

Final Report: Assessment of Phosphorus and Sediment Loss Risk in Silver Spring Creek Watershed

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Background and objective:

Silver Spring Creek watershed (hereafter referred to as the watershed) is an approximately 4300 acre watershed surrounding the 5-mile long Silver Spring Creek located in Lafayette County near the towns of Gratiot and Wiota. The watershed is part of the Sugar-Pecatonica DNR Water Management unit and is located within the Lower Pecatonica and Silver Spring Creek-Pecatonica River Watersheds (Hydrologic unit code 070900030904). Silver Spring Creek's designated, current and attainable use, according to the Wisconsin Department of Natural Resources, is a coldwater fishery. However, it is currently listed on Wisconsin's impaired water (303d) list, with the primary pollutant being sediment/total suspended solids caused by sedimentation from non-point sources.

The objectives of the study described in this report are to characterize land use in the watershed and assess the risk of sediment loss and phosphorus delivery from agricultural lands.

Materials and methods:

Contact information for 41 landowners, field maps, and cropping reports were obtained through the Lafayette County Farm Service Agency and Land Conservation Offices. Initial contact was made with landowners and operators in May of 2010, and an informational meeting was held for landowners to learn more about the project in August, 2010. Copies of current nutrient management plans were obtained if available for the Lafayette County Conservation office. Landowners without a current nutrient management plan were requested to provide information on cropping, tillage, fertilizer and manure application, and soil test information (if available). If no current soil test information was available, permission to sample was requested from landowners.

Land area within the watershed was digitized and classified according to land use using ARCGIS software (ESRI, 2011). Soil and cropping information were entered into the SNAP-Plus software (SNAP-Plus, <http://www.snapplus.net/>) and used to derive rotational RUSLE2-based soil loss and Phosphorus Index (PI) values. Soil loss and P Index values were based primarily on crop rotations in place in the 2010 cropping year, however some of the data reflect rotations that were in place in 2011.

Land Use in Silver Spring Creek Watershed

The geographic database contains 694 unique areas that were classified as one of the following: 1) cultivated cropland, 2) active pasture including pastured woodlands, 3) non-pastured woodlands, 4) non cultivated grasslands, 5) residential areas, 6) designated riparian areas, 7) night pastures, and 8) roads and road rights-of-way. Land use distribution within Silver Spring Creek Watershed is shown in Figure 1. The primary land uses within the watershed are agricultural, with cropland and active pasture (including night pastures) making up approximately 73 percent of the total land area. Non-pastured woodlands makes up 12 percent of the watershed, while permanent grasslands and residential areas makes up 7.6

and 3.6 percent of the watershed area, respectively. Small areas of the watershed are in designated riparian areas and road rights-of-way. Land use designation by area and percentage of total watershed area within the watershed are shown below (Table 1).

Table 1. Land Use distribution within Silver Spring Creek Watershed.

| Land Use Designation | Area (acres) | Percent of total |
|---|--------------|------------------|
| Cultivated cropland | 2556.9 | 59.2 |
| Active pasture | 567.3 | 13.1 |
| Woodlands (not pastured) | 515.9 | 12.0 |
| Non-cultivated grasslands (includes large waterways, CRP, and idle pasture) | 327.1 | 7.6 |
| Residential, buildings and managed turf areas | 156.5 | 3.6 |
| Designated riparian areas | 27.9 | 0.6 |
| Night pastures, earthen lots | 19.4 | 0.4 |
| Roads and road right-of-ways | 173.4 | 4.0 |

Soil Loss, Soil Test Phosphorus, and Phosphorus Risk Assessment.

Enough data was gathered to assess 2211 acres of agricultural land for both soil loss and PI (Table 2). Priority for assessment was given to lands cultivated for cropland and actively grazed areas. Areas not assessed were areas where landowners chose not to participate in the study or where information could not be obtained due to time limitations of the study.

