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The cause and effect of noxious weeds

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As indicated by the title of this paper, I will discuss the cause and effect of noxious weeds. In this paper you will not find the traditional approach by stating and restating various facts, figures, or statistics that are available on noxious weeds. Rather you will find a holistic approach to the management of noxious weeds.

Noxious weeds have been reported to cause the death of other native plant species, reduce carrying capacity of the land for domestic livestock, interfere with agronomic crops, cause the decline of wildlife populations, and even cause the erosion of our soils. Weeds by themselves cannot cause such problems. There are a whole host of interrelationships and interactions that must occur before any of these things can happen. By using the Holistic Resource Management model we will be able to diagnose the effects of noxious weeds.

In the limited amount of time and space that I have for this paper I will not be able to cover all aspects of Holistic Resource Management. I will be able to introduce you to the Holistic Resource Management model and how it can be used in managing noxious weeds.

What is the cause of the current outbreak of noxious weeds – particularly leafy spurge? In examination of the program at this conference, I have concluded that most of you must know what causes leafy spurge. I base this conclusion on the fact that most of the papers to be presented here are talking about controlling leafy spurge, and to have control you must have identified the causes.

To test this hypothesis I will use one of the testing guidelines on the HRM model called Cause and Effect. This guideline helps determine whether our planned use of a particular tool to control noxious weeds will treat the cause or the effect of the problem. Let me use this simple analogy to demonstrate and better understand the cause and effect guideline.

I ask you to play this simple game with me. You sit in this chair, and every minute I hit you along side the head with this stick. The rules are straightforward in that you have only two choices. One, you can ask me to stop hitting you, or your second choice is that you can take some aspirin from the bottle sitting beside you. What would you do?

After several blows to the side of the head you will have a headache. Is the headache the cause or the symptom of the problem? In this simple scenario it is easy to understand

that treating the headache with any aspirin or stronger drug is simply treating the symptom or the effect of the problem.

Of course in real life situations such as leafy spurge, the cause and effect relationships are much more complex. We are usually looking at multiple causes or a chain of events that have led up to the problem today. Man through the last century has changed the successional complexity by using various tools. These changes in the successional complexity have created a perfect niche for such plants as leafy spurge.

I would like to quote Keith Kelly, the director of the Montana Department of Agriculture, who states "I consider knapweed a disease of the land and we are helping to spread that disease." Kelly goes on to state that overgrazing and other poor management practices of our resources really contribute to the spread of noxious weeds. Without changing these poor management practices can you effectively treat the cause of the problem of leafy spurge or other noxious weeds?

Another indication that past mismanagement is one of the causes of noxious weeds is that they appear to be only a problem in certain areas. Initially we have a weed problem in a localized area or only on one side of the fence. How did we affect the successional community in this one area so that it provided the perfect conditions to germinate, thrive and reproduce? These are some of the questions that we should be asking in our search for the causes of the noxious weeds.

How successful have you been in controlling leafy spurge? Once treated does the problem go away or does it come back time and time again, much like that headache. This is an indication of whether you are treating the cause or the effect of the problem. We have been tempted by modern science to take the quick fix solutions in solving our problems.

These quick fixes have been expensive and for the most part ineffective when dealing with things that are alive and non-mechanical. Modern science has for the most part been unable to deal with the non-mechanical aspects of our world. In examining Table 1 you will find that I have broken things down as to mechanical and non-mechanical.

On the mechanical side you will find things that reflect ever increasing success stories. Sure there have been problems, but science has been able to quickly determine the cause of these problems and progress even faster. This side really does reflect the marvels of science.

On the non-mechanical side we find things that have ever increasing complexity. The more we try to deal with this complexity using our current management, the more complex and difficult our problems appear. On this side, we have very few success stories and most of our time has been spent on treating the symptoms rather than the cause of the problem.

TABLE 1. REDUCTIONIST SCIENCE

<u>MECHANICAL* ASPECTS</u>	<u>NON-MECHANICAL** ASPECTS</u>
Transportation	Agriculture
-Air	Rangelands
-Land	Forests
-Water	Oceans
Communication	Watersheds
-Radio	Erosion
-TV	Economies
-Phone	Wildlife
-Satellite	Human Relationships
Weapons	Human Health
-Conventional	Insect Predations
-Nuclear	Weed Infestations
Space Exploration	Air and Water Quality
Computers	Weather
Homes and Appliances	Etc.
Chemical Developments	Etc.
Medical Technology	
Etc.	

