

7.11 RECREATION

Recreation is an important beneficial use of the Missouri River. These beneficial uses include both economic opportunities and improved quality of life for people living near or visiting the river. Each of the six lakes has recreation development and the river reaches between the lakes on the Lower River are used for recreation. Two important recreational activities related to the river include boating and fishing, both of which can be affected by water elevations. Under drought conditions, the river and lakes can become less accessible because boat ramps are not long enough to reach water. In addition to losing revenue caused by missed recreational opportunities, ramp owners may incur extra costs because of efforts to mitigate low water levels by extending ramps or building temporary access roads and ramps. Changes in water elevation (particularly during droughts) can also affect fishing success. Reductions in fishing and boating opportunities can reduce the number of people that visit the river and can also reduce the length of a visit to the river (Corps, 1994h).

The effects of the alternatives on recreation were evaluated based on the economic benefits, measured in millions of dollars. The economic benefits were estimated using the Daily Routing Model (DRM), a hydrologic model, and the Economic Impacts Model (EIM). The DRM (Corps, 1998b) estimates lake surface elevation and river flow at 23 reaches using the alternative operation strategies and the historic runoff levels between 1898 and 1997. The EIM (Corps, 1994r) uses the output from the DRM and economic value functions (Corps, 1994h) to estimate the economic benefit. The economic value functions for recreation benefits are computed by identifying changes in potential visitation, multiplying this visitation times composite values per visitation (one or more activities are usually associated with a visit), and subtracting any capital costs that may be incurred for facilities in each reach. Visitation computations are based on visitation surveys completed in the early 1990s (to determine changes in visitation based on lake-level and river-flow changes) and measured visitation in 1993. Capital costs are those that are incurred when facilities reach the end of their useful life and require replacement. Also included with the capital costs are the costs for boat ramp repairs and extensions required when lake levels drop. Finally, the

resulting benefits were inflated by 12 percent to account for changes in visitation and costs since the early 1990s when the methodology was developed.

Recreation benefits presented in this section of Chapter 7 are National Economic Development (NED) benefits that reflect users' willingness to pay and include only entry and use fees. Consequently, the resulting values are somewhat less than if the values were Regional Economic Development benefits, which include the NED benefits plus other expenditures that are associated with recreation activities such as boat and equipment purchases, motel expenses, restaurant costs, etc. It is important to recognize that the estimated economic benefits are used for comparative purposes only and may not represent actual economic returns under the different alternatives. The models were designed expressly for comparing the effects of changing from the CWCP and not to forecast the future.

Figure 7.11-1 and Table 7.11-1 present the average annual recreation benefits under the alternatives during the 100-year analysis period. These benefits are also broken down for each of the reaches analyzed in Table 7.11-1. Total average annual recreation benefits for the alternatives range from \$84.69 million (under the CWCP) to \$88.68 million (under the GP2028 option), a difference of 4.7 percent.

The CWCP has a flat release of 34.5 kcfs from Gavins Point during spring and summer of most years; but during major droughts, this release is reduced to 28.5 kcfs. This operational pattern results in average annual recreation benefits of approximately \$84.69 million, with 71.3 percent occurring in the mainstem lakes, 23.3 percent occurring along the Lower River reach, and 5.4 percent occurring along the Upper River reaches. This distribution of benefits along the river would not change substantially under any of the alternatives. All of the alternatives would result in greater total average annual benefits than the CWCP. Looking at individual lakes and river reaches, average annual recreation benefits from the alternatives range between about 5.1 percent below and 14.1 percent above the average annual benefits calculated for the CWCP. Under the alternatives, all of the lakes have either no change or an increase in recreation benefits relative to the CWCP. Benefits from the river reaches, except the Fort Peck reach, generally decline relative to the CWCP.

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Table 7.11-1. Average annual recreation benefits (\$millions).

