Natural Resources Conservation Service Guide to Pasture Condition Scoring



Introduction

Pasture condition scoring (PCS) is a systematic way to assess how well a pasture is being managed and resources protected. A pasture rated with a high score is well-managed with productivity (plant and animal) being sustained or enhanced. By rating the key indicators common to all pastures, pasture condition can be evaluated and the primary reasons for a low condition score can be identified. A low rating typically means the pasture has one or more challenges, such as poor plant growth, weedy species invasion, poor animal performance (low forage quantity and quality), visible soil loss, increased runoff, and impaired water quality in or adjacent to the pasture.

PCS, to be most useful to the pasture manager and planners, should occur several times a year during critical management periods throughout the grazing season. The revised "Pasture Condition Score Sheet" (PCSS) should be used to rate individual pastures. Regardless of the time of year selected to do the PCS, the best time to score a pasture is just before it is grazed.

PCS should be performed—

- As a benchmark condition of the pasture.
- Early in the growing season before grazing events occur.
- At peak forage supply periods.
- At low forage supply periods.
- At plant stress periods such as drought or very wet conditions.
- When conservation practices (management) have been fully applied.

At a minimum for best results, the livestock manager and conservation planners should evaluate the pastures once each year to note changes in the condition of the pasture and completed the same time each year.

PCS results can be useful in deciding when to move livestock or planning other management actions. It assists in identifying which improvements are most likely to improve pasture condition or livestock performance.

The PCS is <u>not</u> a replacement for doing a forage inventory or forage production estimates.

PCS involves the visual evaluation of 10 indicators, listed and described below, which rate the pasture vegetation and soils. Rating subjectivity can be reduced by incorporating quantitative measures. For example, using the steppoint method for evaluation provides measured results for five of the



Step point method can provide data for five indicators.

indicators (percent desirable plants, percent legume, live plant cover, plant diversity, and plant residue). Also, by pacing to measure the livestock concentration areas and using a shovel to quickly evaluate the soil compaction and soil regenerative indicator, the user of the PCS scoresheet and guide can have confidence in each indicator rating and the total score.

In the PCS scoresheet, each indicator or factor has five possible ratings, ranging from lowest (poorest) condition (1) to highest (best) condition (5). This objectively identifies the extent of any

pasture challenges and helps determine the likely causes. Evaluate each indicator separately. The indicators can then be combined into an overall score for the pasture unit or utilized as individual scores and compared with the other nine indicators. Indicators receiving the lowest scores can be targeted for corrective action. The plant vigor indicator is the last indicator rated because previous indicators in the assessment give insight into the plant vigor in the pasture.

Indicator Descriptions

Percent Desirable Plants

These are the key species that provide most of the quality forage ingested by the grazing animal being fed. The percent is done by dry matter weight.



Desirable Plants. — Desirable species are well-adapted to the site, are readily consumed, show persistence, and provide high tonnage and quality for a significant part of the growing season.

The most desirable species may be grazed first and close to the ground in poorly managed systems and therefore, may decline in prevalence. Meanwhile, other less-palatable species that can avoid grazing impacts may increase. These less-desirable species eventually can displace the desirable ones since they are grazed less, if at all. This replacement is important to this indicator and should not be overlooked when the desirability score is low. Some examples of desirable species are orchardgrass, white clover, kentucky bluegrass, and big bluestem. Refer to your State or regional desirable plant list, and ideally, by grazing livestock type (cattle, sheep, goats). Desirable, intermediate, and undesirable species will depend upon region and livestock type. Use your state's lists for scoring this indicator.

Intermediate Species. —These are adapted to the prevailing site conditions;

just as desirable species are. Intermediate species are those which, while eaten, provide low production or lose quality fast, are only eaten by certain species, and often have a shortlived grazing-use period. Intermediates increase as desirable species are selectively grazed out but will be the next set of species to decrease if grazing management doesn't intervene. When adequate forage allotments are presented to livestock, the utilization rate of these species will be less than that of the desirable species. Examples of intermediates are dandelions, wild plantains, barnyard grass, and hop clover.