Average soil test phosphorus values in assessed areas within the watershed were 49 ppm and ranged from 4-388 ppm. Area-weighted soil loss averaged within the watershed was 1.7 T/a. Table 2 shows distribution of soil test values and soil loss among agricultural land uses.

Table 2. Percent of watershed area assessed, average and range of soil test P, and area-weighted soil loss estimates for Silver Spring Creek Watershed.

| Ag. Land Use | Area Assessed | % of Total Area Assessed | Average Soil Test P | Soil Test P Range | Area Weighted Soil Loss |
|-----------------|---------------|--------------------------|---------------------|-------------------|-------------------------|
| | acres | | ----- ppm ----- | | T/a |
| Cropland= | 1818 | 71% | 44 | 4-292 | 2.93 |
| pasture= | 341 | 61% | 85 | 23-274 | 1.12 |
| CRP/grass= | 31 | 9% | 50 | 32-85 | 0.09 |
| night pastures= | 20 | 80% | 174 | 51-388 | 4.97 |

Tolerable soil loss (T) values for soil map units within the watershed range from two to five tons per acre per year. Soil loss estimates for assessed agricultural lands range from zero to 31 tons per acre per year (Appendix 2). A majority of the agricultural lands assessed are being managed to less than T (77%), while the remaining areas are being managed to soil loss levels that range from one to ten times T (Table 2).

Table 3: Soil Loss estimates for assessed agricultural lands in Silver Spring Creek Watershed.

| Soil Loss | Area (acres) | % of Assessed Area |
|-------------|--------------|--------------------|
| Less than T | 1709.8 | 77% |
| 1T | 266.5 | 12% |
| 2T | 149.2 | 7% |
| 3T | 42.8 | 2% |
| 4-10T | 43.1 | 2% |

Approximately 16 percent of assessed acres in Silver Spring Creek watershed were evaluated to have a PI greater than the threshold value of six. As shown in Figure 1 and Appendix 3, the majority of agricultural land is being managed to a PI of six or less. However, approximately 344 acres of areas within the watershed exist where PIs exceed the threshold value of 6 (Table 4). These areas may be targeted for additional conservation measures in order to meet water quality objectives.

Figure 1. Distribution of assessed acres by rotational P Index values in Silver Spring Creek Watershed.

