Integrated Pest Management (IPM) Webinar

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CNLA

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Outline

- CNLA Minor Use Coordinator
- Registering Pesticides in Canada
- New Pesticide Registrations including Pesticide Alternatives
  - Product Highlights
  - Horsetail management
  - Fireblight management
- Product Re-evaluations
- Future
- Wrap up

National IPM / Minor Use Coordinator

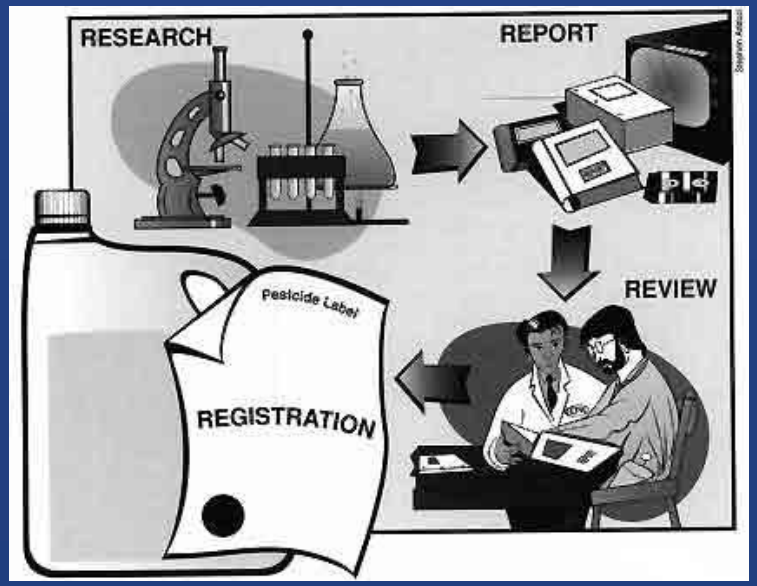
- CNLA grower position initiated in March 2003
- Role: Facilitate and coordinate minor use pesticide registrations with industry and government for the nursery landscape industry

Minor Use Registrations 2000 - 2003

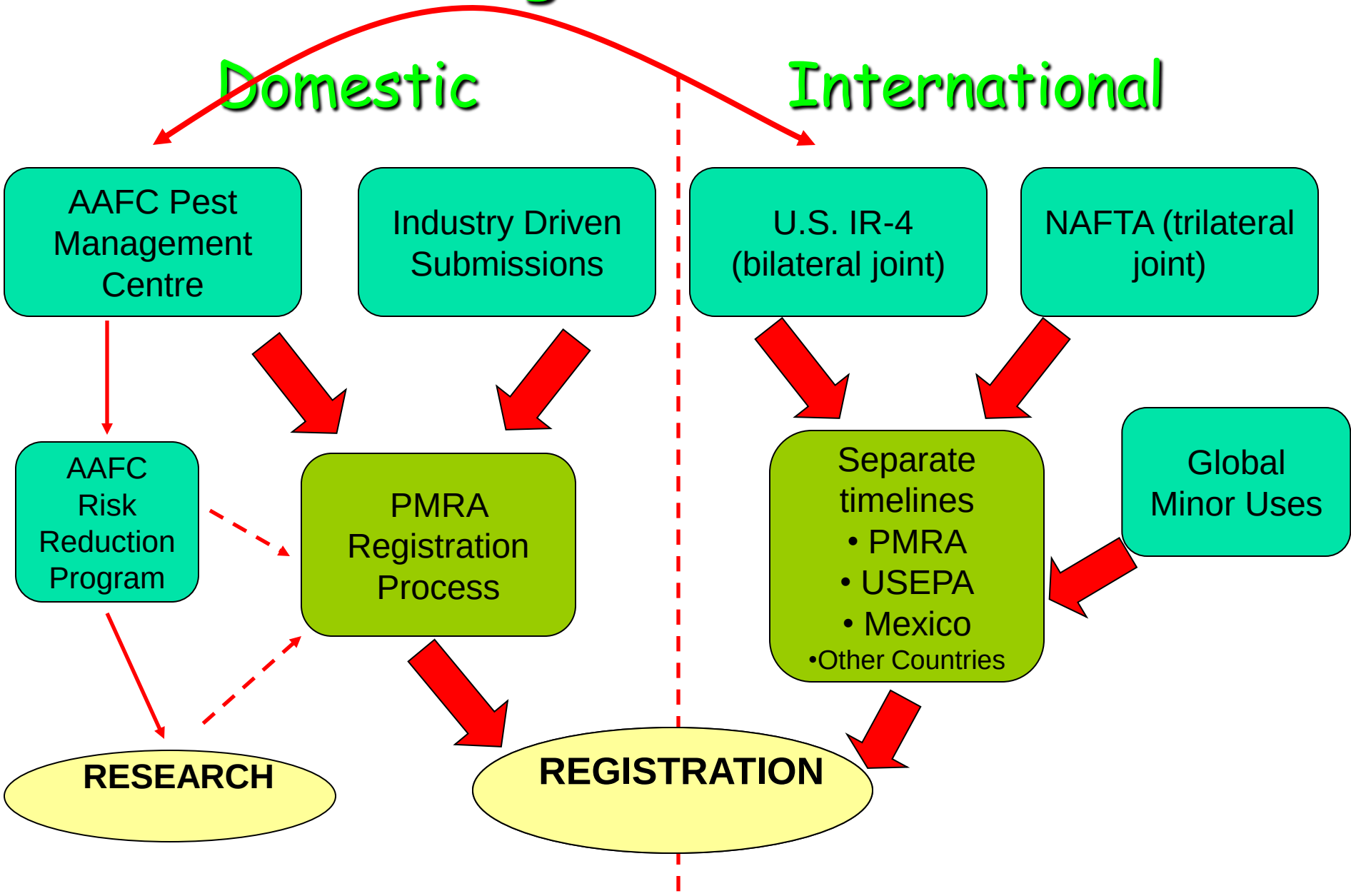
- The three year period prior saw the nursery industry receive a single minor use pesticide registration
  - Ronstar® (oxydiazon) for control of weeds in containers
- In this time Flowers Canada hired a full-time pesticide technician and received a total of 26 pesticide registrations

