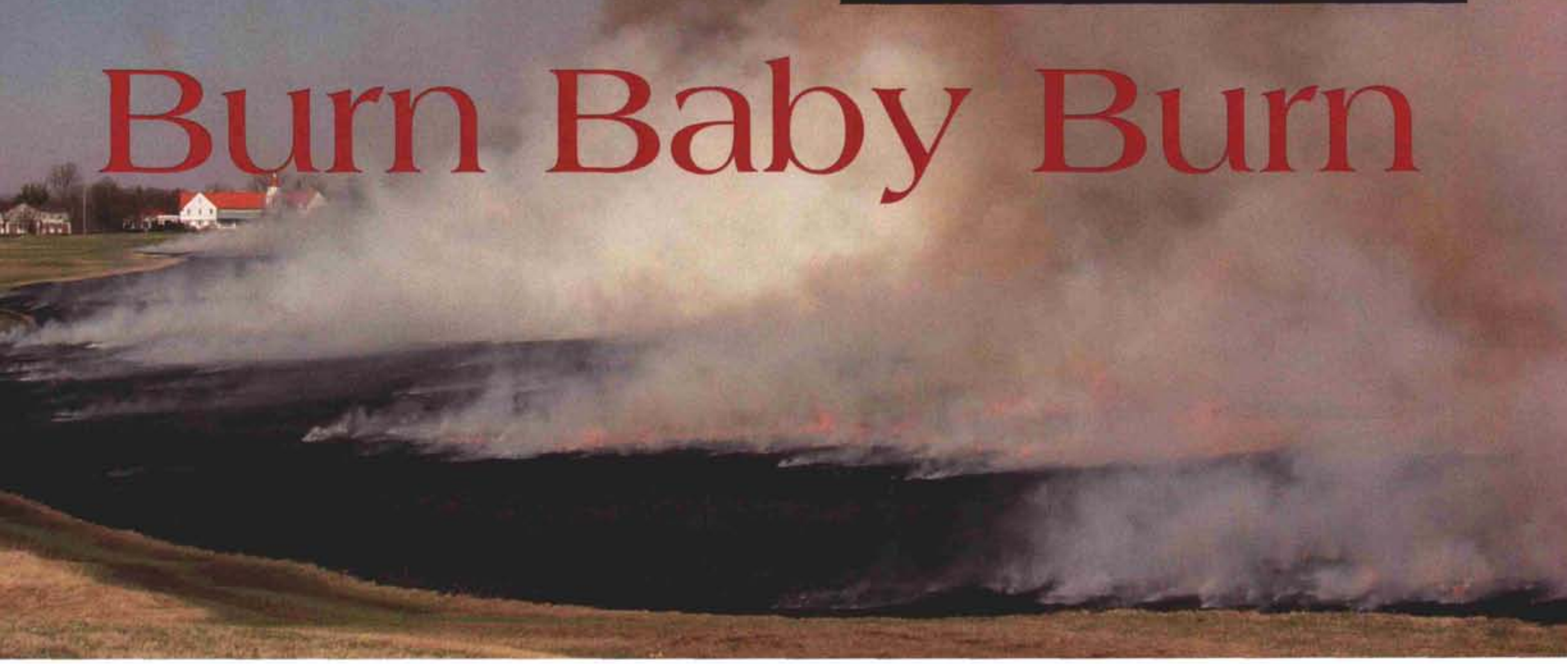
Jon Jennings, CGCS *Chicago Golf Club*

Burn Baby Burn



No, this isn't an article about some of the bad music of the late '70s made famous by the Trammps in their hit song "Disco Inferno." But it is a discussion of fire as one of the best tools that can be utilized to manage naturalized sections of the golf course. One of many areas that has gained in popularity in the last decade is naturalized or native areas on golf courses. Not only are they visually appealing, they provide a haven for wildlife and protect wetlands by creating a buffer between intensely managed sections of turf and waterways that are home to fish, amphibians and other animals.