Undesirable Species. —Those that typically are not eaten (rejected) by most livestock, cause undesirable side effects when eaten, or have little or no forage value. They include some woody invaders, noxious weeds, toxic plants, and plants that crowd out more desirable species. A few forages are undesirable during a specific growth stage when they produce toxins. On severely overstocked sites, such as exercise lots, undesirable species will become the only surviving plants. Examples of undesirable species are nimblewill, wild garlic, horsenettle, and buttercup.

In this indicator assessment, determine the type and amount of plants within the pasture that the livestock will readily graze that are desirable and intermediate. Estimate visually the proportion (percent) of desirable species present in the entire sward by dry matter weight and score accordingly. The technique of estimating dry weight through visual assessment requires training and knowledge of plant

identification. The use of the step-point method is highly recommended for this indicator.

Percent Legume

This indicator measures the average amount (percent) of legume present in a forage stand during the growing season expressed as dry matter weight. The percent legume present at a given time during the growing season can vary considerably, depending upon climate (especially heat), stability, and seasonal growth cycle of the legumes being assessed, the timing and severity of grazing events, and the timing and level of agronomic inputs.

Legumes are important sources of nitrogen for pastures and improve the forage quality of the pasture mix when they comprise at least 20 percent of total air-dry weight of forage. Deeprooted legumes also provide grazing during hot, dry periods in midsummer.



Legumes at 6% by dry weight.

Pastures can sometimes be limited in nitrogen, especially ones lacking enough legumes and low in organic matter. Nitrogen excreted by animals often is not distributed well due to lack of pasture management or the location of water, mineral or shade except in some types of grazing systems such as high-density short-duration grazing. Pastures with few or no legumes will need added nitrogen for increased forage production. Legumes growing along with grasses in pastures have been shown to improve animal intake and performance.

If the proportion of legumes is too high, especially with legumes with bloat potential, forage consumption can cause bloat and thus be detrimental to ruminant livestock health. Legume cells rupture easily after ingestion, causing a high fermentation rate to occur in the rumen. This causes the formation of gas bubbles in a stable foam, which can lead to the rumen distending and causing lung malfunction. When bloating legumes, such as clovers and alfalfa, are greater than 40 percent of total forage dry weight, bloat incidence in ruminants is likely without preventative steps.

To perform this indicator, visually estimate the percentage of legume present in the total forage biomass. When conducting the visual assessment on most introduced cool-season legumes (except Red Clover which has a higher dry weight rank (90%)), the estimate will need to be reduced by approximately 50% of the visual estimate when converting to a dry matter weight (DMW) basis. Most legumes have their leaves in the upper part of the plant with only stems below. Thus, the upper part of the plant appears denser visually when compared to grasses which are denser at the base

of the plants. For rare cases where legume percentages are greater than 40 percent of the stand, but still are less than 40 percent bloat-type legumes, rate as a 5.



Legumes at 15% by dry weight.



Legumes at 27% by dry weight.

Live or Dormant Plant Cover



How good is my solar panel?

The percentage of the soil surface covered by live plants is important for pasture production, and soil and water protection. This indicator rates how well our plant solar panel is working. The higher the leaf area, the higher the photosynthetic activity. A dense stand (high-stem count) of live leaf area ensures, when properly grazed, high animal intake and high sunlight interception for best forage growth. Bare, open spots allow for weed encroachment, increased water runoff during intense rains, soil erosion, and lost production. Attached, standing dead plant material can reduce forage quality, photosynthesis, and new tillering depending on the amount and height.

Live cover assessment can be determined at any time on continuously grazed pastures but is best done closer to optimal grazing heights. On rotational pastures, ideally estimate canopy cover of the paddock the day prior to livestock entry. This will represent the best possible condition. If cover rates fair or lower at this growth stage, management changes are recommended. It can also be used to assess post grazing events to determine if adequate residual is left

or not.

Several things can influence live plant cover, especially time of year, rest period prior to review, forage present, weather conditions, and management. Forages can be easily placed into three different stages. Stage-one plants are short and immature, having high quality but low production. Stage-one plants are good for being a solar panel, but they lack the surface area of stage two, which generally ends right at the early boot stage for grasses. Stage two has the greatest live leaf surface area and normally the best forage quality. The third stage has maturing vegetation of lower quality and dormant vegetation. Although this stage has the greatest volume of forage available, mature and dormant plants are performing less photosynthesis and forage quality is less.

