

An aerial photograph of a golf course. In the center, a large, white, multi-story clubhouse with a dark roof is surrounded by lush green grass and numerous trees. To the right of the clubhouse, a large, calm lake reflects the sky. The golf course features several green fairways, sand traps, and a network of paths. In the background, a large, forested mountain rises under a blue sky with scattered white clouds.

# Practical Greenkeeping from around the world

Ken Siems, CGCS MG  
Golf Course Superintendent

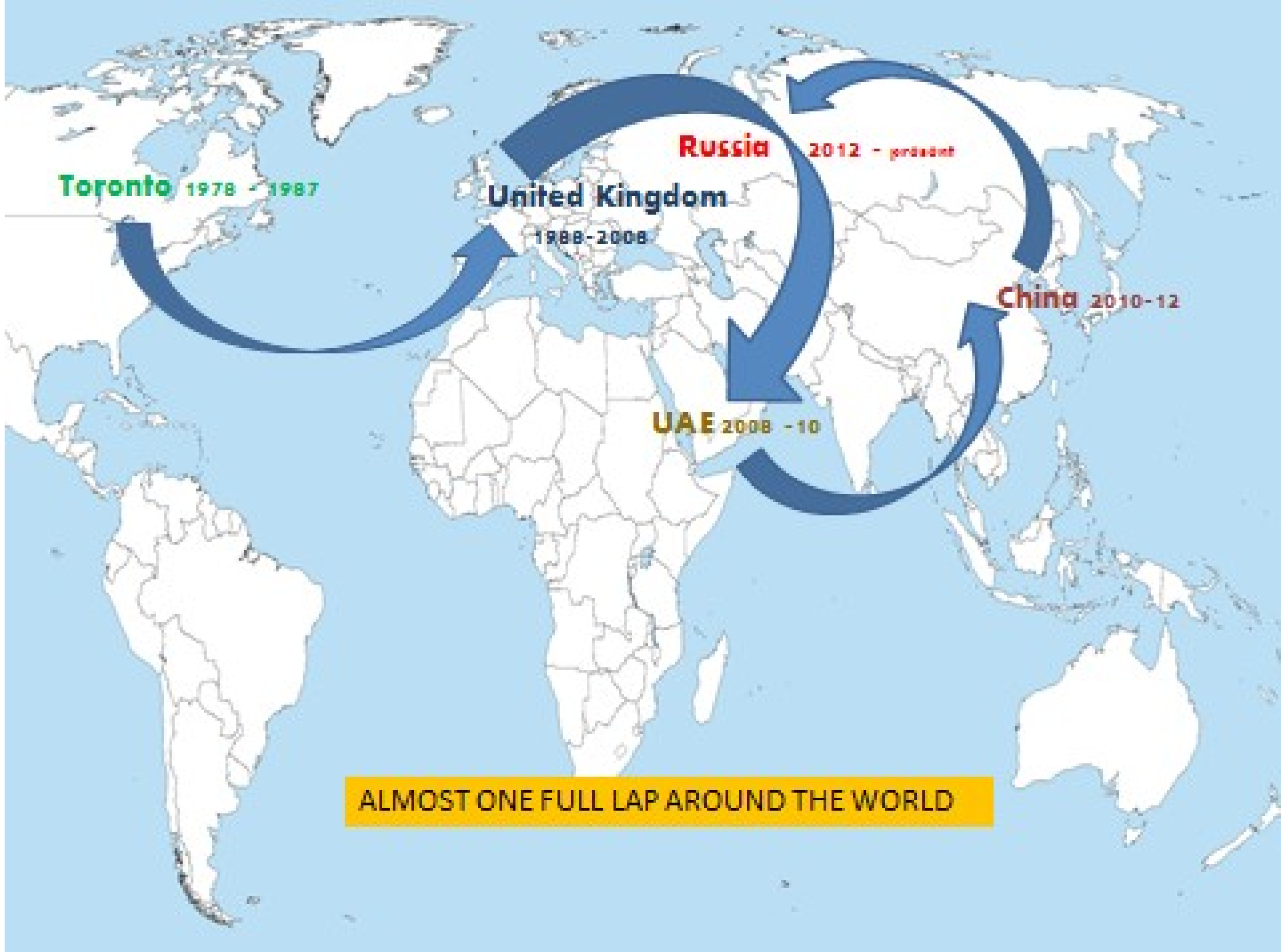


Quote

Declining from the public ways,  
walk in unfrequented paths.

