California Department of Food and Agriculture
ENVIRONMENTAL FARMING ACT SCIENCE ADVISORY PANEL
INCENTIVES WORKING GROUP

MEETING AGENDA

November 8, 2012
1 PM to 4:30 PM

1220 N Street
Room 133
California Department of Food and Agriculture
Sacramento, CA 95833
(916) 654-0433

GoToMeeting Information
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Participant passcode - 3964856#

Jeff Dlott, PhD, Member and Chair
Mark Nechodom, PhD, Member — Don Cameron, Member
Mike Tollstrup, Member — Ann Thrupp, PhD, Member
Luana Kiger, MSc, Subject Matter Expert
Louise Jackson, PhD, Subject Matter Expert
Amrith Gunasekara, PhD, CDFA Liaison

1.	Introductions (10 minutes)	Jeff Dlott
2.	Update on Evaluation Framework Workgroup (10 minutes)	Jeff Dlott
3.	Future Direction of Evaluation Workgroup (20 minutes)	Mark Nechodom
4.	Update on Incentives Workgroup Meeting (10 minutes)	Jeff Dlott
5.	Incentives/Pilot Projects Invited Speakers **See page 2 for supplemental information and purpose** (20 minutes each)	Jeff Dlott
	Voluntary Local Program – Fish and Game/Alameda RCD	Marcia Grefsrud and Leslie Koenig
	Habitat Restoration and buffer strips - Xerces Society	Jessa Guisse and Mace Vaughan
	Riparian Habitats - Audubon Society	Keiller Kyle and Rodd Kelsey
	Native Grasses – UC Davis	Andrew Rayburn
	Pollination services - AgPollen LLC	Steve Peterson
	Performance Based Incentives in the Pajoro Valley - Santa Cruz RCD	Nik Strong-Cvetich and Karen Christensen
6.	Discussion and Public Comments (30 minutes)	All
7.	Adjournment	

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More information at: http://cdfa.ca.gov/Meetings.html and http://www.cdfa.ca.gov/EnvironmentalStewardship/Meetings_Presentations.html

Agenda Item 5 (Supplemental Information)

The purpose of this agenda item for the Science Advisory Panel is threefold:

1. Meet leads and learn more about environmental stewardship activities taking place on California farms and ranches;
2. Consider how these, and projects similar to them, could serve as pilots for testing the CDFA Qualitative Assessment Model, other ecosystem services assessment tools, and potential incentives; and
3. Discuss if there are immediate opportunities to recognize these and similar projects.

Below please find the names of the presenters and a brief description of each project

Voluntary Local Program for Tiger Salamander in Alameda County

Marcia Grefsrud – Environmental Scientist, Department of Fish and Game
Leslie Koenig – Biologist, Alameda County RCD
Purpose is to encourage farmers and ranchers engaged in agricultural activities to establish locally designed programs to voluntarily enhance and maintain habitat for endangered and threatened species. This specific program encourages farmers and ranchers to enhance and maintain stock pond habitats for the Alameda Whipsnake and California Tiger Salamander. CDFA has sent a letter of support.

Habitat Restoration and Buffer Strips

Jessa Guisse, MS – **Pollinator Habitat Restoration Specialist, Xerces Society**
Mace Vaughan – Pollinator Program Director, Xerces Society
The diversity and abundance of native bees on a farm, and subsequently their ability to serve as crop pollinators, are strongly influenced by two factors: suitable habitat on the farm and in the surrounding landscape. The basic habitat needs of native pollinators in any location are the same – nesting or egg-laying sites, flowers on which to forage, secure overwintering sites, and a refuge from pesticides. Discussed will the benefit of native buffer strips and efforts of the NRCS and RCDs to support these projects.

Riparian Habitats - Ecosystem Services on Agricultural Lands

Keiller Kyle – Bird conservation Project Manager, Audubon California
Rodd Kelsey, PhD – Director Migratory Bird Conservation Program, Audubon California
Presentation related to leading the Tricolored Blackbird Working Group and working with farmers to voluntarily protect this rare bird as an alternative to it being listed as an endangered species. Also discussed will be efforts to partner with the Natural Resources Conservation Service and U.S. Fish and Wildlife Service to permanently protect and implement habitat enhancement projects on private ranches in northeastern California.

Effects of Native California Grasses on Ecosystem Services

Andrew Rayburn, PhD – Postdoctoral Fellow, UC Davis Dept. of Plant Sciences
The inclusion of native grasses in California's agricultural landscapes may enhance the provision of numerous beneficial ecosystem services related to water, nutrient cycling, diversity, forage, and other factors. This presentation will provide a brief summary of native grass effects on ES (focusing on those most relevant to the panel), and end with a quick summary of our current research on this topic.

Pollination Services and Native Bees (San Joaquin Valley)

Steve Peterson, PhD – Entomologist, AgPollen LLC
Since 2007, AgPollen has provided blue orchard bees for pollination of almonds. Steve has released blue orchard bees on up to 200 acres of almonds and raised bees on wildflowers in a 5-acre screen houses.

Performance-based Conservation Incentives and Water in the Pajaro Valley

Nik Strong-Cvetich – Program Development Manager, Santa Cruz Country RCD
Karen Christensen – Director, Santa Cruz RCD
When it comes to water resources, the Pajaro Valley has no shortage of challenges. Over the last 50 years the aquifer providing water to the ag community, rural citizens and the city of Watsonville has been significantly overdrafted, leading to saltwater intrusion. Additionally, the Pajaro River and other tributaries have been shown to have some of the highest concentrations of nitrate across the state.

In response to these complex issues, RCDSCC and Driscoll's Strawberry Associates Inc, with the support of the Sustainable Conservation, began looking at how incentives can motivate positive change

in the condition of the aquifer and watershed. This led the partnership to develop the **Performance-Based Conservation Incentive Pilot,** made possible by a grant from the United States Department of Agriculture's Conservation Innovation Program and CA Department of Agriculture's Specialty Crop Block Grant.

