Comments on the November 2008 Draft Water Budget Tool for New Homes

January 2009

Commenter: Steve Snow
Affiliation: ET Water Systems, Inc.
Comment Date: November 20, 2008

I'd suggest you consider the following:

Assume lower levels of efficiency for standard sprinklers (perhaps 5% less) in your assumptions just to be on the safe side, because they are not always installed perfectly. Add MP Rotator from Hunter (similar versions from Toro, etc.) type rotors to your options for sprinklers as they have a very high distribution rate (e.g. 85%) and low precipitation rate (e.g. .39 inches/hour). They are popular, they proven to save a lot of water and you should be encouraging them.

Add a segment for native, drought-resistant shrubs and ground covers. These may only require 20% ET while you have 50% ET for shrubs. Again, listing these as options shows you want to promote them.

Regards,
Steve Snow
VP Marketing
ET Water Systems, Inc.
ssnow@etwater.com

Commenter: Ramon Monzon
Affiliation:
Comment Date: November 20, 2008

From Nursery News, I read this article.
EPA Water Efficient Home Specs.

Perhaps is too late that I'm writing about this but it's better late than never. I don't have any idea of how much water people are using on lawns but I think is more than they are using inside their homes. There are 3 key points I want to point out about how to use water efficiently.

I. DEAD SOILS

Pesticides, herbicides, synthetic fertilizers had killed organisms and microorganisms in the soils that is one reason why soils are compacted requiring more and more water. When soils are alive, organisms and microorganisms run back and forth making the soils smooth. When there is rain or the lawn is watered, the water goes deeper and the grass roots grow deeper into the earth.

II. SPRINKLES SYSTEMS ARE NOT PROPERTLY SET UP

I haven't read a single article where it says that a sprinkle has to be set up for 15 or 20 minutes everyday. Unfortunately, that's the way home owners are watering their lawns. I haven't seen a single house where the irrigation system is one-inch of water once a week as it has to be.

III. HEAVY EQUIPMENT COMPACTATION

At construction time, heavy equipment goes back and forth as a result the soil becomes compacted. What's worst is that the good soil is taking out and at the end it is replaced with one or two inches of loam; practically the grass roots will find compacted soil and sterile soil creating shallow roots requiring more water.

Based on my experience, water couldn't be necessary on lawns if the soils are appropriately cared. I don't use a single drop of water on my lawn in the summer and it looks like the ones with irrigation systems.

I'm really sure that if new houses keep at least six inches of good soil, not use pesticides, herbicides, synthetic fertilizers, and the irrigation system is set up at one inch of water once a week; home owners will have a nice lawn, they'll use water efficiently, and will save money on their water bills.

Any questions please don't hesitate to contact me.

Ramon Monzon
Massachusetts Certified Horticulturist
(774)-285-2106
RMZN2007@YAHOO.COM

Commenter: Lawrence O'Leary
Affiliation:
Comment Date: November 20, 2008

Irrigation efficiency is at least 25% too high; sprays should be 60% and rotors 70%. As economy changes, effective irrigation systems become less common. Shortcuts abound. As long as the US Gov't is involved in a new arena; maybe they can pay landscapers for highly efficient systems compared to the "real norm".

Commenter: Lorne Haveruk
Affiliation: DH Water Management
Comment Date: November 20, 2008

Very helpful. Good work. Thanks.

Lorne Haveruk, CWCM-L, CID, CIC, CGIA, CLIA
Water Resource Consultant,
DH Water Management

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Commenter: Sid Abma
Affiliation: Sidel Systems
Comment Date: November 21, 2008

Good day WaterSense
Have you ever seen natural gas irrigate the lawns and flower beds? This technology would fit better to hospitals and universities, prisons and other large government and commercial facilities. The water can be removed from combusted natural gas that is used to heat these facilities, collected and then used for irrigation purposes.
It's free water! And there is lots of it.

Have a Great Day!

Sid Abma
www.sidelsystems.com
(805) 462-1250
1 800 668-5003
cell (805) 610-9156

Commenter: Shaun Rydell
Affiliation: City of Prescott
Comment Date: November 21, 2008

Excellent draft for landscape.

Several suggestions:
Reference information hyperlink in document to all national websites including Water Sense.

Include a white box for entering in the USDA hardiness Zone:
Average temperatures - by season
Winter
Spring
Summer Fall

Ask: Do you have an underground irrigation System
Yes
No
If no how are you watering

Will you winterize your irrigation System? great place for a hyperlink

Use Annual Rainfall instead of Precipitation: maybe move this box to page one - I missed it several times and did not realize that it was there. Perhaps a hyperlink to rain garden design and planning or rainwater
harvesting. You could insert a picture of a rain garden and have the hyperlink embedded.

Great place to ask Do you harvest rainwater?
If yes
Area of roof or catchment surface ___
ask how big is your holding tank in gallons ____
Annual water captured in tank

Call turf - turf grass because terminology is not understood by all

I would also like a box at this location to summarize landscape. Something like a check box or an area for description:
-Traditional lawn and planter areas
-Reduced lawn and plant
-low maintenance-water sense landscape - plants that are grown regionally for my climate
-no water - native landscape - I water nothing on my site

Soil type:
-coarse
-Medium
-fine

Perhaps in a cell we can request that they insert 4 high resolution pictures of the project.

Ask which direction does your home face: North South East and West
Ask what type of garden Mulch - rock or bark
Is your project completed Yes or No

I like the tool, I think the intent is great. I did have a difficult time finding my reference Et. A general national by state database with hyperlinks would be great. If folks can't find Et they will not fill out.

I would love to see photographs or plan examples to support tab one and two. Again just a few visual support tools for those visual learners.

Page 2 Table 2 Plant Type KL
Include a coefficients for low water use Plants 0.20

I think this is a great opportunity to engage the public in the process of planning intelligent landscapes that are appropriate to the site. So if we probe and offer research links within the document that all users can easily access then we become partners in the process.

Great to see this tool at a national level I look forward to linking my community and contractors to this resource.

Regards,
Shaun Rydell

City of Prescott
Public Works Department
Shaun Rydell, Water Conservation Coordinator
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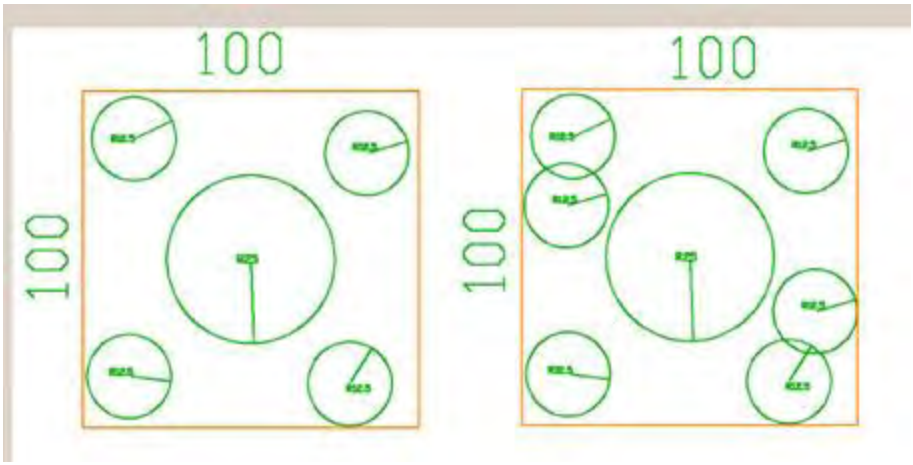
Commenter: Tom A. Reynolds
Affiliation:
Comment Date: November 21, 2008 and November 25, 2008

I have my expert opinion on the matter, but I ask for clarification from you as I start my evaluation of this model:

What do you say the "landscape area" is of the following:

1) A 100 feet x 100 feet area with one 50' diameter tree in the center, and 4 each 25 feet diameter trees within that boundary, located at each corner of the area?

2) How about if 2 more 25 feet diameter trees are added?



Finally, I can spend more time, and compare your results with my own model and algorithms, but it would be more efficient of my time if you would just send me a version with the calculations either shown, or in the margins to the right.

[November 25 comment]

I think you can see what happens when we push this to the extremes. Consider the problem if the 10,000 ft2 area has one 25' diameter tree, but the neighbor across the street has not only the Case #2 trees, but five more 25' diameter trees. As you are probably aware, the plant density, or basal area, has to be considered as a distinct consideration, certainly in the Southwest, and particularly before the landscape has matured.

All of the experts, from Burt to Boswell have concurred on this. Landscapes are dynamic. Once basal area reaches 65% - 75%, your are justified in your budget development using the 10,000 ft2, but not before then.

I sent the EPA a model for budgeting landscape water requirements on a per plant basis about one year ago, but never saw a response. I have developed annual water budgets for the AZ Department of Transportation for several years using this method because we have to water a

wide array of plant species with a common valve. A shrub valve can be internally balanced to dole out water that is more likely to be "beneficially used" using this approach, but the best designers in the West have not recognized this yet. The next step is to develop a long-term emitter schedule for the "most prominent" plant species. My fellow designers don't recognize that yet either.

The tendency in Arizona is to have a few more valve definitions, so that plants can be irrigated according to plant demands. This is not warranted, and just takes more pipe in the ground, which is a waste of fossil fuels.

For all your great intentions, shouldn't we stop treating everything like turf, and like start doing it today?

I will test your model against my own models. I will see if I can find the missing algorithm and any undisclosed factors. I expect you have it about right already, given that the fundamentals are off by some very real plant water requirement orders of magnitude, so why drill down deeper, right?

Tom A. Reynolds
home: 480-649-6462
mobile: 602-463-5072
www.waterbalance.net

Commenter: Rick Fink
Affiliation: Sunset Hills Cemetery
Comment Date: November 24, 2008

This quick guide can come in handy for anyone to help a homeowner estimate water usage for the coming year. It may be confusing to irrigation companies that do not have trained irrigation specialists (i.e. CLIA, CIC, etc.) on staff.

As far as local ET rates for my area, Bozeman Montana, I use the following site; www.usbr.gov/gp/agrimet/station_bozm_bozeman.cfm I think it provides excellent and up-to-date information and use it when scheduling irrigation for our municipal cemetery

Rick Fink
Sunset Hills Cemetery
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rfink@bozeman.net
(406) 586-7238

Commenter: Elizabeth Farr
Affiliation: JEWELL Engineering Consultants
Comment Date: November 25, 2008

This looks like a great tool to use. I quickly tried to use the tool and found the mulch return gave a #value which then gave no result on the rest of the info. Not sure if I did something odd, but it appeared very straight forward and results are immediate. Please check the background info for the mulch column-thanks.

Sincerely
Elizabeth (Betty) A. Farr, PE
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Commenter: John Schlichenmaier
Affiliation:
Comment Date: November 25, 2008

Too complicated.

Commenter: Darell S. Bagley
Affiliation:
Comment Date: November 25, 2008

This is a great tool. Please look more closely at the Irrigation Efficiency Factors. Spray heads should be more like 40% (they are the least efficient), Rotors 60%/ MSMTR (MP Rotator or equal) 70%. The drip is about right.

Darell S. Bagley, ASLA
Senior Landscape Architect

Commenter: Steve Williams
Affiliation: Buildinggreener LLC
Comment Date: November 25, 2008

Topic: Over All
Comment: I think this is a great tool fairly easy to understand
Rationale:
Suggested Change (or Language):

Topic: ETo = Grass reference evapotranspiration (inches/year), location specific
Comment: You need to provide reference links.
Rationale: The one you suggest is good, but when I was learning this I had trouble finding the ET for different plants. I think it would be helpful for those that want to go the extra click.
Suggested Change (or Language):

Topic: Draft specification for water-efficient single-family new homes
Comment: There is no mention of non potable water use. Rainwater Harvesting
Rationale: Half of the problem is the actual choice plantings as you address, but using potable water for irrigation is not mentioned.
Suggested Change (or Language): Rainwater should be a requirement as well. I realize you do not deal with rainwater, but their is no reason that if someone goes to the expense to put in irrigation that they cannot collect the rain. This reduces stormwater peaks and the plants do significantly better then when they are poisoned by chlorine and fluoride.

Topic: Landscape Design Criteria
Comment: No mention of Earthworks Rainwater Harvesting.
Rationale: This is a passive technique to use the water more efficiently
Suggested Change (or Language): Read Brad Lancaster's Rainwater Harvesting Vol 1&2

Commenter: Paul Lauenstein
Affiliation:
Comment Date: November 25, 2008

Thanks for responding to my email.

I would not expect EPA to endorse any specific products. However, there must be a way to recommend drought tolerant grass species, as well as enrichment of soil with water-absorbing organic content (such as grass clippings). I have a beautiful green lawn which I never irrigate. My methods are described in the attached water bill insert entitled "Secrets of a Waterless Lawn".

Instead of jumping through hoops to describe water-saving features for irrigation systems, the draft Water-Efficient Single-Family New Home Specifications should simply state that a home with an automatic irrigation system cannot be considered to be water-efficient.

Regards,
Paul Lauenstein
4 Gavins Pond Road
Sharon, MA 02067
781-784-2986

Commenter: Wayne Thorson
Affiliation:
Comment Date: November 25, 2008

The concept of your water use tool is excellent, but you do not carry it far enough. ET rates of plant families very dramatically, but so do the species within those families. It would be better to give options based on the species. In turf for instance, the water use can vary widely.

Buffalograss 0.30 inches per week
Bermuda 0.45 inches per week
Zoysia 0.60 inches per week
Bluegrass, fescue, St Augustine over 1 inch per week

SEE:
http://ucrturf.ucr.edu/publications/Field%20Day%20Procs/1995%20Proceedings/t02_tf_growth_char_wateruse_rates.pdf
http://www.turf.uiuc.edu/hort436/Lec%206.stm

Other plant families have the same disparity.

Wayne Thorson

Commenter: Russell Schell
Affiliation:
Comment Date: November 30, 2008

Why is there no specification for WaterSense clothes washers, except for homebuilder-provided EnergyStar-labeled clothes washers with a WF equal to or less than 6.0 gals/cu ft capacity? It would seem appropriate to provide specification guidance to homeowners considering purchase of a front-loading clothes washer.

Russell Schell

Commenter: Laurence Budd
Affiliation: Urban Water Conservation
Comment Date: November 30, 2008

Hello Ms. Lee-

I do water budgets for large properties every day. Your tool is a good start. The biggest problem people like Brent Mecham and I have is finding the local reference ET for Alfalfa. Texas and Cal have this online for every hamlet, but in other states it can take days to find.

As you know, the coefficient for turf is around 70% of Alfalfa, and we can take 70% of that to allow for rain and etc. However, we often- usually- find the system being inspected is at 50% DU, or worse. The end result is the needed amount of inches comes right back up to the original coefficient for turf. Funny how often this happens. Therefore, when I construct a budget for a region or property, I put in a "cushion" to allow for inefficiency. We find that if they try to go to straight to the coefficient they start having problems. Another constant effect we see in the field is it takes a period of time to transition form 3 times too much to a reasonable amount. The roots are often on the surface, fighting for air while being overwatered. When the water is cut back and time is allowed for oxygen, the shallow roots start frying.

I spoke for WaterSense at the IA show last month.

I have just been appointed to Denne Goldsiien's new magazine board, and look forward to seeing it promote the WaterSense program and AWE.

Thanks,
Laurence Budd, CLT, CLIA, CWMP
Urban Water Conservation
EPA WaterSense Partner, IA Select Certified
www.urbanwaterconservation.com, www.xeriscape.net
LBBUDD@yahoo.com
cell 970-402-3216

Commenter: André Boerema
Affiliation: Sydney Water
Comment Date: December 1, 2008

To whom it may concern,

You may be surprised why this initiative has raised interest in Australia. A colleague of mine has stumbled across a reference to your water budgeting tool and referred it to me. I've been responsible for the development and implementation of a major outdoor water conservation program in Sydney, Australia called Love Your Garden. This program has recently been further refined into an online tool by URS Australia (who were also directly involved in the development of Love your Garden).

The methodology used to assess landscape irrigation demand stems from over 3 years of careful research into Sydney's domestic landscapes. Essentially we found the irrigation needs of domestic landscapes cannot be accurately assessed using traditional irrigation calculations and tools as these have been developed for agricultural purposes.

The differences between an agricultural crop and a domestic landscape are many and significant and these shouldn't be ignored when attempting to determine an irrigation budget for a landscape.

Consider for example a typical single, separate residential dwelling:

The front garden will be relatively exposed on at least three sides (the house may protect it from the sun and will provide some wind protection). The road and driveway surfaces will absorb heat, elevating surrounding temperatures during sunny days and radiating heat for several hours after the sun has set. Which ever direction the garden area may be facing, it will receive a varying exposure to sunlight. If the garden's slope is significant it will either gain more or less sunlight and the soil will struggle to benefit from heavier rainfalls, unless specific landscape features are present.

The back garden will be protected by the house, and will typically have fences on all four sides. There are typically more established trees in the back garden also. These factors all combine to provide more shelter from both sun and wind. As with the front garden, aspect and slope will impact the back garden's exposure to sunlight and ability to absorb water during heavy rainfall events.

The side gardens will be relatively protected by sun due to the two adjacent dwellings, however depending on the dwelling's aspect and the prevailing wind direction, these garden areas are typically exposed to wind and are often exposed to a 'wind tunnel' effect due to the rigid surrounding structures.

Together with the evapotranspiration rates of the various plants and grasses, these variables are all significant contributors to the landscape's irrigation demand.

The soil will almost certainly (based on our experience of tests in over 10,000 gardens) be different in each garden area, and indeed, within each garden area. The soil type (sand -

through to loam, through to clay and everything in between) texture and depth are absolutely critical in determining irrigation frequency. In Sydney we have soils that vary from sand (about 5mm of water retention capacity in a well structured, 300mm deep soil profile, through to sandy loams (about 22mm of water retention capacity in a well structured, 300mm deep soil profile). Each combination of soil characteristics provides a highly variable ability to benefit from local rainfall, which then has the potential of deferring or eliminating irrigation events.

Combined with rainfall distribution data all these variables, based on our experience, are more significant that the efficiency of the irrigation system. Particularly in areas where irrigation systems are not installed or maintained by professionals.

In Sydney, this approach is presented via an online tool: http://www.ap.urscorp.com/watertool/

Kind regards,

Andre

André Boerema
Program Manager
Water Conservation & Recycling
Sydney Water
(Direct) 612 9350 6485
(Mobile) 612 419 272 369

Commenter: William C. Brigham
Affiliation: City of Atlanta
Comment Date: December 2, 2008

Gentlemen,

Upon review of your overview and information of your "WaterSense Budget Draft Document". I was left with a few questions and comments:

As we all know, irrigation use in the landscape has been increased dramatically over the last 10-15 years where "everything" is irrigated. Thank goodness the use of rain-cup over-rides have been implemented in irrigation systems where at least we aren't watering during rainfall periods. Pressure testing and overall irrigation system design may also need to be inspected within your "calculations" and inspection periods. Leaks result from a majority of water use in the landscape.

The Plant list (which I didn't view but which you noted) is from The California Extension Service. Will one form Georgia be added in its place? What do the folks at UGA say about the plants selection used? Has Dr. Gary Wade, Mike Dirr or Bruce K. Ferguson been consulted?

Plant material needs the most water during establishment. Water use is then decreased over time unless severe drought conditions result. This, of course, is dependent on proper installation methods, soil conditioning and other approved horticultural factors. Nothing I read explains the importance of this or any mention of the Xeriscape processes, only calculations.

It appears that your methods of review and water savings are gravitating more toward engineering processes then horticultural processes. The old line: "Don't put a $25 plant in a $0.50 hole" seems to have been left out. Again, proper horticultural processes are more important in long term plant establishment then a finely tuned irrigation system (as have been my experience).

I apologize if I missed some of the links or other information you provided in this "draft document". Overall I found it explained well and after 5 pages, somewhat intimidating. The use of no turf on greater then 4:1 slopes is a good maintenance practice as you tend to "roll" your mower if not careful on steeper slopes. ["Proper maintenance" is one of the seven Xeriscape principles.]

I think you have a good method of calculations, but, the best method of water conservation in the landscape is, "don't turn the tap on at all and you save even more water". Proper horticultural methods will assist with this water conservation technique as proven before in the droughts of 80, 92, and our current extended drought of 2005-08. I'd suggest you talk further with gardeners, farmers, nurserymen, landscapers and horticulturalist as well as the engineers and mathematicians who came up with your irrigation calculations. They may have some calculations of their own, like soil additives to native soil, for example.

You have a good start with your irrigation calculations, but that is only one key to the water conservation puzzle. If you irrigate correctly now, your plants should be well established enough to make it through the droughts with only supplemental water later. Time will tell if you

planted them and watered them correctly, as time usually does. Since more plant die from over watering then under watering, you offer the irrigation contractor and homeowner a viable tool to schedule and design their systems properly. Good Job!

Good luck with your methods and let me know if I can be of any assistance with this

William C. Brigham, A.S.L.A.
Principal Landscape Architect/Proj.Manager
Dept. of Watershed Management
City of Atlanta
(404) 546-1252 E-FAX (404) 658-7194

Commenter: Susan Crook
Affiliation: IO Design Collaborative
Comment Date: December 2, 2008

I live the desert southwest. The calculations use cool-season grasses. A tab for warm-season grasses would be helpful.

Susan Crook, ASLA
IO Design Collaborative
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Saint George UT 84770
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Commenter: Michael Prevost
Affiliation: Prevost Stamper Incorporated
Comment Date: December 3, 2008

1. Change Builder Name to Builder/Developer Name

2. Add City, State and Zip Code below the Street Address bar

3. ETo = Grass reference evapotranspiration, should read Reference evapotranspiration ET for Turfgrass to match part 3

4. Change Annual ET to Monthly ETo for month of July to match other LEED calculators. We rarely use Annual ETo. We take the highest monthly ETo use seasonal multipliers to get the annual ETo. Maybe you can let the calculator do that. If you have to use Annual ETo rename this to Average Annual ETo.

5. I put my whole site in turf and still met the water budget?? I thought the goal was to use less turf and more plantings with indigenous plants?

Michael Prevost, ASLA
Prevost Stamper Incorporated
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Celebration + Hong Kong designpsi.com

Commenter: P.J. Knopp
Affiliation:
Comment Date: December 3, 2008

To Whom it Concerns,

I was surprised how easy it was to meet the LWA for my area (Cleveland, OH). Using an ETo of 30.73 inches/year and a precipitation (R) of 36.81 inches/year, it was possible to meet the LWA using a conventional rotor irrigation system for a cool season turfgrass that occupies 93% of a yard and a conventional fixed spray irrigation system for a mixture of trees/shrubs/groundcover that occupies 7% of a yard. A similar, irrigated yard would never meet the requirements successfully for a LEED WE credit.

The only problem that I had with the WorkBook was that the column widths for columns C and F on the Part 3 Worksheet are too narrow. They cannot display large numbers.

All in all, a good start!

Commenter: Steven C. Augerot
Affiliation: City of Greeley
Comment Date: December 3, 2008

I tried the water budget tool, and I believe that this could be a valuable tool. I do have a problem with the DU factors that are being used to calculate the water allotment. As a Certified Irrigation Designer and Landscape Irrigation Auditor, I don't believe that the 80% DU for rotors, nor the 75% DU for fixed sprays are achievable.

If you create a requirement that is unobtainable, it has no value. I feel that a more realistic approach would be to create a requirement that is obtainable, and then offer incentives to those that exceed expectations.

As a designer, at this point in time, most manufactures do not provide adequate information to allow for designs that could approach the DU's you are asking for.

Steven C. Augerot, CID, CLIA, CLT
City of Greeley
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Commenter: Adrienne J LaBranche Tucker
Affiliation: Virginia Tech
Comment Date: December 3, 2008

Topic: Annual ET
Comment: **"**ETo = Grass reference evapotranspiration (inches/year)" is not accurate when scheduling irrigation
Rationale: Landscapes are not irrigated year round. Average growing season ET or average monthly ET would be a more accurate number to utilize.
Suggested Change (or Language): ETo = Grass reference evapotranspiration (average inches/growing season *or* average inches/month)

Topic: ET rate
Comment: Not all states have available ET rates
Rationale: Few states have information concerning ET rates. I personally have worked at Virginia Tech to develop a website that details ET rate throughout the state (http://www.turf.cses.vt.edu/Ervin/et_display.html). However, this project is in jeopardy of being discontinued due to the cost to maintain weather stations. If these guidelines are approved and published, EPA should work to further assist funding ET databases throughout the country.
Suggested Change (or Language): NA

Topic: K_L
Comment: "KL = 0.43 This is the area weighted landscape coefficient designating a mixture of high-, medium-, and low-water-using plants" is very misleading.
Rationale: There is no scientific explanation behind the 0.43 level.
Suggested Change (or Language): More information is needed to explain the 0.43 level. The current description is not acceptable.

Topic: Utilizing ET rate
Comment: Implementation will be very complex and adoption will be slow
Rationale: ET rate is the best way to schedule irrigation. However, not many people are familiar with ET rate, especially homeowners. ET rate can vary dramatically from one month to another, so even utilizing seasonal ET rate will cause possible over watering during the beginning of the season and under watering later in the season. ET technology truly needs more development before this program can be adopted and implemented, especially at the homeowner level. EPA should focus on funding technology development and education with this program to increase user adoption and program success.
Suggested Change (or Language): NA

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http://filebox.vt.edu/users/alabranc/
http://www.turf.cses.vt.edu/Ervin/et_display.html

Commenter: Tim Dickson
Affiliation: Chemilizer Products, Inc.
Comment Date: December 4, 2008

The only data I have found for ET rates in Florida is for warm season turfgrass. If I use those figures in the LWA section and select warm season turfgrass for the Plant Type for the LWR, isn't the result understating the actual requirement?

