CHAPTER 4. CONCLUSIONS AND MANAGEMENT IMPLICATIONS

At the study's outset we asked three defining questions: Are natural resources being affected by ATV traffic on forested lands; if so, by how much; and does the way an ATV is equipped make a difference?

In short, this study concludes that ATV traffic can adversely affect natural resources and the way the vehicle is equipped does not make a statistically significant difference. The study further concludes that—of the vehicles tested—all ATVs contribute to the effects regardless of type and equipment.

The effects are considered adverse when the natural resources (vegetation, soil, water, and air) have been reduced or changed in a manner that prevents them from maintaining and performing their ecological functions. The ramifications of the effects are manifested in the removal or destruction of vegetation, including forest-floor litter, the exposure and destruction of plant-root networks, the exposure of bare soil, soil erosion, and dust migration as a result of bare-soil exposure.

Vegetation was reduced by a minimum of 40 percent and more often was completely eliminated as a result of ATV traffic at the test sites. Soils were compacted (except sands and gravels), displaced, or loosened, making it available for transport (erosion) by water. Of the soils tested, the hydraulic conductivity (soil's ability to absorb rainfall) was reduced by more than one-half, while the interrill-erosion coefficient (soil erosion) increased by more than one-half as a result of ATV traffic. Results from the high-intensity rainfall-simulation test concluded that freshly disturbed soils on an ATV trail produce, on average, 10 times more sediment than undisturbed soils.

The dust study (conducted only at the LBL site) was designed to measure the soil displaced by aerial erosion caused by ATV traffic. The goal was to understand the relationship among soil types, vehicle traffic, and dust creation. A secondary objective was to evaluate the effects dust had on native human health and vegetation.

The results of the study (see appendix C) concluded that ATVs can cause significant amounts of soil migration by aerial displacement. Dust particles were captured 200 feet from the trail. Spikes in average-particulate loads greater than 150 micrograms per cubic meter were common as vehicles passed the active monitors positioned 3 to 6 feet off the trail. ATV traffic was relatively light during the experiment. When the numbers of riders are substantially higher, air concentrations would be expected to be well into the unhealthful range where the forested edges of the trails inhibit air circulation. Where trails are open with adequate air circulation, the particulate loads have lower impacts on human health. The passive samplers deployed at head-height confirm a substantial atmospheric loading that could affect the riders' respiratory systems.

The evaluation of dust effects on vegetation suggests that ATVs cause only minor perturbations (disturbances). Some stomatal (pore) blockage was observed, as were surface accumulations of dust that may periodically inhibit photosynthesis and respiration, but little superficial damage to the cuticle was evident in the images captured by a scanning electronic microscope. Because of frequent rainfall at the test site, it is unlikely that the effects are long lasting or a cause for serious concern (Padgett 2006).

There are two surprising results from the study. First, sport-model vehicles (lighter weight ATVs) cause as much disturbance as the heavier utility-model vehicles. There were no significant differences between the level of disturbance caused by sport- or utility-model vehicles. The heavier, more powerful utility vehicles reached the targeted disturbance levels in fewer passes than the sport two-wheel-drive models; but, when the number of passes was the same, the levels of disturbance were the same for each vehicle type.

Second, there were no distinguishable differences between the level of disturbance caused by a vehicle with standard manufacturer-issued tires or a vehicle equipped with more aggressive after-market tires. Ultimately, all tire and vehicle combinations tested caused the same levels of disturbance.

Four trail features were tested: a curve, downhill, uphill, and straight runs. For all soil types, curves were most susceptible to soil displacement, followed by uphill and downhill runs regardless of soil type. Straight runs showed the least amount of soil displacement. The difference in soil displacement for an uphill or downhill section was five to eight times greater than on level-straight sections. Therefore, trail managers should make monitoring and maintaining curves and turns a high priority, followed by uphill and downhill sections of trail. Curves require extra attention to ensure that they are designed and constructed for proper armoring and drainage.

The data also imply that straight sections of trail will require less maintenance, especially if these sections are located away from weaker soils. This is an important distinction to manage as forests involve and work with volunteer groups to make their contributions meaningful and effective.

Perhaps the most important management implication of this study is that ATV traffic should be limited to trails. The data gathered in this study overwhelmingly support this direction. Areas that continue to allow cross-country travel can only expect to see a further reduction in the ability of natural resources to maintain their composition and structure and perform their natural functions. Other studies related to soil and vegetation disturbance indicated that the rehabilitation of these areas will take many years, especially those in arid climate zones (Cole 1986). Some may never recover without assistance.

The study also suggests that limiting ATV traffic to trails is not enough to protect the natural resources. Trail planning and design, particularly the trail's location, are key considerations for limiting natural-resource disturbances. The primary objective of a well-designed ATV trail is to protect and conserve the natural resources while providing an enjoyable and challenging experience. The experience is the purpose of the trip! The design phase should identify destinations as well as areas to avoid, such as soils that are easily disturbed, wet areas (riparian zones), ridge tops, and sensitive wildlife habitats and archeological sites.

Trail alignments should be curvilinear with short sight distances. Avoid tight turns and steep climbs, as these trail features are susceptible to high levels of soil disturbance and erosion. Use contours and the vertical alignment to facilitate drainage across and away from the trail. Avoid constructing trails on the fall line. Use water diversions as often as necessary to move water off the trail and onto the forest floor. These practices will significantly reduce erosion and sedimentation.

The data also suggest setting limits or developing natural-resource tolerance levels as a way to manage and reduce the effects of ATV traffic on the natural resources. Consider for example the hydraulic conductivity, interrill coefficient, and dust-migration data. The hydraulic conductivity of soil (soil's ability to absorb rainfall) is a way of estimating soil saturation and when overland flow begins. This information is very useful for establishing natural-resource tolerances and developing trail-closure parameters based on scientific principles (i.e., the rainfall rate at which soils begin to experience runoff, and the magnitude of rainfall events). The Kisatchie National Forest sets a rainfall limit of 2 inches before closing its ATV trails, and they remain closed until the soil regains its absorption capacity. Similar parameters have been developed for other forests.

Information that describes the effects of dust migration as a result of ATV traffic could also prove to be an effective tool for monitoring trail use and keeping natural resources in balance. Managers could use such information to establish seasonal closures, employ dust abatement techniques, and design better trails to reduce soil migration.

Casual observations made during the study also suggest a need to develop sustainable riding practices to assist riders to improve their riding habits and information to enhance their knowledge about the affects of ATV traffic on natural resources. Riding practices would include: slower speeds through curves, avoiding wheel spins and fish tailing, and avoiding travel through wet areas. Information should also be provided about why it is important to avoid these sensitive areas.