As noted above, the pilot program seeks to improve aquifer and water quality conditions in the Pajaro Valley, by creating a series of standardized metrics to measure water quality and quantity of water used. It also is currently developing a structure of economic and non-economic incentives (e.g. regulatory relief) to motivate grower action, and testing these models on the ground.

This overall approach is unique, uniting private industry, the public and non-profit sectors to use business and policy related incentives to improve environmental conditions. By incentivizing outcomes rather than practices, farmers can find their own strategies to reduce nutrients and improve water quality in ways that are more economically feasible and practical for their own business models.

Voluntary Local Program for Farms and Ranches

Marcia Grefsrud

California Department of Fish and Game

Leslie Koenig

Alameda County Resource Conservation District

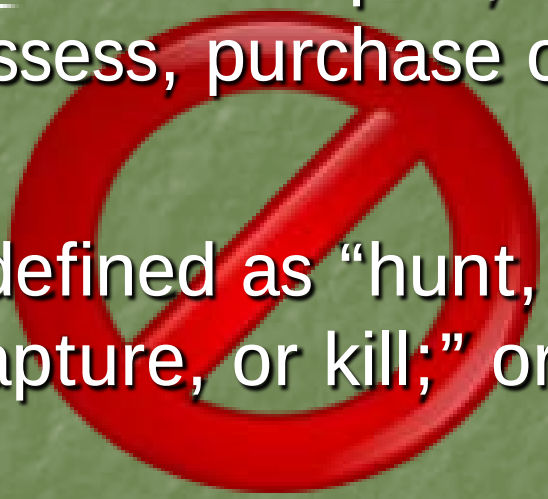
Fish and Game Code and California Endangered Species Act (CESA)

- Initial legislation enacted in 1970 based on Legislative concern regarding the decline of wildlife species in CA. (Stats. 1970, c. 1510 §3.)

- CA became the first state to prohibit the importation, take, possession, or sale of rare and endangered species

CESA Prohibitions

- Misdemeanor to import, export, take, possess, purchase or sell
- Take is defined as “hunt, pursue, catch, capture, or kill;” or attempt to do so



1984 Amendment

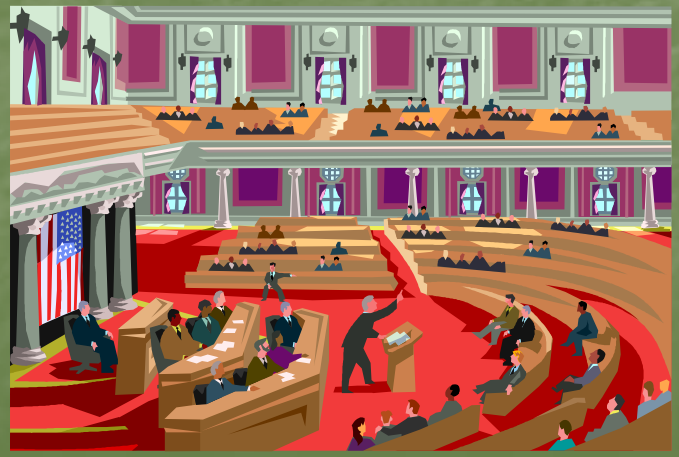
In 1984 the original act, from 1970, was replaced by the current structure. (Stats. 1984,. 1162, §§ 5,6; Stats. 1984, c.1240 §§ 1,2.)

Section 2081

- Exceptions to take prohibition could be authorized through permits or MOU for scientific, educational, or management purposes only...

1997 Amendments

- explicit authority to permit (SB 879)
- incidental take associated with routine and ongoing agricultural activities, (SB 231)
- and consistency determinations (AB21)



FGC 2081: SB 879 (1997)

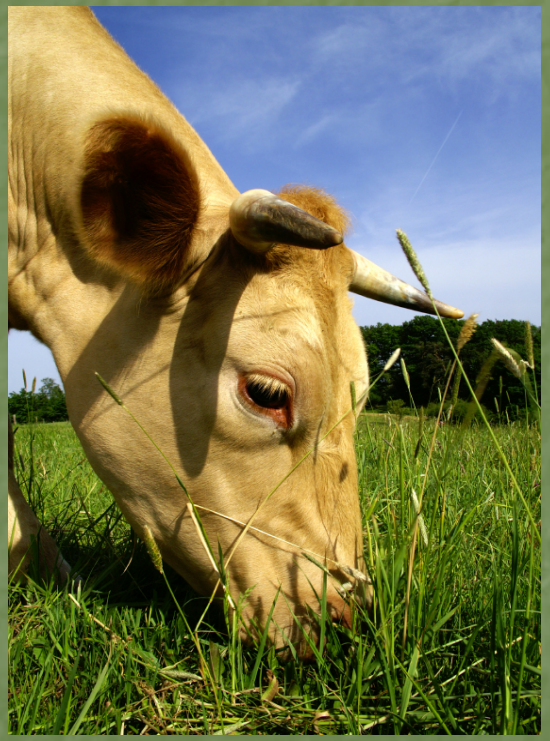
- Divided into two sections
- This bill authorized the department to issue a permit to authorize the incidental take of listed species under specified conditions.

