

# IPM approaches for Japanese beetles at regulated airports

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T. J. Gibb

# IPM:

Phenological

Regulatory

Physical

Mechanical

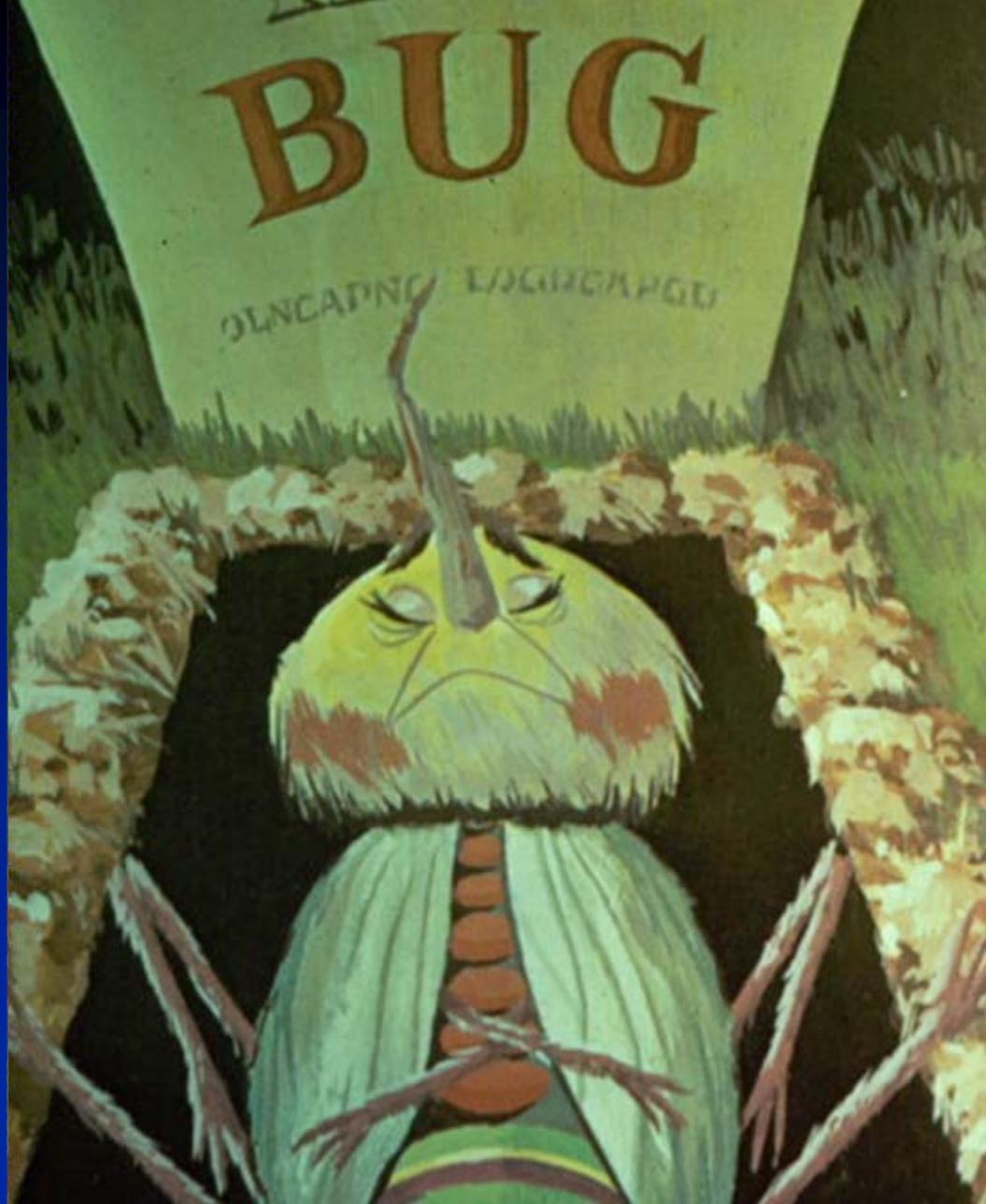
Biological

Chemical

Cultural

Long term  
control =

Population  
Management



# Phenological :

Keeping your ear to the ground to predict  
populations numbers, emergence, timing

Weather data:

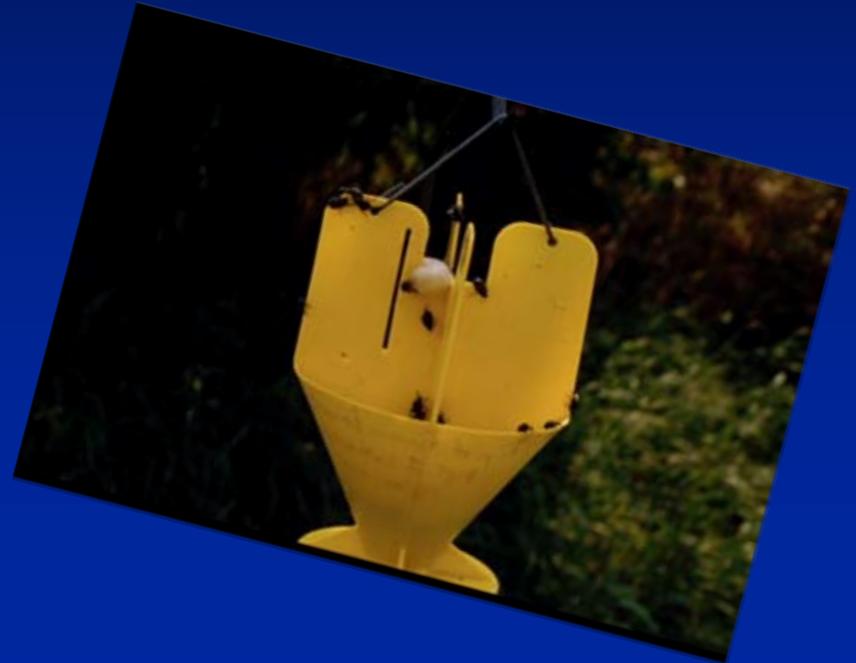
Temperature

Precipitation

Humidity

Degree day

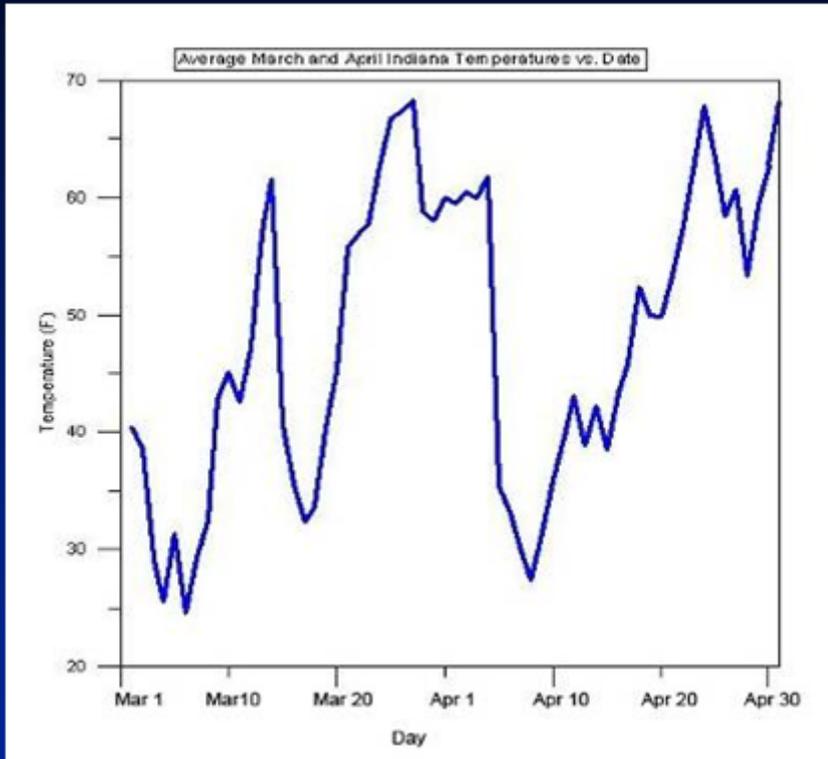
accumulations



# IN weather conditions - 2007 and their effect on JB populations

- Mild winter - record high temps in late March and early April
- Record low temps early April; above average temperatures through late September
  
- Wet weather through May 15 followed by below normal levels of precipitation through October

# Temperature extremes



## March, 2007 All-time Highs (Indy)

13th - Record High, 80 degrees

25th - Record High, 81 degrees

26th - Record High for Minimum  
(Low), 61 degrees

## April, 2007 All-time Low (Indy)

7th - Record low for a Maximum (High),  
32 degrees

# Frost damage

April 8,  
2007



Tree Lilac  
*Syringa reticulata*



Star Magnolia  
*Magnolia stellata*

# Cold damage to evergreens



Delayed symptom expression

# Temperature effects on JB:

Degree day accumulations in soil (base 10° C)  
correlate with first emergence and 50% flight

Japanese beetle 2007  
*mild winter effect*



Beetle emergence = very early  
(June 3rd vs 20th)

