texas, and San Vicente, Coahuila, practice floodplain agriculture and ranching as they have for generations. San Vicente Viejo, Texas, also irrigated farmland with water pumped from the Rio Grande until major flooding rechanneled the river away from the pump location. The community was forced to shift farming operations downstream where the river meander reestablished itself.

The Solis Ranch is found along this segment, which began operation in the 1880s. It is the site of a major cinnabar discovery that resulted in the establishment of Mariscal Mine, a National Historic Register District. Ruins of the ranch are visible from the river. The town site of Boquillas, Texas, is associated with lead, zinc, and silver mining that began in Coahuila in the 1880s.

The Hot Springs Resort is a national register property containing two buildings and one ruin associated with early 20th century commercial development. The site also contains several prehistoric archeological properties including a rock art site. Daniel's Farmhouse at Rio Grande Village is listed in the national register and is actively maintained and interpreted. Barker Lodge, eligible for listing, is maintained but is not actively interpreted. Sites along the lower river terraces are susceptible to damage from abnormally high flooding.

From Missouri National Recreational River (Rush Island to Myron Grove Segment)

The area between Rush Island and Myron Grove holds evidence of the homeland of the Omahas through known, and yet undiscovered, archeological sites. Lewis and Clark documented the presence of an abandoned Omaha village at Bow Creek. Pierre Dorian, a translator for Lewis and Clark, stayed in the area and established the first trading post along the Missouri River at the confluence of the James River. Due to significant steamboat travel, the contribution of this segment of the river to this nation's westward expansion is well documented—steamboat wrecks remain for discovery and exploration. The historic district of St. Helena represents rural America and the importance of the river in transportation and the establishment of communities along its path.

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From Missouri National Recreational River (Myron Grove to Kate Sweeny Bend Segment)

The heavily braided river segment between Myron Grove and Kate Sweeny Bend represents one of the most challenging sections for steamboat navigation, as evidenced by numerous recorded steamboat wrecks including the North Alabama and Kate Sweeny. Prior to westward expansion, this river segment was heavily used by prehistoric and historic tribes including the influential Omaha Tribe. The area includes a great deal of evidence of use including archeological sites and numerous earth lodge depressions of villages similar to those near Mulberry Bend. The segment also includes the location of the original town of Vermillion, destroyed by the 1881 flood that also significantly changed the course of the river. The dynamic Missouri River has required continuous adaptation by communities from prehistoric, through historic, to today.

A short trip north of the Missouri River will take visitors to Spirit Mound, a significant spiritual site to the tribes of the area as well as a location contained within the lore of earlier fur traders attracting the curiosity and subsequent visit by the Lewis and Clark Expedition.

The Wild and Scenic Rivers Act defines free-flowing as "existing or flowing in a natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. The existence, however, of low dams, diversion works and other minor structures at the time any river is proposed for inclusion in the national wild and scenic rivers system shall not automatically bar its consideration for such inclusion: Provided, that this shall not be construed to authorize, intend, or encourage future construction of such structures in components of the national wild and scenic rivers system."

A description of free-flowing condition should also include the use of flow hydrographs of the river if possible. This information is essential to understanding and protecting the river's natural variation in flow regime. Flow hydrographs should represent the entire water year and cover as many years as possible. Typically, mean monthly or weekly flow is measured, computed, or estimated at several sites along the designated reach. Flow hydrographs are also important to understanding how other river-related values are affected by flows. Good historic data can be critical to identifying flow regimes necessary to protect channel and floodplain characteristics.

NOTES

BEST PRACTICES FOR FREE-FLOWING CONDITION

- **Describe the river's in-channel condition and hydrologic function**
  Consider the function and processes of the river, including historic and current conditions, seasonal variations, geomorphology, etc.
- **Describe modifications of the river that impede its free-flowing condition**
  Consider impoundments, dams, wells, diversions, levees, riprap, or other structures that may impact the free-flowing condition of the river. These can occur upstream or downstream from the designated river segment or on its tributaries.
- **Describe existing facilities that may affect the free-flowing condition**
  Consider existing structures such as boat ramps, bridges, culverts, and fish habitat improvements that have the potential to affect free-flow.
- **Describe the in-stream flow of the river**
  Describe the river's hydrology on the date of designation (e.g., flow frequency, duration, magnitude, timing, seasonality, variability, and rate of change). Describe the extent to which the river's hydrology has changed since designation.