Section 2081 conditions

- The take is incidental to an otherwise lawful activity
- The impacts of the authorized take shall be minimized and **fully mitigated**
- **Adequate funding** to implement the measures and for monitoring compliance
- No permit may be issued if issuance of the permit would jeopardize the continued existence of the species

FGC 2086: SB231 (Costa 1997)

- Required DFG, in cooperation with the California Department of Food and Agriculture (CDFA), to adopt regulations that authorize locally designed **voluntary programs** for routine and ongoing agricultural activities on farms or ranches



- CCR T-14 Regs implement FGC 2086
- VLPs would encourage habitat and minimize “take” of threatened, endangered, and candidate species, and wildlife in general
- Farmers and ranchers who **voluntarily** follow the wildlife friendly agricultural practices in the VLP receive take authorization

Section 2086 VLP Requirements

- Must contain farm and ranch "management practices" (MP)
- MP should encourage habitat enhancement for special status species
- Must be consistent with goals and policies of CESA
- Must be supported by best scientific information- ag and conservation

- Must be flexible to maximize participation and gain maximum wildlife benefits
- Not compromise the economics of ag operations
- Must allow participants to drop out with no penalty

DFG Limitations

- Cannot require land be set aside or covered by conservation easements
- Cannot require collection of additional scientific information or data as condition of approval
- Limits DFG use and dissemination of information regarding species and habitat
- No requirement for participant ID

- Non-specific provisions were necessary to preserve flexibility and allow VLPs to be tailored to local biological resources and agricultural practices

1998

- Section 2086 added to FGC
- No VLPs were prepared because of perceived problems with the regulations
- CCR T-14 section 786.0-786.8 regulations amended in 2002
- One VLP written but not approved

2010

- California tiger salamander state listed as threatened
- Breeds in stock ponds and vernal pools
- Spend 95% of their life in surrounding rodent burrows


DFG and ACRCD/NRCS concerned about future stock pond projects and permitting under section 2081


Voluntary Local Program
Alameda County

Program Need

- Agriculturalists that want to do voluntary restoration projects are authorized “take” of tiger salamander or whipsnake during their project installation that includes assigned management practices

- Need a feasible way for land managers to get covered for this type of take (individual permits are time consuming and not easy)

Species Covered

- Seasonal ponds are used for reproduction
- Juveniles and adults live in grassland and oak woodlands, mainly in underground rodent burrows

California tiger salamander

- Habitat is primarily scrub
- Can venture into adjacent grasslands, woodlands
- Like rock outcrops
- Use rodent burrows

Alameda whipsnake

Types of Projects Covered

2012

- Alameda County RCD proposed the Plan
- ACRCD/NRCS submitted the Plan
- ACRCD acted as CEQA lead agency
- DFG provided consultation and review
- Authorized by the F&G Director after public review

CDFA and County Ag Commissioner

- Consultation Required by Regulation
- Shall consider VLP and economics of agricultural operations.
- Original contact with CDFA in August 2011
- County Ag Commissioner July 2012

Comments from CDFA and AC

Overall support of the VLP

Consistent with the economics of agricultural operations

Designed to promote cost-sharing for implementation of specific habitat management practices

Collaborated on rodent control language

Alameda County - Next Steps

- Agriculturalists can sign up for VLP through the Alameda County RCD
- Other mechanisms to ease the permitting process
  - USFWS Biological Opinion (federal take coverage)
  - Renew RWQCB Programmatic 401 Certification (use Small Habitat Restoration Permit in mean time)
- Voluntary restoration projects are implemented!

VLP proposals

- Agricultural commissioners
- Extension Agents
- Farmers and ranchers
- Other agricultural experts

- Can be designed for specific localities, activities or species
- Can have any number of participants

Working together

CALIFORNIA
DEPARTMENT OF
FISH&GAME

ALAMEDA COUNTY
RESOURCE
CONSERVATION DISTRICT

USDA NRCS
Natural Resources Conservation Service

Questions?

Department of Fish and Game

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Alameda County Resource Conservation District

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The Xerces Society
for Invertebrate Conservation

Promoting Agricultural Sustainability: Creating Habitat for Native Bees and Other Beneficial Insects

Presented by Jessa Guisse
Pollinator Habitat Restoration Specialist
The Xerces Society Pollinator Conservation Program

Photo: Edward S. Ross

What is the Xerces Society?

Since 1971, the Society has worked to protect wildlife through the conservation of invertebrates and their habitat.

Major Programs:

- Pollinator conservation
- Endangered species
- Aquatic invertebrates

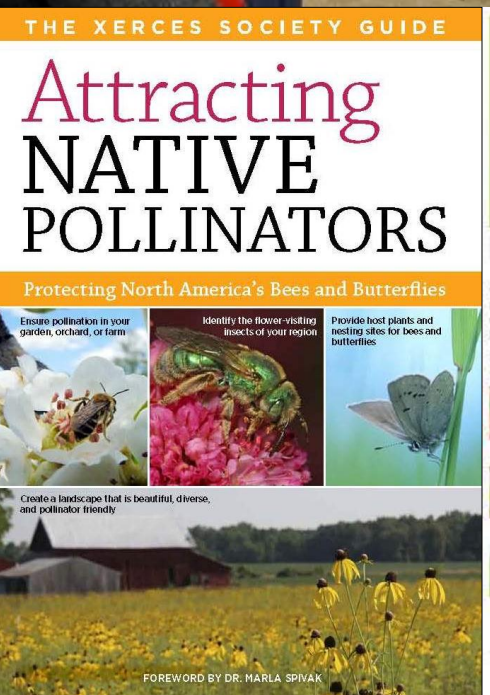
Xerces blue butterfly (*Glaucopsyche xerces*), the first U.S. butterfly to go extinct due to human activities

