

CHAPTER 15

ZONING FORESTS FOR MULTIPLE USE AND NATURE CONSERVATION

CHAPTER OUTLINE

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15.1 INTRODUCTION

Pressure on forest resources is increasing rapidly in Uganda as in many developing countries, and will continue to do so for the foreseeable future. It is therefore important that the existence of Forest Reserves is justified by ensuring that they can provide for a range of uses, rather than just one. It is clear that, while demand for timber is high and rising, demand for other products and services from the forest, such as supplying building poles, firewood, clean water, soil protection services, amenity opportunities and wildlife conservation, is often just as high or higher.

Many countries now recognise that different forests have different values, which determine the uses to which they can best be put. Timber production may remain the primary aim in some, but nature conservation or catering for the needs of local people may take priority in others. The philosophy of **multiple-use**, which is beginning to be widely adopted, can be implemented in two ways:

- by trying to cater for all possible management options in each and every forest reserve;
- by allocating different uses (or combinations of uses) to different reserves.

Table 15.1 lists some of the management options that would need to be considered in the management of the entire forest estate, and assesses how compatible each one is with other options, in the opinion of the authors (Panayotou and Ashton, 1992). It is clear that some options are totally compatible, others are totally incompatible, while others can be compatible in certain circumstances. What this means is that if we want multiple-use management to succeed, we must have some sort of **zoning** scheme, where different management options are permitted, encouraged or prohibited in different zones. We must zone the forest estate, and we may have to zone individual forests. Although the idea is a relatively new one for most foresters, there are some forests that have been zoned for many decades. An early example is Mount Kilimanjaro, which has had a buffer zone of planted forest around the base (outside) of the protected forest since 1941, known as the “half-mile forestry strip” (Kivumbi and Newmark, 1991).

15.2 ZONING THE FOREST ESTATE

15.2.1 Designing a zoning scheme

The Uganda Forest Department has taken on the task of zoning the entire forest estate to cater for a range of management options. To some extent, this is formalising an existing informal system, in which some forests were labelled “production forests” and others “protection forests”. In 1988, the Forest Department made a policy decision that

the forest estate would be zoned into three broad categories, in the following proportions:

- Nature reserves (20%)
- “Buffer” zones (30%)
- Production zones (50%)

Each of these zones would place different priority on the main management options (Table 15.2).

Table 15.1. Compatibility matrix for various forest management options. After Panayotou and Ashton (1992). Primary options are listed in capitals down the left-hand side; secondary options are listed across the top

| | Timber production | Fuelwood production | Non-wood production | Soil and water conservation | Genetic resource conservation |
|--------------------------------------|--|--|--|---|--|
| TIMBER PRODUCTION | <ul style="list-style-type: none"> • Trade-offs between high-quality and general purpose timber • Complementarity between high-quality and general purpose timber (shade, pollination) | <ul style="list-style-type: none"> • Encroachment • Possible damage to standing timber • Thinning • Short-term income • Trade-offs but generally compatible | <ul style="list-style-type: none"> • Encroachment • Possible damage to standing timber • Short-term income • Biological inter-dependence • Trade-offs, but generally compatible | <ul style="list-style-type: none"> • Imposes constraints on logging methods • Complementarity with sustainable yield • Management and selective or strip logging | <ul style="list-style-type: none"> • Generally incompatible except for generalist species, as corridors, and where there is a very selective harvest of high-value species by non-destructive harvest methods |
| FUELWOOD PRODUCTION | <ul style="list-style-type: none"> • Selective logging of high-value species not incompatible • Additional income • Logging may provide more profit | <ul style="list-style-type: none"> • Fuelwood from natural forests versus fast-growing plantations/village forest • Fuelwood versus charcoal versus substitution | <ul style="list-style-type: none"> • Generally compatible in natural forest and multi-species plantations • Additional income • Constraint on fuelwood species | <ul style="list-style-type: none"> • Imposes constraints on access and harvest • Complementarity with sustainable yield • Additional value • Trade-offs, but compatible | <ul style="list-style-type: none"> • Generally incompatible except for managed fuelwood • Corridors for generalist species |
| NON-WOOD PRODUCTION | <ul style="list-style-type: none"> • Compatible except where logging or silvicultural methods damage non-wood production • Additional income | <ul style="list-style-type: none"> • Compatible for only certain species • Encroachment • Additional income • Possible damage to non-wood income | <ul style="list-style-type: none"> • Choice of areas • Choice of species • Densities • Local versus national and export market | <ul style="list-style-type: none"> • Generally compatible • Additional value • Constraints on fodder harvest • Ground cover | <ul style="list-style-type: none"> • Imposes constraints on the collection of plants and animals • Higher management costs • Trade-offs, but compatible |
| SOIL AND WATER CONSERVATION | <ul style="list-style-type: none"> • Compatible only if logging methods do not disturb, compact or expose the soil to erosion • Higher logging and mangt. cost but additional value | <ul style="list-style-type: none"> • Encroachment • Possible damage to ground cover and the soil • Additional value • Compatible if properly managed | <ul style="list-style-type: none"> • Encroachment • Possible damage to ground cover and soil • Additional income • Compatible if properly managed | <ul style="list-style-type: none"> • Selection of critical watershed areas, densities, and cover species • Monitoring and protection • Substitutes • Rehabilitation of degraded areas | <ul style="list-style-type: none"> • Generally compatible but most watersheds degraded or poor in species • Additional value |
| GENETIC RESOURCE CONSERVATION | <ul style="list-style-type: none"> • Generally incompatible | <ul style="list-style-type: none"> • Generally incompatible | <ul style="list-style-type: none"> • Generally incompatible except for collection of species samples for research | <ul style="list-style-type: none"> • Generally compatible • Watershed areas can also serve as corridors | <ul style="list-style-type: none"> • Choice of areas • Choice of species • Generalist versus specialist species |