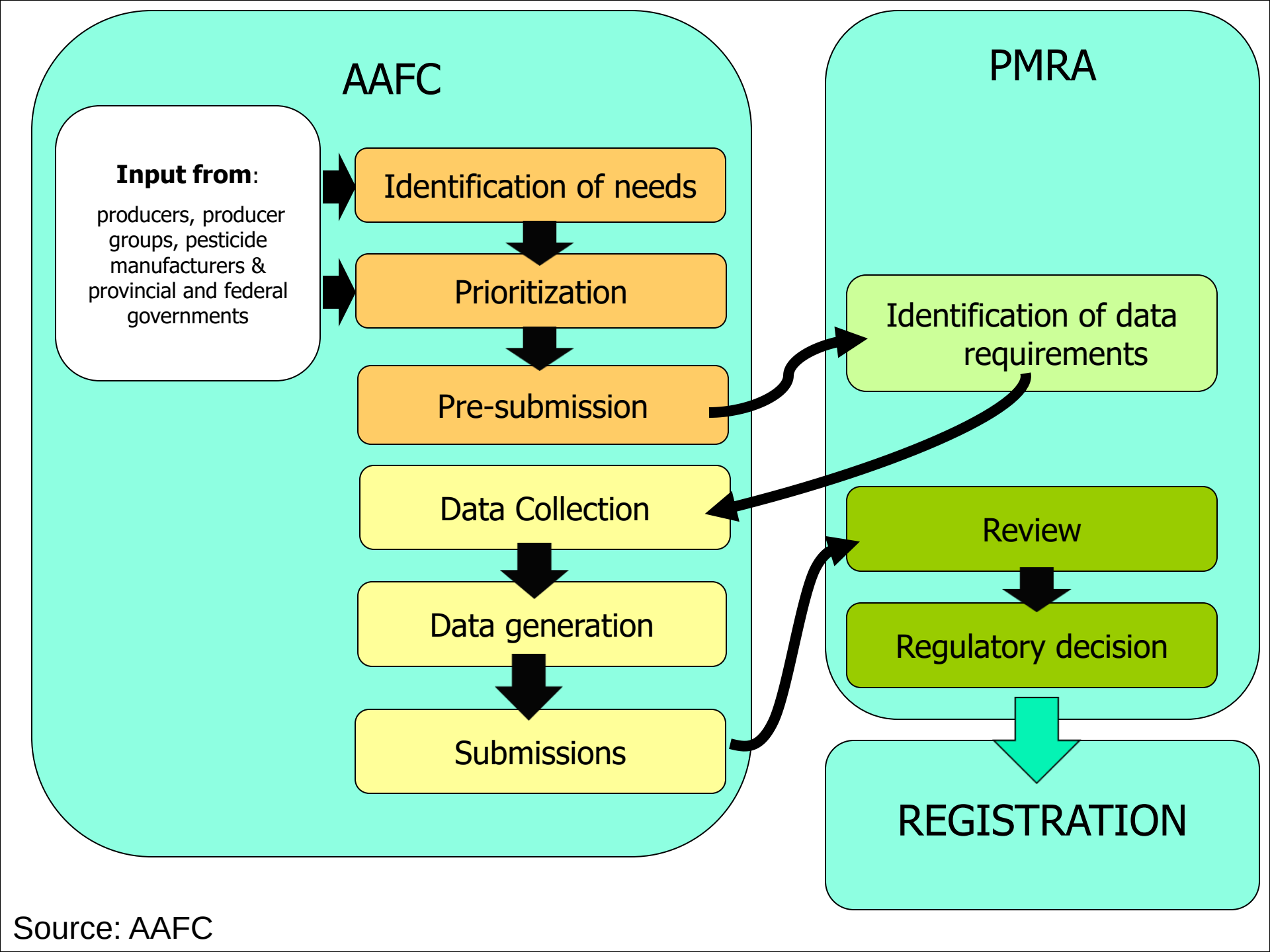
Minor Use Registrations Since 2003

- Since its inception the nursery industry has received **over 40 new pesticide registrations**.
- Currently, there are more than 10 new pesticides in the product stream for registration