The management factor in live plant cover is very important. Frequency of grazing, length of grazing period, stopgrazing height, stocking rates and density, length of rest period and nutrient management are factors to be managed to achieve the highest production of quality forage for animal growth.

There are times when letting the forage mature more can certainly be a positive move, especially to grow deeper roots and potentially build soil organic matter. Dormant forage and stockpiled forage may not be the best collector of sunlight but shouldn't be discounted except under the 5-point category on the PCS scoresheet if everything else is met.

Forage stands with dead or dying intact material should be rated lower

accordingly, this includes attached standing dead plant material. This material is not collecting sunlight, and it is not desirable for the livestock, although there is some fiber benefit early in the season. Too much standing dead material may cause the forage to be rejected by the grazing animal or lead to other forages being selectively grazed.

Visually estimate percent cover of all species. Assign a value based on live green leaf canopy. If the estimate is inconclusive, or difficult to complete because of the complexity of species or stage of growth, then use the step-point method to estimate or use a camera based, accurate green canopy cover measurement tool.

Plant Diversity

This indicator is done by dry matter weight. Forage production varies throughout the grazing season because of changing weather, growing degree days, management, and insect or disease pressures. Increasing diversity can help moderate negative changes. Having multiple dominant desirable forage species in a pasture offers some "insurance" and it's more likely that there is something that can be productive under a wide range of conditions. Warm season grasses for example, can provide quality forage during hot, dry summer periods for areas where adapted, when most coolseason forage tend to go dormant. Low species diversity makes pastures more vulnerable to stress and to changing conditions.

The plant diversity score describes the number and abundance of well-

represented forage plants and plant functional groups. For the PCS scoresheet rating, desirable forage species must comprise more than 50 percent of the total biomass to score above a one. Any time there are more undesirable than desirable plant species, the score will be one point. Refer to your State or regional desirable plant list and ideally by grazing livestock type (species).

The PCS scoresheet considers a dominant species to be one that makes up at least 15 percent of the pasture biomass by dry weight. Dominant species contribute substantially to the total forage biomass, and having several similar dominant desirable species helps to spread the production and lower the risk.



Warm-season grasses are a functional group that when present in the system can ease summer slump periods.

A functional group includes plant species that have similar management requirements, biological contributions, and attributes. For most of the United States, the four basic functional groups for improved pastures are cool-season grasses, warm-season grasses, legumes, and other grazable

nonleguminous forbs (e.g., brassicas, forage chicory, dandelion). A functional group is counted even if it has no dominant species, if the group collectively makes up at least 15 percent of the pasture biomass.

Plants from different functional groups are most compatible when they can be successfully managed together. Mixed species pastures with at least two functional groups and three or more well-represented forage species are generally the most productive. Higher total diversity within a functional group does not ensure higher productivity and may cause animals to avoid some species and graze others heavily, as species differences in palatability and maturity are more likely. The greatest benefit for the grazing system is often achieved by the addition of another functional group.

Adding legumes to the stand increases protein and energy improving forage quality, boosts production, fixes nitrogen for the grasses in the stand, and are agronomically sound, environmentally friendly, and economically advantageous. The addition of forbs can provide plants with deeper roots that can bring up nutrients from deeper in the soil profile, provide some additional drought tolerance to the pasture, and often provide highly preferred species that livestock desire.

The PCS scoresheet rating for diversity balances the number of dominant desirable species within a functional group and the number of functional groups to provide a score that indicates general forage productivity and manageability.

Plant Residue (and Litter) as Soil Cover

Soil cover is important to slow evaporation, maintain and stabilize ideal soil temperatures, be a carbon and food source for soil life, deter erosion, and to help with water infiltration. Residue is dead plant material in varying states of decay.



Decomposing surface residue is detached plant material that typically creates a light duff layer directly on the soil surface. It is highly subject to microbial activity and is in constant flux. Litter is generally the uppermost layer of residue on the soil surface including freshly fallen or slightly decomposed vegetative material and can include flattened plant material from a recent grazing event that may be still attached. Litter is slightly more stable for a longer period of time depending on the presence and amount of biological activity.