Table 15.2. Management objectives of forest zones (Howard, 1991)
Objectives are ranked in order of decreasing priority.

| Strict nature reserve | Buffer zone | Timber production zone |
|------------------------|----------------------------|-----------------------------|
| Gene pool conservation | Gene pool conservation | Sustained timber production |
| Habitat preservation | Water catchment protection | Other consumptive uses |
| Research control | Dispersal centre | Non-consumptive uses |
| Dispersal centre | Non-consumptive uses | Gene pool conservation |
| Non-consumptive uses | Low-impact uses | Water catchment protection |

This is a very simplified version of what is in practice a highly complicated procedure. Since it was devised, the term *buffer zone* has rather gone out of favour, because it is used by other organisations to signify areas *around* a protected area but outside the jurisdiction of the authority managing the protected area. In the Forest Department's case, the term was meant to signify an internal zone. A provisional revised classification of zones has recently been proposed and accepted, in which the 50-50 split between "protection" and "utilisation" is maintained, but the term *buffer zone* no longer features. The

policy is now to zone the estate as shown in Table 15.3 and Figure 15.1.

15.2.2 Deciding which zones are represented in which forests

Deciding on which zones are to be represented in which forests, and in what proportions, requires us to examine each zone in turn. The following paragraphs provide a **provisional** idea of how the Uganda forest estate should be zoned, based on a paper presented to senior Forest Officers by Howard (1994c).

Table 15.3. Current Uganda Forest Department policy for zoning the forest estate.
After Howard (1994c)

| Primary division | Protection | | | | | Utilisation | | | |
|------------------------------------|---|---|--|--------------------------------------|---|---|---|--------------------------------------|--|
| | Zone | Strict nature reserve | Minimal disturbance zone | Watershed protection zone | Recreation zone | Research zone | Commercial use/production zone | Commercial use/silviculture zone | Community use zone |
| Approx. % of forest estate | 20% | 10% | 15% | 3% | 2% | 35% | | 10% | 5% |
| Primary management objective | Biodiversity preservation | Maintenance of integrity of nature reserves | Watershed protection, prevention of soil erosion | Recreation and amenity | Protection of areas of special scientific importance | Sustainable timber production | Restoration of timber production | Subsistence use by local communities | Sustainable timber production outside the natural forest |
| Criteria for selection/designation | Biodiversity value, minimal past disturbance etc. | Location of nature reserves | All areas exceeding 25° slope | Intrinsic appeal, accessibility etc. | Disturbed sites of high conservation value but not warranting nature reserve status | Standing timber volume, accessibility little erosion prospect | Areas degraded by unsustainable timber harvesting or encroachment | Local demand | Land suitability, timber trial results |
| Permitted activities | Research | Subsistence use, research, seed collection | Subsistence use | Recreation | Research, education | Controlled timber harvesting, silviculture | Restoration planting, silviculture | Subsistence use | Intensive timber production |
| Prohibited activities | All other | Timber harvesting | Timber harvesting | Timber harvesting, subsistence use | All other | Recreation and subsistence use | Recreation, subsistence use | Commercial use | All other |

