Lower Platte River
CORRIDOR ALLIANCE

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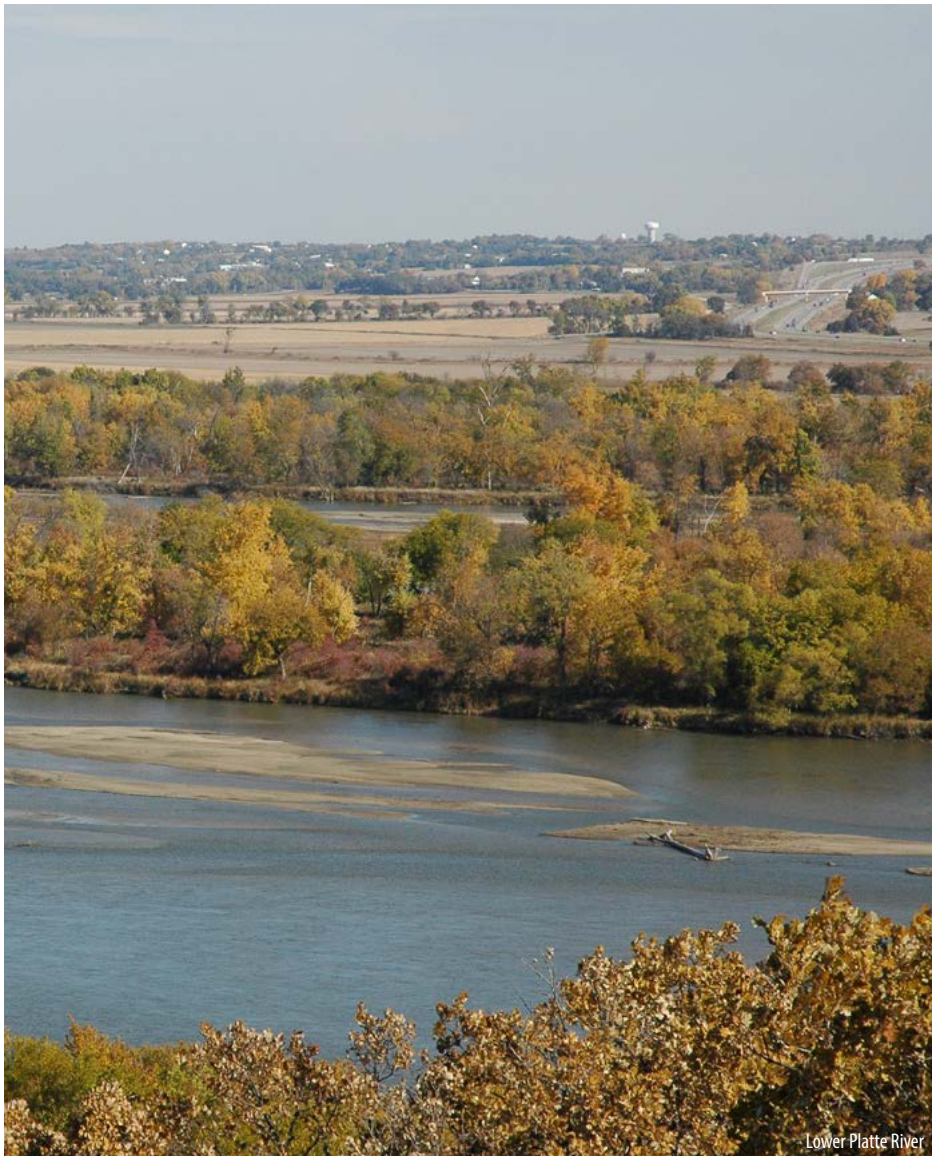
The voice of the Lower Platte.

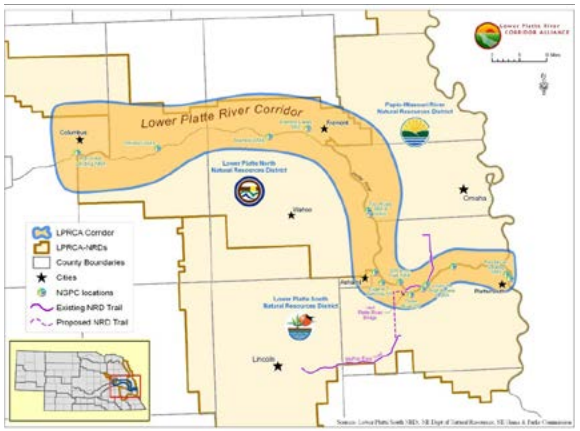
WATER QUALITY MANAGEMENT PLAN

for The Lower Platte River Corridor Alliance

Approved by EPA on April 9, 2019


Lower Platte River

INTRODUCTION



Lower Platte River Corridor

The LPRCA included three Natural Resource Districts (NRDs) and six state agencies dedicated to protecting the long-term vitality of the Lower Platte River Corridor. The entities making up the LPRCA are: Lower Platte North NRD (LPNNRD); Lower Platte South NRD (LPSNRD); Papio–Missouri River NRD (PMRNRD); Nebraska Game and Parks Commission (NGPC); Nebraska Department of Natural Resources (NDNR); Nebraska Department of Environmental Quality (NDEQ); Nebraska Military Department; Nebraska Department of Health and Human Services (DHHS); and University of Nebraska – Conservation and Survey Division, School of Natural Resources, and Nebraska Water Center.

