

Assessment of Environmental Services of CREP Wetlands in Iowa and the Midwestern Corn Belt

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Goals and Objectives:

- Conduct assessment of nitrogen removal, hydrological storage, carbon sequestration, and wildlife habitat enhancement services in existing and potential Iowa CREP wetland sites.
 - Model predictions for simulated populations of wetland sites that would result in a 30% reduction in nitrogen load to the Mississippi River.
 - Design similar assessment of various scenarios for the Midwestern Corn Belt region.
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Progress:

The Conservation Reserve Enhancement Program (CREP) provides a framework for partnerships to meet specific State and National environmental objectives. The Iowa CREP specifically involves the tile-drained north central region of Iowa, and its primary goal is to create wetlands that reduce downstream nitrogen loads. Future program implementation strategies could benefit from a comprehensive assessment of potential environmental services.

Mass balance models were constructed for each of the 27 existing CREP wetlands and used to simulate nitrate removal performance across a representative range in hydraulic loading rate and temperature. Wetland performance is a function of hydraulic loading rate, hydraulic efficiency, nitrate concentration, temperature, and wetland condition. The combined effect of these factors suggests that loading rates can be expected to vary by more than an order of magnitude, and will to a large extent determine nitrate loss for individual wetlands. The greatest benefit of wetlands for mass nitrate reduction will be in extensively row-cropped and tile-drained areas where the nitrate concentrations and loading rates are highest. We used a GIS land cover that included polygon coverages of existing and potential CREP sites, together with existing predictive models of grassland birds and waterfowl (USFWS) and Iowa wildlife species (Iowa GAP analysis), to conduct several analyses of potential wildlife habitat value. We estimated that existing wetlands could provide habitat for 136 pairs of six species of ducks and 48 pairs of Canada Geese. We estimated pre-and post-project grassland bird densities for bobolinks, grasshopper sparrows, sedge wrens, savanna sparrows, and dickcissels. Estimated sedge wren density increased and dickcissel density decreased significantly. An analysis of 69 existing or planned sites predicted that habitat could be provided for 197 species, 30.5% of which are listed as Species of Greatest Conservation Need (SGCN).

We repeated a previous comparison of relative wildlife value of potential CREP sites in four landscape position types: Tile-zone (TZ), Breakpoint (BP), Upstream Floodplain (USFP), Downstream Floodplain (DSFP). Position types were chosen on the presumption that land cover composition and complexity would change as location moved from the upper reaches of the drainage area dominated by cropland, to the lower downstream floodplain reaches with increased pasture and woody habitat components. Improvements in our methodology included 1) increased rigor in site selection by insuring that sites would be eligible for CREP, i.e., used for devoted agricultural production, 2) site-specific size and shape attributes of the constructed wetland and upland buffer, 3) refinement of wildlife presence/absence prediction models. Results suggested that although habitat value in all landscape positions was increased by a CREP project, net gains consistently increased as site location moved from the TZ region at the top of the drainage area into floodplains lower in the drainage. This result is generally due to the concomitant increase in the physical area of the wetland and associated grassland buffer, and the increase in diversity and complexity of the habitat in the surrounding landscape.

Future Plans:

Based on feedback from stakeholders, we expect to continue our evaluations of the relative environmental services predicted for alternative site locations, with the objective of informing future CREP program site location criteria.