In a well-managed system, there should always be some residue and litter present. Extremely active biological systems, such as an intensely grazed dairy or a beef finishing operation, where vegetation is consistently grazed in the vegetative stage, often lack enough residue and litter most of the season. This can be resolved if needed by increasing the rest period and thus allows more trampling of mature forages onto the soil surface.

Excessively high amounts of residue, especially litter, can interfere and slow down new tiller growth, and tie up nitrogen. These systems often lack enough biological activity. This can be resolved if needed by shortening the rest period, adding more diversity, especially legumes, and increasing stock density.

Grazing events, grazing systems, soil biology and life, weather, and management are constantly changing and often quite fluid. The percentage of ideal cover is not exact but should be in most cases a minimum of 60% with good soil biological activity. The higher the requirements of microbial life, the higher amount of residue and litter is needed to support it.

First assess the amount of bare soil.

Cover is easily assessed during step point by gently moving the above ground plant cover to one side with your hand or foot if needed to see if cover is



Estimate the amount of bare soil. When bare soil is easily seen is rated a 1.

provided between plants and under the canopy. The soil should be covered by either live plants and tillers or residue. Those plants could include lichens or moss in some areas. Visually estimate the percent cover between live plants in the stand; step point is a good quantitative way to do this.

Grazing Utilization and Severity

The proper amount and frequency of grazing are critical in maintaining productive pastures. Close and frequent grazing causes loss of vigor, reduces density of desired species and yield, can promote erosion, and have impact on bite size and intake. Differences in species, plant maturity, stocking rate, location and distance to water, shade, and mineral availability may cause uneven grazing to occur.

Grazing utilization and severity is directly related to uniformity of grazing by livestock, with the exception of continually overgrazing. Though an overgrazed pasture may look uniform, the impact of this severity places such pastures in the lowest rating. Uniform grazing results in almost all desirable and intermediate species being grazed to a targeted residual or "stop-grazing" height or slightly higher. Uniform grazing, without overgrazing, usually only exists when proper grazing management techniques are employed and especially where smaller allocations are made.

Non uniformity is spotty or patterned grazing that appears uneven throughout a pasture, with some plants or parts of paddocks grazed heavily and others grazed lightly or not at all. Individual

forage species are being selected by the livestock based on their palatability, nutritional value, amount of other forages available, and location in the pasture.

Selectivity is also affected by differences in stage of maturity among species, amount of forage offered to livestock, their length of stay in the paddock, and the livestock stocking density. In most instances, livestock will readily select younger plants over more mature ones. Livestock will also usually refuse to graze where manure and urine have recently been deposited. This leads to a continuing cycle of uneven grazing patterns and reduced efficiency.

Zone grazing occurs when one end of the pasture is heavily grazed, and the other end is lightly grazed or ungrazed. It often occurs on pastures with long walking distances from one end to the other, especially when shady areas, windbreaks, hay, creep, or mineral feeding and watering sites are a long distance from some parts of the field. Pastures with abrupt topography changes can also cause zone grazing.

For this indicator, when zone grazing is occurring, along with some uneven grazing throughout, rate it a three. Rate the pasture a four if the pasture is uniformly grazed to target residual heights but there is some zone grazing occurring.

While understocking will lead to more selectivity and the potential for uneven grazing, continual overstocking can result in pastures being uniformly grazed (mowed lawn appearance) but to heights that are too low to maintain all the desirable species. These uniformly

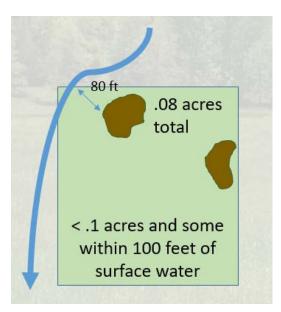
overgrazed pastures should be rated low on the score sheet.

Livestock Concentration Areas

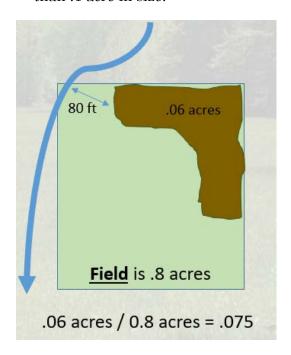
Concentration areas are places in pastures where livestock return frequently and linger near feeding areas, gates, water, mineral or salt, or shade. These areas may have reduced vegetative cover, increased bare ground, and have concentrated animal waste. Livestock trails to and from these preferred areas can create pathways that may increase erosion and become conduits for sediment, nutrients, and pathogens to nearby water bodies.

