Developing a Comprehensive Golf Course Master Plan

As the golf industry evolves and course infrastructure deteriorates, golf facilities must be prepared to make the necessary changes to remain viable and sustainable.

BY ELLIOTT DOWLING AND PAT GROSS

Periodically checking sprinkler nozzles for wear and debris is a best management practice that should be outlined in water management plans.

What will your golf facility look like in five, 10, or 20 years? While nobody has a crystal ball that can look into the future, successful businesses have long recognized that without making constant improvements and planning for the future, they will fall behind. In a rapidly changing industry like golf, facilities need to continually improve the playing experience and prepare for challenges like aging equipment and new governmental regulations. Long-range planning helps facilities identify opportunities and address issues before major problems occur.

Golf course planning committees tend to have frequent turnover, and ideas tend to come and go as new decision makers take charge. With less time to get things done, the focus is usually on short-term solutions that can have a negative effect on long-term progress. Comprehensive master plans help facilities organize and prioritize projects to avoid wasting precious time and money. Master plans also help courses avoid spending money on projects that conflict with future plans or long-term goals.

The most successful master plans are comprehensive and address the following subjects:

- Water management.
- Irrigation system improvements.
- Drainage improvements.
- Equipment inventory and replacement schedule.
- Maintenance facility improvements.
- Tree management.
- Cart path improvements.
- Staffing and labor requirements.
- Architectural and design improvements.

For additional information on the importance of master plans, read the article "Golf Course Renovations And Master Plans: Why And When?"

WATER MANAGEMENT PLAN

Water is taken for granted at many golf courses, and few facilities have a written plan regarding how water is managed. A written water management plan serves several purposes:

- Identifying how much water is actually needed to keep turf alive and playable in an average year.
- Establishing a method for measuring and managing water use.

©2016 by United States Golf Association. All rights reserved. Please see Policies for the Reuse of USGA Green Section Publications. Subscribe to the *USGA Green Section Record*.

- Setting forth contingency plans in the event of water shortages.
- Serves as a valuable document that can be shared with stakeholders, regulators, government officials, and others who may have input on how water is used and managed in the community.

The three main elements of a written water management plan are: a water budget, a list of best management practices (BMPs) for irrigation system operation, and a drought emergency plan.

Water Budget — A water budget uses historical climate information and site data to estimate the amount of water a golf facility needs in an average year to keep turf healthy and playable. The Environmental Protection Agency and other government authorities have recognized the water budget approach as a scientifically valid process for estimating turf and landscape water requirements. As such, the water budgeting methodology is part of water-use regulations in many parts of the country.

Developing a water budget for a particular golf course involves collecting data on the size of the property, obtaining reference evapotranspiration based on the climate and location of the golf course, the grass species being grown, and the historical average rainfall. The information, when inserted into the water budget formula, creates monthly and annual estimates of golf course water requirements. The article "How To Develop A Water Budget For Your Course" includes a water budget calculator tool and describes the step-by-step process for developing a site-specific water budget.

Irrigation BMPs — While irrigation is an intuitive part of the job for many superintendents, it is very important to have a written document that outlines the decision-making process for determining when irrigation is necessary, how much water should be applied, and how the irrigation system controller is programmed. One way to determine what should be included in this document is considering what a new irrigation technician or assistant superintendent would need to know about how the golf course should be irrigated.

Irrigation BMP documents should list the steps that go into determining water needs. For example, how should staff use weather station data and visual assessments of turf health? How is soil moisture measured? What are the different microclimates on the course and how are they irrigated differently? Irrigation BMPs should provide answers to these questions.

Replacing worn or ineffective nozzles is an easy way to improve the overall performance of an irrigation system.

These examples are not a comprehensive list of the items that should be addressed in irrigation BMP documents, but they provide a baseline to help describe the irrigation process in full detail. A list of site-specific BMPs can be added to this document to further describe the many programs that are employed to maximize water use efficiency.

Drought Emergency Plan — Periodic water shortages occur in many parts of the country, even in areas with relatively high rainfall. Developing a written drought emergency plan in advance of mandatory water cutbacks can guide rational decisions in the event of a drought.

Drought ordinances typically mandate that customers reduce irrigation by at least 10-30 percent, depending on the severity of drought. The goal of a drought emergency plan is to determine in advance where and how to reduce irrigation to cope with various levels of water shortage or restriction. A five-step process is described in the article "Developing a Drought Emergency Plan" and involves measuring the size of golf course areas, gathering data on historical water-use patterns, and determining water-use priorities. The information can then be inserted into the USGA Drought Emergency Plan Spreadsheet to help develop a written drought emergency plan.