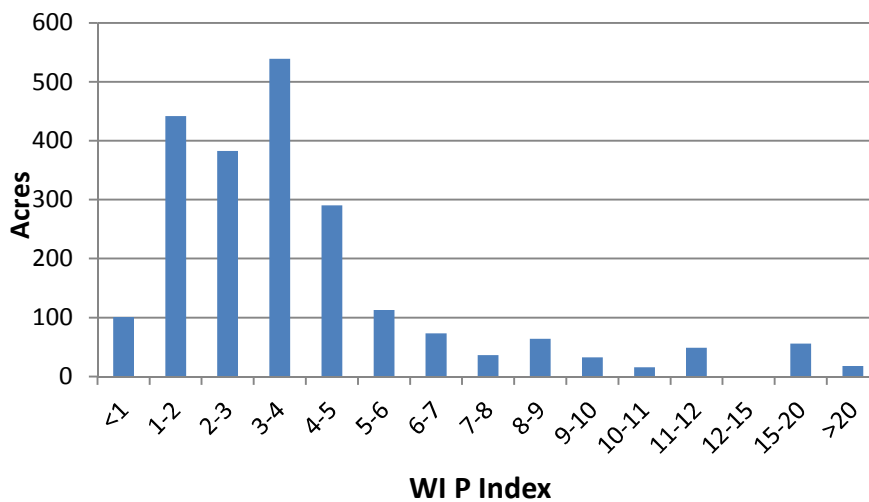


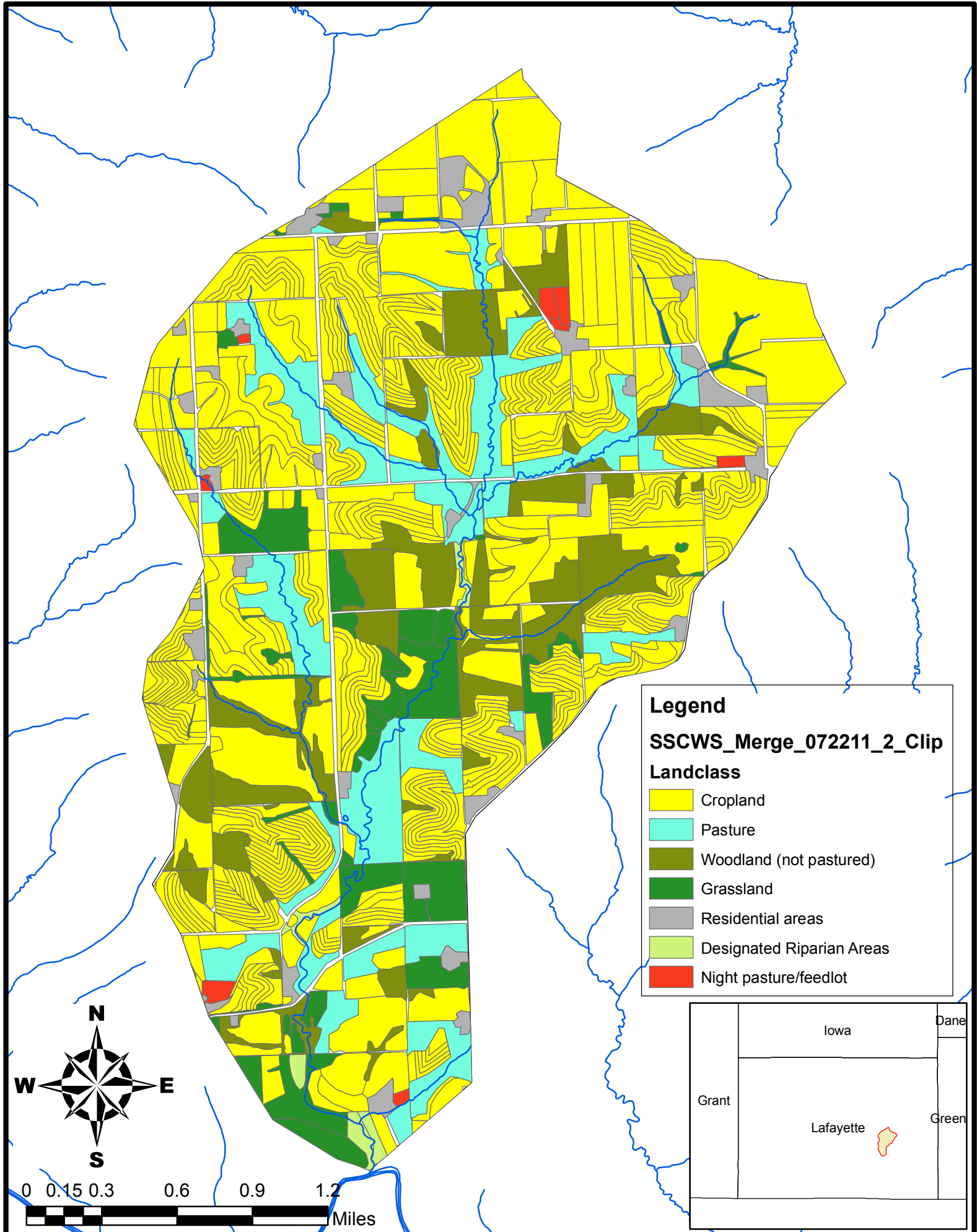
Table 4. Acres and proportion of assessed acres in WI P Index categories.

| WI P Index Category | Acres | Proportion of assessed acres |
|---------------------|-------|------------------------------|
| <3 | 925.3 | 42% |
| 3-6 | 941.9 | 43% |
| >6 | 344.2 | 16% |

