

Developing a Successful Weed Control Program

成功雜草控制程序之創立

Patrick E. McCullough, Ph.D.

The University of Georgia

美國喬治亞州大學

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Please note that Chinese subtitles are for reference only.

請注意：中文翻譯謹作參考用

Cultural Weed Control

草坪護養的雜草防治

■ Routinely scout turf

例行巡查

- Identify weeds that warrant control
鑑別需要控制之雜草
- Note new species that are present
注意新出現之雜草品種

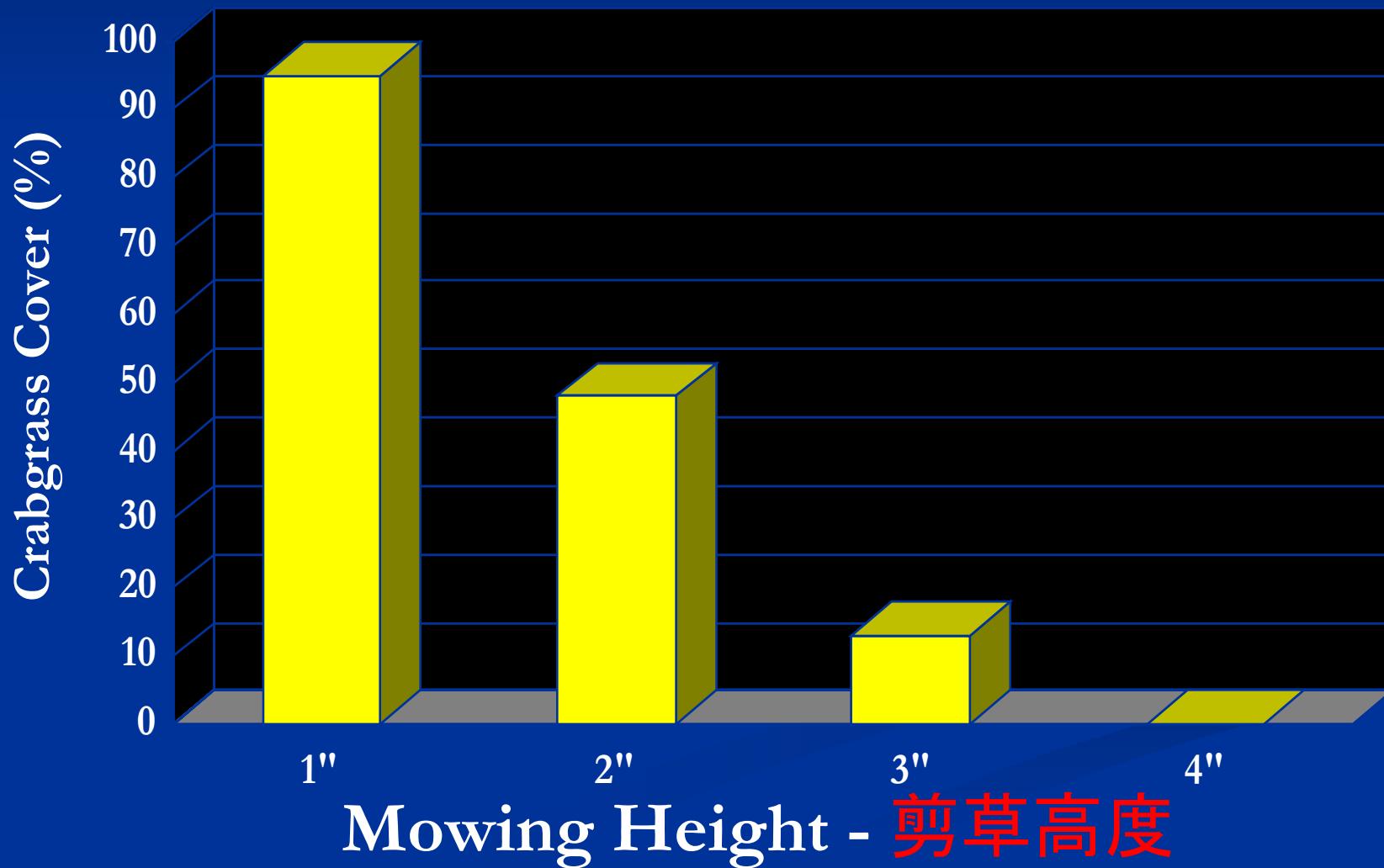
■ Early detection is critical

早期發現是關鍵

- Prevent spread before problematic
在形成問題之前防止其蔓延
- Example: torpedograss in centipedegrass
例子: 在假儉草內之torpedograss
- Evaluate turfgrass cultural practices
評估草地之管理程序

Mowing Height Effect on Smooth Crabgrass Incidence in Tall Fescue

剪草高度對馬唐在高羊茅草地出現率的影響



Species 草的品種	Mower 剪草機類型	Height (in.) 剪草高度(吋)	Frequency (days) 剪草頻率(日)
Bermudagrass 狗牙根			
Common 普通	Rotary/reel	1 to 2	5 to 7
Hybrid 雜交種	Rotary/reel	0.5 to 1.5	3 to 4
Centipede 假儉草	Rotary	1 to 2	5 to 10
St. Augustine 聖奧斯丁草	Rotary	2 to 3	5 to 7
Tall Fescue 高羊茅	Rotary	1.5 to 3	5 to 7
Zoysiagrass 結織草	Reel	0.5 to 2	3 to 7

Weed Populations are Influenced by Irrigation

雜草種群受到澆水的影響

How much water?

澆水的量?

