NTSI 2027



NTSI - Study Guide

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Knowledge Check

Part 1 | Vocabulary of Golf Maintenance

- 10 terms
- Answer bank
- Topics: plant parts and management

Part 2 | Calculations for Turfgrass Management

- 10 questions
- Multiple choice answer selection
- Will need basic calculator (some provided on-site)
- Based on fertilizer, pesticide, and irrigation water applications

Part 3 | The Turfgrass Plant

- 25 questions
- Multiple choice and True/False answer selection
- Based on grass types, common cultivars, growth conditions, and plant anatomy.

Part 4 | Agronomic Management

- 20 Questions
- Multiple choice and True/False answer selection
- Based on mowing, fertility management, soil characteristics, and golf course set-up.

Part 5 | Water Management

- 15 Questions
- Multiple choice and True/False answer selection
- Based on soil and water interaction, irrigation system components, and water management.

Part 6 | Integrated Pest Management

- 15 Questions
- Multiple choice and True/False answer selection
- Based on weeds, insects, diseases, pesticide forms, and label components.

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Case Study Presentations

Overview

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 30 minutes to complete this phase (20 minutes of discussion and planning, 5 minutes for delivery, 5 minutes for questions).
- Participating teams will have access to supplies for capturing ideas and drawing out their plans for the presentation.
- **ALL** team members must participate in the delivery of the proposal.
- Delivery of the proposal will be carried out solely by oral presentation.

Focus Areas

Student teams will choose a single focus area from four possible focus areas to prepare a five minute presentation. Those focus areas are:

A. Best Management Practices
[Industry-recognized standards and recommendations for growing and maintaining turfgrass and soil systems that support recreational activities. Can include but are not limited to: agronomic themes, core cultural practices, and Integrated Pest Management]

B. Industry Challenges
[Barriers and problems that the industry is facing at macro-scale that are not easily solved and may include but are not limited to: new and emerging technology, environmental regulation, and the tangential effects due to the popularity of the game of golf]

C. Operations
[Coordination and considerations that facilities make to host and manage events during their season. Typical "ops" challenges include, but are not limited to: conducting large tournaments, hosting events for the community & membership (if applicable), and partnerships with diverse organizations/stakeholders to strengthen the facility's sustainable business practices]

D. Human Relations
[Management and development of employees on maintenance crews who work in small and large teams to complete the tasks needed to care for the grounds and facility infrastructure. Challenges and scenarios include but are not limited to: personnel recruitment & retention, conflict resolution, employee training, and contemporary practices that enhance crew morale and job satisfaction]

Grading

Item	Superior Evidence of Success (5-4)
Outline of Challenge	Team provides complete insight into process of pulling out the appropriate primary challenge
Connection to Industry Knowledge	Team is able to connect the challenge to multiple peer reviewed/industry recognized agronomic concepts
Discussion Development	Team is able to describe a concise and complete plan that addresses the primary agronomic challenge
Reflection on Case	Team answers post-presentation questions completely with clear indication of preparation
Professionalism	All team members participate in all phases of the planning and delivery. Presentation exhibits indication of experience with public speaking

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On-Course Practicum Demonstrations

Overview

Playing Surface Set-up (100 points, 200 team points)

Participants will demonstrate safe, efficient, and accurate completion of a task related to the management of 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.

**resources for practicum completion can be found in the "Resources" section at the end of the study guide*

1-Green Speed

Item	Superior Evidence of Skill (5-4)
Site Selection	Participant chose three flat areas for roll test that provided ample space for entire length of ball roll
Ball Roll	Participant lifted Stimpmeter at the appropriate speed and ball rolled off ramp with little to no bounce during every test
Measurement	Participant measures ball roll from tee to tee after a down & back roll series and repeats process three times
Data Reporting	Participant reports an average green speed that is within 10% of the actual green speed
Professionalism	Participant collects data efficiently within time allotment and with no damage to the playing surface

2-Moisture Measurement

Item	Superior Evidence of Skill (5-4)
Sampling sites	Participant collect data from all sampling sites that are equally 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%
Flagged areas	Participant notes all 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