Peak early

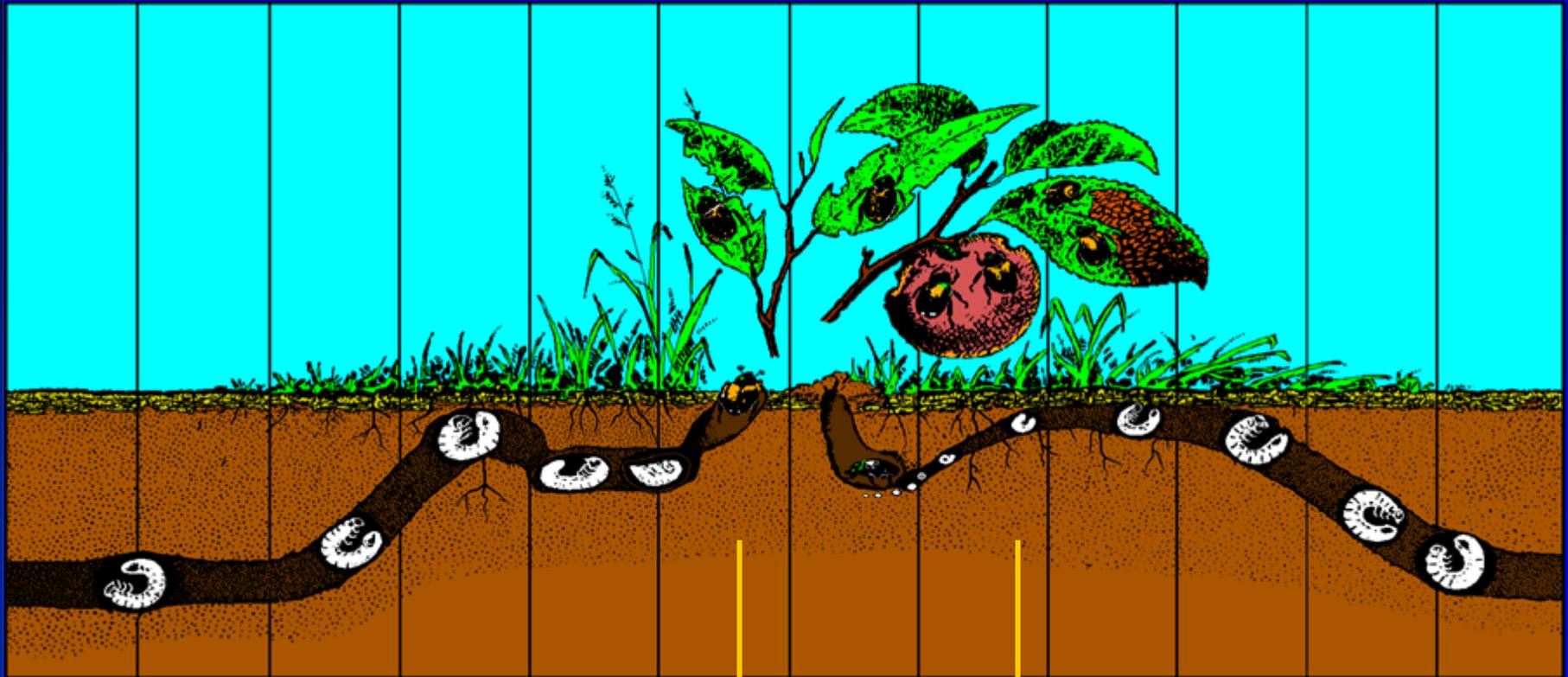
End of adult activity early (early August vs mid)

