

# Glyphosate herbicide review update

## Stakeholder Meeting



Ministry of the Environment  
Department of Environment and Natural Resources

Ministry of Health & Seniors  
Department of Health

12<sup>th</sup> January 2017

## Purpose

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1. To update stakeholders on the findings from the recently completed study – *Glyphosate Presence Study*.

2. To gain feedback from the public.  
Formal submissions in writing to [pollutioncontrol@gov.bm](mailto:pollutioncontrol@gov.bm) or

Ministry of the Environment, Botanical  
Gardens #169 South Road, Paget, DV04

# Agenda

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1. Summarize timeline of the investigation
2. Present the findings and recommendation of the study
3. Questions and Answers

# Introductions

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## **Department of Environment and Natural Resources**

Mr. Drew Pettit –Director

Ms. Terry Lynn Thompson – Principal Plant Protection Officer

Dr. Geoff Smith – Gov. Environmental Engineer

Ms. Claire Jessey – Plant Protection Officer

## **Department of Health**

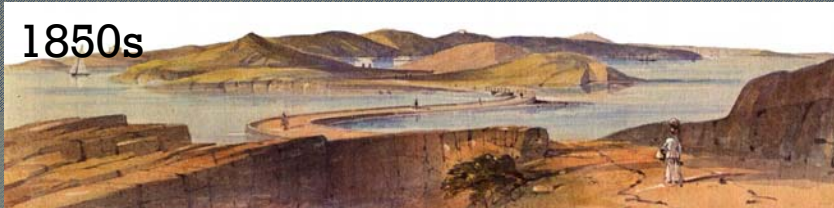
Mr. David Kendall - Director

Mrs. Susan Hill Davidson - Acting Chief Environmental Health Officer

Mr. Armell Thomas – Senior Environmental Health Officer

# Need for weed control in Bermuda

1850s



1880s



1910s



1940s



2016

# Need for weed control in Bermuda: Today

## INVASIVE PLANTS – CATEGORY I

### Common name

### Botanical Name

#### Annual

Bitterweed, Yellowdicks

*Helianthemum amarum*

#### Aquatic

Water Hyacinth

*Eichhornia crassipes*

Water Lettuce

*Pistia stratiotes*

#### Cacti and Succulents

Barbados Gooseberry

*Pereskia aculeata*

Mother-in-Law's Tongue

*Sansevieria trifasciata*

#### Grass & Grass-Like Plants

Cow Cane

*Arundo donax*

Fountain Grass

*Cenchrus setaceus*

Foxtail Grass, Bristly Fox Tail

*Setaria verticillata*

Napier Grass, Elephant Grass

*Cenchrus purpureus*

Para Grass, Buffalo Grass

*Urochloa mutica*

#### Herbaceous Perennial

Asparagus Fern

*Asparagus densiflorus*

Asparagus Wedding Fern

*Asparagus setaceus*

Long Leafed Asparagus Fern

*Asparagus falcatus*

Wireweed

*Sida acuta*

#### Palm

Chinese Fan Palm

*Livistona chinensis*

#### Shrub

Apple of Peru

*Nicandra physaloides*

Beach Naupaka

*Scaevola sericea*

Castor Oil Plant

*Ricinus communis*

Jumbie Bean, Wild Mimosa

*Leucaena leucocephala*

Madagascar Buddleia, Snuff Plant

*Buddleia madagascariensis*

Marlberry, Shoebuttan Ardisia

*Ardisia elliptica*

Russian Berry, Russian Olive

*Elaeagnus angustifolia*

Shrubby Clerodendron

*Clerodendron* sp.

