University of Idaho
Stubble Height Study Report

By:

University of Idaho Stubble Height Review Team

July 2004

University of Idaho Forest, Wildlife and Range Experiment Station

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Submitted to:

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Foreword

Increased emphasis has been placed on the use of stubble height for monitoring livestock use of riparian areas by land management agencies in the past 15 years. In some cases, stubble height has been the only monitoring and management tool for regulating livestock use of riparian areas. The use of stubble height has not been without controversy. Livestock operators in particular have questioned the inclusion of stubble height standards in the terms and conditions of their grazing permits. Many range scientists have been critical of how, when and where stubble standards have been applied and have called on land management agencies to place their monitoring emphasis on long-term trend, rather than annual indicators. Land management agency personnel have also had concerns about the use of stubble height.

In the spring of 2003, K Lynn Bennett, Idaho State Director of the Bureau of Land Management, and Jack Troyer, Intermountain Regional Forester, U.S. Forest, mutually agreed that changes needed to be made in how stubble height was being used. At the urging of Dave Nelson, a rancher and Past-President of the Idaho Cattle Association, they contacted the Department of Rangeland Ecology and Management, University of Idaho and asked for a scientific review of the use of stubble height for monitoring and managing riparian areas in Idaho.

A team of scientists, land management agency specialists and ranchers was formed in the late summer of 2003 to review the use of stubble height and make recommendations on its use to the Bureau of Land Management and U.S. Forest Service. This is the final report of the study team to Mr. Bennett and Mr. Troyer.

The recommendations in this report apply to all riparian areas. However, the study team recognized potential concerns about any changes in the use of stubble height in relation to existing consultations that address both PACFISH/INFISH and the 1998 Biological Opinions for T & E listed species. An addendum is attached to the end of the report titled “Regional Technical Team Response to the Proposed Stubble Height Standards” to address these concerns.

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Introduction

In July 2003 the USDA Forest Service (FS) and the USDI Bureau of Land Management (BLM) entered into an agreement with the College of Natural Resources, University of Idaho (UOI) to study the Agencies' use of stubble height as an indicator of livestock grazing effects within riparian areas and associated fish habitat. All parties have an interest in sustainable management of rangelands and livestock grazing for ecological, social and economic reasons. The study was to respond to the following key questions provided by the BLM and the FS:

1. What Agency objectives are we trying to achieve with stubble height?
2. What is the appropriate use of this measure?
3. How are the Agencies, in fact, using it? Including biological assessments for consultation on Threatened and Endangered species.
4. What are the limitations to its use?
5. How appropriate is it to use this measure to address annual and long-term management strategies?
6. What additional research might be needed, if any, to affirm or refine this measure?
7. What other measures might be used in its place?
8. What other measures might be needed to achieve management objectives in riparian areas?
9. How much rest or change in management is needed when stubble height objectives are not achieved?
10. Can we adjust the stubble height objective if a grazing management system is in place?

The University of Idaho organized a study team in August 2003 consisting of individuals experienced in monitoring, management and/or research on riparian areas in the Pacific Northwest (list of members provided in Appendix A). William H. West and Associates was contracted to set up, facilitate and provide a written record of study team meetings. Three meetings were held in Boise: September 24-25, October 22-23 and December 10-11, 2003.

Study Process: Prior to the first meeting each team member provided the facilitator with their individual answers to the 10 questions. The facilitator summarized these answers and presented the summary at the first meeting. Following a discussion of the answers to the questions, the study team brainstormed summary answers around the question "Why use stubble height?" This resulted in the team identifying five major reasons to use stubble height:

1. As an indicator for livestock management and performance. Performance means the quantity and quality of forage for livestock (well being for the animal).
2. To meet the physiological needs of the herbaceous vegetation and as an indicator of preference for woody species (where there is potential for woody species).
3. As an indicator of bank stabilization and sediment trapping (relates primarily to the greenline).

4. As an indicator of other secondary indirect benefits or conditions.
5. It is quick, cheap, easy and anyone can do it.

The team next developed specific problem statements related to stubble height. The facilitator suggested that the study questions implied there was a problem with the use of stubble height, but there were no specific problems identified in the study charter. He also suggested that the simplest definition of a problem is a gap between a "should be" condition and the actual "as is" condition. Accepting this working definition of a problem, the team eventually developed 13 gap or issue statements in this "should be/as is" format. The facilitator suggested using a root cause analysis to develop solutions to the issues, which were developed in the next two meetings (*see Appendix B: Stubble Height Issue Statements, Root Causes and Possible Solutions).*

Tim Burton and Ron Wiley of the BLM agreed to draft a white paper on stubble height as an indicator of grazing use in riparian areas. Other team members reviewed and provided input into the final version of the paper. The white paper and stubble height issue statements, root causes and possible solutions were then used by the team to develop answers to the ten questions, a process for adaptive management and a monitoring guide that are a part of this final report.

Answers to 10 Questions

1. What agency objectives are we trying to achieve with stubble height?

Bureau of Land Management and U.S. Forest Service resource management objectives for riparian areas include maintaining proper functioning condition of streams and the development of streamside and instream characteristics beneficial to water quality, aquatic species, riparian-dependent wildlife, flood control, aesthetics and sustainable forage production for livestock. Herbivore grazing and browsing may impact stream and streamside conditions directly through mechanical alteration to streambanks and/or indirectly through altering riparian vegetation. Stubble height is an annual monitoring tool to aid in meeting those objectives.

2. What is the appropriate use of stubble height?

In riparian ecosystems, stubble height is appropriate as an annual monitoring tool or indicator for adaptive management. Stubble height has been shown to be related to two areas of concern: 1) the effect of grazing on the physiological health of the individual plant, and 2) the ability of the vegetation to provide streambank protection and to filter out and trap sediment from overbank flows. A summary of the literature (Clary and Leininger 2000) also shows how stubble heights can reflect streambank trampling and shrub (willow) browsing on the greenline. Based on limited research, Clary and Leininger (2000) proposed a 10 cm (4 in) residual stubble height as a "starting point for improved riparian grazing management." However, they acknowledged that, in some instances, 7 cm (2.75 in) may provide adequate riparian protection and that in other instances 15 to 20 cm (6 to 8 in) may be required to limit streambank trampling or to reduce willow browsing. Thus the criteria should vary depending upon local environmental variables and the timing, duration and intensity of livestock use.

The linkages between stubble height and riparian functions have not been extensively researched nor documented through long-term monitoring. Stubble height as an annual indicator of grazing use in riparian areas should only be used where existing science suggests that it is an appropriate indicator and in combination with long-term monitoring of vegetation and channel parameters.

Environmental constraints: The use of stubble height standards should be restricted to "sites near the stream edge, that is, areas that can be described as streamside, or near-stream areas of hydrophilic or potentially hydrophilic vegetation" (Clary and Leininger 2000). At this interface between vegetation and water (the greenline), riparian and stream habitats are most sensitive and dynamic. This is where moist vegetation communities are mostly likely to occur, and where erosive energy of the stream plays a major role. Because hydrophilic vegetation is often rhizomatous, heavy-rooted and tends toward complete continuity of bank cover along the channel margins, it can be very resistant to stream erosion. This resistance lends itself to channel stability and helps to create stream habitat structure and complexity favorable to aquatic organisms. It is here where stubble heights must be measured to reflect the potential effect of grazing on hydrophilic plant vigor and therefore to relate stubble height to channel stability. Because stubble height applies only to herbaceous vegetation, its use applies only where herbaceous vegetation currently controls bank stability. In summary, stubble height can be used as an annual indicator of livestock grazing in riparian areas:

- Of perennial streams or intermittent streams that support hydric vegetation on the greenline.
- Near the stream edge, or along the stream margins, commonly at the bankfull level or first perennial vegetation above the water line.
- Of hydrophilic, or potential hydrophilic vegetation (wet areas adjacent to the stream). NOT in dry vegetation types above the bankful level and at the tops of high cutbanks above the influence of water in the rooting zone of hydrophilic or potential hydrophilic vegetation. Depositional banks are more favorable to potential hydrophilic vegetation; erosional banks whose tops are above the bankful level are not favorable to potential hydrophilic vegetation.
- Where herbaceous vegetation is dominant along the stream edge and controls streambank stability. Stubble height does not apply where woody vegetation and/or rock controls bank stability.

