MANAGEMENT AND RANGE RECOVERY FOLLOWING DROUGHT

To put things in order, before we can discuss management following a drought, we need to determine when there is not a drought. It is interesting that during the current drought several media people have called me with the same question - how will we know when the drought is ended? Even more interesting is the diversity of answers that they received from people. A statewide news release on the drought from Texas A&M referred to aquifer levels and reservoir levels - if they are not full, the drought is probably not over. While low surface and ground water levels are indicators of extended drought, in my opinion the drought is not ended until we have rainfall sufficient to replenish deep soil moisture in our pastures. Heavy rainfall that provides runoff for reservoirs may not recharge subsoil moisture levels. It is the deep moisture in soil profiles that extends the time between rains to get forage growth and production through dry periods. If rainfall is sufficient in amount and over a long enough time period to replenish soil moisture to 60 inches or more, many other drought symptoms, like low reservoirs, will likely be cured as well.

There was a lighter side offered by Joe Fohn of the San Antonio Express-News for determining when a drought is over. His suggestions may be as good as any:

- They stop seeding the clouds and you start seeding the lawn.
- After three years, the spider in your rain gauge has moved out.
- The stock tank gets enough water in it to start leaking again.
- At the coffee shop, more people are talking about politics than the weather.
- Someone knocks at your door - and he's in a boat.
- There's concern that those creatures living in the springs might get swept away by the current.
- You tell the kids you're going to fix water gaps, and they have no idea what you're talking about.
- Your friends complain that something is discoloring their lawns - you explain that it's just new, green leaves.
- Thank goodness, people have quit asking how you coped with the Dust Bowl of the '30s - because you are only in your 40s.

REINSTATE SOIL SURFACE COVER WITH VEGETATION

Assuming that restoring soil moisture is a reasonable goal of postdrought management, the first and foremost objective must be to restore vegetation on the soil surface. The kind and density of plants covering the soil to intercept rainfall and provide retardance for surface flow is critical. Chances are that when the first significant rains come during drought, the soil surface will be have little standing crop or mulch to absorb the energy of hard-falling rain, reduce the sealing of the soil surface, promote infiltration and reduce runoff and erosion. This may be true even if pastures have been deferred from grazing to protect soil cover. If the drought is long enough, weather and time will cause vegetation to deteriorate. Therefore, the critical task for range managers is to rebuild vegetation levels as quickly as possible in order to capture and retain precipitation. It should be noted that droughts tend to end with periods of above average precipitation. The drought of the 50s ended in 1957 with the second wettest year on record in San Antonio. Such large amounts of rainfall occur at a time when the soil lacks protective cover.

It is common practice for grazing lands to be fully stocked on the basis of the average or better than average season before a drought. Consequently, if grazing is not immediately reduced in proportion to the decline in forage production, there will be heavy overgrazing with subsequent injury to the forage species. We should take a lesson from history, the heavy overgrazing that contributed to degradation of our southwestern rangelands is correlated with protracted drought periods.

The best way to restore vegetation after drought is to help nature to the greatest extent possible. Let her have a chance to put cover on the soil before you begin to harvest new growth. IT DOESN'T RAIN GRASS. It rains water, and we must then optimize that moisture to grow vegetation. Therefore, once the drought breaks it is important not to restock too quickly. The range should be allowed to recuperate and gain in strength and vigor, and nature helps us with a little known phenomenon. Several studies have shown that there are often large pools of total nonstructural carbohydrates (TNC) in drought-stresses plants that appear to enhance production when the drought breaks (Busso et al. 1990). Carbohydrates accumulate in water-stressed plants because growth is impaired before photosynthesis declines. If carbohydrates limit plant growth when an adequate number of active meristems are present, carbohydrate accumulation could stimulate growth following drought or drought plus defoliation by grazing.

Some sage advice warns against restocking too early. Following the drought in southwest Texas that began in 1982, good fall rain in 1984 and spring of 1985 caused rapid growth of weeds on soils bared from the drought. A lot of ranchers restocked too quickly. The weeds were dominant in pastures because the grass was weak and couldn't compete. When the weeds dried up, stockmen were faced with another critical situation - a lot of bare ground. So, the restocking speed and intensity must be determined by the perennial grass in the pastures, not a flush of annual weeds (Emmert 1985).

