PERMACULTURE DESIGN

designing our lives with nature as the model

Patrick Whitefield, author of *The Earth Care Manual: a permaculture handbook for Britain and other temperate climates*

The essence of permaculture is that it takes natural ecosystems as the model for our own farms, gardens, buildings and settlements. In most parts of the world where agriculture is possible the natural ecosystem is woodland or forest. The annual production of biomass in a woodland is greater than in a typical agricultural system, such as a wheat field, because more niches are filled. In plain terms the woodland is three-dimensional where the wheat field is two-dimensional. To produce this biomass it needs none of the energy and other inputs which agriculture needs. Present day agriculture is so energy-intensive that on average, by the time food reaches our plates, ten calories of fossil fuel have been expended for every one contained in the food. Nor does the natural ecosystem produce any of the negative ecological impacts of agriculture, such as enhanced soil erosion. The catch is that only a very small proportion of the natural ecosystem's annual production is edible for humans. So the aim of permaculture is to produce systems which have the high yield, low level of inputs, and benign ecological impact of natural ecosystems but which also have a high proportion of edible or otherwise useful yield. In short, the aim is to create edible ecosystems. Permaculture approaches this end in two different ways.

In its early days permaculture focused on imitating natural ecosystems in a fairly direct way. Its key characteristics included, amongst others: a high level of plant and animal diversity, growing perennial food crops rather than annuals, and not disturbing the soil by digging or ploughing. These are typical characteristics of natural ecosystems which can be observed and reproduced empirically in food-growing systems. An example of this approach is the forest garden, which mimics the structure of a natural woodland but replaces native plants with edible equivalents: fruit and nut trees, fruit bushes and perennial vegetables (Whitefield and Cassel 1996). I call this approach original permaculture.

But before long permaculturists began to look beyond the visible characteristics of ecosystems and ask what the basic principle is which enables them to be so high-yielding and self-reliant. The answer lies in diversity, but not so much in the diversity of the component species themselves as in the diversity of beneficial relationships between them. One example of this kind of relationship is that between the flowering plants and the pollinating insects, in which one gets its food need met and the other its reproductive needs. An ecosystem consists of a whole network of relationships of this kind, both between living organisms and between them and the non-living components of the ecosystem such as soil, water and climate.

An example of how beneficial relationships can be created in a human system can be seen in a productive conservatory. The conservatory collects solar energy and passes some of it on to the house in the form of space heating. Energy is also stored in the wall of the house and re-radiated at night, keeping the conservatory frost-free and warmer than a free-standing

greenhouse. Thus each helps to warm the other. The conservatory is relatively narrow from front to back and goes all the way along the most southerly-facing wall of the house. This ensures maximum gain of heat and minimum loss. The conservatory is also used for raising vegetable plants in the spring, and the ease of visiting what is in effect another room of your house, compared to going to an outside greenhouse in inclement weather, means that the seedlings get more attention. This means they get off to a better start in life, which is a very important factor in the final performance of the crop.

A house with conservatory attached does not look like an ecosystem but it shares its most important characteristic: a network of beneficial relationships. This kind of permaculture is not dependent on direct imitations of nature; it depends on placing things in relation to each other so that beneficial relationships can be formed between them. In short, it is a matter of functional design. I call this approach design permaculture. It can be practised with or without the characteristics of original permaculture, though in practice most permaculture contains elements of both.

A central method used in permaculture design is what we call the key planning tools. These comprise the concepts of: zone, sector, network and elevation. By *zone*, we mean the amount of human attention which a piece of land receives. Crops and activities which need the most attention are placed where they will receive it with the least effort. For example, when confronted with the choice between a very small back garden or an allotment which is half an hour away by bicycle, the wise gardener may forgo the allotment and grow their fruit and vegetables in the garden. The constant presence of the gardener means that production can be many times more intensive and the garden may out-yield an allotment several times its size. In addition, more frequent harvesting means that a greater proportion of what is grown actually gets eaten. Although simple, this is a wonderfully powerful design tool, not only for households but for farms and whole settlements.

While the concept of zone deals with the human energy centred on the site, *sector* is about off-site factors which affect it. These include wind, light and shade, water, views, neighbours, and pollution. Many of these are climatic factors and the concept of microclimate - the characteristic climate of a small area - is important in permaculture design. Whilst creating a totally new microclimate, such as a conservatory, can be worthwhile, it is not the first priority. The first step is to observe the site carefully through all the seasons and then match the planting to the various microclimates the site contains. For example, a tough fruiting tree such as a damson will yield as well in a windy or shady spot as it will in a south-facing sun trap. Not so a peach. Matching the plants to the microclimates available means that a wider range of plants can be grown, including more demanding ones, and the overall yield of the system will be higher than if they were placed at random.

Network is similar to zone but it comes to bear when there is more than one centre of human activity. This means it is more often relevant on larger sites such as farms and whole settlements than in domestic gardens. It is concerned with access and links between different nodes of activity. An example in settlement design is to ensure that all frequently used services, from shops to allotments, are within easy walking distance of people's homes.

Elevation is concerned with altitude, both relative and absolute, and degree of slope. It is particularly relevant when dealing with water, both in domestic and broad-scale situations.

