EUROPEAN TURFGRASS SOCIETY

NEWSLETTER 01/2022

Via della Leccia, 18 - 57128 Livorno (Italy) - CF: 95094240249
www.turfgrasssociety.eu
etsoffice@turfgrasssociety.eu

IN THIS 01/2022 NUMBER:

2022 European Turfgrass Society Field Days

The European Turfgrass Society is pleased to welcome ETS members and other turfgrass specialists to the 7th **ETS Field Days 2022 in Barcelona, Spain**

You can now register and find all information here:

https://www.turfgrasssociety.eu/ETSFD_2022/

Welcome: ETS is happy to invite you to the 2022 ETS Field Days!

The European Turfgrass Society is pleased to welcome ETS members and other turfgrass specialists to the 7th ETS Field Days 2022 in Barcelona, Spain.
The ETS organizes its Field Days every two years: Valencia – Spain (2009), Ghent – Belgium (2011), Monte Carlo – Monaco (2013), Helsingør – Denmark (2015), Brno – Czech Republic (2017), and Padova - Italy (2019) were the previous hosts of this international Field Days.

After the long-term restrictions all over the world, we have the possibility now to meet in person again, and we wish to keep on providing knowledge and connections, for the benefit of the turfgrass world.

Spain has been chosen to host the event in 2022, the 17th-18th May, in the heart of the Mediterranean region, home to beautiful natural scenery and internationally renowned modern town. The meeting venue is the Hotel Camiral at PGA Catalunya Resort in Caldes de Malavella.
We are preparing this international Field Days and it is our ambition to provide a forum to spread innovative applications for the benefit of the turfgrass industry promoting the exchange of information among turfgrass specialists.

Program:

Tuesday 17th May
09:00 ETS Welcome and sponsor presentation (at the PGA Catalunya Golf)
10:00 ETS General Assembly (all participants invited)
11:00 Coffee break (at the PGA Catalunya Golf)
11:30 Golf Visit
13:30 Lunch at the Golf
15:00 Bus leave the Golf
16:00 Visit at Royalverd (Les Presses - Girona)
17:00 Coffee break
17:30 Visit second part Royalverd (Les Presses - Girona)
18:30 Aperitif/Dinner BBQ
21:00 Bus return to the Hotel Camiral at PGA Catalunya Resort in Caldes de Malavella

Wednesday 18th May
09:00 Bus leave the Hotel Camiral at PGA Catalunya Resort in Caldes de Malavella
10:00 Arrival and visit at Semillas Fito (Selva de Mar, Barcelona)
11:30 Early lunch at Semillas Fito
13:30 Visit at RCDE Stadium - Estádio Cornellà-El Prat (Espanyol)
15:30 Visit at urban landscape project (Barcelona)
17:00 Bus return to the Hotel Camiral at PGA Catalunya in Caldes de Malavella, end of the Field Days

We hope that ETS members and potential new members will appreciate the possibility to meet, after such a long time, in Barcelona such a beautiful Mediterranean location.
LET'S MEET AGAIN!

DRG Turf Seminar in Erfurt Germany
Save The Date: 16th/17th of May 2022

Source: German Turfgrass Society, DRG

Technical Tour planning is in place
Finally, the time has come again: the German Turfgrass Society is planning, after more than two years of "forced break", to hold its 131st Turfgrass Seminar in the usual way as a face-to-face event. The selected topic emphasis reads:
"Urban green spaces".

The online seminar in May 2021 was definitely a nice success under the given conditions, but there is no substitute for a face-to-face meeting with an intensive exchange of knowledge and opinions! We are already looking forward to your participation.

Fig.1: View from Petersberg (park area during BUGA 2021) to the Erfurt Cathedral.

The conference venue Erfurt and the region offer excellent excursion destinations to "urban greenery". With the listed egapark, where the BUGA 2021 celebrated a success despite a pandemic, Erfurt emphasizes the horticultural and garden show tradition of this city in a special way. Other excursion stops include the Geraaue, Weimar with the park on the Ilm, Tiefurt Castle Park and the Teaching and Research Institute for Horticulture (LVG) in Erfurt.
The Get Together at the conference hotel will conclude the excursion day with the opportunity for intensive professional exchange and personal acquaintance.

General meeting and conference offer
The second day of the seminar will begin with the general meeting and elections to the board of directors. This will be followed by presentations on planning and nature-compatible solutions for urban lawns, the use of drones for turf assessment, and work on warm-season grasses as well as root subsurface examinations. With these current topics, the Turfgrass Seminar offers participants a wealth of technical information combined with an intensive exchange of experience among colleagues.

Application and info
More seminar information with the program schedule will be uploaded on the DRG homepage shortly as well as the registration platform will be activated.
https://www.rasengesellschaft.de/veranstaltungen.html

All turf enthusiasts are cordially invited to attend this seminar.
The DRG board is looking forward to seeing you again in Erfurt!

Fig. 2+3: Excursion to the cultural city of Weimar with the House of the Weimar Republic and the German National Theater Weimar. Photos: K.G. Mueller-Beck

Assessing differences in the thermal stress of soccer players on natural turfgrass and artificial turf

Authorship

* **YouJoung Kim**, Ph.D. Department of Landscape Architecture and Urban Planning, Texas A&M University, College Station, Texas.
Chase Straw, Ph.D. Department of Soil and Crop Sciences, Texas A&M University, College Station, Texas.
Steven E. Riechman, Ph.D. Department of Health and Kinesiology, Texas A&M University, College Station, Texas.
Brown D. Robert, Ph.D. Department of Landscape Architecture and Urban Planning, Texas A&M University, College Station, Texas.
** Corresponding author*

1. Introduction

Playing soccer on a scorching hot summer day may affect athletes' physical performance and lead to exertional heat illness. Microclimates, human-level meteorological conditions modified by nearby man-made and natural objects, have been shown to be significantly impacted by differences between natural turfgrass (NT) and artificial turf (AT) (Francis, 2018; Jim, 2017; Guyer, 2020).

But less attention has been paid to how athletes' thermal sensation is affected between the two field types. Therefore, the purpose of this study was to compare Texas A&M University Men's Club Soccer players' thermal stress when competing on NT and AT fields. While quantifying objective and subjective thermal comfort, particular attention was given to determine differences in the players' physiological and perceived thermal stress on each field type.

Microclimate and questionnaire survey data were collected on each field type and from all players, respectively over four summer days in September 2021. An energy budget model that can estimate human thermal comfort using energy flux theory was used to quantify their physiological thermal stress.

