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**TECHNICAL MEMORANDUM**

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**SUBJECT:           Green River Basin Plan**  
***Future Recreational and Environmental Water***  
***Requirements***

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### **Introduction**

This memorandum presents projections of the future water needs associated with recreational and environmental water uses in the Green River Basin. Where practical, projections were developed for three planning scenarios:

1. Low Growth
2. Moderate Growth
3. High Growth

Unlike other Basin water uses, recreational water uses are generally non-consumptive, while environmental water uses can be either consumptive or non-consumptive, depending upon circumstances. In both cases, quantification of the amount of water needed to meet future needs is difficult, and often must be addressed qualitatively. There is also considerable overlap between the two categories. For example, instream flows are considered an environmental water use for purposes of this water planning process because they are a form of natural resource stewardship undertaken by the State. One important purpose of such flows, however, is to maintain the habitat supporting recreational fisheries. As a result, there is some overlap in the discussion of future water needs for recreational and environmental uses presented in this technical memorandum.

### **Future Recreational Water Requirements**

#### Background and Approach

One of the more difficult problems in water resource planning is estimating the demand or “need” for water-based recreational opportunities in an area such as Wyoming’s Green River Basin. There are several reasons for this difficulty, including the fact that many recreational resources are publicly owned and are utilized without the accounting activity that normally accompanies resource utilization in the private sector. It thus can be difficult to accurately estimate how much water-based recreational activity is currently taking place in a river basin. As a result, estimates of current and historical demands are best viewed as indicators rather than absolute quantities.

There are also problems associated with estimating the supply of water-based recreational resources (Harrington, 1987). Commonly used measures such as miles of stream and acres of standing water do not address issues such as resource quality or ease of access, which are also elements influencing supply.

Nevertheless, such measures do provide indicators of resource supply that can be used for planning purposes.

In some instances, estimates of current recreational activity are available from survey data. For example, the Wyoming Game and Fish Department (WGFD) estimates that resident and non-resident anglers currently spend about 485,000 days annually fishing on standing waters in the Green River Basin (Fowden, 2000). This estimate can be construed as a measure of the current demand for still water fishing in the Basin given the current supply of opportunities for such fishing. What it does not tell us, however, is what demand would be if the supply of still water fisheries increases. For example, if a new reservoir fishery were developed in the Green River Basin, we would expect the demand for fishing to increase, but the amount of that increase is difficult to estimate without detailed site-specific studies.

Site-specific studies of water-based recreation demands are beyond the scope of this and other basin-wide planning studies. Instead, such studies usually adopt the convention of assuming that current activity rates will change in the future in proportion to changes in population, tourism, and angler preferences. Projected recreational activity rates are then compared to resource availability to determine if overcrowding or other unfavorable effects are likely to occur. That convention was followed in developing the recreational demand estimates described in this technical memorandum.

### Current Recreation Activity

The most popular water-based recreational activity in the Green River Basin is fishing. Figure 1 shows that about 60 percent of Basin residents participated in fishing activities in 1989, the most recent year for which detailed survey information is available (University of Wyoming, 1990). The second most popular water-based recreational activity among residents is boating and water skiing, with 18.3 percent of residents participating, followed by bird and waterfowl hunting (13.8 percent participation) and rafting, kayaking, and canoeing (9.7 percent participation). Other popular outdoor recreational activities among Basin residents include camping (40.0 percent participation), picnicking (22.1 percent participation), and big game hunting (15 to 35 percent participation depending upon species). These latter activities are not directly tied to water resources, however, and thus are not included in Figure 1.

Less information is available concerning the participation of tourists in water-based recreation in the Basin. According to surveys commissioned by the Wyoming Business Council (WBC), over 4.2 million tourists visited Wyoming in 1998, and approximately 10 percent of those visitors fished at least once while in the state (Morey & Associates, 1998). No estimates are available concerning the proportion of those tourists that fished or pursued other water-based recreational activities in the Green River Basin.

The WGFD provided estimates of the number of annual activity days of angling and waterfowl hunting in the Green River Basin.<sup>1</sup> These estimates are given in Table 1. The results show that still water fishing on lakes and reservoirs in the Basin accounts for almost one-half million activity days annually. About 80 percent of this activity occurs on lowland reservoirs, the largest of which are Flaming Gorge and Fontenelle. Another 15 percent of still water fishing activity occurs on alpine lakes and reservoirs,

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<sup>1</sup> Activity days are defined as days during which at least some part of the day is spent angling or waterfowl hunting. The number of hours per day spent in these activities varies.

which are concentrated on national forest lands in the Pinedale area. The remaining five percent of activity days involve fishing on farm ponds and natural lowland lakes scattered throughout the Basin.

Stream fishing in the Basin accounts for about 300,000 activity days annually. The main stem of the Green River above Flaming Gorge Reservoir and several of its tributaries in the northern part of the Basin provide very good trout fishing opportunities. The most popular areas for stream fishing in the Basin are the Green and New Fork Rivers in the Pinedale area and the Green River below Fontenelle Reservoir.

