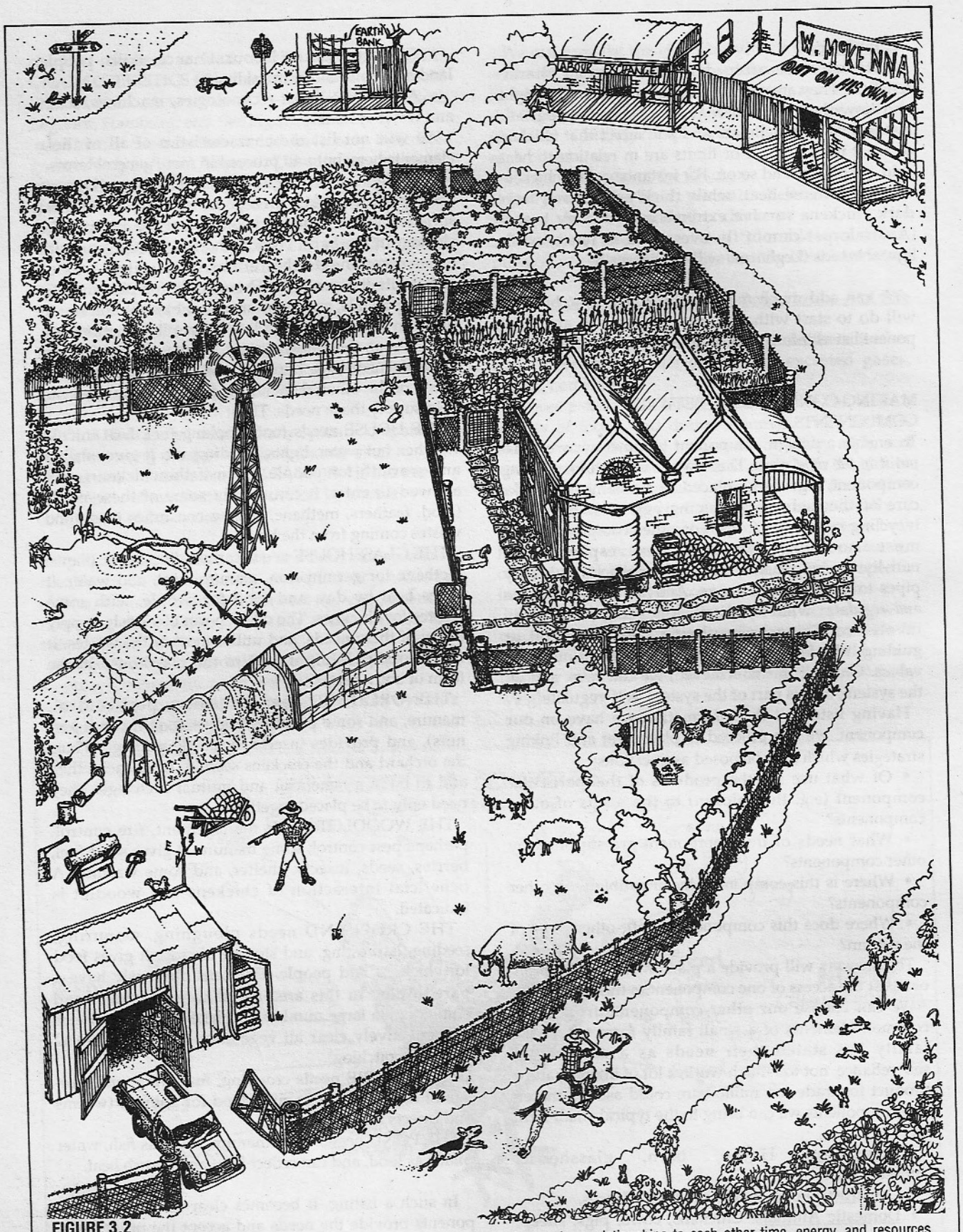


**FIGURE 3.2**
A TYPICAL SMALL FARM.
Villages and farms may contain all the components for self–governance but unless these components are placed in harmonious relationships to each other time, energy, and resources are wasted. In this figure unplanned and segregated systems all demand inputs.

