Using GIS to Analyze Graminoid and Shrub Composition Change from 1997 to 2017 at Atqasuk, Alaska

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Introduction

Climate change has caused many broad functional groups to change overtime. Shrubs are expanding and graminoid height is increasing across the Arctic due to longer growing seasons and rapidly increasing air temperatures (Walker et al. 2006). These changes in community composition may impact critical feedback loops and result in trophic cascades. Some consequences of increased shrub height include changing the surface energy budget, carbon balance, and nutrient dynamics (Sturm et al. 2001). In this study, we mapped the shrub and graminoid cover vegetation change from 1997 to 2017 in order to examine cover trends within the context of the surrounding landscape.

Methods

In this study, we analyzed vegetation cover change at a long-term research site in Atqasuk, Alaska. The site contains 48 total one-square-meter plots in a wet meadow community. There are twenty-four control plots and twenty-four plots that are experimentally warmed (1°C to 3°C) using open-top chambers (OTC). The open-top chambers are used from June through August. Cover data was collected from 1997-2017 by using the point-intercept method (Figure 1). Inverse Distance Weighted (IDW) interpolations were done by using ArcGIS to create a model to estimate the cover on the landscape based on nearby sample points.

1A 1B 1C

Figure 1A. A common graminoid found within the plots, *Carex aquatilis;* **1B**. Demonstration of the point-intercept method for gathering cover data; **1C**. A common shrub found within the plots, *Salix pulchra*

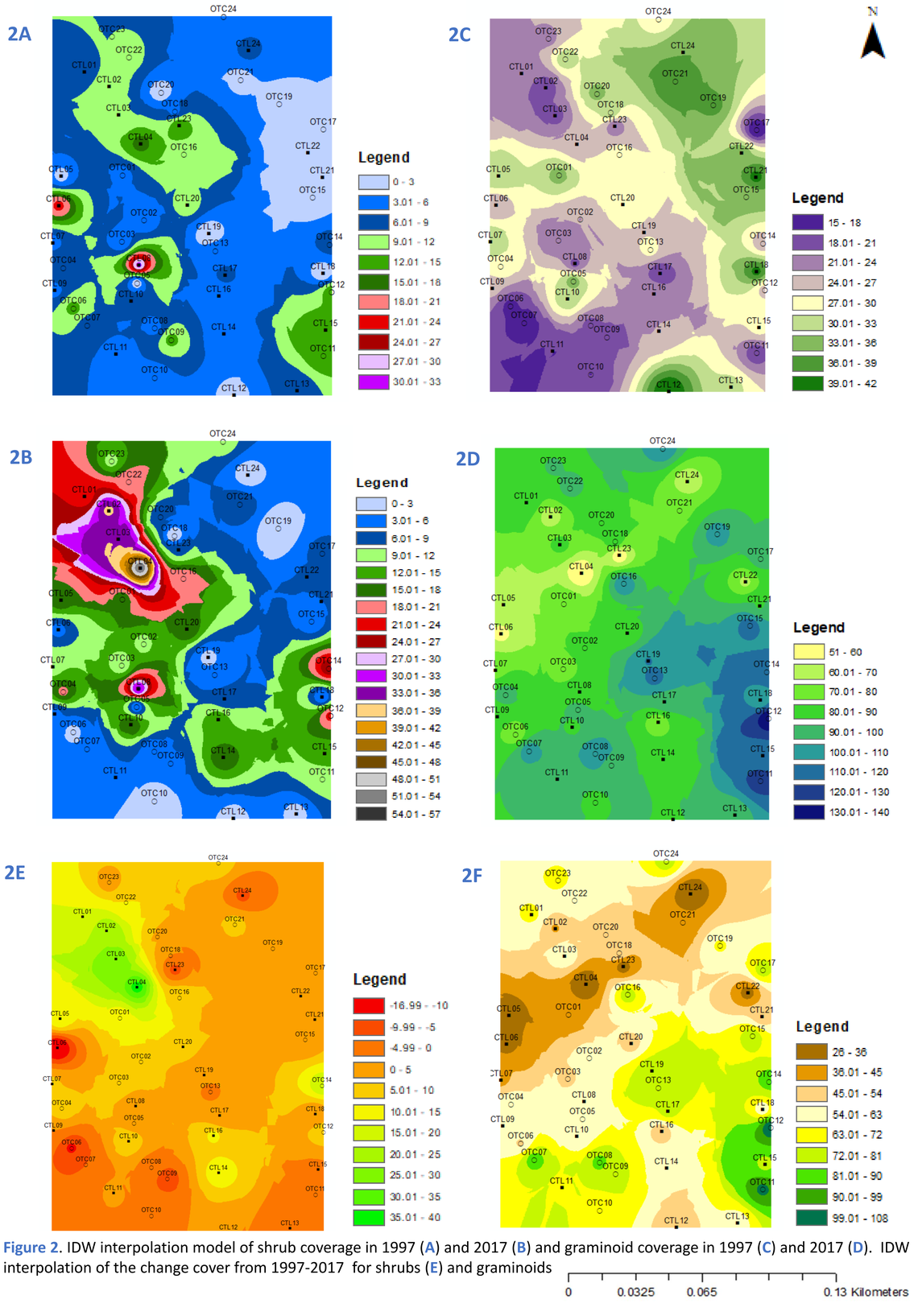

Figure 2. IDW interpolation model of shrub coverage in 1997 (**A**) and 2017 (**B**) and graminoid coverage in 1997 (**C**) and 2017 (**D**). IDW interpolation of the change cover from 1997-2017 for shrubs (**E**) and graminoids

Results and Discussion

Overtime the cover for graminoids and shrubs increased significantly. The maximum number of shrubs counted in a single plot increased by around 66% (Figure 2A and 2B). Additionally, the maximum number of graminoids counted in a single plot increased by more than three times the original amount (Figure 2C and 2D). Overtime, shrubs have shown the largest increase near plots CTL01-CTL04 , but there are areas that have seen a decline in shrub cover as well (Figure 2E). Graminoids have shown only an increase in cover overtime (Figure 2F). Future studies may examine the shrub and graminoid change at Utqiaġvik, AK.

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