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research activities from its headquarters to different regions where peculiar problems may occur. This "direction change" was merely a continuation of decentralization to give more emphasis on direct service to member clubs.

Today, the Green Section maintains six regional offices, as well as its national headquarters based at Golf House in Far Hills, New Jersey. Regional directors and staff agronomists make approximately 1,300 annual visits to subscribing clubs. Its sole mission is, and always has been, to distribute the best possible information to help in the pursuit of the best possible golf

turf.

The USGA Green Section remains active in support of turfgrass research with its proposed multimillion dollar, ten year research program. It will be overseen by the Green Sections Turfgrass Research Committee. This committee is comprised of some of the nation's leading turfgrass experts. Bill Bengeyfield is chairman of this committee.

The primary purpose of the program is to develop minimal maintenance turfgrasses. Emphasis will be placed on salt tolerant, water conserving, heat and cold tolerant, disease and insect resistant grasses with low nutritional needs.

The ultimate goal is a wear resistant turf with the minimal maintenance

qualities that provides excellent playing surfaces.

The Research Advisory Committee serves without compensation at the pleasure of the USGA Executive Committee. It will coordinate and watch over the entire project to insure that these essential goals and proper progress are being met for the future of excellent golf turf.

It is easy to see that for 68 years, the USGA and its Green Section have provided for some of the best turf research and the most efficient dissemination of that information to Golf Clubs around the nation. How appropriate then, that the WGCSA can help support their goals and share in this celebration of excellence in the "Year of the USGA".

POST EMERGENCE BROADLEAF WEED CONTROL IN TURFGRASS

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Before you do anything else, please read the following sentence which appears on almost all herbicide labels. "It is a violation of Federal Law to use any herbicide in a manner inconsistent with its labeling." Having read and vowed to observe the laws, we can proceed.

Most broadleaf weed herbicides are applied with a sprayer. Herbicide drift is a very common and serious problem when herbicides are sprayer-applied when there is any appreciable wind. The question of how much wind is too much isn't easy to determine. Spray drift due to wind is influenced by both wind speed and wind direction and several other factors. Obviously don't spray when there are a lot of sensitive plants downwind from the area you wish to spray. Sprayer pressure affects spray drift. At higher pressures more very fine droplets are formed at the nozzle tip leading to more drift. Nozzle tip size plays a role in drift. In general, the smaller the nozzle tip the more fine droplets and the greater potential for drift. Boom or nozzle height affects drift. The higher the boom or nozzle the greater the potential for drift. Flat fan nozzle tips are available to spray at a 65°, 80° or 110° angle. When 65° spray angle tips are spaced every 20 inches on a boom, the suggested boom height is 22"-24" above the ground or above the turf-weed canopy. At 20 inch nozzle spacing on a boom, and using 110° spray angle tips, the suggested boom height is only 10"-12".

Spray angle (of nozzles)	Spray height 20" spacing of nozzles on boom
65°	22-24"
80°	17-19"
110°	10-12"

Various thickeners are available to add to the sprayer tank. Thickeners reduce the number of very small sized spray droplets hence reduce the potential for drift.

A second way herbicide can move out of the target area is by vapor drift. Volatile ester formulations may evaporate at high temperatures and the vapor can drift downwind. Ester formulations of herbicides are volatile and there are lots of them in the market place. You can purchase 2,4-D, Trimec, Weedone DPC, Turflon D and others in either the ester or amine form. Ester formulations work better because they are oil soluble and penetrate the waxy leaf cuticles better than water soluble amines. Esters can be used in spring or fall when temperatures don't reach 80°F but should never be used in summer when it is hot or may get hot within a day or 2 after application. There are low volatile and high volatile esters available. Both are volatile and too dangerous to use in the heat of summer.

I think we can safely say that there is a certain amount of risk associated with the application of post emergence herbicides that are just as effective in causing injury to grapes, tomatoes and petunias as to dandelions, plantains and other common broadleaf turf weeds. It is up to us to reduce the risk factor as much as possible. Here are

a few suggestions.

1. Spray when it isn't windy.
2. Use low pressure wide angle nozzle tips on boom sprayers.
3. Keep the sprayer pressure low.
4. Product labels often suggest a range of water per acre - perhaps 15 to 40. Use more than the minimum amount of label-suggested water.
5. Consider using thickeners to reduce fine droplets.
6. Keep the boom low by using wide (110°) angle nozzles.
7. Never use ester formulations when ever there is even a remote possibility of temperatures in the 85° or above range.
8. Apply herbicides for broadleaf weed control in early May before the last spring frosts and before people transplant herbicide sensitive bedding plants in their gardens.
9. Or apply the herbicides in fall around the time of the first killing frost that will kill frost intolerant flowers and vegetables.
10. If you must spray next to or very near shrubs, there is less potential for injury in fall when the conifers have stopped growing and the broadleaved shrubs are about to drop their leaves compared to June when growth is very active.

Herbicide application failures result in the need to reapply which increases the "risk" factor. To reduce the potential for herbicide failure:

1. Identify the weeds you intend to eliminate so that you can choose

the correct herbicide or herbicide mixture.

2. Spray when weeds are growing actively as opposed to when weeds are semi-dormant due to drought, heat, cold or flooding.
3. When dealing with annual weeds, they are more easily killed when they are small rather than large and mature.
4. Biennial weeds, bull thistles, burdock, wild carrot, wild parsnip, are easily killed in their 1st year of growth when they are low-growing rosettes. They are difficult to kill in their second year—the flowering year—of their life.
5. Some perennial weeds, Canadian thistle, field bindweed, and milkweeds, are more easily killed if herbicide application is delayed until early flowering.