Ranges that enter drought in good to excellent condition probably will not be adversely affected by droughts of one year, even if they are intense droughts, as long as stocking rates are reduced commensurate with adequate standing crop to provide soil cover. Ranges that are in fair condition could be seriously affected by a year long drought, producing very little desirable forage during drought and greatly less than good condition ranges afterward. Ranges in poor condition are always at the outset of a drought and allow little time to managers for stocking decisions when precipitation falls below normal, even for very short time periods. Unfortunately, a lot of Texas rangelands are in fair and poor categories in the composition of plants that they support. This means that many ranchers got into trouble early as rainfall dropped below normal and did not make stocking decisions in time to provide adequate soil protection.

How much soil cover do I need to be adequate? It varies with different soil textural characteristics and topography, but a good general rule is a minimum of 50-60% organic material covering the soil surface (Fig. 1). Drought management should start well before the minimum cover level is reached and destocking should take place when cover declines to 50%. How much vegetation do I need to give up to equal the minimum cover level for good plant health, effective rainfall infiltration and soil protection? This table from Texas Agricultural Extension Service, L-5141 shows optimal amounts of ungrazed forage for different types of rangeland.

Optimal amounts* of ungrazed forage for different types of rangeland.**

Desert	Shortgrass	Midgrass	Tallgrass
250 lb./A	300-500 lb./A	750-1000 lb./A	1,200-1,5

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*The higher amounts of each category should be left ungrazed if improvement is desired and to reduce risk.

**To promote midgrass over shortgrass, midgrass amounts are required to begin accumulating organic matter, nutrients, and soil moisture to support the midgrass component.

Texas Agricultural Extension Bulletin 1646, "How much forage do you have" is a photographic guide to estimating the amount of forage on the range and will be helpful. The bottom line is to rebuild the vegetation cover on the range as quickly as possible with perennial grasses. This is the best way to cause the next rains you get to stay on the range, go deeper and grow more forage. Many years ago, Dr. E. J. Dyksterhuis stated the situation very well. The man who has a short pasture needs a rain much worse than his neighbor who has ample forage on the range. But, when the rains come, it will do the least good for the fellow who needs it most.

Vegetation type influences surface runoff, sediment loss and infiltration (Fig. 2). Bunchgrasses, such as sideoats grama, little bluestem, Indiangrass and others have a deeper root system that creates an environment more conducive to water infiltration than plants with shallow root systems. Thus, sites with vegetation composed of deep-rooted perennial bunchgrass generally have a higher rate of infiltration than similar sites occupied with perennial sodforming grasses. Vegetation also acts as a physical barrier to runoff. Water moves more rapidly across closely grazed grass than grasses left with several inches of stubble. Hoffman and Ries (1991) concluded that of all factors relating to soil erosion on rangeland, including, soil bulk density, root weight, soil aggregation and soil particle size, vegetation and ground cover were the primary influences of soil loss and runoff.

Your range sites and how you graze your pastures will also dramatically effect the amount of precipitation that you can expect to capture from drought-breaking rain. Deep sites usually have higher infiltration rates compared to intermediate and shallow sites (Fig. 3). You can't change the sites that you have on the ranch, but you can control grazing animals. In a study at the Texas A&M Agricultural Research Station at Sonora, infiltration rates averaged by pastures showed an exclosure and a moderately grazed 4-pasture system to have almost identical infiltration curves and terminal infiltration rates, while both had greater than twice the values of the heavy continuously grazed pasture (Fig. 4). The other, obvious reason for leaving stubble after grazing, is that you can realize greater subsequent production. This figure shows the influence of beginning standing crop on total annual production of buffelgrass in South Texas (Fig. 5). Stubble mass is very important when considering plant-moisture-grazing relationships. Pastures with greater than 400 lbs./acre outproduced those with less than 400 lbs./acre regardless of rainfall amounts received. Nearly 17 inches of rainfall on pastures with only 200 lbs./acre stubble resulted in less than half the production of pastures that received only ten inches of rainfall but had 1,500 lbs./acre stubble.