One of the greatest and oldest management tools that can be utilized in maintaining native areas is burning.

Naturalized areas on a golf course act as a frame for the rest of the turf sections. When someone sees a naturalized section, he or she immediately thinks of the time and money that could be saved if more areas were left unmaintained. However, just because an area is not mowed in a conventional sense, does not mean that a substantial amount of labor will be eliminated from the equation. In order to meet a desired look, herbicide applications and massive amounts of hand-weeding are required. A little progress is made each year, but patience must be employed as it may take several consecutive years of management before an area takes on the desired appearance you are striving for. One of the greatest and oldest management tools that can be utilized in maintaining native areas is burning.

Fire, whether it is set or caused by lightning, has been part of the prairie for thousands of years. Fire can provide many useful benefits to native rough areas. It will remove dead vegetation that hinders new growth. It will release nutrients to enrich the soil, reduce invader plants and encourage native species and create habitats that are attractive to wildlife.

Fire should not be a native-area management choice for a specific area if:

- Federal or state regulations prohibit burning.
- Local ordinances or zoning prohibit burning.
- Containment and safety factors are extremely risky.
- Endangered species or natural communities are subject to harm or their status is in doubt.
- Fire behavior or fire effects will not meet the objectives for the area.
- Local residences would be in jeopardy.

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If fire can not be used for any of the above reasons, accept the decision as final that fire will not be an appropriate tool for your given situation.

At Chicago Golf Club, we are fortunate being located in unincorporated Milton Township within the confines of Wheaton, where we are permitted to conduct prescribed burns for native grass restoration. Our first step each year is to obtain an Environmental Protection Agency (EPA) burn permit. The EPA permit allows you to burn anytime throughout the 12-month period provided that you make all of the appropriate contacts. We learned following our first year of conducting a controlled burn that it is best to make the neighbors aware of the controlled burn through a neighbor notification letter. We do not give a specific date of the burn as weather conditions are unknown and may be a little dicey in the spring. We do, however, offer a two-week window of our intended burn period. As the weather becomes conducive to burn, we select a day based upon weather forecasts. The next step is to contact all fire, police and all other emergency response personnel.

Do not assume that one entity will contact another or you will surely be meeting with them the day of your burn. Being in unincorporated Milton Township, we must also contact the DuPage County Sheriff's Department.

There is no element of a controlled burn more important than weather. The secret to a controlled burn is to let the weather work for you.

Each burn site has its own set of constraints and sensitive issues. Final inventory and evaluation of the total set of constraints for each proposed burn site will help decide if the site should be kept in your overall burn plan. All potential sections of the burn site should be arranged sequentially, starting with the areas that have the least constraints. Constraints can be economical, operational, environmental, regulatory or conflictive depending on the terrain, surroundings or public view of burning within the area. Examples of sensitive issues are smoke problems in relation to residential areas, airports and roads; the presence of electrical poles and wires; adjacent farm crops or livestock; coal or oil deposits; presence of endangered biota or nesting and fawning areas; sensitive neighbors; or poor backup fire-fighting or emergency medical equipment. It will be in your best interests to deal with as many constraints and sensitive issues well in advance of the actual time to burn. You may be surprised at the reaction you receive from neighbors during the burn, despite how much notice you have given.

"Weather" or Not to Burn

There is no element of a controlled burn more important than weather. The secret to a controlled burn is to let the weather work for you. Weather is the main controlling agent of fire behavior, smoke behavior, fuel condition and flammability, and fire containment; all of these affect the success and safety of the burn.

