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An interpretation of future research trends into vegetation and erosion interactions

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The nature of future research relating erosion processes and vegetation cannot be confidently predicted but can be anticipated. Recognizing that erosion is not easily separated from processes of soil genesis, soil loss, and sediment movement and deposition, topics that may receive near-term attention are the interactive effects that vegetation and soil genesis exert on each other, the influence of water and sediment on bottomland vegetation, and the effects of possible climate change. These and other potential research topics and others are considered in terms of (1) vegetation as a control of erosion, (2) erosion as a control of vegetation, (3) vegetation as an agent of erosion, (4) vegetation as an agent of soil stability, and (5) combinations of the first four.

Vegetation as a regulator of soil loss is likely to be emphasized in erosion-prediction modeling given the economic importance of minimizing erosion in agricultural areas. Present models include erosion control by plants of rainsplash impact, by vegetation roughness, and by root-soil cohesion dynamics. Currently model development is incorporating numerous vegetation data bases for croplands to relate soil loss and plant cover. Recent advances in model construction incorporate senescence dates for perennial plants, canopy height in forests, filter strips of native riparian trees to augment erosion-control methods, and algorithms to estimate root biomass.

Other research topics may include the slowing of erosive floods by deeply rooted phreatophytes, reduction of erosion and channel migration by buried debris dams, the resistance to erosion by stems and root crowns of trees, and the effects on vegetation, thus erosion processes, by regional to global climate change. Studies of gravitational processes, such as soil creep and channel-bank retreat through mass wasting, that deliver much sediment to stream channels, may permit the abatement of riverine erosion.

Erosion and sediment are also interactive controls of vegetation. Examples likely to receive continuing study include channel incision, which increases stream power and bed and bank erosion, the effect on vegetation by pronounced stream-channel change, channel and vegetative response to dam construction, the effect on erosion and plant ecology by variable flow and flood frequency, and the sustainability of riparian-zone plants as a result of sediment deposition or the entrainment of alluvial sediment during high flows. As an agent of erosion, at the drainage-basin scale vegetation controls the movement and storage of sediment both in uplands and bottomlands, and at smaller scales affects rill and gully processes and erosion due to fire, forest stress, and bioturbation. As an agent of soil stability, the decay of trees and other vegetation releases nutrients thereby promoting subsequent plant growth, pedogenesis, and protection from erosion runoff events and floods.

These potentials for future directions of research in biogeomorphology are examples of numerous possibilities. The extent to which productive research might be accomplished cannot be fathomed without cooperative efforts by scientists. Many of the current research problems cannot be constrained by accepted discipline boundaries, and collaborative efforts may be needed to continue to yield significant results.