2020 Collegiate Turf Bowl Competition Study Guide

GCSAA would like to thank Leah Brilman, Ph.D., a member of the Turfgrass Breeders Association, and Gwen Stahnke, Ph.D., facilitators of the Turf Bowl, for their work updating and modifying the exam each year.

The Turf Bowl Competition consists of physical and visual identification of samples, multiple choice, fill-in-the-blank, essay, short answer and matching questions.

A list of resources to study for this portion of the exam is included in this document. We also recommend reaching out to local superintendents, chapters or alumni for their help in preparing for the case study/essay section.

If you have any questions about the competition, contact Diana Kern at dkern@gcsaa.org or (785) 832-3600.

Eligibility

To participate in the GCSAA Collegiate Turf Bowl Competition, students must meet all of the following eligibility criteria:

- Must be currently enrolled in a turf program or have graduated at the end of the most recent fall semester but not yet entered a graduate program
- Be an active Student member with GCSAA
- Be a registered attendee at the GCSAA Education Conference and Golf Industry Show

Area of Study

Turfgrass Identification

- Identify live turf specimens and seed specimens by their common names.
- Know common name vs. scientific name.
- For specific turfgrass species, please see Addendum 1.

Turfgrass Growth and Development

- Identify parts of the grass plant.
- Know management and environmental factors that influence growth.
- Understand turfgrass physiology and how it is influenced by management practices.

- Understand plant growth regulators – Use and influence on biology

Turfgrass Soils and Soil Fertility

- Know greens construction, particle sizes, soils and fertility.
- Know of macronutrients and micronutrients, and their influence on growth.
- Soil types and classification

Weed Identification and Control

- Identify common weeds. Note: Any turfgrasses on list can also be weeds.
- Know herbicides, what weeds they control and mode of action.
- Know the life cycle of weeds and how management influences weed growth.
- Know seed labeling for crops and weeds.
- For specific weeds, please see Addendum 2.

Turfgrass Diseases

- Identify common diseases on turf stands.
- Know environmental and management conditions, and the types of diseases that the conditions favor.
- Know common fungicides.
- Know grass species corresponding to various diseases.
- For specific diseases, please see Addendum 3.

Turfgrass Mathematics

- Calculate application rates of chemicals and fertilizers.
- Know quantities of sand and seed to use.
- Know how to correctly calibrate application equipment.
- Know how to use both the Metric and English units in calculations.

Turfgrass Insects

- Identify specimens of larval and adult forms of insects that attack turf.
- Know life cycles, preferred foods, feeding methods and other characteristics important in controlling insects.
- For specific insects, please see Addendum 4.

Irrigation

- Know how to evaluate turfgrass water needs and adjust various irrigation methods and rates accordingly to ensure the efficiency and effectiveness of the irrigation system.
- Calculate water usage.
- Know how to read an irrigation nozzle flow chart.

- Know the basics of using reclaimed water for irrigation.

Water Management

- Understand how turfgrasses process water, including transpiration.
- Understand water terminology
- Know the symptoms of water stress in various turfgrasses and how to remedy.
- Know the causes of pesticide and nutrient runoff and how to prevent.

Business Management

- Employment laws
- Budget, accounting and financial management principles
- Equipment leases
- Depreciation
- Staff management
- Employee training
- Employee performance management
- Amortization

Case Study

The essay will be graded based on a team's ability to:

- Follow instructions given in the scenario.
- Provide clear and concise answers.
- Demonstrate critical thinking.
- Use proper spelling and grammar.

Students will have 30 minutes to write their answer to one of the following scenarios. Only one of the scenarios will be selected for the exam.

Again, students are **strongly encouraged** to seek out local superintendents, chapters or alumni to help them research their answers to these real-world scenarios. Valuable information may also be found in member sections of gcsaa.org and on eifg.org.

Shallow Point Golf Course

Shallow Point Golf Course is an 18-hole championship course owned by the Louisiana State Park system in Delhi, Louisiana. The course, built in 2006, is situated on 160 acres, with 30 acres of fairways and 60 acres of rough. Since it opened, the course has hosted the Adams Pro Tour event. Because of its four sets of tees and affordable rates, it attracts golfers of all levels. The greens are TifEagle Bermudagrass while the tees and

fairways are Tifway 419 Bermudagrass. Native grasses are growing on all non-play areas. Greens fees are $55.00. In addition of the golf course and club house, the facility includes a 17-room lodge.

Ally Maine has been the superintendent at Shallow Point Golf Course since it opened. The crew includes a maintenance team of ten full time employees and four seasonal employees, including one assistant, one equipment manager and two student interns. In addition to managing the golf course and grounds around the club house, the crew also cares for the grounds around the lodge.

Approved Budget for 2020:

Operating		***Capital***	
Payroll	$425,000	Golf Course	$ 230,000
Fertilizer/Chemicals	105,000	Buildings/Grounds	275,000
Water	65,000	Equipment	150,000
Seed	18,000	**Total:**	$655,000
Equipment Maintenance/Leasing	61,000		
Supplies	37,000		
Fuel	31,000		
Professional Development	8,000		
Total:	$ 750,000		

Scenario 1: Because golfers have been complaining about the native areas that line the fairways catching a lot of golf balls and slowing pace of play, management has requested Ally develop a plan to resolve the issue for the average golfers but still leave the course challenging enough for the tour event. Propose a solution to remedy the situation. Develop a budget and a work timeline for the solution you propose.

Scenario 2: The current maintenance facility is housed in a barn that was pre-existing on the property before the golf course was built. In preparation for the upcoming budget year, management has agreed replace the existing facility and ask for Ally's wish list of features. Identify the top three must haves in the new maintenance facility. Explain the importance of these items and identify the ROI these items would bring to the course.

Scenario 3: For the Adams Pro Tour tournament, Ally Maine and her staff get the green speed to 12' on the Stimpmeter. Some course regulars would like to see this 12' speed maintained through the entire season while other players are frustrated with the high green speed. The Shallow Point management wants green speeds at 10' for everyday play. Develop a cultural practices plan with work schedule to get the speed of the greens to a 12' for tournament play. Develop a plan with work schedule to return the greens to 10' for daily play. Develop a communicate message for daily players on green speed.

Scenario 4: Shallow Point Golf Course took a direct hit from Hurricane Jackson and the flooding and wind damage to the course was significant. It took eight days for the flood

waters to fully recede. Ally must report the damage to the course. Identify the first five areas Ally should inspect and explain why you would look at these areas first. Develop a task schedule for the following week and estimate the labor pool needed for each task.

Equipment Identification Section

Teams will be asked answer questions on cutting units and quality of cut. Schematics for this piece of equipment are included in Addendum 5, at back of the study guide.

Resources

The following resources, along with GCSAA's monthly publication *Golf Course Management* magazine, are recommended as study resources. The textbooks may be available through your school library, local bookstore or through the **GCSAA Store online at** https://www.gcsaastore.com/ **.**

1. **The Mathematics of Turfgrass Maintenance** (*Third Edition*) – Michael Agnew and Nick Christians
2. **Mathematics for the Green Industry: Essential Calculations for Horticulture and Landscaping Professionals -** Michael Agnew, Nancy Agnew, Ann Marie VanDerZanden and Nick Christians
3. **Turfgrass Management** (*Fifth or Sixth Edition*) – A.J. Turgeon
4. **Fundamentals of Turfgrass Management** – Nick Christians
5. **Turf Management for Golf Courses** (*2nd Edition*) – James B. Beard
6. **Salt-Affected Turfgrass Sites: Assessment and Management** – R.N. Carrow and R.R. Duncan
7. **Managing Turfgrass Pests –** Thomas L. Watschke, Peter H. Dernoden and David J. Shetlar
8. **Controlling Turfgrass Pests** (*2nd Edition*) – Thomas W. Fermanian, Malcom C. Shurtleff, Roscoe Randell, Henry T. Wilkinson and Philip L. Nixon
9. **Creeping Bentgrass Management: Summer Stresses, Weeds and Selected Maladies** – Peter H. Dernoden
10. **Human Resource Management for Golf Course Superintendents, ch. 6** – Bob Milligan and Tom Maloney
11. **Superintendents Handbook of Financial Management, ch. 2, 3, 5, and 9** – Ray Schmidgall

12. **The Turf Problem Solver: Case Studies and Solutions for Environmental, Cultural and Pest Problems** – A.J. Turgeon and J.M. Jr. Vargas (Dec. 2, 2005)
13. **Identifying Turf and Weedy Grasses of the Northern United States** – D. Pedersen and T. Voight Illinois Pocket ID series University of Illinois Extension pubsplus.uiuc.edu
14. **Turfgrass Identification Tool – Purdue University Turfgrass Science Department of Agronomy** (vernation) - agry.purdue.edu/turf/tool/index.html
15. **Turfgrass Identification** (vernation)- David Gardner, The Ohio State University buckeyeturf.osu.edu/pdf/01_turfgrass_identification.pdf
16. Best Management Practices for Turfgrass Water Conservation commodities.caes.uga.edu/turfgrass/georgiaturf/Publicat/1650_BMP_H2O.htm
17. Best Management Practices: Where Leadership & Action Intersect – GCSAA https://www.gcsaa.org/environment/bmp-planning-guide
18. Golf Course Environmental Profile eifg.org/research/golf-course-environmental-profile

Addendum 1

Cool Season Grasses

Common name	**Scientific name**
1. Kentucky bluegrass	*Poa pratensis*
2. Perennial ryegrass	*Lolium perenne*
3. Tall fescue	*Festuca arundinacea = Schedonorus arundinaceus = Lolium arundinaceum*
4. Hard fescue	*Festuca brevipila (F. trachyphylla)*
5. Chewings fescue	*Festuca rubra* ssp. *commutata (*ssp*. fallax)*
6. Creeping bentgrass	*Agrostis stolonifera*
7. Colonial bentgrass	*Agrostis capillaris*
8. Strong creeping red fescue	*Festuca rubra* ssp. *rubra*
9. Slender creeping red fescue	*Festuca rubra ssp. littoralis*
10. Velvet bentgrass	*Agrostis canina*
11. Rough bluegrass	*Poa trivialis*
12. Annual bluegrass	*Poa annua*
13. Annual ryegrass	*Lolium multiflorum*