Where these environmental conditions do not occur, direct monitoring of shrub browsing and streambank disturbance will be necessary to assess annual livestock grazing impacts.

Sampling Constraints: Stubble height sampling is quick, simple, and reasonably accurate. It can be used to monitor large areas in less time than is needed with traditional utilization study protocols. In some situations, however accuracy can be adversely affected by stand characteristics. Difficulties with stubble height arise, for example, in irregularly grazed bunchgrasses or stands of inconsistent plant composition with varying palatability. For these reasons, stubble height measurements should focus on key riparian plant species, or species groups, important to bank stability. Stubble height should be recorded and averaged by key species, not averaged across multiple species. Because plants have varying growth height potential, averaging stubble height across multiple, dissimilar species can skew the results in

favor of taller or shorter growing species that predominate in a sample area. Averaging or grouping the data should only be done among species with relatively similar growth forms.

Stubble height measurements should be derived from a population of samples statistically adequate to reflect actual grazing use. The selection of species groups, where appropriate, may reduce the total sampling requirements or may increase precision within a given sample number. The selection of monitoring sites (Designated Monitoring Areas – DMAs) should be based on the endpoint objective being monitored. Trend as well as the appropriate short-term indicators should be measured at DMA's. DMA's should reflect management impacts on all major riparian cover types of the stream/riparian area within the pasture, be representative of overall grazing use within the entire riparian area of the pasture, and occur only where livestock are using the riparian area. It should not reflect an "average" amount of use in all riparian areas of the stream reaches in the pasture. The DMA should not be located where the vegetation community type is not an important contributor to stream function or small localized areas where cattle concentrate (e.g. stream crossings). The DMA should include stream segment(s) critical to important riparian-dependant resources (e.g. spawning and early rearing segments). In summary, stubble height can be used as an annual indicator of livestock grazing in riparian areas where hydrophytic greenline vegetation is the primary streambank stabilizer and where:

- It is applied to individual key species or community types that play an important role in maintaining streambank stability and are utilized by livestock.
- It is statistically applied to individual key species or to groups of species with similar growth characteristics (restricting sampling to an individual species, unless it is dominant, may substantially increase sampling requirements).
- Enough observations are collected to reflect grazing use variability across the extent of the monitoring area. A sequential sampling method, such as described by Turner and Clary (2001) has the advantages of being rapid, avoiding skewness, and providing statistically accurate answers.

3. How are the agencies, in fact, using it? Including in biological assessments for consultation on Threatened and Endangered species?

The agencies are inappropriately using stubble height as a performance standard (grazing permit/license term or condition and/or management standard in Forest and Resource Management Plans). It has also been inappropriately used as a riparian management objective in Forest Plans, Resource Management Plans and allotment plans. In some instances it has been used as the only implementation monitoring tool in biological assessments for consultation on T & E species, and in many cases it is used as a substitute for effectiveness monitoring. Agencies have also used it on inappropriate riparian areas (See Question 2 for examples of where it should or should not be used).

4. What are the limitations of its use?

The linkages between stubble height and riparian functions have not been extensively researched nor documented through long-term monitoring. For this reason, stubble height as

an annual indicator of grazing in riparian areas should only be used where existing science suggests that it is an appropriate indicator and in combination with long-term monitoring of vegetation and channel parameters. (See Question 2 for additional limitations to its use and where it is appropriate to use it).

5. **How appropriate is it to use this measure to address annual and long-term management strategies?**

   If it is measured and used properly, it can be used as a guideline or indicator for evaluating and/or changing annual management in the Annual Operating Instructions/Plan. Stubble height, streambank disturbance, woody stem use, etc. are all short-term indicators of grazing effects on meeting long-term riparian management objectives (i.e. green-line vegetation composition, streambank stability). Each can be used in the appropriate situation as indicators of good management and as a target to achieve in the annual operating plan, with the objective of achieving the long-term riparian management goals. Stubble height is not appropriate to use as a long-term monitoring tool to determine trend. It is also inappropriate to use stubble height numeric values as the sole means to manage toward achieving the long-term objectives.

   The wording in permits/LUP's should be changed to use stubble height as a prompt to investigate and assess the resource condition and implement appropriate changes in annual management. Such changes would be made through adaptive management (*See process for adaptive management).*

6. **What additional research might be needed, if any, to affirm or refine this measure?**

   Clary and Leininger (2000) found limited research has been conducted on the relationship between stubble height and streambank trampling, sediment entrapment and shrub (willow) browsing on the greenline. They suggested research was needed in these areas: *1) The determination of where a stubble height guideline is efficient and effective and where it is not appropriate. 2) Determination of proper stubble heights in high elevation or other sites where species composition and growing conditions result in relatively low statured forage plants. 3) Evaluation of the relative preference for herbaceous vegetation and willows in different seasons, under different combinations of herbaceous and woody species, and at different forage stubble heights. 4) Documentation of the direct impacts of livestock on streambanks of different stream types, parent materials, moisture conditions, and livestock occupancy levels as guided by stubble height. 5) Increased understanding of channel evolution and how recovery processes affect the local flood plain watertable and the greenline vegetation in relation to different grazing intensities and residual stubble heights.*

   We recommend that future research should focus on the effects of grazing intensity, frequency and season of use on the physiological health of individual key riparian species, streambank stability, sediment entrapment and willow use. However, agencies should not wait for the research before making changes in how stubble height is used.

We also recommend research on the linkage of streambank alteration or disturbance to streambank stability and greenline composition. Research on shrub utilization effects on shrub regeneration is also needed. Additional research needs are identified in question 7.

7. What other measures might be used in its place?

Emphasis should be placed on long-term monitoring of trend to determine whether resource management objectives are being met or not. Stubble height should not be replaced with another annual indicator (i.e. streambank disturbance, woody stem use) in place of long-term monitoring. However, stubble height and other annual monitoring indicators can provide useful information for interpreting the cause of unsatisfactory trend and for adaptive management.

We want to emphasize that the problems we have identified with the use of stubble height apply to other short-term indicators that might be used as short-term management guides. Many streambank disturbance limitations have been included in grazing management plans without really knowing how much disturbance a local stream can recover from in one year or two years. Research is needed to determine the amount of time required for streambank recovery (via sediment deposits, vegetation growth, etc.) from different levels of disturbance for sites varying by growing season, substrate, streamflow characteristics, grazing systems and other factors. Such research would provide direct information for development of local grazing strategies. For example, if a stream is grazed in alternate years, then one should know how much bank disturbance can, on average, be healed in two years on that particular site.

8. What other measures might be needed to achieve management objectives in riparian areas?

Long-term monitoring of vegetation composition on the greenline, streambank stability and regeneration of woody species are the true measures of whether riparian management objectives are being met or not. Annual indicators, such as stubble height, are only useful for interpretation of why trend is not satisfactory and for use in adaptive management.

