Pasture Feed Budget Maps

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Grass Mapping Enterprises LLC
Carl Fredericks 10246 Gilbertson Road Mt Horeb WI 53572
rehlfred@mhtc.net 608-437-4395

This project proposed to study the use of maps of pasture yields in making grazing and harvesting decisions. The intent was to display data from a grazing wedge as a whole-farm map. However, case studies of five grass-based dairies during the 2011 and 2012 growing seasons suggest that maps of grass yields were not useful on these farms because the managers were not making decisions based on pasture yield measurements and per cow grass intakes.

The project focus was changed to document the logistical factors impacting grazing management and create maps of how many days of grazing were available. Although dry conditions in 2012 reduced the amount of information collected, it also provided opportunity to study how grazing decisions were impacted by drought and heat.

All of the farms had a good intuitive sense of how much grazing they had gotten from specific paddocks in the past and based their management on this. They expressed how much grass was available in terms of grazing days or "events" instead of dry matter per acre.

These farms monitored grass growth, but whole-farm pasture walks were done without measuring grass yields and growth rates were largely seen as dependent on rainfall. Decisions about pasture intake were determined as much by the need to feed silage to avoid spoilage as by the amount of available grass.

Logistics were as important as location in making grazing decisions. Deciding if a paddock was ready to graze had to be balanced with other factors--conditions across the entire farm, weather, supplemental feeding, and on one farm, the demand for milk made from grazed grass for cheese-making--and these factors would change between rotations.

Three of the farms were rather simple systems milking less than 100 cows with one person making grazing decisions. Two of the farms were larger and more complex with respect to factors influencing grazing management and the number of people involved in decision making.

Under typical growing conditions, three of the farms studied fed supplemental forage and grain at rates approaching half to three-quarters of the per-cow daily ration. Two farms fed about 25 percent of daily DMI as grain in the milking parlor. As such, they can be defined as hybrid (grazing and stored feed) operations which are common in Wisconsin.

Their approach to grass management is in contrast to data-driven grazing management (Eastwood and Kenny 2009) that measures pasture cover, calculates demand required by the herd per day, and plans pasture management to meet the demand. In this system pasture walks are

taken weekly, paddocks scored, growth rates calculated and a “wedge” created displaying growth across the farm.

Although this method has been adopted by dairy graziers in places influenced by New Zealand management and investment (parts of Australia, Ireland, the UK, France and Missouri in the US), a minority of New Zealand farmers themselves use regular pasture feed budgeting. Nuthall (2012) cites survey data from the early 1990s showing 72 percent of New Zealand farmers had never used formal feed budgeting. Recent trends suggest even higher percentages don’t budget pastures and are linked with an increase in feeding supplements, primarily corn (maize) silage on New Zealand dairy farms, and less concern with high grass utilization (Phillips, 2012).

Although there appears to be conflict between the intuitive methods used by many farmers to manage grass described by Nuthall and the intensive measurement advocated by Phillips, the farmers studied in the project use both approaches that complement each other.

Farmers use data-driven management where results can be easily seen such as feeding a measured amount of grain to an animal producing a measured amount of milk. The Wisconsin and recent New Zealand experience suggests that reliance on stored feed results in less attention to pasture intake: it is easier to make adjustments at the bunk than in the paddock.

New Zealand pasture feed budgeting was developed on short, uniform ryegrass-based swards in a rather uniform maritime climate. Wisconsin conditions are the opposite: diverse, often clumpy mixed-species swards in an unpredictable and sometimes extreme continental climate.

A common theme when discussing grass management with Wisconsin graziers is that pastures are difficult to measure because they are so diverse and that growth is unpredictable because it depends on rainfall. They assess conditions by what they know from previous experience which is expressed as the number of days or half-days they are usually able to graze in a specific pasture or paddock made with a break wire.

Wisconsin dairy graziers adjust their grazing management by observing twice-daily bulk tank readings which indicate the accuracy of their intuitive decision-making and enables them to quickly use easily available milk yield data instead of difficult to measure pasture yield data.

Farm Visits

Five farms were visited during the 2011 and 2012 growing seasons and information was largely gathered through unstructured interviews during whole-farm walks. The objective was to describe what the farmers were seeing and how they were making grazing decisions.

Farms were selected through referrals and suggestions from grazing educators.

The use of farmer-created maps as a way to describe and better understand how they manage and make decisions has been a key tool in many innovative international agricultural development

projects over the past two decades (Chambers et al 1989; 86-92). This project created maps of grazing days on two farms using the Microsoft Paint program and on-line imagery from Wisconsin DNR Webview and NRCS Web Soil Survey that showed both projected grazing days ahead for a two week period and a monthly and seasonal summary which could be used both as a short-term planning tool and as a look back at what actually happened.

Three of the farms milked fewer than 100 cows and one person made most daily grazing decisions **(smaller farms)**. The size of the farms and the few people involved minimized the amount of information needed for decision-making. One walk was taken and no map-based information compiled on these operations.

Two of the farms milked over 150 cows that were more complex **(larger farms)**. Several people were involved in decision-making and multiple factors (two milking herds on one farm, an on-farm cheese factory on the other) influenced grazing decisions. These farms were visited several times and maps of grazing management created.

Part 1: Smaller Farm Interviews

Farm #1

The first farm visited was on sandy loam soils in Jackson County. There is usually enough rainfall here to grow good grass but growth depends on timely rains especially on the lighter soil.

The main grazing goal is to stagger the growth of grass in spring with an initial "flash" grazing to try and keep ahead of growth to set up for first-cut hay. Paddocks are usually grazed 2-3 times before haying. Haying also controls thistles and burdocks.

Since starting grazing in 1993 they have tended to graze taller, letting the cows select the green understory and making low-quality hay from the headed-out orchardgrass and bluegrass which is sold to nearby Amish for work horses. The regrowth is vegetative and makes good grazing later in the summer. Some parts of the farm have been outwintered and these areas have better growth when it turns dry.

About 55 milk cows are fed before & after milking, approx. 20 lb corn silage/day, 12-15 lb HM corn, 3-4 lb whole bean/distillers mix with the balance of the ration coming from pasture. If it gets really dry they feed more corn silage and baleage. They supplement more in the fall to rest grass in August-October which usually provides grazing until the first week of December.

There are 67 acres of permanent grass surrounding the farmstead. Most of this is bluegrass, orchardgrass, and volunteer white clover with some reed canarygrass in old waterways and on lower ground. There is generally good sward density despite the lighter soils on this farm.

Pasture intake is limited by the amount of supplemental forage fed. The goal is to feed half of the herd's forage from hay which for 45 cows averages three round bales per week. Heifers are grazed separately across road.

There are about 70 acres in contour strips across the road which are grazed late (alfalfa and corn stubble). They usually don't feed baleage late in the season as long as there is enough pasture.

The cows tell how ready the grass is by their milk production and behavior, how much they are eating/leaving, standing, etc. When the grass is dry and brittle the cows don't graze there is only a certain amount they can stockpile; beyond a certain point the cows won't eat it.

Irrigation has been considered on part of the 67 acres because there are some sandy soils with a pond in one corner, but cost is an obstacle. They saw the potential benefits of having water on this ground with some wet years in the early 90s. If there were 3-4 paddocks green with irrigation they could avoid supplementing with baleage in dry spells.

The canary grass is nice in dry weather but needs to be kept low and not get tall.

On August 26, 2011, the goal at this point in late summer was trying to rest grass until freeze-up.

It was getting a little dry but there was lots of grass in paddocks including bluegrass, brome, quack, RCG in wet areas, patches of timothy in wetter areas and scattered tall fescue. White clover was patchy. There was 12-14 inch mature orchard/bluegrass by pond (orchardgrass was never seeded). The plan was to graze this over 2 weeks during this time the cows will eventually eat it. There was scattered red clover from round bales in the outwinter areas.

They still had to graze for milk but were trying to protect grass for late grazing and a quicker start next spring. They started feeding a round bale in the barnyard in mid-August to take pressure off grass.

On this farm, the grazier sees his job as keeping grass green & growing to collect sunlight. When it's hot and dry plants shut down and he can't do this.

Spring management is planned to set up first-cut hay. Late summer grazing management is planned to stockpile fall pasture.

Feeding decisions are made more to plan weeks or months of keeping the herd on grass late into December rather than to plan daily feed intake. Grazing is adjusted in response to cow behavior and production. Grass yields are not measured.