Warm Season grasses

14. Japanese / Korean lawngrass	*Zoysia japonica*
15. Manilla grass	*Zoysia matrella*
16. Hybrid bermudagrass	*Cynodon dactylon* X *C. transvaalensis*
17. Common bermudagrass	*Cynodon dactylon*
18. Centipedegrass	*Eremechloa ophiuroides*
19. Seashore paspalum	*Paspalum vaginatum*
20. Buffalograss	*Buchloe dactyloides*
21. St. Augustinegrass	*Stenotaphrum secundatum*
22. Kikuyugrass	*Pennisetum clandestinum*
23. Bahiagrass	*Paspalum notatum*

Addendum 2

Weeds

Alkaligrass	*Puccinella distans*
Barnyardgrass / Watergrass	*Echinochloa crus-galli*
Bedstraw / Catchweed	*Galium aparine*
Bindweed, Field	*Convolvulus arvensis*
Brassbuttons, Souther	*Cotula australis*
Buttonweed, Virginia	*Diodia virginia*
Carpetweed	*Mollugo verticillata*
Carrot, Wild	*Daucus carota*
Chess, Soft	*Bromus hordeaceus*
Chickweed, Common	*Stellaria media*
Chickweed, Mouseear	*Cerastium vulgatum*
Chicory	*Cichorium intybus*
Clover, White	*Trifolium repens*
Crabgrass, Hairy (Large)	*Digitaria sanguinalis*
Crabgrass, Smooth	*Digitaria ischaemum*
Cudweed, purple	*Gnaphalium purpureum*
Dallisgrass (smooth paspalum)	*Paspalum dilatatum*
Dandelion, False /spotted catsear	*Hypochoeris radicata*
Dandelion	*Taraxacum officinale*
Dichondra	*Dichondra repens*
Dock, Curly	*Rumex crispus*
Downy Brome / cheatgrass	*Bromus tectorum*
English Daisy	*Bellis perennis*
Foxtail, Yellow (pigeon / bristle grass)	*Setaria glauca (pumilla ssp pumilla)*

Foxtail , Green	*Setaria viridis*
Garlic , Wild	*Allium vineale*
Geranium, Carolina / dovefoot	*Geranium ssp.*
Goosegrass/Silver Crab/ Crowfoot	*Elusine indica*
Ground Ivy (Creeping Charlie/Jenny)	*Glechoma hederacea*
Hawkweed	*Hieracium pratense*
Henbit	*Lamium amplexicaule*
Johnsongrass	*Sorghum halapense*
Kikuyugrass	*Pennisetum clandestinum*
Knotweed, Prostrate / Common	*Polygonum aviculare*
Kochia	*Kochia scoparia*
Kyllinga, Annual / Fragrant	*Kyllinga odorata*
Kyllinga, Green / Perennial	*Kyllinga brevifolia*
Lambsquarter	*Chenopodium album*
Lettuce, Prickly	*Lactuca serriola*
Mallow, Common	*Malva neglecta*
Medic, Black	*Medicago lupulina*
Moss, silvery thread	*Bryum argenteum*
Mullein, Common	*Verbascum thapsus*
Nimblewill	*Muhlenbergia schreberi*
Nutsedge, Purple	*Cyperus rotundus*
Nutsedge, Yellow	*Cyperus esculentus*
Oats, Wild	*Avena fatua*
Orchardgrass	*Dactylis glomerata*
Pearlwort	*Sagina apetala (procumbens)*
Pennywort / dollarweed	*Hydrocotyle umbellate*
Peppergrass / pepperweed	*Lepidium virginicum*
Pigweed, Prostrate	*Amaranthus blitoides*
Pineapple Weed / wild chamomile	*Matricaria discoidea*
Plaintain, Broadleaf	*Plantago major*
Plantain, Buckhorn / Narrowleaf	*Plantago lanceolata*
Puncture Vine / goatshead	*Tribulus terrestris*
Purslane, common	*Portulaca oleracea*
Quackgrass	*Elytrigia repens*
Rattail fescue	*Vulpia myuros*
Redtop	*Agrostis gigantean (alba)*
Salsify, Western	*Tragopogon dubius*
Sandbur/ grassbur	*Cenchrus incertus*
Sedge, Annual	*Cyperus compressus*
Shepherd's Purse	*Capsella bursa-pastoris*
Signalgrass	*Urochloa subquadripara*

Smartweed, Spotted (Ladysthumb)	*Polygonum persicaria*
Smutgrass	*Sporobolus indicus*
Sorrell, Red / Sheeps	*Rumex acetosella*
Speedwell, creeping	*Veronica filiformis*
Spurge, Prostrate / Spotted	*Chamaesyce maculata (Euphorbia)*
Star of Bethlehem	*Ornithogalum umbellatum*
Strawberry, Wild	*Fragaria virginiana*
Swinecress	*Coronopus didymus*
Thistle, Bull	*Cirsium vulgare*
Thistle, Canada	*Cirsium arvense*
Thistle, Musk	*Carduus nutans*
Torpedograss	*Panicum repens*
Velvetgrass, German	*Holcus mollis*
Violet	*Viola ssp.*
Woodsorrel, Creeping	*Oxalis corniculata*
Woodsorrel, Yellow (Oxalis)	*Oxalis stricta*
Yarrow	*Achillea millefolium*
Yellowcress	*Rorippa palustris*

Addendum 3

Bacterial Diseases

Bacterial wilt	*Xanthomonas translucens*
Bacterial etiolation and decline	*Acidovorax avenae*

Fungal Diseases

Anthracnose	*Colletotrichum cereale, C. eremochloae*
Ascochyta leaf blight	*Ascochyta avenae*
Bermudagrass decline	See Root decline of warm-season grasses
Blister smut	*Jamesdicksonia dactylidis*
Brown patch **(**C3) & large patch (C4)	*Rhizoctonia solani*
Brown ring patch	*Waitea circinata* var. *circinata*
Brown stripe	*Mycosphaerella recutita*
Cladosporium eyespot	*Cladosporium phlei*
Copper spot	*Gloeocercospora sorghi*
Coprinus snow mold	*Coprinopsis psychromorbida*
Crown rust	*Puccinia coronata*
Curvularia blight	multiple *Curvularia sp.*
Dead spot	*Ophiosphaerella agrostis*
Dollar spot	*Clarireedia* is new genus *Clarireedia homeocarpa* on *Festuca rubra,* UK only

	Clarireedia bennettii on mostly cool season grasses, UK, Netherlands, USA *Clarireedia monteithiana* on Warm-season grasses; found worldwide *Clarireedia jacksonii* on cool-season grasses; found worldwide
Drechslera leaf spots and melting-out	multiple *Drechslera* and *Marielliottia sp.*
Endophytic fungi	*Neotyphodium coenophialum, N. lolii, Epichloe typhina*
Fairy ring	Species of Agraricales and Gastromycetales, mostly in the genera *Agaricus, Calvatia, Chlorophyllum, Clitocybe, Lepiota, Lycoperdon, Marasmius, Scleroderma*, and *Tricholoma*.
Flag smut	*Urocystis agropyri*
Gray leaf spot	*Pyricularia grisea*
Gray snow mold	*Typhula incarnata*
Leaf and sheath spot	*Waitea circinata var. zeae, W. circinata var. oryzae*
Leaf rust	*Puccinia brachypodii*
Leptosphaerulina leaf blight	*Leptosphaerulina trifolii*
Mastigosporium leaf spot (leaf fleck)	*Mastigosporium rubricosum*
Microdochium patch	*Microdochium nivale*
Necrotic ring spot	*Ophiosphaerella korrae*
Phyllosticta leaf blight	Multiple species of *Phyllosticta* and *Guignardia*
Physoderma leaf spot and leaf streak	*Physoderma graminis*
Pink patch and cream leaf blight	*Limonomyces roseipellis*
Pink snow mold	See Microdochium patch
Powdery mildew	*Blumeria graminis*
Pythium foliar blight	*Pythium aphanidermatum*, *P. graminicola*, *P. ultimum, Several other Pythium species*
Pythium root and crown rot	*Pythium aristosporum*, *P. arrhenomanes*, *Pythium volutum, several other Pythium species*
Pythium root dysfunction:	*Pythium volutum*, *P. arrhenomanes*, *P. aristosporum, several other Pythium species*
Rapid blight	*Labyrinthula terrestris*
Red thread	*Laetisaria fuciformis*
Root decline of warm-season grasses	*Gaeumannomyces graminis* var. *graminis, Magnaporthiopsis incrustans, G. wongoonoo*
Septoria leaf spot	several *Septoria* species
Snow scald	*Sclerotinia borealis*
Southern blight	*Athelia rolfsii*
Speckled snow mold	*Typhula ishikariensis*

Spring dead spot	*Ophiosphaerella narmari, O. korrae, O. herpotricha*
Stem rust	*Puccinia graminis*
Stripe rust	*Puccinia striiformis*
Stripe smut	*Ustilago striiformis*
Summer patch	*Magnaporthiopsis poae*
Take-all patch	*Gaeumannomyces graminis*
Tar spot	*Phyllachora* spp.
Thatch collapse	*Sphaerobollus stellatus*
Yellow patch	*Rhizoctonia cerealis*
Yellow tuft	*Sclerophthora macrospora* .
Yellow ring	*Trechispora alnicola*

Nematodes, Parasitic

Awl**:** *Dolichodorus* spp. Cobb
Cyst**:** *Heterodera* spp. Schmidt
Dagger**:** *Xiphinema* spp. Cobb
Lance**:** *Hoplolaimus* spp. Daday
Lesion**:** *Pratylenchus* spp. Filipjev
Needle**:** *Longidorus* spp. (Micoletzky) Thorne & Swanger
Pin**:** Paratylenchus spp.
Pseudo-root knot**:** *Hypsoperine* spp. Sledge & Golden
Ring**:** Criconemella, Criconemoides, *Macroposthonia,* and *Mesocriconema* spp.
Root gall**:** *Subanguina* spp.
Root knot**:** *Meloidogyne* spp. Goeldi
Sheath**:** *Hemicycliophora* spp.
Sheathoid**:** *Hemicriconemoides* spp.
Spiral**:** *Helicotylenchus* spp. Steiner
Sting**:** *Belonolaimus* spp. Steiner
Stubby root**:** *Paratrichodorus* and *Trichodorus* spp.

