

Everglades project - Ridge and Slough model

Project Overview:

The original Everglades was a large patterned peatland of long, linear sawgrass ridges and tree islands among interconnected open water sloughs. Although the ridge and slough orientation was parallel to flow directions, the mechanisms responsible for the patterning have not been determined.

The Ridge and Slough Patterning (RASP) model was developed to investigate the influence of flow on this landscape. RASP is a cellular automata model that uses simple decision rules to relate flow and depth to vegetation. It uses a matrix of square grid cells assigned randomly as either sawgrass or slough vegetation, with associated elevation and resistance. Water flows in from the top and moves downslope, flowing through the simulated landscape according to elevation and hydraulic resistance. Persistent water depths for each cell determine changes between vegetation types. Stable patterns emerge that mimic the dominant attributes of the original landscape: elongated ridges parallel to flow, ridge spacing, slough connectivity, proportions of ridges and sloughs, ridge sizes and dimensions, and even diversity of ridge shapes. Sensitivity analyses indicate that slope and initial proportions of sawgrass/slough cover are important determinants of patterns.

The RASP model suggests that simple relationships between flow, depth, and vegetation dominate Ridge and Slough patterning. The simplicity of this model allows rapid hypothesis testing and suggests further research directions.