

Appendix D: Conservation Effects Assessment Project Summary

The USDA NRCS Conservation Effects Assessment Project (CEAP) estimated the benefits of the 2002 Farm Bill's increase in conservation funding at a national, regional, and watershed scale. The Upper Mississippi River Basin (UMB) was one of 13 basins studied by CEAP. Two nutrient loading scenarios in the CEAP study dealt with increasing treatment for undertreated areas and, more specifically, simulated the effects of structural conservation practices, residue and tillage management, and nutrient management. Similar to the NRS load reduction estimates, the practices used for simulation were selected as example practices that represent the broader range of practices available to operators. Using different analysis methods from this NRS, the CEAP study showed considerable room for improvement in reducing cropland nutrient transport to waters in Minnesota and neighboring states. By treating critical undertreated areas, the CEAP study estimated a 6 percent reduction of overall phosphorus loss to waters from all sources (12 percent reduction of the cropland only losses). By treating all undertreated areas the CEAP study estimated that phosphorus losses to water could be reduced by 17 percent or more (30 percent reduction in the cropland only losses).

The NRS goal of reducing Mississippi River phosphorus by 7.5 percent through cropland BMPs is within the 6 to 17 percent reduction range that the CEAP study determined possible through BMP adoption on some or all of the undertreated areas. The CEAP Study supports the achievability of this NRS's recommendations for additional phosphorus loss reductions in the Mississippi River using traditional cropland conservation BMPs.

The simulated practices included terraces, contouring or strip cropping, riparian buffers, filter strips, nutrient management, and efficiency of irrigation water conveyances and water application. In reality, tillage or residue management and cover crops may be used instead of the simulated structural practices, and drainage water management or cover crops may be used instead of strict nutrient management practices (USDA 2012a).

USDA NRCS conducted an extensive survey of current farming practices to estimate the load reduction being achieved through conserving practices. The farm-scale Agricultural Policy/ Environmental Extender simulation model was used to estimate weighted average yields of surface water delivery, sediment, nutrients, and pesticides. These results were multiplied by the area of cultivated cropland obtained from the Hydrologic Unit Model for the United States database and entered into the Soil and

Water Assessment Tool (SWAT) watershed model for each 8-digit HUC. The SWAT model was used to simulate nonpoint source loadings from land uses other than cropland and aggregate HUC8 loading results for all land uses to the HUC4 scale (Gervino 2013).

While the majority of the modeling steps were specific to the HUC8 scale, the results were reported at the HUC4 level. Seven HUC4 UMB watersheds intersect with Minnesota (Gervino 2013):

- Mississippi Headwaters HUC4 0701: 100 percent within Minnesota
- Minnesota River HUC4 0702: 81 percent in Minnesota
- St. Croix HUC4 0703 and Black–Root HUC4 0704: intersected by the Minnesota-Wisconsin border, relatively large portions within Minnesota
- HUC4s 0706, 0708, and 0710: small portions are located in Minnesota, intersecting at the Minnesota-Iowa border

Since CEAP results at the HUC8 scale are not available, the Mississippi Headwaters 0701 and the Minnesota River 0702 provide the best means of comparison between the NRS and CEAP load reduction results. These watersheds combined represent 74 percent of the UMB within Minnesota (Gervino 2013).

Table D-1 compares the land area assumptions and load reduction results, in terms of percent, between the NRS (Minnesota only, all Mississippi River drainage) and the CEAP study (Mississippi Headwaters and Minnesota River HUC4s). The geographic areas are not the same but they overlap considerably. The relative percentages provide a means of comparison between the NRS and CEAP approaches. Both approaches consider a similar percentage of cultivated land compared to the total land within the study areas. While the simulated BMPs differed, as well as the assumptions, the percent of new treated area is similar between the NRS and the CEAP scenarios. Comparing the CEAP undertreated areas scenario to the NRS, the CEAP results estimate is twice the phosphorus load reduction compared to the NRS (17 percent versus 7.5 percent). The other CEAP scenario shown in Table D-1, treating critical undertreated areas only, simulates a much smaller treated area compared to all undertreated areas but is estimated to achieve a reasonably large percentage of load reduction compared to its treated area.

Underlying both the NRS and CEAP study results are many detailed assumptions and decision rules regarding the extent and type of increased treatment. While the percent of total cultivated land estimates are similar, the source of data on current practices also differs between CEAP and the NRS. Finally, both methods used an uncalibrated approach for estimating pollutant load reductions from practices. When two efforts conduct large scale, uncalibrated loading estimations, a difference in results

is expected. While the methods differed considerably, CEAP provides an additional line of evidence for major nutrient load reductions that can be achieved through additional conserving practices on cultivated land.

Table D-1. Comparison between NRS and CEAP land areas and load reduction results

	Percent of land that is cultivated ^a	Percent of cultivated land simulated with additional treatment	Percent load reduction estimated as a percent of all sources
MN NRS ^b	46%	62%	7.5%
CEAP, Treatment of Critical Undertreated Areas ^c	48%	13%	6%
CEAP, Treatment of All Undertreated Areas ^c	48%	57%	17%

a. CEAP cropland estimates include Conservation Reserve Program land.

b. Represents Minnesota portion of Mississippi Basin, 2012 CDL.

c. Represents mostly Minnesota area with some area in adjacent states; limited to HUC4 0701 (Mississippi Headwaters) and 0702 (Minnesota River).