

## **9.0 BASIN SUMMARIES AND RESULTS**

### **9.1 Blue River Basins**

The Blue River Basins are located in south-central Nebraska and consist of all of the surface areas that drain into the Big Blue River and the Little Blue River and all aquifers that impact surface water flows in the basins.

The basins can be divided into two distinct areas based on the presence or absence of glacial deposits (CSD, 2005). The Hunt methodology was used to determine the 10/50 area and lag impacts due to current and projected future well development. The Hunt methodology was applied to the western portion of the basins to determine the 10/50 area and to estimate lag impacts due to current and projected future well development. At the present time, the Department cannot determine the 10/50 area or the lag effects due to current and projected future well development for the eastern portions of the Big Blue River and Little Blue River Basins. The Department has recently completed a numerical groundwater model for the area, and results from that model were not available at the time of publication of this report; however, the Department will likely evaluate this area in the future.

The Department has reached a preliminary conclusion that no portion of the basins is currently fully appropriated. The Department determined that the near-term and long-term availability of surface water for diversion for each basin exceeds the number of days necessary to meet 65 percent and 85 percent of the net corn crop irrigation requirement for the applicable time periods. The Department has also determined that based on current information, if no additional legal constraints are imposed on future development of hydrologically connected surface water and groundwater and reasonable projections are made about the extent and location of future development, this preliminary conclusion would not change to a conclusion that the basin is fully appropriated.

### **9.2 Lower Niobrara Basin**

The Lower Niobrara River Basin is located in the northeast portion of Nebraska and consists of all of the surface areas that drain into the Niobrara River and that have not previously been

determined to be fully appropriated, from the Spencer hydropower facility downstream to the confluence of the Niobrara River and the Missouri River, and all aquifers that impact surface water flows of the basin.

The stream depletion factor (SDF) methodology was used to determine the 10/50 area and lag depletions due to current and projected future well development. The analysis of lag depletions of current development for the Lower Niobrara Basin indicates a reduction in streamflow of 12 cfs in 25 years. The analysis of the impacts of future development on the Lower Niobrara Basin based on current development trends indicates an additional reduction in streamflow of 108 cfs in 25 years.

The Department has reached a preliminary conclusion that no portion of the basin is fully appropriated. Estimates of future water supplies for junior irrigators could not be estimated due to minimal surface water administration during the past 20 years. Even though the future water supplies were not estimated, the current number of days in which surface water was available for diversion far exceeds the number of days necessary to meet the 65/85 rule.

### **9.3 Lower Platte River Basin**

The Lower Platte River Basin is located in the central and eastern portions of Nebraska and consists of all the surface water areas that drain into the Platte River from its confluence with the Loup River to its confluence with the Missouri 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.

The Department utilized the CENEB model to perform calculations of 10/50 areas and depletions for the Loup River Basin and upper portions of the Elkhorn River Basin. No sufficient numerical groundwater model is available in the remaining portions of Lower Platte River Basin. Therefore, SDF methodology was used to determine the 10/50 area and depletions for those areas.

The analysis of the lag effects of current development indicates a reduction in streamflow by 422 cfs in 25 years. The analysis of the impacts of future development indicates an additional reduction in streamflow of 119 cfs in 25 years.

The Department has reached a preliminary conclusion that no portion of the basin is fully appropriated. The long-term availability of surface water for diversion exceeds the number of days necessary to meet 65 percent and 85 percent of the net corn crop irrigation requirement for the applicable time periods, and the instream flow appropriations in the basin (the junior rights for which administration occurs in the non-irrigation season) have not been eroded. The department has also determined that, based current information, if no additional legal constraints are imposed on future development of hydrologically connected surface water and groundwater, and reasonable projections are made about the extent and location of future development in the entire basin, this preliminary conclusion would not change to a conclusion that the basin is fully appropriated.

#### **9.4 Missouri Tributary Basins**

The Missouri Tributary Basins are located in the north-central and eastern portions of Nebraska and consist of all of the surface areas that drain directly into the Missouri River, with the exception of the Niobrara River and Platte River Basins, and all aquifers that impact surface water flows of the basins.

