# Summary of WaterSense® Spray Sprinkler Nozzles Notice of Intent (NOI) Virtual Public Meeting

**December 14, 2022, 1:00 to 3:00 p.m. Eastern**

## 1. Meeting Summary

The U.S. Environmental Protection Agency (EPA) WaterSense program recently released the *Notice of Intent (NOI) to Develop a Draft Specification for Spray Sprinkler Nozzles*. EPA organized this meeting with stakeholders to describe the revised program and solicit feedback.

The main objectives for this meeting were as follows:

- Explain the research and findings about the product category.
- Answer questions about the material so that interested parties can provide more precise comments.
- Begin to gather information on how to fill data gaps or on additional information that may be available.
- Explain WaterSense's specification development process and next steps.
- Solicit feedback on the NOI from stakeholders.

A PDF of this presentation can be reviewed on the WaterSense website at https://www.epa.gov/system/files/documents/2023-01/ws-outdoor-spray-sprinkler-nozzles-NOI-webinar-slides.pdf. A full list of the attendees and presenters is provided in Appendix A. The presentation discussion and participant questions and comments are summarized below.

## 2. Introduction to WaterSense and Spray Sprinkler Nozzles Background

Stephanie Buckley of Eastern Research Group, Inc. (ERG), a WaterSense contractor, welcomed everyone to the meeting and noted that the presentation PDF would be posted on the public website following the webinar.

Stephanie Tanner of EPA shared the meeting purpose and webinar agenda. She noted that the proposed criteria to be discussed in the meeting can be changed and that EPA is interested in obtaining feedback. Ms. Tanner then provided an overview of WaterSense and WaterSense labeled outdoor products. She discussed the specification development process.

Joanna Kind of ERG described WaterSense's previous research on developing a specification for spray sprinkler nozzles. Ms. Kind explained that WaterSense is reconsidering a specification for spray sprinkler nozzles based on recent developments, such as rebate programs offered by water utilities, the publication of water savings studies, and developments in test methods to differentiate spray sprinkler nozzles.

## 3. WaterSense NOI and Outstanding Data Gaps

### Estimated Water Savings

Ms. Kind explained that WaterSense has estimated that high-efficiency spray (HES) sprinkler nozzles have the potential to use approximately 10 percent less water than standard spray nozzles, based on WaterSense's review of recent studies on real-world water savings. The average household could save approximately 2,400 gallons of water annually by replacing standard spray nozzles with HES sprinkler nozzles. Ms. Kind explained the assumptions that were included in this estimate.

Ms. Kind said that WaterSense is interested in feedback from stakeholders on whether the estimated percentage of outdoor water used for spray irrigation is accurate, or whether spray irrigation typically accounts for more than 50 percent of outdoor water use in residential properties.

Ms. Kind presented WaterSense's calculations that the average household could save approximately $32 annually per landscape by replacing standard spray nozzles with HES sprinkler nozzles. She discussed the payback period and the role of product warranties in calculating the payback period.

Ms. Kind said that WaterSense is interested in stakeholder feedback on spray sprinkler nozzle replacement behaviors. For example, do stakeholders typically replace nozzles after a designated period of time, or do they wait until they need to fix malfunctioning spray sprinkler nozzles in the event of a problem? Specifically, are there data indicating how long spray sprinkler nozzles are installed in the field before being replaced, and/or how long spray sprinkler nozzles typically last in residential settings?

### Scope

Ms. Kind began describing the scope of the NOI. She listed the three relevant industry standards that WaterSense identified and presented the definitions of sprinkler, sprinkler body, and nozzle from the American Society of Agricultural Biological Engineers (ASABE)/International Code Council (ICC) 802-2020 *Landscape Irrigation Sprinkler and Emitter Standard*. Ms. Kind showed a cross-section diagram of a spray sprinkler with the sprinkler body and nozzle labeled.

Ms. Kind shared the definitions of spray sprinkler body, rotor sprinkler body, and valve-in-head sprinkler body, as defined by ASABE/ICC 802-2020. She explained that since there was no definition for spray sprinkler nozzles in ASABE/ICC 802-2020, WaterSense developed its own proposed definition. She also shared the ASABE/ICC 802-2020 definition for multi-stream, multi-trajectory (MSMT) nozzles.

Ms. Kind said that WaterSense would like stakeholder input on its product category definition of "spray sprinkler nozzle."

*Participant Questions and Comments*

*Comment:* Generally speaking, the nozzles definitely outlast the warranty period.
*Response:* Ms. Kind explained that WaterSense intends to define the scope to include only nozzles intended for use in spray sprinklers. She showed photographs of the fan-like spray pattern from a standard sprinkler nozzle and the multiple streams emitted at various trajectories from an MSMT spray sprinkler nozzle.

Ms. Kind showed a diagram illustrating WaterSense's scope for the product category. The diagram shows different types of sprinklers and their components and delineates the items included in WaterSense's proposed scope—spray sprinkler nozzles, including standard and MSMT spray sprinkler nozzles. Ms. Kind noted that most spray sprinkler nozzles currently marked as "high-efficiency" are MSMT nozzles, but that manufacturers could develop other types of high-efficiency spray sprinkler nozzles in the future. As a result, WaterSense is using the phrase "HES sprinkler nozzle" to differentiate the products that WaterSense is considering labeling.