Lake/River Reach	CWCP	MCP	GP1528	GP2021	GP1521	GP2028
Mainstem Lakes						
Fort Peck Lake	2.92	3.17	3.22	3.11	3.11	3.21
Lake Sakakawea	13.81	15.70	15.42	15.07	15.08	15.76
Lake Oahe	14.90	15.92	16.90	15.96	15.92	16.78
Lake Sharpe	7.97	7.97	7.97	7.97	7.97	7.97
Lake Francis Case	10.58	10.85	10.88	10.88	10.88	10.88
Lewis and Clark Lake	10.20	10.20	10.20	10.20	10.20	10.20
Lake Subtotal	60.38	63.81	64.59	63.19	63.16	64.80
Upper River						
Fort Peck	0.35	0.35	0.38	0.38	0.38	0.38
Garrison	3.24	3.15	3.17	3.17	3.18	3.17
Fort Randall	0.99	0.99	0.98	0.97	0.97	0.98
Upper River Subtotal	4.58	4.49	4.53	4.52	4.53	4.53
Lower River						
Gavins Point	5.10	5.06	5.01	4.84	4.86	4.99
Sioux City	11.45	11.39	11.21	10.91	10.95	11.18
St. Joseph	0.61	0.61	0.61	0.60	0.60	0.61
Kansas City	0.90	0.90	0.90	0.89	0.89	0.90
Boonville	0.71	0.71	0.71	0.71	0.70	0.71
Hermann	0.96	0.96	0.96	0.96	0.96	0.96
Lower River Subtotal	19.73	19.63	19.40	18.91	18.96	19.35
Total	84.69	87.93	88.52	86.62	86.65	88.68

As depicted in Figure 7.11-1, all of the alternatives result in greater total average annual recreation benefits than the CWCP. The greatest increases occur under the two GP options that feature a 28.5-kcfs flat release from Gavins Point Dam, with GP2028 and GP1528 resulting in increases of \$3.99 million and \$3.83 million over the CWCP, respectively. The smallest increases occur under the GP1521 and GP2021 options, which result in increases of \$1.96 million and \$1.93 million, respectively. The MCP, with an increase of \$3.24 million, falls between these groups. Increased drought conservation measures appear to have the most influence on recreation benefits because all of the alternatives feature these measures and all result in increases over the CWCP. The flat 28.5-kcfs summer release enhances this increase, but the variable (25/21-kcfs) summer release diminishes the increased benefits resulting from conservation measures.

To allow comparison of the effects of the alternatives addressed in this chapter to those of the submitted alternatives, Figure 7.11-1 includes the values for the alternatives addressed in Chapter 5. Of all the alternatives under consideration, the greatest benefits occur under the GP2028 option, closely followed by the GP1528 option.

The MCP, which features drought conservation measures similar to those of the MRBA and MODC alternatives, results in a similar level of recreation benefits. The BIOP alternative includes variable summer releases and a moderate spring rise, thus its recreation benefits are essentially the same as those provided by the GP options with the variable summer flow pattern (GP1521 and GP2021).

Under normal hydrologic conditions, the MCP operates the system similar to the CWCP, except that it includes unbalanced intrasystem regulation and a spring rise from Fort Peck Dam. Under drought conditions, however, navigation service levels under the MCP could be reduced to an 8-foot draft but could be as low as a 7.5-foot draft, and the navigation season could be reduced to 6 months depending upon the severity of the drought. Under the MCP, average annual benefits from recreation will be approximately \$87.93 million, or \$3.24 million higher than the CWCP. These benefit increases occur entirely in the mainstem lakes because of the availability of greater amounts of water for recreation. The MCP results in no benefit increases from any of the Upper or Lower River reaches; in most reaches no change occurs, and three reaches have decreases ranging from 0.5 percent (Sioux City reach) to 2.8 percent (Garrison reach) below the CWCP.