Stylet or stunt**:** *Tylenchorhynchus* spp. Cobb

Miscellaneous Diseases or Disorders

Black Layer**:** A
Anaerobic soil plus blue-green algae and/or sulfate-reducing bacteria
Slime Molds (superficial, not pathogenic)**:**
Mucilago crustacea
: *Didymium squamulosum*
: *Physarum cinereum*.
: Species of *Physarum* and *Fuligo*

Addendum 4:

Insects

annual bluegrass weevil

billbugs

- bluegrass billbug
- hunting billbug

black turfgrass ataenius

chinchbugs

- hairy chinchbug
- southern chinchbug

craneflies

- European cranefly *(Tipula paludosa)*
- "common" cranefly *(Tipula oleraceae)*

Caterpillars and adults

- armyworm
- black cutworm
- fall armyworm
- winter cutworm

mole crickets

- southern mole cricket
- tawny mole cricket

red imported fire ant

turfgrass ant

white grubs

- Asiatic garden beetle
- European chafer
- Japanese beetle
- masked chafer (southern)
- masked chafer (northern)
- oriental beetle

Wasps

- Scoliid
- Cicada Killers
- yellow jacket
- Paper wasp

Beneficials

Honey bees

Assassin bugs

Ground beetle

Lacewing

Praying Mantis

Addendum 5

Professional Golf Maintenance

JOHN DEERE GOLF

Golf Cut Quality Guide

Environment

- Season
- Temperature
- Humidity
- Irrigation
- Fertilization

Cutting Unit

- Cutting Height
- Rollers & Roller Settings
- Blades & Blade Sharpness
- Reel Aggressiveness
- Cutting Unit Accessories

Turf and Condition

- Grass Type
- Soil Type
- Aeration
- Pathogens
- Location
- Traffic

Mower

- Operator Actions
- Mow Speed
- Mowing Patterns
- Compaction / Tires
- Equipment Condition

Table of Contents

NOTE:

This booklet contains color illustrations of undesirable grass cutting outcomes.

- The condition shown on these illustrations may be exaggerated in order to better show the specific cut quality issue under discussion
- The issues you find in the field may appear differently than illustrations shown here. The abnormality may be less dramatic. There may be more than one cause for the undesirable grass cutting outcome
- These outcomes are not specific to John Deere mowing machines. All machines that use a reel to cut grass can create undesirable outcomes

1. **When addressing cut quality issues it is <u>imperative</u> that turf conditions be considered first.**
   - A machine can only work with what it is given. Precision mowing machinery, when properly tuned, may be able to improve after cut appearances, but will not be able to correct all issues
   - A machine can only assist in improving turf conditions when proper maintenance practices are employed
   - Some cut quality issues cannot be avoided due to environmental (humidity, wind, temperature, and sun), agronomic (grass type, season, pathogens), and soil conditions (fertilization, soil type, location, traffic)

2. **Items to check on cutting units**
   - Reels sharpened to factory recommendations with the land on each blade edge equal to 1 mm (0.040 inches) and relief set to 20 degrees
   - Bedknife angles at factory recommendations – top angle 6 degrees, front angle 15 degrees for greens mowers and 5 degrees for tees, trim and surround, fairways, and approaches
   - Clearance between bedknife and reel – 0.025 mm (0.001 inches) for greens and 0.051 mm (0.002 inches) for fairways, trim and surrounds, tees, and approaches
   - Top shields adjusted so the spacing between the top shield and the reel is no more than 1.5 mm (0.06 inches)
   - Both reel and bedknife are sharp
   - Reel diameter and bearings – Reel is not cone shaped and the bearings are not excessively worn
   - Bench (work table) Height Of Cut (BHOC) has been set to compensate for cutting unit weight (including attachments) and conditions to achieve desired or Effective (actual) Height Of Cut (EHOC)
   - Rollers are the correct type and in good condition
   - Front roller brackets on all cutting units are in the same range number for the desired height of cut, and not bent or broken
   - Bedknife selection is correct application for the desired height of cut
   - When converting to John Deere cutting units, you can expect to need a greater difference between Bench (work table)Height of Cut (BHOC) setting and Effective Height of Cut setting in order to achieve the desired Effective (actual) Height of Cut of grass on the golf course

3. **Items to check on mower and operator**
   - Tire pressures are set factory recommendations
   - Mow speed is set correctly to factory recommendations
   - Hybrid and hydraulic reel drive systems are working properly and all the cutting units are running properly
   - All vehicle electrical systems are functioning correctly
   - Operator is properly trained for this piece of equipment

4. **Cutting Unit Definitions**

   Frequency of Clip - is the forward distance traveled between consecutive cuts

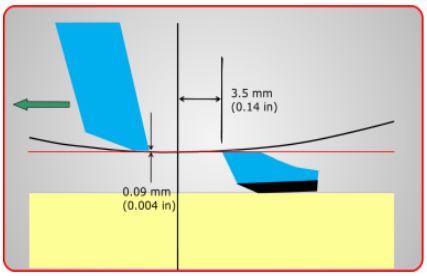
   Bedknife attitude – "non-aggressive versus aggressive"

   - The distance between the front edge of the bedknife (cut point) and the center line of the reel determines the attitude of the bedknife

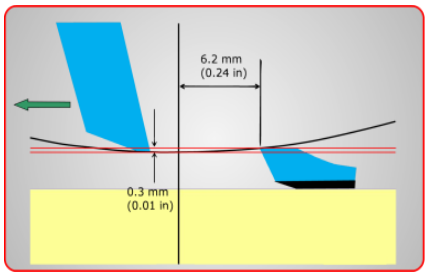
4. Cutting Unit Definitions (continued)

Bedknife attitude – "non-aggressive versus aggressive"

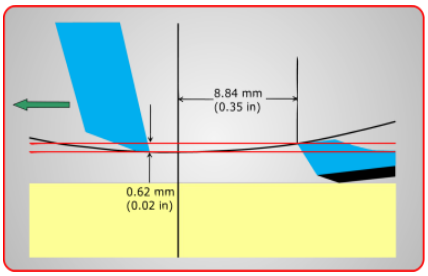
- As the reel turns in the cutting unit the reel blades actually go below the front edge of the bedknife (cut point). This is how the reel gathers the grass to be cut. If the bedknife edge was directly under the center point of the reel the reel blades would not gather the grass and the cutting unit would have a poor cut quality and be non-aggressive
- The closer the bedknife is to the center of the reel the less aggressive the cut. Meaning the reel blades are not going as far below the cut point
- The further back the bedknife is moved from the center of the reel the more aggressive the cut. Meaning the reel blades are going further below the cut point



Less Aggressive



More Aggressive



Most Aggressive

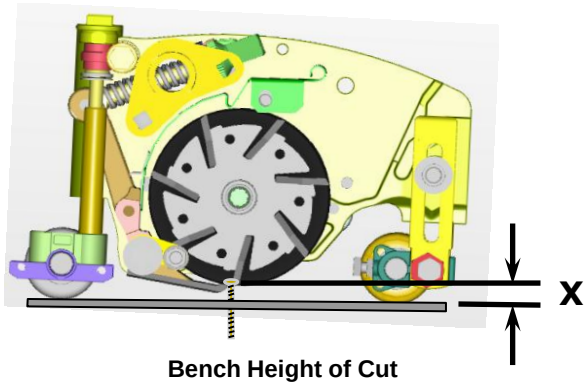
Bench Setting Height of Cut

"Bench Height of Cut" or "BHOC" is the distance between the top of the bedknife (the cutting edge for the grass) and the bottom of the rollers (the suspension of the cutting unit). Bench Setting is done statically in the shop and typically does NOT take into account the conditions in which the reels will be cutting. Bench setting is necessary to make sure that all cutting units on a machine or cutting units mowing in a specific turf condition are set at the same height.

Effective Height of Cut

The "Effective Height of Cut" or "EHOC" is the actual height of the grass plant after it has been cut. It is never the same as "Bench Height of Cut." Effective Height of Cut is measured using a calibrated prism gauge.

Bench Height of Cut will almost always be greater than Effective Height of Cut because of the weight of the cutting unit on turf as it is readied to mow. Factors that affect Effective Height of Cut at any given bench Height Of Cut are, the weight of the reel AND ATTACHMENTS, aggressiveness, soil conditions, surface contact of the rollers, grass and environment conditions, cutting unit attaching points, and possibly the amount of grass in grass catchers



Bench Height of Cut

Effective Height of Cut

5. Impact of Cutting Unit on Individual Grass Blades *

- Clean Cut (Fig. A)
- Properly adjusted and maintained cutting units and machine
- Sharp reel and bedknife

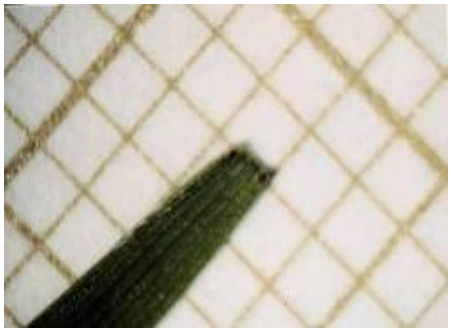


Fig. A

- Frequency of Clip (FOC) is set incorrectly (Fig. B)
  - Low number (distance traveled between cuts is too close), so it is making many cuts in a short distance traveled. This turns the grass blade tips brown because it is stripping the chlorophyll out of the tip of the grass blades because the reel blades are hitting the grass multiple times after it has been cut
- Adjust frequency of clip by reducing reel speed or increase travel speed

Fig. B

- (Fig. C)
- Reel or bedknife dull
- Misadjusted cutting unit
- Excessive reel to bedknife clearance
- Susceptible to diseases