Ms. Kind summarized the product categories excluded from the scope of the NOI. She said that WaterSense would like stakeholder feedback on the intended scope of the specification.

*Participant Questions and Comments*

*Question:* When testing high-performance nozzles, did you use standard sprinkler bodies or pressure-regulated bodies?
*Response:* Dr. Michael Dukes, University of Florida, said that he used standard spray sprinkler bodies. He tested them across a range of pressures, including a regulated pressure.

*Question:* Aren't MSMT spray sprinkler nozzles gear-driven?
*Response:* Ms. Kind said that the gear-driven feature is part of the nozzle, not part of the body.

*Comment:* Most MSMTs have patents specific to certain manufacturers.

*Comment:* There's a vast difference between spray nozzles and MSMT nozzles. They shouldn't be lumped into the same category. Spray sprinkler nozzles are not high-efficiency by any means, even if the [Rain Bird] HE-VAN [model spray sprinkler nozzle] you just mentioned.

*Question:* Has WaterSense recognized the possibility to ban four-inch pop-ups for turf to be mowed very short, which depletes the moisture content, which then forces more irrigation to be applied, wasting a fair amount of water in the South and West [United States]? The four-inch pop-up body is sold in big-box stores nationwide, usually on sale.
*Response:* Ms. Tanner said that WaterSense has not looked into this topic.

*Comment:* You might run into confusion perhaps with your definition of spray nozzles, page 31, versus a bubbler nozzle. I see you've stated on a later slide that bubbler nozzles are not included, but your current definition doesn't specifically exclude them.

*Comment:* I think you mentioned this at the Irrigation Association Show. I feel like the WaterSense certification for "spray head" really dilutes the value of the label. The scope shouldn't be dumbed down to make sure the spray head fits the criteria.

Ms. Kind encouraged all attendees to submit written comments to WaterSense. WaterSense sorts comments by topic and reviews them all.

## Water Efficiency and Performance

Ms. Kind said that WaterSense has identified four attributes that appear to be different between HES and spray sprinkler nozzles. They are application rate, distribution uniformity, distance of throw, and droplet size and spray pattern.

### Application Rate

Ms. Kind presented the equation for application rate (also known as “precipitation rate”) from ASABE/ICC 802-2020. She explained that it is correlated with flow rate and described the relationship with water efficiency. Ms. Kind reviewed the two published evaluation methods for application rate, and explained that Dr. Dukes is conducting research on whether spray sprinkler nozzles can be differentiated based on flow rate.

Ms. Kind said that WaterSense is considering using application rate as a water efficiency criterion to identify HES sprinkler nozzles. She explained the potential approach to setting thresholds for application rates and the proposed testing conditions.

Ms. Kind said that WaterSense is seeking stakeholder feedback on its proposal to use application rate (at recommended operating pressure and high pressure) as a water efficiency criterion for spray sprinkler nozzles. WaterSense is also interested in whether any manufacturers currently use the ASABE/ICC 802-2020 test method for application rate and, if so, would be willing to share masked data with WaterSense.

Ms. Kind said that WaterSense is also requesting stakeholder opinions on using the following parameters to evaluate spray sprinkler nozzles: test each radius in a model’s product family at the full circle pattern only, and test models with an adjustable radius at the maximum radius.

Ms. Kind reminded the audience to provide details on their recommended approach if they disagree with an element of the NOI when they submit written public comments. This helps WaterSense make improvements when drafting a specification, if applicable.

Ms. Kind presented the definition of matched precipitation. She said that WaterSense is not aware of a test method for evaluating matched precipitation provided by spray sprinkler nozzles. Ms. Kind then described the effect of pressure regulation, noting that WaterSense is not aware of a test method for evaluating pressure regulation provided by spray sprinkler nozzles. Ms. Kind described WaterSense’s proposed requirements for evaluating matched precipitation and pressure regulation.

Ms. Kind said that WaterSense is seeking input on whether it should require spray sprinkler nozzles to have matched precipitation to be eligible for the WaterSense label. In particular, what

would be an acceptable variance in application rates to ensure matched precipitation? If WaterSense requires matched precipitation, how should EPA verify the data?

*Participant Questions and Comments*

*Question:* I think if a nozzle is utilized in a high-pressure situation, shouldn't that be automatically discarded as applicable? You've already determined that pressure regulation is important per the spray body specification. Why even bother approving efficiency of nozzles in a situation you don't approve of?
*Response:* Ms. Kind said that ideally, all irrigation systems would have pressure-regulating spray sprinkler bodies. California is currently the only state that prohibits the sale of standard (i.e., non-pressure-regulating) spray sprinkler bodies. WaterSense would likely recommend that stakeholders use HES sprinkler nozzles with pressure-regulating spray sprinkler bodies. However, in many cases, HES sprinkler nozzles may be attached to standard spray bodies, which is why WaterSense is considering that scenario.