There is little incentive to intensify grass management and production on this farm. Additional pasture during dry spell would be useful but involve costs (irrigation) that would have to be averaged out over several growing seasons, some of which would not require irrigation. Variability in growth is expected on sandy soils with uncertain rainfall which makes feed planning difficult.

Increased forage production could support more animals, but the additional labor and milk are currently not a goal of the farm family. There is room to reduce supplement feeding and increase grass intake but no clear incentive to do so.

Farm #2

The second farm was also in Jackson County and has about 170 grazeable acres on the farm which is a mix of wetter lower ground and drier sandy soils. As much as 70 acres of first-cut hayfields are added to the rotation during the summer. The herd is about 90 Holstein-Swiss crosses weighing approx. 1300 -1350 lbs. There are three groups, milk cows(90), open heifers (17) and breeding heifers & dry cows (40). About a third calve in the fall with two thirds calving in spring. They are mostly Swiss now after starting with Holsteins early in his farming career.

Grazing management is based on grass growth that is assumed to be like it has been in previous years. Some years are difficult, for example 2011's haying decisions were not very good and he made about 30 acres of hay first cut off pastures that were too tall to graze.

This farmer noted that "pastures used to look like a lawn" but that he quit clipping pastures several years ago to protect nesting birds (bobolinks.) Now, he tends to graze taller paddocks. Previously he used to graze about every two weeks. He grazes using leader-follower groups with total occupations lasting up to a week although he tries to limit it to 3-4 days.

He used to occasionally apply nitrogen fertilizer but "didn't see benefit." There is now a lot of white clover in pastures which he attributes to no nitrogen fertilizer. Less corn is currently grown and some dry cow and heifer hay purchased.

Occasional grass walks are taken to monitor growth. A main lane goes through the middle of his pastures which lets him see what's going on.

He is uncertain as to per cow pasture intake. It is easier not to maximize grass intake but rather to feed stored feed and maximize production. He also has to keep feeding open silage/baleage to avoid spoilage.

The growing season influences how much fall grazing is available. There was good fall growth in 2010 and he didn't change the ration until November. The 2011 spring was slow (grazing started May 7) and they weren't on "adequate" grass (about one half of DM intake) until the third week of May. Maximizing income per acre is not the primary focus on this farm at this point and here are cow health and lifestyle benefits to managing this way.

The weather is a huge factor determining grass growth. Supplemental feeding is adjusted to deal with changing conditions.

The decisions about how a paddock will be used depend on location, growing conditions and the height of grass growth but are not made with a goal of achieving a per-cow grass intake. Some decisions depend on how the herd is moving through the rotation and where the following herd of heifers and dry cows should end up.

Fescue affects grass intake in some paddocks and impacts where corn will be planted as part of establishing new pasture seedings. The lay of the land is very important and years of experience dealing with wet and dry paddocks determine how they will be used.

Variability from year to year complicates grazing and haying decisions. It is easier to make feeding adjustments rather than pasture management.

On August 8, 2011 I walked the farm with the farmer and took notes on conditions in each paddock and how he was going to manage them.

5e Growing, 5-7 inches. Mineral intake (sodium bicarb) and acidosis in the herd are indicators of very high pasture quality (too much N).

5d Growing.

5c Brome, bluegrass, quack, lots of white clover, some frost seeded red clover. Doesn't like orchardgrass because it is clumpy unlike the very even growth in this paddock (hayed at first cut).

Night pasture is closer to barn and broken into halves or thirds for 90 cows. Moves sometimes depend on how close the clean-up herd is following.

5b Close to grazing, 10-12 inches. Less clover, wasn't clipped.

5a Close to grazing. Good, 3 weeks rest.

Reed canary, marsh pasture. 2 feedings & 18 inches. Some white clover has volunteered.

3b "Best land on farm." 12 inches ready to graze w/ some areas to 15". Very uniform but not hayed or clipped.

7 Refusal—too much fescue, some thistles. Clipped late July. Low but good land. A nice mix—slowing rotation encourages taller grasses. Fescue is "a battle and expanding." It is his main reason to rotate into corn for a year & renovate. Probably will graze 4 days with milkers and 4 days with drys.

6d Reseeded from corn 5-6 years ago.

6c Dense bluegrass etc—should be hayed. Would consider corn next year. Has bought corn from neighbor who will have less for silage next year so may have to plant more of his own. Last renovation 7-8 years ago was successful in controlling fescue.

6b Will hay. 12 inches dense bluegrass etc.

6a 18-20 inch quack, kura (seeded but sparse) white clover etc. Will graze. Last walked here to look at maybe 2 weeks ago.

1a More tall grass. Will graze. Has hauled manure back here, some potash. Very high in P.

1b Corn.

1c Recovering. Milk cows grazed 3 days, it was easy to divide (he was away for a day or two) and the dry cows were pushing them. RCG residual about 9 inches.

2a Grazed 4 days.

2b New seeding after oats & peas. It was hayed and is weak with little grass. New seedings are variable, some good and others poor, but seem to be better after corn.

3a Corn.

9a Milkers 1 day & night, now heifers/drys.

9b Excellent, now ready 12-14 inches lots of clover.

9c Poorer, "neglected & abused." Rocky, doesn't renovate.

9d Heifer lots.

The cows are currently on rented land across the road which is an old hayfield that the neighbor doesn't want in continuous corn. Some of the stand is thin, some good. Cows are now on 10-12 inches to 18 inches budding alfalfa. He would rather trample residual to return nutrients to the soil than make hay.

It is close to the barn and easy to graze. He would rather frost seed, keep alfalfa & fertilize with manure (winter) to improve. Boron & sulpher, P&K makes big difference in yield but are expensive inputs on rented land.

Farm #3

A third farm in Grant County was visited on May 22, 2012, at which point it was getting dry. About 85 milk cows had been in the "South Hedge" pasture at the north end of the farm the past 6-7 days with a break wire moved daily but no back fence. This area has been grazed very hard with little residual. There are heifers awaiting sale in this area as well that add to the overgrazing.

The next move will be into the "North Hedge" with red clover to 12 inches, meadow fescue to 14 – 16 inches with 20 – 24 inch heads.

Fence moves are based on experience—where they were previous times. The "East Paddock" has been grazed most recently and is resting. Most of the other paddocks are at about the same stage of growth with bluegrass to 8", fescue 12 – 14", and urine patches headed-out to 20 inches.

The "West Field" is nearly ready to hay but will be added to the grazing rotation if it stays dry. Growth has slowed and is not as vigorous as he wants (from a distance most looks weak and pale-green).

With dry weather he will make less first cut hay and increase the rest period. He could feed bales if needed since there is a surplus left from the short winter and early turn-out in April.

Cows are currently getting about 10 lb corn daily in parlor. Normal is 12 – 14 lb but he is feeding less due to high corn price (all grain is purchased). These rates are usually pretty steady over the entire grazing season.

This farmer went for a regular Monday morning ride on his dirt bike through the paddocks to check pastures. The farm is a mile long but has a lane running down the middle of it. He is required to keep track of paddock moves to document rotational grazing for farm program enrollment but this data is historical and not used for management. A pasture map is also required for organic certification but is not actively used in grazing management.

Small Farms Summary

These operations seemed quite capable of keeping track of pasture conditions through rather casual observation, although one farm made a point of doing a weekly paddock check. The size and layout of the farms made them easy to monitor from a central location or lane. One person made most of the grazing decisions involving one herd of milk cows.

The farms were not using maps of grazing paddocks although there were maps prepared by agencies for conservation program purposes and nutrient management planning. These were long-established grass farms comfortable in the way they managed with little incentive to intensify production or management.

Every paddock has a story behind it, often revealed in the name, fertility (or the lack of it) or some specific way it has to be managed to avoid problems in extreme conditions.

Grazing decisions depend primarily on grass height and the need to make surplus growth into hay. Other location factors such as closeness to the barn, shade, and visibility also come into play but these decisions are made in response to short-term needs (being away for a day or two) or changing conditions (hot weather).

When discussing how the graziers are going to use a paddock based on the immediate condition of the grass, long-term strategies including possible renovation, reseeding, fertilization, and late season stockpiling or outwintering come up in the conversation. The merging of the short and

long term goals is adaptive management: having a desired outcome but being able to adjust how you get there depending on changing conditions.

