



2014 and 2015 Annual Integrated Management Plan Report

Prepared by the
Department of Natural Resources in collaboration with the
Papio-Missouri River Natural Resources District

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**2014-2015 ANNUAL REPORT
FOR PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT AND
NEBRASKA DEPARTMENT OF NATURAL RESOURCES
INTEGRATED MANAGEMENT PLAN**

Prepared by the Nebraska Department of Natural Resources
May 12, 2016.

1. INTRODUCTION

The Papio-Missouri River Natural Resources District (P-MRNRD) and the Nebraska Department of Natural Resources (NeDNR) jointly adopted an Integrated Management Plan (IMP) which became effective on August 31, 2014, with the goal of jointly managing ground and surface waters within the P-MRNRD to sustain a balance between water uses and supplies for the long term. In this way, existing uses are better protected.

The 2014-2015 IMP annual report is consistent with Chapter 7 of the IMP, which outlines procedures for reviewing and potentially modifying the IMP. In March of 2016, the P-MRNRD and NeDNR met and jointly decided that no amendments to the IMP were needed at the time of the 2014-2015 IMP review. The P-MRNRD and NeDNR collaborated to write respective annual reports, and these reports were posted to the P-MRNRD and NeDNR websites prior to the annual meeting. Highlights from the annual reports were presented by P-MRNRD and NeDNR staff at the P-MRNRD's Board meeting held on May 12, 2016.

This annual report covers the actions and progress made towards IMP action items for both the P-MRNRD and NeDNR. The IMP states that the P-MRNRD and NeDNR will annually report on data collected, on new groundwater or surface permits and uses, and will review progress made toward achieving the goals and objectives. This IMP annual report is intended to provide transparency between the P-MRNRD and NeDNR, as well as to the public of the actions each agency performed in 2014 and 2015 to implement integrated water management.

2. NeDNR SURFACE WATER MONITORING

Introduction

The following sections comprise NeDNR's surface water monitoring report. Neb. Rev. Stat. 46-715 (2) specifies that an IMP must incorporate a plan to gather and evaluate data and methods that can then be implemented and used to validate the basis of understanding of the IMP, and increase understanding of the hydrologically connected area. During IMP development, the P-MRNRD and NeDNR agreed to a monitoring plan with specific tasks assigned to each agency to carry out, as initial steps to meet statutory guidelines specified above. NeDNR's is responsible for collecting, tracking, evaluating, and reporting on the following activities within the IMP area:

- NeDNR stream gage measurements
- Surface water permits issued, cancelled or denied
- Irrigation water use data collected
- Annual water use by the Metropolitan Utilities District and Lincoln Water System.

NeDNR is planning to expand the stream accretions/depletions calculator (currently used in the Upper Platte Basin) to the remainder of Nebraska.

Stream Gage Measurements

NeDNR does not operate any stream gages within the IMP area of the P-MRNRD. The US Geological Survey (USGS), however, owns and operates 6 stream gages. Table 1 shows the site number, location of gage, and beginning date of measurement, and Figure 1 shows the locations of the gages. Additional streamflow data may be acquired from the USGS's National Water Information System (NWIS) at <http://waterdata.usgs.gov/>. The NeDNR will continue to assess the need for additional monitoring in the IMP area (action item 2.1.3), but does not plan to add any stream gages in the IMP area at this point.

Table 1. Listing of USGS stream gages in the P-MRNRD IMP area. NeDNR does not currently operate any stream gages in the IMP area.

Station Name	Site Number	Funding Agencies	Begin Date
Platte River near Leshara, Neb.	06796500	USGS, Metropolitan Utilities District, Lincoln Water System	6/30/1994
Platte River near Venice, Neb.	06796550	USGS, Metropolitan Utilities District	3/23/2010
Elkhorn River at Waterloo	06800500	USGS, US Army Corps of Engineers	9/01/1928
Platte River near Ashland, Neb.	06801000	USGS, Metropolitan Utilities District, Lincoln Water System	9/01/1939
Platte River at Louisville, Neb.	06805500	USGS, US Army Corps of Engineers	5/15/1953
Papillion Creek at Fort Crook	06610795	USGS, Papio-Missouri River NRD	9/01/1948