*Question:* There are many ways to achieve high efficiency. Why is this the proposal?
*Response:* Ms. Kind said that, to issue a draft specification, WaterSense needs to identify performance criteria, which requires referencing relevant data, and a test method. WaterSense is presenting the information it has gathered in each of these categories to date, but that WaterSense encourages stakeholders to submit additional information.

*Question:* Matched precipitation rate nozzles can be high efficiency with good distribution uniformity. Why wasn't that considered?
*Response:* Ms. Kind indicated that the presenters would discuss that topic.

*Question:* Do MSMTs provide pressure regulation in and of themselves?
*Response:* Ms. Tanner said that would be discussed when reviewing Dr. Dukes' research.

Ms. Kind reminded the audience to submit comments if they agree with a particular aspect of the NOI.

**Distance of Throw**

Ms. Kind presented the definition of distance of throw and explained its implications for number and spacing of spray sprinkler nozzles. She reviewed a study by John Wascher in 2011 that showed how irrigation design might differ based on the type of spray sprinkler nozzle used.

Ms. Kind said that WaterSense is interested in feedback from irrigation contractors about whether they are likely to incorporate HES sprinkler nozzles in bids for new irrigation systems; any factors that might influence their decision (i.e., new installation vs. retrofit); and how HES sprinklers affect the cost of materials in practice.

Ms. Kind said that ASABE/ICC 802-2020 includes a test method to calculate distance of throw. However, WaterSense is not aware of any data generated from the test method or other studies.

Ms. Kind explained that WaterSense is considering requiring distance of throw as a water efficiency criterion. EPA has not proposed a threshold, but it would likely be a range.

Ms. Kind said that WaterSense seeks stakeholder feedback on whether ASAE/ASABE S398.1 is an appropriate test method for distance of throw. Do stakeholders believe it is reasonable for WaterSense to require the tested distance of throw to align with the value reported by the manufacturer? WaterSense is also interested in stakeholder input on the appropriate tolerance (e.g., percentage greater than the rated distance of throw) to prevent water waste due to overspray.

*Participant Questions and Comments*

*Question:* Are we taking into account regional vagaries? Vagaries include soil type, plant selection, climate, etc.
*Response:* Ms. Kind said that the NOI proposes a bench-style test conducted at a laboratory, so it did not take those factors into account. From WaterSense's experience with developing a specification and test method for soil moisture sensors, it is extremely difficult and expensive to capture variations in soil across the United States in a single test method. In that case, WaterSense ultimately developed a recipe for a standard soil to avoid making the testing cost-prohibitive.

**Distribution Uniformity**

Kathleen Onorevole of ERG presented the definition of distribution uniformity (DU) and the factors that may influence it. She presented the definition for lower quarter DU ($DU_{LQ}$) as found in ASABE/ICC 802-2020. Ms. Onorevole explained that WaterSense is not aware of any dataset related to DU generated in accordance with the ASABE/ICC 802-2020 test method. Earlier studies on water savings associated with MSMT spray sprinkler nozzles anticipated that DU might be the mechanism for anticipated water savings. However, researchers have not observed water savings associated with higher DUs.

Ms. Onorevole explained that WaterSense is only aware of DU data from field studies in the literature. However, a potential WaterSense spray sprinkler nozzle specification would require licensed certifying bodies to use a laboratory-based test method to measure DU.

Ms. Onorevole said that WaterSense invites manufacturers to submit laboratory data on DU for spray sprinkler nozzles. WaterSense also invites manufacturers to indicate whether they collect DU data in accordance with ASABE/ICC 802-2020 or through another method.

*Participant Questions and Comments*

*Question:* Doesn't CIT [Center for Irrigation Technology] offer this unbiased testing data?
*Response:* Ms. Kind said that she's not sure if they do or whether it's published. She encouraged participants to share unpublished data with WaterSense. Ms. Kind noted that WaterSense is able to handle confidential business information (CBI). Only individuals trained in CBI would see any CBI data, and the data would not be released. Ms. Kind said that individuals could reach out to WaterSense with any questions on CBI.

*Comment:* We 100 percent use DU and collect it using the CIT test setup with the SPACE Pro software.

*Question:* High-efficiency sprinklers and their effectiveness can rely heavily on correct head-to-head spacing. Are you going to provide a false sense of efficiency when someone installs a spray nozzle with a specific efficiency rating, but the nozzles are retrofitted to a poorly designed system or a system that was not designed with the spray nozzle radius available?
*Response:* Ms. Kind said that WaterSense would welcome information on preventing that situation. She explained that WaterSense labeled products are always tested in the lab. WaterSense knows that behavior affects water savings, especially for irrigation products, and that's a challenge to overcome. Ms. Tanner said that WaterSense also tries to address the design element of irrigation products. For example, design and installation professionals can become certified by WaterSense labeled programs, and WaterSense provides information for homeowners about designing irrigation systems. Ms. Tanner said that WaterSense tries to identify water-efficient technology and provide resources to help people properly install and maintain it. In other words, the technology itself is only part of the big picture.