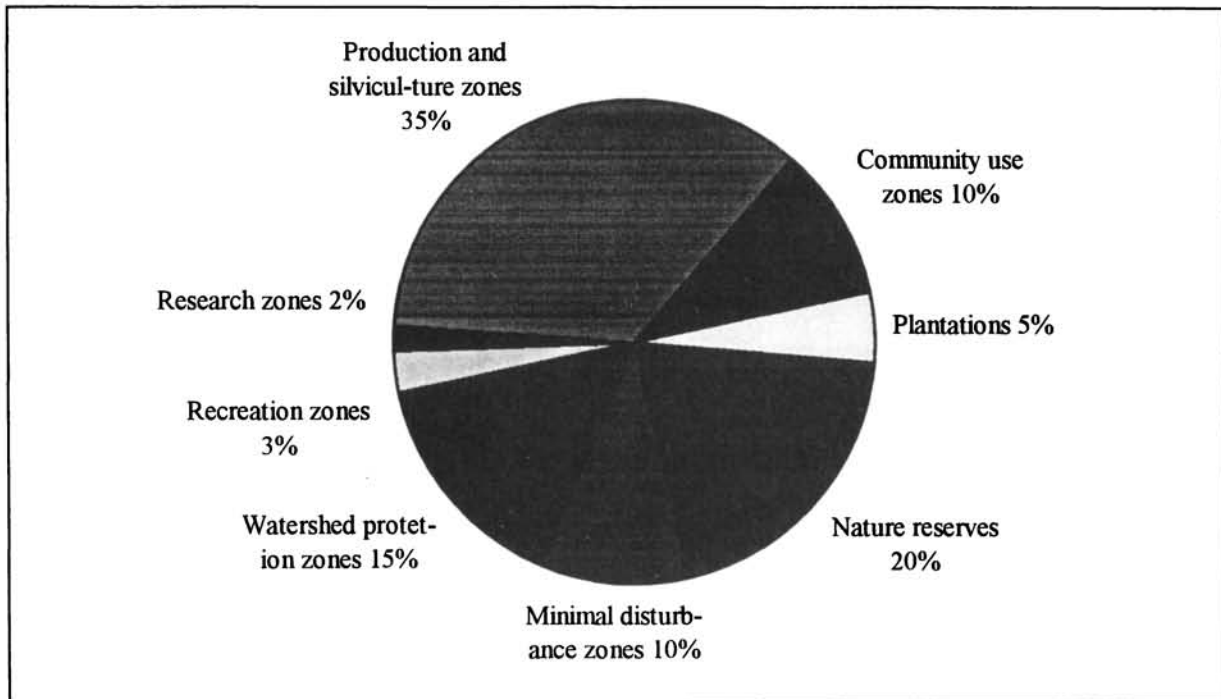


Figure 15.1. Proposed management zones for the entire forest estate of the Uganda Forest Department. After Howard (1994c).

Nature reserves and minimal disturbance zones

The biological inventories that have been conducted in 75% of the forest estate of Uganda (see Chapter 14) will enable priorities to be set regarding the size and location of nature reserves. Reserves with more species, or with many rare or threatened species or habitats, or with large areas of climax communities, will normally require a larger percentage devoted to nature reserves than reserves that seem to be less important for biodiversity conservation. Such conditions are more likely to be met in large reserves (see Section 12.3). Many small and medium-sized reserves may have no nature reserves at all if they are not important enough for biodiversity conservation, but nature reserves will probably be established in most of the large production forests. Minimal disturbance zones, perhaps comprising a strip one compartment or 500 m wide, will be established around these as true buffers, to minimise the impact of any activities outside the buffer.

Watershed protection zones

A large proportion of the forest estate is on slopes exceeding 25°, and therefore is unsuitable for development for timber extraction and important for prevention of soil erosion and for water catchment protection. Thus many forest reserves, particularly those in the north and east of Uganda, will be almost exclusively allocated to watershed protection zones.