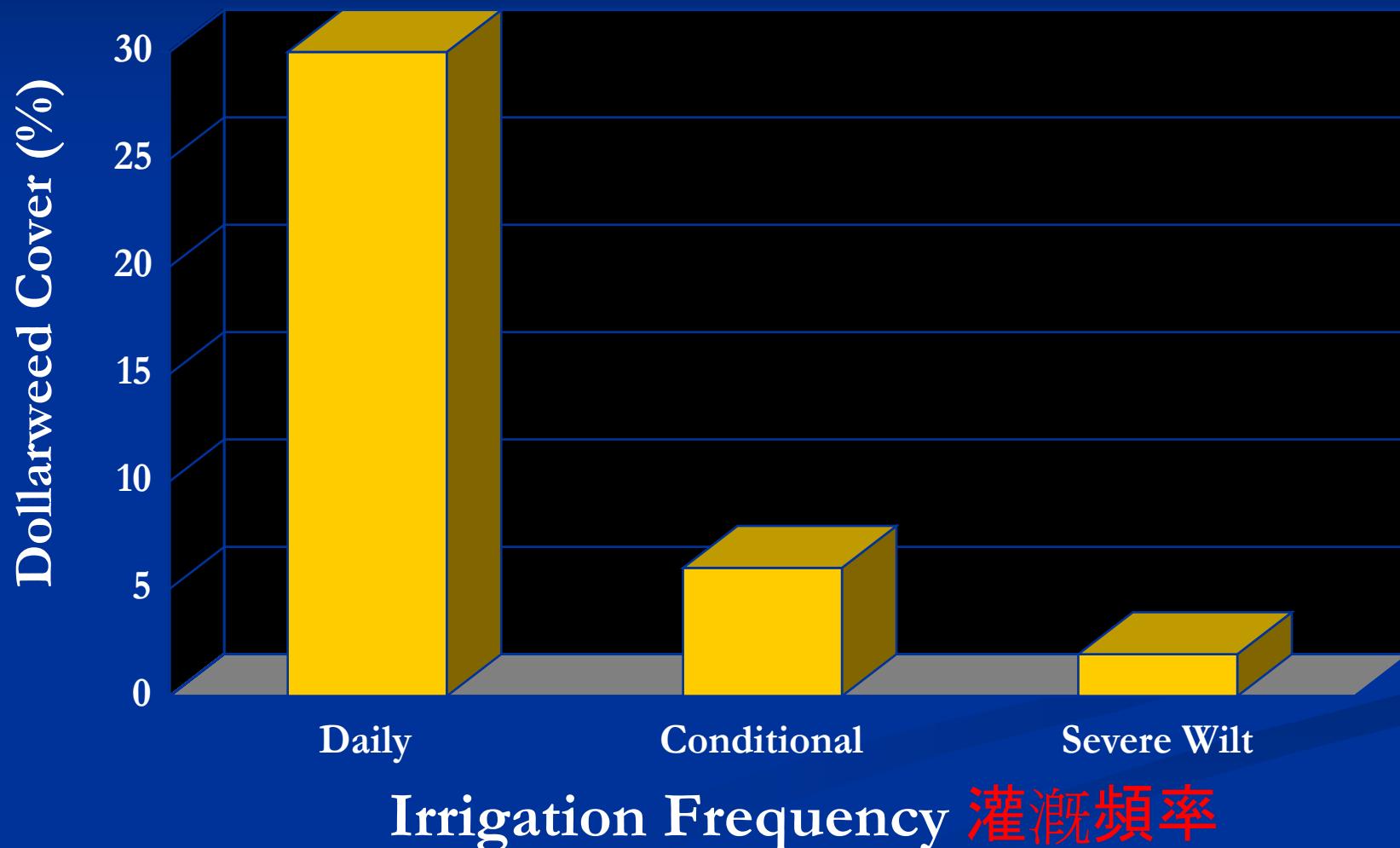
How frequently?

澆水的次數?



Influence of irrigation frequency on average dollarweed occurrence in St. Augustinegrass over 3 years in Florida.

過去三年在佛羅里達州: 灌溉頻率對 dollarweed 在聖奧斯丁草坪平均出現數目之影響。



Cultural Weed Control

草坪護養的雜草防治

■ Soil factors 土壤因素

- Poor drainage, improper pH, or excessive compaction limit turf growth

排水不良、不當的 pH 值、或過分板結均會限制草坪草生長

■ Wet soil 潮濕土壤

- Sedges - purple nutsedge, green kyllinga, Rushes, Annual bluegrass, Mosses

莎草 - 雷公頭, 水蜈蚣; 谷精草; 一年生早熟禾; 茵蘚

■ Compacted soil 板結土壤

- Annual bluegrass, Goosegrass, Prostrate knotweed, Common lespedeza, Path rush

一年生早熟禾; 牛筋草, Pr Prostrate knotweed, Common lespedeza, Path rush

Cultural Weed Control

草坪護養的雜草防治

■ Turfgrass Species Selection

草坪草之挑選

- Evaluate turf species that is planted under specific areas where weeds have established,
評估在特定地區種植的草坪草區內已生長之雜草，
- Example: Bermudagrass in shade will be less competitive with weeds
例子:生長在蔭蔽地方的狗牙根與雜草競爭力將會較弱

■ Turfgrass Cultivar Selection

- Check National Turf Evaluation Program results for latest in cultivar development for specific uses,
參閱國家草坪草評價刊物中用於特定用途之最新發展栽培種結果
- 網址: www.NTEP.org