FREE-FLOWING CONDITION SESSION

Exercise 1 (large group): As a large group, discuss and record notes on the free-flowing condition of each designated river.

Exercise 1 (Small group): As a small group, develop a narrative that summarizes the free-flowing condition of each designated river.

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Example Of Free-Flowing Condition Descriptions

From Delaware River Basin

The Delaware River Basin drains 12,756 square miles across the states of Pennsylvania, New York, New Jersey, and Delaware and flows unimpeded for 330 miles from Hancock, New York, to Delaware Bay. The Delaware is the longest undammed river east of the Mississippi. The headwaters contain a number of impoundments, and flows are highly regulated by a 1954 US Supreme Court consent decree between the decree parties of Delaware, New York, New Jersey, the Commonwealth of Pennsylvania, and New York City. Although altered to some extent in the headwaters, the undammed mainstem of the Delaware continues to provide unimpeded flows that support ecological, scenic, recreational, geologic, and cultural ORVs.

Draining 0.4% of the nation's land area, the Delaware River provides drinking water for more than 16 million people—more than 5% of the US population.

Regulated releases also provide a critical buffer to prevent saltwater intrusion downstream of the confluence of the Schuylkill and Delaware rivers in Philadelphia, Pennsylvania, protecting the municipal water supplies of Philadelphia and Camden, New Jersey. Four dams exist on tributaries to the upper Delaware River, impounding water from approximately 38% of the upper Delaware watershed. Flows in the upper Delaware River—especially in the uppermost section—are impacted by two New York City (NYC) reservoirs: the Cannonsville Reservoir on the west branch of the Delaware and the Pepacton Reservoir on the east branch of the Delaware. Flows in the lower section of the Upper Delaware River and the upper section of the Middle Delaware River are impacted by releases from a hydroelectric generating facility (not a NYC reservoir) on the Lackawaxen River, and to a much lesser extent by releases from the Rio hydroelectric generating facility (not a NYC reservoir) on the Mongaup River. A third NYC reservoir on the Neversink River impacts flows downstream of its confluence with the Delaware River, just upstream from the Delaware Water Gap. The decree provides for the diversion of up to 800 million gallons of Middle Delaware River water per day (annual average) to the NYC metropolitan area and requires a minimum daily flow of 1,750 cfs (in nondrought conditions) at Montague, located at the northern end of the Delaware Water Gap National Recreation Area.

In recent years, New York City has diverted an average of about 650 million gallons of water per day, which is equal to about 55% of the "natural" average daily flow at the upstream boundary of the Upper Delaware River (Hancock, New York).

Since the 1954 decree, reservoir releases have been managed through a series of evolving programs based on unanimous agreement by the parties. The Flexible Flow Management Program provides the current framework for managing diversions and releases from NYC reservoirs. This program was designed by the states to support multiple flow management objectives, including water supply; drought mitigation; flood mitigation; protection of the cold tail-water fishery; a diverse array of habitat needs in the mainstem, estuary, and bay; recreational goals; and salinity repulsion in the Delaware estuary. The region's annual precipitation can vary greatly from year to year, challenging the Flexible Flow Management Program. In drought years, flow formulas and release patterns from upstream reservoirs may not adequately protect river ecology.

The decree designates the US Geological Survey (USGS) as the River Master to implement the provisions of the 1954 decree. In 1961, the Delaware River Basin Commission was created and includes a representative from each state and one from the federal government (currently the US Army Corps of Engineers). The Delaware River Basin Commission is the primary management entity for the Delaware River. The commission plans and regulates water conservation and use and distribution in the basin based largely on the 1954 decree.

Note: the document continues to include a list and river mile of waterway modifications, and tables describing reservoir sizes and existing USGS gauges.

NOTES

From Rio Grande Wild and Scenic River

The Rio Grande Wild and Scenic River is unique in that peak flows are dominated by late summer thunderstorms rather than a snowmelt-generated freshet. Historically, peak flows generated by runoff from the North American monsoon were considerably greater than runoff from the northern branch. Considerable distance from the headwaters in southern Colorado meant that the snowmelt did not reach Big Bend until early summer and was quickly overwhelmed by runoff from the monsoon. The free-flow nature of the river is best experienced during extreme rainfall events and tributary flash floods, as well as during low-flow periods when groundwater contributions sustain flows in the lower reaches. These spring inputs are unique and regionally significant, comprising roughly a quarter of the mean annual river flow and a majority of the river's flow during dry periods. These springs have been designated as ecologically significant by the State of Texas.

