

# Arriving at remedial measures



RANGELAND HEALTH BROCHURE 2





## Abstract

Assessment of range resources is fundamental to applying management. It must provide meaningful information and feedback that is critical for managers to carry out their responsibilities. The step from assessment to selecting and implementing remedial measures can be difficult. In addition to the large number of practices available, there is great variability in their suitability in different environmental settings. This variability affects the potential success of each practice. Additional constraints influence the decision-making process, including economic, social, and legal considerations.

Managers and field personnel need meaningful and readily accessible information to address problems on upland and riparian ranges. They may also find a decision-making model to be of special merit in choosing among the many tools available for rehabilitating rangeland. The Ministry of Forests has provided this brochure as an educational resource for technicians, agrologists, and range officers, as well as related administrative staff.

This brochure is the second in a series on monitoring and assessing range upland and riparian health and in determining management options for remediating unhealthy or at-risk range.

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## Introduction

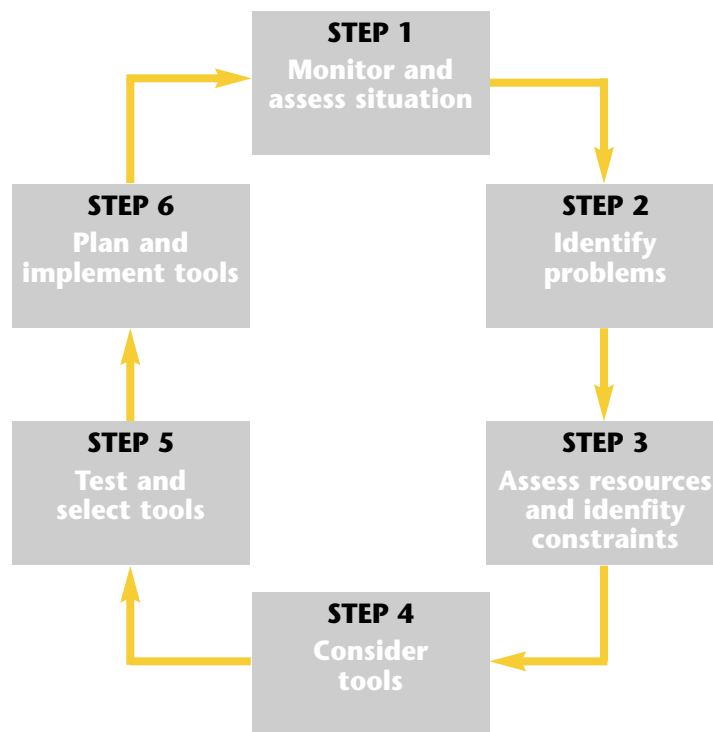
A periodic look at the functioning state of rangelands and the degree to which management goals for that land are achieved can be a useful and often-times required process. This monitoring and assessment, if used in conjunction with a practical decision-making process, can help a rangeland manager prescribe appropriate remedial management strategies whenever these strategies are required. Use of the model described in this brochure can help a manager feel comfortable with recommended and selected strategies.

At first glance, the Remedial Measures Model may appear complex and intimidating. Once you become familiar with it, however, you will find it straightforward, logical, and usable. It will guide you to the best solutions for range problems and increase your confidence in your ability to apply sound remediation practices.

The Remedial Measures Model will guide you in developing proper functioning of uplands and riparian zones. It is important to recognize the model as a series of steps, each one a vital part of the overall process. These steps assess and identify the tools and actions that will result in eventual restoration of a deteriorated ecosystem. The first step, properly applying the Range Resources Assessment Procedures, is key to revealing the functional condition of the riparian or upland systems. It will indicate the nature of any problems encountered and provide the necessary starting point for further application of the model. The Remedial Measures Model depends on sound resource assessment to lead the user to the best remediation tools and actions.

## Functioning of the Model

The basic Remedial Measures Model (Figure 1) is a general representation of an approach for making well-informed resource management decisions. The user begins at Step 1 and follows a clockwise pattern, addressing issues in each section of the model. The user is eventually cycled back to the beginning at Step 1.



