Stock Density & Patchy Landscapes—

Land Planning for Diet Selection

by Jim Howell

I love stock density. Apart from the aesthetic pleasure of watching huge numbers of herbivores grazing in a tight, cohesive herd, just the way nature intended, high stock density is associated with a big list of positives. Stock density refers to the concentration of a herd of animals at a specific point in time. Stocking rate is the total number of animals a property carries over the course of a year. A herd of 1,000 animals on a 100-acre (40-ha) paddock would be grazing at a stock density of 10 animals to one acre (25 animals to hectare). If those 1,000 animals were living on a 10,000-acre (4,000-ha) ranch, stocking rate would be one animal to 10 acres (4 ha).

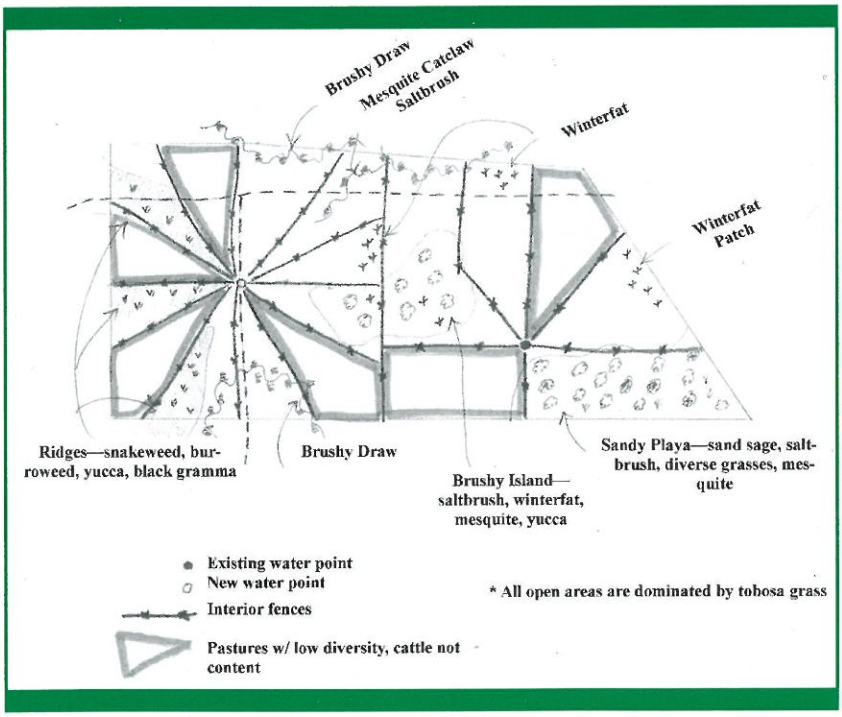
High stock density motivates livestock to get up into nooks and crannies of pastures that they would otherwise never venture into. In topographically difficult country, where fighting gravity is a constant challenge, high stock density results in cattle walking to the top of the ridge on their own free will—no labor intensive herding necessary.

Historically, riparian corridors have been hammered, and the high slopes and ridges barely touched. Merely pushing stock density up to a cow/calf pair per acre (.4 ha)—with some strategically placed portable electric fence—results in cattle taking a voluntary trek up the slope, as opposed to down the creek. That level of density is still a long way from ideal (and is not meant as a benchmark), but compared to the previous norm of season-long grazing at stock densities of one pair per 25 acres (10 ha), it makes a huge, huge difference.

Stock Density "Grows" More Land

Of course, this modified bovine behavior means previously overrested plants and soil surfaces now get the benefit of grazing and impacting. Dung, urine, tracks, and grazing are spread across the whole landscape, as opposed to concentrated along creeks. It also opens up a whole bunch of land previously wasted, allowing for a big jump in stocking rate. The higher your stock density, the bigger your ranch.

Also, the higher stock densities climb, the proportion of plants severely grazed lessens, but the proportion of plants grazed overall increases, with no greater total consumption. For example, assume total consumption by the end of the grazing period works out to 30 SDA (stock days per acre) or 12 SDH (stock days per hectare), and was harvested by 600 stock units grazing 100 acres for 5 days. Compared to 600 stock units grazing 400 acres for 20 days (which still works out to the same 30 SDA), the former situation will result in this more evenly spread degree of grazing intensity. This means more leaf tends to be left in the pasture post-grazing, and less plants end up producing a reproductive tiller and becoming stemmy. More leaf and less stem means more photosynthetic factory, which means more total forage production, which means higher stocking rates, which means more income.