The GP options differ from the MCP by including spring rises and lower summer releases at Gavins Point Dam. A potential starting point for this set of options (because it has the smallest changes at Gavins Point Dam of the four GP options), identified as the GP1528 option, includes a 15-kcfs spring rise and a 28.5-kcfs flat release during summer. Under this option, average annual recreation benefits are about \$88.52 million, a 0.7 percent increase in total average annual recreation benefit, compared to the MCP. Increases from the mainstem lakes and the Upper River reaches compensate for decreases from two out of six Lower River reaches. Relative to the MCP, the greatest increase under the GP1528 option (\$0.98 million) comes from Lake Oahe, and the greatest decrease (\$0.28 million) comes from Lake Sakakawea. Among the river reaches, the greatest increase (\$0.03 million) comes from the Fort Peck reach in the Upper River, and the greatest decrease (\$0.18 million) comes from the Sioux City reach in the Lower River.

To provide a perspective for how recreation benefits could change in the future if changes are made to the GP1528 option, the following paragraphs describe differences in recreation benefits relative to the GP1528 option.

The greatest total average annual recreation benefits occur under the GP option with the higher spring rise and the higher summer low flow, the GP2028 option. Benefits under this option are 0.2 percent higher than under the GP1528 option, and 4.7 percent higher than under the CWCP. Benefits under the other two GP options are 2.1 percent lower than those under GP1528. The magnitude of summer releases appears to have the greatest influence on the relative effects of the four GP options. The total recreation benefits of the GP options with the 28.5-kcfs summer flow is about 2 percent higher than those of their counterparts with a split-season (25/21-kcfs) low flow. The effects of the spring rise from Gavins Point Dam are less consistent. The GP2028 option results in greater benefits than the GP1528 option, whereas the GP1521 option results in greater benefits than the GP2021 option.

The GP2021 option includes a 20-kcfs rise during the spring, and a provision for variable summer low flows (the 25/21 summer flow option). During the periods June 21 to July 15 and August 15 to August 31, Gavins Point releases are set to 25 kcfs. From July 15 to August 15, releases drop to 21 kcfs. According to the EIM, the average annual

recreation benefits under the GP2021 option are approximately \$86.62 million, \$1.90 million (2.1 percent) lower than the GP1528 option. Of all the alternatives addressed in this chapter, the GP2021 option results in the lowest level of recreation benefits from the Lower River reaches and the lowest level of total recreation benefits.

The GP1521 option includes a 15-kcfs rise during the spring and the 25/21-kcfs summer flow measure. Under this option, the average annual recreation benefits are \$86.65 million, \$1.87 million (2.1 percent) lower than the GP1528 option. Of the four GP options, GP1521 results in the lowest level of recreation benefits from the mainstem lakes, but slightly higher benefits than GP2021 from the Lower River reaches.

The GP2028 option includes a 20-kcfs rise during the spring and a flat 28.5-kcfs release during the summer, similar to GP1528. Under this option, the average annual recreation benefits are \$88.68 million, \$0.16 million (0.2 percent) higher than the GP1528 option. This is the highest level of total average annual recreation benefits of any of the alternatives addressed in this chapter. Of the four GP options, GP2028 results in the highest level of recreation benefits from the mainstem lakes, and the second-highest level of benefits from the Upper and Lower River reaches.

The major differences among the alternatives for recreation benefits occur during periods of drought. Figures 7.11-2 to 7.11-4 show a graphical depiction of annual recreation benefits over the 100-year analysis period. Higher drought conservation measures under the MCP and the GP options result in higher recreation benefits relative to the CWCP during the three major droughts. The greatest increase in recreation benefits comes from increased carryover storage in the upper three lakes, which improves accessibility for boating and fishing. The greatest difference is noted during the 1930 to 1941 drought and subsequent recovery period from the lake level declines. The sharpest decline and slowest recovery during this period occurs under the CWCP (Figure 7.11-2). The smallest decline and fastest recovery occurs under the GP2028 option (Figure 7.11-4).

