



# Kikuyugrass Nutrition and Soil Salinity

Larry Stowell, Ph.D.

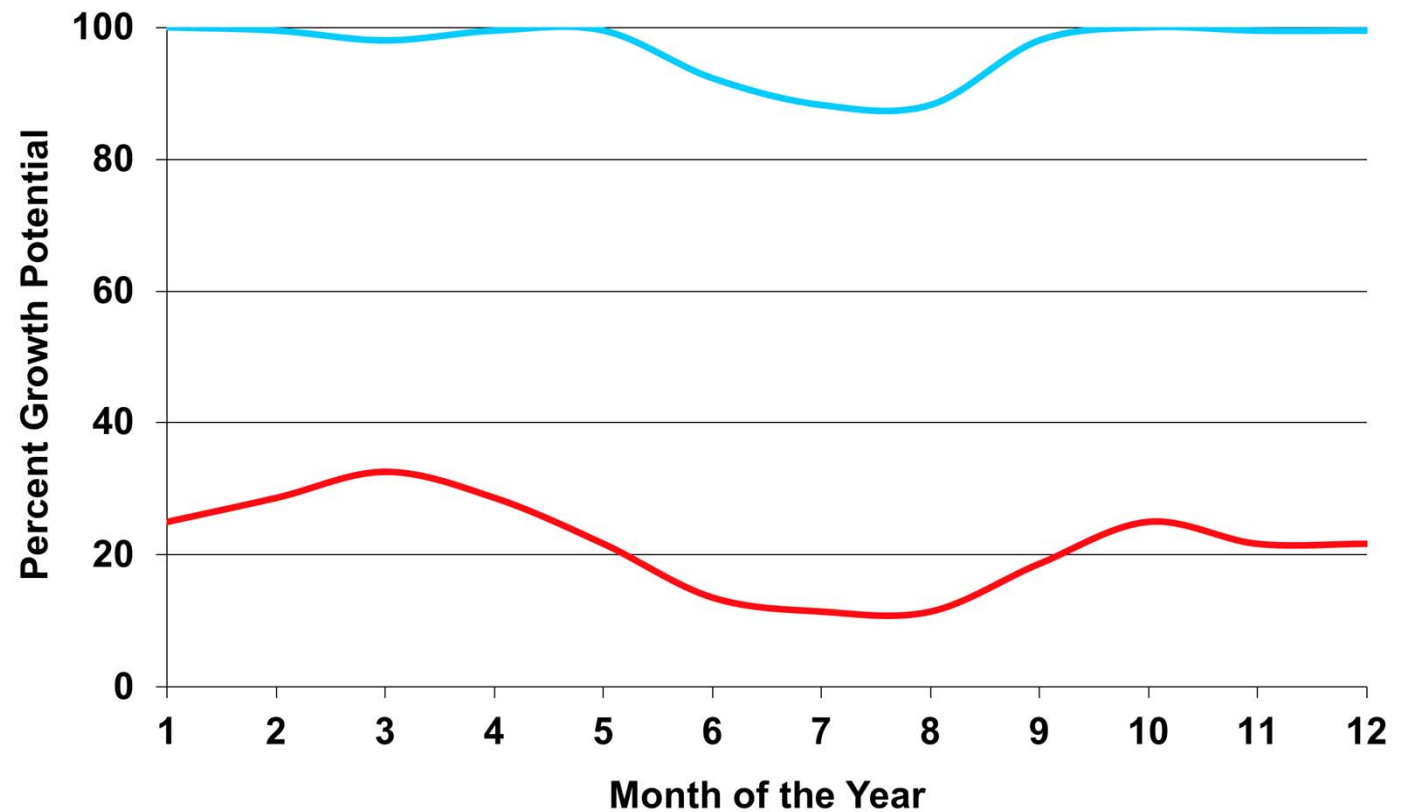
[www.paceturf.org](http://www.paceturf.org)

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Nairobi,  
Kenya  
6600 ft  
elevation  
-  
origin of  
kikuyugrass

Expected nitrogen use: 1.8 lbs N/1000 sq ft (9 g/m<sup>2</sup>)



