

Agenda Item: 11.

Memorandum

To: Papio-Missouri River Natural Resources District Programs Projects and Operations Subcommittee
From: Paul W. Woodward, PE, Groundwater Management Engineer
Date: December 7, 2015
Re: Water Sustainability Fund Application for the AEM Southwestern Sarpy County Dakota Aquifer Mapping Project

The District has been a partner of the Eastern Nebraska Water Resources Assessment (ENWRA) project for almost 10 years. During this time, ENWRA projects have provided valuable insight into the complex geology found in Eastern Nebraska and our District. The most recent Airborne Electromagnetic Survey (AEM) flights were completed in the spring of this year with a final report and data delivered in September. During this survey, several cross sections were flown in western portions of our NRD as shown in the attached Figure 1-1. Of particular interest is the tic-tac-toe pattern of cross sections in Southwestern Sarpy County aimed at defining the extents of the shallow Dakota aquifer in this area that is mostly used for municipal and domestic (acreages) supply, see attached Figure 1 and example cross section.

This potentially isolated Dakota aquifer has been under increasing demand as a drinking water supply, yet has seen areas of high nitrates during water quality testing, see Figure 2 attached. Many of the existing domestic wells have screens near the bottom of the aquifer since it is fairly shallow (between 100' and 200'), but it is anticipated that nitrate contamination near the upper portion of the aquifer may eventually cause concerns. Also, other than potential mapping that can be done using credible well or test hole logs and the recent AEM cross sections, the physical extent and depth of this aquifer cannot be completely defined. Actually knowing and mapping the extent and volume of this aquifer would provide great management benefits. For example:

- Existing residents can determine where their well falls in relation to the actual depth of the aquifer and may decide to drill their well deeper if problems arise.
- New wells can be constructed in better ways to avoid potential issues.
- Recharge of groundwater from the surface can be better understood and managed.
- Water quantity issues can be mapped for insufficient aquifer areas.

Additional AEM surveys are necessary to provide both a defined extent and total volume of this aquifer area. Working together with ENWRA and other interested NRDs, multiple small project Water Sustainability Fund (WSF) applications are being prepared to secure funding for AEM surveys. The proposed survey area shown in Figure 1 is approximately 130 mi². Using a rough airborne flight plan for this area at the minimum resolution needed would require approximately \$400,000. This falls beneath the small project maximum for 60% of eligible costs for the WSF of \$250,000 and may require up to \$160,000 in P-MRNRD funding to be budgeted in FY 2017.

Staff recommends that the subcommittee recommend to the Board of Directors that the General Manager be authorized to execute and submit a Water Sustainability Fund application in the amount of 60% of eligible project costs for the AEM Southwestern Sarpy County Dakota Aquifer Mapping Project, subject to changes deemed necessary by the General Manager.