—Pythagoras

570-490 BC





# PRISONERS OF GEOGRAPHY

WAR ZONE  
CLIMATE  
CIVIL WAR  
HARDWARE  
TRADE  
OIL  
RISING OIL  
RATES  
AND  
GROWING  
AND  
GROWING  
AND  
GROWING

TEN MAPS THAT TELL YOU  
EVERYTHING YOU NEED  
TO KNOW ABOUT  
GLOBAL POLITICS

**Revised  
and updated  
edition**

**THE PHENOMENAL NO.1  
SUNDAY TIMES BESTSELLER**

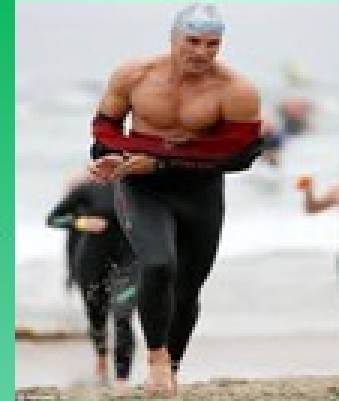


# Agronomics – are the maintenance programs working to ensure the long term health of the turf. How do we measure success?

## Health Check – bench marking



Overweight, high blood pressure = heart attack



Fit, healthy, can cope with tremendous stress



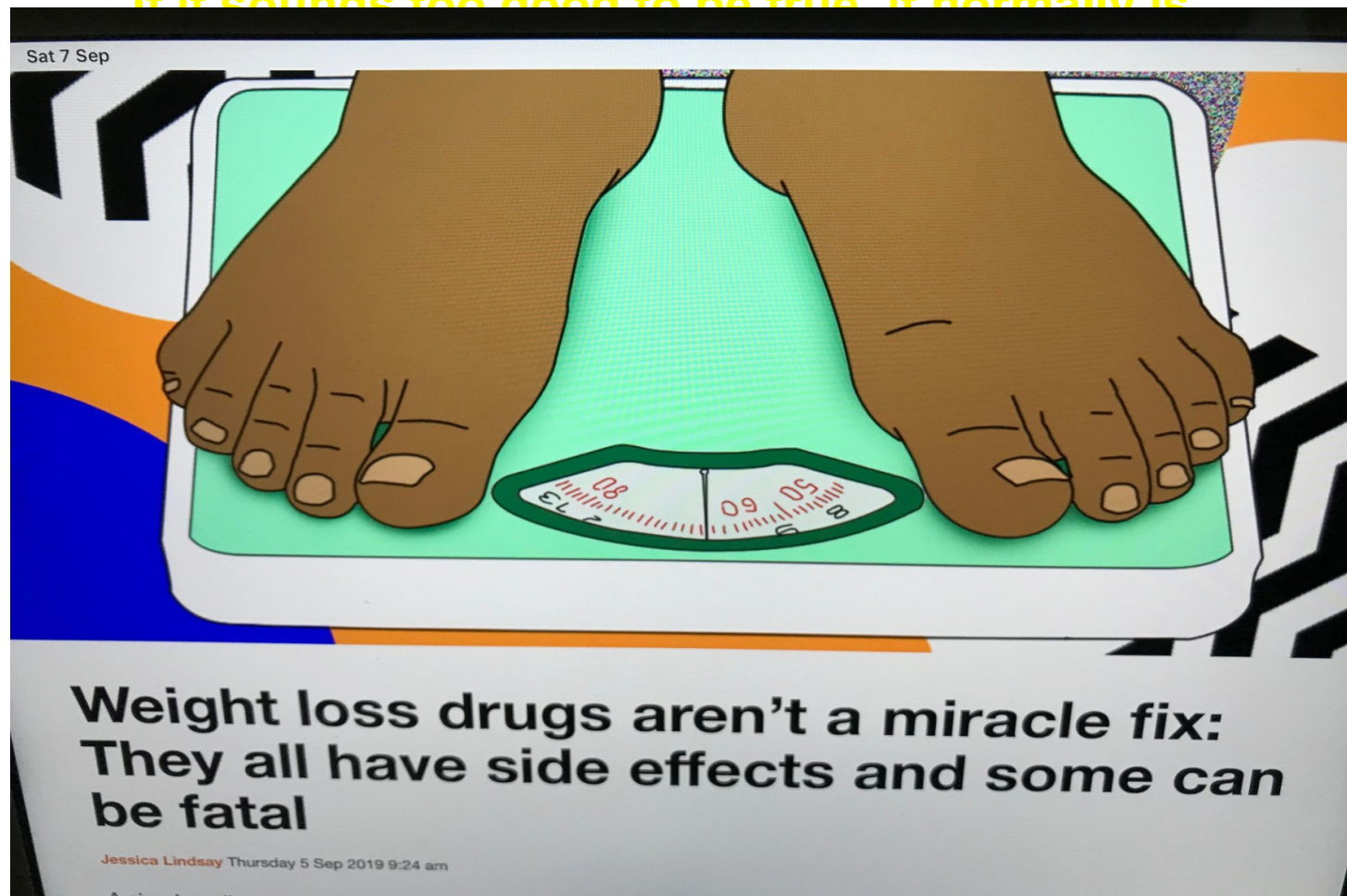
Excessive thatch, shallow roots = weak turf that cannot cope with stress

