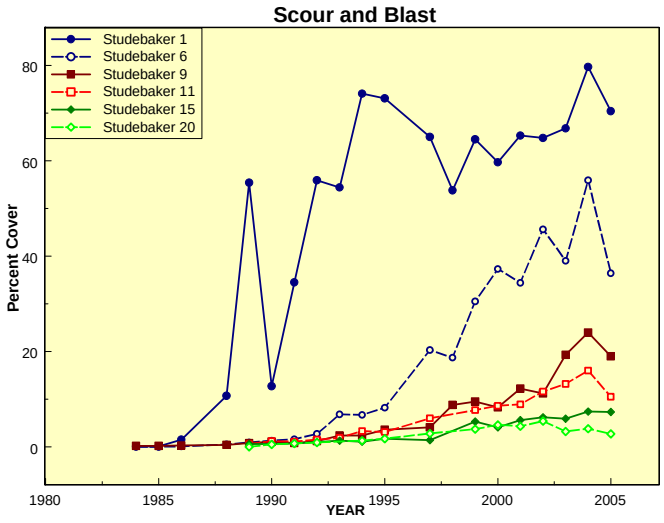
Studebaker Ridge—Permanent Plots

The pattern of cover accumulation on Studebaker Ridge exemplifies how the rate of succession must be gauged by *relative* time, as indexed by rates of biomass accumulation. At 1220 m, lupines soon invaded and exploded by 1990. A steep crash followed (Fig. 1). At 1230 m, 50 m upslope, the lupine pulse was delayed until 1992, and was not as extreme. At 1300 m, development was delayed still further, but there have been two pulses of lupines, the last in 2004. Above this plot, development was slower due to steeper slopes and less residual soil. Plots at 1340 and 1380m developed similarly, with a lupine pulse now beginning. At higher elevations, plots have barely begun to develop. So, succession, here indicated by cover, is related to the degree of environmental stress, indexed by elevation. This pattern has been observed in several situations on Mount St. Helens, and is reported in del Moral & Ellis (2004).



The cover of individual quadrats in permanent plots has been produced in EXCEL files so that changes through time can be estimated. Of course, in every case, there have been significant changes, but the magnitude of these changes differs with the nature of the habitat.

Blast zone on Kilauea, Hawaii

Table 1. Summary of analysis of permanent plot cover, calculated from individual quadrats.

Habitat Type	Range, Years	Lowest Cover (%)	Highest Cover (%)	2005 Cover (%)	Number of Different Groups
Tephra A	1980-2005	15.3	66.9 (1996)	47.7	4
Tephra B	1980-2005	17.8	50.6 (1996)	38.2	3
Scour A	1981-2005	0.71	24.0 (1998)	20.6	2
Scour B	1989-2005	0.46	8.8 (2004)	7.8	3
Lahar - Near	1986-2005	0.88	48.6 (2003)	47.0	7
Lahar - Far	1985-2005	0.42	13.2 (2005)	13.2	7
Pine Creek Scour A	1980-2005	1.54	50.8 (1999)	42.1	10
Pine Creek Scour B	1982-2005	0.29	39.4 (1999)	28.2	5
Pumice Plain 1	1990-2005	0.04	15.5 (2004)	10.4	6
Pumice Plain 4	1990-2005	0.25	34.7 (2004)	21.5	5
Pumice Plain 9	1989-2005	0.42	28.9 (2004)	17.0	4
Pumice Plain 12	1989-2005	0.17	75 (2004)	26.2	4
Abraham Plains 1	1995-2005	1.6	7.9 (2001)	4.8	4
Abraham Plains 5	1995-2005	1.2	6.3 (2004)	5.7	2
Studebaker Ridge 1	1984-2005	0.04	78.5 (2004)	69.6	5
Studebaker Ridge 4	1992-2005	0.04	72.9 (2002)	53.2	5
Studebaker Ridge 6	1991-2005	0.45	54.9 (2004)	35.4	5
Studebaker Ridge 11	1989-2005	0.08	14.4 (2004)	9.6	6
Studebaker Ridge 15	1992-2005	0.12	6.54 (2004)	6.0	2
Studebaker Ridge 20	1992-2005	0.04	3.63 (2002)	1.4	1

Note 1: nomenclature follows that of Fig. 1.

Note 2: all ANOVA are significant at $P < 0.0000$

Representative data are presented in *Table 1*, in which the habitat, length of the record, range of values, number of homogeneous groups based on the Bonferroni comparison of means, peak year, and overall significance of a one-way ANOVA are shown. The record in primary plots did not normally start in the first year of observation because in initially sparse sites, no quadrat had any cover, even though plants were recorded in the plot as a whole. The spreadsheets containing these data are available from Roger del Moral upon request.