Recreation zones

Since the major forest reserves with tourism potential were transferred to National Parks, there remain relatively small areas of forest which are still suitable for development as recreation zones. To qualify, such areas should have an obvious attraction, such as easy access, safety, interesting wildlife or scenery (see Chapter 10). Recreation development should also only proceed where it can serve a useful purpose.

Research zones

Some parts of the forest estate have a long history of research, and other parts could also be opened for research, either ecological or silvicultural, on the advice of academics or foresters. Areas designated specifically for research will only be a very small fraction of the estate, yet they may potentially provide a great deal of useful information for forest management.

Commercial use zones

These are the zones estate where sustainable timber production will be carried out. Timber inventories should provide much information on suitable areas for designation, in combination with other inventories. The suggested percentage represents a sizeable proportion of the estate, probably greater than is actually under this use at present.

Half of this area already has the potential to produce timber sustainably, while the other half should have the potential in the future once it has recovered from past encroachment. Rehabilitating such areas will require major silvicultural input.

Community use zones

A relatively small percentage of the forest estate will be designated as community use zone. It will therefore be important to make sure that the areas designated are appropriate for local use, so designation should be preceded by surveys and consultations with the potential users (see Chapter 13). It should be remembered that community use need not be confined to such zones, but within such zones the community should be the major user.

Plantations

The percentage quoted for plantations reflects the current position. It is hoped that the area of plantation in Uganda will rise, but the extra area should not be taken from other zones. Uganda

needs more plantations, but not at the expense of gazetted natural forest that is already serving other uses (see Chapter 8). One suggestion worth pursuing is the possibility of afforesting part of the large areas of grassland that make up a significant proportion of forest reserves such as Budongo and Bugoma.

It is clear that not all forest reserves are equally important for every management option. In general, large natural forest reserves are likely to be most important for nature conservation, while small reserves are likely to be more important for local community use. In Uganda, there are relatively few large forest reserves, and very many small forest reserves, as Figure 15.2 illustrates. Thus nature reserves and other protection areas will almost certainly be confined to the few large forests, but even so, many large forests will be zoned primarily for utilisation. Table 15.4 gives a proposed breakdown of how the forest in these different size categories might be zoned so that, overall, the 50:50 split between protection and utilisation is maintained.

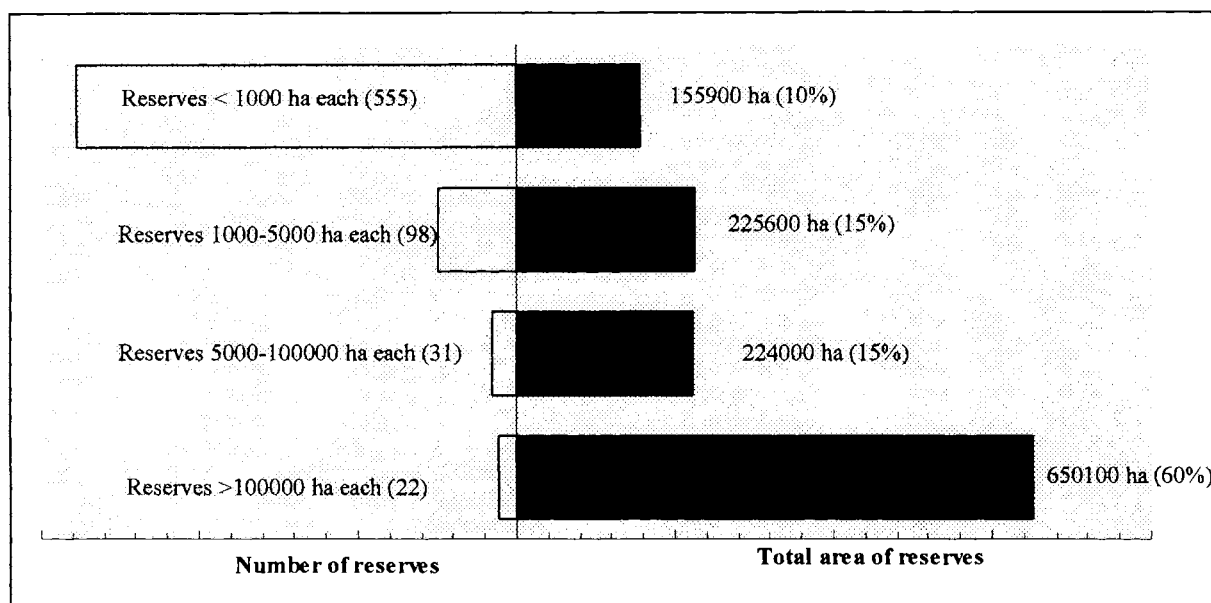


Figure 15.2. The contribution of different size-categories of forest reserves to the forest estate of Uganda. After Howard (1994c).

