RIFA Insecticides and Other Organophosphates: Use Pattern, Concentration and Toxicity in Runoff Water, Source Identification, and Mitigation Measures

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www.cdpr.ca.gov/docs/rifa

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Santa Ana RWQCB, Riverside

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Outline

- Introduction
- Monitoring
- Runoff
- Sources
- Mitigation
- Conclusions

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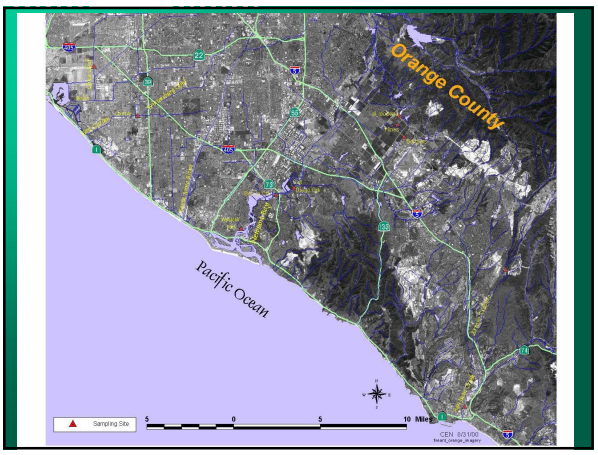
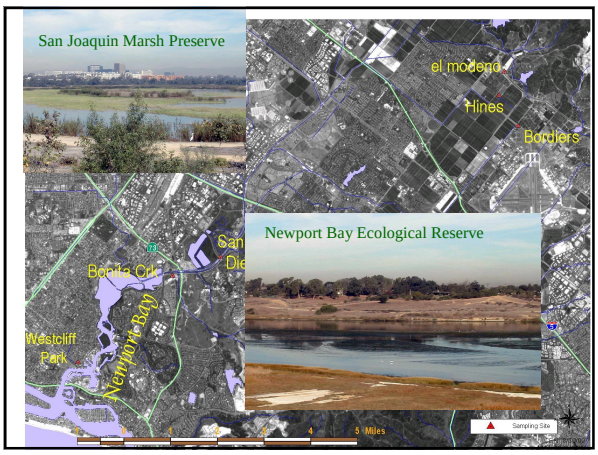
The Insecticides: RIFA

- Bifenthrin (Talstar®)
- Chlorpyrifos (Dursban®)
- Fenoxycarb (Award®)
- Hydramethylnon (Amdro®)
- Pyriproxyfen (Distance®)
- Diazinon

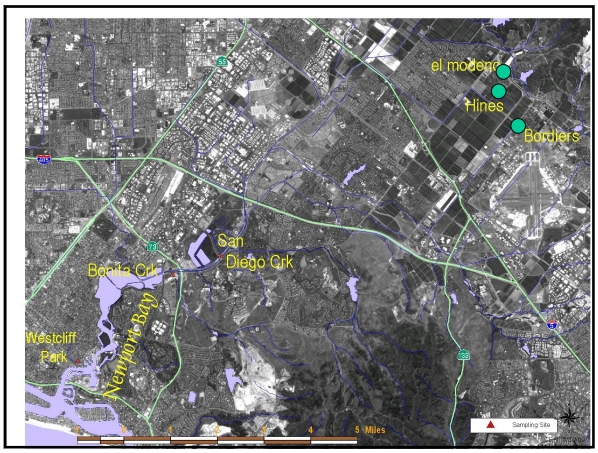
Aquatic Toxicity (LC50 ppb)

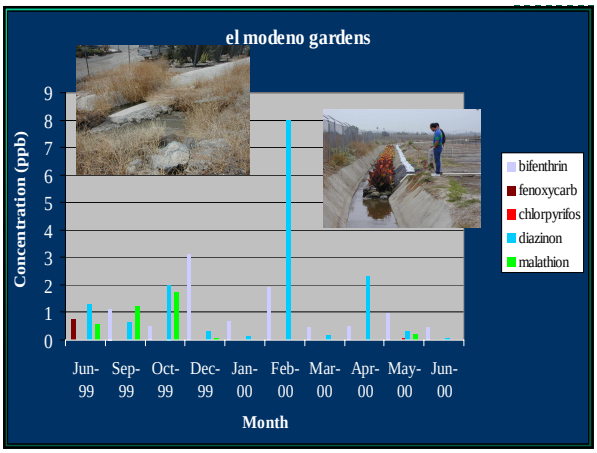
Chemical	R. Trout	D. magna	C. dubia
Bifenthrin	0.15	0.16	na
Chlorpyrifos	3	1.7	0.13
Diazinon	2600	0.96	0.51
Fenoxycarb	1600	400	na
Hydramethylnon	160	1140	na
Malathion	170	1.8	1.14
Pyriproxyfen	>325	400	na