Waterfowl hunters spend about 10,600 days annually in the pursuit of ducks and geese that inhabit or pass through the Basin. The two most heavily hunted areas are the Seedskafee National Wildlife Refuge and the Eden-Farson-Big Sandy area (Tessman, 2000).

Activity day estimates are not available for other water-based recreational pursuits, including boating, water skiing, rafting, canoeing, sailing, and wind surfing. Total visitation estimates are available for certain large bodies of water such as Flaming Gorge and Fontenelle Reservoirs, but these estimates are for all uses, including sightseeing, picnicking, and camping, regardless of whether water based recreation is involved. As an example, the Wyoming portion of Flaming Gorge Reservoir received an estimated 254,000 activity days of use of all kinds in 1999. Use estimates for certain other reservoirs in the Basin are given in a technical memorandum on current recreational uses (Tyrrell, 2000a).

### Recreation Demand Projections

Future demands for recreational water resources in the Basin depend upon numerous factors, including population growth, tourism growth, and participation rates in various water-based recreational activities. Future participation rates depend upon changes in preferences over time as well as the availability of water resources and the amount of congestion encountered at recreational sites. Changes in future recreational preferences are hard to predict, so the projections described in this section are based upon the assumption that participation rates remain constant over the planning horizon. This assumption means that projected recreational demands are proportional to growth in population and tourism in the Basin. The potential effects of congestion on future recreational water uses are discussed in the following section.

Projections of population growth in the Basin are described in a technical memorandum by that title (Watts, 2000). Those projections are summarized in Table 2 in terms of average annual growth rates for the low, moderate, and high growth planning scenarios. These annual average growth rates range from 0.08 percent for the low growth scenario to 1.35 percent for the high growth scenario. Table 2 also gives projections of tourism growth over the planning horizon for low, moderate, and high growth scenarios. The range for these growth rates is from 1.00 to 3.00 percent.

The tourism growth rate projections are based upon data from a variety of sources that provide indications of tourism growth rates in the Green River Basin and Wyoming. For example, The Wyoming Department of State Parks and Cultural Resources (WDSPCR) estimates that visitation at Wyoming's state parks increased at an average annual rate of 0.50 percent annually during the period from 1995 through 1999. During the same period, visitation at Wyoming's historical sites (perhaps a better gauge of tourism than state parks) increased at an annual rate of 1.90 percent (WDSPCR, 2000).

A study of tourism in Wyoming by Morey and Associates and the University of Wyoming found that Wyoming tourism increased at an average annual rate of 3.6 percent during the three- year period from 1996 through 1999, although that growth rate is based upon a very short time period (Morey and Associates, various years). BBC Research and Consulting prepared projections of tourism for the Bear River Basin based upon projected traffic increases along I-80 in the Evanston area and population projections for Utah's Wasatch Front (a large source of southwestern Wyoming tourists). Those projections are for tourism in the Bear River Basin to increase at an average annual rate of between 1.6 and 2.9 percent (Harvey and Jeavons, 2000). Based upon the above data, a range of one to three percent for average annual tourism growth in the Green River Basin was used to project future demands for water-based recreational activities.

The other information needed to project future recreation demand is a breakdown of recreational activity data between residents and nonresidents. According to the WGFD, residents of the Basin account for about 68 percent of the fishing activity days on lakes and about 58 percent of the fishing activity days on streams. Residents also account for about 82 percent of the waterfowl hunting activity in the Basin and about 63 percent of the boating activity (Remmick, 2000a).

This information, in conjunction with the data in Tables 1 and 2, was used to project future recreational activity days over the 30-year planning horizon from 2000 to 2030. Those projections are given in Table 3. The demand for still water fishing, the most popular recreational activity in the Basin, is projected to expand significantly over the next three decades. From a current level of 485,000 activity days annually, demand would grow to 547,000 days in 2030 under the low growth scenario, an increase of 13 percent. For the moderate growth scenario, demand would grow to 685,300 activity days, a 41 percent increase. For the high growth scenario, still water fishing demand would be 869,800 activity days by 2030, an increase of 79 percent over current levels.

Similar increases are projected for stream fishing demands in the Basin. The projections in Table 3 show that demand would increase from a current level of 300,000 activity days to between 348,000 and 566,000 activity days by 2030, depending upon the growth scenario chosen. The high growth scenario projects an 89 percent increase in demand over the next 30 years, which is greater than the increase projected for still water fishing.

The demand for waterfowl hunting is also expected to increase over the planning horizon, but at a lesser growth rate than for fishing. Total annual activity day demand is projected to increase from a current level of about 10,600 activity days to between 11,500 and 17,600 activity days by 2030, depending upon the planning scenario.

The last recreational activity described in Table 3 encompasses all forms of boating, rafting, canoeing, and sailing. No information is available concerning current Basin-wide boating activity days. The projections for this activity category in Table 3 show the percentage increases in demand that are expected for this activity, given projected increases in population and tourism in the Basin over the planning horizon. These increases range from a low of 14 percent to a high of 85 percent, depending upon the growth scenario chosen.

