Turfgrass Science Invitational Handbook

Version 5.1

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Purpose

The National Turfgrass Science Invitational is designed to stimulate student interest and to promote the turfgrass industry as a career choice. It also provides recognition for those who have demonstrated skills and competencies resulting from turfgrass science instruction in the agricultural education classroom and supervised agricultural experiences related to the care and maintenance of turfgrass.

Objectives

Students will be able to

A. Identify turfgrasses, weeds, pests, and diseases common in turfgrass systems in the United States.
B. Demonstrate the ability to identify unhealthy plant conditions due to pests, nutrition, or physiological disorders and mechanical or chemical injuries.
C. Demonstrate knowledge of the principles and skills involved in propagation, growth requirements, growing techniques, marketing and maintenance of turfgrass.
D. Demonstrate the ability to identify, select, use, and maintain appropriate inputs and equipment for turfgrass management.
E. Demonstrate skills in oral and written business communications.
F. Demonstrate the ability to prepare accurate and legible records and reports, and to interpret business documents related to turfgrass management.

Event Rules

(The following rules, policies and procedures relevant to this Invitational)

- The team will consist of four individuals, and all four scores will count toward the team score.
- The team score consists of the combined scores of each individual and the team activity in which all team members will participate.
- Participants must come to the event prepared to work in adverse weather conditions. The event will be conducted regardless of weather. Participants should have rain gear, warm clothes and closed toed shoes. Each participant must provide the following safety equipment, and it must be worn while on course or the participant will be disqualified.
- Students are required to bring their own pencils.
- All other equipment including clipboards will be furnished for the event. Participants must use the tools and equipment provided.
- Participants must follow instructions from event staff for handling materials during the event. Any infraction of this rule will be sufficient to eliminate the team from the event.
- Observers will not be permitted in the event area while the event is in progress.
- No team, team member or team coach shall visit the event facilities to observe materials and facilities after Dec 1. Any team, team member or coach reported and proven to do so will cause the elimination of the team from the National Turfgrass Invitational.
- Participants will be assigned to group leaders who will escort them to various event-staging sites. Each participant is to stay with his or her assigned group leader throughout the event or until told to change leaders by the event superintendent.

- All participants will be given an identification number by which they will be designated throughout the event.
- All written materials will be furnished for the event. No written materials such as tests, problems and worksheets shall be removed from the event site.
- Any participant in possession of an electronic device in the event area is subject to disqualification.

Event Format

Equipment

Materials to be provided by the student:

- Two no. 2 pencils
- Clipboard
- Calculator

Participants are not to bring:

- Cell phones or other electronic devices

Individual Activities

Knowledge Test (Written Exam - 100 points, 400 team points)

- Fifty multiple-choice questions will be selected from areas of the turfgrass industry reflected in the event objectives. This phase of the event will test participant knowledge and understanding of basic principles of turfgrass science and management.
- Each participant will be allowed 60 minutes to complete this phase of the event.

Partner Activities

Practicum 1 - Turfgrass Identification (50 points, 200 team points)

- Twenty live specimens, seeds, and sod samples from the Turfgrass identification specimen list will be displayed for participants to identify by common names. A number will designate each specimen.
- Each participant will be allowed 30 minutes to complete this phase.

Practicum 2 - Equipment Identification (50 points, 200 team points)

- Forty pieces of equipment from the Equipment identification list will be displayed for participants to identify by common names. A number will designate each piece of equipment.
- Each participant will be allowed 30 minutes to complete this phase.

Practicum 3 - Inputs Identification (50 points, 200 team points)

- Thirty soil, fertilizer, and chemical inputs from the Inputs identification list will be displayed for participants to identify by common names. A number will designate each input.
- Each participant will be allowed 30 minutes to complete this phase.

Practicum 4 - Integrated Pest Management (IPM) Identification (50 points, 200 team points)

- Forty weed, insect, and disease specimens from the IPM identification list will be displayed for participants to identify by common names. A number will designate each specimen.
- Each participant will be allowed 30 minutes to complete this phase.

Practicum 5 - Equipment Operation A (100 points, 400 team points)

- Students will demonstrate measurement of green speed.
- Each participant will be allowed 20 minutes to complete this phase.

Practicum 6 - Equipment Operation B (100 points, 400 team points)

- Students will demonstrate calibrating a fertilizer spreader.
- Each participant will be allowed 20 minutes to complete this phase.

Practicum 7 - Interpretation & Analysis A (100 points, 400 team points)

- Students will demonstrate use and interpretation of volumetric water content from a soil moisture probe.
- Each participant will be allowed 20 minutes to complete this phase.

Practicum 8 - Interpretation & Analysis B (100 points, 400 team points)

- Students will demonstrate the process of conducting a field-based soil test and capturing a sample for submission to a soil testing lab.
- Each participant will be allowed 20 minutes to complete this phase.

Practicum 9 - Playing Surface Set-up A (100 points, 400 team points)

- Students will demonstrate cutting a cup for play.
- Each partner group will be allowed 20 minutes to complete this phase.

Practicum 10 - Playing Surface Set-up B (100 points, 400 team points)

- Students will demonstrate setting three sets of tees for play.
- Each partner group will be allowed 10 minutes to complete this phase.

Team Activities

Case Study 1 - Best Management Practices (100 points, 400 team points)

- Students will develop a solution to a case study problem based on turfgrass facility-specific Best Management Practices (BMP's)
- This may include topics and challenges related to:
    - Water management
    - Input reduction
    - Playing surface renovation
    - IPM plan development and delivery
- Each team will be allowed 30 minutes to complete this phase.

Case Study 2 - Industry Challenges (100 points, 400 team points)

- Students will develop a solution to a case study problem based on new and emerging technology in the turfgrass industry.
- This may include topics and challenges related to:
    - Water management
    - Input management
    - Crew Management

    - Marketing
- Each Team will be allowed 30 minutes to complete this phase.