Tim Dickson
Dir. of Business Development
Chemilizer Products, Inc.
tdickson@chemilizer.com
www.chemilizer.com
1 800 234 7211

Commenter: Mike Sherer
Affiliation: Foodservice Equipment Report
Comment Date: December 5, 2008

Would this work for small commercial properties, such as restaurants?
Do you have a tool for restaurants?

Mike Sherer
Foodservice Equipment Report
www.fermag.com

Commenter: David Ruble
Affiliation: Virginia Office of Environmental Education, Department of Environmental Quality
Comment Date: December 9, 2008

Please see attached. This tool has the capacity for being extremely helpful for planning future water needs to keep homeowners happy.

Topic: Locating the Annual Grass Reference Evapotranspiration Rate

Comment: Locating the annual grass reference evapotranspiration rate for several regions in Virginia was difficult. In order to locate this number for the calculator, I had to consult with a (1) local agriculture extension agent who had to refer me to a (2) turf specialist who sent my inquiry to (3 & 4) two turf science professors at Virginia Tech. It took me a total of 4 individuals with a combined total of 6 hours to locate the information necessary to use the Water Budget calculator.

Rationale: Locating this number to use the tool seemed a bit lengthy. I'm not sure if builders or landscapers would choose to use the calculator based on the time needed to locate this number. I am not in the turf trade, so locating the annual grass reference evapotranspiration rate might be easier for those in the profession, but for the lay public I would recommend changes.

Suggested Change (or Language): My specific recommendation would be to provide a fact sheet or additional worksheet in the spreadsheet with information about annual grass reference evapotranspiration rates for a variety of warm and cool season grasses. This would make the WaterSense Landscape Water Budget tool more user friendly; tool that would serve as a "one-stop" calculator for planning water needs.

Thank you,

David Ruble
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804-698-4533 fax
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Commenter: Jill Hoyenga
Affiliation: Eugene Water & Electric Board
Comment Date: December 9, 2008

Hello WaterSense/ERG Staff:

I and my staff road tested the WaterSense Water Budget Spreadsheet Tool using our own audit data from several sites and testing it against our own water budget spreadsheet tool. Eugene Water & Electric Board has used a staff developed water budget spreadsheet tool for customer information and evaluation purposes since 2005. Our comments are listed below.

- The WaterSense tool seems easy to use since it doesn't need as many datapoints as the EWEB spreadsheet tool.

- The EWEB spreadsheet tool has a graph of monthly estimated use compared to actual use. We have found that the graph is critical for effective customer communication. We think that two simple graphs would improve the WaterSense output document. A bar graph comparing LWA vs LWR; a pie chart showing the percent of lawn and shrubs.

-It would be helpful for the percent of lawn & shrubs to show the requirement so that the yes or no is in context. This could be entered as a comment in the yes/no cell, but might be clearer as text on the WaterSense output document.

- There is no selection option for native or low water use plants. We set the water budget at 0.25 for such plantings in the EWEB spreadsheet tool. It seemed to us to be a missed opportunity to not have that in the menu of options and require it be a custom entry (where the contractor would enter any Kc they thought worked).

- All EWEB general use spreadsheets have data selection guides and data input suggestions as comments in the spreadsheet (highlight little red triangle in the cell). We have several temporary employees come through every year. Without the comments right in the cell we were having constant GIGO problems. Flipping between the explanation document and the spreadsheet tool just won't happen consistently according to my 9 years of experience of guiding temporary workers in use of spreadsheet tools. and I had daily oversight of their data entry!! If this will be used by contractors in the field, the comment feature will be very important for consistently correct data entry.

- The A2 annual precipitation entry created huge problems for the water budget calculation outputs for our audit data. EWEB ET data input already has rain subtracted. In addition, the annual precip input seems to assume that the precip is available during the watering season. In Florida this is often true; in the Pacific Northwest it is definitely not! Perhaps the 25% requirement was an attempt to proxy seasonal precip but that still will not work in our region. I suggest the A2 annual precipitation label be changed to effective precipitation during the irrigation season. That way someone would input raw ET numbers and the precipitation numbers would subtract free water from the sky at the time that it would preclude irrigation, not for a percentage of the whole year. The comment for that cell should specify that an input is only needed if the ET numbers used do not have rainfall subtracted from the raw number. We may need a phone conversation if this last comment is too confusing.

Thank you for the opportunity to comment. -Jill

Jill Hoyenga, Water Management Services Supervisor
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Water Management Services

Commenter: Stu Feinglas
Affiliation: City of Westminster
Comment Date: December 10, 2008

- It would be good to have a place that the WaterSense requirements are listed on the tool so designers can keep the requirements and goal in mind.
- Who would determine the annual precip amount to enter? Would it be hard coded for specific areas?
- It would be good to check with Brent Mecham at IA about the use of sprinkler efficiency as a direct factor in determining the water requirement. I learned that if you that number you will generally

Overwater landscapes. Would it be possible to overwrite the system efficiency to enter real data after an irrigation audit?

- With the popularity of MP nozzles and subsurface irrigation, it might bee good to add them as their own irrigation types.
- Should there be an entry for the type of controller? There may be different use factors based on technology such as historical et based, real-time et based, soil moisture based, etc. If the concern is that you don't want to get into the irrigation system due to the number of options, and variables, the system efficiency should not be considered either.
- Could you include consideration for soil amendments or their lack? More water required if amendments are not added.
- You may have addressed these issues already but this is what I see without any history.
- Could reclaimed water and or graywater or harvested water be considered as a benefit?

Stu Feinglas
Water Resources Analyst
City of Westminster
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e. sfeinglas@cityofwestminster.us

Commenter: Kenneth Hignight
Affiliation: NexGen Turf Research
Comment Date: December 11, 2008

To whom it may concern;

I was disappointed to see the EPA try to regulate how much of a homeowners landscape could contain vegetation. While the initial thought of reducing water should be applauded the EPA is making a serious mistake. Regulation of the landscape by limiting plants is contrary to the very mission of the EPA which is to protect the environment. The elimination of plants increases pollution in runoff water, reduces the amount of carbon dioxide which is converted to oxygen, and increases dust and particulate matter in the air we breath and the list goes on.

I believe that the key to water reduction, while still achieving the goal of Water Sense and the EPA, is to select the right species and the right cultivars within the species to plant in the landscape. This approach takes into account the goal of EPA/WaterSense by reducing the water needed on the landscape while protecting the mission of the EPA which is to protect the environment. I think that we can all agree that the best thing we can do for the environment is to have plants instead of rocks or pavement covering the landscape, especially with concerns of global warming.

For the past years I have been developing and identifying turfgrasses that survive and stay green on less water. Water studies during this past year have identified cultivars which could cut water use in half while maintaining the same level of green cover. I believe that this type of approach is much better suited for the EPA, water conservation, pollution control, temperature control, CO2 reduction, etc...

I would request that the water budget tool concept be suspended until all of the information available can be considered so that the correct approach can be taken.

Kenneth Hignight
Director of Research
NexGen Turf Research

Commenter: Jerry Milewski
Affiliation:
Comment Date: December 11, 2008

Water Sense People,

Prior to World War II many downspouts from homes were directed from above ground to brick or concrete cisterns below ground. What happened to make these functioning property elements go away? In other parts of the world, cisterns are still a vital part of any property. Many people use the water in these cisterns for washing clothes or watering their gardens. The cistern has changed with time too. If you travel to the West Indies, you can see the new cistern is made of plastic and its very large.

http://www.tcpalm.com/news/2008/mar/24/letter-homes-cisterns-would-put-utilities-out-busi/

The main reasons why cisterns haven't been resurrected are money and regulations to enforce the use of cisterns. People are interested in water conservation and retention. The rain barrel is a cistern above ground and it is being sold on the internet and at garden centers.

Let's look at bringing back the cistern for new homes built anywhere in America.

Jerry Milewski
Landscape Architect

american gardens
creativity craftsmanship care

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Commenter: Teresa Watkins
Affiliation: Environmental landscaping consultant
Comment Date: December 11, 2008

Topic: Site Assessment
Comment: This draft does not address a correct site assessment at the developer/buyer stage. Assessing the site conditions prior to construction and protecting all native plant areas, native soils on unbuilt areas of the lot, and determining what the conditions *will be after construction* and design the landscape to those impacts.
Rationale:
Suggested Change (or Language): Include submission of paperwork detailing site conditions prior to construction identifying soil structure, native plants available already established with no need of supplemental irrigation.

Topic: Site Assessment
Comment: Keep substrate soils removed from building location onsite and reapplied correctly to landscaped area after construction before plant installation.
Rationale: Recycles native soils and top soil nutrients and organic materials onsite. Keeps water-retention soils for native plants and non-native landscape material**.**
Suggested Change (or Language): Site holds and reuses substrate material onsite for organic amendments of landscape beds after construction**.**

Topic: Native plants, landscape plants, "The Landscape Water Requirement(LWR**) is the amount of irrigation water required** by the designed landscape. *Feature: From the dropdown list, choose the plant type (i.e., ground cover, shrubs, trees, etc.) or landscape feature (i.e., mulch or non-planted area, or pool/spa or water feature) for the associated hydrozone/landscape feature area. The landscape coefficient (KL) for the respective plant type (or landscape feature) will automatically populate in the adjacent cell.*
Comment: Native plants taken out of their endemic regions, non-native soils, and maintained by homeowners with fertilizers, excessive practices, use same amount or more of water in landscapes. Irrigation should not be an automatic conclusion. Mandatory irrigation systems phrasing in CCR's and Covenants should become obsolete. Irrigation of 5 acre ranchettes are water-hogs.
Rationale: Plants in different regions have different watering and maintenance needs. The LWR verbiage automatically assumes that there will be a need for supplemental irrigation after establishment. With preservation of site during construction, properly maintained plants in the proper location and planted in relation to mature size, proper spacing, there should be no need for supplemental irrigation except during extreme droughts. High chemical use and improper maintenance practices become issues with water restrictions and during drought periods.
Suggested Change (or Language): Keep "correctly installed" irrigation to 40% of lot. Educational material on right plant, right place, and proper maintenance by homeowners provided with "homebuyer welcome packets." Mandatory irrigation systems phrasing in CCR's and Covenants should become obsolete or discouraged. Use provenance to select plants.

Topic: Landscape plan does not have species, just type of plant, I.e. annual, shrub, tree.
Feature: From the dropdown list, choose the plant type (i.e., ground cover, shrubs, trees, etc.) or landscape feature (i.e., mulch or non-planted area, or pool/spa or water feature) for the

associated hydrozone/landscape feature area. The landscape coefficient (KL) for the respective plant type (or landscape feature) will automatically populate in the adjacent cell.
Comment: Since not every new plant on the market can be listed, this will increase monocultures and cookie cutter communities. No mention of landscape diversity.
Rationale: Monocultures increase disease and insect risks, which increases water and chemical use, which leads to more leachates and storm water pollution.
Suggested Change (or Language) If irrigation is installed: Require plants be spaced according to mature height and width. Suggest for each lot and each community: a percentage of plants be diverse according to total landscape package, I.e. 10% annuals, 40% turf, 30% shrubs with no more than 5% of any one species, 20% trees with no more than 5% of any one species.

Topic: Landscaping should not be considered as needing supplemental irrigation.
Comment: A correctly assessed site, with proper landscaping installed with proper spacing, once established should not need supplemental irrigation except during extreme drought periods.
Rationale: Same as comment.
Suggested Change (or Language): Right plant, right place according to site conditions will eliminate a need for automatic supplemental irrigation.

Topic: Turf grasses
Comment: All regional turf grasses with no permanent irrigation onsite should be encouraged.
Rationale: Turf grass properly maintained should not need supplemental irrigation.
Suggested Change (or Language): Allow more turf grass areas if not irrigated. Give more latitude to homeowners that want more turf grass and are willing to forego irrigation.

Topic: Water conservation involves not only correctly installed material, technology but the maintenance after homeowner moves in.
Comment: No mention of correct maintenance after homeowner moves in, I.e. over fertilization, monthly landscaping services, excessive pruning of improperly placed plant material, improper mowing, which decreases sustainability and increases the need for more water and curative chemical applications for pest problems due to stressed plants.
Rationale: Same as comments
Suggested Change (or Language): Require home's landscape plant list and details for proper maintenance to homeowner's welcome packet.

Topic: Improper spacing and plant selection
Comment: No mention of using plants that need constant pruning to maintain height and width. Improper plant spacing leads to disease and pests.
Rationale: Instant landscapes should be discouraged. Landscapes are installed to be instantly beautiful rather than allowing them to grow naturally into a natural landscape. Landscapes look beautiful the first six months, next six months start growing quicker, after a year, they are starting to develop insect and disease problems, after three years, you can't see the windows, or doors due to overgrown shrubs and plants. Unhealthy landscapes, higher water use, increased chemical use.
Suggested Change (or Language): Plants and trees should be spaced according to mature size. Landscapes should be allowed three years to mature. Discourage instant landscapes.

Topic: Shrub and tree size
Comment: No mention of plant size.

Rationale: Smaller gallon size containers, smaller tree calipers, smaller rootballs become established quicker, need less water to become established, have reduced stress impacts, and achieve same aesthetics of larger installed landscape material in same time frame. I.e. 2" caliper tree installed properly and maintained properly requires less water than a 4" caliper tree. (Gilman, 2007) http://hort.ifas.ufl.edu/woody/documents/ch_10_mw04.pdf
Suggested Change (or Language): Encourage smaller plant material with long-term vision for healthier, better established landscapes.

Topic: Certified landscapers and irrigation installers.
Comment: Have Water Sense certified designers and installers.
Rationale: None of these water conservation methods will be viable if not designed and installed correctly.
Suggested Change (or Language): Have free certification courses taught by Extension or other professional landscaping and irrigation associations. Provide every opportunity for anyone to become certified.

Topic: Water Budget
Comment: Too complex. Not user friendly or even professional friendly.
Rationale: Majority of irrigation installations now aren't installed correctly. What makes anyone think they will be able to compute the water budgets accurately? Who's going to check the water budgets after installation to make sure that's what they are using? What city and county employee is going to oversee this as part of their permitting process? Automatic rain shutoff gauges have been mandatory since 1991 in Florida. Statute 373.62. It hasn't been enforced, ignored by city and county departments, and still receives shock by homeowners that it's required.
Suggested Change (or Language): Reduce the amount of high volume irrigation and you automatically reduce the water consumption. Add correctly installed low volume irrigation that is correctly maintained and you have reduced water use.

Topic: Water sources
Comment: Are water sources addressed in the water budget?
Rationale: Homeowners do not know how much water they use on a monthly basis.
Suggested Change (or Language): Private wells should be discouraged in areas that have access to alternative water sources. If wells are allowed, metering should be mandatory to give homeowner knowledge of water consumption.

Thank you!
Sincerely,
Teresa Watkins
407-760-3966
Florida Water Star Specialist, SJRWMD; Fellow & Vice President, UF/IFAS Florida Natural Resources Leadership Institute - Alumni Association Board of Directors (2008)
FS-AWWA Award For Public Education (2007); Florida Association of Environmental Professionals; National Garden Writers Association; UF/IFAS Florida Master Gardener Society UF/IFAS Florida Master Naturalist Program

Commenter: Justin Moss
Affiliation: United States Citizen
Comment Date: December 11, 2008

Topic: Option 1 – Turf shall not exceed 40 percent of the landscapable area. Turf shall not be installed on slopes greater than 4:1.
Comment: There should not be a turf limit for landscapable area.
Rationale: Depending on site and conditions, turfgrasses can be utilized that do not need additional irrigation to survive. For instance, bermudagrass can be utilized in the southern US and can easily survive without supplemental irrigation. See data from a study conducted by the San Antonio Texas Water System:
http://www.saws.org/conservation/Ordinance/TurfGrass/index.shtml
Suggested Change (or Language): Drought resistant turfgrasses should be utilized according to the local climate and environment. State university extension turfgrass specialist should be consulted when determining which turfgrass species and varieties are best adapted to the local region.

Topic: Option 1 – Turf shall not exceed 40 percent of the landscapable area. Turf shall not be installed on slopes greater than 4:1.
Comment: Turfgrasses have been proven to mitigate soil erosion and off-site movement of nutrients and pesticides.
Rationale: See Beard and Green paper titled "The Role of Turfgrasses in Environmental Protection and Their Benefits to Humans" in the Journal of Environmental Quality, 1994, volume 23, number 3, pp 452-460.
Suggested Change (or Language): Landscapes should avoid slopes greater than 4:1 by the use of terraces. Sod-forming turfgrasses can be used on terraced slopes to mitigate soil erosion.

Topic: *"KL = 0.43 This is the area weighted landscape coefficient designating a mixture of high-, medium-, and low-water-using plants."*
Comment: Climate and ET rates vary significantly around the country. This is why indigenous and adapted plants vary significantly by region. EPA's approach is "one-size-fits-all".
Rationale: Different species and cultivars of plants utilize water at different rates depending on climate and environment. For instance, the bald cypress (Taxodium distichum) tree can live in standing water and can also live in upland areas and survive during drought conditions.
Suggested Change (or Language): Unique crop coefficients for turfgrass and landscape plants must be utilized based on region, climate, and environment.

Commenter: DeVille Hubbard
Affiliation:
Comment Date: December 16, 2008

Dear Sir/Madam
Please accept my public comment on the water budget tool

I am in agreement with the EPA's commitment in reducing water consumption.

This Water budget tool looks like it is designed to encourage installation of less square footage of landscape plants and more hardscape or non irrigated native areas. This tool leaves un-addressed what many people see as the primary issue, that is proper scheduling of irrigation clocks and proper operation to reduce overwatering. Even if there is less landscape plants the home owner can still waist more water than a 100% landscaped yard by not knowing how to program the controller properly.

If the intent of this tool is to require less landscape plants, than this tool is good for the task. If you are looking for an accurate water budget, I feel this tool over budgets for water use , LWR.

I have calculated the same square footage using 3 different methods and consistently get a lower volume of gallons per year. I have attached files to show these methods.

Your water budget tool gave me the following results.
4,000 square feet, cool season grass, spray heads, annual et of 61.2 inches per year 36 inches of rain

LWA 91,554 gallons
LWR 132,667 gallons {this is equivalent to 50 inches of supplemental water}

4,000 square feet, warm season grass, spray heads, annual et of 61.2 inches per year 36 inches of rain

LWA 91,554 gallons
LWR 92,030 gallons

1. **The rule that it takes 65,000 gallons of water to apply one inch of water to 100,000 square feet**

With this rule it takes 2,600 gallons of water to put one inch of water on 4,000 square feet by cross multiplying. If 30 inches of water are applied in one year to supplement rainfall than that is 78,000 gallons of water In North Texas over the past 25 years I have not needed to exceed 30 inches per year very often.

This calculation puts the tool over budget for gallons of water.

2. **Water Wise council of Texas Landscape irrigation calculator**

This tool is a slide ruler. If you will look at the attached file you will see a pdf of the following information. Look on the top line of row 3 {irrigation water required} go to one inch. Matching below is 4000 square feet. The gallons of consumption resulting from these factors is indicated

by the large black triangle. The resulting gallons for one inch of water on 4000 square feet is 2,500 +/-
If 30 inched of water is applied in one year to supplement rainfall than that is 75,000 gallons per year.

This calculation puts the tool over budget for gallons of water.

3. **Irrigation scheduling worksheet. I developed this worksheet.**

This tool is a excel worksheet and captures similar data as the draft water budget tool. I have attached this worksheet and a power point on how to use it. The historic rainfall data is not used in the calculations.

4,000 square feet, cool season grass, spray heads, annual et of 61.2 inches per year
91,562 gallons per year
4,000 square feet, warm season grass, spray heads, annual et of 61.2 inches per year
68,671 gallons per year
This calculation puts the tool over budget for gallons of water

I have scheduled irrigation in North Texas for over 25 years. My normal yearly portfolio of irrigated turf averages 400 acres. I have found 30 inches per year consistently keeps the Bermuda grass green and healthy. These 30 inches of supplemental water stands true for residential, commercial, retail and large acreage sites in North Texas.

Thank you for taking my comments

DeVille Hubbard LI1836
214-878-8066

Commenter: Batya Metalitz
Affiliation: U.S. Green Building Council
Comment Date: December 18, 2008

Memorandum

To: EPA WaterSense Team
From: Nate Kredich, LEED for Homes; Batya Metalitz, LEED Technical Development
Re: Submittal of Comments requested for WaterSense Water Budget Tool
Date: December 19, 2008

The attached comments on the WaterSense Water Budget Tool are provided by the staff of the US Green Building Council's LEED for Homes Program. We are pleased to see the EPA WaterSense brand continue to expand and we appreciate the opportunity to provide comments.

This memo includes the following three general types of comments:

1. ***Differences between the LEED for Homes Calculator and WaterSense Water Budget Tool.*** Recently, LEED for Homes released its Calculator for Percent Reduction in Outdoor Water Demand. This tool is similar to the WaterSense Water Budget Tool, and projects participating in the two programs may use both tools. We have identified differences in the two tools, and described them in the attached document.

2. ***Differences in the LEED for Homes and WaterSense programs.*** We understand that WaterSense will be posting a revised version of its New Home Certification Protocol. We look forward to reviewing the updated version.

3. ***Suggestions for alignment between LEED for Homes and WaterSense.*** We would appreciate the opportunity to discuss the differences between the two programs, and, where appropriate, seek alignment. LEED for Homes would like to facilitate this as follows:

   • For short term alignment, LEED for Homes would like to highlight the overlap between the programs for project teams

   • For long term alignment, LEED for Homes would like to work with Water Sense to minimize the differences in the programs.

   • For on-going alignment, LEED for Homes would like to invite a member of the WaterSense Team to serve on its Water Efficiency Technical Advisory Subcommittee (WE TASC). This is a voluntary position, and we would be delighted if a WaterSense team member would be willing to offer his/her expertise.

We look forward to further collaboration with the WaterSense program.

Currently, LEED for Homes and WaterSense are somewhat different in their approach to estimating the reduction in outdoor water use. These differences may lead to market confusion, as project teams can participate in both programs.

Generally, the LEED for Homes program would like to work with the WaterSense program to minimize the potential for market confusion, including 2 broad areas:

1. Identify and resolve discrepancies, where possible.

2. Identify issues, and seek strategic alignment, where possible

Our specific comments include:

1) Summary of Discrepancies in Approaches

We have identified key differences in the two tools, and have summarized them below. Ideally, we would like to seek align on these differences. Where alignment is not possible, we would like to provide guidance to clarify the intents and requirements of both programs.

a. Water budget period. WaterSense calculates the water budget for the year. LEED calculates it only for the month of July.

b. Landscape coefficient, KL. In WaterSense, the landscape coefficient, KL, depends on the general type of planting in the hydrozone (e.g., groundcover, tree, shrub). In contrast, in the LEED for Homes program:

- The KL also depends on a microclimate factor, to account for differences in solar exposure and wind.

- Projects are presented with a choice of coefficients for each planting type. This allows, for example, project teams installing drought resistant shrubs to choose a lower coefficient than teams installing shrubs with typical water needs. (Note that both programs allow project teams to enter custom coefficients. The difference is in the default values provided if the project team does not have custom coefficients available.)

c. Irrigation Efficiency, IE. In the WaterSense Water Budget Tool, a project determines its Irrigation Efficiency, IE. The tool then calculates the Landscape Water Requirement (LWR), which is the inverse of IE. The LEED for Homes calculation is based on the IE, and does not include the LWR. The Water Sense, the Irrigation Efficiency, IE, depends on the type of irrigation system that is included. In contrast, in the LEED for Homes program, the IE value also depends on:

The number of irrigation efficiency measures installed (e.g.,, central shut-off valve, head-to-head coverage of the system, separate irrigation zones based on watering needs),

- If the system was inspected and verified by a 3rd party as distributing water evenly, and

- If the system was installed by a WaterSense professional.

WaterSense also assumes higher default IE values than LEED for Homes.

d. Control Factor. WaterSense does not include a control factor, CF, in its calculation. LEED for Homes includes a CF to allow projects to account for water savings from an installed controller (e.g., moisture sensor) with documented water savings.

e. Effective Rainfall. WaterSense accounts for precipitation by including Effective Rainfall in its calculation. In doing so, the reference evapotranspiration value (ETo) affects the outcome of the calculation. LEED for Homes does not include Effective Rainfall.

f. Conversion Factor. The WaterSense Budget Tool uses the conversion factor, Cu = 1.6 gal/(in*sq ft). LEED for Homes uses its inverse, 0.6 in*sq ft/gal.

2. Summary of Related Issues

Can you please help us to understand your position on the following issues? We have had a lot of comments and discussion on these issues, and would greatly value your perspectives.

a. What IE value does a project choose within WaterSense if it does not install irrigation?
Based on the experience of LEED for Homes, many projects do not install irrigation. LEED for Homes has developed a temporary policy for this situation, but would be eager to collaborate with WaterSense to coordinate a more permanent approach.

b. Does WaterSense set a lower limit on the value that a project can enter as a custom coefficient for a planting?
LEED for Homes has set a lower limit of 0.2 for a species factor, but would like to understand the approach used by WaterSense.