**Figure 1** The Basic Remedial Measures Model.

## **Basic instructions for using the Remedial Measures Model**

### ***Step 1. Monitor and assess situation***

Use the Range Resources Assessment Procedures and function checklists (see brochure 1 in this series) to identify the current health or status of the site. If you find that your goals for the site are met, then you are in an enviable position. Continue to periodically monitor and assess the situation and be on the alert for indications that your management for the site is trending downwards. However, if you find that your goals for the site are not being met and there appears to be a problem, go to Step 2.

### ***Step 2. Identify problems***

What is the situation? Review the Range Resources Assessment Procedures function checklists to identify the nature of the problem. Be sure that you are distinguishing between a symptom and the cause or source of the problem. When you are fairly certain that the problem has been determined, go to Step 3.

### ***Step 3. Assess resources and identify constraints***

Assess the resources available to you in tackling the problem. What can slow you down or stop you from achieving a solution? Is it people, money, or an especially harsh or brittle environment? This is sometimes called the “weak-link test.” After you have identified any weak links, go to Step 4.

### ***Step 4. Consider tools***

What tools and actions would potentially remedy the situation, solve the problem, and reach your goal for the site? The tools you just listed must be filtered to select those that are most appropriate for the situation and that have the greatest chance of success. There may be only one or two or there may be many. When you have filtered the best tools available, go to Step 5.

### ***Step 5. Test and select tools***

Now that you have your tools reduced to those with the greatest chance of success, put them through the four tests to arrive at the potential tool or tools. Go to Step 6.

### ***Step 6. Plan and implement tools***

Plan the application of the tool(s) and apply them. After remediation, reassess the site as in Step 1, using the Range Resources Assessment Procedures function checklist. If the site has reached Properly Functioning Condition (see brochure 1 in this series) or is on its way there, success has been achieved. If your goals have not been reached, go through Steps 2 to 6 again.

*Note:* in one case an “at risk” rating of 70% with an upward trend might be deemed a success, given the overall management objectives for the area. In that case, the manager would continue to assess the area according to a normal monitoring schedule and continue present management.

Success may not be achieved quickly because limiting factors such as weather or lack of funds may greatly slow the remediation process. Despite this, chances for success are greatly enhanced by applying the model. For example, this model helps you identify those factors that directly limit success, so that new or better resources can be brought into the situation. Perhaps expertise in a particular field is needed, but is not locally available. Bringing in a specialist can remove this “weak link” and speed the process toward a successful conclusion. Maybe available funding is the weak link. Funds might be available from sources not previously considered, such as a conservation group interested in helping to achieve a particular land management goal.



## The Detailed Remedial Measures Model

Now you're ready to review an enhanced version of the Remedial Measures Model (Figure 2). The steps are exactly the same as the ones we've just gone through. However, we'll spend a bit more time on each step and introduce some screening devices that make using the model still easier and more effective. The detailed Remedial Measures Model is designed to relate appropriate tools and outcomes directly to problems identified by the Range Resources Assessment Procedures function checklists.