Broadleaf dock





Prepare for Annual Weeds in Lawns

每年度草坪雜草控制之準備工作

- Control annuals and maintain dense, high quality turf in spring

控制一年生雜草和在春天保持密集的、高品質草坪

- Modify cultural practices as needed

根據需要修改的護養方法

- Plant the appropriate grass for place and season

在適當的地方和季節種植適當草

- Failure to control weeds in fall/winter

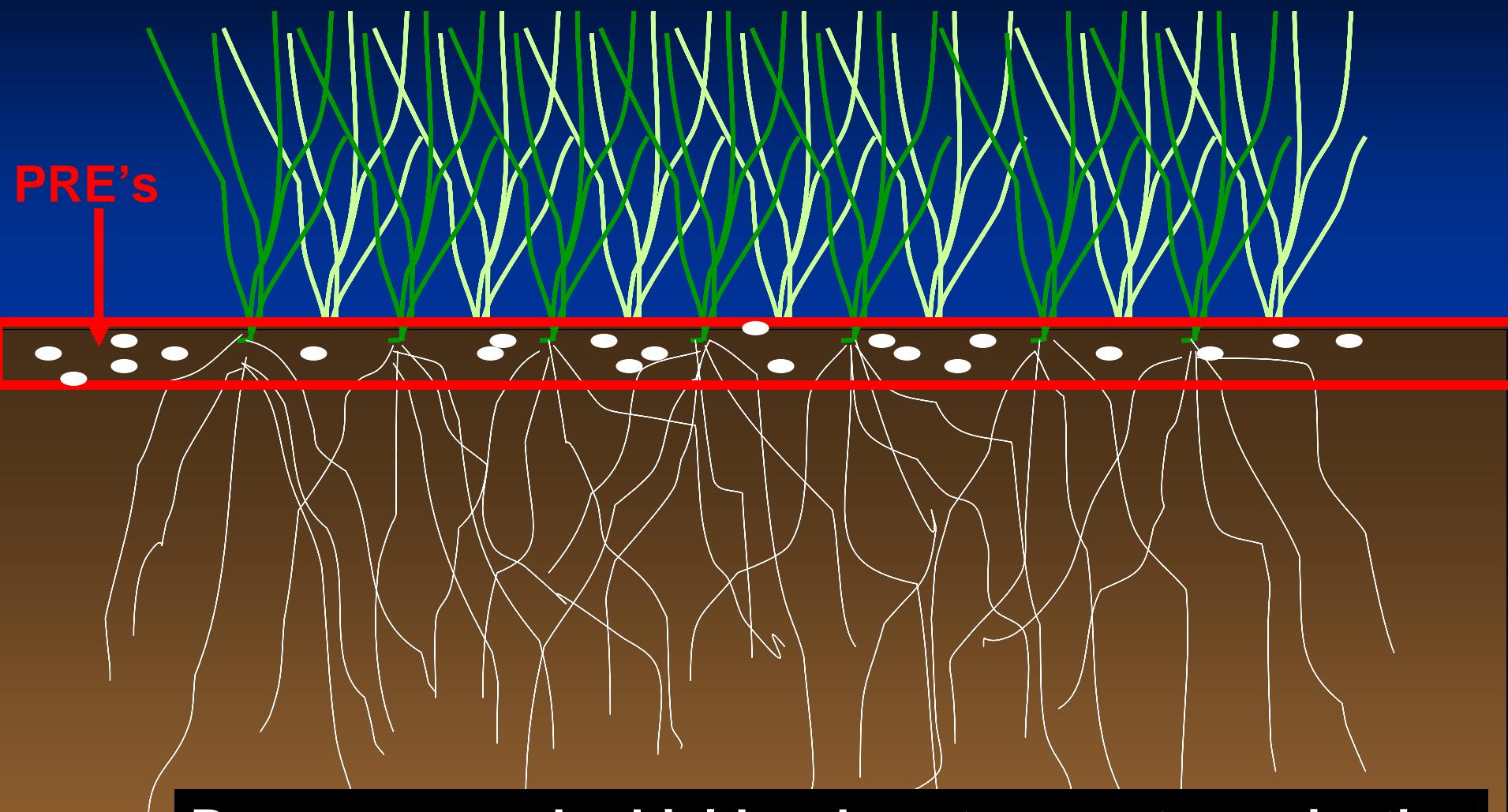
如在秋冬控制雜草失敗

- Reduce turf quality/competition with weeds

草坪品質會降低 / 須與雜草競爭

- Lead to summer annual weed problems

導致夏季一年生雜草問題



Preemergence herbicides do not prevent germination.

芽前除草劑不能防止發芽

Turfgrass Preemergence Herbicides

芽前除草劑

Common Name 普通名	Trade Name (Examples) 商用名
benefin	Balan
bensulide	Betasan, Bensumec
dimethenamid	Tower
dithiopyr	Dimension
isoxaben	Gallery
oxadiazon	Ronstar, Starfighter
pendimethalin	Pendulum, Pre-M
prodiamine	Barricade
siduron	Tupersan

Wide variety of trade names, sprayable and granular formulations, and may be impregnated on fertilizer

Preemergence Turfgrass Herbicides

芽前除草劑

■ Weeds targeted: **Summer/Winter annuals**

目標雜草:夏季/冬季一年生雜草

- **Lifecycle is predictable**

可預知的生命周期

- **Apply preemergence herbicides before establishment**
在雜草成長前施用

■ Weeds not controlled by PRE's

- **Weeds present in turf**

目前在草坪成長的雜草

- **Perennial weeds established from vegetative reproduction (sedges, white clover, etc.)**

