

## 5.5 WETLAND AND RIPARIAN HABITAT

This section focuses on the differences in the impacts of the CWCP and the submitted alternatives on wetland and riparian habitat along the Mainstem Reservoir System and 10 Tribal Reservations. Analysis of the changes in wetland and riparian habitats is based on the inventory of habitat at 42 representative sites along the Mainstem Reservoir System and the Lower River. Vegetation changes at 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 Environmental Studies-Wetland and Riparian Habitat (Corps, 1994o; Corps, 1994p).

### 5.5.1 Wetland Habitat

Table 5.5-1 presents the total and reach breakdown of the average annual wetland habitat for the seven alternatives during the full period of analysis from 1898 to 1997 of the 42 sites analyzed. The total data are also presented in graphic form in Figure 5.5-1. 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).

Figure 5.5-1 graphically shows that the CWCP and most of the other alternatives are closely grouped together between 154,800 and 156,900 acres, a difference of only 2,100 acres. The ARNRC alternative stands out at 160,400 acres. This alternative has 3,500 acres more than the top end of the range for the other alternatives.

The CWCP and MLDDA alternatives are similar in that they both have a balanced intrasystem regulation and do not have an additional spring and summer release. The major difference between the two alternatives is that the MLDDA alternative reduces the system's base flood control storage from 57.1 to 55.1 MAF. The 2-MAF decrease in the base of flood control results in a variation of the average values of total wetland vegetation acres within the Mainstem Reservoir System of less than 1.0 percent. There is a slight increase in the lake deltas and Upper River (100 and 200 acres, respectively) and a slight decrease in wetland habitat the Lower River (200 acres).

Unlike the CWCP, the ARNRC alternative has an unbalanced intrasystem regulation and a split navigation season. From Gavins Point Dam, there is a spring release increase of 15 kcfs and a lower summer release of 18 kcfs after the spring release. The total wetland acreage for the ARNRC alternative is the highest of the seven alternatives in this chapter, a 2.8-percent increase over that of the CWCP. Under the ARNRC alternative, wetland vegetation acreage decreases between 6.3 percent in the lake deltas and increases by 6.8 percent in the Upper River. Wetland acreage values in the Lower River also increase (by 4.6 percent) compared to the CWCP.

**Table 5.5-1.** Average annual wetland habitat (thousands of acres)<sup>1/</sup>.

Alternative	1898 to 1997			
	Total	Lake Deltas	Upper River	Lower River
CWCP	156.1	35.1	44.2	76.8
MLDDA	156.1	35.2	44.4	76.6
ARNRC	160.4	32.9	47.2	80.3
MRBA	154.8	32.1	45.6	77.1
MODC	156.9	32.4	46.7	77.8
BIOP	155.3	31.1	45.5	78.6
FWS30	156.9	32.0	45.0	79.9

1/ Based on 42 representative sites.

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The MLDDA, MRBA, and MODC alternatives maintain a flat release from Gavins Point Dam during the summer; however, under the MRBA and MODC alternatives, intrasystem regulation among the upper three lakes is unbalanced and conservation in the upper three lakes is increased. These scenarios result in different impacts on the wetland sites, with the total value going down for the MRBA alternative and up for the MODC alternative. Under the MRBA alternative, the wetland habitat in the lake deltas is reduced (8.5 percent less than the value for the CWCP) and the wetland values in the Upper and Lower Rivers are slightly higher (3.2 and 0.4 percent, respectively). Under the MODC alternative, the lake deltas acreage is reduced less (7.7 percent less than the value for the CWCP) and the Upper and Lower Rivers acreage is increased more (5.7 and 1.3 percent, respectively).

The BIOP and FWS30 alternatives have unbalanced intrasystem regulation and variable spring/summer release criteria, when compared to the CWCP. These alternatives would increase the spring rise by 17.5 and 30 kcfs, respectively and decrease summer flows to a minimum of 21 kcfs. Overall, these two alternatives provide either more or less wetland habitat at the analyzed sites than the CWCP. The BIOP alternative decreases total habitat by 0.5 percent while the FWS30 alternative increases total habitat by the same percentage. The greatest amount of wetland habitat increase (ranging from 1.8 to 4.0 percent) occurs in the Upper River and Lower River, while a considerable decrease (11.4 percent for the BIOP alternative and 8.8 percent for the FWS30 alternative) occurs in the lake deltas.

The annual values of total wetland vegetation acres for the seven alternatives are shown on Figures 5.5-2 through 5.5-4 for the 42 representative sites. Generally, the three alternatives with spring rises (ARNRC, BIOP, and FWS30) have lower values in many years in the early years in the analysis. This was a very wet period in general, and the spring rises may be a factor in reduced total habitat in wet periods.