The weather variables most applicable to controlled burns are air temperature, relative humidity, wind direction, wind speed, precipitation and air mass stability. A combination of wind speed, relative humidity, temperature and solar insulation largely determines fuel condition, which in turn, affects the fire's behavior. Seasonal wind direction is important when burning near areas having restrictions or smoke regulation. Daily and seasonal precipitation patterns often determine when burns may be conducted during the year, whereas days since measurable precipitation (greater than .01″) determine the severity of the fire and completeness of the burn in terms of fuel consumption. Air temperature greater than 68° is recommended when burns are targeted at total fuel consumption. These include reclamation burns or burning to reduce undesirable plant species and medium-to-heavy course fuels as brush or small trees. Hot, high-intensity fires also produce greater risks than cool, low-intensity fires, resulting in more emphases on control measures. The warmest period of the day is generally between 11:00 a.m. and 4:00 p.m.; the temperature generally drops after 4:00 p.m. in conjunction with increasing humidity. The coolest part of the day is within two hours of daybreak. Fire behavior and fuel conditions are most unpredictable when temperatures are rising during the morning hours.

Relative humidity is an expression of the actual amount of moisture in the air compared to the total amount the air is capable of holding at that temperature and pressure. A temperature rise of 20° from sunrise to mid-afternoon reduces the relative humidity by about 50%.

A similar drop in temperature later in the afternoon or evening can cause relative humidity to rise twofold. This can be quite apparent during a prescribed burn. The fire will intensify as the temperature rises and the humidity drops. Conversely, you will have what was a great burning fire become a smoking, smoldering mess as the temperature drops and the humidity increases.

However, when a cold front passes the temperature drop is usually accompanied by a drop in humidity. Preferred relative humidity for prescribed burns ranges from 25 – 50%. Under certain conditions, a wider range of relative humidities—as low as 20% and as high as 80%—can produce satisfactory burns. When relative humidity is as low as 20%, prescribed burning is dangerous because fires are more intense. When the relative humidity is greater than 50%, fires may not burn an area completely or may not burn hot enough for the desired result. Because relative humidity is so dependent upon temperatures, sunlight and precipitation, it is not a good weather variable to use for predicting fire behavior. Grassland fires can be burned under certain conditions at any level of humidity, however, it is recommended that prescription burns be performed when relative humidity is between 20 and 80%.

Prescribed burns have a more predictable manner if some wind movement is present. The most desirable wind speeds for burning are fairly steady winds between five and 18 miles per hour, but specific conditions may allow for higher speeds. Persistent winds from a constant direction before, during and after a burn provide the safest conditions for burning. Gusty or variable winds are indicators of unstable atmospheric conditions. The probable wind direction and anticipated speed should be obtained just prior to the time of the burn. The placement of firebreaks and other fire-containment measures as well as smoke management are largely dependent upon wind direction.

The prediction of a rain event or how much rain will fall during a given time is often difficult to determine. Having an awareness of the day it last precipitated and how much will be useful in predicting fire behavior and intensity as well as helping you decide what control measures are necessary. You should expect a significantly greater amount of smoke from moist over dry fuels. Grasslands have been successfully burned just nine hours following a 1/2″ rain event. The drying time following precipitation is dependent upon solar radiation, air temperature and wind speed.

Atmospheric stability is the resistance of the atmosphere to vertical motion. A prescribed fire generates vertical motion by heating the air, but the strength of the convective activity over a fire is affected by the stability of the air mass. Strong convective activity will increase the drafts into a fire and can result in erratic fire behavior. When the atmosphere is stable, a small decrease in temperature occurs with an increase in altitude. Under stable conditions, inversions can develop in which temperature actually increases with

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height. Stable air tends to restrict convection column development and produces more uniform burning conditions. When the atmosphere is unstable, there is a large decrease in temperature with height. Once air starts to rise, it will continue to rise, and strong conductive activity may develop over the fire. Strong in-drafts will help confine a fire to its prescribed area.

Field observations of weather should be made at or near the prescribed burn area before and during

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burning. If the weather should change to unfavorable for burning, it may be necessary to extinguish the fire for safety reasons.

