Experimental Evaluation of Moist Soil Management Techniques in the Central Valley:

Incorporating summer invertebrate production into wetland management decisions

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Delta Waterfowl

Overview

I. Experimental wetland plots

II. Cost-effective moist-soil management
   - Brian Olson - 2007-2009

III. Incorporating mosquito production - rationale

IV. Sampling methods – dipping, activity traps

V. Results

VI. Feedback, suggestions?

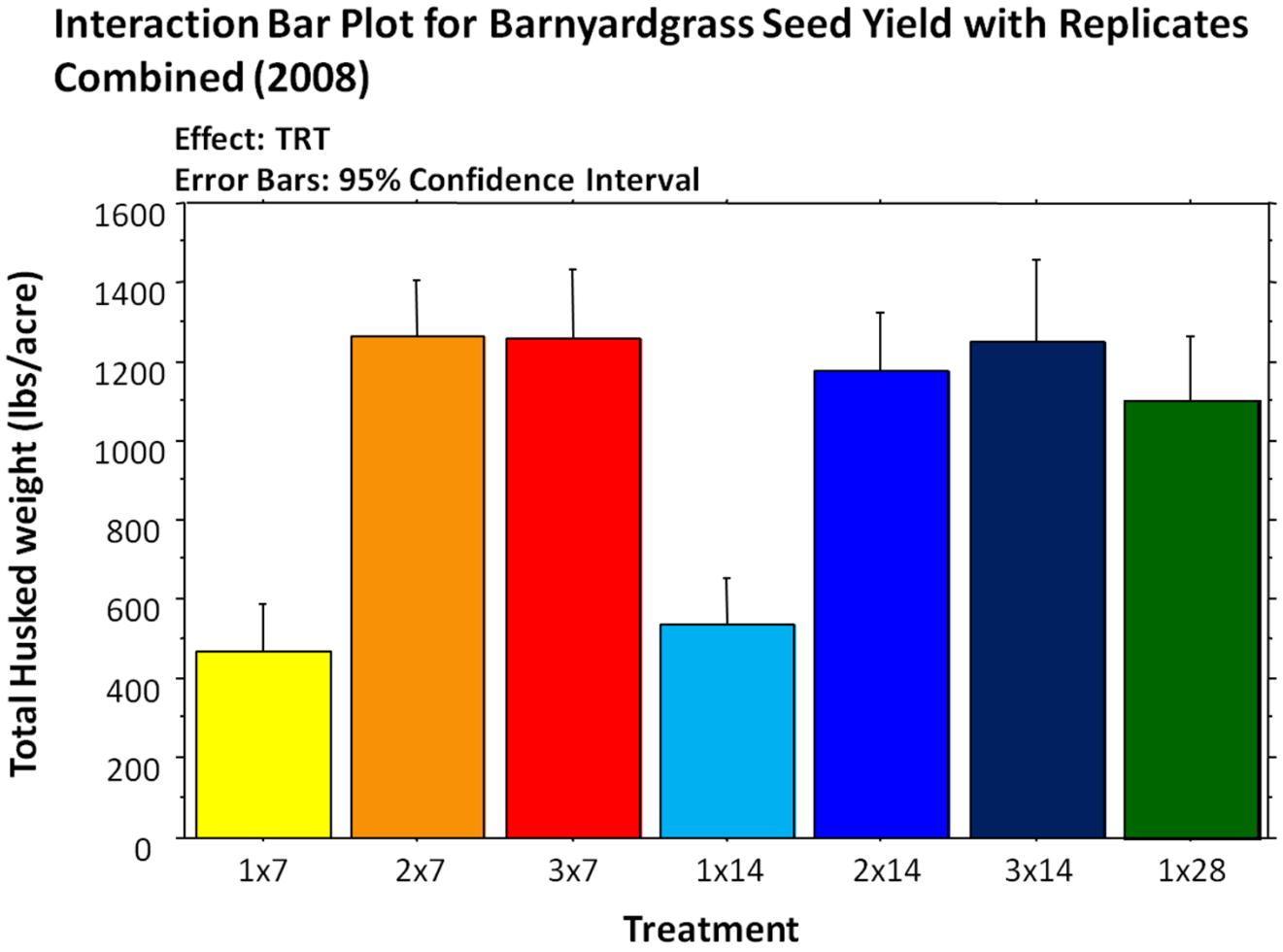
Project background

- 21 experimental wetland plots created in 2007

- 7 different irrigation treatments
  - duration and frequency of summer irrigation