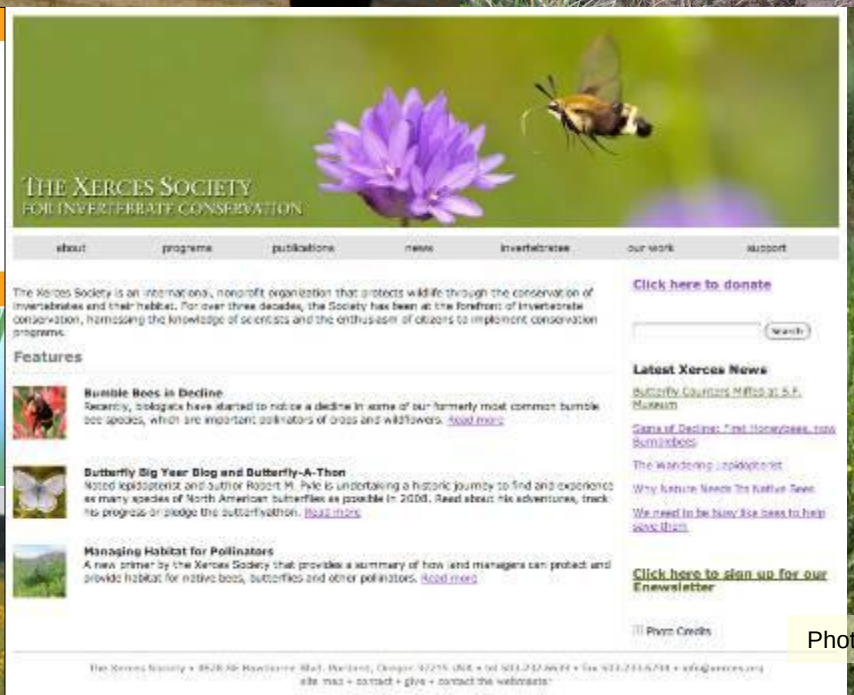
Photo:s California NRCS and Ed Ross

THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION

Pollinator Conservation Program

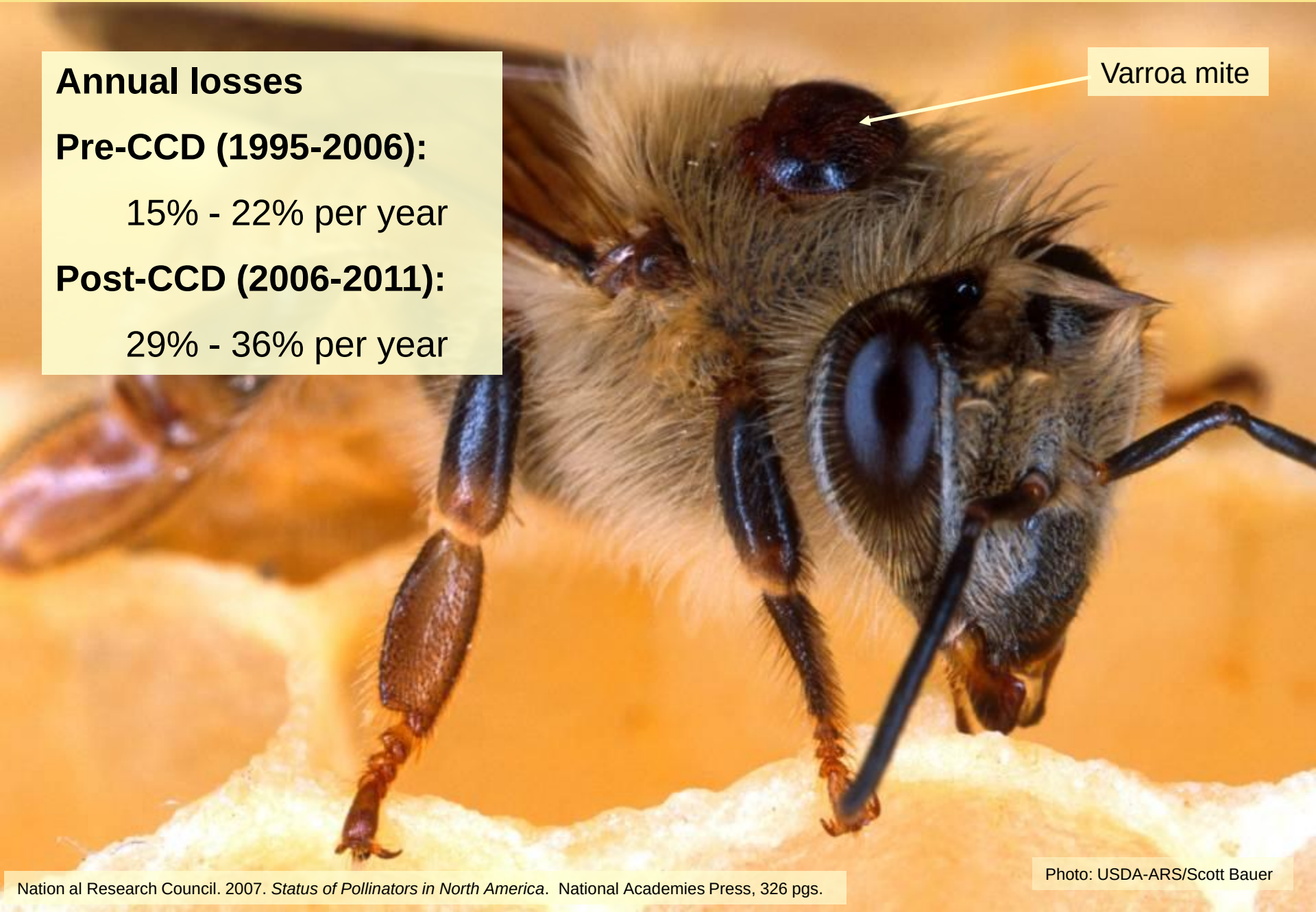
Conservation, education, research, and advocacy for pollinators and their habitat.





Photos: Paul Jepson; Matthew Shepherd; Heidi Ballard

Bee Declines



Annual losses

Pre-CCD (1995-2006):

15% - 22% per year

Post-CCD (2006-2011):

29% - 36% per year

Photo: USDA-ARS/Scott Bauer

Nation al Research Council. 2007. *Status of Pollinators in North America*. National Academies Press, 326 pgs.