從營養繁殖 (例如莎草, 白三葉等)長成的多年生雜草

Preemergence Turfgrass Herbicides

芽前除草劑

- **Persistence** in soil is key to residual activity

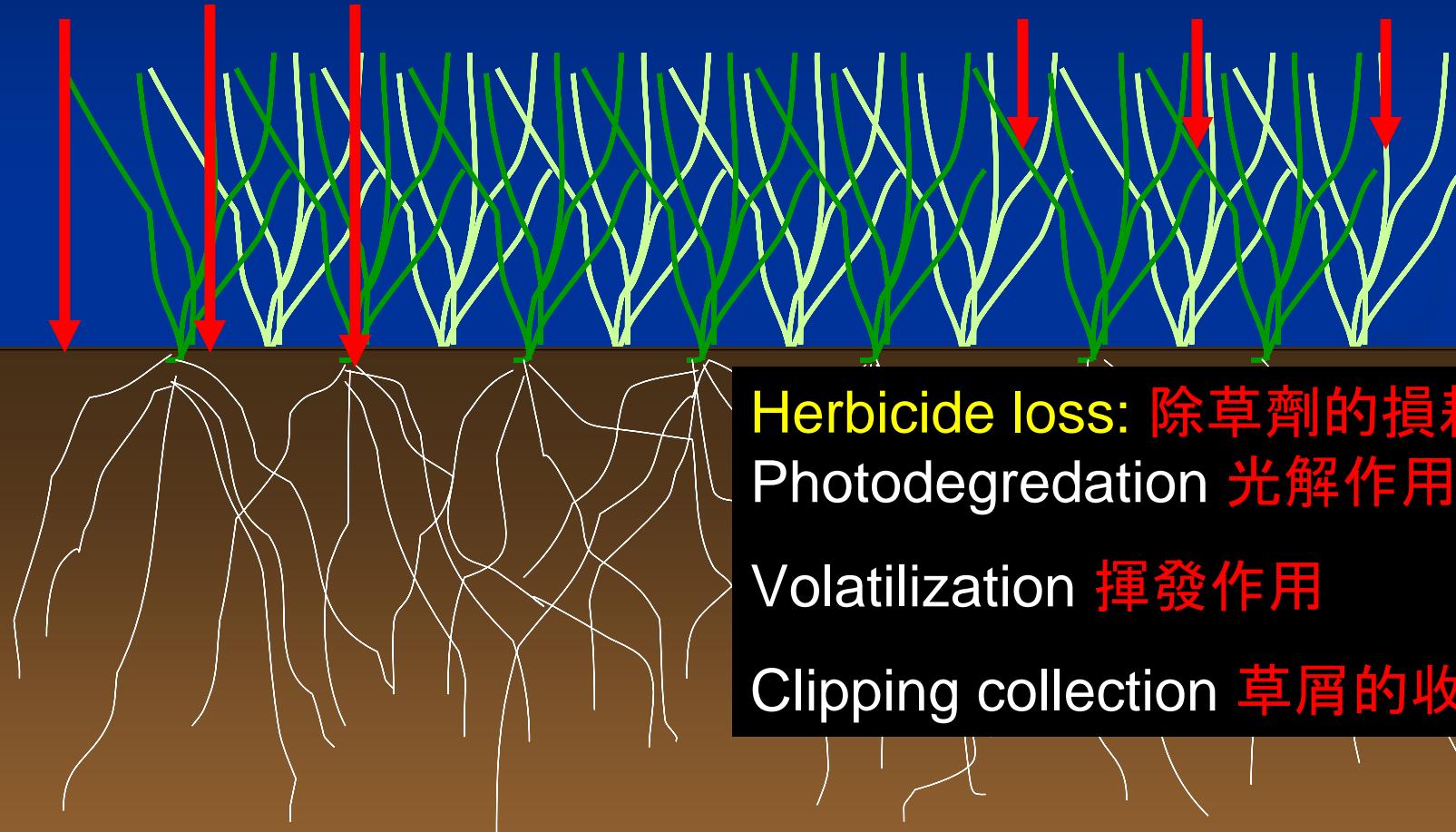
除草劑持久留存於泥土中是活性之匙

- Rate of microbial breakdown
微生物分解的速率
- Less residual activity in summer than winter
在夏天比冬天的殘留活性較少
- Irrigation or rainfall can be critical
澆水或降雨可以是關鍵
 - Move PRE herbicide to soil
芽前除草劑將被沖走
 - Herbicide activation
除草劑之啓動

No Irrigation 無澆水

Dry Granule 乾粒劑

Sprayable (WP) 噴射(可濕性粉劑)