- Seed production estimates
  - percent cover surveys, soil cores, clip samples

Roosevelt Ranch Experimental Wetlands Project, 2007-2008



- 3rd irrigation produces no more seed
- Length of irrigation less critical when 2 are given
- 1x28 comparable to 2x14

B. Olson, unpublished


9/24/2009
photo from Google Earth


10/4/2010
photo taken by Ron Lutsko


PLOT 5
8/27/10


PLOT 10
8/27/10

Reasons to focus on mosquitoes

- Cost to landowners **($50/acre)**
  - Example: Roosevelt Ranch, 2000 acres = $100,000 for each abatement
- Mosquito health concerns
  - 2005 West Nile Virus (WNV) outbreak in Sacramento Valley
- Few studies on summer wetland invertebrates and moist-soil management
  - focus has been on inverts as a waterfowl food source in winter, not on summer irrigations

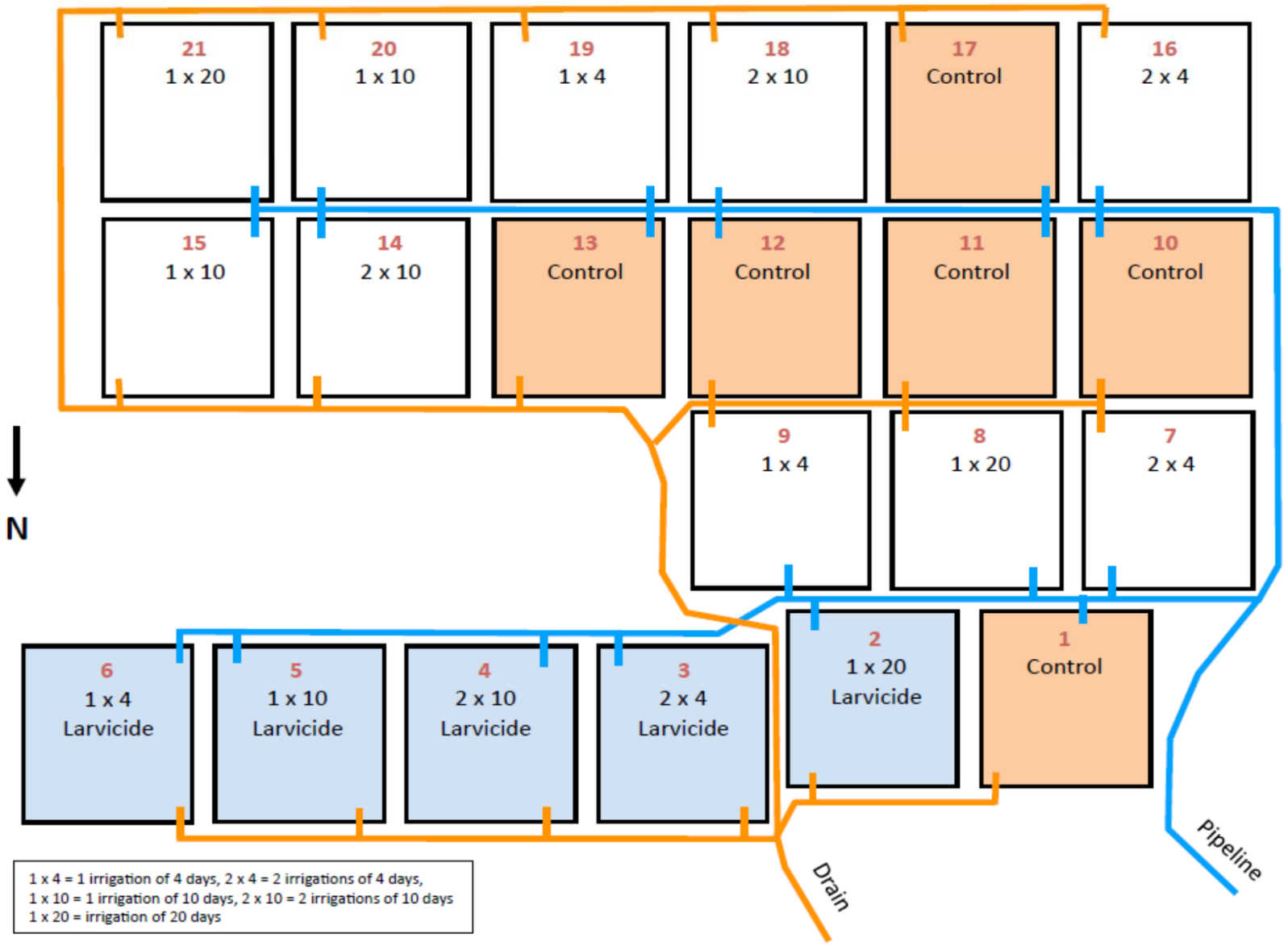
Mosquito Control District	Threshold
Butte County MVCD	3 / dip on 3 or more acres
Colusa County MVCD	2-5 / dip (duck clubs) 2 / dip (within 1 mile of homes)
Lake County MVCD	0.05 / dip (rice fields)
Sac-Yolo MVCD	0.1 / dip
Solano County MVCD	0.1 / dip
Sutter-Yuba MVCD	2 / dip (*Aedes)* 1 / dip (*Culex)*

