

7.5 WETLAND AND RIPARIAN HABITAT

This section focuses on the differences in the impacts of the CWCP, the MCP, and the four GP options on wetland and riparian habitat along the Mainstem Reservoir System and in seven Tribal Reservations areas. Analysis of the changes in these two habitat types is based on the inventory of habitat at 42 representative sites along the Mainstem Reservoir System and the Lower River. Vegetation changes in these sites respond to water surface elevations adjacent to and in the 42 sites.

Because the total acreage is constant and is composed of wetland vegetation types, riparian vegetation types, and water, an increase in wetland vegetation generally results in a decrease in riparian vegetation. A complete inventory of wetland and riparian habitat found along the Missouri River is contained in a technical report, Environmental Studies—Wetland and Riparian Habitat (Corps, 1994a; Corps, 1994p).

7.5.1 Wetland Habitat

Table 7.5-1 presents the total and reach breakdown of the average annual wetland habitat for the CWCP, the MCP, and the four GP options during the full 100-year period of analysis at the 42 sites analyzed. The total data are also presented in graphic form in Figure 7.5-1. The CWCP provides 156,100 acres of habitat on an average annual basis. This total acreage at the sites analyzed is distributed among the lake deltas (22.5 percent), Upper River sites (28.3 percent), and Lower River sites (49.2 percent). The MCP and the four GP options shown in Table 7.5-1 provide between 0.8 and 1.5 percent more total annual wetland habitat than the CWCP. Compared to the CWCP, the MCP and the four GP options would decrease wetland habitat in the lake

deltas and increase wetland habitat in the Upper and Lower Rivers.

Figure 7.5-1 graphically shows that there are three separate groupings of total average annual wetland habitat values. The CWCP has the lowest total wetland habitat value at 156,100 acres. The MCP and the GP1528 option, the potential starting point option, are closely grouped together between 157,400 and 157,500 acres, and the three remaining GP options are more closely aligned between 158,400 and 158,500 acres. Both of these groupings differ by only 100 acres. The CWCP has 1,300 acres less wetland habitat than the bottom end of the range for the MCP and the four GP options, providing the least amount of total annual wetland habitat. The CWCP provides the least amount of wetland habitat within the Upper and Lower Rivers, but the most wetland habitat within the lake deltas. Figure 7.5-1 also shows the values for the submitted alternatives discussed in Chapter 5 to provide perspective as to how the GP options perform relative to the submitted alternatives. The GP1528 option provides total wetland habitat amounts that are closest to both the MODC and FWS30 alternatives. These two submitted alternatives are similar to the GP options in that intrasystem regulation among the upper three lakes is unbalanced, all have a Fort Peck spring rise, and conservation in the upper three lakes is increased to the same level. The FWS30 alternative has a 30-kcfs spring rise and a split navigation season while the MODC alternative has neither of these features but extends the full service navigation flat release (34.5 kcfs) to mid-September.

Both the CWCP and the MCP have no additional spring rise, and the summer release at Gavins Point Dam is flat (34.5 kcfs). The primary differences between these two alternatives are that the intrasystem regulation among the upper three lakes is unbalanced and drought conservation is greater

Table 7.5-1. Average annual wetland habitat (thousands of acres).^{1/}

Alternative	1898 to 1997			
	Total	Lake Deltas	Upper River	Lower River
CWCP	156.1	35.1	44.2	76.8
MCP	157.4	33.1	47.2	77.1
GP1528	157.5	30.5	47.5	79.6
GP2021	158.4	32.6	47.5	78.3
GP1521	158.5	32.4	46.7	79.3
GP2028	158.4	30.8	47.8	79.9

1/ Based on 42 representative sites.

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for the MCP. These two differences result in a 0.8 percent increase in total wetland vegetation acres along the Mainstem Reservoir System and Lower River. Compared to the CWCP, there is a 5.7 percent reduction in wetland habitat in the lake deltas and a 6.8 percent increase in wetland habitat along the Upper River. Only a 0.4 percent increase in wetland habitat would occur along the Lower River.

The GP1528 option has a 15-kcfs spring rise unless downstream flood control constraints are exceeded. The summer release under this option is flat (28.5 kcfs) from Gavins Point Dam and represents a 6-kcfs decrease in summer release when compared to the MCP. The total increase in wetland habitat under the GP1528 option is 0.1 percent over the MCP. The greatest change in wetland habitat occurs under the GP1528 option in the lake deltas, where wetland habitat would decline by 7.9 percent. Compared to the remaining three GP options, this represents the greatest decrease in wetland habitat within this reach. The GP1528 option increases wetland habitat over the MCP by 0.6 and 3.2 percent along the Upper and Lower Rivers, respectively.

The GP2021, GP1521, and GP2028 options described below provide perspective for how habitat could change in the future if changes are made from a potential starting point for the GP options (the GP1528 option). The GP2021 option has a 20-kcfs spring rise that occurs once every 3 years on average and a summer release that is split between 25 and 21 kcfs from Gavins Point Dam. This change from the GP1528 option results in a 0.6 percent increase in total annual wetland habitat. The GP2021 option increases wetland habitat over the GP1528 option within the lake deltas by 6.9 percent but decreases this wetland habitat by 1.6 percent in the Lower River. Compared to the GP1528 option, there is no change in the amount of wetland habitat within the Upper River under the GP2021 option.