A summary of current and projected recreational activity day demands is presented in Figure 2 for those activities for which data is available (fishing and waterfowl hunting). The results show that, currently,

those activities account for about 796,000 user days annually. For the low growth scenario, that figure is expected to rise to 905,600 activity days by the year 2030, an increase of 14 percent. For the moderate and high growth scenarios, the projections are for 1,140,800 and 1,452,400 activity days, respectively, by the year 2030. These projections constitute increases of 43 and 83 percent over current recreational activity estimates.

#### Adequacy of Existing Resources to Meet Projected Demands

The issue of the adequacy of water resources to meet projected demands on a Basin-wide basis is difficult to assess because it involves subjective judgments. There are no absolute standards for determining the number of miles of stream fisheries or acres of reservoir fisheries that are needed to accommodate a given number of anglers. Similarly, there are no absolute standards for the water resources needed to meet demands for boating or waterfowl hunting.

The WGFD in the past has estimated the supply of water resources available to meet the demands of fishermen in various regions of the state (WGFD, 1989). These supply estimates were expressed in terms of fishermen days, and reflect the amount of pressure that the Department believed at that time (1988) that publicly accessible fisheries could withstand without significant deterioration. Although these estimates have not been updated in the past decade, they serve as one benchmark for judging the capacity of fisheries in the Green River Basin to meet projected future demands. It should be emphasized, however, that these supply estimates reflect not only resource availability in 1988, but also the management goals and objectives of the WGFD in terms of fishing success rates and other factors.

According to the WGFD, the Green River Basin (including the Little Snake Drainage) and the Bear River Basin combined provide an annual supply of 1,122,800 activity days of lake and reservoir fishing opportunities. Almost all of this supply is located in the Green River Basin. When contrasted with current utilization rates of about 485,000 activity days of use annually, it is apparent that, with the possible exception of certain localized areas, there is no current shortage of still water angling opportunities in the Basin. This observation is consistent with the observed fact that the region is endowed with numerous lake and reservoir fisheries ranging from small alpine lakes in the higher elevations of the Bridger-Teton National Forest to Flaming Gorge and Fontenelle Reservoirs in the lower part of the Basin.

Projections of future demands for still water fishing opportunities described above range from 547,000 to 870,000 activity days annually by the year 2030, depending upon the growth scenario used. None of these projections approach the estimated supply of over 1.1 million angling days, shown in Figure 3. Thus, the supply of lake and reservoir resources should be adequate to meet projected needs for the Basin as a whole. Individual waters may experience over crowding, however, and the distribution of future demand should be monitored to assess resource adequacy on an ongoing basis.

Figure 3 shows that a somewhat different conclusion applies to the Basin's stream fisheries. According to the WGFD, in 1988 the Basin had a total supply of about 411,000 angler days of stream fishing opportunities available, but only about 213,000 angler days of this supply were in areas where public access was guaranteed. That figure contrasts with a current estimated annual use of about 300,000 angler days of activity, and projected demands in the range of 327,000 to 566,000 angler days of activity by the year 2030. These estimates indicate that the Basin's stream fisheries are at capacity now, on the

average, and will come under increasing pressure in the future as it's population increases and tourism related fishing pressure grows.<sup>2</sup>

The implications of this latter conclusion are limited by the fact that there is a relatively fixed supply of streams in the Basin that are suitable for maintaining recreational fisheries. One inference that can be drawn is that any future water development activities in the Basin that would denigrate existing recreational stream fisheries could have significant negative recreational effects. On the other hand, new reservoir projects in the Basin could generate significant recreational benefits if they include provisions for establishing tailwater fisheries in areas where good quality fisheries do not currently exist. Another inference that can be drawn from these projections is that private landowners who control access to good quality stream fisheries in the Basin own a valuable asset and may be able to derive income in the coming decades by charging access fees for those fisheries, either through private leases, leases to public agencies such as the WGFD, or through daily access fees.

The other water-based recreational pursuit for which demand projections were developed is waterfowl hunting. Those projections indicate that demand is expected to rise from a current level of 10,600 activity days to between 11,500 and 17,600 activity days by the year 2030 (Table 3). The WGFD has not estimated the supply of waterfowl hunting opportunities in the Basin, partially because populations are migratory and hunting seasons and bag limits are established in accordance with guidelines established by the U.S. Fish and Wildlife Service (USFWS). These guidelines are intended to maintain sustainable populations of migratory birds that are subject to hunting in several states along their migratory routes (USFWS, 1996).

## **Future Environmental Water Requirements**

### Background and Approach

Current environmental uses of water in the Green River Basin are described in a separate technical memorandum (Tyrrell, 2000b). Those uses include:

- instream flows and reservoir bypasses;
- minimum reservoir pools;
- maintenance of wetlands, riparian habitat, and other wildlife habitat; and
- direct wildlife consumption.