California Mosquitoes

- ***Aedes –*** floodwater mosquitoes
  - lay eggs in moist soil
  - can emerge within 4 days of irrigation
  - eggs can be dormant for years

- ***Culex & Anopheles –*** standing water mosquitoes
  - lay eggs in water
  - can emerge within 10 days of irrigation
  - *Culex* = most competent WNV vector

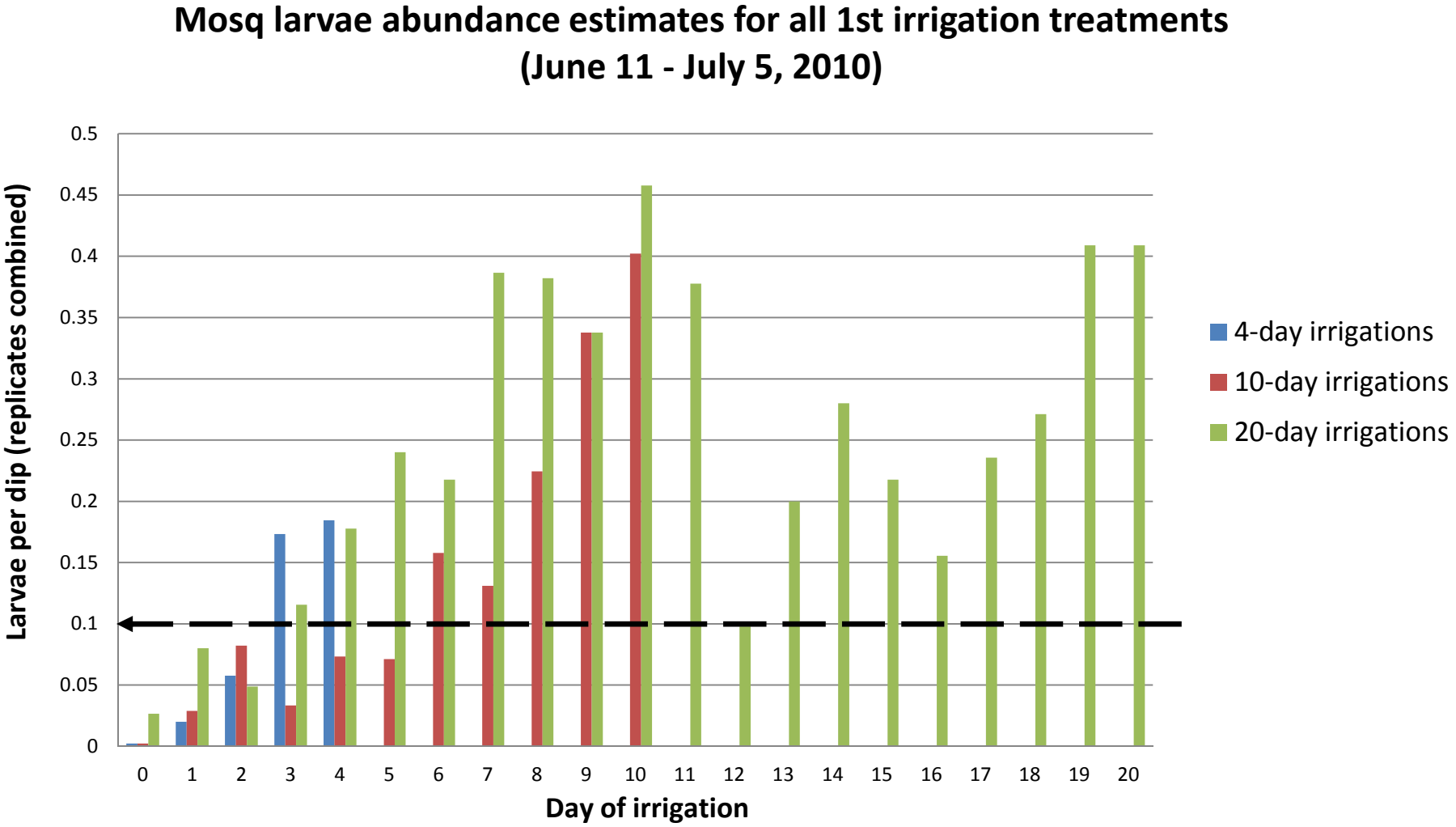
2009 Roosevelt Ranch Experimental Wetlands Project