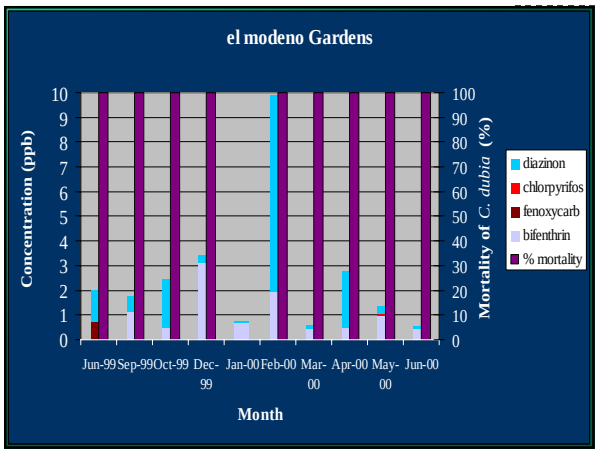


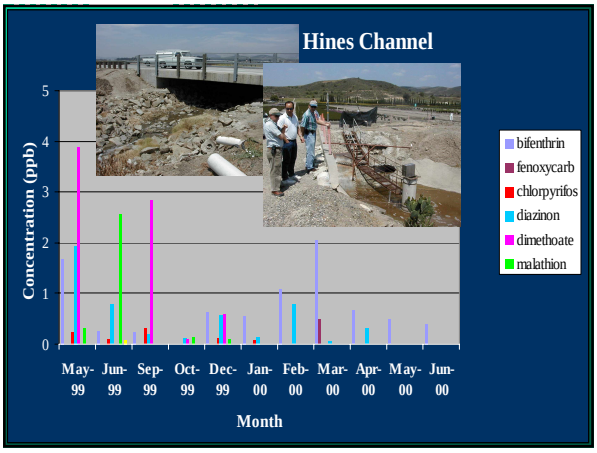


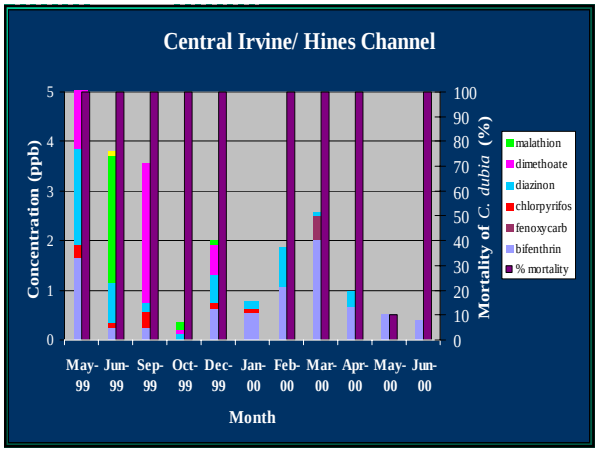
Irrigation Runoff: base flow

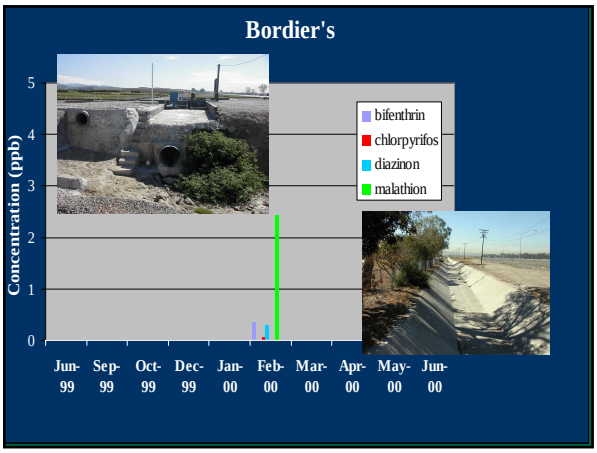


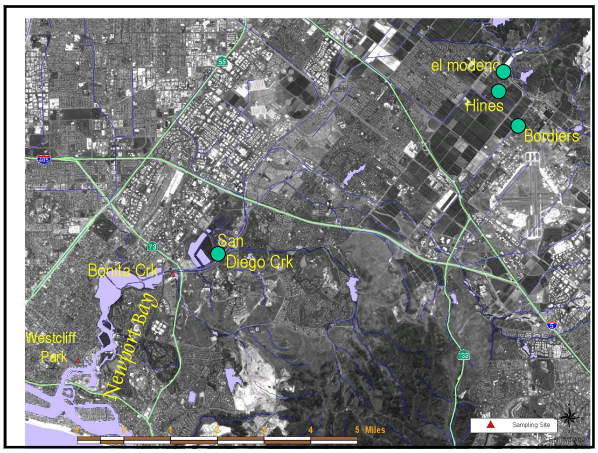


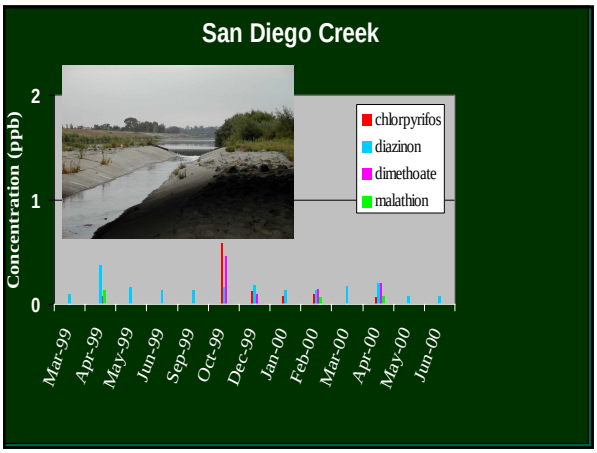


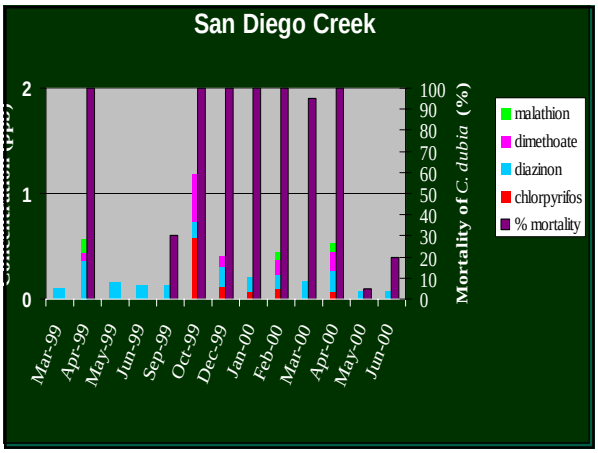


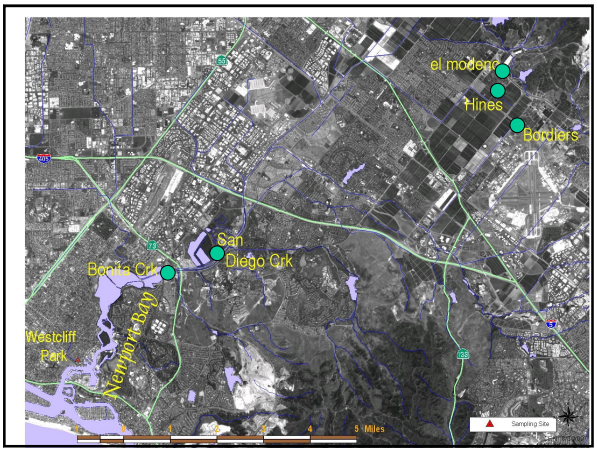