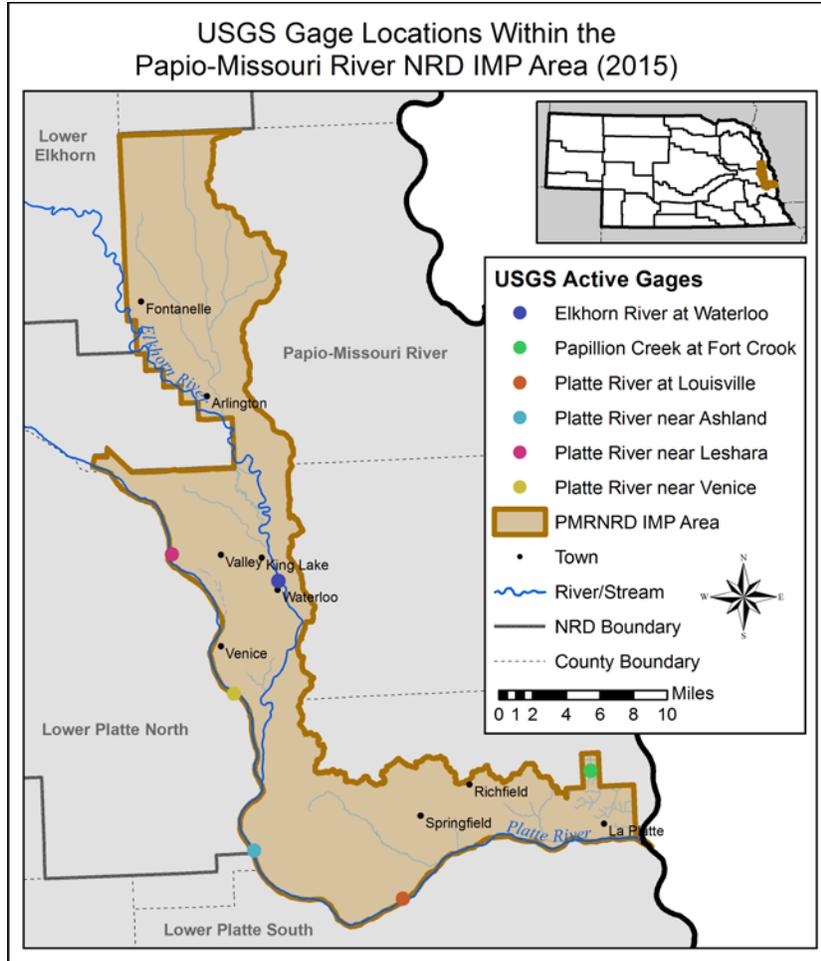


Figure 1. Location of stream gages within the IMP area

Stream Gage Measurements (action item 2.2.4)

Although reporting was not required for USGS gages (only NeDNR gages) as a part of the monitoring plan in Chapter 6, action item 2.2.4 specifies that NeDNR and P-MRNRD should track water use and supply variability by regularly evaluating data from various monitoring networks. Hence, as a part of this report the NeDNR compiled streamflow data (some provisional) from the NWIS website to show average daily discharge (Figure 2) and total annual discharge (Figure 3) for each gage, for the water years 2014 and 2015. Data from future water years will be compiled and added to these charts for subsequent IMP annual reviews, to track variability through multiple years of IMP implementation.

Figures 2 and 3 show the non-Platte River gage values on the outside bars; of these, the Elkhorn River drains into the Platte and the Papillion Creek is a tributary to the Missouri River. The middle bars show the Platte River gages in downstream order (from left to right). For the Platte River gages, there is an average 20% increase in average daily and total annual discharge from 2014 to 2015, with slightly more variability in discharge when looking at annual totals opposed to average daily measurements (Figure 2). The tributary gages show relatively little change in average daily and total annual discharge values for the 2014 and 2015 water years.