Fig. C

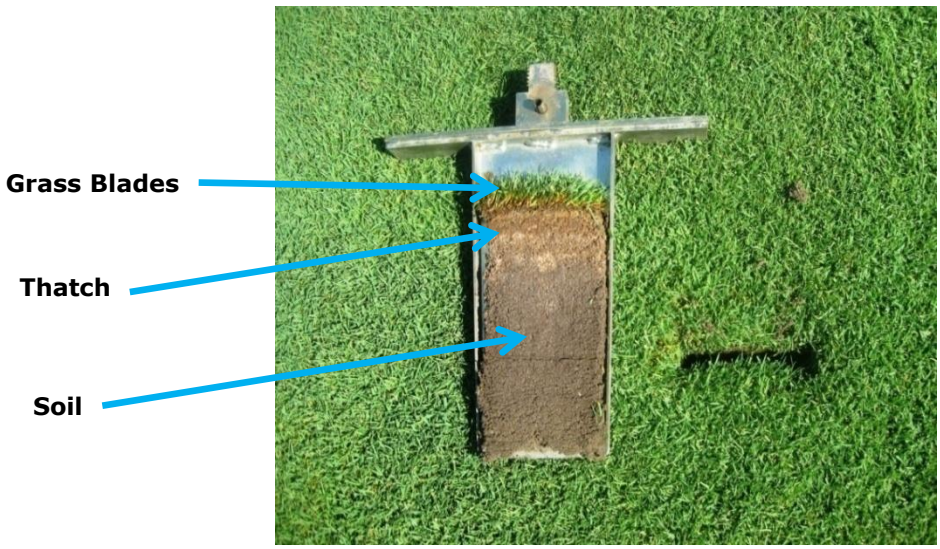
**** Photos courtesy of Iowa State University***

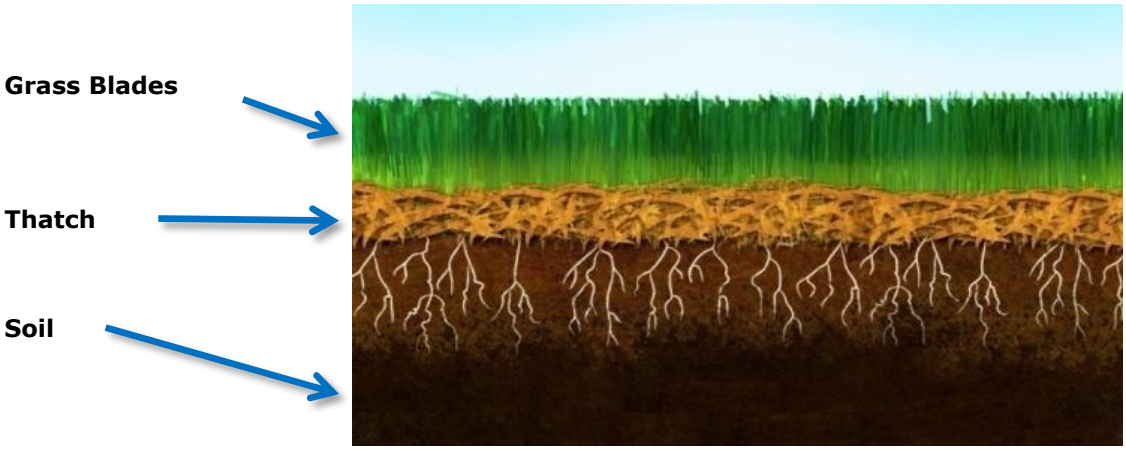
Thatch

Issue:

A tightly intermingled layer of dead and decaying roots, stolons, shoots and stems that develops between the green vegetation and the soil surface.

- Thatch is associated with sponginess, softness, or fluffiness in turf





Thatch

Possible Causes:

- Continuously mowing in the same direction
- Growth of the grass
- Agronomic practices – aeration, verticut, over fertilization
- Poor drainage
- Floating head mower promotes thatch on greens

Possible Solutions:

- Verticut more frequently to remove the thatch build up. Verticut is designed to remove the thatch in the turf and grain from greens
- Aerate more frequently to remove the thatch build up
- Top dress after aeration and in between aerations
- Switch or convert to fixed-head walk-behind greens mowers instead of floating head greens mowers
- Greens Tender Conditioner (GTC), Fairway Tender Conditioner (FTC) installed onto the cutting units
- Depending on conditions some amount of thatch will always be present

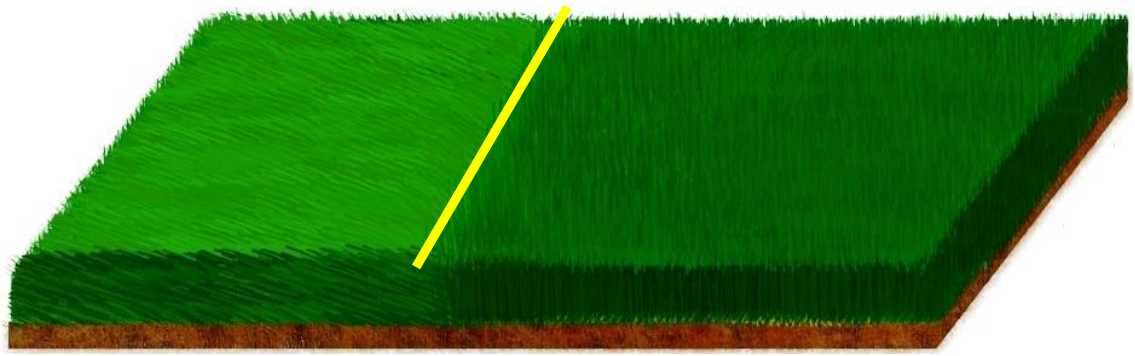
Checklist:

- Pull a soil profile (previous photo) and look for a yellowish organic matter thatch layer
- Does the turf area feel soft, fluff, spongy? Does the turf lack firmness?
- When walking on the green or fairway does it feel very soft underfoot?
- When you press your fingers into the turf does it feel soft?
- Walk a short distance on the turf, then turn around and look at your foot prints. If footprints are still visible where you walked, there is likely thatch present
- Be sure to check several location on the green or fairway before making your conclusions

Grain

Issue:

Grass grows horizontally and follows the water runoff pattern or sunlight.
Grass blades typically lie down in one direction and influence the natural roll of the golf ball.



Grain **Normal**

Mowing Direction

Mowing Direction

Grain **Normal**

Grain

Possible Causes:

- Routinely mowing in the same direction
- Turf density – not consistent
- Solid front roller pushing grass down before cutting
- Environmental conditions – sunlight
- Lack of turf conditioning – grooming, brushing, and verticutting
- Excessive water on turf due to poor drainage or over watering
- Excessive turf fertilization
- Infrequent mowing

Possible Solutions:

- Change mowing pattern daily
- Use Greens Tender Conditioner (GTC) / Fairway Tender Conditioner (FTC) / or Front Rotary Turf Brush cutting unit attachments to help stand the grass up before cutting
- Change the front roller – a heavy duty grooved disc front roller or spiral grooved front roller with spiral end caps helps pull grass up and also reduce thatch buildup
- Verticut – to cut the horizontal growth and promote improved vertical grass growth
- Aerate and top dress – to promote better vertical grass growth
- Increase mowing frequency

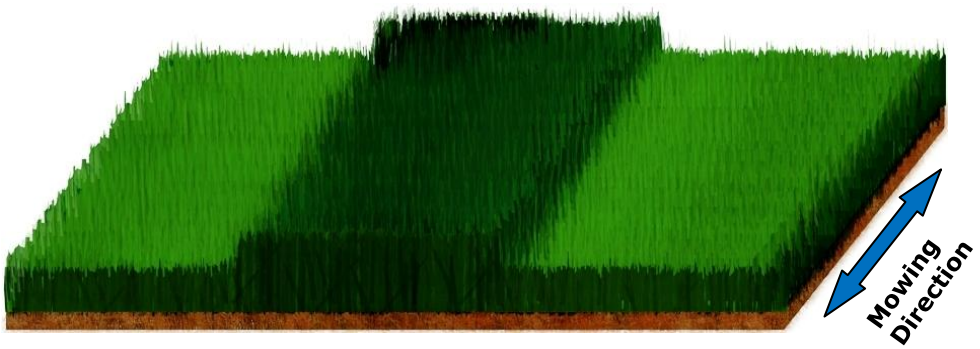
Checklist:

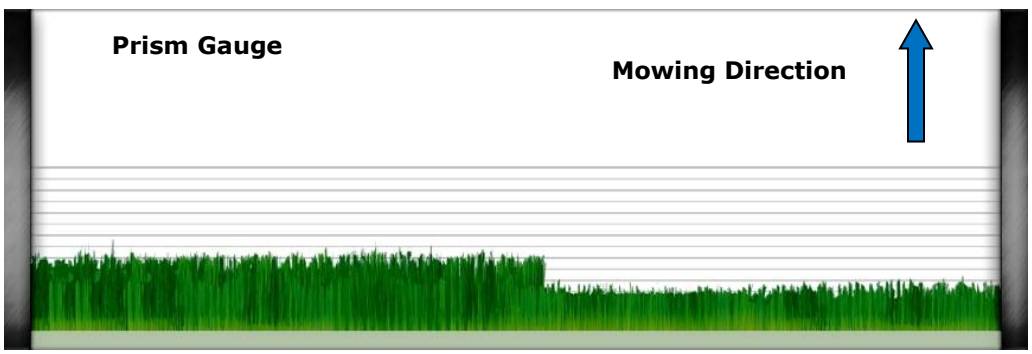
- Run your hand across the grass in several different directions. Use a prism gauge to see if the grass stands up higher when brushed in one direction than the other? Check other areas
- Review mowing practices to determine mowing frequency and direction
- Look at the grass at different angles. Does the color change?
- Look at the terrain in the area – is grass following drainage, heavy runoff, or sunlight?
- Are mowing patterns changed daily?
- Is the front roller contributing to the cause? Should a more aggressive roller be selected?
- Review turf conditioning practices (both current and seasonal)

Uneven Heights of Cut

Issue:

Cutting units are not cutting at the same height of cut





Uneven Heights of Cut

Possible Causes:

- Turf Conditions – thatch build up, if travel speed is too fast in thatch buildup the cutting units cannot stay in the turf and they will want to ride up
- Height of Cut – not set consistently across all cutting units
- Bedknife attitudes – individual reels set at different aggressiveness
- Excessive travel speed during mowing
- On fairway mowers, down pressure pins may be incorrectly installed
- Mower lift arms or pins bent – mower yokes or bushing worn and sloppy
- Bedknife to reel cutting units – the reels do not have similar wear

Possible Solutions:

- Make sure all cutting units are set to the exact same height of cut on a bench (work table)
- If symptom occurs on a fairway mower, verify that all of the down pressure pins are either installed or removed in all the hydraulic cylinders throughout the machine
- Make sure front roller brackets on all cutting units are set in the same range number and that all bedknife attitudes are similar between reels
- Clearance between the reel and bedknife is the same on all the cutting units
- Make sure all of the reels on the machine are the same diameter. If just one reel was replaced in a set, the newer reel will be more aggressive than the worn reels on the same machine
- If uneven heights of cut symptom is intermittent, reduce travel speed or vary mowing direction
- Verticut to remove thatch
- Top dress to fill in low areas so cutting units better follow turf contours
- Verify that the lift arms, yokes, pins, and bushings are at factory recommendations and secure without excessive movement or wear

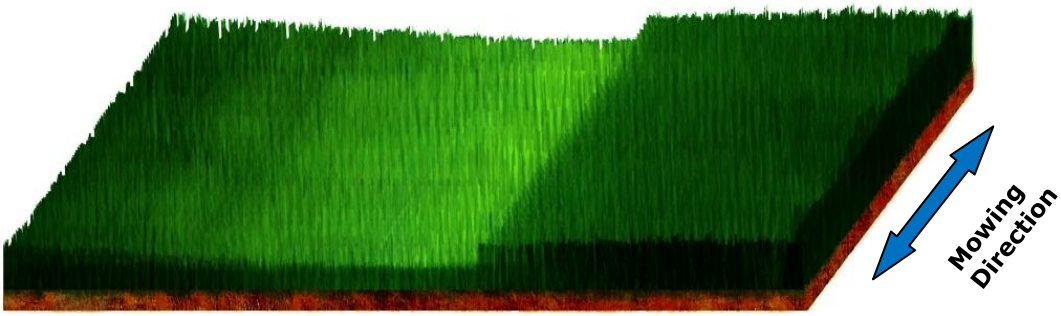
Checklist:

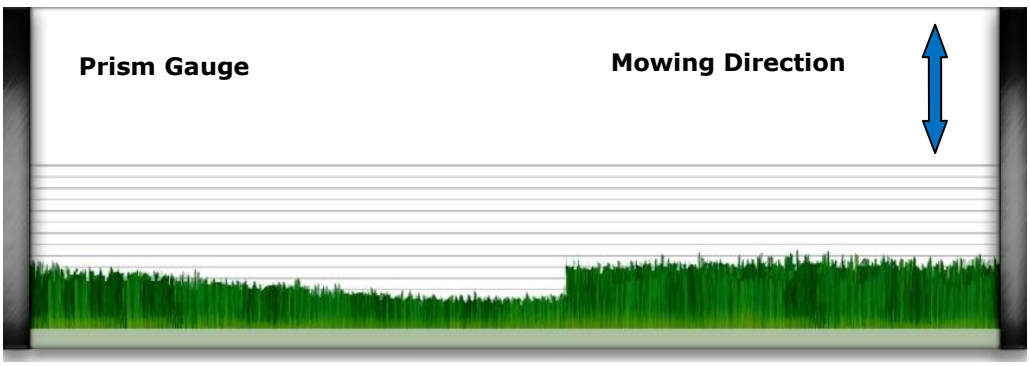
- Use a prism gauge to check to see if the heights of cut for different cutting units are the same or different. Check across cutting unit overlap to see if difference is detected
- If heights of cut are different (above) use a gauge bar or dial indicator to verify that all cutting units are set to the same height. Re-set all to same height of cut
- Make sure reel and bedknife are set to the factory recommendations (see page 3)
- Are all the front roller brackets on all of the cutting units set to the same range number? Are any of the front roller brackets bent or damaged?
- Was one or more of the reels in this set recently replaced?
- Has the travel speed or mowing pattern been changed recently?
- Do parts of the affected turf feel soft and spongy? May indicate the presence of thatch buildup. Take soil profile
- If using grass catchers, do symptoms occur only when baskets are full? As they are filling up? Empty?
- Check machine for bent or worn parts: lift arms, yokes, bushings, and pins. Anything loose?

Step Cut

Issue:

One side of the reel is cutting at a different height than the other side.





Step Cut

Possible Causes:

- Terrain – topography of the mowing area. If mowing on a slope the shifting weight of the cutting unit may cause step cutting, undulations, contours. Is it continuous or in spots.
- Height of Cut set improperly – could be different from one side of cutting unit to the other side
- Cutting unit not paralleled – rollers and bedknife may not be in parallel
- Worn roller or reel bearings – replace if necessary
- Uneven turf density – when cutting unit encounters soft or spongy turf it tends to cut lower
- Cutting unit pivot points restricted – not allowing cutting unit to float over grass or follow terrain
- Inability of cutting units to articulate during turns – causing cutting unit to dig into grass
- Clearance between the reel and bedknife is not consistent across the full width of the cutting unit
- The reel is cone shaped due to wear – causing it to cut better on one side than the other

Possible Solutions:

- Set all cutting units to the exact same height of cut on a bench (work table), checking both sides of the cutting unit to be sure all are equal height
- Parallel front and rear rollers with bedknives
- Replace any worn or loose bearing or bushings on reel or rollers
- Grind cone shape out of worn reels
- Remove any restrictions in cutting unit attachment system. Grease yoke ball joint
- Set clearance between the reel and bedknife the same on all the cutting units
- Top dress to eliminate low spots if the cutting units are step cutting in intermittent areas
- Review mowing practices to reduce the amount of side cutting on slopes

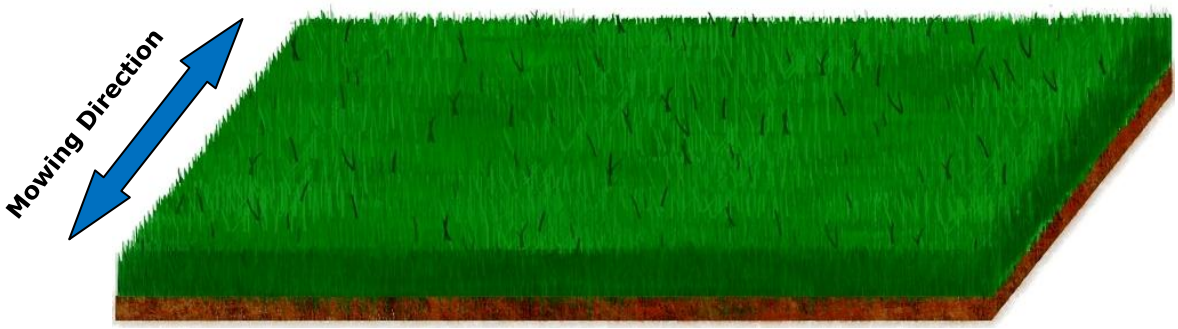
Checklist:

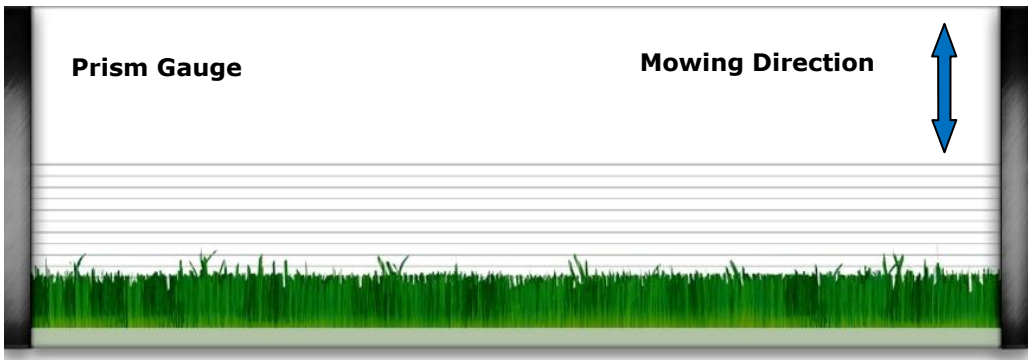
- Use a prism gauge to check to see if the heights of cut for different cutting units are the same or different. Check across cutting unit overlap to see if difference is detected
- Check to be sure the front roller is parallel to the bedknife and the all the rollers are on the same range number for the desired height of cut, and that none of the brackets are bent or damaged
- Check height of cut on each cutting unit with a gauge bar or dial indicator to verify that all cutting units are set at the same height. Check each side of the cutting unit to be sure both sides are same height
- Is the reel and bedknife set to the factory recommendations (see page 3)?
- Investigate mowing practices. Does the step cut occur just in low areas, where turf is wet, in machine tire tracks or mower grooves? Is the right machine being used?
- Investigate cultural practices if turf appears soft and spongy

Stragglers

Issue:

Leaves uncut blades of grass.





