7.0 LOWER PLATTE RIVER BASIN

7.1 Summary

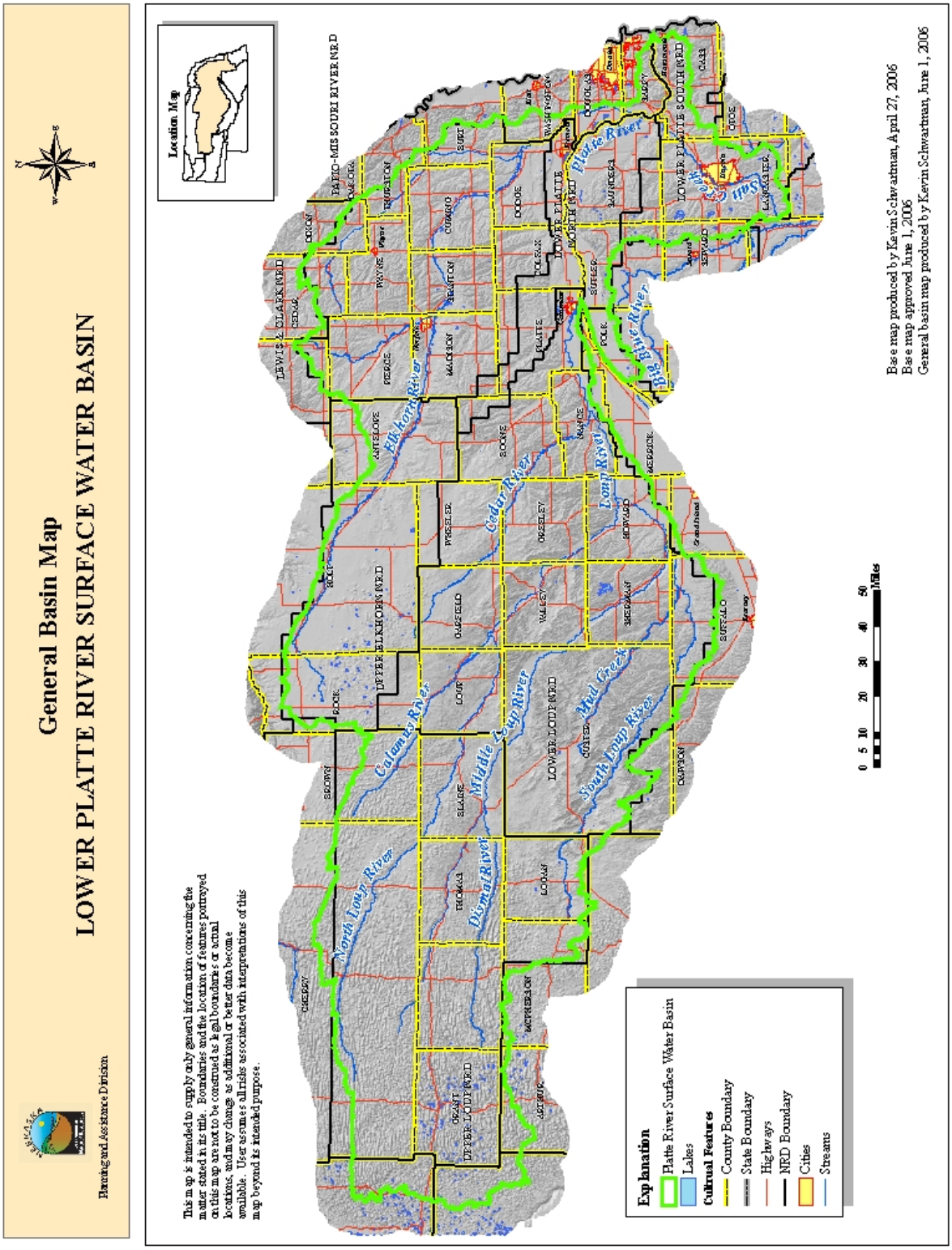
Based on the analysis of the sufficiency of the long-term surface water supply in the Lower Platte River Basin, the Department has reached a conclusion that the basin is not fully appropriated. The analysis of the lag effects from current development on the Lower Platte Basin indicates a reduction in streamflows of 616 cfs upstream of Louisville, approximately 202 cfs occurs due to lag impacts upstream of North Bend. The analysis of the impacts of future development (including the lag depletions from current levels of development) on the Lower Platte River Basin based on current development trends indicates a reduction in streamflows of 737 cfs in twenty-five years upstream of Louisville, approximately 255 cfs of which occurs due to development upstream of North Bend. The analysis of future water supplies in the Lower Platte River Basin indicates that, if no additional constraints are placed on ground water and surface water development and reasonable projections are made of the extent of future development, then the effects on the long-term water supply would cause the basin to become fully appropriated in the future.

7.2 Basin Description

The Lower Platte River is defined as the reach of the Platte River from its confluence with the Loup River to its confluence with the Missouri River. The Lower Platte River Basin is defined as all surface areas that drain into the Lower Platte River, including those areas that drain into the Loup River and the Elkhorn River, and all aquifers that impact surface water flows of the basin (Figure 7-1). The total area of the Lower Platte River surface water basin is approximately 25,400 square miles, of which approximately 15,200 square miles are in the Loup River subbasin and approximately 7,000 square miles are in the Elkhorn River subbasin. Natural resources districts with significant area in the basin are the Lower Platte South Natural Resources District; the Lower Platte North Natural Resources District; the Upper Elkhorn

Natural Resources District; the Lower Elkhorn Natural Resources District; the Upper Loup Natural Resources District; the Lower Loup Natural Resources District; and the Papio-Missouri River Natural Resources District.

Figure 7-1 General basin map, Lower Platte River Basin.