*Question:* Several states have outlawed standard spray bodies. Others are sure to follow. Why waste effort on testing nozzle efficiency on non-regulated bodies when the inbound pressure is a huge factor?
*Response:* Ms. Tanner said that there are many states where testing is not required, so WaterSense wants people to be able to install a water-efficient spray sprinkler nozzle, regardless of the spray sprinkler body.

*Question:* MPR is one of the few key factors that should certainly be considered. Why have pressure regulation or high-efficiency nozzles without matching the output? In terms of variance, there may be an industry standard that designates what MPR defines, but not sure what that percent variance is.
*Response:* Ms. Kind said that it sounded like the comment was in favor of matched precipitation.

Ms. Onorevole explained that WaterSense could take two approaches to establishing a threshold for DU: 1) identifying a minimum level of performance, or 2) identifying a value that differentiates between HES and standard spray sprinkler nozzles. WaterSense would likely require that DU is calculated based on the distance of throw test in ASABE/ICC 802-2020.

Ms. Onorevole said that WaterSense would like stakeholder input on whether DU should be used in a specification to establish a minimum level of performance or used to differentiate HES and standard spray sprinkler nozzles. WaterSense invites stakeholders to submit data pertaining to the relationship between DU and water savings and/or performance (e.g., landscape health).

*Participant Questions and Comments*

*Question:* Our market has excluded the smallest MSMT nozzle option because even with potable water, the filter screens plug and cause maintenance issues. Any way the standard could address this issue?
*Response:* Ms. Kind encouraged the participant to submit this comment and any additional

information in a public comment. She indicated that WaterSense is aware of and considering this issue.

**Droplet Size and Spray Pattern**

Ms. Onorevole explained that MSMT sprinkler nozzles have a spray pattern that creates larger droplets and reduces misting. This helps distribute water more evenly and could help prevent water from being distributed to undesirable areas. Ms. Onorevole said that the ISO standard 15886, *Agricultural Irrigation Equipment - Sprinklers*, includes a drop size test in one of the annexes, and described the setup of the test method. She said that WaterSense is not aware of any data on droplet size or spray pattern that have been collected in accordance with the standard.

Ms. Onorevole explained that WaterSense is not aware of any published research that measures droplet size or data that demonstrates a correlation between droplet size and water savings. She explained potential ways that droplet size could reduce water used for irrigation.

Ms. Onorevole said that WaterSense invites stakeholders to share data on droplet size and water efficiency, especially collected in accordance with ISO Standard 15886-2:2021. WaterSense welcomes feedback on whether stakeholders think droplet size should be included as a criterion in a WaterSense specification.

Ms. Onorevole noted that there are two tables in the NOI that provide more details on the four attributes of spray sprinkler nozzles discussed in the presentation. One table provides information about features of MSMT spray nozzles produced by a variety of manufacturers, and the other is a general comparison of these attributes between standard spray nozzles and MSMT sprinkler nozzles.

**Possible Additional Criteria**

Ms. Onorevole noted that there are other criteria that WaterSense could include in a potential specification, by referencing certain sections in ASABE/ICC 802-2020.

Ms. Onorevole said that WaterSense welcomes stakeholder feedback on whether to require these additional criteria included in sections of ASABE/ICC 802-2020 in a potential specification.

## Existing Performance Data

Ms. Onorevole said that she would be presenting preliminary results from research conducted by Dr. Dukes, who developed a test method based on ASABE/ICC 802-2020 to measure the flow rate of standard and high-efficiency sprinkler nozzles. Ms. Onorevole noted that Dr. Dukes is still analyzing the data.

Ms. Onorevole presented a graph showing flow rate (gallons per minute [gpm]) for HES and standard spray sprinkler nozzles across changing pressure (pounds per square inch [psi]) (Figure 1). She said that in general, the HES nozzle had a 44 percent lower flow rate than the standard spray sprinkler nozzle at the recommended operating pressure.

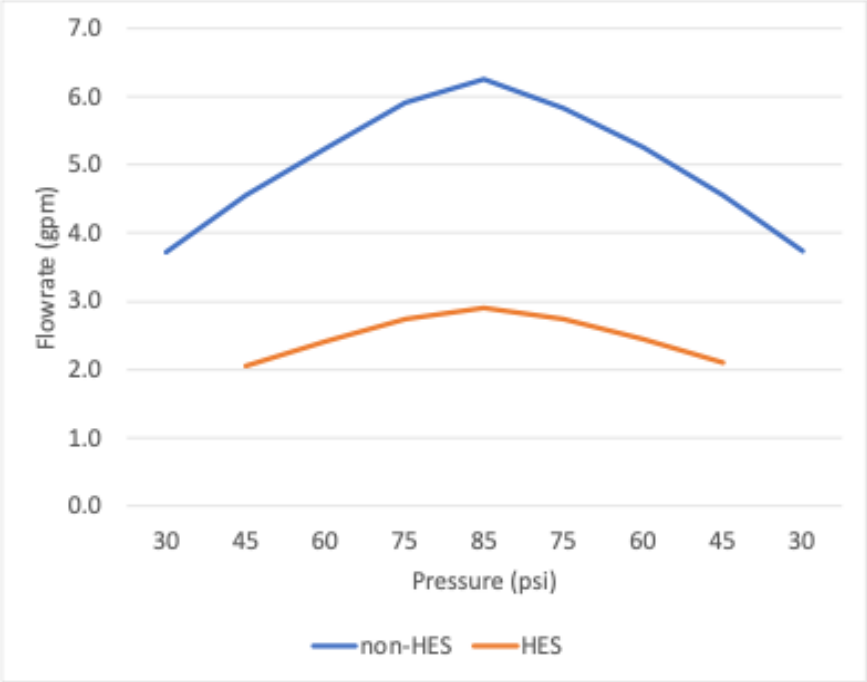


**Figure 1.** Preliminary results from a 15-foot full-circle single test comparison conducted as part of Dr. Dukes' research on HES sprinkler nozzles and standard sprinkler nozzles (abbreviated as "non-HES").