**<https://www.paceturf.org/index.php/journal/climate>**

Location: Nairobi, Kenya

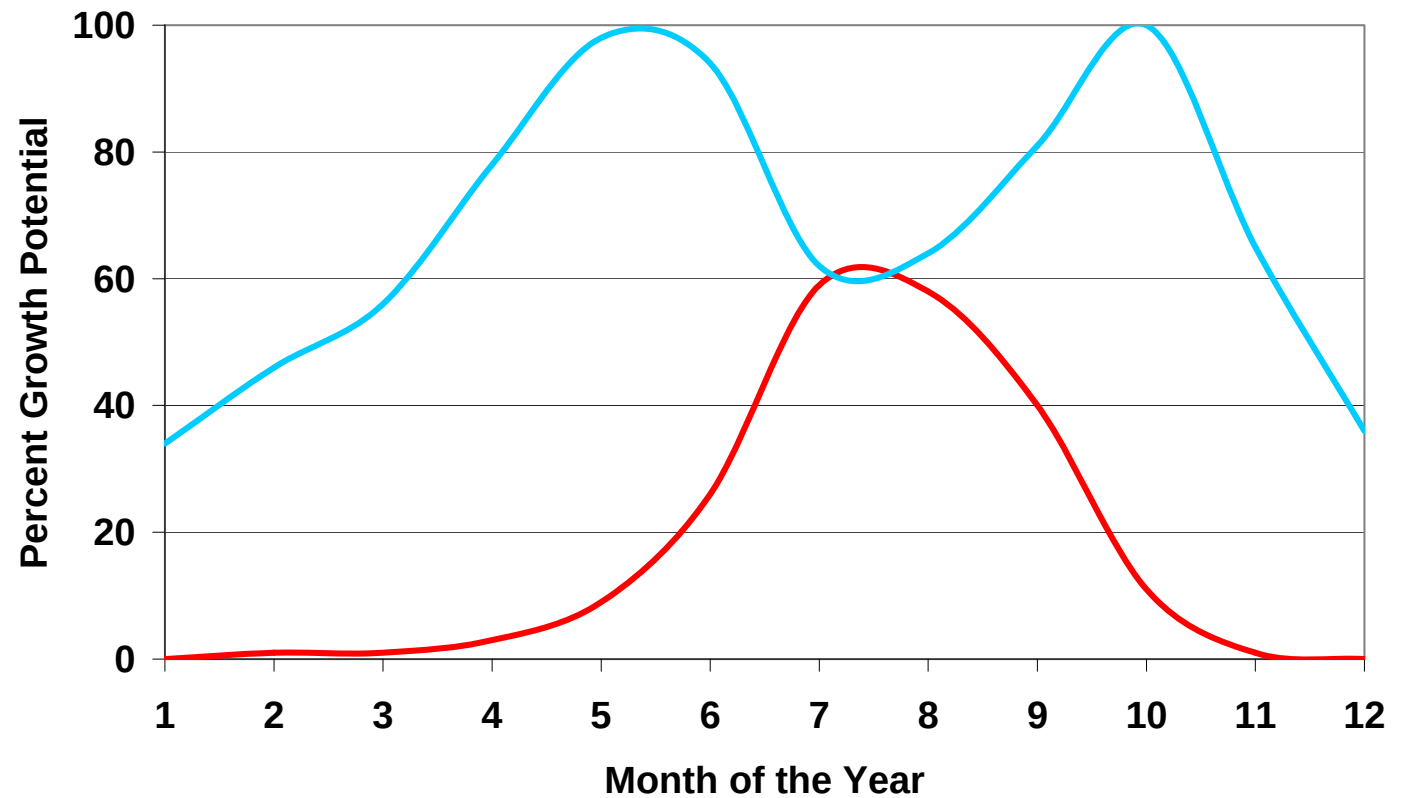
|               | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
|---------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Avg T (F)     | 68.0 | 69.0 | 70.0 | 69.0 | 67.0 | 64.0 | 63.0 | 63.0 | 66.0 | 68.0 | 67.0 | 67.0 |
| Rainfall (in) | 1.8  | 1.7  | 2.9  | 6.3  | 4.7  | 1.2  | 0.5  | 0.5  | 1.0  | 1.7  | 4.7  | 3.0  |

Warm Season Grass Maximum N/month lb/1000 sq ft = 0.70

[illegible]

**Inland  
Southern  
California  
(Riverside)**

**Expected nitrogen use: 2.1 lbs N/1000 sq ft (10.5 g/m<sup>2</sup>)**



**<https://www.paceturf.org/index.php/journal/climate>**

Location: Riverside, CA

|               | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
|---------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Avg T (F)     | 53.3 | 62.9 | 60.2 | 63.6 | 62.6 | 74.5 | 77.5 | 76.5 | 72.6 | 67.7 | 62.2 | 54.1 |
| Rainfall (in) | 2.4  | 0.2  | 0.7  | 0.2  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.9  | 1.1  | 3.7  |

Warm Season Grass Maximum N/month lb/1000 sq ft = 0.70

[illegible]



**Tyler Mock,  
University of  
California,  
Riverside**

- Two year study evaluating fertilization and cultural practices
- 2 lbs N/1000 sq ft produced higher quality kikuyugrass surfaces compared to 5 lbs N/1000 sq ft

