International Turfgrass

The Newsletter of the International Turfgrass Society

September 2013 Edition

Beijing!! Post Conference Report

by Dr. Liebao Han, past-ITS President
Beijing Forestry University, Beijing, China

From 14-19, July 2013, the 12th International Turfgrass Research Conference was successfully held in Beijing, China. The quadrennial International Turfgrass Research Conference was eagerly expected by all the turfgrass science researchers and offered the best platform to demonstrate and exchange the latest research results as well as strengthen communication and cooperation among members and non-members alike. ITRC won great recognition and was welcomed by all colleagues and has promoted the development of international turfgrass science and made contributions and improvements to the level of turf scientific research and popularization of this relevant knowledge.

In this conference, altogether 184 scientists, professors, specialists, and students from 20 different countries and from many global regions attended the magnificent quadrennial conference (Fig.1).

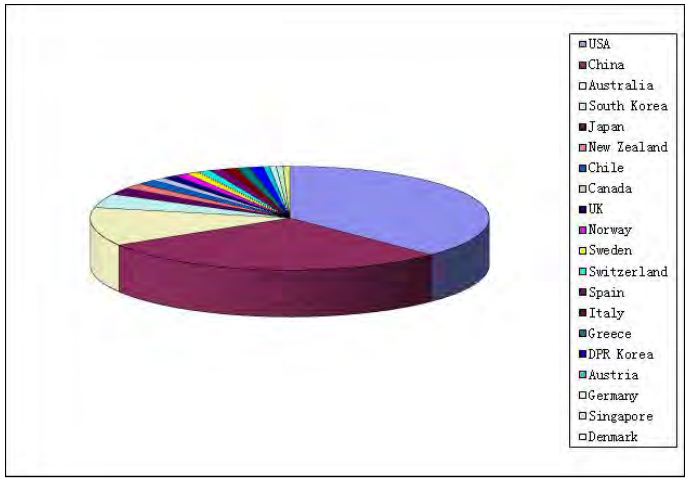

Fig. 1 Participants at the 12th International Turfgrass Research Conference based on country.

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I enjoyed the presentations and visiting with everyone at the conference in July. Every four years new board members are elected and those that have served their terms are replaced. I specifically would like to thank those members who contributed newsletter articles over the last several years, including Alexander Richter, Shoichi Kimura and those contributors that have assumed new roles in ITS including Liebao Han, Richard Gibbs, James Murphy, Michael Fidanza and Don Loch. Please note the new membership drive and savings. Also, if you have any newsworthy stories or information for readers of International Turfgrass I hope you will consider submitting an article for the next newsletter in January 2014.

I hope you enjoy the very good articles in this edition.

Sincerely,
Nathan R. Walker

In this Edition

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Among the participants, 68 were ITS members, 72 were not members of ITS, and student participants numbered 23, and accompanying persons were 21 (Fig. 2).

One hundred and twenty three papers were presented at the conference, 97 were research publications and 26 short communications (Fig. 3).

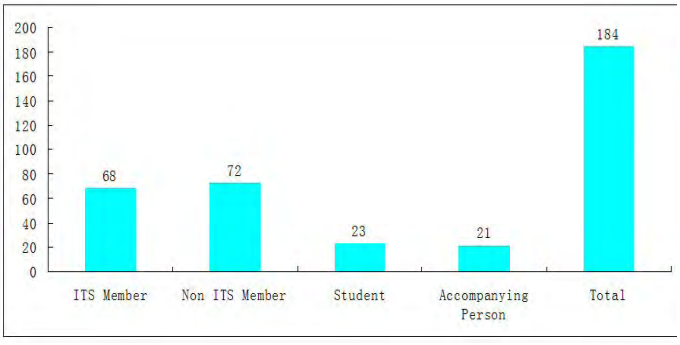

Fig. 2 Classification of participants at the 2013 ITRC.

