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How vegetation alters water motion, and the feedbacks to environmental system structure and function.

For over a century vegetation has been removed from channels and coastal zones to facilitate navigation and development. In recent decades, however, we have recognized the ecologic and economic benefits of aquatic vegetation. It removes nutrients, providing a buffer against coastal eutrophication. Marshes and mangroves provide coastal protection by damping waves and storm surge. Through its ecosystem services, aquatic vegetation contributes economic benefits worth over ten trillion dollars per year. This seminar will first summarize basic concepts in vegetation hydrodynamics, i.e. the physical way vegetation changes the flow field, including the coherent turbulent structures formed within the wakes behind finite patches of vegetation and in the shear layers at vegetation boundaries. Second, using these concepts we will explore two case studies. In the first case, we consider the changes in flow and sediment resuspension as the density of plants within a seagrass meadow increases. In the second case we consider the structure of the wake behind a finite patch of vegetation. Because of its porosity, some flow can pass through the patch, and this delays the formation of the von-Karman vortex street, leaving a region of low velocity and turbulence directly behind the patch [clear region in photo]. Fine particle deposition is enhanced in this region, providing a positive feedback for patch growth in the streamwise direction