**Grafton,  
New South  
Wales,  
Australia**

**Expected nitrogen use: 2.4 lbs N/1000 sq ft (12 g/m<sup>2</sup>)**

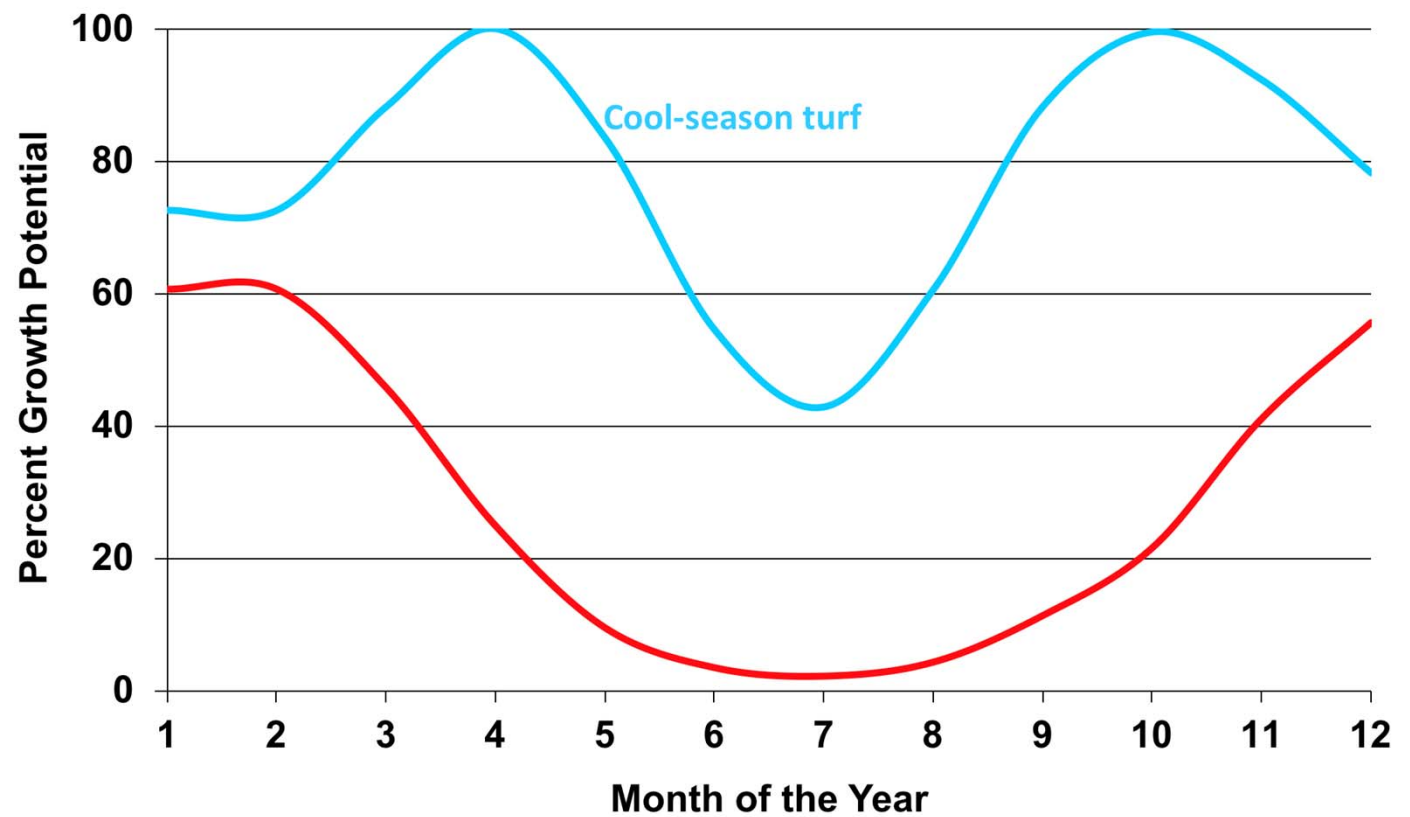


TABLE 3

*Effect of sowing rate and nitrogen fertilizer on mean yield of seed of Whirtet kikuyu for five sowing rates and four levels of nitrogen during two years*

| Treatment                            |                 | Yield of Seed<br>(kg ha <sup>-1</sup> ) |      | Yield of Leaf<br>(kg ha <sup>-1</sup> ) |      |
|--------------------------------------|-----------------|-----------------------------------------|------|-----------------------------------------|------|
|                                      |                 | 1969                                    | 1970 | 1969                                    | 1970 |
| Sowing rate (kg ha <sup>-1</sup> )   | 5.6             | 507                                     | 105  | 4956                                    | 5222 |
|                                      | 11.2            | 580                                     | 104  | 5217                                    | 5020 |
|                                      | 22.4            | 639                                     | 103  | 5349                                    | 4706 |
|                                      | 44.8            | 673                                     | 88   | 5599                                    | 4365 |
|                                      | 89.6            | 702                                     | 86   | 5872                                    | 4095 |
| LSD (P = 0.05)                       |                 | 37                                      | 10   | 287                                     | 220  |
| Nitrogen rate (kg ha <sup>-1</sup> ) | 0               | 652                                     | 114  | 4830                                    | 3621 |
|                                      | 1 lb/1000 sq ft | 56                                      | 110  | 5323                                    | 4621 |
|                                      | 2 lb/1000 sq ft | 112                                     | 100  | 5448                                    | 4927 |
|                                      | 4 lb/1000 sq ft | 224                                     | 65   | 5994                                    | 5795 |
| LSD (P = 0.05)                       |                 | 34                                      | 9    | 260                                     | 200  |



Location: Grafton, New South Wales, Australia

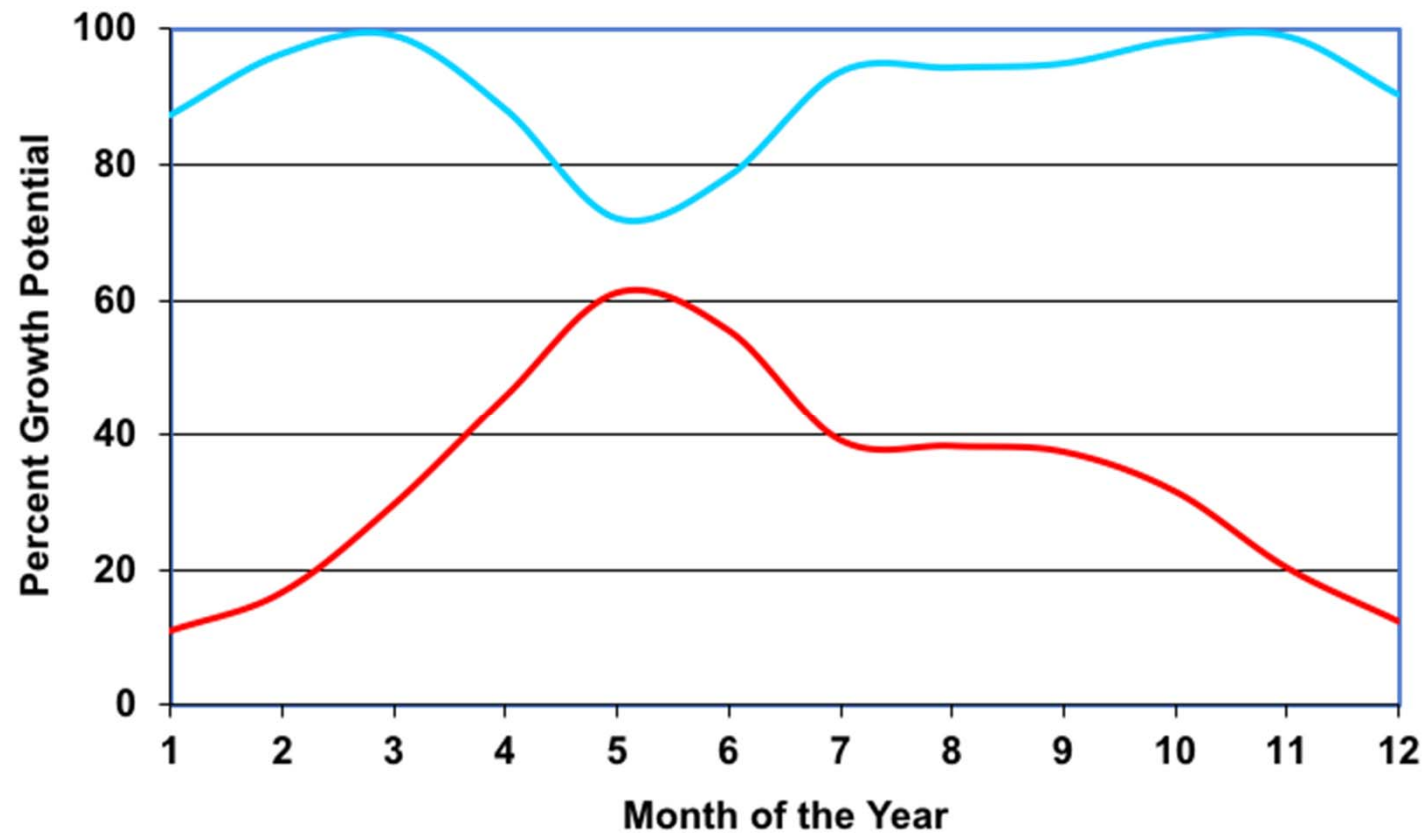
|               | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
|---------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Avg T (F)     | 76.0 | 76.0 | 73.0 | 68.0 | 62.0 | 57.0 | 55.0 | 58.0 | 63.0 | 67.0 | 72.0 | 75.0 |
| Rainfall (in) | 5.0  | 5.0  | 4.0  | 3.0  | 2.0  | 2.0  | 2.0  | 1.0  | 1.0  | 2.0  | 3.0  | 4.0  |