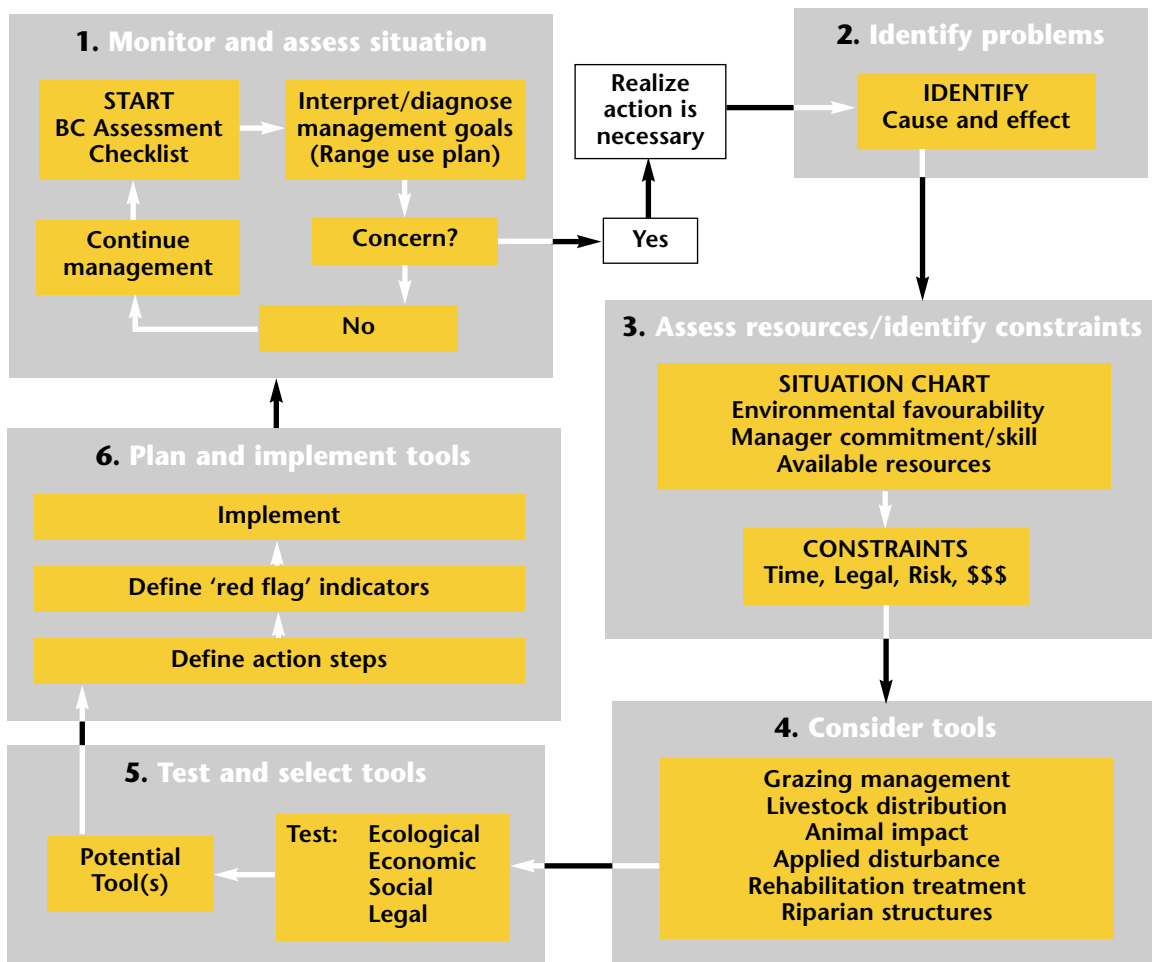


Figure 2 The Detailed Remedial Measures Model.

## Step 1 Monitor and assess situation

The saying, “You can’t manage what you don’t know” applies to land management. It is important to understand the existing condition or functioning ability of the resource you are responsible for. The Range Resources Assessment Procedure (the first key) provides the manager with preliminary ecological information and characterizes the area into “Properly Functioning,” “at risk,” or “Non-Functional” condition.

Goals for the area being managed need to be identified and agreed on by those involved in the planning process. In addition, our legislation requires that range use plans describe both current and desired plant communities (DPCs) and strategies to achieve these DPCs.

The assessment checklists are designed to assess the functionality of ecosystem processes in upland and riparian areas. Properly Functioning Condition (PFC) is seen as a minimum target for which we manage. Since it is possible to reach PFC before some other societal goals (e.g., biodiversity, water quality, and habitats for fish and perching song-birds) are met, the plant community must also be considered. The DPC for any site is additional to the PFC and is determined based on society’s goals and values for that site.

If the site meets Properly Functioning Condition and the plant community is the desired plant community or is moving in that direction, then a continuation of management practices would be recommended. If a site is “at risk,” then a decision to modify management would normally be made. This is when the Remedial Measures Model would be used to identify new management options. The Remedial Measures Model is designed to help guide the manager through the process of finding these tools and options.

### ***A Word About Goals***

While Properly Functioning Condition will probably be the ecological goal to achieve, you should consider other goals as well. A successful management program hinges on inclusion rather than exclusion of people and their desires as affected by your management. Don’t forget to review associated land uses such as recreation, logging, and agriculture and think about the goals of the many people who are part of the WHOLE.