Case Study 3 - Human Relations (100 points, 400 team points)

- Students will develop a solution to a case study problem based on Human Relations.
- This may include topics and challenges related to:
    - Crew management
    - Golfer/Athlete interface
    - Relationships with administration
    - Community engagement
- Each Team will be allowed 30 minutes to complete this phase.

Scoring

Contest Component		Activities	Individual Points	Team Points
Knowledge Test		Written Exam	100	400
Practicum	*Identification*	1 - Turfgrass	50	200
		2 - Equipment	50	200
		3 - Inputs	50	200
		4 - IPM	50	200
	Skillset	5 - Equipment Operation A	100	400
		6 - Equipment Operation B	100	400
		7 - Interpretation & Analysis A	100	400
		8 - Interpretation & Analysis B	100	400
		9 - Playing Surface Setup A	100	400
		10 - Playing Surface Setup B	100	400
Case Study	*1*	BMPs		400
	2	Technology		400
	3	Human Relations		400
		Total	**900**	**4800**

Tiebreakers

Team
Tiebreakers for teams will be determined by adding together the individual ranking of team members. The team with the lowest score will earn the tiebreak.

Individuals
1. Knowledge exam
2. Turfgrass identification
3. Equipment identification
4. Total rotational practicum score

Request for Reasonable Accommodations

The National Turfgrass Invitational is committed to providing equal access to our events and activities for all people.

This information will be kept confidential and will be used only to process the request. Our staff will review the request upon receipt and contact the requestor with additional information. The association cannot guarantee accommodations or assistance if a form is received less than 4 weeks before an event. Accommodations being requested that require the assistance of another person (nurse, interpreter, scribe, reader, etc.) is the responsibility of the school/requestor. It is also the school/requestor's responsibility to provide any approved equipment that aids in the accommodation process, if applicable.

Awards

Awards will be presented at the awards ceremony to individuals and/or teams based upon their rankings. Awards are sponsored by cooperating industry sponsors as a special project and/or by the general fund of the National Turfgrass Invitational.

The high individual in each of the following areas will be given special recognition certificates:

- General knowledge exam.
- Practicums.
- Team activity.

References

This list of references is not intended to be all-inclusive. Other sources may be utilized, and teachers are encouraged to make use of the very best instructional materials available. Use discretion when selecting website references by only using reputable, proven sites. The following list contains references that may prove helpful during event preparation. The most current edition of resources will be used.

Knowledge Test

- Turgeon and Kaminski (2019). Turfgrass Management (Current Edition)
- Christians and Agnew (2008). The Mathematics of Turfgrass Maintenance (Fourth Edition).
- Emmons and Rossi (2015). Turfgrass Science and Management (Fifth Edition).
- Puhalla, Krans, and Goatley (2010). Sports Fields: Design, Construction, and Maintenance.
- Walker (2009). The Field Guide: The Layout and Dimensions of Sports Fields.
- Smiley, Dernoeden, and Clarke (2005) Compendium of Turfgrass Diseases (Third Edition)
- Uva, Neal, and DiTomaso (1997). Weeds of the Northeast.
- Brandenburg and Villani (1995). Handbook of Turfgrass Insect Pests.
- Penn State Center for Turfgrass Science – Resources on Professional Turfgrass Management - https://plantscience.psu.edu/research/centers/turf/extension/professional-turf

Turfgrass Identification

- Penn State Center for Turfgrass Science – Plant ID - https://plantscience.psu.edu/research/centers/turf/extension/plant-id
- NC State Extension Publications - ID https://content.ces.ncsu.edu/weed-identification-in-pastures-hayfields-and-sprayfields

Turf Management and Related Careers

CAREER OPPORTUNITY

Career Clusters

- Agriculture, Food & Natural Resources
- Business Management & Administration
- Marketing
- Finance
- Science Technology, Engineering & Mathematics
- Education & Training

CAREER OPPORTUNITY FOUND IN THE CAREER CLUSTERS

Agricultural, Food & Natural Resources

- Greenkeeper
- Landscaper
- Sod Production Specialist

Marketing

- Landscape Contractor
- Turf Product Sales
- Equipment Sales

Finance

- Lawn and Turf Care Services

Science Technology, Engineering & Mathematics

- Plant Taxonomist
- Turfgrass Research Technicians

Education & Training

- Landscape Photographer
- Postsecondary Educator

SUPERVISED AGRICULTURAL EXPERIENCE OPPORTUNITIES

- Employment at a golf course
- Employment at a lawn care business
- Open own business in lawn care
- Employment at a sod/turf farm

EDUCATIONAL REQUIREMENTS /OPPORTUNITIES

Associate Degree and/or industry training

- Landscaper
- Home Lawn Maintenance

Bachelor's Degree

- Greenkeeper
- Landscape Contractor
- Graduate Degree
- Plant Ecologist
- Plant Taxonomist
- Postsecondary Educator

PROFICIENCY AWARD AREAS

- Turfgrass Management
- Agriculture Sales and/or Services
- Diversified Horticulture

Knowledge Test Topic Areas

- Golf course maintenance history and design
- Soil physics and soil chemistry
- Turfgrass physiology & Breeding
- Water management & Environmental stewardship
- Fertility for golf courses
- Integrated Pest Management
- The Turfgrass Industry and Professional Associations

Sample Knowledge Test Questions

Customers mentioned that they had a very bad Crabgrass problem last summer and would like to not have the same problem next year.

