



The 3,4,5 Leaf Theory for Harvesting Cool Season Grasses by Chad Hale, CGFP

When managing the harvest of cool season grasses (CSG), either for cutting or grazing, our objective should be to harvest the grass in such a way that gives a good balance of yield, quality and longevity for the plant. Without a doubt, these three things are at odds with each other. The highest yield comes from scalping the plants at an advanced maturity, the highest quality comes from harvesting the plants very young when there is very little yield, and the most longevity comes from harvesting the plants about once per year! So, as they say, you can't have it all. In most cases, we want yields that are high enough to meet our forage demand, quality good enough for dairy cows or finishing stock and enough longevity to fit within the whole farm rotation.

So how do we do this in practice? What the plant needs at the time of cutting is adequate sugar reserves in the stem bases for quick regrowth. Each time we harvest a grass, we are cutting off the energy the plant depends on for its energy requirements. This means the plant will be living on reserves until new leaves regrow. Once the plants accumulate a certain amount of leaf material, it should be safe to harvest them again. People have used height, estimated biomass or calendar days to predict when to harvest. On a scientific level, it was observed that for different grass species, their energy reserves were replenished by the time they had grown a certain number of leaves on each tiller. In general perennial ryegrass is the most studied forage grass worldwide and it is fairly well established that a tiller will support three leaves. Once the fourth leaf starts to emerge the oldest (bottom) leaf starts to die.

This idea of counting leaves has been around with perennial ryegrass in other countries for years. It is based on two points. First, a ryegrass tiller will only support three leaves. Once the fourth leaf emerges the oldest leaf is starting to die. Second, only one leaf is growing at any given time on a ryegrass plant. When one leaf is finished growing, another one begins to grow above it. As a manager if you want to harvest ryegrass, you wait until the fourth leaf starts to emerge and that is your signal that the plant is ready to harvest.

While this is interesting and makes managing ryegrass more visual, not many of us are using ryegrass as our base forage. How does this translate to CSGs like orchardgrass and the tall and meadow fescues. These other species haven't been studied as thoroughly, but there seems to be consensus that both tall and meadow fescue will support four leaves per tiller and orchardgrass will support five. Also by the time each of these species have their specified number of leaves present, the energy reserves of the plant are recharged. Yes, the 'gas tank' is full.

While the fescues will support 4 leaves on a tiller, folks in the grazing community often manage these species for 3 leaf harvest. If we are thinking about cutting haylage, we need enough yield to justify running the equipment. Therefore, waiting for 4 fully emerged leaves makes more sense.

What about farmers who cut by the calendar – every 25, 28 or 30 days? That practice is still valid, but in that case evaluating the stand at cutting time might give insights into the status of the stand. For instance, if tall fescue only has 3 leaves every time you cut it, you are probably stressing the plant and longevity of the stand might be shorter than if you lengthened the rotation. While counting leaves per tiller is simple enough, nature is never so cut and dry (especially dirt!). Research has indicated that grasses change the lifespan of each leaf and how quickly they start a new leaf is based on growing



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conditions. So it is possible that a tiller will support more leaves in the fall than in the spring before the plants go reproductive. With experience over several growing seasons, you can learn to use this simple technique to time your forage harvests. It may be that we can get away with harvesting fescues with only three leaves in the spring but we need four leaves in the heat of summer when plants are stressed. If your fertility is spot on, you might be able to push the envelope and harvest more frequently than a neighbor who has marginal fertility.

In summary, the idea here is to use the practice of counting leaves is a visual “gas gauge” for the plants. In ryegrasses, the tank is full with three fully emerged leaves, with tall and meadow fescue, the tank is full with 4 leaves, and with orchardgrass it is full by 5 leaves. Do we have to let the tank get completely full before harvesting the plants? No, but the closer to that ideal we can come, the quicker our regrowth will be and the longer our stands will last. If we continue to run the tank dry, our stands and yields will eventually suffer. Note that you can’t just run out to the field, pick off one tiller and count the leaves. You need to check several tillers at different locations in the field. Tillers are growing and dying all the time. When the average of 10-20 tillers hits the desired number of leaves, it’s time to harvest.