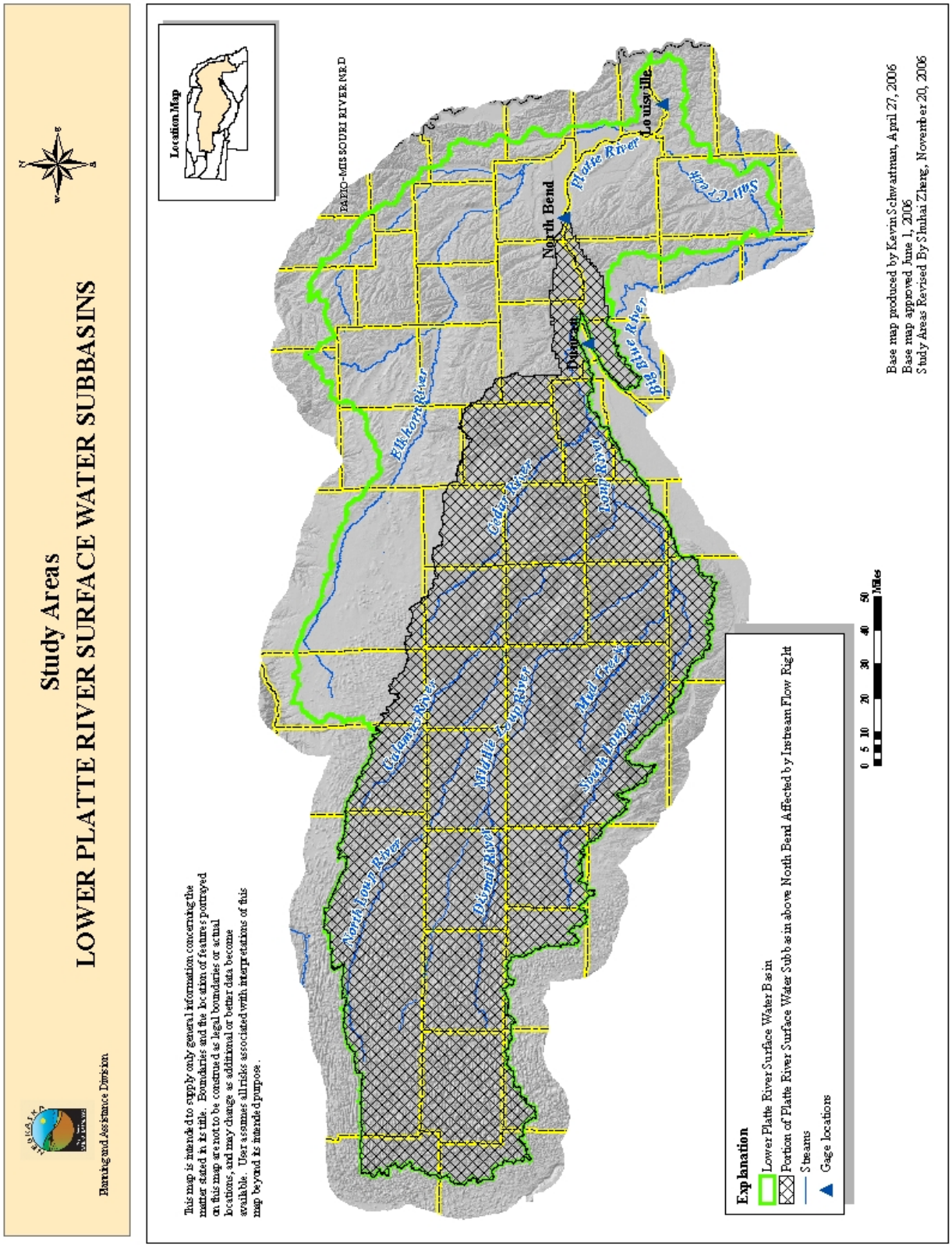
7.2.1 Subbasin Relationships

When considering the Lower Platte River Basin, it is important to understand the relationship between the senior surface water appropriations and the junior surface water appropriations in the Loup and Elkhorn River subbasins with regard to appropriations in the downstream portion of the Lower Platte River Basin. In general, when a senior water right calls for water, all water rights upstream of the senior right will be shut off to get water to the senior appropriator. Starting with the most junior appropriators, the Department will shut off as many junior appropriators as necessary to provide water to the senior appropriator. For senior appropriations along the Lower Platte River, this includes junior appropriators in the Loup and Elkhorn subbasins, because those subbasins provide flows to the reaches of the Lower Platte River that require administration for senior appropriators.

The senior appropriations calling for water in the Lower Platte River Basin are the instream flow rights. The instream flow rights have a priority date of November 30, 1993, and, when these appropriations are not being fulfilled, all surface water appropriations junior to that priority date will be closed. The instream flow appropriations are measured at the North Bend gage and the Louisville gage, although the appropriations extend to the confluence with the Missouri River. When instream flow appropriations are not met at the North Bend gage, all junior surface water appropriations above that gage, including those in the Loup River Basin, are closed to diversion (Figure 7-2). When instream flow appropriations are not met at both the North Bend and the Louisville gages, all junior surface water appropriations above both gages, including those in both the Loup and Elkhorn River subbasins, are closed to diversion. In circumstances where the instream flow appropriation is being met at the North Bend gage but not at the Louisville gage, all junior appropriations above the Louisville gage, including those in both the Loup and Elkhorn River subbasins, are closed to diversion.

Administration for the instream flow rights did not begin until 1997 when the permits were actually issued. Therefore, to evaluate a twenty-year record, the Department had to determine the number of days in which administration would have occurred if the instream flow rights had been in existence for the entire period of evaluation (1988-2007). Between 1988 and 2007, the junior surface water appropriations above North Bend, including those in the Loup River subbasin, would have been closed due to the instream flow appropriations not being met during July and August (the 65% time period from the 65/85 rule) for a total of 590 days. The junior surface water appropriations downstream of North Bend but upstream of Louisville would have been closed due to the instream flow appropriation not being met during July and August for a total of 549 days.

Figure 7-2 Map of the Platte River Basin highlighting the subbasin above the North Bend gage.



7.3 Nature and Extent of Water Use

7.3.1 Ground Water

Ground water in the basin is used for a variety of purposes: domestic, industrial, livestock, irrigation, and other uses. A total of 43,506 ground water wells had been registered within the basin as of December 31, 2007 (Department registered ground water wells database) (Figure 7-3). The locations of all active ground water wells can be seen in Figure 7-4.

Figure 7-3 Current well development by number of registered wells, Lower Platte River Basin.

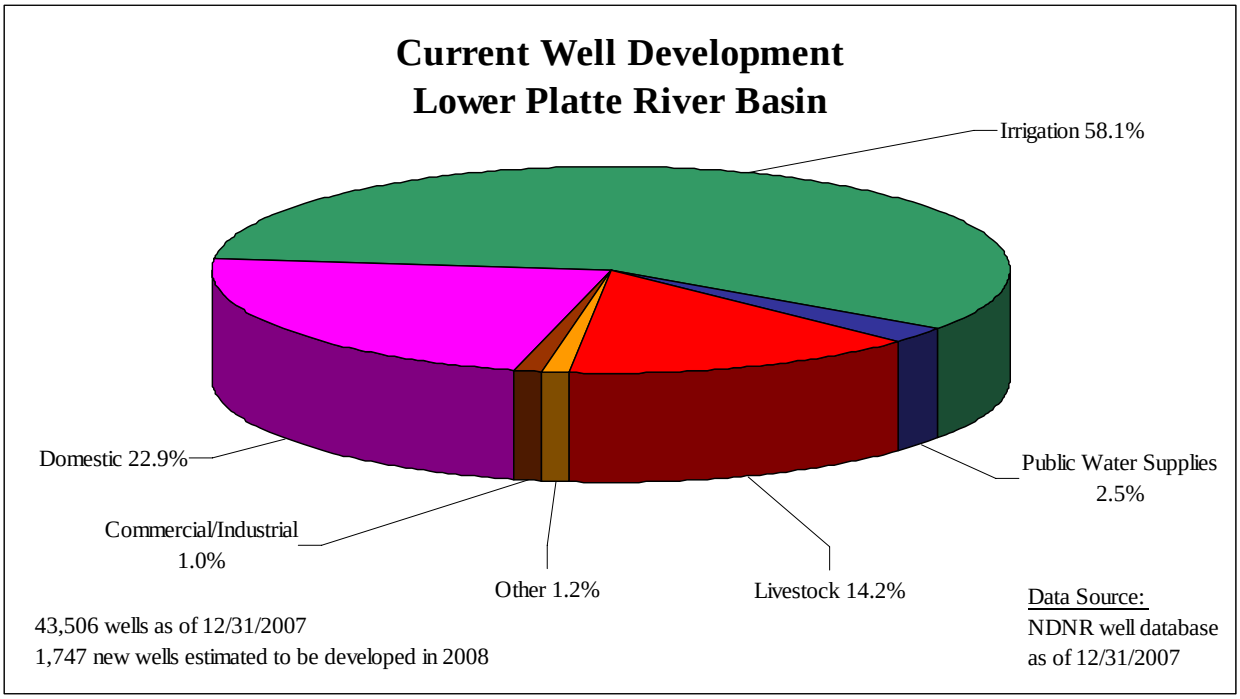
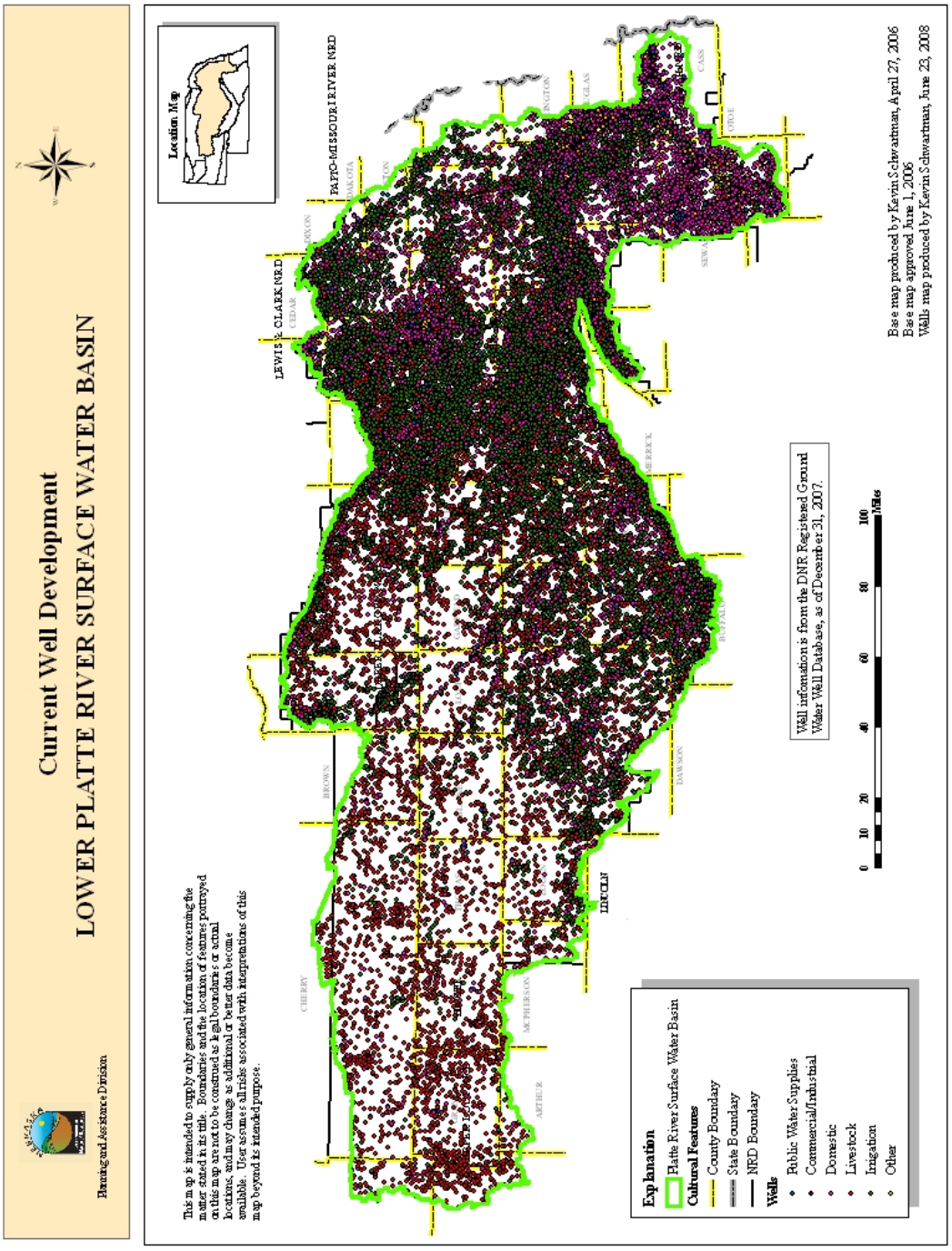