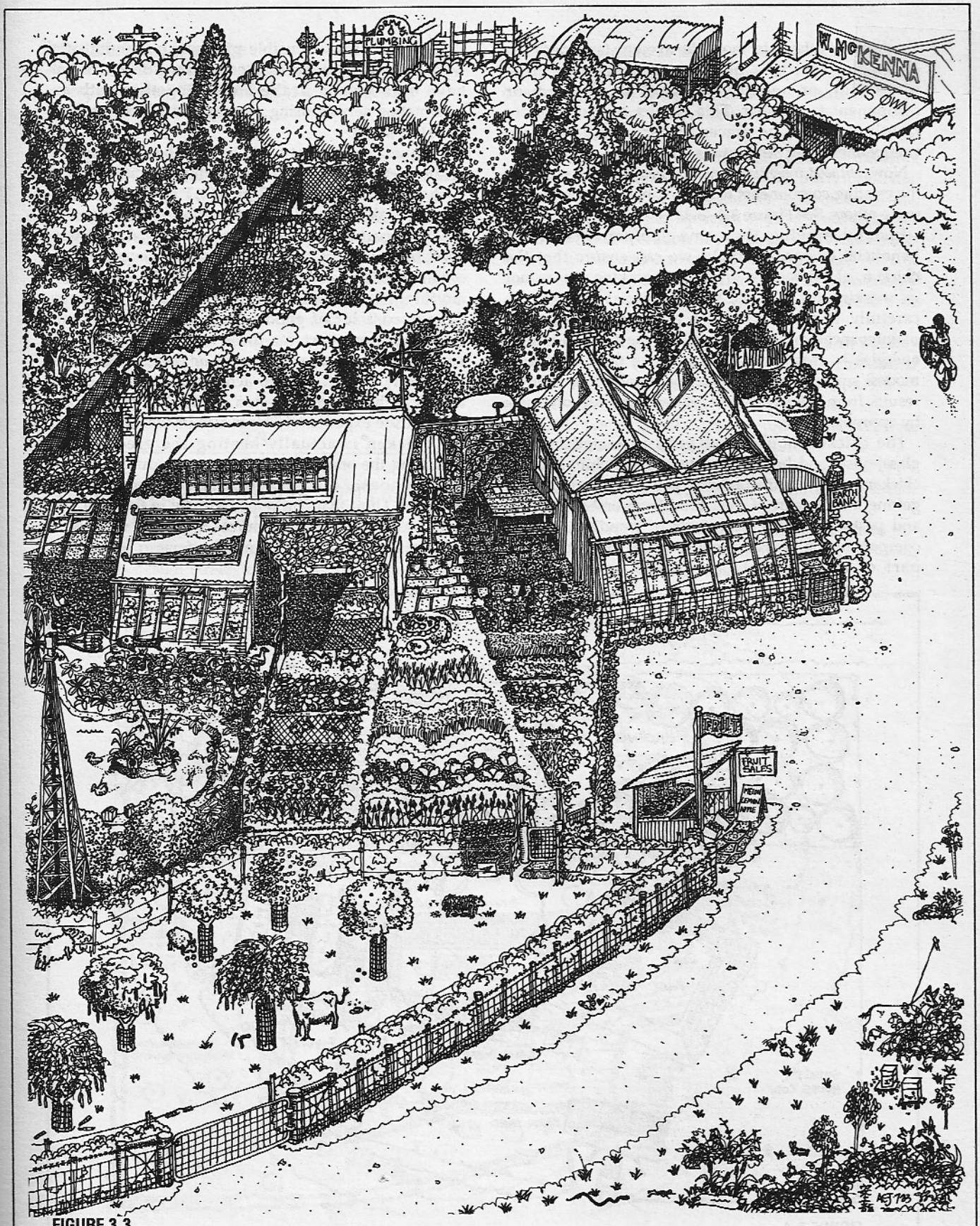


**FIGURE 3.3**
A RE–DESIGNED SMALL FARM.
In this figure many elements supply the energy inputs for others, and the system can be largely self–regulating.

biomass represents an end storage of energy, and a decreasing yield in the total system.

Only local disturbance (fire, flood, death) renews the flow of energy through old systems. The time of cycling of natural systems may be a very long period, but in annual cropping it may be reduced to just one season or less. Permaculture thus uses the time resource much better than does annual gardening alone, and so uses sun energy to better effect. The mixed ecology of annuals and perennials maximises not only product yield, but also the resourcefulness of the men and women who establish, control, and harvest, it. It is only in a thoughtless, monetary, and doomed economy that we can evolve the concept of unemployed and unwanted human beings.