Bee Declines

Native bees also in decline:

Four closely related species of bumble bees: 96% decrease in population
(Cameron et al 2011)

Evans, E.,R. Thorp, S. Jepsen, and S. Hoffman Black, 2009. Status Review of Three Formerly Common Species of Bumble Bee in the Subgenus *Bombus.* Xerces Society.

Cameron et al. 2011. Patterns of widespread decline in North American bumble bees. PNAS

Native Bees Also in Decline

Native Bees and Crop Pollination

What does all this mean for the sustainability of crop pollination?

Photo: Mace Vaughan

Native Bees and Crop Pollination

Fewer honey bees available

- Important to diversify pollinators for production agriculture
- Important to adopt practices that support native bees and honey bees

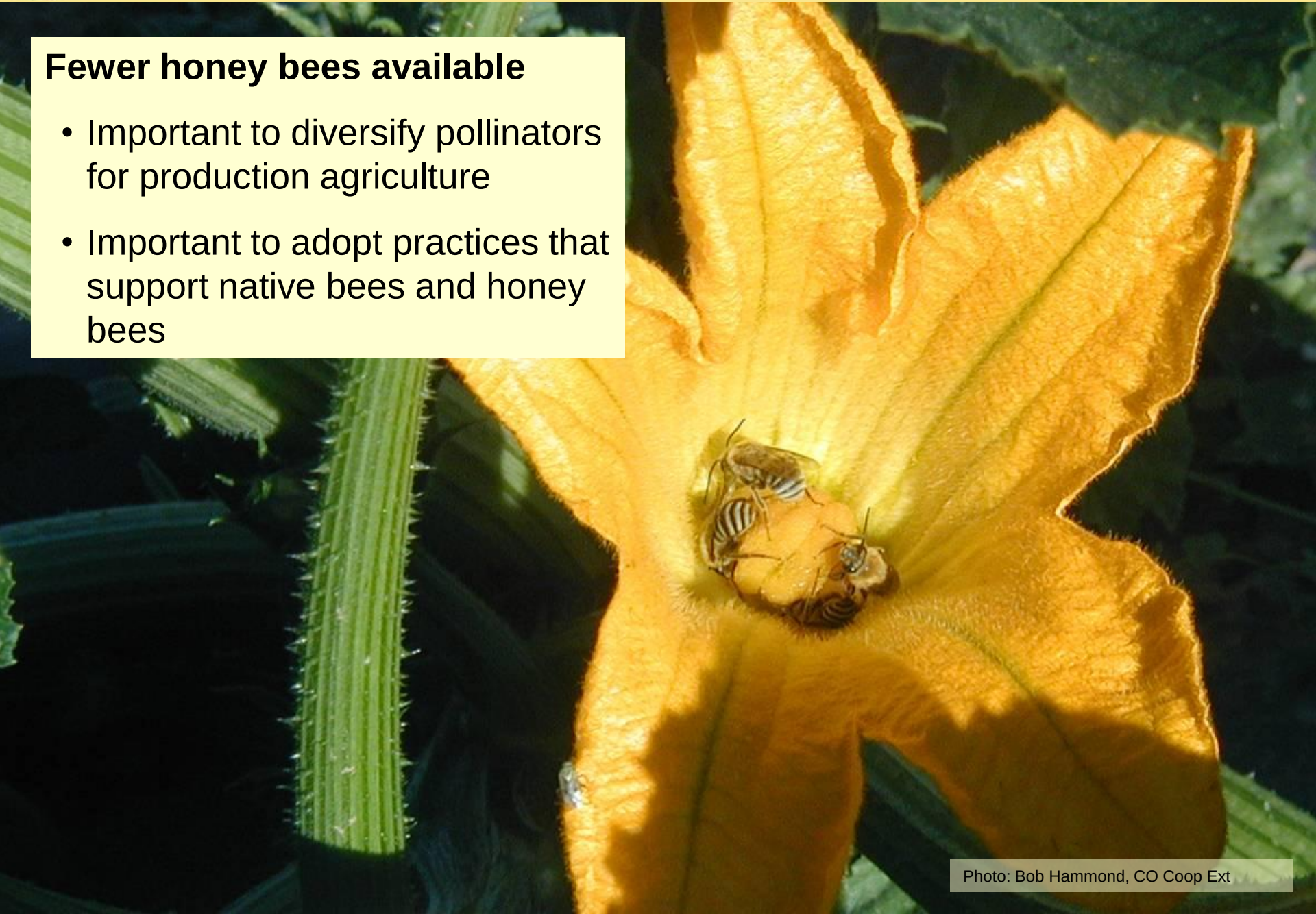


Photo: Bob Hammond, CO Coop Ext

THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION

Native Bees are Critical Crop Pollinators

Photos: Doug Walsh, Bob Hammond, Eric Mader, Nancy Adamson

Habitat is the Key Ingredient

Non-Crop Habitat

The amount of natural habitat on a farm has a direct influence on pollinator abundance and diversity

Photo Rollin Coville

Habitat is the Key Ingredient

Example: Watermelon in California

Native bees fully pollinate Central Valley watermelons when more than 30% of the area within 1.2 km of the farm is natural habitat.

Kremen, C. et al. 2004.