This map represents an approximation of the land plan we developed on the portion of the ranch on the flat bottom country. This area of the ranch started with three pastures and ended up with 18, but many of those new pastures didn't end up containing enough plant diversity for the cattle to be able to adequately meet their nutritional needs.

Animal Performance & Land Planning

Lastly, assuming good grazing planning, animal performance tends to improve, because the higher the stock density, the quicker animals are able to move onto new, recovered, fresh forage. Good grazing planning is a complex art that melds practical husbandry with sound science. At its core, well planned grazing ensures that animal demand and forage supply are optimally matched, plants aren't overgrazed, and a myriad of other factors are accounted for (livestock working logistics, wildlife needs, poisonous plant problems, family vacations, wife's birthday, etc.) in the process of getting animals to the right place at the right time for the right reasons.

But if grazing planning and implementation is not skillfully done, animal performance can suffer as opposed to improve. On top of that, I contend that poor land planning can also inhibit animal performance. Land planning is the process of designing the placement of fencing and stockwater infrastructure that (among other things) enables us to move toward higher and higher stock density. Yes, good grazing planning is essential to good animal performance, but no matter how well the grazing is being planned, if it is happening within a poorly designed land plan, it's really tough to achieve high levels of animal performance.

Sixfold Stock Density

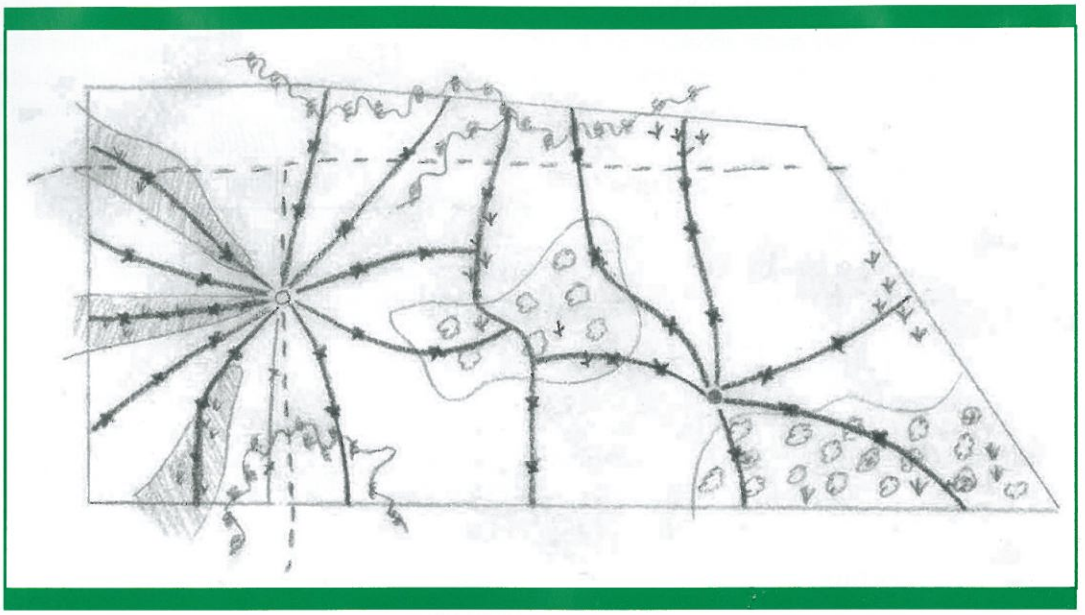
This lesson stemmed from my early days of grazing planning, when my wife, Daniela, and I were employed as the on-site managers of the High Lonesome Ranch in southwestern New Mexico. We had some great successes over the course of that five-year experience, but also suffered some hard knocks that didn't sink in until several years after the whole experience was over.

We were highly motivated to push stock density as high as we could, but it wasn't an easy task, given that it was just she and I, 35,000 acres (14,000 ha) of pretty harsh desert grasslands and mountains, and a whole bunch of wild Barzona cattle (that had been very well trained to barge through/ignore electric fences). The previous owner had built a couple of grazing cells encompassing 16 pastures (and taking in about 40 percent of the ranch, including most of the mountain country), but had abandoned all that fence after a couple of years. When Daniela and I arrived, the fences were strewn out all over the place, and those skinny red cows were dragging them through the brush.