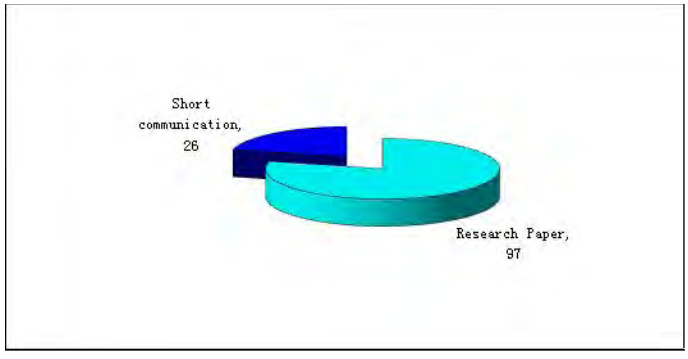

Fig. 3 The number and type of papers submitted at the 2013 ITRC.

More conference highlights from Beijing

by Dr. Liebao Han, past-ITS President and Shuxia Yin
Beijing Forestry University, Beijing, China

Meeting registration open until 2 am to welcome the participants. Thank you volunteers!

Welcome address by then ITS President Dr. Liebao Han during the opening ceremony.

ITS Board members at welcome reception.

Welcome reception Monday evening.

Continued on next page

Technical Tour visit to Qinghe Bay Golf Course.

Technical Tour Participants.

Poster Sessions on Wednesday.

Graduate Student presentations on Thursday.

Student volunteers signing Take Me Home, Country Roads at the closing ceremonies.

Ceremonial transfer of the ITS flag from Dr. Liebao Han, outgoing President to incoming President Dr. Bruce Clarke.

ITS Website Updates and Membership Renewal

by Tom Hsiang, Website Editor and ITS Board Member
The University of Guelph, Guelph, Canada

The ITS Website (turfsociety.com) has had some updates during summer 2013.

At the 13th ITS Research Conference held in Beijing, the old ITS Board met before the meeting and the new ITS Board met after the meeting. The ITS Board of Directors is composed of representatives from countries across the world, and includes executive members elected by the Board members. At the pre-conference board meeting, the old ITS Board prepared a slate of Directors which was presented at and voted upon (where multiple candidates were involved) at the General Business Meeting of ITS members held at the end of the conference. The list of new Board of Directors can be found at http://turfsociety.com/2013/20130725_its_board.pdf.

The Board encourages ITS members who are interested in becoming Board members to make their thoughts known to any Board member before the start of the next conference. The duties of the Board members are to actively recruit ITS members and gather news for the Newsletter from their respective countries, as well as participate in the mid-conference meeting where preparations for the next conference at the next conference location are closely examined. In addition, attendance at the pre-conference Board meeting is needed (usually the afternoon of the day before the talks begin), and if remaining on the board (one can serve two terms of 4 years), then to participate in the post-conference Board meeting which is usually held the afternoon of the last day of the meeting. These are all voluntary positions as are the Newsletter Editor and the Website Editor positions.

Another update on the website is the Table of Contents from the Research Conference Journal from this past conference in Beijing now available at http://turfsociety.com/2013/itsrj12_toc.htm. These individual articles will eventually be found on the Turfgrass Information Center hosted at Michigan State University, if the authors provide permission. If you're interested in a hardcopy of the proceedings, please check the website for details. Both electronic access to theses article (members only section) and a hardcopy/CD of the proceedings are benefits of ITS membership.

Finally, we are beginning a drive for new and returning ITS members, and have a special price for membership for 2014-2017 if purchased before the end of this year: $300. This covers membership for the next four years including ITRC 2017 which will take place in New Jersey, USA. One of the benefits of membership is reduced conference fees which was US $800 for non-members and $US 550 for members during this last meeting in Beijing. If membership is purchased after Jan 1, 2014, then the price increases to $325. Membership fees can be paid by Credit Card (PayPal system - you don't need a PayPal account, just a credit card), or by U.S. check to the Treasurer. For details, see "Membership & Renewal" at turfsociety.com.

If you have suggestions for revisions or additions to the website, please don't hesitate to contact me.

The Australian and New Zealand Contingent at ITS meeting - courtesy David Aldous.

Participants in a post-conference tour in Lhasa, Tibet at the Summer Palace - courtesy David Aldous.