Figure 7-4 Current well locations, Lower Platte River Basin.



7.3.2 Surface Water

As of December 31, 2007, 2,935 surface water appropriations were held in the basin, issued for a variety of uses (Figure 7-5). Most of the surface water appropriations are for irrigation use and tend to be located on the major streams. In addition, two instream flow appropriations and two hydropower appropriations are held in the basin. The instream flow appropriations are located on the Platte River and are measured at North Bend and Louisville. The hydropower appropriations are located on the Loup River and the Cedar River. The first surface water appropriations in the basin were permitted in 1890, and development has continued through the present day. The approximate locations of the surface water diversion points are shown in Figure 7-6.

Figure 7-5 Surface water appropriations by number of diversion points, Lower Platte River Basin.

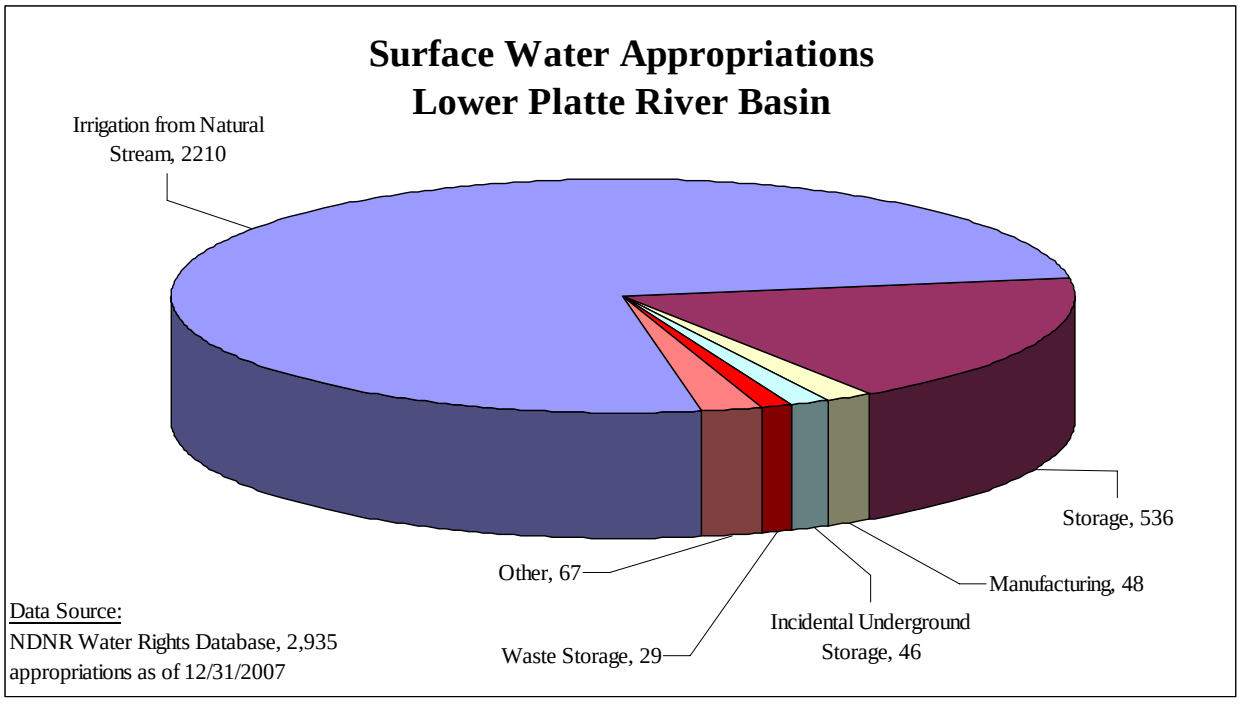
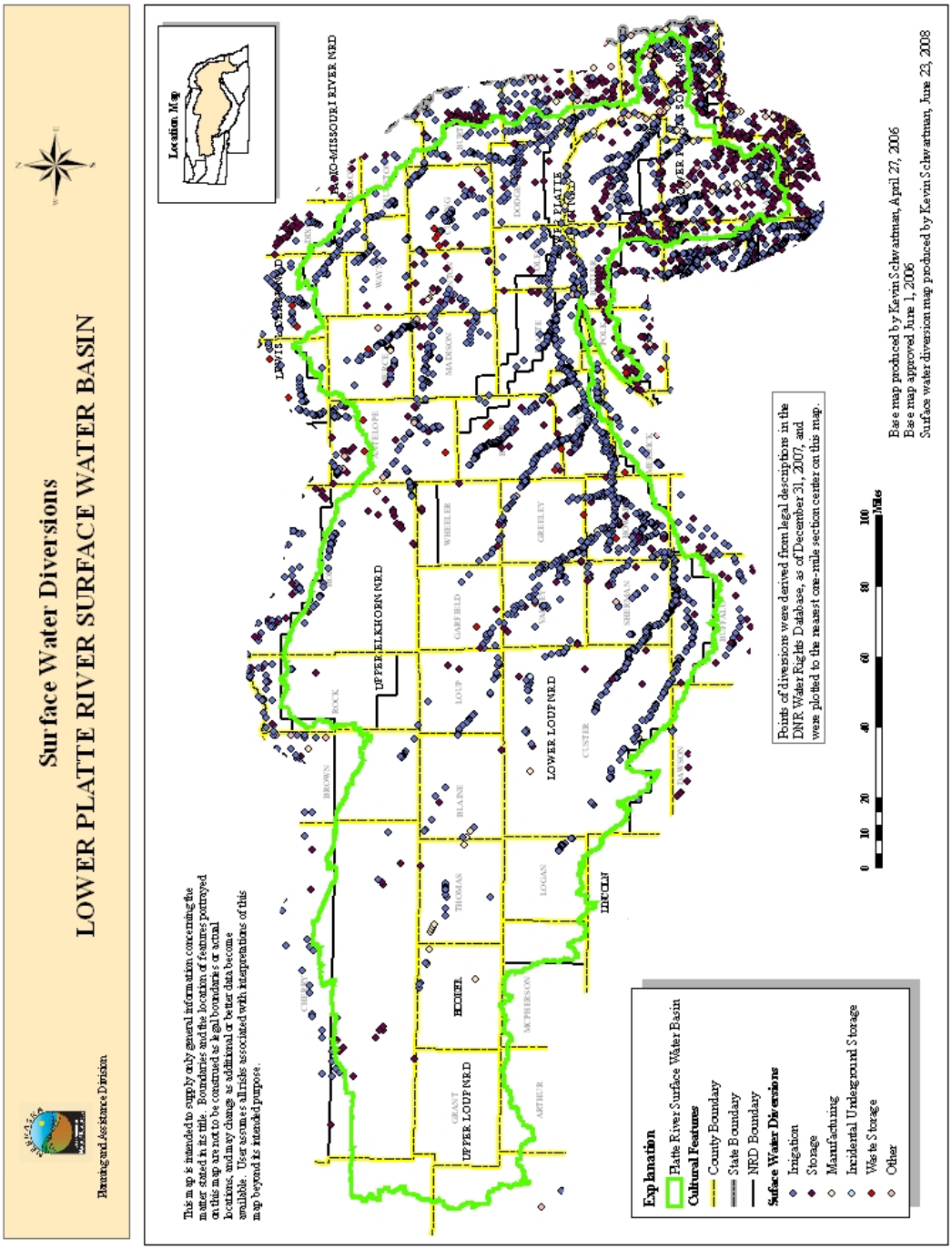


