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Integrated Brush Management Systems for Texas

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What do we mean by integrated brush management systems, or IBMS? IBMS means managing brush with a "long-term" perspective. It means setting management objectives based on an inventory of range resources, the identification of problems, and the economic and environmental analysis of alternative solutions. Those management objectives must consider all enterprises affected by brush management, such as livestock and wildlife management. IBMS is a planning process that follows a logical sequence of steps (Fig. 1) leading to implementation of the system. Successful use of IBMS should result in improved management processes and greater profitability of the ranch.

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The term "brush management" is more appropriate than "brush control" because it describes current attitudes toward woody plants on rangeland. During the 1940s and early 1950s, many ranchers tried to eradicate brush. It soon became obvious that this was not possible. The concept of "brush control" became popular in the mid-1950s; its goal was suppression rather than elimination, although there were still attempts to eliminate entire stands of woody plants.

The concept of "brush management" recognizes the potential value of some quantity of woody plants in range management. The development of this concept is closely tied to the realization that wildlife is an economic asset and that management objectives should accommodate the habitat needs of wildlife. While increasing livestock production is usually a high priority in range management, it should not be done at the expense of other products, such as wildlife, that might yield economic returns. Therefore, brush management strategies should be part of an effort to manage rangeland as a multiple-use resource.

Many shrublands were formerly open grasslands that are now densely infested with woody species. They are apparently "steady state" systems that resulted from changes in the conditions that produced the earlier grasslands. These shrublands have successfully resisted man's efforts at eradication and, for the most part, even effective control. There are several reasons why this is true.

There are many woody species and they reproduce easily, making brush management difficult. In south Texas, brush stands may be composed of 12 to 15 different species, all with basal stem, crown and/or root