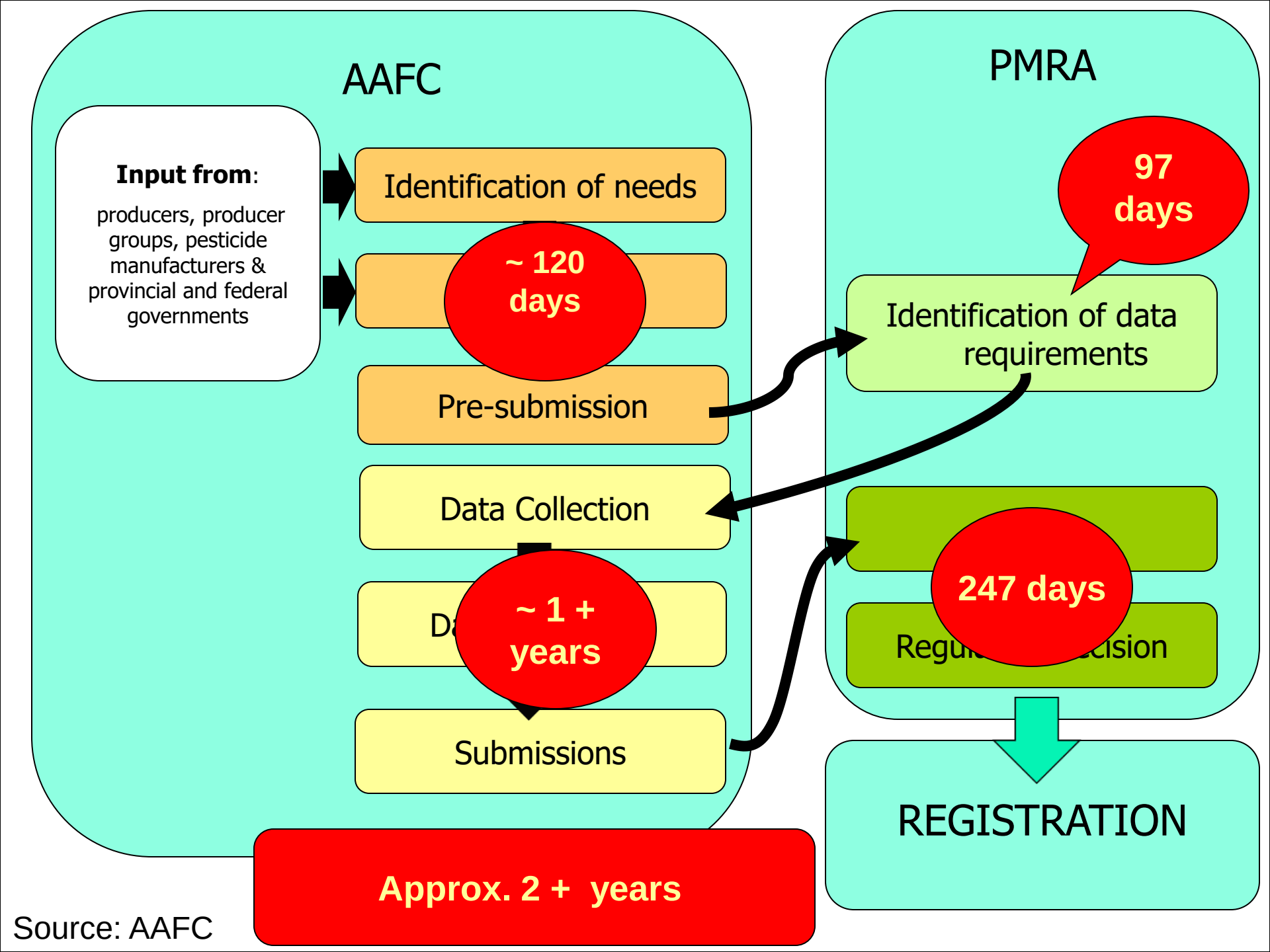


Pesticide Registration Flowchart




AAFC
Input from:
producers, producer groups, pesticide manufacturers & provincial and federal governments
Identification of needs
Prioritization
Pre-submission
Data Collection
Data generation
Submissions
PMRA
Identification of data requirements
Review
Regulatory decision
REGISTRATION

Source: AAFC


AAFC
Input from:
producers, producer groups, pesticide manufacturers & provincial and federal governments
Identification of needs
~ 120 days
Pre-submission
Data Collection
~ 1 + years
Submissions
Approx. 2 + years
PMRA
97 days
Identification of data requirements
247 days
REGISTRATION

Source: AAFC

HERBICIDES

Successful Registrations: Herbicides

- Broadstar (flumioxazin) – Group 14
- Sureguard (flumioxazin) – Group 14
- Goal 2XL (oxyfluorfen) – Group 14
- Dual II Magnum (s-metolachlor) – Group 15
- Gallery 75DF (isoxaben) – Group 21
- Frontier Maxx (dimethenamid-p) – Group 15

Container Weed Management

- Prior to IPM program only two products: Ronstar and Devrinol
- Registrations for:
  - Gallery 75DF (isoxaben)
  - Dual II Magnum (s-metolachlor)
  - Broadstar (flumioxazin) - granular
  - Goal 2XL (oxyfluorfen)
  - Prowl H2O (pendimethalin)
  - Frontier Max (dimethenamid-p)

Broadstar and Sureguard

- Probably the most significant registration we have received through the CNLA
- Now widely used by container and field growers across Canada
- Dependence has resulted in weed escapes (e.g annual grasses)

Broadstar and Sureguard

- Mode of action similar to Goal (oxyfluorfen) but better
- Good pre-emergent on Broadleaves and Grasses
- Sureguard (spray) provides early post-emergent control
- Controls Triazine-Resistant Weeds
- Not as strong for annual grasses

Broadstar Labelled Weeds

- Canada
  - Hairy bittercress/snapweed (*Cardamine hirsuta*)
  - Liverwort (*Marchantia polymorpha)*
  - Suppression only:
  - Common groundsel (*Senecio vulgaris*)
  - Common chickweed (*Stellaria media*)

- United States
  - Alyssum, Hoary (*Berteroa incana*)
  - Amaranth
    - Palmer (*Amaranthus palmeri*)
    - Spiny (*Amaranthus spinosus*)
  - Barnyardgrass (*Echinochloa crus-galli*)
  - Beggarweed, Florida (*Desmodium tortuosum*)
  - Bittercress, Hairy (*Cardamine hirsute*)
  - Bluegrass, Annual (*Poa annua*)
  - Burclover, California (*Medicago hispida*)
  - Carpetweed (*Mollugo verticillata*)
  - + 78 more weeds