1. What type of chemical should be used for this problem?
    a. Post emergent herbicide
    b. Non-selective herbicide
    c. Pre-emergent herbicide
    d. Broadleaf herbicide
2. What time of year should this application take place?
    a. Late Fall
    b. Late Summer
    c. Early Spring
    d. Early Fall
3. Your plan is to apply Dimension 2EW Specialty Herbicide at 1.5 pints/ 43,560ft2. The customer's lawn is 27,600 ft2. How much product will be needed for this application? (Rounded to the tenth of a fluid ounce)
    a. 24.1 fl-oz.
    b. 15.2 fl-oz.
    c. 19.9 fl-oz.
    d. 41.3 fl-oz.
4. The product cost $152.00 for a half gallon bottle. How much will the application cost you? (Round to the nearest dollar)
    a. $15
    b. $24
    c. $36
    d. $95
5. Your sprayer is set up to spray 1.5 gallons per 1000 ft2. How many gallons of spray solution will be needed for this application? (Round to the nearest gallon)
    a. 15 gal.
    b. 27 gal.
    c. 41 gal.
    d. 95 gal.

Sample Case Study Assignment

Case Study 1 - Best Management Practices (100 points, 400 team points)
Students will develop a solution to a case study problem based on turfgrass facility-specific Best Management Practices (BMP's).

- Each team will be allowed 50 minutes to complete this phase (30 minutes of discussion and planning, 5 minutes for delivery, 5 minutes for questions).
- All team members must participate in the delivery of the proposal.

-Managing Moisture in the Mountains-

Wade Hampton Golf Club is located in a sub-tropical rain forest in the mountains of western North Carolina. The average rainfall in this area is between 80 and 100 inches annually. Heavy clay soils that drain poorly are found throughout the golf course and the original drainage system could not handle the excessive annual rainfall. Even small rain events would require closing the golf course for extended periods of time. In such a wet climate, it is essential to improve the golf course for playability and turf health. Your challenge is to develop a 5-minute verbal proposal that outlines the primary challenge, a connection to modern agronomic best management practices, and a discussion illustrating an appropriate solution.

Equipment Required:

- ☐ Large Post-It Sheets
- ☐ Markers

Grading:

Item	Superior Evidence of Success (5-4)	Satisfactory Evidence of Success (3-2)	Unsatisfactory Evidence of Success (1-0)	Multiplier	Points
Outline of Case	Team provides complete insight into process of pulling out the appropriate primary challenge	Team provides insight into process of pulling out the appropriate primary challenge	Team provides little insight into process of pulling out a challenge that may or may not be the primary challenge	x2	
Connection to Industry knowledge	Team is able to connect the challenge to multiple peer reviewed/industry recognized agronomic concepts	Team is able to connect the challenge to peer reviewed/industry recognized agronomic concepts	Team is unable to connect the challenge to any valid peer reviewed/industry recognized agronomic concepts	x2	
Discussion Development	Team is able to describe a concise and complete plan that addresses the primary agronomic challenge	Team is able to describe a plan that addresses the primary agronomic challenge	Team is unable to describe a plan that addresses the primary agronomic challenge and lacks focus/addresses an inappropriate challenge	x2	
Reflection on Case	Team answers post-presentation questions completely with clear indication of preparation	Team answers post-presentation questions adequately with some indication of preparation	Team fails to answer post-presentation questions adequately and there is no indication of preparation	x3	
Professionalism	All team members participate in all phases of the planning and delivery. Presentation exhibits indication of experience with public speaking	Most team members participate in all phases of the planning and delivery. Presentation exhibits some experience with public speaking	Less than half of the team members participate in the planning and delivery. Presentation exhibits little experience with public speaking		
				Total	

Practicum Rubrics

Practicum 1

(20 minutes)
Turfgrass Identification (50 points, 200 team points)
Participants will demonstrate efficient and accurate identification of warm season turfgrass, cool season turfgrass, and native plant types based on prepared knowledge.

- Each participant will be allowed 20 minutes to complete this phase.
    - All specimens will be set out on tables for review.
    - Participants will rotate through each station at their own pace.
    - Participants will be allowed to study the specimen with Magnifying glass and may use forceps to manipulate a small sample of the specimen to inspect specific plant parts.
    - Participants will need to rotate through and identify all specimens by the conclusion of the 20 minutes.
- All tools and resources required for the practicum will be at the site.
- The use of cell phones for this practicum will not be allowed

-Identify various types of plant materials found on the golf course-

For thousands of years, turfgrasses have been used as low growing groundcover with cultural, strategic, and sporting value. Modern turfgrass varieties have a myriad of uses including and not limited to the protection of the playing surface for golf. From construction to maintenance, selecting the best suited and appropriate grass for a specific area on the golf course is both a complicated and essential duty for a builder. Selecting the right turfgrass can save a superintendent countless hours of labor and significant amounts of money on inputs. Your challenge will be to identify warm-season, cool-season, and native turfgrass species.

Equipment Required:

- ☐ Magnifying glass
- ☐ Forceps
- ☐ Recording card

Grading:

Item	% of Practicum	Multiplier	Points
Identification of Warm Season Grass	40	x2	
Identification of Cool Season Grass	40	x2	
Identification of Native Plant Species	20		
		Total	

Practicum 2

(20 minutes)

Equipment Identification (50 points, 200 team points)

Participants will demonstrate efficient and accurate identification of equipment used to maintain a golf course based on prepared knowledge.

- Each participant will be allowed 20 minutes to complete this phase.
    - All equipment will be set out for review.
    - Participants will rotate through each station at their own pace.
    - Participants will be allowed to study the equipment but will not be allowed to turn the equipment on, climb on, or operate any piece of equipment.
    - Participants will need to rotate through and identify all equipment by the conclusion of the 20 minutes.
- All tools and resources required for the practicum will be at the site.
- The use of cell phones for this practicum will not be allowed.

-Identify the Equipment Needed to Maintain a Golf Course-

The course conditions we enjoy today depend on highly specialized equipment. Things have come a long way since the days when sheep and rabbits handled the mowing. The equipment needed to maintain the grass on a modern golf course are extremely sharp, finely tuned, and constantly evolving. Additionally, highly specialized tools, vehicles, and instruments help Superintendents sustainably manage playing surfaces for the best golfer experience. Your challenge will be to identify every tool that is used to maintain a golf course.