This indicator addresses the potential impacts on water quality by assessing the <u>size</u> of the disturbed areas and the <u>connectivity</u> to adjacent water bodies through trailing and location. Livestock concentration areas near water sources or with direct conveyance to surface water can create resource concerns. Additionally, these areas on pervious soils over shallow groundwater can also create water quality problems from introduced contaminants when close to adjacent waterbodies.

For estimates and comparisons, one square acre is 208' by 208' and 10 percent of that or 0.1 of an acre is 66' by 66'. When assessing pastures that are less than 1 acre, use 10 percent of grazing unit area as an alternative to 0.1 acres, to determine score.



Example of a 2-point rating. Concentration areas are within 100 feet of water body and less than .1 acre in size.



Example of a 2-point rating where the field is less than 1 acre. It receives a rating of a 2.

Soil Compaction and Soil Regenerative Features

Soil compaction is the diminished pore space between soil aggregates that hold air and water. Compaction reduces a pasture's ability to infiltrate water by minimizing pore space and increasing bulk density of the soils, negatively affecting hydrologic function, nutrient cycling, and the energy flow throughout the pasture ecosystem. Compaction affects the ability of plant roots to access water and nutrients. Increased runoff resulting from soil compaction creates the potential to transport contaminants such as sediment. nutrients, and pathogens to surface water, degrading water quality.



Compaction is one of the most detrimental resource concerns.

Soil regenerative features focus on the condition of plant roots and the abundance of soil life, both of which can improve important soil attributes like structure and organic matter. Soils with roots growing deep and downward have the potential to feed a large and diverse population of soil life. These soil organisms can improve water-holding capacity, nutrient cycling, plant productivity, plant health, and nutrient density.

To evaluate, use a shovel to dig a hole in the pasture, large enough to see the

indicator features.

If a comparison is needed or desired, locate one hole in a protected area, such as a fence line where grazing can occur, but soil is not adversely affected by hoof action, and the other within the pasture away from the protected area and on the same soil type to compare differences in soil features.

Soil features to observe and or to compare in the soil of each hole are—

- Ease of getting the shovel into the soil.
- Soil structure—look for platiness and aggregates in the top 6 inches.
- Rooting depth.
- Root morphology and direction of growth—roots should be growing downward through the soil profile.
- Color—contrasting color changes in the soil with darker soil in the more biotically active upper layer.
- Worms, tunnels, or other biotic presence and activity.



Healthy pasture soils should have good aggregates, vertical roots, and soil life.

When rating this indicator, begin with the primary sub-indicators (compaction layer, then root characteristics) and use these two sub-indicators as the main scoring factors, with the <u>most adverse</u> factor of the two sub-indicators determining the score. Soil color and soil life subindicators are secondary indicators and can be considered where applicable but used primarily for discussion with the manager and planning for improving soil health.

Plant Vigor

In simplest terms, plant vigor refers to the health of a plant. Another interpretation is the plant's robustness in comparison to others of the same species, relative to the size and age of the plant within the environment where it is growing. A loss of plant vigor can cause a loss in desirable species and plant cover. Primary things to consider when rating plant vigor are color and rate of regrowth (recovery) following a grazing event, but also taking into consideration the grazing height of plants, size (density) of plants, and productivity. This indicator is purposely placed as one of the last indicators to score doing this PCS. The scorer can then use the earlier indicator scores information to better score Plant Vigor.

Color is a major indicator of plant vigor. Yellowing plants indicate drought, insect damage, or prolonged heavy usage (continuous grazing). Pale green grass plants can be indicative of low fertility or cool, wet, and poor soils and growing conditions. Fields where nitrogenstarved grasses exist will be obvious and have dark green spots under dung or urine patches with the rest of the pasture area or unit being pale in comparison. Frost-damaged plants will turn yellow or to a blue-gray cast depending on the severity of the cold

damage.