9. How much rest or change in management is needed when stubble height objectives are not met?

The question is, will the reduced residual vegetation height significantly affect the resource condition? The answer will vary depending on how many years the standard was not met, how severe the use was and the type of riparian area being considered. For example, one or two years of not meeting the standard in a riparian system with a cobbled or coarse substrate may well be relatively benign to stream/riparian recovery. However, there may be more reason for concern on a stream with a fine substrate. A pattern of non-compliance (i.e. 3 or more consecutive years) could severely affect the health of individual plants, leading to such effects as reduced root mass, thinning of the desired greenline plant community and/or limiting bank building. Continued non-compliance would indicate that some change in grazing strategy may be necessary. Continued non-compliance would also indicate that the allotment should be placed on a high priority for monitoring long-term trend. If riparian

conditions are not meeting resource objectives, are degraded and static or in downward trend due to livestock grazing, changes in management should be implemented and monitoring of riparian response initiated.

10. Can we adjust the stubble height objective if a grazing management system is in place?

Clary and Leininger (2000) proposed a 10 cm (4 in) residual stubble height as a "starting point for improved riparian grazing management." However, they acknowledged that in some instances, 7 cm (2.75 in) may provide adequate riparian protection and in others 15 to 20 cm (6 to 8 in) may be required to limit streambank trampling or to reduce willow browsing. The criteria could vary depending upon local environmental variables, condition and trend of the stream, species composition on the greenline and the season, frequency and duration of livestock use. Thus, stubble height criteria not only can but should be adjusted through adaptive management, based on riparian conditions and trend *(see Process for Adaptive Management).*

Linkages between stubble height and riparian functions have not been extensively researched nor documented through long-term monitoring. Research that identifies appropriate stubble height indicator values that should be associated with specific seasons of use, grazing strategies, etc. is also lacking. Caution should be used in setting stubble height indicator values until information is collected that relates the indicator value used to responses in riparian and aquatic variables (long-term trends) on the sites being monitored.

Process for Adaptive Management

Though stubble height is easy to use, it is not a resource objective and therefore inappropriate as a performance standard (see Clary and Leininger 2000, and the IIT Monitoring Module Manual 2003). Thus stubble height should not be used as a term and condition in the Grazing Permit or Standard in the Land Use Plan (LUP). It should be used as a guideline or indicator for changing annual management in the Annual Operating Instructions/Plan. The term and condition or standard should be based on trending towards or achieving riparian resource objectives. Stubble height, streambank disturbance, woody stem use, etc. are all short-term indicators of grazing effects on meeting long-term riparian management objectives (e.g. green-line vegetation composition, streambank stability). Each can be used in the appropriate situation, as indicators of good management, and as a target to achieve in the annual operating plan, with the objective of achieving the long-term riparian management goals. It is also inappropriate to use stubble height numeric values as the sole means to manage toward achieving the long-term resource objectives.

Field units should change the wording in the permits/LUPs to use stubble height as a prompt to investigate and assess the resource condition and to indicate the need to make appropriate changes in annual management. If stubble height indicates that grazing management is not achieving the desired resource values, then identify appropriate and timely action to correct the root cause. This should be accomplished through adaptive management, as described below.

Adaptive management is an interdisciplinary planning and implementation process that identifies desired riparian conditions, defines criteria for modifying grazing operations when progress towards achieving the desired conditions is not being made, and specifically defines the monitoring strategy and protocols. Monitoring can determine whether the project-level decision is being implemented as planned (implementation monitoring) and, if so, whether the objectives are being achieved in a timely manner (effectiveness monitoring). The process invites participation from rangeland users and other interested parties where feasible. The process involves several steps:

I. Define the resource objectives (riparian management objectives).
II. Develop a grazing plan to accomplish the objectives
III. Identify trigger and endpoint indicators, and the numeric criteria for these monitoring indicators used to assess success.
IV. Implement the grazing plan and monitor the indicators
V. Annually evaluate success of the grazing plan and adjust as needed

I. Resource objectives for the riparian/aquatic communities are defined at the pasture scale. Since livestock grazing primarily influences greenline ecological status, bank stability, and woody species regeneration, the objectives often focus on these three resource characteristics. Objectives for greenline ecological status and bank stability are normally quantitative, and objectives for woody species regeneration qualitative.

II. The grazing plan should be designed to accomplish achievement of the resource objectives within a reasonable period of time. The plan should be at the pasture and allotment scale and identify timing, intensity, and duration of use expected to achieve the desired objectives. Care must be taken to insure that the plan meets both riparian and upland objectives. The permittees should be a full partner in developing the grazing plan.

III. Monitoring indicators are used to gauge success of the grazing plan. *Trigger indicators* are an opportunity and responsibility of the permittees to make ongoing changes throughout the season to ensure that *endpoint indicators* (described below) are met. They define when livestock should be moved and as such are *within-season* tools, i.e., "Is it time to either ride harder to keep cows in the uplands away from the creek or move them to another area of the pasture or even completely remove them from the pasture?" They are used by permittees as indicators of allowable use in a given riparian area, and are designed to limit livestock effects to riparian vegetation and stream channels to acceptable levels. Hall and Bryant (1995) provide an excellent example of how a permittee can use stubble height as a warning of when to move livestock. Site variability ensures that a single trigger will not be appropriate in all situations.

Selection of trigger indicators is based on which one(s), will be most appropriate for a particular pasture. An Interdisciplinary Team might select three triggers to start with, and as they gain experience find that only one or two are needed. When any one of the selected triggers is reached first, the permittee should take appropriate action to meet endpoint indicators.

Endpoint indicators are the responsibility of agencies, as a means to assess resource impacts of current year's grazing. However, the permittees and, in the case of concern about listed species,

the consulting agencies need to be involved in the annual grazing assessment. The appropriate time to measure and evaluate endpoint indicators is typically after the end of the growing and grazing season for the current year, but before the next high flow event that may reach or exceed bankfull. This assessment must also be based on observations and discussions among the permittees, the action agency, and the consulting agencies. This process might involve the Level 1 Team with the permittees and action agency manager in an annual meeting and/or field review. The purpose of the assessment is to determine if the actual grazing use in the current year's grazing season left the stream and associated riparian area in a condition which is likely to result in a desired trend towards meeting management objectives. As such, endpoint indicators are *end-of-season* tools. Most appropriate endpoint indicators for stream/riparian areas center on vegetation (herbaceous and/or woody riparian species) for protection and building of streambanks, and mechanical damage that leaves streambanks vulnerable to increased energies experienced during high flows. They should include the indicators described in Appendix C (Monitoring Guidelines).

It is a relatively common practice to factor in expected re-growth when setting within-season triggers for vegetation, particularly herbaceous stubble height. In these cases, end-of-season monitoring is of critical importance to evaluate the appropriateness of the trigger. All too often expected re-growth does not materialize, either due to lower than expected precipitation or overly optimistic estimates of the actual length of the growing season. The critical point for discussing triggers is at the end of the growing season when the results are apparent. Without end-of-season monitoring, there is no timely way to verify that the established trigger is leaving the stream and associated riparian area in a condition that can be expected to result in an upward trend towards management objectives (i.e., aquatic habitat quality). While other monitoring such as greenline (protocol), channel morphology, etc., are useful in establishing trend over the mid- to long-term (at least 3–5 years and in many instances longer), endpoint indicators help with the interpretation of whether the current year's management was appropriate. This is particularly important where federally listed or sensitive aquatic species are involved.

When using both within-season triggers and endpoint indicators, allowable numeric values should be established. The monitoring strategy must not only measure and evaluate whether or not the allowable numeric value is met, but also whether the value is correct. Due to site-specific differences across the landscape, the determination of allowable numeric values must rely to a large part on professional judgment. Current research can give the manager a starting point but may not be precise enough to apply in a "cookbook fashion." The interdisciplinary team must begin with current applicable research then factor in site-specific characteristics to arrive at an allowable numeric value that is reasonable. This reinforces the value of adaptive management. At each stage of the monitoring cycle (i.e., within-season trigger, endpoint indicator, etc.) evaluations must consider whether triggers, endpoint indicators, and associated allowable numeric values are useful in making management adjustments to meet riparian objectives. The manager must continuously refine triggers, endpoint indicators, and management to achieve desired results.