Equipment Required:

- ☐ Recording card

Grading:

Item	% of Practicum	Multiplier	Points
Identification of Large Engine Equipment	25		
Identification of Small Engine Equipment	25		
Identification of Implements	15		
Identification of Hand Tools	20		
Identification of System Parts	15		
		Total	

Practicum 3

(20 minutes)

Inputs Identification (50 points, 200 team points)

Participants will demonstrate efficient and accurate identification of inputs needed to maintain a golf course based on prepared knowledge.

- Each participant will be allowed 20 minutes to complete this phase.
    - All inputs will be set out for review. (no inputs will be open).
    - Participants will rotate through each station at their own pace.
    - Participants will be allowed to study the inputs and the labels on each, but will not be allowed to open the input's container unless a sample is set out specifically for Participants to manipulate.
        - Manipulable samples will be noted with a sign.
    - Participants will need to rotate through and identify all inputs by the conclusion of the 20 minutes.
- All tools and resources required for the practicum will be at the site.
- The use of cell phones for this practicum will not be allowed.

-Identify primary types of inputs applied on a golf course-

There currently are around 15,000 courses in the United States, averaging about 150 acres. Every superintendent is focused on maintaining a quality playing surface while balancing the necessary water and chemical inputs, managing overall land use, coexisting with the surrounding natural environment and wildlife, and operating within local, state and sometimes federal guidelines. Many scientific innovations have changed how turfgrass maintenance is done and help to ensure a safe, sustainable, and satisfying playing surface for golf. Your challenge will be to identify inputs Superintendents use on a golf course.

Equipment Required:

- ☐ Recording card

Grading:

Item	% of Practicum	Multiplier	Points
Identification of Fertilizer types	20		
Identification of Fungicides	20		
Identification of Pesticides	20		
Identification of Herbicides	20		
Identification of Soil Amendments	20		
		Total	

Practicum 4

(20 minutes)

Integrated Pest Management (IPM) Identification (50 points, 200 team points)

Participants will demonstrate efficient and accurate identification of insects, disease, and weeds found on a golf course using prepared knowledge.

- Each participant will be allowed 20 minutes to complete this phase.
    - All specimens will be set out for review.
    - Participants will rotate through each station at their own pace.
    - Participants will be allowed to study the specimens but will not be allowed to open the specimen container unless a sample is set out specifically for Participants to manipulate.
        - Manipulable samples will be noted with a sign.
    - Participants will need to rotate through and identify all specimens by the conclusion of the 20 minutes.
- All tools and resources required for the practicum will be at the site.
- The use of cell phones for this practicum will not be allowed.

-Identify the various types of pests found on a golf course-

Golf course superintendents and their staff work diligently to provide the best playing conditions possible; however, proper course management today also requires not only maintaining turf, but also conserving natural resources and protecting the environment. The goal for any superintendent is to reduce and focus pesticide use, increase understanding of plant disease and insect pests, provide better plant resistance to both pest and climatic stresses, and improve overall management for the best playing surface possible. Your challenge will be to identify the pests that a superintendent may encounter and treat for through cultural and chemical strategies.

Equipment Required:

- ☐ Magnifying glass
- ☐ Forceps
- ☐ Recording card

Grading:

Item	% of Practicum	Multiplier	Points
Identification of Insects	35		
Identification of Diseases	35		
Identification of Weeds	30		
		Total	

Practicum 5

(20 minutes)

Equipment Operation A (100 points, 400 team points)

Participants will demonstrate efficient and high-quality cutting of a new cup based on successful repair of the old cup and straightness of a new cup with a set pin.

- Each participant will be allowed 20 minutes to complete this phase.
- All tools and resources required for the practicum will be at the site.
- The use of cell phones for this practicum will not be allowed.

-Cut a new cup for play on a green-

The most valuable areas of a golf course are the greens. Any activity that occurs on the greens should be the most meticulous, cautious and professional activity that transpires anywhere on the golf course. The cup at the bottom of the hole that measures 4.25 inches ensures that the golfer has a uniform and fair ending to the play of a golf hole. Your challenge is to change the location of a cup on a golf green.

Equipment Required:

- ☐ Cup Cutter
- ☐ Electrical tape
- ☐ Cup pulling tool & Cup setter
- ☐ Finishing sand
- ☐ Water bottle
- ☐ Roller

Grading:

Item	Superior Evidence of Skill (5-4)	Satisfactory Evidence of Skill (3-2)	Unsatisfactory Evidence of Skill (1-0)	Multiplier	Points
Identification of new pin location	Participant is able to follow pin sheet to quickly and efficiently step out location of new pin within 1-yard tolerance	Participant is able to follow pin sheet to step out location of new pin within 2-yard tolerance	Participant is unable to follow pin sheet to step out location of new pin within 2-yard tolerance		
Cut new cup	Participant is able to efficiently and safely use cup cutter to cut a new cup to within .25 inches of assigned depth with no damage to green	Participant is able to efficiently and safely use cup cutter to cut a new cup to within .5 inches of assigned depth with no damage to green	Participant is unable to efficiently and safely use cup cutter to cut a new cup to within .5 inches of assigned depth and/or causes damage to green	x2	
Replace & repair old cup	Participant is able to place new plug into the old cup hole flush surface to surrounding turf, apply sand to fill in any gap, and appropriate amount of water applied.	Participant is able to place new plug into the old cup hole nearly flush to surrounding turf, apply sand to fill in any gap, and appropriate amount of water applied	Participant is unable to place new plug into the old cup hole flush surface to surrounding turf, fails to apply sand to fill in any gap, and does not apply appropriate amount of water.	x2	
Professionalism	Participant operates quickly, safely, and efficiently with no damage to green	Participant operates quickly, safely, and efficiently with very little damage to green	Participant fails to operate quickly, safely, and efficiently with no damage to green		
				Total	

Practicum 6

(10 minutes)

Equipment Operation B (100 points, 400 team points)

Participants will demonstrate efficient and accurate use of a moisture meter to assess soil moisture based on volumetric water content.