Thank you.
Batya Metalitz
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Commenter: Dean Minchillo
Affiliation: LCRA
Comment Date: December 18, 2008

Dear WaterSense-

LCRA appreciates EPA's initiative developing the Water Budget Tool based on previous comments and concerns of many WaterSense Partners. EPA's time and efforts have produced a water budget tool with great potential. However, we feel there are still some areas worth addressing in order to realize the full potential of this calculator.

(1) The draft specification, states in section 4.2.1.3 "Sprinkler heads shall not be used to water plantings other than maintained turf grass." Accordingly, the water budget tool should limit the irrigation type to the two drip options rather than including rotors and spray heads as an option for design when non-turf plant types are selected.

(2) The water budget tool assumes Irrigation Efficiency of 75-95% for sprays, rotors or drip irrigation--although there is very little in the draft specification to require efficiency measures for the irrigation system (no mention of head-to-head coverage, etc.). The System Efficiency (which is about 20% to high for spray irrigation according to Texas A&M) and distribution uniformity (head – to – head coverage) are key aspects to proper irrigation and will directly influence the amount water applied to landscapes.

It is a recommendation to either (a) manually over-ride the irrigation efficiency percentages, (b) include more irrigation design elements into the draft specification, and/or (c) adjust the preset efficiency standards to reflect true water application data.

(3) Typically a Reference ET0 reflects the water requirements for a plant assuming deep soil conditions.

It is recommended that, (a) minimum standards for soil improvement be addressed in the draft specification, since this is not included as a stress or quality factor, nor is it mentioned in the Water Budget Tool, and, (b) crop coefficients for plants and trees are re-evaluated. A .5 plant/tree coefficient is very close to that of warm season turfgrass coefficient which has a much higher rate of transpiration and stress.

(4) Usually water requirements vary depending on the amount of shade or direct sunlight. No such factor is incorporated into the calculations.

(5) The Water Budget Tool provides and option of either calculating a water budget, or limiting the turf area to 40%.

It is recommended some irrigation criteria be applied to this 40% irrigated area. An area planted in 40% cool season turfgrass could use as much water, if not more, than an area planted in 100% warm season turf. Insuring the 40% area is planted with a turfgrass, or other ground cover, suitable for the climate and site being landscaped.

Thank you, again, for the hard work developing materials and ideas which promote the beneficial and efficient use of water across the United States.

Dean Minchillo
Water Conservation Coordinator-LCRA
512.473.3200 ext. 2114
dean.minchillo@lcra.org
http://www.lcra.org/water/save/index.html

Commenter: Paul G. Diegnau
Affiliation: Keller Golf Course
Comment Date: December 18, 2008

Dear EPA,

I am infuriated and appalled after reading the EPA's water conservation initiative – "Water Sense."

I have many questions regarding this proposal of which I will list several here. I hope to receive specific responses to my questions from the EPA.

· What is the length of the public comment period for this proposed Water Sense "program"? I was notified of this "program" one day prior to the deadline! Is EPA attempting to slide this proposal through with minimal public comment????? Word of this proposal just started circulating today in the local academia and golf course industry. EPA must consider an extension to the public comment period.

· Why is a government agency setting water-use policy?? It makes a whole lot more sense to have end-users, water conservation experts, and manufacturers develop a policy to present to the American public. Let's try something novel and use FACTS when shaping policy, NOT emotion!

· How did the EPA arrive at .43 as the universal landscape irrigation coefficient for the water budget tool???? Where is the science to back this up? How is it possible to establish a universal coefficient across an entire country, multiple climate zones, micro-climate zones, seasons, cultural programs?

· This is being presented as a voluntary program. Right. I can see it becoming a regulatory program in the foreseeable future.

· I do not appreciate MY GOVERNMENT telling me how much turfgrass I can grow on MY property.

· Why can you not grass slopes greater than 4:1? A healthy turfgrass is one of the best water filters found in nature. What about all the positive benefits that turfgrass provides in our environment?

· This program needs to be refocused on improving water use efficiency without regulating types of use.

· How about focusing on eliminating or at least reducing wasteful water use in the landscape???? It is commonplace to see commercial and residential lawn sprinkler systems running every day, running during a rain event, irrigating waterlogged soils, watering the street, etc. On a national basis, waste reduction would account for a very significant savings in water use.

I am not in favor of adopting government “programs” that morph into nanny state regulations. Efforts should be put in to educating irrigation system owners to reduce waste and improve efficiency. I hope the EPA will respond to my questions and extend the public comment period.

Thank you.
Paul G. Diegnau
Certified Golf Course Superintendent
Keller Golf Course
2166 Maplewood Drive
Maplewood, MN 55109
651-766-4174
paul.diegnau@co.ramsey.mn.us

Operator of a computer-based centralized irrigation system that utilizes an on-site weather station for real-time ET values and soil moisture sensors.

Commenter: Kevin Norby
Affiliation: Registered landscape architect and owner of Norby & Associates Landscape Architects, Inc. of Chaska, MN
Comment Date: December 18, 2008

Topic: Landscape Irrigation Management

Comment: My general comment is that I am delighted to see that the EPA is taking a pro-active approach to dealing with water management in Minnesota. However, after reading your proposal, I am fearful that it is far too technical for the average designer, landscape architect or contractor to understand or support. If the requirements are not easily understood it will be difficult to enforce and difficult if not impossible for the industry and the general public to buy into. I would suggest that this is a good starting point but that you may want to consider now extending an offer to individuals within the landscape and irrigation industry to participate in drafting a series of water/irrigation management guidelines which can be adopted and supported by the industry. I would suggest that you seek out a panel of representative from a number of different disciplines who could offer insight and constructive feedback as to how to make this proposal enforceable. In essence, I would suggest that a partnership might be more successful in achieving your end goal rather than passing legislation and then forcing industry professionals to abide by your requirements. I would suggest that you include individuals from, not only the Minnesota Nursery and Landscape Association (MNLA) and the Irrigation Association but also, various disciplines such as contractors, licensed landscape architects, irrigation suppliers (in Minnesota MTI and Hydrologic) and irrigation designers.

Thank you.
Kevin Norby

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Commenter: Andrew Porter
Affiliation: URS Corporation
Comment Date: December 19, 2008

18 December 2008

United States Environmental Protection Agency (USEPA)
watersense-newhomes@erg.com

Dear Sir/Madam,

Subject: Feedback - WaterSense® Water Budget Approach and Tool

Thank you for the opportunity to provide feedback on your innovative approach to managing landscape water demand across new American homes. Residential and commercial outdoor water use is an area URS Australia Proprietary Limited have been working very closely with Australian water agencies/authorities on, and we have developed considerable expertise in this sector. Our team have developed, designed and delivered face to face and web based programs that determine how much water a landscape needs to remain healthy, and when to apply this water in response to rainfall. Using site specific information these programs also develop individual water saving strategies for each landscape assessed. These programs have been delivered across greater Sydney, NSW (the largest Australian city, with a population around 5 million); and in 2009 will roll out across three (3) other Australian capital cities. These programs will therefore provide interactive, individual garden water use information to approximately 50% of Australia's population, via the web. For further information on the Sydney program, please view the following weblink:
http://www.sydneywater.com.au/SavingWater/InYourGarden/
and open the "WaterRight Gardens WebTool"[1]

With our considerable experience in mind, we have reviewed the available information on the WaterSense® Water Budget Approach and Tool, and we offer the following key observations for your review, and potential incorporation into your approach:

- Landscape Design Criteria – Option 1.

1) This is a simple and potentially effective approach, offering easy compliance for the majority of applicants. In Australia, like the US, we grow both cool season and warm season turf. We have observed warm season turf growing despite extended and severe drought conditions with minimal supplementary water, whereas cool season turf requiring almost daily watering events during summer to survive. We have also found many 'high' and 'very high' water use plants requiring considerably more water than turf to survive.

[1] Note we also developed the "Plant Selector Tool" and the "Love Your Garden" programs on this website for our partners, Sydney Water Corporation.

We therefore feel Option 1 should be tightened to remove the potential for large plantings of high water use plants (i.e. up to 60% of garden beds), and to define the targeted turf species (i.e. cool season turf). Note this may change across the continent in response to climate.

2) In Australia we have many 'rural/residential' allotments surrounding our large cities, which are connected to municipal supply. These are single dwelling houses sited on large parcels of land (i.e. 2 – 5 acres). Most of this land is essentially 'unimproved pasture', or used for hobby based grazing (i.e. 2-3 ponies). The definition of 'landscapable area' in this situation would cover the entire parcel of land; potentially allowing large, high water use gardens and/or areas of lawn without penalty (using Option 1).

3) Water supply security across Australia is highly variable - and is based on population, climate (rainfall), consumer behaviour, and current and proposed infrastructure. We suspect the US has the same set of issues. On this basis, the 'percentage' could potentially be modified based on state boundaries, municipal boundaries or even zipcode, in response to the above factors. For instance, why should a new American home in a high rainfall area with plentiful water supply have the same "percent" (restriction) placed upon them as a gardener who is attempting to sustain healthy turf growth in a desert, with a limited or unreliable water supply?

We would be happy to discuss solutions we have developed to address these significant equity issues in Australia.

• <u>Develop the landscape design using a water budget approach – Option 2.</u>

4) This option is clearly more favourable as there is scientific rigour, and it allows new homebuilders (applicants) choice on how they wish to achieve compliance (i.e. flexibility). However, during our testing we found the excel spreadsheet very difficult to understand, and difficult to complete. Furthermore, many of the population are unlikely to be familiar with 'MS Excel', which further confuses this exercise. A simple, effective, customised web based tool would deliver exactly the same outcome, with reduced chance of error, greater certainty of lodgement (i.e. electronically), whilst providing a more satisfying experience for the applicant. Data can also be collated online to help drive monitoring and evaluation programs. Additional interactive information can also be built into such a webtool to facilitate the applicant in designing a "low water use" landscape, which after all is the key objective of the initiative. As a team, we have developed many tools like this, and would be happy to share our considerable experience with you.

5) Whilst the use of local evapotranspiration data in the model helps address climate variability across the US, at this stage it relies on the applicant to source this data (i.e. interrogate websites etc). This would likely result in the generation and lodgement of non-conforming applications. It is also unlikely that an 'Inspector' would ever check or verify this data. A web tool would standardise and resolve this issue.

6) Plant water demand is a significant factor in the health of a garden, however our work in Australia has demonstrated that the soil growing media has an even bigger contribution. A shallow, sandy soil will not support the growing (or survival) requirements of a 'high water use' plant without significant supplementary water application during summer, as it holds very little plant available water.

A deep, well structured sandy loam will hold approximately 4 times more plant available water than a sand, which therefore provides water and nutrient to encourage growth (and survival) of all plant types, with minimal supplementary water. In areas that receive regular summer rainfall, often these landscapes can remain rainfed (year round) if designed correctly. Of course there are many other factors that influence plant water demand, (and our various programs simulate most of them), but in Australia the soil depth, type and structure is critical. In our opinion, soil has not been adequately addressed in the draft WaterSense® tool, despite the incorporation of the conservative 'effective rainfall' calculation. A web-tool could be developed to account for regional soil variation across the US, leading to a significant improvement in the calculation of landscape water demand, and the effectiveness of the applicants solutions.

7) The incorporation of 'custom plants' in the tool, whilst offering advanced users flexibility, also exposes the entire process to prolonged academic debate, and therefore difficulty to assess 'compliance'. Further consideration should be given to this option.

8) Work in progress on independent audits of irrigation systems in residential (and commercial) Australian gardens indicates these systems perform very poorly in terms of distribution uniformity, and efficiently delivering water to the respective 'hydrozones'. Whilst professionally installed systems are more likely to comply with various plumbing codes (compared with Do it Yourself {DIY} installations), the majority of systems leak if not properly maintained. Many are programmed to irrigate more than the landscape requires (in terms of frequency and duration), and most residents do not understand how to manage or maintain their systems, particularly over the seasons. This is particularly apparent in areas with a transient population. We would be happy to discuss in further detail the findings of the Australian experience, and how we intend to develop these findings into innovative training, policy and rebate programs. This work is also highlighting the large disparity between the design of an irrigation system on paper, and the performance of the irrigation system in the field. Perhaps these findings could be included in your 'irrigation efficiency' data? At the very least, there should be a differentiation between professional installed and maintained irrigation systems verses DIY solutions.

• Other General Comments

9) Checking compliance on a program like this, especially if it is paper based, creates considerable difficulty. In Australia, many new homes are constructed, with landscaping to follow later – often many years when funds (might) become available. Professionally designed irrigation systems are also expensive to install. Essentially this has the potential to lead to significant delays in approvals. These compliance issues need to be carefully considered. We would be happy to outline the approaches we have taken in various jurisdictions across Australia to address the compliance issues.

10) It is not clear how the program intends to address the use of non-drinking water for garden water use and/or swimming pool top up. Is rainwater, greywater, bore water and/or recycled water excluded from the calculations? For instance, a high water use garden that doesn't comply with the policy could be irrigated entirely from sustainable non-drinking water sources such as rainwater and greywater. Could this applicant obtain an exemption…? If so – how?

In the past, we have resolved these issues using savings benchmarks (i.e. target 40% less than average consumption), and using a webtool to calculate garden watering requirements, and therefore compliance.

11) The use of a webtool could also help water managers regulate the development of new gardens in response to regional water scarcity (i.e. droughts). This forces applicants to engage with water restrictions, and highlights the critical messages of water conservation. This begins the long process of cultural reform…

~ oo0oo ~

All good policy needs a process of stakeholder engagement, and a process of monitoring and verification. Policy that is difficult to implement, frustrating to achieve compliance for users, lacks scientific rigour, costs applicants money, delays housing approvals and achieves no beneficial community outcome is detrimental to the reputation of Government. On the other hand, good policy develops achievable targets, accounts for regional variation, engages stakeholders to strive beyond minimum compliance, educates, provides flexibility in achieving the desired outcomes, and is easy to check compliance, monitor and verify.

In Australia, URS have worked with a variety of Government Clients and Industry Stakeholders to develop, design, and deliver good policy. In the US, some of our offices are working on opportunities to coordinate and collaborate with the US EPA (Office of Research and Development) through a Cooperative Research and Development Agreement (CRADA) to develop, design, and quantify good policies and implementation practices as it relates to Green Infrastructure. We thank you for the opportunity to provide a very brief submission, and would be pleased to discuss any aspect of this submission with you in greater detail.

Regardless, we encourage you to continue developing good policy that delivers savings across America's emerging residential landscapes.

Yours sincerely

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Commenter: Pat Morstad
Affiliation:
Comment Date: December 19, 2008

1. EPA is confusing a goal of efficiency with limiting the types of use
    a. Efficiency: the ability to do something well or achieve a desired result without wasted inputs, energy or effort mpg, gallons per flush
    b. EPA does not appear interested in limiting or eliminating waste in the landscape and instead is suggesting that if the target is changed (or eliminated), water use will decrease.
    c. This program needs to be refocused on improving water use efficiency without passing judgment on types of use.

2. Environmental performance
    a. The net environmental performance of the home does not appear to impact the logic in this program.
    b. Which landscape in the above examples is best at making oxygen, sequestering carbon, managing stormwater, trapping dust, absorbing noise, etcetera.
    c. Objectives and goals for this effort seem to focus solely on net water use reductions only, without regard to an environmental management systems matrix.

3. Market enhancement or pseudo-regulatory program
    a. EPA states an objective of improving the market for water efficient products and services and continues to assert this is a volunteer program.
    b. There is a real threat of this becoming a de facto standard for state and local regulatory programs.

4. The water budget tool is flawed as the plant factor is pre-selected
    a. The landscape coefficient of .43 is used in the spreadsheet tool, with no flexibility for other site conditions, local climate, season, winter hardiness, cultural practice
    b. No justification is provided for the selection of .43 and there is no science in existence that would suggest this is an equitable, national standard
    c. Plant factor data is scarce or completely unavailable for much of the US and for many plants
    d. ETo data varies by location, season, methods

5. Effective rainfall is different with each rain event
    a. CA, rain is a gift, for the purposes of the state's regulatory program
    b. The 25% effective rainfall is static in the spreadsheet
    c. Many species that are native or adapted to wetter climates would not be allowed in a WaterSense home as they have high landscape coefficients and we only are credited for 25% of the rainfall.
    d. Incorporation of appropriate sensory feedback technology would suspend irrigation cycles in periods of sufficient moisture or rainfall, rendering this factor only applicable for plant selection purposes.

6. Where is the best place to make decisions about water use and who is best qualified?
    a. Washington DC or Mainstreet

b. A federal agency or an identified group of stakeholders and subject matter experts.
c. All decisions should be made on a state by state level, we need less government not more!

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Commenter: Kevin Morris
Affiliation: President, National Turfgrass Federation, Inc., Executive Director, National Turfgrass Evaluation Program
Comment Date: December 19, 2008

Topic: Water Sense Landscape Water Budget Tool
Comment: My concern is with the 0.43 plant factor that has been assumed for Equation 4-3
Rationale: I believe that this plant factor is too limiting and not practical when applied nationwide
Suggested Change (or Language): See my additional comments below

First, on behalf of the members of the National Turfgrass Federation and the National Turfgrass Evaluation Program, I want to say thanks for allowing me this opportunity to address the water budget calculator in the Water Sense new homes construction draft specs. I think that the Water Sense program is crucial as we need to reduce water use in our homes. That being said, I believe there are many ways to achieve the water savings in our landscapes that EPA desires.

I gave a presentation on August 14, 2008 to a meeting of turfgrass industry professionals, scientists and EPA personnel. In that presentation I outlined some of the issues related to the differences in trying to implement water savings in the landscape, and specifically with turfgrass, than with installing efficient irrigation technology or low water using faucets. One of the tenets of the Water Sense program is that a homeowner should not have to change their lifestyle to implement this program. I believe with something like a low flush toilet, this is easily achievable. However, with living plants, biological organisms, this is much more complicated. Plants interact with their environment and how they are maintained; therefore, what is applicable to one situation or one geographical area may not be at all applicable to another area. Since the ultimate goal of Water Sense is to reduce water use, this fact cannot be emphasized enough.

One of the flaws of the water budget approach, as it is written in the draft specs, is that a very low plant factor of 0.43 is to be applied nationwide. How was this number developed? What is the science behind this plant factor? By virtue of this letter, I am asking for copies of all reference materials, consultants reports, meeting minutes and any other relevant information used to develop a plant factor of 0.43. Additionally, I would ask for a list of stakeholders and subject matter experts who have participated in the development of this information in any way. I believe this low plant factor is simply not practical. If a homeowner wants to have turf in their landscape in the northern tier states, where cool-season grasses are grown and warm-season grasses cannot grow, the builder or homeowner either must reduce significantly the amount of turf or eliminate turf entirely. This goes against the spirit of Water Sense, I believe, that states one should not have to make lifestyle changes to implement the program.

There are between 50 and 100 million home lawns in the USA. A large percentage of these lawns are located in areas where cool-season grasses are well adapted. Clearly, many people love their lawns, they enjoy the activity on the lawn, the beauty, the cooling effect, the water absorbing/ cleansing aspect, etc. Lawns are a perfect place for the dogs to play, the kids and family to recreate, barbeque, etc. However, since the ET rate of warm-season grasses and cool-season grasses is generally 0.6 and 0.8, respectively, this proposed water budget formula using 0.43 as an average landscape plant factor will virtually eliminate lawns around Water Sense homes. This is my concern, that what many people desire will not be an option, or

severely limited, for Water Sense landscapes. In addition, there are many environmental benefits of turfgrass that have been seemingly disregarded, namely heat reduction, erosion control, dust abatement, and water filtering.

In the desert southwest, which I believe the Water Sense landscape guidelines were originally intended for, ET rates are readily available and many plants will not survive without supplemental irrigation. It makes sense to implement these landscape water-saving strategies in that region. However, how about New England, or Seattle or the southeast US? These climates are completely different, plants used and adapted are much higher water users (higher ET factor), yet these plants survive well, often with no supplemental irrigation. Yet under the proposed EPA water budget approach, implementing the Water Sense new homes specs would mean that grasses in the northern tier states and the southeast would have to be restricted or eliminated. This, I believe, is not what the American public desires.

There is a great deal of turfgrass research, past and present, conducted in this country. We have good estimates on water use, conservation and efficiency and we are working to implement these practices and strategies. Many of the strategies involve choosing the proper grass species, using the appropriate management, setting the irrigation controller properly, etc. We can already document significant water savings just by using proven strategies. Turfgrass can remain; it just needs to be managed more efficiently.

You may be interested in a study conducted by University of Florida researchers John Cisar and George Snyder. The intent of the study, partially funded by EPA Grant No. C9994515-00-0, was to compare, in south Florida, a st. augustinegrass sod landscape, the most popular lawn grass in Florida, with the 'Florida Yard' concept of mixed, native landscape species. The two landscapes were evaluated, over a three year period, for amount of water used, nutrient runoff and leaching. With respect to the water use, the mixed species landscape used much greater water during year one of the study (this is expected during establishment). However, the interesting aspect of the study was that during year three (the final year), the mixed landscape still used more water (165 mm) than the turfgrass (102 mm). Also, the mixed landscape suffered severely during the last dry season of the study, prompting the researchers to believe that many may soon die (J. Cisar, personal communication).

In summary, I believe the 0.43 plant factor is a flawed portion of the water budget, especially when applied nationwide. I believe this number needs to be regionally adjusted and developed through an input process involving identified subject matter experts and relevant stakeholders.

Kevin Morris
National Turfgrass Federation, Inc.
National Turfgrass Evaluation Program, Inc.
Beltsville, MD 20705

Commenter: John MacKenzie
Affiliation: Superintendent North Oaks Golf Club, BOD Minnesota Golf Course Superintendents Association, BOD Minnesota Turf and Grounds Foundation
Comment Date: December 19, 2008

Good Morning,

Kudos to the EPA for their interest in developing a program that encourages the efficient use of a limited resource, water. However I have a grave concern and a few questions.

.43? As a turf professional I have to ponder the science, or lack there of, behind this inaccurate universal ET plant factor. Who came up with this number? In an industry known for scientific monitoring to best manage our resources I am surprised and very concerned the EPA would gravitate toward an unrealistic universal ET plant factor.

At .43 ET plant factor very few turf varieties will survive a typical season across the country. What ground cover will provide the public with the aesthetics they expect while providing for noise abatement, carbon sequestration, soil erosion control, glare mitigation, biofiltration and heat dissipation?

Where is the science behind the universal .43 ET plant Factor? Again, who developed this erroneous figure?

What will the economic impact be to the current 100 plus billion dollar annual production of turf and turf management businesses? Who stands to gain?

Because they have direct information regarding this issue was industry consulted for their help or input?

Thank you and I look forward to your answers to my questions.

Respectfully Yours,

John MacKenzie CGCS
Superintendent North Oaks Golf Club
BOD Minnesota Golf Course Superintendents Association
BOD Minnesota Turf and Grounds Foundation

Commenter: Terrence Donahoe
Affiliation:
Comment Date: December 19, 2008

Please do not pass these measures without research and thought. You would be in effect changing nature's ability to regulate itself in terms of temperature and moisture.

These turf less landscapes are at least 20 to 30 degrees warmer and create a multitude of problems that have to date been unplanned for.

Compromise with options Please!

Commenter: Larissa Mark and Kevin Morrow
Affiliation: National Association of Home Builders
Comment Date: December 19, 2008

Good morning,

Attached you will find NAHB's response to the draft Water Budget Tool. We are pleased to take the opportunity to review, critique and provide suggestions to this tool in an effort to make it more useful to the home building industry. If you have questions or would like further information on the information and suggestions provided herein please do not hesitate to contact either Kevin Morrow or myself. We look forward to the final iteration of this document once the tool is reconfigured and updated.

As a clarifying point, the response document is broken into two parts. Pages 1-5 is our comment letter broken into topic areas, per the program's suggestion. The second part (pages 6-11) is the Association's full comment letter.

Topic: Introduction (General Comments)
Comment & Rationale: General Comment: NAHB supports EPA's endeavors to provide alternative strategies and tools to increase Builder participation in the WaterSense® home specification program and recognizes that reducing outdoor water use is an important part of reducing the overall environmental impact of a new home and landscape design. The Association also recognizes that a Water Budget approach is more favorable than straight turf limitations because it is more closely related to the goal of the WaterSense® program; a quantifiable reduction in outdoor water use. However, a chief concern with the two landscaping options currently allowed by the WaterSense® program is that both seek to limit irrigation requirements by setting arbitrary limits without sufficiently recognizing the impact of certain site-specific variables.

Prior commentary provided by NAHB makes clear that a 40% turf limit is arbitrary and inadequately recognizes the positive and negative impacts that site-specific conditions, turf species and other legitimate variables can have on irrigation requirements. The Water Budget option proposes a different-yet-still-arbitrary limit; that the expected irrigation requirement of a given area shall not exceed 60% of the local ETo. It is unclear if the limit was selected based on presumption that such a limit would favorably impact outdoor water use at a rate equivalent to a flat 40% turf limit, but such a conclusion would be difficult to justify given the variable impact such turf limits have in different site conditions.

Suggested Change (or Language): NAHB requests that EPA provide information on how the Water Budget limit was set and consider the importance of other site-specific conditions not currently recognized by the tool, notably soil and slope conditions, and correct the tool accordingly.

Topic: The Water Budget Tool
Comment & Rationale:
Mathematical Issue
Table 1 of the current LWR worksheet does not allow for the possibility of no irrigation system in the drop down lists, even though the most recent Water Sense Specification, Sec. 4.2

recognizes that an irrigation system might not be installed. Further, since AIE is the divisor in determining KWA, and the lack of a irrigation system presupposes an AIE equal to zero or an infinitely efficient system, determining LWA when there is no irrigation system is mathematically indefinable using the current equations.