Sureguard Labelled Weeds

- Canada
  - Redroot pigweed (*Amaranthus retroflexus*)
  - Green pigweed (*Amaranthus powellii*)
  - Common ragweed (*Ambrosia artemisiifolia*)
  - Common lamb's-quarters (*Chenopodium album)*
  - Green foxtail (*Setaria viridis*)
  - Hairy nightshade (*Solanum sarachoides*)
  - Dandelion (*Taraxacum officinale*)
  - Eastern black nightshade (*Solanum ptycanthum*)
  - Kochia (*Kochia scoparia*)
  - Canada fleabane (*Conyza canadensis*)

- United States
  - Alyssum, Hoary (*Berteroa incana*)
  - Amaranth
    - Palmer (Amaranthus palmeri)
    - Spiny (Amaranthus spinosus)
  - American Burnweed (*Erechetities hieracifolia*)
  - Barnyardgrass* (*Echinochloa crus-galli*)
  - Beggarweed, Florida (*Desmodium tortuosum*)
  - Bittercress, Hairy (*Cardamine hirsuta*)
  - Bluegrass, Annual* (*Poa annua*)
  - Burclover, California (*Medicago polymorpha*)

  - + 95 more weeds

Broadstar and Sureguard Crop Tolerance

- Broadstar
  - Canada: 10 listed tolerant plant species
  - United States: 136 tolerant plant species
- Sureguard
  - Canada: 8 listed tolerant plant species
  - United States: 136 tolerant plant species

How to Injure Plants with Broadstar

- Treat broadleaf plants when the foliage is wet
- Treat YOUNG newly potted 1- gallon liners
- Use higher than the labeled rate

Frontier Maxx

- Called Tower Herbicide in the US
- Like Dual II Magnum is efficacious on sedges (annual and yellow)
- Can be tank mixed with Prowl H2O Aquacap (pendimethalin) for better weed spectrum
- Broadleaf Weeds
  - Amaranthus spp., Carpetweed, Common purslane, Eclipta, Nodding spurge, Spotted spurge, Nightshade spp.
- Grass Weeds
  - Barnyardgrass, Bluegrass spp., Large crabgrass, Smooth crabgrass, Goosegrass

What about Horsetail…?

- Field horsetail (*Equisetum arvense*) is a growing problem in nurseries, particularly in Western Canada
- Difficult to manage weed that is resistant to cultivation and mowing
- Poorly controlled with Roundup, Goal, Simazine, 2,4-D, Venture L, Velpar

Above: Horsetail in a newly-installed landscape bed, likely introduced on nursery stock.
Right: It prefers wet, poorly drained soils but will establish and spread on dry sites.

HORSETAIL IN FARMS OF WESTERN CANADA

Pictures above: Horsetail found in the B.C. Lower Mainland.
Left: Growing among nursery production of Thuya (arborvitae).
Right: Growing among commercial production of blueberries.

Pictures above: Horsetail found in the B.C. Interior (East of Cascade Mountains).
Left: Growing at a commercial nursery. Right: Growing in an apple orchard.

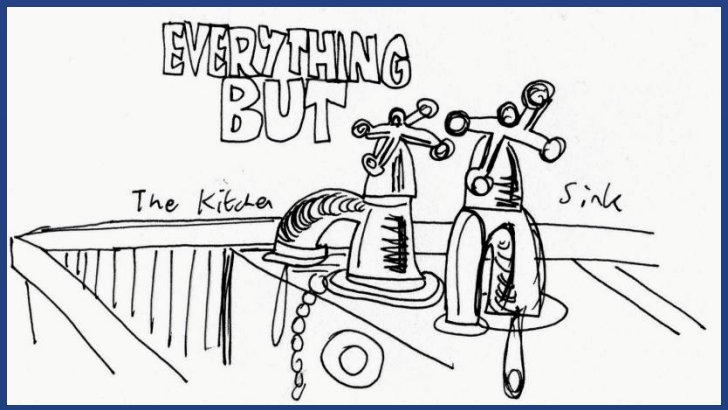
Pictures above: Horsetail found in commercial nurseries of South Alberta.
The weed escapes applications of glyphosate (Round-up) made for weed control.
Left: Growing in the tree row. Right: Horsetail has spread through a spruce planting.

What about Horsetail…?

- Casoron (diclobenil) is effective when applied pre-emergence in late fall or late winter
- MCPA formulations provide top-growth control and must be re-applied annually to maintain sustained control
- Amitrol is only available for spruce bareroot nursery stock but is effective post-emergence when the plant is fully emerged and near the end of its growth cycle (late June or early July)

Horsetail Screening Study

- Sureguard + Sedgehammer
- Casoron G-4
- Sulfentrazone
- Sureguard + glyphosate + Merge
- Flumetsulam + Dual II Magnum
- Pyroxasulfone + Sureguard + Merge
- Flumetsulam
- Saflufenacil + Merge
- Chlorsulfuron
- Sureguard + Merge
- Dual II Magnum + glyphosate
- Suflometuron-methyl
- Flumetsulam + chlopyralid
- Pyroxasulfone + carfentrazone
- Carfentrazone
- Saflufenacil + glyphosate
- Primisulfuron-methyl



Insecticides

Successful Registrations: Insecticides

- Acelepryn (chlorantraniliprole) – Group 28
- Beleaf (flonicamid) – Group 9c
- Dursban (chlorpyrifos) – Group 1b
- Endeavor 50WG (pymetrozine) – Group 9b
- Intercept 60WP (imidacloprid) – Group 4
- Kontos / Movento (spirotetramat) – Group 23
- Landscape Oil (horticultural oil) – Group NA
- Success 480SC (spinosad) – Group 5
- Tristar 70WSP (acetamiprid) – Group 4

Neonicotinoid Replacements

- Growers are under pressure from customers to reduce or eliminate neonicotinoid insecticides
- Issue is impact on bees and other pollinators
- Focus is on imidacloprid products (Intercept) and thiamethoxam products (Actara)
- Tristar (acetamiprid) ends up as an unfortunate casualty ☹