No thatch, long roots = great stress tolerance



‘If you do need some extra help to reach your target weight and lower your body mass index, they might suggest medication. But the most important thing is to make sure that you’re keeping to your diet plan and doing enough physical activity.’

If it sounds too good to be true, it normally is



# KMT

## (Key Management Principles)

1.

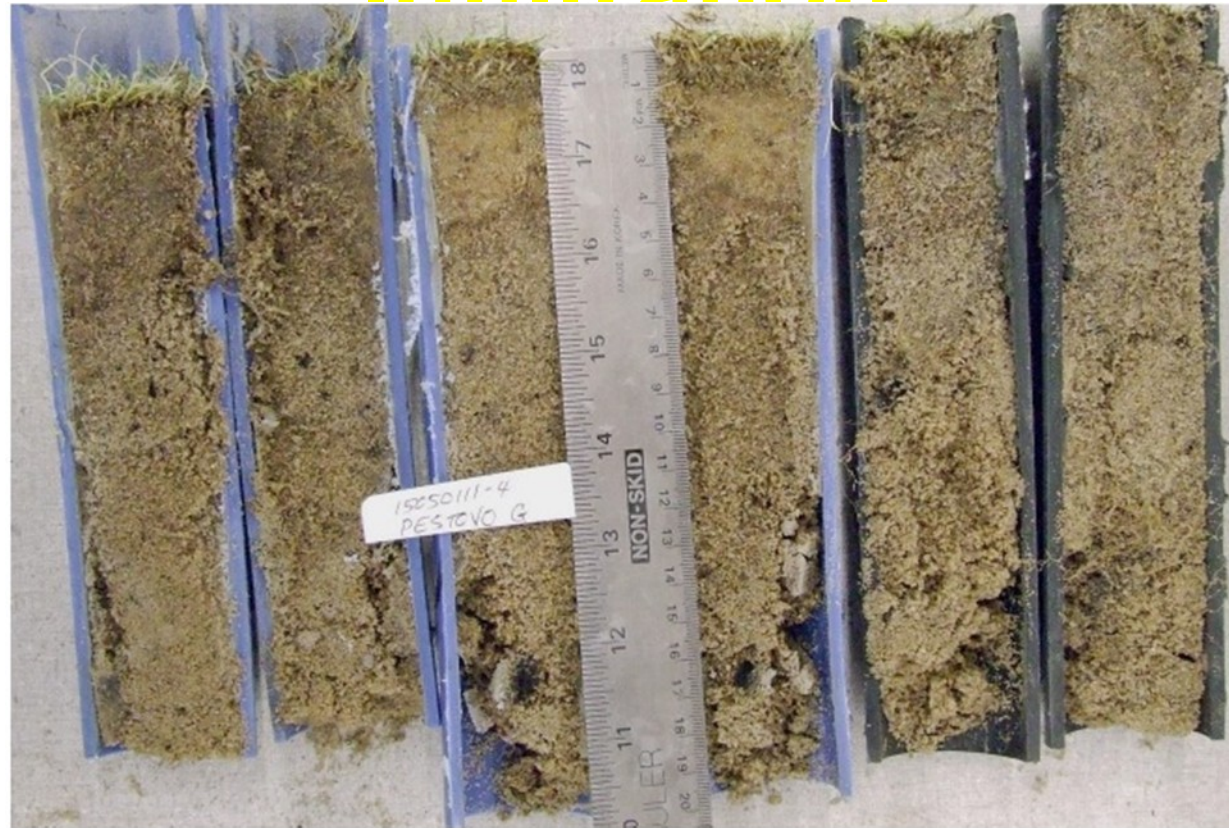
2.

