This presentation premiered at WaterSmart Innovations

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Water Quality Protection and Conservation on Golf Courses

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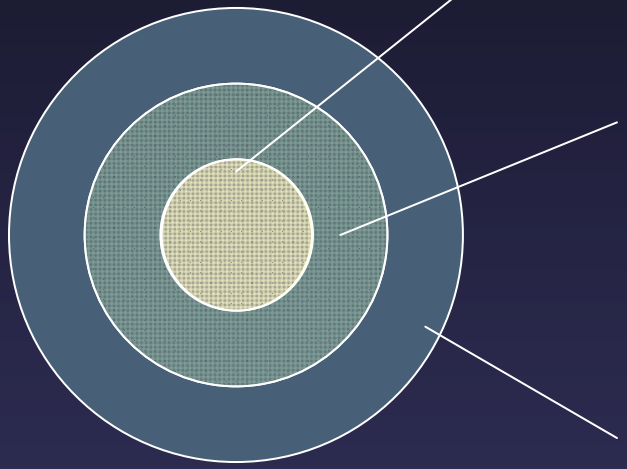
Who is Audubon International?



Individual Level
Stewardship Action

Site Level
Environmentally-sensitive
Development and Management

Community Level
Strategic Planning and
Sustainable Community Initiatives

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Who is Audubon International?

Golf & the Environment

- By fostering environmentally-sound developed and managed golf courses, we are providing business models that benefit people, wildlife, and the natural systems that support all life, while also remaining profitable, good neighbors in their communities.

Portland Country Club, ME
Certified Audubon Cooperative Sanctuary

Why are these programs so important?

- Address golf's specific environmental issues and opportunities.
- Assist courses in becoming, and being recognized as, community environmental assets.

Prairie Dunes Country Club, KS
Certified Audubon Cooperative Sanctuary

How the ACSP works…

PLAN	Complete a Site Assessment and Environmental Plan
DO	Implement your Environmental Plan
CHECK	Gauge your results and apply for certification
ACT	Strive for continuous improvement

Six Environmental Focus Areas

- Environmental Planning
- Wildlife and Habitat Management
- Chemical Use Reduction and Safety
- Water Conservation
- Water Quality Management
- Outreach and Education

Spyglass Hill Golf Course, CA
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Water Conservation & Quality Protection

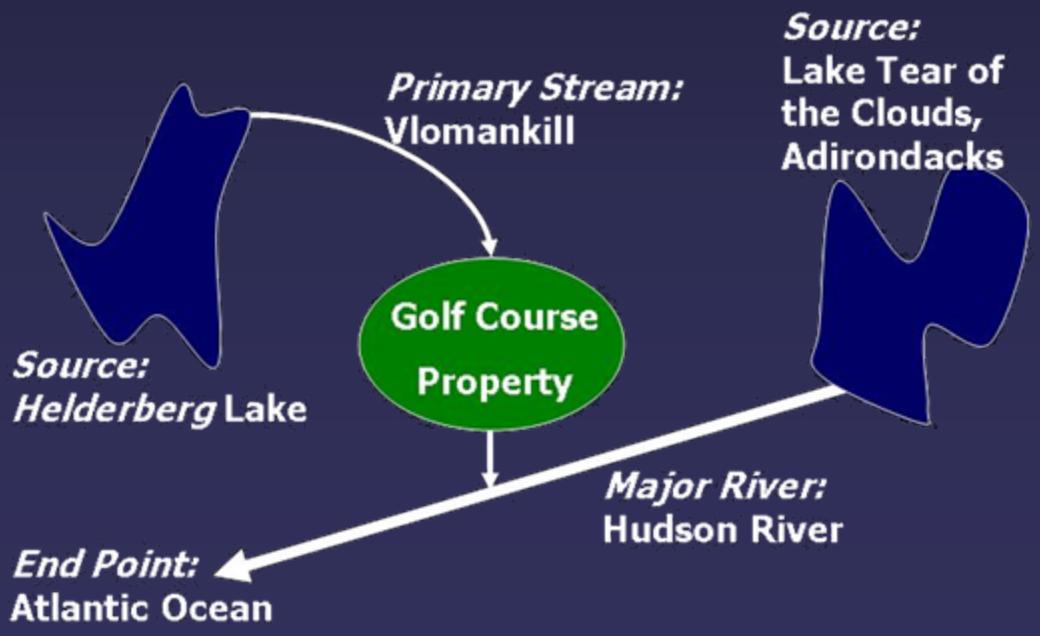
- *Purpose*: To ensure adequate water supplies for irrigation and maintain the health and integrity of water bodies, such as rivers, streams, wetlands, lakes, and ponds.