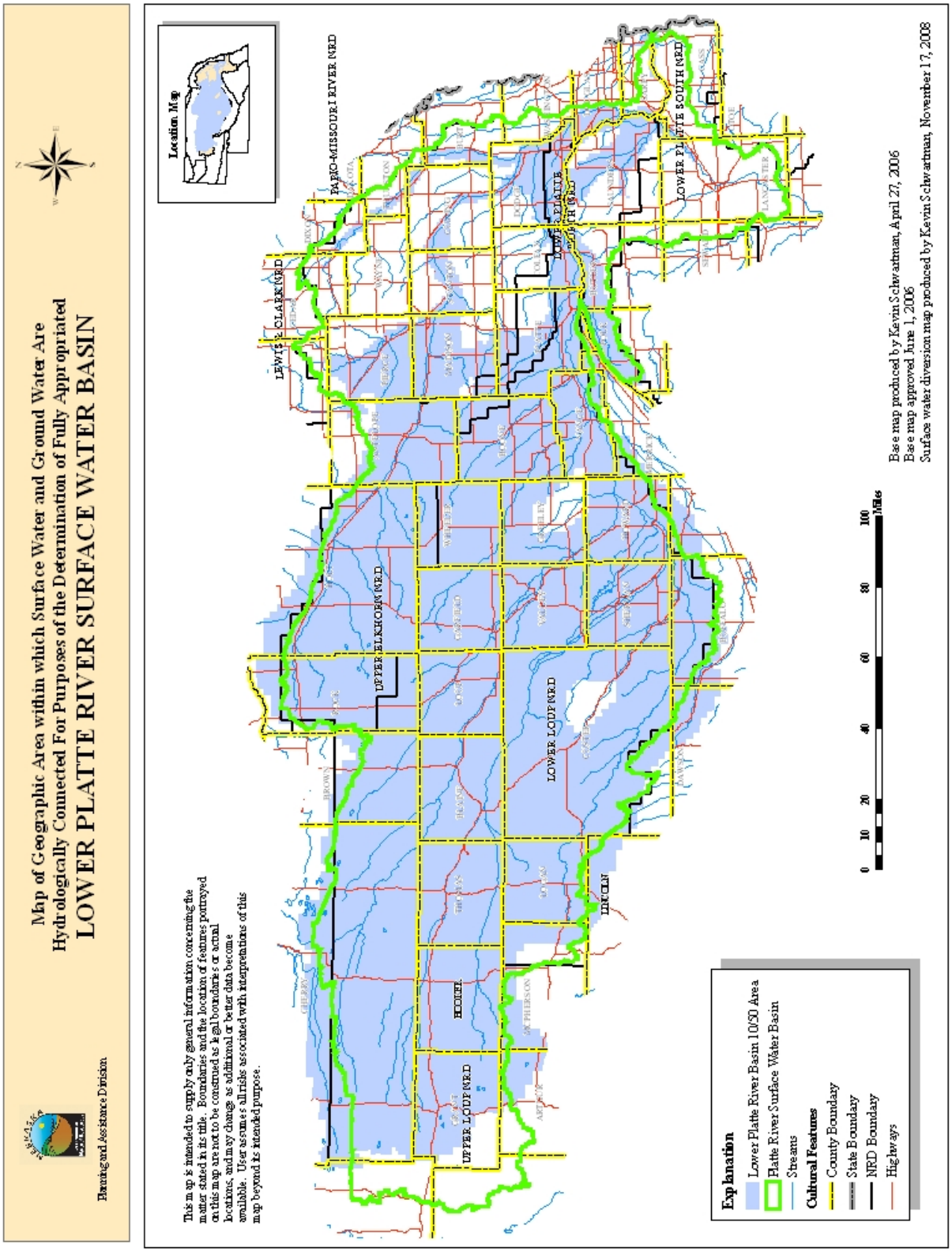
Figure 7-6 Surface water appropriation diversion locations, Lower Platte River Basin.



7.4 Hydrologically Connected Area

The Elkhorn-Loup model (ELM) was used to determine the extent of the 10/50 area for the Loup Basin and portions of the Elkhorn Basin. In areas that were not covered by the ELM but were considered to be hydrologically connected, the 10/50 area was determined using stream depletion factor (SDF) methodology. Figure 7-7 specifies the extent of the 10/50 area. A description of the SDF methodology used appears in the “Methodology” section of this report.

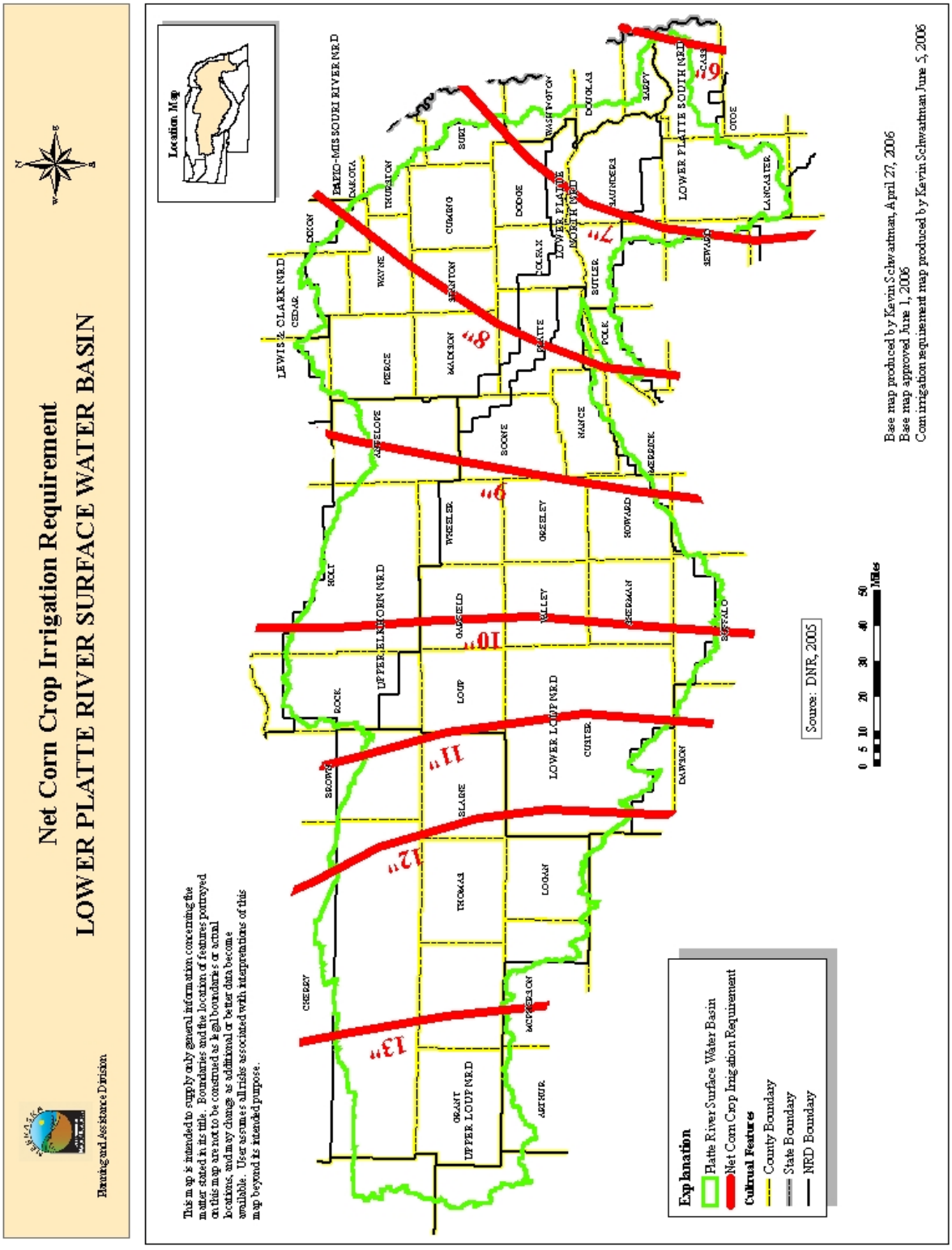
Figure 7-7 10/50 area, Lower Platte River Basin.



7.5 Net Corn Crop Irrigation Requirement

Figure 7-8 is a map of the net corn crop irrigation requirement for the Lower Platte River Basin (DNR, 2005). The NCCIR for a junior surface water appropriation above the North Bend gage is 10.52 inches. To assess the number of days required to be available for diversion, a surface water diversion rate equal to 1 cfs per 70 acres, a downtime of 10%, and an irrigation efficiency of 80% were assumed. Based on these assumptions, the most junior surface water appropriations would need 27.9 days annually to divert 65% of the NCCIR and 36.5 days to divert 85% of the NCCIR.