The Lower Platte River Corridor generally is defined as the 110 miles of the Lower Platte River, the bluffs, and adjoining public and private lands located within the floodplain of the Lower Platte River from Columbus, Nebraska, to the mouth of the river near Plattsmouth, Nebraska. The Lower Platte River Corridor dissects a portion of 8 counties and 24 communities fall within its boundaries.

In September 2012, LPRCA submitted a Nonpoint Source Pollution Management Project application to NDEQ for funding under the State's Nonpoint Source Water Quality (Section 319) Program. The watershed management portion of this study was funded allowing for the development of this study, the Lower Platter River Watershed – Water Quality Management Plan (Plan).

Department of Environmental Quality Section 319

Under Section 319 of the federal Clean Water Act, the federal government awards funds to the Nebraska Department of Environmental Quality to provide financial assistance for the prevention and abatement of nonpoint source water pollution. This funding is passed through to units of government, educational institutions, and non-profit organizations, for projects that facilitate implementation of the state Nonpoint Source Management Plan.

E. coli bacteria

Members of two bacteria groups, coliforms and fecal streptococci, are used as indicators of possible sewage contamination because they are commonly found in human and animal feces. Although they are generally not harmful themselves, they indicate the possible presence of pathogenic (disease-causing) bacteria, viruses, and protozoans that also live in human and animal digestive systems. Therefore, their presence in streams suggests that pathogenic microorganisms might also be present and that swimming and eating shellfish might be a health risk. Since it is difficult, time-consuming, and expensive to test directly for the presence of a large variety of pathogens, water is usually tested for coliforms and fecal streptococci instead.

The most commonly tested fecal bacteria indicators are total coliforms, fecal coliforms, Escherichia coli, fecal streptococci, and enterococci. All but *E. coli* are composed of a number of species of bacteria that share common characteristics such as shape, habitat, or behavior; *E. coli* is a single species in the fecal coliform group. Nebraska state bacteria water quality standards are based on concentrations of *E. coli*.

Watershed management plans funding by Section 319 are required to follow the guidelines established by EPA for their development. EPA has developed the *Handbook for Developing Watershed Plans to Restore and Protect our Waters* (EPA, 2008) to aid in the development of Section 319 funded watershed management plans. The guidance establishes nine elements that must be included in a watershed management plan. The following provides the element and the location of the presentation of that element within this Plan:

1. Identify causes and sources of pollution
2. Estimate pollutant loading into the watershed and the expected load reductions
3. Describe management measures that will achieve load reductions and targeted critical areas
4. Develop an information/ education component
5. Develop a project schedule
6. Describe the interim, measurable milestones
7. Identify indicators to measure progress
8. Develop a monitoring component
9. Estimate amounts of technical and financial assistance and the relevant authorities needed to implement the plan

TSS – sediment

Total solids are dissolved solids plus suspended and settleable solids in water. In stream water, dissolved solids consist of calcium, chlorides, nitrate, phosphorus, iron, sulfur, and other ions particles that will pass through a filter with pores of around 2 microns (0.002 cm) in size. Suspended solids include silt and clay particles, plankton, algae, fine organic debris, and other particulate matter. These are particles that will not pass through a 2-micron filter. The analyses performed in this watershed plan attempt to characterize the sediment load but use the TSS measurements as the best available data to use as a surrogate.

Total Phosphorus

Phosphorus is an essential nutrient for plants and animals. However, an excess amount of phosphorus in a waterway may lead to low levels of dissolved oxygen and negatively alter various plant life and organisms. Pure, "elemental" phosphorus (P) is rare. In nature, phosphorus usually exists as part of a phosphate molecule (P04). Phosphorus in aquatic systems occurs as organic phosphate and inorganic phosphate. Organic phosphate consists of a phosphate molecule associated with a carbon-based molecule, as in plant or animal tissue. Phosphate that is not associated with organic material is inorganic. Inorganic phosphorus is the form required by plants. Animals can use either organic or inorganic phosphate. Both organic and inorganic phosphorus can either be dissolved in the water or suspended (attached to particles in the water column).

Total Nitrogen

Nitrogen is an essential nutrient for plants and animals. However, an excess amount of nitrogen in a waterway may lead to low levels of dissolved oxygen and negatively

STUDY AREA

The Plan Study Area is approximately 1,120 square miles all within the Lower Platte- Shell, Lower Platte, and Salt Hydrologic Unit Code 8 watersheds (see **Figure ES-1**). In addition, a portion of the Lower Elkhorn watershed was included due to the overall influence of the Elkhorn River to the Lower Platte River **Table ES-1.**

Table ES-1. Study Area Size Details

HUC 8 Name	Square Miles	Percent
Lower Platte – Shell	376.74	33.63
Lower Platte	498.93	44.53
Salt	205.68	18.36
Lower Elkhorn	38.97	3.48
Total	1120.32	100.00

PLAN GOALS

The overarching vision for the development of the Plan is to gain an understanding of select surface water constituent contributions to and distributions within Study Area. The following goals were established for the Plan:

- **Goal 1 – Identification of Management Actions**
  Prioritize watersheds based on contributions of *E. coli* bacteria to the Lower Platte River to determine planning and management actions.
- **Goal 2 – Reduce Point Source Contribution of *E. coli* bacteria**
  Establish a mechanism for point source reduction of *E. coli* bacteria from unregulated septic tank sources.