Water Conservation - Goals

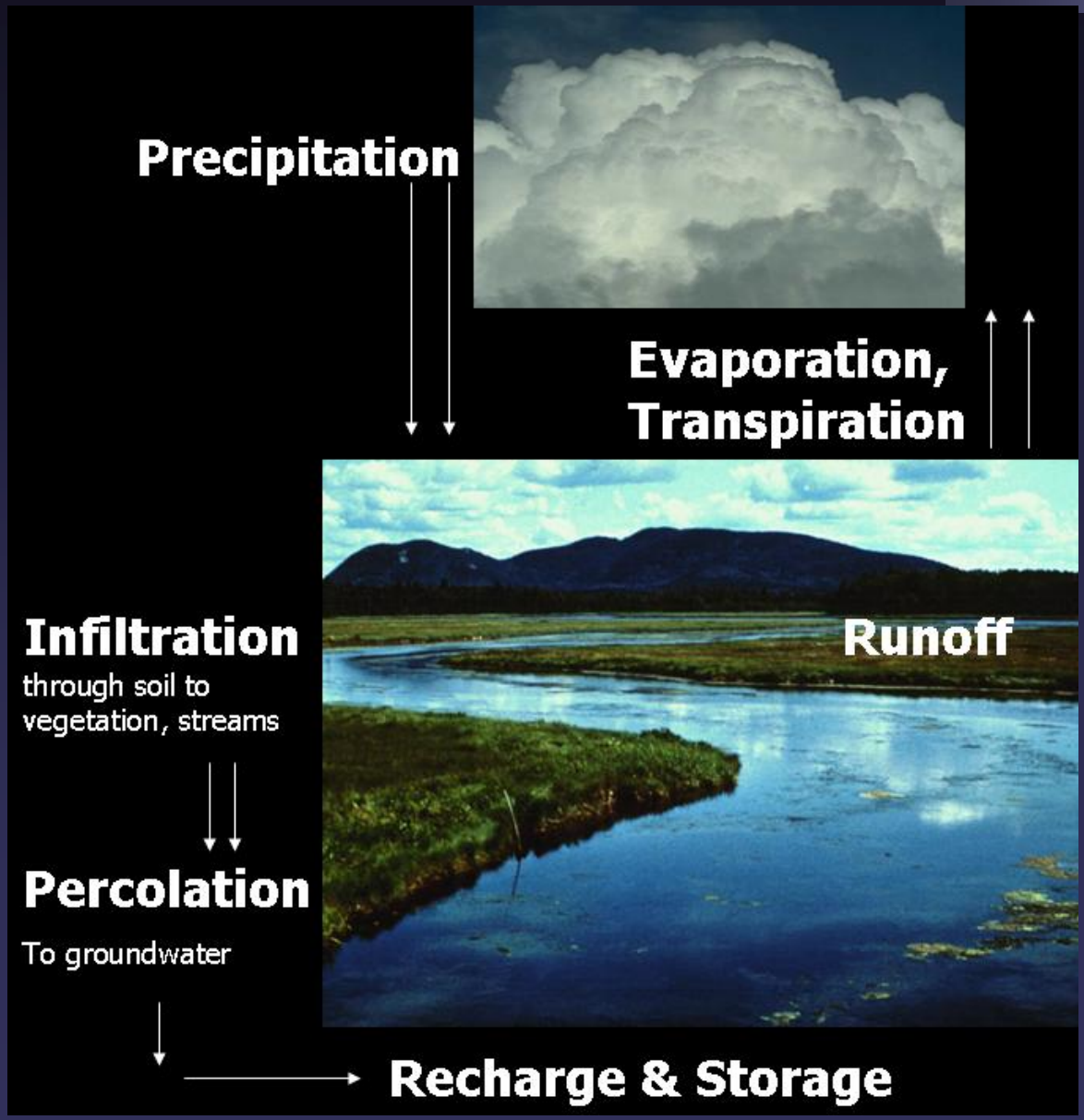
- Identify local watershed and water sources of the course
- Make a commitment to judicious water use.
- Maintain irrigation equipment for maximum efficiency and minimal water waste.
- Implement water conservation practices.