IV. Implementing the grazing plan and monitoring: The monitoring guidelines and agency/ permittee responsibilities described below and in Table 1 are recommended. Stubble height is an

indicator of livestock use and potential impact, not a riparian management objective. Proper livestock management in riparian areas requires assessing livestock use and riparian response (i.e., trend). Thus monitoring should be used to evaluate intensity, duration, and timing of livestock use within the pasture to insure it is not adversely impacting the riparian-dependant resource values. In practice, monitoring evaluates whether the grazing plan meets short-term goals for vegetation use and bank disturbance (triggers and end point indicators), and whether these goals are meeting long-term riparian management objectives.

Permittee responsibilities: Permittees should take the initative in watching for, evaluating, and acting on within-season triggers. Permittees should use triggers as an early warning system for assessing the need to move livestock to another pasture or reduce use in the riparian area by herding, etc., as described by Hall and Bryant (1995). Permittees should also take an active part in the discussion and selection of DMAs and endpoint indicators and be encouraged to participate in monitoring endpoint indicators. Having the permittees as integral participants in the implementation monitoring and evaluation is advantageous to both the permittees and the agencies, as it will lead to better and more acceptable management decisions.

Agency responsibilities: Endpoint indicator monitoring and DMA selection are the overall responsibility of the action agency, however permittees and other stakeholders should be encouraged to participate. It is important that the agency use the endpoint indicator results to determine if the conditions for recovery are being met by current standards or if the standards are appropriate. Both triggers and endpoint indicators are important and must be completed.

Consulting agency responsibilities: Where appropriate, consulting agencies have the responsibility to participate in discussions on DMA selection, and endpoint indicator assessments. They may also participate in endpoint indicator monitoring.

Process for selecting indicators: When choosing triggers and endpoint indicators, consider the following elements:

1. Residual vegetation height on pre-selected key riparian-wetland species on the greenline (not the average height on all herbaceous species).
2. Riparian woody browse incidence of use on key species (trees and shrubs).
3. Streambank alteration as a result of livestock grazing (bank trampling).

A critical point must be made here. It is **inappropriate** to use endpoint indicators and their associated numeric values as the sole means to determine whether a particular grazing system is contributing to stream/riparian recovery or conversely, contributing to degradation.

- Precision of data sampling must also be taken into account. For example, samples that do not have the sensitivity to detect means within ½ inch, may not be able to differentiate between 3½ and 4 inches of stubble height. Assuming the difference between observed measurements is clearly real rather than an artifact of sampling imprecision, and that the standard is actually correct, one must then evaluate whether or not the difference does in fact translate into unacceptable impacts to the resource in question. For example, when evaluating the effect of a reduced residual vegetation height, the purpose behind using residual vegetation height must first be examined.

- Interpretation of long-term monitoring data (resource condition), including that focusing on other parameters such as greenline vegetation and bank stability, is needed before a reasonably accurate determination of the true impacts of the activity can be made.

Therefore, the question is really “will the reduced residual vegetation height significantly affect the resource condition?" The answer to this question is further complicated by the fact that it will likely vary depending on how many years the standard is not met, e.g., one year of not meeting the standard may well be relatively benign to stream/riparian recovery. However, a pattern of non-compliance (i.e. 3 or 4 consecutive years of not meeting the numeric value) could very well severely affect the health of individual plants leading to such effects as reduced root mass, thinning of the plant community and/or limit bank building. These effects must be addressed by the grazing strategy. This takes field time and communication between the members of the Interdisciplinary Team, the Line Officer, and permittees.

Other environmental factors must also be considered before making the assumption that livestock grazing is having an adverse effect on resource condition. Weather conditions, such as drought, 35 or 50 year flood events, ice damage to streambanks, etc. can adversely affect stream and streambank conditions. Heavy use by elk, moose and deer can have the same effect as heavy use by livestock. Insects, such as crickets, grasshoppers and stem/root borers can affect the vigor of plants.

The monitoring guide in Appendix C was developed to describe monitoring indicators and sample frequencies that apply to trigger, endpoint, and riparian objective monitoring .

V. Annually evaluate success of the grazing plan with the permittees: The interdisciplinary team assesses compliance with the management criteria. In cases where the criteria are not met, including the end of-season use criteria, the ID Team should make recommendations for whether changes to the grazing plan are needed and if so, what changes should be made. The ID Team will use input from the Level 1 Team where ESA is relevant to the non-compliance. The line manager and range conservationist then meets with the permittees to discuss any necessary adjustments to the annual grazing plan. Where the grazing operation is not in compliance with any portion of the permit, the manager consults with the ID Team (and Level 1 Team where ESA consultation measures are not met), and determines whether a letter of non-compliance or permit action is warranted. However, it should again be noted that the real question is will the reduced residual vegetation height significantly affect the resource condition.

Table 1. The Adaptive Management Process showing agency and permittee responsibility and participation.

ACTION	TIMING & FREQUENCY	RESPONSIBILITY	PARTICIPANTS
I. Set Riparian Objectives	During planning phase	Action Agency	Permittees and Consulting Agencies
II. Develop the Grazing Plan	During planning phase	Action Agency	Permittees and Consulting Agencies
IIIa. Selection of trigger indicators	Planning and potentially after annual management evaluations	Permittees and Action Agency	Consulting agencies
IIIb. Selection of endpoint indicators	Planning phase, or potentially after periodic evaluations	Action agency	Permittees and Consulting Agencies
IIIc. Selection of Long-Term Monitoring Indicators to assess meeting riparian objectives	Planning phase, or after riparian objective evaluations	Action agency	Permittees and Consulting Agencies
IIId. Selection of the DMA(s)	First field season and after periodic evaluations	Action Agency	Permittees and Consulting Agencies
IVa. Monitor trigger indicators	Field season annually	Permittees	Action Agency
IVb. Monitor endpoint indicators	Field season annually at end of growing season or grazing season, whichever comes last	Action Agency	Permittees and Consulting Agencies
Va. Evaluate endpoint indicators	Annually after endpoint indicator monitoring and before next bankful event	Action Agency and Permittees	Permittees and Consulting Agencies
Vb. Determine and implement management changes	Annually after endpoint indicator monitoring and before next bankful event	Action Agency and Permittees	Consulting Agencies
IVc. Monitoring Long Term indicators -riparian objectives	Once every 3 to 5 years	Action Agency	Permittees and Consulting Agencies
Vc. Evaluate Long Term indicators - riparian objectives	After riparian objectives monitoring	Action Agency	Permittees and Consulting Agencies
Vd. Determine and implement management changes resulting from riparian objectives assessment.	After riparian objectives monitoring	Action Agency	Permittees)and Consulting Agencies

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APPENDICES

Appendix A: University of Idaho Stubble Height Study Team

Appendix B. Stubble Height Issue Statements, Root Causes and Possible Solutions

Appendix C: Monitoring Guide

I. "C" channel type, herbaceous vegetation dominant, potential vegetation: herbaceous or mixed herbaceous and shrubs

II. "C" channel type, herbaceous vegetation dominant, potential vegetation: mixed herbaceous and shrubs

III. "C" channel type, woody dominant, potential vegetation: shrubs and trees

IV. "E" channel type, herbaceous vegetation dominant, potential vegetation: herbaceous or mixed herbaceous and shrubs

V. "F" channel type (entrenched floodplain), herbaceous vegetation dominant, potential vegetation: herbaceous or mixed herbaceous and shrubs

