



Water Conservation Guidelines for Golf Courses

(Updated October, 2002)

General

Careful water use in golf course irrigation is not only environmentally and fiscally sound, but also is essential to promote healthy turfgrass that is better able to tolerate environmental stress and resist insect pests, weeds and disease. Healthy turfgrass subsequently requires less water, fertilizer and pesticides. More efficient water use reduces the amount of water removed from streams, resulting in less disturbance to aquatic systems. Less water taken from wells reduces impacts on the ground water levels and wells in that locality.

A water conservation scheme depends on several factors: soils, terrain, course layout, grass selection and acreage, irrigation system design and control, and whether or not treated sewage effluent is available. Operational considerations affecting irrigation water management will include irrigation quantity and frequency, fertilization program, pest management, and mowing.

The following information related to reducing irrigation needs, irrigation supply, irrigation Best Management Practices (BMPs) fertilizer and pesticide management, and associated contacts are provided to advise the applicant proposing a new or expanded water withdrawal in connection with a proposed or existing golf course. The elements outlined herein should be addressed as part of an application for a ground water or surface water withdrawal to DRBC for the purpose of golf course irrigation.

Reducing Irrigation Needs

Layout: Golf course layout has a large impact on water use. The total property area for most golf courses is between 150 – 200 acres. Of this, typically 40 acres will be irrigated. Narrowing fairways and incorporating warm season native vegetation such as switchgrass, bluestem and Indian grass in roughs can lower this amount. Prioritize areas for irrigation:

1. Greens and collars
2. Tees
3. Greens approaches
4. Fairway landing zones
5. Other fairway areas
6. Shorter rough areas

Turfgrass Selection

Significant water savings are possible with the use of fine leaf fescues and tall fescues for rough and other non-turf planted areas.

Irrigation Supply

If irrigation water is to be taken from natural surface waters, a surface or ground water withdrawal permit will be required. Water sources for irrigation supply should be evaluated and prioritized in order to reduce impacts on natural water sources. An accurate reporting of the acreage to be irrigated is required. A prudent priority of sources for irrigation might be:

1. Stored stormwater in ponds or detention basins onsite
2. Treated sewage effluent
3. Public or municipal water supplies
4. Existing natural surface waters
5. Private wells

Irrigation BMPs

Fine tune irrigation practices and maintain peak irrigation system efficiency. Careful use of the irrigation system will result in a better quality turf. Avoid over irrigation in the spring. A continually saturated condition in the springtime root zone prevents the development of a deep, fibrous root system, which means trouble for summer survival. Critical irrigation best management practices include:

- Soil probing before irrigating to determine existing soil conditions.
- Applying irrigation water as uniformly as possible (variability of soils and turf types will require customized application in some instances).
- Applying water only as fast as the soil can accept it. To avoid puddling and runoff, use short duration cycles.
- Irrigating when there is little wind and avoid mid-day irrigation during peak evaporation periods.
- Utilizing drip irrigation for tree and shrub areas and reduce or eliminate irrigation for the driving range.
- Operation plan for reduction of either total water volume or irrigation area during a drought emergency declared by the State or DRBC.

A well designed, properly installed, maintained and managed automatic irrigation system usually provides the best means of conserving water. Water savings of 40% to 75% have been documented on golf courses that have converted from manual to automatic. Regardless of system type, it should be operating at peak efficiency. Principles for efficient operation are:

- Repair all leaks.
- Check nozzle size as it relates to available pressure and resulting coverage.
- Check for nozzle wear and replace as needed.
- Use half-circle sprinklers where applicable.
- Check pump performance and other pump-house systems.
- Test sprinkler application rate and evenness often.

Fertilizer Management

Fertilizers are necessary to maintain healthy turfgrass that is under heavy use. The primary necessary turfgrass fertilizer nutrients are nitrogen (N), phosphorous (P) and potassium (K). Excessive applications of N and P can encourage weed growth, turf disease and cause pollution of both ground and surface waters. Surface runoff from established, healthy turf does not usually carry harmful amounts of N and P. The potential for nutrient polluted runoff increases in newly seeded areas, on steep slopes, when application is done at improper times, and during rehabilitation of depleted or damaged turfgrass. The proper objective of a fertilizer management program is to supply plant nutrients at the proper time and in the proper amount to supply sufficient food for the turf with no excess. Recommendations are:

- Develop and document fertilizer programs for each area of the golf course. Nutrient needs vary by cultivar, soil conditions, and use pressure. A fertilizer plan should address the different needs of each area of the course. Application frequency, timing, formulation and amount should be documented each time.
- Manage fertilizer applications according to weather and soil conditions. Never exceed Rutgers Cooperative Extension fertility recommendations.
- Avoid fertilizer applications during dry soil conditions just prior to significant rainfall events. Do not apply high N fertilizers on wet turf. Always avoid heavy applications of soluble nitrogen fertilizers.
- Instead, use light foliar feedings of soluble N concentrations.
- On coastal plain or similar coarse textured soils, use lower amounts applied more frequently in order to meet the turf nutrient requirements.
- Perform light feedings during the late fall near the turf dormancy date. This will reduce the need for early spring fertilization and eliminate the wintertime turf thinning common in the Northeast. Slow release temperature sensitive nitrogen fertilizers should be used for applications done late in the season. These fertilizers remain insoluble in cold temperatures, which reduces leaching to ground water. Slow release fertilizers should supply 50% of the nitrogen requirements.