No sufficient numerical groundwater model is available in the Missouri Tributary Basins to determine the 10/50 area. Much of the basins were glaciated and in those areas, the lack of sufficient data and/or appropriate hydrogeologic conditions does not allow for the use of the existing methodologies. Therefore, the Department was unable to delineate the 10/50 area for the glaciated portions of the basins. The non-glaciated area surrounding the headwaters of Bazile Creek is the only portion of the basins where the principal aquifer is both present and in hydrologic connection with the streams; therefore, the 10/50 area was delineated using the SDF methodology for that portion of the Missouri Tributary Basins only.

The analysis of lag effects of current and potential future development was only conducted in the Bazile Creek subbasin due to a lack of sufficient data or appropriate hydrogeologic conditions in

all other areas. The analysis of the Bazile Creek subbasin indicates a reduction in streamflow by 15 cfs in 25 years. The analysis of the impacts of future development on the Bazile Creek subbasin based on current development trends indicates an additional reduction in streamflow of 19 cfs in 25 years.

The Department has reached a preliminary conclusion that no portion of the Missouri River Tributary Basins is fully appropriated. The near-term availability of surface water for diversion exceeds the number of days necessary to meet 65 percent and 85 percent of the net corn crop irrigation requirement for the applicable time periods. Estimates of future water supplies for junior irrigators in the Bazile Creek subbasin could not be estimated due to minimal surface water administration during the past 20 years. For all other subbasins, the inability to calculate the lag effects of existing and future groundwater development prohibited a determination of future water supplies for junior irrigators at this time. Even though the long-term water supplies were not estimated, the current number of days in which surface water was available for diversion far exceeds the number of days necessary to meet the 65/85 rule.

## **9.5 Results of Analyses**

Tables 9-1 and 9-2 summarize the results of the analysis for sufficiency of water availability for irrigation in each basin.

**Table 9-1.** Summary of comparison between the number of days required to meet 65% of the net corn crop irrigation requirement and number of days in which surface water is available for diversion, July 1 – August 31.

	<b>Days Necessary to Meet 65% of Net Corn Crop Irrigation Requirement</b>	<b>Average Number of Days Available for Diversion at Current Development</b>	<b>Average Number of Days Available for Diversion at Current Development with 25 Years of Lag Impacts</b>	<b>Average Number of Days Available for Diversion with Future Development and 25 Years of Lag Impacts</b>
Big Blue River Basin	23.9	51.8	49.3	48.9
Little Blue River Basin	25.7	55.9	52.4	51.2
Lower Niobrara River Basin	23.6 – 25.5	62.0	Not Calculated*	Not Calculated*
Lower Platte River Basin upstream of North Bend, including the Loup River Basin	27.9	38.8	36.3	35.4
Lower Platte River Basin downstream of North Bend and upstream of Louisville including the Elkhorn River Basin	27.9	41.1	38.4	37.4
Missouri Tributary Basins	14.1 – 26.6	60.7	Not Calculated*	Not Calculated*

\* This number could not be calculated due to a lack of geologic data, hydrologic data, or surface water administration.

**Table 9-2.** Summary of comparison between the number of days required to meet 85% of the net corn crop irrigation requirement and number of days in which surface water is available for diversion, May 1 – September 30.

	<b>Days Necessary to Meet 85% of Net Corn Crop Irrigation Requirement</b>	<b>Average Number of Days Available for Diversion at Current Development</b>	<b>Average Number of Days Available for Diversion at Current Development with 25 Years of Lag Impacts</b>	<b>Average Number of Days Available for Diversion with Future Development and 25 Years of Lag Impacts</b>
Big Blue River Basin	31.3	141.2	138.4	137.9
Little Blue River Basin	33.6	144.6	138.2	136.1
Lower Niobrara River Basin	30.9 – 33.4	153.0	Not Calculated*	Not Calculated*
Lower Platte River Basin upstream of North Bend, including the Loup River Basin	36.5	114.7	110.7	108.9
Lower Platte River Basin downstream of North Bend and upstream of Louisville including the Elkhorn River Basin	36.5	118.7	113.9	112.2
Missouri Tributary Basins	18.4 – 34.7	151.7	Not Calculated*	Not Calculated*

\* This number could not be calculated due to a lack of geologic data, hydrologic data, or surface water administration.