Deferment of some kind, better in a planned system on a regular basis, is critical to range management but even more so to drought preparation. Remember that moderate or even light grazing is no substitute for deferment because animals will eat all they can find of the most preferred species and reduce range improvement and production. Grazing management and grazing systems that incorporate effective deferments help build the range forage base. There are many, effective grazing systems to use. Select the one that best fits your specific circumstances.

PLAN CONTINUOUSLY FOR THE NEXT DROUGHT

The best time to think about drought conditions is when it's raining straight down. During favorable years you have to control your optimism and enthusiasm and be able to look into the future - to see the next drought coming. Start planning now, because when you realize you are in a drought it is too late to plan for drought - your options have been spent.

The best management at the end of a drought is to insulate yourself as best as possible against the next one. Fortunately, there are options available to reduce the impact of droughts. Unfortunately, the most effective of these options are strategic in nature, that is, they require long-term decisions and commitments prior to drought. This may force us to think about bad times when we are having good times, which is not always easy for folks among whom "hope springs eternal." Of course, there are things you can do when you are six months into a drought, but we seldom like the alternatives at that point in time.

Strategic objectives that can mediate the effects of drought and that should be an integral part of total ranch management include:

1. Building the range forage base.
2. Maintaining or creating diversity of plant and animal populations.
3. Improving efficiency of range utilization through better grazing distribution.
4. Matching animal nutrient requirement with range nutrient availability.
5. Developing alternate sources of feedstuffs.
6. Building cash equity position.
7. Developing less drought sensitive on- and off-ranch alternative income sources.
8. Don't forget wildlife!
9. Contingency (including drought) planning.

There are other things we can do in the early post-drought period that can help the next time around. Several of these involve management decisions on the livestock operation, and drought may provide a good time to reevaluate goals. Drought, and attendant herd reduction, offers the unexpected possibility of reviewing an entire livestock production enterprise.

1. Is your breeding season short enough? A short breeding season (no more than 90 days) is the key management tool around which other ranch programs are built. It is difficult to correctly supplement, select heifers or cows on a performance basis, efficiently market animals when cows calve year-round or over an extended period of time.
2. Is the breeding system right for you, purebred vs. crossbreeding.
3. Are you using the right breed or breeds?
4. Is there an opportunity for combination stocking that you have overlooked?
5. Is the supplement program you use the most efficient? Consider the use of NIRS technology and "fecal profiling" your herds to improve the efficiency of your feeding program.
6. Revisit your marketing options - are they the best they can be?

Build the Range Forage Base

Observations verify that going into dry periods on deep soils, the short grasses brown up first, followed by mid-grasses and finally the tall grasses, only when deep moisture is completely exhausted. A poor condition range is generally occupied by vegetation that is much less drought resistant than the climax decreaser species for the same site. Red grama, red lovegrass and hairy tridens are just a few perennial grass species that are more shallow-rooted than climax decreaser species that could occupy the same soil profile. These invader species may look good during wet times, but they fade fast during droughts, compounding the problem of low forage availability. Results of a 6-year study at the Texas Experimental Ranch at Throckmorton clearly show that long-term heavy continuous grazing reduces potential range forage production because of a shift in plant species composition from a midgrass to a shortgrass dominant community. During drought or winter induced dormancy, nutrient intake of livestock was restricted on these areas, requiring either greater amounts of supplement compared to

moderately grazed areas or destocking (Tex. Agr. Exp. Sta. 1988). When we consider that most droughts are of one year of less duration, managing for the right plants on the range simply eliminates the effects of most droughts and ameliorates the effects of longer ones.

The first strategic post-drought consideration should be what management can do to influence change in vegetation composition. This will depend on many factors, including range site potential, current range condition, technically feasible alternatives, economic feasibility, kinds of livestock, and wildlife habitat requirements. The information needed to make these and other strategic management decisions must come from a comprehensive resource inventory of the soil, water, vegetation and physical facilities that exist on the ranch. Subsequent range management should produce the highest quality range possible under the natural limitations of climate and soils, and based on the requirement established by management goals.