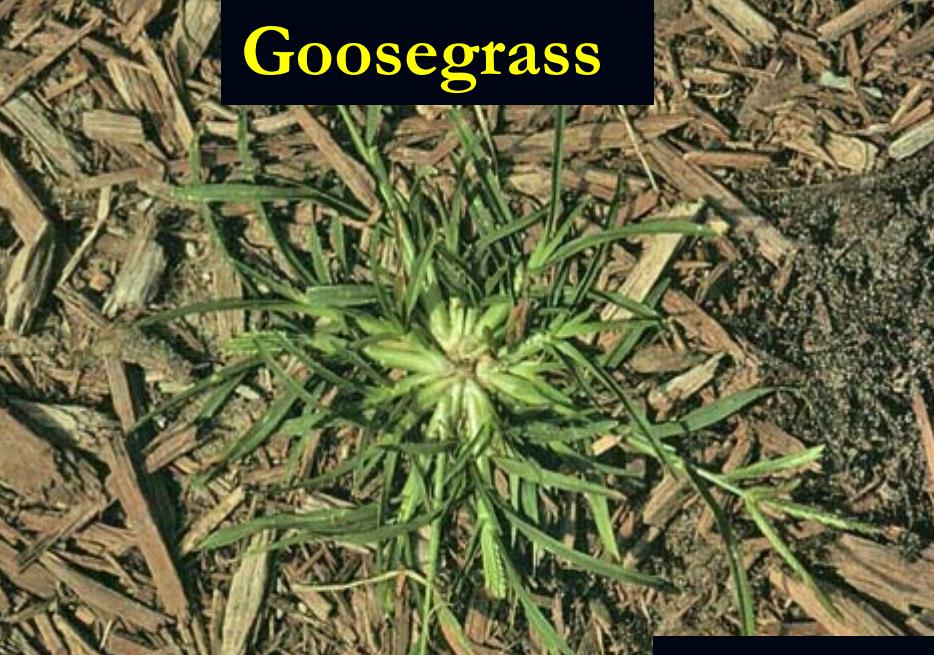


Herbicide loss: 除草劑的損耗
Photodegradation 光解作用

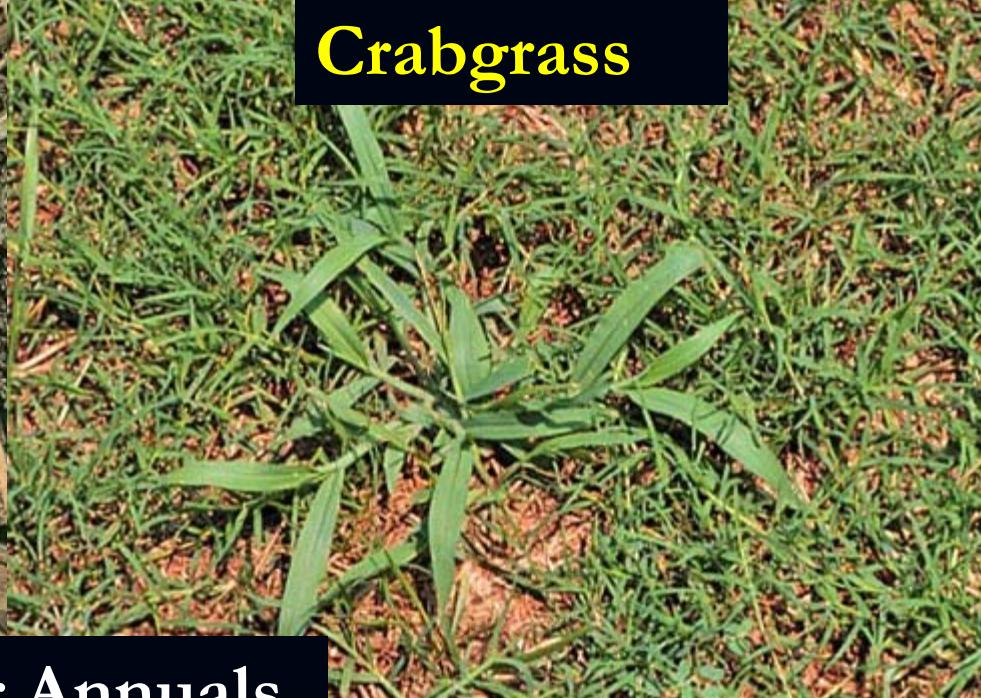
Volatilization 挥發作用

Clipping collection 草屑的收集

Goosegrass



Crabgrass



Summer Annuals

夏季一年生雜草



Common Purslane

Spotted Spurge



Summer Weed Control Programs

夏季控制雜草的程序

Summer annual weed control

夏季控制雜草

Begin emerging when soil temperatures reach around 55 to 60 F,

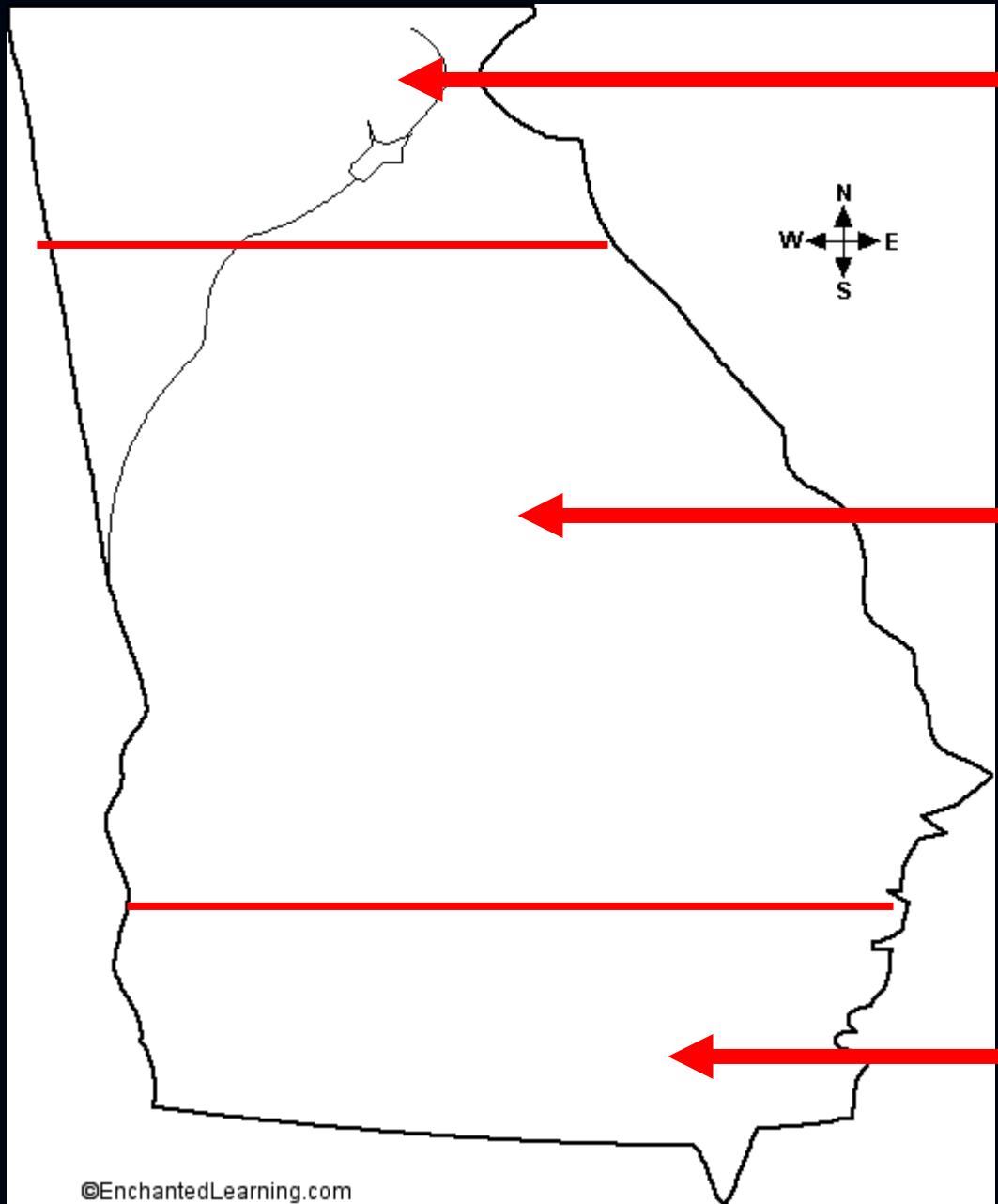
泥土溫度達55-60 F雜草開始萌生

Can be controlled with pre-emergence herbicides in spring,

春季可用芽前除草劑控制

Proper application timing and activation are critical.

適時施用除草劑及活化是關鍵



March 1 to April 1

March 1 to 20

**January 1 to
March 1**

Residual Activity 殘餘活性

* Available in Hong Kong

Longest_{最長}

prodiamine*

oxadiazon

Moderate_{中度}

trifluralin*

dithiopyr

Shortest_{最短}

bensulide

siduron

pendimethalin

Residual of individual herbicides is dependent on use rate, soil, and environmental factors.

個別除草劑殘留份量是依賴于其使用率、土壤和環境因素。

Extending the Length of Crabgrass Control

擴展馬唐雜草控制的期限

- Apply split applications 6-8 weeks apart
在6-8 周分開二次施用
- For example, prodiamine 1 kg a.i./ha
例子: 使用 prodiamine 1 kg a.i./ha
 - In March, apply 0.5 kg a.i./ha
在三月, 使用0.5 kg a.i./ha
 - In June, apply 0.5 kg a.i./ha
在六月, 使用0.5 kg a.i./ha

Reseeding Restrictions

重新播種的限制

Herbicide 除草劑	Time After Application 施用後所需時間
benefin	6 to 16 weeks
bensulide	4 months
dithiopyr	2.5 to 4 months
oxadizaon*	4 months
oryzalin	3 to 4 months
pendimethalin	3 months
prodiamine*	4 to 12 months
trifluralin*	6 to 16 weeks

* Available in Hong Kong 在香港可購買到

Concerns Over Lateral Rooting Inhibition in Lawns

抑制側生根的顧慮



pendimethalin on zoysiagrass



Surflan on St. Augustinegrass



Dimension on bermudagrass

Major concern in centipedegrass and St. Augustinegrass lawns

受較大影響為假儉草及聖奧斯丁草

Extending the Length of Summer Annual Weed Control

擴展夏季雜草控制時間的長度

■ Use a PRE with a POST herbicide

使用芽前加有芽後的除草劑

- Tank mix residual herbicide with a POST herbicide in May.

