

richness), the makeup of the species in the assemblage (species composition), or some index reflecting a combination of these two values.

Species richness (the number of species in a given area and time), as we have seen, is a tricky measure upon which to base a monitoring program for at least two reasons. First, species richness is often a nonlinear function of time and is expected to overshoot the control plots during the course of recovery. As a result, remediation programs may be halted prematurely when control species richness equals that of the recovering plots. For example, recovering bauxite and manganese mines may yield ant assemblages whose species richness approaches that of control sites after 7.5 years. But these sites can have quite different species (Majer 1984). Second, species richness may remain constant even while the assemblage undergoes major restructuring (Brown et al. 1997).

The use of species richness has its advantages, including its relative lack of ambiguity and its already wide use. We suggest that it be incorporated, but not relied upon solely, as one index among many in a monitoring program.

Andersen (Chapter 3; 1997b) advocates ant functional groups (collections of species based on an amalgam of phylogeny, habitat, and microclimate) as another potential index.

## Conclusion

The study of ecology, although it has made great strides in the past hundred years, is still coming to grips with the complexity of ecosystems—a complexity manifest in the intricate dynamics we have reviewed in this chapter. We feel that the three sampling approaches just highlighted—based on individuals, populations, and diversity—will likely capture much of the phenomena required to describe and reconstruct ecosystem structure and function. We also foresee that attempts at ecosystem remediation, and the monitoring they require, will only *increase* our understanding of these dynamics and point to relationships yet unknown. Many, if not most, of the profound advances in ecosystem and community ecology will come from these tentative applications of our current understanding (Palmer et al. 1997).