IRRIGATION SYSTEM IMPROVEMENTS

An efficient irrigation system is critical to conserving water resources and producing quality turf. Irrigation systems are also one of the more costly parts of the golf course infrastructure to replace when things start falling apart. Sprinklers, pipes, fittings, valves, and controllers all experience wear and eventually must be replaced. The master plan should include a section describing the decision-making process and timeline for making necessary irrigation system improvements. The following items should be included in the irrigation system improvement plan:

- Documentation on the age of various irrigation system components and their expected life span.
- Provisions for irrigation system auditing at regular intervals to document efficiency and uniformity. This information will also provide an indication of the expected life span of components.
- Documentation on the current cost to operate and repair the irrigation system and purchase water.
- Provisions to upgrade and adjust the irrigation system as part of any architectural changes to the course.
- Plans for upgrading to new technology as it becomes available.

The article "When Is It Time To Replace An Irrigation System?" provides further details on many aspects of the irrigation system that need to evaluated and addressed as part of a master plan.

©2016 by United States Golf Association. All rights reserved.
Please see Policies for the Reuse of USGA Green Section Publications. Subscribe to the *USGA Green Section Record*.

DRAINAGE INFRASTRUCTURE IMPROVEMENTS

Few things are as important to turf health and playability as water management. The common misconception is that water, regardless of quantity, is good for turf. The reality is that too much water is detrimental to turf health and playability. Therefore, an efficient drainage system — i.e., a combination of surface and subsurface drainage — is essential to maintain high-quality turf that golfers demand. Key elements of a successful drainage master plan include:

- A map of existing drain lines that identifies their age and performance.
- The locations of wet areas.
- The locations of surface collection areas.
- Notes identifying where seepage drains are needed.
- Pipe sizing and drainage design for any necessary improvements.
- Labor and cost estimates for improving drainage.

The best approach to managing golf course drainage is to perform a thorough site analysis and install drainage before a problem occurs. The article "Planning a Golf Course Drainage Project" helps explain the importance of focusing drainage projects on improving high-profile areas such as greens, fairway landing zones, and high-traffic areas. Removing excess water from playing surfaces in a quick and effective manner will improve turf health and allow play to quickly resume following rain events. Ultimately, successful drainage translates to fewer lost rounds because of saturated course conditions.

EQUIPMENT

Golfers expect a high level of turf conditioning, but many are unaware of everything it takes to deliver such conditions. An appropriate, properly maintained equipment fleet that is tuned to perform specific tasks is necessary to meet the requirements of today's demanding golf market.