## Step 2 Identify problems

If a decision to take management action has been made, then a few preliminary actions will help you better understand and manage the situation. Analysis of “cause and effect” relationships is essential.

Identify what may and may not be the fundamental cause of the problem. If the creek's banks are washing away, is it a riparian problem, or is it caused by a management action on the uplands? If there is a weed infestation, is it because of new seed sources, or because an environment was created that favoured weedy plants? If cattle are trampling a stream bank, is it because there are too many cattle or because there is not a good grazing management plan in place?

Distinguishing between a genuine cause and its symptom or effect can make the difference between success or failure of your efforts.

It is not always easy to trace the root cause of a problem; some "detective work" may be required. A simple exercise can be to list all apparent problems on an area and then ask if these "problems" are truly the source of the concern, or are there larger, more deeply rooted causes involved?

### **Step 3** Assess resources and identify constraints

Identify what resources you have working in your favour and try to recognize where weaknesses lie. A tool to help you do this is shown in Figure 3. This Situation Chart provides a means of scoring human, environmental, and physical resources available for applying tools in a management situation. It will help you identify weak links and limiting factors. Here are the three elements considered in the chart:

#### 1. Environmental favourability

This category is meant to provide some sense of the recovery rate to be expected in a particular situation. What is the nature of the local environment, especially in terms of climate, soils, and factors that affect growing conditions and animal behaviour? Some ecosystems (non-brittle) provide more favourable growing environments than others. Abundance or lack of moisture and heat are critical factors. The more moisture, humidity, and heat available (up to a point!), the more favourable the environment. The more favourable the environment, the faster the expected recovery period. You may ultimately be successful in a harsher (brittle) environment, but success will come at a slower pace.

## 2. Manager commitment/skill

Consider the strengths of your management team, especially in terms of commitment, skills, and creativity, as well as the strengths of others directly involved in management of the land. A Montana researcher found in his study of riparian management along 71 stream reaches that the “commitment of the land manager... and the degree of operator involvement” were the most important ingredients for success of a management system. The type of grazing management was not the deciding factor for success, nor was it how many water access points had been placed. If the manager had a high degree of involvement, the chance for success was much higher. Your management team must assess its commitment level, but ultimate success often rests on the person applying the day-to-day management. That person must be committed, involved, and supported by the team to enjoy full success. Collectively, the team must possess the skills necessary to carry out the management option chosen. Because commitment and skills are so important, they carry a higher numeric value in the Situation Chart than any other category.

## 3. Available resources

What equipment, materials, facilities, money, livestock, or other resources do you have available? How big and full is your tool chest? Sometimes creativity and ingenuity will substitute for money and equipment. But sometimes, nothing but money will do. Given that rangelands are often not “high dollar” lands, money for remediation is typically scarce. Are there alternative funding sources such as special grants or conservation organizations?

### ***The Situation Chart***

An exercise that can help you judge the condition or state of your situation is provided by working through the Situation Chart (Figure 3). This chart can also help identify the “weak links” and “limiting factors” within

the situation. It works rather like a plant key. Categories are broken into Environmental favourability, Manager commitment/skill, and Available resources.

Environmental favourability	Manager commitment/skill	Available resources	Situation score
High (3)	High (4)	Many (3)	10.0
		Moderate (1.5)	8.5
		Few (0)	7.0
	Moderate (2)	Many (3)	8.0
		Moderate (1.5)	6.5
		Few (0)	5.0
	Low (0)	Many (3)	6.0
		Moderate (1.5)	4.5
		Few (0)	3.0
Mid (1.5)	High (4)	Many (3)	8.5
		Moderate (1.5)	7.0
		Few (0)	5.5
	Moderate (2)	Many (3)	6.5
		Moderate (1.5)	5.0
		Few (0)	3.5
	Low (0)	Many (3)	4.5
		Moderate (1.5)	3.0
		Few (0)	1.5
Low (0)	High (4)	Many (3)	7.0
		Moderate (1.5)	5.5
		Few (0)	4.0
	Moderate (2)	Many (3)	5.0
		Moderate (1.5)	3.5
		Few (0)	2.0
	Low (0)	Many (3)	3.0
		Moderate (1.5)	1.5
		Few (0)	0

Figure 3 The Situation Chart.