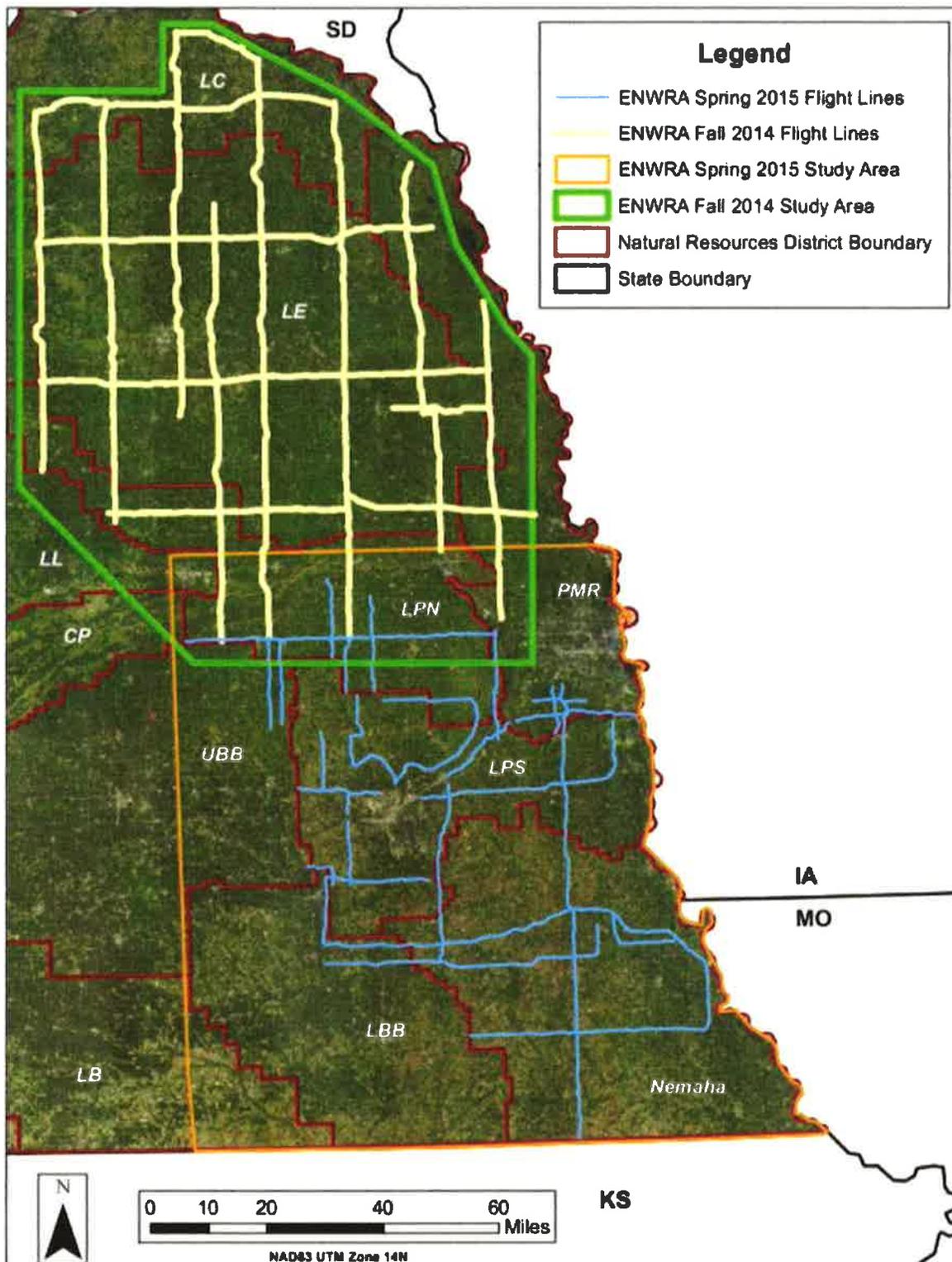