Egg hatch early

Optimal treatment time = mid-late July

# JB Normal Adult Activity Period

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC



Avg yr

# JB 2007 Adult Activity Period

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

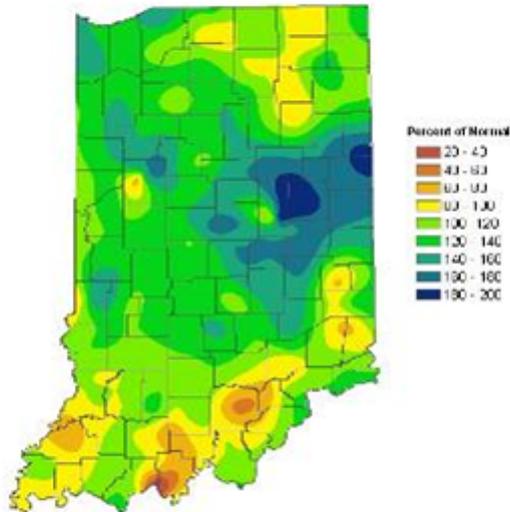


2007

Avg yr

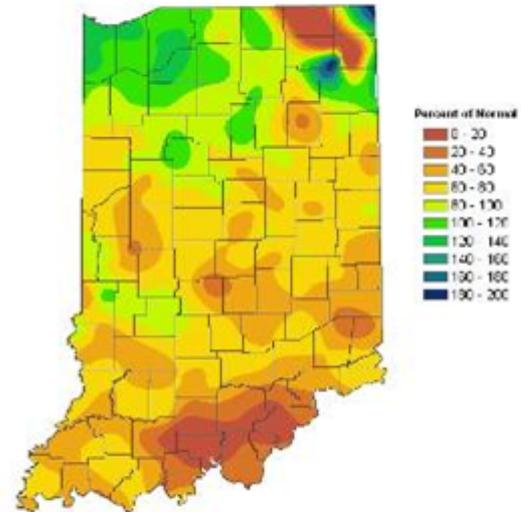
# Precipitation

Percent of Normal Precipitation  
Jan - Apr 2007



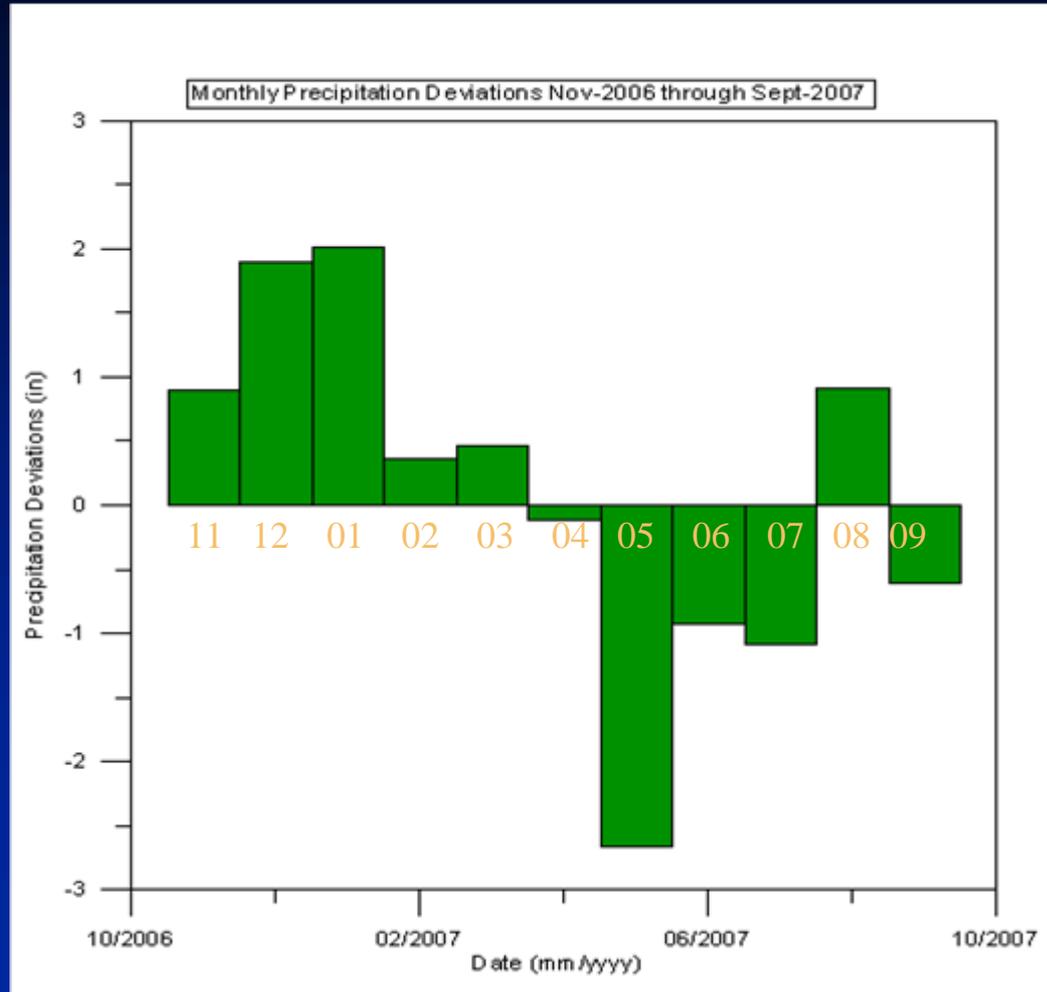
Analysis by Indiana State Climate Office  
Web: <http://www.isclimate.org>

Percent of Normal Precipitation  
May - Sep 2007



Analysis by Indiana State Climate Office  
Web: <http://www.isclimate.org>

# Monthly Rainfall Deviations



# Drought Stress



**Spruce**



# Drought affects plants AND animals





Drought: 2007

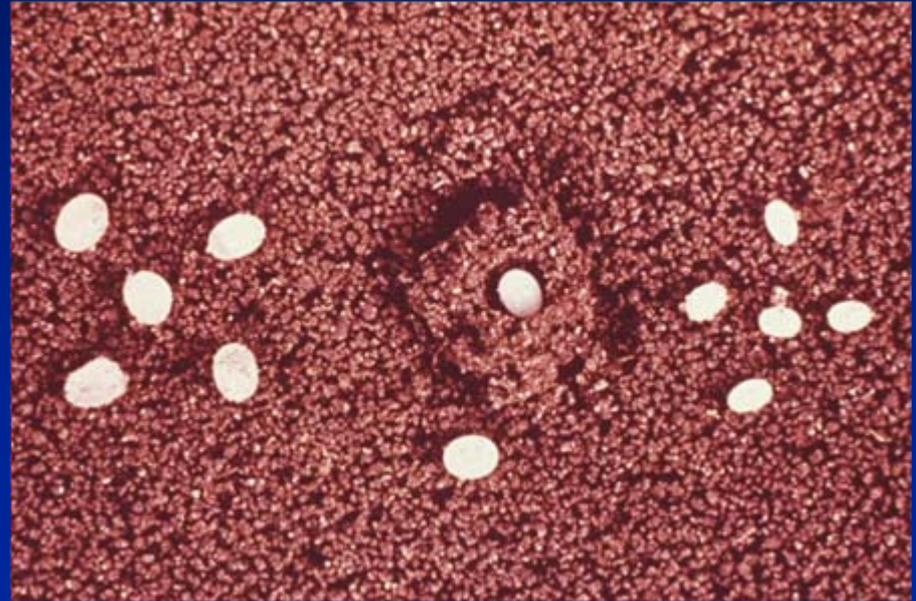
So dry in some areas that  
fire hydrants actually  
welcomed dog visits.