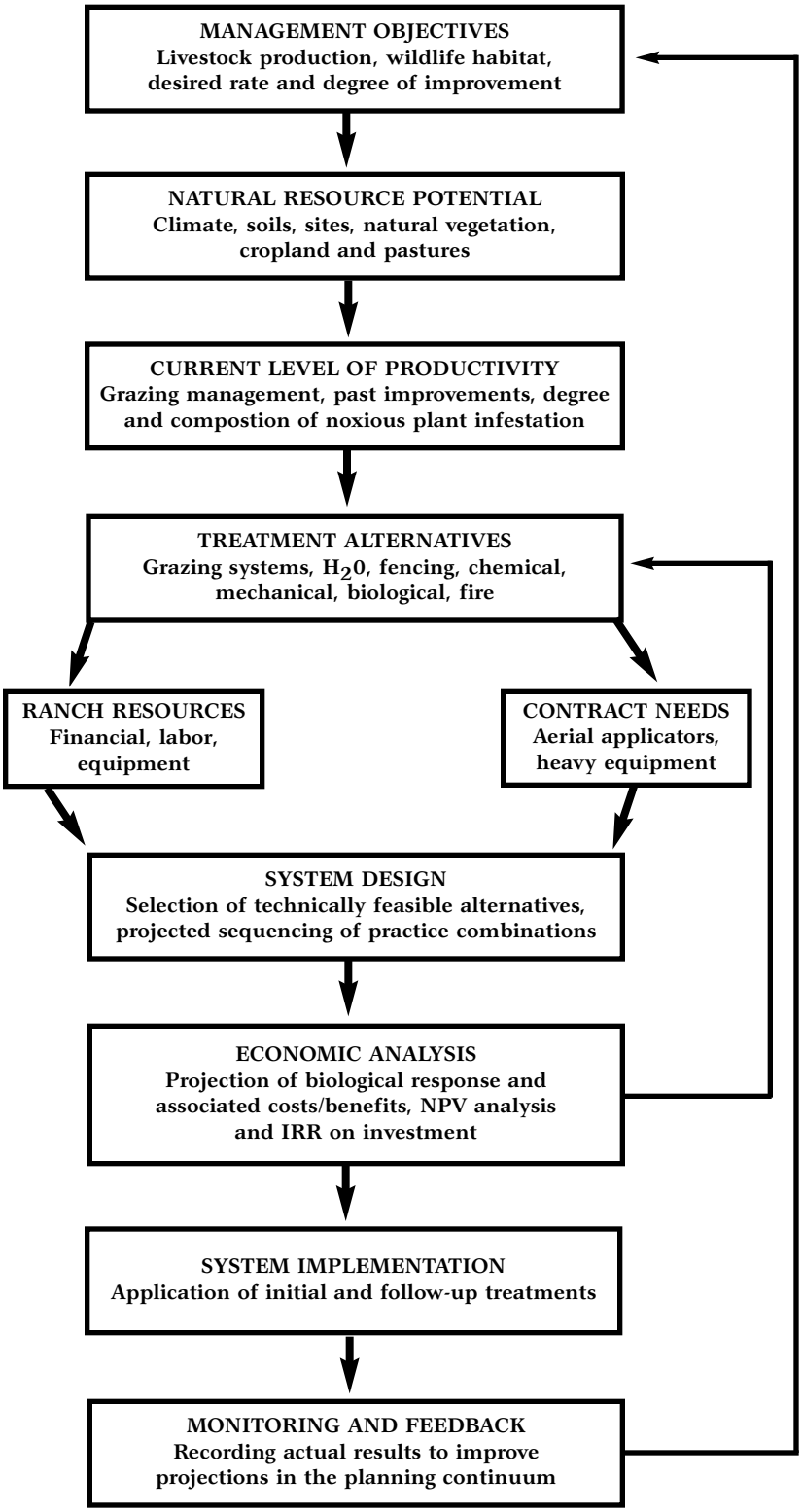

Figure 1. Diagram of the IBMS planning system.

resprouting potential. The mix of brush species within stands varies in different regions of Texas.

The differences in resource potential and desired level of management vary widely among ranches. Thus, it is unlikely that generalized "prescriptions" are possible, or that any two brush management programs should be exactly the same. Moreover, brush management programs must be economically viable. Control methods can be justified only if their cost is recovered over a reasonable period of time.

Effective brush management uses technology from a number of disciplines, including range management, wildlife biology, animal science and economics. Other disciplines such as recreation and tourism sciences also may be needed to address the potential for ecotourism or other range-related activities. In 1981, a group of Texas Agricultural Experiment Station scientists and Extension specialists with similar concerns for management of south Texas rangelands, but with different areas of expertise, formed an IBMS work group. Their perspective and recommendations are the basis for this bulletin.

Brush - Is There A Problem?

The first step in considering brush management strategies is to determine if a problem exists. "Brush" has often been described as a dense growth of bushes, shrubs and small trees. There is little question that brush has increased in density and distribution in areas that were once open grasslands. (Some land management practices have contributed to brush invasion.) Where this has

occurred, brush plants are usually labelled as pests.

Managers often describe any plants that reduce forage availability to livestock as brush or weeds. However, cattle and other livestock species are exotic, introduced animals, and it must be realized that although many native rangeland plants have no value for livestock production in a typical ranching environment, these plants are essential to the survival of native wildlife, including game, non-game animals, birds and even insects. Brush species provide wildlife with food, water, shelter and nesting cover.

The value of a plant, then, often lies in the eyes of the beholder, and brushy plants may not always be pests. Certainly brush competes with forage for water, and shading by brush over a long period can change the forage species composition from warm-season grasses, valued for livestock production, to cool-season grasses that grow beneath the canopy. However, cool-season grasses also can be an asset. They can be grazed in the winter to reduce supplemental feed expenses.

Other ecological shifts that may occur when brush invades grassland can be beneficial. Brush stands alter the environment underneath their canopy and may provide a more nutrient rich environment for other plants. Deep-growing roots can bring minerals to the soil surface where other plants may benefit through the recycling of leaf litter. Stands of plants with thorns or barriers to grazing, such as prickly pear, protect desireable, sensitive plants growing within them. Such protected areas allow these plants to survive as future seed sources. Desirable woody plants also often grow inside the protective canopy of spiny plants.

Brush also may increase the price of land being sold for rural and suburban development. In fact, acreages cleared of all brush may sell for 60 percent less than land where the brush was left intact because developers, builders and future buyers value an aesthetically pleasing view. So in dealing with brush, it is wise to consider how the future value of a property may be affected.

Some woody plants have value other than for grazing, shade or aesthetic value. Honey mesquite, for example, can be cut for firewood, bar-b-que chips, wood for making charcoal and fine heart wood for making expensive furniture.

Brush often occurs in mixed stands, and it is necessary to identify the individual brush species when deciding whether or not there is a problem. Simply classifying the plants as brush limits any understanding of their value or of the techniques and strategies needed to manage the area.

Developing and Implementing an IBMS

If a brush problem is identified, then a logical plan for addressing the problem can be developed. These are the steps in developing and implementing an IBMS.

1. Setting Objectives

The IBMS planning process should begin with identifying the general objectives of ranch management. These might include increasing forage production and carrying capacity of the range, realizing income from a wildlife-related enterprise, or preserving the future value of the property. Specific objectives are determined after conducting a comprehensive inventory of soil and vegetation resources, projecting the responses of those resources to treatment alternatives, and considering what effects those treatment alternatives will have on livestock, wildlife and related ranch programs. Treatment alternatives have different input costs, follow-up maintenance requirements, and predicted economic performance. Each also will affect the appearance of the land in a different way.