Back to the Future: Advances in Cool-Season Turfgrass Breeding

Keynote presentation at ITRC by Stacy A. Bonos and W.A. Meyer
Rugters University,New Brunswick, New Jersey, USA

Although selection of superior ecotypes of cool-season turfgrasses began in North America in the early 1900s, turfgrass breeding did not really gain momentum until the 1950's with the work of H. Burt Musser who developed Penncross creeping bentgrass in 1954 and Glen Burton who developed Tifgreen in 1956. Both Musser and Burton were forage breeders and only worked part-time as turfgrass breeders. The first two full time turfgrass breeders hired in the US were C. Reed Funk at Rutgers University and Joseph Duich at Penn State University. Together these four individuals made significant and long lasting contributions to the field of turfgrass breeding and revolutionized the entire US turfgrass industry. Their impact was especially important for the rapid spread of the game of golf throughout the U.S. These scientists trained students that eventually became leaders in turfgrass science and education. The impact of this training is still being felt today.

Some of the traits that breeders selected for in the early years included: mowing quality, plant height / low growth habit (Figure 1), color, density, leaf texture and seed yield. Breeding for most of these traits has been accomplished. Probably the most impressive gains in selection have been observed for seed yield. Tall fescue (*Schedonorus arundinaceus*) had a gain of 283% in seed yield from 1976 to 2009. Perennial ryegrass (*Lolium perenne*) had a gain of 175%, Kentucky bluegrass (*Poa pratensis*) 223%, Chewings fescue (*Festuca rubra* var. *commutata*) 210%, red fescue (*F. rubra* var. *rubra*) 204%, and creeping bentgrass (*Agrostis stolonifera*) 179% (Oregon Agricultural Information Network (OAIN). website (http://oain.oregonstate.edu/). The only species that saw little improvement in more than thirty years was colonial bentgrass (*Agrostis capillaris*) which had the exact same seed yield in 2009 as it had in 1976. This could be attributed to the fact that much of the colonial bentgrass produced in Oregon to this date is Highland colonial bentgrass, not an improved turf type cultivar.

Fig 1. Selection for plant height/low growth habit Turf-type tall fescue (*Schedonorus arundinaceus*) Never cut (left) and KY 31 cut twice (right).

Current breeding objectives include germplasm collection, disease resistance, growth habit (i.e. rhizomes in tall fescue) and drought (Figure 2), heat, salinity (Figure 3) and wear tolerance. Germplasm collection is an integral part of all breeding programs. It is the basis for selection and improvements. It can provide new sources of resistance/tolerance to stresses and helps to increase or maintain heterozygosity in breeding populations. The Rutgers breeding program has collected more than 16,000 ecotypes of cool-season turfgrasses from the centers of origin, where for the majority of cool-season turfgrasses, is Europe.

Fig 2. Selection of tall fescue for drought/heat stress tolerance.

One example where germplasm collection has had an effect on breeding objectives is with gray leaf spot in perennial ryegrass. Gray leaf spot (caused by *Pyricularia grisea*) was first identified on the east coast of the US in mid 1980's. At that time, all commercial perennial ryegrass cultivars were susceptible to this disease. In 15 years, the disease spread north and west across the country. In 2000, an epidemic of gray leaf spot occurred at the Rutgers research farm in Freehold, NJ, USA. Approximately 30 plots were identified with improved gray leaf spot

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Fig 3. Breeding for salt tolerance.

resistance (Figure 4). When these germplasm sources were traced to their original source, it was found that 50 percent of the germplasm sources traced to germplasm collected in Europe (Bonos et al., 2004). One cycle of selection dramatically improved gray leaf spot resistance. Now, numerous commercially available cultivars with improved gray leaf spot resistance exist.