# Effect of moisture on JB survivability - 2008 ????

Eggs and 1st instar larvae desiccate under moisture deficit extremes.

Heterogeneous moisture conditions have been cited as a major cause of spatial and temporal fluctuations in JB populations..

Villani 1999





Effects of 07 drought --- 2008

# Japanese beetle feeding



Phenological indicator plant

# Environmental effects



on behavior  
And activity

Understanding: ..... Predicting

Year to year population fluctuations

Seasonal population development

Daily activity fluctuations

(effects of wind, temperature, cloud cover)

Population hot spots

Understanding: ..... Behavior

Dispersal cues (thoracic temp > 27°C)

Flight distance and patterns

(5K sustained - 1000 meters / hr)

(500 meters to traps)

Movement:

flight is photophyllic and crawling is thigmotactic

Understanding: ..... Behavior

12 - 5 PM = highest activity times

Attracted to plants silhouette

(trees/planes?)

regardless of feeding suitability

More attracted to 'damaged' plants

Activity (flight) depressed = non peak  
times, overcast, windy, rainy, cold

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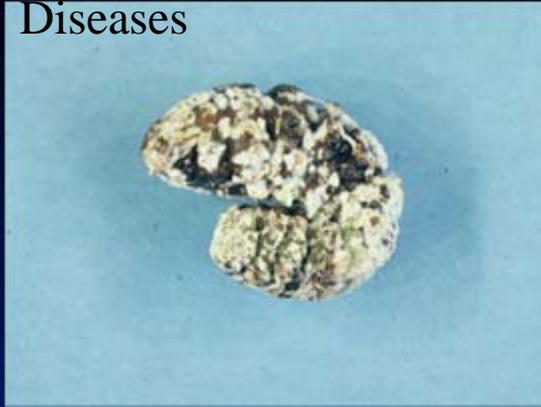
Mechanical