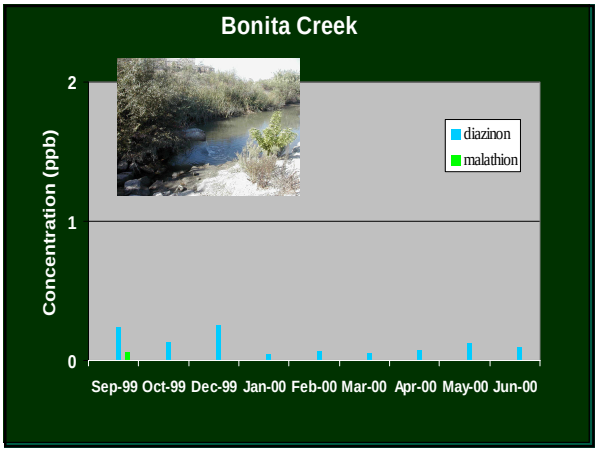

Bordier's
Concentration (ppb)
0
1
2
3
4
5
bifenthrin
chlorpyrifos
diazinon
malathion
Jun-99
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00

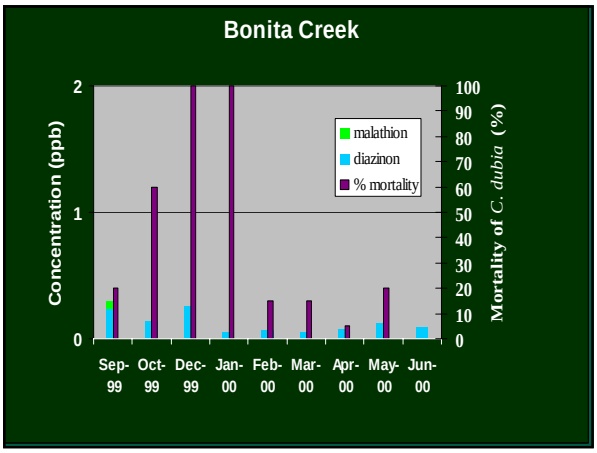

el modena
Hines
Bordiers
San
Diego Crk
Bonita Crk
Westcliff
Park
Newport Bay
Sampling Site
5 Miles