Warm Season Grass Maximum N/month lb/1000 sq ft = 0.70

[illegible]

**Central  
Mexico 5,085  
ft elevation  
(Guadalajara  
, Mexico)**

**Expected nitrogen use: 2.8 lbs N/1000 sq ft (14 g/m<sup>2</sup>)**



Location: Guadalajara, Mexico

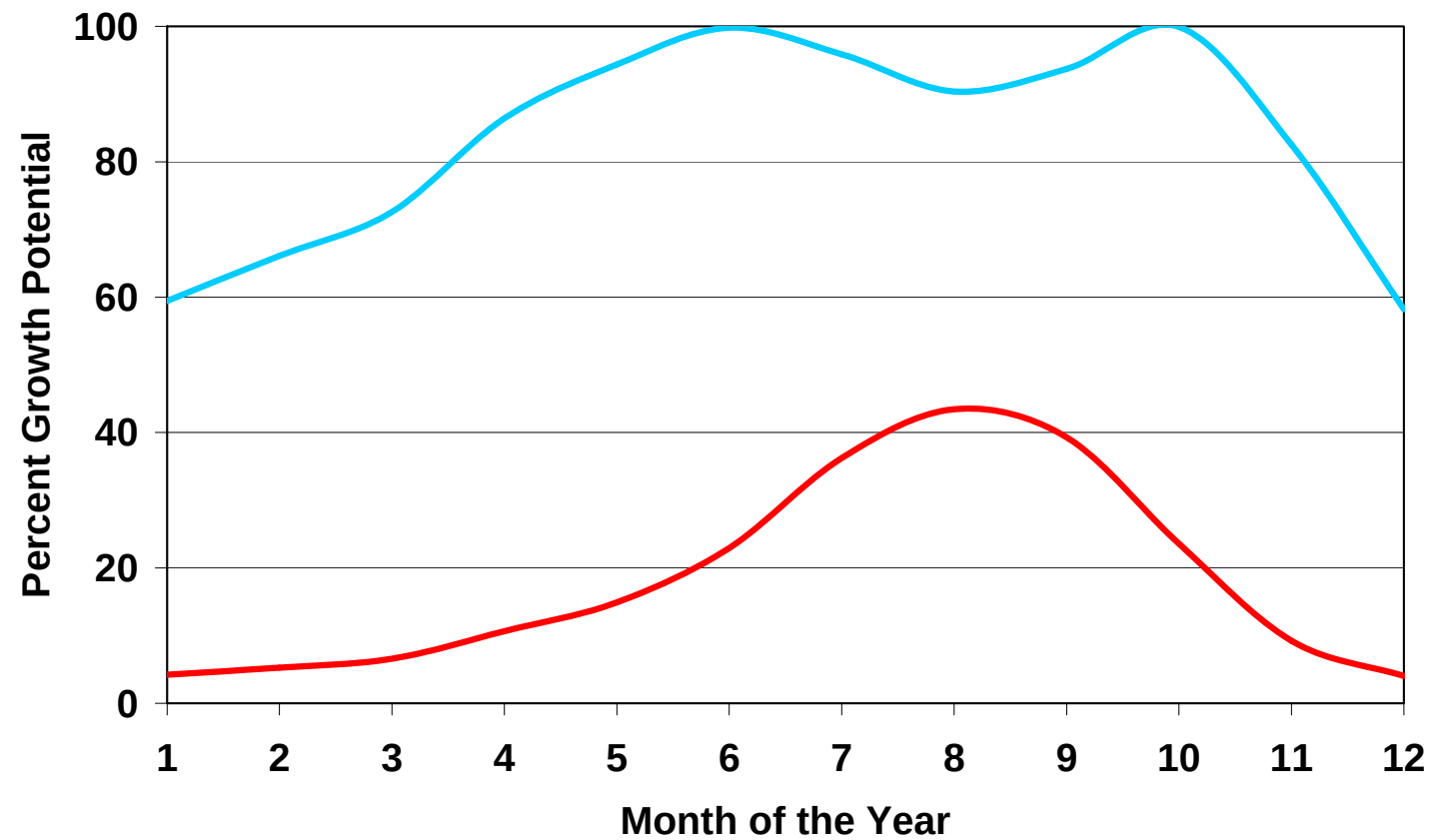
|               | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
|---------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Avg T (F)     | 62.8 | 65.3 | 69.3 | 73.0 | 76.1 | 75.0 | 71.6 | 71.4 | 71.2 | 69.8 | 66.6 | 63.5 |
| Rainfall (in) | 0.6  | 0.2  | 0.2  | 0.2  | 1.0  | 7.5  | 10.7 | 8.9  | 6.6  | 2.5  | 0.6  | 0.4  |