The GP1521 option has a 15-kcfs spring rise and a split 25/21-kcfs low summer flow from Gavins Point Dam. Since this option has a greater water savings measure during the summer, subsequent fall and April releases may be higher than the GP1528 option in wetter years. Under the GP1521 option, total annual wetland habitat increases by 0.6 percent. The GP1521 option increases wetland habitat within the lake deltas by 6.2 percent, while the Upper and Lower Rivers experiences 1.7 and

0.4 percent decreases in wetland habitat, respectively.

The GP2028 option has a 20-kcfs spring rise and a flat summer release of 28.5 kcfs that represents the minimum summer low flow for continued navigation service. Compared to the GP1528 option, this option increases the total annual wetland habitat by 0.6 percent. The greatest amount of variation from GP1528 under the GP2028 option occurs within the lake deltas, where wetland habitat increases by 1.0 percent. Wetland habitat increases occur in the Upper River (0.6 percent) and Lower River (0.4 percent) as well.

The annual values of total wetland vegetation acres for the CWCP, the MCP, and the four GP options are shown on Figures 7.5-2 through 7.5-4. All of the alternatives discussed in this chapter tend to respond to changes made during the 100-year period of analysis in a similar fashion. The average acreage of wetland habitat for the 42 sites throughout this period ranges between 150,000 and about 175,000 acres. During the early 1940s, there is a 2- to 3-year period when wetland habitat acreage is at its lowest (about 100,000 acres). Of the alternatives analyzed, the MCP and the GP2021 and GP1521 options show slightly higher wetland acres during this period. There is no set pattern in the rest of the 100-year period.

A change from the CWCP to the MCP improved wetland habitat in the 1909 to 1956 period. Changing from the MCP to the GP1528 option resulted in losses over much of that period, but provides larger wetland habitat acreages in primarily the 1964 to 1987 period. A switch to the other three GP options generally improves wetland habitat over the GP1528 option from about 1940 through the early 1990s. To conclusively identify the cause of the changes is not possible. Increased conservation and unbalancing the storage among the three upper lakes are primary causes, but the amount of the spring rise and the summer low flow are also factors.

Wetland Habitat For 10 Tribal Reservations

Table 7.5-2 presents the average annual wetland habitat under the alternatives for 10 Tribal Reservations during the full period from 1898 to 1997. The Reservations analyzed include those along the lake deltas (Standing Rock, Cheyenne River, and Santee Reservations and Ponca Tribal

Table 7.5-2. Average annual wetland habitat (thousands of acres) for 10 Tribal Reservations.^{1/}

Reservation	1898 to 1997					
	CWCP	MCP	GP1528	GP2021	GP1521	GP2028
Fort Peck	4.75	4.91	4.08	4.09	4.38	4.44
Standing Rock	1.43	1.29	0.55	1.46	0.86	0.58
Cheyenne River	0.74	0.60	0.67	0.64	0.79	0.69
Yankton	4.14	4.19	4.36	4.35	4.28	4.38
Ponca and Santee	8.62	8.54	8.60	8.09	8.14	8.58
Winnebago and Omaha	4.31	4.43	4.23	4.18	4.31	4.23
Iowa and Sac and Fox	3.92	3.98	4.19	4.08	4.17	4.20
Total	27.91	27.94	26.68	26.89	26.93	27.10

^{1/} Based on appropriate representative sites.

Lands), the Upper River (Fort Peck and Yankton Reservations), and the Lower River (Winnebago, Omaha, Iowa, and Sac and Fox Reservations).

Total wetland habitat associated with the analyzed sites adjacent to these Reservations equals 27,910 acres. The MCP is the only alternative that increases this wetland habitat (0.1 percent) over the CWCP. The four GP options decrease total wetland habitat: the GP1528 option by 4.4 percent, the GP2021 option by 3.7 percent, the GP1521 option by 3.5 percent, and the GP2028 option by 2.9 percent. The GP1528 option has an added 15-kcfs spring rise and reduces total wetland habitat associated with the Reservations the most. The GP2028 option, with its added 20-kcfs spring rise, reduces total wetland habitat the least. Both of these options have a minimum summer service level that is 6 kcfs less than the CWCP. These net changes from the CWCP result from a combination of positive and negative changes for individual Reservations.

The MCP is the only alternative that results in an increase in wetland habitat over the CWCP within Fort Peck Reservation (3.4 percent). The GP2028 and GP1521 options both reduce wetland habitat within Fort Peck Reservation by 6.5 and 7.8 percent, respectively. The third largest reduction in wetland habitat occurs under the GP2021 option (13.9 percent), and the GP1528 option shows the largest total percent reduction in wetland habitat of the four GP options (14.1 percent).

Within Standing Rock Reservation, the GP2021 option increases wetland habitat by 2.1 percent over the CWCP. All of the remaining alternatives discussed in this chapter decrease wetland habitat within this Reservation. The MCP reduces wetland habitat by 9.8 percent, while the GP1521 option decreases wetland habitat by 39.9 percent. Compared to the CWCP, the GP2028 and GP1528 options show the greatest reduction in wetland

habitat within Standing Rock Reservation (59.4 and 61.5 percent, respectively).

Within Cheyenne River Reservation, the MCP and three of the GP options decrease wetland habitat from the CWCP, while the GP1521 option provides a 6.8 percent increase in wetland habitat. The GP2028 and GP1528 options reduce wetland habitat within Cheyenne River Reservation by the least amount (6.8 and 9.5 percent, respectively). The GP2021 option and the MCP reduce wetland habitat by the greatest amount (13.5 and 18.9 percent, respectively).