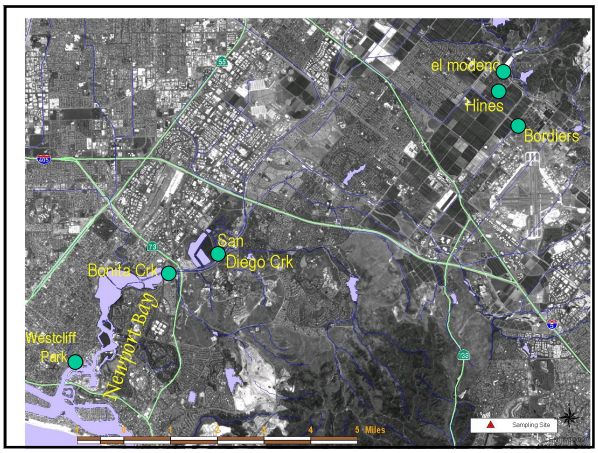

San Diego Creek
Concentration (ppb)
0
1
2
chlorpyrifos
diazinon
dimethoate
malathion
Mar-99
Apr-99
May-99
Jun-99
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00


San Diego Creek
0
1
2
100
90
80
70
60
50
40
30
20
10
0
Mortality of C. dubia (%)
malathion
dimethoate
diazinon
chlorpyrifos
% mortality
Mar-99
Apr-99
May-99
Jun-99
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00

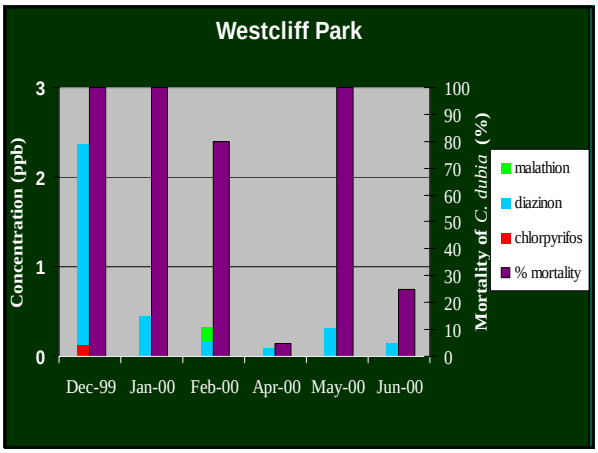

el modena
Hines
Bordiers
San
Diego Crk
Bonita Crk
Westcliff
Park
Newport Bay
Sampling Site
5 Miles

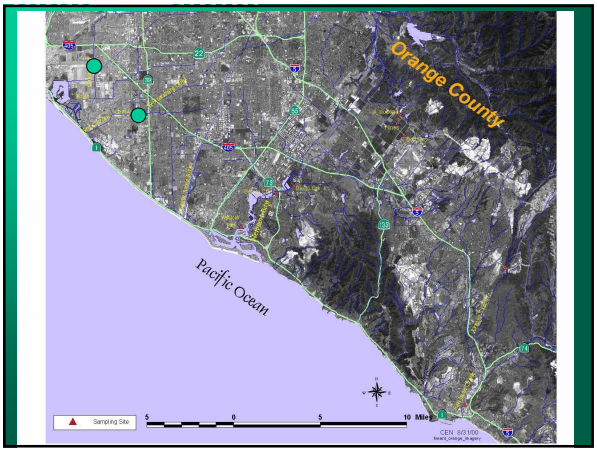

Bonita Creek
Concentration (ppb)
0
1
2
diazinon
malathion
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00

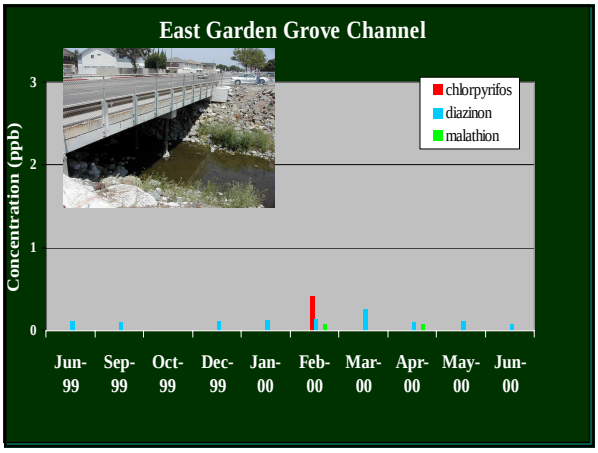

Bonita Creek
Concentration (ppb)
Mortality of C. dubia (%)
malathion
diazinon
% mortality
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00