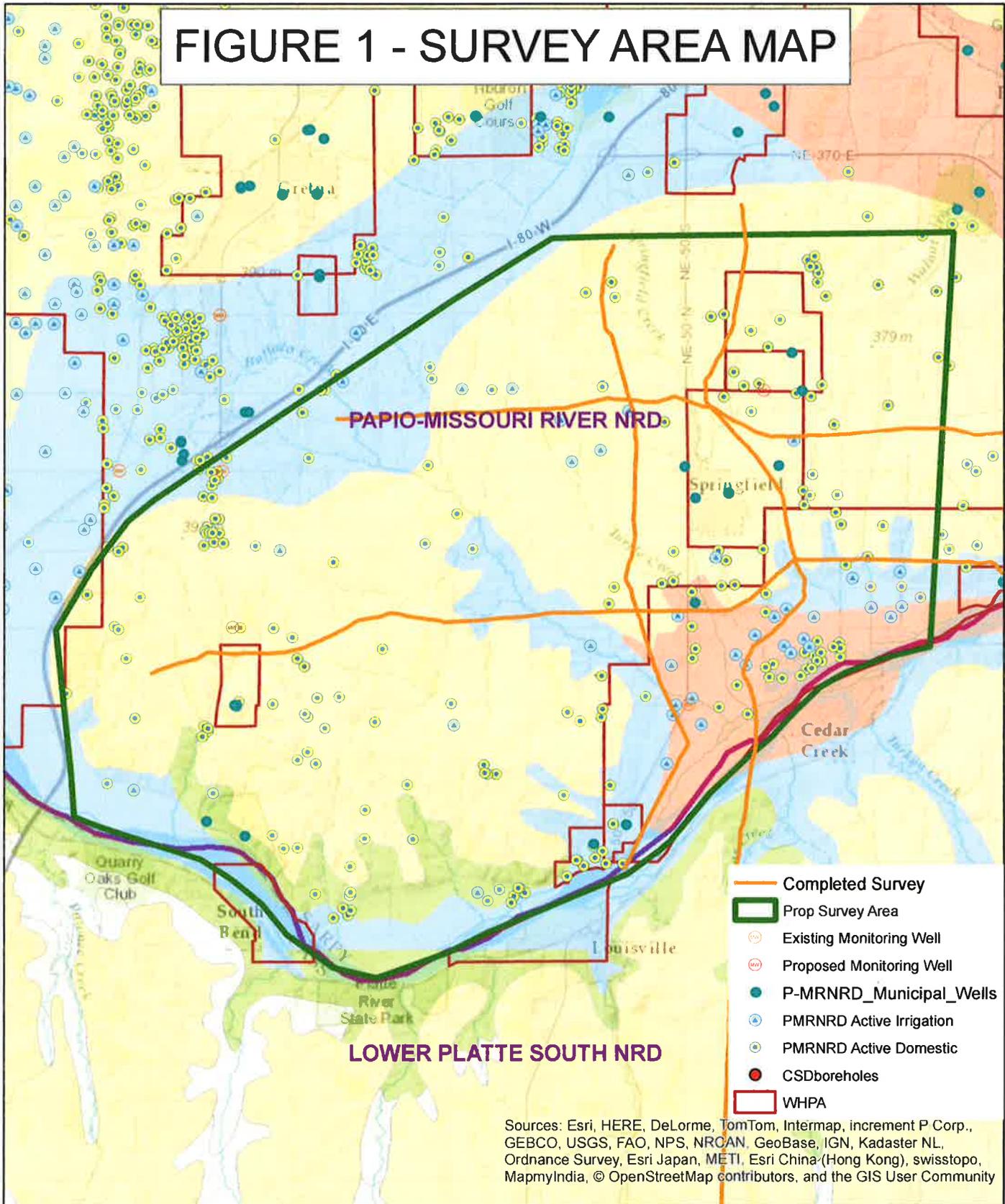
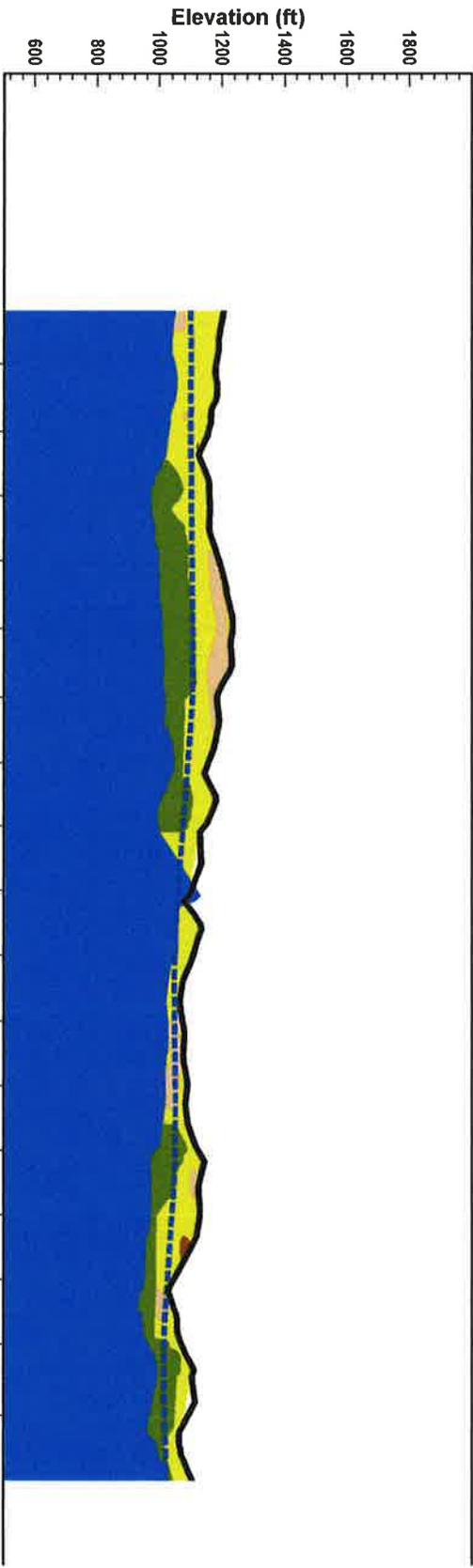