3.

4.



# – Rootzone testing and measure for Organic Matter content, Particle size and Infiltration



# Organic Matter (Thatch) test

## 1.) Organic Matter Loss by Ignition

- Send in top OM layer (THE DARK LAYER) to any USGA accredited lab (**usually, 0-2 inch (0 to 5 cm zone)**)
- Results <3% are good news
- Results 3-5% are borderline
- Results >5% are cause for concern. Serious effort to remediate required. Extra sand applied to surface may not work alone, need aeration with filling of columns. In cool climates, may be over 5% with few field symptoms. Beware because death can be quick with high temps





# Laboratory test result

12100022.pdf (SECURED) - Adobe Reader

File Edit View Window Help

Tools Sign Comment

100%

3 / 4

Pestovo Golf and Yacht Club  
Ken Siems  
Nikolskaya Str 1-1, Village Rumyncevo  
Moscow Region 141052 RUSSIA  
PHONE: 7-4950739-2020

Date received Oct-08-2012  
Account Number 10121070  
Date Reported Oct-12-2012  
Facility Pestovo Golf and Yacht Club

**ACCREDITED**

**Particle Size Evaluation\***

| Lab ID#                         | Sample Name      | % Sand<br>2.0 - 0.05 mm | % Silt<br>0.05-0.002mm | % Clay<br>< 0.002mm | Gravel<br>2.0 (10) | % Retained mm (US sieve) |                    |                     |                    |                       |
|---------------------------------|------------------|-------------------------|------------------------|---------------------|--------------------|--------------------------|--------------------|---------------------|--------------------|-----------------------|
|                                 |                  |                         |                        |                     |                    | V. Coarse<br>1.0 (18)    | Coarse<br>0.5 (35) | Medium<br>0.25 (60) | Fine<br>0.15 (100) | V. Fine<br>0.05 (270) |
| 12100022-4                      | FN1 (0 - 25 mm)  | 84.2                    | 7.6                    | 4.2                 | 4.0                | 9.8                      | 20.0               | 30.1                | 17.4               | 7.1                   |
| 12100022-4                      | FN1 (25 - 50 mm) | 88.8                    | 4.2                    | 2.7                 | 4.3                | 10.3                     | 19.3               | 29.6                | 18.3               | 11.5                  |
| 12100022-4                      | FN1 (50 - 75 mm) | 80.4                    | 6.6                    | 3.3                 | 9.7                | 10.6                     | 18.1               | 25.7                | 15.9               | 10.1                  |
| 12100022-5                      | GN1 (0 - 25 mm)  | 95.9                    | 2.2                    | 1.7                 | 0.2                | 2.8                      | 22.2               | 44.0                | 20.1               | 7.1                   |
| 12100022-5                      | GN1 (25 - 50 mm) | 97.0                    | 1.6                    | 1.4                 | 0.0                | 1.5                      | 32.9               | 46.1                | 13.0               | 3.4                   |
| 12100022-5                      | GN1 (50 - 75 mm) | 97.9                    | 1.1                    | < 1.0               | 0.1                | 0.4                      | 41.9               | 48.1                | 6.5                | 1.0                   |
| USGA Recommendations for Greens |                  | > 92%                   | < 5%                   | < 3%                | < 3%               | < 7%**                   | > 60% Combined     |                     | < 20%              | < 5%                  |