Table 15.4.
Suggested zoning allocations for Ugandan forest reserves of different sizes (Howard, 1994c)

| Reserve size (km ²) | Number of reserves | Total area (km ²) | % Protection zones | % Utilisation zones |
|---------------------------------|--------------------|-------------------------------|--------------------|---------------------|
| >100 | 22 | 6501 | 75 | 25 |
| 50-100 | 31 | 2240 | 34 | 66 |
| 10-50 | 98 | 2256 | 25 | 75 |
| < 10 | 555 | 1559 | 4 | 96 |
| TOTAL | 706 | 12556 | 50 | 50 |

15.3 ZONING INDIVIDUAL FORESTS

One of the key factors on which the zoning of individual forests in Uganda is to be based is the **conservation value** of each forest. This is derived from the results of the ranking exercise based on the biological inventory procedure discussed in Chapter 14. In addition, we need to take into account other factors such as the role of each forest in watershed protection and their current value for timber production and local use.

Because nature conservation is most important in the largest forest reserves, let us confine our discussion to this group. Table 15.5 lists the 22 forest reserves in Uganda that exceed 100,000 ha, together with a **preliminary** indication of how each may be zoned. Large forest reserves that lie wholly within national parks (Mount Elgon, Rwenzori, Bwindi and Semliki), and the parts of other forest reserves that lie within national parks (Zulia, Kalinzu/Maramagambo, Nyangea Napore and Morongole), have been excluded from the table, since their national park status already implies 100% protection. Note that the scheme

enables these large forests once again to be broadly classified into "production" and "protection" forests.

The table does not go into the detail about how much of the protection zones should be strict nature reserves. This is something that would have to be decided on the basis of each forest's conservation value (based on the biological inventory), weighed up with the other factors. Once it has been decided what proportion of a forest reserve should be protected as a nature reserve, there is still much work to do in actually defining precisely which area should be protected. In theory, the second phase of the biological inventory, in which important forest reserves are investigated in detail, should point to the most important areas needing designation. Whether this happens or not, there are many questions that would need addressing at this stage. Box 15.1 lists some of them.

Table 15.5.
Suggested allocation of protection and production zones in Uganda's major forest reserves
(after Howard, 1994c)

| FOREST TYPE | Forest Reserve | Total area outside N.P.s (km ²) | Protection zones (km ²) | Protection zones (%) | Utilisation zones (km ²) | Utilisation zones (%) |
|--------------------|--------------------------|---|-------------------------------------|----------------------|--------------------------------------|-----------------------|
| PRODUCTION FORESTS | Budongo (forested part) | 428 | 107 | 25 | 321 | 75 |
| | Budongo (grassland part) | 397 | 297 | 75 | 100 | 25 |
| | Kalinzu | 132 | 46 | 35 | 86 | 65 |
| | Maramagambo (South) | 151 | 151 | 100 | 0 | 0 |
| | Bugoma (forested part) | 300 | 120 | 40 | 180 | 60 |
| | Bugoma (grassland part) | 65 | 0 | 0 | 65 | 100 |
| | Kasyoha-Kitomi | 399 | 199 | 50 | 200 | 50 |
| | Mabira | 300 | 60 | 20 | 240 | 80 |
| | South Busoga | 164 | 41 | 25 | 123 | 75 |
| | Sango Bay | 151 | 76 | 50 | 75 | 50 |
| | Kagambe | 113 | 57 | 50 | 56 | 50 |
| PROTECTION FORESTS | Mount Zulia | 700 | 700 | 100 | 0 | 0 |
| | Mount Moroto | 483 | 459 | 95 | 24 | 5 |
| | Labwor Hills | 437 | 415 | 95 | 22 | 5 |
| | Nyangea Napore | 317 | 301 | 95 | 16 | 5 |
| | Mount Kadam | 399 | 379 | 90 | 20 | 5 |
| | Mount Kei | 384 | 358 | 93 | 26 | 7 |
| | Agoro-Agu | 236 | 212 | 90 | 24 | 10 |
| | Napak | 203 | 193 | 95 | 10 | 5 |
| | Otze | 188 | 178 | 95 | 10 | 5 |
| | Morongole | 76 | 72 | 95 | 4 | 5 |
| | Timu | 117 | 105 | 90 | 12 | 10 |
| | Rom | 124 | 118 | 95 | 6 | 5 |
| | Kilak | 102 | 97 | 95 | 5 | 5 |

