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Sommario/riassunto	Acidic deposition is one of the most serious environmental problems affecting Shenandoah National Park in north-central Virginia. The park is the third most contaminated park in the National Park System because of the deposition of acid rain. Acid rain affects headwater streams in the park by temporarily reducing the acid-neutralizing capacity (ANC) of the water, a process termed episodic acidification. In turn, the increase in acidic components in streamwater can have deleterious effects on the aquatic biota. Although acidic deposition to the park is relatively uniform across its land area, the water-quality response of streamwater during rain events varies substantially. This response is a function of the underlying geology and topographic attributes of watersheds. Geologic and topographic data for the park's 231 watersheds are readily available; however, long-term (years and tens of years) measurements of streamwater ANC and accompanying discharge are not and would be prohibitively expensive to collect. Modeled predictions of the vulnerability of the park's streams to episodic acidification are an alternative to long-term water-quality

monitoring. These predictions can aid park officials in making management decisions.