***Mechanical** - in this area of science we find ever increasing success stories. The true marvels of sciences occur here.

****Non-Mechanical** - in this area science has found increasing complexity and development of problems.

If you will examine Graph 1 you will find a graph that depicts insect damage from 1948 to 1984. It shows that insect damage has doubled despite a 12-fold increase in the use of insecticides. The same could be said about noxious weeds. Do we have more or less problem weeds today than we had 40 years ago?

For the last three hundred years we have used a mechanistic approach in managing and studying our natural world. We have ignored the incredibly complex interrelationships and have treated each part of our natural world as a machine part that could be removed or exchanged at will.

I am not trying to blame anyone or say that all this research is wrong. You and I did the best we could with the information that we had. Now the good news, there is a way to manage our natural resources in a holistic manner. In managing our natural resources in a holistic manner we will still need a lot of the research that has been derived through the reductionist approach.

With the development of the Holistic Resource Management model we have the ability to determine the cause and effect of noxious weeds. Using the HRM model we can treat the cause of the problem, which many times is not the weed itself, rather it is a successional problem. Many farmers, ranchers, and other resource managers have been able to reduce weed problems through methods that are socially, economically and ecologically sound. You can find a copy of the model at the end of this paper.

The model is goal driven and thus you are required to develop a three-part goal. These three parts are defined as follows:

Quality of Life - What do you want and need out of life for yourself, your family and the other people you associate with. Quality of life could include things such as freedom, time for vacation and personal growth, quality education for children, clean air and water, a healthy dependable food supply, a healthy prosperous local community where local services can be obtained.

Production - Here you would define what you need to produce to support that Quality of Life. It could be profit from crops, livestock, recreation, etc. You could also describe the quality of the product you're producing, recreational opportunities, the aesthetics of the land, other cultural aspects that you're trying to protect and produce.

Landscape Description - Here you would define what the landscape must look like to support and sustain that production. Our ability to attain our production and quality of life rests on the Ecosystem Foundation Blocks. Here we describe how the ecosystem must be functioning to attain those goals. What must the soil surface look like to have effective mineral and water cycles. What kind of successional complexity do you need to harvest the sun on a sustainable basis?

When describing the successional complexity for the landscape description you do not describe the current problems such as noxious weeds. What you describe is a successional community of plants, animals, insects and microorganisms that does not favor those weeds.

Many of you have a goal to eradicate leafy spurge. Such a goal can be described as a non-goal. If you were successful at eradicating leafy spurge in the short term, what would it be replaced with? A native plant or possibly another noxious weed only to begin the process again. You must describe what you want the land to look like before you use any tool to change the landscape.

Once you have a three-part goal developed then your next step is to determine the health of the ecosystem. You do this assessment in relation to the four ecosystem processes. How are the minerals and water cycling within and above the soil? Determine the successional community in relationship to all the plants, animals, and microorganisms. How effectively are we harvesting sunlight and how is this energy flowing through the food chain?

To attain the production and landscape parts of the goal will require you to use tools. These tools can be found on the model below the ecosystem blocks. How do we know which tool to use and in what fashion a tool should be used?

The testing guidelines help you determine whether a particular tool will indeed help you attain your goal and whether it is financially, socially, and ecologically sound. I have already discussed the testing guideline *Cause and Effect*. I would quickly like to review the other testing guidelines with you.

Whole Ecosystem is the testing guideline that keeps the whole ecosystem in balance. In the United States we have pushed up energy flow by using petroleum products and have damaged the other three blocks with our current farming practices. Today, on average, to produce one calorie of food requires 30 calories of petroleum products. In control-

ling noxious weeds by using chemicals we often destroy other living organisms, reduce the effectiveness of the mineral and water cycle, and reduce the energy flow.

Weak Link is the testing guideline that checks every facet of the operation for weak links continuously. Every organization and operation has a weak link. If the operation becomes stressed enough the weak link will break. This guideline helps you pinpoint the weak link and then strengthen this link by taking appropriate action. Many times the weak link is not weed control, but poor management of the resources. I have never seen a rancher or farmer have to leave the land because of noxious weeds, I have seen them leave because they could no longer achieve profitability.