2. Method and materials

2.1. Study site

Two soccer fields at Penberthy Rec Sports Complex in College Station, Texas were selected as sites for the study. According to the Köppen climate classification, College Station's climate is considered Humid Subtropical Climate (Cfa), where the average daily high temperature between June and September is above 31.6 °C.

Both soccer fields are managed by SSC Services for Education at Texas A&M University. The NT field was 105,000 ft^2 and consisted of 'Tifway 419' hybrid bermudagrass on native soil, and the AT was 115,000 ft^2 and consisted of Astroturf RootZone 3D3 Blend 52 that was installed in 2008 and had a blend of monofilament, slit film, and nylon "root-zone" fibers with crumb rubber infill. The area around the fields was wide-open with no presence of natural or man-made objects nearby (eg., buildings, water bodies, trees, and vehicle roads) that may potentially affect thermal conditions.

The study area location, field layouts, photographs of the weather sensors used, and infrared thermal imagery taken from grass and turf are shown in Figure 1.

2.2. Data Collection

2.2.1 Microclimate measurement

Microclimate conditions of the soccer fields were measured on hot, sunny summer days (Sep 7th, 8th, 21st, and 22nd of 2021). Two sets of weather sensors (Maximet 501 and ATOMS 41) were installed at the center of each natural turfgrass and artificial turf field. The microclimate - air temperature (°C), relative humidity (%), wind speed (m/s), wind direction, and solar radiation (W/m2) - was collected from 11:00 AM to 6:00 PM CST with a 1-minute recording interval. In addition, the surface temperature was measured every 15 minutes on both filed types by two trained surveyors using a thermal infrared camera (FLIR IR E5). The measurement height of those sensors was five feet above the ground to represent the thermal conditions at an athlete's chest level. The summary of measured microclimate over four days is presented in Table 1. Although the same weather sensors were not used for data collection, they were thoroughly calibrated prior by multiple field tests.

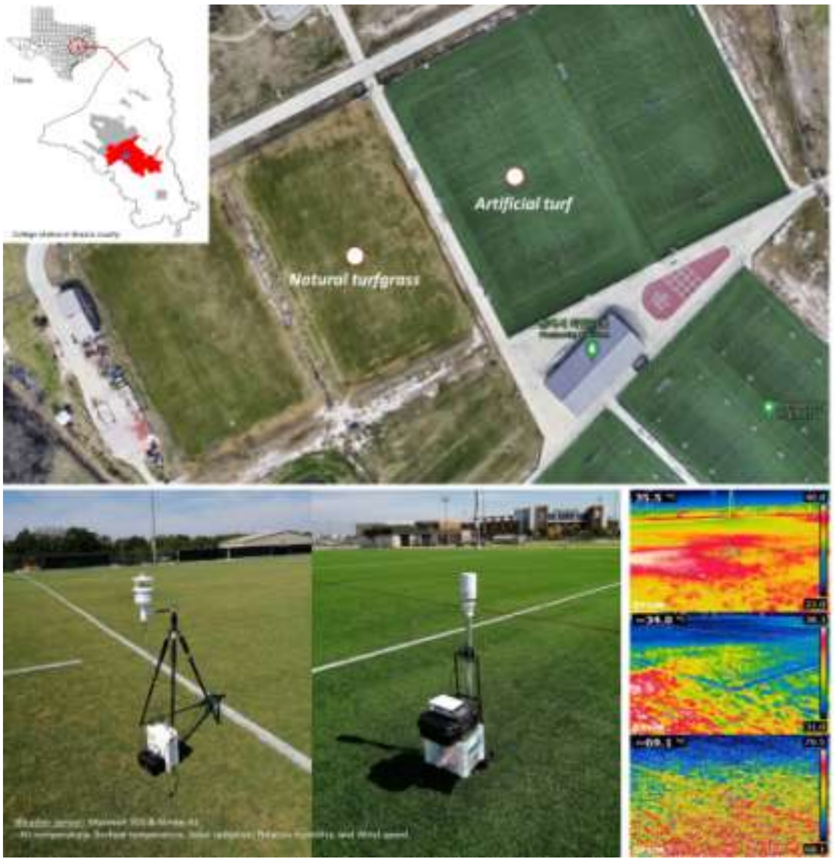

Figure 1) Microclimate measurement on Penberthy Rec Sports Soccer fields in College Station, Texas

Table 1) Summary of Microclimate condition on Penberthy soccer field

Date		Air temperature (°C)	Solar radiation (W/m^2)	Relative humidity (%)	Wind speed (m/s)
Sep 7th	Mean	33.29	810.26	33.75	1.70
	Sd	1.40	156.61	7.25	0.21
Sep 8th	Mean	33.05	622.89	32.23	3.31
	Sd	0.91	314.81	3.43	0.76
Sep 21st	Mean	32.93	570.96	55.71	2.92
	Sd	1.72	136.72	8.53	0.82
Sep 22nd	Mean	28.43	736.66	26.15	3.70
	Sd	0.22	105.07	0.36	0.26
Total	Mean	33.29	685.19	36.96	1.70
	Sd	1.40	178.30	4.89	0.21

* Standard deviation (Sd)

2.2.2 Questionnaire survey

An on-site questionnaire survey was adopted to measure the perceived thermal stress that the soccer players felt during matches. Over the four days of data collection, six soccer matches (6 vs. 6) were played with TAMU Men's Club Soccer players who volunteered as study participants. Two matches were held approximately 11:00 AM to 1:00 PM CST, and the other four matches approximately 2:00 to 4:00 PM CST to have a wide range of daytime field thermal conditions. Matches consisted of four quarters, where each quarter of a match lasted 22.5 minutes with a 10-minute break in between. At each break, 3 out of 12 players were randomly asked to respond to eight questions about how thermally comfortable they were during the matches with a 10-point rating scale, where 0 represented "much too cold" and 10 represented "much too hot". These questions can be grouped in three parts: 1) perceived exertion (i.e., a laborious or perceptible effort), 2) perceived surface heat conditions, 3) perceived thermal stress. The response rate was 87.5%, meaning 63 out of 72 participants responded to the survey without missing values.