Ease of Use
NAHB is concerned that, in its current form, the water budget tool does not provide the clarity, assistance and ease-of-use that would encourage its widespread use. Indeed, the shortcomings of the tool may ultimately negatively impact the voluntary adoption of the WaterSense program by Home Builders.

Populating the cells of the Budget Tool with the requisite variables involves much research effort on the part of the user, a shortcoming that could negatively affect the number of builders who choose to seek the WaterSense label for their projects. NAHB suggests that inputs ultimately determined by location, such as ETo and Average Rainfall, should be populated automatically after a user has supplied the tool with a zip code, address or other location-identifying data. Such an improvement would greatly simplify the user experience, thus increasing the likelihood of greater use.

NAHB also suggests relegating formulas and their explanations to a separate worksheet or appendix. While the mathematical formulas explaining the determinations are important, builders and developers will be less interested in these formulas and more interested in the end results.

Suggested Change (or Language):
A more efficient interface would simply require the user to enter those variables that are site specific, such as the zip code, the surface area of the site and the proposed vegetative selections. The Tool itself could then return the ETo, Average Rainfall and KL for the site based on credible, third party data and then calculate the LWA, LWR for the site. Finally, the tool would indicate in simple terms whether the current plan would or would not be in compliance with Water Sense requirements. At minimum, the tool should provide links to resources for credible ETO, Average Rainfall and KL data. Other helpful links would direct users to additional helpful resources; for example, prior commentary provided by NAHB points out that the term “landscapable area” merits further definition since it is fathomable that a user might errantly provide the area of the site without subtracting building footprint, hardscape, LID or undisturbed areas that should not be included. A link from the tool to guidance on determining landscapable area would help minimize these errors. A completed example including explicit directions/discussion on the best course of action for obtaining the information necessary to successfully complete the water budget tool would also be helpful in reducing errors.

A further improvement to the tool would include a field for the user to provide a site’s soil and slope conditions, any Low Impact Development features or areas that will remain undisturbed. These variables factor significantly into a site’s irrigation needs and should be a taken into consideration by the current Water Budget Tool.

Topic: Determining the Landscape Water Allowance
Comment & Rationale:
Critical Areas Missing from Draft Water Budget Tool

The effective development and implementation of a water conservation measurement tool must approach water conservation strategic planning holistically. In order to successfully measure all inputs that may assist or hinder water conservation techniques, the LWR must consider climate, plant type, irrigation system efficiency (if applicable) soil and topography. The current tool addresses all of these components except slopes and soil makeup. The water cycle varies considerably from humid regions such as the northeastern states to more arid regions such as the southwestern part of the country. Annual average precipitation for the Northeast can be as high as 46 inches, compared with 30 inches for the country as a whole and as low as 9 inches for the southwestern states. The amount of precipitation varies depending on the local climate, topography, and soil conditions.

Soil Conditions

The water budget tool, while incorporating acreage and plants used onsite, fails to address the soil conditions of the property. Typically soil type, condition and ability to retain water will influence the vitality and variety of the plants used on the project site. There are three basic soils: sand, silt and clay with various combinations of minerals and matter. The various combinations of minerals and organic matter influence different soil types, ranging from dense, impermeable clays to loose, gravelly sands. These highly varied combinations influence the draining ability of certain areas. These soil types, depending on their combination and pore size, will influence water saturation points, soil texture, water retention capability and plant viability in any given area. For example, within a single farm field, some parts of the field may drain immediately after a rain event whereas other areas remain flooded for weeks at a time. This is due to the varying amounts of organic matter and sizes of mineral particles in the field's soils and the forces acting upon the water molecules and the ease with which they can flow through the soil, both of which control the movement of water. The addition of organic matter makes any soil easier to work and improves its drainage properties but varies from site to site. For example, organic matter helps sandy soils retain water, thereby preventing drainage from occurring too rapidly through large pores. Conversely, the addition of organic matter to clay soils helps to open up small pores, making the soil more workable and more permeable to water. So, although a clay soil can hold more water than a sandy one, it holds it more tightly in smaller pores, slowing drainage and making the water less readily available to plant roots. Because soil type, along with climate, plant type, irrigation system efficiency and topography all impact how much water will percolate through the soil and how easily the remaining water can be taken up by plants, it should be a consideration in determining a project’s water budget.

LID Techniques

The Water Budget tool, and the Home Specification program both fail to address the benefits of Low Impact Development (LID) techniques. Home Builders are increasingly being encouraged to implement LID on the single lot level. LID techniques often incorporate soil conditions, frequency of climatic events, use of local plants, topography and disconnected water sources into design strategies.

LID techniques promote the natural tendencies of an area to infiltrate and/or re-infiltrate water into the soil. While not applicable in areas with high water tables or other naturally occurring conditions, LID is increasingly being used to promote water conservation and reduce offsite runoff. Utilizing flexible low impact techniques enables builders to maximize natural climatic events while promoting water conserving practices. The continued development of LID technologies allows for varied cost models that can meet an individual homeowner’s needs.

Many water conserving techniques can be cost efficient, reduce runoff volume and promote water reuse. Popular examples of LID water conservation techniques include rain barrels and cisterns, both of which reduce runoff volume and, for smaller storm events, delay and reduce the peak runoff flow rates. In addition to onsite water retention, these devices can be effectively used as secondary sources of untreated soft water for gardening or lawn irrigation thereby reducing the demand on the municipal (or well) water system.

Rain gardens, another cost effective LID technique, is a "garden which takes advantage of rainfall and stormwater runoff in its design and plant selection. Usually, it is a small garden which is designed to withstand the extremes of moisture and concentrations of nutrients, particularly Nitrogen and Phosphorus, which are found in stormwater runoff. Rain gardens are sited ideally close to the source of the runoff and serve to slow the stormwater as it travels downhill, giving the stormwater more time to infiltrate and less opportunity to gain momentum and erosive power[2]." Rain gardens that utilize minimally disturbed soils, in addition to the appropriate native plants, work as a bioretention cell where stormwater is cleaned and reduced in volume. Due to the design of the rain garden, natural sources of water, not treated potable water, will sustain the garden, collect water and allow excess water to infiltrate naturally.

Low Impact Development techniques have the ability to offset exterior water usage and should be incorporated not only into the water budget tool, but into the Water Efficiency Home Specification program as well. The utilization of LID techniques allows for minimized land disturbance, disconnected sources of water from climatic events that can then be used for irrigation; increased use of native plants and topography and increased infiltration of stormwater. Since traditional landscaping maintenance requires up to 40% of a home's water allowance, the incorporation of LID techniques not only reduces the water demand, but increases the likelihood of water reuse.

Suggested Change (or Language):
It is the suggestion of NAHB that the EPA WaterSense program seriously reconsider and revise the water budget tool and approach. Key concepts and opportunities for innovation were neither addressed nor encouraged in this draft release. The tool itself has not been developed for the average builder and will, therefore, be of little assistance as members of the housing industry work towards this voluntary home certification. The guidance documents associated with the tool are not fully developed and therefore provide little assistance for those attempting to navigate through the tool. In addition, the tool fails to provide key information or links to key information (annual grass reference evapotranspiration (ETo) and annual precipitation rates at the site) that is needed for efficient tool usage and accurate results determination.

As the nation continues to develop innovative approaches to water restrictions, the EPA WaterSense program, including the water budget tool, must allow flexibility and alternatives to its existing framework. Increasingly, builders are incorporating innovative water conservation techniques into a project's standard operating practices and should be rewarded for doing so. The current tool and approach fails to reward or support those that think and create homes that are innovative and use a holistic approach to residential development.

[2] Low Impact Development Center, 2008. "What is a Rain Garden" Available at: http://www.lowimpactdevelopment.org/raingarden_design/whatisaraingarden.htm.

We look forward to discussing these recommendations, if necessary, and hope the final iteration of this tool provides not only opportunities and rewards for landscape innovation but is a straightforward tool that provides the supportive information needed to effectively calculate water savings using this feature of the WaterSense Home Specification Program. If you have any questions, please feel free to contact us at 202-266-8000 or by email at kmorrow@nahb.com or lmark@nahb.com.

Advocacy Group
Green Building Department
Water and Wetlands Department
December 19, 2008

Sheila Frace
EPA WaterSense® Program
U.S. Environmental Protection Agency
Office of Wastewater Management (4204M)
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Re: Draft WaterSense® Water Budget Approach and Tool

Dear Sheila:

On behalf of the National Association of Home Builders (NAHB), we are pleased to submit the following comments on the U.S. Environmental Protection Agency's (EPA) draft WaterSense® Water Budget Approach and Tool, that was published on EPA's Office of Water website on November 25, 2008 (today's proposal).

NAHB represents more than 235,000 member firms involved in home building, remodeling, multifamily construction, property management, housing finance, building product manufacturing and other aspects of residential and light commercial construction. For many of NAHB's members, water supply is a vital concern. The wise and efficient use of water, including reuse, can contribute to conservation efforts, offer significant financial benefits to both water suppliers and consumers, and help ensure adequate water supplies that will allow for future community growth and development. As a representative of the regulated community and the growing number of certified green builders, NAHB has an intense interest in the New Home Specification program. The possible impact on and benefits to our members, who will voluntarily seek to earn EPA's WaterSense label for their new homes, cannot be overestimated nor assumed.

Several compliance concerns with the Landscape Design Criteria component of the WaterSense® Home specification program have resulted in the development and release for public comment of the optional water budget tool. This tool has been developed to provide an alternative compliance strategy for builders who are unable to meet the initial Landscape Design Criteria where "turf shall not exceed 40% of the landscapable area. Turf also shall not be installed on slopes greater than 4:12."

NAHB has taken the opportunity to review the draft *Water Budget Approach and Tool* released for public comment on November 25, 2008. This tool was developed to determine (1) the

amount of water the designed landscape is allowed (budgeted) based on EPA criteria; (2) how much water the designed landscape requires based on climate, plant type, and irrigation system efficiency; and (3)whether the designed landscape meets the budgeted amount. After careful review, NAHB has several areas of concern which have been categorized below. While we agree that a comprehensive alternative tool should be created to assist builders, developers and landscape architects with the development of a landscape that fulfills the obligations listed in the Landscape Design Criteria, we feel that the development of easy to use tools should look at all of the environmental components that impact the ability of a landscaped area to reduce water consumption rather than a few. NAHB hopes that, once these issues are adequately addressed, many of the Nation's builders will be inspired to participate in the WaterSense® New Homes Specification program and will find the Water Budget Tool to be a useful means to develop resource efficient landscaping.

General Comment:
NAHB supports EPA's endeavors to provide alternative strategies and tools to increase Builder participation in the WaterSense® home specification program and recognizes that reducing outdoor water use is an important part of reducing the overall environmental impact of a new home and landscape design. The Association also recognizes that a Water Budget approach is more favorable than straight turf limitations because it is more closely related to the goal of the WaterSense® program; a quantifiable reduction in outdoor water use. However, a chief concern with the two landscaping options currently allowed by the WaterSense® program is that both seek to limit irrigation requirements by setting arbitrary limits without sufficiently recognizing the impact of certain site-specific variables.

Prior comments provided by NAHB makes clear that a 40% turf limit is arbitrary and inadequately recognizes the positive and negative impacts that site-specific conditions, turf species and other legitimate variables can have on irrigation requirements. The Water Budget option proposes a different-yet-still-arbitrary limit; that the expected irrigation requirement of a given area shall not exceed 60% of the local ETo. It is unclear if the limit was selected based on presumption that such a limit would favorably impact outdoor water use at a rate equivalent to a flat 40% turf limit, but such a conclusion would be difficult to justify given the variable impact such turf limits have in different site conditions.

NAHB requests that EPA provide information on how the Water Budget limit was set and consider the importance of other site-specific conditions not currently recognized by the tool, notably soil and slope conditions, and correct the tool accordingly.

Comments Directly Related to the Water Budget Tool:
Mathematical Issue
Table 1 of the current LWR worksheet does not allow for the possibility of no irrigation system in the drop down lists, even though the most recent Water Sense Specification, Sec. 4.2 recognizes that an irrigation system might not be installed. Further, since AIE is the divisor in determining KWA, and the lack of a irrigation system presupposes an AIE equal to zero or an infinitely efficient system, determining LWA when there is no irrigation system is mathematically indefinable using the current equations.

Ease of Use

NAHB is concerned that, in its current form, the water budget tool does not provide the clarity, assistance and ease-of-use that would encourage its widespread use. Indeed, the shortcomings of the tool may ultimately negatively impact the voluntary adoption of the WaterSense program by Home Builders.

Populating the cells of the Budget Tool with the requisite variables involves much research effort on the part of the user, a shortcoming that could negatively affect the number of builders who choose to seek the WaterSense label for their projects. NAHB suggests that inputs ultimately determined by location, such as ETo and Average Rainfall, should be populated automatically after a user has supplied the tool with a zip code, address or other location-identifying data. Such an improvement would greatly simplify the user experience, thus increasing the likelihood of greater use.

NAHB also suggests relegating formulas and their explanations to a separate worksheet or appendix. While the mathematical formulas explaining the determinations are important, builders and developers will be less interested in these formulas and more interested in the end results. A more efficient interface would simply require the user to enter those variables that are site specific, such as the zip code, the surface area of the site and the proposed vegetative selections. The Tool itself could then return the ETo, Average Rainfall and KL for the site based on credible, third party data and then calculate the LWA, LWR for the site. Finally, the tool would indicate in simple terms whether the current plan would or would not be in compliance with Water Sense requirements. At minimum, the tool should provide links to resources for credible ETO, Average Rainfall and KL data. Other helpful links would direct users to additional helpful resources; for example, prior commentary provided by NAHB points out that the term "landscapable area" merits further definition since it is fathomable that a user might errantly provide the area of the site without subtracting building footprint, hardscape, LID or undisturbed areas that should not be included. A link from the tool to guidance on determining landscapable area would help minimize these errors. A completed example including explicit directions/discussion on the best course of action for obtaining the information necessary to successfully complete the water budget tool would also be helpful in reducing errors.

A further improvement to the tool would include a field for the user to provide a site's soil and slope conditions, any Low Impact Development features or areas that will remain undisturbed. These variables these factor significantly into a site's irrigation needs and should be a taken into consideration by the current Water Budget Tool.

Critical Areas Missing from Draft Water Budget Tool

The effective development and implementation of a water conservation measurement tool must approach water conservation strategic planning holistically. In order to successfully measure all inputs that may assist or hinder water conservation techniques, the LWR must consider climate, plant type, irrigation system efficiency (if applicable) soil and topography. The current tool addresses all of these components except slopes and soil makeup. The water cycle varies considerably from humid regions such as the northeastern states to more arid regions such as the southwestern part of the country. Annual average precipitation for the Northeast can be as high as 46 inches, compared with 30 inches for the country as a whole and as low as 9 inches for the southwestern states. The amount of precipitation varies depending on the local climate, topography, and soil conditions.

Soil Conditions

The water budget tool, while incorporating acreage and plants used onsite, fails to address the soil conditions of the property. Typically soil type, condition and ability to retain water will influence the vitality and variety of the plants used on the project site. There are three basic soils: sand, silt and clay with various combinations of minerals and matter. The various combinations of minerals and organic matter influence different soil types, ranging from dense, impermeable clays to loose, gravelly sands. These highly varied combinations influence the draining ability of certain areas. These soil types, depending on their combination and pore size, will influence water saturation points, soil texture, water retention capability and plant viability in any given area. For example, within a single farm field, some parts of the field may drain immediately after a rain event whereas other areas remain flooded for weeks at a time. This is due to the varying amounts of organic matter and sizes of mineral particles in the field's soils and the forces acting upon the water molecules and the ease with which they can flow through the soil, both of which control the movement of water. The addition of organic matter makes any soil easier to work and improves its drainage properties but varies from site to site. For example, organic matter helps sandy soils retain water, thereby preventing drainage from occurring too rapidly through large pores. Conversely, the addition of organic matter to clay soils helps to open up small pores, making the soil more workable and more permeable to water. So, although a clay soil can hold more water than a sandy one, it holds it more tightly in smaller pores, slowing drainage and making the water less readily available to plant roots. Because soil type, along with climate, plant type, irrigation system efficiency and topography all impact how much water will percolate through the soil and how easily the remaining water can be taken up by plants, it should be a consideration in determining a project's water budget.

LID Techniques

The Water Budget tool and the Home Specification program both fail to address the benefits of Low Impact Development (LID) techniques. Home builders are increasingly being encouraged to implement LID on the single lot level. LID techniques often incorporate soil conditions, frequency of climatic events, use of local plants, topography and disconnected water sources into design strategies.

LID techniques promote the natural tendencies of an area to infiltrate and/or re-infiltrate water into the soil. While not applicable in areas with high water tables or other naturally occurring conditions, LID is increasingly being used to promote water conservation and reduce offsite runoff. Utilizing flexible low impact techniques enables builders to maximize natural climatic events while promoting water conserving practices. The continued development of LID technologies allows for varied cost models that can meet an individual homeowner's needs.

Many water conserving techniques can be cost efficient, reduce runoff volume and promote water reuse. Popular examples of LID water conservation techniques include rain barrels and cisterns, both of which reduce runoff volume and, for smaller storm events, delay and reduce the peak runoff flow rates. In addition to onsite water retention, these devices can be effectively used as secondary sources of untreated soft water for gardening or lawn irrigation thereby reducing the demand on the municipal (or well) water system.

Rain gardens, another cost effective LID technique, is a "garden which takes advantage of rainfall and stormwater runoff in its design and plant selection. Usually, it is a small garden which is designed to withstand the extremes of moisture and concentrations of nutrients,

particularly Nitrogen and Phosphorus, which are found in stormwater runoff. Rain gardens are sited ideally close to the source of the runoff and serve to slow the stormwater as it travels downhill, giving the stormwater more time to infiltrate and less opportunity to gain momentum and erosive power3." Rain gardens that utilize minimally disturbed soils, in addition to the appropriate native plants, work as a bioretention cell where stormwater is cleaned and reduced in volume. Due to the design of the rain garden, natural sources of water, not treated potable water, will sustain the garden, collect water and allow excess water to infiltrate naturally.

Low Impact Development techniques have the ability to offset exterior water usage and should be incorporated not only into the water budget tool, but into the Water Efficiency Home Specification program as well. The utilization of LID techniques allows for minimized land disturbance, disconnected sources of water from climatic events that can then be used for irrigation; increased use of native plants and topography and increased infiltration of stormwater. Since traditional landscaping maintenance requires up to 40% of a home's water allowance, the incorporation of LID techniques not only reduces the water demand, but increases the likelihood of water reuse.

It is the suggestion of NAHB that the EPA WaterSense program seriously reconsider and revise the water budget tool and approach. Key concepts and opportunities for innovation were neither addressed nor encouraged in this draft release. The tool itself has not been developed for the average builder and will, therefore, be of little assistance as members of the housing industry work towards this voluntary home certification. The guidance documents associated with the tool are not fully developed and therefore provide little assistance for those attempting to navigate through the tool. In addition, the tool fails to provide key information or links to key information (annual grass reference evapotranspiration (ETo) and annual precipitation rates at the site) that is needed for efficient tool usage and accurate results determination.

As the nation continues to develop innovative approaches to water restrictions, the EPA WaterSense program, including the water budget tool, must allow flexibility and alternatives to its existing framework. Increasingly, builders are incorporating innovative water conservation techniques into a project's standard operating practices and should be rewarded for doing so. The current tool and approach fails to reward or support those that think and create homes that are innovative and use a holistic approach to residential development.

We look forward to discussing these recommendations, if necessary, and hope the final iteration of this tool provides not only opportunities and rewards for landscape innovation but is a straightforward tool that provides the supportive information needed to effectively calculate water savings using this feature of the WaterSense Home Specification Program. If you have any questions, please feel free to contact us at 202-266-8000 or by email at kmorrow@nahb.com or lmark@nahb.com.

Cordially,
Kevin Morrow
Program Manager, Green Standards Environmental Policy Analyst

Larissa Mark
Environmental Policy Analyst

Commenter: David W. Williams
Affiliation: University of Kentucky
Comment Date: December 19, 2008

19 December 2008

Mr. John Flowers
U.S. Environmental Protection Agency
Office of Wastewater Management (4204M)
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Dear Mr. Flowers,

I am writing as the Chairperson of Division C-5 of the Crop Science Society of America. Division C-5 members, currently 400+, are mostly research scientists and educators in the field of turfgrass science. We represent the vast majority of all turfgrass and affiliated scientists nationwide. As the current Chair, I am hoping to express our collective concerns with the draft specifications for WaterSense new home construction as related to landscaping, specifically regarding the uses of amenity grasses in the landscape.
First of all, I can say without reservation that Division C-5 of the CSSA both applauds and supports the efforts of the EPA to address water use and management in the U.S. It is beyond clear that conservation and improved water management must be instituted for the ultimate well-being of our society and our environment. I don't think any informed individual would argue that point. What is not so simple is how best to proceed with these efforts. It is a very complex issue; ethically, morally, and from our perspective, scientifically. There are numerous consequences to implementation of the draft specifications as currently written that are very serious for citizens all across the nation. I am not implying that the EPA has not considered these consequences. Rather, it is my intention to insure that the EPA is fully aware of the specific consequences regarding the uses (or lack thereof) of amenity grasses from a scientific perspective. I believe you may also construe our perspective to be socially valid as wells as scientifically valid.

In an effort to be reasonably succinct, we are most concerned with the ET plant factor of 0.43. We do not understand how the factor was derived and we are extremely concerned about the consequences of actually instituting the 0.43 factor in WaterSense labeling. More specifically, we submit the following questions:

1. How exactly was the 0.43 ET plant factor derived? Is it based on work(s) published in the scientific, peer-reviewed literature? If not, what is the origin of the factor?

2. What are the reasonable expectations of the 0.43 ET plant factor being employed across the entire U.S. regarding plant selection and use? In other words, is it feasible to impose the same ET plant factor across the vastly different environments found in the U.S. with reasonable expectations of success (e.g., Oregon vs. California, Vermont vs. Arizona)?

3. Are the other, not-necessarily-intended consequences of restricting plant selection and use being considered in proposing the 0.43 ET plant factor?

The basis for these questions does arise from the scientific, peer-reviewed literature. A review of the literature clearly indicates that implementation of the 0.43 ET plant factor will effectively eliminate the use of currently available cool season (C3) grasses in new home lawns seeking the WaterSense label (e.g., Kentucky bluegrasses, tall fescues, perennial ryegrasses). While that fact alone is quite alarming, it is of even more concern that we do not currently have acceptable replacements for these species such that any permanent turf could be cultured by homeowners with or without irrigation. Several studies have investigated appropriate ET plant factors for turfgrass species. None of these studies supports or even proposes consideration of an ET plant factor less than 0.65. I refer you to a letter dated 4 September 2008 written to you by Dr. John Stier, the immediate past-chair of Division C-5. Dr. Stier's letter specifically provides references to these and several other studies. It can only be concluded from those works that the 0.43 ET plant factor will result in either extreme restriction or total elimination of both warm and cool season species currently cultured as home lawns in America.

Mr. Flowers, I hope you will agree that the elimination of these species as choices for home lawns by virtue of the 0.43 ET plant factor may not be immediately practical. What will homeowners in Michigan (or choose a state) propagate as lawns if they cannot comply with WaterSense labeling with one of the aforementioned species of cool season grasses? Perhaps a more concise question would be: Are we prepared to have no home lawns at all? If the answer to that question is no, we are not prepared to do that, then we must re-evaluate the specifications as proposed. It is really is that simple. There are currently no commercially available species of grasses that will comply with the 0.43 ET plant factor.

Also very worthy of note is consideration of the potential non-intended consequences of the aforementioned restrictions. The scientific literature contains many references to the environmental benefits of grasses cultured as lawns. Some of these benefits include evaporative cooling of the ambient air, extremely efficient filtering of surface water, and reducing dust and noise pollution. This does not even consider what is perhaps the most important, non-intended consequence; where will our children play? Will they play in and on graveled areas? Bare soil? Again, it just does not seem very practical to effectively eliminate our only current choices for lawn grasses by virtue of the current specifications. These are only a few of many social and environmental consequences of the specifications as proposed.

Several of my colleagues are working feverously to address the issues of water conservation and management while allowing for acceptable and functional home lawns. I just yesterday completed review of (and approved) a manuscript submitted for publication that evaluated 22 native or endemic, long-adapted species of grasses cultured as lawns. Several entries in that study performed adequately but are not commercially available and still require additional study regarding cultural practices to reduce inputs while producing a sustainable lawn. It is only a matter of when, not if, we will achieve these goals. We are working very hard to define appropriate species and practices for sustainability, but we are not yet there.

In the interim, it seems most practical not to act in haste by instituting the 0.43 ET plant factor. We should and will endeavor to increase awareness of these issues to all those involved ranging from lawn and landscape professionals to private home owners. At the same time, the EPA could take a leadership role in instituting more practical specifications that do not impose

such drastic and unacceptable consequences such that all of the currently available cool season grass species are eliminated as choices under the WaterSense label.

In conclusion, I and many of my Division C-5 colleagues would anxiously participate by aiding the EPA in defining specifications based on fact through science; specifications designed to fit today's environmental and societal requirements. I am confident we can accomplish this while at the same time making significant contributions to the goals of the WaterSense program. I see these issues as extremely important to our entire nation and our society. I would be anxious to contribute my scientific expertise to this process as well as the expertise of my many colleagues across the U.S. through the published scientific literature. Please contact me at your convenience to discuss this matter further or to accept my offer of assistance to contribute to this extremely important process. Thank you very much for the opportunity to express our concerns and offer our assistance.