Biological

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Cultural

Diseases

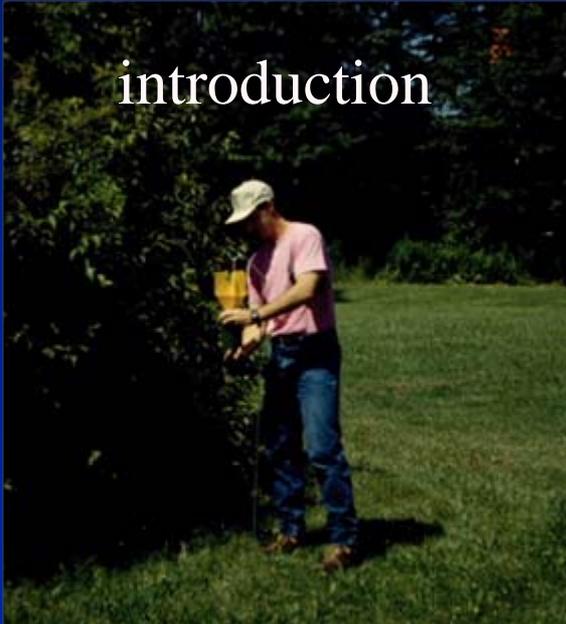


Parasites



# Natural enemies

introduction



conservation



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# Tempo SC Ultra



# Grub sampling



and ID to determine  
need for grub control

# Grub Control - Chemical Update - #9

**Merit:** Imidacloprid - owns majority of market - new labels

**Meridian:** Thiamethoxam - long awaited label in turfgrass

**Mach2:** Halofenozide - growth regulator - preventative

**Dylox:** Trichlorfon - curative grub control - penetrates thatch

**Sevin:** Carbaryl - curative grub control - common

**Arena:** Clothianidin - new neonicotinoid product - also controls surface feeders

**Allectus:** new Bayer product = 2% imidachloprid + .16% bifenthrin

**Aloft:** new Arysta product = .25% clothianidin + .12% bifenthrin

New product - Dupont - **Acelepryn**

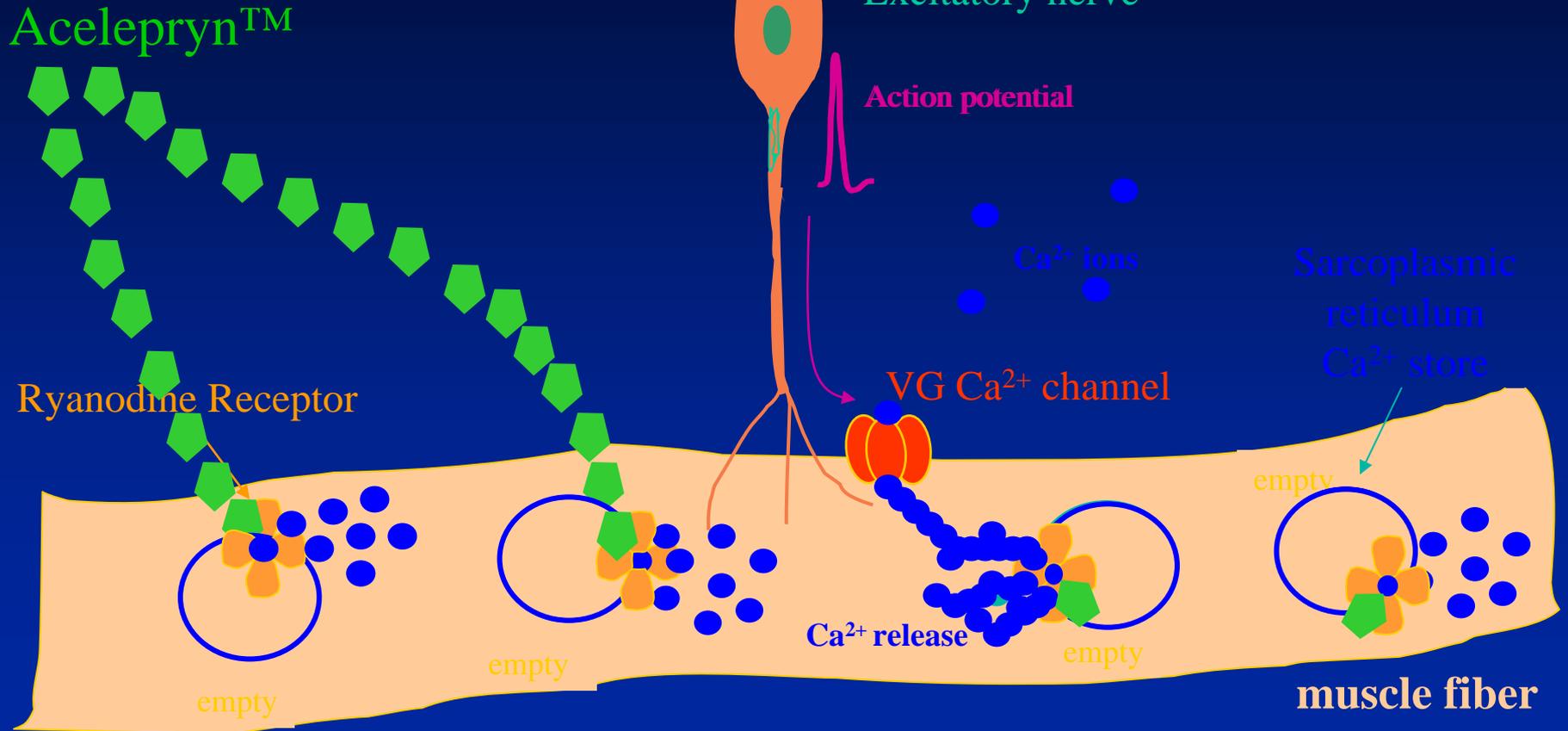
# Acelepryn<sup>TM</sup>

- ◆ New class of chemistry – Anthranilic Diamide
- ◆ Novel mode of action
  - ◆ Activates the ryanodine receptor, which depletes Ca<sup>+</sup> from insect muscles
- ◆ Systemic activity
- ◆ Excellent white grub activity
- ◆ Controls other key turf and ornamental pests
- ◆ Sprayable and granular formulations
- ◆ Extremely low mammalian toxicity
- ◆ Extremely low fish and bird toxicity
- ◆ Virtually non-toxic to honey bees

# Acelepryn™ Mode of Action

Action potential triggers brief Ryanodine Receptor openings

Release of  $\text{Ca}^{2+}$  → muscle contraction



Contraction & Paralysis

# Acelepryn™ Turf Spectrum of Activity

## White Grubs

**European Chafer**

**Japanese Beetle**

**Northern Masked Chafer**

**Oriental Beetle**

**Southern Masked Chafer**

**Asiatic Garden Beetle**

**Black Turfgrass Ataenius**

**Green June Beetle**

**May/June Beetles**

**Aphodius spp.**

## Other Turf Pests

**Annual Bluegrass Weevil**

**Bluegrass Billbug**

**European Crane Fly**

**Chinch Bug (Suppression)**

**Armyworms**

**Black Cutworm**

**Sod Webworms**

# Acelepryn™ Registration Status

- ◆ EPA registration packages submitted in January 2007
- ◆ End-use formulations include:
  - ◆ Acelepryn SC
  - ◆ Acelepryn Granular
  - ◆ Acelepryn Granular Fertilizer
- ◆ Expect EPA approval in March/April 2008
- ◆ Granted EPA Reduced Risk Status on turf 03 April 2007