2.3. Estimation of objective thermal stress

To evaluate the athlete's physiological thermal stress, the COMFA energy budget model was employed. It is an outdoor thermal comfort index that estimates the objective thermal comfort of a person based on energy budget equation. In other words, it calculates the physiological thermal load that the human body receives to maintain thermal balance with the surrounding outdoor environment. The energy budget is described as follows:

$$\Delta S = M + R - C - K - E \ (Eq1)$$

where ΔS is the change in heat storage (W/m^2). When the change in heat storage is near 0, the inputs and outputs of energy would nearly balance, and a person would be thermally comfortable. A large positive value would suggest that a person is receiving much more heat than they are giving off, and they would feel too hot. A large negative value would have the opposite effect. The major energy streams are convective heat loss (C), evaporative heat loss (E), conductive heat loss (K), radiative exchange (R), and metabolic heat production (M) (Kenny et al, 2009). The estimated physiological thermal stress, also called energy budget value, can be measured as watt per square meter of a person's surface area (W/m2), a unit of energy density. The measured microclimate and the athlete's surveyed exertion level were the main inputs to the COMFA model estimation. The metabolic rate of a running person ranged between 300 – 650 W/m2 depending on exertion level, and the summer uniform was selected to determine the clothing insulation level.

3. Results

3.1. Microclimate condition

Surface temperature showed a significant difference between NT and AT. The differences in microclimate between the two field types are summarized in Table 2. Regarding the overall pattern, all the measurement values of AT's microclimate (e.g. air temperature, solar radiation, relative humidity, and wind speed) were slightly higher than NT. However, except for surface temperature, the degree of their difference is not significant considering their error ranges of measurement. In contrast, the surface temperature presented a large deviation between AT and NT, whose average difference was over 21.0 °C.

The daytime pattern of AT and NT surface temperature was further explored to identify the difference in variation over the day (Figure 2). AT's surface temperature showed considerable fluctuation over time compared to NT's. Over the four-days of measurements, the surface temperature ranged between 40.3 °C and 71.1 °C for AT and between 30.4 °C and 39.2 °C for NT. It seems that their daytime mean surface temperature was primarily affected by cloud cover. Overall, the surface temperatures peaked on Sep 7 when the cloud cover was at the lowest at 10%. Meanwhile, surface temperatures were lowest on Sep 22 when the cloud cover was relatively higher at 40%, with a somewhat cooler ambient temperature.

The AT – NT difference in surface temperature showed similar daytime patterns with the mean surface temperature. Their difference reached a peak of 35.8 °C at 2:30 PM CST, Sep 7 and lowest at 8.2 °C on 3:30 PM CST, Sep 22. The degree of temperature gap was likely due to increase from morning to high solar noontime at around 1:00 PM CST and after then declining toward evening time at 4:00 PM CST. As surface temperature was the microclimate component primarily determined by field characteristics, we expected it to be a crucial driver causing differences in players' thermal stress.

Table 2) AT – NT difference in microclimate conditions

Variable	Mean	Sd	Min	Max
Diff. in Air temperature (°C)	.62	.21	.314	1.058
Diff. in Solar radiation (W/m^2)	16.58	35.76	-29.54	74.76
Diff. in Relative humidity (%)	2.97	0.95	1.33	4.38
Diff. in Wind speed (m/s)	.746	.627	-.7	2.036
Diff. in Surface temperature (°C)	21.197	7.995	8.267	35.833

*Standard deviation (Sd) *Difference (Diff.)