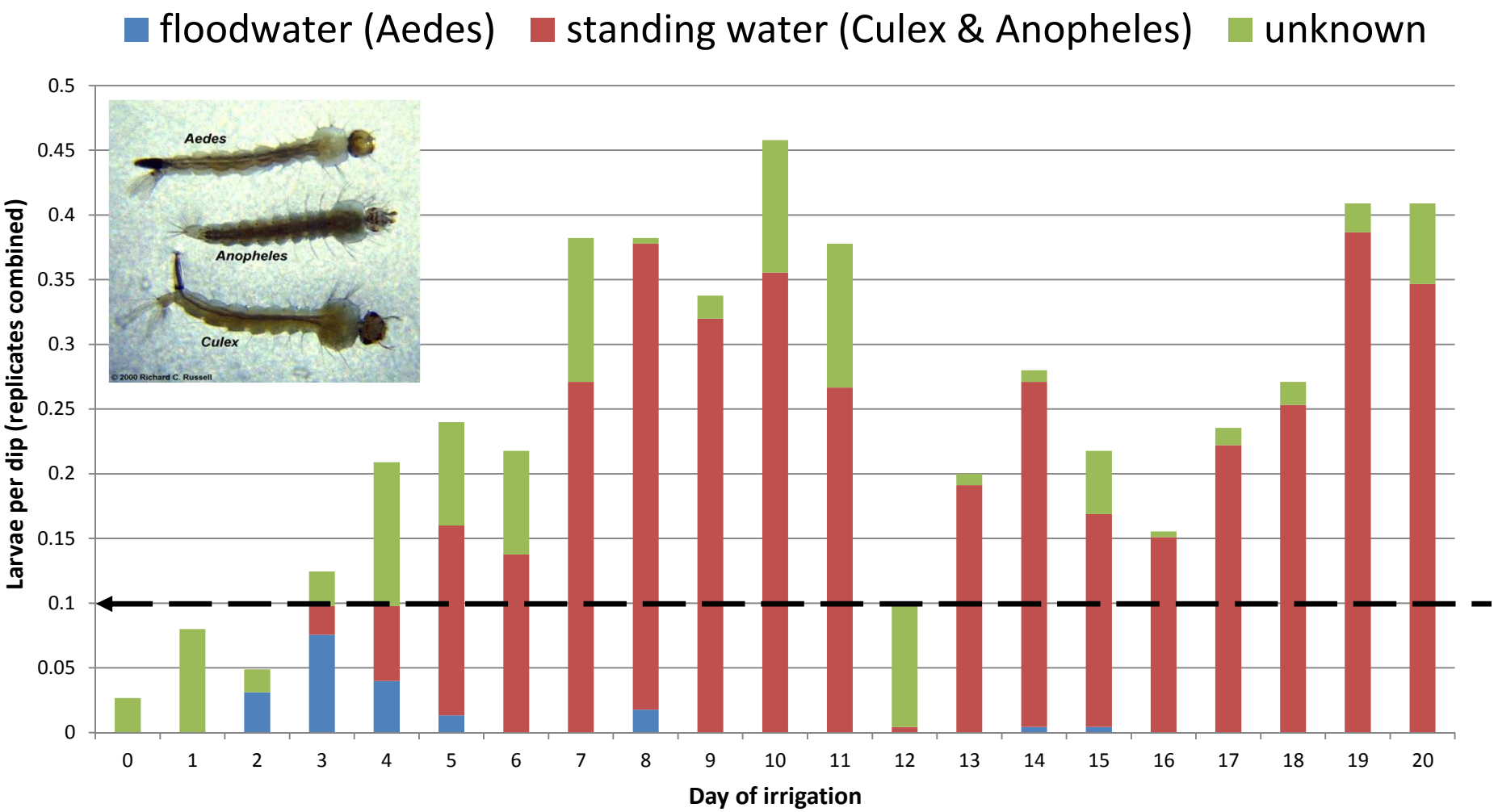
Invertebrate Sampling Methods

- **Mosquito dipping**
  - captures mosquito larvae and pupae on water surface
  - 75 dips/plot/day