STAKEHOLDER INVOLVEMENT

Due to the large size of the Plan study area and the overall basis for the Plan development, stakeholder involvement is addressed through a technical advisory group. The technical advisory group was formulated based on input from the technical staff at the participating NRDs, NDEQ, and other state agencies. Stakeholder input in this fashion was obtained through stakeholder meetings at key points in the Plan development as well as at regularly scheduled LPRCA meetings.

POLLUTANT LOADING

The primary pollutant sources being addressed by this study is *E. coli* bacteria. Other constituents being addressed are nutrients total phosphorus (TP), total nitrogen (TN) and sediment (total suspended sediment (TSS) . The existing loadings of *E. coli* will be determined so that appropriate load reductions can be determined, based on best management practices (BMPs) to meet the desired goals and objectives set forth for the Plan.

Point and nonpoint pollutant sources for *E. coli* (as well as other constituents) were identified for each of the 34 sub-watersheds within the Study Area (**Figure ES-2**). Recreational season[1] *E. coli* loadings at key locations throughout Study Area were characterized using load duration curves (LDCs) developed from existing data. As described below, the loadings were apportioned by land use to the 12-digit HUCs within the LPRCA study based on a source tracking study from a nearby basin and using literature-based assumptions regarding decay rate and stream velocity. A full explanation of this method is provide in **Appendix B**.

[1] In Nebraska, the recreational season runs from May 1 through September 30 and is the only period in which the *E. coli* criterion of 126 cfu/100 mL applies. Therefore, bacteria TMDL loading do not apply outside this period and will not be calculated on an annual basis. Although the proposed approach focuses on the recreational season, this is not meant to imply that best management practices would not or should not be applied year-round. In fact, studies have shown that bacteria can survive in stream sediment for extended periods of time only to be resuspended during high flows at a later date (Cervantes 2012).

alter various plant life and organisms. There are three forms of nitrogen that are commonly measured in water bodies: ammonia, nitrates and nitrites. Total nitrogen is the sum of total Kjeldahl nitrogen (ammonia, organic and reduced nitrogen) and nitrate-nitrite. Total nitrogen can be determined as the sum of the total Kjeldahl nitrogen plus nitrate-N and nitrite-N. TN can also be measured by a high temperature persulfate digestion step that converts all of the nitrogen to nitrate, which is then measured by colorimetric or other method.

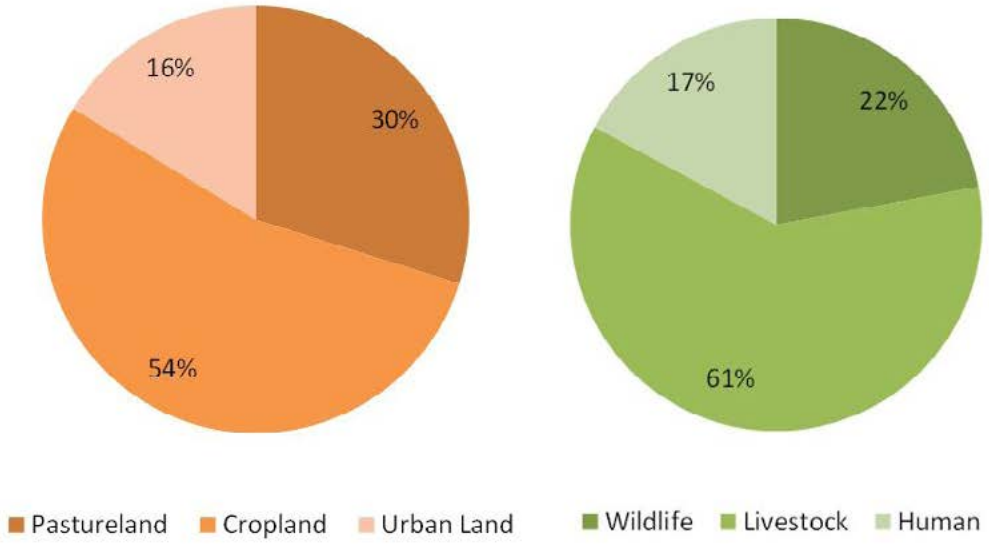
Atrazine

Atrazine is a white, crystalline solid organic compound. One of the most widely used agricultural pesticides in the U.S., atrazine may be applied before and after planting to control broadleaf and grassy weeds. It is used primarily on corn, sorghum, and sugarcane, and is applied most heavily in the Midwest. Atrazine is used to a lesser extent on residential lawns.

The estimated total recreational season *E. coli* loadings by watershed is shown in **Figure ES-3**.

Based on these results, approximately 54% of the bacteria loading within the Study Area originates from cropland due to it being the dominant land use (see graphic below). Based on the breakdown of bacteria sources, approximately 61% of the bacteria loading is estimated to originate from livestock. Wildlife is the next largest source at approximately 22%, followed by humans at 17%. Potential delivery pathways associated with each of the three model sources are discussed below.

Percent Contribution of Bacteria Loadings in the LPRCA Study Area by Land Use and Source




Schramm Bluffs

POLLUTANT LOAD REDUCTIONS

The overarching vision for the development of this Plan is to gain an understanding of the contributions and distribution of select water quality constituents (*E. coli* bacteria, total nitrogen, total phosphorus, total suspended sediments, and atrazine) within the Lower Platte River Corridor to improve and protect surface water quality in the lower Platte River. Due to the establishment of a TMDL for the Lower Platte River Basin (TMDL–LPRB) (NDEQ, 2007) for *E. coli* bacteria, a focus on the reductions needed to meet the water quality standard for this parameter are of utmost importance.