Unlike recreational water requirements, environmental water requirements are not necessarily related to changes in population or tourism in the Basin. Instead, environmental water requirements are at least partially a function of human desires concerning the type of environment in which people want to live. These desires are expressed in many ways, including environmental programs and regulations

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<sup>2</sup> Although the total demand for stream fishing opportunities exceeds the total publicly available supply, some stream reaches may be underutilized because they are in remote locations or on private lands. Conversely, easily accessible stream segments on public lands may consistently be overutilized.

promulgated by elected representatives at the state and federal levels. Thus, future environmental water requirements in the Green River Basin will be determined, at least partially, by existing and new legislation dealing with environmental issues at the state and federal levels, and how that legislation is implemented by federal and state agencies.

Examples of such legislation include Wyoming Statutes S41-3-1001 to 1014, which stipulate that instream flows are a beneficial use of Wyoming's water and specify procedures for establishing such flows using unappropriated water. This legislation authorizes the WGFD to specify stream segments and flow requirements for an instream flow filing. The WWDC is authorized to file an instream flow application with the State Engineer and perform hydrologic analyses on filings recommended by the WGFD. The State Engineer can then issue a permit for an instream flow water right following a public hearing.

Future water requirements for instream flows in the Green River Basin (and other river basins throughout the state) depend largely upon how Wyoming's instream flow legislation is implemented over the 30-year planning horizon. Projecting the outcome of this process quantitatively would be difficult, and is perhaps unnecessary because instream flows and other environmental water uses are largely non-consumptive. Instream flow designations can conflict with potential new out-of-stream uses at specific locations, however, a topic that is discussed below.

#### Instream Flows and Reservoir Bypasses

Wyoming's instream flow statutes recognize the obvious economic fact that Green River Basin water resources have value in non-consumptive uses such as instream flows. Such flows not only contribute to aesthetic character and biological diversity of the Basin, they also support recreational fisheries that are important to Basin residents and to the Basin's economy. The amenities provided by free flowing streams have been at least partially responsible for economic growth in the Pinedale area in recent years, and are reflected in local real estate values (Remmick, 2000b).

The WGFD has a goal of maintaining and enhancing existing fisheries in the Green River Basin through the statutory designation of instream flow segments and other management strategies. An important subsidiary objective of the Department is to protect existing populations of Colorado River cutthroat trout and increase the distribution of the species in their ancestral waters. Colorado River cutthroat now inhabit 23 percent of the streams in the Green River Basin. They are classified as a sensitive species by the WGFD, meaning that they are in need of protection to avoid being listed as threatened or endangered.<sup>3</sup> The Department has implemented a management plan in cooperation with the U.S. Forest Service for managing Colorado River cutthroat populations in the Basin that includes seven elements, ranging from population and habitat surveys to non-native trout removal and instream flow designations (Remmick, 2000c).

To date, the WGFD has instituted a total of 34 instream flow requests for the Basin. Some of those requests are to protect existing recreational fisheries involving non-native species, while others are targeted specifically to preserving habitat for Colorado River cutthroats. To date, only two of these

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<sup>3</sup> A private group petitioned the U.S. Fish and Wildlife Service to list the Colorado River cutthroat as threatened or endangered in December 1999. If a listing is granted, it could have serious ramifications for traditional uses such as grazing, logging, mineral development, and fisheries management (Annear, 2000).

requests have resulted in a permit being issued by the State Engineer's Office (Tyrrell, 2000c). All of the filings to date have been for stream segments on publicly owned lands. The Department would consider a filing on a private stream segment only if requested to do so by the landowner (Annear, 2000). The two stream segments for which instream flow permits have been granted are a 10-mile stretch of the Green River near Warren Bridge and a 1.5-mile stretch of the West Fork of the New Fork River southeast of Pinedale. A complete description of pending instream filings is contained in a separate technical memorandum (Tyrrell, 2000c).

Although the WGFD has not completed its assessment of instream flow needs in the Green River Basin, it does not anticipate devoting significant efforts toward developing additional flow recommendations to the WWDC during the next five years. If and when additional instream flow requests are forthcoming, they would likely be in conjunction with Department efforts to maintain and reestablish Colorado cutthroat trout populations in the northwest tributaries of the mainstem Green River in the Big Piney area, certain tributaries in the Pinedale area and small streams in the Blacks Fork and Little Snake Drainages (Annear, 2000). The extent to which current and future instream flow requests may conflict with potential storage developments for supplemental irrigation water in the Basin is unknown, but the potential for conflicts does exist. These conflicts would have to be resolved on a case-by-case basis, weighing the potential benefits of water to the state in instream versus out-of stream uses.

Some groups in the Basin are pursuing strategy alternatives other than formal instream flow recommendations in an effort to enhance fisheries habitat. These strategies involve cooperative efforts to manage existing water rights in a manner that maintains traditional water uses and also provides improved instream flow conditions. An example of this strategy is a cooperative effort by Wyoming Trout Unlimited and private water rights holders to enhance the stream fishery below Fremont Lake through voluntary water releases during low-flow periods. Such strategies will likely become more common in the future as the demand for stream fishing opportunities increases.