The MCP and the four GP options provide an increase in wetland habitat over the CWCP within the Yankton Reservation. The GP2028, GP1528, and GP2021 options provide the greatest increases at 5.8, 5.3, and 5.1 percent, respectively. Lesser increases occur under both the GP1521 option (3.4 percent) and the MCP (1.2 percent).

Compared to the CWCP, the MCP and the four GP options decrease wetland habitat within Ponca Tribal Lands and Santee Reservation. The least amount of wetland habitat reduction occurs under the GP1528 option (0.2 percent), followed by the GP2028 option (0.5 percent) and the MCP (0.9 percent). The greatest reductions in wetland habitat occur under the GP1521 option (5.6 percent) and the GP2021 option (6.1 percent).

Under the GP1521 option, there is no change in wetland habitat from the CWCP within Winnebago and Omaha Reservations. The MCP increases wetland habitat by 2.8 percent, while the remaining three GP options decrease wetland habitat. The least amount of wetland habitat reduction occurs under the GP1528 and GP2028 options; both of these options decrease wetland habitat by 1.9 percent. The greatest reduction in wetland habitat occurs under the GP2021 option (3.0 percent).

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Compared to the CWCP, the MCP and the four GP options increase wetland habitat adjacent to the Iowa Reservation and the Sac and Fox Reservation. The GP2028 option increases wetland habitat the most (7.1 percent), while the GP1528 and GP1521 options provide lesser increases (6.9 and 6.4 percent, respectively). Of the four GP options, wetland habitat increases least under the GP2021 option (4.1 percent); however, the MCP provides the smallest percent increase in wetland habitat over the CWCP (1.5 percent).

7.5.2 Riparian Habitat

As discussed earlier, riparian habitat should vary indirectly with the values presented for the wetland habitat. The methodology for the analysis of riparian and wetland habitat changes is based on field surveys of existing wetland sites. All of the sites have vegetation types that could be classified as either wetland or riparian, and the methodology identified changes in the vegetation types with changes in water levels at the wetland sites. As water levels decline, wetland vegetation types are likely to be replaced with riparian vegetation types, and vice versa. The methodology does not identify expansion or contraction of the size of each site except for the conversion of vegetation to open water at extremely high water levels. This leads to the general conclusion that if there is an increase in wetland habitat there will be a corresponding decrease in riparian habitat.

Table 7.5-3 presents the total and reach breakdown of the average annual riparian habitat in the 42 representative sites for the CWCP, the MCP, and the four GP options during the full period from 1898 to 1997. These data are also presented in graphic form in Figure 7.5-5. The CWCP provides 108,100 acres of riparian habitat on an annual basis. This total acreage at the sites analyzed is distributed among the lake deltas (11.1 percent), Upper River sites (38.8 percent), and Lower River sites (50.1

percent). Compared to the CWCP, the MCP and the GP1528 option decrease total riparian habitat by 2.1 and 4.4 percent, respectively (see Table 7.5-3). Two of the three remaining GP options increase total riparian habitat by between 0.3 and 0.6 percent compared to the GP1528 option, while the third option decreases total riparian habitat by 0.8 percent.

Figure 7.5-5 graphically shows that there are three separate groupings of total average annual riparian habitat values. The CWCP has the highest total riparian habitat value at 108,100 acres. The next grouping includes only the MCP, which provides 2,300 acres (2.1 percent) less riparian habitat than the CWCP. The four GP options constitute the third grouping. Of the GP options, GP1521 reduces riparian habitat by the least amount (4,200 acres, or 3.9 percent less than the CWCP). The GP2028 option, the bottom end of the range of options, shows the greatest reduction in total riparian habitat (5,600 acres, or 5.2 percent less than the CWCP). Also shown in Figure 7.5-5 are the values for the submitted alternatives discussed in Chapter 5. As mentioned above, they are included to provide some perspective as to how the GP options perform relative to the submitted alternatives. The GP1528 option provides total riparian habitat amounts that are closest to the BIOP, FWS30, and ARNRC alternatives, which all have a spring rise followed by lower summer flows than the CWCP.

Both the CWCP and the MCP have no additional spring rise, and the summer service level release at Gavins Point Dam is flat at full service to navigation (modeled at 34.5 kcfs). The CWCP has a balanced intrasystem regulation among the upper three lakes, whereas the MCP is unbalanced, with greater conservation during the drought periods.

Also, the MCP's summer release remains higher throughout much of the drought periods than the CWCP. This results in a decrease in total riparian

Table 7.5-3. Average annual riparian habitat (thousands of acres).^{1/}

Alternative	1898 to 1997			
	Total	Lake Deltas	Upper River	Lower River
CWCP	108.1	12.0	41.9	54.1
MCP	105.8	11.7	40.2	53.8
GP1528	103.3	11.7	39.8	51.8
GP2021	103.6	11.4	39.9	52.3
GP1521	103.9	11.3	40.2	52.4
GP2028	102.5	11.7	39.5	51.3

1/ Based on 42 representative sites.

habitat of 2.1 percent compared to the CWCP. The greatest decrease in riparian habitat occurs in the Upper River (4.1 percent less riparian habitat than the CWCP), while lesser amounts of riparian habitat decreases occur in the lake deltas (2.5 percent less) and Lower River (0.6 percent less).