Conversely, the spring rise alternatives provide the most habitat in many of the years starting in about 1950. This may indicate that the spring rises are beneficial for wetland habitat in dry to normal runoff periods, which was the case in much of the 1950 to 1997 period.

## Wetland Habitat for 10 Tribal Reservations

Table 5.5-2 presents the alternatives' average annual wetland habitat under the submitted alternatives for 10 Tribal Reservations during the full period of analysis from 1898 to 1997. The Reservations analyzed are those within the lake deltas (Standing Rock, Cheyenne River, and Santee Reservations and Ponca Tribal Lands), the Upper River (Fort Peck and Yankton Reservations), and the Lower River (Winnebago, Omaha, Iowa, and Sac and Fox Reservations).

As shown in Table 5.5-2, total wetland habitat associated with the analyzed sites and adjacent to these Reservations equals 27,910 acres for the CWCP. Three of the submitted alternatives increase this wetland habitat: MLDDA by 4.8 percent, ARNRC by 1.1 percent, and MRBA by 0.7 percent. The other three alternatives decrease total wetland habitat associated with the Reservations: MODC by 1.2 percent, BIOP by 6.0 percent, and FWS30 by 3.3 percent. These net changes from the CWCP result from a combination of positive and negative changes for individual Reservations.

Fort Peck Reservation has 4,750 acres of average annual wetland habitat under the CWCP. The only submitted alternatives that increase wetland habitat over the CWCP are the MRBA alternative (6.3 percent) and the ARNRC alternative (0.6 percent). The remaining four alternatives decrease wetland habitat within this Reservation. The MODC and MLDDA alternatives decrease wetland habitat by 0.2 and 6.1 percent, respectively. The FWS30 alternative reduces habitat by 11.6 percent, while the BIOP alternative has the greatest percentage decrease of wetland habitat within Fort Peck Reservation (13.7 percent).

Under the CWCP, Standing Rock Reservation has 1,430 acres of average annual wetland habitat. Two of the submitted alternatives increase habitat over the CWCP, the MLDDA alternative by 79.7 percent and the ARNRC alternative by 21.0 percent. Under the MRBA alternative, wetland decreases in this Reservation equal 7.0 percent, the lowest reduction in habitat of the remaining three and MODC alternative reduce greater amounts of habitat (22.4 and 35.0 percent, respectively). The greatest reduction in wetland habitat within Standing Rock Reservation occurs under the BIOP alternative (45.0 percent).

**Table 5.5-2.** Average annual wetland habitat (thousands of acres) for 10 Tribal Reservations<sup>1/</sup>.

Reservation	1898 to 1997						
	CWCP	MLDDA	ARNRC	MRBA	MODC	BIOP	FWS30
Fort Peck	4.75	4.46	4.78	5.05	4.74	4.10	4.20
Standing Rock	1.43	2.57	1.73	1.33	0.93	0.78	1.11
Cheyenne River	0.74	1.05	0.72	0.55	0.67	0.53	0.55
Yankton	4.14	4.25	4.29	4.20	4.11	4.34	4.39
Ponca Tribal Lands and Santee	8.62	8.81	8.13	8.54	8.52	8.13	8.00
Winnebago and Omaha	4.31	4.22	4.04	4.45	4.54	4.28	4.45
Iowa and Sac and Fox	3.92	3.89	4.53	3.98	4.07	4.07	4.28
<b>Total</b>	<b>27.91</b>	<b>29.25</b>	<b>28.22</b>	<b>28.10</b>	<b>27.58</b>	<b>26.23</b>	<b>26.98</b>

1/ Based on appropriate representative sites.

Cheyenne River Reservation has 740 acres of wetland habitat under the CWCP. The MLDDA alternative is the only submitted alternative that increases wetland habitat (41.9 percent). Habitat is reduced under the remaining five submitted alternatives. The ARNRC and MODC alternatives result in the least amount of habitat decrease, 2.7 and 9.5 percent, respectively. Both the MRBA and FWS30 alternatives decrease wetland habitat by 25.7 percent. The BIOP alternative results in the greatest percentage decrease of wetland habitat at the Cheyenne River Reservation (28.4 percent).