Sincerely,

D.W. Williams, Ph.D.
Chair, Division C-5, Crop Science Society of America
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Commenter: John P Williams
Affiliation: Land Management Group, Inc.
Comment Date: December 19, 2008

Thank you for the opportunity to comment on this matter.

My firm does not have a position on this issue at this time, but would like to remind the stakeholders of potential regulatory conflicts. Many state and local regulatory agencies permit water application on a crop as part of some other mandate, i.e. wastewater dispersal, stormwater management, etc. I would beg for consistency between the regulations and any new guidance that comes from this effort. If my firm has completed the requisite agronomic, soil, and geologic investigation to support a golf course irrigation project with reclaimed wastewater or the irrigation of a hay crop with water from a commercial facility for example, we expect to be held to the permitting standard applicable to that permitting agency. I would be concerned if my future designs are not in step with the EPA guidance on the same subject and my client is denied a permit because of a guidance tool from a 3rd party, not associated with the regulatory permitting process.

I would also caution that when performing any type of modeling of a natural resource, that the most accurate and extensive site specific data collection techniques be utilized. Book values and assumptions will often cause real world problems.

John P Williams
General Manager
Land Management Group, Inc.
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Commenter: Michael Dukes, Ph.D., P.E., C.I.D., Kevin Kenworthy, Ph.D., Bryan Unruh, Ph.D., Benjamin Wherley, Ph.D.
Affiliation: University of Florida
Comment Date: December 19, 2008

Topic: Part B: Determining landscape water requirement
Comment: Be more specific in determining RTM. "Irrigation efficiency" could be interpreted as distribution uniformity (low quarter or low half), application efficiency, or a number of efficiencies.
Rationale: Different values for irrigation efficiency will result in different answers.
Suggested Change (or Language): Use "Distribution Uniformity low half" instead of "irrigation efficiency".

Topic: Part 2 water budget calculator
Comment: KL values need to reference "accepted" and peer reviewed science.
Rationale: The KL of 0.43 for all areas of the U.S. is not appropriate without more scientific justification. The references cited are not peer reviewed (Note my comment later indicating that the IA manual is under review) and would not stand heavy scrutiny. Furthermore, we know that the methodology used to develop Kc (i.e. KL values here) significantly impacts Kc values. For the definition of Kc, the turfgrass values used here do not match the peer reviewed scientific literature for "well-watered" conditions (the definition of Kc). Data from Florida, Arizona, and Las Vegas show Kc values of warm-season grasses as high as 0.8-0.9 (contact me for references). Some of the literature showing warm-season grasses have an annual Kc of 0.6 has flawed methodology, out of date methodology, does not follow the definition of "well-watered" in Kc determination, or a combination of all the above. Or, the 0.6 Kc conclusion is being taken out of context in that a 0.6 number is developed in a region where the grass goes dormant several months of the year and then applied to a region where the grass does not go dormant. We have documented this difference between North and South Florida.
Suggested Change (or Language): Use cited literature where possible to substantiate Kc/KL values. Romero and Dukes (2008) presented a paper at the IA summarizing many turf Kc studies. Ornamental Kc values will be much harder to find for documentation. Beeson and Gilman from Florida have data for this region on ornamental and trees. Similar to grass Kc values though, this information might not be extended to other climates directly. It may be appropriate to allow users to reference Kc values specific to their region that are published in the scientific literature. Water Sense could assemble these values or allow users to look to their state land grant universities.

Topic: Table 3. Irrigation Efficiency
Comment: Document specific source of these numbers and justify
Rationale: It was not clear to me exactly where these numbers came from in the LISWM document.
Suggested Change (or Language):

Topic: Validity of all the citations of LISWM
Comment: This document has been retracted by the IA and is now under peer review. How valid is the methodology used in the Water Sense approach?

Rationale: The industry and academia have concerns that the LISWM manual was not properly peer-reviewed and always in draft form.
Suggested Change (or Language): LISWM needs a final review by the IA, at least the parts used in this tool.

Topic: General
Comment: No doubt that there is a lot of resistance in the industry to this tool without more explanation.
Rationale: We have commented and believe others will that the 0.43 KL seems to be California or at the very least arid climate specific. One size may not fit all here. However, this approach has a lot of potential for design flexibility.
Suggested Change (or Language): After addressing the comment of scientific based KL and Kc values, we suggest creating some scenarios with the tool for different climate (i.e. different parts of the U.S.) zones showing what types of landscapes would meet the spec and how these might compare to existing landscapes in those zones.

Topic: Part 1 – LWA (spreadsheet)
Comment: "Annual reference ET for cool-season grass (inches/year)" change to "Annual reference ET (inches/year)"
Rationale: The definition of ETo is for a cool season grass.
Suggested Change (or Language): See above in my comment.

Commenter: Steve Windhager, Ph.D.; Michael Barrett, Ph.D., P.E., D.WRE; Michael Clar, P.E., D.WRE; Robert Goo; William Hunt, Ph.D., P.E.; Tom Liptan, ASLA; Ed MacMullan; James Patchett, ASLA, RLA, LEED AP; Eric Strecker, P.E.; David J. Yocca, ASLA, RLA, AICP, LEED AP
Affiliation: Hydrology Subcommittee, Sustainable Sites Initiative
Comment Date: December 11, 2008

Topic: General
Comment: We compliment those involved with the EPA's WaterSense program for their ongoing efforts to provide guidance and incentives for curtailing water use. In general, we support the direction of this effort, but we do have concerns related to the specific targets being set. We would welcome the opportunity for the Sustainable Sites Initiative and WaterSense to collaborate toward mutually supportive outcomes. Please see our more specific comments below.
Rationale:
Suggested Change (or Language):

Topic: Baseline establishment for water reduction calculation
Comment: Setting the water reduction goals at 40% from a very high initial "baseline" is a very low bar. 100% cool-season turf is not a realistic baseline for most projects, and sets an unreasonably high level of water use for the baseline from which to assess your "reduced" use.
Rationale: 100% cool-season turf is not a realistic baseline for most projects, and sets an unreasonably high level of water use for the baseline from which to assess your "reduced" use.
Suggested Change (or Language): Require that baseline be set from a realistic baseline for their region. This will likely be less than 100% turf, and in many areas of the country, would consider warm season grasses rather than cool season grasses.

Topic: Target reduction amount for water reduction calculation
Comment: Reduction of 40% from the baseline is a lower standard that either LEED NC or the Draft Guidelines in the Sustainable Sites Initiative, both of which require 50% reduction (for credit).
Rationale: LEED NC requires 50% reduction for a credit, and the Sustainable Sites Initiative requires 50% reduction from baseline as a prerequisite.
Suggested Change (or Language): In order to promote similar goals, we recommend that the minimum target reduction should be increased to 50% reduction from baseline.

Topic: Provide Credit for utilizing non-potable water sources
Comment: Provide credit for reduction of potable water use through the substitution of non-potable sources such as greywater and captured rainwater.
Rationale: The key issue in terms of sustainable use of water in the landscape will be to significantly reduce **potable water** use. Diverting water that is typically considered waste (greywater) or a problem (stormwater) to beneficial reuse should be encouraged.
Suggested Change (or Language): Recognition/Credit should be given to strategies which substitute non-potable water sources for potable water so long as the total amount of potable water used is less than the target amount (based on % reduction from the baseline).

Topic: Concerns with theoretical water use by various plant types as a proportion of local evapotranspiration.
Comment: The specified water usage for general plant form (shrub, turf, tree, etc.) is inaccurate and there is no accountability to have actual water use fall within the estimated amounts.
Rationale: While there is definitely a correlation between plant form and water use, there is a wide variety of water needs between species with similar growth forms. The approach suggested gives no credit for careful plant selection to further reduce water use, nor does it hold accountable those that have poor plant selection. There is no verification of the estimated water use as part of this program, so if a landscape was predicted to be water saving, but in fact actually used significantly more than the estimated amount of potable water, there would be no effect on the applicant.
Suggested Change (or Language): Provide a way to calculate the K_L value for a given species. If this cannot be done accurately on a species basis (even with low precision) then there is little value beyond providing a "ballpark" estimate from this calculator. If this "ballpark" estimate is the most accurate that can be calculated, it must be verified through reporting of actual water use over the first 3 to 5 years after installation in order to have any rigor. Without it, the WaterSense designation will likely be given to sites that did not in fact meet the goals of the program.

Amy Belaire
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Commenter: John N. Thatcher
Affiliation: TruGreen LawnCare
Comment Date: December 19, 2008

Dear WaterSense:

1. It is not widely known that water use for landscapes is the largest use of water in many communities. The generalization that water use for landscapes is the largest use may be false. Water use for industrial and power-generation cooling is the greatest use of water in many communities.

2. It is not solely EPA's responsibility to dictate the quantitative use of water. That is the function of all regulatory agencies that have an interest in water, including the USGS, USDA, Dept. of the Interior, Dept. of Commerce, etc., as well as being a legislative agenda for Congress, States, and local units of government. It is the EPA's responsibility to monitor and regulate the qualitative aspects of water.

3. Water that percolates to groundwater is beneficial reuse of irrigation water. Water that "runs off" will ultimately be found in surface or ground water supplies (except for the amount that is lost to evaporation). Water that is "lost" to evapo-transpiration is not "lost" but enters the atmospheric water cycle. Granted there is an economic cost associated with supplying the water that is used for irrigation and then is "lost" to evapo-transpiration. The cost is partly regained in the cooling effects of water that transpires from lawns in residential landscapes. In addition, there is an undefined economic value associated with the positive human emotional response to turfgrass.

My comments are opinion based upon my educational background, experience as a Soil Scientist with the Ohio Department of Natural Resources, and the Natural Resource Conservation Service (old SCS). In addition, I have been in a technical position in the turfgrass industry for 34 years, and know that my opinions have some measure of validity.

Please allow more time for comment on the proposed regulations by those in a position of academic research who are better prepared than I to present a scientific rationale - backed by data - that meets the varying climate, microclimate, soil, and geologic conditions found even within small communities. I understand the period for comment ends today, Friday, December 19, 2008. I would ask that the comment period be extended an appropriate period of time for additional input.

Thank you for your consideration.

John N. Thatcher
Region Technical Manager
TruGreen LawnCare
johnthatcher@trugreenmail.com

Commenter: Alison Ramoy, Senior Water Conservation Analyst
Affiliation: Southwest Florida Water Management District
Comment Date: December 19, 2008

Topic: I. Introduction
"**…**specifically, the amount of water required by a landscape consisting of cool-season grass…"

Comment: Consider warm-season grass.

Rationale: Warm-season grass grows year round in Florida (and possibly elsewhere).
Suggested Change (or Language):

Topic: I. Introduction
"The water budget approach will allow landscape designers to plant a mixture of high-, medium-, and low-water-using plants, lending flexibility in the design of the water-efficient landscape."

Comment: Flexibility is good, but the emphasis should still be on using the right plant in the right place.
Rationale: Within a landscape, the site characteristics may vary.
Suggested Change (or Language):

Topic: Equation A-3: Average Irrigation Efficiency = 71%
Comment: Installed systems are far less efficient. Is 71% a realistic goal?
Rationale: University of Florida Institute of Food and Agricultural Sciences (IFAS) recommended run times based on 60% efficiency. (http://edis.ifas.ufl.edu/document_ae220)
Suggested Change (or Language): In Florida, consult experts from IFAS.

Topic: Effective rainfall
Comment: Effective rainfall = 25% of annual participation is likely too low, at least in Florida.
Rationale: This may be an appropriate assumption is some areas, but not others.
Suggested Change (or Language): Consult sources outside of California.

Topic: Location specific reference ET.
Comment: This information has been difficult to obtain.
Rationale:
Suggested Change (or Language): As suggested on the WaterSense Water Budget Tool website, provide specific sources by state.

Topic: Plant Type or Landscape Feature
Comment: It does not seem appropriate to consider the pool/spa area equal to a high-water use plant.
Rationale: Is there an allowance for a pool cover or shade offered by an enclosure?
Suggested Change (or Language):

Topic: General
Comment: Will there be training offered/required for certifiers?

Rationale: Certifiers should have a thorough understanding of the parameters used to determine the Landscape Water Allowance and Requirement.
Suggested Change (or Language): Develop training materials, including examples, for certifiers.

Topic: General
Comment: Will this tool be tested in installed landscapes in various regions before it is accepted to be used in the new homes specification?
Rationale: It appears that many of the assumptions were based on data from California.
Suggested Change (or Language):

Topic: General
Comment: While it is easy to enter the values in the Water Budget Tool, there may be cause for concern over the results.
Rationale: A 100% turf landscape met the Landscape Water Allowance because there was a significant amount of daily water use allowed.
Suggested Change (or language):

Alison Ramoy, Senior Water Conservation Analyst
Conservation Projects Section
Resource Projects Department
Southwest Florida Water Management District
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Brooksville, FL 34604-6899
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Commenter: Mark A. Peterson
Affiliation: San Antonio Water System
Comment Date: December 19, 2008

Attached are comments from the San Antonio Water System Conservation Department, San Antonio, Texas. Please incorporate into the official public comments for the EPA WaterSense Landscape Water Budget Tool.

Topic: Landscape Water Allowance (LWA)
Comment: Although we comprehend the rationale and formulae basis of the LWA, we cannot determine how or who calculated the Area-weighted landscape coefficient (K*L*). The K*L* should reflect the goal of drought tolerant landscapes that match the physical site conditions.
Rationale: For more than 30 years, state extension, urban forestry, and nursery professions have urged consumers to use drought tolerant plants and plants that match or suit the physical site conditions. The goal clearly is to lower the consumption requirements while maintaining healthy plants. This should be the goal of WaterSense as well. Since we cannot determine how or who calculated the K*L*, we cannot verify if this number adequately represents the goal. An accurate K*L* may be lower and as such will reduce the overall Landscape Water Allowance.
Suggested Change (or Language): Describe and document the calculations of the Area-weighted landscape coefficient (K*L*).

Topic: Run Time Multiplier (RTM)
Comment: We vigorously urge the elimination, or at the very least, the severe modification of this factor from the calculations of the Landscape Water Requirement.
Rationale: This one factor consistently promotes excess water on the landscape by "watering to the dry spot". This violates the essence of WaterSense. We understand that IA is reviewing their position on the methodology of calculating DU. They, too, seem to understand the problems inherent with the RTM. The Texas A&M University System Irrigation Technology Center does not use a Run Time Multiplier based irrigation efficiency in its state wide recommendations for homeowners. The San Antonio Water System uses a minimal .95 IE for rebate calculations. We understand that wind and evaporation is important but we do not want to promote additional run time to compensate.
Suggested Change (or Language): Eliminate or severely modify the RTM, e.g. ,95 IE for wind and evaporation.

Topic: Effective Rainfall (Re)
Comment: Using only 25% of historic annual precipitation as the Re, dramatically increases the Landscape Water Requirement (LWR). Other entities use higher percentages without plant loss. Use of historic precipitation diminishes the need to use a lower percentage
Rationale: Within the LWR formula, the smaller the Re the larger the LWR. This is contrary to the goal of reduced consumption. The IA (IA 2005) has in the past recommended a Re of 50%. The Texas A&M University Irrigation Technology Center, which provides recommendations throughout the state, uses a larger number of 67%. Based on our review of historic precipitation in South Texas, we concur with the IA and use 50% in all our calculations. With respect to the comment, "Due to the patterns of increased drought

frequency and no guarantee that annual rainfall will reflect historical precipitation patterns…", we must point out that by *definition* historic averages reflect actual wet and dry cycles and that no current computer model can predict new local precipitation patterns as a result of climate change. Therefore, we urge caution on changing a factor that has had historical and scientific basis. We also urge caution on using a California model for the rest of the country until additional applications can be made by university staff.
Suggested Change (or Language): Change Re to 50% historic annual precipitation

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Topic: Landscape Coefficients (K*L*)
Comment: The Landscape Coefficients still do not reflect actual water requirements of established plants, particularly of trees and woody perennials, and should be reduced.
Rationale: Although turf coefficients have been agreed to for some time, research suggests that smaller coefficients could be used without loss or appearance. For woody plants the evidence is stronger. Lindsey (1990) and Knox (1989) found strong correlation between tree transpiration and pan evaporation. Lindsey found the amount to be an average of 30% of pan evaporation and approximately 20% for large trees. Ponder (1984) compared different irrigation rates and found no significant difference in growth at 25% of net evaporation. Lindsey and Bassuk (1991) used 20% to determine the water needs of mature urban street trees. In a follow-up study, Sivyer et al (1997) found that even at 20% the Lindsey and Bassuk's model over compensated the water requirement as compared to actual soil moisture measurements. Finally, Harris (1992) in his seminal book, *Arboriculture: Integrated Management of Trees, Shrubs, and Vines*, recommends "30% or more below ET for many woody plants with little or no adverse affects on plant appearance or performance". Empirical and anecdotal evidence strongly indicates that the Landscape Coefficient can be reduced without damage to plant health and still reduce outdoor water consumption. Truly WaterSense.
Suggested Change (or Language): Reduce the K*L* of trees, shrubs and groundcovers to .3

Topic: Landscape Coefficient (K*L*)
Comment: The Water Budget Tool does not compensate for seasonal or quality factors. Plant water requirements change dramatically from spring, summer, and fall. Others have pointed out that most xeric plants naturally go dormant during the summer. Significant water savings can be achieved by addressing the season or quality aspects of the landscape with an additional Coefficient.
Rationale: The Water Budget Tool as currently developed does not factor in the "real world" of seasonal changes or quality issues, yet plants do. San Antonio and other Texas communities (Hartwell, 2008) consistently see irrigation controllers over-water during the early to mid spring and fall when ETo for plants is low or they are actually still dormant. During these "shoulder months", plant water requirements are low but the Budget Tool does not reflect the gap between the water requirements of spring and fall and summer.
Also, in many parts of the country, native plants go dormant during the summer. Many individuals try to add water to these plants in the hopes of retaining lushness or flowers, but this violates the plant's physiology and genetic disposition. The Texas A&M University System Irrigation Technology Center (http://texaset.tamu.edu) recommends five quality factors for Turf – Maximum, High, Normal, Low, and Minimum – to address this conundrum, i.e., plant actual needs vs. human perception. When we apply our Seasonal Coefficients to

actual ET, we experienced a 30% beyond actual ET (ETo x Kc – Re) without any loss in acceptable appearance (Fipps, 2000).
Finally, the SWAT protocols regard 70% of actual ET, not ETo, as providing acceptable landscape appearance, yet this is not reflected in either LWA or LWR formulae.
Suggested Change (or Language): An additional Column in Table 1 where another Coefficient can be multiplied to meet the Seasonal / Quality issue. Recommended Turf Seasonal/Quality Coefficients: Spring and Fall - .6 ; Summer - .8

Topic: Landscape Water Allowance (LWA)
Comment: The language of Step 1B is scientifically and grammatically confusing.
Rationale: The annual reference ETo is the landscape reference, although a reference grass is used to determine it. Furthermore, many parts of the country have both cool and warm season grasses, so the statement “Annual reference ET for a cool-season grass” is misleading and ambiguous.
Suggested Change (or Language): ENTER THE ANNUAL LANDSCAPE REFERENCE EVAPOTRANSPIRATION (ETo) and Annual Reference ET (inches/year)

Thank you,

Mark A. Peterson
Project Coordinator - Conservation
San Antonio Water System
2800 U.S. Hwy. 281 N.
San Antonio, TX 78212
Phone: 210-233-3081
Fax: 210-233-4451

Commenter: Brent Mecham, John Farner, and Andrew Smith
Affiliation: Irrigation Association
Comment Date: December 19, 2008

Friends,
Attached you will find a copy of IA's comments related to EPA's water budget tool. Because of the intensity of the science and tight timelines, I am unable include signatories on our comment form. What I would ask is that if you have support for our position, please indicate so directly as follows:

Please send any comments or suggestions regarding this landscape water budget tool to watersense-newhomes@erg.combefore 5:00 pm EST on December 19, 2008. All comments become a part of the public record. (Comment form attached)

I am sorry for the short turnaround on this, but we need to make sure we get this right. The implications of activities such as this are significant and I very much appreciate your support and input.

Sincerely,
Andrew K. Smith, CIC, CID, CLIA
External Affairs Director
Irrigation Association
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Topic: "Option 1 – Turf shall not exceed 40 percent of the landscapable area. Turf shall not be installed on slopes greater than 4:1."

Comment: The Irrigation Association is committed to efficient irrigation and believes that our partnership with the EPA in the WaterSense program helps promote the benefits of efficient irrigation to not only irrigation and landscape professionals, but also the general public. A goal of the Irrigation Association is to ensure that there is enough water for irrigation for future generations and there is no doubt that the WaterSense partnership ultimately saves water through efficient and smart irrigation practices. We believe that in many instances, however, the 40% turf limitation does not achieve this goal. There are inherent values of turfgrass, if responsibly installed and maintained properly. Turfgrass should not be undervalued as part of the WaterSense program and we urge the EPA WaterSense Program to reevaluate the 40% and slope ratio requirements under Option 1.

Rationale: Many local governments and municipalities rely on turfgrass to serve as a natural filter for water runoff, thus resulting in less pollution of the groundwater. In fact, many municipalities are taking the opposite approach of the proposed EPA WaterSense program by utilizing turfgrass as a BMP for erosion control, filtering storm water etc based on research funded by the EPA nonpoint source pollution program. These communities are

requiring a certain percentage of land property be covered by turfgrass and landscape. An example of this is the Raleigh, NC, Zoning Case Z-53-08. In this proposal, the City of Raleigh would require any new residential construction to limit any impervious surface coverage (roofs, decks, pavements, driveways, etc.) to less than 25% of the total property. If impervious surfaces cover more than 24%, approved on-site stormwater controls must be installed. In this instance, Option 1 would not even be a viable option, and from the IA's perspective the benefits of turfgrass outweigh the 40% and the 4:1 slope requirements.

We are committed to making the WaterSense Budget Tool (Option 2) work and feel that this will be the best environmental and economic option to ensure the success of the EPA's WaterSense program.

Suggested Change: Remove this option and use the water budget method to determine the size and type of lawn area in the landscape.

Topic: The use of and reference to Landscape Irrigation Scheduling and Water Management (LISWM, 2005) and Predicting and Estimating Landscape Water Use (PELWU, 2001) both from the Irrigation Association.

Comment: EPA has modified or misinterpreted terms and applications to those stated in IA's LISWM document. We understand that this is a complicated subject, but cooperative efforts to make it work well can have a positive impact on improving irrigation management and reducing water waste.

Rationale: As stated in the forward of the LISWM document, the concepts about irrigation scheduling, water management and water budgeting are sound, but additional research is needed to help refine those presented. Included is the need for more research about plant and turf species water needs, more research on rainfall effectiveness and understanding soil moisture uniformity based upon sprinkler system performance. Additionally, a water budget calculator which is to be used nationally without local input on things like plant water requirements, plant palette, rainfall effectiveness, etc., suggests that all areas and regions of the country are all equal as far as climate, weather patterns and plant species. Obviously, that is not true. The Irrigation Association, over the years, has tried to emphasize the need for engaging local professionals and scientists to help determine what will work best to achieve the desired outcome of efficient water use in the landscape. To ensure success, local participation and decision-making are necessary to have effective water conservation programs, especially when they are voluntary.

Suggested Change (or Language): Use the terms from the reference documents correctly, and alter the water budget calculations appropriately.

Topic: ETo or reference evapotranspiration terminology, data and geographic considerations

$$LWA = \mathbf{ET_O} \times K_{WA} \times A \ / \ C_U$$

Comment: There is not a national ET equation accepted and used in all states and regions of the country, but rather a variety of equations are used to determine ET_O. Therefore there

can be a large difference in the calculated reference ET which requires unique modifiers to correctly estimate plant water use.

Rationale: While this term, ETo would make one think that is the same everywhere, ETo can be calculated using a variety of equations. Each state or area uses a preferred equation by which many water rights issues have been determined as well as research conducted at many universities around the country. There can be as much as 30% difference in the calculated ETo depending on what ET equation is used and how a weather station is sited. So although the same weather data can be used, different results are generated. Crop coefficients have been derived and used to modify the reference ET to fit the needs of plants according to the reference ET equation being used. Since crop coefficients are unique to the reference equation that was used to determine them, they are not necessarily transferable from equation to equation or from state to state. A document published by the University of Arizona called "Converting Reference Evapotranspiration into Turf Water Use" is referenced. http://ag.arizona.edu/pubs/water/az1195.pdf Looking at peak water demand of July, there is a 30% difference in the corresponding crop coefficient depending on the equation being used although it is the same weather data used to calculate the reference ET. Another challenge is finding local sources of ET information. It seems to be readily available in the western part of the United States and more difficult to locate in the eastern part of the country. Therefore substitute information is often used as a best guess estimate which is close, but not precise.

Suggested Change (or Language): EPA should provide specific references and guidance for the use and applicability of ET_O for the purposes of this process. This could include using the ASCE/EWRI Standardized Penman Monteith equation (accepted and endorsed by the Irrigation Association) as a means to standardize values used on a local basis to fit the proposed water budget calculator.

Topic: K_{wa} or water adjustment factor

$$LWA = ET_O \times \mathbf{K_{WA}} \times A \ / \ C_U$$

Comment: The water adjustment factor is confusing to an end user because it incorporates a modifier of ET information to determine the water needs for specific plants or groups of plants and combines with it an irrigation efficiency factor.