Warm Season Grass Maximum N/month lb/1000 sq ft = 0.70

[illegible]

**Coastal  
California  
Climate  
(San Diego)**

**Expected nitrogen use: 1.4 lbs N/1000 sq ft (7 g/m<sup>2</sup>)**



**<https://www.paceturf.org/index.php/journal/climate>**

Location: San Diego, CA

|               | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
|---------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Avg T (F)     | 57.1 | 57.9 | 59.4 | 61.7 | 64.0 | 66.4 | 70.0 | 71.6 | 70.6 | 66.7 | 61.3 | 56.5 |
| Rainfall (in) | 2.0  | 2.3  | 1.8  | 0.8  | 0.1  | 0.1  | ---  | ---  | 0.2  | 0.6  | 1.0  | 1.5  |

Warm Season Grass Maximum N/month lb/1000 sq ft = 0.70

[illegible]

<https://www.paceturf.org/index.php/journal/climate>

Location: Riverside, CA

|               | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
|---------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Avg T (F)     | 53.3 | 62.9 | 60.2 | 63.6 | 62.6 | 74.5 | 77.5 | 76.5 | 72.6 | 67.7 | 62.2 | 54.1 |
| Rainfall (in) | 2.4  | 0.2  | 0.7  | 0.2  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.9  | 1.1  | 3.7  |

Warm Season Grass Maximum N/month lb/1000 sq ft = 0.70

[illegible]



## Soil Nutrients vs MLSN guidelines

[https://www.paceturf.org/journal/minimum\\_level\\_for\\_sustainable\\_nutrition](https://www.paceturf.org/journal/minimum_level_for_sustainable_nutrition)

| Mehlich-3 ppm | El Niguel | Mesa Verde | Mission Viejo | Santa Ana | MLSN |
|---------------|-----------|------------|---------------|-----------|------|
| K             | 337       | 347        | 395           | 193       | 72   |
| P             | 140       | 82         | 194           | 53        | 30   |
| Ca            | 2882      | 3531       | 3395          | 3395      | 338  |
| Mg            | 590       | 311        | 766           | 766       | 51   |
| S             | 522       | 338        | 975           | 285       | 11   |

## Estimated Annual N Release Due to Organic Matter Mineralization

| % OM | N ppm | Lb N/1000<br>sq ft |
|------|-------|--------------------|
| 1    | 40    | 1.2                |
| 2    | 60    | 1.8                |
| 3    | 80    | 2.4                |
| 4    | 90    | 2.7                |
| 5    | 100   | 3.0                |
| 6    | 105   | 3.2                |
| 7    | 110   | 3.3                |
| 8    | 115   | 3.5                |
| 9    | 120   | 3.7                |
| 10   | 125   | 3.8                |

**Estimated annual kikuyugrass nitrogen use:**  
**2 lbs/1000 sq ft (10 g/m<sup>2</sup>)**

|                            | El Niguel | Mesa Verde | Mission Viejo | Santa Ana |
|----------------------------|-----------|------------|---------------|-----------|
| OM %                       | 11        | 9.3        | 8.9           | 6.3       |
| OM N release lb/1000 sq ft | 4         | 4          | 4             | 3         |
| Soil test N levels:        |           |            |               |           |
| N ppm                      | 44        | 42         | 57            | 19        |
| N LB/1000 sq ft            | 1.3       | 1.3        | 1.7           | 0.6       |
| N g/m <sup>2</sup>         | 6.5       | 6.5        | 8.5           | 3.0       |

## Soil and Water Salinity and Sodium

|              | El Niguel<br>Recycled | Mesa Verde<br>Well | Mission Viejo<br>Recycled | Santa Ana<br>Well |
|--------------|-----------------------|--------------------|---------------------------|-------------------|
| <b>Soil</b>  |                       |                    |                           |                   |
| EC dS/m      | 4.6                   | 3.0                | 7.7                       | 3.3               |
| Na ppm       | 548                   | 343                | 1110                      | 1000              |
| Na %         | 8.1                   | 5.2                | 17                        | 16                |
| N PPM        | 44                    | 42                 | 57                        | 19                |
| <b>Water</b> |                       |                    |                           |                   |
| EC dS/m      | 1.5                   | 0.6                | 1.5                       | 0.5               |
| Na ppm       | 140                   | 84                 | 149                       | 123               |
| SAR          | 3.6                   | 3.8                | 3.9                       | 8.2               |
| NO3+NH4 ppm  | 9.6                   | 0                  | 22                        | 0.2               |

## Soil and Water Salinity and Sodium

|              | El Niguel<br>Recycled | Mesa Verde<br>Well | Mission Viejo<br>Recycled | Santa Ana<br>Well |
|--------------|-----------------------|--------------------|---------------------------|-------------------|
| <b>Soil</b>  |                       |                    |                           |                   |
| EC dS/m      | <b>4.6</b>            | <b>3.0</b>         | <b>7.7</b>                | <b>3.3</b>        |
| Na ppm       | <b>548</b>            | <b>343</b>         | <b>1110</b>               | <b>1000</b>       |
| Na %         | <b>8.1</b>            | <b>5.2</b>         | <b>17</b>                 | <b>16</b>         |
| N PPM        | <b>44</b>             | <b>42</b>          | <b>57</b>                 | <b>19</b>         |
| <b>Water</b> |                       |                    |                           |                   |
| EC dS/m      | <b>1.5</b>            | <b>0.6</b>         | <b>1.5</b>                | <b>0.5</b>        |
| Na ppm       | <b>140</b>            | <b>84</b>          | <b>149</b>                | <b>123</b>        |
| SAR          | <b>3.6</b>            | <b>3.8</b>         | <b>3.9</b>                | <b>8.2</b>        |
| NO3+NH4 ppm  | <b>9.6</b>            | <b>0</b>           | <b>22</b>                 | <b>0.2</b>        |