在 5 月在容器內混合殘效除草劑與芽後除草劑。

- May be able to reduce rate of residual herbicide – Only on irrigated sites

也許能夠減少殘效除草劑的用量 - 僅可用於有灌溉的地區

Tenacity plus Barricade

Applied June 14 (Early post + Residual)

Untreated

無施用

Tenacity + Barricade

已施用

2018.7.5

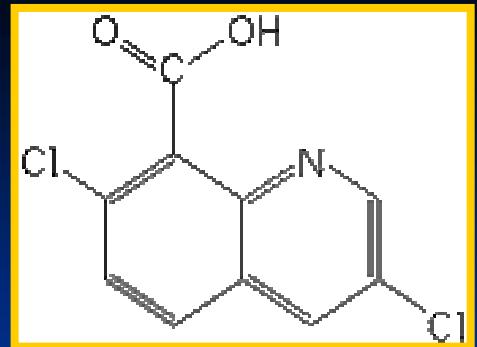
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Herbicides for Summer Grassy Weed Control in Turf 夏季草本雜草殺草劑

	Bermuda	Centipede	St. Augustine	Tall Fescue	Zoysia
amicarbazone	X	X	X	X	X
atrazine/simazine*		X	X		X
bentazon	X	X	X		X
clethodim		X			
fenoxaprop				X	X
flazasulfuron	X	X			X
foramsulfuron	X				X
imazaquin*	X	X	X		X
mesotrione		X	X	X	
quinclorac *	X			X	X
sethoxydim *		X			

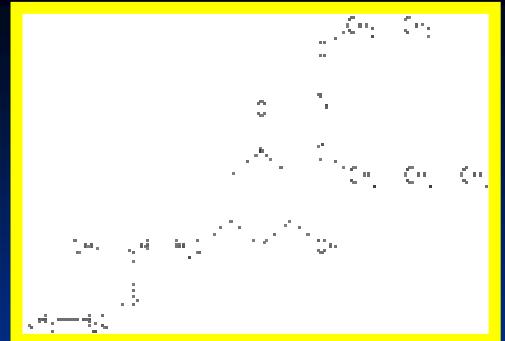
* Available in Hong Kong 在香港可購買到

quinclorac



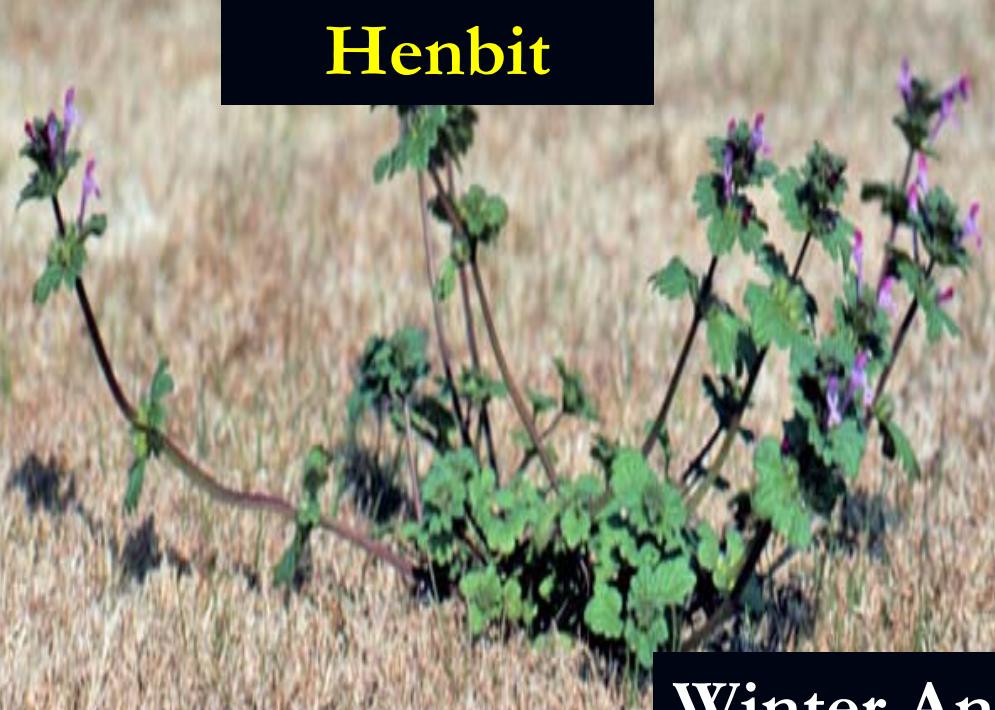
- Trade name 商用名: Drive
 - Used for crabgrass and broadleaf weed control.
用於馬唐和闊葉雜草控制
 - Lawns in GA: Bermudagrass, tall fescue, and zoysiagrass
在喬治亞州的草坪：狗牙根、高羊茅、和結縷草
 - Compatible with broadleaf weed herbicides.
與闊葉雜草除草劑相容.
- **Found in Combination Products:** One-Time, Q4, Square One.
在於下列組合產品中找到: One-Time, Q4, Square One.

sethoxydim



- Trade name 商用名: Segment, others
 - Safe in centipedegrass lawns only
只在假儉草草坪上安全使用
 - Used for controlling crabgrass, bermudagrass, torpedograss, and other grassy weeds
用以控制馬唐, 狗牙根, 鋪地黍及其他草類雜草
 - No activity on broadleaf weeds.
在闊葉雜草上無效.