Agricultural use of the river upstream from Big Bend National Park and Rio Grande Wild and Scenic River is longstanding. Pueblo peoples in New Mexico were using ditch irrigation on a limited scale at the time of Spanish exploration in 1591 (Scurlock 1998). Spanish and Mexican settlers expanded irrigation on floodplains and terraces in New Mexico (Sorenson and Linford 1967, cited by Scurlock 1998). Ditch irrigation began in the mid-1600s in the El Paso/Juarez Valley, and direct diversions of the main channel in this valley were underway by at least the late 1700s (Stotz 2000). Water was being diverted from the Rio Conchos for use at the presidio in the Presidio Valley by 1750. Depletions of stream flow caused by irrigation withdrawals have been substantial for more than a century. Kelley (1986, cited by Stotz 2000) estimated that more than half the summer stream flow from central and northern New Mexico between 1890 and 1893 was consumed by irrigation.

Following construction of two dams in 1915—La Boquilla on the Rio Conchos in Mexico and Elephant Butte on the middle Rio Grande in New Mexico—the natural hydrology of the Rio Grande changed dramatically downstream from the Rio Conchos. The hydrology of the Rio Conchos is entirely determined by rainfall and runoff in the Sierra Madre Occidental, which is greatest during the North American monsoon. This watershed yields the bulk of its natural stream flow between July and the following March (Schmidt et al. 2003). Prior to 1915, the magnitude of peak flows downstream from the Rio Conchos was approximately four times what they were upstream (Schmidt et al. 2003). During September, when the Rio Conchos reached its annual maximum discharge, approximately 93% of the lower Rio Grande's total monthly flow came from the Rio Conchos.

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Flow depletions in the northern branch of the Rio Grande in the United States and Mexico have a significant impact on the timing of onset of peak annual flows. Unlike most streams and rivers of the American West, with peak flows occurring during the spring freshet, the Rio Grande below the Rio Conchos historically saw peak flows in late summer and early fall. Annual peak flows are now an artifact of dam operations at Presa (Lake) Luis Leon in the Mexican state of Chihuahua. Timing is governed by agreements between Mexico and the United States made under the Water Treaty of 1944 and administered by Mexico's National Water Commission (CONAGUA). Annual peak floods can come during any month of the year.

The loss of annual scouring flows has had a significant negative impact on ecological and hydrological function within the river. Tributary sediment, which would be carried away by annual high flows, now aggrades within the channel, covering cobble bars and filling backwaters. As the channel constricts, the conveyance capacity is reduced and flooding frequency increases. This phenomenon is well documented for the reach within Big Bend National Park. Its extent in the Lower Canyons is a little less known. With a steeper gradient in Segment 8 canyons and steeper tributaries that deliver a more coarse sediment load, it is likely that the style and extent of channel constriction alters with distance downstream.

Large, decadal scale, hydro-climatic events that can overwhelm diversion and storage structures on the Rio Conchos are capable of moving much of this sediment downstream and into Lake Powell. In 2008, several tropical systems moved through Chihuahua, Mexico, filling reservoirs and necessitating a large release that inundated every riverside community downstream of Presidio. Despite the dramatic event, the scouring provided by this flood did not widen the channel to previous dimensions. Channel width is progressively narrower over the past 50 years (Dean 2011).

Alluvial and bedrock rivers are fundamentally different in that alluvial channels are shaped by sediment transport and bedrock channels are shaped by structural and lithologic controls. Several differences exist between the hydrologic conditions in canyon reaches versus alluvial reaches within Rio Grande Wild and Scenic River. Canyon reaches such as Santa Elena have steeper gradients, more exciting rapids, less sediment storage, and a thin, patchy riparian zone. Alluvial reaches such as Segment 9B have a wide meandering channel with a wide and dense riparian forest. Canyon reaches such as Segment 5 have numerous springs issuing from limestone cliffs at river's edge and ephemeral spring ponds formed by scouring floods on floodplains. Alluvial reaches lose water to the underlying basin. Some reaches, such as Segment 3, are imprinted on a series of basin and range tilted blocks and are neither completely canyon or alluvial. Sediment transport determines channel condition in much of the reach, yet there are locations with bedrock springs right next to the river.