Neonicotinoid Replacements

- Acelepryn (chlorantraniliprole) – Group 28
  - Japanese beetle grubs
  - Expansion for other pests
- Beleaf (flonicamid) – Group 9c
  - Aphids, thrips, whitefly
- Kontos / Movento (spirotetramat) – Group 23
  - Whitefly, thrips, aphids, Citrus mealybug, Euonymus scale and spider mites in outdoor and greenhouse grown ornamentals (except conifers)
  - Balsam gall midge (field grown Balsam and Fraser fir)

Caution with Spirotetramat

- Kontos is an excellent systemic insecticide but there is known phytotoxicity to some plants
  - E.g. Geraniums (Pelargonium spp.), orchids, hoya, Dracaena, Cordyline, Schefflera, neanthebella palm, and ferns.
  - Be cautious on Hydrangea spp., Impatiens spp., crotons, Fuchsia hybrids, Petunia, Peperomia, stocks, Coleus, Violas, or cyclamens.

Growers should always read pesticide labels and use on small areas first before broadcasting unfamiliar products

Miticides

Successful Registrations: Miticides

- Apollo (clofentezine) – Group 10
- Floramite (bifenazate) – Group un
- Forbid (spiromecifen) – Group 23
- Kanamite (acequinocyl) – Group 20b
- Sanmite (pyridaben) – Group 21
- Vendex (fenbutatin) – Group 12

A Word on Floramite…

- Floramite (bifenazate) controls two-spotted spider mite and spruce spider mite
- Spruce spider mites prefer older needles and are more likely to be found inside the plant canopy.
- Growers often blame ineffective pesticides for poor results against spruce spider mites.
  - The problem is often poor coverage from inadequate settings of speed, pressure and nozzles.

FUNGICIDES

Boxwood Blight Identification Guide

INITIAL SYMPTOMS

Dark leaf spots (left) and spores of the boxwood blight fungus (*Calonectria pseudonaviculata)* on lower leaf surfaces (right).

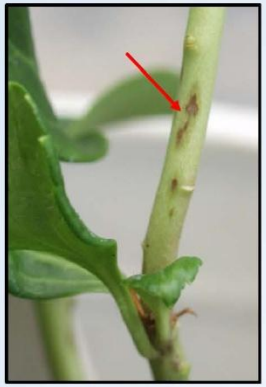
Zonate leaf lesions.

Black stem lesions.

LANDSCAPE AND NURSERY SYMPTOMS

Foliar and stem symptoms result in severe defoliation leading to decline and death of boxwood plants. Boxwood blight affects all species of boxwood, pachysandra, and sarcococca.

Infected boxwood and pachysandra in the landscape (left) and leaf spots on pachysandra (right).



Stem lesions on pachysandra (left) and fungal spores on lower surface of pachysandra leaves (right).

All photos from CAES.
Funding from FY2013 Farm Bill, USDA-APHIS.

For more information:
www.ct.gov/caes/boxwoodblight
www.boxwoodblight.org

CAES
The Connecticut Agricultural Experiment Station
Putting Science to Work for Society since 1875

Successful Registrations: Fungicides

- Aliette (foestyl-al) – Group 33
- Banner Maxx (propamocarb) – Group 3
- Compass (trifloxystrobin) – Group 11
- Heritage (azoxystrobin) – Group 11
- Milstop (potassium bicarbonate) – Group NA
- Palladium (cyprodinil + fludioxonil) – Grp 9+12
- Presidio (fluopicolide) – Group 43
- Previcur N fungicide (propamocarb) – Grp 28
- Pristine (boscalid + pyraclostrobin) – Grp 7+11
- Subdue Maxx (metalaxyl) – Group 4

Boxwood Blight

- Emergency registrations:
  - Compass expired December 31, 2015
  - Medallion expires April 23, 2016
- Registrations have been approved for (just awaiting final label to be legal)
  - Compass (trifloxystrobin) – Group 11
  - Medallion (fludioxonil) – Group 12
- Note: Daconil (chlorothalonil) registrations were declined and will not happen

Fungicide Labels are Improving!

- Heritage Max (azoxystrobin)
  - Currently only for Daylily rust
  - Soon to include: a variety of diseases
- Palladium (fludioxonil + cyprodonil)
  - Currently suppression of 2 powdery mildews
  - Soon to include: alternaria, anthracnose, fusarium, sclerotinia, grey mould, and others

Biological Controls

What is a Microbial Biopesticide ?

- The active ingredient of a microbial biopesticide is a living microorganism, such as a bacterium, fungus or yeast
- A number of microbial biopesticides are registered for use on ornamental crops
- They have many benefits whether or not you use chemical pest management tools
- They are “custom made” for integrating into IPM programs

Why You Might Want to be Interested?

- In the past several years, the large chemical pesticide producers have realized some economic facts

1. It costs a lot more to develop and register a chemical pesticide
2. The profit horizon for new chemical pesticides is a lot shorter than it used to be
3. PMRA give biopesticides a much easier ride through the registration process
4. The market for biopesticides is growing

Successful Registrations: Biologicals

- Actinovate (*Streptomyces lydicus*)
- Blossom Protect (*Aureobasidium pullulans*)
- Bloomtime biological FD biopesticide (*Pantoea agglomerans*)
- Prestop (*Gliocladium catenulatum*)
- Regalia Maxx (Extract of *Reynoutria sachalinensis*)
- Rhapsody ASO (*Bacillus subtilis*)
- Rootshield Plus (*Trichoderma harzianum + T. virens*)

Regalia Maxx

- Extract of *Reynoutria sachalinensis*
- Suppress powdery mildew of field and container grown ornamentals and landscape areas.
- Suppression of downy mildew
- Partial suppression of foliar bacterial diseases (*Xanthomonas campestris* and *Pseudomonas chickorii*)

Fire Blight Products

- Bacterial disease of apple, pear, hawthorn, crabapple and ornamentals in the Rosaceae family
- There is no cure for fireblight but spread of the bacteria can be managed
  - Including diligent pruning to remove cankers in the winter and pruning during the season to remove blight symptoms
  - Good horticultural practices
  - Complete tree removal

FIRE BLIGHT: NEW INFECTION

Above: Overview of Malus shoot

The terminal growth is green and healthy. Note a leaf lower down with a developing black vein.