Another tool for maintaining fisheries habitat in the Basin is the provision of minimum flow bypasses at reservoir sites. Currently, only three reservoirs in the Basin have minimum flow bypasses included as requirements in their permitting documents; Fontenelle, Meeks Cabin, and Stateline Reservoirs (Tyrrell, 2000c). The development of additional reservoir storage in the future would likely bring about requests by the WGFD and others for such minimum flow bypass requirements. As discussed elsewhere, the likelihood of additional storage being developed in the Basin will be greatly influenced by future trends in cattle and forage prices and state funding mechanisms available to irrigators in need of supplemental water (Watts, 2000).

### Minimum Reservoir Pools

Another environmental water use is the provision of minimum reservoir pools for fish and wildlife purposes. Five reservoirs in the Basin have "fish" or "fish and wildlife" uses listed in their permitting documents; Big Sandy, Boulder, Flaming Gorge, Fontenelle, and High Savery. Of these, only two have a specific amount of storage committed to a minimum pool: Boulder with 1,621 acre-feet, and High Savery with 4,955 acre-feet. Given the current federal regulatory environment and public desires to maintain and enhance recreational fisheries in the Basin, it is likely that any additional storage developed in the future will have a portion of its storage devoted to fish and wildlife purposes.

### Wildlife Habitat

Another important environmental use of water in the Basin is the provision of habitat for wildlife. Wildlife habitat exists in wetland and riparian areas on public and private lands through out the Basin, some of it occurring naturally and some of it as a result of human activity. A complete tabulation of wildlife habitat areas in the Basin has not been undertaken, but some of the more important human efforts to provide such habitat are discussed briefly in this memorandum. A more complete description is contained in a separate technical memorandum by Tyrrell (2000b).

One federally managed area dedicated to the preservation and restoration of wildlife habitat is the Seedskadee National Wildlife Refuge, which contains approximately 26,000 acres of land along the Green River below Fontenelle Reservoir. The refuge provides a variety of wetland, riparian, and grassland habitats for numerous wildlife species. Currently, there are about 335 acres of wetland habitat and 1,400 acres of riparian habitat on the refuge, and total water depletions associated with maintaining this habitat is estimated to be about 840 acre-feet annually (Tyrrell, 2000b). One goal of the refuge is to reestablish a number of wetlands that existed prior to the construction of Fontenelle Reservoir. These wetlands were maintained by high early season flows that have been reduced since the reservoir became operational. No precise estimates are available for the number of wetland acres that might be reestablished in the future, but the refuge does have the right to divert up to 28,000 acre-feet of direct flow and storage water annually below Fontenelle Reservoir. Under high growth assumptions, depletions for wetlands reestablishment may approach one-half of that amount on an annual basis.

Three federal programs, the Conservation Reserve Program (CRP), the Wetlands Reserve Program (WRP), and the Wildlife Habitat Incentives Program (WHIP) encourage the development of wildlife habitat on private lands. The CRP program is administered by the Farm Service Agency of the U.S. Department of Agriculture (USDA), and provides incentive payments for various conservation practices that will enhance wildlife habitat, as well as improve water quality and reduce erosion. Examples of such practices include fencing riparian areas, planting erosion-resistant groundcovers, building wind and snow breaks, installing water-filtering grass strips and contours, and developing shallow water areas. Only a small amount of acreage in the Basin is currently enrolled in the CRP. Some acreage in Lincoln County has been planted in erosion resistant cover and some additional acreage in Uinta County has been fenced to keep livestock out of riparian areas. A small number of wells were developed to provide water for livestock that were fenced out of riparian areas in Uinta County.

More lands in the Basin are expected to be enrolled in the CRP in the future, although no acreage estimates were made for purposes of this water plan. Most CRP lands do not involve consumptive use of surface water and thus will not affect future surface water availability for other uses.

The WRP is administered by the Natural Resources Conservation Service (NRCS) of the USDA. It is a voluntary program that provides financial and technical assistance to private landowners to reestablish wetlands on their property. Currently, there are 44 acres of land in the Basin enrolled in the WRP with an estimated annual consumptive water use of 110 acre-feet (Tyrrell, 2000b). These lands consumptively use water through evapotranspiration. Since the acreages in the WRP are relatively small, however, no projections of future depletions for this use were made.

The WHIP is also administered by the NRCS, and provides technical and financial assistance to private landowners interested in improving wildlife habitat on their property. Approximately 240 acres of land in the Basin is currently enrolled in the WHIP, but involve no consumptive use of surface or groundwater. As a result, no projections of future water needs for such lands were developed as a part of this water plan.

The Little Snake River Conservation District has been active in establishing wetland areas in the Little Snake Drainage. These lands are not currently registered under the WRP, although they may be in the future. During the 1990s, 113.5 acres of wetlands were created, with an estimated consumptive use of 284 acre-feet. The District expects to triple this acreage over the next 30 years, resulting in an annual depletion of almost 1,000 acre-feet.

### Direct Wildlife Consumption

The only estimates of current consumptive water use by wildlife in the Basin are approximate. They indicate that big game and wild horses consumptively use about 500 acre-feet of water annually, 100 acre-feet from groundwater sources and 400 acre-feet from surface water sources (Tyrrell, 2000b). This level of consumptive use is relatively small and is not expected to change significantly over the planning horizon.