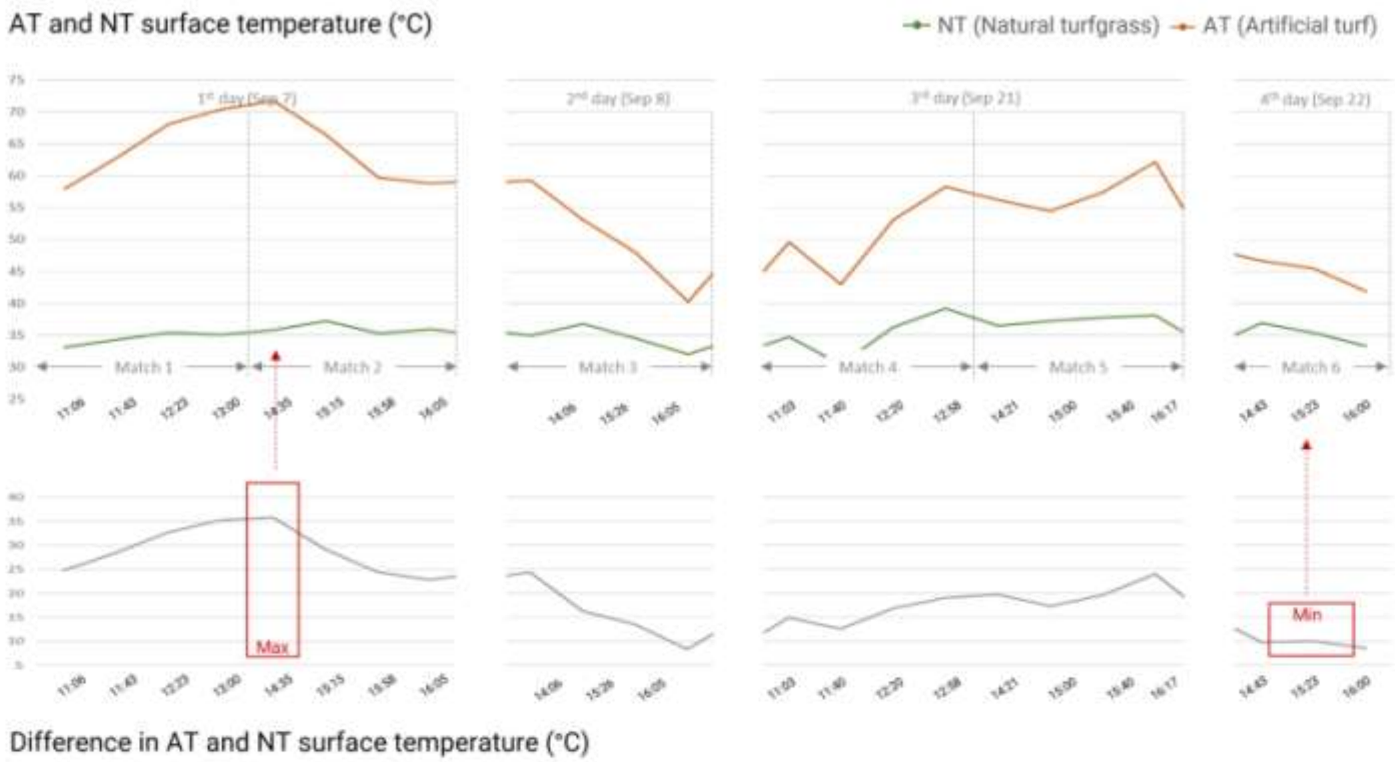

Figure 2) Daytime pattern of AT and NT surface temperature and its difference

3.2. Perceived thermal stress (Survey response)

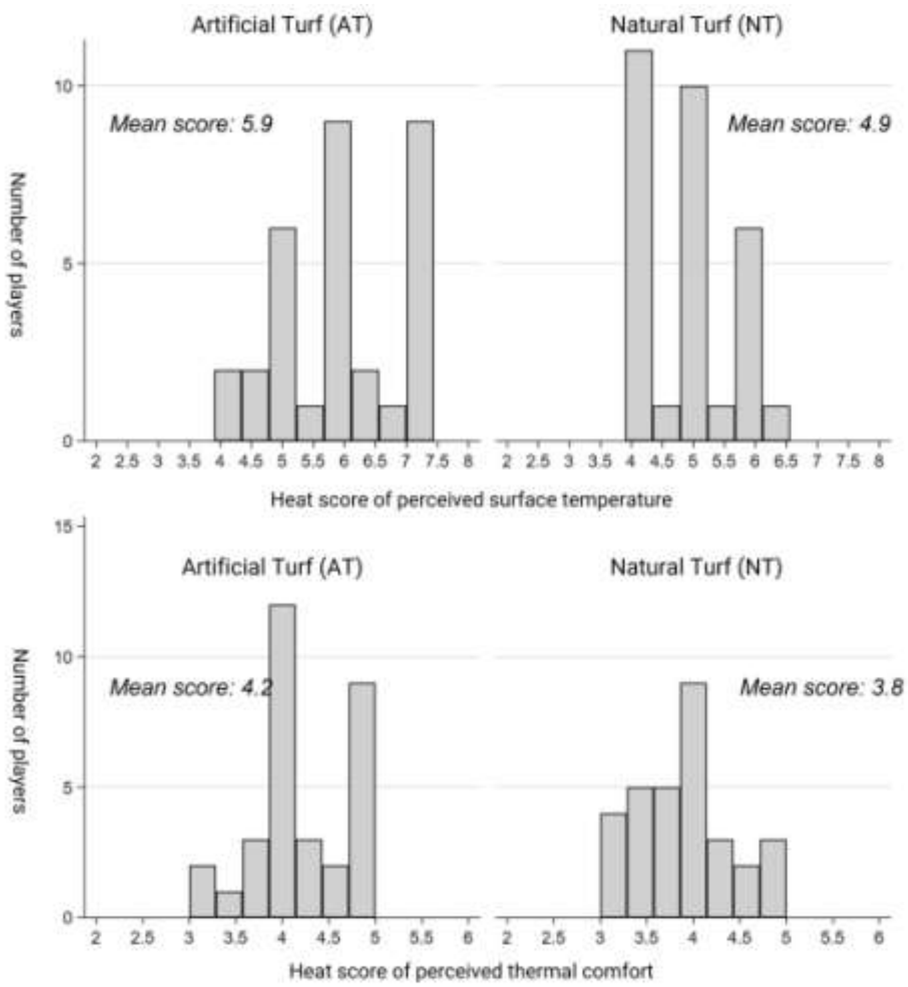

Figure 3) Distribution of perceived thermal stress on AT and NT

Soccer players felt higher thermal stress when playing on artificial turf (AT) than natural turf (NT). Figure 3 presents the frequency distributions of players' perceived level of surface temperature and thermal stress for AT and NT. The X axis is the heat scores of perceived surface temperature (upper figure) and perceived thermal comfort (bottom figure), respectively. These values reflect how thermally comfortable they were on each field type during match. And the Y axis is the number of players choosing each score. The upper histogram shows that AT has a relatively higher perceived surface temperature score with a broader range than NT. The frequency distribution curve also indicates that the mean AT's heat score is 6 points which is one point higher than the mean NT's. Moreover, the heat score of the AT ranges between 4 to 7.5, which is slightly broader than that of the NT. Regarding the perceived thermal comfort, although the range of heat score range is identical as it ranges between 3 to 5, the mean AT score is at 4.3 points, which is higher than the mean NT score of 3.8.

3.3. Objective thermal stress (Energy budget model)

3.3.1 Evaluation of thermal stress on natural and artificial turf

Figure 4) Estimated physiological thermal stress of AT and NT (upper) and their composition of thermal loadings (bottom)

Physiological thermal stress of soccer players on the two field types were evaluated using the COMFA model. The estimated COMFA output was described as energy budget values that can be categorized into four classified thresholds of heat stress values (Harlan et al., 2006): Caution (65–120 W/m2), Extreme caution (121–200 W/m2), Danger (201–339 W/m2), and Extreme Danger (340 or higher W/m2). According to the classification, Figure 4 showed that, for the majority of the match, the players felt very hot and had Extreme Danger levels of thermal stress. Energy budget values reached the peak of 620

W/m2 at 2:00 PM CST, Sep 7 and arrived at the low of 300 W/m2 at 4:00 PM CST, Sep 8, and 2:00 PM CST, Sep 22. Only limited periods, from 2:00 to 4:00 PM CST on Sep 8 and from 2:00 to 2:30 PM CST on Sep 22, fell into Danger level of thermal. Their daytime patterns with peak and bottom hours were highly coupled with surface temperature.

When it comes to the AT-NT difference in physiological thermal stress, it was found that NT can reduce the thermal stress of soccer players by up to 20% compared to AT. Overall daytime patterns of thermal stress demonstrated that the difference in energy budget values between AT and NT was 10.6 % higher in the afternoon than the noon during clear sunny days. Their highest difference was on Sept 7 around 3:00 PM CST at 124 W/m2, while their lowest difference was on Sep 22 around 4:00 PM CST at 25 W/m2. It seemed that the magnitude of disparities in thermal stress was likely to increase when the shortwave solar radiation (or direct solar beam) coming from the sky was strong. Meanwhile, their disparities tended to decline when the cloud cover was relatively larger with high wind speed.

The most significant components of thermal loading to which players are exposed are Kabs for NT and Labs for AT. The Figure 4 indicates individual contribution of four energy components (absorbed solar radiation (Kabs), absorbed terrestrial radiation (Labs), convective heat loss (C), and evaporative heat loss (E)) to thermal loadings that athletes received during daytime hours. The Kabs are the amount of incoming shortwave solar radiation that a player absorbs, and the Labs are the amount of absorbed longwave ground radiation emitted from field. Evaporative heat loss is the loss of body heat that occurs through respiration and perspiration, whereas convective heat loss is the transfer of heat from the body due to the wind. Kabs and Labs comprise the largest proportion of the net energy budget, leading to the overall increase in thermal stress of players. As the Kabs was determined by exposure level to direct solar radiation, no difference was observed between the field types. Meanwhile, the Labs of AT was 97.7% and 91.5% higher at the noon and the afternoon, respectively, compared to NT.