## Soil and Water Salinity and Sodium

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|--------------|-----------------------|--------------------|---------------------------|-------------------|
| <b>Soil</b>  |                       |                    |                           |                   |
| EC dS/m      | 4.6                   | 3.0                | 7.7                       | 3.3               |
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| N PPM        | 44                    | 42                 | 57                        | 19                |
| <b>Water</b> |                       |                    |                           |                   |
| EC dS/m      | 1.5                   | 0.6                | 1.5                       | 0.5               |
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## Soil and Water Salinity and Sodium

|              | El Niguel<br>Recycled | Mesa Verde<br>Well | Mission Viejo<br>Recycled | Santa Ana<br>Well |
|--------------|-----------------------|--------------------|---------------------------|-------------------|
| <b>Soil</b>  |                       |                    |                           |                   |
| EC dS/m      | 4.6                   | 3.0                | 7.7                       | 3.3               |
| Na ppm       | 548                   | 343                | 1110                      | 1000              |
| Na %         | 8.1                   | 5.2                | 17                        | 16                |
| N PPM        | 44                    | 42                 | 57                        | 19                |
| <b>Water</b> |                       |                    |                           |                   |
| EC dS/m      | 1.5                   | 0.6                | 1.5                       | 0.5               |
| Na ppm       | 140                   | 84                 | 149                       | 123               |
| SAR          | 3.6                   | 3.8                | 3.9                       | 8.2               |
| NO3+NH4 ppm  | 9.6                   | 0                  | 22                        | 0.2               |



## Soil and Water Salinity and Sodium

|              | El Niguel<br>Recycled | Mesa Verde<br>Well | Mission Viejo<br>Recycled | Santa Ana<br>Well |
|--------------|-----------------------|--------------------|---------------------------|-------------------|
| <b>Soil</b>  |                       |                    |                           |                   |
| EC dS/m      | 4.6                   | 3.0                | 7.7                       | 3.3               |
| Na ppm       | 548                   | 343                | 1110                      | 1000              |
| Na %         | 8.1                   | 5.2                | 17                        | 16                |
| N PPM        | 44                    | 42                 | 57                        | 19                |
| <b>Water</b> |                       |                    |                           |                   |
| EC dS/m      | 1.5                   | 0.6                | 1.5                       | 0.5               |
| Na ppm       | 140                   | 84                 | 149                       | 123               |
| SAR          | 3.6                   | 3.8                | 3.9                       | 8.2               |
| NO3+NH4 ppm  | 9.6                   | 0                  | 22                        | 0.2               |

## Soil and Water Salinity and Sodium

|              | El Niguel<br>Recycled | Mesa Verde<br>Well | Mission Viejo<br>Recycled | Santa Ana<br>Well |
|--------------|-----------------------|--------------------|---------------------------|-------------------|
| <b>Soil</b>  |                       |                    |                           |                   |
| EC dS/m      | 4.6                   | 3.0                | 7.7                       | 3.3               |
| Na ppm       | 548                   | 343                | 1110                      | 1000              |
| Na %         | 8.1                   | 5.2                | 17                        | 16                |
| N PPM        | 44                    | 42                 | 57                        | 19                |
| <b>Water</b> |                       |                    |                           |                   |
| EC dS/m      | 1.5                   | 0.6                | 1.5                       | 0.5               |
| Na ppm       | 140                   | 84                 | 149                       | 123               |
| SAR          | 3.6                   | 3.8                | 3.9                       | 8.2               |
| NO3+NH4 ppm  | 9.6                   | 0                  | 22                        | 0.2               |

**Salinity  
Management**

**Estimated Increase in Soil EC**  
Deficit Irrigation – Salts Accumulate in Top Three Inches

|      | Irrigation Water EC (dS/m) |      |      |      |      |
|------|----------------------------|------|------|------|------|
| A Ft | 0.5                        | 1.0  | 1.5  | 2.0  | 2.5  |
| 1    | 1.4                        | 2.7  | 4.1  | 5.4  | 6.8  |
| 2    | 2.7                        | 5.4  | 8.1  | 10.8 | 13.5 |
| 3    | 4.1                        | 8.1  | 12.2 | 16.2 | 20.3 |
| 4    | 5.4                        | 10.8 | 16.2 | 21.6 | 27.0 |