Photos: Mace Vaughan, Laurie

Value of pollinator habitat: Native bees

Pollinator plantings in California

- Even in areas with little surrounding natural habitat, planting strips of natural vegetation increased pollinator populations and subsequent visitation of adjacent orchard crops (Klein et al, 2012)

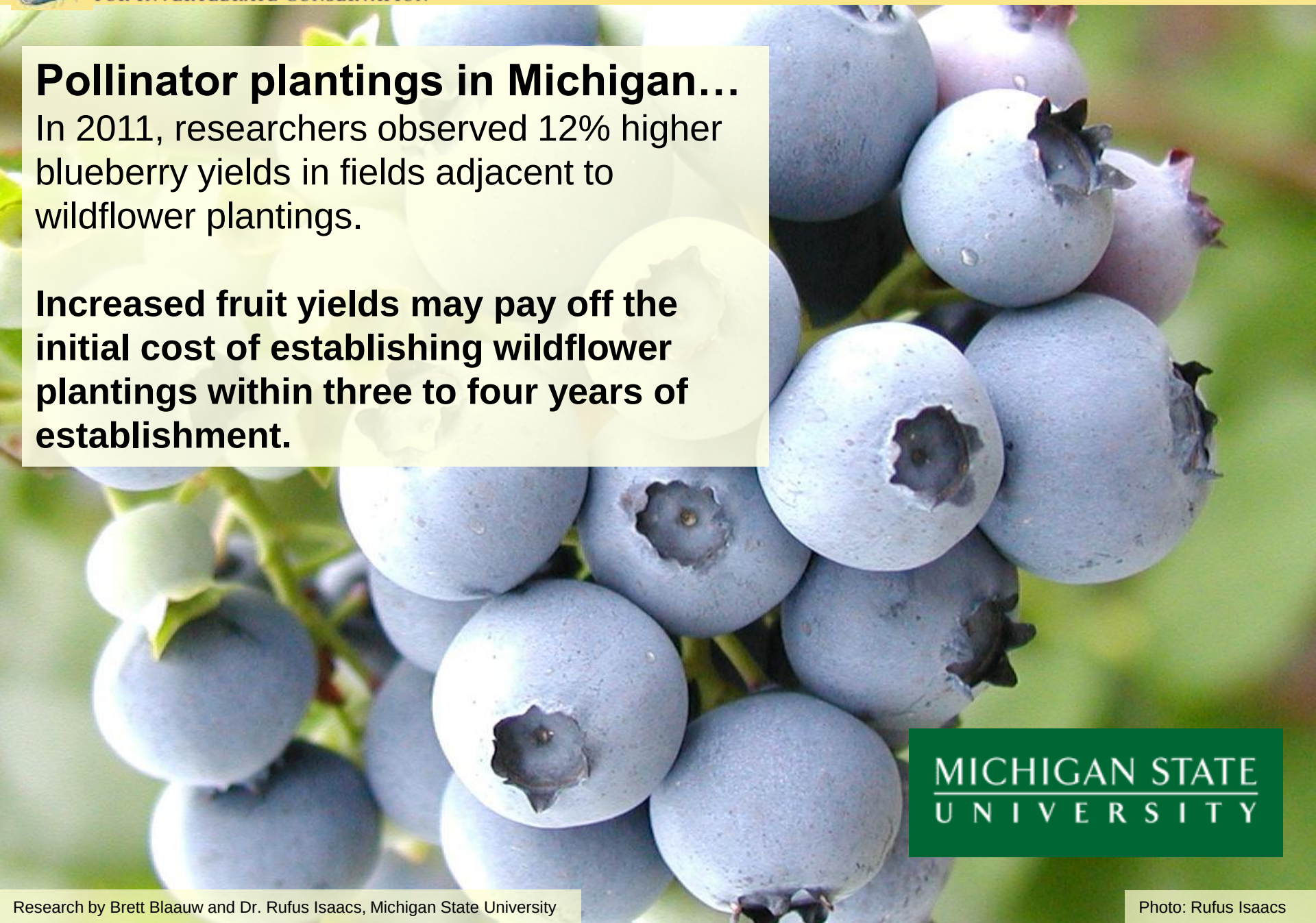
Photo: Stephen Buchmann

Value of pollinator habitat: Native bees

Weedy

Hedgerow

Value of pollinator habitat: Native bees



Pollinator plantings in Michigan…

In 2011, researchers observed 12% higher blueberry yields in fields adjacent to wildflower plantings.

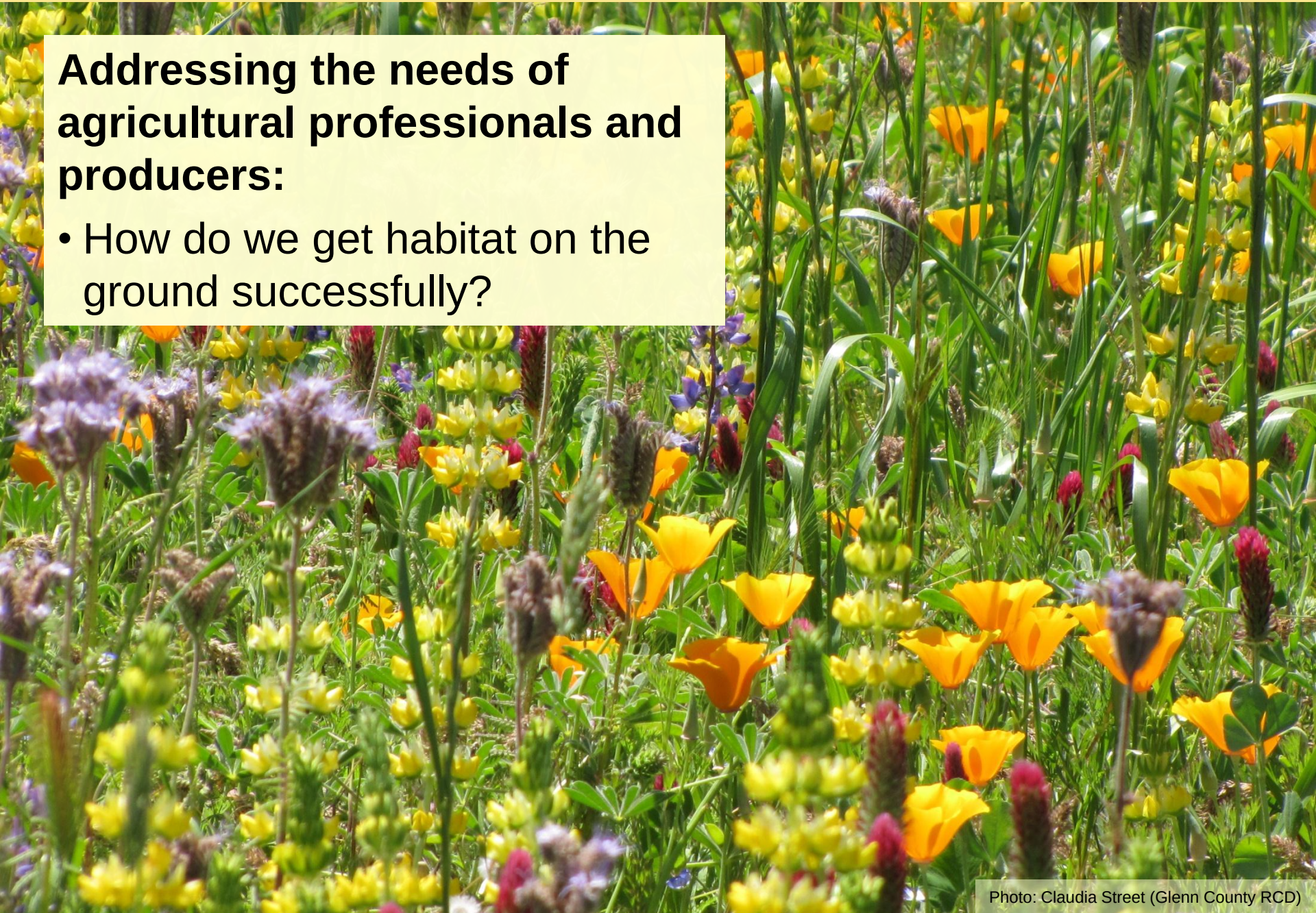
Increased fruit yields may pay off the initial cost of establishing wildflower plantings within three to four years of establishment.