Along the entire wild and scenic river designation there are no impoundments, modifications, or diversions. This is extremely rare for an almost 250-mile stretch of a major river in the United States. However, flow inputs to this wild and scenic river are regulated, both on the Upper Rio Grande and Rio Conchos. For example, upstream levees and diversions above the designation fail to attenuate larger floods that exacerbate downstream sediment deposition problems. International treaty obligations and water delivery requirements further affect the water quantity aspect of the river's free-flowing nature. These influences have resulted in a river system that can no longer maintain its natural channel morphology.

Water Quality

In addition to ORVs, the water quality of the rivers is integral to their designated status. Because water quality supports the integrity of the ORVs and is a key component of future management, it is included as part of the ORV statement.

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BEST PRACTICES FOR WATER QUALITY DESCRIPTIONS

- **Describe the baseline water quality conditions of the river**
  Consider water quality, including chemical, physical, and biological conditions. Consider variations during seasons, storm events, and droughts. Are any of the state water quality standards being exceeded? Are any portions of the river on the state 303d impairment list or designated as outstanding waters? Are there any USGS or agency (state or federal) water quality stations on the river?
- **Describe the water quality trends of the river**
  Considering the baseline conditions described above, describe the recent trends in water quality. Are chemical, physical, and biological conditions stable, improving, or degrading?
- **Describe existing or potential threats to water quality**
  Consider both point and nonpoint sources that can impair the existing aquatic and terrestrial ecosystems and diminish the utility of park waters for visitor use and enjoyment. Consider the quality of both surface and groundwater resources, as well as pollution by human activities occurring within and outside the designated river segment.

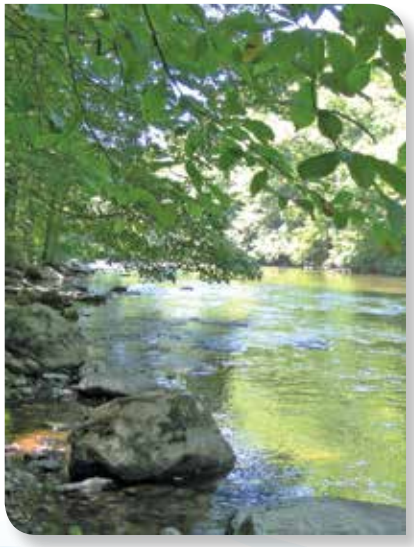
WATER QUALITY SESSION

Exercise 1 (large group): As a large group, discuss and record notes on the water quality of the river.

Example of Water Quality Descriptions

From Delaware River Basin

Water quality in the nontidal portion of the Delaware River is perhaps the purest of all the large rivers in the mid-Atlantic and northeastern United States.



At most times water quality exceeds federal and state criteria levels. The Delaware River serves as a regional reference condition river for water quality and biological assessments. The uses that are most dependent on the extraordinarily clean water are water-based recreation, water supply that requires little treatment, and excellent habitat for thriving aquatic life.

Because of such exceptional water quality, keeping the Delaware River uncontaminated is the primary policy of regulatory agencies. This policy is known as anti-degradation, and is consistent with the Wild and Scenic River Act anti-degradation policy. The entire 197-mile nontidal portion of the Delaware River between Hancock, New York, and Trenton, New Jersey, is classified by the

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Delaware River Basin Commission (DRBC) as "Special Protection Waters." This represents the longest contiguous reach of anti-degradation waters in the United States. The Upper Delaware Scenic and Recreational River and the Delaware Water Gap National Recreation Area are accorded the highest level of anti-degradation protection by the Delaware River Basin Commission as outstanding basin waters. The Lower Delaware River is classified by the Delaware River Basin Commission as significant resource waters. Both classifications are equivalent to EPA tier III anti-degradation protection of water quality and allow "no measurable change in existing water quality except toward natural conditions."

Outstanding basin waters include the additional provision disallowing mixing zones for approved dischargers whereas mixing zones are allowed in significant resource waters. Many tributaries in Pennsylvania, New York, and New Jersey are also afforded a similar level of water quality protection through state regulations, but only those tributaries within the boundaries of Delaware Water Gap National Recreation Area are included as outstanding basin waters by the DRBC Special Protection Waters regulations. Primary regulatory protection of other tributaries within the basin is maintained by the states, although the Delaware River Basin Commission does have some regulatory authority on point source dischargers to tributaries in order to protect the shared interstate waters of the mainstem. The DRBC Special Protection Waters regulations are unique in that they are monitored to determine if "measurable change" is occurring. This monitoring program is conducted through an informal partnership between the National Park Service and the Delaware River Basin Commission called the Scenic Rivers Monitoring Program. Both the Special Protection Waters regulations and the Scenic Rivers Monitoring Program are crucial to maintaining the level of water quality in the designated waters of the mainstem Delaware River.