#### Tree

Brazilian Pepper, Mexican Pepper

*Schinus terebinthifolius*

Casuarina

*Casuarina equisetifolia*

Indian Laurel

*Ficus microcarpa*

Madagascar Olive

*Noronhia emarginata*

Queensland Umbrella Tree

*Schefflera actinophylla*

Walking Casuarina

*Casuarina cunninghamiana*

#### Vine

Asparagus Wedding Fern

*Asparagus setaceus*

Balloon Vine (Large Fruited)

*Cardiospermum halicacabum*

Black bean, Hyacinth bean, Lablab

*Dolichos lablab*

Kudzu

*Pueraria montana*

Morning Glory

*Ipomoea indica*

Pothos Vine

*Epipremnum pinnatum*

Wedelia, Seaside Creeping Daisy

*Sphagneticola trilobata*

# Need for weed control in Bermuda

Aesthetics



Structural damage



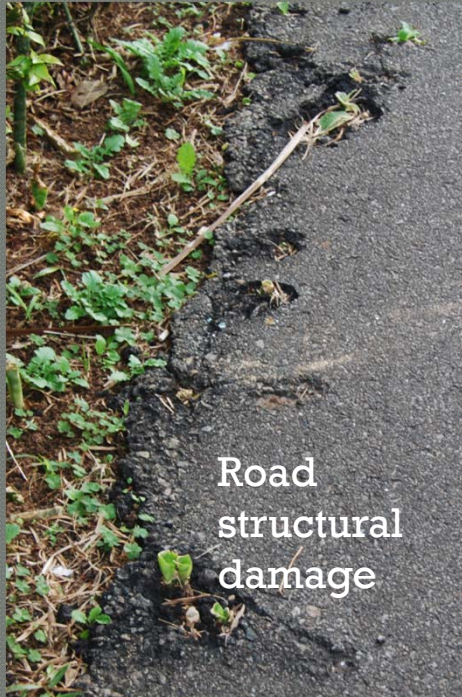
Competition



Driver & pedestrian safety



Road structural damage



# Need for effective weed control

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## Embarrassed to be Bermudian, Royal Gazette 12<sup>th</sup> Oct 2015

“I was embarrassed to be a Bermudian. We have sunk to such depths, we must no longer care what our beautiful Island has become. Weeds, overhanging trees in the roads and generally just a mess. “Is this the way Bermuda is going to look going forward? If it is, we must look seriously at finding a better way to get our Island back.”

## Overgrown weeds are a disgrace, Royal Gazette, 12<sup>th</sup> Sep 2015

“I am in shock and in awe at the condition of the roads, trees, weeds, hedges, etc, on our beautiful Island. I am a senior citizen and in all of my years on this Island, I have never ever seen anything as disgraceful as our roads and overgrown trees and hedges.

Right now, Bermuda is a national disgrace and I am humiliated by this. Can the Government please, please, please do something about this situation immediately.”



# Methods of weed control

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1. **Chemical** - the use of herbicides
2. **Cultural** - practices that promote the growth of desirable plants, which reduces opportunities for weeds to grow.
3. **Mechanical** - physical damage or removal of all or part of the weed.
4. **Biological** - using one organism to control another – example- dense groundcover that excludes weeds can be a form of biological control
5. **Integrated Pest Management (IPM)**

# Methods of weed control

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## Integrated Pest Management (IPM)

**IPM** is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.

**Integrated Vegetation Management** is a subset of IPM whereby as many approaches as possible are used, in a coordinated fashion to control plant pests. Integrated Vegetative Management is PREVENTIVE management for vegetation, predicated on the concept that the preservation of desirable plants is equally as important as controlling pest plants.

# Pesticide management in Bermuda

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Two Departments manage pesticides in Bermuda as per the **Pesticide Safety Act 2009**

The Department  
of Environment  
and Natural  
Resources  
**Importation**

The Department  
of Health  
Sales, Use,  
Storage, Disposal

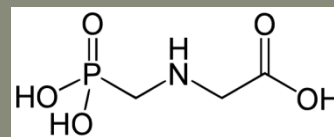
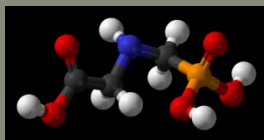
# Herbicide control



## Categories of Herbicides:

1. **Contact** – kill the part of the plant it touches.
2. **Systemic** – are absorbed by foliage or roots and translocated to other parts of the plant.
3. **Pre-emergent** – mixed into soil to kill germinating seed and small seedlings. These type take action before growth.