The published TMDL–LPRB calls for targeted load reductions throughout the Lower Platte River Basin to meet water quality criteria that are fully supportive of the primary contact recreation beneficial use. To account for uncertainty in the nonpoint source load reduction, the TMDL–LPRB targets reductions set at 90% of the water quality criterion of 126 col/100 ml. Specifically, the TMDL–LPRB targets an *E. coli* concentration of 113 col/100 ml as a recreational season mean in both the lower (LP1-10000) and upper (LP1-20000) segment of the Lower Platte River. To achieve this target, the TMDL–LPRB calls for an 85% reduction in LP1-20000 based on an observed *E. coli* concentration of 750 col/100 ml. A 64% reduction is called for in LP1-10000 based on an observed geometric mean concentration of 314 col/100 ml which would require an 82% reduction.

While the TMDL–LPRB calls for a 64–85% reduction in *E. coli*, targeted reductions are based here on more recent data collected from the Platte River at Louisville (USGS Gauge 06805500). Per methods described in **Appendix B**, a load duration table was developed for *E. coli* for the Louisville station (**Table ES-2**). The Louisville station is considered representative of the Study Area as it is located near the downstream end of the Platte River. Based on the load duration curve, the most significant bacteria loadings occur during wet weather conditions. However, as the *E. coli* target is applied as a recreational season geometric mean the required reductions are not specific to any one flow regime. Therefore, existing conditions were set equal to the geometric mean weighted across all flow regimes. Based on this approach the Platte River has an *E. coli* concentration of 640 col/100 ml, which requires an 82% reduction to achieve the TMDL target of 113 col/100 ml. The targeted 82% reduction shall broadly apply to the entire Study Area. Contributing drainage areas located outside the study area are beyond the scope of this Plan.

PLAN FORMULATION

Prioritizing Watersheds for Management Measure Implementation

Understanding the potential for load reductions is a valuable tool to aid in determining the benefits a watershed could incur with increased management practices. However, due to the number of assumptions needed for percent of the HUC 12s in the Study Area that have existing treatments and the effectiveness of those treatments, it was determined that the total contributing loads to the observed seasonal geometric means at both North Bend and Louisville for *E. coli* bacteria would be used to determine priority watersheds within the Study Area to begin focused efforts to improve water quality. As described above, some measures to remove *E. coli* bacteria would also be effective in removal of total nitrogen, total phosphorus, total suspended sediments, and atrazine.

Due to the focus on addressing the *E. coli* TMDL, the contributions of each watershed to the observed geometric mean establishing the TMDL was used. The following describes this priority system:

- **Priority 1 Watersheds** – Due to the number of watersheds having large *E. coli* loadings within the Study Area, multiple factors were considered in determining the Priority 1 watersheds. Each NRD analyzed the needs of their respective watersheds when determining priority beyond *E. coli* loading. Due to the amount of agriculture with the watershed, the Lower Platte North NRD considered the availability of landowners willing to implement BMPs in determining priority areas as well as geographical considerations of watershed position (watersheds higher in the contributing drainage area to the lower Platte River. The Lower Platte South and Papio-Missouri River NRDs are situated within areas that are experiencing high levels of agriculture conversion to suburban and urban development uses. These NRDs used future land use planning as a criteria in deciding priority areas to identify which watersheds had availability to establish BMPs prior to development occurring. In addition, the potential for landowner participation in BMPs and most cost effective practices were considered in the prioritization.
- **Priority 2 Watersheds** – The next top ten highest contributing watersheds of *E. coli* contributions (cfu/100 ml) regardless of NRD Boundary.
- **Priority 3 Watersheds** – All remaining watersheds with the Study Area in order of *E. coli* contributions (cfu/100 ml).

Based on the *E. coli* loadings, **Table ES-2–4** provides the Priority 1, 2, and 3 watersheds, respectively. **Figure ES-3** provides these watershed locations within the Study Area.

Based on the management measures described above, the Priority 1 watersheds were analyzed for the potential BMP implementation and the resultant anticipated *E. coli* load reductions. Preliminary estimates indicate that the cumulative reduction for the Priority 1 watersheds would be 75%.

Management Measures

The LPRCA has identified management measures that will occur on a watershed specific basis as well as across the entire Study Area in order to meet the plans, goals and objectives. Also, due to the number of watersheds within the Study Area and likely lengthy duration for overall implementation, these management measures were grouped into Management Initiatives for implementation. These Management Initiatives are (further details on these management measures are provided in the following section, **Management Plan Implementation**):

MANAGEMENT INITIATIVE 1

This Management Initiative will focus on management measures for the reduction of *E. coli* bacteria within Priority 1 watersheds. Each of the NRDs would assist in determining the types of BMPs appropriate for each Priority I watershed and would develop a project implementation plan. Coordination with the NDEQ and USGS would occur to determine the appropriate actions necessary to ascertain water quality information for each Priority I Watershed.

MANAGEMENT INITIATIVE 2

This Management Initiative will be implemented across the entire Study Area concurrently with Management Initiative 1.