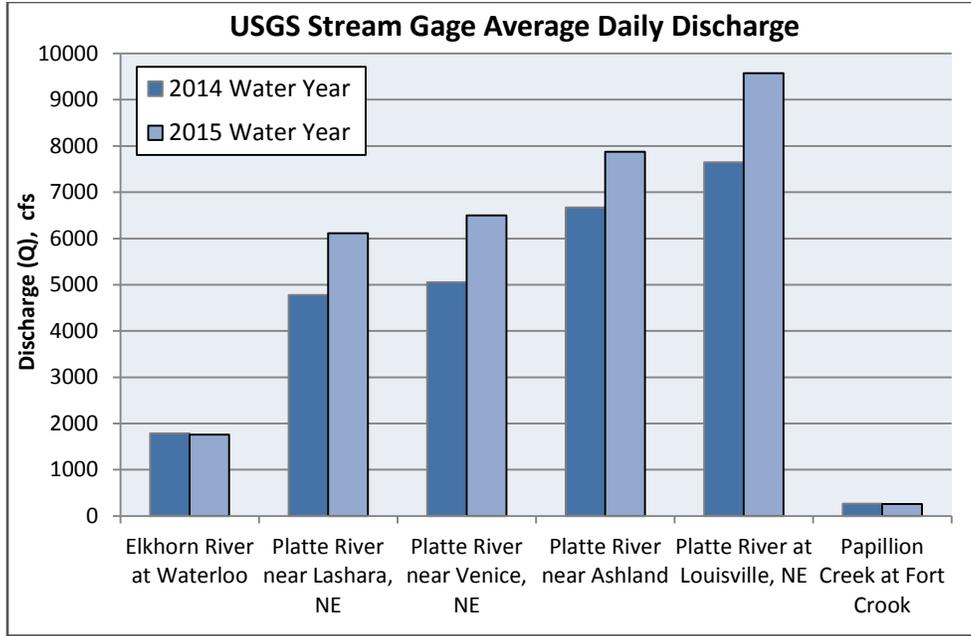


Figure 2. Average daily discharge shown by IMP area USGS stream gages, for the 2014 and 2015 water years (some provisional USGS data used)

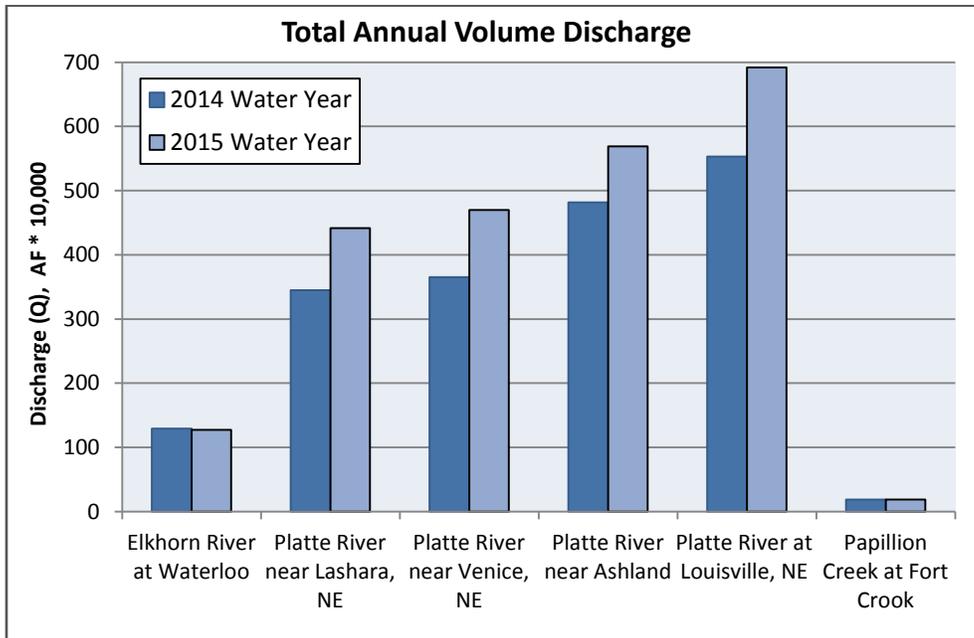


Figure 3. Total annual discharge shown by IMP area USGS stream gages, for the 2014 and 2015 water years (some provisional USGS data used)

Surface Water Permitting Activity (IMP monitoring chapter, and action items 2.1.5 and 2.2.1)

The NeDNR continued to monitor and administer surface water appropriations and maintain records of cancelled, new, or transferred rights within the surface water control area of P-MRNRD. NeDNR did **not** approve, cancel, deny or transfer any surface water applications/rights in 2014 or 2015.

Surface Water Irrigation Use Data (IMP monitoring chapter, and action items 2.2.3, 2.3.2)

In 2014, NeDNR implemented a voluntary water use reporting program which was a significant step forward in tracking of surface water use. This is an important part of IMP implementation and begins to address portions of action item 2.2.3, which is to establish a system to improve monitoring and evaluation of supplies and uses and changes therein, as well as action item 2.3.2, which is to develop an online water reporting tool.

To implement the voluntary water use reporting system, NeDNR sent out invitations via postcards to surface water irrigation permit holders in the IMP area of the District. The respondents could voluntarily submit information by filling out an online form at <http://data.dnr.nebraska.gov/wateruse> or by calling in their information. Permit holders were asked to provide information on the location and number of surface water appropriated irrigated acres, whether irrigation was used for the given year, type of irrigation used, crop type, and type of tillage (Tables 2 and 3). In 2014, 12 responses were received out of 50 requests (24%). The 2014 reporting activities accounted for 1,335 acres across Douglas and Washington counties. The respondents' information was summarized as follows:

- 100% of respondents used some sort of tillage conservation practices (minimum or no till)
- 58% of the total crops reported were irrigated, accounting for 1,252 irrigated acres
- The crop types of total reported acres were corn (62%) and soybeans (38%).
- The crop types of total irrigated acres were 70% corn and 30% soybeans

Table 2. Voluntarily Reported Surface Water Use Data for 2014

Crop type	Total Reported Crop Acres	Crop Acres Irrigated		Crop Acres Not Irrigated	
		Acres	% of total	Acres	% of total
Alfalfa	0	0	0	0	0
Beans, Dry Edible	0	0	0	0	0
Corn	1335	881	41	454	21
Forage Hay/Grass	0	0	0	0	0
Millet	0	0	0	0	0
Sorghum	0	0	0	0	0
Soybeans	817	371	17	446	21
Wheat	0	0	0	0	0
Totals	2152	1252	58	899	42

In 2015, 7 voluntary water use reports were received out of 50 surface water irrigation (from a flowing source or from a reservoir) appropriations (14%). Permit holders who reported provided information on the location and number of surface water irrigated acres, whether or not irrigation was used in 2015, crop type, and type of tillage. The 2015 reporting activities accounted for 557 acres across Washington County. Of the 7 total responses:

- 6 (86%) employed tillage conservation practices (minimum or no till)
- There was no reported irrigation; everything was in dryland
- The crop types of total reported acres were 56% corn and 46% soybeans

Table 3. Voluntarily Reported Surface Water Use Data for 2015

Crop type	Total Reported Crop Acres	Crop Acres Irrigated		Crop Acres Not Irrigated	
		Acres	%	Acres	%
Alfalfa	0	0	0	0	0
Beans, Dry Edible	0	0	0	0	0
Corn	315	0	0	315	56
Forage Hay/Grass	0	0	0	0	0
Millet	0	0	0	0	0
Sorghum	0	0	0	0	0
Soybeans	242	0	0	242	44
Wheat	0	0	0	0	0
Totals	557	0	0	557	100

Municipal Water Use

NeDNR compiled data from the Lincoln Water Supply (LWS) and Metropolitan Utilities District (MUD) in preparation for the annual review. In all, there are five combined groundwater well municipal transfer permits held by LWS and MUD, although one permit on file (A-10595) is not currently being used. Lincoln Water Supply holds groundwater well permits A-10367, A-10595, and A-16917 and MUD holds well permits A-10538 and A-17356. Figure 4 shows the total volume of water pumped for each calendar year, for the groundwater well municipal transfer permits held by LWS and MUD. Permit A-17356, held by MUD, is the only groundwater municipal transfer that has a maximum annual volume limit, and in 2014, and 2015, the annual use was less than 60% of allowable pumping.

Both LWS and MUD hold surface water appropriations for induced groundwater recharge within the IMP area. These permits are located on or in close proximity to the Platte River, and allow the appropriator to pump surface water through a groundwater well. At this time, there are no reporting requirements for these induced groundwater recharge permits.