| Lab ID#    | Sample Name      | Uniformity<br>Coefficient<br>Cu | D15<br>mm | D50<br>mm | D85<br>mm | Shape<br>Angularity    | Shape<br>Sphericity | Acid<br>Reaction | pH <sup>†</sup><br>1:1 | % Organic<br>Matter<br>Dry Wt.*** |
|------------|------------------|---------------------------------|-----------|-----------|-----------|------------------------|---------------------|------------------|------------------------|-----------------------------------|
|            |                  |                                 |           |           |           |                        |                     |                  |                        |                                   |
| 12100022-4 | FN1 (25 - 50 mm) | 5.0                             | 0.13      | 0.34      | 0.99      | Sub-Angular to Rounded | Medium              | Slight           | 6.8                    | 0.82                              |
| 12100022-4 | FN1 (50 - 75 mm) | 9.4                             | 0.11      | 0.36      | 1.41      | Sub-Angular to Rounded | Medium              | Severe           | 6.8                    | 0.77                              |
| 12100022-5 | GN1 (0 - 25 mm)  | 2.8                             | 0.17      | 0.34      | 0.69      | Sub-Angular to Rounded | Medium              | None             | 6.1                    | 2.67                              |
| 12100022-5 | GN1 (25 - 50 mm) | 2.7                             | 0.21      | 0.40      | 0.75      | Sub-Angular to Rounded | Medium              | None             | 6.2                    | 1.72                              |
| 12100022-5 | GN1 (50 - 75 mm) | 2.1                             | 0.27      | 0.45      | 0.79      | Sub-Angular to Rounded | Medium              | Slight           | 6.1                    | 0.73                              |

A2LA Testing Certificate Number 797-01      \*ASTM F1632 Method B & Determination of Size Factors SOP      †ASTM D4972 w/ CaCl<sub>2</sub>      \*\*\*ASTM F1647 Method A

\*\*Maximum of 10% combined on Gravel (2.0 mm) and Very Coarse (1.0 mm) fractions.  
Samples were tested as received and comments pertain only to the samples shown.  
This report may not be reproduced in part, but only in full.  
Sample condition upon receipt was normal.  
Samples were received with a transmittal letter.

# Organic Matter testing

| PESTOVO ORGANIC MATTER RESULTS |                    |             |             |             |
|--------------------------------|--------------------|-------------|-------------|-------------|
| Location                       |                    |             |             |             |
|                                | Depth (MM)         | 0-25        | 25-50       | 50-75       |
|                                |                    |             |             |             |
| <b>FAIRWAY #<br/>1</b>         |                    |             |             |             |
|                                |                    |             |             |             |
|                                | <b>Oct 12/12</b>   | <b>8.77</b> | <b>0.82</b> | <b>0.77</b> |
|                                | <b>May 30/15</b>   | <b>5.77</b> | <b>0.8</b>  | <b>0.53</b> |
|                                | <b>Mar 15/17</b>   | <b>3.75</b> | <b>0.8</b>  | <b>0.5</b>  |
|                                | <b>Sept 4 2017</b> | <b>4.8</b>  | <b>0.5</b>  | <b>0.3</b>  |
| <b>GREEN #1</b>                | <b>Oct 12/12</b>   | <b>2.67</b> | <b>1.72</b> | <b>0.73</b> |
|                                | <b>May 30/15</b>   | <b>3.75</b> | <b>1.79</b> | <b>1</b>    |
|                                | <b>Mar 15/17</b>   | <b>2.5</b>  | <b>1.9</b>  | <b>0.9</b>  |
|                                | <b>Sept 4 2017</b> | <b>3.2</b>  | <b>1.9</b>  | <b>0.9</b>  |
| <b>Green 18</b>                | <b>Mar 15/17</b>   | <b>2.4</b>  | <b>1.5</b>  | <b>0.9</b>  |