7.11.2 Recreation for Tribal Reservations

Tables 7.11-2 and 7.11-3 allow comparison of how the different alternatives influence average annual recreation benefits for the affected Reservations

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during the 100-year period of analysis. Different data are available depending on the location of the Reservations. Effects to Reservations along river reaches are presented as an index of average annual recreation benefits, relative to the CWCP (Table 7.11-2). Effects to Reservations on the lakes are presented as average annual recreation benefits, measured in millions of dollars (Table 7.11-3). Changes in recreation benefits are discussed for each Reservation, starting with Fort Peck Reservation in Montana and proceeding downstream.

Fort Peck Reservation, downstream of Fort Peck Dam, currently has one boat ramp. No recreation areas identified along the Missouri River serve the Reservation. With future economic development in mind, the data in Table 7.11-2 indicate that, for the 100-year period analysis, the GP2021 option provides the maximum average annual recreation benefits to Fort Peck Reservation (9.0 percent). The other GP options provide increases of 8.0 percent, and the MCP results in no change from the CWCP.

Fort Berthold Reservation, located on Lake Sakakawea, has 15 recreation areas identified on Reservation land. These areas include two cabin developments, the McKenzie Marine Club and the New Town Marine Club. The CWCP provides

\$2.91 million in average annual recreation benefits. The data in Table 7.11-3 indicate that the GP2028 option provides the highest recreation benefits to the Fort Berthold Reservation at \$3.33 million, a 14.4 percent increase over the CWCP. The MCP provides a 13.7 percent increase over the CWCP, and the GP1528 option provides an increase of 11.7 percent. The remaining two GP options (GP2021 and GP1521) both provide increases of 9.3 percent.

Four recreation sites have been identified on Standing Rock Reservation lands along Lake Oahe. The GP1528 and GP2028 options provide the largest increase in recreation benefits over the CWCP, which has a \$0.42 million annual benefit (Table 7.11-3). The GP1528 and GP2028 options both provide a \$0.05 million (11.9 percent) increase over the CWCP. The GP2021 and GP1521 options and the MCP all have a smaller increase of \$0.03 million (7.1 percent) in average annual recreation benefits compared to the CWCP.

One recreation site has been identified on Cheyenne River Reservation. The average annual recreation benefits under any of the alternatives for Cheyenne River Reservation are less than \$5,000. Recreation benefits less than \$0.01 million are not shown in Table 7.11-3 due to rounding off to the nearest \$10,000.

Table 7.11-2. Index of average annual recreation benefits to Reservations adjacent to Upper and Lower River reaches.

Reservation	CWCP	MCP	GP1528	GP2021	GP1521	GP2028
Fort Peck	1.00	1.00	1.08	1.09	1.08	1.08
Yankton/Ponca Tribal Lands	1.00	0.99	0.99	0.98	0.98	0.98
Winnebago	1.00	0.99	0.98	0.95	0.96	0.98
Omaha	1.00	0.99	0.98	0.95	0.96	0.98
Iowa and Sac and Fox	1.00	1.00	0.99	0.98	0.98	0.99

Table 7.11-3. Average annual recreation benefits for Reservations adjacent to lakes (\$millions).

Reservation	CWCP	MCP	GP1528	GP2021	GP1521	GP2028
Fort Berthold	2.91	3.31	3.25	3.18	3.18	3.33
Standing Rock	0.42	0.45	0.47	0.45	0.45	0.47
Cheyenne River	0.00	0.00	0.00	0.00	0.00	0.00
Lower Brule	2.94	2.94	2.94	2.94	2.94	2.94
Crow Creek	1.41	1.41	1.41	1.41	1.41	1.41
Yankton	1.38	1.40	1.41	1.41	1.41	1.41
Santee	0.17	0.17	0.17	0.17	0.17	0.17
Total	9.23	9.68	9.65	9.56	9.56	9.73

Lower Brule and Crow Creek Reservations, located on Lake Sharpe, have no change in average annual recreation benefits under any alternative (Table 7.11-3). For the 100-year period of analysis, there are roughly \$2.94 million in benefits for Lower Brule Reservation and \$1.41 million in average annual recreation benefits for Crow Creek Reservation. Lower Brule Reservation has 10 existing recreation facilities identified on Reservation land, with one identified future site. There are seven existing recreation facilities located on Crow Creek Reservation.