Below: Close-up of new infection

The leaf shows a developing black vein, from the bacteria entering into the leaf from the vascular system (sap).

The stem near-by is turning a dark purple colour. A droplet of ooze is diagnostic of fire blight.

Young trees grown in nurseries have extensive new growth during summer months. These new leaves are more susceptible to small rips during windstorms.

FIRE BLIGHT: WINTER APPEARANCE

Fire blight canker on Malus

Picture shows a dark purple discoloration of the trunk on a Malus Rosthern. Note the clear line between "purple" and "green" wood.

The discolored area is a fire blight canker, the dormant winter stage. "Canker" is a general term for dying or dead areas of plants.

Cankers are formed in late summer when the tree stops growing and the disease bacteria moves into older wood. In the spring, liquid ooze is formed in cankers, which spreads the bacteria to near-by trees.

FIRE BLIGHT: SPRING SYMPTOMS

Above: Typical symptoms of shoot blight caused by fire blight early in the growing season. Note the black colour, as if burned by fire, and drooping end, often called "shepherd's crook". Typically, most affected varieties are Rudolph, Rosthern, Royalty, Dolgo, Norland, Strathmore.

Courtesy: CropHealth Advising and Research

Fireblight Products

- Streptomycin kills bacteria and is the most effective product for fireblight but resistance is a concern
  - Maximum of 3 applications per year
  - Keep one for immediately after a June or July hail storm (apply within 4 hours)
  - Do not spray after bloom – it is ineffective

Fireblight Products

- Rhapsody (*Bacillus subtilis*) and Bloomtime (*Pantoea agglomerans*) help colonize open flowers with beneficial bacteria (they are less effective than Streptomycin but helps with resistance management)
  - Note: Bloomtime must be kept frozen or refrigerated
  - Note: Bloomtime and Serenade can be tank mixed with Streptomycin

Fireblight Products

- Suggested management regime:
  - 1st spray: Serenade Max + Agral 90 (spreader sticker) when flowers near open (1-5% bloom)
  - 2nd spray: Streptomycin 17 at early to full bloom (20-30% of flowers open)
  - 3rd spray: Streptomycin + Bloomtime at 50-70% flowers open

Fireblight Products

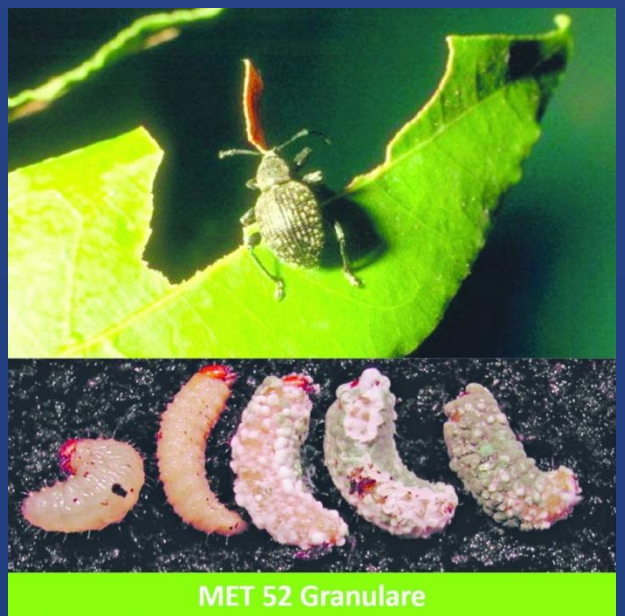
- Blossom Protect (*Aureobasidium pullulans*) + citric acid
  - The acid lowers the pH in the flower an inhibits the fireblight pathogen
  - Lower pH allows the yeast to colonize the flower
  - May be applied 4x (10%, 40%, 70% and 90% open blossoms)
  - Obviously needs to get on preventatively
  - Better long term storage than Bloomtime

