

WSF 2021 Annual Report #5192

Quantifying the Impact of Eastern Redcedar Encroachment on Recharge in the Nebraska Sandhills

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A lot has been accomplished in the last year. One student is working on gathering data to improve our understanding of the Sand Hills hydrology and improve our model inputs. The other student is focused on the modeling. Below are details of their accomplishments this year and future work. We intend to expend the complete budget by December 2021. We expect the project benefits to be the same and are excited about determining the model outputs and its impact on water resources in the Sand Hills.

Redcedar encroachment in the Nebraska Sand Hills

We first created potential encroachment scenarios ranging from 10% to 100% (see figure below). This information was used to determine the impact of encroachment on recharge and streamflow in the Nebraska Sandhills. We also evaluated how the reduced flow will impact water quality in the Platte River. We are now working on identifying the realistic encroachment we can expect by the year 2100. We assessed the rate of encroachment using satellite images acquired at two different dates, for example, 1990 and 2010. The transition potential of different land to Redcedar is then calculated using the difference in area occupied by Redcedar at those dates. Markov CA approach is then used to predict the encroachment for future time. This helps us to identify location that are vulnerable to Redcedar encroachment. It also helps us to formulate plans and policy to address the encroachment process.

Our next step will be to complete the analysis of redcedar encroachment through 2100. We are also simulating the impact of climate change in the Sandhills and evaluating how climate change, coupled with redcedar encroachment, will impact the water resources.

We now have the calibrated SWAT and MODFLOW models. This summer we will couple the two models. This will give us more accurate results and permit us to evaluate the impact of climate change and redcedar encroachment on recharge, evapotranspiration, streamflow and groundwater levels. Understanding the impact on groundwater levels will help us understand how the climate change and redcedar encroachment will influence the thousands of lakes in the Sandhills.