Stragglers

Possible Causes:

- Dull reel and/or bedknife
- Clearance between reel and bedknife is excessive or inconsistent
- Turf is mowed consistently in the same direction
- Trying to remove too much grass at one time
- Not enough reel to bedknife attitude – not aggressive enough for turf type and conditions
- Incorrect number of blades on the cutting unit for the desired Effective Height of Cut (EHOC)
- Mowing in the direction of grain in turf
- Not enough front angle ground into bedknife

Possible Solutions:

- Perform maintenance grind to sharpen reel and bedknife (see page 3)
- Backlap reels after grinding to remove burrs which wear away quickly
- Increased care in setting reel to bedknife clearances to factory specifications (see page 3). Use appropriately sized metal gauge strip to set clearance. Make sure clearance is the same for all cutting units in the set
- Change the front roller position on the cutting unit to provide a more aggressive bedknife position
- Change mowing direction daily
- Increase mowing frequency. If weather does not permit, you may need to raise the height of cut on the cutting units and then successively lower it until the desired height of cut is achieved
- Use reels with appropriate number of blades for the desired height of cut

Checklist:

- Use a prism gauge to determine if stragglers are present (see illustration). Check path of each cutting unit to see if issue is common to all cutting unit in set or just one or two cutting units in set
- Inspect reel and bedknife for sharpness. When was the last time ground or backlapped?
- Inspect reel and bedknife for proper grind angles (see page 3)
- Measure clearance between reel and bedknife. Is clearance at factory specification (see page 3)
- Identify front roller bracket position. Determine workshop height of cut using gauge bar or dial indicator. Reference cutting unit set up charts to determine if cutting unit has an appropriate attitude or aggressiveness for desired height and cutting conditions
- Look at front roller type. A smooth front roller will generate the most amount of stragglers, a grooved front roller less stragglers, and a spiral front roller the least amount of stragglers. Area to be mowed (greens, fairways, roughs), Height Of Cut, and type of grass are also important considerations when selecting front rollers
- Ask about mowing practices. Are patterns changed daily? Has the presence of stragglers been caused because too much grass must be removed at one cutting?
- Grass type will make difference in the prevalence of stragglers – cool season grasses tend to lay over more and do not stand up as well as warm season grasses
- Height of cut will make a difference in the prevalence of stragglers – higher Heights Of Cut generate more stragglers than lower Heights Of Cut

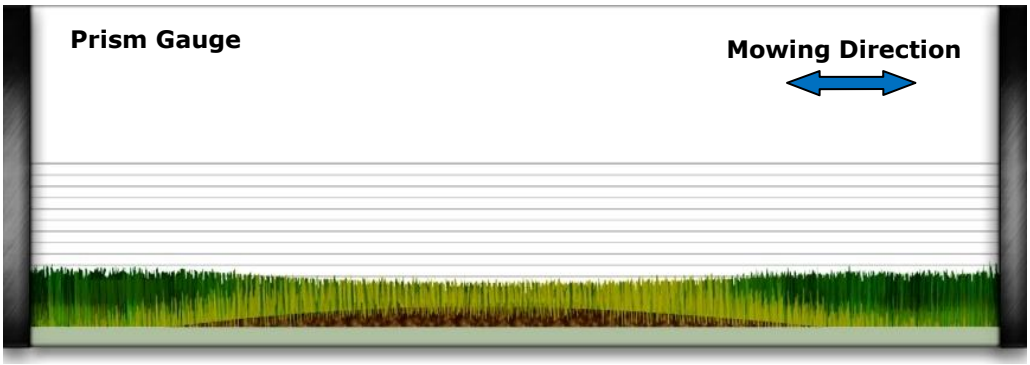
Scalping

Issue:

Height of cut is set too low for turf conditions/terrain.

- Cutting off too much grass at one time exposing the lower leaves of the grass plant

Mowing Direction



Scalping

Possible Causes:

- Not taking into consideration turf conditions and weight of the cutting unit including attachments when setting Bench Height of Cut (BHOC) to achieve a desired Effective Height of Cut (EHOC)
- Incorrect bedknife selection – bedknife may be dragging the turf
- Turf conditions – uneven turf that the mower is not capable of mowing or excessively soft turf that will not support cutting units evenly
- Front roller brackets on one or more of the cutting units is in a different range setting than the other cutting units, causing the Bedknife attitudes or aggressiveness not to be the same. The more aggressive cutting unit will cut deeper into the turf than the other units
- Mowing into the grain after grain is well established
- For Quick Adjust 5 Reels, the bedknife cam (eccentric) has not been placed in the proper position after the reel has been worn or ground to a smaller diameter, causing the reels to be very aggressive, or the reels do not have similar wear

Possible Solutions:

- Raise the Bench (work table) setting for Height Of Cut (BHOC) and the Effective (actual) Height Of Cut (EHOC)
- Increase Bench (work table) Height Of Cut (BHOC) settings if attachments such as groomers are added to the cutting unit. Increase Bench (work table) Height Of Cut settings if more aggressive front rollers are installed
- Change management practices to verticut and aerate more frequency to reduce thatch build-up
- Adjust front roller setting and rear roller to provide a less aggressive bedknife attitude. See cutting unit set-up charts
- Install the correct bedknife based on the desired height of cut
- Top dress to fill in the areas that are causing the intermittent scalping
- Increase mowing frequency
- Change mowing direction to avoid gouging or bottoming of the reels over uneven terrain and to reduce grain
- Make sure all reels within the cutting unit set are the same diameter
- Newer reels will be more aggressive versus worn reels

Checklist:

- Check Bench (work table) Height Of Cut (BHOC) settings against Effective (actual) Height Of Cut (EHOC) settings for each cutting unit. Make sure all cutting units are set up the same
- Check to be sure that the correct bedknife is being used based on the desired height of cut
- Check the front rollers of each cutting unit to be sure the brackets are in the same position and that brackets are not bent or damaged
- Check to see if a reel on one or more of the cutting units has recently been replaced
- Investigate the turf area. Is grain present? Is thatch present? (guidelines in previous section)
- Investigate mowing practices and machines assigned to this specific mowing task
- Try to determine when and where scalping occurs. Is it greens, fairways, contours, high or low spots, soft areas, every pass or every other pass, random or isolated?

Overlap Marks

Issue:

Overlap occurs in two ways.

Roller overlap - rollers on one cutting unit overlap rollers from the adjacent cutting unit, rolling grass four times (front and rear rollers) in that area.

- Roller overlap marks are usually 7.62 cm (3 inches). These marks, usually darker than nearby turf, will disappear throughout the day because the grass stands back up

Reel overlap – reels from one cutting unit overlap the reels from the adjacent cutting unit cutting the grass twice at the overlap area instead of once.

- Reel overlap marks are usually 5.08 cm (2 inches). These marks, usually lighter than the nearby turf, do not disappear throughout the day and may stay visible for some time

Some reel and roller overlap is normal. However in some conditions this overlap mark can produce an undesirable result.

Roller Overlap Marks

Reel Overlap Marks

Roller Overlap Mark

Reel Overlap Mark

Overlap Marks

Possible Causes:

- Turf and mower conditions that can cause pronounced roller overlap striping:
  - High growth lush grass due to heavy fertilization, moisture, or season
    - Cool season grass vigorous growth in spring and decreasing in the summer
    - Warm season grass vigorous growth in the summer months and slower growths in the spring and fall
  - Less aggressive roller systems
- Turf and mower conditions that can cause pronounced reel overlap striping:
  - Grass is stressed due to high heat or lack of moisture
  - Grass is stressed because Effective (actual) Height Of Cut (EHOC) is too low
- Frequency Of Clip (FOC) is too low (distance between cuts too close) for grass conditions
- Effective (actual) Height Of Cut (EHOC) is too low for grass and weather conditions
- Bedknife attitude is too aggressive for cutting height and grass conditions
- Operator is mowing to the adjacent strip with too much overlap of outside cutting units
- Too much reel to bedknife contact, or reel and/or bedknife are dull

Possible Solutions:

Roller Overlap Marks:

- If using Quick Adjust 5 Cutting Units, switch to MTSpiral rollers
- Change to grooved or spiral front rollers
- Consider reducing current fertilization and irrigation applications

Reel Overlap Marks:

- Increase Frequency Of Clip (FOC) (distance between consecutive reel cuts) so grass tips are not being impacted less by reel blade during cutting operation
- Reduce bedknife attitude or aggressiveness
- Increase Effective (actual) Height Of Cut (EHOC) to allow improved recovery of grass
- Assure that cutting units are set up according to factory recommendations (see page 3) and that reel and bedknife surfaces are sharp

Checklist:

- Use a prism gauge to verify that Effective (actual) Height Of Cut (EHOC) is the same in marked area, and appearance marks are not due to difference in height of grass.
- Closely investigate grass condition in the overlap area
  - Roller Overlap Marks
    - Usually about a 7.6 to 8.9 cm (3 to 4 inch) wide stripe
    - Generally dark green high growth
    - Almost always disappear during the day following cutting
  - Reel Overlap Marks
    - Usually about a 5.0 to 7.6 cm (2 to 3 inch) wide stripe
    - Generally very stressed grass with white/yellow/brown grass tips
    - Almost always takes grass some time to recover

Overlap Marks

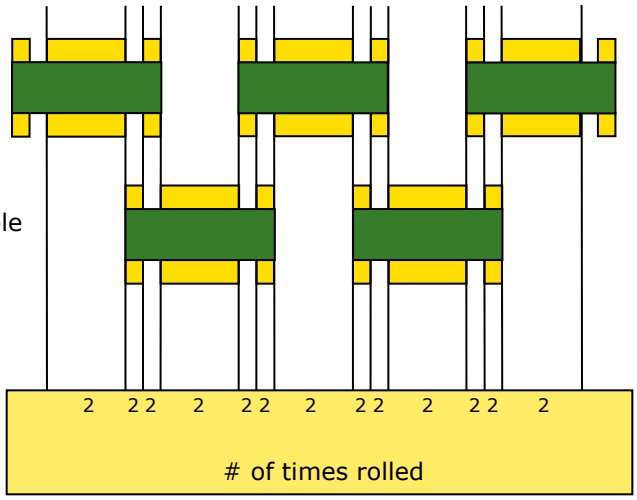
Checklist:

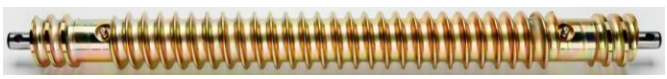
- Operate the mower over the same area without the reels engaged. If overlap marks still occur, it is roller overlap
- Determine Frequency Of Clip (FOC). Frequency Of Clip (FOC) can be calculated using vehicle speed, size and number of blades on reel, and reel speed. Is Frequency Of Clip (FOC) appropriate for actual Height Of Cut and grass conditions?
- If reel overlap marks are noticed, is operator driving machine too slow or slowing down where marks are prevalent? Is operator trained to maintain only amount of reel overlap required?
- Use a prism gauge on affected area. There should be no difference in height of cut in marked area, only a difference in field appearance
- Check front roller bracket position to determine if reel is too aggressive for desired cutting height and grass conditions. Review cutting unit set-up chart and set to a less aggressive position to see if overlap marking is reduced

MTSpiral Rollers for Quick Adjust 5 Cutting Units

The MTSpiral roller option provides a unique solution to minimize roller overlap marks. The material at the ends of the roller is machined down to a slightly smaller diameter, allowing the ends of the rear cutting unit rollers to roll through the open space of the from cutting unit rollers.