### **Summary and Conclusions**

The Green River Basin is endowed with numerous streams and reservoirs that provide excellent opportunities for water-based recreation. Existing reservoirs in the Basin appear adequate to meet both current and projected needs for recreation, but stream fisheries will come under increasing pressure in the future as the demand for stream fishing opportunities increases among Basin residents and tourists. Future water development projects that denigrate stream fisheries would have significant negative impacts upon recreation in the Basin, while projects that enhance stream fishing habitats would have significant benefits. The WGFD is committed to preserving existing stream fisheries through instream flow recommendations and other management techniques. Instream flow permits will, to some extent, dictate the geographic availability of water for out-of-stream developments. Increasing interest by private parties, organizations, and municipalities in improving stream flows through volunteer water releases will also influence future water use patterns in the Basin.

Other environmental uses of water in the Basin are largely for the maintenance and development of wildlife habitat. Potential future uses of water for this purpose include the reestablishment of wetlands on the Seedsdakee National Wildlife Refuge, wetlands development projects in the Little Snake Basin by the Little Snake River Conservation District, and habitat development on private lands under the auspices of federal programs that provide technical and financial assistance for that purpose. None of these developments are expected to conflict with other water uses.

**Table 1**  
**Water-based Recreational Activity Days –**  
**Green River Basin**

| Activity                  | Activity Days          |
|---------------------------|------------------------|
| Stillwater fishing        | 485,600 <sup>1</sup>   |
| Stream fishing            | 300,000 <sup>2</sup>   |
| Boating/waterskiing       | n/a <sup>3</sup>       |
| Waterfowl hunting         | 10,600                 |
| Rafting/kayaking/canoeing | n/a <sup>3</sup>       |
| Sailing/wind surfing      | <u>n/a<sup>3</sup></u> |
| Total                     | 796,200                |

<sup>1</sup> Estimate provided by Mark Fowden (2000), WGFD.

<sup>2</sup> Estimate by Watts & Associates based upon WGFD data.

<sup>3</sup> Data not available.

**Table 2**  
**Projected Annual Growth Rates**  
**In Green River Basin**  
**Population and Tourism -**  
**(2000-2030)**

| Scenario        | Average Annual Growth Rate |         |
|-----------------|----------------------------|---------|
|                 | Basin Population           | Tourism |
| Low growth      | 0.08%                      | 1.00%   |
| Moderate growth | 0.68                       | 2.00    |
| High growth     | 1.35                       | 3.00    |

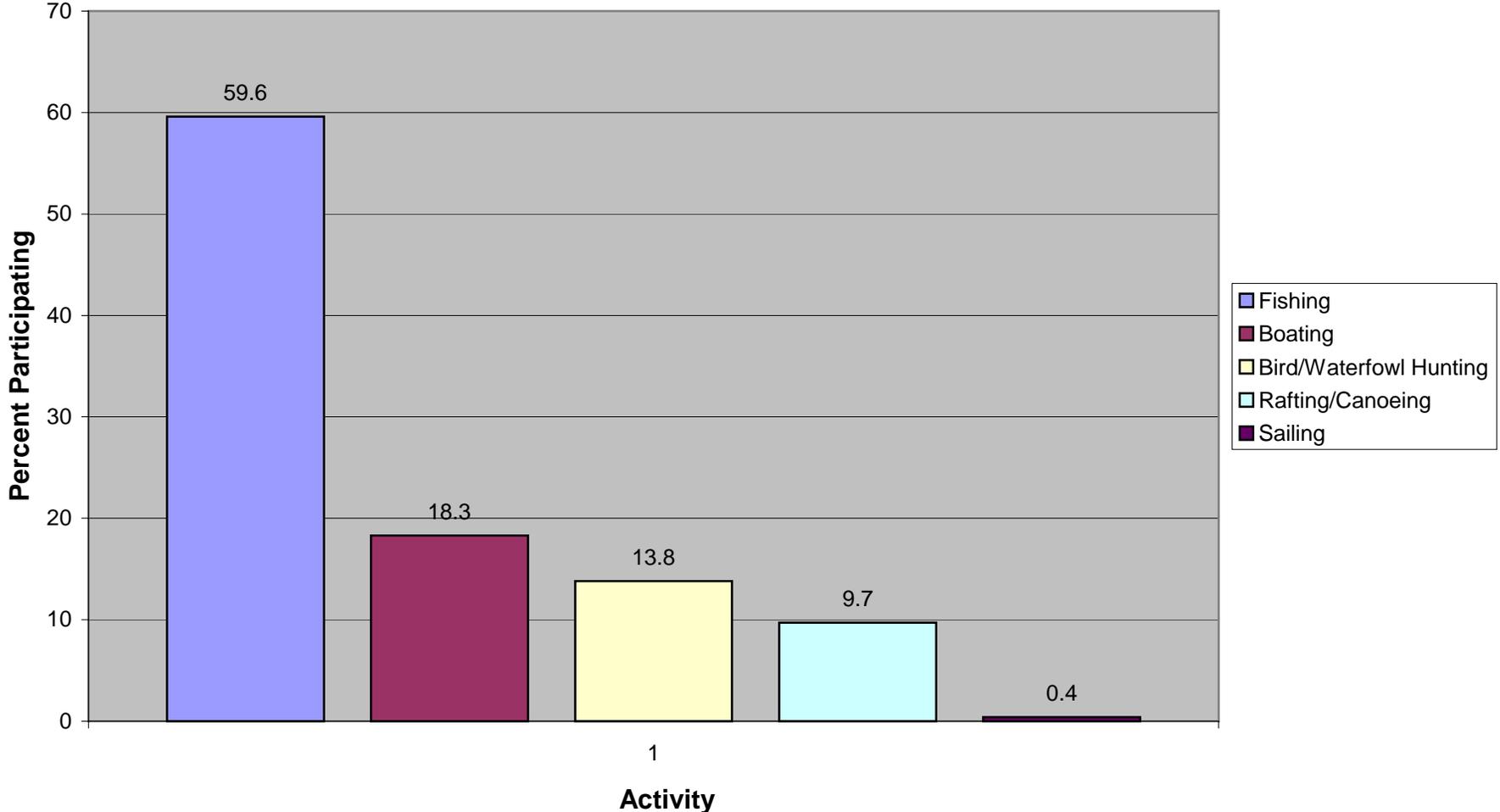
Source: See text.