Another example of breeder's efforts to improve disease resistance is breeding for dollar spot resistance. Dollar spot is caused by *Sclerotinia homoeocarpa* (although the pathogen name will most likely be changing shortly). This disease

Fig 4. Identification of perennial ryegrass with improved resistance to gray leaf spot.

affects most turfgrass species around the world, but it is an important and costly disease of creeping bentgrass (*Agrostis stolonifera*). It accounts for a large amount of fungicides used on golf courses annually in North America. Selection has proven to be effective in improving dollar spot resistance in creeping bentgrass (Figure 5). The use of more resistant cultivars can help to reduce fungicide costs on golf course by as much as 85%. It turns out that

Fig 5. Selection of dollar spot resistance cultivar (center) versus non-selected (right).

resistance in these two disease examples, dollar spot and gray leaf spot are highly heritable. Unfortunately, other diseases are not as easy to breed for i.e. brown patch (*Rhizoctonia solani*) (H = 0.74) and Pythium diseases. These would be examples where molecular markers could play an important role in turfgrass breeding.

There are many uses of molecular markers in turfgrass breeding including, genetic diversity studies, DNA fingerprinting/ cultivar identification, genetic linkage mapping, identification of Quantitative Trait Loci (QTL) and genomic selection. In reviewing QTL studies in the major cool season turfgrasses, perennial ryegrass had by far the most with more than 560 QTLs reported (Shinozuka et al. 2012). For tall fescue, the majority of QTLs were for forage characteristics. In bentgrass, only a few have been reported including dollar spot resistance (Chakraborty et al., 2006), snow mold (Young-Ki, 2007) and drought (Merewitz et al., 2012). There have been no QTL reported for the fine fescues or Kentucky bluegrass. So it is thought that QTLs can still play an important role in turfgrass breeding for the near future.

Many other more advanced breeding programs are looking toward genomic selection as a new tool for selection of germplasm. Genomic selection (GS) is a new approach for improving quantitative traits in large plant breeding populations. It uses SNP (Single Nucleotide Polymorphisms) markers discovered by GBS (Genotyping by Sequencing) which combines genome sequencing and high-throughput genotyping (Goddard and Hayes, 2007). Genomic selection combines marker data with phenotypic and pedigree data (when available) in an attempt to increase the accuracy of prediction of breeding

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and genotypic values (http://genomics.cimmyt.org). The approach represents a paradigm shift in marker-assisted selection methodology in which the summed estimated effects of all marker loci are used for selection instead of just one marker. Selection via GS has dramatically changed standard practices used in animal breeding and private plant breeding programs. However, for most crops, it has only been studied in theory, using computer models, or not at all. *L. perenne* is probably the closest species for which genomic selection is possible, however, L. perenne has a genome size and complexity similar to *Zea mays* which contains 80% repetitive sequences (Studer et al., 2012)(personal communication). Unfortunately, most cool-season turfgrasses are polyploid and heterozygous which will make sequencing somewhat problematic. GBS can be done without a genome sequence (Lu et al., 2013) but will require significant bioinformatics support.

The goal of most breeding programs is to develop turfgrasses that require less pesticides and have more sustainable maintenance requirements. Breeding for important sustainable qualities such as heat, drought and disease resistance may require genomic selection in addition to traditional phenotypic selection due to the complex inheritance of these traits. Genome sequences in combination with transcriptome sequencing will help improve the interaction of stress tolerance mechanisms with genotype variation. Transgenic approaches will play a role in turfgrass breeding and cultivar development once we learn more about stress mechanisms at the molecular level. QTL studies will still be important for turfgrasses due to the complexity of the genomes. Both traditional and modern techniques will be useful in breeding programs for the near future.

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Pre-Conference ITS board meeting with several out going members.

Post-Conference ITS board meeting with new members present.

Discovery and Development of Herbicides with Special Emphasis on Sulfonylurea Herbicides

Keynote presentation at ITRC by Sowmya (Shoumo) Mitra, Ph.D.,
Head Technical Services L&G APAC, Syngenta Asia Pacific Pte. Ltd.