Yankton Reservation has 4,140 acres of wetland habitat under the CWCP. All the submitted alternatives except one, the MODC alternative, increase the amount of wetland habitat within this Reservation. The FWS30 alternative provides the greatest percentage increase (6.0 percent), while the MRBA alternative provides the smallest percentage increase (1.4 percent). The MLDDA alternative provides a 2.7 percent increase in habitat. The BIOP and ARNRC alternatives increase wetland habitat amounts by 4.8 and 3.6 percent, respectively. The MODC alternative decreases wetland habitat in Yankton Reservation by 0.7 percent.

Under the CWCP, Ponca Tribal Lands and Santee Reservation have the greatest amount of wetland habitat of any of the Reservations, 8,620 acres. Of the submitted alternatives, the MLDDA alternative is the only one that increases wetland habitat (2.2 percent). All other submitted alternatives reduce habitat. The MRBA alternative reduces the least amount of wetland habitat (0.9 percent), while the FWS30 alternative reduces the most wetland habitat (7.2 percent). Compared to the CWCP, the MODC alternative reduces wetland habitat by 1.2 percent, and both the ARNRC and BIOP alternatives reduce wetland habitat by 5.7 percent.

The CWCP provides 4,310 acres of wetland habitat within the Winnebago Reservation and Omaha Reservation. The MODC alternative provides an additional 5.3 percent of wetland habitat over the CWCP, while the MRBA and FWS30 alternatives both increase habitat by 3.2 percent. The BIOP, MLDDA, and ARNRC alternatives decrease wetland habitat, by 0.7, 2.1, and 6.3 percent, respectively.

Iowa Reservation and Sac and Fox Reservation have 3,920 acres of wetland habitat under the CWCP. Five of the submitted alternatives provide an increase in habitat within this Reservation. The submitted alternatives that provide the greatest percentage increase in wetland habitat over the CWCP are the ARNRC alternative (15.6 percent) and the FWS30 alternative (9.2 percent). Both the MODC and BIOP alternatives increase wetlands by 3.8 percent. The MRBA alternative provides the least percentage increase in wetland compared to the CWCP (1.5 percent). One submitted alternative, the MLDDA alternative, decreases habitat within Iowa Reservation and Sac and Fox Reservation (0.8 percent).

### 5.5.2 Riparian Habitat

As discussed earlier, riparian habitat values should vary inversely with the values presented for the wetland habitat. The methodology for the analysis of changes in riparian and wetland habitat is based on field surveys of existing wetland sites. All of the sites had 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 in the wetland sites. As water levels declined, wetland vegetation types were likely replaced with riparian vegetation types, and vice versa. The methodology did not identify expansion or contraction of the size of each site except for the conversion of vegetation to open

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water at extremely high water levels. This also leads to the general conclusion that if there is an increase in wetland habitat, there will be a corresponding decrease in riparian habitat.

Table 5.5-3 presents the total and reach breakdown of the average annual riparian habitat of the 42 representative sites for the submitted alternatives during the full period from 1898 to 1997. The total data are also presented in graphic form in Figure 5.5-5. 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)

Figure 5.5-5 graphically shows that three of the alternatives are grouped together between 108,100 and 109,800 acres, a difference of 1,700 acres, and the other four are grouped between 102,000 and 105,000 acres, a difference of 3,000 acres. The MLDDA alternative increases total riparian habitat for the representative sites by 1,700 acres (1.6 percent more than the CWCP) whereas the ARNRC and FWS30 alternatives reduce the habitat by the greatest amount, 6,100 acres (5.6 percent less than the CWCP).

The alternative with the greatest increase in total average annual riparian habitat for the representative sites over the CWCP is the MLDDA alternative. Under this alternative, total riparian acreage increases as the system storage (flood control) is reduced from 57.1 MAF to 55.1 MAF. This decrease in the base of flood control would result in varied average values of total riparian vegetation acres within the reservoir system. The greatest increase in riparian habitat over the CWCP occurs in the lake deltas (8.3 percent), and there would be a slight increase along the Upper River (2.1 percent). The MLDDA Alternative results in a 0.2 percent decrease in riparian habitat along the Lower River.

The ARNRC alternative has an unbalanced intrasystem regulation and a split navigation season, which generally reduces the amount of riparian habitat. The greatest reduction in riparian habitat acreage under the ARNRC alternative occurs in the lake deltas, where there is 12.5 percent less habitat than under the CWCP. There is also a slight decrease in riparian habitat in the Upper and Lower River sites (3.8 and 5.2 percent, respectively).