Rationale: The draft water budget calculator sets the K_{WA} as 0.60. There does not appear to be any explanation or justification as to why this has been set so low. The document that accompanies the calculator shows that it has a plant factor of 0.43 and irrigation efficiency is 0.71. The plant factor has some basis in the GEIWN document which teaches the landscape coefficient method which the Irrigation Association has referenced for a number of years to teach students a method for taking reference ET and modifying it to estimate the amount of water required by the plants in a landscape. According to the Guide to Estimating Irrigation Water Needs of Landscape Plantings in California (GEIWN, 2000) the plant factor of 0.43 falls in the low end of moderate water use. However, the 0.43 number seems very precise when the moderate range is 0.4-0.6 (GEIWN), but it is supposed to be a weighted average of plant materials that could be used. As an association we do not claim to be experts at knowing the exact amount of water all different kinds of plants need, but we do

know that this low plant factor will severely limit the mix and type of plants that could be used in the landscape. The irrigation efficiency is set at .71 which is "raising the bar" from where it has been in a typical situation and while as an irrigation industry we would have to work to get there, it is achievable. The PELWU book used in Irrigation Association classes shows an example of using a K_{WA} of .80 which represents more than a 20% decrease in water use from what has been typically been used over the years. This fits nicely with the stated goals of the EPA Water Sense program to reduce use by 20%. On pages 65-67 of Predicting and Estimating Landscape Water Use a detailed discussion is made of how the water adjustment calculator is determined. We emphasize the importance of determining the K_{WA} on a local basis with local experts to help determine what it should be. It also states that the adjustment factor should end up between 0.80 and 1.00 of ET_O. The proposed water budget calculator's use of a K_{WA} of 0.60 will radically change the type of landscapes that could be installed and will most likely greatly exceed the stated goal of the program of reducing water use of 20%.

Suggested Change (or Language): The Irrigation Association maintains that the K_{WA} needs to be determined on a local or regional basis where plant materials and climate factors are very similar and local experts know and understand plant water requirements. The objective should remain to reduce water use by 20%.

Topic: K_L or landscape coefficient

$$LWR_H = RTM \times (ET_O \times \mathbf{K_L} - R_e) \times A / C_U$$

Comment: Assumptions have been made to insert a static K_L without an appropriate or adequate process for such a determination.

Rationale: The landscape coefficient in Table 2 uses default values that can be found in any of the references and are the mid points of the ranges for the various items listed. While custom plant factors can be used, very little information based on science exists. The landscaper could choose values from the WUCOLS list which is part of the GEIWN document, but this document has been created for use in California and could not be used for all states or regions in the country. Therefore most users will rely on the default values, and in truth, could overestimate the amount of water the landscape actually needs. Logically, if the LWA uses the low end of the spectrum for moderate water use plants, then the same should be done in the LWR calculator default values to represent that lower water using plants are being incorporated into the landscape to meet the water allowance.

Suggested Change (or Language): Default values of plants in Table 2 should be on the lower end of the spectrum or range rather than the medium or higher end range.

Topic: RTM or run time multiplier

$$LWR_H = \mathbf{RTM} \times (ET_O \times K_L - R_e) \times A / C_U$$

Comment: The application of the RTM terminology has been altered by EPA for the purposes of the proposed water budget calculator.

Rationale: The water budget calculator states that RTM is equal to 1 / irrigation efficiency. This is changing the term as explained in the LISWM document. In the referenced LISWM document, RTM is calculated based upon sprinkler distribution uniformity and is 1 / DU_{LH} or lower half distribution uniformity, NOT 1 / irrigation efficiency as listed in the calculator. The irrigation efficiency (IE) identified in the calculator as Table 3 uses values that are the same as the LISWM document or the PELWU book but the values listed in the Irrigation Association documents are values for distribution uniformity of an excellent sprinkler/drip irrigation zone. Distribution uniformity (DU) and irrigation efficiency (IE) are not the same thing. While it seems like a small detail, the RTM for a spray system with 75% IE is 1.33 (1/0.75) as per the calculator, however when the RTM is used correctly based upon distribution uniformity the RTM is 1.18. This is a significant reduction is the amount of water required by the landscape as determined by the calculator.

Suggested Change (or Language): Use the terms correctly as per referenced documents or respectfully remove IA documents from your listed references.

Topic: R_e or effective rainfall

$$LWR_H = RTM \times (ET_O \times K_L - \mathbf{R_e}) \times A / C_U$$

Comment: A static rainfall determination is not equitable because of regional environmental conditions and site specific conditions.

Rationale: The calculator allows only 25% of the rainfall to be counted as effective. While there is not a definitive answer to what is effective, the best study conducted by USDA/NRCS (referenced in the LISWM document) on irrigated agriculture determines that effective rainfall is 76%. The LISWM document suggests using no more than 50% because of shallower root zones and is based upon Table 2-43, Part 623 of the National Engineering Handbook. In reality, a blanket statement is dangerous because of the diverse climates covered in the United States. Local input based upon expertise would be best. If the goal is to increase irrigation efficiency which can be accomplished using new technology for controlling irrigation and assuming excellent irrigation management, then rainfall should be counted at least 50% if not more. This would then reduce the irrigation water requirement.

Suggested Change (or Language): Effective rainfall should be determined in a geographically sensitive manner.

Topic: Water Reuse / Alternate Water Supplies

Comment: The WaterSense for Homes draft and this budget tool make no reference to or allowances for reclaimed water use. Multiple issues should be addressed, such as leaching and poor water quality when it would be used in irrigation, before the budget is finalized.

Rationale: Should these conditions be placed upon houses in regions where reclaimed water use is acceptable, subject properties could possibly encounter plant health issues.

Suggested Change (or Language): It will be necessary to raise the K_{wa} significantly to compensate for water quality issues.

Topic: Conclusion

Comment: Overall, the water budget calculator can function correctly when appropriate values are in place. It can be a very useful tool, but over simplification limits the acceptance of it, and in its current form, misrepresents the Irrigation Association's teachings. The current calculator results may well exceed the WaterSense Program's goals at the expense of the environmentally-beneficial landscape.

Removing "Option 1," eliminating a national plant factor, and correcting the calculations within this draft calculator will make this a program that the Irrigation Association can fully support.

As we reflect upon IA's relationship with EPA related to landscape water use, our unified goal has been to reduce or eliminate waste. This is something that is broadly agreed upon and could be of significant value as a unifying goal across a broad spectrum of stakeholders.

We thank the EPA for our continued WaterSense partnership and urge that these comments are positively considered when developing the final WaterSense budget tool and the next draft of the WaterSense for Homes specifications.

Commenter: Bob Fitch
Affiliation: Minnesota Nursery & Landscape Association
Comment Date: December 19, 2008

The Minnesota Nursery & Landscape Association fully supports the comments submitted by the Irrigation Association.

Commenter: Chris Pine
Affiliation: C. Pine Associates, Inc.
Comment Date: December 19, 2008

I support the comments provided by the Irrigation Association on the EPA's Water Budget Tool and hope that you will include these changes in the final draft.

Thanks for your consideration.
Chris Pine CID, CIC, CLIA, MCLP
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Commenter: Dana Nichols
Affiliation: Manager Outdoor Programs, San Antonio Water System
Comment Date: December 19, 2008

Topic: Introduction

Comment: The Landscape Criteria Options (1 and 2) seem to be built around the assumption that an irrigation system will be present.

Though I am ok with a turf limit of 40% in general for diversity's sake, for pure conservation I would rather have a yard of all drought tolerant turf that is allowed to go dormant in the summer and winter and has no irrigation system than a 40/60 turf to bed with an irrigation system that is regularly used. Of course the most desirable is a 40/60 turf to bed, with no irrigation system.

In my 15 years as a Water Conservation professional in a retail water utility I have never once come across a home landscape that has used less water after an irrigation system was installed, unless it was installed but never actually turned on. To account for this inevitability, if an irrigation system is present then additional indoor or other water saving devices should be required to offset this additional water use.

Rationale: While I fully understand that many homeowners will choose to have an irrigation system, if used on any regular basis, they will use more water than a landscape without an irrigation system.

In many cases a home with older plumbing fixtures but no irrigation system will use less water than a home with water efficient plumbing fixtures and an irrigation system that is regularly used. The WaterSense program should fully recognize that no matter how perfect an irrigation system is and what the budget is, the operator (the homeowner) will use more water than if the house did not have an irrigation system.

Any kind of regular use of the irrigation system will negate any savings gained from indoor appliance/plumbing savings particularly in the parts of the country that have very long growing seasons and mild winters.

Suggested Change (or Language): Give more credit and flexibility to landscapes that have no irrigation system at all.

Topic: Determining Landscape Water Requirement

Comment: There seems to be a general bias toward the assumption that plant material, in order to survive, needs supplemental irrigation. Our National Parks and Wildlands, that are full of plant material yet not irrigated, seem to negate this notion. A WaterSense home landscape should first and foremost have plant material appropriate to the region that needs little to no supplemental irrigation to survive.

Rationale: In San Antonio if all homes used this water requirement methodology we would probably already be out of water. Luckily most people apply little to no additional water to their landscape yet San Antonio is well vegetated as appropriate to its region. When reviewing California water budget recommendation in the past I was surprised to learn that in California, trees need more supplemental water than other plant material. This is something we have not seen in San Antonio and as such do not and would not use their calculations as a benchmark to determine a water conserving landscape.

Suggested Change (or Language): Count *at least* 50% of the rainfall. Plant material that cannot be managed under these conditions should not be present in a WaterSense landscape.

Topic: Landscape Coefficient

Comment: The Water Budget Tool does not compensate for seasonal factors – plants have very different water requirements throughout the year based on both the biological requirements of the plant species as well as the homeowners' wishes.

Rationale: Adding a seasonal (or growth factor) acknowledges that homeowners can, and in a WaterSense Home, I would argue, should choose to allow turf and other plants species that have winter and summer dormancy capabilities to go dormant. In San Antonio, only those turf species that have summer dormancy capabilities (defined in San Antonio as being able to go 60 days without water in the hot Texas summer) are allowed to be planted in home and commercial landscapes. This is to protect their investment in the case of an extended drought where irrigation may be significantly curtailed. Grass that has dormancy capabilities will survive for a rainy day.

Suggested Change (or Language): Add the ability to apply seasonal coefficients that would result in reduce water requirements.

Sincerely,

Dana Nichols
Manager –Outdoor Programs
San Antonio Water System
San Antonio, Texas
210-233-3656

Commenter: Robert E. Schutzki
Affiliation: Department of Horticulture, Michigan State University
Comment Date: December 19, 2008

Topic: Option 1 – Turf shall not exceed 40 percent of the landscapable area. Turf shall not be installed on slopes greater than 4:1.

Comment: We agree that efficient irrigation application is an important consideration in the design and development of both residential and commercial landscapes. We also operate with the belief that sustainability is a foundational principle in designing today's landscapes. Turf serves multiple functions in today's landscape such as recreation, environmental benefits and aesthetics and in many cases addresses municipal ordinance requirement. It is not the percentage of turf that is an issue; it is the turfgrass selection and how it is managed. It seems arbitrary to set a maximum of 40% as does to eliminate turf on slopes greater than 4:1. WaterSense can address appropriate selection management practices based on region conditions.

Rationale: The property owner's desired function of the site, site and environmental conditions, and management considerations determines how a site will be developed. Commercial sites or those others going through site plan review will have to satisfy municipality ordinances, many of which specify the turf conditions. We can make water. There are a number of turfgrass species that are being promoted for their sustainable characteristics and many professionals are coupling this with responsible turf management practices. Please focus on selection and management of turf, rather than the approach that limiting the amount of turf is water wise. This recommendation seems to miss employing best management practices.

Suggested Change (or Language): Let water budget determine the size and type of turf area in the landscape.

Topic: ETo or reference evapotranspiration terminology, data and geographic considerations

$$LWA = \mathbf{ET_O} \times K_{WA} \times A \ / \ C_U$$

Comment: There is not a national ET equation accepted and used in all states and regions of the country, but rather a variety of equations are used to determine ET_O. Therefore there can be a large difference in the calculated reference ET which requires unique modifiers to correctly estimate plant water use. The Irrigation Association is the national resource for the latest in irrigation technology and best management practice; I support their position on this topic.

Rationale: ETo can be calculated using a variety of equations. Each state or area uses a preferred equation by which many water rights issues have been determined as well as research conducted at many universities around the country. There can be as much as 30% difference in the calculated ETo depending on what ET equation is used and how a weather station is sited. So although the same weather data can be used, different results are generated. Crop coefficients have been derived and used to modify the reference ET to

fit the needs of plants according to the reference ET equation being used. Since crop coefficients are unique to the reference equation that was used to determine them, they are not necessarily transferable from equation to equation or from state to state. A document published by the University of Arizona called "Converting Reference Evapotranspiration into Turf Water Use" is referenced. http://ag.arizona.edu/pubs/water/az1195.pdf Looking at peak water demand of July, there is a 30% difference in the corresponding crop coefficient depending on the equation being used although it is the same weather data used to calculate the reference ET. Another challenge is finding local sources of ET information. It seems to be readily available in the western part of the United States and more difficult to locate in the eastern part of the country. Therefore substitute information is often used as a best guess estimate which is close, but not precise.

Suggested Change (or Language): EPA should provide specific references and guidance for the use and applicability of ET_O for the purposes of this process. This could include using the ASCE/EWRI Standardized Penman Monteith equation (accepted and endorsed by the Irrigation Association) as a means to standardize values used on a local basis to fit the proposed water budget calculator.

Topic: K_{wa} or water adjustment factor

$$LWA = ET_O \times \mathbf{K_{WA}} \times A \ / \ C_U$$

Comment: The water adjustment factor is confusing to an end user because it incorporates a modifier of ET information to determine the water needs for specific plants or groups of plants and combines with it an irrigation efficiency factor. The Irrigation Association is the national resource for the latest in irrigation technology and best management practice; I support their position on this topic.

Rationale: The draft water budget calculator sets the K_{WA} as 0.60. There does not appear to be any explanation or justification as to why this has been set so low. The document that accompanies the calculator shows that it has a plant factor of 0.43 and irrigation efficiency is 0.71. According to the Guide to Estimating Irrigation Water Needs of Landscape Plantings in California (GEIWN, 2000) the plant factor of 0.43 falls in the low end of moderate water use. However, the 0.43 number seems very precise when the moderate range is 0.4-0.6 (GEIWN), but it is supposed to be a weighted average of plant materials that could be used. This low plant factor will severely limit the mix and type of plants that could be used in the landscape. We emphasize the importance of determining the K_{WA} on a local basis with local experts to help determine what it should be. It also states that the adjustment factor should end up between 0.80 and 1.00 of ET_O. The proposed water budget calculator's use of a K_{WA} of 0.60 will radically change the type of landscapes that could be installed and will most likely greatly exceed the stated goal of the program of reducing water use of 20%.

Suggested Change (or Language): K_{WA} needs to be determined on a local or regional basis where plant materials and climate factors are very similar and local experts know and understand plant water requirements. The objective should remain to reduce water use by 20%.

Topic: R_e or effective rainfall

$$LWR_H = RTM \times (ET_O \times K_L - \mathbf{R_e}) \times A / C_U$$

Comment: A static rainfall determination is not equitable because of regional environmental conditions and site specific conditions. The Irrigation Association is the national resource for the latest in irrigation technology and best management practice; I support their position on this topic.

Rationale: The calculator allows only 25% of the rainfall to be counted as effective. While there is not a definitive answer to what is effective, the best study conducted by USDA/NRCS (referenced in the LISWM document) on irrigated agriculture determines that effective rainfall is 76%. The LISWM document suggests using no more than 50% because of shallower root zones and is based upon Table 2-43, Part 623 of the National Engineering Handbook. In reality, a blanket statement is dangerous because of the diverse climates covered in the United States. Local input based upon expertise would be best. If the goal is to increase irrigation efficiency which can be accomplished using new technology for controlling irrigation and assuming excellent irrigation management, then rainfall should be counted at least 50% if not more. This would then reduce the irrigation water requirement.

Suggested Change (or Language): Effective rainfall should be determined in a geographically sensitive manner. This makes water sense.

Robert E. Schutzki
Associate Professor
Department of Horticulture
Michigan State University
East Lansing, MI 48824-1325
Voice: 517-355-5191 ext. 1337
Fax: 517-353-0890
Email: schutzki@msu.edu

Commenter: Jim McCabe
Affiliation: Sensible Technologies, Inc., Houston, TX
Comment Date: December 19, 2008

Topic: WaterSense Landscape Water Budget Approach and Tool – Option 2

Comment: In a manner similar to how the EPA proposes to assign the ETo value, the KL Water Adjustment Factor in Equation A-2 should be assigned regionally by the local Cooperative Extension office to account for climate and other local factors. The proposed value of 0.43 will likely underwater WaterSense landscapes in some regions.

Rationale: As Editor of the document cited [Irrigation Association (IA). 2005. Landscape Irrigation Scheduling and Water Management.], the Irrigation Association Water Management Committee was specifically concerned with approaches that over-simplify landscape water applications. That document specifically states (in Section 5.6) "Note: It is essential that local experts be consulted to determine landscape coefficients for specific plants and grasses used in the landscape."

If you must keep the approach simple with one Kwa value applicable to the entire USA, then please consider a value of 0.50 for the KL which will result in a calculated Kwa of (0.5 / 0.71) = 0.70. This will better serve the entire USA if one coefficient must be used, and is more representative of an average of high water and low water plants [i.e., (0.8 for high-water-plants + 0.2 for low-water-plants) / 2 = 0.5 for medium-water-plants on average].

Suggested Change (or Language): Change Equation A-3 to 0.70 = 0.50 / 0.71

Sincerely,
Jim McCabe
Sensible Technologies, Inc.
Richmond, TX

Commenter: Deirdre A. Irwin
Affiliation: St. Johns River Water Management District
Comment Date: December 19, 2008

Here are some comments. In general the tool is user-friendly for irrigation installers/designers with some training. Many of our comments address potential water saving areas and reflect our experience in Florida.

We applaud your efforts to develop a standard that is both achievable and will perform nationwide.

> *Option 1 – Turf shall not exceed 40 percent of the landscapable area. Turf shall not be installed on slopes greater than 4:1.*
>
> *Option 2 – Develop the landscape design using a water budget approach. The evapotranspiration (ET) limit on the landscapable area shall be no more than 60 percent of the reference ET (ETo). For purposes of the ET calculation, the available rainfall shall be no more than 25 percent of the average annual rainfall amount. Turf shall not be installed on slopes greater than 4:1.*

Reduction of Turf grass and associated high volume irrigation will certainly reduce water use. Consider other aspects of the landscape that contribute to water savings.

- Protect native plant areas, native soils on un-built areas of the lot
- Plants in different regions have different watering and maintenance needs. In the tool this is not addressed with selecting “annual, shrub, tree” from a water budget. The Landscape Water Requirement (LWR) is the amount of irrigation water required by the designed landscape. This automatically assumes that there will be a need for irrigation after establishment. With properly maintained plants, in the right location - there should be no need for supplemental irrigation except during extreme droughts.
- Landscape plan does not have species - just "type" of plant. This will increase monocultures and cookie cutter communities. No mention of landscape diversity – monocultures increase disease and insect risks, which increases water and chemical use which increases leaching of storm water pollutants.
- Option one and two do not provide an easy way for builders who are not using an in-ground irrigation system to become certified. This is a growing trend in Green building and should be encouraged.
- Plant size. Smaller plants, smaller tree calipers, smaller rootballs become established quicker, need less water, have reduced stress impacts, and retain the aesthetic value in the future as larger landscape materials, example: 2” caliper trees are the same size as a 4” caliper tree in 5 years.
- Correct installation of the irrigation system is not addressed , perhaps assumes by the water budget.

- The tool allows for 71% and in Florida irrigation audits show 40 – 50% on average.

Thank you,
Deirdre

Deirdre A. Irwin
Florida Water Star Coordinator
Office of Communications and Governmental Affairs
St. Johns River Water Management District
P. O. Box 1429
Palatka, Fl 32177-1429
office phone (386)312-2310
cell phone (386)546-8437
For more information about Florida Water Star, visit www.floridawaterstar.com

Commenter: Mary Kay Woodworth
Affiliation: Metro Atlanta Landscape and Turf Association
Comment Date: December 19, 2008

Good afternoon,

Attached please find submission from the Metro Atlanta Landscape and Turf Association supporting IA comments and position regarding EPA Water Sense budget.

The Metro Atlanta Landscape and Turf Association, Atlanta, GA is in full support of the comments made by Irrigation Association regarding EPA WaterSense draft, listed below:

Thank you for the opportunity, Mary Kay

Wishing you Merry Christmas and Happy Holidays,

Mary Kay Woodworth
Executive Director, MALTA
2300 Henderson Mill Road, Ste 227
Atlanta GA 30345
770-732-9832/Fax 770-414-6805/Cell 770-359-7337

Atlanta's Landscape Resource … www.maltalandscape.com

Commenter: Marc Teffeau, Director of Research and Regulatory Affairs
Affiliation: American Nursery and Landscape Association (ANLA)
Comment Date: December 19, 2008

To Whom It May Concern:

Please find attached comments from our Association regarding the draft of the WaterSense Water Budget Approach and Tool.

Topic: Relationship with other EPA Programs - Duplication of Efforts?

Comment: What is the relationship, if any, with the EPA GreenScapes Program?

Rationale: **ANLA** is a partner and participant in the EPA GreenScapes program. Since this water budget concerns irrigation practices in landscape situations, would this effort be better handled under the GreenScapes Program than through WaterSense? It appears that the major emphasis of the WaterSense program is more efficient water use within built structures – home, commercial, industrial. Is there or has there been has been a direct coordination/linkage/consultation with the EPA GreenScapes program regarding this landscape water budget formula development?

Suggested Change (or Language): Coordination and consultation with the GreenScapes program staff in regards to Landscape Design Criteria (Section 4.1.1).

Topic: Transparency of the Development Process

Comment: There is no mention in the development of the WaterSense programs and documents of working with the nursery and landscape industry. Has been any nursery and landscape industry stakeholder involvement in this development process?

Rationale: Stakeholder involvement from the landscape industry knowledgeable on plant materials and irrigation practices is critical to developing such a formula.

Suggested Change (or Language): Submission of the WaterSense Budget to a FORMAL, peer review process of industry stakeholders, including the nursery and landscape industry and academic experts for comment and a more direct, participatory stakeholder involvement should be implemented.

Topic: Methodology/formula for WaterSense Budget

Comment: In the reference section only two citations are listed; the California Department of Water Resources and the Irrigation Association. There are no scientific peer reviewed publications or journal articles for academic or industry sources to indicate the scientific bases of the formula. Basing any formula heavily on a California source is problematic and does not represent other climatic areas of the U.S.

Rationale: The formula development is partially based on the Irrigation Association's Landscape Irrigation Scheduling and Water Management publication (2005) as stated on

Page 1 of this document. Since we understand that the initial publication has been withdrawn by IA for additional peer review and study, it seems premature, if not inappropriate to base this formula upon an industry publication that has not been properly vetted to the industry.

Suggested Change (or Language): Indicate that this is a beta or preliminary version of the formula and include language that extensive industry and scientific review will occur before a formal draft version will be made available for public comment.

Topic: K_L or landscape coefficient and plant groupings

Comment: The arbitrary constant landscape coefficient of .43 in the formula is not appropriate or accurate.

Rationale: There is no justification for the use of this value in the formula as a national standard. The coefficient does not take into consideration variable site conditions, local climate and microclimates within a landscape, season, and any characteristics of plant material, including drought tolerance, winter, hardiness or stage of growth/age of plant material. In addition, no accounting is made for differences in landscape plant material water use depending on plant type – annual, herbaceous perennial, woody or evergreen. On page 6, section b. Plant Type or Landscape Feature: reference is made to the Univ. California Extension publication in determining the landscape coefficient as the only source for this number. This does not represent other areas of the United States. In addition, it is mentioned "landscape coefficients for common landscape plants may be obtainable at local Cooperative Extensions or online." These coefficients are not available from local Extension offices in other locations within the U.S. and in reality, do not exist at this time nor with they be developed or made available in the foreseeable future. Custom plant factors can be used in the formula but very little, if any, research based data is available in local areas of the country to substitute for the .43 landscape coefficient.

The support document refers to the following***: "K_L = o.43. This is the area weighted landscape coefficient designating a mixture of high, medium and low – watering using plants."*** In the plant materials palette available for the landscape designer what constitutes plants in these three categories? There does not exist in either the nursery/landscape industry nor in horticultural scientific literature definitions of what constitutes "high", "medium", or "low" water using plants. In addition, there are currently no scientifically researched and validated criteria to determine plant material water use in the landscape. These definitions would have to be determined on a much localized level and account for all the environmental variables in the specific landscape.

Suggested Change (or Language): Remove the arbitrary landscape coefficient at this time.

TOPIC: Conclusion:

The American Nursery and Landscape Association, the national trade association representing nursery crop producers, independent garden centers, landscape design and build firms and landscape distribution companies is committed to the concept of efficient water use and management in commercial and residential landscapes. Our members are

concerned about and are committed to the need to reduce water use and waste in the landscape in appropriate and prudent ways. We currently are a partner with US EPA in the GreenScapes program and have adopted the concept of sustainability as one of our major focus areas with our membership.