Over the course of our two years, we rebuilt all that abandoned electric fence, built about 40 miles (64 km) of new fence, and constructed a really fancy cell center with the county road running right through the middle of it. We eventually got those Barzona cows gentled down and trained to a hot wire, and to a large extent had things running reasonably smoothly when we left for greener pastures.

Most of the fence we built on the High Lonesome radiated out from that very publicly visible split cell center on the county road. This was down on the flat part of the ranch, which, compared to the steep, rocky mountains on the ranch's west side, seemed pretty straightforward to develop and manage, or so we thought. We built 12 nearly equal-sized pastures radiating off this cell center, six on one side of the road, and six on the other. Another new series of six pastures radiated off an existing watering/storage facility a few miles further east. We went from three big pastures in that part of the ranch to 18. When we had it completed, we were in the middle of a 16-month drought and knew all these new pastures were going to be pivotal to surviving till the next possible monsoon season, which ended up being eight months away. This part of the ranch had a significant amount of standing dormant forage, which we hadn't touched since it quit raining.

Now we could increase stock density in this part of the ranch by *sixfold* on average. Instead of grazing 3,000-acre (1,200-ha) pastures with our 400 pairs, we were grazing 500-acre (200-ha) pastures. We knew that level of density would get cattle to the back corners, up to three miles (4.8 km) from water—corners that we had previously barely touched. We needed that feed to make it to July. We also knew we could move cattle more quickly onto new ground, and assumed this was going to help tremendously in maintaining cattle condition.



If we had been more aware of the need to provide this diversity, some minor changes in our fence placement would have greatly improved the ability of the cattle to more successfully select their diet. This is the same map as on the previous page, but with the fences changed to take in greater diversity within each pasture.

The Challenge of Patchiness

To a degree, it all worked as planned, but in about half of those new pastures, the cattle just were not happy. For example, if we had an eight-day grazing period planned in one of these pastures, by day two or three, the cattle wanted out, despite lots of remaining grass. They'd stand at the cell center and bawl like babies, their flanks sucked up with hunger. In other pastures that seemed basically the same, the cattle were happy throughout the whole grazing period. We had to use the grass in these unfavored pastures—either that or start buying hay. We were putting out a molasses/fat/alcohol/urea lick, and the cattle inhaled it when in these pastures, but still weren't at all happy. We made it, but it was stressful on people and cows. I suspected they were less biologically diverse pastures even though they contained as much or more grass cover as the "good" pastures.

In desert grasslands, vegetation patterns tend to be highly mosaic in nature. This patchiness is tied to soil type, but I think is also largely a result of their degraded state due to decades of partial rest and overgrazing. No

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matter the cause, it's reality across huge expanses of our western rangelands. On the High Lonesome, the "flat" country taking in our new grazing hubs did have slight ridges and depressions. The depressions were really broad draws containing about 95 percent tobosa grass (which passes as very marginal cow feed when dormant, which it usually is), and the ridges were more silty rises dominated by bare ground, broom snakeweed, and burroweed. These two "weeds" are actually low growing woody shrubs that are toxic to cattle. Sounds like paradise, doesn't it?

Some of these ridges also contained a little black gramma grass (generally higher in quality than tobosa, especially when dormant), and soaptree yucca. A few washes had dense thickets of mesquite and catclaw (both leguminous shrubs), and fourwing saltbrush, and scattered here and there were little patches of winterfat (a very palatable shrub). Other than the saltbrush and winterfat, I didn't regard any of the rest of those species as cow fodder. Some years the mesquites produced a few beans, and in good springs, the yuccas sent up a stalk that stayed tender and palatable for about 10 minutes. The cows liked both of those, but they were so seldom available, we figured them as insignificant. We nearly wrote the snakeweed ridges off as useless, too, assuming we needed to greatly expand their perennial grass cover before we could count them as significant contributors to forage availability.

My mind traveled back to those bawling Barzona cows standing in shin-deep, dormant tobosa grass, looking across the fence at that snakeweed ridge.

So, when we built all that new fence, we paid no attention to the type of grazing and browsing resources we were including in each pasture. We were mostly concerned with just getting our 18 new pastures built, and keeping them roughly the same size so that stock density and frequency of moves would stay reasonably constant. The result was unhappy, underperforming cattle about half the time.