**Remember:** a high score gives you access to many tools, while a low score will restrict you to only a few tools.

As previously discussed, “the degree of manager commitment and involvement” provides critical momentum towards project success. This attribute carries a heavier weighting than other attribute areas. Skill or expertise also enters into this category. You must use your judgement in determining how commitment and expertise balance out as you assess this category.

After working through the Situation Chart you should be relatively clear about where your strengths and weaknesses lie. You will also have gained a situation score that will help you select realistic tools for a solution.

### How to use the Situation Chart

1. To start, identify the **Environmental favourability** category. Decide whether the environment involved offers very favourable (# high), intermediate (# mid), or not favourable (# low) conditions that will influence your remediation treatments. Consider the kinds of soil involved, length of growing season, temperature extremes, precipitation timing and amounts, brittleness, animal depredation, competition from other plants, trampling by grazing animals, steepness of slopes, and other site features. Recognize that environmental favourability will greatly influence the performance of any tool(s) you wish to use in remediation. The scores for this category range from 0 to 3. Note the numerical score your decision produces and move to 2.
2. Next, you and your team must honestly assess your level of **Manager commitment/skill**, and most importantly, the level and degree of commitment of the operator who will be involved on a day-to-day basis. You will choose either low, moderate, or high categories. Note that your choice will result in a numerical score from 0 to 4. That choice will indicate which portion of the chart to use in Step 3.
3. Go to the **Available resources** category and decide what level of resources is available to you. Do you feel that you have abundant resources in terms of equipment, funds, supplies, personnel, admin-

istrative support and logistical support that will allow you to access many different tools, or are resources very limited? Will you have to make do with a very simple grazing plan and several hundred dollars worth of fencing materials? Decide on a value of 0, 1.5, or 3 for Available resources. Move to Step 4.

**Remember:** a high score gives you access to many tools, while a low score will restrict you to only a few tools.

4. Total the score for the categories of **Environmental favourability**, **Manager commitment/skill**, and **Available resources**. The score will range from a possible high of 10 to a possible low of 0. You'll need this number when you use the Tool Filter (Figure 5).

**EXAMPLE:** You have used the Situation Chart to find that in a particular situation in Vanderhoof the environment is not brittle and you have decided to give Environmental favourability a score midway between 0 and 3, which is 1.5. The managers are committed to some change. This provides a score of 2 for Manager commitment/skill. Available resources of all kinds are abundant, including funding, equipment, and labour, so that score is 3. Added altogether, the score is 1.5 plus 2 plus 3, for a total of 6.5. This is the score you will use in the Tool Filter (Figure 5).

Environmental favourability		Manager commitment/skill		Available resources		Situation score
1.5	+	2	+	3	=	6.5

### Other constraints

Before we leave this area of the Remedial Measures Model, consider whether there are additional constraints not covered in the Situation Chart. There usually are. For example, are there legal obstacles to contend with? Are there time deadlines that must be met? How much risk is involved? What would be the consequences of failure? Is funding sufficient? Will anyone's paradigms prove to be serious obstacles? Note these constraints, because they will be considered in detail in one of the following steps as we continue to screen the tools and test them.

Here is an example of two contrasting tools: prescribed burning and long-term rest. Prescribed burning has a value of **8 – 10** in the Tool Filter because fire requires high levels of expertise, backup equipment, and support, and has a fairly high risk factor. Long-term rest, with a value of **0 – 10** doesn't need a great deal of skill to apply, requires few additional resources, and has limited risk associated with its use. Thus, prescribed burning requires a much higher score from the Situation Chart to consider its use than does long-term rest.

**Remember:** tools with high scores are harder to qualify because they require more expertise, greater funding, a less brittle environment, etc.

## Step 4 Consider tools

At this point the team should begin listing and brainstorming potential tools. The tools are divided into categories of **Grazing management, Livestock distribution, Animal impact, Applied disturbance, Rehabilitation treatments, and Riparian structures.**

### *How the tools are rated*

Each tool in the Tool Filter is rated on the following basis:

- level of skill or expertise required to apply it properly
- how “management intensive” the tool is
- how many resources are required to apply the tool (labour, equipment, funding, etc.)