The GP1528 option, the potential starting point for the GP options, with a 15-kcfs spring rise and flat summer release (28.5 kcfs) from Gavins Point Dam added to the MCP, provides 2.4 percent less total riparian habitat than the MCP. Under the GP1528 option, the greatest reduction in riparian habitat (3.7 percent) occurs in the Lower River. In addition, the GP1528 option decreases riparian habitat by 1.0 percent in the Upper River, although there are no change in riparian habitat from the MCP in the lake deltas.

The following discussion on the GP2021, GP1521, and GP2028 options provides some perspective for how riparian habitat could change relative to the GP1528 option. Most notable is that the remaining three options all show an inverse relationship between riparian and wetland habitats within the lake deltas, Upper River, and Lower River. For example, when riparian habitat is increased under a particular scenario, the corresponding wetland value decreases (see Section 7.5.1).

The changes from the potential starting point option under the GP2021 option include a 20-kcfs spring rise that occurs once every 3 years on average and a split summer release from Gavins Point Dam. This change results in a 0.3 percent increase in total annual riparian habitat within the Mainstem Reservoir System and Lower River. The GP2021 option decreases riparian habitat compared to the GP1528 option within the lake deltas by 2.6 percent, but increases this habitat by 0.3 and 1.0 percent in the Upper and Lower Rivers, respectively. The GP1521 option has a 15-kcfs spring rise, a split summer flow from Gavins Point Dam, and greater water savings measures during the summer. Under the GP1521 option, the total annual riparian habitat increases by 0.6 percent compared to the GP1528 option. The GP1521 option decreases riparian habitat within the lake deltas by 3.4 percent, while the Upper and Lower Rivers experience a 1.0 and 1.2 percent increase in riparian habitat, respectively. These values are higher than those associated with the GP2021 option, which indicates that a lower spring flow combined with a split summer flow provide more area for the establishment of riparian habitat.

The GP2028 option has a 20-kcfs spring rise and a flat summer release, representing the minimum navigation service summer low flow. Compared to the GP1528 option, this option decreases the total annual riparian habitat by 0.8 percent. There is no variation from the GP1528 option within the lake deltas. Riparian habitat declines in the Upper River (0.8 percent) and Lower River (1.0 percent).

The annual values of riparian vegetation acres for the CWCP, the MCP, and the four GP options are shown on Figures 7.5-6 through 7.5-8. Generally, the CWCP, the MCP, and the four GP options show a similar response to changes. The most significant increase in riparian habitat begins about 1940 and lasts for 3 years before there is a general downward trend in habitat. This is opposite from the results discussed for wetland habitat where, during this 3-year period, there is a significant decrease in wetland habitat. The GP1528 option reaches slightly higher amounts of riparian habitat during this 3-year period. Between 1913 and 1922, the GP2021 option shows slightly higher amounts of riparian habitat than the other options, whereas the CWCP tends to show higher riparian acres from about 1934 to 1976.

Riparian Habitat for 10 Tribal Reservations

Table 7.5-4 presents the average annual riparian habitat for those sites analyzed adjacent to the Reservations under the alternatives for 10 Tribal Reservations during the full period from 1898 to 1997. The Reservations analyzed include the lake delta Reservations (Standing Rock, Cheyenne, River, and Santee Reservations and Ponca Tribal Lands), the Upper River Reservations (Fort Peck and Yankton Reservations), and the Lower River Reservations (Winnebago, Omaha, Iowa, and Sac and Fox Reservations).

With the CWCP, total riparian habitat associated with these Reservations equals 20,120 acres. The MCP and the four GP options decrease total riparian habitat from that of the CWCP: the MCP by 0.5 percent, the GP1528 option by 2.0 percent, the GP2021 option by 3.9 percent, the GP1521 option by 2.9 percent, and the GP2028 option by 3.2 percent. The GP2021 option reduces total riparian habitat the most, and the MCP reduces total riparian habitat the least. Generally, Fort Peck Reservation has the most riparian habitat while Cheyenne River Reservation has the least amount of riparian habitat. As a result, the smallest and

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Table 7.5-4. Average annual riparian habitat (thousands of acres) for 10 Tribal Reservations.^{1/}

Reservation	1898 to 1997					
	CWCP	MCP	GP1528	GP2021	GP1521	GP2028
Fort Peck	5.55	5.54	5.54	5.54	5.54	5.54
Standing Rock	1.73	1.77	1.81	1.58	1.49	1.75
Cheyenne River	0.18	0.16	0.12	0.14	0.13	0.13
Yankton	2.18	2.14	2.10	2.09	2.16	2.08
Ponca and Santee	0.66	0.63	0.65	0.69	0.69	0.65
Winnebago and Omaha	4.85	4.83	4.75	4.49	4.70	4.55
Iowa and Sac and Fox	4.97	4.94	4.75	4.81	4.82	4.78
Total	20.12	20.01	19.72	19.34	19.53	19.48

^{1/} Based on appropriate representative sites.

largest percentage differences from the CWCP occur within these respective Reservations.

Within Fort Peck Reservation, the MCP and the four GP options decrease riparian habitat from the CWCP by the same amount (0.2 percent). This is the only Reservation where this type of result would occur.

Compared to the CWCP, the greatest increase in riparian habitat within Standing Rock Reservation occurs under the GP1528 option (4.6 percent). Lesser increases occur under both the MCP (2.3 percent) and the GP2028 option (1.2 percent). The GP2021 option decrease riparian habitat the least (8.7 percent) and the GP1521 option reduce riparian habitat the most within Standing Rock Reservation (13.9 percent).