Yankton Reservation has five recreation areas located on Lake Francis Case. The CWCP provides \$1.38 million in average annual recreation benefits for Yankton Reservation (Table 7.11-3). The four GP options all provide increases of \$0.03 million (2.2 percent) in average annual recreation benefits compared to the CWCP. The MCP increases average annual recreation benefits by about \$0.02 million (1.4 percent) compared to the CWCP.

The data for the Fort Randall reach, which includes the majority of Yankton Reservation banks, indicate that all of the alternatives produce decreases in average annual recreation benefits compared to the CWCP (Table 7.11-3). The smallest decreases (1.0 percent) occur under the MCP and the GP1528 option. The other three GP options have a larger decrease of 2.0 percent.

Ponca Tribal Lands are located near the headwaters of Lewis and Clark Lake, and the Tribe currently has no recreation facilities on the lake or along the upstream river reach. If the Tribe were to develop

facilities along the river, it could expect to have effects similar to that described above for Yankton Reservation banks along the Fort Randall reach. The Ponca Tribal Lands, therefore, are included in Table 7.11-2 with Yankton Reservation.

Santee Reservation, located on the headwaters of Lewis and Clark Lake, has two identified recreation areas. No change in average annual recreation benefits occur under any alternative (Table 7.11-3). For the 100-year period of analysis, all alternatives result in roughly \$0.17 million in average annual recreation benefits for Santee Reservation.

Potential recreation development and use along Winnebago Reservation and Omaha Reservation are included in Table 7.11-2. The CWCP offers the greatest benefits for recreation development. On both Reservations, the GP2021 option has the largest decrease in average annual recreation benefits with a 5.0 percent decrease compared to the CWCP. The MCP, with a 1.0 percent decrease in recreation benefits compared to the CWCP, has the smallest decrease. The GP1528 and GP2028 options both result in decreases of 2.0 percent, and the GP1521 option has a decrease of 4.0 percent.

Along the St. Joseph reach, recreation development on either Iowa and Sac and Fox Reservations will be affected by the water control plans. The recreation benefits index in Table 7.11-2 indicates no change from the CWCP under the MCP. A decrease of 1.0 percent in average annual recreation benefits occurs under the GP1528 and GP2028 options, and a decrease of 2.0 percent occurs under the GP2021 and GP1521 options.

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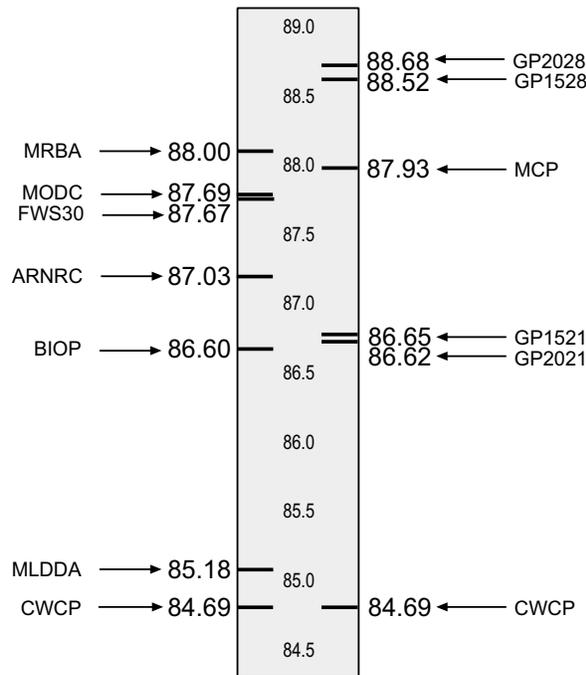


Figure 7.11-1. Average annual recreation benefits for submitted alternatives and the alternatives (\$millions).

