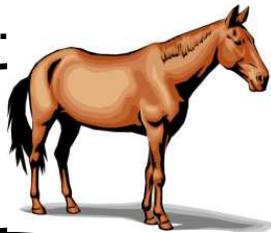


Notes from....



Serrano Creek Ranch Equestrian Center

MAY 2007

25201 Trabuco Road, Lake Forest, CA 92630
Office Phone 949-768-5921

Email: <SerranoCreekRanch@msn.com>

The Big Manure Issue

One of the ongoing challenges of stabling horses in Orange County is that there is fewer and fewer means of disposing horse manure. Land that previously grew strawberries and could accept manure, now instead sprouts new housing. Coupled with this is a whole array of new regulations from a plethora of government agencies that regulate air, water, and land, all is not sunny on this horizon. For example any new composting facility of any size must now capture emissions from the piles, as these are considered contributors to smog.

As a descendent of Adam Smith (well, more truthfully -just studying economics in school), it just seemed wrong that our manure which in the rest of the world is a valuable asset, is viewed as a waste product. In India, as well as throughout the world, there is a class of entrepreneurs that make their living by collecting the dung of the cattle that roam the streets and sell it for fertilizer and fuel. Then absurd thought (or maybe more honestly- childish) that our manure isn't wanted here, I'll take somewhere else in the world and just ship it to India! Do the math and this is at least a 500%+ increase in our current disposal costs -but still an option.

Under the current arrangement, our manure is hauled to Hemet where it is composted and then sold to wholesalers who bag it and put it on the shelves of your local nursery store. As diesel prices rose dramatically in the last years, and legal disposal sites shrunk, we were offered only a 40% increase in hauling rates. This is still a bargain over straight land filling cost through the local waste hauler who bid the effort at a 260% increase! India still comes in a quite distant third

place.

In keeping with modern marketing techniques I will now use a quote from great leader to associate my safe, pedestrian effort with the real accomplishment that he / she achieved.

The ultimate measure of a man is not where he stands in moments of comfort and convenience, but where he stands at times of challenge and controversy.

Martin Luther King Jr. (1929 - 1968),
Strength to Love, 1963

So the 40% increase was my: battle cry, rallying cry, call to arms, rebel yell, war cry, banzai, war dance. . . Matt, get on with it, it's just a newsletter.

Our first step was to verify that in fact the truck was fully loaded for its trip to Hemet. For many years passed Fernando, would load 18 tractor scoops per trailer, for a total of 36. We were told by the hauler that this was a full load. Under California Vehicle Code, the truck is allowed to carry 80,000 pounds total weight. If one is caught with more weight than that, the fine is as high as \$2,500. Plus the truck is parked until the weight is reduced to 80,000. So there is a real incentive to err on the side of caution when it comes to weight. A truck can be weighed at truck scales that are along the freeways. But they can be weighed with portable scales as well.

But one can be too cautious about weight. So we purchased a set of portable scales, similar to ones that the CHP uses to weigh trucks. And lo and behold we discovered that the trucks were leaving SCR considerably underweight. Still leaving a safety margin from possible scale error, we were able to increase the amount hauled per load by 30%. The scales are not cheap (\$2,500), but will pay for themselves in good time. While the truck now carried more material, there was still some

carrying capacity that could not be utilized because of the weight limit.

A quick spin on the internet showed that dry shavings weight 450 pounds per cubic yard (c.y.). And fresh manure (measured at let's say euphemistically *at the well head*) weighs 1,200 pounds /c.y. Since dry hay and dry shavings are about the same weight, the moisture content of the manure is 750 pounds / c.y. or 2/3 of the total weight. It doesn't take a rocket scientist, (but maybe an economist) to figure out that most of what's being hauled to Hemet isn't manure, but water. Haulin' (that's trucker talk) water to Hemet is pertainnear stupid.

On the day I started writing this article, the temperature is 61° and the relative humidity is 63%. Relative humidity is the ratio between the current amount of water vapor in the air divided by the maximum potential water that could be held in the air at a given temperature. As the temperature rises, the capacity for the air to hold more water vapor rises. For a given amount of water vapor, raising the air temperature lowers the percentage of water that is held in the air, i.e. relative humidity falls. If the air is heated, it can hold more water, and conversely if it is cooled, it can hold less.

Back to the internet, and then stopping at the National Service web site, one finds a temperature for the dew point for today is 48 degrees. This means if I took a sample of the today's air, put it in container, and lowered it below 48 degrees, that air in that container would produce liquid water. This is why at dew forms at night. Now if I took that same container and heated it up to 90 degrees, not only would the liquid water evaporate, but I could add more water and that would also evaporate. This is because the relative humidity would go from 100% (at 48°) to 16% (at 90°).

So why is this important? As the bacteria breaks down the material in the manure pile, heat is produced as a by-product. As a result, the pile of shavings and manure heats up to 160° during the composting process. Air that is drawn blown into the pile (today is 61° with 63% relative humidity), when heated by the pile has a relative humidity of just 3%. This means that there is still 97% capacity for carrying more water vapor. As the air travels through the pile it becomes saturated with water vapor from the manure. This hot air exits the pile, super saturated and then dissipates in the atmosphere. The steam you see is the air cooling, losing its water holding capacity, and in effect

raining. In picture #1 shows our first attempts to force air into the pile to reduce the amount of moisture. Fans are attached to perforated pipe, and the fans were held in place at manure was piled around them. This was a significant improvement over doing nothing, but it was quickly discovered that the air entered and exited the pile in a 1' radius around the pipe. This material never got hot and consequently dried only partially. The remainder of the pile outside the radius got hot but little air was expelled from the pile. The bottom of the pile did nothing.