Figure 7-8 Net corn crop irrigation requirement, Lower Platte River Basin.



7.6 Surface Water Closing Records

Tables 7-1 and 7-2 record all surface water administration that has occurred in the basin upstream of the North Bend and Louisville gages, respectively, between 1988 and 2007. Additionally, the Department received a request from Loup Public Power District (LPPD) on May 2, 2008, to administer for their water rights in the Loup River Basin. At the time of this report the Department can not determine when the most junior surface water appropriations would have been closed and therefore unable to divert during the previous twenty-year period as required in 457 N.A.C. 001.01A. The Department is continuing to review this matter and may address it in future reports.

Table 7-1 Surface water administration in the Lower Platte River Basin upstream of the North Bend gage, 1988-2007.

Year	Water Body	Days	Closing Date	Opening Date
2000	Lower Platte River Basin above North Bend	53	Aug 8	Sep 30
2001	Lower Platte River Basin above North Bend	11	Aug 7	Aug 18
2002	Lower Platte River Basin above North Bend	6	Jun 6	Jun 12
2002	Lower Platte River Basin above North Bend	67	Jun 25	Aug 31
2002	Lower Platte River Basin above North Bend	24	Sep 6	Sep 30
2003	Lower Platte River Basin above North Bend	81	Jul 11	Sep 30
2004	Lower Platte River Basin above North Bend	13	May 6	May 19
2004	Lower Platte River Basin above North Bend	7	Jun 29	Jul 6
2004	Lower Platte River Basin above North Bend	58	Jul 27	Sep 23
2005	Lower Platte River Basin above North Bend	48	Jul 12	Aug 29
2005	Lower Platte River Basin above North Bend	28	Sep 2	Sep 30
2006	Lower Platte River Basin above North Bend	35	May 15	Jun 20
2006	Lower Platte River Basin above North Bend	45	Jun 26	Aug 10
2006	Lower Platte River Basin above North Bend	28	Aug 14	Sep 11
2006	Lower Platte River Basin above North Bend	22	Oct 5	Oct 27
2006	Lower Platte River Basin above North Bend	20	Oct 31	Nov 20
2007	Lower Platte River Basin above North Bend	5	July 9	July 14

Table 7-2 Surface water administration in the Lower Platte River Basin downstream of the North Bend gage and upstream of the Louisville gage 1988-2007.

Year	Water Body	Days	Closing Date	Opening Date
1990	Willow Creek	14	Aug 17	Aug 31
1991	Taylor Creek	4	Jul 30	Aug 3
1991	Taylor Creek	3	Aug 23	Aug 26
1991	Taylor Creek	7	Aug 28	Sep 4
1991	Union Creek	7	Aug 28	Sep 4
2000	Lower Platte River Basin above Louisville	53	Aug 8	Sep 30
2001	Lower Platte River Basin above Louisville	11	Aug 7	Aug 18
2002	Lower Platte River Basin above Louisville	6	Jun 6	Jun 12
2002	Lower Platte River Basin above Louisville	59	Jun 25	Aug 23
2002	Lower Platte River Basin above Louisville	4	Aug 27	Aug 31
2002	Lower Platte River Basin above Louisville	24	Sep 6	Sep 30
2003	Lower Platte River Basin above Louisville	66	Jul 14	Sep 18
2004	Lower Platte River Basin above Louisville	13	May 6	May 19
2004	Lower Platte River Basin above Louisville	7	Jun 29	Jul 6
2004	Lower Platte River Basin above Louisville	58	Jul 27	Sep 23
2005	Lower Platte River Basin above Louisville	14	Jul 12	Jul 26
2005	Lower Platte River Basin above Louisville	31	Jul 29	Aug 29
2005	Lower Platte River Basin above Louisville	28	Sep 2	Sep 30
2006	Lower Platte River Basin above Louisville	35	May 16	Jun 20
2006	Lower Platte River Basin above Louisville	45	Jun 26	Aug 10
2006	Lower Platte River Basin above Louisville	28	Aug 14	Sep 11
2006	Lower Platte River Basin above Louisville	22	Oct 5	Oct 27
2006	Lower Platte River Basin above Louisville	20	Oct 31	Nov 20
2007	Lower Platte River Basin above Louisville	5	July 9	July 14

7.7 Evaluation of Current Development

7.7.1 Current Water Supply

The current water supply is estimated by using the previous twenty years (1988-2007) of flows and comparing them to the flows necessary to satisfy the senior surface water appropriation (i.e., the instream flow appropriations). The results of the analyses conducted for the Lower Platte River Basin upstream of North Bend and downstream of North Bend and upstream of Louisville, respectively, are shown in Tables 7-3 and 7-4. The results indicate that the current surface water supply in the Lower Platte River Basin

upstream of North Bend provides an average of 32.5 days available for diversion between July 1 and August 31 and 103.9 days available for diversion between May 1 and September 30 (Table 7-5). The results for the Lower Platte River Basin downstream of North Bend and upstream of Louisville indicate an average of 34.6 days available for diversion between July 1 and August 31 and 106.8 days available for diversion between May 1 and September 30 (Table 7-6).

Table 7-3 Estimate of the current number of days surface water is available for diversion upstream of North Bend.

Year	July 1 though August 31 Number of Days Surface Water is Available for Diversion	May 1 through September 30 Number of Days Surface Water is Available for Diversion
1988	10	69
1989	14	47
1990	16	77
1991	6	66
1992	62	153
1993	62	153
1994	56	143
1995	52	134
1996	62	153
1997	40	131
1998	62	153
1999	61	152
2000	32	94
2001	28	111
2002	2	48
2003	6	72
2004	20	75
2005	10	71
2006	0	6
2007	49	140
Average	32.5	103.9

Table 7-4 Estimate of the current number of days surface water is available for diversion downstream of North Bend and upstream of Louisville.

Year	July 1 though August 31 Number of Days Surface Water is Available for Diversion	May 1 through September 30 Number of Days Surface Water is Available for Diversion
1988	10	69
1989	15	49
1990	18	79
1991	10	71
1992	62	153
1993	62	153
1994	59	149
1995	53	144
1996	62	153
1997	43	134
1998	62	153
1999	62	153
2000	35	97
2001	34	118
2002	5	51
2003	11	77
2004	22	78
2005	12	73
2006	3	40
2007	51	142
Average	34.6	106.8

Table 7-5 Comparison between the number of days required to meet the net corn crop irrigation requirement and number of days surface water is available for diversion upstream of North Bend.

	Number of Days Necessary to Meet the 65% and 85% of Net Corn Crop Irrigation Requirement	**Average Number of Days Available for Diversion with Current Development**
July 1 – August 31 (65% Requirement)	27.9	32.5 (4.6 days above the requirement)
May 1 – September 30 (85% Requirement)	36.5	103.9 (67.4 days above the requirement)