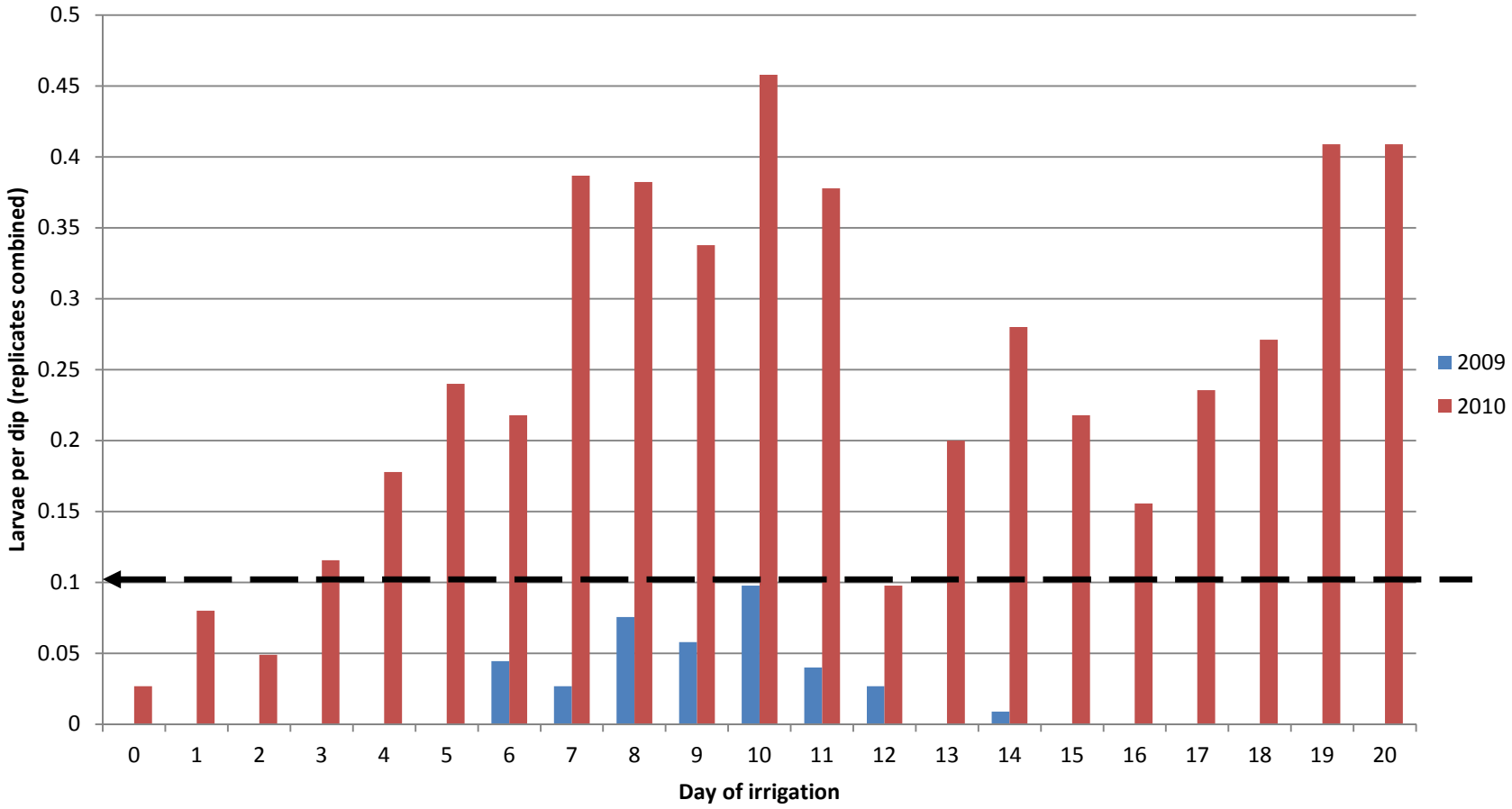
- **Activity traps**
  - captures active invertebrates in the water column
  - 10 traps/plot/irrigation