3.3.2 Effects of AT and NT surface temperate on player’s thermal stress

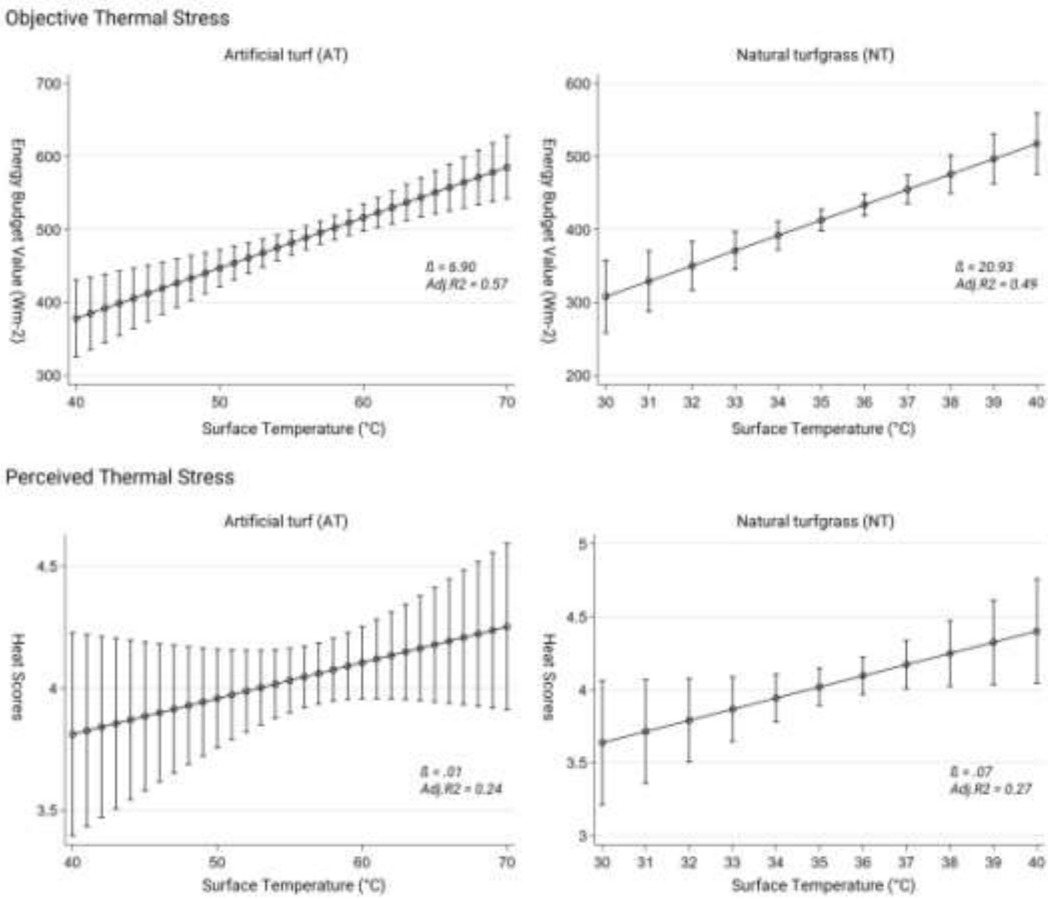

Figure 5) Relationships between turf surface temperature (AT and NT) and thermal stress (Physiological and perceived sensation)

The impact of AT and NT surface temperature on players' thermal stress was estimated using a statistical modeling procedure called multiple linear regression, where time of day and day of week were considered. Two sets of models were developed for players on each field type - physiological thermal stress and perceived thermal stress. Particular attention was given to (1) the comparison of the impact of turf surface

temperature on different types of thermal stress, as well as to (2) investigate the explanatory capacity of turf surface temperature as a proxy of thermal stress. Upper plots showed the predicted changes in physiological thermal stress (W/m2) by an increase in one Fahrenheit degree of AT and NT surface temperature, whereas the bottom plot indicated the predicted shifts in perceived thermal stress. All models were statistically significant, indicating that both filed types affects physiological and perceived thermal stress significantly.
The impact of surface temperature on athletes' thermal stress is higher on NT than AT. The coefficient slope of NT is 20.9 for physiological thermal stress, meaning that the 1 °C increase in surface temperature led to 20.9 growth in energy budget values (W/m2). The coefficient slope of AT was 6.9 which was three times less than NT. Interestingly, a similar outcome was found in perceived thermal stress, where NT's coefficient slope (0.07) was higher than AT's (0.01). These findings indicate that the both perceived and physiological thermal stress of the players are more sensitive when they are performing on NT. We assume that this is mainly due to the higher thermal stress level on AT that may result in the reduced performance (or amount of activity) and lower metabolic rates leading to decreases in thermal stress of players compared to NT.

Explanatory power of surface temperature for thermal stress varies on the types of thermal stress. In this study, explanatory power indicates the ability on how much variations in players' thermal stress can be explained by the surface temperature. Overall, the surface temperatures showed better performance in explaining athletes' physiological thermal stress than the perceived thermal stress model. In the physiological thermal stress model, the explanatory power (or adjusted r-squared) values are 57% and 49% for AT and NT respectively, which are around 30% higher than the perceived thermal stress model. This implies that, considering their high explanatory power of around 50%, surface temperature can be considered a superior proxy when it is used for measuring the physiological thermal stress of soccer players.

4. Conclusion

This study compared the perceived and physiological thermal stress of soccer players performing on AT and NT. Microclimate was measured on each field type during four hot, sunny, summer days in 2021. Questionnaire surveys and the COMFA model were adopted to measure perceived and physiological thermal stress, respectively. Our findings confirmed that surface temperature is the main driving factor that leads to an increase in both perceived and physiological thermal stress of the soccer players in summer daytime. The highlights of the key findings are as follows:

- Mean AT-NT difference in surface temperature was over 21.0 °C, which tends to be more pronounced when the direct solar beam is stronger, and the time reaches solar noon at around 1:00 PM CST
- Athletes performing on AT had higher perceived and physiological thermal stress than those on NT. Compared to AT, NT can reduce the physiological thermal stress by up to 20% in a setting of a clear, hot, and sunny day.
- The impact of NT surface temperature on player's perceived and physiological thermal stress is higher than that of AT. This implies that athletes are likely to be more sensitive to field heat conditions when performing on NT.

The findings of this study are useful for biometeorology and sports field management to enhance the athletes' safety from heat stress and increase their match performance. Future studies need to address how the difference in thermal stress induced by AT and NT affects the athlete's physical performance and physiological body changes, such as hydration.