Death in over–mature systems is thus seen as the essential renewal of life, not in the negativistic sense of the fatalist, but in a positivistic and natural way. It is better that elements die, and are renewed by other species, than the system simplifies to extinction. It is better for the tribe if its components change than if it turns in on itself, ages, and decays as a whole. Life is then seen as a preparation for succession and renewal, rather than a journey to extinction.

Time as Watt notes is a resource. Like all resources, too much of it becomes counterproductive, and a system in which too much time is accumulated becomes chronically polluted, as a system in which not enough time has accumulated is below peak yield. A strawberry seedling and an old strawberry bush are equally unproductive, as are the very young and the very old in society. As there are age–specific diseases in people (whooping cough, prostate hypertrophy) so there are age–specific diseases in whole systems, and a mixed–age stand is the best insurance against complete failure or epidemic disease of this nature. As individuals, we have a right to live a responsible life, and a right to die. If our efforts to prevent ageing succeed, we may produce a crowded, unstable, and unproductive society subject to gerontocratic peevishness!

## 2.14
## PRINCIPLE SUMMARY

**The Prime Directive of Permaculture:** The only ethical decision is to take responsibility for our own existence and that of our children's.

**Principle of Cooperation:** Cooperation, not competition, is the very basis of future survival and of existing life systems.

**The Ethical Basis of Permaculture:**

1. CARE OF THE EARTH: Provision for all life systems to continue and increase.

2. CARE OF PEOPLE: Provision for people to access those resources necessary to their existence.

3. SETTING LIMITS TO POPULATION AND CONSUMPTION: By governing our own needs, we can set resources aside to further the above principles.

**Rules of Use of Natural Resources:**

- Reduce waste, hence pollution;
- Thoroughly replace lost minerals;
- Do a careful energy accounting; and
- Make a biosocial impact assessment for long term effects on society, and act to buffer or eliminate any negative impacts.

**Life Intervention Principle:** In chaos lies unparalleled opportunity for imposing creative order.

**Law of Return:** Whatever we take, we must return, or
Nature demands a return for every gift received, or
The user must pay.

**Directive of Return:** Every object must responsibly provide for its replacement. Society must, *as a conditions of use*, replace an equal or greater resource than that used.

**Set of Ethics on Natural Systems:**

- Implacable and uncompromising opposition to further disturbance of any remaining natural forests;
- Vigorous rehabilitation of degraded and damaged natural systems to a stable state;
- Establishment of plant systems for our own use on the *least* amount of land we can use for our existence; and
- Establishment of plant and animal refuges for rare or threatened species.

**The Basic Law of Thermodynamics** [as restated by Watt[13]]:

"All energy entering an organism, population or ecosystem can be accounted for as energy which is stored or leaves. Energy can be transferred from one form to another, but it cannot disappear, or be destroyed, or created. No energy conversion system is ever completely efficient."

[As stated by Asimov (1970)]: "The total energy of the universe is constant and the total entropy is increasing."

**Birch's Six Principles of Natural Systems:**

1. Nothing in nature grows forever. There is a constant cycle of decay and rebirth.

2. Continuation of life depends on the maintenance of the global bio–geochemical cycles of essential elements, in particular carbon, oxygen, nitrogen, sulphur, and phosphorus.

3. The probability of extinction of populations or a species is greatest when the density is very high or very low. Both crowding and too few individuals of a species may reach thresholds of extinction.

4. The chance that a species has to survive and reproduce is dependent primarily upon one or two key factors in the complex web of relations of the organism to its environment.

5. Our ability to change the face of the earth increases at a faster rate than our ability to foresee the consequence of change.

6. Living organisms are not only means but ends. In addition to their instrumental value to humans and other living organisms, they have an intrinsic worth.

**Practical Design Considerations:**

• The systems we construct should last as long as possible, and take least maintenance.

• These systems, fueled by the sun, should produce not only their own needs, but the needs of the people creating or controlling them. Thus, they are sustainable, as they sustain both themselves and those who construct them.

• We can use energy to construct these systems, providing that in their lifetime, they store or conserve more energy than we use to construct them or to maintain them.

**Mollisonian Permaculture Principles:**

1. Work with nature, rather than against the natural elements, forces, pressures, processes, agencies, and evolutions, so that we assist rather than impede natural developments.