VI. "G" channel type (entrenched-no floodplain), herbaceous vegetation or bare banks dominant, potential vegetation: herbaceous

VII. "B" channel type, mixed shrubs-herbaceous vegetation dominant, potential vegetation: mixed herbaceous and shrubs, or shrubs

VIII. "B" channel type, woody dominant, potential vegetation: shrubs and trees

IX. "A" channel, mixed shrubs and herbaceous, or shrubs dominant, potential vegetation: mixed shrubs and herbaceous, or shrubs. Substrate large

Appendix D: Channel type descriptions

Appendix E: Glossary

Appendix A. University of Idaho Stubble Height Study Team

Name	Title	Representing
Larry Bryant, PhD.	Rangeland Ecologist	U.S. Forest Service Washington, D.C.
Wayne Burkhardt, PhD.	Range Consultant Affiliate Professor Professor Emeritus	Ranges West University of Idaho University of Nevada
Tim Burton	Fisheries Biologist	Bureau of Land Management
Warren Clary, PhD.	Retired Range Scientist Rangeland Consultant	U.S. Forest Service
Rick Henderson	Fisheries Biologist	U.S. Forest Service
Dave Nelson	Rancher	Livestock Permittees
Warren Ririe	Rangeland Management Specialist	U.S. Forest Service
Ken Sanders, PhD.	Professor of Rangeland Ecology & Management	University of Idaho
Ron Wiley	Leader, National Riparian Team	Bureau of Land Management
*Jonathon Foster	Chief, Resources & Science	Bureau of Land Management Idaho State Office
**John Palmer	Director of Vegetation Management	U.S. Forest Service Region IV

The consulting agencies, NOAA Fisheries and U.S. Fish & Wildlife Services, have reviewed and provided comments on this report. Their comments have been incorporated into the report.

*Bureau of Land Management Liaison to Team
**U.S. Forest Service Liaison to Team

Appendix B. Stubble Height Issue Statements, Root Causes and Possible Solutions

This section includes the issues, causes for the issue and possible solutions for each cause developed by the Study Team. The issues are in the order of priority as determined by the team. Causes and solutions were not developed for issues 10, 11 and 13.

1. **The issue is**: The stubble height measure is appropriate as an annual indicator for adaptive management and the reality is it is being inappropriately used as a performance standard (permit term or condition).

   A cause is: Agencies need performance indicators to effectively manage the allotment and stubble height is easy to use.

   The solutions are:

   a. Though stubble height is easy to use, it is not a resource objective and therefore inappropriate as a performance standard (see Clary and Leininger 2000, and the IIT Monitoring Module Manual 2003). Thus stubble height should not be used as a term and condition in the Grazing Permit or Standard in the Land Use Plan. It should be used as a guideline or indicator for changing annual management in the Annual Operating Instructions/Plan. The term and condition or standard should be based on trending towards or achieving riparian resource objectives. Stubble height, streambank disturbance, woody stem use, etc. are all short-term indicators of grazing effects on meeting long-term riparian management objectives - (e.g. green-line vegetation composition, streambank stability). Each can be used in the appropriate situation, as indicators of good management, and as a target to achieve in the annual operating plan, with the objective of achieving the long-term riparian management goals. It is also inappropriate to use stubble height numeric values as the sole means to manage toward achieving the long-term resource objectives.
   b. Change the wording in the permits/LUPs to use stubble height as a prompt to investigate and assess the resource condition and implement appropriate changes in annual management. If stubble height indicates that grazing management is not achieving the desired resource values, then identify appropriate and timely action to correct the root cause. This would be accomplished through adaptive management.
   c. Stubble height should be used by the livestock manager as an early warning indicator.

2. **The issue is**: Multiple tools should be used as indicators of short/long-term resource management and the reality is stubble height is being used as the only tool.

   A cause is: No outside demand for research on other methods to drive a demand in the agencies.

   The solutions are:

a. Develop organization or organized activity to build this support (including Governors, congressional delegation, user and conservation groups).
b. Agencies should reemphasize and reestablish their mission and gain support of the agency people for that mission.
c. Develop other tools to serve as Quality Assurance or Quality Control on the use of stubble height.
d. Implement the other long-term tools that we already have available.

A cause is: Stubble height is cheap and easy to use.

The solutions are:

a. Agencies should recognize the limitations and use it the way it was intended to be used and in the proper way.
b. Need to develop comparable tools that are as easy to use.
c. Need to develop comparable tools that are just as inexpensive.

A cause is: Having to know something right now in order to satisfy the Biological Opinion.

The solution is:

a. Use Adaptive Management process.

3. **The issue is**: In certain situations, (1) in steep gradient streams, 2) where bank stability is controlled by rock and wood, 3) deeply incised channels without floodplains, and 4) closed canopy overstory, other indicators should be used and the reality is that stubble height is being applied in these riparian areas.

A cause is: People incorrectly believe that stubble height was dictated by the PACFISH and INFISH decisions.

The solutions are:

a. Issue a directive to clarify where stubble height should and shouldn't be used.
b. Technology transfer (training) of the information.
c. Accountability for implementation of the directive via monitoring audits.

A cause is: The first consultations were applied as a template for all other situations.

The solutions are:

a. Revisit the documents (e.g. forest plans, RMPs, allotment management plans) by consulting on the application of appropriate indicators for the riparian situation.
b. Use a programmatic approach to apply the appropriate short-term indicator(s), which may include stubble-height, and to amend existing documents where stubble height has been applied inappropriately or used as the only tool.
c. Technology transfer (training) of the information.
d. Accountability for implementation of the directive via monitoring audits.

A cause is: People are not always aware of the limitations of stubble height.

The solutions are:

a. Issue a directive where stubble height should and shouldn't be used.
b. Technology transfer (training) of the information with special emphasis on managers.
c. Accountability for implementation of the directive via monitoring audits.

4. **The issue is**: The management resource objective(s) should be clearly defined and the stubble height tool applied to that objective(s) and the reality is the tool is used without a clearly defined resource objective(s).

A cause is: Short-term production performance evaluations by and of the line officer are being used instead of performance evaluations based on long-term resource oriented evaluations.

The solutions are:

a. Institutionalize a change in the management evaluation process, for line manager down to the field staff, from action based to the resource-oriented measures.
b. Identify short-term resource objectives that can be used to evaluate managers or field people and can be measured within the tenure of the people at an office.
c. Develop ecological performance measures for all line officers.

A cause is: There is no accountability of and by line officers for long-term resource oriented outcomes.

The solutions are: See previous cause.

A cause is: Political and legal pressure to set objectives in a very short term.

The solutions are:

a. The resource people have an obligation to communicate their issues and concerns with their political representation and agency leadership.
b. Simplify and integrate the multiple resource management laws to promote appropriate and obtainable resource management objectives.

A cause is: The drive to set numerical objectives with no ecological data to support the objectives.

The solutions are:

a. Implement the R4 riparian evaluation guide
b. Don't set numerical objectives without the data.
c. Set meaningful narrative objectives (not numerical objectives) where there is not supporting data. And review the existing numerical objectives for supporting data.
d. Implement uncertainty boundaries on the objectives where there is no or poor supporting data.
e. Consider the spatial scale of the data when setting objectives.

A cause is: They don't have the resources or funding to do the job.

The solutions are:

a. More funding and resources by putting range management back on the congressional radar screen.
b. Develop efficient/effective monitoring strategies and workforce utilization.

c. Reevaluate and shift the spending priorities on Forests and BLM field offices back to range administration and monitoring.

A cause is: Gap in ecological knowledge and data.