Part 2: Larger Farm Interviews

These farms were not only larger in size but also complexity. More people were involved in both labor and decision-making. Multiple groups of cattle were being grazed.

Farm # 4

This farm is in southern Lafayette County.

Three cow groups are grazed: a 157 cow milking herd, a smaller 30 cow herd managed separately to control staph mastitis, and 45 dry cows and springing heifers. Youngstock are managed separately on another farm. There are spring and fall calving groups.

This farm has been in an expansion mode which has forced adjustments and flexibility in making decisions. They prioritize growing as much of their forage as possible and not buying hay which can reduce the time and labor available for grazing management at busy times of the growing season.

Maintaining feed intake and milk production are a priority and are done by adjusting feeding at the bunk and not so much by regulating grass intake. Several factors complicate grass intake on this farm including leaf blight on orchardgrass, access to shade and water, and the logistics of managing two groups of milk cows. Hay-making decisions have a large impact on grazing management at several points between late May and August.

Although they could use tools like the NRCS web soil survey to compute acreages of paddock sizes to match stock densities with paddock sizes, they prefer to eyeball polywire locations based on past moves. They use 2 groups to clean-up if estimates are off and err on larger than needed paddock size instead of smaller. They can also make adjustments at mid-day silage feeding.

Pasture rotation suffers (less time to plan & manage) when haying which often takes 3-4 days to a week. Since the fall of 2010 with 200 cows they are making more hay instead of clipping paddocks for thistle control. Feed quality has increased since they purchased their own wrapper and can make hay at optimum times instead of relying on custom harvesting.

There is a similar situation with fertilizer—they can apply where they want it without having to spend time explaining fence locations to custom spreaders.

Weather, quality/growth stage, and logistics determine grazing while making hay. It comes down to what's ready to hay vs. what needs grazing.

Hot weather management is also a challenge. Cow behavior disrupts grass management as they don't graze when or as hard as needed. They end up feeding lush immature pasture at night to get intake but at the expense of grass growth.

July 2012 Management

The growing season started very early after warm weather in March. The grass started growing 2-3 weeks ahead of normal which impacted grazing in April and haying in May. All of the challenges of managing during hot and dry weather encountered in 2011 were multiplied during the summer months.

There is no orchardgrass leaf disease so quality and intakes are good and don't impact decisions. Much of first cutting has been made but there are still tall paddocks that need decisions as to haying.

Some high-testing paddocks on lower ground will have to be managed differently due to a nutrient management plan. They are attempting to "mine" P&K by haying rather than grazing.

It was getting dry and growth was slow on some weak paddocks. These would probably be rested instead of hayed or grazed if it stays dry.

A large area of reed canarygrass and kura clover had been hayed and would not be ready for grazing for at least 20 days.

It would be useful to have something other than milk cows to graze residual left behind. They do have a market to sell rank hay to a heifer grower at times.

The early spring has changed "normal" management. Usually there is a gap between orchardgrass and reed canarygrass maturity but not this year. First cut hay and planting are done leading to less workload than usual in late-May.

Conditions were evaluated during a whole-farm walk on July 18 (paddocks are named and not numbered on this farm).

Mailbox. Resting.

Mailbox. Resting.

Mailbox. Just grazed. Waiting on clipping—hot & dry

Mailbox. Red clover & bromegrass, 12 – 14 inches, 9 days rest.

Powerline. Headed-out fescue, 12 – 18", over 50 % headed, 2 weeks rest.

Powerline. Brome, 20 inches, heading, at least 5 days out. Good clover, can be flexible in needing to graze and go to when needed.

2.7 Bromegrass & kura, 14 – 16”, 7 days rest.

Bottom Meadow fescue interseeded with clover/alfalfa this spring, 10 – 12”, 8” smaller clumps.

Trailer. Reed canarygrass, orchardgrass 12 – 14”, headed to 24”, will make hay.

Old orchard. Spotty, have to decide hay or graze. Short areas 8 – 10”, some 12 – 14”, orchardgrass headed at 24”.

7.6. Meadow fescue 12 – 14”, good and quite dense. Clover 8 – 10” 12 days rest since grazed by milkers (grazed by bulls in spots).

10 acre. Orchardgrass, 8 – 10”, weak, grazed 6 days ago.

Reedcanary –Kura.. Hayed, looking good.

Field road. Cows are here now. Quite tall, could have hayed or grazed. Patches of Canada thistle.

Rented.. Reed canarygrass, meadow fescue 18 – 22” and heading, will graze next. Manure water spread after last grazing.

Greg’s hillside. Decided to hay rather than graze.

Rented. Growing.

9. Weak, dry, bluegrass & orchardgrass. Going dormant on thin soil—will rest instead of haying or graze.

10. Better than 9, will wait to see if it rains to determine hay, graze or rest.

Schlim’s. Orchardgrass, 12 – 14” and heading, will make hay. No clover, not good enough feed to graze at this point.

Left of drive. Staph cows are grazing.

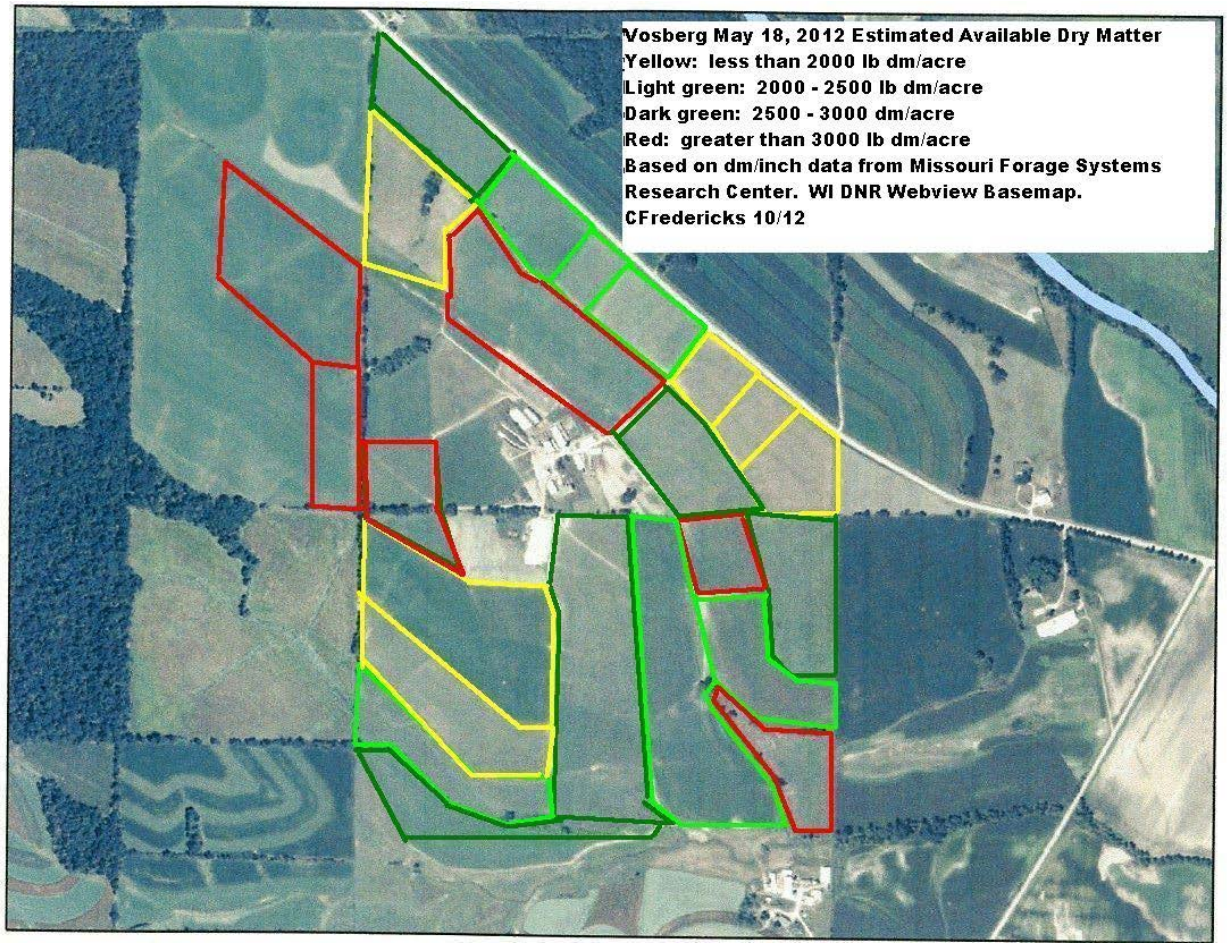
Left of drive. Just grazed, high residual (8-12”).