Henbit



Hop Clover



Winter Annuals

冬季一年生雜草



Annual Bluegrass



Hairy Bittercress

Fall Weed Control Programs

秋天雜草控制程序

Winter annual weed control

冬季一年生雜草之控制

■ Begin emerging when soil temperatures drop below approximately 70 F,

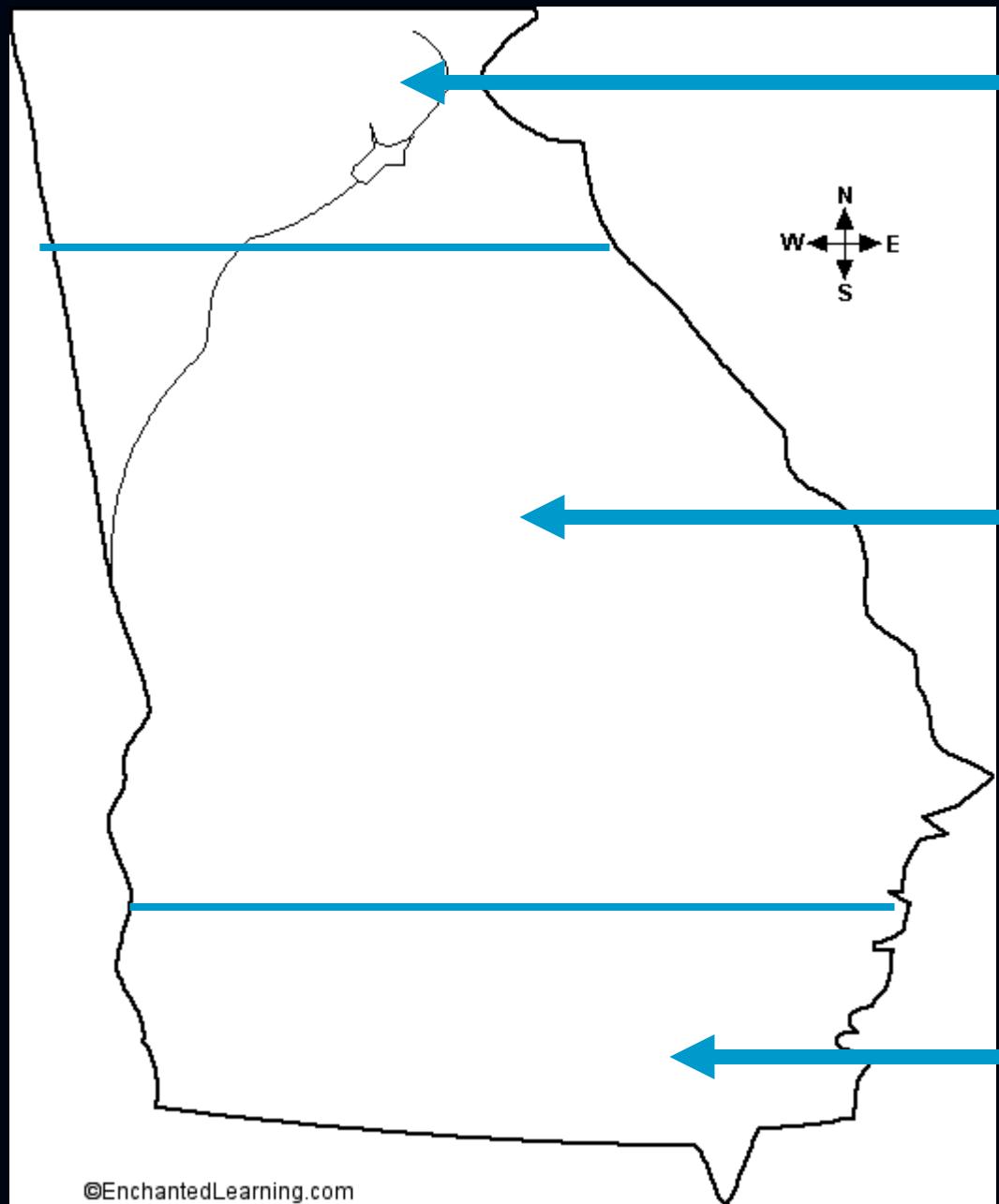
當土壤溫度降至約 70 F 以下開始出現

■ Can be controlled with pre-emergence herbicides in fall,

可以在秋天施以芽前除草劑控制

■ Proper application timing is critical.

正確施用時機最為關鍵。



Sept. 1 to 15

Sept. 15 to Oct. 1

Oct. 1 to Oct. 15

Preemergence Herbicides for *Poa annua* Control 芽前除草劑對早熟禾的控制

Common Name	Trade Name	Activity
atrazine	Various	E
benefin	Balan	E
bensulide	Betasan	F
dithiopyr	Dimension	G
ethofumesate	Prograss	G-E
indaziflam	Specticle	E
mesotrione	Tenacity	F
oryzalin	Surflan, Harrier	G
oxadiazon	Ronstar	G
pendimethalin	Pendulum	G
prodiamine	Barricade, others	E
pronamide	Kerb	E
simazine	Princep, Wynstar	E

Weed and Feed Products

雜草和肥料產品

- Herbicide + Fertilizer Combination for homeowners
為房主使用之除草劑 + 肥料組合
- Preemergence Products: Primarily targeted for cool-season turfgrasses
芽前除草劑產品: 主要目標為冷季型草坪草
- Concerns
關注點
 - Fertilizing dormant turf
休眠期草坪之肥料施用
 - Select Weed + Feed products without nitrogen or phosphorous such as 0-0-7 (N-P-K)
選擇雜草 + 肥料產品, 無氮或磷素 0-0-7 (N-P-K)

Broadleaf Weed Herbicides 殺闊葉雜草之除草劑

(Check labels for turf species)

