Plant ecology and the greenkeeper

By Eddie Park

IT IS a sad fact that to master anything worth doing requires a great deal of hard work. You can't play the trumpet without practising the scales. You can't be a brain surgeon without learning anatomy. Indeed, you can't play golf without some tuition on grip, stance and swing and I would suggest that you can't be a first-class golf greenkeeper without first learning plant ecology—i.e. the study of plants as they relate to their environment and the habitat in which they grow.

I know that greenkeepers are always more interested to learn about 'how' to do their job—showing great interest in new methods, chemicals and machines. To be really in control, however, they must also know 'why.' They can then diagnose any faults, work out the conrrect treatment and its timing and, most important, accurately predict the effects of what they do.

All that sounds very attractive, but isn't it all very dull and complicated? Far from it! It makes the job much more interesting to assemble facts, many of which we know anyway, in a more logical manner.

In my young days, I think more people learned botany and nature study. We were sent out to make collections of wild flowers and the subject seemed to be taught in a practical and interesting way. Nowadays, even in universities, botanists are a much rarer breed, but they still have much to teach us. Some years ago, when checking on grass identification, we called in a university ecologist. He kept saying he knew nothing about greenkeeping, yet I bet most greenkeepers would have loved to have talked to him.

When Dr Hayes came to Bingley, he came from a distinguished career in agricultural grassland ecology and management. Yet, to my certain knowledge, within days he was well able to make authoritative statements on golf greenkeeping relying on his superb grasp of first principles.

In just the same way, R. B. Dawson—fresh in 1930 from the Rothampstead Agricultural Research Institute—was able to bring immediate help to the world of golf after a decade of liming and other unwise manurial excesses. It is interesting to note that the subject Dawson chose for his first instructional article in the Bingley journal was plant ecology.

Now, I cannot possibly hope to cover this subject in one article, but perhaps I can point you in the right direction. Anyone who becomes interested in plants soon notices that most species are restricted to a particular type of habitat and will want to know more about the reasons for their distribution. Briefly, we group these reasons into categories—climatic (temperature and rainfall), edaphic (terrain and soils) and biotic (animals and man).

But, before we go into detail, there are a few general points.

Ecologists think of all organisms as composing communities and their locality and inter-relationships as an ecosystem (in other words, how they all live together).

Natural succession is a subject I can best illustrate from experience. About nine years ago, a firm testing a bulldozer cleared some spare land of all vegetation for a spare car park, down to bare limestone rock. I thought it would stay that way, but the next year it was covered with lichens and with the humus formed from these, breakdown of the rock surface and ample rainfall within two years, we had progressed to grasses, herbs and wild flowers.

The following year, there was gorse and so on and then hawthorn and birch scrub—all in nine years. If we leave it alone, it will eventually carry on with taller and more permanent trees to forest.

In other words, any community reaches a relatively stable state—in this case, forest—with average conditions. This is the climax phase—the assembly of plants and trees best adapted to the prevailing conditions.

Nature is cruel. Darwin showed us long ago that nature selects the best adapted organisms—plant or animal—to dominate any ecosystem. We call that natural selection. Poorly adapted organisms face extinction. We can easily see what is meant by adaptation. Willow trees head straight for a wet place. They are adapted to pump up and transpire enormous quantities of water, but put some other less well-adapted tree in the same place and it dies. Some living thing will occupy almost every space in a community, taking advantage of its own particular adaptations to gain sustenance. We say that all 'ecological niches' become filled.

If you think I have strayed far from golf greenkeeping, think again. The best adapted grasses will invade and dominate the conditions that exist. We cannot win by seeding or turfing with something we would like, but is not adapted to the conditions we are ourselves providing by our form of management. So, the fittest will survive and natural succession is difficult to resist.

Left to nature, our greens would become dominated by the grasses and weeds best fitted for the conditions. They would be succeeded by taller plants, then by bushes and eventually by forest. All quite orderly and quite inevitable. We see it happening on many courses where nice gorse and broom 'rough' becomes blotted out by ever-encroaching scrub — probably hawthorn. Conservation does *not* mean doing nothing.

The penalty for disturbing our ecosystem is an increased expenditure of energy to maintain the alteration and, of course, we are not going to allow our precious greens and fairways to go on to forest. We have to keep this ecosystem in juvenile 'sub-climax' state—in a successional stage, hence mowing—and we begin to see the sheer stupidity of fertiliser and extra water. As I have shown, we change the grass type, but we also increase the productivity of the plant community. We can deal with the excess vegetation on top

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with today's mowers, but the gross photosynthetic production is also reflected in an increase in roots. We have no means of accelerating their decay—even earthworms are unacceptable because of casting. The result is accumulation and thatch and if we water it and spray it with fungicide even the bacteria, which are our main hope, cannot operate.