2. Conducting an Inventory

Range sites are areas of the landscape with different production potentials. Conducting an inventory of the resources on each range site is an essential element of the planning process. Managers should have an accurate picture of the brush species composition and distribution for each range site, the current and potential level of forage production, the characteristics of the land (terrain, contour, rainfall, soils, etc.), the wildlife species that are present and what their needs are, and the kind and number of domestic animals that will use the land. Brush species have different values according to the planned uses of the range, the ways they respond to control treatment, and their relationships to the production potential of the different kinds of land involved. The most appropriate management strategies are those which produce the best results for the cost, in relation to the planned use and potential of the range site.

3. Considering Alternative Management Strategies

After the resource inventory, the next step is to identify the most appropriate brush management strategies. To do this, those who plan IBMS must understand the growth habits and reproduction of brush species, the modes-of-action of the various treatment methods, and the ways brush species and more desireable plants will respond to them.

To help ranchers and technicians select the most appropriate brush management practices, the Texas Agricultural Experiment Station and Texas Agricultural Extension Service developed an expert system called EXSEL. It is now available for purchase by the public (further information is on page 6). The user of the system describes a brush management problem and receives technically feasible control alternatives (including chemical, mechanical, and fire) developed by brush and weed management professionals.

4. Analyzing the Economics of Treatment

The IBMS planning process must also analyze the economics of treatment alternatives. This means determining both the time period in which the investment in brush management is to be recovered, and an acceptable rate of return on the investment. Managers should select a discount rate that considers opportunities for alternative investments, as well as the risk factor associated with brush management as compared to other opportunities.

5. Improving the System with Feedback

Once the economic analysis of technically feasible alternatives is completed, the most promising plan can be implemented. Managers should record information about the actual results over time, and use it to improve the future accuracy of the planning process. In this way, IBMS becomes a planning continuum that helps managers make increasingly better decisions.

Choosing the Best Management Practices

Brush control options include mechanical, chemical, fire and biological methods. These are described in publication B-5004, "Brush Management Methods," available from the Texas Agricultural Extension Service. There is seldom one best method of brush management for any particular ranch or pasture. Brush management is usually more effective and economical when a combination of methods is integrated over a period of several years. Integrated methods, for example, can increase the effectiveness and minimize the use of herbicides. Before selecting a method, feasible alternatives must be evaluated relative to 1) the degree of control expected, 2) their characteristic weaknesses, 3) the expected life of the treatment, 4) possible secondary effects (e.g, increase of a secondary undesirable plant), 5) application requirements, 6) effect on wildlife habitat, 7) cost vs. benefit, and 8) safety.

The method chosen may be applied to individual plants or to large areas, depending on plant densities. If densities are low to moderate it may be more ecologically and economically feasible to treat individual plants. Greater densities may require broadcast methods.

The efficacy of a treatment will depend upon whether it completely kills the growing point of the plant. The growing points are usually located below the soil surface on the base of the stems but just above the first lateral roots. On most brush plants, stems will sprout from this "bud zone" if it is not completely killed.

Treatment methods must be applied in a logical sequence to take advantage of their respective strengths and weaknesses. After the initial reclamation of a pasture, maintenance measures are necessary. Maintenance is that time period when the production benefits of the initial treatment are held near optimum with low-cost secondary treatments. For example, prescribed burning, low-energy grubbing, goating, and individual plant treatments with herbicides can be used to extend the life of initial treatments.

Integrating Grazing Management Into the System

The goal of brush management is often to encourage desirable forage plants in order to increase livestock carrying capacities and stocking rates. However, improper grazing management after treatment can undermine this goal. The way the land is grazed after treatment affects the response of

plants to treatment and the time required to realize the benefits of treatment. Proper use and rest allow desirable forage plants to thrive and gain a competitive edge over brush. Therefore, grazing often should be deferred after brush management practices.

It would be best if a sound grazing management program could be established before other range improvement practices are attempted. Usually, however, a major investment and management commitment has already been made in a particular grazing system, so that brush management strategies must be incorporated into the existing system. If grazing is generally unstructured, and graze/rest decisions are made on a relatively short-term basis, brush management strategies can be based solely on their efficacy, influence on wildlife habitats, and economics.

The optimum approach to range management is to plan brush management and grazing management simultaneously, because a greater array of management combinations is then possible. These combinations can be evaluated as to their effects on production and their economic feasibility.