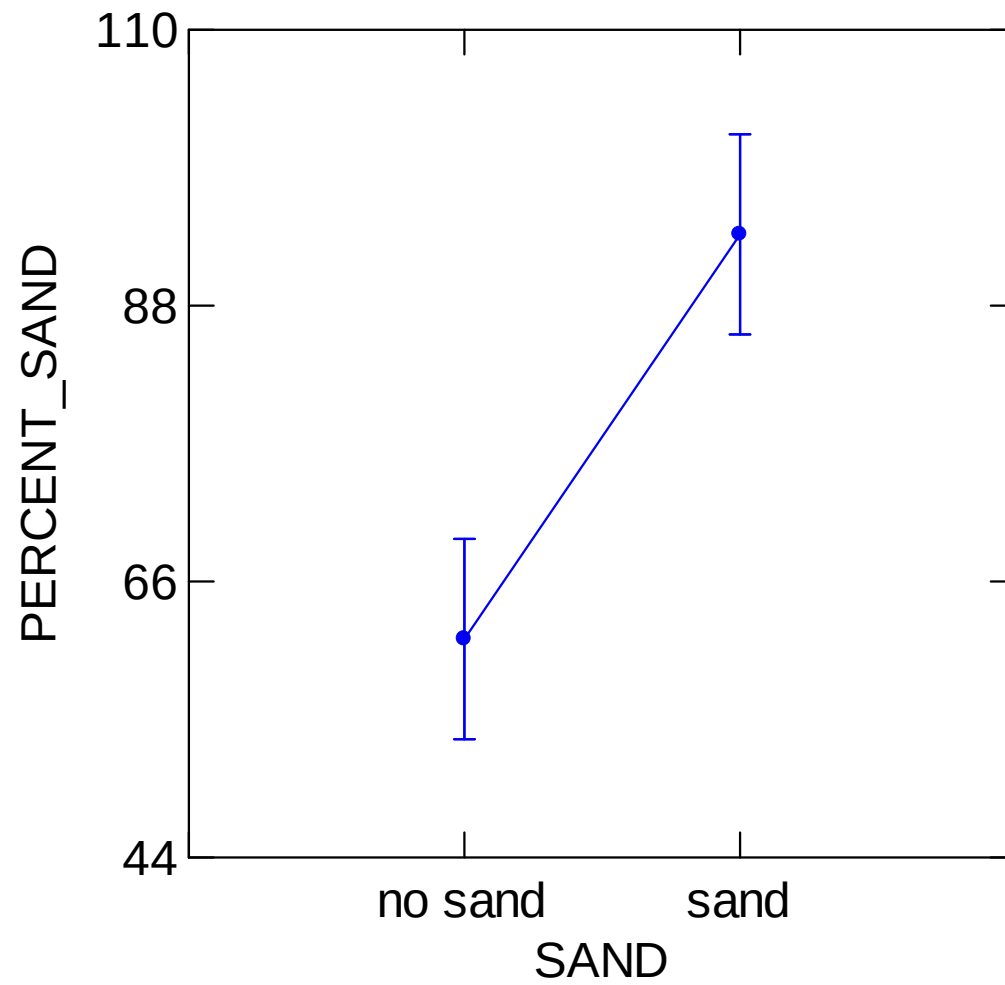
**Topdressing  
and Salinity  
Management**