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References

Francis, R. A. (2018). Artificial lawns: Environmental and societal considerations of an ecological simulacrum. Urban Forestry & Urban Greening, 30, 152-156.
Guyer, H. (2020). Athletic Surfaces' Influence on the Thermal Environment: An Evaluation of Wet Bulb Globe Temperature in the Phoenix Metropolitan Area. Arizona State University, Temple, AZ
Harlan, S. L., Brazel, A. J., Prashad, L., Stefanov, W. L., & Larsen, L. (2006). Neighborhood microclimates and vulnerability to heat stress. Social science & medicine, 63(11), 2847-2863.
Jim, C. Y. (2017). Intense summer heat fluxes in artificial turf harm people and environment. Landscape and Urban Planning, 157, 561-576.
Kenny, N. A., Warland, J. S., Brown, R. D., & Gillespie, T. G. (2009). Part A: Assessing the performance of the COMFA outdoor thermal comfort model on subjects performing physical activity. International Journal of Biometeorology, 53(5), 415-428.

Brown patch disease –
Protect your turf by choice, not by chance

A major concern, particularly for the football industry, is the rise in reported instances of brown patch. DLF can now offer mixtures with the most brown patch tolerant grasses for sports fields. We have screened our portfolio of ryegrasses for brown patch tolerance. Once again, the results show that DLF's 4turf® varieties have a higher natural disease tolerance.

As climate change brings more hot and humid weather, the severity and geographic range of fungal diseases are increasing. We experience new diseases where we have not seen them before, known diseases occur more often and the attacks become more severe. That can compromise the quality even on the best managed pitch.

Most groundsmen are trying to deliver the best playing quality and the best visual appearance on their stadium and trainings grounds. However this type of grass is pushed to the limit due to challenging growth conditions and lots of wear. Anything that can damage the quality of the pitch is therefore a threat. In that context fungal diseases are something that groundsmen do not want.

Top football around Europe is played all year round except for a short period over the summer. During the short match-free summer period, renovation of stadiums and training grounds are often carried out by sowing new grass. The pitch renovation is a crucial point for the groundsmen, as they want their pitch to establish quickly. In this renovation period conditions might be hot and humid which promote the development of fungal diseases. Groundsmen in Europe are experiencing disease outbreaks during the summer renovation. One of the diseases that are causing problems is brown patch, which in worst cases can ruin the entire pitch and postpone the playing season.

Brown patch is a turfgrass foliar disease caused by Rhizoctonia spp. The fungus is most devastating to perennial ryegrass, bentgrass and tall fescue but all cool-season turfgrasses are susceptible to potential attack by the fungus. Attacks are often triggered by hot, humid conditions. An increase in cases is identified on plants that are moist and have been over-stimulated with nitrogen fertilisers.
Furthermore, disease control has become a greater challenge for many groundsmen as they seek to reduce pesticide use due to legislation. It is therefore important for groundsmen to be able to choose grasses with the highest tolerance to turf diseases.

As a seed supplier focused on environmental sustainability, DLF are obliged to take the disease threats seriously and come up with solutions that provide our customers with the most brown patch tolerant varieties. These solutions will give them peace of mind during summer renovation and reduce reliance on fungicides. Especially because this disease is not evaluated in official trials in Europe.

DLF has been working on a screening program for brown patch for the last two years in order to provide the most brown patch tolerant varieties to customers dealing with this disease. The first screening was on perennial ryegrass, the staple species for football mixtures because of its hard-wearing nature, tolerance of a variety of soil types and rapid germination and establishment. The screening included diploid perennial ryegrass varieties and the whole portfolio of our 4turf® varieties. Additionally the screening was performed with fungal isolates originating from a disease outbreak on a high-end football pitch in Europe.

Trials have been undertaken at DLF Beet Seed research facility in Landskrona, Sweden. DLF Beet Seed has a research facility specialising in fungal testing and years of knowledge and experience in the area of Rhizoctonia fungi. By conducting trials in the lab, we were able to ensure that all the grasses were inoculated at the same time, with the same amount of fungal inoculum and at a time when the grass is predicted to be most susceptible.

We were able to determine, with very high confidence, that there was a significant difference between the diploid and 4turf® varieties when it comes to brown patch tolerance. The 4turf® varieties demonstrated the best tolerance to brown patch, which correlates with the results we've seen in other disease trials where 4turf® species have outperformed traditional diploids. Even though 4turf® already have demonstrated the highest tolerance to red thread and fusarium in European turf trials, it was great to see that there were a few outstanding diploid DLF varieties that also demonstrated good tolerance to brown patch. That means that we can now provide mixtures with our top performing and most resilient diploids and 4turf® varieties with improved tolerance to brown patch.

4turf® – The sustainable turf solution
DLF 4turf® tetraploid perennial ryegrasses have a larger seed which helps them establish quickly, they produce a larger root system which helps to strengthen turf and significantly improves drought tolerance, and this ensures a healthy colour through the spring and summer. The additional natural disease tolerance of 4turf® does not only makes the maintenance of the turf much easier it can significantly reduce your input costs by reducing the need for chemicals and fertiliser. With input costs rising rapidly, there has never been a better time to make the switch to 4turf®, the environmentally sustainable choice.

High disease-tolerance

Low disease-tolerance

Inoculation with Rhizoctonia (Brown patch) –
6 replicates of each perennial ryegrass variety

Welcome to the 14th International Turfgrass Research Conference

The 14th International Turfgrass Research Conference will be arranged by STERF and held in Copenhagen, Denmark on 10-15 July 2022

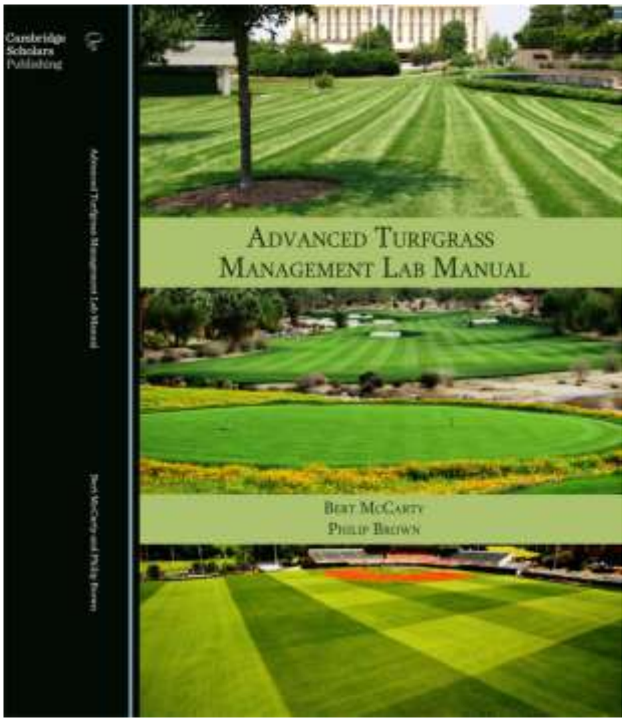
The conference theme is:
Development & Sustainability