This design is only available in the 50.8 mm (2 inch) machine spiral configuration at this time. It is available to fit both 45.7 mm (18 inch) and 55.9 (22 inch) cutting units To be effective these rollers should be installed in both front and rear roller positions. Since these are grooved rollers, they will tend to engage the turf more, and will require a slightly higher Bench (work table) Height Of Cut (BHOC) setting to achieve the same Effective (actual) Height Of Cut (EHOC).





Roller Overlap Marks - Bentgrass fairway

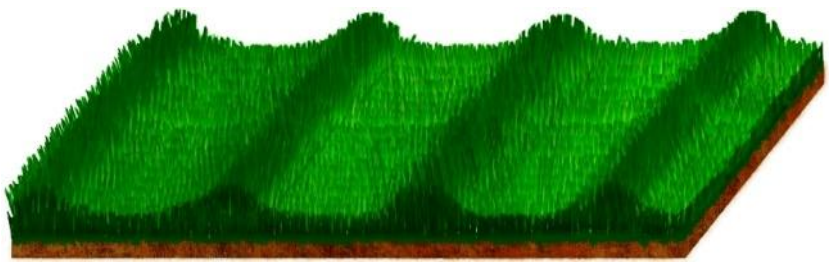
Reduction of Overlap Marks - Bentgrass fairway

Reduction of Overlap Marks - Paspalum fairway

Cutting Unit Hop

Issue:

The travel speed is too fast for the terrain/turf conditions, causing the cutting unit to bounce which creates a wavy effect. The rear roller is coming off the ground instead of staying on the turf which creates the wavy appearance (note this effect is different than marcelling).



Mowing Direction

Approximate Waves 15 – 20 cm (6 – 8 inches)

Cutting Unit Hop

Possible Causes:

- Mow speed is too fast
- Inadequate down pressure on cutting units
- Cutting units pulling too much from front
- Grass buildup on rear roller
- Bent roller shaft or worn out roller bearings
- Improper bedknife selection for cutting height – bedknife drags turf
- Very soft turf conditions allowing front roller to dig in
- Rough terrain

Possible Solutions:

- Reduce travel speed during mowing, particularly on rough terrain
- Increase cutting unit down pressure
  - – Install standard down pressure pins on John Deere fairways
  - – Optional hydraulic down pressure kit on John Deere fairways
  - – Rear attaching point yokes and lift arms for John Deere triplex mowers
- Repair and replace rollers and bearings as needed
- Install scrapers or power brushes on rear rollers to reduce grass buildup on rear roller particularly when mowing wet grass
- Install the correct bedknife selection based on the desired height of cut
- Verticut and aerate to reduce thatch and improve turf density

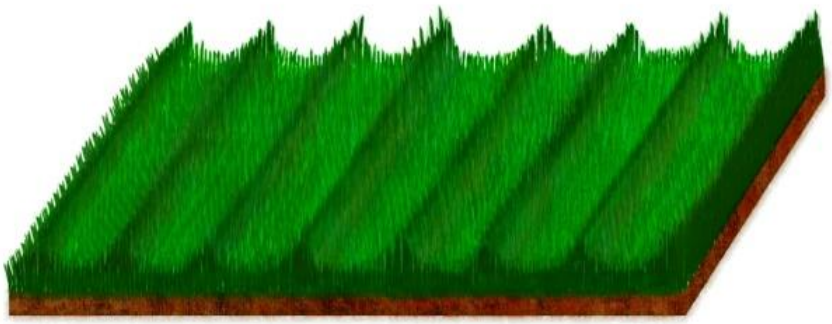
Checklist:

- Look for a wave pattern in the grass following the direction of mowing. Waves likely 15 – 20 cm (6 – 8 inches) apart
- For John Deere fairway mowers, check to see that down pressure pins have been installed in lift arms
- Check that cutting unit yokes are securely attached and functioning properly
- Check rear roller for grass buildup. Determine if scrapers or power brush attachment is required
- Check rollers for bearings and shaft condition
- Determine if bedknife is dragging on the turf. Determine if bedknife is appropriate for cutting height
- Ask that operator reduce mow speed by 20% and make several passes. Do cutting units still hop?
- Examine turf conditions. Is excessive thatch present?

Marcelling

Issue:

Visual rippling or wave effect in the turf grass.



Mowing Direction

Wave pattern 5 cm (2 inches) or less

Possible Causes:

- Frequency of clip (FOC) is too high (distance between cuts is too great) – either the travel speed is too fast or the reel speed is too slow
- Incorrect reels (blade count is too low) selected for the desired Height of Cut (HOC)

Marcelling

Possible Solutions:

- Adjust the mow speed stop to reduce travel speed during mowing operation
- Increase reel speed – if already at the fastest setting then mow speed must be reduced
- Select reels with the correct number of blades on the cutting units for desired Effective (actual) Height Of Cut (EHOC) – fewer blades are needed for higher heights of cut

Checklist:

- Visually inspect turf for a wave pattern of 5 cm or less (2 inches or less)
- Check to be sure that reel speed control know is at highest setting. Reel speed is often reduced during backlapping operations. Operator must remember to turn setting back to original mow position
- Check to see that mow speed has been set appropriately
- Determine that reel blade count is appropriate for desired Effective (actual) Height Of Cut (EHOC) setting
- If reel speed still seems to be insufficient, investigate the following possibilities:
  - Hydraulic pump or reel motor may be failing or inefficient
  - Excessive contact between reel and bedknife may be slowing reel speed
  - Cutting too much grass causing reel motors to go into relief

Clipping Dispersal

Issue:

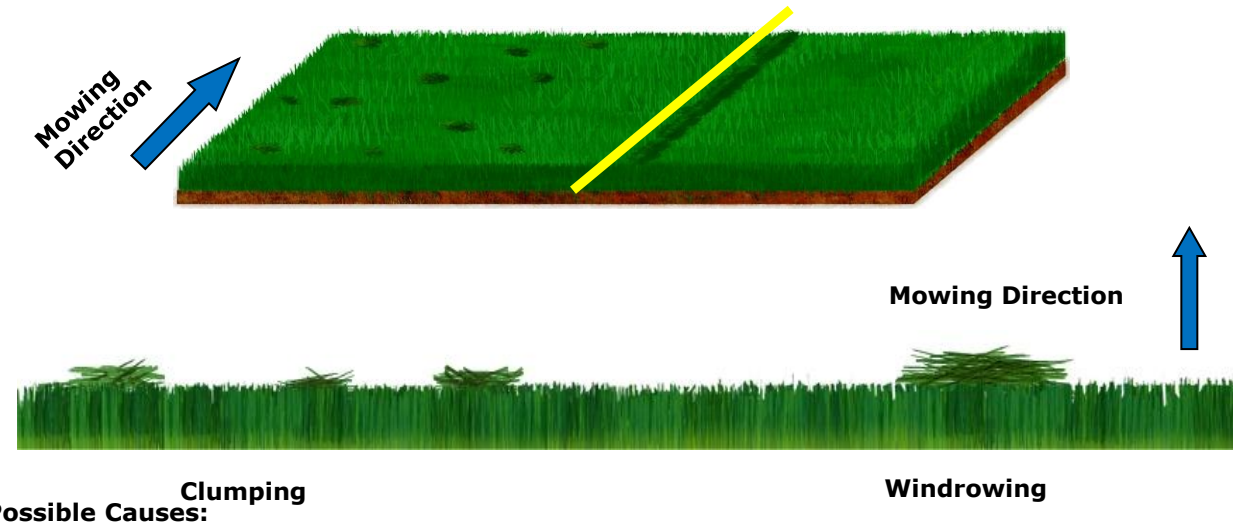
Grass clippings that are being ejected from the cutting unit are not being evenly dispersed.

- **Clumping** – Clippings are deposited in small clumps on the area being cut
- **Windrowing** – Clippings are deposited in a row on the left side of the cutting unit

Clumping

Windrowing

Clipping Dispersal



Possible Causes:

- Moisture on the grass from dew, irrigation, or rain
- An excessive amount of grass is being removed
  - Season rapid growth
  - High fertilization and irrigation
  - Delayed mowing due to weather conditions
- Cutting unit top shield not adjusted properly
- Shield extensions not removed from Quick Adjust 5 Cutting Units during wet mowing conditions
- Build up of grass on rear roller

Clumping and windrowing are primarily factors of the amount of grass being cut. Removing an excessive amount of grass can adversely affect clipping dispersal.

