

Grids

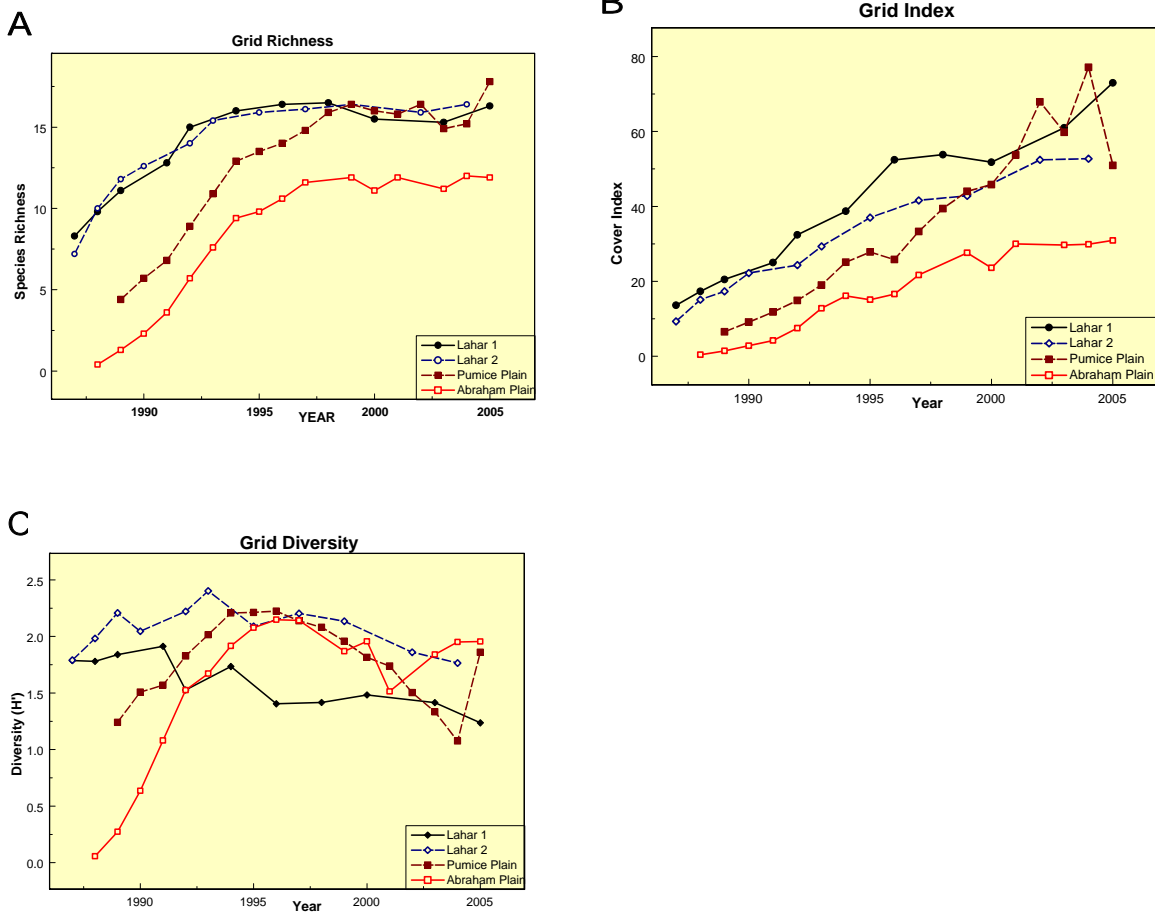
A grid consists of many 10 by 10 m contiguous plots and is used to document recovery over extensive areas and have been used to track expansions of individual species populations. Within each plot, each species is recorded according to a log-scale cover estimator. Richness, index scores, percent cover, evenness, diversity and individual species patterns have been summarized. These data have been used to test hypotheses about spread of colonists, development of heterogeneity and succession trajectories, and to show how vegetation develops over wider areas. Grid data provide a time dimension to the study of spatial heterogeneity. The Pumice Plain grid was a central element of a study on invasion patterns and development of succession trajectories. A study of the Abraham Plains focused on trajectory convergence is in preparation. Data from Lahar 1 and Lahar 2 were used in a published study of heterogeneity patterns in space and time.

Three grids were sampled in 2005: Lahar 1, Pumice Plain, and Abraham Plain. Data from 2004, Lahar 2, are included in the graphs below.

Richness of both Lahars has stabilized (*Fig. 1a*). Some plots, with dense conifers, have declined, but more open plots continue to accrue species. Species turnover has begun in dense plot. Richness on the Pumice Plain continues to expand after suppression due to dense *Lupinus lepidus*. The Abraham Plains, stressful and isolated, has not increased in richness since 1997.

The cover on lahars continues to expand as conifers develop (*Fig. 1b*). Despite lower conifer cover, Lahar 2 has approached the same average cover as Lahar 1, due to *Lupinus* expansion. On Pumice, the increase in 2004 was due to the explosion of *Lupinus lepidus* since 2002, but the crash of this species in 2005 led to a strong reduction in overall cover. However, mosses and *Agrostis* appear to have benefited from this collapse. In the future, I expect that cover increases will resume. Many *Lupinus lepidus* individuals, though badly damaged during the winter of 2004-2005, began to recover in late July, but their abundance was much lower than during 2004. Cover of the Abraham Plain grid has remained stable for several years. Early pioneer species (*Hypochaeris* and *Chamerion*) have declined, while grasses have increased. Vegetation is beginning to show hierarchical patterns, as shown by reductions in diversity (H' , *Fig. 1c*). Only in the Pumice Plain, with the collapse of lupines, has diversity increased. This appears to be an anomalous event.

Fig. 1. Mean species richness on plots on the four grids. B. Mean cover index total for plots on four grids. C. Mean diversity (H')



Major changes in community structure are predicted for Lahar 1 and Pumice Plain as environmental conditions are altered by dominant species. Overall, studies of these grids have confirmed that early species assembly was stochastic.