Box 15.1

Some of the many questions that would need to be addressed in any plan for zoning forest reserves for multiple use including nature conservation

- How important is it to include representative areas of all the forest types present, in a strict nature reserve?
- Should we also try to include any grassland?
- Are all forest types of equal conservation value, or should we favour the mature types, or the rarest?
- Is it feasible to protect a whole catchment, for example as a mixture of nature reserve and buffer zone?
- How important or feasible is it to protect examples of forests from the full range of altitudes represented?
- Are there any rivers, valley bottoms or hill-tops that might make easily-demarcated boundaries for zones?
- How important is it to site a nature reserve as far as possible away from surrounding settlements?
- Can the location of settlements, roads and pit sawn areas help us decide which areas local people would find most useful as buffer zones?
- Should we assume that any logged areas are now of low conservation value, and beyond recovery?
- Should the condition of any sawmills or existing access road affect our decisions about where mechanical logging should be permitted in the future?
- Does the location of the any guard-post help us to decide where to locate any boundaries between zones?
- To what extent does high basal area of timber trees imply high conservation value?
- To what extent should we minimise conflict with timber interests by avoiding designating areas with high basal area as nature reserves or buffer zones?
- Does a currently low basal area mean that an area is intrinsically poor for long-term timber production, or is it more likely that it reflects past logging, in which case the basal area will soon increase?
- Is an area's species richness in any indicator group a good indication of its conservation value?
- Do rare species automatically occur in areas richest in species?
- Is there any relationship between an area's species richness and its value for forest products?
- To what lengths should we go to make sure that any rare species are protected in nature reserves?
- How risky would it be to assume that any rare species present would be safe outside a strict nature reserve?
- Are the rare species recorded during the inventory likely to be the only rare species in the forest?
- If there are likely to be other rare species, might we expect them to be found in those already recorded?
- The scientific guidelines for designing nature reserves assume an ideal situation. Do we have one here?
- If the situation is not ideal, how much should we deviate from the guidelines?
- If it is impossible to include all conservation areas in a single nature, should we consider having several nature reserves instead, embedded in a buffer zone?
- How far should we deviate from the idealised "concentric circle" zoning scheme?
- How much weight should we put on the results of scientific surveys and analyses, as opposed to our own feelings and those of the local community, politicians and businessmen?

The Uganda Forest Department is attempting to rationalise the selection of strict nature reserves by using computers to analyse the inventory information so as to find the most appropriate parts of any forest reserve for designation. Figure 15.3 shows how this might work in practice for a single forest reserve, and for just three of the many possible variables that might deserve consideration: total tree species richness, presence of a rare species, and suitability for timber harvesting. The computers can be used to

"weight" the information so that, for instance, the presence of species unique to a particular forest reserve has more influence on the location of the strict nature reserve than, for instance, the presence of a red data book species which is nevertheless found in several other reserves. Computers can help the process, but they are only as clever as their operators, and the location of nature reserves and other zones will depend more on human judgement.

15.4 SUMMARY

- Forests have frequently been managed for single objectives, such as timber production or watershed protection. In the future, more forests will be managed for multiple objectives, including local community use.
- Sometimes this will involve zoning so that different objectives apply to different areas.
- Local communities have often been excluded from the planning and management process. Sometimes this has led to their alienation from

the forest, which has contributed to encroachment and resource degradation in the absence of firm control of the forest by the Forest Department. In the future, local

communities ought to have a greater say in the management of some of the forests, both for their own benefit and for the benefit of the forest resources and their conservation.

15.5 FURTHER READING

Howard, P.C. 1991. *Nature conservation in Uganda's tropical forest reserves*. IUCN, Gland.

Springall, H. (ed.). 1994. *Proceedings of workshop on nature conservation for senior forest officers, 19th-23rd September 1994*. Forest Department, Kampala.