Left of drive.. Grazed 10 days ago, will graze soon at night.

Above round pen. High P&K paddocks, will make hay instead of graze to draw down nutrients. May fertilize with N to increase yield.

There was more uncertainty than usual about grazing and haying decisions at this point in the year. The early start to the growing season and questions about future growth due to dryness complicated decision-making and made it difficult to map exactly what was going to happen on several paddocks.

A map was created to show estimated dry matter per acre based on height. These results are probably not very accurate as the swards were clumpy and the height measurements were taken in random locations where the growth appeared to be representative. However, they do show paddocks (outlined in red) ready to hay if not grazed soon.



Most decisions will depend on "if it rains." Decisions about specific paddocks also depend on location, day or night (better fence), and how many days ahead of grass are ahead of them. Forage height determines whether to make hay or graze.

At this point they need about 20 days of growth before 1st cut hay paddocks are ready for grazing (normally it is only 10 -14 days this time of year).

Adding up "grazing events" in various paddocks reveals how many grazing days are ahead. The number of days they can graze in a specific paddock are based on previous experience.

To provide grazing for the next 20 days out, the plan was made to hit stuff about to head in the next 5 – 6 days (if it rains) then back off and feed more alfalfa until 1st cut regrowth was ready.

If some of the close paddocks headed out they would have to decide between haying and grazing some paddocks.

As it turned out, after estimating 20 days of grazing ahead on May 18 they actually got 22. Some hay was fed but they never stopped grazing. In early June they were starting to clip and make 2nd cut hay on 30 days rest since the alfalfa was starting to flower and its value for grazing was declining. Rainfall was between 1-2 inches below normal during this mid-May to mid-June period.

August 2012

After 2 inches of rain on August 4 they have been grazing about a week after 3 weeks off pasture. They started by grazing alfalfa that was flowering with slow growing grass and paddocks with thistles and chicory that need clipping, then moved into reed canarygrass paddocks. They started feeding haylage & silage when dry and have to keep feeding so are not able to graze harder but are making 4th cut hay and hope to take a 5th cut in September. 50 lb/acre nitrogen and potassium was be spread ahead of predicted rain and they are currently in good shape with a lot of grass ahead of them.

Reed canarygrass/kura growth prompted the walk to assess conditions. They haven't kept track of pasture growth the past few weeks since they are feeding haylage which lessens the urgency to monitor growth.

Decisions that need to be made on an August 20 walk: what's been grazed and recovering and what needs cutting.

Above pit & silo. Clipped, 8" growing, grazed 10 days ago.

Field road.. Last grazed when hot (shade) 10-12 days rest, 12 – 14"

Field road. Ready, 12 – 16" orchardgrass.

Rented. Hayed a few days ago.

7. Was grazed hard 3 + weeks ago when hot because it is shaded. Bluegrass at 6", orchard to 12".

Big waterway. Recovering, 1 week rest.

Greg's hillside. Hay

9. Hot weather shade, grazed hard, clipped. At least 1 week out.

Schlim's. Haven't clipped thistles because grass was growing fast. Have been prioritizing making good-quality hay over clipping. Choices—clip? Or mow high & get thistle seedheads off? Or graze now with only 10" growth?

Left of drive. Only 5 days rest after clean-up herd grazed (drys/heifers). Will probably bat-wing high now (remove heads & protect growing grass) (same choices as above)

Only 14 cows in staph herd now—bounce around as needed.

Clipping decisions due to thistle growth. Discussion of clump grasses (fescue, orchard) and bare spots/thistles. Some orchard appears weak/dead due to heat/drought stress.

Mailbox. Currently being grazed.

Power line. Wanted to clip last round but growing too fast. Grazed 2 weeks ago? Looks good but lush brome not typical of August, usually stemmy, leaf disease, so not usually a solution to weak, open late summer swards.

Thistles here due to past outwintering which opened sward.

2.7. 12 – 14" dense brome, Kura.

Bottom. Recently clipped, meadow fescue @ 10 – 12", graze in 3 – 5 days.

Trailer. Clipped 8 - 9 days ago, very uniform 8 – 12 " growth.

10 acre.. Clipped after grazing 5 – 7 days ago due to thistles, chicory. Orchardgrass 6 – 9", graze soon because disease starting on leaf tips.

Reedcanary-Kura. Dense, 16 – 20 inches, ready to hay or graze. Hard to make hay decisions in August, usually have to start planning stockpiling but will wait 2 -3 weeks to make decision this year due to grass growth. Usually this time of year RCG is stemmy, kura is short. Now, RCG is leafy and kura 10 – 12" like late spring. (After adding up paddocks they decided to make hay on this).

Machinery paddock. Clipped 1 week ago to 2-3", now 6 – 8".

Regrowth is still coming. Can assume it will slow some but unknown when (with flush of growth after drought). Will play optimistic with grazing since they have an open haylage bunker,

Adding up moves/days of grazing ahead showed the following:

Ready now

Above round pen 2-3

#7 1

2.7 2

10 4 Total 5 days

3 days out

Bottom 3

Trailer 4

Power lines 4 Total 5.5 days

7 -10 days out

9 – 10 2

Left of drive 3

Old orchard 3 Total 4 days

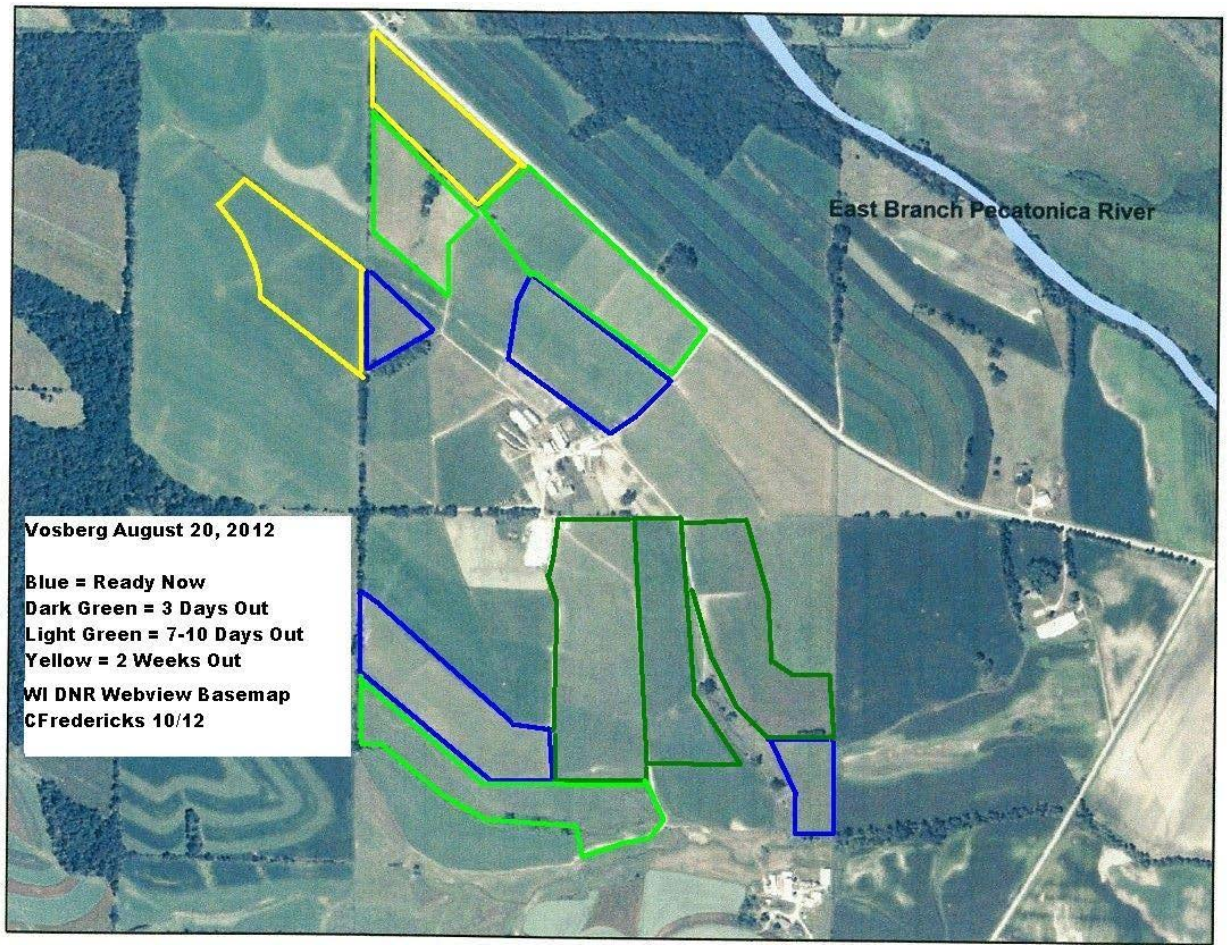
2 weeks out (?)