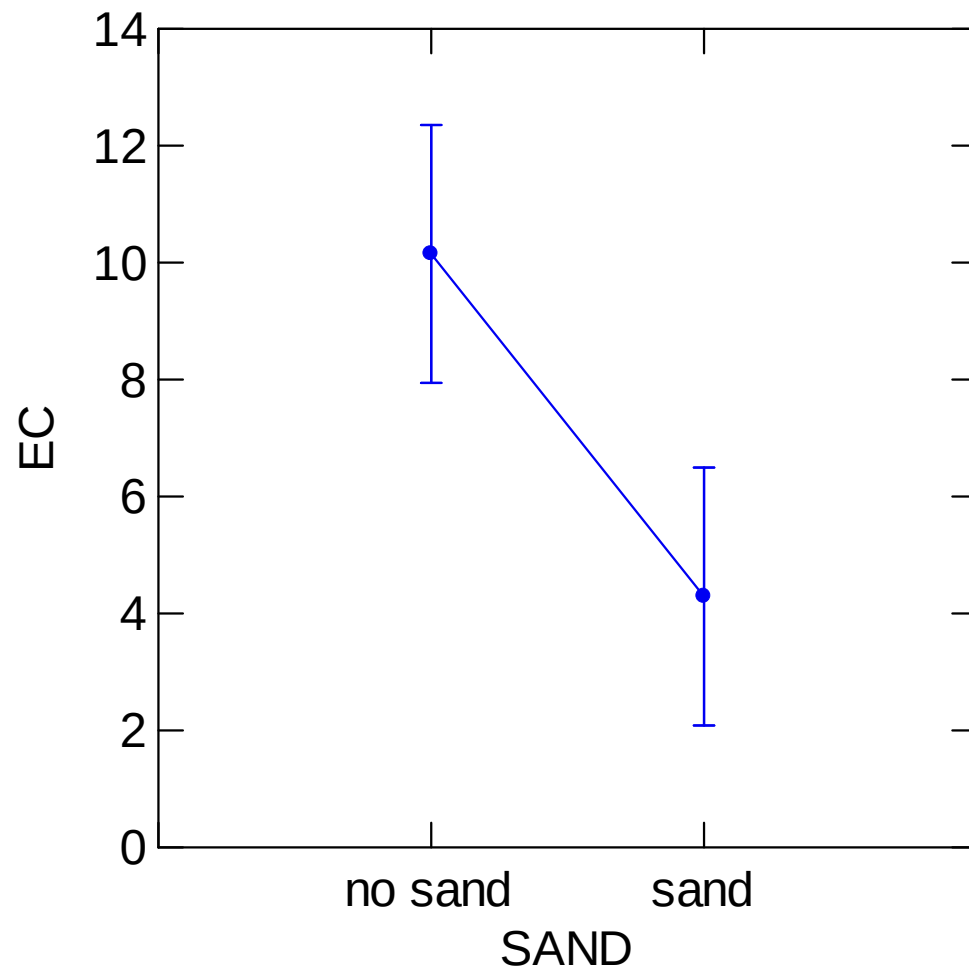
## Topdressing and Salinity Management



**Topdressing  
and Salinity  
Management**



**Topdressing  
and Salinity  
Management**



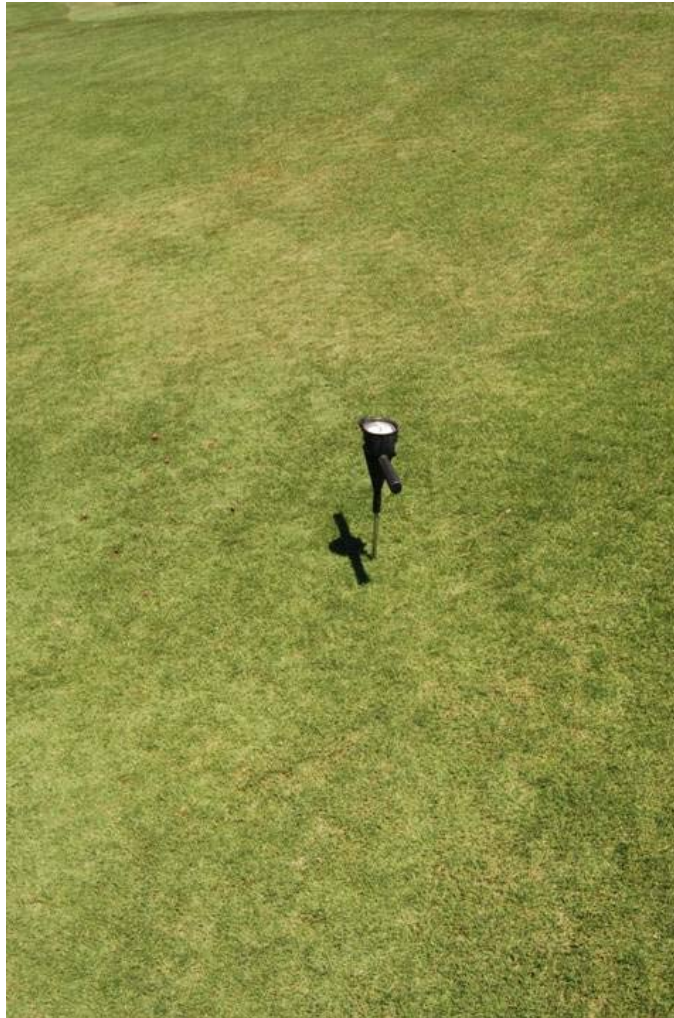


**No roots near  
crown results  
in scalping**

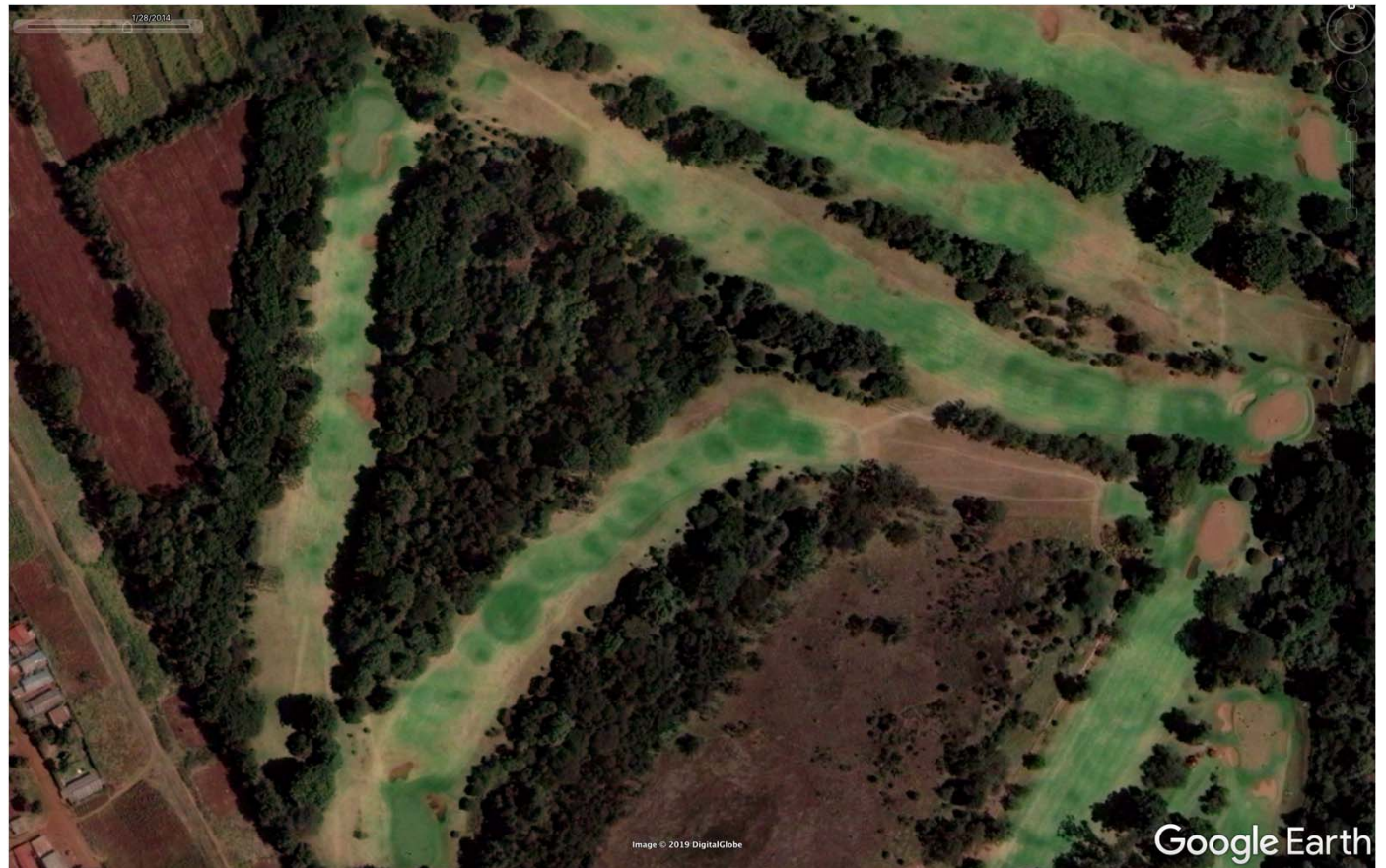




**Irrigation  
distribution**



## Irrigation distribution





# Kikuyugrass Nutrition & Salinity

- Monitor water and soil chemistry
- Maintain soil salts below 6 dS/m
- Limit N applications, 1.5 – 2 lbs N/1000 sq ft (7.5 – 10 g/m<sup>2</sup>) per year
- Manage soil organic matter target <5%
- Use manganese and iron for color
- Mow as frequently as possible
- PGRs will help restrict growth and prevent scalping
- Vertical mow to shorten stolons and prevent scalping