Within Cheyenne River Reservation, the MCP and the four GP options decrease riparian habitat from the CWCP. The MCP decrease riparian habitat by 11.1 percent. The greatest reduction in riparian habitat occur under the four GP options. The GP2021 option result in a 22.2 percent reduction in riparian habitat. Both the GP1521 and GP2028 options reduce riparian habitat by the same amount (27.8 percent), while the GP1528 option result in the largest decrease in riparian habitat from the CWCP (33.3 percent).

Within Yankton Reservation, the MCP and the four GP options decrease riparian habitat from the amount under the CWCP. The GP1521 option result in the least amount of riparian habitat reduction (0.9 percent), and the MCP reduces

riparian habitat by 1.8 percent. The GP1528, GP2021, and GP2028 options all result in greater riparian habitat reductions from the amount under the CWCP (3.7, 4.1, and 4.6 percent, respectively).

The GP2021 and GP1521 options provide an increase in riparian habitat over the CWCP on Ponca Tribal Lands and Santee Reservation. Both of these options increase habitat over the CWCP by the same amount (4.5 percent). Both the GP1528 and GP2028 options result in a 1.5 percent reduction in riparian habitat from the CWCP, and the MCP reduces riparian habitat the most (4.5 percent).

Within Winnebago Reservation and Omaha Reservation, the MCP and the four GP options decrease riparian habitat. The MCP results in the least amount of riparian habitat reduction (0.4 percent). The GP1528 and GP1521 options reduce riparian habitat by 2.1 and 3.1 percent, respectively. The greatest reductions in riparian habitat occur under the GP2028 option (6.2 percent) and the GP2021 option (7.4 percent).

The MCP and all of the GP options reduce riparian habitat from the CWCP within Iowa and Sac and Fox Reservations. The MCP results in the least amount of riparian habitat reduction (0.6 percent). Three of the four GP options, the GP1521, GP2021, and the GP2028 options, reduce riparian habitat by 3.0, 3.2, and 3.8 percent, respectively, while the potential starting point option, the GP1528 option, reduces riparian habitat the most (4.4 percent).

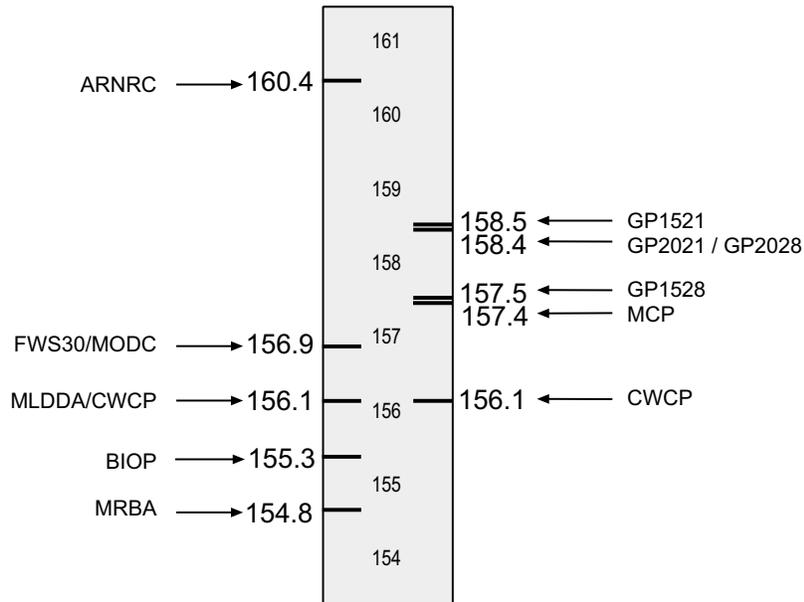


Figure 7.5-1. Average annual wetland habitat (thousands of acres) for the submitted alternatives and the alternatives.