# Purdue Grub Insecticide Testing

<u>Pesticide:</u>	<u>expected control: (%)</u>
Merit (Imidachloprid)	95
Meridian (Thiamethoxam)	94
Mach2 (Halofenozide)	89
Dylox (Trichlorfon)	77
Sevin (Carbaryl)	70
Arena (Chlothianidin)	95
Allectus (Merit + Bifenthrin)	90
Aloft (Arena + Bifenthrin)	96
Acelepryn (Anthranilic Diamide)	95

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Distribution and Dynamics of Japanese Beetles Along the Indianapolis Airport Perimeter and the Influence of Land Use on Trap Catch. Population Ecology - Environmental Entomology - ESA. 2007

Bottom line is that changing land use (agronomic field crops) patterns can affect JB population densities

# Cropping Practices



# Host Plant Reduction





APPRENTICE AND JOURNALISM  
TRAINING CENTER



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# JB Best Management Practices at FedEX Indianapolis



T. J. Gibb and Jim Carroll

## Success in 2007

- 99.63% of beetles seen = excluded
- only 1 w/ >1 live beetle found / 360 regulated flights

Success is predicated upon the following  
'best management practices'

Carrier commitment:

annual basis

demanding - resources - time  
major financial investment  
management buy-in

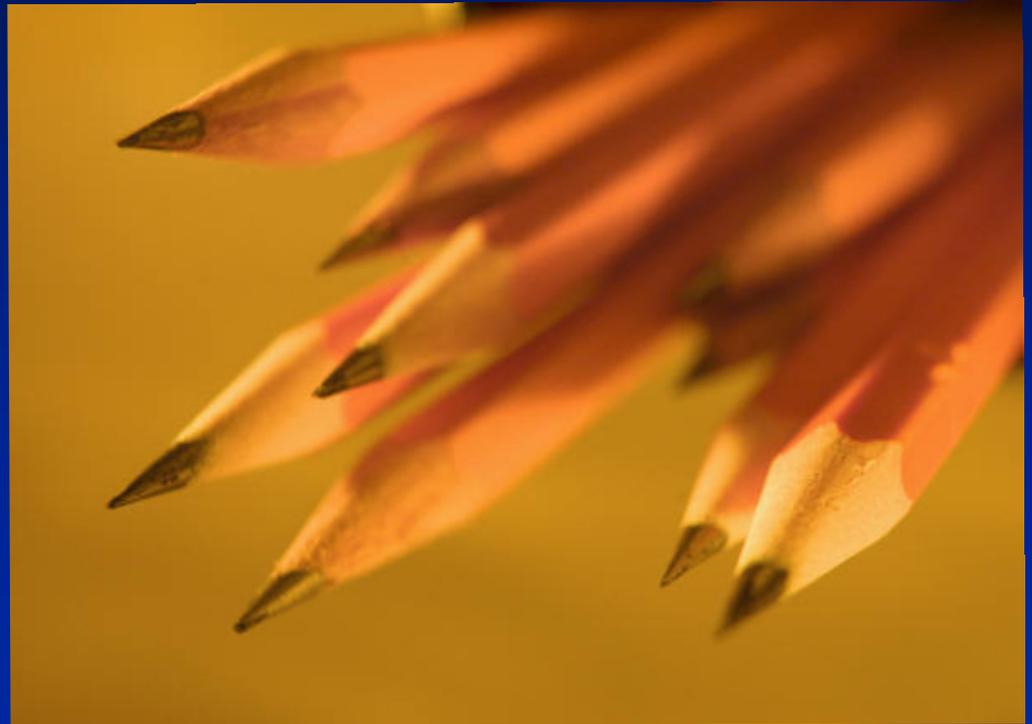
Constraints:

unpredictable nature of JB - every year is different  
changes - management other personnel  
USDA regulation updates  
changes in equipment excluders

? ?