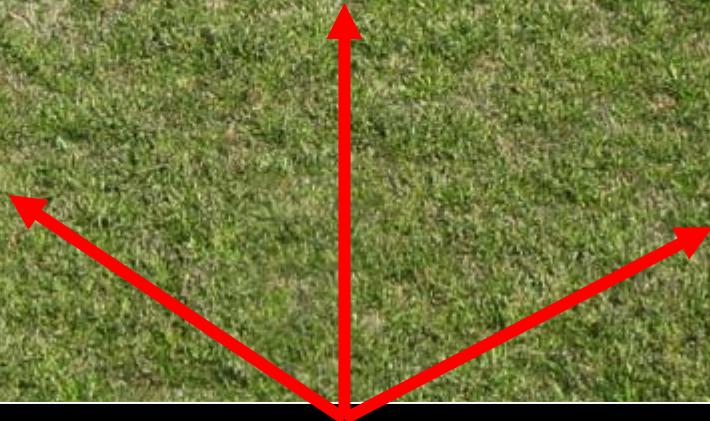
Common Name	Trade Name (Examples)
2,4-D	(Various)
atrazine/simazine	various
chlorsulfuron	Corsair®
clopyralid	Lontrel®
dicamba	Vanquish®
MCPP	Mecoprop®
metsulfuron	Blade®, or Manor®
sulfentrazone	Dismiss®
sulfosulfuron	Certainty®
triclopyr	Turflon®
trifloxysulfuron	Monument®

Escalade at 3 pt/acre (fluroxypyr + 2,4-D + dicamba)
4 WAT 2009, UGA



Common Bermudagrass in Griffin, GA, May 13, 2009

狗牙根在 Griffin, GA, May 13, 2009



Annual Bluegrass/ Bermudagrass
(dormant)

一年生早熟禾/狗牙根(休眠)

Common Bermudagrass in Griffin, GA , May 13, 2009

狗牙根在 Griffin, GA, May 13, 2009



Common Bermudagrass in Griffin, GA May 13, 2009

狗牙根在Griffin, GA, May 13, 2009





**Glyphosate Use on Dormant Bermudagrass
(with or without preemergence herbicides)**

Glyphosate 用於休眠的狗牙根

(有或沒有同時的單草甘膦除草劑)



Glyphosate (49 days after treatment)

Glyphosate(施用49天後)



Green under “dormant” zoysiagrass

休眠的結縷草下的綠色



“Dormant zoysiagrass” spot sprayed with glyphosate

在休眠的結縷草上,定點施用 glyphosate

Temperature Will Affect Weed Control

溫度會影響雜草之控制



1.33 oz/acre
30°C (86 F)

5.32 oz/acre
10°C (50 F)

Optimizing Weed Control

最佳之雜草控制

Temperature 温度



■ Major influential parameter of herbicide efficacy

影響除草劑效果的主要變數

- Differential herbicide metabolism,

各除草劑特定的代謝作用,

- Volatilization of applied herbicides,

■ 已施用除草劑的揮發

■ Seasonal application timings

季節性的施用期

- Influence turf safety and weed control,

影響草坪安全和雜草控制,

- Related to growth rate and growth stage of plants.

與植物生長速率及生長階段有關係.

Seasonal Weed Control in Lawns

草坪的季節性雜草控制

- Fall is excellent time of year to control perennial weeds

一年內秋天是最好的時間進行多年生雜草的控制

- Dallisgrass, bermudagrass, white clover, others
例如 **Dalligrass**, 狗牙根, **White Clover**, 等.
- Plants begin allocating carbohydrates for storage in rhizomes,

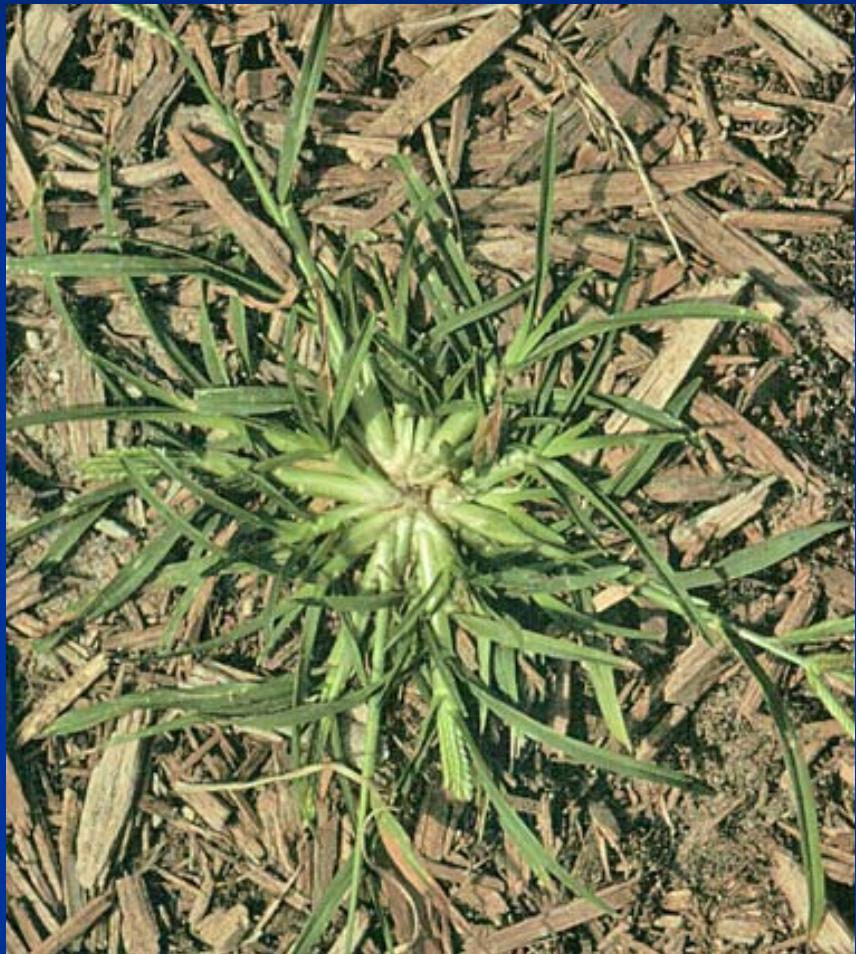
植物開始分配碳水化合物以存儲於根莖中

- Better herbicide translocation and more effective control of these weeds.

更好的除草劑傳送及更有效控制雜草

Growth Stage of Weeds Influences Herbicide Efficacy

雜草的生長階段會影響除草劑效果



Plan for Success

成功的計劃

- Scout turf and identify weeds,
巡查草地及鑑定雜草類別,
- Evaluate cultural practices that may need modifications to improve turf competition,
評估以往所採用的護養方法, 可能需要修改, 以提高草坪競爭的能力,
- Select herbicides and apply at appropriate timings to maximize efficacy for control.
選擇除草劑和在適當的期間應用, 以達致最大控制效果

Thanks!
謝謝!