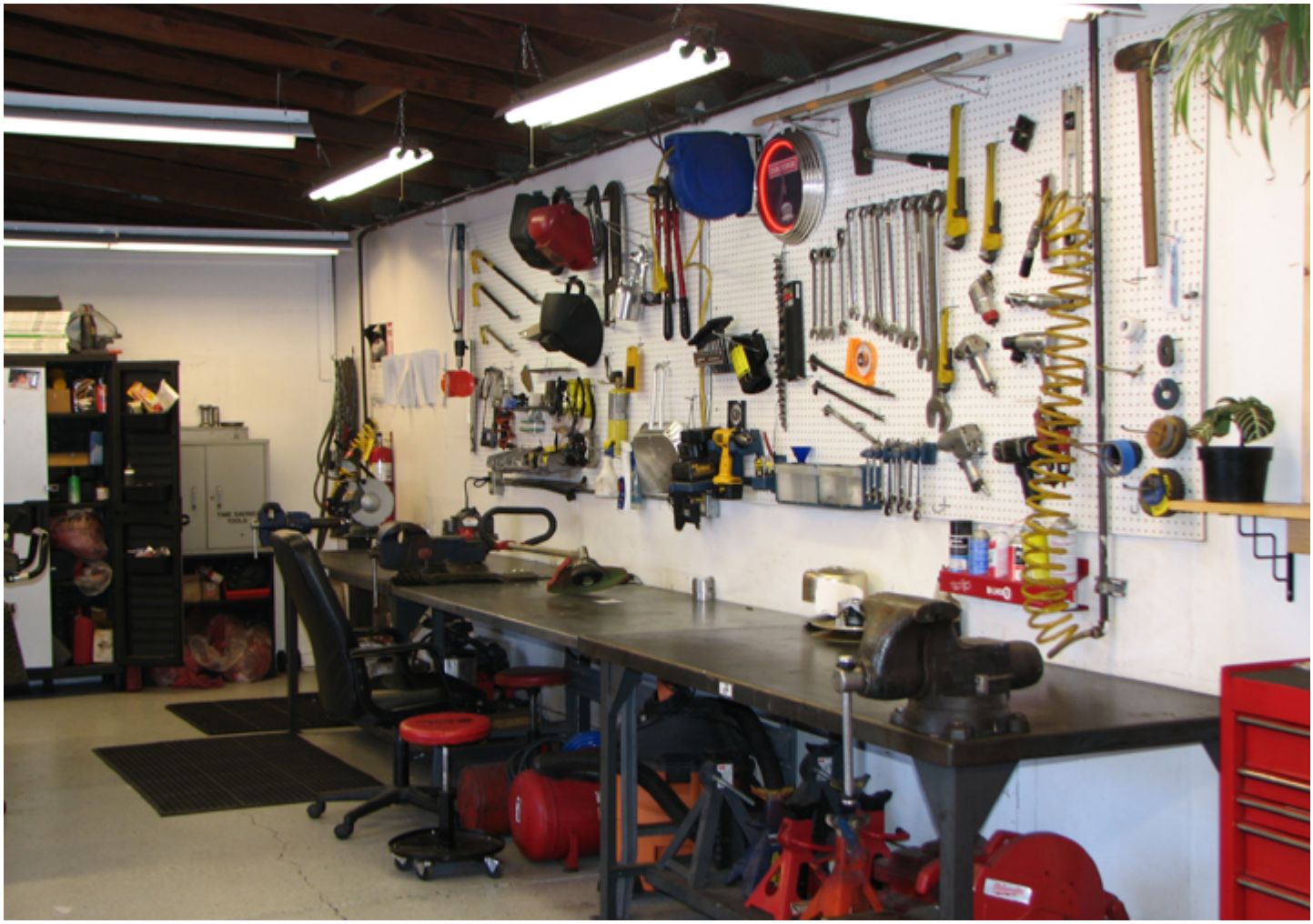
An equipment replacement master plan is critical for maintaining an efficient equipment fleet. Unfortunately, maintaining an aging equipment fleet has become an expensive reality for many superintendents and their equipment technicians. Courses using outdated equipment can spend more than $100,000 per year on equipment maintenance and repair, which is significantly higher than courses with an up-to-date equipment fleet.

Furthermore, consider the impact on the maintenance operation each time a piece of equipment breaks down. Equipment being repaired obviously cannot be used for course maintenance. Breakdowns increase as equipment ages, which could lead to frustrated golfers over time if important tasks are not being accomplished as often as necessary. For more information on the costs associated with maintaining an aging equipment fleet, refer to the article "With a Good Mechanic, It Will Run Forever."

If your facility receives negative comments regarding course conditioning, it may be time to develop a master plan for equipment replacement. The master plan should include a plan for each piece of equipment in the inventory, detailing when it was purchased, how much money has been spent

Drainage improvements are an important part of golf course maintenance. Playability and plant health are optimized when there is balance between soil moisture and drainage.

©2016 by United States Golf Association. All rights reserved.
Please see Policies for the Reuse of USGA Green Section Publications. Subscribe to the *USGA Green Section Record*.



Repair costs for aging equipment can stretch even the largest budgets. Replacing old equipment on a timely schedule maximizes efficiency and reduces repair costs.

on repairs, the useful life span of the equipment, and the estimated replacement cost. The annual expenditure necessary to keep pace with equipment replacement can be estimated by dividing the total replacement cost by its useful life span. For example, a $2-million equipment inventory with a useful life of 10 years will require an annual expenditure of $200,000 for new equipment. For more information regarding the need for an equipment replacement schedule, refer to the article "Fleeting Moments." For additional equipment-related considerations, the USGA digital collection Equipment Management For Golf Courses will help your facility make important decisions.

MAINTENANCE FACILITY

A safe, clean, organized, and well-planned maintenance facility is essential for maintaining a golf course to today's high expectations. Developing a maintenance facility master plan will answer important questions regarding the effectiveness of your maintenance facility. Some key questions that all golf courses should answer are:

- Is all of the equipment kept inside?
- Is there adequate room to access frequently used items without moving other equipment?
- Is there adequate space for employees — i.e., breakroom and locker room?
- Are chemicals stored in a clean, well-lit, organized, and secured structure? Is that structure located away from high-traffic areas in the maintenance facility where materials can be easily and safely handled?
- Does the maintenance facility promote efficient workflow onto and off the golf course? Is a significant amount of travel time required to go from the maintenance facility to the golf course?
- Does the maintenance facility promote efficient workflow between employee meeting rooms, break rooms, and equipment storage areas?