Introduction

Sulfonylurea herbicides (SU) can be used to control difficult to control weeds like annual bluegrass (*Poa annua*), clumpy ryegrass (*Lolium perenne*), creeping bentgrass (*Agrostis palustris* Huds.) and sedges like yellow nutsedge (*Cyperus esculentus*), purple nutsedge (Cyprus rotundus), green kyllinga (*Kyllinga brevifolia*) and false green kyllinga (*Kyllinga gracillima*) (Yelverton, 2003 and 2004). The SU herbicides are tools that golf course superintendents can use to control weeds before overseeding warm-season turfgrasses and controlling cool-season turfgrasses during spring transition.

Trifloxysulfuron (Monument) has been reported to control various sedges and should be applied as a late spring transition aid in removing perennial ryegrass since it controls perennial ryegrass rapidly (Yelverton, 2004).

SU herbicides tend to move laterally so application of SU's in saturated soils should be avoided. To reduce lateral movement a short irrigation (0.25 inch or 0.6 centimeter) can be applied after herbicide application (Yelverton, 2004). Hydrolysis of SU herbicides which leads to degradation of the parent herbicide molecule is favored under acidic soil pH conditions compared to neutral and basic soil pH conditions (Sarmah et. al., 2000).

SU herbicides inhibit the activity of an enzyme called acetolactate synthase (ALS), also known as acetohydroxyacid synthase (AHAS), which is a key enzyme in the branched chain amino acid biosynthetic pathway of bacteria, fungi and higher plants. The branched chain amino acid pathway is responsible in producing three essential amino acids, valine, isoleucine and leucine.

Poa Control before Overseeding

Poa annua infestation in an overseeded stand of perennial ryegrass is a major problem for golf course superintendents. Introduction of various sulfonylurea herbicides has given golf course superintendents new tools in managing *Poa annua*. The best strategy to control *Poa* is to apply sulfonylurea herbicides before overseeding but care should be taken not to apply the herbicides too close to overseeding (Mitra, 2007).

Monument application at 7.06 g/acre (0.24 ounces/acre) can control over 90% of the *Poa annua* population within 28 days after application. Lower rate of application of Monument (7.06 g/acre) was as effective as higher rate of application (9.33 g/acre) for controlling *Poa annua* (Figure 1). Sequential application of sulfonylurea herbicides are more effective in controlling *Poa annua* compared to a single application (Mitra, 2005). Monument application at 9.33 g/acre controlled *Poa* effectively

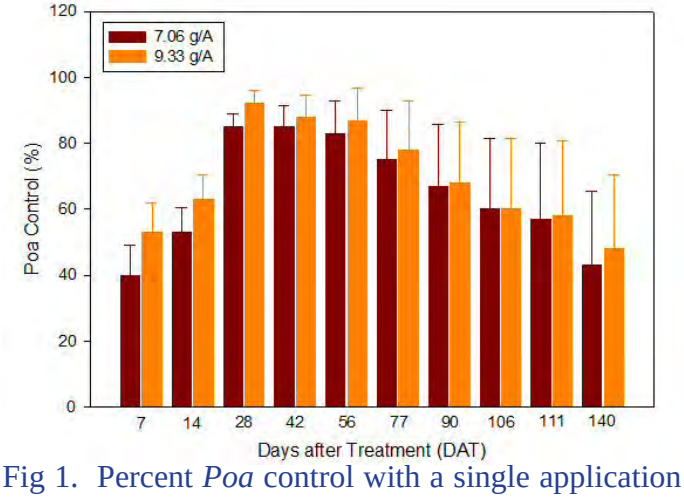

Fig 1. Percent *Poa* control with a single application of Monument 75 WG applied at 7.06 g/Ac and 9.33 g/Ac on GN-1 bermudagrass maintained under fairway management conditions.

and the optimum level of control was achieved between 30 and 70 DAT (Figure 2). The efficacy of a single application of Monument reduced after 80 DAT.