Georges' hillside 4

Schlmitz 3 Total 5 days

A map was created showing paddocks needing to be grazed or hayed in the next two weeks. This map differs from the June map in that it shows estimated grazing days ahead instead of available dry matter.

The grass had broken dormancy in July at the same time and was growing quite uniformly across the farm although the unusually good growth this time of year complicated decisions about what to hay and when to start stockpiling.



Normally they want to have at least a week of grass ahead of them in late August unless it is hot or there is a lot of leaf disease. A summary of days added up from the walk found 18 days of grass ready in the next 10 -12 days.

There is some headed-out alfalfa on the other farm and they might bring heifers back home to keep up with the growth and rest the other farm.

There will be five hay cuttings this year despite the drought so they should get about same hay yield as normal 4-cut year due to early first cut in May (two weeks ahead). They have to consider feed management decisions now for next year based on drought impacts—will it stay dry, feed shortages, etc. If rains continue they can still graze this fall while non-grazing farms have to feed stored forage.

Farm #5

The fifth farm studied was an operation in Iowa County supplying milk to a farmstead cheese operation that produces a grass-based cheese. The more grazing during the growing season the more grass cheese can be made and the more profitable the enterprise.

Grazing decisions are made by the farm manager who has been on the farm two years. The job is challenging because of his short experience with the farm, meeting the needs of the cheese making side of the operation, and a high stocking rate on rather dry upland soils.

Maps of planned grazing moves on this farm were difficult to create in 2012 due to the steady decline in grass growth from May into June as drought intensified. There was no grazing between June 25 and August 5 due to lack of grass and the herd was fed hay in sacrifice paddocks during this time. Management was a challenge since they were still calving in June due to poor conception during hot weather in the summer of 2011 and had to manage a group of close cows as well as the milking herd in addition to the dry cow herd following behind.

The grazier recorded daily information on where and how many cows were grazing. Maps were created on this farm using these records to display how many days each paddock was grazed every month and proved more useful in describing how paddocks had been grazed instead of showing upcoming growth. This was because growth was sporadic with most taking place in late May-early June and again in late July-early August.

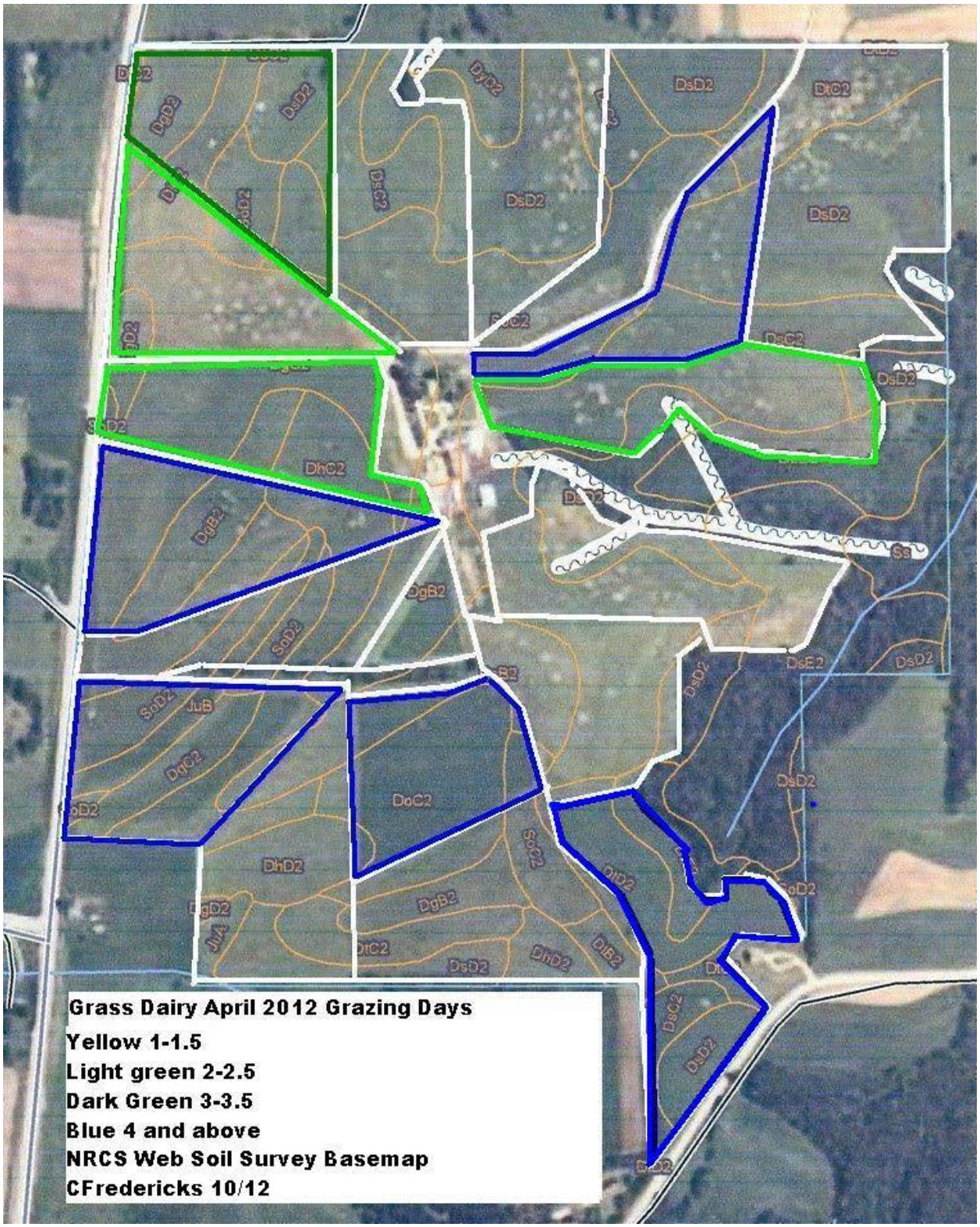
Bluegrass-dominated pastures on this farm were already going dormant on a May 23 farm walk with soil cracks developing in some paddocks and only about 10 days of grass ahead of the herd. However, growth resumed after a good rain a few days later and by June 6 there was an estimated 20 days of grazing ahead. This estimate turned out to be accurate as they were able to graze until June 25 before running out of grass.

The maps created on this farm display number of grazing events per paddock for the months of April, May, June and August 2012, and cumulative events for the four months and are a record of slow growth during the dry, hot summer of 2012.