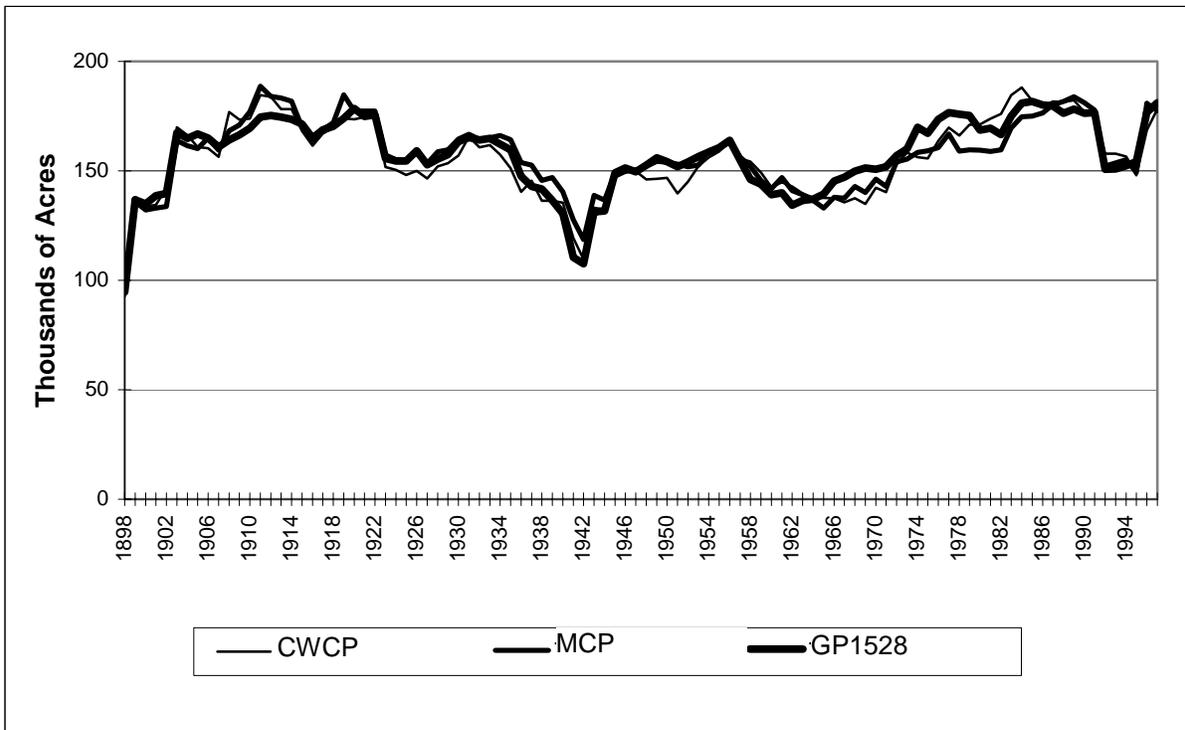


Figure 7.5-2. Average annual wetland vegetation acres for CWCP, MCP, and GP1528.

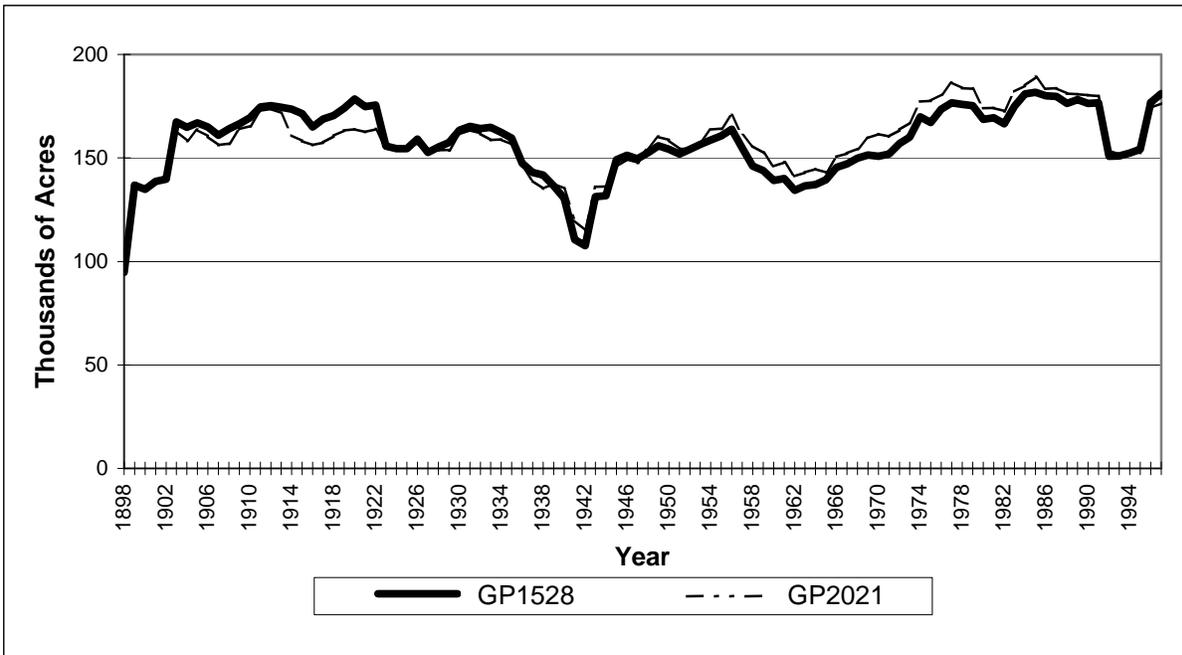


Figure 7.5-3. Average annual wetland vegetation acres for GP1528 and GP2021.