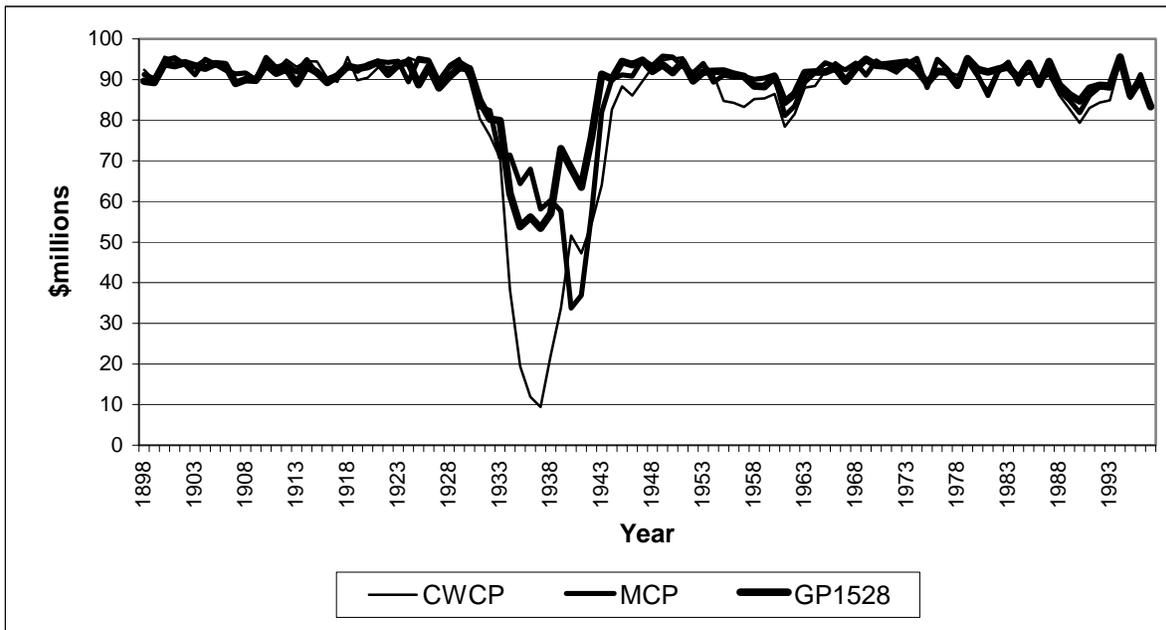


Figure 7.11-2. Average annual values for recreation benefits for CWCP, MCP, and GP1528.

