

# SCIENCE AND THE COMMUNITY: ROLE OF THE ECOLOGICAL APPROACH IN SUSTAINABLE RANGELAND MANAGEMENT

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## Contents

1. Definition of the ecological approach
  - 1.1. The Concept of the Ecological Approach
  - 1.2. Role of the Ecological Approach in Sustainable Rangeland Management
  - 1.3. The Role of the Ecological Approach in Optimizing the Use of Natural Resources
2. Participatory implementation of the ecological approach
  - 2.1. Participation
3. A Village-based Catchment Management Plan
  - 3.1. Annual Planning
  - 3.2. The Annual Plan Meeting
  - 3.3. Plan Implementation
  - 3.4. Plan Monitoring
- Glossary
- Bibliography
- Biographical Sketch

## Summary

The concepts and principles that are inherent in the ecological approach are explained. An ecological approach allows a simple scientific basis for environmental actions to be presented to the community and allow it to be involved in deciding how to balance community and natural ecosystem needs. There are 4 common principles that are embodied in the ecological approach (i) the linkages between the components of the ecosystem and resource uses and users (ii) actions and interventions should lead to sustainable outcomes (iii) stakeholders take precautions to avoid deleterious actions and (iv) be adaptive in seeking more effective approaches based on experience. An ecosystem based approach should explicitly account for the interconnections within the ecosystem recognizing the importance of interactions among many of the target species, key services and other non target species; acknowledge the interconnections between ecosystems present in a catchment; and integrate ecological, social, economic and institutional perspectives and recognize their interdependencies. The ecological approach defines ecological sustainability in quantitative, measurable terms.

The ecological approach and sustainable land management are based on a sophisticated concept and advanced scientific research, yet they need to be understood and implemented by people using the land. The use of real examples to present this

information allows an effective combination of ecological principles and a community-based planning process. Farmers are assisted to develop an understanding of degradation trends in their own area and recognize vegetation types representing sustainable conditions. The ecological approach maximizes the use of natural resources without causing damage to an ecosystem.

Implementation usually occurs at the level of a small catchment used by the community. The facilitators of the community based planning process develop an understanding of the whole catchment. They present this understanding to the village people as individual issues, focusing on one problem at the time while considering connections of that problem with the rest of the catchment. This is particularly important with regard to availability of water and soil protection.

The use of the ecological approach has potential to revolutionize catchment management especially when used in conjunction with participatory scientific management. Participation in natural resource management and development is broadly defined as: 'people's active involvement in making decisions about the use of resources, and the design, implementation, and review of processes, programs and projects which affect them'. In order to implement effective programs, an outcome must be found which benefits both the land user and is a sustainable environmental practice, creating downstream benefits in lower catchments.

An example from the Huangshui catchment project in the Qinghai-Tibet Plateau of NW China is presented to illustrate the implementation of the participatory approach.

### **1. Definition of the Ecological Approach**

An ecological approach allows a simple scientific basis for environmental actions to be presented to the community and allow it to be involved in deciding how to balance community and natural ecosystem needs. There are 4 common principles that are embodied in the ecological approach (i) the linkages between the components of the ecosystem and resource uses and users (ii) actions and interventions should lead to sustainable outcomes (iii) stakeholders take precautions to avoid deleterious actions and (iv) be adaptive in seeking more effective approaches based on experience. An ecosystem based approach should explicitly account for the interconnections within the ecosystem recognizing the importance of interactions among many of the target species, key services and other non target species; acknowledge the interconnections between ecosystems present in a catchment; and integrate ecological, social, economic and institutional perspectives and recognize their interdependencies.

An ecological approach which is based on vegetation communities or vegetation classes is a practical way to combine several of the catchment characteristics. Climate, geology and physiography, soils, land use and cover conditions are all controlling factors in determining vegetation classes. Catchment hydrology is a function of all of these factors. While scientific analysis of each of these factors can be undertaken to assess the resilience of the environment and catchment hydrology under existing land use, the detail required and the difficulty in explaining the combination of complex factors to the community recommend against such an approach.

It is recommended that the analysis and presentation to the community be reduced to two matters: vegetation classes and socio-economic features.

### **1.1. The Concept of the Ecological Approach**

The idea behind the ecological approach is the development of an objective understanding of an ecosystem which is achieved by taking a perspective of an ecosystem rather than relying on human perception. This involves understanding ecological processes, including the trends in degradation and regeneration. The understanding is developed in a 3-step process:

- i. Field survey to capture the ecological diversity of a given area
- ii. Computer analysis to classify vegetation types
- iii. Preparation of an ecological model to show structure and dynamics of an ecosystem. (Structure of an ecosystem is represented by vegetation types and the dynamics is shown by changes of these types from one to another).

The heart of this model is an understanding of the processes of degradation and recovery as outlined by Squires et al., in their book. Model development is not a single step process of data collection, analysis and model construction using the results of the analysis. Rather, it is a process of observation, data collection, proposing a hypothesis, testing the hypothesis against the collected data, and revising the hypothesis. Development of the model for a particular ecosystem requires both insight and intuition to propose the hypothesis.