The solutions are:

a. Recapture the existing data and analyze in light of new ecological understanding.
b. Begin collection of ecological data on areas where there is not ecological data currently existing.
c. The range conservationist primarily responsible for management of the allotment working directly with the permittee and the ID team.
d. Research focus on the knowledge gaps.

5. **The issue is**: The stubble height threshold should be linked to and valid for specific riparian area objectives and it is in fact not being linked or may not be valid for the objectives.

A cause is: There are no clear objectives (see previous problem)

A cause is: Not taking any long-term objectives measurements

The solutions are:

a. Provide direction to the manager that they have to periodically tie the annual indicators to the resource response.
b. Provide direction on how to measure trend on the riparian zone.
c. Provide more money and resources to conduct the long-term measures.
d. If additional resources are not made available, then focus attention on priority areas where we can do the intensive monitoring with the resources available using a tiered approach to ensure other areas are not forgotten.
e. Encourage the permittees/stakeholders, in joint venture with the management agency, to conduct long-term monitoring in accordance with established protocols.

A cause is: There is no protocol, sampling design or procedure for validating stubble heights measures with objectives.

The solutions are:

a. Provide direction on how to measure trend on the riparian zone.
b. Provide more research to correlate stubble height to long-term objectives on a broader scale.

6. **The issue is**: Stubble height should be used on hydric species as an indicator of bank integrity and the fact is that when hydric species are not dominate or absent in locations that are otherwise appropriate to address bank integrity, then stubble height is being inappropriately used on non hydric species.

A cause is: Lack of understanding of the limitations of stubble height.

The solutions are:

a. Absence of hydric species where riparian dependent species should be expected should trigger an immediate review of the grazing system (e.g., consider a shift out of hot season use, fencing, or piping water to remove use on the green-line zone). See issue 9.

b. Monitor timing, duration and frequency of use.
c. While changing the grazing system, modify the annual indicator by:
   - Using bank alteration or other measures instead of stubble height
   - Specifying stubble height threshold or percent utilization specific to non-hydric species which allows the hydric species to out compete the non-hydric species
   - Implementing long-term species composition monitoring in the green-line zone.

7. **The issue is**: The stubble height measure is appropriate as an annual indicator for adaptive management and the reality is it is being inappropriately used as a long-term resource objective or standard.

   A cause is: Budget constraints

   The solutions are:

   a. Need more resources (workforce and money)
   b. Reallocate the resource money pie

   A cause is: No resource objectives (see issue 4).

   A cause is: No validation or linkage between stubble height and long-term objectives (see issue 5)

   A cause is: Perceived and/or actual resource conditions were not what resource specialist believed the conditions should be and frustration within the management agencies personnel to force needed changes in the agency.

   The solutions are:

   a. Document the true resource conditions and get away from the specialist perceived condition.
   b. See solutions to issues 4 and 5.
   c. Show resource condition improvement with application of these proposed changes.
   d. Range conservation, permittee, hydrologist, riparian specialist, fisheries biologist and other agencies (e.g., NOAA) should work together monitoring and developing management plans on an allotment.

8. **The issue is**: Stubble height should be applied on the depositional bank between the green-line (see definition) to bankfull to address bank integrity and the reality is the tool is being applied to areas outside this zone in an attempt to address bank integrity.

   A cause is: Lack of understanding between the two different uses of stubble height.

   The solutions are:

   a. Clearly link the use of stubble height to the resource objective on the green-line zone.
      - Technology transfer.
   b. Clearly link the use of stubble height to the resource objective on the terrace.
      - Technology transfer.

9. **The issue is**: Stubble height should be used with an understanding and consideration of the natural variability and persistence of riparian dependent species and the reality is it is being applied in small inclusion areas along stream reaches where it does not represent the majority of the stream reach and without consideration of the natural variability of riparian dependent species.

   A cause is: Agency staff does not have adequate training and background to do monitoring or tie monitoring to objectives.

   The solutions are:

   a. Implement the monitoring training proposal
      - Make this training available to the industry.
   b. Implement some form of certification for monitoring professionals.
   c. Develop and deliver training for managers on how to use monitoring and objectives.

10. **The issue is**: There should be sound research about the use of different stubble heights and the reality is the heights are being applied in most locations without appropriate supporting research.

11. **The issue is**: There should be an institutionalized interagency-wide (both FS and BLM) standard protocol for the stubble height measure and the reality is there is no institutionalized interagency protocol.

12. **The issue is**: Both upland and riparian objectives should be addressed in allotment management and the reality is focusing on stubble height to achieve riparian objectives may be to the detriment of the uplands.

    A cause is: Planning process does not allow for easy correction when you see a problem coming.

    The solutions are:

    a. Develop and/or revise plans that use adaptive management that avoid too restrictive prescriptions.
       - Develop plans that are more outcome (objective) oriented and not prescriptive.
    b. Do planning on a true watershed scale.
    c. Include the permittee in the planning process.
    d. Stand up and defend the successful management of both upland and riparian resources and not quickly cave to pressure for more emphasis on riparian areas.

    A cause is: Listing of T&E species have focused our attention on the riparian issue.

    A cause is: The ESA commitments and litigation have driven the agencies to an administration level that is beyond our capabilities.

    The solutions are:

    a. Determine the acceptable minimal standard for monitoring of the watershed areas.

b. Continue to point out the conflicts between the laws and the impact on overall resource management resulting from litigation.

13. **The issue is**: The sampling protocol should be applied consistently between agencies, states, individuals within an office and the reality is it is not being applied consistently.

Appendix C. Monitoring Guide

Selection of streamside monitoring methods for livestock grazing, based on channel type and greenline vegetation.

The following Guide can be used to prescribe streamside monitoring methods appropriate for various channel types (Rosgen, 1996), and existing and potential vegetative conditions along the greenline. Descriptions of the Channel Types are contained in Appendix C.

I. "C" channel type, herbaceous vegetation dominant, potential vegetation: herbaceous or mixed herbaceous and shrubs.

- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
    - Stubble height on key riparian species, or species groups on the greenline
    - Use compliance (livestock numbers and time in pasture).
    - Bank disturbance or alteration

- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stablizers:**
    - Stubble height on key riparian species, or species groups on the greenline
    - Bank disturbance or alteration

- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
    - Streambank stability
    - Greenline composition maintained or trend toward hydric stablizers

II. "C" channel type, mixed shrub - herbaceous vegetation dominant, potential vegetation: mixed herbaceous and shrubs, or shrubs.

- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
    - Stubble height on key riparian species or species groups on the greenline
    - Use compliance (livestock numbers and time in pasture).
    - Bank disturbance or alteration
    - Change in preference to woody species sprouts and young

- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stablizers:**
    - Stubble height on key riparian species or species groups on the greenline
    - Bank disturbance or alteration
    - Incidence of use on woody sprouts and young

- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
    - Streambank stability
    - Greenline composition maintained or trend toward hydric stablizers
    - Woody species regeneration – 15-20% sprouts and young, 60-70% mature, and 15-20% dead

III. "C" channel type, woody dominant, potential vegetation: shrubs and trees.

- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
    - Use compliance (livestock numbers and time in pasture).
    - Bank disturbance or alteration
    - Change in preference to woody species sprouts and young

- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stablizers:**
    - Bank disturbance or alteration
    - Incidence of use on woody sprouts and young

- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
    - Streambank stability
    - Woody species regeneration – 15-20% sprouts and young, 60-70% mature, and 15-20% dead

IV. "E" channel type, herbaceous vegetation dominant, potential vegetation: herbaceous or mixed herbaceous and shrubs.

- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
    - Stubble height on key riparian species, or species groups on the greenline.
    - Use compliance (livestock numbers and time in pasture).
    - Bank disturbance or alteration

- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stablizers:**
    - Stubble height on key riparian species, or species groups on the greenline.
    - Bank disturbance or alteration.

- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
    - Streambank stability.
    - Greenline composition maintained or trend toward hydric stablizers

V. "F" channel type (entrenched floodplain), herbaceous vegetation dominant, potential vegetation: herbaceous or mixed herbaceous and shrubs.

- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
    - Stubble height on key riparian specie, or species groups s on the greenline.
    - Use compliance (livestock numbers and time in pasture).
    - Bank disturbance or alteration

- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stablizers:**
    - Stubble height on key riparian species, or species groups on the greenline.
    - Bank disturbance or alteration.

- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
    - Streambank stability.
    - Greenline composition maintained or trend toward hydric stablizers

VI. "G" channel type (entrenched – no floodplain), herbaceous vegetation or bare banks dominant, potential vegetation: herbaceous.

- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
    - Use compliance (livestock numbers and time in pasture).
    - Bank disturbance or alteration

- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stablizers:**
    - Bank disturbance or alteration.

- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
    - Streambank stability.
    - Greenline composition maintained or trend toward hydric stablizers

VII. "B" channel type, mixed shrub - herbaceous vegetation dominant, potential vegetation: mixed herbaceous and shrubs, or shrubs.

- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
    - Stubble height on key riparian species, or species groups on the greenline
    - Use compliance (livestock numbers and time in pasture).
    - Bank disturbance or alteration
    - Change in preference to woody species sprouts and young

- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stablizers:**
    - Stubble height on key riparian species, or species groups on the greenline
    - Bank disturbance or alteration
    - Incidence of use on woody sprouts and young

- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
    - Streambank stability
    - Greenline composition maintained or trend toward hydric stablizers
    - Woody species regeneration – 15-20% sprouts and young, 60-70% mature, and 15-20% dead

VIII. "B" channel type, woody dominant, potential vegetation: shrubs and trees.

- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
    - Use compliance (livestock numbers and time in pasture).
    - Bank disturbance or alteration

- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stablizers:**
    - Bank disturbance or alteration
    - Incidence of use on woody sprouts and young

- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
    - Streambank stability
    - Woody species regeneration – 15-20% sprouts and young, 60-70% mature, and 15-20% dead

IX. "A" channel type, mixed shrubs and herbaceous, or shrubs dominant, potential vegetation: mixed shrubs and herbaceous, or shrubs, substrate large.

- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
    - Use compliance (livestock numbers and time in pasture).
    - Bank disturbance or alteration
    - Change in preference to woody species sprouts and young

- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stablizers:**
    - Bank disturbance or alteration
    - Incidence of use on woody sprouts and young

- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
    - Streambank stability
    - Greenline composition maintained or trend toward hydric stablizers
    - Woody species regeneration – 15-20% sprouts and young, 60-70% mature, and 15-20% dead

Appendix D. Channel type descriptions (Rosgen 1996, p. 4-5).

Channel type	Description	Entrench-ment ratio	W/D ratio	Sinuosity	Slope	Landform
C	Low gradient, meandering, point-bar, riffle/pool, alluvial channels	> 2.2	>12	>1.4	<.02	Broad valleys with terraces. Well defined meandering channels
E	Low gradient, meandering riffle/pool stream with low width/depth ratio and little deposition.	>2.2	<12	>1.5	<.02	Broad valley/meadows. Alluvial materials with floodplains. Highly sinuous. Very low width/depth ratio.
F	Entrenched meandering riffle/pool channel on low gradients with high width/depth ratio	<1.4	>12	>1.4	<.02	Entrenched in highly weathered material. Gentle gradients with high bank erosion rates.
G	Entrenched "gully" step/pool and low width/depth ratio on moderate gradients	<1.4	<12	>1.2	.02 to .039	Gullies, step/pool morphology. Narrow valleys or deeply incised in alluvial or colluvial materials. Unstable with high bank erosion rate.
B	Moderately entrenched, moderate gradient, riffle dominated channel, with infrequently spaced pools.	1.4 to 2.2	>12	>1.2	.02 to .039	Moderate relief, colluvial deposition, and/or structural. Narrow, gently sloping valleys.
A	Steep, entrenched, cascading, step-pool streams. Very stable if bedrock or boulder dominated.	<1.4	<12	1.0 to 1.2	.04 to .10	High relief. Erosional or depositional and bedrock forms. Entrenched and confined streams with cascading reaches.

Appendix E. Glossary

Community: An assemblage of populations of plants and/or animals in a common spatial arrangement.

Composition: The proportions (percentages) of various plant species in relation to the total on a given area. It may be expressed in terms of relative cover, relative density, relative weight, etc.

Evaluation: (1) An examination and judgment concerning the worth, quality, significance, amount, degree, or condition of something; or (2) the systematic process for determining the effectiveness of on-the-ground management actions and assessing progress toward meeting management objectives.

Greenline: The first perennial vegetation that forms a lineal grouping of community types on or near the water's edge. Most often it occurs at or slightly below the bankfull stage.

Herbaceous: Vegetation growth with little or no woody component; non-woody vegetation such as graminoids and forbs.

Monitoring: The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives.

Shrub: A plant that has persistent woody stems and a relatively low growth habit, and that generally produces several basal shoots instead of a single bole. It differs from a tree by its low stature, less than 5 meters (16 feet), and non-arborescent form.

Streambank disturbance or alteration: The effect of livestock to alter the physical dimensions (e.g., increasing the bankfull width) and stream bank stability of stream channels by bank trampling and shearing.

Streambank stability: The tendency of streams to form banks resistant to the erosive energy of streamflow. This tendency toward stability has been referred to as self-stabilization (Rosgen 1996). Deep-rooted vegetation plays a key role in stabilization of most stream systems.

Stubble: The basal portion of herbaceous plants remaining after the top portion has been harvested either artificially or by grazing animals.

Stubble Height: The measure or height (in centimeters or inches) of herbage left ungrazed at any given time (USDA Forest Service, et. al, 1999, Interagency Technical Reference 1743-3).

Regional Technical Team Response to the Proposed Stubble Height Standards

The Stubble Height Review Team recognized potential implications about how residual stubble height might be used in relation to existing consultations that address both PACFISH/INFISH and the 1998 Biological Opinions. To explore these implications, it was agreed by the group and its sponsors to have two senior staff specialists familiar with these requirements as well as the stubble height issue review the information and statements in the draft report regarding the appropriate use of stubble height. These two specialists, Tim Burton, BLM and Bill Lind, NOAA Fisheries also serve on the Regional Technical Team (RTT) that provides technical expertise on ESA consultation issues to Level 1 and Level 2 Teams as well as to the Regional Executives, the Interagency Coordination Subgroup and the Interagency Implementation Team. As such, their efforts as a subset of the RTT provided a basis for addressing the concerns and making recommendations associated with Land Use Plans, Allotment Management Plans and Implementation.

The following response is included in the report to help explain and clarify these concerns.

Concerns: There is concern with the Stubble Height Study Group's statement that residual stubble height is inappropriate as a performance standard. The current broad direction, contained in both PACFISH/INFISH and the 1998 Biological Opinions makes it clear that grazing must be monitored to assure that riparian management objectives (RMOs) are achieved. This would not be possible without measurable standards, against which the monitoring data would be compared to assess need for change in management direction for the following years grazing. The absence of explicit measurable standards would preclude effective adaptive management used to make these changes. The concern is with respect to the certainty that short-term monitoring would actually maintain RMO's or that modifications would actually be made on an annual basis to move degraded conditions towards the RMO's. Under the Endangered Species Act (ESA), short-term effects are sometimes acceptable to achieve long-term benefit. However, depending upon the status of the stocks in question (e.g., endangered sockeye salmon), delays in attainment of RMO's could trigger significant risks to the status of these stocks and/or other species. Because there are no short-term standards in the study groups draft proposal, there is a concern that the proposal would de-emphasize implementation monitoring, and perhaps replace it with effectiveness monitoring, thereby creating a lag time between condition observation and management response. There is also concern that requiring effectiveness monitoring would be laborious and therefore more costly than just relying upon the less expensive implementation monitoring approach now applied in most situations. The elevation letter also recommends a greater role by Level 1 Teams in the adaptive management process. The elevation letter is attached.