Ryegrass Injury

SU herbicides are wonderful tools in controlling weeds before overseeding bermudagrass tees and fairways but the biggest problem with these products is the chances of injury to ryegrasses. Hence, the application timing of the SU herbicides is very important. Minimum injury to perennial ryegrass was observed with 9.33 g/acre rate of Monument when applied 21 days before overseeding (DBO) compared to the application made 10 DBO (Figure 3). The extent of injury was not very severe (approximately 12%

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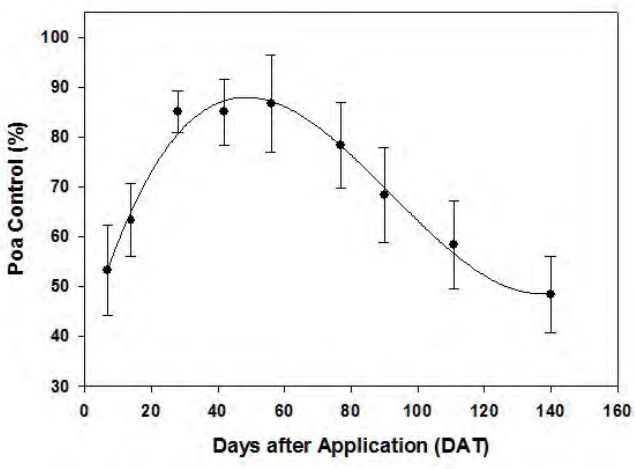

Fig 2. *Poa annua* control with a single application of Monument 75 WG at 9.33 g/Ac.

injury). The ryegrass was stunted and showed some yellowing after 8 weeks after overseeding (WAO).

The percentage of ryegrass injury is plotted as a contour diagram with colors. Monument even applied at a higher rate of 9.33 g/acre resulted in almost no injury when applied 21 DBO (purple color, 0% injury) compared to the application at 10 DBO (dark green color, 6% injury) when observed 2 weeks after overseeding (WAO). Monument applied closer

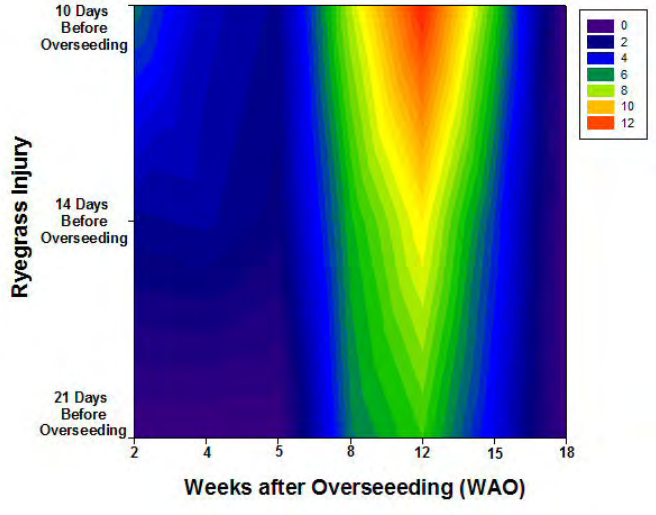

Fig 3. Effect of application timing of Monument 75 WG at 9.33 g/Ac on perennial ryegrass injury. Orange color denotes higher percentage of injury while purple color indicates no injury to ryegrass.

to the overseeding date (10 DBO) resulted in higher amount of injury which is depicted by the orange color (12% injury) compared to the application made at 14 DBO (light green color, 8% injury) or the application made at 21 DBO (dark green color, 6% injury) at 12 WAO (Mitra, 2005). Stunting and chlorosis of ryegrass was observed later on after 8 WAO. The reason for a delayed response could be due to desorption of the herbicide molecule into the soil solution slowly over a long period of time. The experiment was conducted on a clay loam soil. Bermudagrass (GN-1 and Tifway) were maintained under fairway management conditions (mowed at 0.5 inches) with low nitrogen fertility (4 lbs of N/1000 ft^2 per year). The herbicide adsorbed strongly on the fine textured soil after application and was not present in the soil solution. Slowly over a period of time the herbicide desorbed from the solid surface and dissolved in the soil solution. The ryegrass plants then picked up the herbicide and some yellowing was observed.

Conclusions

- Sequential application of sulfonylurea herbicides (SU) is more effective than single application in controlling *Poa*.

- Movement of SU's can be a concern.

- It is better not to irrigate before application of SU herbicides since the movement of the herbicides is markedly reduced under unsaturated soil conditions. SU's are prone to move in saturated soils.