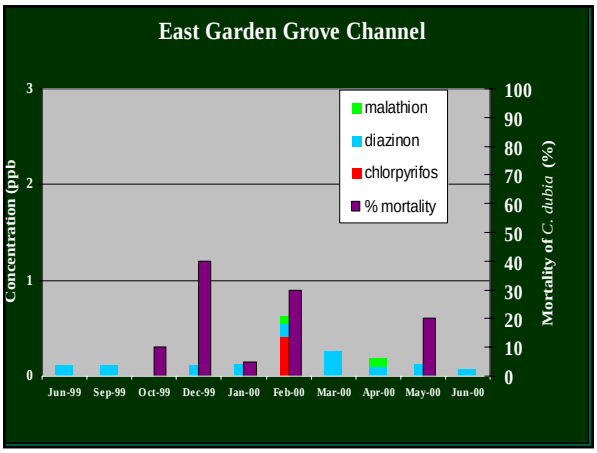

el modena
Hines
Borders
San Diego Crk
Bonita Crk
Newport Bay
Westcliff Park
Sampling Site
5 Miles

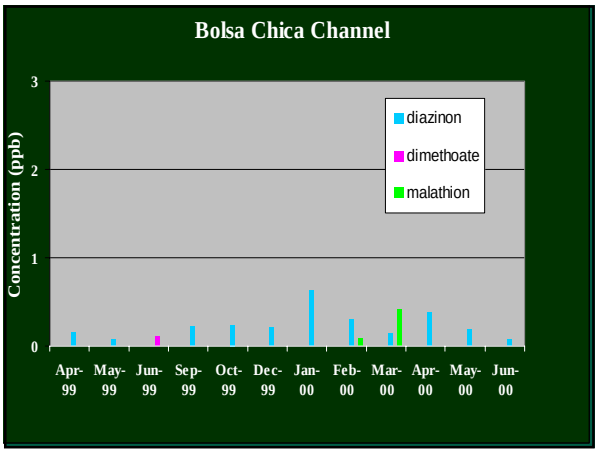
Westcliff Park
Concentration (ppb)
chlorpyrifos
diazinon
malathion
Dec-99
Jan-00
Feb-00
Apr-00
May-00
Jun-00

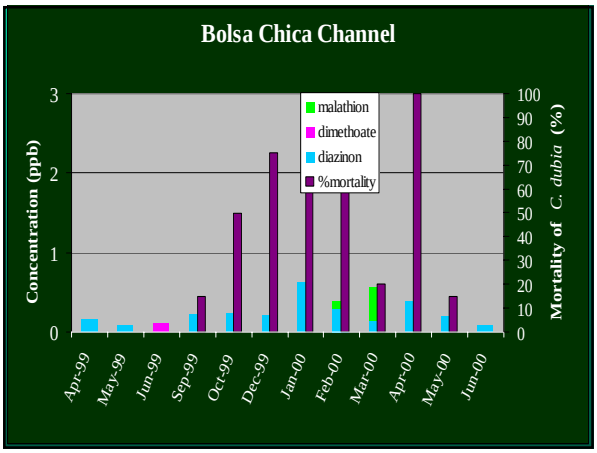

Westcliff Park
Concentration (ppb)
Mortality of C. dubia (%)
malathion
diazinon
chlorpyrifos
% mortality
Dec-99
Jan-00
Feb-00
Apr-00
May-00
Jun-00


Orange County
Pacific Ocean
Sampling Site
10 Miles

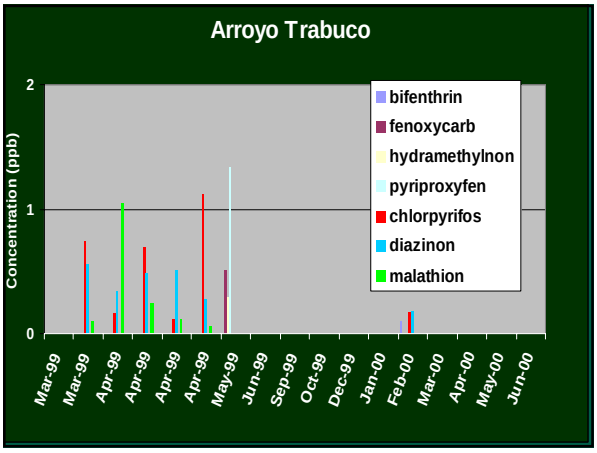

East Garden Grove Channel
Concentration (ppb)
chlorpyrifos
diazinon
malathion
Jun-99
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00

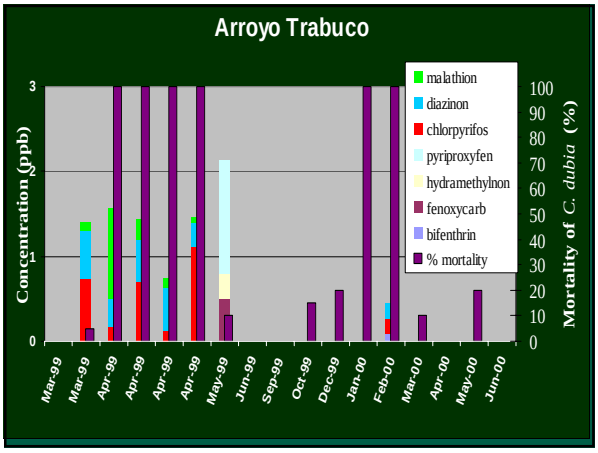

East Garden Grove Channel
Concentration (ppb)
Mortality of C. dubia (%)
malathion
diazinon
chlorpyrifos
% mortality
Jun-99
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00