Although the MRBA and MODC alternatives both maintain a flat release from Gavins Point Dam during the summer, have an unbalanced intrasystem regulation, and increase conservation in the upper three lakes, they result in different impacts on riparian habitat, with the total value for the representative sites going up slightly for the MRBA alternative and down for the MODC alternative. Under the MRBA alternative, the acres of riparian habitat in the Upper River are increased (1.4 percent more than the CWCP) and the acres of riparian habitat are slightly decreased in the lake deltas and Lower River (1.7 and 0.5 percent less, respectively). Under the MODC alternative, riparian acreage is reduced in all three reaches. The greatest amount of reduction occurs in the Upper River (4.2 percent less habitat than the value for the CWCP), and the least amount occurs in the Lower River (1.3 percent less).

The BIOP and FWS30 alternatives also have most of the components of the MRBA and MODC alternatives; however, there is variation in the additional spring/summer release criteria compared to the CWCP. These two alternatives provide less riparian habitat within each of the three sets of reaches. The BIOP alternative reduces riparian habitat by 4.1 percent while the FWS30 alternative reduces riparian habitat by 5.6 percent. The greatest reduction in riparian habitat occurs in the lake deltas under the BIOP alternative (9.2 percent less riparian habitat than the CWCP) and in the

**Table 5.5-3.** Average annual riparian habitat (thousands of acres)<sup>1/</sup>.

Alternative	1898 to 1997			
	Total	Lake Deltas	Upper River	Lower River
CWCP	108.1	12.0	41.9	54.1
MLDDA	109.8	13.0	42.8	54.0
ARNRC	102.0	10.5	40.3	51.3
MRBA	108.2	11.8	42.5	53.8
MODC	105.0	11.6	40.1	53.4
BIOP	103.7	10.9	39.9	52.9
FWS30	102.0	11.6	40.0	50.4

1/ Based on 42 representative sites.

Lower River under the FWS30 alternative (6.8 percent less). The reduction in the amount of riparian habitat in the Upper River under the BIOP and FWS30 alternatives would be similar, with a 4.8 and 4.5 percent reduction in habitat, respectively.

The annual values of riparian vegetation acres for the representative sites for the seven submitted alternatives are shown on Figures 5.5-6 through 5.5-8. Generally, the submitted alternatives show an increase in riparian habitat beginning in 1922, reaching their highest values in the 3-year period between 1940 and 1943, which occurs at the end of the 1930 to 1941 drought. Between 1940 and 1943, all of the submitted alternatives show a maximum increase in annual values for riparian habitat. The alternatives with higher annual values during this period are the MLDDA and FWS30 alternatives. From 1943 to 1997, riparian habitat generally decreases but is more abundant than in the years prior to 1940. The alternative that shows the greatest variability from the CWCP is the ARNRC alternative, under which total annual values for the representative sites are generally mixed in the years prior to 1940 and lower after 1943. There is little variation between the CWCP and the MRBA alternative.

## Riparian Habitat For 10 Tribal Reservations

Table 5.5-4 presents the total average annual riparian habitat for the sites analyzed adjacent to the Reservations under the submitted alternatives for 10 Tribal Reservations during the full period, 1898 to 1997. The Reservations analyzed are those within the lake deltas (the Standing Rock, Cheyenne River, and Santee Reservations and Ponca Tribal Lands), the Upper River (the Fort Peck and Yankton Reservations), and the Lower River (the Winnebago, Omaha, Iowa, and Sac and Fox Reservations).

Total riparian habitat associated with these Reservations under the CWCP is 20,120 acres. Only one alternative,

MLDDA, increases total riparian habitat over the CWCP (+1.4 percent more

habitat). The remaining five alternatives all reduce habitat: ARNRC by 6.3 percent, MRBA by 0.5 percent, MODC by 0.9 percent, BIOP by 4.1 percent, and FWS30 by 5.5 percent.

Compared to the other Reservations evaluated, the CWCP provides the greatest amount of riparian habitat within Fort Peck Reservation, 5,550 acres. The MLDDA alternative is the only submitted alternative that does not change the amount of riparian habitat within this Reservation. All five of the remaining submitted alternatives decrease riparian habitat by the same amount, 0.2 percent.

The CWCP provides 1,730 acres of riparian habitat within Standing Rock Reservation. The MLDDA, MRBA, FWS30, and MODC alternatives increase riparian habitat by 3.5, 2.9, 1.2, and 0.6 percent, respectively. Two of the submitted alternatives, the ARNRC and BIOP alternatives, reduce riparian habitat within Standing Rock Reservation. The BIOP alternative has the second largest habitat reduction (-21.4 percent), and the ARNRC alternative has the greatest reduction in habitat (-37.6 percent).