Watershed Connections

- Where does water enter your property?
- What's the quality of the water as it enters?
- Where does water exit your property?
- Does water quality improve, decline, or stay the same as it moves off the course?



General Knowledge-Water Cycle



Water Conservation Practices

- Install and maintain an efficient irrigation system
- Apply water efficiently
- Eliminate unnecessary water use
- Maximize ground water infiltration
- Minimize water loss through runoff, evaporation, and transpiration

Optimizing Equipment Efficiency

- Use modern technology- computers and weather stations
- Analyze your system
- Relocate heads to improve distribution
- Use half-circle sprinklers
- Designate management zones for areas that require the same amount of irrigation
- Keep records

Proper Irrigation Practices

- Reduce irrigated acreage
- Prepare turf for hot, dry summer weather
- Use a soil probe
- Water on a deep, infrequent basis
- Water uniformly, slowly, and at correct time
- Hand water if needed
- Use drip irrigation in landscape beds
- Use weather data

How to improve the water cycle?

- Improve drainage to minimize runoff and evaporation
- Reduce compaction
- Aerate
- Add organic matter
- Maintain soil cover
- Reduce turf stress
- Reduce thatch
- Overseed with improved varieties

Water Quality Management - Goals

- Improve general knowledge of water quality protection and pollution prevention.
- Employ best management practices to eliminate the potential for chemical runoff, nutrient loading, and drift.
- Monitor the health of water features to detect possible movement of nutrient and chemical inputs and correct problems as needed.

Brigantine Golf Links, NJ

Certified Audubon Cooperative Sanctuary

Identify Potential/Actual Impacts

- Discharges of chemical pollutants via leaching, drift, or runoff
- Sedimentation due to eroding shorelines
- Thermal pollution due to lack of shade
- Impacts associated with excessive water withdrawals
- Oxygen depletion due to excessive growth of algae/nutrient loading

Best Management Practices

- Prevention
- Detection
- Control

The more you can prevent problems from occurring, the easier, less costly, and more effective your water quality management program will be.

Eliminate chemical runoff and drift

- “No spray” and “limited spray” zones
- Spoon feeding
- Fertigation
- Slow-release fertilizers

Water Quality Management

- Best Management Practices - Prevention
  - Vegetative Buffers
  - No-spray zones

Vegetative Buffers

Blue Hills Country Club, KS

Filter strip – turfgrass

Ideally 25-30 feet of dense turf on a slight slope

The Haymaker, CO

Extended dense buffer – native vegetation

Maintenance Facility

- Properly store, handle, and dispose of chemicals
- Equipment should be cleaned in a manner that does not allow chemicals to move into waterways
- Chemicals should be stored safely
- Spill containment should be guaranteed
- Empty chemical containers should be stored and disposed of properly.

Water Quality Monitoring

Monitor the health of water features to detect possible movement of nutrient and chemical inputs into water sources and correct problems as needed.

Warren Golf Course at Notre Dame, IN

Conducting the Tests

- Do-it-yourself
- Contract Laboratory
- Working with a local organization

Woodway Country Club, CT

Types of Monitoring

- Physical characteristics- dissolved oxygen, pH, temperature, conductivity
- Nutrients- nitrogen (nitrate and ammonia) and total phosphorus
- Macroinvertebrates
- Pesticides

Results count!

The general public, government agencies, and environmental community look at NUMBERS and RESULTS to evaluate how good golf is for the environment.