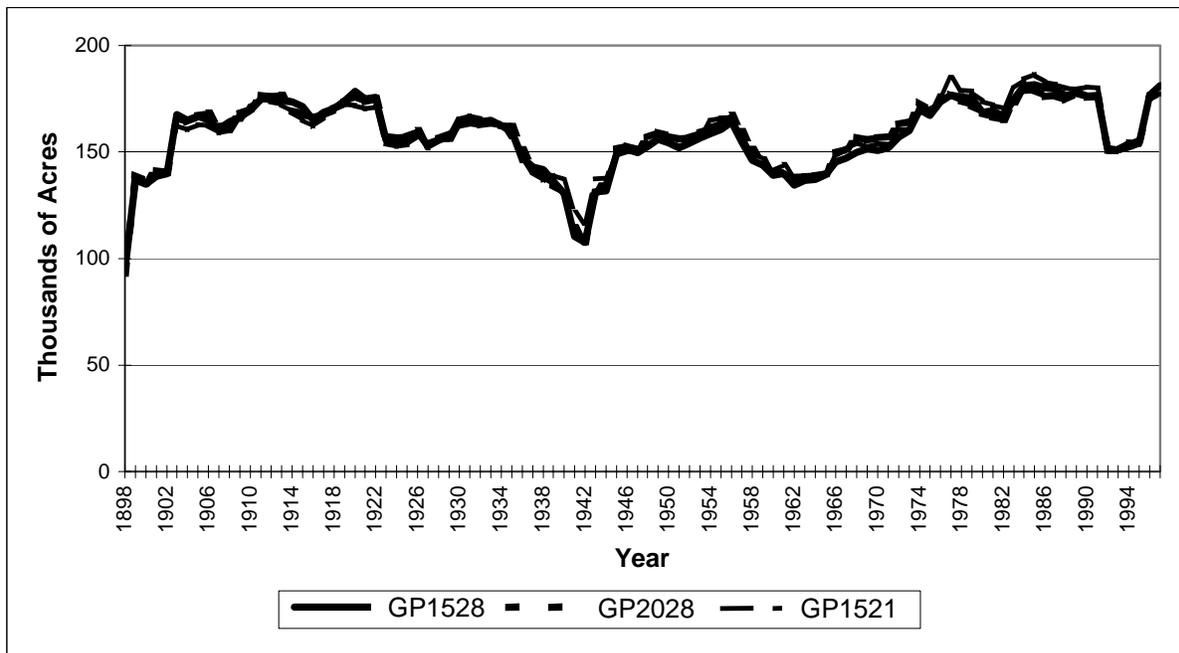


Figure 7.5-4. Average annual wetland vegetation acres for GP1528, GP2028, and GP1521.

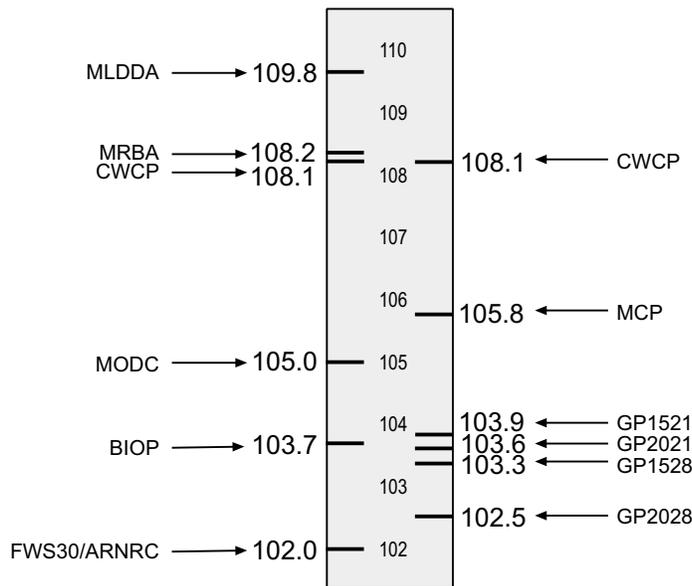


Figure 7.5-5. Average annual riparian habitat (thousands of acres) for the submitted alternatives and the alternatives.

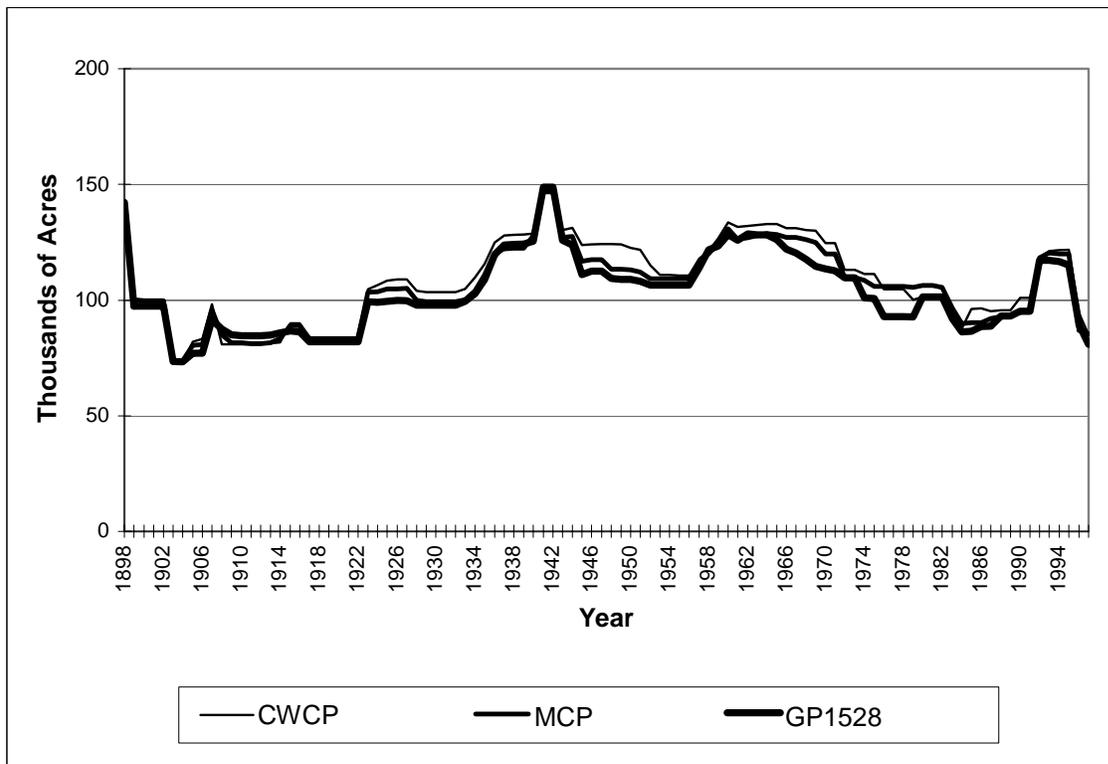


Figure 7.5-6. Average annual riparian vegetation acres for CWCP, MCP, and GP1528.