2. The problem is the solution; everything works both ways. It is only how we see things that makes them advantageous or not (if the wind blows cold, let us use both its strength and its coolness to advantage). A corollary of this principle is that everything is a positive resource; it is just up to us to work out *how* we may use it as such.

3. Make the least change for the greatest possible effect.

4. The yield of a system is theoretically unlimited. The only limit on the number of uses of a resource possible within a system is in the limit of the information and the imagination of the designer.

5. Everything gardens, or has an effect on its environment.

**A Policy of Responsibility (to relinquish power):** The role of beneficial authority is to return function and responsibility to life and to people; if successful, no further authority is needed. The role of successful design is to create a self–managed system.

**Categories of Resources:**

1. Those which increase by modest use.
2. Those unaffected by use.
3. Those which disappear or degrade if not used.
4. Those reduced by use.
5. Those which pollute or destroy other resources if used.

**Policy of Resource Management**: A responsible human society bans the use of resources which permanently reduce yields of sustainable resources, e.g. pollutants, persistent poisons, radioactives, large areas of concrete and highways, sewers from city to sea.

**Principle of Disorder:** Any system or organism can accept only that quantity of a resource which can be used productively. Any resource input beyond that point throws the system or organism into disorder; oversupply of a resource is a form of chronic pollution.

**Definition of System Yield:** System yield is the sum total of surplus energy produced by, stored, conserved, reused, or converted by the design. Energy is in surplus once the system itself has available all its needs for growth, reproduction, and maintenance.

**The Role of Life in Yield:** Living things, including people, are the only effective intervening systems to capture resources on this planet, and to produce a yield. Thus, it is the sum and capacity of life forms which decide total system yield and surplus.

**Limits to Yield:** Yield is not a fixed sum in any design system. It is the measure of the comprehension, understanding, and ability of the designers and managers of that design.

**Dispersal of Food Yield Over Time:**

• By selection of early, mid and late season varieties.

• By planting the same variety in early or late-ripening situations.

• By selection of long–yielding varieties.

• By a general increase in diversity in the system, so that:

• Leaf, fruit, seed and root are all product yields.

• By using self–storing species such as tubers, hard seeds, fuelwood, or rhizomes which can be "cropped on demand".

• By techniques such as preserving, drying, pitting, and cool storage.

• By regional trade between communities, or by the utilisation of land at different altitudes or latitudes.

**Principle of Cyclic Opportunity:** Every cyclic event increases the opportunity for yield. To increase cycling is to increase yield.

Cycles in nature are diversion routes away from entropic ends—life itself cycles nutrients—giving opportunities for yield, and thus opportunities for species to occupy time niches.

**Types of Niches:**

• Niche in space, or "territory" (nest and forage sites).

• Niche in time (cycles of opportunity).

• Niche in space–time (schedules)

**Principle of Disorder**: Order and harmony produce energy for other uses. Disorder consumes energy to no useful end.

Neatness, tidiness, uniformity, and straightness signify an energy–maintained disorder in natural systems.

**Principle of Stress and Harmony**

Stress may be defined as either prevention of natural function, or of forced function; and (conversely) harmony as the permission of chosen and natural functions and the supply of essential needs.

**Principle of Stability:** It is not the number of diverse things in a design that leads to stability, it is the number of beneficial connections between these components.

**Information as a Resource:** Information is *the* critical potential resource. It *becomes* a resource only when obtained and acted upon.

## 2.15
## REFERENCES

Waddington, C. H., *Tools for Thought*, Paladin, UK, 1977.

ZONE AND SECTOR ANALYSIS: Design by the application of a master pattern (3.9).

All these methods can be used to start on sensible and realistic design, with innovative characteristics. Each method is described below.

## 3.2
## ANALYSIS
## DESIGN BY LISTING THE CHARACTERISTICS OF COMPONENTS

The components of a total design for a site may range from simple technological elements to more complex economic and legal systems. How are we to make decisions about the patterning and placement of our components (systems, elements, or assemblies)? We can list what we know about the characteristics of any one component, and see where this leads us in terms of beneficial connections.

Principle of Self–Regulation

The purpose of a functional and self–regulating design is to place elements or components in such a way that each serves the needs, and accepts the products, of other elements.

To illustrate, we could select a homely and universally–known component, a chicken. What do we know about this hen? We can list its PRODUCTS (materials, behaviours, derived products), NEEDS (what the

**TABLE 3.1**
ELEMENTS OF A TOTAL DESIGN