How important is the forage base? A range producing 4000 pounds per acre of forage would obviously carry more grazing animals than range producing only 1000 pounds per acre. but it will also produce more future forage on the same rainfall. This means that the same 3" rain means different things to different ranches based on their past management and efforts to improve range condition. Assuming range proper use (removal of about one-half of total production), there would also be several times more forage left on the 4000 pound range at the end of the grazing season that could be used to carry animals during drought, 2000 lbs vs. 500 lbs. The 4000 pound range could be grazed again after proper use during the dormant season or during drought enforced dormancy and, if conditions dictated, as long as the integrity of the watershed characteristics were maintained. The 1000 pound range would probably be below the minimum for preserving soil cover if one-half of the total yield was used. It offers no opportunity for further grazing use without potential loss of soil and/or reduction in soil moisture to support future plant growth.

Investing in range improvements, such as fencing and water development for grazing systems, or mechanical or chemical brush treatments that will speed up secondary succession, or revegetation in severe circumstances, can help overcome low range productivity and provide a more stable forage base. There is often a great difference, however, in where this money is spent on improvements in relation to potential benefits and economic payback. Research by Scifres et al. (1988) in South Texas shows clearly that the most productive sites on the ranch respond more positively in internal rate of return on investment from tebuthiuron treatments. Matching range management problems with the appropriate technology and putting dollars where they will be most effective is good business. Increasing the productivity of range sites with improvement practices can improve the cushion of reserve forage available during drought.

Diversity of Vegetation and Animals

Good range management is good drought management. It balances the amount and kind of forage with the number and kind of domestic animals grazed and/or wildlife resident on the range. Most efficient use of diverse plant components on the range is accomplished by combinations of livestock to utilize the broadest spectrum possible of the vegetation (Savory and Parson 1980, Taylor 1981). In some instances, one type of animal in a combination can suppress as well as effectively utilize those plants which are a problem in single stocking programs. If the livestock enterprise is diversified to include more than one kind of livestock, such as a combination of cattle, sheep and goats, drought risk is lowered as animals will draw on a larger segment of total range vegetation. It may also mean that one or more kinds of animals can be kept on the ranch to produce income while another kind is necessarily marketed.

Diversity of vegetation and of the animals that use this vegetation is a significant factor in reducing

drought impact. For example, during droughts the forb component may be dramatically reduced and, under severe conditions, even grasses may not green up, leaving deep-rooted woody plants as the primary source of nutritious forage. Not having the right animals to take advantage of woody plants, however, limits the advantage of having this forage component. Independent studies in South Texas on the use of brush by cattle indicate that cattle will significantly increase use of woody plants only after herbaceous forage supply has dropped to less than 1000 pounds per acre in most seasons (Mastel 1987, Hanson 1987). Normal use of brush when herbaceous material was not limited was about 10% or less. As the levels of woody plant use increased to about 15-20% of diet due to limited herbage, cattle condition began to decline and stress became obvious. The high lignin content of browse reduced rate of passage and simply did not allow the cattle to ingest enough nutrients to supply minimum requirements. Brush has value to grazing animals, even cattle, if they are able to use it by selection when there is adequate herbaceous forage present on the range.

The balance between forage supply and livestock demand, or stocking rate, is the single most important factor in grazing management. Stocking rate expresses the land area allotted to an animal unit for the duration of the stocking period in order to supply the forage requirement for satisfactory levels of animal production without range condition degradation. Satisfactory animal production includes such things as conception rate, and costs, such as variable costs to keep the cow (ewe, nanny). As drought depresses forage supplies below the expectation based on current stocking rate, the number of animals must be reduced to regain balance with forage availability or supplemental feed provided if target production levels are to be maintained. Reducing stocking rate can be very traumatic, particularly if good breeding females must go to market and bring a fraction of their value.

