

Trouble Shooting and Managing Soil Physical Problems

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There Has Been a Crime



...The Turf is Dead!!!

Our Job is to Play Investigator

- What happened and why?
- Exactly how did it occur?
- What is the underlying cause of the problem?
- How do we correct the situation and prevent it from happening again?

Basic Steps

1. Be objective - Clear your mind of preconceived ideas
2. Interview witnesses - Gather info from knowledgeable individuals
3. Inspect the crime scene - Assess the situation yourself
4. Formulate a list of possible hypotheses
5. Collect evidence:
 - a. Photos
 - b. Conduct tests and record measurements
 - c. Gather previous test data from others

Basic Steps (Cont'd)

6. Listen to comments of others
7. Be observant:
 - a. Take an overview and look at the big picture
 - b. Look for related issues such as irrigation, disease, shade, or water quality
 - c. Remember – the problem may be a combination of several factors
8. Ask Questions

Useful Questions to Ask

- When did the problem show up?
- Was it sudden or gradual?
- Is it widespread or localized?
- Is there anything unique about the location?
 - Traffic, wetness, soil texture
- What is the water source?
- Is the area underdrained?

Examples

- 4 examples or case studies
 - Background information
 - Thought process involved
 - Measurements needed and results
 - Conclusion of the case

Example #1 Background

- 1 year old putting green
- Sand met California Spec.
- Root zone depth is uniform 30 cm (12")
- Rather severe contours in the green
- Turf consistently dies on the high spots

Example #1 (Cont'd) Photo



Example #1 (Cont'd) Possible Causes

1. High salinity
2. Poor construction and/or materials
3. Disease
4. Vandalism
5. Drought stress

Example #1 (Cont'd) Testing and Data Collection

- High salinity
 - Soil sample shows low EC
- Poor construction and/or materials
 - Profile shows 30 cm and similar sand quality
- Disease
 - Pathology lab does not find any disease
- Vandalism
 - Occurs on several greens in similar high spots
- Drought stress

Example #1 (Cont'd) Diagnosis

- Drought Stress
- Although the subgrade is 12" below the surface in all locations, the effective depth at the top of the hill is equal to the difference between the top of the soil at the top of the hill and the top of the subgrade at the bottom of the hill.

Example #1 (Cont'd) Proof

- Immediately after a heavy rainfall the moisture content was 25-29% at both the top and bottom of the hill.
- After 4 hours of drainage time, the moisture content at the top was 5% and at the bottom was 25%.

Example #1 (Cont'd) Solution

- Reduce the amount of elevation change
- Add organic matter to the root zone on the high spots to retain more water
- Reduce the thickness of the root zone at top of the hill.

Example #2 Background

- New Residential Development
- Poor grass growth/establishment near fence line

Example #2 (Cont'd) Photo



Example #2 (Cont'd) Possible Causes

- Construction activities associated with utilities and fence brought up large amounts of subsoil to the surface.
- Poor fertility and poor physical properties of the subsoil are inhibiting turfgrass growth and establishment.

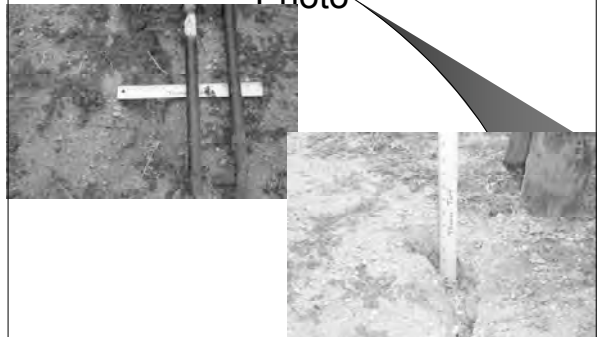
Example #2 (Cont'd) Testing and Data Collection

- Collect sample for soil test – need both physical and nutrient tests
- Based on the test results we need to:
 - Apply fertilizer to area
 - Amend soil and/or use cultural practices to help offset physical limitations

Example #3 Background

- Well maintained collegiate baseball field
- Numerous depressions appeared in the warning track after a 5-inch rainfall event
- No depressions formed in the playing field
- Depressions present a risk of injury to players and a maintenance cost to field staff
- How can they be prevented from returning

Example #3 (Cont'd) Photo



Example #3 (Cont'd) Look at Big Picture

- Depressions form only in running track
- Depressions are long and narrow resembling a desiccation crack
- Field is irrigated but track is not due to limited water supply
- Problem occurred after a heavy rain following an extended drought.
- Make an excavation across one of the depressions to see what is happening below the surface

Example #3 (Cont'd) Proof

- Red topping in cracks of black subsoil



Example #3 (Cont'd) Diagnosis

- Surface 3-4 inches of topping formed a strong crust
- The underlying soil was a native clay with high shrink-swell potential
- During an extended drought, large desiccation cracks formed in the subsoil because the warning track was not irrigated
- The 5" rain softened the crust and washed the topping into the cracks leaving depressions on the surface

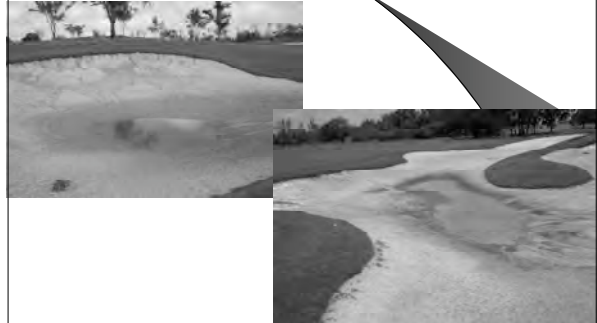
Example #3 (Cont'd) Solution

- Add topping to fill depressions
- Keep warning track area irrigated to prevent crack formation in subsoil

Example #4 Background

- 2-yr old golf course
- Bunkers don't drain
- Built by reputable architect and contractors

Example #4 The Problem



Example #4 Possible Causes

- Subsurface Drains not functioning
 - Incorrect installation
 - Crushed
- Sand migration into gravel
- Contamination of sand

Example #4 Diagnostic Symptoms

- **If** subsurface drains are not functioning:
 - Standing water in drain pipe, gravel and sand
- **If** there is sand migration into the gravel:
 - Visual evidence of contamination of gravel
 - Restricted water movement into and through gravel
- **If** there is contamination of sand
 - Restricted water movement into and through sand
 - Rapid water movement into and through gravel

Example #4 Investigation



- No standing water in drain lines or gravel bed
- No evidence of sand migration into gravel

Example #4 Investigation

- Water enters and moves rapidly through gravel and drains.
- A layer of sand as thin as 1" above the gravel nearly stopped water flow.

Example #4 Source of contamination



- Runoff from adjacent areas
- Sidewall erosion
- Long travel distance to drains

Example #4 (Cont'd) Solution

- Remove the poorly draining sand
- Add more drainage to reduce surface water flow and erosion
- Replace sand with clean, coarse bunker sand with high saturated hydraulic conductivity.



Conclusion

Good Problem Solving Involves:

- ✓ Have an open mind about the situation
- ✓ Get a good overview of the problem
- ✓ Gather good information
- ✓ Understand the mechanism
- ✓ Select appropriate management activities to control the underlying problem – not just to cover up the symptoms