1. Implement Voluntary Septic Tank Upgrade Program
2. Contributing Watershed Coordination Plan

Table ES-2: Priority 1 Watersheds

HUC	Subwatershed Name	Recreational Season *E. coli* Loading (cfu/year total)	NRD Name
102002010308	Headwaters Skull Creek	3.04E+16	Lower Platte North
102002010304	Headwaters Bone Creek	2.95E+16	
102002020210	Eightmile Creek	3.05E+16	Lower Platte South
102002020208	Turkey Creek-Platte River	2.77E+16	
102002020204	Buffalo Creek	2.54E+16	Papio-Missouri
102002020211	Zwiebel Creek-Platte River	2.13E+16	
102002020206	Turtle Creek	1.68E+16	

Table ES-3 Priority 2 Watersheds

HUC	Subwatershed Name	Recreational Season *E. coli* Loading (cfu/year total)	NRD Name
102002020101	Rawhide Creek-Platte River	9.49E+16	Lower Platte North
102200031006	Big Slough-Elkhorn River	4.44E+16	Papio-Missouri
102002010301	Shonka Ditch	3.90E+16	Lower Platte North
102002010209	Brewery Hill-Shell Creek	3.88E+16	
102002010310	Lost Creek-Platte River	3.73E+16	
102002020202	Western Sarpy Ditch-Platte River	2.98E+16	Papio-Missouri
102002020203	Decker Creek-Platte River*	2.81E+16	Lower Platte South
102002010307	Village of Abie	2.81E+16	Lower Platte North
102002010309	Outlet Skull Creek	2.69E+16	
102002010303	Deer Creek-Platte River	2.48E+16	

*As of the submittal of this Plan, Lower Platte South NRD is developing a District-wide 319 Watershed Water Quality Management Plan. Decker Creek-Platte River is currently anticipated to be Priority 1 watershed in that plan.

Table ES-4: Priority 3 Watersheds

HUC	Subwatershed Name	Recreational Season *E. coli* Loading (cfu/year total)	NRD Name
102002020103	Elm Creek-Platte River	2.41E+16	Lower Platte North
102002020205	Cedar Creek	2.31E+16	Lower Platte South
102002020104	Otoe Creek-Platte River	2.21E+16	Papio-Missouri
102002020207	Mill Creek-Platte River	2.17E+16	Lower Platte South
102002010306	Tomek Island-Platte River	2.15E+16	Lower Platte North
102002030907	Dee Creek-Salt Creek	2.12E+16	Lower Platte South
102002010305	Outlet Bone Creek	2.11E+16	Lower Platte North
102002020102	Headwaters Otoe Creek	1.79E+16	
102002010302	Headwaters Lost Creek	1.65E+16	
102002020201	Pawnee Creek	1.44E+16	Lower Platte South
102002020105	102002020105	1.43E+16	Papio-Missouri
102002031003	Headwaters Clear Creek	1.11E+16	Lower Platte North
102002031005	Wahoo Creek*	1.07E+16	
102002010311	102002010311	9.97E+15	
102002030906	Callahan Creek	8.45E+15	Lower Platte South
102002031002	Johnson Creek	7.88E+15	Lower Platte North
102002031004	Clear Creek	7.75E+15	

*An EPA 319 Watershed Water Quality Management Plan for Wahoo Creek has been developed for this watershed. Management strategies are addressed in that plan.

Implementation Schedule

The following is a proposed scheduled for the management measures identified here. LPRCA has grouped these measures into two implementation phases. This does not represent a priority for implementation, but rather, the duration of implementation as well as the necessary order of implementation to have the best information available for successful implementation of each management measure. The following provides the implementation schedule. Updates to this schedule are anticipated to occur annually as part of the LPRCA's review of all on-going project and initiatives.


Platte River at Louisville

YEARS 1–2

- Initiate Management Initiative 1 for Priority Watersheds
- Initiate Management Initiative 2

YEARS 3–5

- Initiate and implement BMPs for Priority 1 Watersheds
- Re-evaluate Priority Watersheds (as part of yearly Plan Re-Evaluation)
- Continue Voluntary Septic Tank Inspection Program
- Evaluate Management Initiative 2 and determine future course of action
- Watershed Plan Update (estimated at Year 5) including re-evaluation of Priority Watersheds

YEARS 6–10

- Initiate and implement BMPs for re-assessed Priority 1 Watersheds, as applicable
- Re-evaluate Priority Watersheds (as part of yearly Plan Re-Evaluation)
- Watershed Plan Update (estimated at Year 10) including re-evaluation of Priority Watersheds

YEARS 11–20

- Initiate and implement BMPs for re-assessed Priority 1 Watersheds, as applicable
- Re-evaluate Priority Watersheds (as part of yearly Plan Re-Evaluation)
- Watershed Plan Update (Year 15 and Year 20) and Re-evaluate Priority Watersheds

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Plan Implementation Costs

The costs for the implementation of this Plan are estimates based on best professional judgments. For Management Measure 2, costs are provided for the development of the performance of septic tank inspections. **Table ES-5** provides the summary of costs.