Energized by the success of the plastic pipe fan effort, the next step was to blow air only along the bottom of the pile. In photo #2, the plastic pipe is replaced with heavy gauge metal, and holes are drilled only along the bottom so that the air is diffused over a greater horizontal area. As the air rises from being heated, like a giant pachinko machine, the entire pile is oxygenated. All the bacteria remain healthy, and continue to eat and multiply.

There is a temptation to that blowing more air into the pile means that it will dry faster. Here is not the case. Because blowing too much air will over cool the pile and slow bacterial activity. A cooler pile lowers raises the relative humidity, which results in less water absorbed by the air, and eventually expelled. The purpose the air is to feed oxygen to the bacteria so they can to multiple. More bacteria means a hotter pile, which means more water removed through a lower relative humidity. So if less air is more, then shouldn't zero air introduced be the best. Again contrary to common sense, if the pile runs out of oxygen, then the aerobic bacteria (which need oxygen to do their work) die off. They are slowly replaced with anaerobic bacteria (meaning no oxygen). If these take over, the pile begins to really smell. Aerobic composting is generally far less odorous.

With the new scheme in place, we are now able to load 70 tractor scoops in the hauler's trailers. This is a substantial improvement from the original 36, and then 44 scoops when the scales were used. In truth though, we really put 80 scoops because the accelerated drying process has a side benefit that the bacteria eat the pile reducing its overall volume. Measurements we've made show that in a two week time, the volume can be reduced by 20%. Each truck load is now 222% more than has been historically the case. And yet it is still underweight by some 6,000 pounds. The capacity is completed maximized by making sure that every corner of the

trailer is filled, and the top is heaped.

At this point please set the newsletter aside and save for tomorrow's reading when you'll be bright and eager once again.

Good Morning. Now we begin part two of the manure chronicle. So far we've reduced weight and volume. But the real excitement has yet to be reached.

In the week or so that the pile is being heated, what we are really producing is the first big step towards compost. Because the pile is so hot, aside from the specific bacteria and fungi that can survive the high temperatures, all else is killed. This material makes an excellent mulch that can't be bought in bulk anywhere around here. In the last four years I've have landscape my house and in the process have used almost a hundred cubic yards of raw manure. I began with clay that if I were a potter, I'd be in paradise. Every three to four months I'd take a few truck loads and cover all the planting beds with three to four inches. Within a short time the material turn a dark brown. Then the worms and other local folk would digest the manure and shavings into a rich humus. Initially for the plants it was either gooey saturated mess or rock hard chunks depending on the water schedule. Plant health requires healthy soil. Dumping the latest miracle from chemical engineers will provide a momentary grow spurt, but in the long run accomplish nothing but enrich the boys in white lab coats. Always feed your soil before you feed your plant. Remember that plants live in soil, so soil building is your number one job.

- Mulch reduces soil evaporation so you can water less and less often. Don't let the top of the mulch determine if you need to water. Dig down a few inches to see what going on in the soil. Over watering is common when you begin to use mulch.
- Un-mulched soil surface tend to become hard and reduces the amount of water that can penetrate into the roots. This mean more water runs off the planter and into the gutter.
- Soil temperatures, especially bare soil, can vary widely. By mulching, the plants high and cold temperatures near the top will be ameliorated, thus increasing the size of the root zone
- Weeds are discouraged because there is no sunlight for them to germinate and get sun to survive.
- A soft soil allows rain drops to not pound the soils and this greatly reduces soil erosion.
- Minimizes cultivation. The less disturbance of

beneficial microorganisms the better. Microorganisms secrete a sticky substance that glues the soil into little crumbs, promoting better soil structure.

- Helps feed and increases the beneficial soil life at the surface. Soil microorganisms breakdown the organic mulch and provides slow release of soil nutrients through the decay of organic matter. In the process, growth promoting hormones, antibiotics and certain toxins that don't harm plants are formed. This helps control diseases, root rot, and damping off fungi. A more fertile soil environment is conducive to growth of mycorrhizal fungi, which also increases the root zones of plants. Actively growing mycorrhizal fungi ward off root pathogens and damaging nematodes.
- Saves you time and money by reducing your water, herbicide and fertilizer use and plant replacement.
- Landscapes and beds look tidier and prettier with a mulch cover.
(*The Garden-ville Method, Lessons in Nature*, Malcolm Beck, 1991)

To make the stable more green, we have begun bagging the aged manure / mulch to provide a direct line from horse to garden. It makes little sense for this material to hauled far away, and then hauled back. Not only the hauling is wasteful, but each unnecessary step adds more cost. By bagging our own material, we hope to provide an excellent product as an inexpensive price. Our shavings come in a bag, that is carefully opened the first time, can be reused and resealed, thus getting two uses. If all the bags were reused, we'd save 18,000 bags from being landfilled.

Our hope is that we can collect a nominal fee for the efforts, at this time estimated to be \$2 per bag for the 3 cubic foot bags. Straight wood mulch without the benefits of the manure can sell for as much as \$7.95 for a similar sized bag per bag. For the first few months, we'll be giving away the mulch, only asking that you give us feedback on material, and if satisfied, tell your neighbors and friends (assuming that these are mutually exclusive). You'll also have the option of purchasing in bulk, @\$5 per tractor scoop,

For purchasing in either sizes, please contact one of the guys, or the office.