Ms. Onorevole showed an annotated version of Figure 1 that highlighted conditions at 85 psi (Figure 2). She explained that at the maximum tested pressure of 85 psi, which represents conditions without pressure regulation in the sprinkler body, the HES sprinkler nozzle had a 54 percent lower flow rate than the standard sprinkler nozzle.

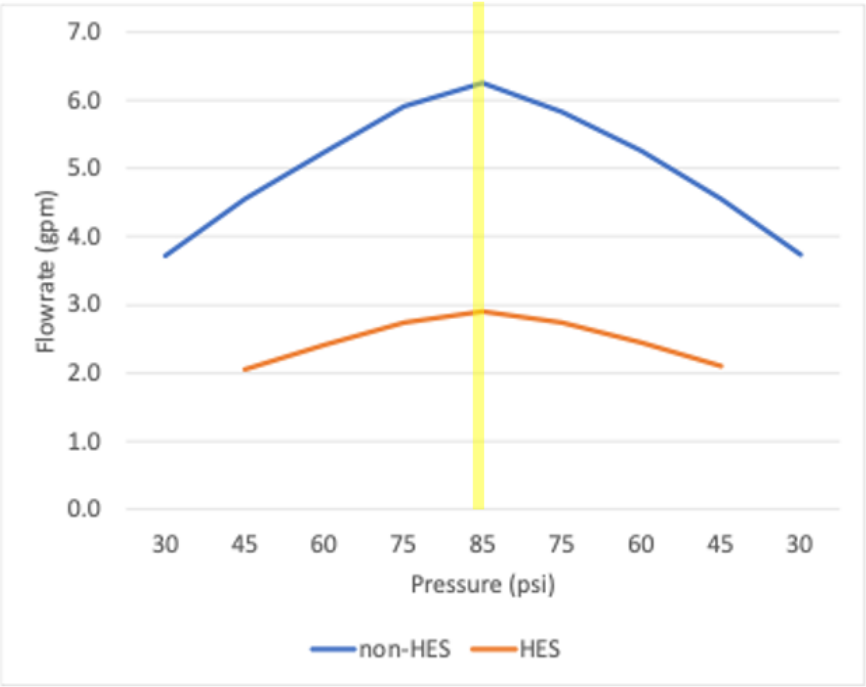


**Figure 2.** Preliminary results from a 15-foot full-circle single test comparison conducted as part of Dr. Dukes' research on HES sprinkler nozzles and standard sprinkler nozzles (abbreviated as "non-HES"). Test conditions at 85 psi are highlighted to facilitate the discussion of those results.

Ms. Onorevole presented another annotated graph that highlighted conditions at 45 psi (Figure 3). She explained that the HES sprinkler nozzle had a 44 percent lower flow rate than the standard spray sprinkler nozzle at 45 psi, which is the recommended operating pressure.

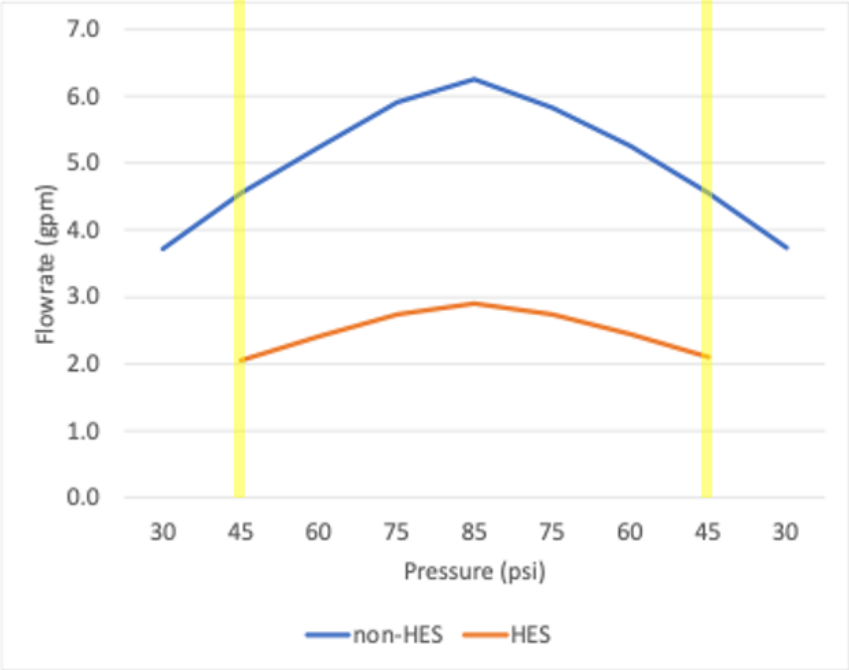


**Figure 3.** Preliminary results from a 15-foot full-circle single test comparison conducted as part of Dr. Dukes' research on HES sprinkler nozzles and standard sprinkler nozzles (abbreviated as "non-HES"). Test conditions at 45 psi are highlighted to facilitate the discussion of those results.