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3-Equipment ID

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

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

4-IPM ID

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*)
1. Barnyardgrass (*Echinochloa crusgalli*)
2. Bentgrass (*Agrostis sp.)*
3. Crabgrass (*Digitaria Sp.)*
4. Foxtail (*Setaria sp.*)
5. Goosegrass (*Eleusine indica)*
6. Nimblewill (*Muhlenbergia scherberi*)
7. Orchardgrass (*Dactylis glomerata*)
8. Quackgrass (*Agropyron repens*)
9. Tall Fescue (*Festuca arundinacea)*
10. Yellow Nutsedge (*Cvperus esculentus)*
11. (purple) Nutsedge (*Cvperus rotundus)*
12. Wild Garlic/Onion (*Allium vineale)*
13. Black Medic (*Medicago lupulina)*
14. Broadleaf Plantain (*Plantago rugelii and P. major)*
15. Buckhorn Plantain (*Plantago lanceolata)*
16. Bull Thistle (*Cirsium vulgare)*
17. Canada Thistle (*Cirsium arvense)*
18. Carpetweed (*Mollugo verticillata)*
19. Common Chickweed (*Stellaria media)*
20. Mouseear Chickweed (*Cerastium vulgatum)*
21. Curly dock (*Rumex crispus)*
22. Dandelion (*Taraxacum officinale)*
23. Ground Ivy (*Glecoma hederacea)*
24. Common groundsel (*Oxalis montana)*
25. Yellow/Orange Hawkweed (*Hieracium pratense H. aurantiacum)*
26. Healall (*Prunella vulgaris)*
27. Henbit (*Lamium amplexicaule)*
28. Japanese stiltgrass (*Microstegium vimineum)*
29. Knotweed (*Polygonum aviculare)*
30. Mallow (*Malva neglecta)*
31. Mullien (*Verbascum thapsus)*
32. Pennywort (Dollarweed) (*Hydrocotvle sp.)*
33. Purslane (*Portulaca oleracea)*
34. Rough Bluegrass (*Poa trivialis)*
35. Sheep Sorrel (*Rumex acetosella)*
36. Shepherds purse (*Capsella bursa-pastoris)*
37. Creeping Speedwell (*Veronica filiformis, V. Officinalis,V. serpvllifolia)*
38. Corn Speedwell (*Veronica arvensis)*
39. Spurge (*Euphorbia maculata & E. supina)*
40. Velvetgrass (*Holcus lanatus)*
41. White Clover (*Trifolium repens)*

42. Wild Carrot (*Daucus carota)*
43. Yellow Woodsorrel (*Oxalis stricta)*
44. Yarrow (*Achillea millefolium)*
45. Yellow Rocket (*Barberea vulgaris)*

[Warm-season]

46. Bermudagrass (*Cynodon dactylon)*
47. Crabgrass (*Digitaria Sp.)*
48. Common Chickweed (*Stellaria media)*
49. Mouseear Chickweed (*Cerastium vulgatum)*
50. Green kyllinga (*Kyllinga brevifolia)*
51. Spurge (*Euphorbia maculata & E. supina)*
52. Dogfennel *(Eupatorium capillifolium)*
53. Bahiagrass *(Paspalum notatum)*
54. Goosegrass *(Eleusine indica)*
55. Foxtail *(Alopecurus pratus)*
56. Yellow Nutsedge (*Cvperus esculentus)*

5-Turf ID

Possible 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)*

Possible 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)*

6-Cup Cutting

Item	Superior Evidence of Skill (5-4)
Identification of new pin location	Participant is able to mark pin sheet and both quickly and efficiently step out location of new pin within 1-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
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.
Professionalism	Participant operates quickly, safely, and efficiently with no damage to green

7-Soil Sampling

Item	Superior Evidence of Skill (5-4)
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
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 to correctly identify the exact soil type
Preparation of Soil Test	Participant is able to collect the ideal amount of soil for a sample, place in box, and complete accompanying soil test form with all required information
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
Professionalism	Participant makes little to no mess and treats site and equipment with utmost respect

8-Sprayer Calibration

Item	Superior Evidence of Skill (5-4)
Nozzle type identification	Correct nozzle is identified with all pertinent information included to communicate type and use
GPM calculation	Gallons per minute are calculated within .5 gallons of actual application amount during demo
Problem layout	Application problem based on nozzle type and desired rate is laid out; demonstrating familiarity and mastery of calculation needed
Problem solution	Problem solution is within 5% of correct application answer
Professionalism	All materials are handled safely and no wear is inflicted

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