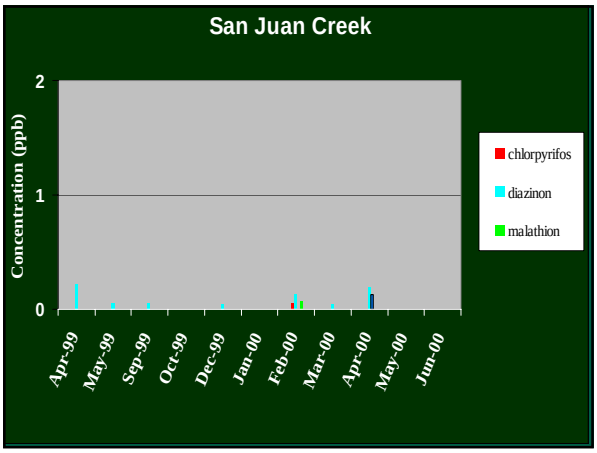

Bolsa Chica Channel
Concentration (ppb)
diazinon
dimethoate
malathion
Apr-99
May-99
Jun-99
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00

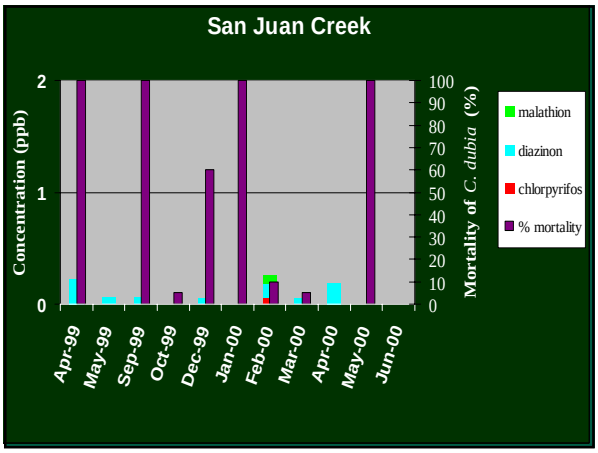

Bolsa Chica Channel
Concentration (ppb)
Mortality of C. dubia (%)
malathion
dimethoate
diazinon
%mortality
Apr-99
May-99
Jun-99
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00

Orange County
Pacific Ocean
Sampling Site

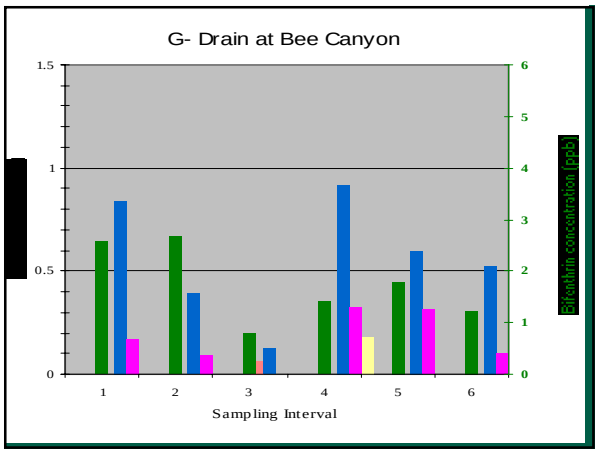

Arroyo Trabuco
Concentration (ppb)
bifenthrin
fenoxycarb
hydramethylnon
pyriproxyfen
chlorpyrifos
diazinon
malathion
Mar-99
Mar-99
Apr-99
Apr-99
Apr-99
Apr-99
May-99
Jun-99
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00

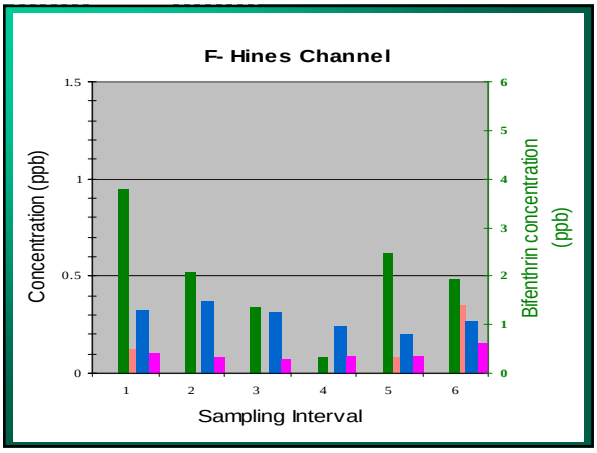

Arroyo Trabuco
Concentration (ppb)
Mortality of C. dubia (%)
malathion
diazinon
chlorpyrifos
pyriproxyfen
hydramethylnon
fenoxycarb
bifenthrin
% mortality
Mar-99
Mar-99
Apr-99
Apr-99
Apr-99
Apr-99
May-99
Jun-99
Sep-99
Oct-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00