Maintenance facilities pose the greatest potential risk of environmental impact at a golf facility. Potentially hazardous materials such as fuels, fertilizers, pesticides, and other chemicals are all stored at maintenance facilities. Therefore, maintenance facilities should be constructed and maintained with human and environmental safety in mind. All areas of a maintenance facility must meet current local and federal environmental codes and regulations. For more information on fertilizer and chemical storage, as well as other maintenance facility

©2016 by United States Golf Association. All rights reserved.
Please see Policies for the Reuse of USGA Green Section Publications. Subscribe to the *USGA Green Section Record*.

considerations, please refer to the article "I Know We Don't Have the Money, but Can We Afford NOT to Invest in a New Maintenance Facility?"

It is often difficult to get support for making necessary improvements to a maintenance facility because golfers seldom visit the area. Employee morale, safety, and workflow are also difficult to quantify but extremely important nevertheless. A maintenance facility master plan will help identify ways to improve an existing maintenance facility or possibly lead to the construction of a new facility. In either case, maintenance facility improvements can enhance safety and employee morale, reduce environmental risks, and improve golf course conditioning.

For additional information regarding the importance of maintenance facility master plans, refer to the article "What Makes a Good Maintenance Facility?"

TREE MANAGEMENT

One of the most emotional elements of golf course management is trees. Trees and turf can coexist, but an overabundance of trees — especially poor-quality trees — can increase maintenance costs and negatively affect turf quality. Additionally, tree populations are subject to rapid change due to numerous factors, and new pest problems are constantly emerging. Therefore, a tree management plan is an important document for all courses, regardless of the overall number of trees. Keeping in mind these Ten Timely Tips to Avoid Tree Troubles, a successful tree management plan should include:

- A maintenance and pruning program.
- A tree planting plan.
- A tree removal plan.

When developing a tree management plan, it is important to consider the architect's original design. Too often golf courses overplant trees in an effort to create separation between holes, direct players around an obstacle, or add difficulty. In reality, many "in-house" plantings detract from the original architecture.

For more information regarding key considerations related to tree management, consult the USGA digital collection Trees and Golf Courses, a compilation of USGA articles, webcasts, and other educational materials on the subject.

CART PATHS

Cart paths are an important tool for managing traffic at many golf facilities. Having a comprehensive plan is the best way to conserve resources and address the long-term functionality of cart paths. Cart paths can fail for numerous reasons, such as weather, tree roots, traffic, underlying soil conditions, age, or improper construction. They may also be poorly designed or located in a way that prevents them from effectively handling traffic. Regular maintenance is necessary to ensure cart paths remain smooth, safe, and appropriately positioned. Installing and maintaining cart paths is expensive. Fortunately, cart path improvements can be accomplished in phases so that costs can be spread out over time.

One common cart path mistake is installing paths that only accommodate cart traffic. Paths should also be designed to accommodate all pieces

A clean, organized, and well-designed maintenance facility will bolster employee morale and efficiency.

©2016 by United States Golf Association. All rights reserved.
Please see Policies for the Reuse of USGA Green Section Publications. Subscribe to the *USGA Green Section Record*.

A comprehensive tree management plan outlines a long-term vision for tree removal and planting, ensuring consistent tree management decisions. Without a plan, the risk of overplanting increases with changing decision makers.

of maintenance equipment to reduce traffic stress on turf and allow the maintenance staff to rapidly and efficiently move equipment around the golf course in all types of weather. For more information about developing a comprehensive cart path plan, please refer to the article "Common Sense Cart Paths."

STAFFING AND LABOR REQUIREMENTS

To be successful, golf courses must recruit, train, and retain quality employees. The easiest way to determine how many employees or labor hours are necessary at your facility is to have a written set of maintenance standards. Once the maintenance standards are established, the superintendent can perform a labor analysis that outlines daily, weekly, and periodic maintenance duties. Using labor analysis, superintendents can determine where additional labor hours are necessary or where labor can be reallocated to other areas. A labor analysis also is extremely helpful for budgeting purposes and can provide valuable support and guidance when contemplating new maintenance programs. For a detailed description on how to formulate a labor analysis, please review the article "A Labor of Love or a Love of Labor?"

ARCHITECTURAL AND DESIGN IMPROVEMENTS

An architectural master plan should be developed by a golf course architect. The impartial and well-trained eye of an architect is crucial for evaluating the strategy and playability of a golf course and recommending necessary changes. An architectural master plan should include a hole-by-hole analysis of the strategy and playability of tees, fairways, bunkers, greens, trees, water features, and other design elements. The plan should also include recommendations for improvement. A good architectural master plan also incorporates the infrastructure elements previously discussed in this article, including the irrigation system, drainage, cart paths, trees, equipment, maintenance facility, and staffing requirements. Combining both architectural and infrastructure components into a master plan makes it possible to properly forecast and budget for improvements while avoiding costly mistakes. For additional information on architectural master plans, please refer to the articles "Renovations Can Make Your Course More User Friendly" and "So, You Want To Renovate Your Course?"