For more information please visit:
https://itrc2022.org

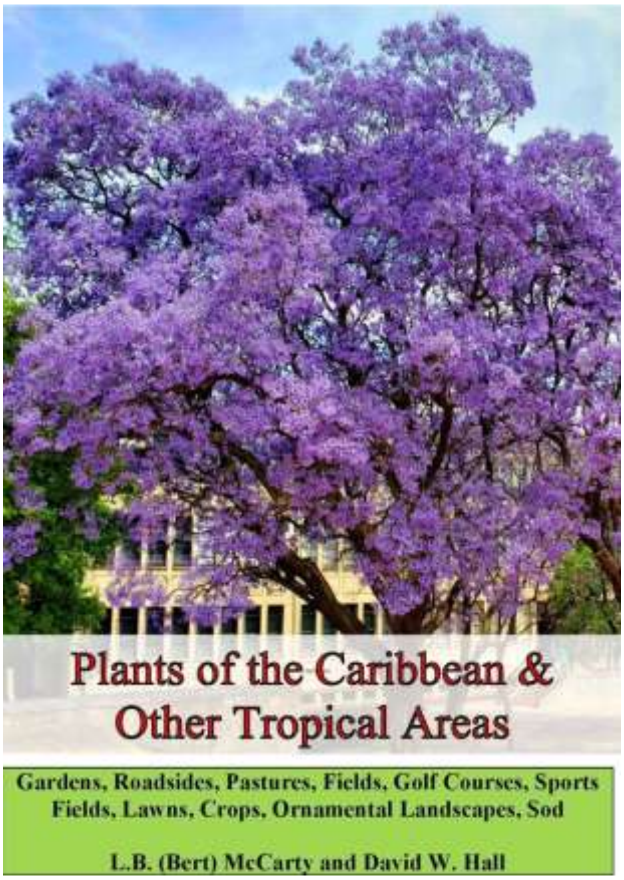
Two New Books

Advanced Turfgrass Management Lab Manual

This lab manual written by Drs. Bert McCarty and Philip Brown has been created to provide students studying turfgrass management/science practical experience doing hands-on experiments. Possessing the ability to do these experiments will help them stand out from their peers throughout their careers. The manual is a first of its kind, bringing all the practical experimentation into one place. The manual is based on years of experience the authors have had in practical turfgrass settings, in the classroom, and the laboratory.



Experiments in the manual are designed to improve the students understanding of managing turfgrass helping them develop to be at the top of their profession. Experiments take in a wide range of subjects from soil science, to fertilizer and herbicide calibration, to managing irrigation systems. Each lab provides a comprehensive description of how these subjects impact the turfgrass world, as well as real world applications and hands on experiments. No comparable publication is currently available.
Order from:
https://www.cambridgescholars.com/product/978-1-5275-7554-7/. **ISBN: 1-5275-7554-3.**



Plants of the Caribbean & Other Tropical Areas

People visit the Caribbean and other tropical areas due to the warm weather, inviting beaches, numerous outdoor activities, and to visit various historical sites. Once they arrive, one of the first questions often asked is "what's that plant." Finally, a practical, fully illustrated guide of the most common plants occurring in the Caribbean and other tropical areas.

This guide not only provides detailed color photographs of each plant but also provides a full description of them, their benefits and practical usefulness. This book by Drs. Bert McCarty and David Hall offers the most commonly found and used plants in tropical areas along with a complete glossary as well as numerous additional common names.

Order from https://www.amazon.com/dp/B09NS4FYDY.
ISBN 979-8784635921

Edited by Claudia de Bertoldi PhD, etsoffice@turfgrasssociety.eu

Deadline for submission of material for 02/2022 edition: **JUNE 20th**

The EUROPEAN TURFGRASS SOCIETY

The objectives of the **ETS** include the spread of innovative applications and encouragement of a holistic view of turf, particularly with respect to its influence on urban and environmental quality. This approach is significant as the founding members are representatives of a large industry that has global importance. We aim to:

a) Provide a forum for scientists, consultants, companies and practitioners to discuss technical issues related to the provision of turf surfaces.
b) Spread innovative applications for the benefit of the turfgrass industry, national and local government, and the European public. Encourage a systems-based approach to the study of turfgrass through multi-disciplinary groups working at different levels.
c) ETS considers turfgrass knowledge in the broadest sense, including its use in sport and leisure, its role in improving urban quality and its importance in the mitigation of environmental effects such as soil erosion.
d) Develop a strong ethos to promote sustainable, low input systems and solutions based on the conscious use of non-renewable resources.

Current ETS Board of Directors

Stefano Macolino
University of Padova, (IT)

ETS President

Stefano Macolino is an Associate Professor at the Department of Agronomy, Food, Natural resources, Animals, and Environment of the University of Padova.

He graduated in Forestry Science in 1996, Faculty of Agriculture at Padova University.
He has carried out research on forage management and turfgrass at the Department of Environmental Agronomy and Crop Production as a Postgraduate Researcher. In 2003, he achieved the Ph.D. in Environmental Agronomy.
He has been teaching actively, including three courses: Turfgrass and Revegetation, Forage Crops, and Botany of Cultivated Plants. Dr. Macolino is currently the president of the Committee for the improvement of teaching at the School of Agriculture and Veterinary Medicine of Padova University.
He conducts researches on the following:
1. Impact of cultural practices on cool and warm-season turfgrasses in transition zones.
2. Forage crop production and management.
3. Production and plant biodiversity of mountain grasslands.
He supervised Ph.D. students and postdoctoral fellows on the made mentioned topics.
Dr. Macolino is the author and co-author of nearly 50 scientific publications in peer-reviewed journals, and numerous publications in conference proceedings, and technical magazines. He is also the author of two books in Italian for undergraduate students.