Within Cheyenne River Reservation, the CWCP provides only 180 acres of riparian habitat. The MRBA alternative does not result in a change in habitat over the CWCP. The only submitted alternative that provides an increase in habitat over the CWCP is the MLDDA alternative (an additional 400 acres, or +122.2 percent). The remaining four submitted alternatives all result in a decrease in riparian habitat within the Cheyenne River Reservation. Compared to the CWCP, the FWS30 alternative results in a 27.8 percent decrease in alternative results in the smallest percentage decrease (-0.5 percent), and the FWS30 alternative results in the largest percentage decrease (-7.8 percent). The MRBA and BIOP alternatives decrease riparian habitat within Yankton Reservation by 2.3 and 3.7 percent, respectively.

**Table 5.5-4.** Average annual riparian habitat (thousands of acres) for 10 Tribal Reservations<sup>1/</sup>.

Reservation	1898 to 1997						
	CWCP	MLDDA	ARNRC	MRBA	MODC	BIOP	FWS30
Fort Peck	5.55	5.55	5.54	5.54	5.54	5.54	5.54
Standing Rock	1.73	1.79	1.08	1.78	1.74	1.36	1.75
Cheyenne River	0.18	0.40	0.11	0.18	0.16	0.11	0.13
Yankton	2.18	2.23	2.17	2.13	2.19	2.10	2.01
Ponca and Santee	0.66	0.66	0.71	0.63	0.64	0.69	0.70
Winnebago and Omaha	4.85	4.78	4.58	4.81	4.75	4.64	4.25
Iowa and Sac and Fox	4.97	4.99	4.67	4.94	4.91	4.86	4.63
<b>Total</b>	<b>20.12</b>	<b>20.40</b>	<b>18.86</b>	<b>20.01</b>	<b>19.93</b>	<b>19.30</b>	<b>19.01</b>

<sup>1/</sup> Based on appropriate representative sites.

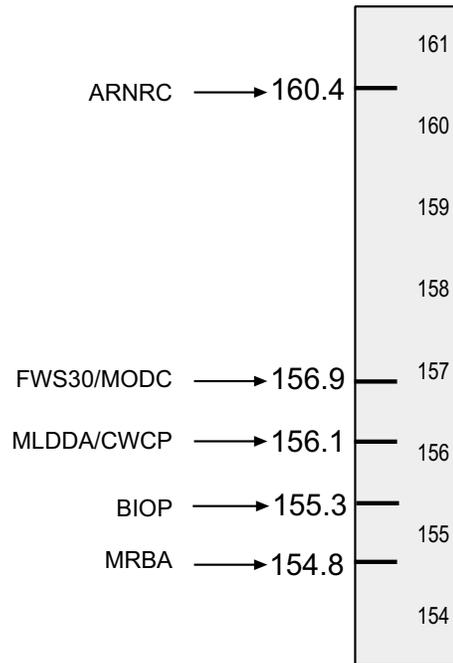
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Under the CWCP, there are 660 acres of riparian habitat within Ponca Tribal Lands and Santee Reservation. Of the submitted alternatives, the MLDDA alternative is the only one that does not result in a change in riparian habitat. Three submitted alternatives provide an increase in habitat, the ARNRC alternative (+7.6 percent), the FWS30 alternative (+6.1 percent), and the BIOP alternative (+4.5 percent). The remaining two submitted alternatives, the MODC and MRBA alternatives, decrease riparian habitat by 3.0 and 4.5 percent, respectively.

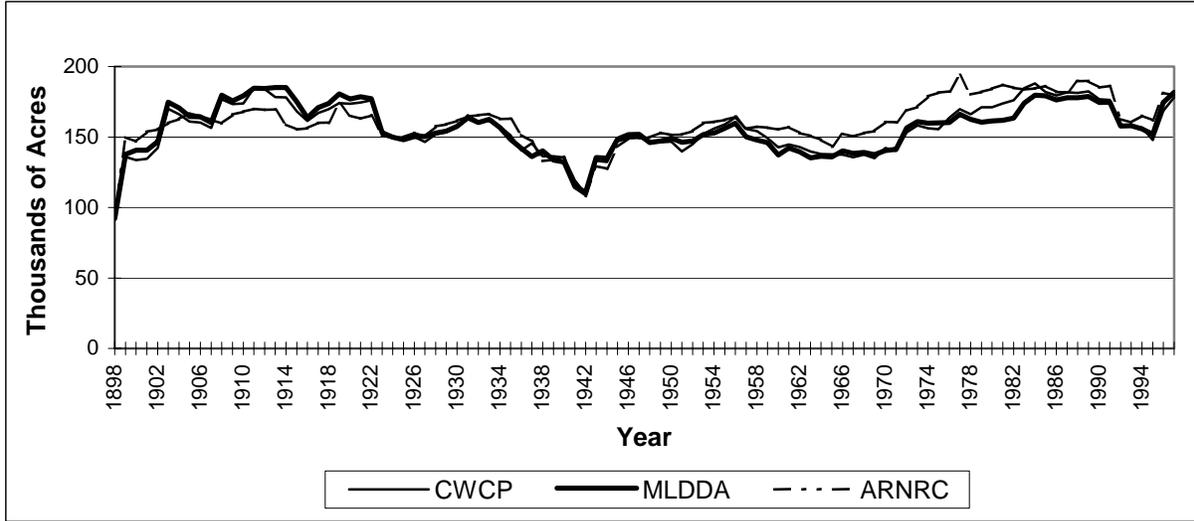
The CWCP provides 4,850 acres of riparian habitat within Winnebago Reservation and Omaha Reservation. All of the other submitted alternatives analyzed decrease riparian habitat compared to the CWCP. The MRBA alternative