Fireblight Products

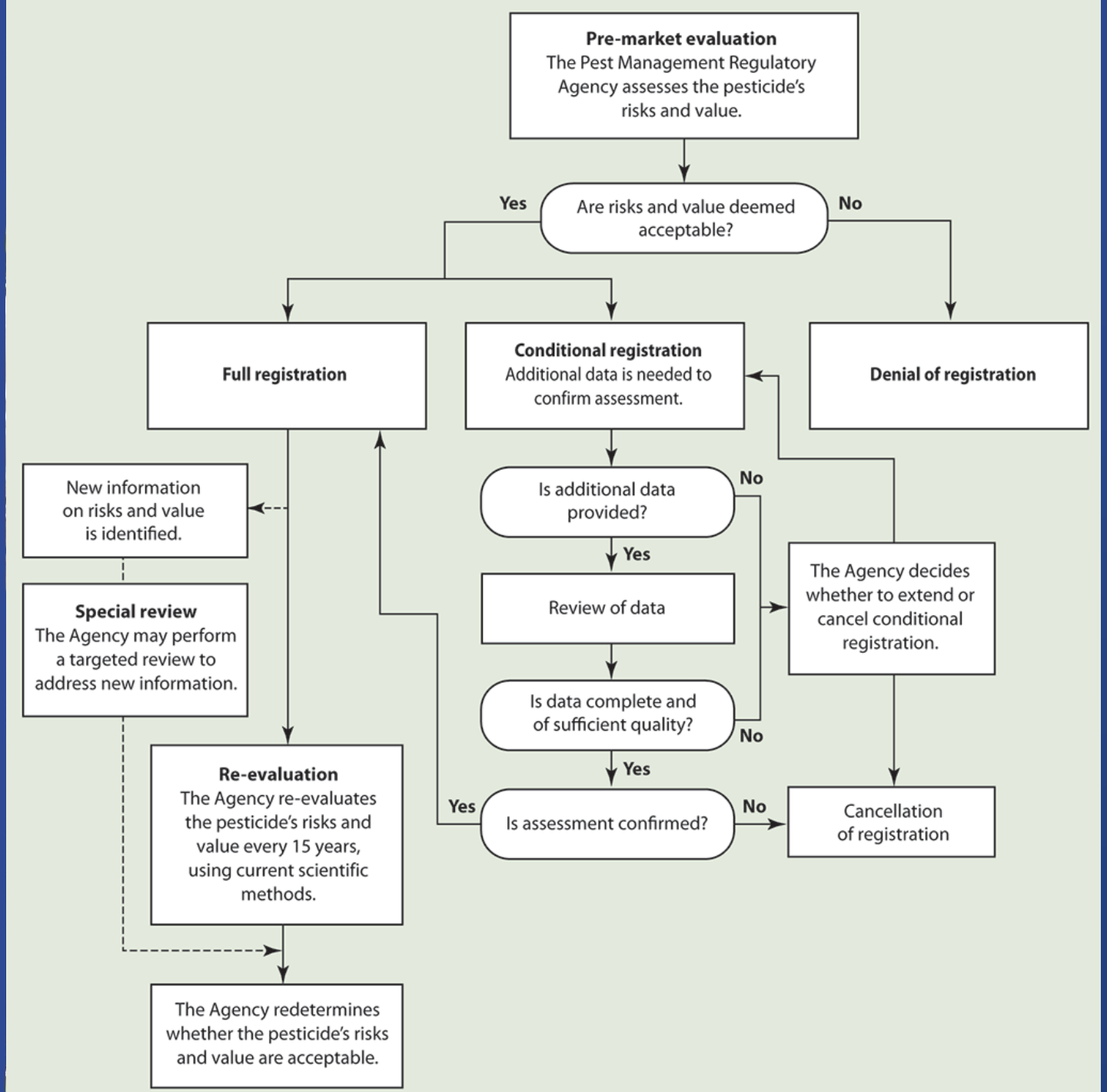
- BlightBan – 2 products
  - BlightBan A506 (*Pseudomonas fluorescens*)
  - BlightBan C9-1 (*Pantoea agglomerans*)
- Suggested use pattern is to apply with Streptomycin (at early bloom)
- Acts like other microbial antagonists by colonizing the flower and preventing *Erwinia amylovora* from establishing in flowers
- Resistance management tool

Note on Met52 (Bioinsecticide)

- Met52 (*Metarhizium anisopliae*) is incorporated into container media for root weevil control
- Marketed by Monsanto but unavailable at this time due to manufacturing challenges
- They have assured us they plan to continue this product and it should be available again after this growing season



Regulatory Process



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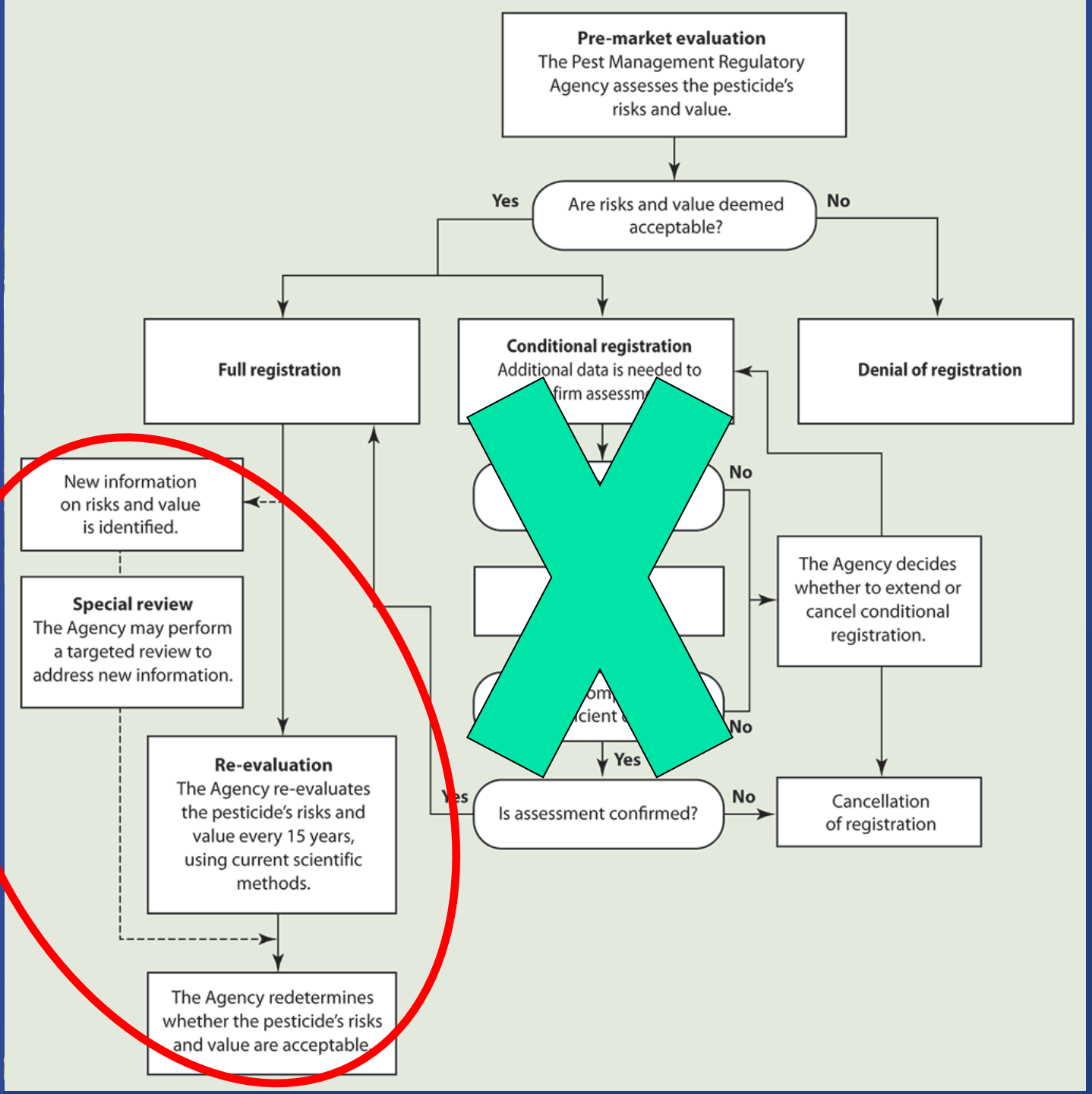