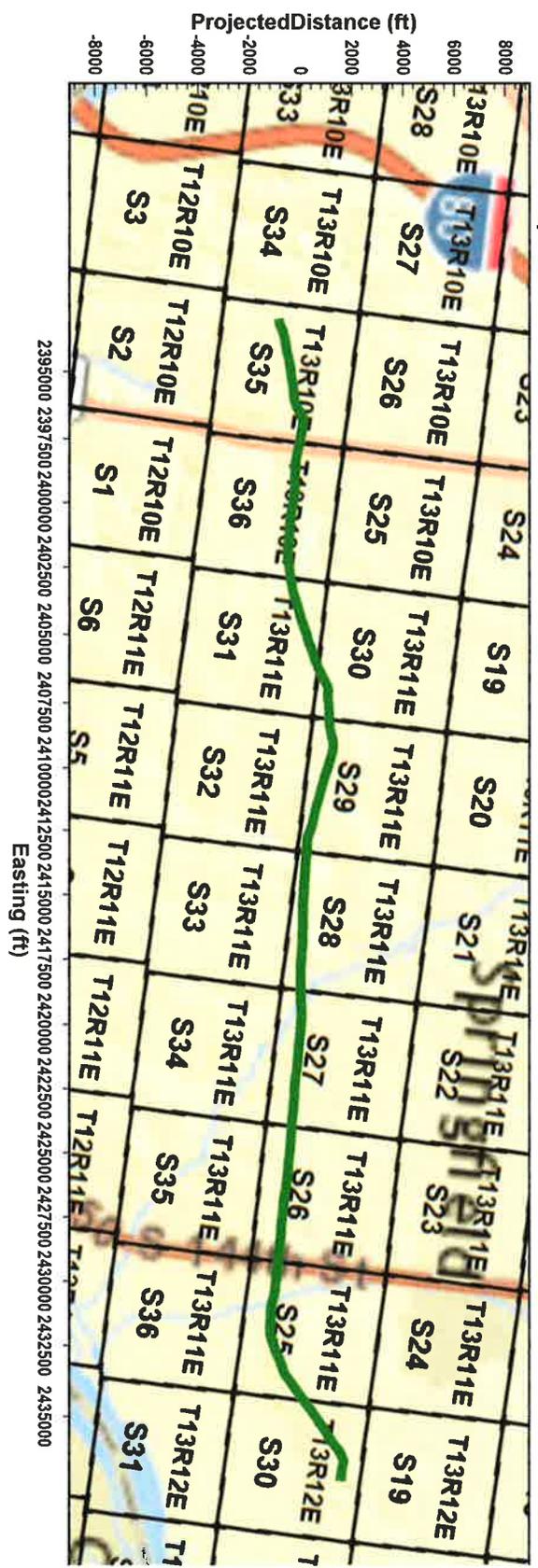