results in the smallest percentage decrease (-0.8 percent), and the FWS30 alternative results in the largest percentage decrease (-12.4 percent). The MLDDA, MODC, BIOP, and ARNRC alternatives decrease riparian habitat by 1.4, 2.1, 4.3, and 5.6 percent, respectively.

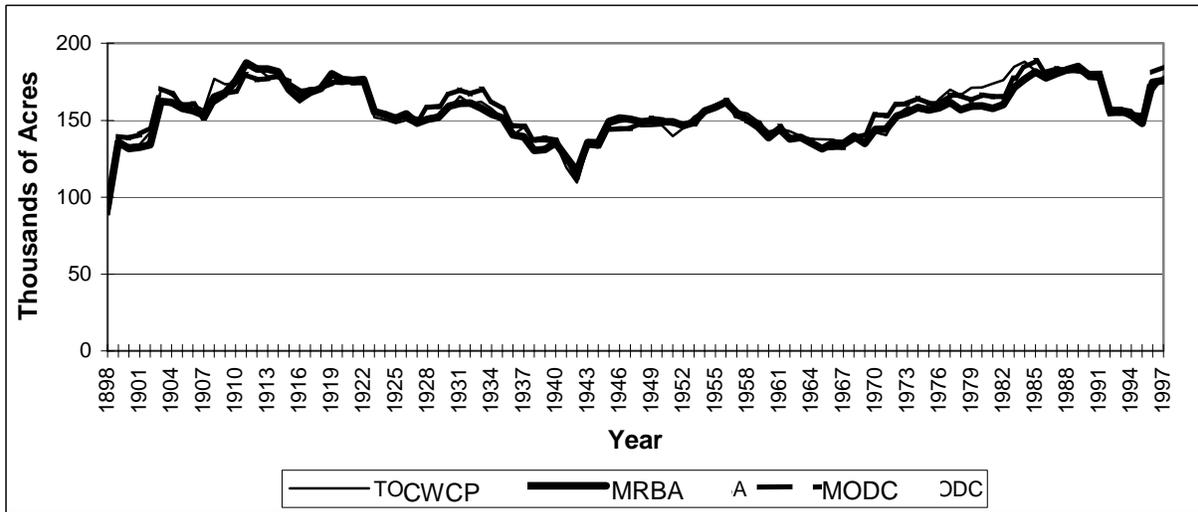
The CWCP provides 4,970 acres of riparian habitat within Iowa Reservation and the Sac and Fox Reservation. One alternative, the MLDDA alternative, increases this habitat over the CWCP by 0.4 percent. All of the other submitted alternatives decrease riparian habitat compared to the CWCP. The FWS30 alternative results in the greatest decrease (-6.8 percent), and the MRBA alternative results in the least percentage decrease (-0.6 percent). The MODC, BIOP, and ARNRC alternatives decrease riparian habitat by 1.2, 2.2, and 6.0 percent, respectively.



