

**Project Name** | LSC1W1P Pollutant Delivery Assessment**Date** | 8/16/2022**To** | Mike Isensee, Casey Thiel**Cc** |**From** | Mike Talbot, Sarah Voje, Carl Almer (EOR)**Regarding** | Pollutant Delivery Assessment Proposal

## Background

EOR was contacted by the Lower St. Croix River One Watershed, One Plan (LSC1W1P) Prioritization and Assessment Subcommittee (“the Subcommittee”) and asked to submit two proposals to conduct GIS evaluations of the Lower St. Croix Watershed:

1. Delineation and prioritization of contributing subcatchments
2. Identification of pollutant hot spots

Item 1 was completed and delivered in July 2022. Figure 1 shows the resulting catchments, which can be considered accurate enough for watershed planning purposes and will be sufficient for further prioritization via the pollutant delivery assessment.

## Proposed Approach

### Pollutant Delivery Assessment

In August of 2019, CMSCWD completed a watershed-wide Pollutant Delivery Assessment. The assessment followed on the heels of the subwatershed redelineation effort, which evaluated hundreds of basins across the District in an effort to determine the degree to which they were landlocked relative to a “terminal” downstream resource. These terminal resources were chosen because they represented the District’s priority lakes and streams that were listed in the 10-year watershed management plan.

The Pollutant Delivery Assessment used a variety of GIS datasets – notably topography, soils, land use, land cover – to determine TP and TSS loading on a gridded basis (the “Pollutant Load” rasters). The TSS dataset was generated using the Revised Universal Soil Loss Equation (RUSLE) and was not calibrated, while the TP dataset was generated using a lookup table correlated to the intersection of land use and land cover and was minimally (roughly) calibrated using large-scale water quality monitoring data in the St Croix River basin. Additionally, the characteristics of overland flow and the presence of wetlands and other particulate settling features were used to generate a “Delivery Ratio” raster. Lastly, a gridded representation of basin “Landlockedness” was also generated using an early hydrology-only version of the District’s now-updated PCSWMM model.

When overlaid with the pollutant load rasters, the Delivery Ratio and Landlockedness rasters resulted in “Pollutant Delivery” rasters that provided a more accurate (albeit still relative) estimate of the actual delivery of pollutants to the nearest downstream terminal resource. Finally, TP and TSS Delivery Rasters were overlaid to produce an aggregate, qualitative “Hotspot” layer (see Figure ). The transparent regions on the map represent substantially landlocked basins. The

Hotspots layer can be found on the District’s web map, which is currently hosted at <https://www.eorinc.io/maps/CMSCWD/>.

Several barriers exist to performing an identical analysis to the Pollutant Delivery Assessment across the LSC1W1P Watershed. The first is that there is no watershed-wide water balance model from which to draw direct conclusions about the degree to which basins are landlocked, and second is that Pine County currently has little if any digitized soils data. The first of these issues is perhaps easier to overcome (at least in a simplified manner) with a subcatchment screening process using terrain analysis techniques and the statewide lidar – a task that has already been substantially completed during the Contributing Subcatchment Evaluation. The second issue will require waiting until digitized soils data are available for southern Pine County.

We propose to perform a pollutant delivery assessment across the LSC1W1P Watershed using a similar approach to that used in CMSCWD. Key differences will include:

- The landlocked basin analysis will involve a slightly difference approach, since no water balance model is available to distribute runoff between basins. Instead, landlockedness will be evaluated at multiple scales (e.g., HUC-12, HUC-14, HUC-16) and the results will be aggregated to develop a more comprehensive understand of the relative landlockedness of the NHDPlus HR catchments than would be achieved by evaluating individual catchments.
- The TP and TSS gridded pollutant load analyses will be performed at a coarser scale, likely using either a 10-meter or 30-meter grid resolution.
- The TP pollutant load analysis will use the latest available National Land Cover Dataset (NLCD), rather than the MLCCS, which does not extend into Isanti, Chisago, or Pine counties. The analysis will only consider this recent historic land cover data and will not consider any historic or projected land use information (e.g., zoning, planned development), and will use the Unit Area Loading (UAL) methodology with values from the literature.
- No further hydrocorrection of the DEM will be performed beyond what was performed during the Contributing Subcatchment Evaluation, meaning the results of the analysis may be less accurate than it is in CMSCWD, especially in areas with inaccurate or outdated information on culverts and other influential hydraulic structures. Additional local culvert data could be incorporated at additional cost or in a future update of the analysis.

The analysis will be performed initially across the entire LSC1W1P Watershed excluding Pine County; however, all workflows will be scripted such that the entire analysis could be re-run as soon as soils data becomes available. Deliverables will include GIS data layers and a summary technical memorandum describing the work completed and interpreting the results of the analysis. The estimated level of effort required to complete this analysis is \$27,200, as detailed below.