Table ES-5. Estimate of Plan Implementation Costs

Activity	Cost
Management Initiative 1 Implementation	
Best Management Practice Identification	$5–10k x 6 = $30–$60k
Implementation Cost and Schedule	$13.9m – $37.2m
Management Initiative 2	
Information Materials Development	$5–10k
Voluntary Inspections (15 anticipated for Year 1)	$7.5k
Corrective Actions for Septic Tanks (5) during Year 1	$30k
Voluntary Inspections (15 anticipated for Year 2)	$7.5k
Corrective Actions for Septic Tanks (5) during Year 2	$30k
Plan Update (year 5)	$50k
Information and Education	$1.5k
Plan Re-Evaluations (yearly)	Performed as part of LPRCA administrative actions
Plan Update (year 10)	$50k
Plan Update (year 15)	$50k
Total	**$14.1m – $37.5m**

Figure ES-1. Study Area

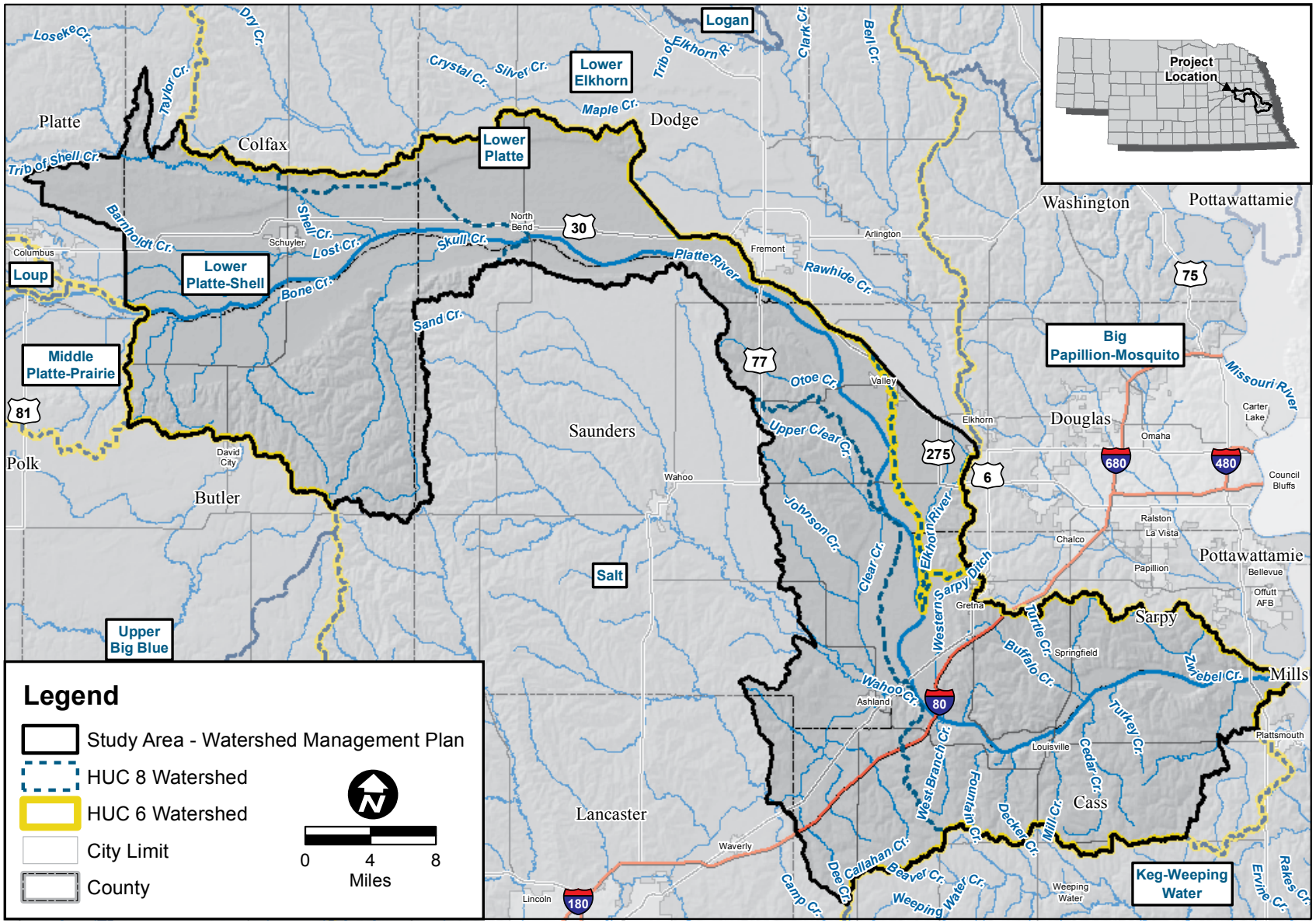