CONCLUSION

Constant improvement is the hallmark of all great golf facilities. Golfers and committees can easily develop an endless list of ideas to enhance a golf course, but improvements should have a specific goal and purpose. Improvements should be part of a comprehensive master plan and be coordinated with other projects to avoid the added expense of disrupting work that has already been completed.

An effective master plan is much more than a design document; it addresses all aspects of golf facility infrastructure, including water management, the irrigation system, drainage, equipment, the maintenance facility, trees, cart paths, staffing requirements,

©2016 by United States Golf Association. All rights reserved.
Please see Policies for the Reuse of USGA Green Section Publications. Subscribe to the *USGA Green Section Record*.

and architecture. A comprehensive master plan helps current and future decision makers prioritize and budget for needed improvements. With a master plan on hand, golf courses will be better equipped to make needed improvements while using resources as wisely as possible. Furthermore, master plan documents can help golf facilities move toward a more economically and environmentally sustainable future.

REFERENCES

Dowling, Elliott L. "Renovations Can Make Your Course More User Friendly." Green Section Record, vol. 52, no. 10, May 2014, pp. 1-3.

Forrest, Steven P. "Golf Course Renovations And Master Plans: Why And When?" ASGCA Web Site, asgca.wpengine.com/design/existing-courses/course-renovation-articles/golf-course-renovations-and-master-plans-why-and-when/.

Gilhuly, Larry, and Todd Gray. "Fleeting Moments." Green Section Record, vol. 46, no. 5, Sep./Oct. 2008, pp.1-5.

Gross, Patrick J., and Chris Hartwiger. "How To Develop A Water Budget For Your Course." Green Section Record, vol. 54, no. 7, 1 Apr. 2016, pp. 1-5.

Gross, Patrick J. "When Is It Time to Replace the Irrigation System?" Green Section Record, vol. 53, no. 5, 6 Mar. 2015, pp. 1-8.

Gross, Patrick J. "Developing a Drought-Emergency Plan." Green Section Record, vol. 51, no. 14, 12 Jul. 2013, pp. 1-5.

Gross, Patrick J. "A Labor of Love or a Love of Labor?" Green Section Record, vol. 48, no. 3, May/Jun. 2010, pp. 24-27.

Hartwiger, Chris. "With a Good Mechanic, It Will Run Forever." Green Section Record, vol. 47, no. 3, May/Jun. 2009, pp. 14-15.

Lowe, Todd. "What Makes a Good Maintenance Facility?" Green Section Record, vol. 52, no. 20, 3 Oct. 2014, pp. 1-6.

Oatis, David A. "I Know We Don't Have the Money, but Can We Afford NOT to Invest in a New Maintenance Facility?" USGA Green Section Record, vol. 52, no. 7, 4 Apr. 2014, pp. 1-6.

Oatis, David A. "Common Sense Cart Paths." Green Section Record, vol. 32, no. 1, Jan./Feb. 1994, pp. 1-5.

Oatis, David A. "So, You Want To Renovate Your Golf Course?" Green Section Record, vol. 35, no. 5, Sep./Oct. 1997, pp. 1-5.

O'Brien, Patrick M. "Planning a Golf Course Drainage Project." Green Section Record, vol. 43, no.5, Sep./Oct. 2005, pp. 16-20.

Vermeulen, Paul. "Ten Timely Tips to Avoid Tree Troubles." Green Section Record, vol. 28, no. 5, Sep./Oct. 1990, pp. 15-17.

Cart paths are an integral part of many golf courses. When they fail, they become costly eyesores that golfers are reluctant to use.

ADDITIONAL RESOURCES

USGA Digital Collection — Equipment Management for Golf Courses

USGA Digital Collection — Trees and Golf Courses

ELLIOTT DOWLING *is an agronomist in the Northeast Region, and* PAT GROSS *is the regional director of the West Region.*

SUBSCRIBE TO THE USGA *GREEN SECTION RECORD*

TEXT "GREENSECTION" TO "22828" OR CLICK HERE

Offering the latest information on golf course management, turfgrass culture, environmental issues, research and economic sustainability.

©2016 by United States Golf Association. All rights reserved. Please see Policies for the Reuse of USGA Green Section Publications. Subscribe to the *USGA Green Section Record*.