- SU herbicides adsorb on the soil more under acidic soil conditions and desorb to the soil solution under basic soil conditions. Hence basic soils are prone to cause phytotoxicity or injury to plants more than acidic soils.

- Herbicide resistance to SU herbicides has been observed in field crops so golf course superintendents should rotate SU's with other herbicides with different mode of action.

- SU herbicides should be applied at least 10 to 14 days before overseeding to reduce injury to ryegrass.

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Announcement of the 4th ETS conference in Germany
University of Applied Sciences, Osnabrueck
6th – 9th July 2014

Every two years, the European Turfgrass Society ETS runs its scientific turfgrass conference in one of its member countries. Following Italy, France and Norway, Germany has been chosen to host the event in 2014. The University of Applied Sciences, Osnabrueck has won the bid to stage the conference from 6th – 9th July 2014. The convener, Prof. Martin Thieme-Hack from the faculty A&L and the Institute for Landscape Construction, and the organising committee in collaboration with the German Turf Society (Deutschen Rasengesellschaft e.V, DRG) are currently preparing for this international congress. The keynote theme is:

“Balancing turfgrass performance and sustainability”

Members of the ETS and European and international research institutions are called upon to register papers for presentation at the conference. Registration is online at www.ets-conference-2014.eu. Here you can find more information about the “call for papers”, general instructions and the planned schedule along with registration details which are available to download.

As in past years, the focus of the congress lies on discussion of the latest research results in the area of turfgrass in its most diverse manifestations from institutions in Europe and overseas, especially in North America.

After a shortlisting process for the submitted abstracts and subsequent review process, scientific articles and technical contributions will be published in special issues of the journals “European Journal of Horticultural Science” and “European Journal of Turfgrass Science”.

The University of Applied Sciences, Osnabrueck and the German Turfgrass Society are looking forward to a lively participation in this renowned European Turfgrass Society ETS event.

New research and development programme within multifunctional golf facilities

by Maria Strandberg, Director of Research and Development, STERF
Danderyd, Sweden

STERF will start new projects based on the research and development programme within multifunctional golf facilities, during the autumn 2013. If you have any ideas of projects suitable for international collaboration, please contact Maria Strandberg.

In STERF´s new research and development program we describe the current position and present the need for research, development and communication so that golf courses can be transformed into more multifunctional facilities. Through the program, we also want to demonstrate the potential of the golf sector to contribute to the achievement of important international and national environmental quality objectives, to improve people's health and quality of life, and to the implementation of the European Landscape Convention. In addition, we want to show that a multifunctional approach can be profitable for individual golf courses.

The aim of the R&D program is to create conditions for development of more multifunctional golf courses. In order for this to be achieved, increased competence is needed at all levels within the golf sector and among other parties in society that are interested in the land used for golf courses. The following questions must be answered:

- How can golf courses contribute to the production of biological diversity, the conservation of natural and cultural environments and the retention and expansion of ecosystem services in periurban environments and the cultivated landscape?

- How can the societal benefit of golf courses be improved through increasing accessibility and participation, thereby improving the conditions for good quality of life and better mental and physical health for more groups in society, e.g., through providing a broader active outdoor life, experiences of nature and better climate adaptation in the everyday landscape?

- How can the business advantages of multifunctional activities be identified and expanded for different types of golf facilities?

STERF has identified four central research and development areas in order to answer the questions above:

1. The everyday landscape and periurban nature.
2. Nature and culture.
3. Dialogue and cooperation.
4. Business promotion.

The R&D program can be found on http://sterf.golf.se/extra/pod/?action=pod_show&id=186&module_instance=1

STERF´s R&D programme within multifunctional golf facilities can be found on sterf.golf.se.

Pre-ITRC Conference Tour: The Three Gorges Four Day Tour

By Otto Weilenmann

After the 2.5 hour flight from Beijing to Chongqing, known as the Mountain City, we visited the Panda park and the Three Gorges Museum. On board the ship "Victoria Selina" at 8:00 pm, we started the

Welcome-door for entering the Museum of the Three Gorges in Chongqing with Elisabeth Weilenmann, Demie Moore, Tracy M. Jarman and the Tour Guide.