Ms. Onorevole said that WaterSense invites stakeholders to share any additional performance data on HES sprinkler nozzles.

*Participant Questions and Comments*

*Question:* So both high-efficiency and non-high-efficiency bodies were without pressure regulation in the graph?
*Response:* Ms. Onorevole confirmed that was correct.

Ms. Onorevole presented additional results from Dr. Dukes' research and concluded that preliminary results show that HES sprinkler nozzles had a lower flow rate over a wide range of pressures compared to standard spray sprinkler nozzles. She noted that the percentages she discussed are not necessarily representative of potential water savings.

*Participant Questions and Comments*

*Question:* The lower flow rate means that you have longer run--that you have to use longer runtimes. It doesn't mean more efficient. You're already designating low flow rate as high efficiency.
*Response:* Ms. Tanner said that the presenters would discuss that comment more before the end of the meeting.

*Question:* Just wanted to point out that most manufacturer charts indicate that the recommended operating pressure for spray nozzles is 30 psi. Why was 45 psi used?
*Response:* Since Dr. Dukes had to leave the meeting, Ms. Kind said that most of the nozzles' recommended operating pressure for MSMT are 45 psi. She said she thought that Dr. Dukes tested standard spray nozzle starting at 30 psi.

*Question:* How many different manufacturers were compared?
*Response:* Ms. Kind said that Dr. Dukes tested spray sprinkler nozzles from four manufacturers, and that he was trying to look at a wide range of what was on the market. She noted that his data are not published at this point. If WaterSense moved forward with a draft specification and used his data, Dr. Dukes would analyze and share masked data. Ms. Kind said that WaterSense does not know which manufacturers were tested, just the number. This is similar to Dr. Dukes' research for soil moisture sensors. Bernard Cardenas, who is in Dr. Dukes' lab, confirmed that they tested spray sprinkler nozzles produced by four manufacturers.

*Question:* I have heard that the average U.S. water pressure supply is 40 psi. Would that need to be verified? What would exclude MSMT—would that exclude MSMT for many homes? I know manufacturers recommend 45 psi. One manufacturer recommends higher for optimal MSMT performance.
*Response:* Ms. Kind said that homeowners or irrigation professionals can add a pressure boost or pressure regulator if needed. If WaterSense recommends installing spray sprinkler nozzles on pressure-regulating spray sprinkler bodies, it should not be an issue. Ms. Tanner said that residential water pressure can vary widely. Most plumbing products are tested between 45 and 60 psi, although sometimes as high as 80 or 90 psi.

## Product Marking, Documentation, and Marketing

Ms. Onorevole presented potential considerations for product packaging and marking, including that WaterSense is considering requiring product packaging and/or documentation or marking material of WaterSense labeled spray sprinkler nozzles to indicate whether a spray sprinkler nozzle should be installed on a WaterSense labeled spray sprinkler body with integral pressure regulation.

Ms. Onorevole said that WaterSense invites stakeholder feedback on these proposed product marking and documentation requirements.

*Participant Questions and Comments*

*Question:* Your 85 psi selected randomly (?) for maximum pressure comparison between MSMT and standard spray nozzles. How can you compare efficiency for nozzles designed for 30 psi and nozzles designed for 45 and then draw conclusions on flow rate and then imply water savings based on flow rate? Too much voodoo in your math to try and justify this standard that will result in legislators taking this standard as the gospel for water savings methodology and creating legislation to benefit a manufacturer and their established intellectual property. I cannot support this standard as a way to save water with the research supplied as justification.
*Response:* Ms. Onorevole noted that the data presented were preliminary, and that Dr. Dukes would analyze additional data if WaterSense proceeded with a specification. She also said that

WaterSense is not assuming that the percentages presented on the previous slides were representative of water savings.

Mr. Cardenas added that they used random pressures to conduct their test. They began with 30 psi, then chose different pressures to see if there were differences. Mr. Cardenas said that they were not trying to show that nozzles performed better or worse, but to see if they performed differently at different pressures. They could have chosen higher or lower pressures for the preliminary test. Mr. Cardenas emphasized that they were not trying to show that certain spray sprinkler nozzles performed better, including at very high pressures.

*Question:* Did the graph represent the average overall?
*Response:* Ms. Onorevole confirmed that it was the average of the two categories of spray sprinkler nozzles.

## Communicating Savings

Ms. Onorevole noted that WaterSense has identified application rate as the primary mechanism leading to water savings in HES sprinkler nozzles. She described that there may be communication challenges, since homeowners may be likely to maintain similar irrigation schedules after retrofitting sprinkler nozzles.