Marcela Munoz
Bion (SPA)

ETS Board Member

My name is Marcela Munoz, I'm a leading turfgrass specialist qualified as an Agronomist Engineer from The Pontifical Catholic University of Chile and have a Master of Science Degree from The Ohio State University in Turfgrass Management. Since 2015 I'm based in Cambridge, UK, working as Syngenta's Technical Services Manager for the EAME region.
I'm an amateur football player that joined this industry moved by my passion for sports, agronomy and science. I had been in the turf industry for more than 15 years and worked at different positions and countries around the world. Some of my latest exciting experiences include working for the STRI as a turf agronomy consultant for the FIFA 2014 Brazil World Cup and providing technical support at the Ryder Cup at Le Golf National in Paris. I'm also an active member of many turf associations around the world and volunteer since 2011 in the International Committee of the Sports Turf Managers Association of America (STMA)
In my current role I work closely with associations such as ITS, FEGGA, GMA, BIGGA, STERF, R&A and other local associations and Federations around the region. I also work very closely with the Syngenta Turf Research facility at Stein in Switzerland and the International Research Centre at Jealott's Hills in the UK, as well as independent researchers, agronomists, greenkeepers and sports turf managers across Europe, Africa and the Middle East. My role also includes supporting the marketing team and commissioning pioneering research to maintain Syngenta at the leading edge of turf science, as well as delivering the results back to the industry in the form of practical solutions to help create consistently better playing surfaces.

Claudia de Bertoldi
Turf Europe Srl (ITA)
ETS Secretary and Treasurer

I received my BA in 2003, after an internship at North Carolina State University (USA) and I have completed my M.Sc (*Progettazione e Pianificazione delle Aree Verdi e del Paesaggio*) at University of Pisa (Italy) in 2006. My PhD (*Allelopathic interferences of plants*) was from S. Anna School of Advanced Studies in 2007-2010. I have been working as consultant at Pacini Company (Pisa – IT) for warm season turfgrass production made in Tunisia during 2010-2012. Since 2013 I am employed by Turf Europe srl (Livorno – IT). I am actively engaged in landscaping and realization of gardens and turfgrasses for ornamental and sport use. Management of high-quality sport fields also through precision agriculture. Consultant for turf seeding in difficult zones (dumps and caves). Botanical censuses and visual tree assessment. Participation in R&D projects financed at European level. More than 15 publications, posters and presentations on conferences and meetings on turfgrass.

Marco Schiavon
University of Florida (USA)
ETS Board Member

Ph.D., is an Assistant Professor in the Environmental Horticulture Department, University of Florida at the Fort Lauderdale Research and Education Center.
His primary research interests include potable water conservation for irrigating turfgrass areas, salinity management, physiology of turfgrass in response to drought stress. He received a B.S. in Agronomical Sciences in 2005 and a M.S in Agronomy in 2008 both from University of Padua, Italy, and a Ph.D. in Agronomy in 2013 from New Mexico State University. In 2013, he moved to University of California Riverside where he worked as a Postdoctoral Scholar until December 2016, and subsequently as an Assistant Researcher until November 2019. He has published more than 30 refereed journal articles.

Karin Juul Hesselsøe
Norwegian Institute of Bioeconomy Research (NOR)
ETS Board Member

M.Sc in Agriculture 1996, Copenhagen University. From 2006-2019 employed at the Greenkeepers College Sandmoseskolen in Denmark as teacher in greenkeeping and landscape gardening.

From June 2019 employed at NIBIO, Landvik. Experience with writing/translation of popular articles and fact sheets on golf course management. In 2018 project leader on an IPM-project on Danish golf courses financed by the Danish Environmental Protection Agency.

Fritz Lord
COMPO Expert (GER)
ETS Board Member

Study of horticultural science at Rhein University Geisenheim, M.sc. in soil science/entomology. Study of Agricultural Science at Humboldt University Berlin; M.Sc. in crop science, plant diseases; Ph.D at Humboldt University Berlin in phytopathology, antagonistic rhizobacteria (PGPR), soil borne pathogens (Fusarium). Since 2008 working for one of Europe`s leading fertilizer manufacturer COMPO Expert in Münster, Germany. Responsible for the segment turf and public green, vegetation-technical consultation, research and development, product management and education. Specialties/ experiences: soil-plant-microorganism interactions, bio stimulants, microbial fertilizer, turf nutrition and maintenance. Various publications regarding turf fertilization and maintenance (e.g. European Journal of Turfgrass Science, New Landscape). Teaching turf seminars for greenkeepers and groundsmen in Germany and abroad. ETS member since 2008, board member of the International Turf Grass Society (ITS) since 2014. Further memberships: German Turfgrass Society (DRG), Greenkeeper Association of Germany (GVD) , Austrian Greenkeeper Association (AGA), Förderkreis Landschafts- und Sportplatzbauliche Forschung (FLSF), Forschungsgesellschaft Landschaftsbau e.V. (FLL).

Wolfgang Praemassing
DEULA (GER)
ETS Board Member

Study of Agricultural Biology (University Diploma) at University of Hohenheim, 1991 Doctoral Dissertation (PhD) Promotion with Prof. Dr. H. Franken, University of Bonn, subject: Soil physical Effects of Aeration on Turfgrass Soils, 2008.

Occupation and activities:
Professor for Sustainable Turfgrass Management at University of Applied Sciences Osnabrueck, Agronomist and lecturer in Greenkeeper Education and Training for golf and sport sites at DEULA Rheinland GmbH, Education Center, Kempen. Member of editorial staff of "European Journal of Turfgrass Science". Member of Turf expert committee of German Soccer League (DFL).

Member of working group "Water" at German Golf Federation. Member of examination boards of Chamber of Agriculture Nordrhein-Westfalen Golf Course Greenkeeper and Head-Greenkeeper, Greekeeper/Groundsmen Sport Sites, Competence of Pesticide application.

Carlos Guerrero
University of Algarve (POR)
ETS Board Member

Carlos Guerrero is graduated in Horticulture Engineering at the University of Algarve (Portugal). Has a M.Sc. in Soil Fertility and Plant Nutrition at the Agronomy Superior Institute, of the Technical University of Lisbon (Portugal) and a PhD in Environmental Agronomy at the University of Algarve (Portugal).

Assistant Professor at the University of Algarve (Faculty of Sciences and Technology), a former Diretor of the Degree Program in Agronomy (2015-2018) and also a former Director of the Master Program in Management and Maintenance of Golf Courses between 2008-2010.

Teaches Soil Science in Landscape Architecture and Soil Science and Agriculture Machinery in the Agronomy. Is also specialized in groundwater and soil nitrate pollution and has experience on organic and compost uses in agriculture and turfgrass.

Actually, is working on biological control of plant diseases, mainly turfgrass, and also on remote sensing for turfgrass maintenance purposes with unmanned aerial vehicles and multispectral sensors."