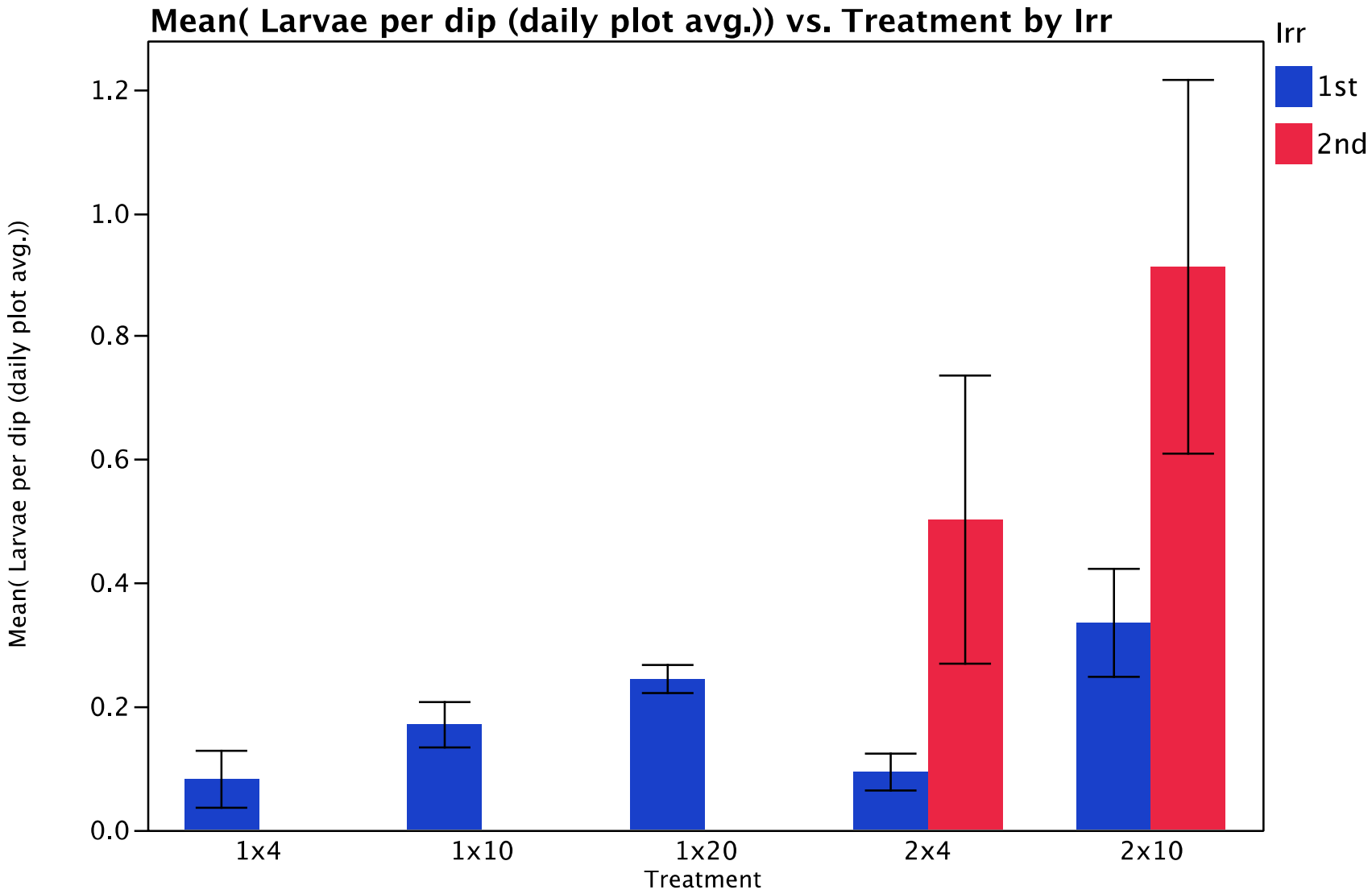
- Fluctuation in mosquito larvae caught throughout irrigation period