Bethpage State Park- Black Course, NY
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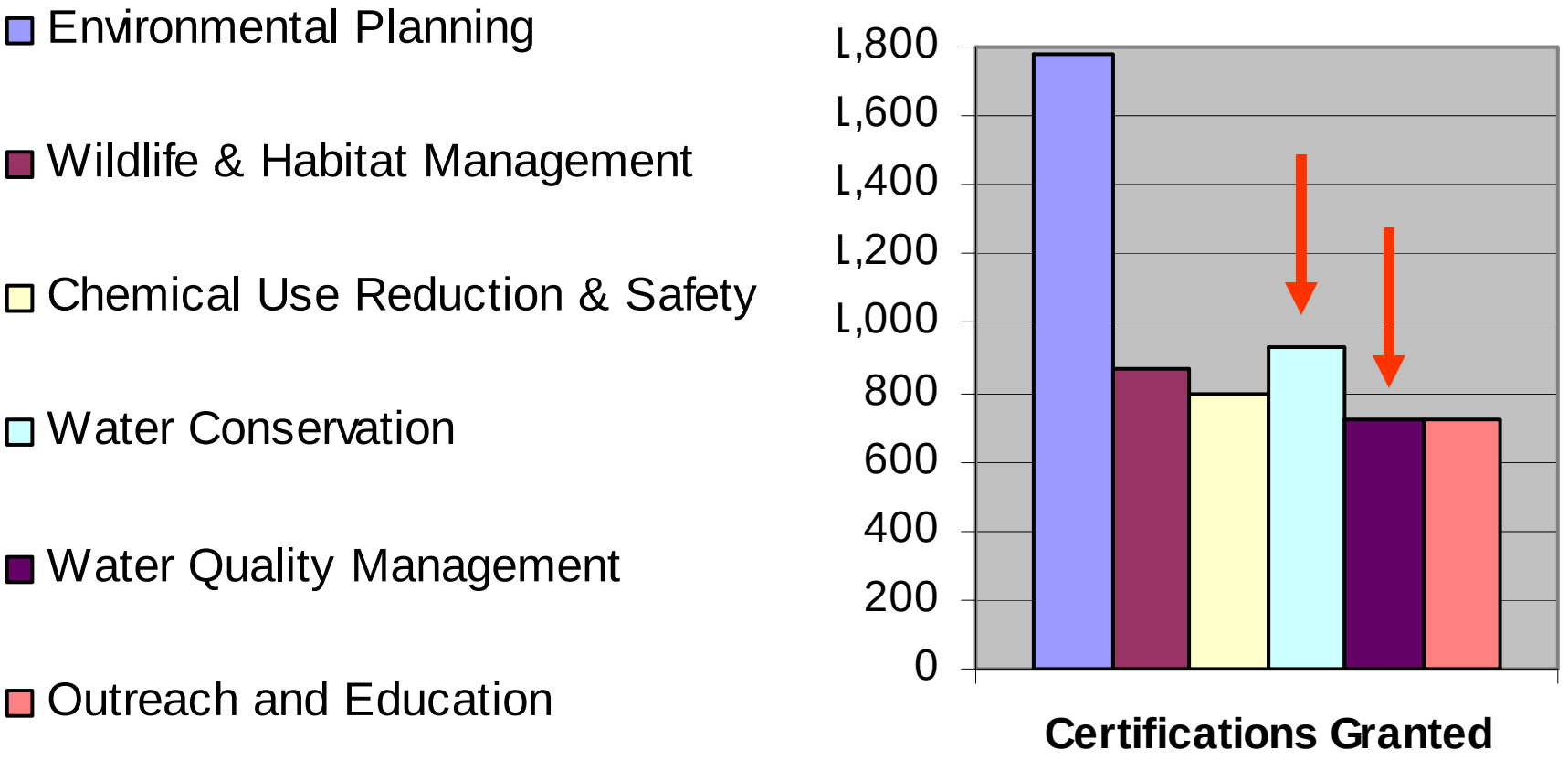
Results: Membership Activity

- ACSP Members are developing plans and taking action.