Photo credit: David B. Soete. Used by permission.

The anti-degradation policy is very important, not only for river recreation and aquatic life, but also for the water supply for approximately 16 million people in New York, Pennsylvania, New Jersey, and Delaware. The Delaware River watershed is relatively small, comprising only 0.4% of continental US land area; its clean water is a drinking water source for 5% of the US population.

In comparing water quality of the Delaware River and tributary wild and scenic segments, both the Upper and Middle Delaware river segments are the cleanest and healthiest. The Lower Delaware is much more urbanized and historically industrialized and farmed, so water quality is not as good, although it still supports the most stringent of uses. The Musconetcong River water quality is good, supporting reproducing trout populations, but not as good as the Lower Delaware River.

Tohickon Creek is one of the highest water quality streams in Pennsylvania and is classified as a cold water fishery by the state's Department of Environmental Protection. A DRBC study of water quality in the lower Delaware in 2004 found that, of the 18 lower Delaware River segments and tributaries analyzed, Tohickon Creek was ranked fourth in overall water quality. Tinicum Creek is designated an exceptional value stream and Paunacussing Creek is designated as a high quality cold water fishery.

From Virgin Wild and Scenic River

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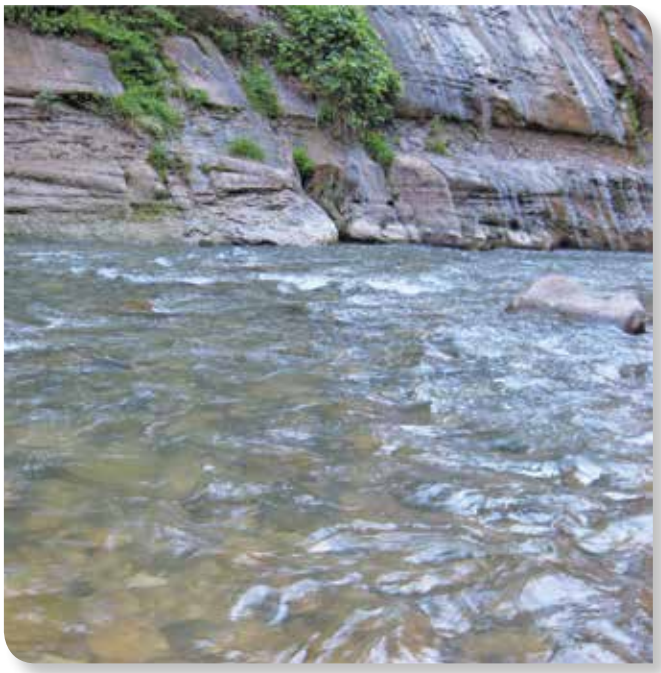
Water quality conditions of the North and East Forks of the Virgin River and its tributaries are generally considered natural and high quality. They are reflective of the largely unaltered geohydrologic setting and are generally within state water quality standards. This is due to the relatively light level of development on the watershed, and to the fact that most, and for some of the tributary streams all, of the flow is from groundwater discharge from the Navajo Sandstone. The Navajo Sandstone is made up of more than 99% pure quartz sand and provides a near perfect sandstone filter. Major cations in the water are calcium, magnesium, and sodium, while anions are dominated by bicarbonate, sulfate, and chloride. The dissolved minerals are present at levels that would be expected in an arid watershed of sedimentary rock and increase in a downstream direction as the river contacts geologic layers with a greater amount of soluble minerals. Water temperatures would be marginal for cold water fish, but are well suited for the native fish species.

Two water quality characteristics that could be considered problematic are suspended sediment and fecal bacteria. The sediment loading in these streams is spectacular during floods, and while it might be influenced to some degree by upstream land use practices, it is generally considered to be a reflection of the extreme rate on natural erosion of this watershed. This level of sediment loading and turbidity during floods would be considered a major deficiency elsewhere, but in these rivers it is an attribute of natural conditions rather than a concern and sediment levels appear to be a major factor preventing the invasion of nonnative fish species. The level of fecal bacteria has proven to be a chronic problem on the North Fork of the Virgin River upstream of the Temple of Sinawava. The state has included this reach on the list of rivers not meeting water quality standards and the park advises extra caution for visitors hiking the Zion Narrows. The source of the contamination is under investigation. Occasional spikes of bacteria concentrations also occur on other rivers usually during flood events when such occurrences would be expected.