Ms. Onorevole discussed the fact that homeowners should ideally increase irrigation runtimes after retrofitting with HES sprinkler nozzles because they have a lower flow rate. The water savings studies in the literature have not explored this element of human behavior.

Ms. Onorevole said that when WaterSense spoke with water utilities, they heard that customers might not feel comfortable running their irrigation system for more than about 30 minutes because of outreach about drought. If many people feel this way, homeowners may have substantial water savings from installing HES sprinkler nozzles, since they may irrigate for the same time as before with lower flow rates.

Ms. Onorevole said that WaterSense is interested in stakeholder feedback on suspected reasoning behind potential water savings, including any information on whether stakeholders change irrigation schedules after a retrofit. WaterSense invites stakeholder opinions on irrigation runtimes, including preferences for duration of irrigation.

Ms. Onorevole explained that it is possible that the longer runtimes required by HES sprinkler nozzles could cause a conflict with local watering restrictions. She said that WaterSense is interested in feedback from water utilities on promoting WaterSense labeled HES sprinkler nozzles. WaterSense would like to know if water utilities have concerns about whether consumers with HES sprinkler nozzles could meet their irrigation needs with watering windows in place.

*Participant Questions and Comments*

*Question:* Maybe the proposal is for manufacturers to say end users can save water by one of two ways. One, using multi-stream nozzles and not adjust the irrigation times. And this assumes everyone is overwatering. Or two, use high-efficiency nozzles based on DU and reduced

runtimes. Would EPA consider multiple ways to achieve the HE designation?
*Response:* Ms. Tanner said that WaterSense generally tries to have one path to designate efficiency.

## Next Steps

Ms. Tanner explained that WaterSense is requesting stakeholder feedback, data, and information. The deadline for public comments is February 6, 2023, [**Editor's note:** *The deadline has been extended to April 7, 2023*] and stakeholders can submit public comments to watersense-products@erg.com.

Ms. Tanner noted that WaterSense is requesting feedback on all of the topics discussed during the public meeting. She encouraged commenters to provide suggestions if they disagreed with something.

Ms. Tanner provided some information on WaterSense's approach to marketing in response to an earlier question. She said that the program has information available on its website, as well as information that goes to water utility partners and professional partners to provide information to their customers. WaterSense also conducts direct outreach to consumers through avenues like a newsletter and social media. However, as a federal partnership program, the main focus is on providing information to partners who can disseminate it.

Ms. Tanner said that WaterSense would continue to develop its marketing and educational materials on spray sprinkler nozzles if the program proceeded with a draft specification. However, WaterSense is currently focused on establishing the technical criteria.

*Participant Questions and Comments*

*Comment:* We need to be careful about highlighting multi-stream nozzles as they're not the only HES.
*Response:* Ms. Tanner said that WaterSense understands that. She added that WaterSense tries to set criteria that are performance-based and not technology-based, so that manufacturers can innovate and create different types of products. The goal is to be specific enough that the product category is clearly defined, but broad enough so that innovation is possible.

*Comment:* The graph showed that on the screen that illustrated high flow rate variation with standard spray nozzles than with MSMTs, but the selected pressure range, 30 to 85 for the standard and the smaller, 45 to 85 for MSMTs. So you're testing them at two times their suggested pressure and implying that the reduced variation and reduced flow rate is somehow savings.
*Response:* Ms. Kind said that the purpose is to examine the changes in flow rates at different pressures for the two types of products and present the results. Ms. Tanner added that WaterSense wants to test products in the way they are designed to operate, as well as at a higher or more extreme pressure that might exist in residential settings. Mr. Cardenas said that they tested the pressure at the recommended pressure, as well as above and below it. They were observing how the product operated at the optimal pressure, below it, and above it.

Ms. Kind noted that there is a public comment template available online that stakeholders should use to format their comments. Ms. Tanner said that she encouraged participants to submit additional studies if they were aware of any.

In response to a comment recommending using a standard, Ms. Tanner said that WaterSense tries to use voluntary consensus standards if possible. WaterSense would be happy to work with a standard-setting body to include a potential test method in a standard. If there is a test method in an existing standard, WaterSense is happy to work with the organization before the draft specification is issued to include the standard. WaterSense uses referable standards as the basis of its specification when possible.

Ms. Tanner adjourned the meeting by thanking everyone for their participation.