Highest Marginal Reaction is the testing guideline that indicates which tool will help you attain that three-part goal the quickest using the least input. This guideline would allow you to compare the costs of chemical control versus biological control of noxious weeds. You could also use it in comparing the cost of controlling weeds versus improving the management of the entire ranch through more training in Holistic Resource Management.

Energy/Wealth Source and Use is the testing guideline that determines the source of energy that a tool would require if it was implemented and if the use of this tool will increase the overall wealth of the operation. To produce and use herbicides requires the use of petroleum products of which we have a finite supply. Biological control such as insects or goats used to control spurge would eat plants which are produced from the sun, a renewable source of energy.

Society and Culture is the testing guideline that directs the attention back to our quality of life and others. Will the use of this tool enhance my quality of life and the society that I live in? People may not accept the noxious weeds that I have on my place, but are they willing to accept contaminated water and food supplies if they force me to spray? Most states and counties have legislated control of noxious weeds. This legislation usually requires that people apply chemicals on the land. Simultaneously, many states are passing legislation to control chemical contamination of water and food supplies.

The last testing guideline, *Gross Margin*, does not test the use of a particular tool. It tests the profitability of various enterprises -that you may be involved with now or in the future. No single testing guideline determines whether you should or should not use a particular tool. Should you find a tool not passing several guidelines, it is a warning that this tool may not be the best one to use if your goals involve long-term success. Many times tremendous amounts of human creativity are required to find different methods and tools that will accomplish that three-part goal.

Once a tool has been selected we must develop a plan that describes how this tool is to be used. You develop a plan-monitor-control-replan procedure that will ensure the successful use of those tools. The Management Guidelines found on the model assist in developing such a planning procedure.

In summary, the cause of noxious weeds is the result of complex interrelationships resulting from man's management of the ecosystem processes. We have changed the succes-

sional complexity, the effectiveness of mineral and water cycles, to such a point that noxious weeds have found a perfect niche. Unless we begin to change our management of the ecosystem processes we will always be treating the effect of our poor management such as noxious weeds.

The Center for Holistic Resource Management has developed a model that allows you to handle the complex interrelationships that occur in managing our natural resources. It does this by guiding your thoughts through the model to handle all the complex variables such as determining the cause and effect of noxious weeds. Our experience has shown that with a little training, all resource managers can learn to use this model effectively.

I would like to relate one success story from a rancher in New Mexico using Holistic Resource Management. In 1983, the Bowes Ranch was faced with a severe snakeweed infestation. Their choices were to begin spraying the snakeweed at \$8.00 per acre every five years or look for other alternatives. The Bowes chose to look for other alternatives and attended an HRM in Practice course in 1983.

In using the HRM model the Bowes have been able to accomplish the following things:

Production Results:

<u>Annual Beef Produced</u>		
	1983	15 LBS/ACRE
	1987	25 LBS/ACRE
<u>Cost of Production</u>		
	1983	66 CENTS/LB
	1987	32 CENTS/LB
<u>Improvement in Landscape Results</u>		
<u>Soil Surface Cover</u>	<u>1984</u>	<u>1987</u>
Bare ground	46%	30%
Litter	44%	54%
Basal	8%	16%
<u>Plant Type</u>		
Grass	80%	88%
Forbs	10%	4%
Snakeweed	10%	8%
<u>Perennial Plant Spacing</u>	<u>1.8"</u>	<u>.96"</u>
Number of Grass Species	6	16

The Bowes Ranch discovered several things. 1) That snakeweed was only the effect of previous mismanagement of the ecosystem and that by improving the ecosystem blocks they could slowly reduce the population of snakeweed. 2) That snakeweed did not suppress livestock production as previously reported. 3) If they would have begun spraying the snakeweed as suggested the production costs would have increased to 75 cents per lb.

Another success story using HRM can be found by reading the paper "Treating Leafy Spurge as a Successional Problem in Eastern Montana" by Parman and Foss in these proceedings.

References

Quote from Keith Kelly was taken from the Bozeman Daily Chronicle, Titled Weed Invasion, Sunday edition, July 3, 1988.

The Center for Holistic Resource Management is a non-profit organization headquartered in Albuquerque, New Mexico. The Center is dedicated to improving the quality of life and human environment through the application of Holistic Resource Management. In particular, we seek to halt the desertification and the deterioration of land and human resources on a world-wide basis. For more information write P.O. Box 7128, Albuquerque, NM 87194 or phone 505/242-9272.