Protection from water quality degradation is provided under the Clean Water Act by state-designated protected uses. All segments are protected as a source of irrigation water. The North and East Forks of the Virgin River and North Creek are protected as sources of domestic drinking water. All of the segments except the North Fork of the Virgin are protected for secondary contact recreation, while the North Fork of the Virgin River is designated for primary contact recreation in recognition of the large number of people engaging in water play and swimming. To protect fish and aquatic life, the North Fork of the Virgin River, Kolob Creek and Taylor Creek carry a designation for cold-water fisheries; La Verkin Creek has a designation for warm-water fisheries, and the East Fork of the Virgin River and North Creek are designated for nongame fish. In addition, the North and East Forks and Kolob Creek have a High Quality Category 1 designation that precludes new point-source discharges. A stream-specific standard for total dissolved solids is established for North Creek at 2,035 mg/l, though this has little bearing on park waters in a different geologic setting.



River-Related Issues

A comprehensive list of issues helps river managers identify and prioritize future management efforts. Issues are sorted into both broad and site-specific issues. Site-specific issues can also be denoted on a map of the river and river segments to help inform river managers.

RIVER-RELATED ISSUES SESSION (LARGE GROUP)

Exercise 1 (large group): As a large group, identify broad and site-specific issues for each designated river

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Examples of River-Related Issues

From Delaware River Basin

- Natural gas extraction (including hydraulic fracturing; surface disturbance; visual, noise, community values, quality of life, etc.; and infrastructure)
- Ridgetop development
- Climate change effects (e.g., increased flood events, intensity)
- Recreational carrying capacity (related to visitor experience, impacts on resources, etc.)
- Wastewater infrastructure management and maintenance
- Protection and sustainability of diadromous fish
- Providing and maintaining recreational facilities
- Land use management in local communities (consistent ordinances with protection goals of W&SR)
- Forest fragmentation and forest harvesting… and declining forest value/quality
- Degradation of tributaries (silting, water quality, etc.)
- Point and nonpoint pollution sources across watershed (e.g., ag, residential, commercial)
- Water quantity issues – flow regime needs, hydrographs (e.g., via flexible flow mgmt. plan)
- Flow diversions and withdrawals
- Climate change effects (e.g., increased flood events, intensity)
- Wastewater infrastructure management and maintenance
- Power/energy generation and infrastructure (e.g., transmission lines, gas pipelines, solar dev., wind turbines, hydro facilities, etc.), and right-of-way maintenance of these facilities
- Transportation corridors and infrastructure (e.g., impacts from development, maintenance, salting, traffic crowding/noise)

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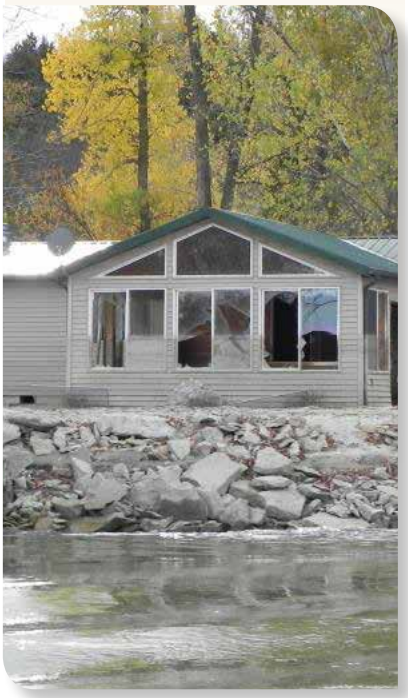