Salad Bar Restriction

Dr. Fred Provenza, from Utah State University (see "Cows Have Culture, Too" in *IN PRACTICE* # 82), has done some great work in this area. I had the chance to attend a day-long course taught by Provenza several years ago. After he explained about how native animals learn what to eat (usually eating a little bit of lots of things), that toxic plants usually aren't toxic if consumed only up to a certain point, and that animals need to be able to select from a diversity of plants to meet their energy, protein, mineral, and vitamin needs, a lightbulb went on. My mind traveled back to those bawling Barzona cows standing in shin-deep, dormant tobosa grass, looking across the fence at that snakeweed ridge. The snakeweed ridge was comprised of a different soil type, so the plants growing on it had a different nutrient profile. The snakeweed itself, though toxic if consumed in abundance, actually had a little green in it, and these native cows knew they needed a bite.

Never in their lives had these cows been in the predicament of having nothing to consume but tobosa grass. They knew how to make a living in this harsh landscape, but if they were restricted to one little corner of their salad bar, they were immediately unable to meet their needs—especially in the middle of a 16-month drought. It's true that at the conventional low stock densities these cattle were accustomed to, lots of country was underused and overrested. But, on any given day, they had the option to graze tobosa grass, pick a few twigs off the winterfat and saltbrush, lick up a few old mesquite beans, and chew on some prickly pear cactus. When we built all that fence, we didn't realize that they still needed to have the ability to access most of their normal salad bar at the higher stock densities.

Thinking back on it, if we had been conscious of this principle, it would have taken just a little modification to our fencing layout to greatly improve the diversity, and therefore the ability to select, in each of our new pastures (see accompanying maps).

Here in Colorado, the rangelands we manage, for the most part, have lots of diversity, and this diversity isn't patchy. It's a well-mixed diversity. Each acre tends to have lots of species. But even here, there can be a big difference in animal behavior depending on the types of range sites to which the cattle have access. The ranch we lease is mostly comprised of three canyons running north and south. For the most part, each pasture we've created takes in both the west and east facing slopes of the canyon (each pasture is basically a cross section of the canyon).

The east facing, wetter slopes tend to have higher levels of diversity—more grass species, and lots more forbs. The west facing slopes are dominated by a bunch grass of the Festuca genus. It comprises roughly 90 percent of the vegetation on these slopes. At reasonably high stock density, cattle will climb these west-facing slopes and consume this bunch grass, and they do it without complaining. But, they do complain if they can't get to the other side of the canyon. If they only have access to the west-facing slope, no matter how much grass is there, they just do not like it. They need to balance that bunch grass with the diversity across the canyon. We have one pasture that is almost solely comprised of one of these west-facing slopes, and it drove me crazy this year. Next year, I'm going to shift the fence around to include more diversity.

Big Herds are Better

A stock density of five stock units to the acre can be accomplished with a herd of five animals on one acre, or 5,000 stock units on 1,000 acres. Due to the behavioral changes that occur with ever larger herds, the effect on each acre in both of these cases will not be the same. Despite the same level of density for the same amount of time, the big herd will create a much more well-disturbed soil surface and more evenly grazed landscape. Because of this, Allan Savory has long preached that ranches, as units of management, need to get bigger so that we can create these bigger herds.

But, in the patchy environments that characterize lots of the arid and semi-arid areas of the world, there's another big advantage to large herds. Take the extreme case above. If you're out on the flat desert grasslands of southwestern New Mexico, moving a herd of five head to a new acre every couple days, the patchy nature of the landscape will result in drastic changes to the daily salad bar. The cattle would not be able to take it—not without lots of outside supplements. The 5,000 head herd, on the other hand, with access to a new patch of 1,000 acres every couple days, is far more likely to have lots of choice on each 1000-acre block. So with bigger herds grazing bigger areas, providing a full salad bar becomes far more practical.

That's why I love stock density. There is no more powerful means to cycle carbon, plant seeds, break soil caps, and fertilize the soil than with big herbivores grazing in big herds. But, this is not easy to accomplish, especially in low production, highly brittle landscapes, so whatever we can learn to help us in this quest needs to be shared. The practical insights gained through the research of Dr. Provenza, combined with intimate knowledge of our specific landscapes, can help ensure we not only heal our land, but our livestock stays healthy and we are profitable in the process.