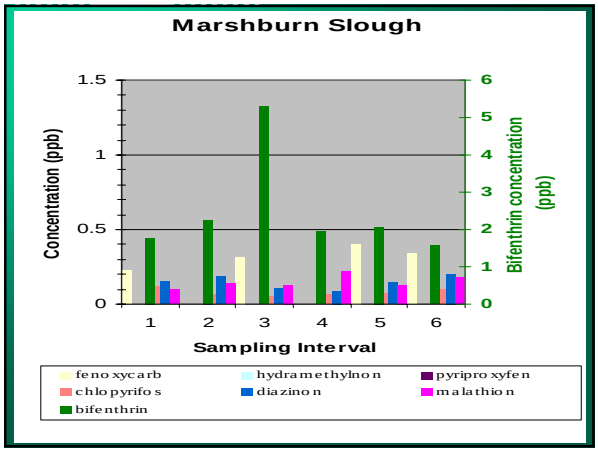


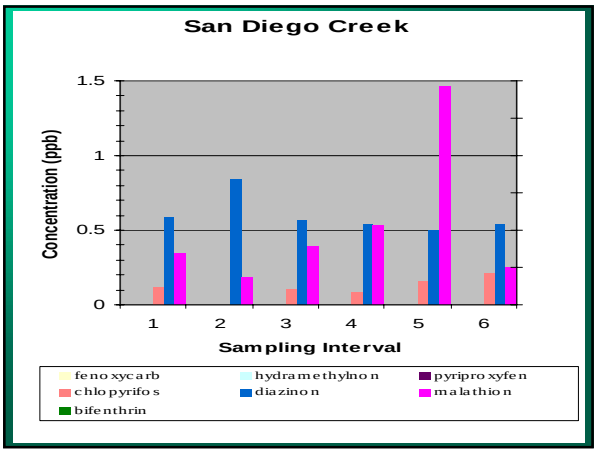


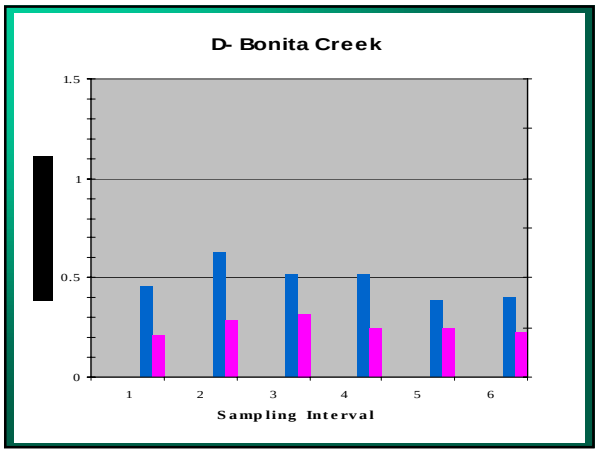
Storm Runoff

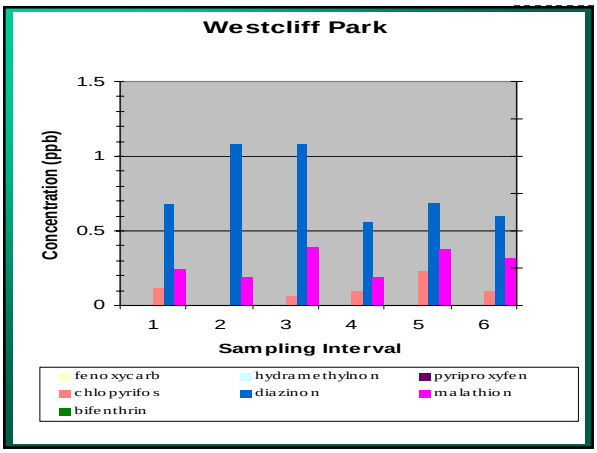




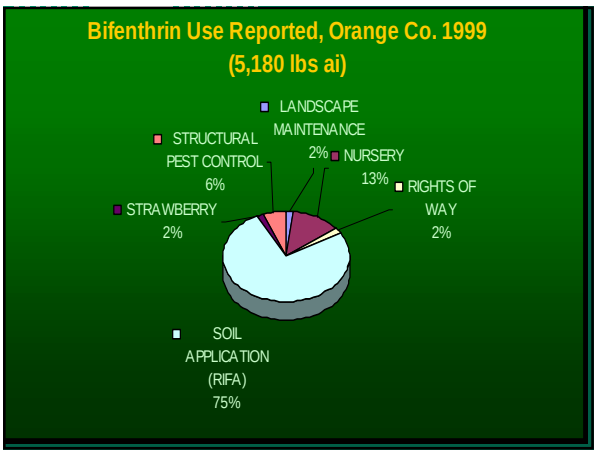


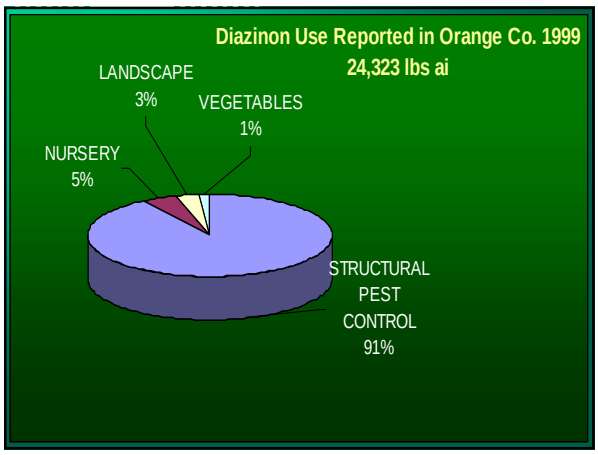


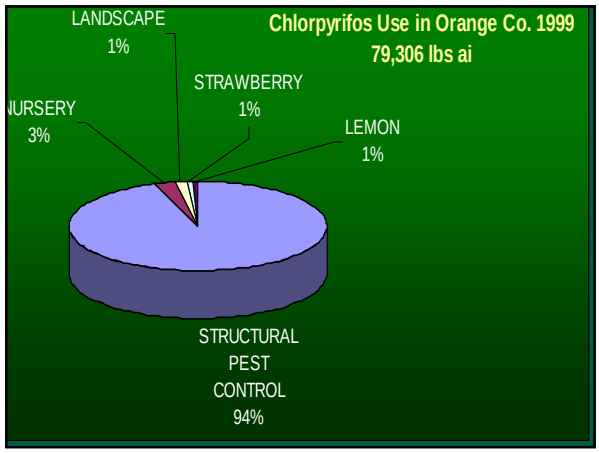


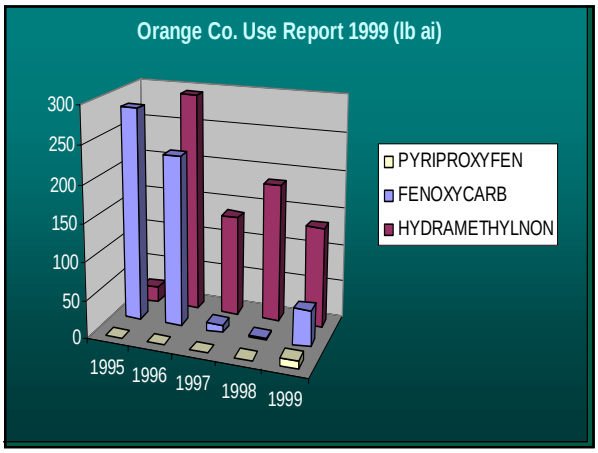


Insecticide Use Pattern

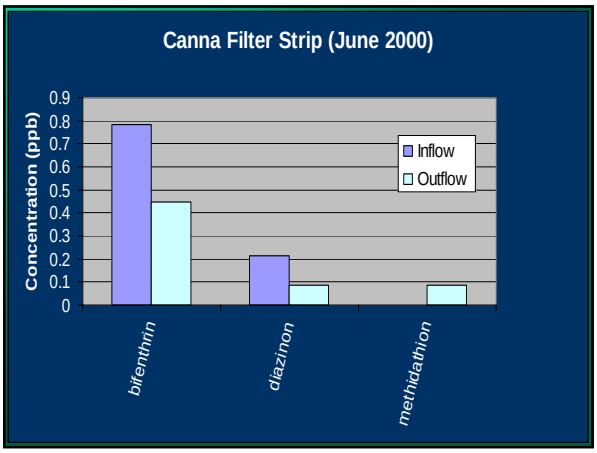





Chlorpyrifos Use in Orange Co. 1999
79,306 lbs ai
LANDSCAPE 1%
STRAWBERRY 1%
NURSERY 3%
LEMON 1%
STRUCTURAL PEST CONTROL 94%


Orange Co. Use Report 1999 (lb ai)
300
250
200
150
100
50
0
1995
1996
1997
1998
1999
PYRIPROXYFEN
FENOXYCARB
HYDRAMETHYLNON

Mitigation



Conclusions

Detections

- Single detect: hydramethylnon, pyriproxyfen
- Nursery: Bifenthrin, Fenoxycarb, Diazinon, Chlorpyrifos, Malathion, Dimethoate
- Urban: Diazinon, Chlorpyrifos Malathion, Dimethoate

Toxicity

- **Nursery sites:**
  - **18: Bifenthrin, Diazinon, Chlorpyrifos, Malathion**
  - **1 unknown**
  - **2 non toxic**
- **Urban and integrated sites:**
  - **27 Diazinon, Malathion, Chlorpyrifos**
  - **27 unknown**
  - **21 non toxic**

Prevention & Mitigation

Insecticide Application
Irrigation Management
Water Recovery
Sediment Pond
Buffer Strip