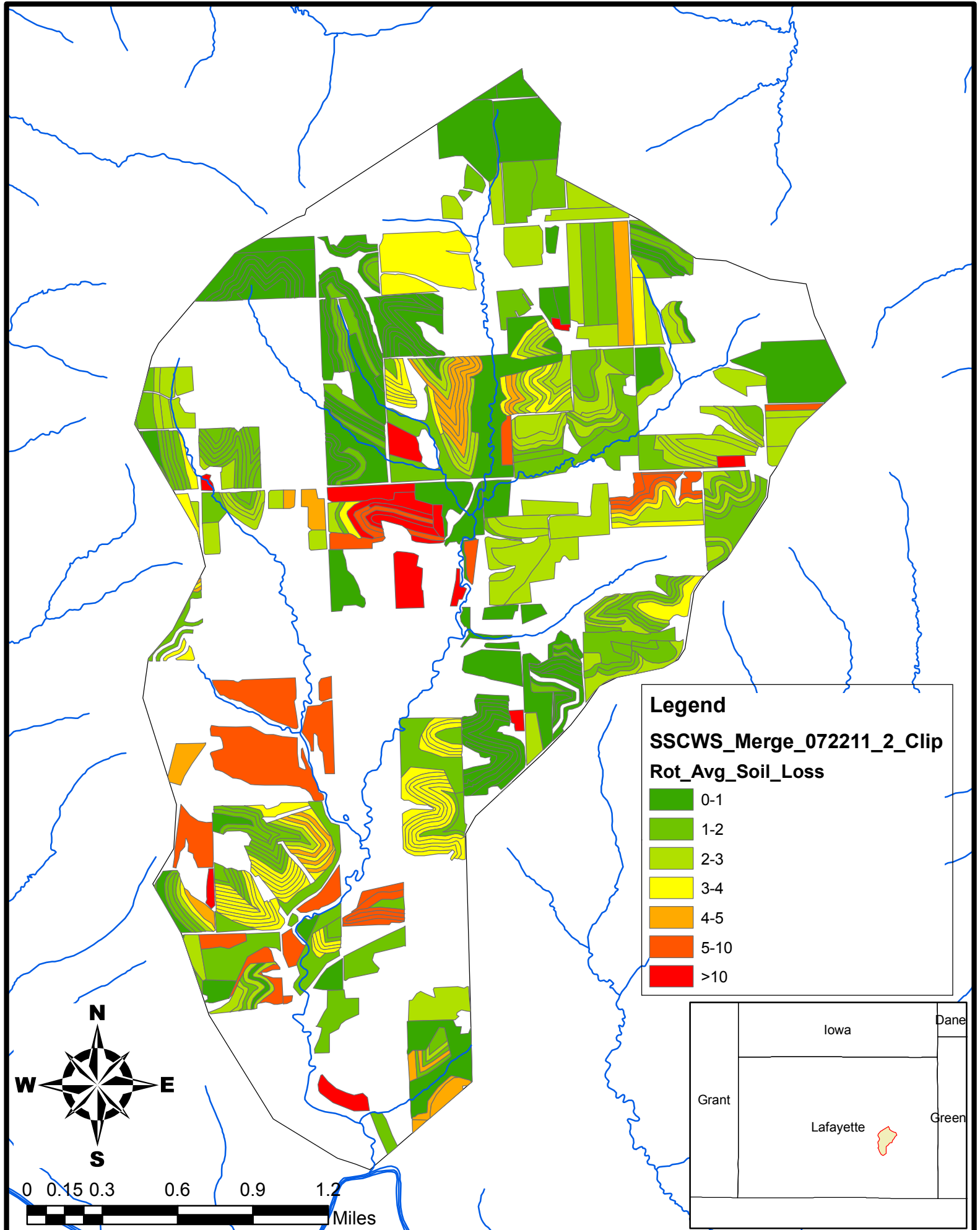
References

ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.

Appendix 1. Land Use Classification in Silver Spring Creek Watershed



Appendix 2. Rotational Average Soil Loss in Silver Spring Creek Watershed



Appendix 3. Rotational Average Phosphorus Index in Silver Spring Creek Watershed