MICHIGAN STATE UNIVERSITY

Research by Brett Blaauw and Dr. Rufus Isaacs, Michigan State University

Photo: Rufus Isaacs

Advancing Pollinator Habitat Restoration



Addressing the needs of agricultural professionals and producers:

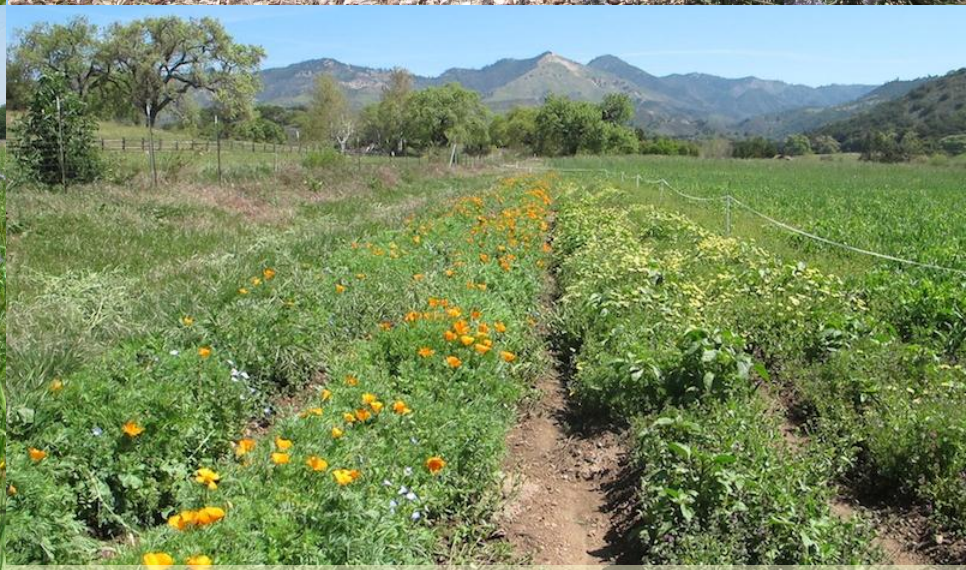
- How do we get habitat on the ground successfully?

Photo: Claudia Street (Glenn County RCD)

Creating Habitat and Biodiversity

Restoration and Research

- Installing pollinator habitat
- Habitat establishment research



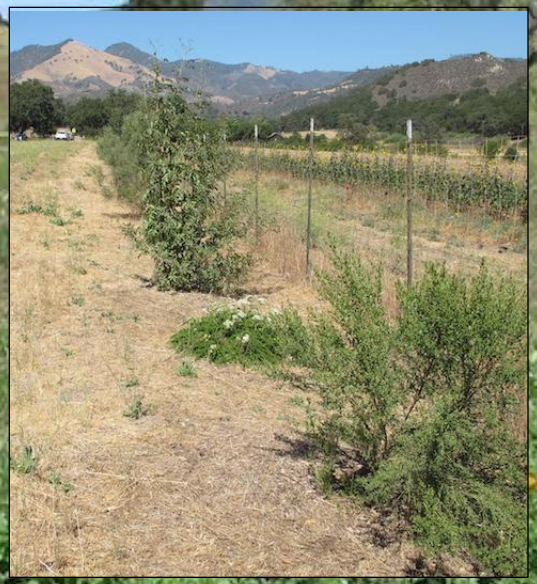
Photos: Mission RCD, Cachuma RCD, Jessa Guisse (Xerces)

Creating Habitat and Biodiversity

Diverse Organic Farm, Santa Cruz County

Creating Habitat and Biodiversity

Small Diverse Farm, Santa Barbara County



Creating Habitat and Biodiversity

Conventional Avocado and Exotic Fruit and Nut Orchard, San Diego County

Creating Habitat and Biodiversity

Conventional Almond Orchard, Merced County

Case Study: California Rangeland Planting

California Cattle Ranch

April 2010

May 2010

August 2011

Photos: Claudia Street (Glenn County RCD)