# Appendix A: Meeting Participants

| Attendee | Organization |
|---|---|
| Russell Ackerman | City of Glendora |
| Jason Anderson | Design 24/26 |
| Doug Anthony | The Urban Farmer Store |
| Alex Archuleta | City of Columbia Utility Services |
| Darin Ayres | Rain Bird Corporation |
| Sean Azad | Rain Bird Corporation |
| Darell Bagley | City of Frisco Planning |
| Celine Benoit | Metropolitan North Georgia Water Planning District |
| Christopher Berkey | Nevada Rural Water Association |
| Toby Bickmore | Southern Nevada Water Authority (SNWA) |
| Charles Bohlig | East Bay Municipal Utility District |
| Brad Bowen | Cheyenne Board of Public Utilities |
| Angie Brown | American Water Works Association (AWWA) |
| Jacy Brydges | Capital Regional District (Victoria, British Columbia, Canada) |
| Brandon Burgess | Chino Basin Water Conservation District |
| Steve Cadorette | Falmouth DPW |
| Bernard Cardenas | University of Florida |
| Josh Carmichael | K-Rain Manufacturing Corporation |
| Adam Carpenter | American Water Works Association (AWWA) |
| Brandon Carreno | New Jersey Department of Environmental Protection (NJDEP) |
| Thomas Carroll | Water Engineering, Inc. |
| Jessica Case | Rain Bird Corporation |
| Alek Crnogorac | City of Sacramento |
| Chris Davey | The Toro Company |
| Edwin deLeon | Golden State Water Company |
| Shirley Dewi | International Association of Plumbing and Mechanical Officials (IAPMO) Research and Testing (R&T) |
| Jeff Dias | RMA Irrigation |
| Sam Draper | Arizona Municipal Water Users Association (AMWUA) |
| Jason Duff | Massachusetts Department of Conservation and Recreation |
| Julius Duncan | MAD Scientist Associates, LLC |
| Johann Feller | Southern Nevada Water Authority (SNWA) |
| Fred Fraisse | Neoperl |
| Larry Giroux | Ewing |
| Sean Golden | James River Design, LLC |
| Geneva Gondak | East Bay Municipal Utility District (EBMUD) |
| John Gumm | The Toro Company |
| Jay Guthy | The Toro Company |

| Attendee | Organization |
|---|---|
| Michael Gutierrez | Broward County |
| Rick Hall | K-Rain Manufacturing Corporation |
| Kevin Hartley | Town of Windsor |
| Joey Hearn | Franklin Energy Services |
| Doug Heller | Heller Enterprises LLC DBA Northwest Iowa Sprinkler |
| Ileana Hernandez | City of Tampa |
| Ali Hibbard | Connecticut Department of Energy and Environmental Protection (CT DEEP) |
| Sandra Hurbut | City of Surprise, Arizona |
| Kelsey Jacquard | Hunter Industries |
| Blair Jasie | Blue Grass Irrigation, Inc. |
| Kyle Jeffries | Rancho Water |
| Mark Johnson | Ridge Landscape Architects |
| Ziad Khallouf | Own |
| Kyle Kichura | AM Conservation |
| Jeff Knopp | Behnke Landscape Architecture |
| Scot Latham | Poseidon Irrigation Oklahoma |
| Douglas Macdonald | Aqua Engineering, Inc. |
| Rick Magill | City of Aspen |
| Kevin McCaleb | Lake Oswego Water |
| Cary McElhinney | U.S. EPA Region 5 |
| Todd McVicker | Columbia Water and Light |
| Amy Meaut | City of Hillsboro Water Department |
| Greg Meyer | Meyerco sprinklers |
| Nicolle Miller | East Bay Municipal Utility District (EBMUD) |
| Joseph Montemurno | Orlando Utilities Commission |
| Melissa Mostowy | Connecticut Department of Energy and Environmental Protection (CT DEEP) |
| Roy Neves | D J Rain |
| Kate Norum | Center for Irrigation Technology |
| Darren Nowels | Northern Water |
| Oluwaseun Ogungbenle | City of Rio Rancho Utilities Department |
| Robert Pickering | Eastern Research Group, Inc. (ERG) |
| Gregory Plumb | Marin Water |
| Tige Procyshyn | Landscape Irrigation Solutions Ltd. |
| Russel Prophit | Floralawn |
| Sergio Ramirez | San Francisco Public Utilities Commission (SFPUC) |
| Julie Riddle | SiteOne Landscape Supply |
| Ron Robbins | Harmony Golf Club |
| Katherine Rojas | Monte Vista Water District |

| Attendee | Organization |
|---|---|
| Kenny Shiflett | Foothill Lawn Service, Inc. |
| Paula Staples | University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) Extension Hillsborough County |
| Jacey Stewart | City of Georgetown |
| Matt Stuart | Orbit |
| Kay Sydow | City of Prescott |
| Paige Tara | Southwest Florida Water Management District (SWFWMD) |
| Juan Tejeda | City of Turlock |
| Gary Tilkian | Metropolitan Water District |
| Daniela Urigwe | Energy Solutions |
| Steven Valle | City of Lompoc |
| Elven Webb | Hydro-Rain |
| Jason Westmoreland | Hit Products Corporation |
| Kelsey Whorton | City of Oklahoma City |
| Joseph Wilson | Sterling Design Associates, LLC |
| Jessica Woods | City of Round Rock |
| Tres Wangsgaard | Orbit Irrigation |
| Jacob Zerger | City of Portland Parks and Recreation |

| Presenter | Organization |
|---|---|
| Stephanie Tanner | U.S. EPA |
| Dr. Michael Dukes | University of Florida |
| Joanna Kind | Eastern Research Group, Inc. (ERG) |
| Kathleen Onorevole | Eastern Research Group, Inc. (ERG) |
| Stephanie Buckley | Eastern Research Group, Inc. (ERG) |