The ease with which brush management strategies can be integrated with planned grazing systems over a given time depends on the physical and logistical characteristics of the grazing system. The arrangement of watering locations, the shapes of pasture, the placement of fences, and the locations of corrals and roads may limit treatment alternatives. Other factors such as the number of pastures; the graze/rest sequences used; the flexibility in moving livestock; the forage's ability to absorb short-term, heavy grazing; the sensitivity of the range to the stocking rate; and the portion of the ranch committed to a structured grazing system will all interact and affect a grazing system's compatibility with long-term brush management strategies.

Post-treatment grazing strategies can be immediate, long-term, or intermittent. Immediate grazing strategies are those adjustments required after a brush control procedure (e.g., deferment after treatment). Long-term strategies promote the growth of more desirable forage species. Intermittent strategies are temporary adjustments to long-term grazing strategies needed to accommodate brush treatments.

When grazing and brush management are planned simultaneously, it is critical that they be compatible. If either system is given priority, the other must be adjusted to fit it within the context of the overall management program. The selection of specific brush management and grazing systems is always determined by ranch objectives and constraints, and by manager preferences.

Managing Wildlife with Other Resources

Each wildlife species has different habitat requirements that must be accomodated in a brush management system. Some prefer areas of dense brush. Some must have open areas. Most species prefer vegetation patterns in which there are both brushy and open areas. Removing too much brush destroys habitat, but thinning brush or creating patterns of alternating brushy and open areas can improve wildlife habitat while increasing forage production.

In implementing IBMS, a wildlife manager should design a brush mosaic suitable for the wildlife and the range site, and then treat brush to create and maintain that mosaic.

The first step in wildlife habitat management should be to determine the importance of the area to be treated in relation to the wildlife habitat on the whole ranch. What is the size of the area and what proportion is it of the total ranch area? What is its contribution to wildlife habitat? How will treatment affect its usefulness as wildlife habitat? The cover mosaic established should allow the treated segment to carry its own populations of wild animals, to contribute to the diversity and interspersion of the habitat on the ranch, and to give access for viewing and/or hunting. Where adjacent land already lacks adequate cover, or where the brush being treated acts as a wildlife shelter in a fairly open habitat, treatment should be conservative. If the area to be treated is part of a large region of mature brush thickets, treatment can be more aggressive. In order for treatments to be beneficial to both wildlife and livestock, the following must be considered:

- size and pattern of the area to be treated;
- management options available;
- application methods;
- timing of applications; and
- the presence of endangered species.

Designing a habitat mosaic begins with identifying landscape features with special utili-

ty. Then the effects of terrain, existing brush patterns , brush types, pasture shapes, and treatment history should be considered. Each design will be unique. A series of feasible alternative techniques for treating the brush should emerge from this analysis.

Feasibility is a function of the compatibility of the pattern with the method of treatment. For example, different methods are used to create strip patterns, variable rate patterns and zigzag patterns.

Likely there will be only a few pattern/treatment combinations for which equipment is locally available and which suit the preferences of ranch management. These should be ranked in terms of their utility for satisfying game management and forage production objectives. There may need to be compromise among management objectives to further limit alternatives. Finally, a system with the most promise for optimizing income from both wildlife and livestock can be identified.

Considering Economic Factors

Managing brush for both livestock production and wildlife habitat takes time. At least 15 years should be allowed for investment recovery, because the economic benefits seldom offset the costs of the initial treatment plus added costs (additional cows, etc.) until well into the maintenance period.

Predicted results of brush management need to be translated from biological into economic terms to give managers a basis for decision making. This is done by using response curves that plot how the integrated brush/wildlife/grazing management program will change the carrying capacity of the range over a given period. These production changes are then given a monetary value so the economic performance of each alternative can be analyzed.

Managers also should consider the cost of doing nothing. Brush encroachment is largely inevitable, and will reduce carrying capacity if nothing is done to manage it. Individual animal performance also may decline, and variable costs increase, thus compounding production loss. Carrying capacity and individual animal performance often increase with IBMS. One reason for improved individual animal performance is that conception rates and weaning weights may increase slightly as a result of improved forage quality. These benefits should be considered during the economic analysis stage of the planning period.

Risk associated with historic variability of rainfall can also be incorporated into the economic analyses. A computer program called ECON is available to help ranchers make these economic analyses of IBMS.

To order the EXSEL or ECON expert system, contact the Extension Range Specialists' office at (409) 845-2755.

Additional Reading

Scifres, C. J., W. T. Hamilton, J. R. Conner, J. M. Inglis, G. A. Rasmussen, R. P. Smith, J. W. Stuth, and T. G. Welch. 1985. "Integrated brush management systems for south Texas: development and implementation." Texas AgriLife Experiment Station, B-1493.

Welch, Tommy G. 1991. "Brush Management Methods." Texas AgriLife Extension Service, B-5004.

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