An example of this process of model development from work in north-west China is given in Section 3.

Once an ecosystem's dynamics are understood, it is possible to identify a 'sustainable land condition' defined as a vegetation type or sub-type with a specific combination of dominant species and typical appearance. This 'type' representing the sustainable condition is not natural, or degraded, it is in a modified condition from which it can readily regenerate, should the productive use be discontinued. Maintaining the balance of this condition is the main principle of ecologically sustainable land-use (see *New Thinking in Range Ecology*).

This approach is ideal for rangeland catchments which are not greatly modified from the natural condition as farmland might be. The approach is not directly applicable in cropped farmland situation as sustainability there does not relate to the plant communities.

*The ecological approach defines ecological sustainability in quantitative, measurable terms.*

### **1.2. Role of the Ecological Approach in Sustainable Rangeland Management**

Environmental protection and sustainable use of natural resources is increasingly difficult. Demands for land and its products are increasing with a growing population:

natural resources are under increasing pressure and regulation of natural resources use is needed.

Regulation includes making decisions about which land is to be rehabilitated and which land can be used for productive purposes. Division of land for protection and production is done on the basis of existing scientific understanding and experience. The experience gained in rehabilitating degraded land or in its productive use should be used to increase this understanding and improve later decisions. Clear understanding is necessary to implement this type of adaptive management (see *Range Improvements* and *Integrated Rangeland Management Systems*). The role of an ecological approach in catchment management is to provide the type of understanding necessary for ecologically sustainable land management.

### **1.3. The Role of the Ecological Approach in Optimizing the Use of Natural Resources**

Land with no potential for productive use, or where there is clear indication that the current land-use is leading to destruction of the ecosystem, must be protected even if local communities depend on this land for their livelihood. If land is allowed to continue to degrade it ceases to be productive, and at that stage local people have no choice but to abandon it.

An ecological approach is unique in considering the needs of an ecosystem for its own survival before the needs of people. Ultimately this is for the sake of the long-term benefit of local people and the wider community. An ecological approach also makes it possible to identify the full potential of land and to determine how productivity can be sustained without a negative impact on the environment. With the use of this knowledge, local communities can rehabilitate degraded land, protect ecologically important land (e.g. wetlands and headwaters of the streams), while using land with productive potential for their economic *benefit*.

*The ecological approach maximizes the use of natural resources without causing damage to an ecosystem.*

## **2. Participatory implementation of the ecological approach**

### **2.1. Participation**

Participation in natural resource management and development is broadly defined as: 'people's active involvement in making decisions about the use of resources, and the design, implementation, and review of processes, programs and projects which affect *them*' (The Food and Agriculture Organization defines participation as "a process of equitable and active involvement of all stakeholders in the formulation of development policies and strategies and in the analysis, planning, implementation, monitoring and evaluation of development activities. To allow for a more equitable development process, disadvantaged stakeholders need to be empowered to increase their level of knowledge, influence and control over their own livelihoods, including development initiatives affecting them." It goes on, however, to note there is no agreed definition

among practitioners.

[http://www.fao.org/participation/english\\_web\\_new/content\\_en/definition.html](http://www.fao.org/participation/english_web_new/content_en/definition.html) 18 August 2009). In order to implement effective programs, an outcome must be found which benefits both the land user and is a sustainable environmental practice, creating downstream benefits in lower catchments. There would be an unacceptable cost in policing environmental practices and programs which are of little benefit to rural communities to benefit down-stream populations (some of whom may be urban). This strategy would fail both stakeholder groups.

This rationale for participation in natural resource management is particularly relevant to rangeland management. Rangelands are, by their nature, areas of low population density. In these areas, self-policing is the only practical option.

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### Biographical Sketch

**Hugh Milner** is an independent water resource consultant with 30 years experience working in Australia and in developing countries on:

- Sustainable management of water resources
- Policy development
- Institutional development and capacity building
- River basin planning
- Irrigation and water supply management
- Surface water hydrology
- Water resources development
- Data management for water resource systems
- Water allocation issues and property rights
- Environmental impact assessment

Hugh worked for the Department of Land and Water Conservation (and its predecessors) in Australia for 26 years. His final position in the Department was Senior Hydrologist, Water Resource Management Directorate. In this position he was responsible for a number of policy and technical aspects of inter-state and inter-governmental water resource planning and management, particularly the Murray Darling Basin Commission (total area about 500,000 km<sup>2</sup>, affecting four State Governments and the Commonwealth of Australia) and the Snowy Mountains Scheme, jointly operated to produce electricity and divert water into the Murray-Darling Basin. Since the late 1990s he has worked as an international consultant and team leader in water resources management and water policy in several countries in Asia, including China, Afghanistan, Lao PDR and Cambodia.

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