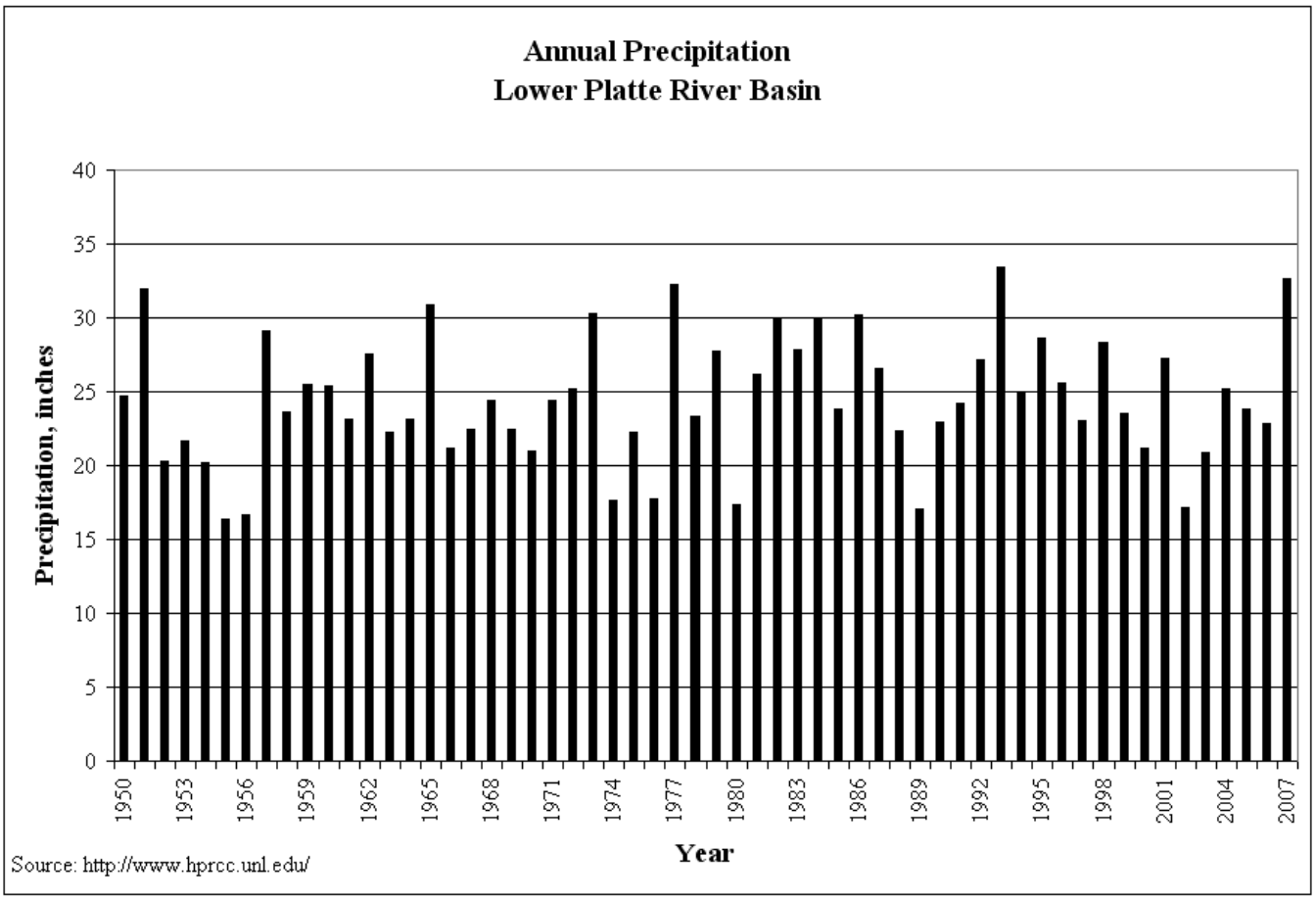
Table 7-6 Comparison between the number of days required to meet the net corn crop irrigation requirement and number of days surface water is available for diversion downstream of North Bend and upstream of Louisville.

	Number of Days Necessary to Meet the 65% and 85% of Net Corn Crop Irrigation Requirement	**Average Number of Days Available for Diversion with Current Development**
July 1 – August 31 (65% Requirement)	27.9	34.6 (6.7 days above the requirement)
May 1 – September 30 (85% Requirement)	36.5	106.8 (70.3 days above the requirement)

7.7.2 Water Supply

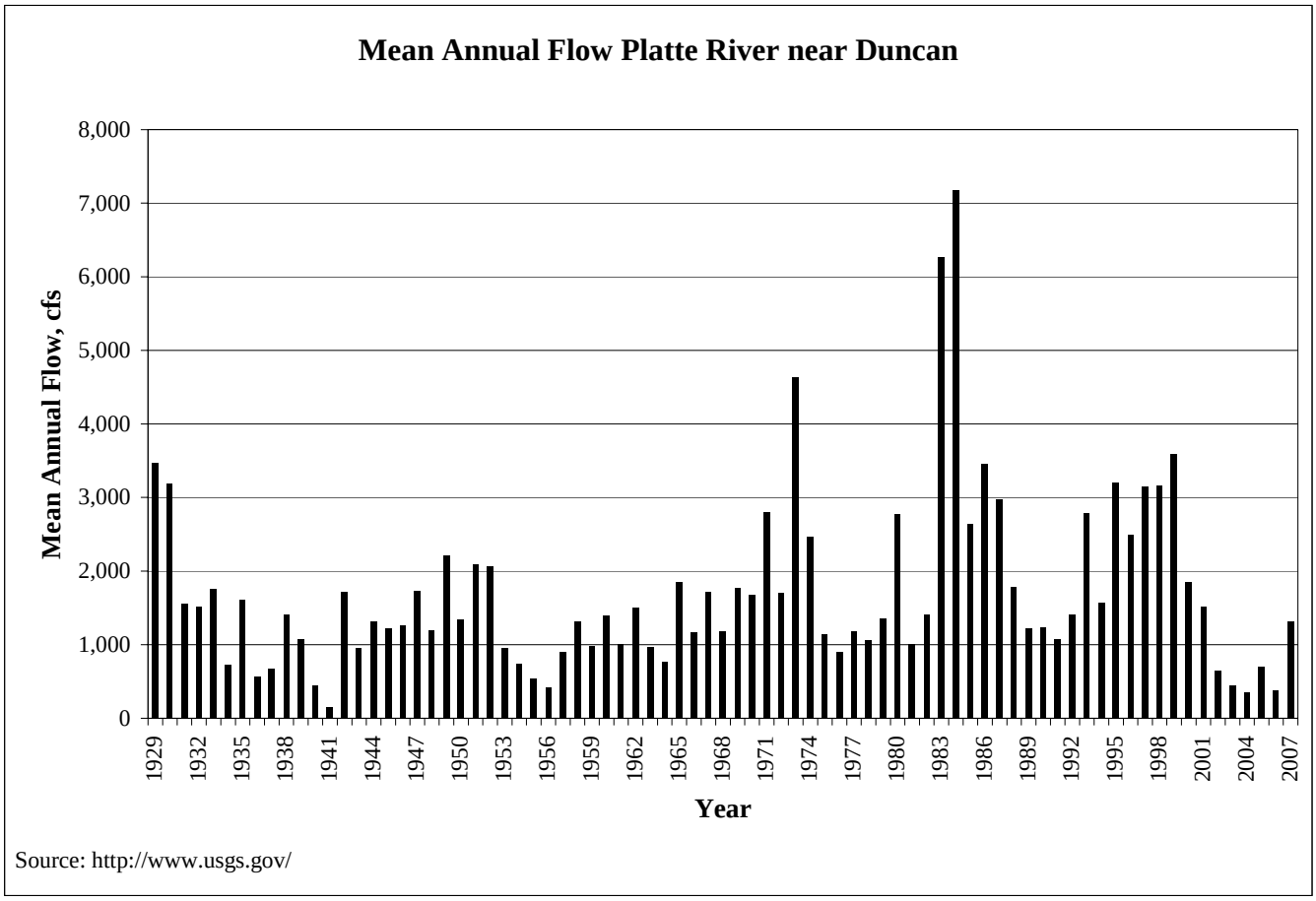
In order to complete the long-term evaluation of surface water supplies, a future twenty-year water supply for the basin must be estimated. The basin's major water sources are precipitation, which runs off as direct streamflow and infiltrates into the ground to discharge as baseflow; ground water movement into the basin, which discharges as baseflow; and streamflow from the middle Platte River. Using methodology published in the *Journal of Hydrology* (Wen and Chen, 2005), a nonparametric Mann-Kendall trend test of the weighted average precipitation in the basin was completed. The analysis showed no statistically significant trend in precipitation ($P > 0.95$) over the past fifty years (Figure 7-9). The same type of statistical analysis of streamflow from the middle Platte River (using the Platte River at Duncan gage as inflow to the Lower Platte Basin), also showed no statistically significant trend ($P > 0.95$) (Figure 7-10). Therefore, using the previous twenty years of precipitation and streamflow data as the best estimate of the future surface water supply is a reasonable starting point for applying the lag depletions from ground water wells.

Figure 7-9 Annual precipitation, Lower Platte River Basin[1]



[1] The results include precipitation stations covering the Loup, Elkhorn, and Platte River Basins.

Figure 7-10 Mean annual flow, Platte River near Duncan



Source: http://www.usgs.gov/

7.7.3 Depletions Analysis

The future depletions due to current well development that could be expected to affect streamflow in the basin were estimated using the ELM for the Loup Basin and portions of the Elkhorn Basin, whereas the SDF methodology was used in all other areas where data exist. The results estimate the future streamflow at North Bend to be depleted by 202 cfs in twenty-five years. The results estimate the future streamflow at Louisville to be depleted by 616 cfs in twenty-five years. The 616 cfs depletion at Louisville includes the 202 cfs at North Bend, 108 cfs calculated using the results of the ELM for the Elkhorn River upstream of Norfolk, 25 cfs calculated using the Jenkins method for areas downstream of North Bend and downstream of Norfolk but upstream of the Louisville gage, 160 cfs[1] from the Metropolitan Utilities District's Platte

West wellfield, located on the Platte River upstream of the confluence of the Platte and Elkhorn Rivers, and 121 cfs[2] from the Lincoln Water Systems's wellfield, located on the Platte River near Ashland.