With the Situation Chart we learned what kinds of resources were available and where our weak links and constraints were. We came up with a situation score of **6.5** in our hypothetical Vanderhoof example, which we can now use to screen potential tools. The Tool Filter (Figure 5) lists all the tools available to us and separates them into the categories of **Grazing management, Livestock distribution, Animal impact, Applied disturbance, Rehabilitation treatments, and Riparian structures.** The filter shows minimal scores necessary to “qualify” a tool for use in a particular situation. **If a tool has a score that exceeds your situation score, it is not available to you.** After you have determined a situation score for your particular situation, you can review the tools and pull out those that are “qualified” (example shown in Figure 6).

The Tool Filter is designed to identify viable tools for particular situations.

To give you a better idea of the overall procedure we're engaged in, Figure 6 illustrates the entire **tool screening process.** In it, many tools are poured into the top filter and allowed to trickle down through the remaining filters. Each filter, such as the limiting-factors filter, removes some tools from further consideration. By the time all the tests are applied, perhaps only a few tools will remain.



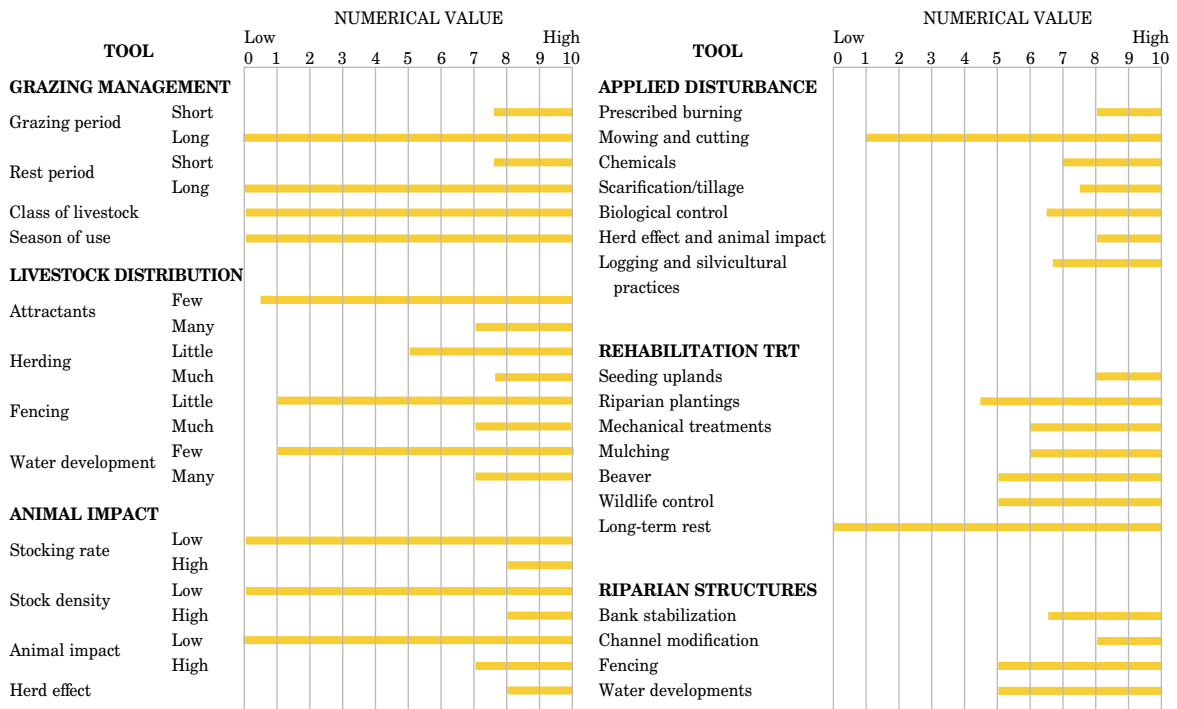


Figure 4 The Tool Filter.