Figure ES-2. Watersheds

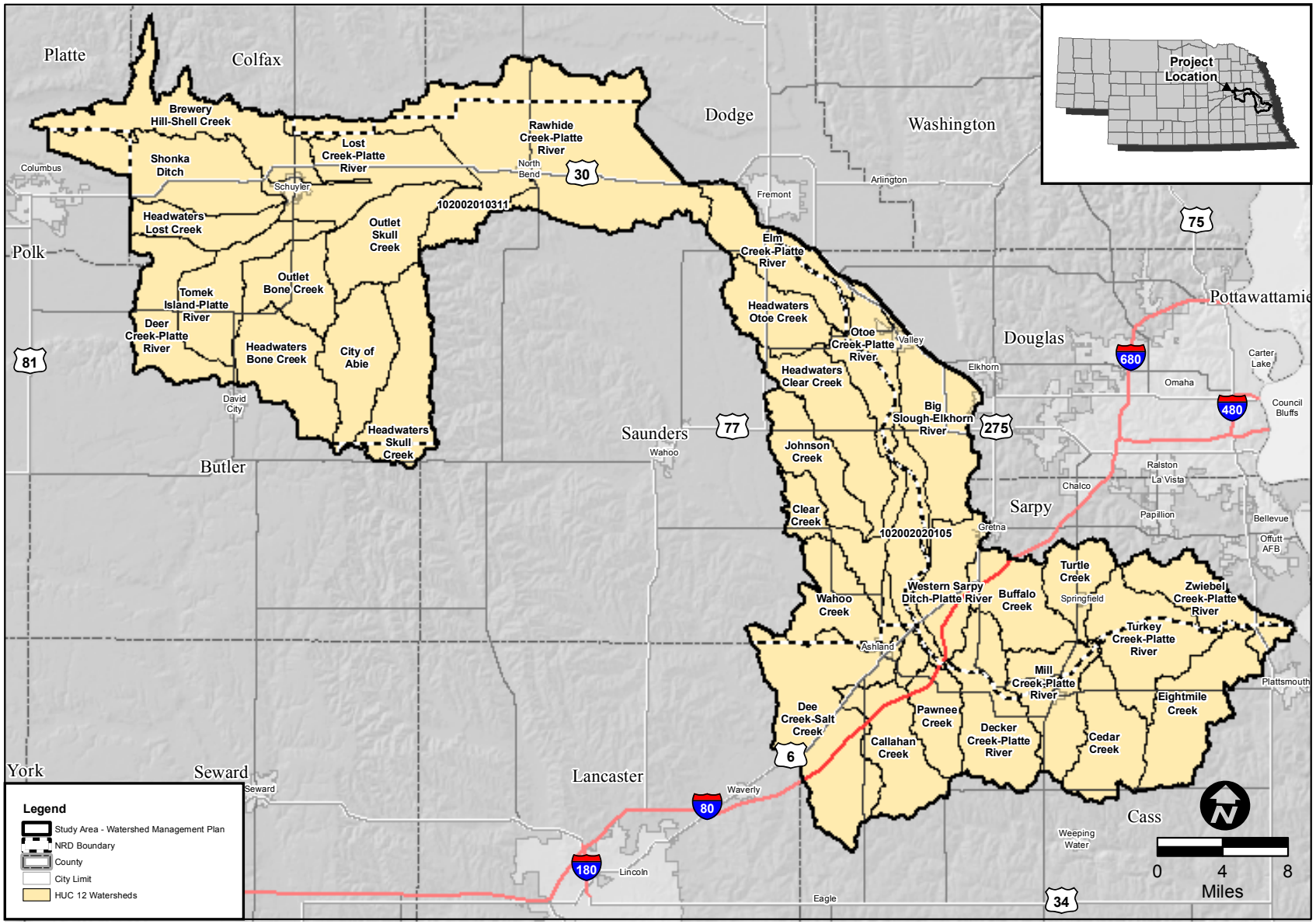


Figure ES-3. Estimated Recreational Season *E. coli* Loadings

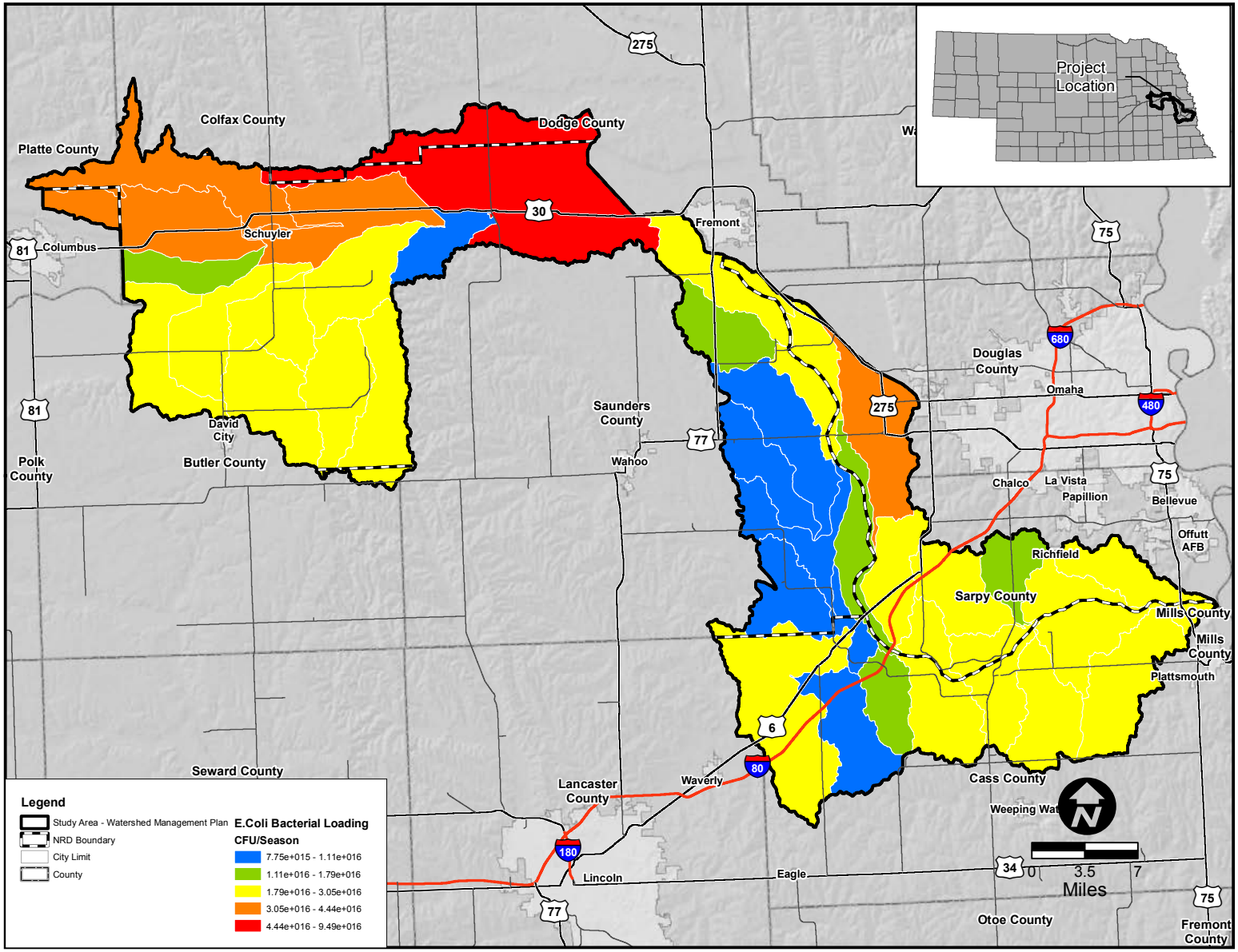
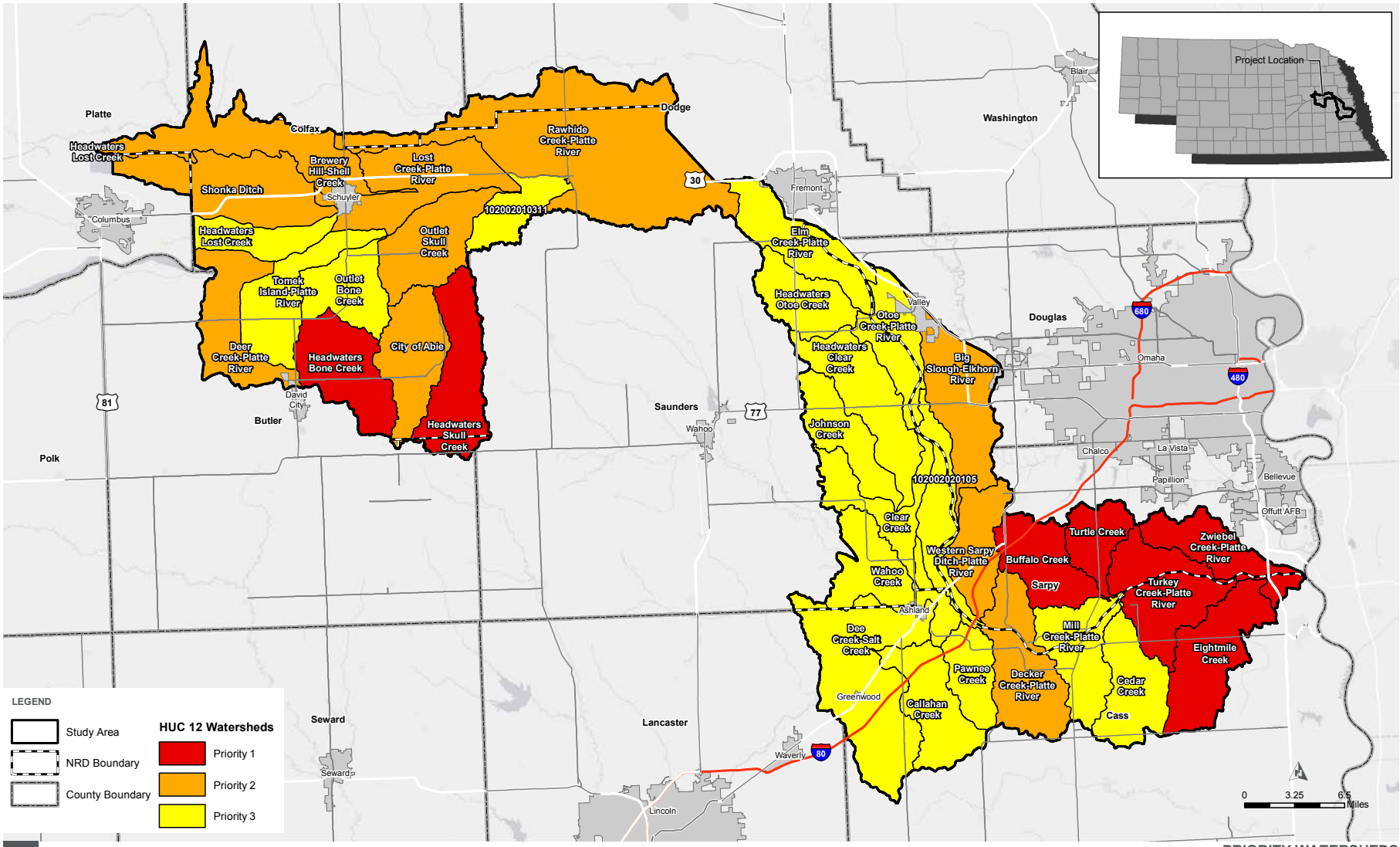


Figure ES-4. Priority Watersheds



PRIORITY WATERSHEDS

FIGURE 27

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WATER QUALITY MANAGEMENT PLAN FOR THE LOWER PLATTE RIVER CORRIDO