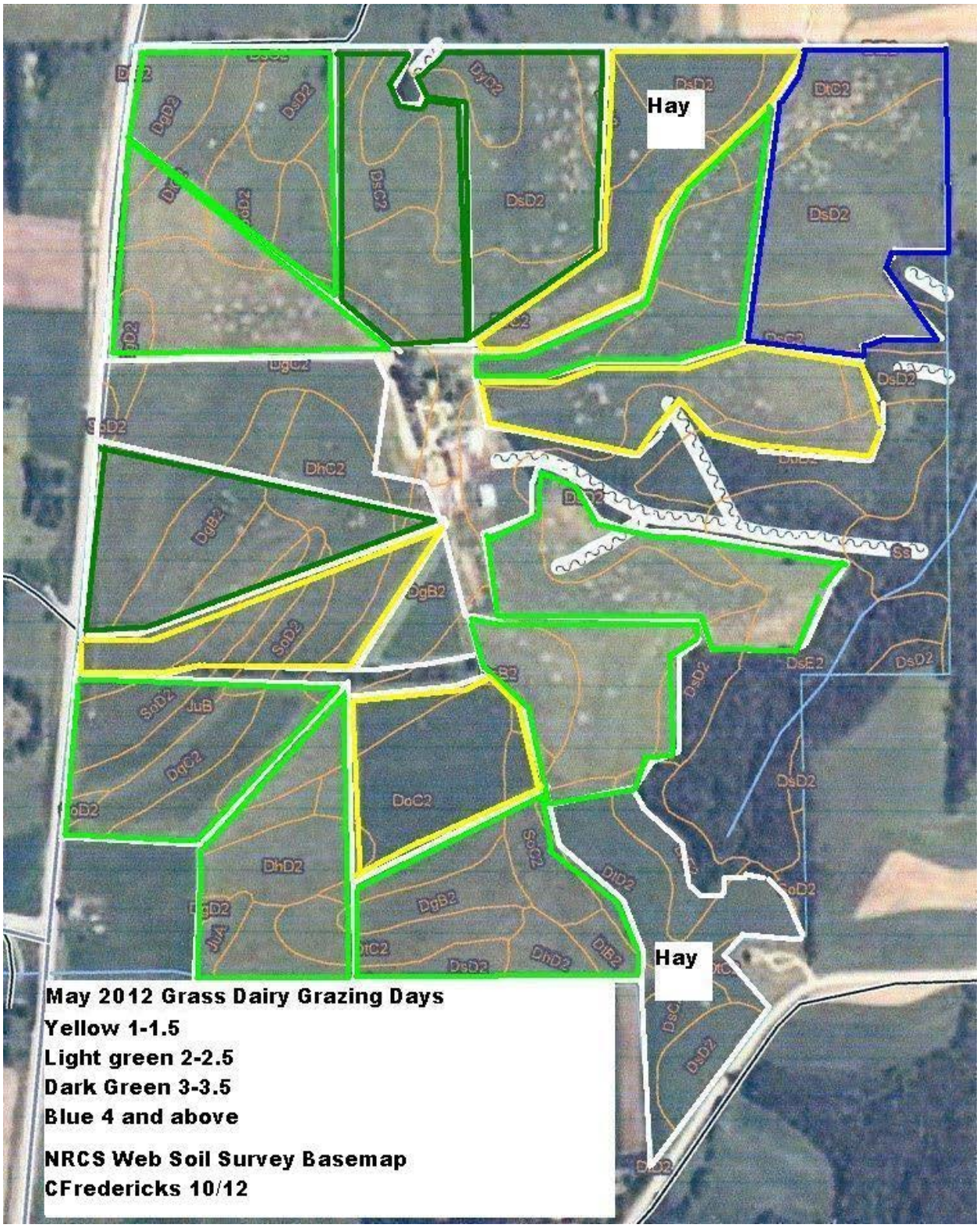
A map of number of grazing days per paddock in June showed only nine of nineteen paddocks were grazed and four of those paddocks accounted for about half of the 26 days of grazing in that month. Grass started growing again after rainfall in mid-July and grazing resumed August 6 and continued into the first week of September.

These maps summarize several pages of daily notes of cow moves for 115 days written in a notebook. The daily notes are adequate to note recovery times which are a key indicator of grazing management on the farm, but displaying the notes in map form allows the manager to look back and identify paddock performance through the growing season at a glance. This grazier found the maps useful since he had only two years of experience on the farm.

The April map shows a fast rotation on paddocks that started growing during unusually warm weather in March.



The May map identifies paddocks set aside for hay and other paddocks coming into the grazing rotation. Growth is already slowing in the weakest paddocks.



The June map shows slowing growth and long rest periods during a month that usually has peak grass growth. Only half of the paddocks were grazed that month.