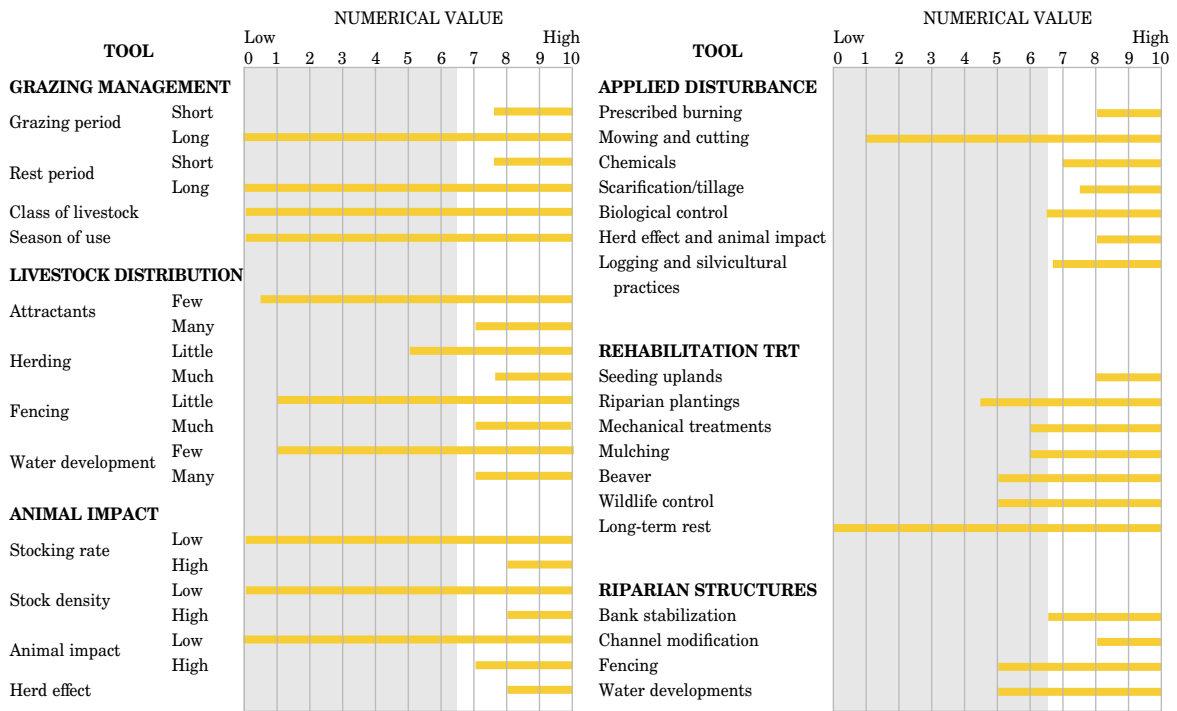
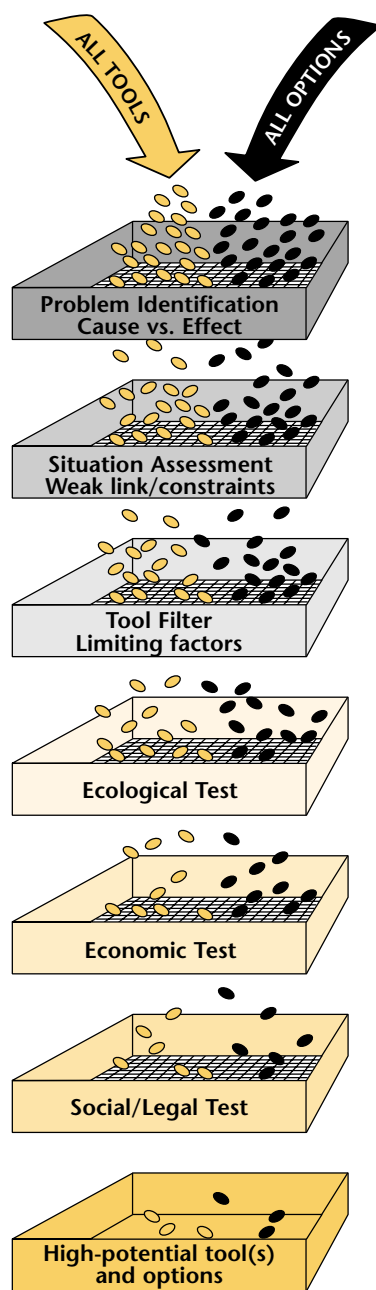


Figure 5 The Tool Filter – example situation score of 6.5.