Figure 1-1: Map of the ENWRA project area, with the northern extent of the survey area (Phase I) and flight lines highlighted in green and yellow, respectively. The southern half of the project area (Phase II) is outlined in orange.

FIGURE 1 - SURVEY AREA MAP



Location Map - Line L300402a



Quaternary/Ogallala Aquifer Material Legend



Stratigraphy Interpretation



Interpreted geologic sections from AEM data and flight line location map provided in conjunction with Google Earth kmz file. Interpreted sections and flight lines have been broken into 10 mile (or shorter) segments. The projected downline distance is equal for the flight line (top image) and the AEM data interpretation (bottom image). The CSD 1995 water table is shown as a dashed blue line on the interpretation image. Additional information regarding the use of these figures and the AEM data may be found in the report titled "Airborne Electromagnetic Geophysical Surveys and Hydrogeologic Framework Development for Selected Sites in the Eastern Nebraska Water Resources Assessment".

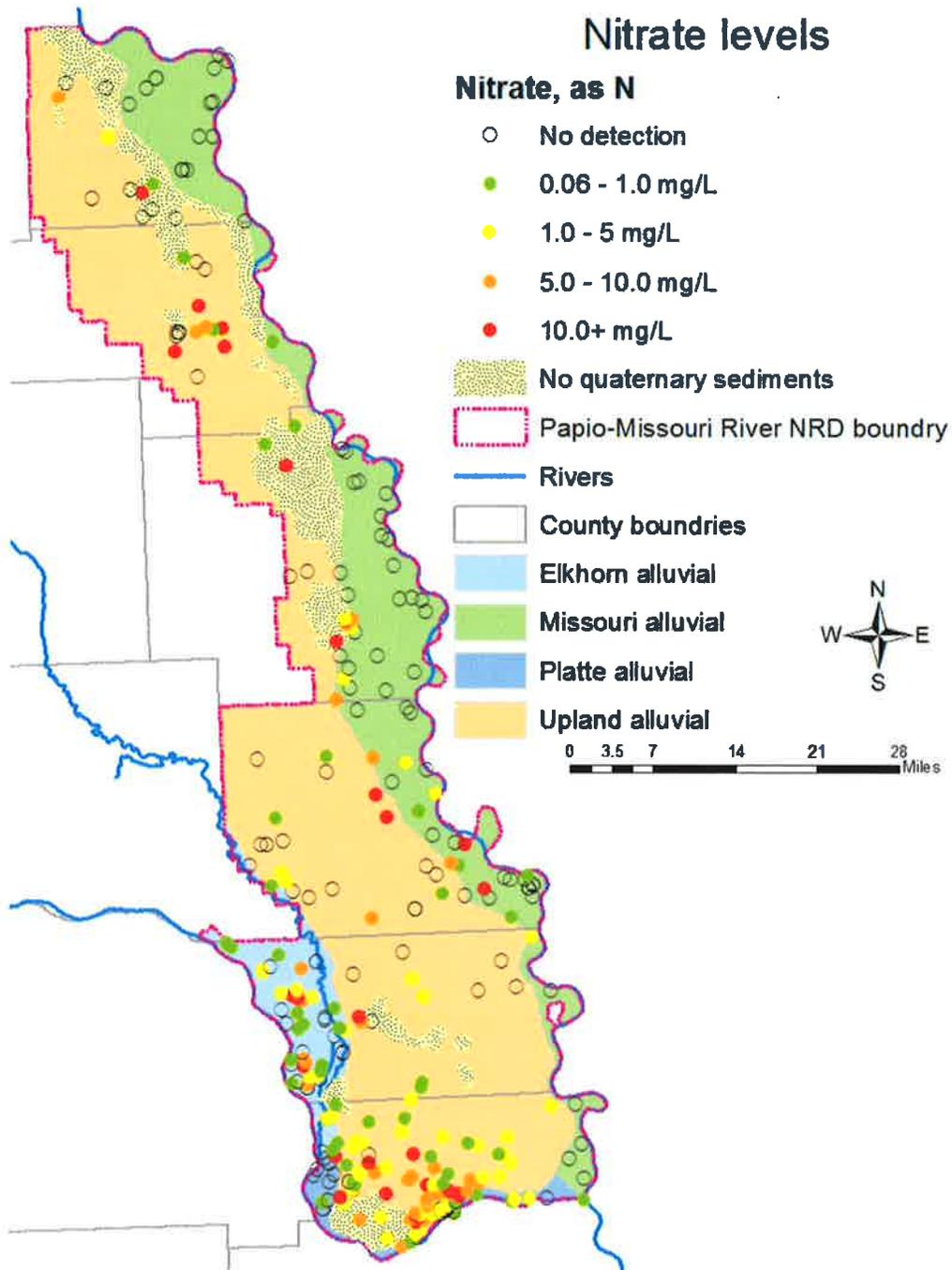


Figure 2. Wells sampled from 1992-2013 (Produced by USGS 2015)