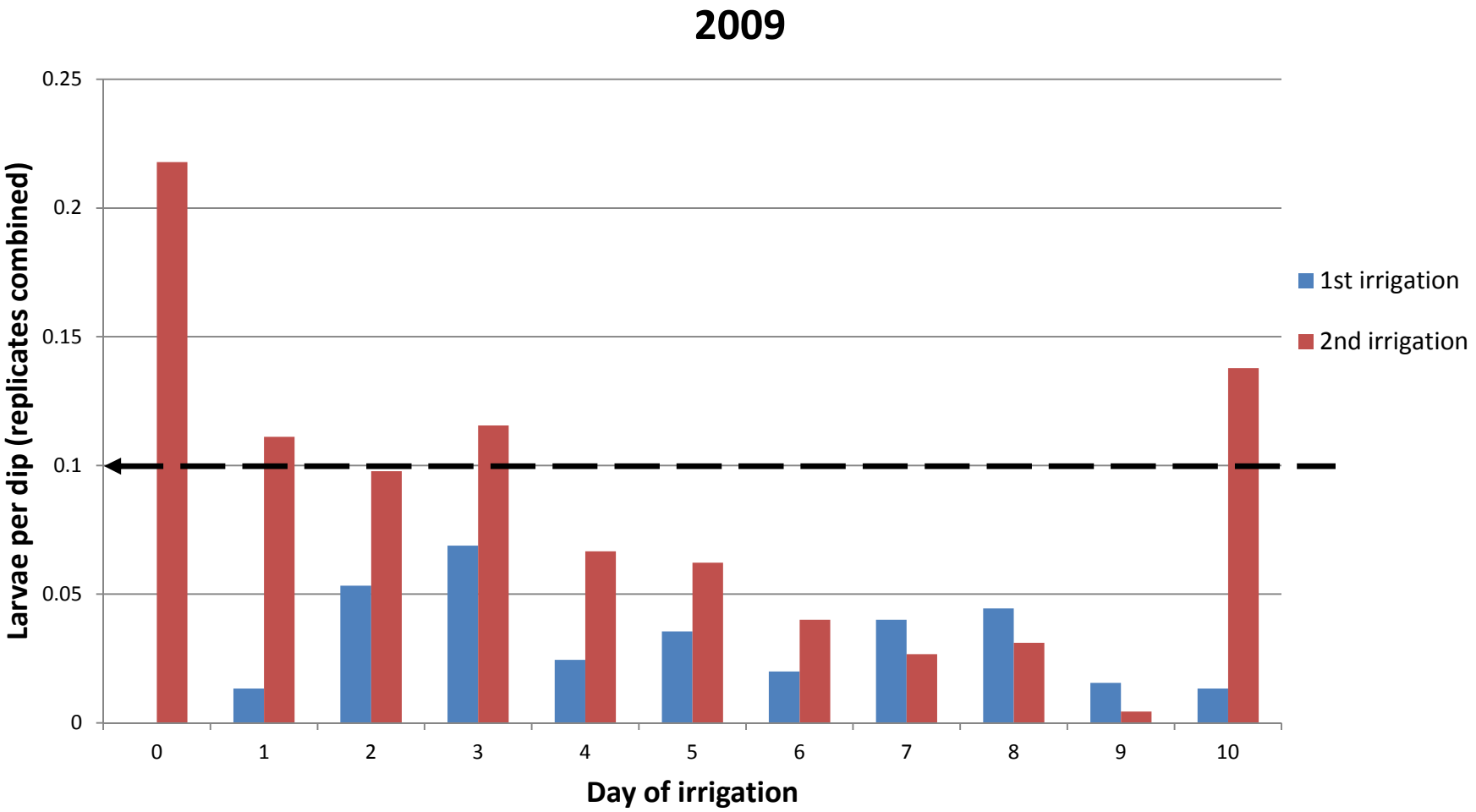
- The type of mosquito larvae present changes throughout irrigation.