<i>Task</i>	<b>Hours</b>	<b>Cost</b>
<i>GIS data preprocessing</i>	26	\$3,300
<i>TSS loading analysis (RUSLE)</i>	28	\$3,600
<i>TP loading analysis (UAL)</i>	20	\$2,600
<i>Delivery ratio analysis</i>	28	\$3,600
<i>Subcatchment prioritization</i>	20	\$2,600

<i>Hotspot identification</i>	20	\$2,600
<i>QA/QC, summary memorandum and maps</i>	32	\$4,700
<i>Meetings and project administration</i>	26	\$4,200
<b>Total</b>	<b>200</b>	<b>\$27,200</b>

**Assumptions:**

- While some aspects of the analysis will be processed watershed-wide, the results of analysis will only be produced for the tributary area to the Sunrise River, which is the highest priority area according to the Subcommittee
- The delivery ratio will be computed relative to the nearest downstream named resource, unless specific resources of interest are indicated by the Subcommittee
- All data not already obtained by EOR will be provided by Anoka, Chisago and Pine County staff
- Field verification will be performed by Chisago and Pine County staff (as necessary and feasible)

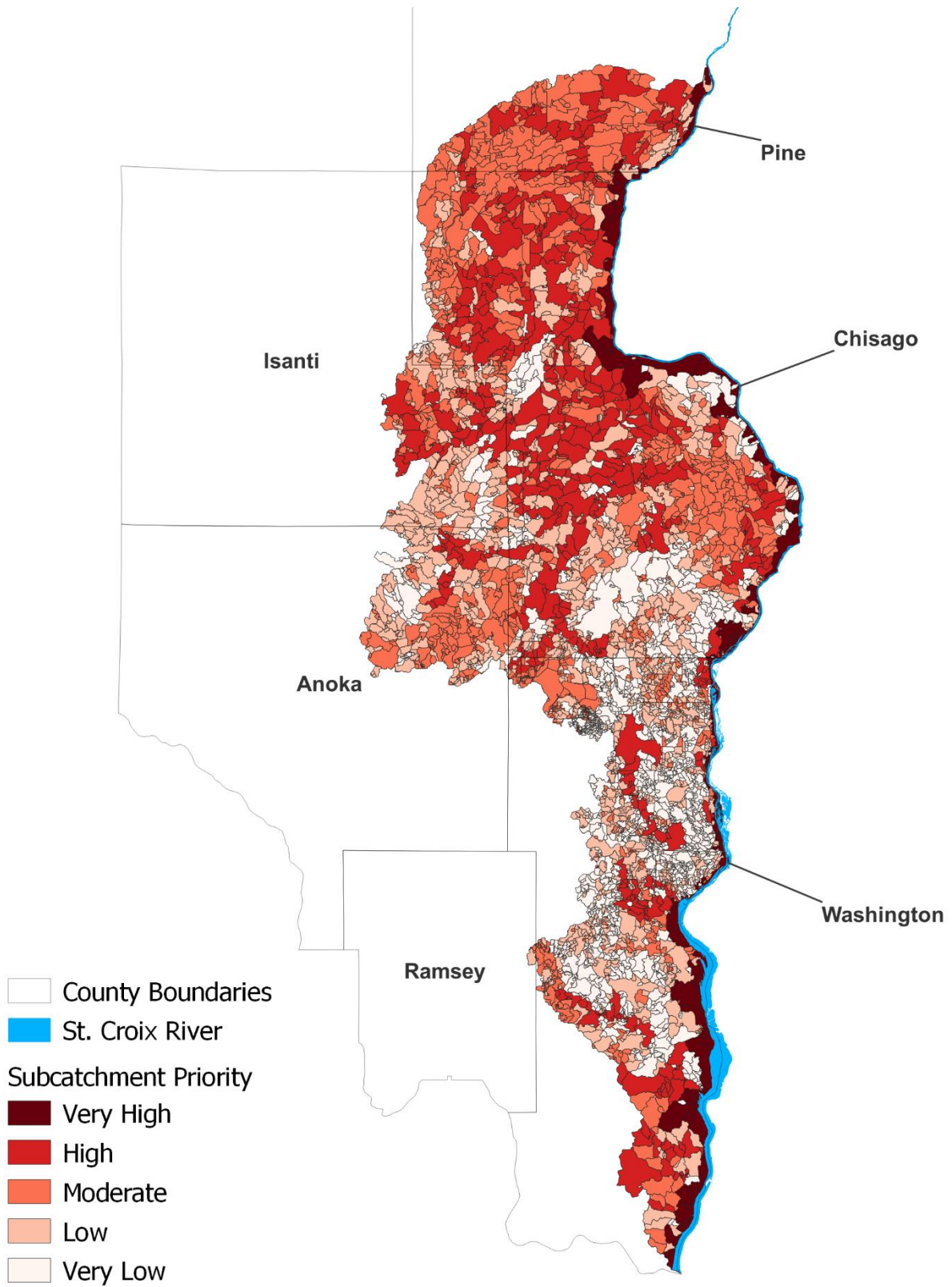


Figure 1. Priority assigned for the purposes of selective subcatchment review and refinement