- Each participant will be allowed 10 minutes to complete this phase.
- All tools and resources required for the practicum will be at the site.
- The use of cell phones for this practicum will not be allowed.

-Calculate Soil Moisture present on a golf course-

Moisture management is one of the most important aspects of bringing high performance turfgrass stands through dry periods. Too much moisture can lead to diseases, poor recovery, inconsistent performance, and susceptibility to pests. Too little moisture brings on wilt, higher canopy temperatures, and potential for more localized dry spot. A superintendent must track moisture to preserve turf and sustainably manage resources. Your challenge is to identify the moisture present in the soil in a target area.

Equipment Required:

- ☐ Field Scout Soil Moisture probe
- ☐ Marking Flag

Grading:

Item	Superior Evidence of Skill (5-4)	Satisfactory Evidence of Skill (3-2)	Unsatisfactory Evidence of Skill (1-0)	Multiplier	Points
Sampling sites	Participant selects at least 9 sampling sites that are equally spaced out within target site	Participant selects at least 5 sampling sites that are fairly spaced out within target site	Participant selects less than 5 sampling sites that are unequally spaced out within target site		
Average moisture value	Participant is able to quickly and efficiently calculate a grand average for volumetric water content based on readings within 5%	Participant is able to calculate a grand average for volumetric water content based on readings within 10%	Participant is unable to calculate a grand average for volumetric water content based on readings within 10%		
Flagged areas	Participant flags all areas that are significantly lower in volumetric water content than the grand average	Participant flags some areas that are significantly lower in volumetric water content than the grand average	Participant fails to flag any areas that are significantly lower in volumetric water content than the grand average		
Professionalism	Participant collects all data and flags dry areas without any disruption to the target area	Participant collects all data and flags dry areas without hardly any disruption to the target area	Participant causes disruption to the target area during data collection		
				Total	

Practicum 7

(10 minutes)

Interpretation & Analysis A (100 points, 400 team points)

Participants will demonstrate efficient and accurate identification of soil types based on a pulled core sample according to the soil texture and color.

- Each participant will be allowed 10 minutes to complete this phase.
- All tools and resources required for the practicum will be at the site.
- The use of cell phones for this practicum will not be allowed.

-Identify the soil types present on a golf course-

Estimating or measuring soil texture provides valuable information about soil properties affecting plant growth. Soil texture affects the movement and availability of air, nutrients and water in a soil. Sampling soil and identifying texture quickly by hand can provide a Superintendent insight into drainage and a possible need for further analyzation. Your challenge is to identify the soil in a target area based on a texture analysis by hand.

Equipment Required:

- ☐ T-probe
- ☐ Wash bottle
- ☐ Soil texture triangle
- ☐ Soil Sample Box

Grading:

Item	Superior Evidence of Skill (5-4)	Satisfactory Evidence of Skill (3-2)	Unsatisfactory Evidence of Skill (1-0)	Multiplier	Points
Soil probe sampling	Participant is able to quickly and efficiently identify a site and push probe into the ground to safely collect a soil core to place in a box	Participant is able to identify a site and push probe into the ground to safely collect a soil core to place in box	Participant is unable to quickly and efficiently identify a site and causes damage while pushing probe into the ground to collect a soil core to place in box		
Conducting soil identification tests	Participant is able to complete an efficient texture test by hand through an attempt to form a ball, ribbon, and smears soil sample between fingers	Participant is able to mostly complete a texture test by hand through an attempt to form a ball, ribbon, and smears soil sample between fingers	Participant is unable to complete an texture test by hand, forgetting most or all tests including formation of a ball, ribbon, and smears between fingers	x2	
Identification of soil	Participant is able to correctly identify the exact soil type according to location on soil texture triangle	Participant's response for soil type is no more than one class away from the correct soil type according to the soil texture triangle	Participant's response for soil type is outside of one class away from the correct soil type according to the soil texture triangle	x2	
Repair of collection site	Participant quickly and efficiently repairs the area around the site for the soil core retrieval to make it look like the site is undisturbed	Participant repairs the area around the site for the soil core retrieval to make it look like the site has been minimally disturbed	Participant is unable to repair the area around the site for the soil core retrieval to make it look like the site has been minimally disturbed		
Professionalism	Participant makes little to no mess and treats site and equipment with utmost respect	Participant makes minimal mess and treats site and equipment with utmost respect	Participant makes a significant mess and treats site and equipment with a lack of respect		
				Total	

Practicum 8

(20 minutes)

Interpretation & Analysis B (100 points, 400 team points)

Participants will demonstrate an efficient and accurate calibration of a fertilizer spreader based on size and desired application rate for an area on a golf course.

- Each participant will be allowed 20 minutes to complete this phase.
- All tools and resources required for the practicum will be at the site.
- The use of cell phones for this practicum will not be allowed.

-Measure an area and calibrate a spreader-

Spreaders must be properly calibrated if they are to deliver granular fertilizers and pesticides to turf at correct rates. If calibration is done incorrectly, the product may be misapplied, and either too much or too little of the product will reach the turf. In addition to calibration, a Superintendent must be able to calculate the correct amount of input to apply using a calibrated spreader. Your challenge will be to measure an area, calculate the amount of input needed to apply, and calibrate a spreader to apply the input.