We encourage and support EPA's effort in the area of promoting efficient water use on a national level. This effort needs to be based, however, upon research results that have been scientifically validated and peer reviewed. We encourage the WaterSense program to pursue a more diligent and focused effort in this area to insure that any formula, calculation or water conservation practice recommended by the program can be justified to the end user.

Marc Teffeau
Director of Research & Regulatory Affairs
American Nursery & Landscape Association
Director of Research
Horticultural Research Institute
1000 Vermont Ave, NW, Suite 300
Washington, D.C. 20005
Voice - (202) 741-4855
Fax – (202) 789 – 1893
Email: mteffeau@anla.org
Cell – (410) 924- 4491

Commenter: Thomas Delaney
Affiliation: Professional Landcare Network
Comment Date: December 19, 2008

Thank you for the opportunity to comment on the proposed EPA WaterSense landscape water budget tool. We are very supportive of saving water resources whenever possible as does the WaterSense program. Unfortunately, we feel our industry was given too short of a time frame to respond to this proposal, especially since it came at a time when many of us were involved in turfgrass conferences around the country. We respectfully request that you extend the comment period on this proposal to allow more groups to formulate responses.

It is also evident that this proposal has many very knowledgeable people in the industry concerned and troubled about making a *0.43 ET plant factor universal for all plant types and all regions across the United States,* considering the diversity that exists in this country. As with any EPA proposal, the best science and validation for any proposal needs to be used; this does not appear to be the case in this proposal as of yet. The creditability of the EPA and the WaterSense program is vital to those who are in the program, those who might choose to join the program, or even those who might just want to reference it. Also there needs to be some recognition of the inter-relationship of each of the EPA programs and of how suggested plant selection to meet the criteria for one program may influence another program's criteria, especially in the case of the storm water program.

We support the comments on this proposal from the Irrigation Association and the American Crop Science Society of America Section C-5. Thank you for your work on this important program, but we believe more work needs to be done to get it right.

Tom Delaney
Director of Government Affairs
Professional Landcare Network
E-Mail: tomdelaney@landcarenetwork.org
www.landcarenetwork.org
Headquarters:
950 Herndon Parkway, Suite 450
Herndon, VA 20170
(800) 395-2522
(703) 736-9668 Fax

Commenter: Brian Vinchesi, Michael Temple, Michael lgo – WaterSense Partners
Affiliation: Irrigation Consulting, Inc.
Comment Date: December 19, 2008

Topic: Evapotranspiration Rates

Comment: Most parts of the country do not irrigate all year. It is not clear whether the intent is to isolate irrigation season ET and Precipitation Data or use yearly data.

Rationale: There is a big difference in temperate climates where only half the year irrigation is operational but only 50% of the precipitation falls and 90% of annual ET occurs during this period.

Suggested Change (or Language): Clarify the reference period for ET in Part 1, Step 2B to take regional irrigation season into consideration.

Topic: Rain Water Collection

Comment: No provisions for tanking roof runoff. With more and more individual tanking systems on the market, this option should be accounted for in the spreadsheet.

Rationale: Storing rain water for later use in the landscape can greatly reduce the amount of water required from an off-site source.

Suggested Change (or Language): Add a place in Part 2 in the calculator to input the amount of rain water to be collected to be used to reduce the landscape water requirement.

Topic: Irrigation Scheduling

Comment: This worksheet focuses too much on “how much” water as opposed to “when” it is applied. Our research shows that the irrigation controller has the greatest affect on consumption. There is no mention of controller efficiency, method, etc. which really dictates how much water is consumed.

Rationale: Irrigation system efficiency is more than just the efficiency of the application device (i.e. sprinklers, drip, etc.). The operation of the system can have a greater effect on efficiency than everything else. For example, if the irrigation system can apply water with an efficiency, as defined in this tool, of 80% but the controller is programmed incorrectly and overwaters or applies water too rapidly to a heavy soil, the overall system efficiency can be 30% because the controller has wasted water. Also, there are controllers available that automatically adjust the irrigation operating times based on weather data or soil moisture. These controllers only replace the water actually used by the landscape bringing a much higher level of efficiency than a standard controller.

Suggested Change (or Language): Add a controller efficiency field in Part 2 that can be used to adjust the overall irrigation system efficiency that would then be used to calculate the Run Time Multiplier.

Topic: Landscape Coefficients and Irrigation Efficiency

Comment: The EPA worksheet guidelines limit homeowners to a specific palette of landscaping materials. While lower Landscape Coefficient plant material does use less water, even with higher KL ornamentals, with proper scheduling and distribution method, less water can be consumed. As proposed, the restrictions will result in substantially more outdoor water savings than the EPA WaterSense Program target of 20% while harming the diversity and aesthetic value of the landscape.

Rationale: Using a low irrigation efficiency percentage and a high landscape coefficient, the 40% reduction can still be achieved by using better controller technology like ET capable controllers or soil moisture sensors. See attached table outlining water requirements based on varying irrigation efficiencies and controller technology. This also shows that it is possible to have more than 40% turf and still achieve a reduced landscape water requirement.

Suggested Change (or Language): Place more emphasis on irrigation controller efficiency.

Topic: Effective Rain Fall

Comment: A blanket rainfall determination is not equitable because of regional environmental conditions and site specific conditions.

Rationale: The calculator allows only 25% of the rainfall to be counted as effective. While there is not a definitive answer to what is effective, the best study conducted by USDA/NRCS (referenced in the Irrigation Association's Landscape Irrigation Scheduling and Water Management document) on irrigated agriculture determines that effective rainfall is 76%. The LISWM document suggests using no more than 50% because of shallower root zones and is based upon Table 2-43, Part 623 of the National Engineering Handbook. In reality, a blanket statement is dangerous because of the diverse climates covered in the United States. Local input based upon expertise would be best. If the goal is to increase irrigation efficiency which can be accomplished using new technology for controlling irrigation and assuming excellent irrigation management, then rainfall should be counted at least 50% if not more. This would then reduce the irrigation water requirement.

Suggested Change (or Language): Effective rainfall should be determined in a locally sensitive manner.

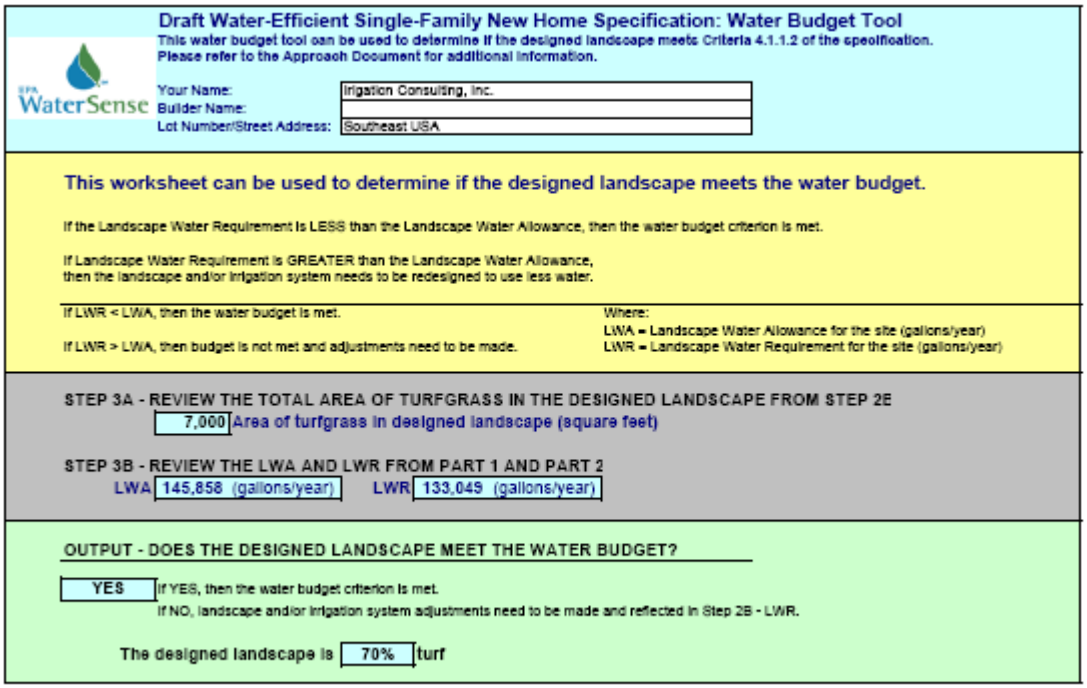
Topic: "Option 1 – Turf shall not exceed 40 percent of the landscapable area. Turf shall not be installed on slopes greater than 4:1."

Comment: Limiting the amount of turf and where it is installed does not in itself limit the amount water required by the landscape. Proper species selection, use and maintenance practices have more effect than quantity. Also, turf has some very good environmental uses.

Rationale: See the attached results page from the EPA Water Budget Tool that uses 70% cool season turf with fixed spray irrigation. It shows that the water requirement is less than the allowance. Additionally, turfgrass is used by many municipalities to serve as a natural filter for

water runoff as a means to reduce pollution of the groundwater. Many municipalities are taking the opposite approach of the proposed EPA
WaterSense program by utilizing turfgrass as a BMP for erosion control, filtering storm water etc. based on research funded by the EPA nonpoint source pollution program. These communities are requiring a certain percentage of land property be covered by turfgrass and landscape. An example of this is the Raleigh, NC, Zoning Case Z-53-08. In this proposal, the City of Raleigh would require any new residential construction to limit any impervious surface coverage (roofs, decks, pavements, driveways, etc.) to less than 25% of the total property. If impervious surfaces cover more than 24%, approved on-site stormwater controls must be installed. In this instance, Option 1 would not even be a viable option, and from our perspective the benefits of turfgrass outweigh the 40% and the 4:1 slope requirements.

Suggested Change (or Language): Remove this option and use the water budget method to determine the size and type of lawn area in the landscape.



Draft Water-Efficient Single-Family New Home Specification: Water Budget Tool

This water budget tool can be used to determine if the designed landscape meets Criteria 4.1.1.2 of the specification.
Please refer to the Approach Document for additional information.

EPA WaterSense

Your Name: Irrigation Consulting, Inc.
Builder Name:
Lot Number/Street Address: Southeast USA

This worksheet can be used to determine if the designed landscape meets the water budget.

If the Landscape Water Requirement is LESS than the Landscape Water Allowance, then the water budget criterion is met.

If Landscape Water Requirement is GREATER than the Landscape Water Allowance, then the landscape and/or irrigation system needs to be redesigned to use less water.

If LWR < LWA, then the water budget is met.

If LWR > LWA, then budget is not met and adjustments need to be made.

Where:
LWA = Landscape Water Allowance for the site (gallons/year)
LWR = Landscape Water Requirement for the site (gallons/year)

STEP 3A - REVIEW THE TOTAL AREA OF TURFGRASS IN THE DESIGNED LANDSCAPE FROM STEP 2E

7,000 Area of turfgrass in designed landscape (square feet)

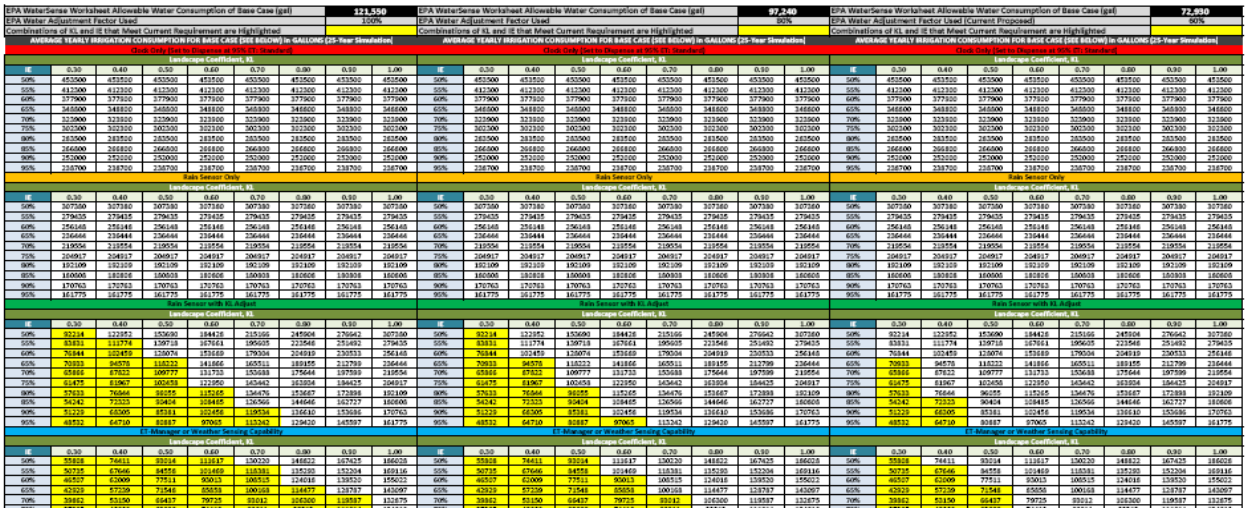
STEP 3B - REVIEW THE LWA AND LWR FROM PART 1 AND PART 2

LWA 145,858 (gallons/year) LWR 133,045 (gallons/year)

OUTPUT - DOES THE DESIGNED LANDSCAPE MEET THE WATER BUDGET?

YES If YES, then the water budget criterion is met.
If NO, landscape and/or irrigation system adjustments need to be made and reflected in Step 2B - LWR.

The designed landscape is 70% turf



EPA WaterSense Worksheet Allowable Water Consumption of Base Case (gal)	121,550
EPA Water Adjustment Factor Used	100%

Combinations of KL and IE that Meet Current Requirement are Highlighted

AVERAGE ANNUAL IRRIGATION CONSUMPTION FOR THIS CASE (SEE BELOW) in GALLONS (25-Year Simulation)

Clock Only (Set to Dispense at 90% ET; Standard)

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	453500	453500	453500	453500	453500	453500	453500	453500
55%	412300	412300	412300	412300	412300	412300	412300	412300
60%	377900	377900	377900	377900	377900	377900	377900	377900
65%	348800	348800	348800	348800	348800	348800	348800	348800
70%	323900	323900	323900	323900	323900	323900	323900	323900
75%	302300	302300	302300	302300	302300	302300	302300	302300
80%	283500	283500	283500	283500	283500	283500	283500	283500
85%	266800	266800	266800	266800	266800	266800	266800	266800
90%	252000	252000	252000	252000	252000	252000	252000	252000
95%	238700	238700	238700	238700	238700	238700	238700	238700

Rain Sensor Only

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	307300	307380	307380	307380	307380	307380	307380	307380
55%	279435	279435	279435	279435	279435	279435	279435	279435
60%	256148	256148	256148	256148	256148	256148	256148	256148
65%	236444	236444	236444	236444	236444	236444	236444	236444
70%	219554	219554	219554	219554	219554	219554	219554	219554
75%	204917	204917	204917	204917	204917	204917	204917	204917
80%	192109	192109	192109	192109	192109	192109	192109	192109
85%	180608	180608	180608	180608	180608	180608	180608	180608
90%	170763	170763	170763	170763	170763	170763	170763	170763
95%	161775	161775	161775	161775	161775	161775	161775	161775

Rain Sensor with KL Adjust

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	92214	122952	153690	184428	215166	245904	276642	307380
55%	83831	111774	139718	167661	195605	223548	251492	279435
60%	76844	102459	128074	153689	179304	204919	230533	256148
65%	70933	94578	118222	141866	165511	189155	212799	236444
70%	65866	87822	109777	131733	153688	175644	197599	219554
75%	61475	81967	102458	122950	143442	163934	184425	204917
80%	57633	76844	96055	115265	134476	153687	172898	192109
85%	54242	72323	90404	108485	126566	144646	162727	180808
90%	51229	68305	85381	102456	119534	136610	153686	170763
95%	48532	64710	80887	97065	113242	129420	145597	161775

ET Manager or Weather Sensing Capability

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	55818	74411	93014	111617	130220	148822	167425	186028
55%	50735	67646	84558	101469	118381	135293	152204	169116
60%	46507	62009	77511	93013	108515	124018	139520	155022
65%	42929	57239	71548	85858	100168	114477	128787	143097
70%	39862	53150	66437	79725	93012	106300	119587	132875

EPA WaterSense Worksheet Allowable Water Consumption of Base Case (gal)	97,240
EPA Water Adjustment Factor Used	80%

Combinations of KL and IE that Meet Current Requirement are Highlighted

AVERAGE ANNUAL IRRIGATION CONSUMPTION FOR THIS CASE (SEE BELOW) in GALLONS (25-Year Simulation)

Clock Only (Set to Dispense at 90% ET; Standard)

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	453500	453500	453500	453500	453500	453500	453500	453500
55%	412300	412300	412300	412300	412300	412300	412300	412300
60%	377900	377900	377900	377900	377900	377900	377900	377900
65%	348800	348800	348800	348800	348800	348800	348800	348800
70%	323900	323900	323900	323900	323900	323900	323900	323900
75%	302300	302300	302300	302300	302300	302300	302300	302300
80%	283500	283500	283500	283500	283500	283500	283500	283500
85%	266800	266800	266800	266800	266800	266800	266800	266800
90%	252000	252000	252000	252000	252000	252000	252000	252000
95%	238700	238700	238700	238700	238700	238700	238700	238700

Rain Sensor Only

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	307300	307380	307380	307380	307380	307380	307380	307380
55%	279435	279435	279435	279435	279435	279435	279435	279435
60%	256148	256148	256148	256148	256148	256148	256148	256148
65%	236444	236444	236444	236444	236444	236444	236444	236444
70%	219554	219554	219554	219554	219554	219554	219554	219554
75%	204917	204917	204917	204917	204917	204917	204917	204917
80%	192109	192109	192109	192109	192109	192109	192109	192109
85%	180608	180608	180608	180608	180608	180608	180608	180608
90%	170763	170763	170763	170763	170763	170763	170763	170763
95%	161775	161775	161775	161775	161775	161775	161775	161775

Rain Sensor with KL Adjust

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	92214	122952	153690	184428	215166	245904	276642	307380
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75%	61475	81967	102458	122950	143442	163934	184425	204917
80%	57633	76844	96055	115265	134476	153687	172898	192109
85%	54242	72323	90404	108485	126566	144646	162727	180808
90%	51229	68305	85381	102456	119534	136610	153686	170763
95%	48532	64710	80887	97065	113242	129420	145597	161775

ET Manager or Weather Sensing Capability

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	55818	74411	93014	111617	130220	148822	167425	186028
55%	50735	67646	84558	101469	118381	135293	152204	169116
60%	46507	62009	77511	93013	108515	124018	139520	155022
65%	42929	57239	71548	85858	100168	114477	128787	143097
70%	39862	53150	66437	79725	93012	106300	119587	132875

EPA WaterSense Worksheet Allowable Water Consumption of Base Case (gal)	72,930
EPA Water Adjustment Factor Used (Current Proposed)	60%

Combinations of KL and IE that Meet Current Requirement are Highlighted

AVERAGE ANNUAL IRRIGATION CONSUMPTION FOR THIS CASE (SEE BELOW) in GALLONS (25-Year Simulation)

Clock Only (Set to Dispense at 90% ET; Standard)

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	453500	453500	453500	453500	453500	453500	453500	453500
55%	412300	412300	412300	412300	412300	412300	412300	412300
60%	377900	377900	377900	377900	377900	377900	377900	377900
65%	348800	348800	348800	348800	348800	348800	348800	348800
70%	323900	323900	323900	323900	323900	323900	323900	323900
75%	302300	302300	302300	302300	302300	302300	302300	302300
80%	283500	283500	283500	283500	283500	283500	283500	283500
85%	266800	266800	266800	266800	266800	266800	266800	266800
90%	252000	252000	252000	252000	252000	252000	252000	252000
95%	238700	238700	238700	238700	238700	238700	238700	238700

Rain Sensor Only

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	307300	307380	307380	307380	307380	307380	307380	307380
55%	279435	279435	279435	279435	279435	279435	279435	279435
60%	256148	256148	256148	256148	256148	256148	256148	256148
65%	236444	236444	236444	236444	236444	236444	236444	236444
70%	219554	219554	219554	219554	219554	219554	219554	219554
75%	204917	204917	204917	204917	204917	204917	204917	204917
80%	192109	192109	192109	192109	192109	192109	192109	192109
85%	180608	180608	180608	180608	180608	180608	180608	180608
90%	170763	170763	170763	170763	170763	170763	170763	170763
95%	161775	161775	161775	161775	161775	161775	161775	161775

Rain Sensor with KL Adjust

Landscape Coefficient, KL

IE	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
50%	92214	122952	153690	184428	215166	245904	276642	307380
55%	83831	111774	139718	167661	195605	223548	251492	279435
60%	76844	102459	128074	153689	179304	204919	230533	256148
65%	70933	94578	118222	141866	165511	189155	212799	236444
70%	65866	87822	109777	131733	153688	175644	197599	219554
75%	61475	81967	102458	122950	143442	163934	184425	204917
80%	57633	76844	96055	115265	134476	153687	172898	192109
85%	54242	72323	90404	108485	126566	144646	162727	180808
90%	51229	68305	85381	102456	119534	136610	153686	170763
95%	48532	64710	80887	97065	113242	129420	145597	161775

ET Manager or Weather Sensing Capability

Landscape Coefficient, KL

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55%	50735	67646	84558	101469	118381	135293	152204	169116
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65%	42929	57239	71548	85858	100168	114477	128787	143097
70%	39862	53150	66437	79725	93012	106300	119587	132875

Thank you,
Mike

Michael G. Temple, LEED AP, CID, CIC, CLIA, CGIA n Project Manager
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NC Office n P.O. Box 387, Waxhaw, NC, 28173
Phone (704) 843-3688 n Fax (704) 843-3511 n Mobile (704) 913-4792

Commenter: Timothy Malooly
Affiliation: EPA WaterSense Partner, IA Member, Irrigation professional
Comment Date: December 19, 2008

WaterSense Team,

Attached you will find my comments on the Water Budget calculator and the 40% turf limit within the Model Homes Spec.

I am generally in favor of a responsibly assembled, science and best practices-based approach to reduced and/or more efficient use of outdoor water. An adjusted water budget calculator may help serve that purpose.

Please let me know if I may be of service regarding these comments.

Topic: 0.43 Plant factor embedded within the current EPA Water Budget Calculator

Comment: Inserting a predetermined, non-science-based national plant factor is irresponsible and ignores important factors including but not limited to regional climate and plant material variations throughout the United States.

Rationale: Each state has climate and plant material unique to that land area. A single plant factor imposed upon the entire country will necessarily have unintended negative consequences, including waste of outdoor water in some areas of the USA.

Suggested Change (or Language): Create a 50 state plant factor chart for the user to insert the plant factor appropriate to that state. Consult the Green Industry for official/workable input and see submittal by the Irrigation Association related this comment period/topic. I also support IA comments attached to this comment (pages 2-6 below).

Topic: 40% Turf alternate within the New Homes Model Spec

Comment: 40% Turf alternate is non-workable and will likely undermine the better benefit of a properly assembled Water Budget calculator.

Rationale: 40% turf on a property is a non-science, emotion-based response to a desire to reduce outdoor water use and does not address the root causes of water waste. Efficient irrigation practices, proper soil preparation and education related to proper landscape maintenance combined with water pricing practices such as tiered water pricing will address root causes of water waste, enable informed decision-making and allow free market decisions to take place.

Suggested Change (or Language): Remove the 40% limit on turf and support Green Industry Best Practices as part of a properly installed landscape. If professionals and consumers are compelled to install and maintain landscapes based on Best Practices, landscapes will necessarily be more expensive to install and will necessarily become “smaller”, including less turf. Further, properly installed landscapes will require fewer resources, including less outdoor water.

Work with water purveyors to introduce tiered water rates and other workable, market-based mechanisms to enable informed choice while preserving the right of the public to choose.

I also support IA comments attached to this comment

Cordially,

Tim
Timothy R. Malooly CID, CLIA, CIC **2008 EPA WaterSense Partner of the Year!**
President
Irrigation By Design, Inc.
14070 23rd AvenueNorth
Plymouth, Minnesota 55447
763-559-7771

Commenter: T. Kirk Hunter
Affiliation: Executive Director, Turfgrass Producers International & The Lawn Institute
Comment Date: December 19, 2008

Topic: WaterSense - Water-Efficient Single-Family New Home Specification

Comments:

Mr. John Flowers
U.S. Environmental Protection Agency
Office of Wastewater Management (4204M)
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Dear Mr. Flowers,

On behalf of the members of the Turfgrass Producers International (TPI) and The Lawn Institute, thank you for allowing us an opportunity to comment on the WaterSense - Water-Efficient Single-Family New Home Specification and the water budget calculator. We support the EPA's efforts to address water conservation. Sustainable water management must be instituted for the well-being of our society and environment. We feel that if properly designed and implemented, the WaterSense program could be of vital importance as we strive to conserve and reduce water use in our homes.

As the executive director of TPI, I need to express our collective concerns with the WaterSense draft specifications as they relate to the landscape. There are numerous consequences to implementation of the draft specifications as they are currently written. We believe that the 40% turf limitation does not achieve the intended goals of WaterSense. There are inherent values of turfgrass, if responsibly installed and maintained properly. Turfgrass should not be undervalued as part of the WaterSense program and we urge the EPA WaterSense Program to reevaluate the 40% and slope ratio requirements. Remove "Section 4.1 Landscape - Option 1 – Turf shall not exceed 40% of the landscapable area. Turf shall not be installed on slopes greater than 4:1" and use correct calculations for reference evapotranspiration for the water budget in "Option 2." We feel the water budget (Option 2) will be the best environmental and economic option to ensure the success of the EPA's WaterSense program. Reference Evapotranspiration rates need to be determined on a local or regional basis where plant materials and climate factors are very similar and local experts know and understand plant water requirements. Plants interact with their environment and respond to how they are maintained; therefore, what is applicable to one geographical area may not be at all applicable to another area. Since the ultimate goal of Water Sense is to reduce water use, this fact cannot be emphasized enough.