**Figure 5.5-1.** Average annual wetland habitat for submitted alternatives (thousands of acres).



**Figure 5.5-2.** Average annual wetland vegetation acres for alternatives CWCP, MLDDA, and ARNRC.



**Figure 5.5-3.** Average annual wetland vegetation acres for alternatives CWCP, MRBA, and MODC.

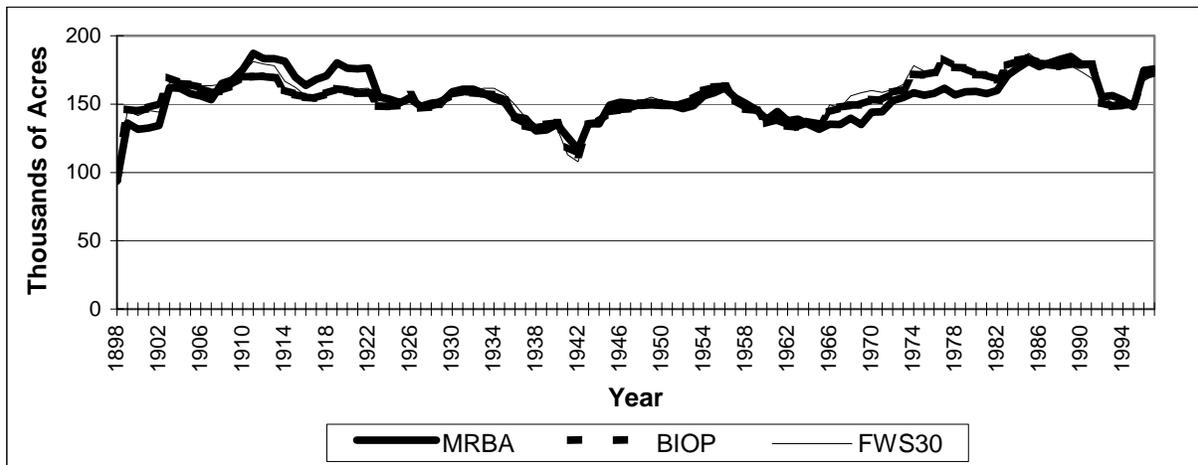


Figure 5.5-4. Average annual wetland vegetation acres for alternatives MRBA, BIOP, and FWS30.

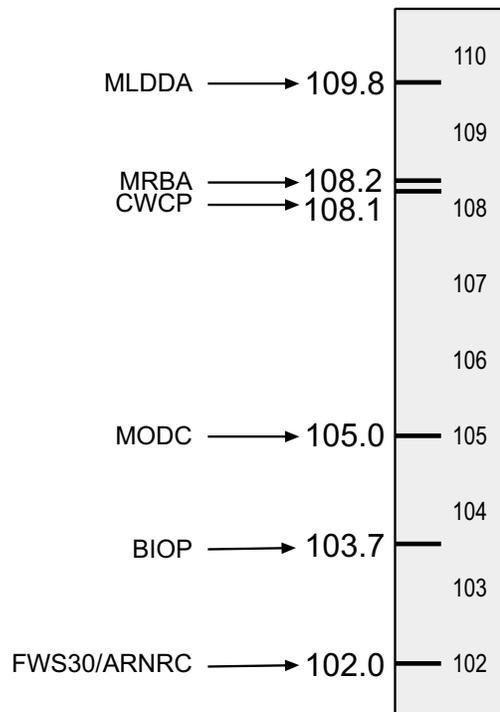
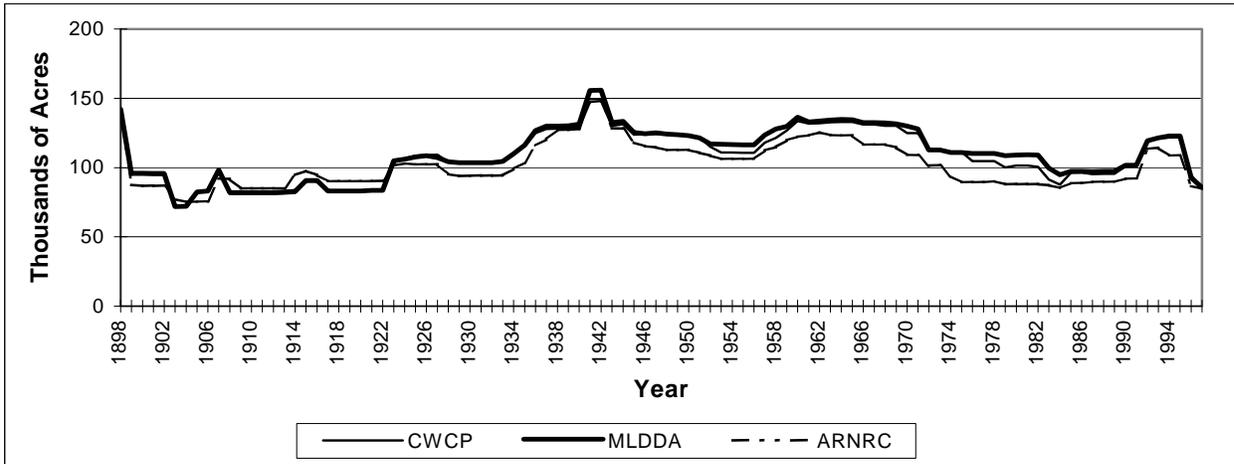
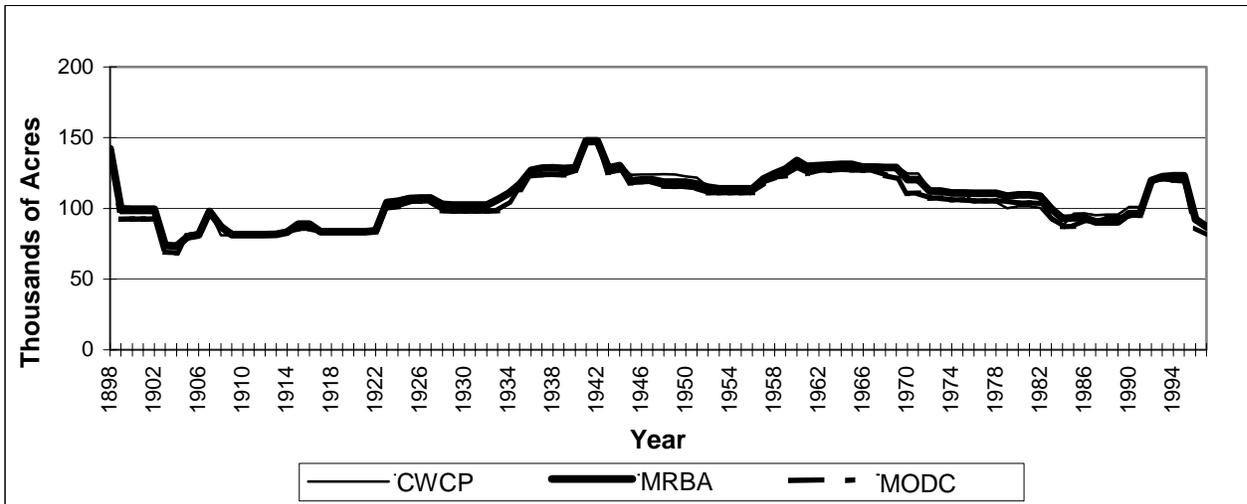