- Maintain a fertilizer free transition zone around all surface waters, including stormwater detention facilities. Transition zone grasses that receive no fertilizer act as buffers or filter strips. This zone should be considered the upper area of the riparian buffer.
- Be moderate with fertilizer on newly seeded areas. Grasses lacking a fully developed root system are unable to assimilate high levels of nutrients. Use several light applications in the critical establishment phase.

Pesticides on the Golf Course

Pesticides will usually reduce pest damage to turf grasses but can also have serious environmental effects. To protect water resources, careful consideration must be given to pesticide selection and application. Integrated pest management programs should always incorporate the following principles:

- Minimize chemical use through cultural control measures, if possible.
- Select the least toxic, least persistent, least mobile and most pest specific NJ registered pesticide.
- Apply the pesticide at the pest's most vulnerable life cycle stage.
- Apply the pesticide at the minimum required rates to the minimum area necessary.
- Use the pesticide in strict accordance with the product label directions and guidelines.
- Avoid continually using pesticides of the same chemistry or active ingredient mode of action to avoid buildup of pest resistance.
- Be aware of the 36-48 hour weather forecast.
- Adopt a notification program for neighbors when pesticides are to be applied near course boundaries.
- Pesticide Selection

There will always be more than one type of pesticide that is effective and registered for a specific use. Pesticide selection must consider environmental factors, as well as the pesticide toxicity, persistence, tendency to accumulate in living tissues, solubility and soil adsorptive characteristics. These factors all play an important role in the movement of pesticide surface runoff and leaching to ground water. Environmental criteria for profiling and selecting pesticides are listed below.

- Profile the important physical environmental factors affecting chemical mobility for each area of the golf course. Several factors are soil organic matter, clay content, texture, permeability, subsoil texture, and drainage, affect pesticide movement and should be factored in chemical management plans. For example, the higher the percentage of organic matter and clay content in the soil, greater is the soil ability to adsorb chemicals and decrease leaching. In contrast, sites featuring coarse textured soils offer high permeability, which makes it easier for mobile chemicals to leach down to the water table. Golf courses built over karst, fluvial or alluvial sandy-gravelly complexes also run higher risk of leaching and runoff.
- Avoid pesticides that are very toxic to birds, fish and wildlife.
- Eliminate pesticides that are persistent and can bioaccumulate. Such substances, which may include pesticides and pesticide metabolites, pose the greatest environmental risk. Pesticides with a soil persistence of greater than 21 days, a soil adsorption (K_{oc}) value of less than 300 and a solubility of greater than 30 mg/l should be used with extreme caution. These general guidelines are especially important in areas with coarse textured soils, soils with low organic matter, and steep slopes near surface waters.
- Avoid applying wettable powders in potential runoff areas. Wettable powders exhibit relatively high runoff rates, characteristically (5% of amount). Better alternatives are water-soluble powders or emulsifiable concentrates.
- Avoid applying pesticides in late fall and winter in flood prone or ponded areas. Some waterfowl species, both resident and migratory, are attracted to flooded fields. They can be poisoned through ingestion of persistent pesticides, particularly granular formulations.

Pesticide Application

It is the applicator's responsibility to take appropriate precautions to protect non-target organisms from exposure. All pesticide applicators and supervisors must be trained and licensed through the Pesticide Applicator Licensing Program of New Jersey, a joint venture of Rutgers Cooperative Extension and NJDEP.

- Read product labels carefully and completely. Apply chemicals only according to the manufacturer's recommended usage and only for registered uses. Pay particularly close attention to the delivery rate and spray volume per unit area.
- Properly calibrate all pesticide sprayers prior to use. Accurate calibration will assure better pesticide application and reduce the risk of chemical drift, runoff and turf stress caused by misapplication.
- Minimize drift. There are a number of techniques that can be employed:
 1. Closely monitor weather conditions and forecasts to comply with application guidelines. Avoid application when wind speeds exceed 5 miles per hour or when winds are blowing toward adjacent non-target sensitive areas. Avoid conditions of temperature inversions – they can lead to vapor cloud formation.
 2. Use low pressures and large droplet nozzles if practical. Large droplet nozzles can adversely affect weed control.
 3. Consider use of drift inhibitor or retardant additives.
 4. Mix a spray pattern indicator with pesticide when spraying near a pesticide free buffer area.
 5. Use wind skirts, guards and shrouds on all sprayers.
- Do not fill pesticide sprayers near water courses and drains.
- Do not leave sprayers unattended while filling.
- Maintain nozzles, hoses, tanks, pumps and all other application-related equipment.

Pesticide-Free Buffer Zones

Use of pesticide free zones reduces the chance of pesticide drift, runoff or leaching into sensitive areas.

Surface waters to be protected by pesticide free zones include all water courses (including stormwater ditches), ponds, lakes and wetlands. Maintain a minimum 35 foot pesticide free zone adjacent to watercourses or water bodies. No pesticide or application equipment may enter the zone. Set a buffer along the pesticide free zone. Generally, a 15 foot buffer zone should be added to the width of the pesticide free zone. In the buffer, pesticide application equipment may travel, but pesticide application should be avoided.

Source of Water Conservation Guidelines: *NJDEP 2nd Draft Guidance Manual: Best Management Practices for Golf Course Construction and Operation in New Jersey*

Useful Contacts:

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