Equipment Required:

- ☐ Walk-behind rotary push spreader
- ☐ Tarp
- ☐ Measuring wheel
- ☐ Recording card

Grading:

Item	Superior Evidence of Skill (5-4)	Satisfactory Evidence of Skill (3-2)	Unsatisfactory Evidence of Skill (1-0)	Multiplier	Points
Area Measurement	Participant quickly and efficiently uses measuring wheel to take just enough measurements to accurately calculate area without damaging turf	Participant uses measuring wheel to take measurements to roughly calculate area without damaging turf	Participant fails to quickly and efficiently use measuring wheel to take measurements to accurately calculate area without damaging turf	x2	
Calculation	Participant is able to calculate the area of the target area within 5% of actual measurement	Participant is able to calculate the area of the target area within 15% of actual measurement	Participant is unable to calculate the area of the target area within 15% of actual measurement	x2	
Calibration	Participant is able to quickly and efficiently calibrate the spread based on prescribed application rate to the exact letter	Participant is able to calibrate the spreader based on prescribed application rate within 2 letters of the actual letter	Participant is unable to calibrate the spreader based on prescribed application rate within 2 letters of the actual letter	x2	
Application	Participant makes an application of the input on the target area at the appropriate speed and with proper overlap after two passes	Participant makes an application of the input on the target area at a near appropriate speed and with close to proper overlap after two passes	Participant makes an application of the input on the target area at an inappropriate speed and/or with improper overlapping after multiple passes		
Professionalism	Participant finishes practicum within the time allotment and maintains a clean and safe work area	Participant finishes practicum within the time allotment and maintains a fairly clean and safe work area	Participant fails to finish practicum within the time allotment and does not maintain a clean and safe work area		
				Total	

Practicum 9

(10 minutes)

Playing Surface Set-up A (100 points, 400 team points)

Participants will demonstrate safe, efficient, and accurate completion of a task related to the setup of a playing surface for competition from the Playing Surface Set-up list.

- Each participant will be allowed 10 minutes to complete this phase.
- All tools and resources required for the practicum will be at the site.
- The use of cell phones for this practicum will not be allowed.

-Measure green speed using a USGA Stimpmeter-

One of the most significant aspects of a golf course is the uniformity of its putting greens. Variations in speed, whether from one green to the next or on different parts of the same green, can negatively impact a golfer's round. Golf course superintendents constantly seek better ways to establish consistent speed on all putting greens. The Stimpmeter is a simple, accurate device to measure green speed. It has proven to be an invaluable asset to the game of golf, both for daily play and championship preparations, and a helpful management tool for the golf course superintendent. Your challenge will be to collect green speed data on a golf green.

Equipment Required:

- ☐ Stimpmeter
- ☐ Three golf balls
- ☐ Three tees
- ☐ 20-foot measuring tape
- ☐ Recording card

Grading:

Item	Superior Evidence of Skill (5-4)	Satisfactory Evidence of Skill (3-2)	Unsatisfactory Evidence of Skill (1-0)	Multiplier	Points
Site Selection	Participant chose three flat areas for roll test that provided ample space for entire length of ball roll	Participant chose at least 2 flat areas for roll test that provided ample space for entire length of ball roll	Participant chose only 1 or no flat areas for roll test and did find ample space for the ball roll	x2	
Ball Roll	Participant lifted Stimpmeter at the appropriate speed and ball rolled off ramp with little to no bounce during every test	Participant lifted Stimpmeter at the appropriate speed and ball rolled off ramp with very little bounce during most every test	Participant inconsistently lifted Stimpmeter and ball rolled off ramp with significant bounce during many tests rolls	x2	
Measurement	Participant measures ball roll from tee to tee after a down & back roll series and repeats process three times	Participant measures ball roll from tee to tee after a down & back roll series and repeats process at least 2 times	Participant fails to measure ball roll from tee to tee, inconsistently uses a down & back roll series, and fails to repeat process	x2	
Data Reporting	Participant reports an average green speed that is within 10% of the actual green speed	Participant reports an average green speed that is within 15% of the actual green speed	Participant reports an average green speed that is beyond 15% above or below the actual green speed	x3	
Professionalism	Participant collects data efficiently within time allotment and with no damage to the playing surface	Participant collects data somewhat efficiently within time allotment and with no damage to the playing surface	Participant fails to collects data efficiently within time allotment and inflicts damage to the playing surface		
				Total	

Practicum 10

(10 minutes)

Playing Surface Set-up B (100 points, 400 team points)

Participants will demonstrate safe, efficient, and accurate completion of a task related to the setup of a playing surface for competition from the Playing Surface Set-up list.

- Each participant will be allowed 10 minutes to complete this phase.
- All tools and resources required for the practicum will be at the site.
- The use of cell phones for this practicum will not be allowed.

-Set-up Tee Markers-

Golf course superintendents rotate tee markers on a regular basis to help turf on teeing grounds recover from traffic and give divots time to heal. Whether they move forward, backward, right or left, moving tee markers not only impacts turf health, it has a direct impact on a round of golf. When the maintenance staff moves the tee markers on each hole, they must think about how the tee marker locations on all 18 holes affect the course yardage for each set of tees. Increasing or decreasing the total yardage from a set of tees by more than 22 yards for men and 18 yards for women will alter the USGA Course Rating™ by one-tenth of a stroke or more. Your challenge will be to set a new location for tee markers.

Equipment Required:

- ☐ Tee Blocks (2)
- ☐ Sand Box
- ☐ Trowel
- ☐ T-Square

Grading:

Item	Superior Evidence of Skill (5-4)	Satisfactory Evidence of Skill (3-2)	Unsatisfactory Evidence of Skill (1-0)	Multiplier	Points
Site Selection	Participant is able to quickly identify the next ideal location to move the tee blocks to based on specific attention to traffic mitigation	Participant is able to identify the next ideal location to move the tee blocks to based on some attention to traffic mitigation	Participant is unable to identify an ideal location to move the tee blocks to based on some attention to traffic mitigation	x2	
Alignment	Participant is able to quickly align tee blocks to be perfectly perpendicular to the direction of the golf hole	Participant is able to align tee blocks to be very perpendicular to the direction of the golf hole	Participants is unable to align tee blocks to be perpendicular to the direction of the golf hole	x2	
Uniformity	Participant sets tee blocks exactly equal distance away from center of tee box	Participant sets tee blocks fairly equal distance away from center of tee box	Participant sets tee blocks unequally away from center of tee box	x2	
Divot Repair	Participant identifies divot to repair and fills it to appropriate level based on ground surface	Participant identifies divot to repair and fills it to near appropriate level based on ground surface	Participant fails to identify divot to repair and/or fills it to an inappropriate level based on ground surface	x3	
Professionalism	Participant sets tees efficiently within time allotment and with no damage to the playing surface	Participant sets tees within time allotment and with no damage to the playing surface	Participant fails to set tees within time allotment and/or damages the playing surface		
				Total	