Making Safety A Burning Priority

Safety of the people involved with your burn is your highest priority. Safety should be promoted through proper training, removal of hazards and thorough provisions for personnel-protective equipment and devices. Many more people are injured than killed by fires. Most fatalities occur during times of extreme fire danger or during high-risk burns when people experience heat stress or are overcome by smoke inhalation. Serious fire encounters should be avoided at all costs; material can be replaced whereas life is lost forever. Some indicators of potentially hazardous conditions include: flame lengths exceeding four feet; fire brands or spots ahead of a main fire front; smoldering fires over a large area; a sudden increase in wind speed or a large change in wind direction; and thick, massive smoke held close to the ground for lengthy periods. The best advice to follow is that unless you are trying to assist another person, these are instances when you should use your alternate escape route.

As previously mentioned, publicity is necessary for every prescribed fire. The local fire department chief and any neighbors within a reasonable distance of the burn area should be notified in advance of a burn as well as on burn day. If necessary, provide all of these people with your name, office telephone number and how long the burn will probably take.

Feeling the Burn

To conduct a burn, the first basic step is to determine the onsite wind direction by holding up a light cloth or by watching the smoke and fire behavior from a small test fire. With the wind direction in mind, you should now be able to plot the direction of the prescribed burn. If only one person is setting the fire and starting at a corner, the fire should be set in a series. First, set 300 feet or less of fire line on one side and then about the same on the other until a backing fire has been established. If you have two people setting the fire and the wind is blowing perpendicularly to your baseline, start the fire at the midpoint of the baseline with the fire setters moving in opposite directions from the midpoint. It is much easier to start a fire at a corner with two fire-setters than with one. Corners and points are higher-risk areas to burn than gradual curves, so when possible bend your fire containment lines around corners and obstacles rather than use sharp angles.

Gradual curves, rather than sharp angles, are preferred for fire containment lines.

Smoke can sometimes be an undesirable element of a prescription burn. Smoke can be highly visible and attract unnecessary attention. Smoke can also reduce the visibility on highways and roads. In terms of smoke management, some things to remember before you start the burn are: moist fuels produce more smoke than dry fuels; head fires produce more smoke than slower, backing fires that give more complete consumption of fuel; smoke problems in the late afternoon or early evening are more hazardous than during daylight; and stable air mass conditions can cause air inversions that restrict smoke convection and dispersion. Unstable atmospheric conditions are usually better for smoke management.

Smoke management is a critical component of a controlled burn.

Spread the fire lines with drip or propane torches.

After fires are started, the next step is to spread the fire lines with drip torches or propane torches. There are three kinds of prescribed fires: backing, head and flank fires. Backing fires burn into the wind. Fire is started along a prepared baseline, such as a road or other barrier, and allowed to burn into the wind. Backing fires for the most part are the easiest way to burn. The flame lengths are shorter, the rate of fire spread is slow and the density of the smoke is generally less than with head or flank fires. Backing fires burn hotter at the ground surface and do a better job of total fuel consumption. Backing fires work best with wind velocities of four to 12 miles per hour from a constant direction. A disadvantage to a backing fire is the time involved and the need for interior fire lines at frequent intervals to speed up the burning of a large or long area.

Head fires burn with the wind. They have greater flame lengths, faster rates of spread, greater smoke volumes and burn cooler at the ground surface than backing or flank fires. Because of the rapid rate of burn, the head fire's overall burn costs are lower per acre. Containment becomes more critical, however, as wind speed and fuel quantity increase. With head fires, you must absolutely be certain the fire will not escape into unintended areas.

Ensure that fires don't escape into unintended areas.

Flank fires burn at oblique angles to the wind direction. They are a modification of backing fires in that lines of fires are set to burn into the wind but at angles to the wind direction. Flank fires are commonly used to secure the flanks of a head fire as the head fire progresses.