A nucleus cow herd provides stability, but a portion of ranch carrying capacity should be devoted to "resale animals". The appropriate proportion will vary between ranches, but a 60-40 or even a 50-50 ratio of brood animals to those that can be moved quickly on or off the ranch as forage conditions dictate would be a reasonable balance. Steers are commonly used as stockers, however, heifers certainly provide another option (Holloway 1985). They can be sold as slaughter animals, open, bred or calved out and sold as pairs. This gives a great deal of flexibility in opportunities to keep or sell in relation to forage resources, as well as marketing advantages. In severe droughts, that part of ranch forage resources that would normally be used for resale animals can usually be made available for breeding herds, thus reducing feed supplement requirements, preserving herd integrity, and reducing risk of forced sale.

Grazing Distribution

Stocking rate is the most important decision in good grazing management, but it is not the only one. Even if stocked correctly for total carrying capacity, a pasture may be very inefficiently used because of poor grazing distribution. When this happens, you lose two ways; areas where livestock overuse forage will decline in range condition and productivity and areas underused by livestock represent valuable forage lost. The primary reason for poor grazing distribution is distance from water sources, but others as topography, heavy brush, prevailing wind, and preference for sites by different kinds of animals are also important. Most of these can be mitigated by improvement practices or management techniques. A significant element of post-drought planning should be to improve grazing distribution.

Match Animal Requirements with Forage Supply

Range management following drought should include a review of the match between range forage and animal demand based on their physiological status. Range forage production varies dramatically over the year in amount produced per unit of time and in nutritive quality. Animal requirements vary

dramatically over their production cycle. It makes sense to try and match the highest nutritional requirements of grazing animals with the periods of greatest nutrient supply from range vegetation. Forage production can be plotted in relation to precipitation and temperature, since they are the most significant influences on range vegetation. A chart such as the following is helpful in identifying critical livestock requirements with forage availability and quality and should influence decisions about herd management, including breeding season and subsequent calving and weaning (Fig. 6).

Alternate Feedstuffs

The bottom line of drought impact as it affects livestock production often relates to the nutritional plane just prior to and during breeding season. Herd productivity in the next calving season can be the single most disastrous effect of drought; that is, reduction in conception rate and subsequent loss of income.

Providing the feed supplements necessary to maintain cow energy levels and insure breed-back may be a very economical investment compared to potential conception rate loss. However, if you are going to buy feed for livestock during drought, be sure that you feed for the right reasons, at the right time and in the right amount to do the job. I like the reference made by a younger rancher to the old timer that told him how to survive a drought - not to borrow money and to sell cattle to pay drought expenses (John Northcut 1985). This is similar to the quotation credited to a banker advising a rancher on drought feeding: "feed your cattle what they need; just be sure that you sell enough cattle to pay for the feed" (Merrill 1985).

Supplemental forage produced on the ranch is often used to offset the impact of reduced standing crop caused by drought and can become an important ranch enterprise. The most common of these feeds is hay, put up in good times to stretch resource productivity through the lean times. Silage is another, though less popular, reserve feed material. Both of these materials capture nutrients within feedstuffs and allow long-term storage without significant loss. The longevity of hay and silage quality depends in large part on management expertise in the culture, harvest, and storage of each crop, and they require large investments in land, equipment, labor, and storage facilities.

It behooves us to give much thought and serious analysis before deciding that an enterprise of producing feedstuffs on the ranch is as economical as purchasing hay and protein supplements. Dependency on annual forage crops, such as warm-season forage sorghum or cool-season small grains, or even perennial grass pastures is risky during drought, because they are also affected by poor growing conditions. Reserve feed that is likely to help the most is what you have in the barn or in a pit for some time period before drought conditions prevail - as a result of strategic planning.

Equity Position

Survival during droughts may well depend upon cash equity position. We have probably all known ranchers that were able to make it through rough times better than others because they had good cash reserves on hand. Among the better managers, this is no accident. Providing for financial reserves to handle drought-related expenses when they occur should be part of any strategic ranch plan in the southwest. It is not a question of whether or not we will need such funds, it is only a question of when. As long as they are drawing interest, let them grow and be glad they are there when you need them. Some people find other ways to make it through drought. I can't help but think of the fellow that said, "You know my wife has always had to work for us to keep this place, but with this drought she is going to have to find a second job."