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Turfgrass Identification List

Live Samples

1. Creeping Bentgrass (*Argrostis palustris)*
2. Velvet Bentgrass (*Agrostis canina)*
3. Kentucky Bluegrass (*Poa pratensis)*
4. Rough Bluegrass (*Poa trivialis)*
5. Annual Bluegrass (*Poa annua)*
6. Perennial Ryegrass (*Lolium perenne)*
7. Annual Ryegrass aka. Italian Ryegrass (*Lolium multiflorum)*
8. Tall Fescue (*Festuca arundinacea)*
9. Fine Fescue (includes: *Festuca rubra ssp.rubra, Festuca rubra ssp. Cumnutata)*
10. Common Bermudagrass (*Cynodon dactylon*)
11. Hybrid Bermudagrass (*Cynodon dactylon x Cynodon transvaalensis*)
12. African Bermudagrass *(Cynodon transvaalensis)*
13. Buffalograss (*Bouteloua dactyloides*)
14. Centipedegrass (*Eremochloa ophiuroides)*
15. St. Augustinegrass (*Stenotaphrum secundatum)*
16. Seashore Paspalum (*Paspalum vaginatum)*
17. Zoysiagrass (*Zoysia japonica*)
18. Kikuyugrass *(Pennisetum clandestinum)*

Seeds

1. Creeping Bentgrass (*Argrostis palustris)*
2. Kentucky Bluegrass (*Poa pratensis)*
3. Perennial Ryegrass (*Lolium perenne)*
4. Annual Ryegrass aka. Italian Ryegrass (*Lolium multiflorum)*
5. Tall Fescue (*Festuca arundinacea)*
6. Fine Fescue (includes: *Festuca rubra ssp.rubra, Festuca rubra ssp. Cumnutata)*
7. Common Bermudagrass (*Cynodon dactylon*)
8. Seashore Paspalum (*Paspalum vaginatum)*
9. Buffalograss *(Bouteloua dactyloides)*
10. Centipedegrass (*Eremochloa ophiuroides)*

Sod

1. Hybrid Bermudagrass (*Cynodon dactylon x Cynodon transvaalensis*)
2. Centipedegrass (*Eremochloa ophiuroides)*
3. St. Augustinegrass (*Stenotaphrum secundatum)*
4. Seashore Paspalum (*Paspalum vaginatum)*
5. Zoysiagrass (*Zoysia japonica*)
6. Kikuyugrass *(Pennisetum clandestinum)*
7. Velvet Bentgrass *(Agrostis canina)*
8. Kentucky Bluegrass *(Poa pratensis)*
9. Rough Bluegrass *(Poa trivialis)*
10. Annual Bluegrass *(Poa annua)*
11. Perennial Ryegrass *(Lolium perenne)*
12. Annual Ryegrass *(Lolium multiflorum)*
13. Tall Fescue *(Festuca arundinacea)*
14. Fine Fescue *(Festuca rubra)*

Equipment Identification List

Mower Parts

1. Air Filter
2. Fuel Filter
3. Fuel Tank
4. Hydraulic Filter
5. Hydraulic Line
6. Hydraulic Pump
7. Hydraulic Reservoir
8. Oil Filter
9. Reel Mower HOC Gauge/Accu-Gage
10. Reel Mower Components
    a. Spider
    b. Reel cylinder
    c. Reel blade
    d. Shaft
    e. Bedbar
    f. Bedknife
    g. Bedknife adjuster
    h. Roller
    i. Roller adjuster
    j. Rotary Mower Components
        i. Mulching blades
        ii. Bench grinder
        iii. Balancer

Irrigation Parts

1. Diaphragm Pump

Tools

1. Broom
2. Grader/Laser Level
3. Painter
4. Tamp
5. Transit
6. Trimmer - Line trimmer
7. Trimmer - Hedge
8. York Rake
9. Sod knife
10. Shovel

Small Equipment

1. Backpack Blower
2. Edger
3. Fertilizer Spreader
    a. Drop
    b. Rotary
4. Sod cutter
5. Soil Probe
6. Backpack Sprayer

Large Equipment

1. Aeration Equipment
    a. Air Injection
    b. Deep Drill
    c. Fraise Mower
    d. Hollow tines
    e. Hollow tine aerator
    f. Solid tines
    g. Solid tine aerator
    h. Spiker/Slicer
    i. Vertical Mower/Verticutter
    j. Water Injection
2. Drag Mat
3. Tractor Mounted Spreader
4. Front End Loader
5. Groomer
6. Mowers
    a. Flail
    b. Reel
    c. Rotary
7. Roller
8. Seeder
9. Skid-Steer
10. Boom Sprayer
11. Sweeper
12. Topdresser
13. Tractor
14. Trencher
15. Utility Vehicle

Input Identification List

Soil

1. Brick Dust
2. Calcined Clay
3. Clay Rootzone
4. Compost
5. Crumb Rubber
6. Diatomaceous Earth
7. Drainage Stone
    a. Pea gravel
8. Expanded Shale
9. Infield Mix
10. Limestone
11. Mound Clay
12. Native Soil Rootzone
    a. Heavy clay
    b. Loam
13. Peat
14. Sand
    a. Topdressing Sand
    b. Sand Rootzone
    c. Silica sand
15. Topsoil
16. Vitrified Clay
17. Warning Track Material
18. Zeolite