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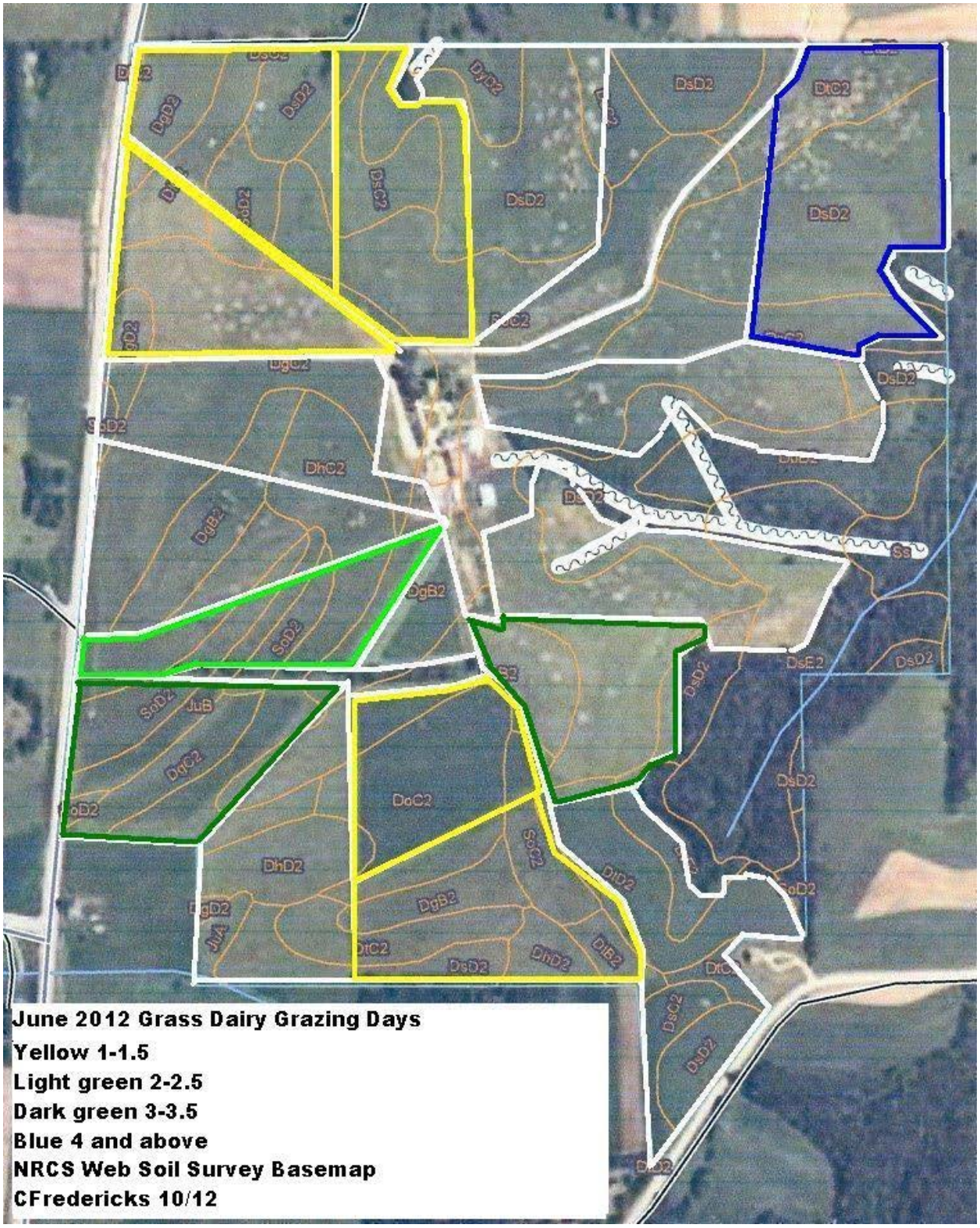
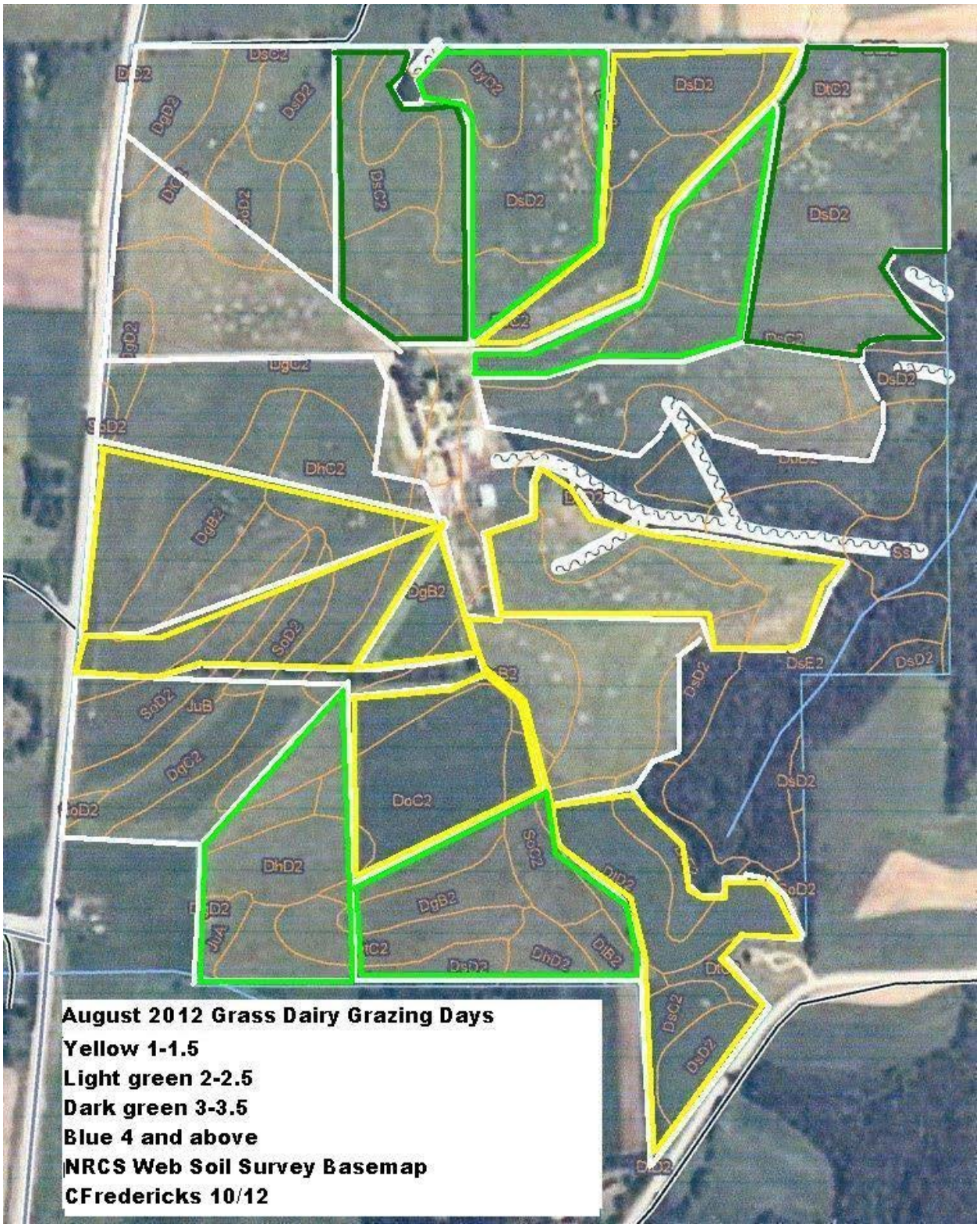
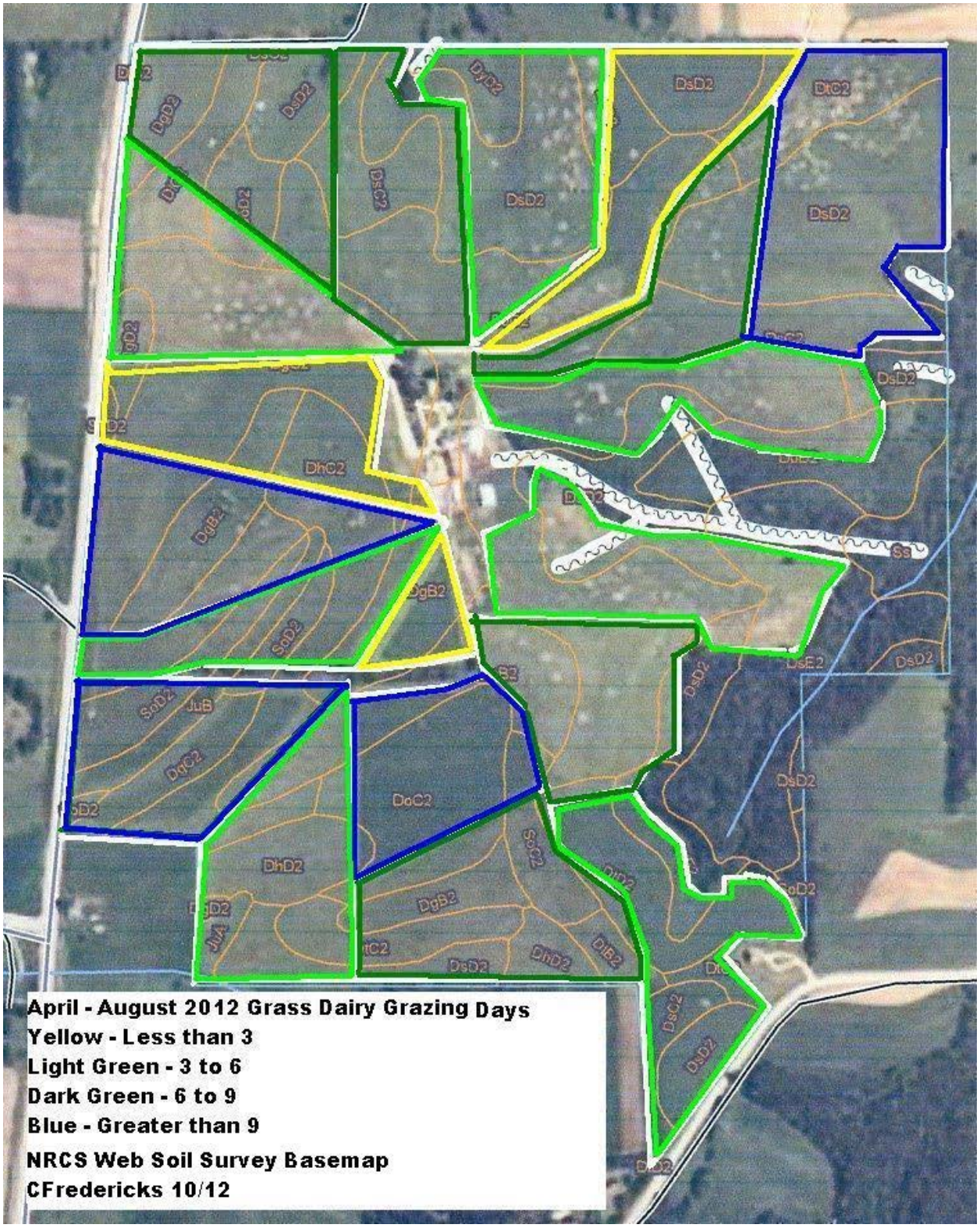