7.7.4 Evaluation of Current Levels of Development against Future Water Supplies

The estimates of the twenty-year average number of days available for diversion are calculated by comparing the lag-adjusted future water supply with the flows necessary to satisfy the senior calling surface water appropriations (in this case, the instream flow rights) that have caused administration of junior appropriations in the basin. The results of the analyses are shown in Tables 7-7 and 7-8. The results of the analyses as compared to the numbers of days surface water is required to be available to divert 65% and 85% of the NCCIR are detailed in Tables 7-9 and 7-10. The long-term surface water supply estimates, given current levels of development, are sufficient to meet the needs of the most junior surface water appropriations for the Lower Platte River Basin upstream of North Bend.

[1]This is the maximum amount of water that is permitted to be pumped from the stream by the wellfield, not the entire amount of streamflow for which the induced recharge permit was granted.
[2]This is the difference between the maximum amount of water permitted to be pumped from the stream by the wellfield and the best estimate of average July-August water currently being pumped from the stream by the wellfield.

Table 7-7 Estimate of days surface water is available for diversion upstream of North Bend with current development and twenty-five-year lag impacts.

Year	July 1 though August 31 Number of Days Surface Water is Available for Diversion	May 1 through September 30 Number of Days Surface Water is Available for Diversion
1	**4**	**55**
2	**13**	**40**
3	**10**	**71**
4	**3**	**63**
5	**58**	**140**
6	**62**	**153**
7	**48**	**127**
8	**49**	**128**
9	**60**	**151**
10	**38**	**129**
11	**61**	**145**
12	**61**	**152**
13	**20**	**81**
14	**16**	**87**
15	**1**	**41**
16	**4**	**69**
17	**16**	**61**
18	**5**	**66**
19	**0**	**29**
20	**39**	**130**
Average	28.4	95.9

Table 7-8 Estimate of days surface water is available for diversion downstream of North Bend and upstream of Louisville with current development and twenty-five-year lag impacts.

Year	July 1 though August 31 Number of Days Surface Water is Available for Diversion	May 1 through September 30 Number of Days Surface Water is Available for Diversion
1	**4**	**55**
2	**13**	**41**
3	**12**	**73**
4	**6**	**66**
5	**58**	**140**
6	**62**	**153**
7	**50**	**136**
8	**50**	**132**
9	**60**	**151**
10	**42**	**133**
11	**62**	**146**
12	**62**	**153**
13	**26**	**87**
14	**21**	**93**
15	**4**	**44**
16	**6**	**71**
17	**17**	**62**
18	**7**	**68**
19	**2**	**33**
20	**39**	**130**
Average	30.2	98.4

Table 7-9 Comparison between the number of days required to meet the net corn crop irrigation requirement and number of days surface water is available for diversion upstream of North Bend with current development and lag impacts.

	Number of Days Necessary to Meet the 65% and 85% of Net Corn Crop Irrigation Requirement	**Average Number of Days Available for Diversion at Current Development with Twenty-Five Years of Lag Impacts**
July 1 – August 31 (65% Requirement)	27.9	28.4 (0.5 days above the requirement)
May 1 – September 30 (85% Requirement)	36.5	95.9 (59.4 days above the requirement)

Table 7-10 Comparison between the number of days required to meet the net corn crop irrigation requirement and number of days surface water is available for diversion downstream of North Bend and upstream of Louisville with current development and lag impacts.

	Number of Days Necessary to Meet the 65% and 85% of Net Corn Crop Irrigation Requirement	**Average Number of Days Available for Diversion at Current Development with Twenty-Five Years of Lag Impacts**
July 1 – August 31 (65% Requirement)	27.9	30.2 (2.3 days above the requirement)
May 1 – September 30 (85% Requirement)	36.5	98.4 (61.9 days above the requirement)

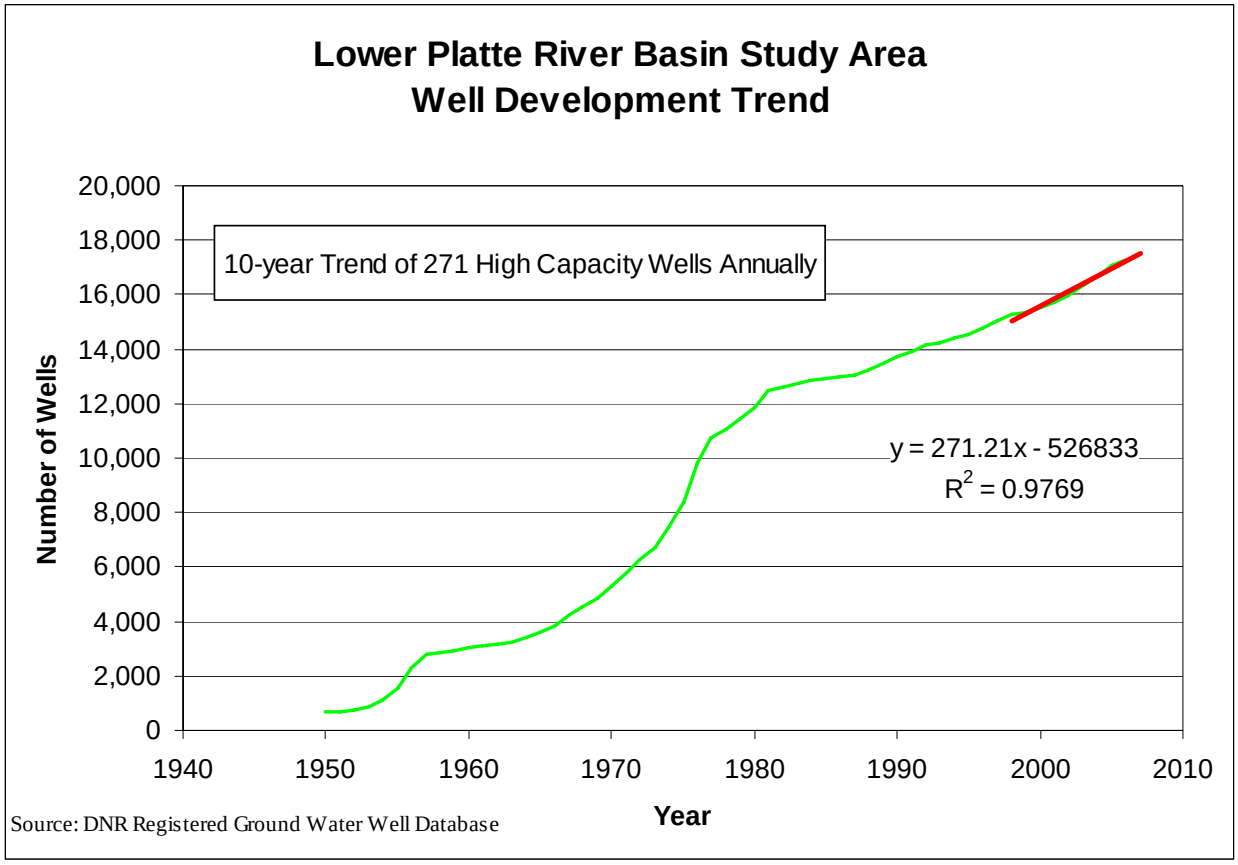
7.8 Evaluation of Predicted Future Development

Estimates of the number of high capacity wells (wells pumping greater than 50 gpm) that would be completed over the next twenty-five years, if no new legal constraints on the construction of such wells were imposed, were calculated based on extrapolating the present-day rate of increase in well development into the future (Figure 7-11). The present-day rate of development is based on the linear

trend of the previous ten years of development. Based on the analysis of the past ten years of development, the rate of increase in high capacity wells is estimated to be 271 wells per year in the basin.

At the present time, the Lower Loup Natural Resources District and portions of the Lower Platte North Natural Resources District have moratoriums on well development. Therefore, the yearly development figures for the Lower Loup Natural Resources District, and the affected portions of the Lower Platte North Natural Resources District, were not included in the estimate of future development.

Figure 7-11 High capacity well development, Lower Platte River Basin



The future depletions due to current and future well development that could be expected to affect streamflow in the basin were estimated using the Elkhorn Loup Model and the SDF methodology. The results estimate the future streamflow at North Bend to be depleted by 255 cfs in twenty-five years. This estimate includes the 202 cfs of lag from current levels of development and 53 cfs of depletion due to projected future irrigation development. The results estimate the future streamflow at Louisville to be depleted by 737 cfs in twenty-five years. This estimate includes the 616 cfs of lag depletion from current levels of development, 53 cfs of depletion due to projected future irrigation development upstream of North Bend and 68 cfs of depletion due to projected future irrigation development downstream of North Bend.