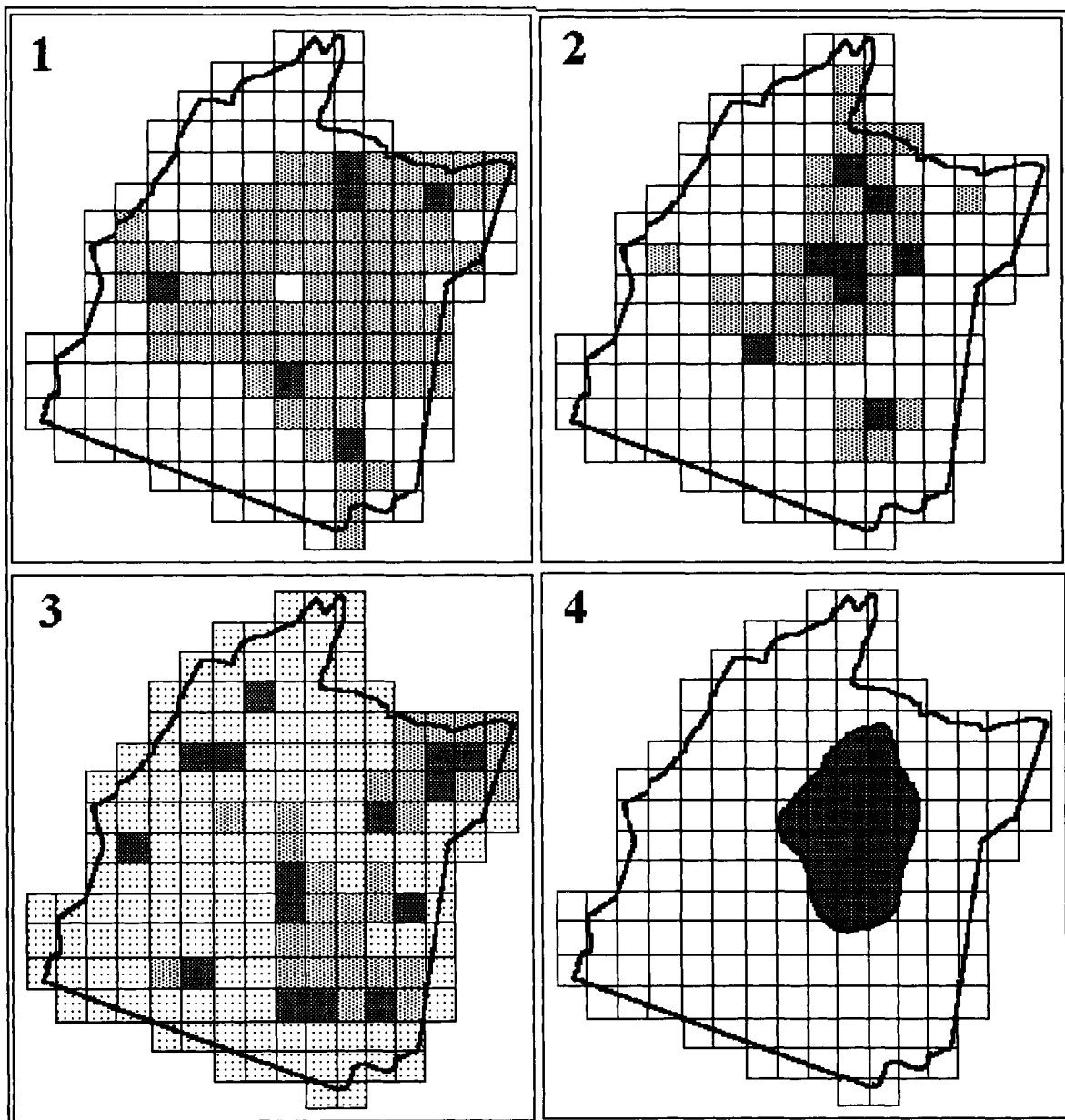


Figure 15.3. Maps showing how inventory information can help decide on the location of a strict nature reserve and other zones. The maps are based loosely on Itwara Forest Reserve, but are for illustrative purposes only. In the first three maps, the intensity of shading indicates the density of the variable in question. 1: Tree species diversity; 2: Distribution of the tree *Isolona congolana*, a rare species; 3: basal area of class 1 timber trees; 4: a possible location for a strict nature reserve, based partly on the criteria in the three previous maps. After Howard and Viskanac (1994). See text for further details.