**Table 3**  
**Current and Projected Water-based Recreational**  
**Activity Days – Green River Basin**  
**2000-2030**

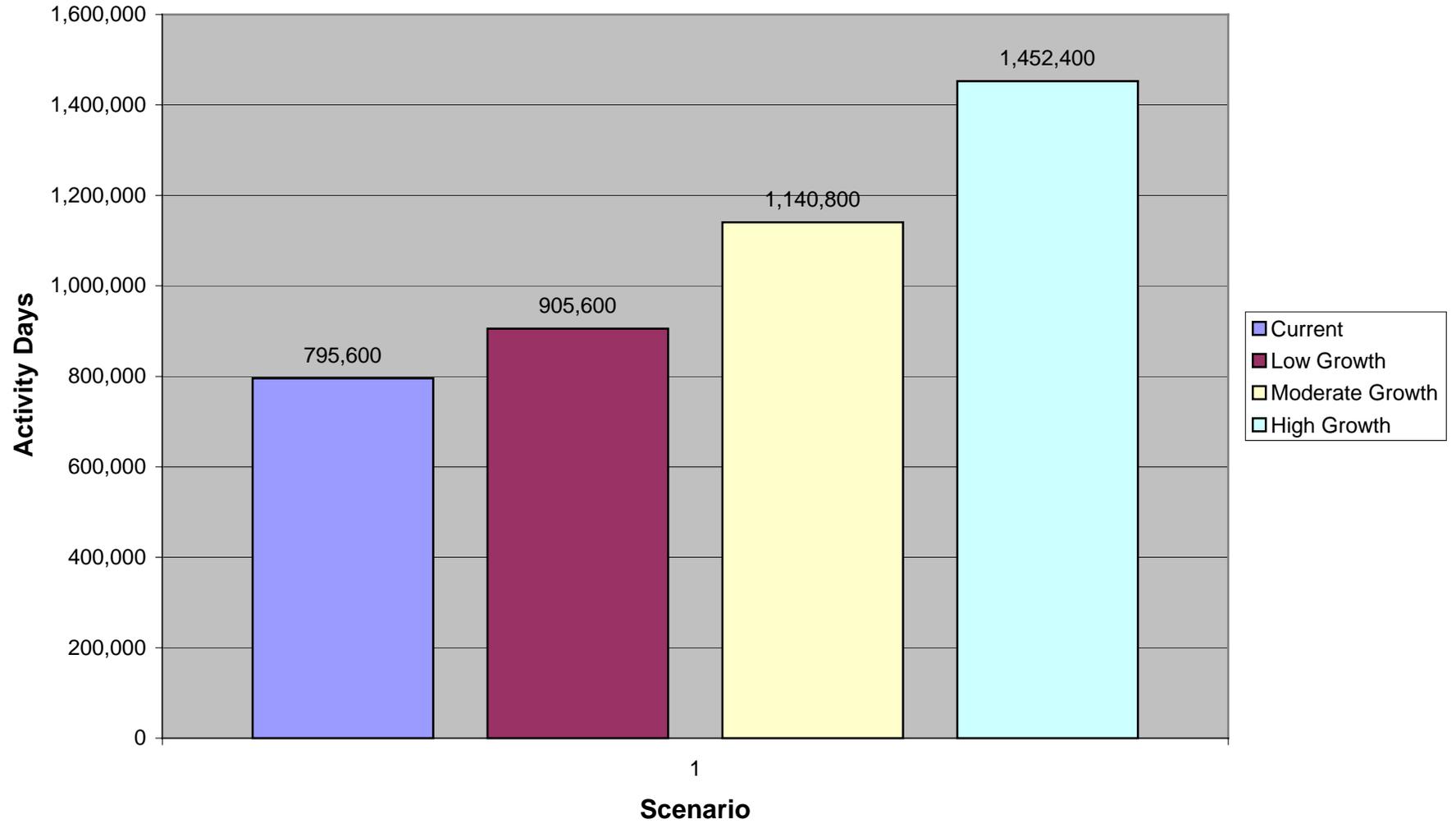
| Activity               | Activity Days |            |                 |             |
|------------------------|---------------|------------|-----------------|-------------|
|                        | Current       | Low growth | Moderate growth | High growth |
| Stillwater fishing     | 485,000       | 547,000    | 685,300         | 869,800     |
| Stream fishing         | 300,000       | 348,000    | 441,400         | 566,000     |
| Water fowl hunting     | 10,600        | 11,500     | 14,100          | 17,600      |
| Boating, rafting, etc. | n/a           | +14%       | +44%            | +85%        |