Results: Proven Environmental Outcomes

- Water Conservation
  - 69% decreased water use
  - average savings: 1.9 million gallons/ year/course
- Water Quality Protection
  - 89% of respondents improved cultural control methods
  - 92% used pesticides with a lower toxicity level
  - 86% increased efforts to monitor water quality

6,748 new birds fledged on 112 golf courses

2005 Nestbox Survey

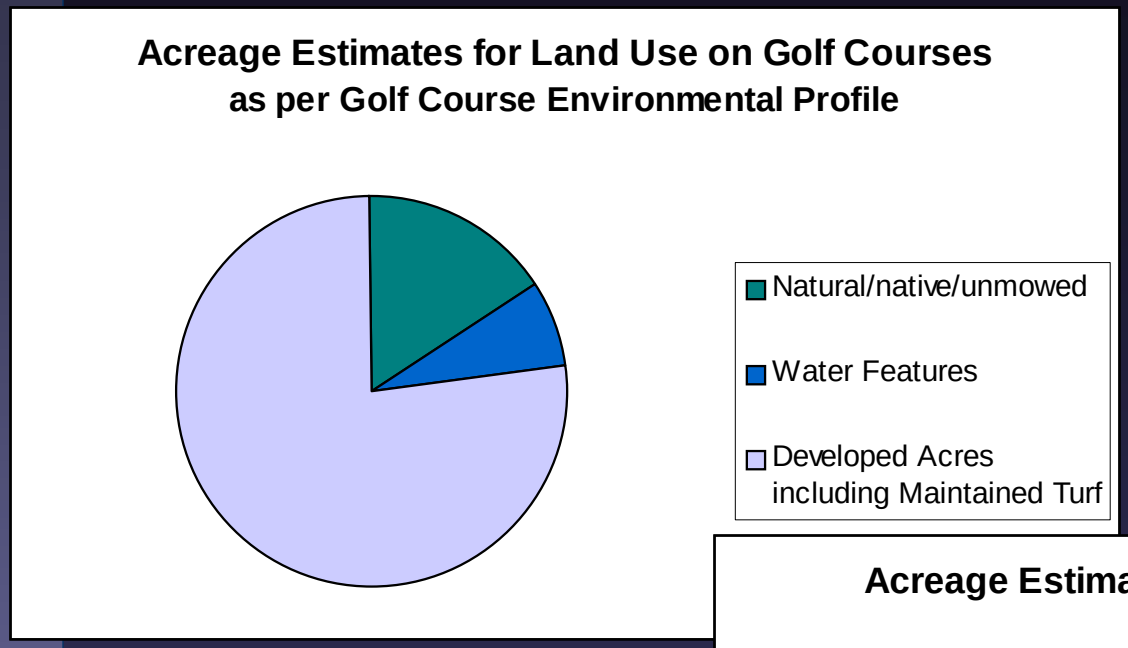
Results: Proven Environmental Outcomes

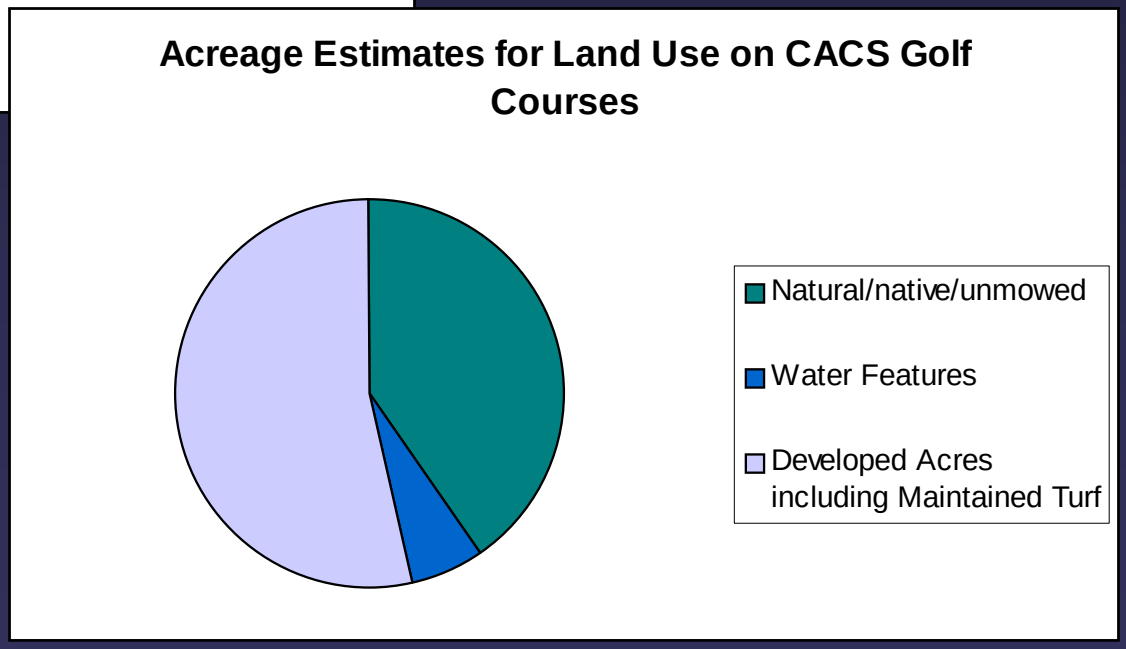
- Habitat Management
  - 55% increased emergent vegetation in golf course ponds
  - 89% emphasize native plants when landscaping
  - 80% decreased turfgrass
  - The average increase in wildlife habitat: 22 acres per golf course