We have spoken to many research scientists within the green industry, and they are quite concerned with the ET plant factor of 0.43 and the consequences of instituting such a restriction. These scientists have the following questions:

1. How exactly was the 0.43 ET plant factor derived? Is it based on work(s) published in the scientific, peer-reviewed literature?

2. What are the reasonable expectations of the 0.43 ET plant factor being employed across the entire U.S. regarding plant selection and use? Is it feasible to impose the same ET plant factor across the vastly different environments and climatic regions found in the U.S. ?

3. Are the other, not-necessarily-intended consequences of restricting plant selection and use being considered in proposing the 0.43 ET plant factor?

The basis for these questions does arise from the scientific, peer-reviewed literature. A review of the literature clearly indicates that implementation of the 0.43 ET plant factor will effectively eliminate the use of currently available cool-season grasses in new home lawns seeking the WaterSense label (e.g., Kentucky bluegrasses, tall fescues, perennial ryegrasses). It is even more concerning that we do not currently have acceptable replacements for these species such that any permanent turf could be cultured by homeowners with or without irrigation. Several studies have investigated appropriate ET plant factors for turfgrass species. None of these studies supports or even proposes consideration of an ET plant factor less than 0.65. We request to see all reference materials, consultants' reports, meeting minutes and any other relevant information used to develop a plant factor of 0.43. Additionally, we would like to see a list of stakeholders and subject matter experts who have participated in the development of this information in any way.

There is a great deal of turfgrass research conducted in this country. We have good estimates on water use, conservation and efficiency and we are working to implement these practices and strategies. Many of the strategies involve choosing the proper grass species, using the appropriate management, setting the irrigation controller properly, etc. We can already document significant water savings just by using proven strategies. Turfgrass can remain; it just needs to be managed more efficiently.

There are between 50 and 100 million home lawns in the USA. A large percentage of these lawns are located in areas where cool-season grasses are well adapted. Clearly, many people love their lawns, they enjoy the activity on the lawn, the beauty, the cooling effect, the water absorbing/ cleansing aspect, etc. Lawns are a perfect place for the dogs to play, the kids and family to recreate, barbeque, etc. However, since the ET rate of warm-season grasses and cool-season grasses is generally 0.6 and 0.8, respectively, this proposed water budget formula using 0.43 as an average landscape plant factor will virtually eliminate lawns around Water Sense homes. The lawns that many people desire will not be an option, or will be severely limited. In addition, there are many environmental benefits of turfgrass that have been seemingly disregarded, namely heat reduction, erosion control, dust abatement, and water filtering.

Many local governments and municipalities rely on turfgrass to serve as a natural filter for water runoff, thus resulting in less pollution of the groundwater. In fact, many municipalities are taking the opposite approach of the proposed EPA WaterSense program by utilizing turfgrass as a BMP for erosion control, filtering storm water etc based on research funded by the EPA non-point source pollution program. These communities are requiring a certain percentage of land property be covered by turfgrass and landscape limiting any impervious surface coverage (roofs, decks, pavements, driveways, etc.) to less than 25% of the total property.

Conclusion:

Plants don't waste water, people do! Turfgrass sod producers feel that conservation and sustainability are of vital importance to our nation and to the world. With proper specifications, we can achieve these goals and the goals of the WaterSense program.

The proposed water calculator may well exceed the WaterSense Program's goals at the expense of an environmentally-beneficial landscape. We encourage the EPA to utilize specifications based on scientific data with consideration for the overall environmental impact and consideration for the many benefits that landscapes and green spaces provide. A water budget calculator can be a very useful tool when appropriate values are used; however, over simplification or a "one-size-fits-all" approach would be detrimental to the adoption and success of the WaterSense program. If designed and implemented properly, WaterSense could be a successful program that the green industry can endorse and support.

We thank the EPA for considering our comments when developing the next draft of the WaterSense - Water-Efficient Single-Family New Home Specification. Please contact me if you have any questions or would like additional information. Again, thank you for the opportunity to provide comments.

T. Kirk Hunter
Executive Director
Turfgrass Producers International & The Lawn Institute

Commenter: Modan K. Das, Ph.D.; Dr. Arden Baltensperger
Affiliation: Seeds West, Inc
Comment Date: December 19, 2008

To Whom It May Concern:

This letter is regarding your decision to use an ET 0.43 plant factor for your water budget calculation in the Water Sense Program.

We are concerned about this because any turfgrass would require a higher ET than 0.43 for their growth. ET rates of most warm-season grasses range from 6 to 7 mm/day while ET rates of most cool season grasses is higher than 10 mm/day.

We know that as a nation we are blessed with a good supply of water, but its distribution is less than equitable. We are also aware that portions of some arid-region states needing to ration water. We understand that there is a need to use our water resource wisely. We know especially among the turfgrass scientists, many are working on this direction to reduce water use by turfgrasses. In this effort turfgrass breeders are developing varieties with drought tolerance so that less water is needed to maintain these varieties. Breeders are also developing turfgrass varieties with salt tolerance so that reclaimed water can be used to irrigate these varieties of turfgrasses. Similarly, agronomists are working to find what cultural practices to turfgrasses would make them more efficient users of water. In the past several years turfgrass scientists have made excellent progress in this area of research, however, at this point no varieties or cultural practices exist that would allow an ET of 0.43 for the growth and maintenance of turfgrasses.

We feel that the Water Sense program is an excellent effort to use our water resource wisely. However, it is also important that proper consideration for the intact lifestyle of the citizens should be given. It will be necessary at this point to relax the ET 0.43 plant factor so that people can still have turfgrasses on their lawns.

Dr. Arden Baltensperger
Seeds West, Inc
1807 Half Moon Dr.
Las Cruces, NM 88005
Phone: 575-524-2785

Dr. Modan Das
Seeds West, Inc.
37860 Smith-Enke Rd.
Maricopa, AZ 85238
Phone: 520-381-2262

Commenter: Brenda O'Brien
Affiliation: Green Industries of Colorado (GreenCO*)
Comment Date: December 19, 2008

Attached is feedback regarding the EPA Water Budget Calculator Tool. Please contact me with any questions or concerns. GreenCO is interested in helping EPA WaterSense rollout a tool that works both regionally and nationally.

Topic: EPA's use of a "standardized" crop coefficient of 0.43.

Comment: GreenCO and its members across Colorado are committed to efficient irrigation and sound water use. Existing horticultural research cannot support the justification in using 0.43 as an acceptable or realistic crop coefficient for planted landscapes nationwide. Crop coefficients should be determined regionally, not nationally and depend on a variety of factors. As such, we adamantly oppose the use of a standardized crop coefficient.

Rationale:
A Crop Coefficient Study of Plant Water Requirement Estimates was published in GreenCO's Best Management Practices for the Conservation and Protection of Water Resources in Colorado by GreenCO and Colorado State University. The study documented the water needs of the landscape and ranked each species accordingly. Crop coefficients for Colorado are defined as the amount of water a species needs compared to a standard crop. For ornamental horticulture, this standard crop is cool-season turf, specifically Kentucky bluegrass. The evapotranspiration rate (the combined water loss by transpiration and from evaporation from soil and plant surfaces) for Kentucky bluegrass is known as reference ET, or ETo. Each species' crop coefficient (Kc) is a percentage of ETo. The study revealed that water requirements vary quite significantly in the state of Colorado alone. For example, water use estimates will be significantly higher in areas such as Pueblo and Grand Junction and significantly lower in mountainous areas such as Steamboat Springs and Vail. Experts in horticulture from around our region, using their best professional opinions regarding crop coefficients, would advise against attempting to standardize a percentage of ETo for use in a national campaign. Using a standardized factor will have significant negative impacts on landscapes nationwide. A robust water budget should properly account for the plant's Kc and adjust the irrigation accordingly throughout the growing season. In landscapes, the demand of water by plants on a site is influenced by the site's openness and exposure, the soil type, the extent and nature of surface covering, wind (frequency, duration, & speed), method of irrigation, as well as the degree of canopy closure. A copy of the Crop Coefficient Study of Plant Water Requirement Estimates is attached for your review.
http://www.greenco.org/bmp_downloads/BMP_Manual_Appendices.pdf

Suggested Change (or Language): Remove the use of a standardized crop coefficient and refer to regional horticultural recommendations.

Topic: "Option 1 – Turf shall not exceed 40 percent of the landscapable area. Turf shall not be installed on slopes greater than 4:1."

Comment: GreenCO has been a longtime proponent of "right turf, right place." Replacing turf with other plant material does not mean the landscape will be more water efficient. The focus

should shift to the seven principles of Xeriscape, one being “practical turf areas.” All the principles of Xeriscape need to operate in tandem for a landscape to be water efficient.

Rationale: Per GreenCO’s Turf Management BMP the goal is to plan, properly install and maintain practical turf areas. Healthy, properly maintained turf can reduce stormwater runoff rates and volumes, sediment and pollutant loads, reduce heat island effects and provide other environmental benefits. 1. Select turfgrass species that will best meet the requirements and purposes of the lawn area. 2. Areas that receive wear and tear will require sod-forming species such as Kentucky bluegrass. 3. Areas that are difficult to mow, or are only for visual appeal, may be appropriate for slower-growing, lower maintenance, lower-water-requiring species such as buffalograss or blue grama. Soil conditions, such as soluble salt level, should also be taken into consideration when selecting turfgrass species. 4. Consider turf alternatives for some areas (e.g., narrow strips, hard-to-water areas, steep slopes, low-usage areas) such as native or low-water-use plantings, patios, decks or mulches or low-water turfgrasses, when these alternatives meet the needs of the area and do not create a negative environmental impact. When considering lower-water-requiring alternatives to Kentucky bluegrass, base turf selection on the results of a soil analysis. In sandy soils in particular, some alternative species do not perform as well. 5. When possible, avoid placing turf in long narrow areas, on steep slopes, hard-to-maintain corners and isolated islands due to difficult mowing and irrigation challenges. Turf is better suited to larger, relatively flat areas. 6. Good surface drainage can be achieved by sloping the lawn away from buildings and properly grading low areas and steep slopes to prevent future trouble spots. Where appropriate, grade to allow turf to take advantage of runoff from impervious surfaces such as driveways and roofs.

Suggested Change (or Language): Remove Option 1 and focus on water use efficiency in the landscape overall. Removing turf and adding low-water use plants does not equal a water efficient landscape. Some type of plant material is likely to replace the turf and will require supplemental irrigation as well. Again, stress the seven principles of Xeriscape.

**GreenCO is an umbrella trade association of eight-landscape related organizations in Colorado. The Associated Landscape Contractors of Colorado, The Colorado Chapter of the American Society of Landscape Architecture, Colorado Nursery and Greenhouse Association, Colorado Association of Lawn Care Professionals, Garden Centers of Colorado, International Society of Arboriculture, Rocky Mountain Chapter, Rocky Mountain Golf Course Superintendants’ Association and Rocky Mountain Sod Growers Association.*

Regards,
Brenda O'Brien
GreenCO Project Manager
Phone: 303.973.4026
Fax: 303.973.2263
www.greenco.org

Commenter: Carol M. Ward-Morris
Affiliation: Arizona Municipal Water Users Association
Comment Date: December 19, 2008

Mr. John Flowers
USEPA Headquarters
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Mail Code: 4204M
Washington, D.C. 20460

RE: U.S. Environmental Protection Agency's WaterSense Draft Landscape Water Budget Tool

Dear Mr. Flowers:

The Arizona Municipal Water Users Association (AMWUA) is a voluntary association of the municipalities of Avondale, Chandler, Gilbert, Glendale, Goodyear, Mesa, Peoria, Phoenix, Scottsdale, and Tempe. On behalf of the water conservation staffs of the member municipalities, working together as the AMWUA Regional Water Conservation Committee, I submit the following comments regarding the U.S. Environmental Protection Agency's WaterSense Draft Landscape Water Budget Tool.

AMWUA supports the EPA's efforts to encourage the use of water efficient landscapes. This is especially critical in the southwestern states where irrigation is most often a necessary in residential landscaping due to limited precipitation. We appreciate the work that has gone into the development of this tool and the opportunity to provide comments.

We understand that the current comment period specifically focuses on the budgeting tool, but we feel it is important to first reiterate and emphasize some of the comments that were made by others regarding the labeling program.

AMWUA recognizes that the use of turf in a landscape is an acceptable choice; however, the principles of Xeriscape require turf areas be appropriately sized and located. The amount of turfgrass that is appropriate varies by region. Limiting turfgrass to 40 percent of the landscape will very likely initiate a positive change in practices in many areas of the country, but it could negatively impact practices in areas such as ours, where considerably less turf area is acceptable. One of our member municipalities, for example, has in place an ordinance that restricts model homes to no more than 20 percent water-intensive landscaping.

In a similar vein, high-water-use-plants can use as much or more water than turf. Under the current draft guidelines, a landscape in the Phoenix area consisting of 39 percent turf and 61 percent citrus trees would still qualify for a WaterSense certified home under option number one. Taken to the extreme, a landscape could consist entirely of citrus trees and still be certified under this criteria, while requiring significant quantities of water. By our standards, neither can be considered water-efficient.

AMWUA recognizes that other regions will not accept, nor should they, the more stringent limitations on the amount of turf that we would consider appropriate in our region. Due to lower

ETo and higher annual precipitation, turf is much more sustainable in northeastern Ohio than it is in the low desert. Perhaps developing regional subsets for the budgeting tool could provide the solution to the issues created by climate and water supply differences across the country.

The water budgeting option could be viable, but as it is currently written it allows for even more water-intensive landscape than option number one does. The Phoenix area average Reference ETo rate is 62.9 inches per year, as determined from a four-year average of the Phoenix Encanto and Greenway AZMET weather stations using the new Irrigation Association standard Penman-Monteith method. (Past data have shown the ETo variations in the Arizona low deserts are minimal and a four-year average is acceptable.) The average annual precipitation of 8.2 inches was obtained from the NOAA climate data. Using this regional data, the budgeting tool would allow a landscape to be 79 percent planted in warm season turfgrass, with the remainder begin a non-planted area. This cannot be considered water-efficient or sustainable in our region. The public, and most certainly water conservation professionals, would question the value of a certification that would allow for so much turf in our region.

We understand that it is difficult to balance the need for customization in the budgeting tool while maintaining its integrity. It has not been made clear who will be charged with ensuring that the data sets for precipitation and ETo in the different areas are correct and uniform. Userss with a basic knowledge of water management could easily manipulate the tool by simply increasing the ETo and/or increasing the annual precipitation, allowing a landscape to have an even higher percentage of water-intensive plant material than in the aforementioned example and still qualify for the EPA label. This would further erode the credibility of the program.

Some direction is needed regarding how to enter the square footage of the planted areas to ensure the input is based on the mature canopy size of the plant material; otherwise, the calculation for fifty citrus trees with a three-foot diameter canopy each at the time of planting would result in 353 square feet of plant material; at an average mature diameter of twenty feet, these same trees would cover an area of 15,700 square feet.

There area several areas that need to be addressed concerning the listed crop coefficients.

1. The lowest provided crop coefficient is .5 – no crop coefficient is provided for low-water-use plants and native plants. While there is the capability to create custom palettes and coefficients that allows a work-around for the lack of lower coefficients, this, too, is problematic. There is no scientific, empirical data available for the coefficients of the different plants (unlike turf, which has been well researched). The plant coefficients that would be used will therefore be debatable. Without empirical data, how can arguments for unreasonable coefficients be refuted? We would strongly support research to resolve this issue.

2. Although it is unclear due to the cell protection in the worksheets, it appears that the crop coefficients being used are static throughout the year. This especially creates a problem with the water use calculations for climates that only have spring through fall as an active growing season. Residents in northeastern Ohio are most likely not watering their lawns when they are covered with two feet of snow. Even in the desert southwest crop coefficients are not static across the year. How will this be addressed? Will the monthly coefficients then be listed?

3. Related to the previous point – Bermuda, a warm season turfgrass, is typically used for lawns in the low deserts. If lawns are allowed to go dormant in the winter months, the crop coefficients drop dramatically; however, it is a very common practice to “overseed” these lawns with a cool season turfgrass, predominately perennial ryegrass, for the months of October through April. This in effect raises the crop coefficient from the summer months when the Bermuda is active to a higher one for the cool season winter ryegrass. Will the coefficients in the spreadsheets be adjusted to reflect these circumstances? Because the potential for overseeding exists and is often practiced, it should be built into the budget, with the appropriate monthly crop coefficients in place. These points are another indication of the need for regional subsets.

In areas with higher normal annual precipitation rates, irrigation systems should be considered as supplemental water, and taking into account a usable amount of rainfall would be acceptable. In the low desert, irrigation systems are often a necessity. There is limited rainfall in the desert and a percentage of that precipitation certainly usable; however, water budgets in our area typically do not include rainfall. Rainfall should be responded to, but proper system design requires it to be able to meet the water requirements while ignoring the potential for rainfall.

AMWUA appreciates and encourages the goal of increasing irrigation efficiencies; however, the listed efficiencies of the different types of systems in the budgeting tool are not realistic based on current technologies. In a perfect system, as evaluated in the Hyperspace of software from CIT, a fixed pattern spray system would result in a distribution uniformity of 63 percent. This was achieved with 15-foot spacing. The tests are executed at zero wind and exactly 30PSI – the spray head manufacturer’s specification for the correct operating pressure. Although emerging nozzle technology is improving, and will continue to improve, the vast majority of these systems utilize standard nozzle technologies. If 63 percent distribution uniformity is the best that can be achieved inside a building with zero wind a perfect pressure and perfect spacing, how can we expect them to perform better in real landscapes? This example of fixed pattern nozzle technology carries over to all the other types of systems listed, including the pressure compensated drip systems. It is unlikely that even the coefficient of variation in the manufacturing process would make 95% uniformity unobtainable, right from the factory floor. How will these systems perform better than that, once they are installed? While it is admirable to encourage the best efficiencies, we cannot support using water budgets based on unrealistic and currently unobtainable distribution uniformities.

Again, we appreciate the opportunity to provide comments.

Sincerely,
Carol M. Ward-Morris
Program Coordinator
Regional Water Conservation Programs

Commenter: Edward J. Klass
Affiliation: Southern Sprinkler Systems, LLC
Comment Date: December 19, 2008

Dear EPA WaterSense and ERG,

I write in support of the Irrigation Association's position and comments on the WaterSense budget tool and the WaterSense for Homes specifications. We urge EPA to give serious consideration to the comments provided by the Irrigation Association and encourage EPA to make every effort to advance a program that the irrigation industry can fully support.

Respectfully,

Edward J. Klaas, II, CLIA, CGIA
Owner/Vice President – Business & Legal Affairs
Southern Sprinkler Systems, LLC
President – Georgia Irrigation Association
GIA Board Representative – Georgia Urban Agriculture Council
Vice Chair – Irrigation Association Contractor Common Interest Group
1180 North Coleman Road
Roswell, GA 30075-3404
Office (678) 461-7922
Fax (678) 461-7921
Mobile (770) 309-7032

Commenter: Eric Ofstedahl, CIC
Affiliation: Member – Irrigation Association; Member – Minnesota Landscape & Nursery Association; Irrigation Manager – Horticulture Services, LLC, Scandia, MN
Comment Date: December 19, 2008

Please review the attached comments that are intended to be constructive feedback regarding proposed irrigation guide lines.

Topic: Proposed Water Budget Calculator for new construction

Comment: The "landscape coefficient of 0.43" in the proposed water budget calculator is an unfair "one size fits all" blanket that does not take into account differences of climate across various regions of the country. We all want to save water, but we need to start from a scientifically sound and realistic basis.

Rationale: Having a landscape coefficient of 0.43 is a bit like mandating that all new light bulbs can only be produced at 25 watts max, even though there are legitimate times when 75 watts are needed. In this analogy, someone could still come up with 75 watts by simply adding more 25 watt fixtures.

In a similar fashion, a homeowner with an irrigation system designed around a 0.43 coefficient might very well pull out a garden hose to manually add water to make up for a built in deficiency. In other words, an unrealistic landscape coefficient may open the door to unintended side affects that could (ironically) short circuit what the Water Sense program is about – saving water!

Suggested Change (or Language): A landscape coefficient of 0.80 is realistic as a guideline and avoids the water wasting, "garden hose" temptation just mentioned.

Topic: 40% max for turf area in new landscapes

Comment: Many municipalities already have higher water rates for those who consume water above a certain level. This seems like a better approach, since the realities of economic "pain" for higher level consumers will naturally curb their consumption.

Rationale:
Suggested Change (or Language): Drop the 40% turf guide line altogether.

Sincerely,
Eric Ofstedahl, CIC
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Commenter: Rick Deziel Jr.,
Affiliation:
Comment Date: December 22, 2008

It would be a nice gesture to allow a time extension for replies on this topic. Please consider it. Thank you. Rick Deziel Jr.,

Commenter: Ray Mims
Affiliation: Sustainable Sites Initiative and Conservation Horticulture
Comment Date: December 19, 2008

Topic: Baseline establishment for water reduction calculation

Comment: The water reduction goal of 40% from high initial "baseline" is seems like it is not enough. Outside of midatlantic 100% cool-season turf is not a realistic, and sets an unreasonably high level of water use for the baseline from which to assess your "reduced" use.

Rationale: 100% cool-season turf is not a realistic baseline for most projects, and sets an unreasonably high level of water use for the baseline from which to assess your "reduced" use.

Suggested Change (or Language): Require that baseline be set from a realistic baseline for their region. This will likely be less than 100% turf, and in many areas of the country, would consider warm season grasses rather than cool season grasses. The lowering of the use of water should be the goal - and designing or changing a landscape to fit this is a necessary requirement.

Topic: Target reduction amount for water reduction calculation

Comment: Reduction of 40% from the baseline is lower than LEED NC and than what the Sustainable Sites Initiative (Draft Guidelines). Both require 50% reduction (for credit).

Rationale: LEED NC requires 50% reduction for a credit, and the Sustainable Sites Initiative requires 50% reduction from baseline as a prerequisite and elimination of potable water use is for credit.

Suggested Change (or Language): It is important to have consistent goals from various tools so we recommend that the minimum target reduction should be increased to 50% reduction.

Topic: Provide Credit for utilizing non-potable water sources

Comment: Provide credit for reduction of potable water use through the substation of non-potable sources such as greywater and captured rainwater.

Rationale: The sustainable use of water in any landscape has to be a significant reduction in ANY **potable water** use. Diverting water that is typically considered waste (greywater or stormwater) should be encouraged (and required)

Suggested Change (or Language): Recognition/Credit should be given to strategies which substitute non-potable water sources for potable water so long as the total amount of potable water used is less than the target amount (based on % reduction from the baseline).

Topic: Concerns with theoretical water use by various plant types as a proportion of local Evapotranspiration.

Comment: It appears that water use listed for shrub, turf, tree, etc… are not accurate. There doesn't seem to be accountability to have actual water use fall within the estimated amounts.

Rationale: While there is definitely a correlation between plant form and water use, there is a wide variety of water needs between species with similar growth forms – especially regionally. Should there be credit for careful plant selection that reduces water use. The proposed does not punish (hold accountable) poor plant selection. There is no verification of the estimated water use as part of this program, so if a landscape was predicted to be water saving, but in fact actually used significantly more than the estimated amount of potable water, there would be no effect on the applicant.

Suggested Change (or Language): Provide a way to calculate the K_L value for a given species. If this cannot be done accurately on a species basis (even with low precision) then there is no little value beyond providing a "ballpark" estimate from this calculator. If this "ballpark" estimate is the most accurate that can be calculated, it must be verified though reporting of actual water use over the first 3 to 5 years after installation in order to have any rigor. Without it, the WaterSense designation will be completely meaningless and merely provide for greenwashing.

Merry Christmas!
Ray Mims

Ray Mims
Conservation Horticulture
United States Botanic Garden

Commenter: Craig Otto, CWCM-L, CLIA, CIC, CID, EPA WaterSense Partner
Affiliation: Irrigation Consultants & Control, Inc.
Comment Date: December 29, 2008

To Whom it may concern,

I strongly support the comments furnished by IA (copy attached) on the EPA Water Budget Tool.

Craig Otto
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Commenter: Bill Kabaker
Affiliation: Precise Landscape Water Conservation, Inc.
Comment Date: December 31, 2008

My general comment is that to improve acceptability compare your recommendations with current management practices. If there is too wide a gap between them, new regulations will be opposed, resistance will be counter productive to achieve long term goals. The wider the gap, regulations will be difficult to enforce, and more expensive.

Specific comments.

1. Irrigation serviced via separate water meter.

2. No areas less than 8 feet wide planted to turf without approved variance.

3. All (municipal)parkways planted to more compatible plant materials than turf.

4. All irrigation plans include drainage detail to eliminate/address run off. This will be difficult and expensive to enforce.

5. Only weather based controllers specified. Why do current recommendations omit any reference to "smart" controllers, when the majority of utility rebates center on their installation?

6. Would not recommend installing drip irrigation in turf areas. It is curious to me that your recommendations prefer drip systems, while all rebate programs do not include drip, indicating that utilities have are not convinced as to the efficacies of these systems.

Bill Kabaker
President
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