Possible Solutions:

- Properly adjust cutting unit top shields (see page 3 and Operators Manual)
- Adjust mowing practices
  - Increase mowing frequency
  - Remove proper amount of grass – 1/3 of the grass plant or less
  - Start at higher cutting height, then move down
  - Whenever possible mow which conditions are drier
  - Irrigate before mowing to remove dew that is present
  - Reduce travel speed during mowing
- Make appropriate cutting unit adjustments
  - Remove shield extension on Quick Adjust 5 Cutting Units
  - Open rear grass deflectors on Quick Adjust 7 Cutting Units
  - Reduce down pressure on cutting units (remove down pressure pins on John Deere fairway mowers)

Clipping Dispersal

- Add specialized cutting unit attachments
  - Install rear roller power brush keep roller from clogging and spin away clippings
  - Install Greens Tender Conditioners (GTC) / Fairway Tender Conditioners (FTC) to help break up clumps that may form during mowing
  - Install grass catchers to collect clippings
- Utilize other methods to mitigate clippings
  - Use a powered blower to remove dew or disperse grass clippings
  - Use a drag mat to remove dew or to break apart the clumps

Checklist:

- Determine uncut grass height and set Effective (actual) Height Of Cut (EHOC) so no more than 1/3 of grass plant is cut during mowing session. If this does not achieve desired Effective (actual) Height Of Cut (EHOC), then multiple cuts may be required.
- Check that top shields of cutting units are adjusted to factory specifications (see page 3). Make sure the shield extension is removed on Quick Adjust 5 Cutting Units mowing in wet grass, and that the rear grass deflector is open on Quick Adjust 7 Cutting Units.
- Review mowing practices to determine if mowing frequency can be increased
- Try to determine where and when clipping dispersal issues occur. Is it just in early morning mowing? Low lying areas? Fairways? Just after irrigation?
- Some varieties of grass tend to clump more than others during the cutting process. From worst to best: ryegrass, bentgrass, fescue, bluegrass, hybrid bermuda, zoysia, bermuda , paspalum.
- Suggest the installation of cutting unit accessories such as rear roller power brush, greens tender conditioner or fairway tender conditioner

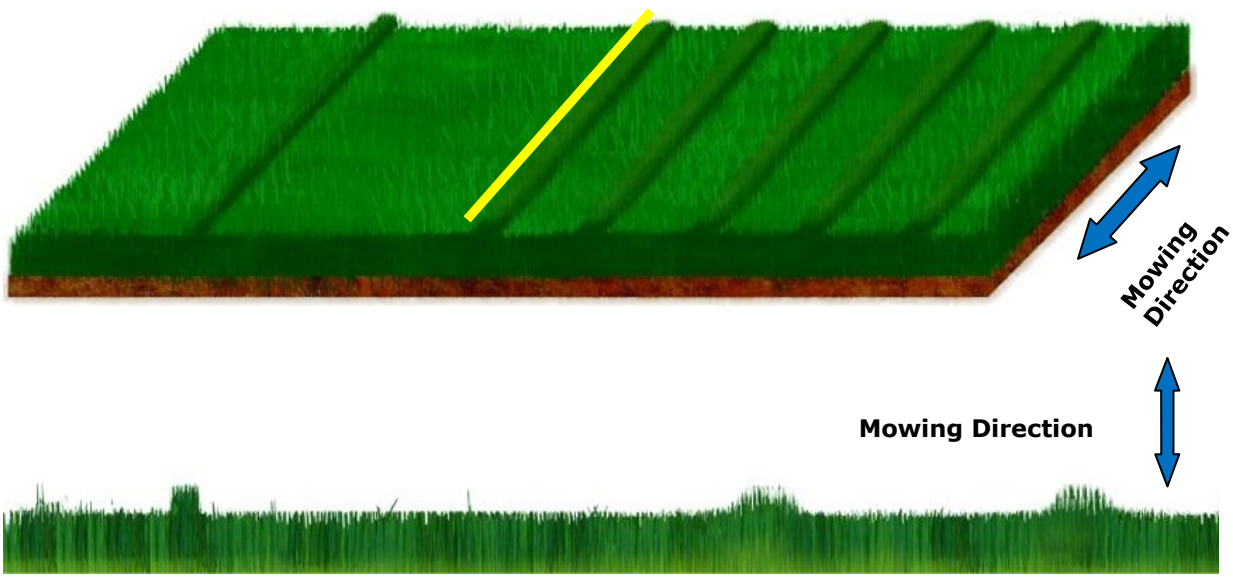
Streaks / Damaged (Rifled) Bedknife

A line of grass that was uncut after the area was mowed.

Streak

Damaged (rifled) Bedknife – within one cutting unit

Streaks / Damaged (Rifled) Bedknife



Streak **Rifled Bedknife**

Possible Causes:

Streaking caused by cutting unit:

- Nicks or gouges in bedknife or reel due to impact with hard object
- Rifling of bedknife due to excessive contact
- Bedknife or reel not sharpened correctly
- Bent bedknife, missing or loose hardware
- Wrong front roller for turf conditions
- Grass is excessively wet

Streaking caused by mower:

- Cutting units are not properly overlapping
- Turning radius is too tight – turning the machine too tight when making turns
- Mowing on slopes – front and rear cutting units can loose overlap when mowing across a slope
- Uncut grass standing up between the front and rear tires
- Steering toe-in on the rear wheels is incorrectly adjusted (fairway mowers only)

Streaks / Damaged (Rifled) Bedknife

Possible Solutions:

- Inspect bedknife and reel to determine if nicks or gouges are present. Sharpen or replace the bedknife and/or reel to factory specifications to restore proper cutting edges
- Inspect hardware on the bedknife shoe to ensure that all hardware is present and tight
- Use cutting unit anti-steering pins where appropriate
  - – Install when mowing across slopes to maintain overlap between front and rear cutting units
  - – Remove when mowing on level terrain to allow the cutting units to better follow contours
- Reduce travel speed in turns and on slopes – make wider turns
- Remove proper amount of grass – 1/3 of the grass plant or less
- If possible mow when grass or soil is dry
- Select a more aggressive front roller to help lift grass for cutting
- Check and adjust vehicle tire pressures to factory recommendations
- Correctly adjust the steering toe-in on fairway mowers
- Install four wheel drive kit option on John Deere fairway mowers for additional traction

Checklist:

- Determine if streak is occurring between adjacent cutting units or within the cutting unit path.
- If streak is occurring within a cutting unit pass, stop the mower during a pass. Locate streak and inspect reel and bedknife directly ahead of streak to determine if damage has occurred.
- If the streak is occurring between cutting units, observe the operator:
  - – Check for excessive speed during turns and on slopes
  - – Watch for crab steering that might occur on slopes
  - – Check for turns that are too tight during mowing operation
  - – Counsel operator for corrective action
- If operating on slope, install anti-steering pins and check for improvement
- In a turn – cutting units loosing overlap
- Are the reel and bedknife set to the factory recommendations (see page 3)
- Check the machine
  - – Is tire pressure set at factory recommendations?
  - – Are tires and rollers appropriate for turf and operating conditions?
  - – Are cutting unit anti-steering pins installed on slopes and removed on level terrain?
  - – Are tires causing scuffing that appears like streaks?
  - – Is cutting unit suspension operating correctly?
- If fairway mower is operated on slopes, suggest installation of four wheel drive kit

Triplex Ring

Issue:

Tire ring in clean up pass.

- Scalping in clean up pass.

Possible Causes:

- Tires are tracking in the same path in the turf thus reducing Effective (actual) Height Of Cut (EHOC) during trim
- Tire compaction creates an uneven ground surface around the edge of a green
- Improper vehicle tire pressure

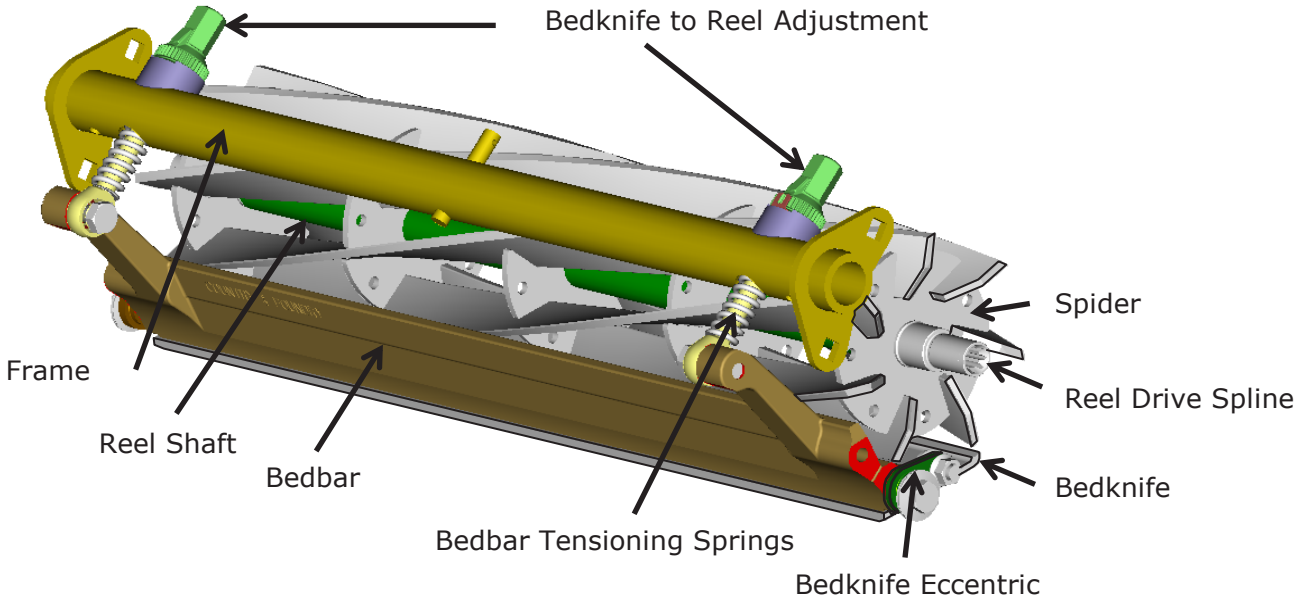
Possible Solutions:

- Utilized John Deere 2500 Triplex mowers with offset cutting units. If mowing direction is alternated every day, the tires do not track in the same location as the previous day reducing impact of compaction on green
- Pay close attention to aerating and top dressing the outer ring on the green to reduce the impact of compaction from vehicle tires while executing clean up trimming

Checklist:

- Visually inspect outside edge of green or fairway looking for dark green streaks where mowing vehicle tires would pass. This grass looks slightly greener because it is slightly longer
- Use a 122 cm (48 inch) level or piece of wood with a straight edge that is 183 cm (72 inches) long and lay the level or wood across the clean up pass. Look along the bottom of the level or wood to determine if there are indentations in the turf due to tire compaction
- Check mower tire pressure to be sure it is set at factory recommendations
- Effect may be greater in areas with excessive thatch, grain, or in low spots

Rear View Quick Adjust 5 Reel Cutting Unit



Cutting Unit Angles

Four Principal Angles