



USGA, Golf Courses and Water Use: Current Facts and Figures (2022)

USGA's Role in Sustainability of Golf Courses

- The United States Golf Association started investing in golf course sustainability in 1921. Water conservation has been a focus for decades
- The USGA currently invests \$10 million annually towards golf course sustainability, which provides more than \$1.9 billion in annual savings back to U.S. golf facilities
- The USGA made a commitment in 2022 to invest \$30 million over the next 15 years to further reduce golf's use of water by 45 percent
- The USGA currently employs 13 expert agronomists based in field offices throughout the U.S.,
- Our work and investment have centered on five main initiatives: cutting-edge research, expert course consulting, championship/event agronomy, industry-wide education, and tools development
- Four key actions led by the USGA's work delivered substantial water savings on golf courses: water budgeting by measuring evapotranspiration; widespread use of handheld moisture meters; development of resource-efficient turfgrasses; and replacing managed turf with naturalized areas.

Today's State of Golf and Water – Results of USGA Investment and Initiatives, Industry Collaboration

- From 2005 to 2020, golf reduced its use of applied water by 29 percent. Two-thirds of that amount is directly attributed to advances in water efficiency; the remaining third is due to course closures (GCSAA Research released in 2022)
- The most effective strategies to date have been reducing irrigated acreage, introducing water-efficient turfgrasses, and implementing numerous precision irrigation strategies
- The USGA has invested nearly \$50 million in more than 800 research projects at universities throughout the U.S. since 1982.
- More than 40 new turfgrasses have been developed by USGA-funded scientists, many of which use less water and tolerate poorer-quality irrigated water (wastewater, salty or recycled water)
- 22 percent of golf courses surveyed by the GCSAA reported using more drought-tolerant turfgrasses in 2020 – a 4% increase from the last survey in 2013
- The use of technologies such as handheld moisture meters continues to grow – saving more than \$500 million in golf course management costs per year that represents a 6 percent decrease per course in annual maintenance costs
- Estimating irrigation requirements – specifically through evapotranspiration (water budgeting) – is becoming more sophisticated on golf courses, saving golf courses more than \$200 million per year
- 21 percent of all water applied to U.S. golf courses is recycled water. In the Southwest, 33 percent of all golf course irrigation water is sourced from recycled water
- Reducing managed turf and incorporating naturalized areas has led to substantial water savings, estimated at \$1,700 to \$7,000 per acre, per year in water costs
- While we can celebrate significant advances, water conservation and protection are still central initiatives to USGA work
- Many areas in the U.S. face seasonal water supply shortages. Climate change continues to increase drought frequency and severity, and population increases will directly impact water availability
- Greater adoption of technology, improved turfgrass and management practices is needed. Even the most widely adopted research-based management practices studied are only used by approximately half of U.S. golf courses.

Key milestones of the USGA's work in water conservation:

- 1921: USGA forms the Green Section, working with U.S. Dept. of Agriculture to optimize resource use and playing conditions.
- 1937: The Pennsylvania State University begins bentgrass breeding, with germplasm from the USGA
- 1945: The USGA funds its first turfgrass research projects with key universities, emphasizing turfgrasses with lower water use rates
- 1946: USGA funds bermudagrass breeding projects with the USDA in Georgia
- 1960: USGA funds research at Rutgers University for cool-season grass breeding (Kentucky bluegrass, perennial ryegrass and creeping bentgrass)
- 1970s: Severe drought across the U.S. prompts the USGA to hold a symposium to advance the use of recycled water for irrigation in the Southwest
- 1982: The USGA formally establishes the Turfgrass Research Grant Program, emphasizing the development of lower-maintenance turfgrasses and improved management practices
- 1980s – today: USGA research on turfgrass water use helps define irrigation requirements of numerous grasses, including how various grasses respond to drought and prescribed irrigation deficits to save water
- Late 1980s: USGA funds research to improve the cold tolerance of warm-season grasses at Texas A&M, Oklahoma State and New Mexico State universities. The University of Nebraska – Lincoln begins a similar program for buffalograss, which has exceptional cold tolerance and requires very little water once established. The programs have delivered cold-tolerant warm-season grasses, which has expanded the range where these grasses can be used and saves water
- In 1991, the USGA began working with Audubon International in support of the Audubon Cooperative Sanctuary Program for Golf Courses (ACSP)
- 1990-2000: The USGA invests \$10 million in 100 separate research projects focused on golf's environmental impact and the protection of surface and groundwater. The results clearly show that the small amounts of pesticides and nutrients that end up in surface- and groundwaters, and are found at levels below standards established by the U.S. EPA
- 2003: Seashore paspalum breeding begins at the University of Georgia with USGA funding – improving the quality and use of a species of turfgrass that tolerates salty water sources such as recycled wastewater
- 2011: The Audubon Cooperative Sanctuary Program, supported by the USGA, reports that 50 percent of participants had removed irrigated turfgrass acreage, 69 percent had improved irrigation systems, and 51 percent had reduced water costs since joining the ACSP. In addition, the 2,000 courses in 38 countries involved in the program reported adding an average 20 acres of wildlife habitat. Similar naturalization of roughs is estimated to save courses \$71,000 in annual maintenance costs
- 2012: USGA hosts the “Golf's Use of Water: Solutions for a More Sustainable Game” conference
- 2012: The USGA promotes the widespread use of soil-moisture sensors and meters by superintendents to quickly determine when to irrigate drying soil. The sensors, when combined with an irrigation controller, allow automatic irrigation only when needed. Research shows that this method can reduce water use by 84 percent compared to a traditional irrigation strategy
- 2015: USGA collaborates with the University of Minnesota and the Natural Capital Project, which ultimately demonstrates the benefits golf courses provide to local environments and communities. These benefits include high temperature mitigation, stormwater nutrient retention, and habitat that improves biodiversity for wildlife, including pollinators
- 2020 – USGA-funded scientists demonstrate subsurface drip irrigation as an effective means of reducing water use by up to 90 percent compared to sprinkler irrigation
- 2021: The USGA renames the Turfgrass and Environmental Research Program to the Mike Davis Program for Advancing Golf Course Management (Davis Program). Projects continue to focus on detailing turfgrass responses to stresses such as drought, heat, cold and salinity
- 2021: After several years of innovation and development, the USGA introduces Deacon, a new online technology with 10 features to improve course management efficiency, particularly in targeting water, fuel, labor and nutrient use
- 2022: USGA CEO Mike Whan commits \$30 million in the next 15 years to help golf reduce its use of water by 45 percent

USGA Research

- The USGA has invested nearly \$50 million in turfgrass and environmental research with prominent land-grant universities and independent researchers since 1983
- The USGA's annual \$10 million investment in golf course sustainability saves the industry an estimated \$1.92 billion annually, evidenced through six key initiatives
 - \$529 million from advancing irrigation scheduling with soil-moisture meters
 - \$469 million from converting managed turf to naturalized rough
 - \$201 million from advancing irrigation with estimates of turfgrass water use
 - \$295 million from more efficient fertilizer and pesticide use
 - \$243 million from advanced putting green construction methods
 - \$174 million from development of more sustainable turfgrasses
- The United States Golf Association (USGA) invests \$1.9 million in grants every year to fund more than 80 research projects through the Mike Davis Program for Advancing Golf Course Management – the largest private turfgrass and environmental research effort in golf's history
- More than 40 different sustainable turfgrasses have been developed as a result of USGA-funded research

Notable projects being funded in 2022 include:

- A national, multi-university evaluation of drought tolerance and water use of grasses commonly used on fairways
- Turfgrass breeding programs at several universities, aimed at improving the quality, stress tolerance, and resource-use characteristics of important turfgrasses
- Projects focused on advancing precision irrigation with better use of local and satellite-based remote sensing technologies and weather data

Assets & Links

- Green Section Record: [Golf Natural Capital Project Provides Most Comprehensive Study of Golf Course Environmental Benefits to Date](#)
- Case Study: [Back From The Brink — Agronomy Sparks A Turnaround](#)
- Case Study: [Restoring Bethlehem Golf Club with Help from a USGA Agronomist](#)
- Case Study: [Fairways for the Future](#)
- [Fairway Regrassing — Can You Afford Not To? \(usga.org\)](#)
- [Fairway Conversion Saves Water and Generates Profits \(usga.org\)](#)
- [Breeding For Wintergreen Turf Saves Water \(usga.org\)](#)