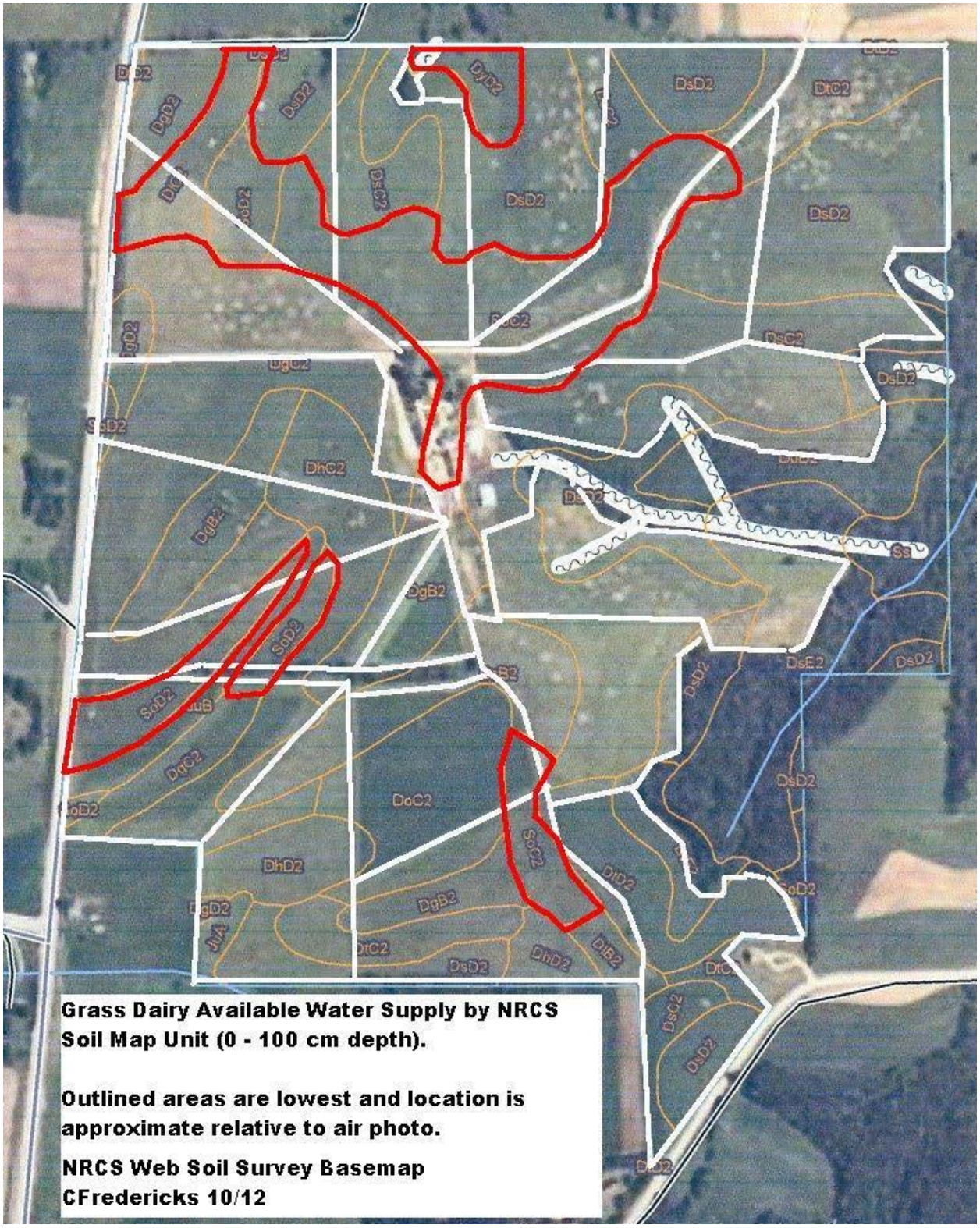
Grazing resumed again in early August but most paddocks had long recovery times and were going back into dormancy late in the month.



This map displays total grazing days during the April-August period. The hardest grazed paddocks are outlined in blue and could be avoided first rotation in 2013 while weaker paddocks could be targeted for reseeding, fertilization and possible outwintering.



A map created using NRCS Web Soil Survey was useful in identifying the driest soils relative to paddock location. Paddock fencelines and dry soil areas were highlighted in Microsoft's Paint program. This map displayed the driest paddocks that need to be managed carefully.



Larger Farms Summary

Size, complexity and the number of people involved separate these operations from the smaller farms interviewed.

The hot, dry summer of 2012 started early in the growing season and grass growth was slowing in May, a month in which it is usually approaching peak growth. There was almost no growth through much of June into July, then explosive growth of leafy, vegetative grass for a few weeks following rain in late July-early August. This made it challenging both to manage pastures as well as document what was happening on the farms.

Maps of grazing days were more useful at the Iowa County farm where they allowed the grazier to better understand soils and growth in specific paddocks since he had only two years experience on the farm. The daily information collected by the farmer (cow numbers, paddocks grazed) was adequate to create maps of grazing days on a monthly and seasonal basis.

On the Lafayette County farm, maps provided information that was already known from previous experience (how many days of grazing were usually in each paddock). In his early years on the farm, this farmer had learned how to plan days of grazing ahead by estimating where he would be in upcoming days, writing this on a calendar, then comparing what actually happened over the time period. Being able to estimate the amount of time paddocks would feed a given number of cows was a skill learned by practice, and adjustments were needed as herd size grew.

On both farms, pasture growth ends up being measured not by forage yields, but in terms of easily computed indicators like number of days of grass cheese being made or daily milk production and sales. Time, measured in hours or days of grazing, is as important a measurement as volume in assessing grass productivity.

Conclusion

The case studies suggest that

-- Graziers were making management decisions based on logistical factors (how things fit together) rather than just location: location itself was not as important as the location relative to other factors. Logistical decision-making is largely intuitive and based on experience gained from previous situations and conditions.

--Pasture management on these farms is focused on paddock location relative to other factors rather than dry matter per acre in a particular paddock. Beyond observing that grass is ready to be cut or grazed, these are not calculated measurements of available forage. However, they are estimates of how many hours of grazing is available in a fenced area.

--Grazing moves are based on what is ready to be grazed over the next few days balanced with longer-term decisions involving the time and labor demands of harvesting, rainfall, and winter feed needs. Hay making decisions are important and impact grazing: five to six months of feed depends on decisions made on just a few days each year. Feeding decisions (and hence grazing decisions) are often based on the need to keep feeding silage (from bags or bunks) to avoid spoilage. Stored feed spoilage is minimized by limiting grazed grass.

--Maps may be useful to less-experienced graziers in helping them with management decisions.

Grass management on these farms is a response to variability: different soils and elevation on the farms, changing grass growth, changing weather, changing cow numbers and stage of lactation, etc. All of the farms had a good intuitive sense of how much grazing they had gotten from specific paddocks in the past and based their management on this. Larger farms had more incentive to monitor pastures more intensively due to their size and complexity.

Both of the large farms were able to accurately predict number of days of grazing ahead for up to three weeks by estimating how many paddocks were ahead of them based on a farm walk. Maps of this information could be used to display both future grazing days as well as provide a historical record of the number of actual grazing days on a monthly or seasonal basis.

The use of intuitive decision-making on these farms mirrors the experience of many dairy farmers in Australia and New Zealand who appear to be ambivalent about using data driven grazing management based on feed budgeting. Eastwood and Kenny (2009) found that case studies on Australian farms "showed that when assessing sources of pasture data farmers looked at the accuracy and timeliness of data, in addition to the fit of data within existing information networks and its impact on uncertainty in planning" and conclude their paper by noting that "dairy farmers look for simplicity, cost, and fit within their established routines and goals." All of these themes were found on the Wisconsin farms in this study as well.

Similarly Nuthall (2012) in a study of New Zealand dairy farms "found the farmers almost totally relied on their experience gathered intuition in making feeding decisions," also matching the Wisconsin experience. (It is not stated if these Australian and New Zealand farmers used calculated feed budgeting early in their careers as a training exercise. This is not uncommon in their educational and extension programming and may have contributed to success in using intuitive grazing management in later years.)

Nuthall suggests improving observational, anticipatory and risk management skills to develop good intuition, and in fact these are the foundations of how the farmers in this study made decisions:

--they observed conditions

--anticipated what would happen based on prior experience

--created alternative strategies in case things didn't work out as planned

The need to be able to make adjustments in grass farming has long been recognized: Andre Voison (1988; 177-180) wrote in 1959 that "Flexibility in management is essential" and that "It is not a case of rigidly obeying figures; one must follow the grass."

Despite recent criticism (Kahneman 2011) of using intuition to make reliably good financial and personal management decisions, the ancient relationship of humans and grazing livestock may be an advantage to graziers. The same instincts in our brains poorly suited to making sound decisions in many aspects of our modern world may be well suited for managing animals and grass if, as current research suggests (Uno et al 2011), human evolution coincided with the evolution of grazing animals on African savannas.

Intuitive decision making provides the flexibility to manage the complexity and variablilty of managing cows and grass. It links known, often quantified information, data, and knowledge with the need to make creative daily adjustments in the face of uncertainty.

The challenge for farmers relying on this approach is that the agricultural world around them is increasingly becoming data-driven for everything from nutrient management planning to lending decisions. Without grass yield and input data, they may find themselves at a competitive disadvantage to producers and other farming systems that are able to leverage subsidies and technology to their advantage.

Attaching a production value to the concept of grazing days could strengthen the position of graziers by providing yield data that can be back-calculated from information collected daily by farmers: cow numbers, milk yields, maps of paddock sizes, days of grazing marked on a map or calendar. Data collected on a large number of farms over several growing seasons is needed to control variability and could validate the intuitive "eye of the grazier" in making sound grazing decisions without measuring pasture yields.

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