

ecosystems are complex, dynamic things, with countless taxa exhibiting an array of interactions between organisms and the abiotic environment. As described in Chapter 6, selected taxa are often used as indicators of the diversity or ecological responses of other taxa and sometimes even as representatives of an entire ecosystem. In monitoring environmental change, taxa that are hypersensitive to perturbations (Kareiva et al. 1993) are most often chosen. Spellerberg (1991) suggests a set of criteria for including taxa in a monitoring program.

Ants are an ideal indicator group for inclusion in such a program. Many ant species have narrow tolerances and thus respond quickly to environmental change. Ants' small size and reliance on relatively high temperatures make them especially sensitive to climate and microclimate change. In addition, some ant colonies are long lived and have permanent nests that can be marked and revisited. Long-lived species thus allow us to monitor the health of a colony as the environment changes around it. In contrast, short-lived ant species may show high turnover and immediate responses to a stressor. Ant assemblages, therefore, allow a monitoring program that is sensitive to change on a number of temporal scales. (See Chapter 6 for other attributes of ants as an indicator taxon.)

Here we explore the potential role for ground-dwelling ant assemblages in programs aimed at monitoring environmental change and evaluating remediation (recovery) efforts. We first review the evidence for long-term stability in ant assemblages. We then review how ant assemblages have been used to study remediation efforts after perturbation. We conclude with modest suggestions—based on our best evidence and a fair bit of conjecture—of the properties of ant assemblages that would be most valuable for a successful environmental monitoring program.

Baseline Change: Variable Ant Populations in a Changing World

The assumption of any monitoring program is that a pristine ecosystem is sensitive to changing conditions. Remediation programs attempt to reconstruct ecosystems that behave, to some degree of accuracy, like pristine systems. The point of baseline monitoring studies, as controls for remediation or as worthy endeavors in themselves, is to determine the degree to which ecosystem properties (e.g., productivity, biomass, species composition and richness) vary naturally. Even if populations fluctuate wildly, such a “fuzzy target” becomes our expectation of normalcy and should temper our interpretation of any remediation effort.

To assess this variability, we need long-term data sets, ideally greater than the average lifespan of our longest-lived organism (Connell and Sousa 1983). Such data sets are rare. This section summarizes a few studies that followed ant populations or assemblages for at least four years. In each, we look for evidence of stasis in population trends and community dominance. We find, instead, dynamic populations and assemblages. At least one study points to long-term trends in climate as a potential cause for these ecosystem changes.

A Neotropical Ant Guard Assemblage

In a Neotropical second-growth rainforest, ants were monitored attending *Calathea ovandensis*, an understory herb (Horvitz and Schemske 1990). The flowers of *C. ovandensis* produce a sugary solution that attracts ants. These ants, in turn, remove herbivores from *Calathea*. Four plots, from 25 to 64 m² in area and from 80 to 250 m apart, were monitored every two weeks from 1983 through 1986. Inflorescences were surveyed for ants. In effect, Horvitz and Schemske report data from a four-year bait study. Their results are sobering.