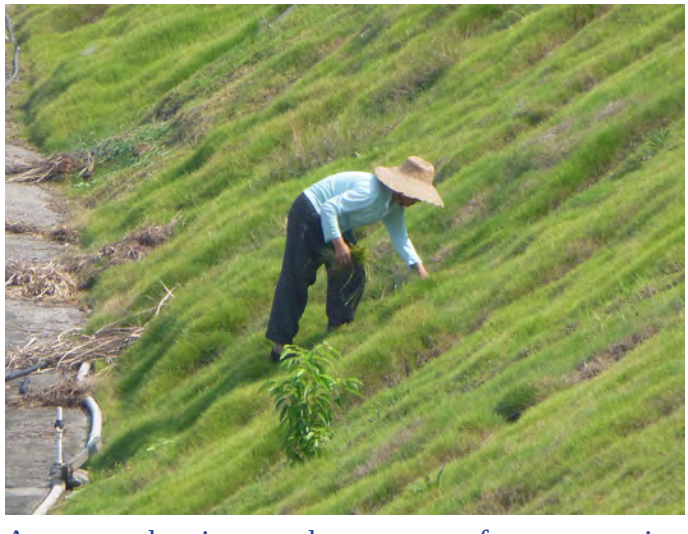
560 km long cruise on the new lake of the 6,300 km long Yangtze River. Beautiful landscapes, famous gorges located in between 2,000 m high hills, and ancient Chinese traditional culture along the way were fascinating to the "longnose tourists" from USA and Switzerland. It was midnight, when

Flooded areas with the old rice terraces and the new housing areas in the back about 30 meters on top of the July water level.

we entered the huge lock of the Three Gorges Dam. More than one third of China's population is dependent on the economy of the Yangtze River region. The main purpose of the new dam was, with the lake as a basin, to protect the fertile plains below

Entrance into the first gorge. To cruise through the 2,000 m high chain of hills takes 20 minutes.

down to the east coast from heavy flooding. This approach has worked well. Twenty six generators are now producing 18,200 Megawatts of electricity annually. Until few years ago, more than 60 % of the cargo transports went over the river. The capacity of transports up to the end of the new lake has been increased by the dam from 10 to 50 Million tons per year. After 15 years of construction the project has cost 28 Billion US Dollars. One point three million people had to find a new home. The height of the old river to the new lake surface was raised up by 110



A women cleaning weedgrasses out of a re-vegetation slope near the dam.

meters. From spring to July, before the rainy season the level of the lake is lowered by 30 meters, for taking up the flood waters. Many lingering questions are still out there for example the influences of the

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Thirty meters or more water height capacity remains in July on the 185 m high and 2,340 meter long dam. The dam wall is 130 meters wide on the bottom and 18 meters on the top.

New created bridge and tree planted landscape along the Yangtze River in Yichang.

new housing areas, the conservation of old historical sites and traditional cultural buildings, the pollution of water, the impact of earthquakes, the deposit of silt in the lake and so on. Vast plantations of trees, re-vegetation of slopes, creation of green parks and landscapes shows the high priority of erosion control and an environmentally friendly impact of the project. This has basically had a positive effect on land- and water conservation and the second economic impact resulting from the millions of tourists that visit the project each year. In Yichang, we visited a famous traditional market before flying back to Beijing. The Three Gorges Cruise was an exciting experience.

Copies of the 12th International Turfgrass Society Research Journal and Proceedings are available

The 12th International Turfgrass Research Journal and Proceedings are available as either a hard copy journal or as a CD. There are very few hard copies left at his time. Both versions are $300 USD each plus $15 shipping and handling. Contact Mike Fidanza if you would like a copy in either format.

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If you know any non-members, new faculty, staff, and new personnel involved in turfgrass research who might be interested in joining ITS please forward their email address to me and I will send a complementary copy of the next Triannual issue of International Turfgrass.

The deadline for submissions for the next newsletter is December 15, 2013