Alternate Income Sources

Almost all ranch related activities are affected by drought, but some more than others. For example, income generated from wildlife or ecotourism may be less influenced by reduced forage production associated with droughts than livestock income. However, waiting until drought comes may be too late to increase income from wildlife operations or other alternate income source if it is not already in place and functioning. We also have a tendency to think about the traditional income producing wildlife enterprises, such as deer, turkey and quail, but there are significant others, such as feral hogs, javelina, doves, and one that is apparently catching on, trophy fishing.

I like to use the example of a friend that cuts firewood from oak stands on the ranch to sell to backhaul truckers. One year he cut 950 cords from the same pasture and estimated he had cut only about 10% of the total oak available. The cut oak promotes sprouting from the base that becomes accessible, palatable browse for livestock and wildlife and that is more dependable than the herbaceous component in very dry times.

Stabilizing income through drought periods may also require that a greater portion of available capital be invested in off-ranch, non-agricultural investments. For example, the interest on a CD is paid whether it rains of not.

Don't forget Wildlife

We often spend time and effort concerned about the nutritional status of wildlife when times get tough. Water is the most important of all nutrients. An animal can lose almost all of its fat and half of its body protein and survive, but a loss of as little as one-tenth of the body's water will result in death. Water for the various bodily processes can come from three sources: free, preformed or bound, and oxidative or metabolic. Free water is contained in ponds, streams, etc. Preformed water is contain within plants (Brown 1985). Metabolic water is formed upon the oxidation of proteins, carbohydrates and fats within the body for energy. Wildlife species tend to be better at adapting to their environment than do domestic animals. Some animals, such as pronghorn antelope, can survive without free water when forbs are lush and plentiful. Mule deer and bighorn sheep have an estimated consumption of three to six quarts of water per day of free water. White-tailed deer seem to have about the same requirement. It is not clear if deer can survive without any free water during lush forb growth. Collared peccary have no need for free water because of their use of high quantities of cactus that is >75% water. In drier climates they may require about 1.25 liters per day and will die if they lose 17% of their body water.

Free water is essential for wild turkeys during the warmer months. Most flocks range with a mile of water and hens often nest within a half mile of water. Water may be crucial for the survival of poults during hot, dry periods. Bobwhite quail get a lot of water from the foods they eat in years with at least 16 inches of rain. What happens in drought years when green plants, insects and berries are scarce? Laying hens have high water requirements which makes up 70% of an egg. If laying hens are deprived of water for one day, egg production stops temporarily and remains low for six to eight weeks. In dry springs, hens must have access to surface water if they are going to be productive. Although it won't be needed every year, water availability may increase productivity and survival during droughts. A water hole per 300 acres may be a minimum need (Guthery 1985). Guthery measured a high bobwhite density with a watering source per 100 acres in a fairly dry year. Density of waterers probably need not exceed this figure.

The bottom line for wildlife as you plan for the next drought is to improve the density and distribution, as well as the reliability, of water points.

Contingency Planning

A wise rancher I know repeats to himself the saying "It is our responsibility to be successful under conditions as we find them (instead of what we wish they were)." Ranch plans need to be flexible enough to adjust for changing circumstances on a continuous basis. The components of range, livestock, market, and money management are interrelated and almost inseparable. Is your plan one that can accommodate changes from "normal" conditions, such as drought? In many parts of Texas, as much as two-third to three-fourths of the total annual forage is produced by June 30. At that time you can foresee what changes should be made immediately or by fall. Timely recognition and action to make needed stocking rate adjustments protects both forage and livestock performance, preserves flexibility and avoids forced sales on distressed markets. Timely stocking rate adjustments in small increments spread marketing opportunities and risks and maintain steadier numbers and cash flow, as opposed to massive selloff or expensive relocation.