The fire is not over until all of the burned areas are cold and no longer producing smoke. The basic steps to post-burn assessment are: perimeter monitoring; necessary mop-up of smoking or burning patches of fuel; and site clean-up. Perimeter monitoring of the burn unit is a continuous function from the onset of the fire until it has been determined the fire is out and cold. Mop-up includes any actions to put out smoke, hot coals or flames from anything within the burn or within spot fire distances. Mop-up actions may include drenching with water, smothering with a covering of soil or sand, flapping or raking the fuels apart or, if time permits, monitoring the area until everything is cold and there is no longer any smoke production. Post-burn site clean-up may be as simple as removing all personnel and equipment from the area or as complex as renovating the firebreaks and removing undesirable rubbish.

Clean-up after a prescribed burn might involve renovating the firebreaks and removing rubbish.

Following the burn that we have conducted sometime during the end of March or early April each year, the burned areas of the rough begin to green up in a period of four to five weeks, depending upon the weather. Our observation has been a reduction in woody intruders and a proliferation of warm-season grasses.

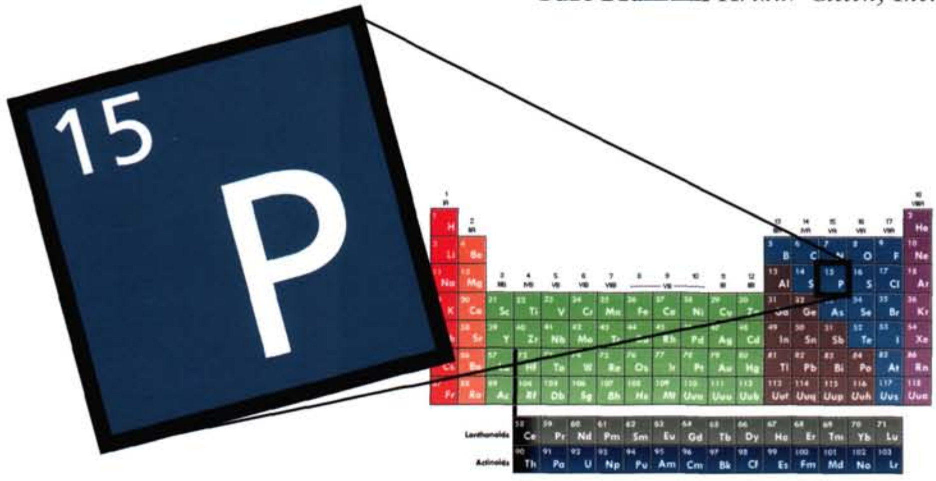
Safety of the people involved with your burn is your highest priority.

Chicago Golf Club sees fruitful results from its controlled burns.

FEATURE ARTICLE

Curt Franklin *Arthur Clesen, Inc.*

The Spin on P



Phosphorus (P) is one of the big three nutrients (N- nitrogen, P- phosphorus, K-potassium). Lately, it has been a hot topic in our industry because of all the new P products hitting our market. These new P products have given rise to some new terms and concepts that might be confusing. Here, I will attempt to decipher the terms and hopefully give you a better understanding of all the P sources that are available in the marketplace.

Phosphorus (P) is the plant world's equivalent of carbohydrates— it provides the energy that a plant needs to grow. The marketplace currently affords several options for delivering P to your turf.

First, where does P come from and why do plants need it? Next, what are the different forms of P and their availabilities to the turf? Finally, how can superintendents utilize the different types of P on their golf courses?

Fossilized marine animals are the main source of P found in the United States and other countries around the world. This element is mined as a raw ore (phosphorite or phosphate rock) and is mainly processed to create water-soluble compounds for fertilizers. One example is super phosphate (calcium hydrogen phosphate), which makes P available to the plant. The plant needs these readily available P sources so it can convert and store light energy to chemical energy during photosynthesis by ATP transformations and carbohydrate transformations. This allows the plant to enhance its root growth for better uptake of water during drought stress, but it also helps in the wear tolerance of the plant by increasing the recuperative potential of the plant. P is the plant world's equivalent of carbohydrates—it provides the energy that a plant needs to grow.