## #2 – Irrigation Audit





# Measuring Sprinkler spacing (Triangle vs Square), Pressure at nozzle, Nozzle type = Precipitation rate









# Sprinkler system Audit





# Sprinkler - site specific application

Station Detail

Golf Areas: 1 < > 1 < >

All Areas Green Tee Approach Fairway Rough Perimeter Lake

14786

| 1G1  | B |     | 2 | 22461 | 1 - FD102 | 1 | 1 | 4  |  | 1 |  | 1 | 3 | 1 | 60 | 6    | E |
|------|---|-----|---|-------|-----------|---|---|----|--|---|--|---|---|---|----|------|---|
| 1G2  | B |     | 2 | 22449 | 1 - FD102 | 1 | 1 | 5  |  | 1 |  | 1 | 3 |   |    | 6    | E |
| 1G3  | B |     | 2 | 22447 | 1 - FD102 | 1 | 1 | 5  |  | 1 |  | 1 | 3 |   |    | 6    | E |
| 1G4  | B |     | 2 | 22454 | 1 - FD102 | 1 | 1 | 3  |  | 1 |  | 1 | 3 |   |    | 6    | E |
| 1G5  | B | LSP | 2 | 22289 | 1 - FD102 | 1 | 1 | 5  |  | 1 |  | 1 | 3 |   |    | 6    | E |
| 1G6  | B |     | 2 | 22346 | 1 - FD102 | 1 | 1 | 4  |  | 1 |  | 1 | 3 |   |    | 6    | E |
| 1T1  | A |     | 2 | 22286 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 3 | 6 |   |    | 6.98 | E |
| 1T2  | B |     | 2 | 22481 | 1 - FD102 | 1 | 1 | 5  |  | 1 |  | 3 | 6 |   |    | 6    | E |
| 1T3  | B |     | 2 | 21927 | 1 - FD102 | 1 | 1 | 7  |  | 1 |  | 3 | 6 |   |    | 6    | E |
| 1T4  | A |     | 2 | 21926 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 3 | 6 |   |    | 6.98 | E |
| 1T5  | A |     | 2 | 21917 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 3 | 6 |   |    | 6.98 | E |
| 1T6  | B |     | 2 | 22700 | 1 - FD102 | 1 | 1 | 5  |  | 1 |  | 3 | 6 |   |    | 6    | E |
| 1T7  | B |     | 2 | 26325 | 1 - FD102 | 1 | 1 | 7  |  | 1 |  | 3 | 6 |   |    | 6    | E |
| 1A1  | B |     | 2 | 21986 | 1 - FD102 | 1 | 1 | 5  |  | 1 |  | 2 | 6 |   |    | 6    | E |
| 1A2  | B |     | 2 | 26333 | 1 - FD102 | 1 | 1 | 7  |  | 1 |  | 2 | 6 |   |    | 6    | E |
| 1F1  | A |     | 2 | 23084 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F2  | A |     | 2 | 23088 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F3  | A |     | 2 | 23099 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F4  | A |     | 2 | 23098 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F5  | A | LSP | 2 | 23079 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F6  | A |     | 2 | 22167 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F7  | A |     | 2 | 22387 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F8  | A |     | 2 | 23080 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F9  | A |     | 2 | 22533 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F10 | A |     | 2 | 23086 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F11 | A |     | 2 | 23089 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F12 | A |     | 2 | 22335 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F13 | A |     | 2 | 22334 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F14 | A | LSP | 2 | 22326 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F15 | A |     | 2 | 23081 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F16 | A |     | 2 | 22327 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F17 | A |     | 2 | 22333 | 1 - FD102 | 1 | 1 | 5  |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F18 | A |     | 2 | 22330 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F19 | A | LSP | 2 | 22255 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F20 | A |     | 2 | 22329 | 1 - FD102 | 1 | 1 | 5  |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F21 | A |     | 2 | 22328 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F22 | A |     | 2 | 22297 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |
| 1F23 | A | LSP | 2 | 22222 | 1 - FD102 | 1 | 1 | 10 |  | 1 |  | 5 | 6 |   |    | 6.98 | E |

# Moisture Meter





FIELD SCOUT®

Stndrd VWC%=17.4  
PL=S N002 A=18.3

TDR 300

ON

MODE

Delete  
Clr Avg

READ

Spectrum®  
Technologies, Inc.





Syringing during winter to  
prevent desiccation of Leaf -  
Beijing



Niels also said 'Nǐ hǎo' to the ladies while visiting!