Leaf color can also change due to age. Older, lower leaves of plants turn yellow as they become more shaded and nutrients are translocated from them to the younger leaves higher in the canopy. This type of progressive vigor decline on a single plant is critical to the producer timing the rotation of livestock from one pasture to the next. In general, color is a visual indicator of either mineral deficiencies or. occasionally, of over-fertilization. Overfertilization is not separated out in this indicator but should be annotated in the notes when observed and rated a "1" if an issue. Excess applications of nitrogen can cause some major nitrate toxicity issues. A lush, lodged, very dark green to bluish-green grass is indicative of over-fertilization especially by nitrogen. It can also occur where livestock have concentrated on a pasture such as at a permanent water trough or feed bunk. These spot areas are often ungrazed by livestock due to taste, smell, or post-ingestive feedback caused by low level nitrate poisoning.



Recovery and forage color are good indicators of plant health.

Growth rate is a key trait of plant vigor, which is greatly affected by the management of the plant community. Plant recovery should be evaluated based on average growth rates for the plant community involved at the time of the season being rated. This is easier to evaluate on rotational pastures, because the last time an individual plant was grazed is likely to be known.

Too often, the recovery period for the plants is too short. Ideally, when growth is slow, longer recovery is needed, and when growth is fast, shorter recovery is needed. Recovery is influenced by the time of year, the type of plants, and even manager goals, such as if it is planned to be used for stockpiled forage or not. It is highly influenced by how severely the pasture was used the last time it was grazed. The more severe the grazing (below recommended stopgrazing heights), the longer the recovery required. Most severe grazing occurs when a pasture is overstocked. Pasture plants when continuously grazed have little or no recovery. In contrast are pastures that are rarely grazed below the recommended stop-grazing heights and normally grazing management is initiated at prime plant recovery and intake amounts.

Erosion

Soil erosion involves the detachment, transport, and redistribution of soil particles by forces of water, wind, or gravity. The types of erosion evaluated for pasture condition score are below.

Sheet and Rill. —Soil loss caused by water drop impact, drip splash from water dropping off plant leaves and stems onto bare soil, and a thin sheet of

runoff water flowing across the soil surface. Sheet and rill erosion increases as cover decreases. Evidence of sheet erosion appears as small debris dams of plant residue that build up at obstructions or span between obstructions. Some soil aggregates or worm castings may also be washed into these debris' dams. Rills are small, incised channels in the soil that run parallel to each other downslope. When rills appear, serious soil loss is occurring. This erosion type includes most irrigation-induced erosion.

Streambank, Shoreline. —When in pastures, channels or shorelines can have heightened erosion problems and loss of vegetative cover that typically



There are at least two types of erosion on this field. The lowest rating score which accounts for the worst erosion present should be given.

grows on them. These accelerated damages can result from grazing animal traffic in or on them. Open channels may be intermittent or perennial flowing streams or dry washes. The factors that affect the extent of disturbance livestock cause to streambanks, shorelines, and their associated vegetation are—

• Livestock traffic patterns.

- Frequency, duration, and intensity of use.
- Attractiveness of these channels or banks as sunning, dusting, travel lanes, watering, grazing, or rubbing areas.
- Channel shape and steepness of banks.
- Flow characteristics (frequency, depth, sediment load, velocity, and turbulence).

Only consider erosion caused or influenced by livestock use.

Wind. —The transport and deposition of soil from one location to another, occurring when heavier, windblown soil particles abrade, exposing soil and causing particles to become airborne. Deposition of the heavier soil particles occurs downwind of obstructions, such as fence lines, buildings, and vegetation. Often vegetative debris is windrowed against obstructions and in extreme cases soil will abrade and smother vegetation.

Gullies. —An advanced stage of water erosion, developing in situations where rill erosion has not been addressed. Concentrated, fast-moving water can cause gully expansion through both mass soil caving along sides and head-cutting upslope, creating deep channels in the ground. Both ephemeral and advanced classic gullies should be addressed under this sub indicator.

Circle or mark all erosion types found within the planning unit. Rate the indicator with the score for overall erosion as the lowest scoring point value of the erosion types.

References

National Resources Inventory Grazing Land On-Site Data Collection, Handbook of Instructions, Chapter 13, Dry Weight Rank Method, Page 13-8

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