Example drought plan statements could include (Merz 1985):

1. Ranch is stocked at 25% below average forage production on good condition range. Only during extended dry periods are adjustments necessary. However, forage will be evaluated during July and adjustments made at shipping time on October 1. When adjustments are initiated, priorities will be as follows for increasing drought severity; a) cull heifers, b) sell 10% of breeding herd, c) feed stored hay, d) move top 50% of registered breeding herd to alternate feed, and e) liquidate herd.
2. If at least 5 inches of rain in not received by June 1, plan will be initiated to cull bottom 15% of herd. If short duration system begins to cycle too fast because of dry weather (less forage), plan will continue to cull stock to get cycling back into line with dates on the grazing plan. Five inches of rain by June 1 is 25% below normal for this time of year based on average annual rainfall.
3. Continuously evaluate forage and moisture conditions. In October, standing hay and Texas wintergrass will be inventoried as to AUM of forage. Livestock will be adjusted, as needed, so that forage will not be overused by beginning of growing season in April.

Management

Walt Richburg of The Uvalde Bank always "tells it like it is" when talking to producers about their financial management. Walt stresses MANAGEMENT as the single most important factor in surviving drought and his admonishments make sense for post-drought management strategy. He strongly recommends building equity position. The good manager will be just a conscientious in the easy times as in the hard times (Richburg 1985). He is putting aside a reserve rather than spending all he makes (this must reflect on the biblical story of Joseph and how he prepared for drought by storing surplus during the seven good years which allowed him to survive and prosper during the seven lean years.) Walt also stresses cutting costs - there is always another way to cut costs. During droughts when we are in a survival mode pull the belt up several more notches. Get serious about business management. When the next drought comes and you want or need financial assistance, have a current financial statement, profit and loss statement, projection and production records to back them up. Even if these records paint less than a rosy picture, the fact that you have them, know how to develop them and are aware of what they say is a plus in dealing with bankers.

New Models May Help Decisions

The Ranching Systems Group at Texas A&M University is testing a climate and hydrology-based model called PHYGROW for simulating daily plant growth on rangeland. It can be used to predict peak standing crop herbage yields from plant growth parameters, climatic data records and hydrologic information. PHYGROW can utilize current climatic data to simulate ongoing processes or long-term

weather records to simulate runoff and herbage production under a range of climatic conditions and management practices. When the model becomes available, it should help ranchers with early stocking decisions based on predicted changes in forage availability.

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Grazing Management During and After Extended Drought

From "Beef: Questions & Answers" newsletter*
by Dr. Jeff Mosley, Extension Range Management Specialist, Department of Animal & Range Sciences, Montana State University, Bozeman

To me, drought and taxes have a lot in common: they're both facts of life that must be dealt with periodically; they're both royal pains in the rear; and they both carry serious consequences if we choose to ignore them.

Most ranch businesses can readily adjust to one or two dry years in a row, and I don't believe that short-term drought necessitates major changes to most ranch grazing plans. However, three or more successive dry years challenge even the best graziers, and unfortunately, many range livestock producers across our state now face this situation. Besides the immediate concerns about how to feed the livestock, serious drought also stresses the land, often to the brink of change.

Years can pass without much apparent change to seeded pastures and rangelands, but extended drought can cause dramatic shifts in vegetation. The land then remains relatively unchanged until the next environmental trigger occurs. Drought conditions over the last three or four years have created an environmental trigger for Montana's pastureland and rangeland, and failure to care for the land during this year may create serious consequences for decades to come.

Assess Drought Impact

How much of an adjustment is needed to your ranch grazing plan for Spring and Summer 2001? The answer depends, of course, upon how hard you've been hit by drought. The drought has not impacted everyone to the same extent, and even pastures or portions of pastures within one ranch have not been affected equally. Consider these questions to assess drought's impact:

Were weeds a problem before the drought? If weeds were a problem before the drought, they'll probably be even worse after drought. Drought stresses all plants, but weeds are usually stressed less than desirable forage plants because most weeds grow earlier in the growing season before soil moisture is fully depleted. Also, weeds are usually grazed less than other plants. When rainfall does occur, weeds are in better shape to respond and they get a jump-start on the desirable plants. Producers need to be especially vigilant about new weed infestations if they brought in hay from new sources this past fall and winter. Inspect areas where the hay was fed and plan to control new infestations this summer - before weeds get well established and before weed control becomes more costly.