Response:

A comprehensive summary of the literature on this subject evaluated the best science on stubble height as a management tool (Clary and Leininger 2000). A co-author was also a

member of the Stubble Height Study Group. Statements in this reference, and interpretations by the co-author in the draft Stubble Height Report help to clarify how stubble height should be used in grazing management and where and when stubble height criteria should be used. It is important to make it clear that stubble height can be an excellent tool for assessing a number of RMOs, such as: maintaining forage vigor, entrapping and stabilizing sediment under inundated flow, streambank stability, and diversion of willow browsing (Clary and Leininger 2000 – page 568-569). However the authors make it clear that their suggestion of using 4- to 6-inches of stubble height is "a starting point when initiating improved riparian management, one that can be changed as monitoring indicates" (Clary and Leininger 2000 – page 569). In other words, there is no set standard value for the stubble height; any local value needs local validation through monitoring.

In the Stubble Height Study Groups proposal, the stubble height standard is not eliminated, but would be used as a short-term prompt or "red flag" indicating when current season's grazing might affect long-term achievement and maintenance of the RMOs. Thus stubble height criteria would be included as part of an adaptive management process with other indicators to make informed management decisions. Stubble height would not be a long-term standard as currently used, but rather a short-term criterion to evaluate the success of current season's grazing. The adaptive management process would include changes in the grazing system needed to achieve long-term RMO's, but also include a determination of the appropriate stubble height criterion for the grazing unit (allotment or pasture) through monitoring. As the literature summary stated: "In some situations, 7 cm (2.75 inches) or even less stubble height may provide for adequate riparian ecosystem function, while under other conditions 15-20 cm (6-8 inches) of stubble height may be required to reduce willow browsing or to limit animal impact on vulnerable streambanks" (Clary and Leininger 2000 – page 569). Measured stubble heights would be compared to the condition and trend of measured RMO indicators to determine the appropriate criterion for the grazing unit. Thus, stubble height and implementation monitoring would be refined so that the suggested stubble heights in the literature would be a starting point and then adjusted site-specifically to ensure they actually reflect achievement of RMO's.

Given these observations, it was clear that a more definitive, short-term standard needs to be identified as a means of defining performance compliance. Stubble height criteria are to be developed over time, and will be only one of the short-term indicators of livestock use impacts. Site-specific standards will be adjusted through the adaptive management process itself. This approach can be achieved through a combination of Land Use Plan (LUP) and Allotment Management Plan (AMP) standards and objectives, added through plan amendment, plan revision, and/or allotment-specific section 7 consultations. The Regional Technical Team (RTT) recommends the following approach:

1. New Land Use Plan Direction:

    a. Standards/Objectives – Standards shall be developed requiring that grazing strategies be developed for each AMP. LUPs shall also describe desired

outcomes or LUP objectives for terrestrial, riparian, and aquatic resources (e.g. prominence of hydrophilic vegetation along the greenline, stable streambanks, woody species generation, etc.). The LUP shall identify broad, general resource objectives to be achieved within the planning period, and require that more-specific and measurable objectives are to be developed at the AMP level. LUP's shall also require that where ESA-listed species are involved, LUP/AMP resource objectives shall be developed in coordination with the consulting agencies.

b. Monitoring - The LUP monitoring plan shall require annual review and assessment of the grazing strategy associated with each AMP. Where ESA-listed species are relevant, include the Level 1 Team in the annual reviews and assessments. In preparation of the AMP, monitoring plans will be required to include both short-term livestock movement triggers and end-point indicators, and long-term indicators of the resource objectives (terrestrial, riparian, and aquatic). Monitoring triggers, indicators, and resource objectives will be developed according to the Stubble Height Study Group recommendations in Appendix C – Monitoring Guide.

2. Allotment Management Plan Direction:

a. General Standard – Will require that AMP's develop specific, quantifiable RMO's for each pasture. Identify the appropriate short-term movement triggers and endpoint monitoring indicators for the unique stream and channel types within each pasture. The trigger and end-point indicators shall be based upon the best available criterion for the AMP or pasture. Until site-specific metrics can be established, use the suggested criterion in the literature (Clary and Leininger 2000) as interim criteria, and adjust through time as local monitoring results indicate. Monitor the short-term indicators annually and the long-term indicators as frequently as is appropriate for the specific indicator (e.g. Winward (2000) recommends greenline vegetation be monitored on a 3 -5 year rotation). Where ESA-listed species are relevant, the Level 1 Team shall assist with the development and fine-tuning of short-term movement triggers and endpoint indicators, and shall be included in the annual review of monitoring results.

b. Monitoring - Each year, or as often as is necessary to assess trend in key riparian resource indicators, monitoring results shall be used to assess the need to make changes in timing, intensity, and/or duration of grazing, and those changes shall be required in the next year's annual grazing instructions. In other words, failure to achieve short-term move triggers or endpoint indicators will trigger required changes in the next year's annual operation instructions and could potentially result in re-initiation of consultation for the AMP. Failure to achieve the riparian resource objectives would likely result in re-initiation of consultation for the AMP. This approach should ensure no lag-time between monitoring observations and implementation of changes to the

grazing strategy. Level 1 teams shall review monitoring results annually and be able to elevate instances where AMPs are not changed or instances of recalcitrant repeat offenders occur. Annual changes may include any modifications of timing, intensity, and duration of grazing at any location(s) within the allotment. Permit performance will then be based upon compliance with those annual grazing instructions. The annual grazing instructions may include triggers defining when livestock would be moved from each pasture.

c. Monitoring Plan Standard - As recommended by the Stubble Height Study Group, the AMP monitoring plan shall require training certification of monitoring personnel. The RTT suggests the Monitoring Core Team develop a canned training program and certification for those conducting the monitoring in association with implementation of the IIT Monitoring Module. The plan shall include quality assurance measures (e.g. follow-up field checks, training, program reviews, etc.).

3. Implementation:

The RTT recommends that this process be phased in over time, and that it be field tested on a few priority grazing allotments where ESA consultation has occurred. Include the consulting agencies in the field tests through the Level 1 Teams. This would also constitute a learning experience for individual field units, therefore the field tests should be applied broadly on as many field units as possible. The RTT acknowledges the concern that requiring effectiveness monitoring would be laborious and therefore more costly than just relying upon the less expensive implementation monitoring approach now applied in most situations. However, the literature makes it clear that implementation monitoring criteria are not useful unless they are validated for achieving resource objectives, and such achievement is not possible to detect without effectiveness monitoring. If monitoring is designed to be efficient, the increases in monitoring costs can be minimal. For example, a stubble height monitoring project may require 2 hours to access the site, and 1 hour to make measurements. The addition of an assessment of bank alteration, woody use, greenline vegetation, woody regeneration, and bank stability at the same points of measurement would add approximately 1 hour to the sampling, based on recent tests in the field. A more efficient protocol that would address this need is currently being developed by BLM based upon combined parameter measurements at the same sample quadrat.

References

Clary,W.P. and W.C. Leininger. 2000. Stubble height as a tool for management of riparian areas. Journal of Range Management 53:562-573.

Winward, A.H. 2000. Monitoring the vegetation resources in riparian areas. Gen. Tech. Rep. RMRS-GTR-47. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 49p.

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