# Glyphosate



## Use:

Broad-spectrum systemic herbicide used to control *weeds*, especially annual *broadleaf* weeds and grasses that compete with *crops*.

Glyphosate was discovered to be an herbicide by Monsanto chemist John E. Franz in 1970.

Monsanto brought it to market in 1974 under the trade name *Roundup* and Monsanto's last commercially relevant United States patent expired in 2000.

Today, glyphosate is produced by several manufacturers.

# Glyphosate

Glyphosate is the most widely used herbicide in the world. It is now generic and used in many products, not only Roundup. Primarily used in agriculture, forestry, road side management and in urban/home settings.



Use of glyphosate has soared in the last two decades because of *Monsanto's Roundup Ready crops*, which account for most corn and soybeans grown in the United States. These crops are genetically engineered to withstand glyphosate, allowing farmers to spray their fields without harming the crops.

# Glyphosate use in Bermuda

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In Bermuda, GM crops are not grown and glyphosate is not known to be used by farmers on any non-GM crops.

In Bermuda, glyphosate is primarily understood to be used for weed control.

Historic importers in Bermuda of >2% glyphosate include: Government (roadside), Hotel/Condo's, Golf Courses, Plant Nurseries, Landscapers, Farmers, Pest Control Companies, Hardware/Retail Stores, Construction Companies, and Private Use.

Some farmers in Bermuda use glyphosate for weed control only (it is not applied to crops). In these instances it is used around borders of fields and to prepare fields prior to seeding.

# Products / Formulations

## CONCENTRATES

### **ROUNDUP PRO Herbicide**

(41% isopropylamine salt of glyphosate) 0410482

### **ROUNDUP PROMAX[™] HERBICIDE**

(48.7% potassium salt of glyphosate)  
04-1047-2

### **RODEO HERBICIDE**

(53.8% Glyphosate N-(phosphonomethyl) glycine, isopropylamine salt) 84825 [EPA. No. 62719-324]

## READY TO USE (RTU)

### **ROUNDUP RTU WEED & GRASS KILLER**

0.96% glyphosate) 5103210/ 5002110/  
5003110

### **ROUNDUP RTU EXTENDED CONTROL WEED & GRASS KILLER PLUS WEED PREVENTER**

(1% glyphosate, 0.017% imazapic)  
5700010/5107300

### **ROUNDUP WEED & GRASS KILLER RTU PLUS**

(2% glyphosate, 2% pelargonic acid)  
[EPA:71995-33] 500321070



## Alternative Herbicides\*

Alternative Herbicides	Results	Conclusion
Clove Oil/Citric Acid/Acetic Acid (vinegar) (Defoliant)	Little effectiveness (weed levels very close to that of untreated plots) – does not kill plant crowns	Weak immediate suppression but some effect by the end of season. Repeated applications required.
Pelargonic Acid (Defoliant)	Strong immediate suppression, but dissipated after time (crown not completely killed and seedlings emerging after application unaffected)	Stronger immediate suppression but effect wears off. Repeated applications required.
Clove Oil/Pelargonic acid/Glyphosate (Defoliant)	Grape and poison ivy. Effective suppression by all at end of season. Clove oil unsatisfactory on vines at end of season. Pelargonic acid initial appearance of efficacy, but diminishes towards end of season. Glyphosate initially ineffective but very effective at end of season.	Weak immediate suppression but some effect by the end of season. Repeated applications required.
Corn Gluten Meal (varying rates) (Pre-emergent)	Little suppression on weed growth. Plots prepared by burning (weed torch) showed little effect. Plots prepared with glyphosate had continued weed control. Weed mass increased with increasing applications as corn gluten is a nitrogen fertilizer. Corn gluten meal did not suppress growth.	Some suppression of seed germination but did not control vegetation growth – some stimulation of growth. Required pre-treatment of burning or herbicide killing. Expensive, ineffective. Not suitable for roadside application.