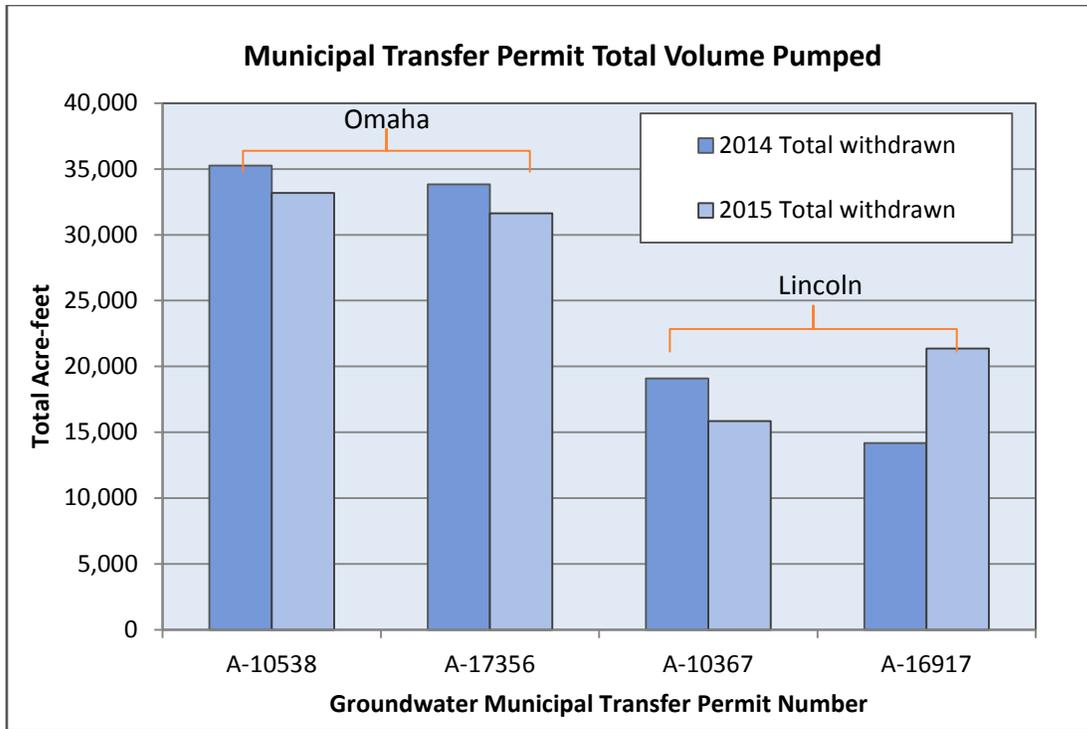


Figure 4. 2014-2015 City of Lincoln’s and Metropolitan Utilities District’s total amount of water pumped for municipal transfer permits

3. ADDITIONAL PROGRESS TOWARDS GOALS, OBJECTIVES AND ACTION ITEMS

The following gives an overview of NeDNR’s activities in 2014-2015 that support the goals and objectives, and action items of the IMP. The specific goal, objective, and/or action item(s) that the activity pertains to is denoted after each sub-heading below.

ENWRA (Goals 1, 2 and 4; action items 1.1.4, 2.1.5, 4.1.2)

NeDNR has participated in the Eastern Nebraska Water Resources Assessment (ENWRA) program in 2014 and 2015 to cooperate on hydrogeologic data research and modeling. ENWRA’s participants include six NRDs in eastern Nebraska and NeDNR. ENWRA’s primary project involves collection and interpretation of Airborne Electromagnetic Survey (AEM) data, which is a helicopter based-geophysical remote sensing tool that acquires subsurface data via continuous electromagnetic transmittals that penetrate the land surface. The acquired data are synthesized, which enables estimation of aquifer locations and thicknesses. The data will be used to update regional aquifer maps for eastern Nebraska.

In the summer of 2014, NeDNR entered into an interlocal cooperative agreement with ENWRA. As a part of this agreement, NeDNR contributed \$500,000 towards AEM data acquisition that covered approximately 1,400 miles of flight lines across Eastern Nebraska. NeDNR is in the process of studying whether the use of AEM data as input layers for NeDNR groundwater models can improve results, and ultimately refine hydrologically connected area delineations. NeDNR representatives attend technical and managerial meetings and review ENWRA reports as these become available to stay current with ongoing activities. For more information on ENWRA, please see <http://www.enwra.org/>.

NeDNR Pump-Site Inspections (Goal 2, Action items 2.1.5, 2.2.1, 2.2.2)

The NeDNR Field Office staff has been conducting surface water pump site inspections in the IMP area for the last two years. The goal of the pump site inspections is to gather information pertaining to use or non-use of the surface water right, crop type and irrigation status, at times a spot flow measurement, and irrigation method (gravity vs. center pivot).

In 2014, 37 out of 49 permits were inspected in 2014 by NeDNR Field Office staff. They visited pump sites and compiled data pertaining to each site. In 2015, the NeDNR Field Office staff visited 42 sites. Permitted activities for the sites included irrigation from natural flow and irrigation from storage facilities. At the time of the inspections, there were nine pumps in 2014 and eleven pumps in 2015 that were set up to irrigate. However, when visited none of the pumps were actually running, which could be due to a variety of factors (precipitation, timing of visit, etc.). The locations of the pump checks are shown in Figure 5.