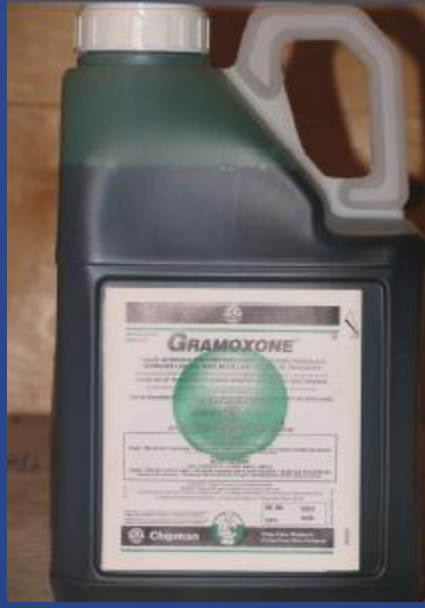
Recent PMRA Decisions

- Discontinuation of Endosulfan
- Special Review Decision: Paraquat
- Proposed Re-evaluation Decision: Acephate
- Re-evaluation Note: Chlorothalonil

Endosulfan

- Last date of use is December 31, 2016 for all ornamental uses of endosulfan containing products
- It is unlawful to use these products on any crop after this date

Paraquat



- Gramoxone Liquid Herbicide is to be designated a “Restricted Class”
  - “This product is to only be used by individuals holding an appropriate pesticide applicator certificate or licence”
- Additional PPE
  - During mixing/loading, cleanup and repair workers must wear chemical-resistant coveralls over a long-sleeved shirt and long pants, socks and chemical-resistant footwear, chemical-resistant gloves, protective eyewear and approved gas mask

Chlorothalonil

- Proposed decision is to eliminate all ornamental uses of chlorothalonil (=Daconil) (except snow mould in turf)
  - We do have a number of new fungicides registered and a number in the process
- Are there any specific diseases that will be impacted with the loss of this control product?
- Potential problems with conifer foliar blights (needlecasts etc.)

Acephate

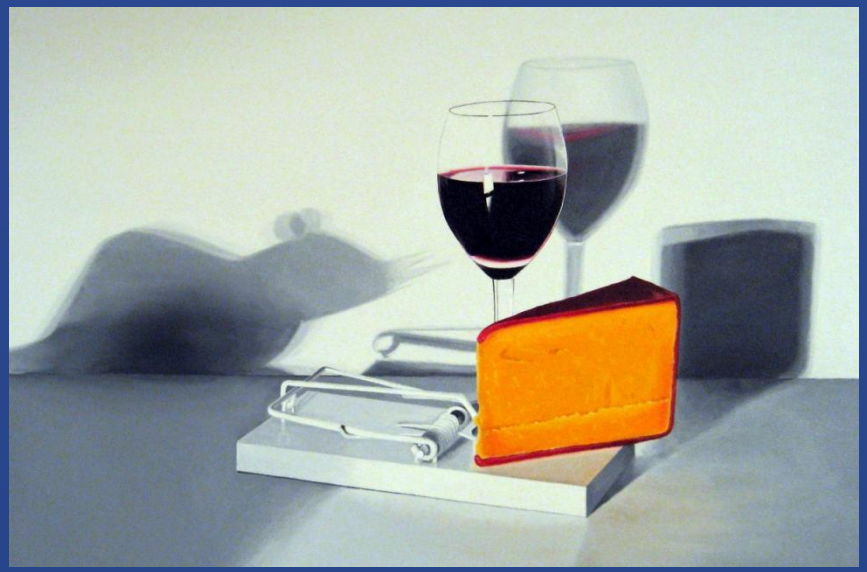
- Orthene 75% Soluble Powder and Acecap 97 Systemic Insecticide
- Proposal will significantly affect the use of this product
  - Loss of all greenhouse and cut flower uses
  - Loss of all residential uses
  - Remove mist blower and fogging applications
  - Proposed removal of soluble powder formulation and replace with a pellet formulation

The Future

The pesticide landscape continues to change…

- Look for more pest specific products and fewer broad spectrums
- Look for more reduced-risk products and biologicals
- Look for more emphasis on application technologies to make these work
- Look for continued pressure by special interest groups

- Look for new and exciting pest control products !!!



- Maybe even a better mousetrap...

thank you!