Were poisonous plants common before the drought? Poisonous plant problems often worsen during or after an extended drought, especially early in the growing season. Many poisonous plants are "weeds" that survive drought better than desirable forage plants, and many poisonous plants green up early in the season (e.g., low larkspur, death camas, and locoweed). Poisonous plant infestations tend to thicken after serious drought, but toxicity problems can be more common after drought even when poisonous plants don't increase in density. One reason for increased toxicity

> Early planning will enable you to carefully consider potential alternatives for your grazing plan this summer.

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problems is that after a dry year there is less (if any) residual carry-over forage from the year before to buffer the toxins. Thus, dietary concentrations can reach toxic levels even when livestock don't increase their consumption of poisonous plants. A related concern for this spring is grass tetany. Without last year's residual carry-over grass to buffer the new green growth in the gut, grass tetany becomes more likely and strategic supplementation will be warranted.

When was the area grazed last year? One silver lining about drought years is that much more of the grazing season usually occurs after seeds ripen and when plants are dormant. Plants are more tolerant of grazing during these later stages of plant development, so some plants may have endured less stress from grazing than in normal years. The plants stressed most by last year's drought were those grazed in early summer, because they were unable to regrow before soil moisture was depleted.

How heavily was the area grazed last year and in previous years? Light or moderate grazing doesn't harm most plants, nor does heavy (< 60% utilization) or severe use in one year if the plants are given an opportunity to recover. Plants are stressed when heavy or severe use occurs for two or more years in a row. When drought breaks, plants grazed lightly to moderately in the past will recover from drought faster than plants that have been heavily grazed for many years.

Do plants appear stressed this spring? Stressed plants begin growth later and grow slower in spring, and most plants will be stressed after three or four drought years. Consequently, turnout in spring will likely need to be later this year in many areas across our state. The rooting depth of your forage plants and the length of drought in your area can help you judge how long plant growth will be delayed this spring. After one or two dry years, growth usually begins earlier in deep-rooted versus shallow-rooted plants because deep-rooted plants had access to more soil water and were less stressed. After an extended drought, however, deep-rooted plants may rebound slower because they remained green longer into the growing season and probably received extra grazing pressure during drought.

Grazing Strategies

Early planning will enable you to carefully consider potential alternatives for your grazing plan this summer. Waiting to plan until June or July will leave fewer options available. Some potential options include:

Reduce the Amount of Forage Needed

- Cull more heavily before the grazing season begins and before the market becomes glutted. Reduce the number of replacements, if possible. Mature cows will survive and reproduce better than young cows or heifers that are still growing.
- Wean calves early. Dry cows consume about 35% less forage than lactating cows and 400-lb calves consume about one-third as much as mature cows.

Graze Somewhere Else

- Lease additional pasture.
- Use tame pastures, especially subirrigated or irrigated ones, more heavily than usual. The improved forage species can tolerate heavy grazing more so than native rangeland, so allocate more of the load to those pastures that can tolerate it best.
- Try to graze areas this year that didn't get much or any grazing use last year. For

example, consider areas near reservoirs and springs that went dry last year. These areas may have been grazed less than in a normal year when water is available. Herding, supplemental feeding, hauling or piping water, temporary fencing or shutting off water in over-used areas can all be used to control where livestock graze. Be sure to carefully evaluate the costs and benefits of these practices versus the costs and benefits of reducing livestock numbers.

Adjust the Timing of Grazing

- Delay turnout in spring so that forage plants can recover vigor. Delayed turnout will also lessen problems with poisonous plants and grass tetany.
- In rotational grazing systems, rotate more frequently.
- Consider using any rested pastures and thereby spreading the use this year across all of your pastures.
- For early season grazing this year, try to graze any areas that were ungrazed last year or those areas that were grazed after plant dormancy during last summer's drought.
- For late season grazing this year, try to use those areas that were grazed heavily last year before plant dormancy.

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Each issue of Beef: Questions & Answers this year will include a profile of ranch operations around Montana.

* Beef: Questions & Answers is a joint project between MSU Extension and the Montana Beef Council. This column informs producers about current consumer education, promotion and research projects funded through the $1 per head checkoff. For more information, contact the Montana Beef Council at (406) 442-5111 or at beefcncl@mt.net

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