Figure 5.5-5. Average annual riparian habitat for submitted alternatives (thousands of acres).



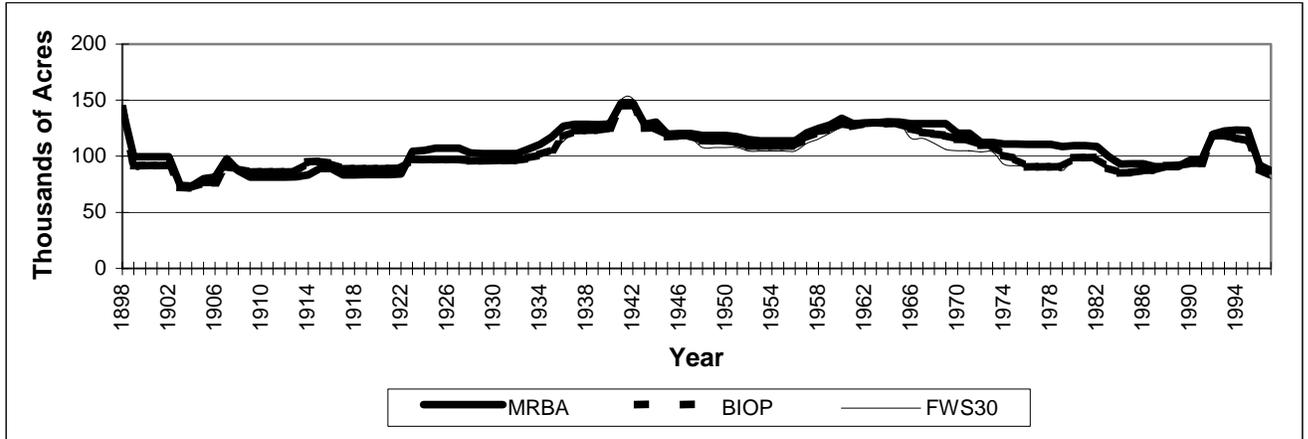
**Figure 5.5-6.** Average annual riparian vegetation acres for alternatives CWCP, MLDDA, and ARNRC.



**Figure 5.5-7.** Average annual riparian vegetation acres for alternatives CWCP, MRBA, and MODC.

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**Figure 5.5-8.** Average annual riparian vegetation acres for alternatives MRBA, BIOP, and FWS30.