The estimate of the twenty-year average number of days surface water is available for diversion with additional future development is calculated by comparing the future lag-adjusted flow with the flows necessary to satisfy the senior surface water appropriation. The results of the analyses are shown in Tables 7-11 and 7-12. The results of the analyses as compared to the numbers of days surface water is required to be available to divert 65% and 85% of the NCCIR are detailed in Tables 7-13 and 7-14. The results indicate that, if no additional constraints are placed on ground water and surface water development and reasonable projections are made of the extent of future development, then the effects on the long-term water supply would cause the basin to become fully appropriated in the future.

Table 7-11 Estimated number of days surface water is available for diversion upstream of North Bend with current and predicted future development

Year	July 1 though August 31 Number of Days Surface Water is Available for Diversion	May 1 through September 30 Number of Days Surface Water is Available for Diversion
1	**4**	**54**
2	**13**	**37**
3	**9**	**70**
4	**2**	**62**
5	**57**	**133**
6	**62**	**153**
7	**46**	**124**
8	**47**	**126**
9	**58**	**149**
10	**38**	**129**
11	**61**	**144**
12	**61**	**152**
13	**17**	**77**
14	**14**	**84**
15	**0**	**38**
16	**4**	**68**
17	**16**	**59**
18	**5**	**66**
19	**0**	**27**
20	**37**	**128**
Average	27.6	94.0

Table 7-12 Estimated number of days surface water is available for diversion downstream of North Bend and upstream of Louisville with current and predicted future development

Year	July 1 though August 31 Number of Days Surface Water is Available for Diversion	May 1 through September 30 Number of Days Surface Water is Available for Diversion
1	**4**	**54**
2	**13**	**38**
3	**11**	**72**
4	**5**	**65**
5	**57**	**133**
6	**62**	**153**
7	**48**	**133**
8	**48**	**129**
9	**58**	**149**
10	**41**	**132**
11	**62**	**145**
12	**62**	**153**
13	**24**	**84**
14	**17**	**88**
15	**3**	**41**
16	**6**	**70**
17	**17**	**60**
18	**7**	**68**
19	**2**	**30**
20	**37**	**128**
Average	29.2	96.3

Table 7-13 Comparison between the number of days required to meet the net corn crop irrigation requirement and number of days surface water is available for diversion upstream of North Bend with current and predicted future development

	Number of Days Necessary to Meet the 65% and 85% of Net Corn Crop Irrigation Requirement	**Average Number of Days Available for Diversion with Future Development and Twenty-Five Years of Lag Impacts**
July 1 – August 31 (65% Requirement)	27.9	27.6 (0.3 days below the requirement)
May 1 – September 30 (85% Requirement)	36.5	94.0 (57.5 days above the requirement)

Table 7-14 Comparison between the number of days required to meet the net corn crop irrigation requirement and number of days surface water is available for diversion downstream of North Bend and upstream of Louisville with current and predicted future development

	Number of Days Necessary to Meet the 65% and 85% of Net Corn Crop Irrigation Requirement	**Average Number of Days Available for Diversion with Future Development and Twenty-Five Years of Lag Impacts**
July 1 – August 31 (65% Requirement)	27.9	29.2 (1.3 days above the requirement)
May 1 – September 30 (85% Requirement)	36.5	96.3 (59.8 days above the requirement)

7.9 Instream Flow Surface Water Appropriation Analysis

During the non-irrigation season, the junior water rights in the Lower Platte River system are the Nebraska Game and Parks Commission's instream flow rights. The purpose of these rights is to maintain habitat for the fish community. Therefore, the Department determined that an appropriate standard of

interference would be to determine whether the instream flow requirements that could be met at the time the water rights were granted can still be met today.

To calculate the average monthly flow that the instream flow permits could have expected at the time they were granted, the twenty-year period prior to the permits being granted (1974-1993) was used. In conducting this analysis, the lag impacts were calculated for development through 1993 and subtracted from the daily flows (see Section 4.4.5 for more detail). The average number of days that flows were available for each month at the time the appropriations were obtained was compared with the current average number of days that flows are available for each month. The results are shown in Table 7-15 and 7-16.

Results indicate that the North Bend instream flow appropriation would experience minor erosion after twenty-five years for the months of March (2.0 days) and April (0.1 days). The Louisville instream flow appropriation would experience minor erosion after twenty-five years for the months of March (1.9 days) and April (0.2 days). The long-term surface water supply estimate in the basin is sufficient for the instream flow appropriations in the basin, based on the current level of development and the calculated twenty-five year lag impacts.

Table 7-15 Number of days North Bend instream flow appropriation expected to be met

Month	Number of Days Flows Met at Time of Application [1]	Number of Days Flows Met With Current Development [2]	Difference in the Number of Days Instream Flow Appropriation is Currently Met
October	14.8	17.8	3.0
November	18.0	19.6	1.7
December	18.4	21.4	3.0
January	19.8	21.8	2.0
February	22.2	23.8	1.6
March	30.8	28.8	-2.0
April	27.7	27.6	-0.1
May	26.3	26.5	0.2
June	22.1	24.4	2.3
July	12.8	16.1	3.3
August	11.2	12.7	1.5
September	13.6	15.5	1.9

Table 7-16 Number of days Louisville instream flow appropriation expected to be met

Month	Number of Days Flows Met at Time of Application [1]	Number of Days Flows Met With Current Development [2]	Difference in the Number of Days Instream Flow Appropriation is Currently Met
October	14.8	17.8	3.0
November	18.1	19.9	1.8
December	18.6	21.8	3.2
January	20.1	23.0	2.9
February	22.3	23.9	1.6
March	30.8	28.9	-1.9
April	27.8	27.6	-0.2
May	26.3	26.6	0.3
June	22.3	24.7	2.4
July	13.5	17.6	4.1
August	11.5	13.0	1.5
September	13.7	15.7	2.0

[1] The number of days instream flows would be expected to be met at the time of application (1974-1993) with lag effects of well development at the time of the appropriation

[2] The number of days instream flows would be expected to be met at current time (1988-2007) with lag effects of current well development

7.10 Sufficiency to Avoid Noncompliance

There are no interstate compacts or decrees, or other formal state contracts or agreements in the Lower Platte Basin that could be affected by reduced stream flows. There are state and federally endangered and threatened species in the Lower Platte River Basin. The requirements of the Nebraska Nongame and Endangered Species Conservation Act and the federal Endangered Species Act prevent actions that could cause harmful stream flow reductions. At this time, there is sufficient water supply in the basin to comply with NNESCA and the ESA. Because future development will be limited so as to continue compliance with NNESCA, the long-term surface water supply in the basin is sufficient.

7.11 Current Studies being Conducted to Assist with Future Analysis

Three major studies are currently being conducted within the Lower Platte River Basin. The first is the Eastern Nebraska Water Resources Assessment (ENWRA). ENWRA is an effort between several agencies to categorize the aquifer characteristics and the water supply of the glaciated portion of eastern Nebraska, which includes large areas of the Lower Platte River Basin. This extensive body of work will provide critical data for use in future reports.

The second is the Elkhorn-Loup ground water model (ELM) study Phase II. The ELM study is working to further refine the Phase I ground water model which covers a substantial portion of the Lower Platte River Basin, to evaluate the ground water and surface water relationship and the water supply of much of the Elkhorn and all of the Loup River basins. Efforts will be made to incorporate results from this model into future reports.

The third study being conducted is an evaluation of streambed conductance for the Elkhorn River. This study is a joint effort of several agencies and will work to develop vertical hydraulic conductivity values for potential use in future depletions analysis of the Elkhorn River Basin.

7.12 Relevant Data Provided by Interested Parties

The Department published a request for relevant data from interested parties for this year's evaluation on May 12, 2008 (see Appendix A for Affidavit). The Department did not receive any such information prior to the issuance of the draft annual evaluation report in December 2008, which included a preliminary conclusion that the Lower Platte Basin was fully appropriated. Subsequently, the Department held four public hearings on the preliminary determination that the Lower Platte Basin was determined to be fully appropriated. Both oral and written testimony was presented to the Department at those hearings. Summaries of excerpts from that testimony as well as Department responses to those excerpts are provided in Appendix A.

7.13 Conclusions

Based on the analysis of the sufficiency of the long-term surface water supply in the Lower Platte River Basin, the Department has reached a conclusion that, the Lower Platte River Basin upstream of the confluence with the Missouri River is presently not fully appropriated. The Department has also determined that if no additional legal constraints are imposed on future development of hydrologically connected surface water and ground water and reasonable projections are made on the extent and location of future development, then this conclusion would change to a conclusion that the basin is fully appropriated, based on current information.

Bibliography of Hydrogeologic References for Lower Platte River Basin

Conservation and Survey Division. 2005. *Mapping of Aquifer Properties-Transmissivity and Specific Yield-for Selected River Basins in Central and Eastern Nebraska.* Lincoln.

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