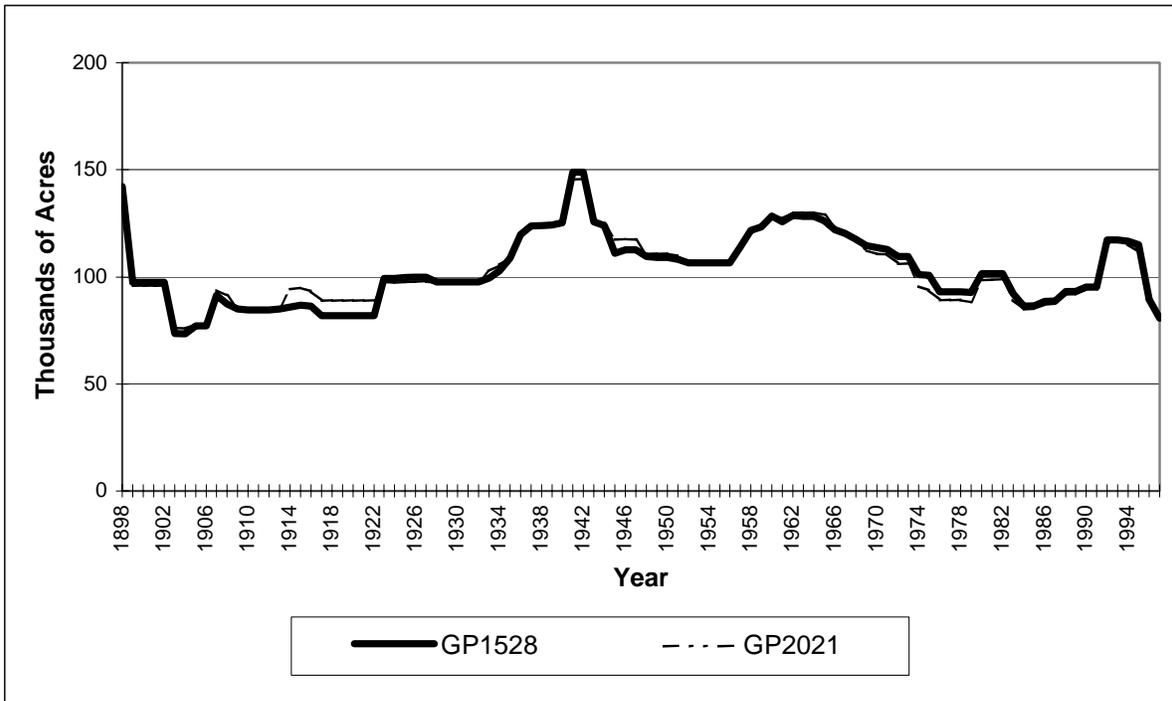


Figure 7.5-7. Average annual riparian vegetation acres for GP1528 and GP2021.

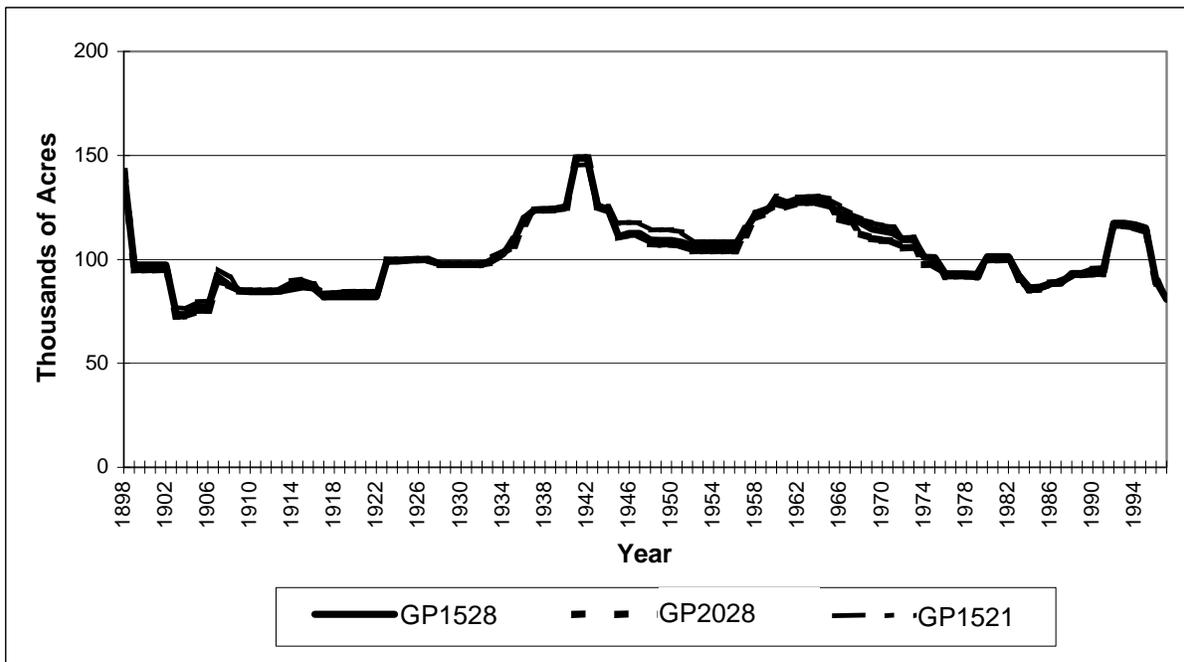


Figure 7.5-8. Average annual riparian vegetation acres for GP1528, GP2028, and GP1521.