For example, the conventional approach to siting a pond for farmland irrigation is to place it on flat ground at the bottom of the slope and use fuel to pump the water to wherever it is needed. The permaculture approach is to find a spot which combines three characteristics: low enough in the landscape to be able to collect water; high enough so that it is above the area to be irrigated; and on a relatively flat piece of land for economy of construction – you need a taller dam to make a pond of given size on a steep slope than on a more gradual one. A pond in such a position may have to be a little smaller or may be a little more difficult to construct than one sited on the flat land at the bottom. But throughout the fuel-hungry ages which stretch before us it will irrigate the land entirely by gravity.

When they are used together as a set, the synergistic effect of these planning tools is powerful. They are far from being the only design method used by permaculturists but they are perhaps the most effective. A frequent theme which runs through them is the reduction of energy expenditure, both human and fossil fuel. In the examples I have chosen here: excessive travelling is cut out and more food is produced per unit of energy invested; tender fruit can be grown without the need for glasshouses or imports; journeys can be made by foot instead of powered transport; and water is available where it is needed without any pumping. In the past, human needs were met largely by muscle power, which meant unremitting drudgery for the majority of the population. In the present our needs are met by throwing unlimited quantities of under-priced fossil fuel at any problem. People often assume that these are the only two options but permaculture seeks to provide a third, one which is based on design.

Most of the elements of permaculture design, from conservatories to irrigation ponds, are not unique to it. Even the less familiar elements which are associated with original permaculture, such as the forest garden, have their equivalents in other parts of the world or in other times. The contribution which permaculture brings to the practice of sustainability is less to do with the elements it contains than the connections between them. The network of beneficial relationships which characterises a permaculture system is an alternative to the excessive use of energy which is characteristic of present-day systems. Although I am focusing here on energy use, permaculture is about much more than energy, just as the challenges which face us in the 21st century are not confined to climate change and peak oil. But these are certainly the biggest and most urgent of those challenges and permaculture has an important role to play in confronting them.

Whatever design methods are used, they are used within a clearly defined design sequence. The stages of the sequence are: making a map of the existing situation; conducting a site survey; asking the people who inhabit or use the site what they want from it and what work and skills they can provide; evaluation of the information gathered; formulating design proposals and drawing these on a map; and finally re-evaluation. A great emphasis is placed on the early stages, those of observing and listening. The temptation to rush into making design decisions early on is always there but a good, workable design is unlikely to result if the receptive part of the process is rushed. Listening rather than speaking, valuing the passive above the active, is the antithesis of our contemporary culture. We find it very hard to do. Yet it is a cultural change we need to make if we are to learn to live with nature rather than in spite of her.

Ideally the designers should be the inhabitants themselves. The time they are able to give to the design, compared to a consultant designer who will complete the job in a few days, is

important. It allows for observation during all the seasons so that microclimates can reveal themselves. It allows time for all the people involved to have their say and be well listened to. It also allows initial ideas to be mulled over in the light of experience. There is a place for permaculture consultants but most people who want to practice permaculture prefer to learn how to do it themselves and only bring in professional help to check that their design is on the right track.

At present, permaculture tends to be taught outside formal education in short courses in a two-week block, a series of weekends or evening classes. These courses provide a good model for how permaculture design could be introduced in formal education in dedicated modules, although permaculture principles could also be woven in right across the curriculum. Active learning is essential for gaining permaculture skills. The core of the standard permaculture course consists a series of design exercises, usually one for each of the stages in the design sequence listed above. This is carried out on an actual piece of land but with a fictitious inhabitant. The land gives the exercises the element of reality and the tutor who plays the part of the 'client' can choose a scenario which will give the best learning experience. Having learnt how to do permaculture design in this practical way, the students can go home and do it on their own place.

That place need not be the idyllic smallholding or large garden which may spring to mind as the sort of place you need in order to practice permaculture. One of the strengths of permaculture is that it can be used to make the most of unpromising situations. Balconies, shady back yards, odd scraps of unused land, even flat roofs have their potential, and the permaculture design process can seek out these potentials and maximise them. It is also well adapted to community situations, where many voices need to be heard, and often the human aspect is more of a challenge than the physical. In the twenty first century, the long, vulnerable, energy-intensive supply lines which presently keep us fed are unlikely to perform as smoothly as we have become used to. It is likely that we will need to cultivate every scrap of land available to us, especially in cities, and to learn how to work together as we do it. Permaculture design skills therefore have an important role to play if we are to survive and thrive in the difficult times ahead.

Goldring, Andrew (ed.) (2000) *Permaculture Teachers' Guide.* Hamshire: Permanent Publications

Holmgren, David (2002) *Permaculture, principles and pathways beyond sustainability.* Holmgren Design Services.

Jacke, Dave and Eric Toensmeier (2005) *Edible Forest Gardens.* 2 vols. London: Chelsea Green [includes an excellent account of the science which supports original permaculture]

Mollison, Bill and Reny Mia Slay (1991) *Introduction to Permaculture.* Tasmania: Tagari

Permaculture Magazine. www.permaculture.co.uk [an excellent source of inspiration and practical ideas]

The Power of Community, how Cuba survived peak oil. DVD (2006) The Community Solution.

UK Permaculture Network. www.permaculture.org.uk

Whitefield, Patrick (1993) *Permaculture in a Nutshell.* Hamshire: Permanent Publications
Whitefield, Patrick (2004) *The Earth Care Manual, a permaculture handbook for Britain and other temperate climates.* Hamshire: Permanent Publications.
Whitefield, Patrick and Tricia Cassel (1996). *How to make a forest garden.* Hamshire: Permanent Publications