Let us return, as Dawson did in 1930, to the environmental factors that influence plants and grasses in particular. Climatic factors are mainly temperature and rainfall. In this country, we lie in the cool temperate zone, which would climax in deciduous summer forest if we gave it a chance. There are variations between north-west and south-east, but in broad terms we have cool winters (not cold) and cool summers with rain well-spread through the year.

The fine fescues and bents are well-adapted to these conditions and are especially well-adapted to deal with the inevitable relatively short droughts. They will survive. We have been misled by watching golf events from America or Spain, where a much more difficult climate means that even moderate grasses can only survive with artificial watering and other aids.

Indeed, we should compliment these countries on their success in growing any sort of grass at all in many areas. But we should not try to copy them. We already have a much better article and we can damage it by adapting their methods. The wretched poa annua is adapted to most environments and, indeed, is a world-wide pest, but it does especially well in compacted wet and fertile soil. Just look at your rose borders!

Edaphic Factors

These comprise the effect of the types of soil, sub-soils and underlying rocks. We can see these if we dig a pit and examine the different layers or horizons. The size of the soil particles determines the texture of soils ranging from the coarse gravels and sands to the fine clays and silts.

Different characteristics give differences in water movement, fertiliser usage, root growth, etc, and just as important is soil structure. Good structure gives soils with particles held together in crumbs with adequate spaces between.

Humus is an important constituent. All too frequently, a soil with poor structure is simply, but wrongly, labelled clay. Maps in my possession showing British and Continental golf clubs in the early years of this century are labelled with types of soil. There are some golfers and perhaps some grenkeepers who would be surprised to find their 'clay' course perhaps just had its structure damaged or drains broken. Edaphic factors are varied and interesting, but we should be careful not to over emphasise them.

Biotic Factors

These are the effects of living organisms on each other. At one time, grazing by animals (including rabbits) had a major effect on our grassland. In the main, though, man has replaced this with mechanical methods. Indeed, you could argue that man is now the chief influence on the environment or he thinks he is. Certainly over the last two thousand years, we have removed almost all the climax forest in Britain and replaced it with grassland, arable crops and even golf courses. It should be obvious that if man always bears in mind the full range of environmental factors, he can use some of them to his advantage.

Go back to Gilbert White who wrote his *Natural History Of Selborne* in 1789: 'The botanist that could improve the sward of the district where he lived would be a useful member of society. To raise a thick turf on a naked soil would be worth volumes of systematic knowledge and he would be the best Commonwealth's man that could occasion the growth of two blades of grass where one alone was seen before.'

In fact, over the following two centuries, man did increase his knowledge and his ability to influence the environment. The question now to be asked, in all forms of husbandry especially, is 'have we got it right?'

Roger Grounds, writing in one of his gardening books, put it rather well. 'The attitude is that man is master of the world, lord of all he surveys and much that is too tiny for him to see with the naked eye. He sees nature as provided by some beneficent God to serve his every whim, to obey him and, like some servant wench, to be drubbed into submission to his every wish when she displeases him. It is a mediaeval anthropocentric view of the world.'

We might add that most men are too lazy or too arrogant to even realise that nature has certain laws and principles which, for all their modern technology, they cannot overcome.

The best place to see plant ecology in action is Kew Gardens. The environment, which knowledge has demonstrated is required by each plant, is given to it. Temperature, moisture, day length or whatever special conditions are required will be provided and so plants from equatorial forests to frozen tundra are successfully cultivated and propagated. Kew also has a fine grass garden and it is no surprise to find that the author of the 'bible' on grasses Charles Hubbard spent much of his career there.

When it comes to managing either permanent pasture or sports turf, we find the same basic situation. First, we must decide which of the grasses we want and then set out to manage the environment to provide the exact conditions in which 'our' grasses will thrive and other grasses will perish. 'Our' grasses in Britain will be species of agrostis and fescue which were usually present on the original site and are probably still present in the rough.

In scientific language, we are providing the ecological niche that through its combination of factors, specifies, as the lock specifies the key, the plants that will best fit. Some people call it simply ecological management. If we manage our greens to suit annual meadow grass (fertile, wet and compacted), that is what we will get. If we want agrostis and fescue, we must manage our greens to suit these grasses (infertile, aerated to give good structure and with minimum water—even some totally dry periods).

If you find these topics interesting, then delve into plant ecology. Some specialist books are far too complicated for practical use, so go to a good library and study anything readable on botany and soil science. There will probably be an advanced book on botany with a general introduction to plant ecology. That will get you started.

It seems to me that, at present, golf greenkeeping is too often an exercise in blind courage. There will always be a need for conviction, resolution, awareness and courage, but we can make it a bit easier to see the way ahead. I would be the last person to denigrate experience, but I think basic science *added* to experience is even better.