Section C

Goals of Restoration

Anthony D. Bradshaw

If we were to take a broad view of the world, there is no reason why the degradation of Sudbury could not be left as it is, as a monument to the destructive way in which resources were exploited in the past. Although the degraded area is very large in relation to other degraded areas, it is small in relation to the whole of North America, and although there is some pollution leaving the area, most of the effects of the degradation are self-contained. To many visitors, the area is extraordinary and fascinating. At the same time, it is a sharp lesson for us all about the ease with which we can degrade our environment completely.

But it is unlikely to be acceptable to most people, particularly those who live in the Sudbury area. There is plenty of experience from other areas that because, above all else, environmental degradation leads to loss of attractiveness of a region, there is a vicious spiral of economic and social degradation. Industries leave, new industries find sites elsewhere, unemployment increases, the more active members of the work force move out, incomes decline, and the total economy of the area crumbles. As a result, the area becomes less and less able to improve itself.

The primary goal of restoration is therefore, for most people, an aesthetic one—to restore the visible environmental quality of the area. This could be done either by restoring the quality of the built environment or the quality of the natural environment. However, the former is unlikely to happen without a restored confidence in the area bringing in new capital. It is therefore restoration of the quality of the natural environment that is the key.

But, except in exceptional circumstances and at great expense, the natural environment cannot be bought off the shelf and carried in by truck; it has to be carefully created from what is there. This is not easy. The primary goal is made up of several separate but related goals, all aimed toward the re-creation of a

viable functioning ecosystem—the community of soils, water, plants, and animals that live and interact together in one place.

The first of these goals must be a chemical one—to restore the invisible quality of the environmental background of the area. In an intensely degraded area such as Sudbury, the soil has been almost completely lost and with it the store of organic matter and plant nutrients without which plants cannot grow. These have to be painstakingly rebuilt by the use of fertilizers and the growth of the plants themselves. At the same time, there can be continuing pollution—problems of acidity and metal contamination in the soils and tailings and in leachates from them and dust-blow from the tailings and degraded land surfaces. These have to be eliminated by soil treatments and plant growth so that the release of pollutants is prevented at source. This will then improve the quality of the water bodies that receive their water from the polluted land.

The second goal is then a biological one—to set about creating ecosystems that grow and prosper. This means establishing plants that will grow vigorously and clothe the denuded hillsides. In doing this, they will stabilize the eroded soils, add organic matter, tie up the metal pollutants, and so progressively make conditions better for themselves as well as for other more-sensitive species. In the water bodies, the communities have to re-establish similarly.

The third goal, which stems from the first two, is biological and aesthetic—to restore the biological diversity of the area. In its degraded state, the area supports only a very few terrestrial plants and animals, those tolerant of the extreme conditions. The missing plant and animal species must be encouraged to recolonize. In part, this will be brought about by achievement of the first two goals. In particular, most of the animals will come back if the conditions are right, but some of the plants and other less mobile organisms such as the fish may require help. None of the missing species should be considered as unimportant; the fish, for example, have profound effects on the feeding (trophic) structure of the aquatic communities.

In the end, the measure of success is the degree to which ecosystems are created that have satisfactory structure and function. What this entails can be most easily demonstrated in the Fig. C.1, in which there are two dimensions, representing the negative changes in structure and function that have occurred in the degradation and therefore the positive changes that restoration must entail. Onto this diagram, the goals that have been discussed can be readily superimposed, because improvement in ecosystem structure and function are the two processes that underlie all the other goals.

The contributions in this section show very clearly and elegantly what this entails in practice and how possible it is to achieve the ultimate goal of total environmental improvement,

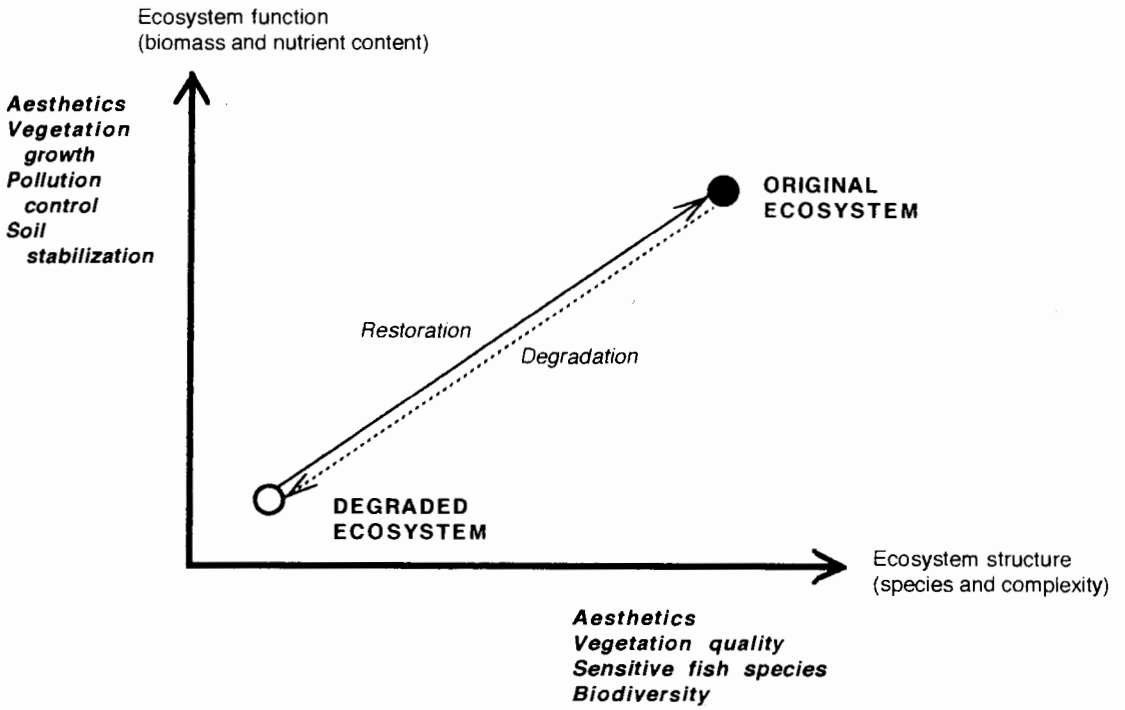

FIGURE C.1. Degradation and restoration of an ecosystem (developed from Bradshaw, 1987, in Restoration Ecology, W.R. Jordan et al. (eds.), Cambridge University Press).

even from such an extreme starting point as that to be found at Sudbury. But the contributions also show that achievement depends on people. Goals can only be reached if the community takes part, and if people, whether in industry, townships, or schools, understand the goals and are prepared to participate.