KEN - 1983

Augusta Herald 3D



Staff photo by Lannis Waters

**Mudd abuses par 5s  
for second round 68**



# **Augusta National GC Management Take Home Lesson #1**



# Smart Purchasing – Buyer beware





Name Almack Agronomic Services Inc City Carlisle State ONT

Independent Consultant Almack Agronomic Services Inc. Date 06/01

Sample Location Turf brand

Sample Identification

Lab Number

0652-1

Total Exchange Capacity (ME/100 g)

19.39

pH (H<sub>2</sub>O 1:1)

a  
7.6

Organic Matter (humus) %

Estimated Nitrogen Release lb/A

| ANIONS | SOLUBLE SULFUR |             |      | ppm  | 338  |  |  |  |  |
|--------|----------------|-------------|------|--|------|--|--|--|--|
|        | PHOSPHORUS     | MEHLICH III | lb/A | P as P <sub>2</sub> O <sub>5</sub><br>ppm of P | 1401 |  |  |  |  |
|        |                | BRAY II     | lb/A | P as P <sub>2</sub> O <sub>5</sub><br>ppm of P | 1420 |  |  |  |  |
|        |                | OLSEN       | lb/A | P as P <sub>2</sub> O <sub>5</sub><br>ppm of P |      |  |  |  |  |



## SOIL AUDIT AND INVENTORY REPORT

Name Almack Agronomic Services Inc City Carlisle State ONTIndependent Consultant Almack Agronomic Services Inc. Date 06/01/2009

|                                    |                |   |      |       |       |       |
|------------------------------------|----------------|---|------|-------|-------|-------|
| Sample Location                    | Non Turf brand | -   |      |       |       |       |
| Sample Identification              |                |   |      |       |       |       |
| Lab Number                         |                | 0653-1  |      |       |       |       |
| Total Exchange Capacity (ME/100 g) |                | 31.44   |      |       |       |       |
| pH (H <sub>2</sub> O 1:1)          |                | a<br>8.5  |      |       |       |       |
| Organic Matter (humus) %           |                |   |      |       |       |       |
| Estimated Nitrogen Release lb/A    |                |   |      |       |       |       |
| ANIONS                             | SOLUBLE SULFUR | ppm   | 15   |       |       |       |
|                                    | MEHLICH III    | lb/A P as P <sub>2</sub> O <sub>5</sub> ,<br>ppm of P | 14   |       |       |       |
|                                    | BRAY II        | lb/A P as P <sub>2</sub> O <sub>5</sub> ,<br>ppm of P | 238  |       |       |       |
|                                    | OLSEN          | lb/A P as P <sub>2</sub> O <sub>5</sub> ,<br>ppm of P |      |       |       |       |
| EXCHANGEABLE CATIONS               | CALCIUM:       | lb/A _____<br>ppm                                     | 4148 | _____ | _____ | _____ |
|                                    | MAGNESIUM:     | lb/A _____<br>ppm                                     | 506  | _____ | _____ | _____ |
|                                    | POTASSIUM:     | lb/A _____<br>ppm                                     | 9756 | _____ | _____ | _____ |
|                                    | SODIUM:        | lb/A  | 2550 |       |       |       |



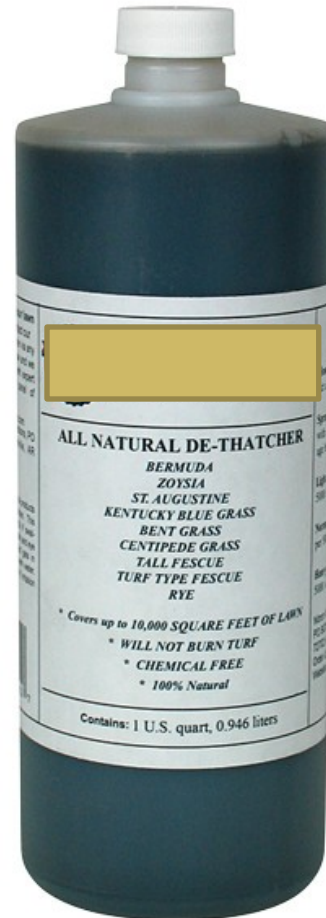
### Coverage Rates:

Light Application: 1/4 gallon per 5,000 square feet

Normal Application: 1/2 gallon per 5,000 square feet

Heavy Application: 1 gallon per 5,000 square feet

**Average application cost/Ha = 600 euro/Ha**



# #4 Fertility Management

1

2

3



# Analysis Results (LEAF)

**Customer** LOCH LOMOND GC

**Distributor** LOCH LOMOND GOLF COURSE  
ROSSDHU HOUSE  
LUSS  
BY ALEXANDRIA  
DUNBARTONSHIRE

**Sample Ref** GREEN 1

**Date Received** 09/04/2008

**Sample No** C41513/02

**Crop** GRASS GROWTH

| Analysis               | Result | Guideline | Interpretation | Comments                          |
|------------------------|--------|-----------|----------------|-----------------------------------|
| Nitrogen (%)           | 3.99   | 2.60      | Normal         | Adequate level.                   |
| Phosphorus (%)         | 0.40   | 0.30      | Normal         | Adequate level.                   |
| Potassium (%)          | 1.78   | 2.10      | Slightly Low   | CONSIDER TREATMENT.               |
| Calcium (%)            | 0.47   | 0.60      | Slightly Low   | Low priority. See comments below. |
| <u>Magnesium (%)</u>   | 0.20   | 0.15      | Normal         | Adequate level.                   |
| <u>Manganese (ppm)</u> | 408.0  | 35.0      | Normal         | Adequate level.                   |
| Boron (ppm)            | 8.3    | 6.0       | Normal         | Adequate level.                   |
| Zinc (ppm)             | 42.6   | 20.0      | Normal         | Adequate level.                   |
| Iron (ppm)             | 496    | 150       | Normal         | Adequate level.                   |
| Copper (ppm)           | 23.1   | 6.0       | Normal         | Adequate level.                   |
| Molybdenum (ppm)       | 2.92   | 0.15      | High           | Above normal range.               |
| Sulphur (%)            | 0.41   | 0.20      | Normal         | Adequate level.                   |

## Additional Comments

Underlined nutrients should be treated as a priority. However where these are adequate, treatment of deficient low priority nutrients should be considered. For any product applied, always refer to manufacturers advice for rates and timing of application. PLEASE NOTE : The guideline levels quoted should be regarded as the absolute minimum at which crop yield or quality may be

| 2017 Golf Course Fertiliser applications |          |                  |       |       |
|--|----------|------------------|-------|-------|
| Greens                                   |          |                  |       |       |
|  |          |                  |       |       |
| Date                                     | Product  | Product rate/ ha | N/ Ha | K/ Ha |
| 4/30/2017                                | 19-6-20  | 25               | 4.75  | 4.75  |
| 5/7/2017                                 | 19-6-20  | 30               | 5.7   | 5.7   |
| 5/17/2017                                | 21-0-0   | 15               | 3.15  |       |
|  | 13-0-46  | 10               | 1.3   | 4.55  |
| 5/25/2017                                | 19-6-20; | 15               | 2.85  | 2.85  |
|  | 46-0-0   | 6                | 2.76  |       |
| 5/27/2017                                | 21-0-0   | 10               | 2.1   |       |
| 7/3/2017                                 | 21-0-0   | 20               | 4.2   |       |
|  | 13-0-46  | 10               | 1.3   | 4.55  |
| 7/11/2017                                | 19-6-20  | 20               | 3.8   | 3.8   |
| 7/14/2017                                | 21-0-0   | 20               | 4.2   |       |
| 7/25/2017                                | 21-0-0   | 12               | 2.52  |       |
|  | 19-6-20  | 8                | 1.52  | 1.52  |
| 7/31/2017                                | 21-0-0   | 12               | 2.52  |       |
|  | 13-0-46  | 12               | 1.56  | 4.55  |
| 8/5/2017                                 | 21-0-0   | 10               | 2.1   |       |
|  | 13-0-46  | 5                | 0.65  | 2.3   |
| 8/22/2017                                | 19-6-20  | 15               | 2.85  | 2.9   |
| 8/25/2017                                | 21-0-0   | 15               | 3.15  |       |
| 9/2/2017                                 | 19-6-20  | 17               | 1.3   | 1.3   |
| 9/15/2017                                | 19-6-20  | 10               | 1.9   | 1.3   |
| 9/20/2017                                | 13-0-46  | 10               | 1.3   | 4.55  |
|  |          |                  |       |       |
|  |          |                  | 57.48 | 44.62 |



## #4 - Non disturbance Management



•

## SUPERINTENDENT ROLE – Dr. Joe Duich, Professor Emeritus

20% growing the grass – easier part of the job

80% Management and communication – The hardest part of the job. Managing staff, members, finances, projects, health and safety, environment, government legislation and so forth. How good one becomes at managing success or





# How important is the Superintendent????

1

Thank You!