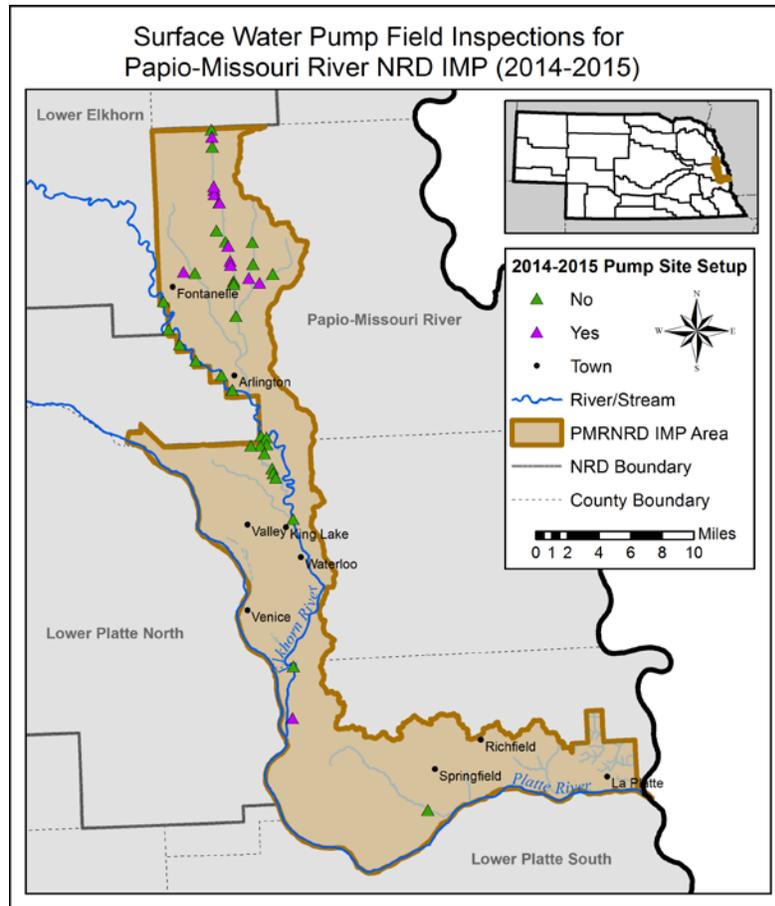


Figure 5. Surface water pump-site inspections

Lower Platte Missouri Tributaries Model (Goal 1, Objectives 1.1 and 1.3)

In 2014, NeDNR contracted with HDR, Inc. to develop a numerical groundwater model for Lower Platte and Missouri Tributaries (LPMtribs) basins. In an earlier assessment of available data and hydrogeology, it was determined that the model should be broken into two parts to create the Upper LPMtribs and the Nemaha (lower portion) groundwater models (Figure 6). Over the last year, NeDNR developed irrigated/dryland acres datasets for both the Upper LPMtribs and Nemaha models, using NRD certified acres datasets, and county assessor spatial data. These land use datasets will be used to create inputs for estimating recharge and pumping via a “watershed” model.

At the time of this writing, the Upper LPMtribs model is nearing completion of calibration, and once that is complete, those efforts will be moved to the Nemaha model. When complete, these models will be used as a tool for the fully appropriated basins annual report, as well as for assessing impacts of emerging and historic surface water and groundwater developments in the region, as well as will aid in refinement of hydrologically connected areas.

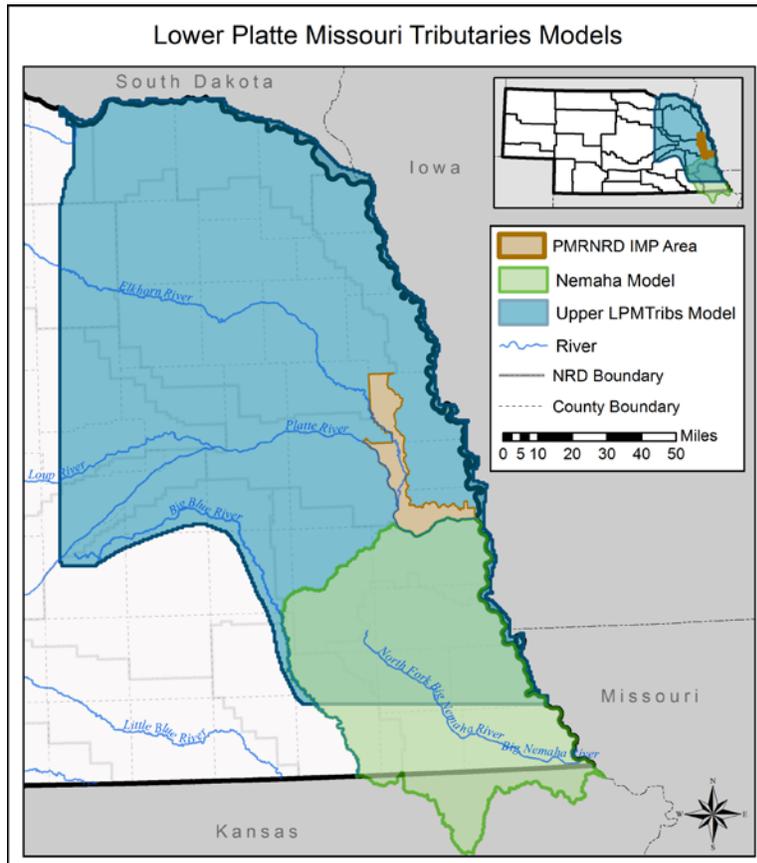


Figure 6. The Upper Lower Platte Missouri Tributaries and Nemaha model Boundaries