- Communication infrastructure (e.g., cell towers), pros and cons of communication for parks and visual impacts on landscape
- Nonnative species (plant and animals)
- Recreational carrying capacity (related to visitor experience, impacts on resources, etc.)
- Recreational tourism facilities along rivers
- Funding for caretaker agencies for rivers (e.g., Delaware River Basin Commission)
- Community relationship-building, leadership/politician turnover in local communities prompts continual re-education efforts
- Atmospheric pollutant deposition
- Mercury
- Waste disposal
- Pharmaceutical waste disposal
- Identifying data gaps for resources/issues, and filling them e.g., USGS stream gauges
- Internal communications across units and agencies
- Flood-control structures
- Deer overpopulation
- Finding ways to invest in financial capital to retain natural capital that provides ecosystem services and promotes sustainability
- Promote development of technology that will promote attaining zero-discharge goal of the Clean Water Act
- Erosion and sedimentation
- Promote/seek ways to advance alternative mechanisms of land protection (e.g., conservation easements, etc.)
- Children education efforts
- New York City "education" efforts that make residents aware of the repercussions of their energy and water decisions on other water users downstream and the river itself
- River safety efforts (UPDE river ranger program is an example of an effective approach)
- Pursue/further interagency collaboration on cross-basin resource management (e.g., to address nonnative species, fish/wildlife management)
- Link cultural heritage from upper down to lower (all the way—full connection)
- Enhanced education program for private landowners to emphasize importance of river/riparian stewardship
- Protection and investigation of archeological resources
- Need more geomorphology studies that reveal past flow regimes of rivers
- Defining reference conditions for all natural resources
- Scenic resource assessment needs
- Inconsistency of federal contribution to the Delaware River Basin Commission (a.k.a., lack)

River-Related Stakeholders

Often, many individuals, organizations, institutions, and agencies throughout the region have participated in past planning, management, and program efforts with NPS staff for river management. The input and involvement from these stakeholders and partners are essential for effective management of the rivers. A list of stakeholders and partners will continue to be updated to ensure they have an opportunity to engage in future management efforts.

NOTES

RIVER-RELATED STAKEHOLDERS SESSION (LARGE GROUP)

Exercise 1 (large group): As a large group, identify stakeholders and their interests for each designated river.

Examples of River-Related Stakeholders

From Missouri National Recreational River

- Nebraska Department of Roads
- Nebraska Game and Parks Commission
- South Dakota Department of Transportation
- South Dakota Game, Fish, and Parks
- South Dakota Department of Corrections
- Northeast Nebraska Cooperative Weed Management Area
- Clay County
- Dixon County
- Boyd County
- Yankton County
- Charles Mix County
- Bon Homme County
- Union County
- Cedar County
- Knox County
- Private landowners
- South Dakota Canoe and Kayak Association
- University of Nebraska
- South Dakota State University
- University of South Dakota
- University of Sioux Falls (Keith Perkins)

NOTES

- Missouri River Institute-USD
- Mount Marty College
- Omaha Tribe of Nebraska
- Ponca Tribe of Nebraska
- Santee Sioux Tribe of Nebraska
- Yankton Sioux Tribe
- Federal Bureau of Prisons
- Missouri River Bank Stabilization Association
- Sierra Club – Living Rivers Group
- Spirit Mound Trust
- Missouri River Relief
- Missouri River Futures
- Izaak Walton League of America
- Boy Scouts of America
- Girls Scouts of the USA
- Boys & Girls Clubs throughout the MNRR Corridor
- NPS – Northern Great Plains I&M Network
- US Army Corps of Engineers
- Lewis and Clark Visitor Center (USACE)
- US Fish and Wildlife Service
- US Geological Survey
- USDA – Natural Resource Conservation Service – Northeast Nebraska Resource Conservation & Development District
- MRRIC Federal Working Group
- Missouri River Association of States and Tribes
- Missouri River Basin Interagency Round Table

- Missouri River Ecosystem Recovery Program
- Missouri River Natural Resources Committee
- Missouri River Recovery Implementation Committee
- Missouri River Ecosystem Coordination Group
- Missouri Sedimentation Action Coalition
- Corps of Discovery Welcome Center
- Niobrara National Scenic River
- Pipestone National Monument
- Lewis and Clark National Historic Trail
- Jefferson National Parks Association
- Pawnee Nation of Oklahoma
- Vermillion Chamber & Economic Development
- Vermillion Public Library
- Yankton Chamber of Commerce
- Yankton Public Library
- City of Yankton Parks and Recreation Department
- City of Yankton Sesquicentennial Committee
- Keep Yankton Beautiful
- Clay County Park
- School Districts/Schools
- Yankton Public Library
- City of Yankton Parks and Recreation Department
- City of Yankton Sesquicentennial Committee
- Keep Yankton Beautiful
- Clay County Park
- School Districts/Schools

NOTES

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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