Source: See text.

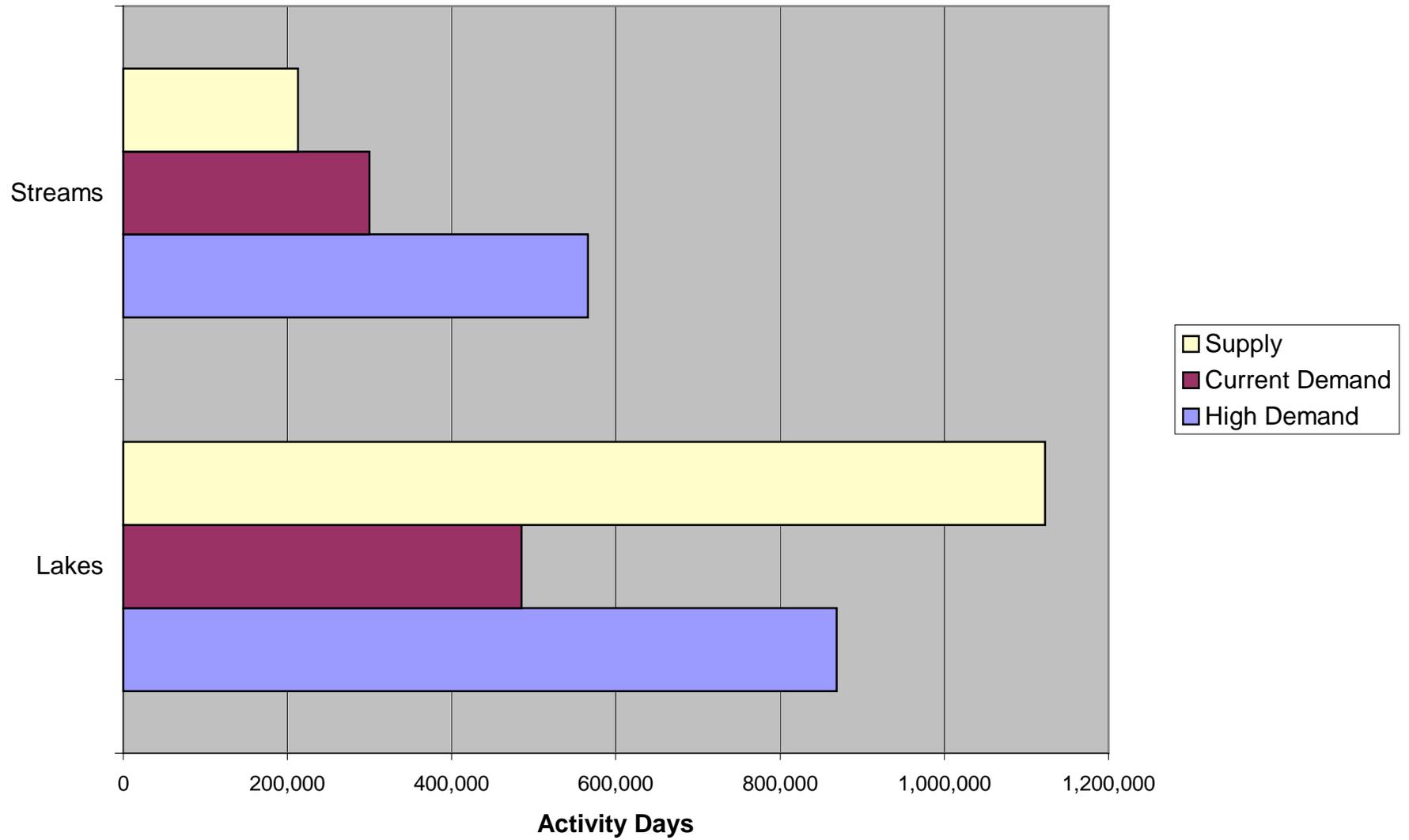
**Figure 1: Resident Participatation in Water-based Recreational Activities - Green River Basin (1989)**



**Figure 2: Current and Projected Recreational Activity Days - Green River Basin (2000-2030)**



**Figure 3: Supply and Demand of Green River Basin Fishing**



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