How many choices of P do you have? The answer is "several." Here are some options that the marketplace currently affords with an explanation of each.

1. **Phosphates**. Salts that are formed by neutralizing **phosphoric acid** with a base like potassium hydroxide (KOH) or ammonium hydroxide (NH_4OH).
   Examples:
   a. Super phosphates (calcium phosphates 0-46-0)
   b. Ammonium phosphates (monoammonium, MAP 11-50-0 and diammonium, DAP 21-52-0)
   c. Potassium phosphates (monopotassium phosphorous 0-32-52)
   d. Ammonium polyphosphates (10-34-0)
   e. Phosphoric acid (0-55-0)
2. **Phosphoric Acid (H_3PO_4)**. Normally referred to as a **phosphate**, interchangeable.

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3. **Phosphorous Acid (H_3PO_3).** Normally referred to as a **phosphite**, interchangeable.
4. **Phosphonate.** An organic derivative of **phosphorous acid**, it breaks down into a phosphonic acid.
5. **Phosphites.** Salts that are formed by neutralizing **phosphorous acid** with a base like potassium hydroxide or ammonium hydroxide. Two forms of **phosphite** salts are formed, one containing dihydrogen phosphite ion (H_2PO_3) and the other containing a hydrogen phosphite ion (HPO_3). The hydrogen phosphite ion is an unstable compound that easily converts to **phosphoric acid** in the presence of oxygen. Therefore, when making a foliar application of phosphite products, part of the product is reduced to readily available **phosphates** or **phosphoric acid** that is utilized by the plant as a nutrient and the other portion of the **phosphite** is used by the plant for possible fungicidal capabilities. The dihydrogen phosphite ion is more stable and reacts with oxygen at a slower pace, therefore allowing it to stay in phosphite form to act as a possible fungicide.

Getting P to the Plant

How available are these forms of P to the plant? Granular fertilizers (**phosphates**) are the most readily available forms of P, but they have difficulties being absorbed by the plant due to soil pH. Alkaline soils, usually calcareous soils, tie up P with their high calcium content to form insoluble precipitates unavailable to the plant. On the other hand, acidic soils tie up P by combining it with aluminum to form insoluble precipitates unavailable to the plant also. Therefore, your soil test may read high phosphorus levels, but your pH levels may have an adverse affect on P availability. The fixation of P is most prevalent in older soils that are high in 1:1 type clays and hydrous Fe and Al oxides. Foliar fertilizers (**phosphates** or **phosphites**) might be a better, more efficient alternative of P sources for the plant than granular fertilizers, because they are usually absorbed by the plant before they reach the soil surface, which makes them less likely to form insoluble precipitates in the soil profile.

Making P Work for You

How do I utilize these different forms of P? Usually, during the spring and fall seasons, the cool-season grasses are more efficient in the uptake of nutrients from the soil; thus, granular forms of P (**phosphates**) are the best alternative because you can apply larger amounts of P at one time instead of multiple applications of the more expensive foliar fertilizers. Although that works for spring and fall applications, summer stress periods require a different scenario. The plant is not as efficient with nutrient uptake during the summer because of heat and drought stress; it needs a more efficient method of P uptake for photosynthesis. Foliar fertilizers are a perfect fit during these stressful months to provide the plant with the P that it needs from feeding the plant P through its foliar membranes and not its roots, where the fixation of P may occur from high or low pH levels. This (timely application of nutrients) is probably the single most important aspect of providing excellent plant health.

Granular fertilizers (phosphates) are the most readily available forms of P, but they have difficulties being absorbed by the plant due to soil pH.

Good luck on choosing your P sources wisely and remember, your membership and/or customers could probably care less about the differences between a phosphate, phosphite or fungicide!