Education and Outreach (Goals 3, action item 3.1.1)

Integrated Network of Scientific Information and Geohydrologic Tools (INSIGHT)

The Integrated Network of Scientific Information and Geohydrologic Tools (INSIGHT) website at <http://dnr.nebraska.gov/insight/> is an important part of NeDNR's public outreach program. INSIGHT was released in January 2014, and it provides a mechanism for the public to access and review water use and water supply information as it relates to Nebraska's unique subbasins. INSIGHT aids water managers and other interested parties to better understand current and future water demands, effectiveness of water management strategies, and critical areas of water shortage. The user can access information pertaining to precipitation, water demands (irrigation, hydropower, etc.), as well as view maps with associated charts that show overall water balance (current, near-term or long-term) for the subbasin. Another great feature of INSIGHT is that all the datasets that are used to compile the water balance analyses are also stored within the web application, and are available for download.

At this time, NeDNR has compiled data for the Lower Platte River, North Bend to Louisville, which covers a portion of the P-MRNRD IMP area (Figure 7); however there are areas of the Missouri Tributaries that are not covered by INSIGHT. NeDNR plans to expand the area covered by INSIGHT as data become available, such as the modeling data from the LPMT model.

Public Outreach Events

During 2014 and 2015, NeDNR promoted wise water use and conservation at outreach events through the development of a television documentary, and through the INSIGHT web portal. NeDNR had educational booths at the Nebraska State Fair (2015 only), Husker Harvest Days, and the Nebraska Women in Agriculture conference, which all attract attendees from across the state. One demonstration NeDNR performed at the State Fair and Husker Harvest Days was using its groundwater model to convey the hydrologic connection between surface water and groundwater, emphasizing how over-pumping groundwater can change the direction of flow and reduce surface water availability. At the Women in Agriculture Conference, NeDNR focused specifically on the Integrated Water Management Division's current planning and modeling efforts within each NRD, including the P-MRNRD.

Other Media

NeDNR also worked with NET Television in 2015 to develop a 30-minute documentary program entitled "Water Today: Water Tomorrow." Topics covered in the video that are relevant to integrated management planning include surface water-groundwater interactions, how data and analyses are used to support water supply planning and management decisions, and the uniqueness of IMPs as a collaborative management effort between DNR and the NRDs. This video has aired on NET Television stations across the state and is available on both NeDNR and NET's websites for online viewing.

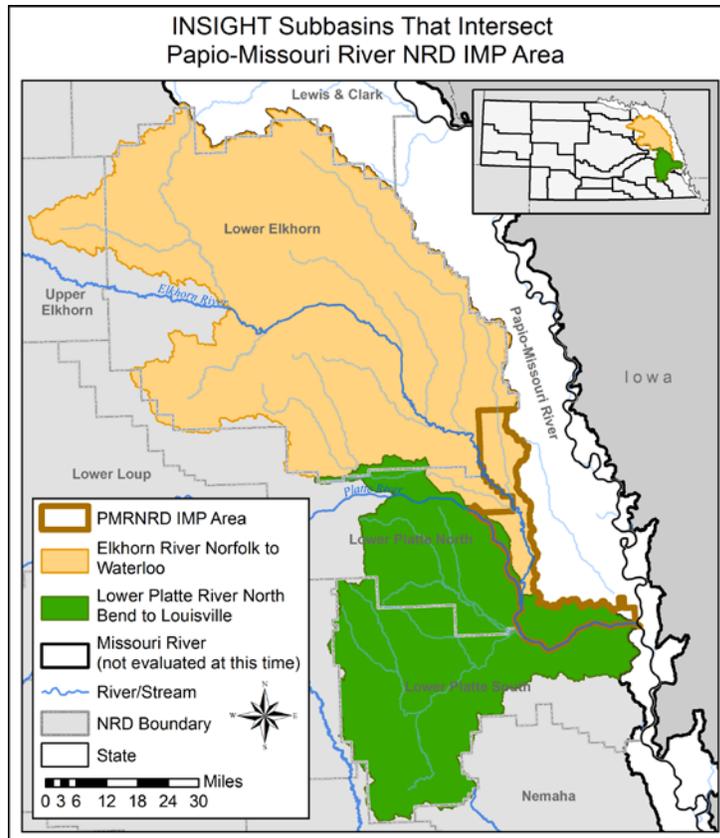


Figure 7. INSIGHT subbasins that intersect the P-MRNRD; INSIGHT areas will be expanded as data becomes available.