Now lets look at the herbicides available for post emergence application for selective control of broadleaf weeds. The 3 most widely used herbicides are 2,4-D, MCPP and dicamba. These 3 herbicides are available alone (2,4-D alone, etc.) or as combinations of the three. 2,4-D is very effective in control of common turf weeds such as dandelion and plantain. It injures but does not kill other common turf weeds such as white clover, chickweed and ground ivy. 2,4-D is not recommended for use on bentgrass putting greens. low-mowed bentgrass under heat and/or drought stress can be severely injured or killed by 2,4-D. The bentgrass warning on 2,4-D labels suggests to some people that 2,4-D can be used to kill bent patches in bluegrass lawns. My experience strongly suggests that 2,4-D amine causes little if any serious injury to bentgrass mowed 1.5-2.5" high.

MCPP or mecoprop as it is also called is safe to use on bentgrass putting greens during periods of cool weather. MCPP is fairly effective in control of white clover and chickweeds as well as dandelions. MCPP is frequently mixed with 2,4-D as a general turf herbicide for weed control in lawns.

Dicamba (Banvel) is usually available in a 3-way combination with 2,4-D and MCPP or as a 2-way combination with 2,4-D. The 3-way combination is a very effective herbicide mixture that controls most common turf weeds. Dicamba is somewhat volatile and should not be used alone or in combination with other herbicides when air temperatures are or may reach 85°F. Under no circumstances should the application rate of dicamba exceed 1

lb. of active ingredient per acre per season. Also keep dicamba away from the root zone of trees and shrubs.

The 3-way combinations of 2,4-D, MCPP and dicamba often contain about 2 lbs. of 2,4-D, 1 lb. of MCPP and .2 lbs. of dicamba per gallon. The recommended application rate is 3.5-4 pints per acre which results in application of approximately .1 lb. of dicamba per acre. The low application rate of .1 lb. dicamba in the 3-way combinations per acre reduces its potential for injury to desirable plants. Dicamba may be used on golf course fairways, tees and roughs at rates of .5 lbs. ai/acre or less. It is not recommended for use on bentgrass greens.

The PBI Gordon Company and perhaps others market a 3-way combination of 2,4-D, MCPP and dicamba for use on bentgrass. The product contains less 2,4-D than many of the 3-way combinations labeled for general turf use.

2,4-D and dicamba are fairly effective pre-emergence herbicides. Do not apply either one to newly seeded turf areas. Apply only after grasses are well established and mowed several times.

Bromoxynil is safe to use on newly seeded grasses for control of seedling broadleaf weeds. For best control, apply when weeds are in the 3-5 leaf stage.

There are some weeds that are just plain hard to kill. Among them are violets and ground ivy. Two very effective broadleaf weed herbicides are now available for control of hard-to-kill weeds. They are Turflon, a combination of 2,4-D and triclopyr and Weedone DPC, a combination of 2,4-D and 2,4-DP. Both are available in either amine or ester formulations. Both are effective for control of brush and brambles.

The herbicide 2,4-D tends to have a bad name among certain groups in our society. Are there substitutes for 2,4-D? A person could mix MCPP and dicamba to produce an effective broadleaf weed herbicide. MCPA can be substituted for 2,4-D. The PBI Gordon product Encore Trimec is a 3-way combination of MCPA, MCPP and dicamba. MCPA is somewhat less effective than 2,4-D in control of turf weeds.

Another herbicide which is used as a substitute for 2,4-D for turf weed control is chlorflurenol. My experience with chlorflurenol is limited but suggests that it is not as effective as 2,4-D and probably should be mixed with another herbicide.

The following is a list of common and

chemical names of herbicides labeled for broadleaf weed control in turfgrass.

Common Name	Chemical Name
2,4-D	2,4-dichlorophenoxyacetic acid
MCPP	2-(2-methyl-4-chlorophenoxy) propionic acid
Dicamba	3-6-dichloro-0-anisic acid
MCPA	2-methyl-4-chlorophenoxyacetic acid
2,4-DP	2-(2,4-dichlorophenoxy) propionic acid
Triclopyr	3,5,6-trichloro-2-pyridyloxyacetic acid
Bromoxynil	3,5-dibromo-4-hydroxybenzotrile
Chlorflurenol	methyl 2-chloro-9-hydroxyfluorene-9-carboxylate

For non-selective grass and broadleaf weed control before seeding or sodding, apply glyphosate (Roundup or Kleenup) to actively growing weeds. Do not disturb the site for 7 days. Then prepare the seedbed via tillage.

For weed control in a gravel parking lot and similar sites, apply glyphosate tank mixed with a pre-emergence herbicide.

Remember these things:

1. In most turf areas the only real reason to kill weeds is to have them replaced by more desirable plants—the turfgrasses. So kill weeds in the cool spring and/or the cool fall when turfgrasses actively grow to fill in areas formerly occupied by the weeds you killed.
2. Water tends to run downhill and carry with it anything in its path. Before applying a herbicide, take a look at what's downhill from it. Assess its replacement value and act accordingly.
3. The prevailing winds in Wisconsin are from the west. Be very careful when there are sensitive plants east of the spray target area.
4. Granular herbicides reduce the herbicide drift problem but do not eliminate the volatility problem. Ester formulations of dry herbicides will volatilize when temperatures are high and when the herbicide particle or granule is moist.
5. How much wind is too much? The Banvel label book makes the following statement: "Do not spray near sensitive plants if wind is gusty or in excess of 5 mph and moving in the direction of nearby sensitive crops." Prepare to spray at sundown or sunup—the 2 times during the day when winds are often calm.

The use of trade names in the text does not imply endorsement of that product over others with similar ingredients.