# Planning

- Advance planning - > 3 month adult activity season
- Personnel
- Equipment
- Projects
- Chemical
- Training



# Hiring of personnel:

- 2007 = >100 employees dedicated to beetle management.
- Assignment of personnel - turnover and loss of

Other assignment issues:

Working relationships

- matching personalities

(Entomophobia)

(Chemophobia)

(Sweatophobia)



# Training:

## Significant

- Classroom vrs OTJ - flexibility required depending on yr.
- Personnel
  - SIT Teams
  - SWAT Teams
  - Team Leads
  - Baggers
- Ramp Managers (awareness of requirements EAN)
- Loading Crew personnel (use of excluders & other procedures)
- Management

# Inspection













AMJ 47736 FX

AMJ 41240 FX

TW 2120

31332

FedEx





AMJ 10236 FX

FEDEX

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# Spray team training:



Temp SC ultra  
efficacy  
- rates, application, etc

Safety



# Personnel attention/focus

- Maintaining vigilance in slow times

Responsibilities / ownership



Statistics - comparisons

15-minute walk-arounds

Meetings - face time

On site leadership

Awards - encouragement (Prize beans)

On task vs reassignments

# Record keeping

WHERE ARE BEETLES FOUND	
BALL MAT:	9
DOOR SILL:	6
REST OF TOPSIDE:	5
REAR BELLY:	2
AFT BULK:	2
CREW DOOR AREA:	0
FORWARD BELLY:	2
COCKPIT	1
TOTAL:	27

# Equipment procurement and maintenance:

- Excluders:
  - # of excluders - mounted - timeliness
  - Maintenance / design improvements
  - SAFETY HAZARDS**
    - aircraft strikes
  - Operator certification
  - Impaired visibility for loading crews



# Equipment procurement and maintenance:

- Other equipment

Availability

Security / safety

Maintenance



# Flexibility and local control:

timeliness  
authority

ie. parking aircraft in low risk gates  
bagging, extra inspectors, swat teams,  
tail swaps, delays, etc

# Can monitoring and control: risk of entry - trojan horse

- Importance of flexibility and local control
- Splitting demi's to better inspect
- Plastic bag fit concerns
- 450 beetles killed on cans in 2007
- 2008 modifications

# Non-regulated flights

- Why an issue ? 16 btls in 2006 vs 3 in 2007
- VOLUNTARY tracking and safeguarding/spraying
- -158 non-reg flights treated/guarded

# Blitzing aircraft

(tracking of EVERY Indy aircraft in daylight hrs)

- when and why
- how it helps



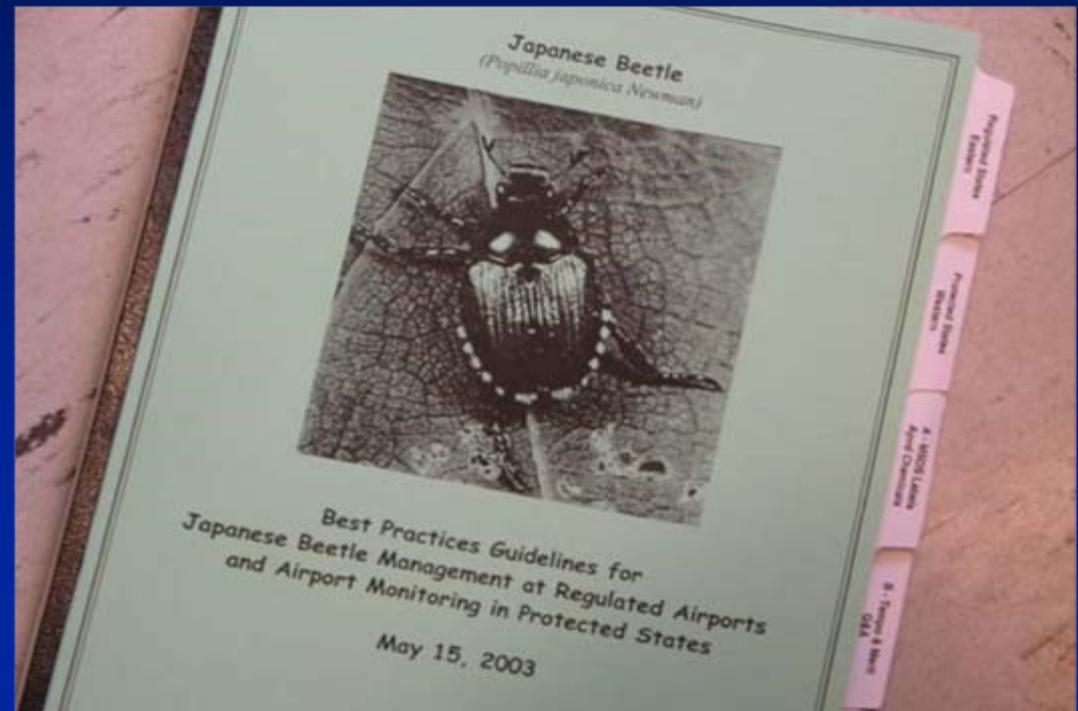
# Security constraints:

- Post 911 fallout
- Ramp access/ security clearance
- USDA and consultant mobility
- Restrictive on-site experimentations and monitoring



# Cooperation from protected states

- Accurate categorization of beetles
- Quick feedback, esp w/ live finds
- Identify flights  
of concern
- Location, #,  
category = essential



# Potential program problems in 2008:

- Management change
- Philosophy / cooperation
- Facility expansion
- Beetle unpredictability