Basin-wide Planning (Goals 4, action items 4.1.1, 4.2.2, 4.2.3)

NeDNR is a member of the Lower Platte River Basin Coalition, a group that includes seven NRDs that are developing a Lower Platte River basin-wide plan. NeDNR attends meetings and keeps up with reports and literature pertaining to these activities, and continues to be an active participant in developing this plan.

4. REGULATORY ACTIONS

IMPs must include one groundwater control and one surface water control. NeDNR's surface water control mimics the P-MRNRD groundwater control, which is to restrict the number of acres available for irrigation. More specifically, NeDNR will restrict the number of additional acres for surface water irrigation in the surface water areas that drain into the hydrologically connected areas (surface water control area) in an amount equal to 1/3 of the amount of acres that P-MRNRD will allow for new groundwater irrigated acres. At the close of each year, NeDNR inquires with the P-MRNRD about their acres limitations at that time. NeDNR then sets their limit at 1/3 that amount for the following year.

The P-MRNRD has limited development to 2,500 acres at the close of both 2014 and 2015, and as such, NeDNR has placed a limit on expansion of surface water acres to 834 acres both in 2014 and 2015 in the surface water control area (Figure 8). NeDNR did **not** approve, cancel, deny or transfer any surface water applications/rights in 2014 or 2015.

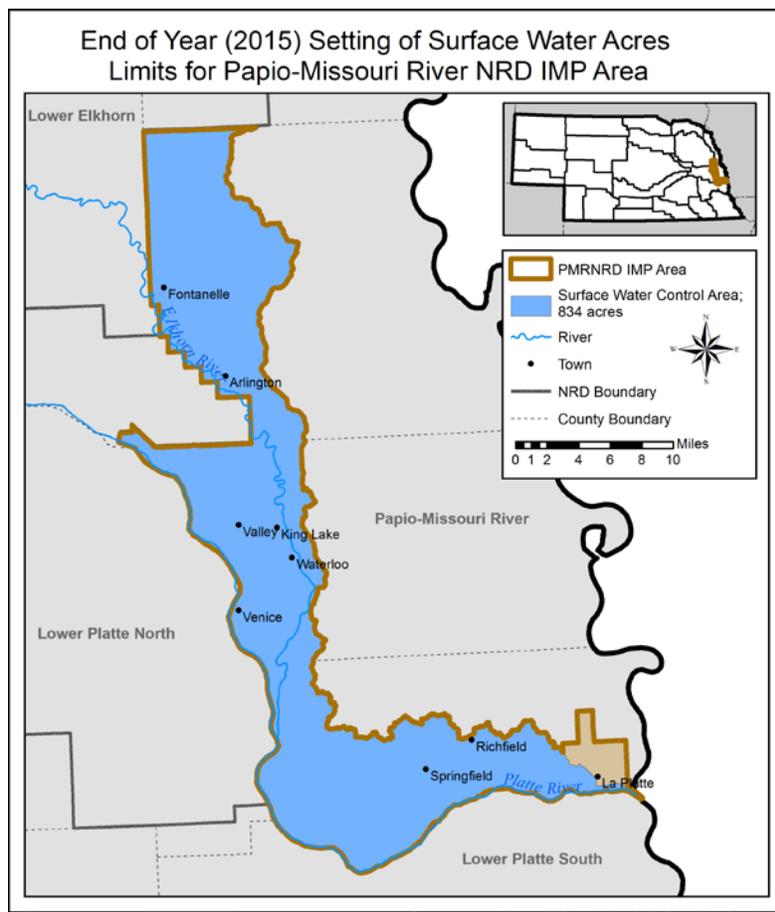


Figure 8. The surface water control area of the joint P-MRNRD and NeDNR IMP.

5. JOINTLY IDENTIFIED ACTIONS FOR SUCCEEDING TWO YEARS

The action steps that the NeDNR and P-MRNRD plan to implement in the next two years follow. These are in addition to the continued monitoring and reporting outlined in the regulatory and non-regulatory sections of this annual report, and serve as action steps in meeting goals and objectives presented in the IMP:

1. NeDNR will continue to develop INSIGHT as a tool for water management, and will expand the analysis to the east (Missouri Tributaries) as data become available.
2. NeDNR will continue to participate in ENWRA. NeDNR will continue to study whether aquifer properties from AEM data improve model results over current methods.
3. NDNR will work on expanding the stream accretions/depletions calculator (currently used in the Upper Platte Basin) to the remainder of Nebraska.
4. NeDNR will continue public outreach activities related to integrated water management, and will plan to participate in one joint public outreach event with the P-MRNRD in the next two years.
5. NeDNR will continue to monitor surface water permit sites on a rotating basis to gain a better understanding of surface water use within the P-MRNRD.
6. NeDNR will continue to evaluate the need for additional stream gages in the IMP area.