289 birds identified on 53 golf courses

2006 North American Birdwatching Open

Results: Proven Environmental Outcomes





Case Studies - Telling A Good Story

Donald K. Gardner Memorial Golf Course, IA

- Naturalized 20 acres
- Cost: $500
- Savings: $1,000/year in maintenance labor

Quail Run Golf Course, AZ

- Removed 8 acres of turf
- Saved 16 million gallons of water and 800 gallons of fuel

Quail Run Golf Course, OR

Certified Audubon Cooperative Sanctuary

Case Study - Erosion Control
Shawnee Inn and Golf Resort, PA

Before- erosion and poor bank stability

After- tree wells in place with vegetation

Case Study - Outreach
TPC Summerlin, NV

At the waste water treatment plant

On the course

In the pumphouse

Case Studies – Naturalizing Turf Areas
Edgewood Country Club, NJ

- Naturalized 30 acres of formerly mown roughs
- Project cost: $4,500
- Savings:
  - $10,000/year on fuel, pesticides, labor, equipment wear and tear
  - 250,000 gallons of water/year

The Environmental Institute for Golf - The Institute's Environmental Information Tool - Mozilla Firefox

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Environmental Institute for Golf

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The Institute's Online Environmental Resource

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designed to provide the most current and
related to golf and the environment. EDGE
information in a variety of critical areas inc

Focus areas:

- Water Management
- Integrated Plant Management
- Wildlife Management
- Golf Course Siting, Design and Constr
- Energy and Waste Management

Information you will find includ

- **Best Management Practices** for golf
area of focus.
- **Technical information** reporting on e
research relevant to golf.
- **Case studies** about environmentally-fr
conservation-oriented management prac
courses.
- **Sources for education** in a variety of
topics related to golf.

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Success Stories

WATER USE AND CONSERVATION

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Conserving Water by Converting to a Desert Garden

Tournament Players Club at Summerlin, Las Vegas, Nevada

The Tournament Players Club at Summerlin replaced 7,500 square feet of maintained sheep's fescue with this desert garden leading to water conservation, more appealing aesthetics,

We all know that water is one of our most valuable natural resources. There is not an endless supply and careful steps must be taken to ensure the continued availability of this resource. Golf courses are often criticized for the large amounts of water that they use as part of their turf care operations, and, as a result, water conservation projects are often given a priority. The Tournament Players Club at Summerlin, a private 18-hole club located in Las Vegas, Nevada, is no exception. In desert ecosystems, water is a precious resource, and increased scrutiny is placed on its use.

A 7500 square foot area consisting of sheep's fescue adjacent to the 6th hole was chosen for naturalization. Golf course superintendent Dale Hahn selected this project for a couple of reasons. One was to convert an unsightly grass area into a more aesthetically-pleasing garden and to give that section of the course more visual appeal. Another goal of the project was to take a section of the course that had fairly high water use and convert it to a low-water use desert garden. Additionally, the desert garden would serve as an educational tool for members, informing them about the variety of native plants that could be found on and around the course.

Case Studies – Golf Leading the Way

- Red Eagle Golf Course in Eufaula, AL led a tour of the course to town officials, leading the mayor to contact Audubon International and the eventual development of the Sustainable Communities Program.

For more information:

Audubon Cooperative Sanctuary Program

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www.golfandenvironment.org