Fertilizer

1. Ammonium sulfate
2. Urea
3. Superphosphate
4. Potassium chloride
5. Potassium nitrate
6. Potassium sulfate

Pesticide Label

[herbicides]

1. 2,4-D
2. Benfluralin
3. Clopyralid
4. Dicamba
5. Diquat Dibromide
6. Dithiopyr
7. Glyphosate
8. Isoxaben
9. Triclopyr

Insecticides

10. Bifenthrin
11. Carbaryl
12. Fipronil
13. Imidacloprid
14. Permethrin
15. Trichlorfon

Fungicides

16. Azoxystrobin
17. Myclobutanil
18. Propiconazole
19. Sulfur
20. Thiophanate methyl

IPM Identification List

Diseases

1. Anthracnose
2. Brown Patch
3. Dollar Spot
4. Fairy Ring
5. Gray Leaf Spot
6. Gray Snow Mold
7. Helminthosporium Leaf Spot
8. Large patch
9. Necrotic Ring Spot
10. Nematodes
11. Pink Snow Mold
12. Powdery Mildew
13. Pythium Blight
14. Red Thread
15. Rust
16. Spring Dead Spot
17. Summer Patch
18. Take-all Patch

Insects

1. Annual Bluegrass Weevil
2. Armyworms
3. Asiatic Garden Beetle
4. Black Turfgrass Ataenius Beetle
5. Bluegrass Billbugs
6. Chinchbugs
7. Cutworms
8. Fall Armyworm
9. Fire Ants
10. Green June Beetle
11. Japanese Beetle
12. May and June Beetles
13. Masked Chafer
14. Mites
15. Mole Crickets
16. Oriental Beetle
17. Sod Webworms
18. White Grubs

Weeds

[cool-season]

1. Annual Bluegrass (*Poa annua*)
21. Barnyardgrass (*Echinochloa crusgalli*)
22. Bentgrass (*Agrostis sp.)*
23. Crabgrass (*Digitaria Sp.)*
24. Foxtail (*Setaria sp.*)
25. Goosegrass (*Eleusine indica)*
26. Nimblewill (*Muhlenbergia scherberi*)
27. Orchardgrass (*Dactylis glomerata*)
28. Quackgrass (*Agropyron repens*)
29. Tall Fescue (*Festuca arundinacea)*
30. Yellow Nutsedge (*Cyperus esculentus)*
31. (purple) Nutsedge (*Cyperus rotundus)*
32. Wild Garlic/Onion (*Allium vineale)*
33. Black Medic (*Medicago lupulina)*
34. Broadleaf Plantain (*Plantago rugelii and P. major)*
35. Buckhorn Plantain (*Plantago lanceolata)*
36. Bull Thistle (*Cirsium vulgare)*
37. Canada Thistle (*Cirsium arvense)*
38. Carpetweed (*Mollugo verticillata)*
39. Common Chickweed (*Stellaria media)*
40. Mouseear Chickweed (*Cerastium vulgatum)*
41. Curly dock (*Rumex crispus)*
42. Dandelion (*Taraxacum officinale)*
43. Ground Ivy (*Glecoma hederacea)*
44. Common groundsel (*Oxalis montana)*
45. Yellow/Orange Hawkweed (*Hieracium pratense H. aurantiacum)*
46. Healall (*Prunella vulgaris)*
47. Henbit (*Lamium amplexicaule)*
48. Japanese stiltgrass (*Microstegium vimineum)*
49. Knotweed (*Polygonum aviculare)*
50. Mallow (*Malva neglecta)*
51. Mullien (*Verbascum thapsus)*
52. Pennywort (Dollarweed) (*Hydrocotvle sp.)*
53. Purslane (*Portulaca oleracea)*
54. Rough Bluegrass (*Poa trivialis)*
55. Sheep Sorrel (*Rumex acetosella)*
56. Shepherds purse (*Capsella bursa-pastoris)*
57. Creeping Speedwell (*Veronica filiformis, V. Officinalis,V. serpvllifolia)*
58. Corn Speedwell (*Veronica arvensis)*
59. Spurge (*Euphorbia maculata & E. supina)*
60. Velvetgrass (*Holcus lanatus)*
61. White Clover (*Trifolium repens)*
62. Wild Carrot (*Daucus carota)*
63. Yellow Woodsorrel (*Oxalis stricta)*
64. Yarrow (*Achillea millefolium)*
65. Yellow Rocket (*Barberea vulgaris)*

[Warm-season]

66. Bermudagrass (*Cynodon dactylon)*
67. Crabgrass (*Digitaria Sp.)*
68. Common Chickweed (*Stellaria media)*
69. Mouseear Chickweed (*Cerastium vulgatum)*
70. Green kyllinga (*Kyllinga brevifolia)*
71. Spurge (*Euphorbia maculata & E. supina)*
72. Dogfennel *(Eupatorium capillifolium)*
73. Bahiagrass *(Paspalum notatum)*
74. Goosegrass *(Eleusine indica)*
75. Foxtail *(Alopecurus pratus)*
76. Yellow Nutsedge (*Cyperus esculentus)*

Skill Set List

Equipment Operation

- Re-string a string trimmer head
- Build mini irrigation system (cutting pipe, gluing)
- Irrigation installation
- Adjust a reel height
- Spreader/sprayer calibration

Interpretation & Analysis

- Sand sieve analysis
- Reading soil reports
- Interpreting pesticide labels
- Measuring green speed
- Surface firmness test
- Calculations-pesticides, water
- Operations budgeting
- Irrigation audit

Playing Surface Set-up

- Tee set up
- Cup cutting
- Mound/home plate repair
- Field logo painting
- Chalking base lines
- Topdressing application
- Bunker repair