\* Source: University of Massachusetts, 2008

# Mechanical Methods

Mulches (bark, woodchip) – 2 to 3 inches applied to bare plot	Gave season long vegetation control. Lowest weed mass at end of trial.	Strong season- long suppression of growth. Requires pre-treatment. Labor intensive ad costly (delivery of mulch etc.)
Burning	Good control through early and mid-season. Lost effectiveness due to re-growth from seedlings and crown.	Nearly complete immediate control of shoot growth. Plants grow back. Several applications needed. Time consuming.
White Clover coverage	Some early and mid-season control, but this may have been due to burning plot preparation.	Not significantly effective.
Hot Water/Steam and Foam and Hot Water on farm plots	Effective suppression 24 hours after application. Strong for 3 weeks but by 6 weeks, vegetation returned. Killed only above ground vegetation. Steam slightly more effective than burning.	Nearly complete immediate control of shoot growth. Plants grow back. Several applications needed. Time consuming. Foam surfactant toxic to fish.
Steam on roadside	Single applications had low efficacy lasting for only four weeks. Dual applications more effective over the season. Triple applications considerably more effective than dual.	Nearly complete immediate control of shoot growth. Plants grow back. Several applications needed. Time consuming.
<b>Conventional Herbicide</b>		
Glyphosate and glufosinate-ammonium (Systemic)	Consistently provided acceptable to excellent control of vegetation with one application. Glyphosate better than glufosinate-ammonium.	Good season control. Cost effective.

# Timeline

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**Mar 2015 – WHO/IARC** - Classification of glyphosate raised from '*Possible carcinogen to humans*' to '*Probable carcinogen to humans*'.

**May 2015** – Petition from Bermuda public to Minister. In an abundance of caution the **Minister of Health, Seniors and Environment** introduced a suspension the importation of glyphosate products for 6 months pending a review (May 25th 2015).

Instructed Ministry technical officers to design a study and investigate the **presence of residual glyphosate in the environment**, specifically a product made by DOW Chemicals called Rodeo which is currently used by the Ministry of Public Works for roadside weed control.

The department had difficulty in sourcing analytical laboratories overseas that could conduct the analyses to the appropriate detection limits.

# Timeline

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**Nov 2015** – EFSA - Stated glyphosate not carcinogenic to humans.

**Nov 2015** – EFSA result prompted the Minister to relax importation suspension on dilute products (<2%).

**Feb 2016** – DENR/DoH – Stakeholder presentation . At which the department committed to the following:

1. *Complete detection study by July 2016.*
2. *Upon completion review findings in conjunction with EU studies. Submit recommendation to the Ministry.*
3. *During study to work with importers to identify effective and environmentally friendly alternatives*
4. *Promote the implementation of vegetation management strategies that incorporate Integrated Pest Management*
5. *Permit the importation of RTU glyphosate formulations <2% active ingredients*
6. *Continue ban on concentrated forms until final decision on importation is made*

# Timeline

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**May 2016 – WHO/FAO** - Glyphosate unlikely to pose carcinogenic risk to humans from exposure through diet. No reason to change existing Acceptable Daily Intake (ADI) limits.

**June 2016 - European Commission** extends approval of the substance, with the following conditions.

1. Ban a co-formulant called POE-tallowamine from glyphosate based products;
2. Minimise the use of the substance in public parks, public playgrounds and gardens;
3. Minimise the pre-harvest use of glyphosate.

*[http://europa.eu/rapid/press-release\\_MEMO-16-2012\\_en.htm](http://europa.eu/rapid/press-release_MEMO-16-2012_en.htm)*

# Timeline

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**Jun 2016** – Samples collected for analysis (air, water, sediment, soil, food stuffs).

**Oct 2016** – Results received from AXYS Analytical Services Ltd, British Columbia, Canada.

**Nov 2016** – DENR monitoring study report completed.

**Dec 2016** – Public consultation planned but event cancelled

**Dec 2016** – Study released – [www.gov.bm](http://www.gov.bm)

**Jan 2017** – Public Consultation

# Discussion Monitoring Study Findings