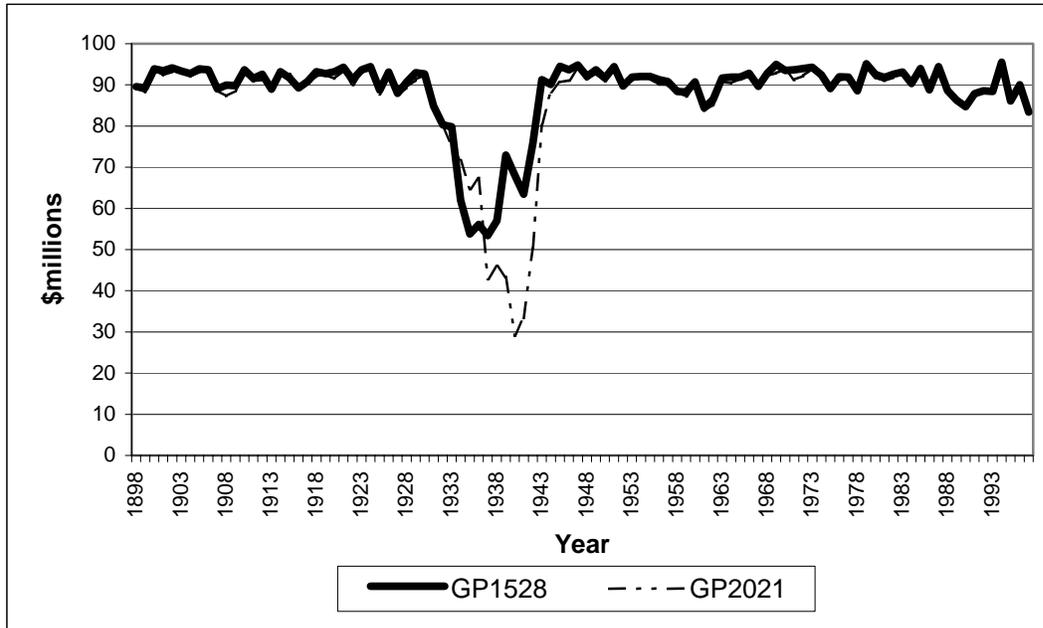


Figure 7.11-3. Average annual values for recreation benefits for GP1528 and GP2021.

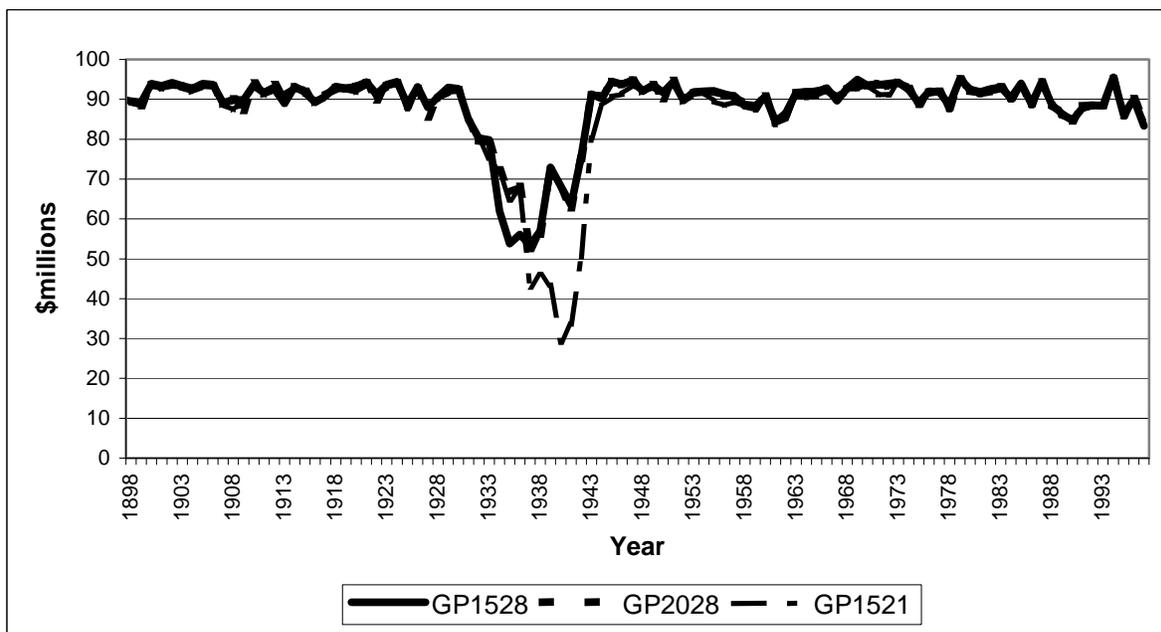


Figure 7.11-4. Average annual values for recreation benefits for GP1528, GP2028, and GP1521.

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