**Figure 6** Remedial Measures Model tool screening process.

### Final testing of tools

Compare the score for your situation to those of each tool in the Tool Filter. Then list the qualified tools available for your remediation situation. These tools will now be put through the next three tests.

## Step 5 Test and select tools

The final screening of the tools comes with **Ecological, Economic, and Social and Legal** test questions. These questions override all other considerations because they collectively represent the concerns of all users and managers of natural resources.

### Ecological testing

You must ask if the action you're about to take with the tool you are considering will have positive or negative consequence for the ecosystem. Most tools tend to affect and manipulate the four basic ecosystem processes (water cycle, mineral cycle, succession, and energy flow). Some tools have a negative effect on particular processes and others have a positive effect on those processes. Suppose the tool you are considering is a herbicide. Is it biodegradable? Will it have possible off-site consequences if it enters groundwater or a stream? Suppose the tool is cultivation, which disturbs the soil. Is there potential for stream sedimentation from erosion? Will it affect succession by opening the site to weedy plants?

By asking these questions, you anticipate consequences and preclude nasty surprises. The final question to ask is, "Will this tool move us **closer to or away from** our ecological goals for the site?"

### Economic testing

The primary economic test to be considered is the marginal reaction test. It asks which tool will provide the most effective push toward the goal, with the least amount of time, money, and labour involved. Financial restraints are common in range settings. When money is scarce it becomes more important to ensure that each dollar is spent wisely and appropriately.



Attractant



Riparian planting



Water development

**Figure 7** Some tool examples.

Will spending money on a tool or action have to be repeated within a few years? What is the life expectancy of the treatment or is it “self-sustaining?” If fossil fuel is required in large amounts, can the use of the non-renewable resource be well-justified? These questions overlap with the following social and legal tests.

### ***Social and legal testing***

We must ask whether the tool under consideration is socially, culturally, and legally acceptable within the community and region. Legislation and regulations tend to reflect provincial/national standards. Some tools are no longer considered appropriate, because environmental scrutiny and public pressure has challenged their use.

Ask if the tool or action will violate the cultural values and standards of the local community. Learn whether it meets standards for environmental compliance. Are permits required? Will the district manager require referral of the proposed action to other users or government agencies? If a tool is suspect in this analysis, be particularly careful in selecting and applying it.

## **Step 6 Plan and implement tools**

After a tool has passed through all the testing stages, implementation can begin. Management considerations for application of the tool should be planned, action steps defined, and tasks delegated to accountable team members. You must also consider “red-flag” indicators, the first evidence indicating that the wrong tool was applied or the right tool was misapplied. This is an important step because it causes the land manager to consider what negative signs to look for as well as signs of success.

What “red flags” should you look for? They are dependent mostly upon the category of tool used. If the tool is grazing-related, the signs may be subtle plant vigour or vegetation composition changes, or they may be reflected by soil surface conditions or erosion. If the tool is from the applied disturbance category, a red flag might be cloudy runoff waters or off-site damage to vegetation. If the tool was from the rehabilitation treatments category, the red flag may be dead or dying

seedlings on a planted area. A red flag for a tool that involved construction of a structure might be evidenced by some structural failure. The management team should anticipate and identify red-flag indicators during the planning and implementation phases.

## Reassessment

You have now completed one rotation through the decision model and have been brought back to the monitoring and assessment quadrant (Step 1). Application of the tool should be moving the site toward your intended goal. The rate of improvement is driven by environmental conditions. However, other factors will also play a role, including skill in application of the tools. Monitoring is important to document results, to determine the apparent rate of improvement, and to ascertain whether further action is needed. If further action appears unnecessary, the present management may be continued. Otherwise, the Remedial Measures Model is called upon once more and the decision-making process is repeated.

This brochure has covered one model for determining appropriate tools to apply to your situation. It is not the only model you could choose and use. However, we hope that, having seen the simplicity and effectiveness of this model, you will consider using it when you are faced with developing management options to remediate unhealthy upland and riparian areas.