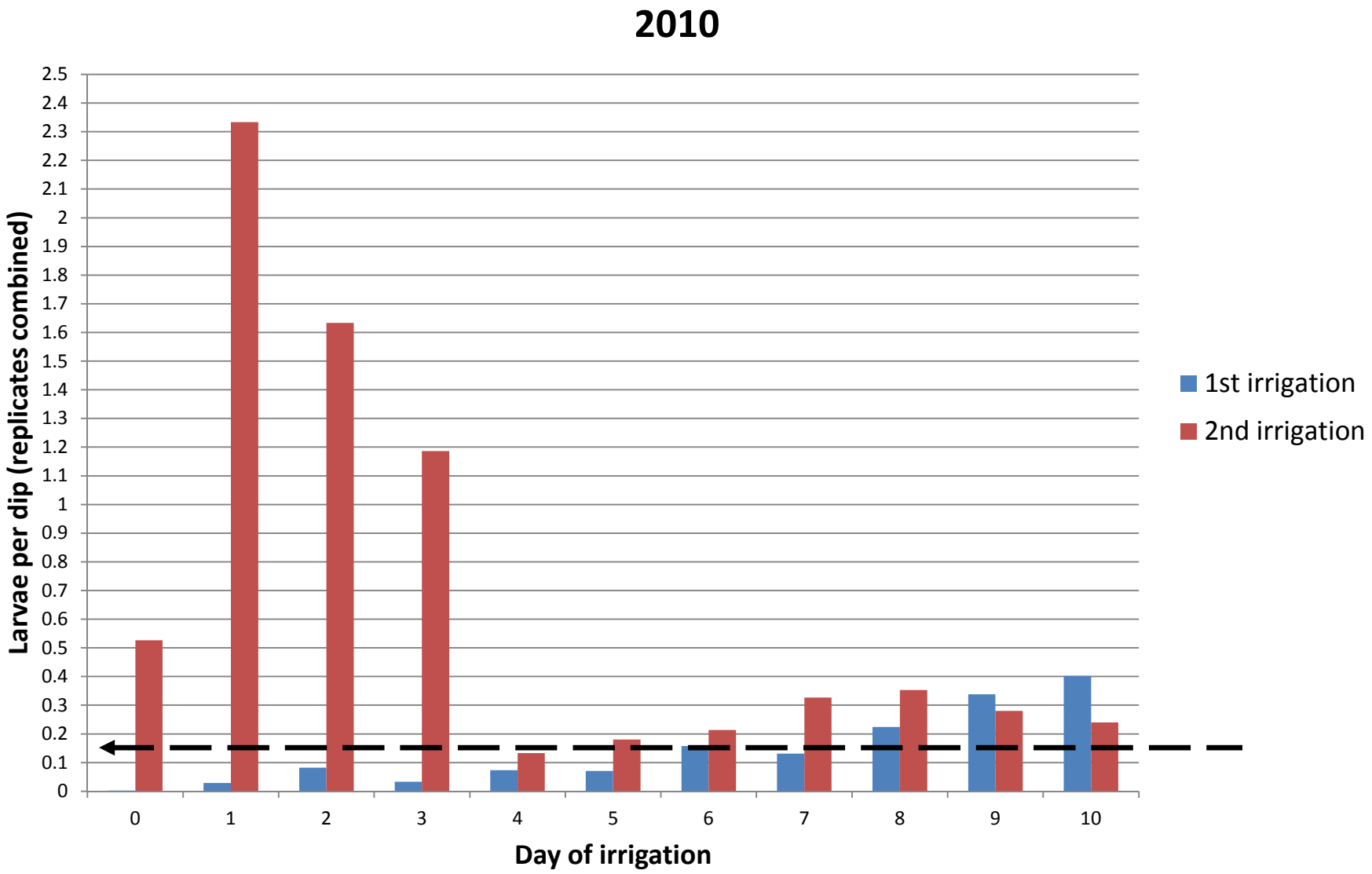
- The drop in mosquito larvae on day 12/13 is most likely an emergence event, seen in both years around the same time



- A 1x20 plot produces less mosquito larvae per dip than a 2x10



- Mosquito #s well below threshold in 1st irrigation of 2009


2010
Larvae per dip (replicates combined)
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
4
5
6
7
8
9
10
Day of irrigation
1st irrigation
2nd irrigation

Average Mosq. Predators Per Trap

Year	Irr	Water Scavenger Beetles	Predaceous Diving Beetles	Backswimmers
2009	1st	37.74	35.71	9.61
	2nd	3.31	6.22	0.19
2010	1st	7.84	2.35	0.03
	2nd	4.75	0.99	0.02

- Notice high aquatic predator #s during 1st irrigation of 2009

Take home messages

• Mosquito control in the Central Valley is a huge cost associated with active moist-soil management

• Our goal is to find an irrigation schedule that **maximizes seed production** and **minimizes mosquito larvae**

• Of management interest – inoculating units with water rich in predatory aquatic inverts may depress mosquito larvae numbers

- holding ponds to build up predators and also function as brood ponds

Directions for 2011 and beyond

- Continue with seed sampling (percent cover, seed clipping, coring) for 5th year
- Continue with invertebrate sampling (mosquitoes and mosquito predators) for 3rd year
- Investigate emergence rate with field traps and lab breeders
- Aquatic invert predator build up in semi-permanent ponds

Feedback?