Creating Habitat and Biodiversity

Hedgerow Demonstration, NRCS Plant Materials Center, San Joaquin County

Creating Habitat and Biodiversity

Wildflower Meadow Demonstration, NRCS Plant Materials Center, San Joaquin County

Creating Habitat and Biodiversity

Wildflower Meadow Demonstration, NRCS Plant Materials Center, San Joaquin County

Benefits of Habitat and Biodiversity

Cover Crops:
Improve soil
Control dust

Riparian Habitat:
Protect waterways
Recycle water (tailwater ponds)

Banks and Ditches:
Erosion Control

Insectary Strips
Disburse habitat

Benefits of Habitat and Biodiversity

Hedgerows:

- Roadsides, field borders
- Privacy screening, windbreaks, wildlife habitat

Value of Pollinator Habitat: USDA's Organic Rule

Organic Defined by the USDA:

- "A production system that is managed…by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity" *(7 CFR 205.2)*

Organic Food Production Act, 1990

Photo: Mace Vaughan (Xerces Society)

OREGON TILTH

Tools Available to Support Growers

Farm Bill conservation programs

- EQIP, WHIP, CSP, GRP, WRP, CRP, CREP, etc

Many NRCS conservation practices can include habitat for pollinators.

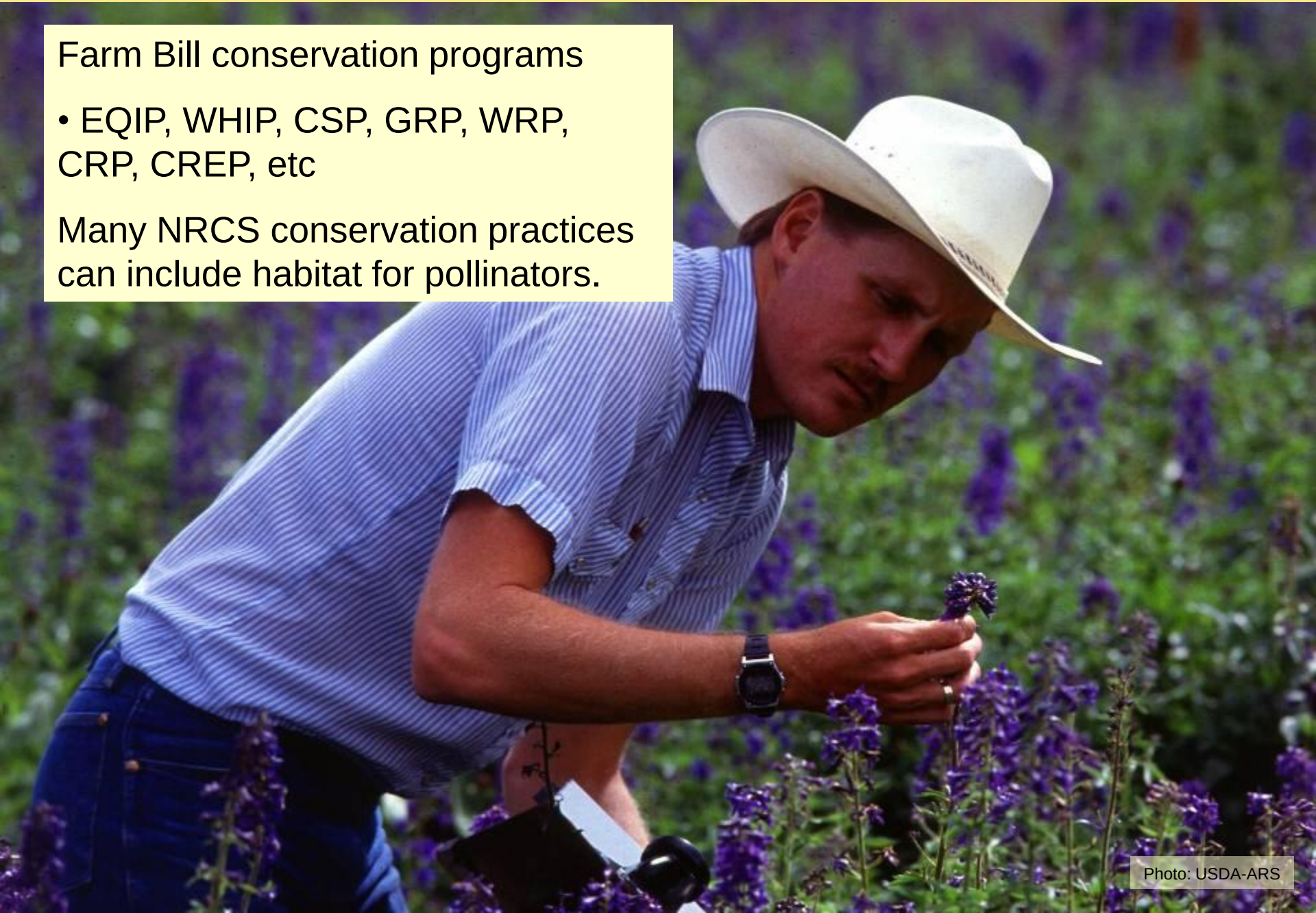


Photo: USDA-ARS

Pollinator Conservation Program: Partners

SARE Sustainable Agriculture Research & Education

UNIVERSITY OF CALIFORNIA 1868

PENNSTATE 1855

UCDAVIS UNIVERSITY OF CALIFORNIA

RUTGERS THE STATE UNIVERSITY OF NEW JERSEY

NRCS Natural Resources Conservation Service

RESOURCE CONSERVATION DISTRICTS

MICHIGAN STATE UNIVERSITY

Plant Materials Program

Agrecol® Native Seed, Plants & Restoration

FARMERS!

Cape Cod 125 years Cranberry Growers Association

UF UNIVERSITY of FLORIDA

ERNST Conservation Seeds

Cardno JFNew

Native Pollinators in Agriculture PROJECT

UMASS

UNIVERSITY of NEW HAMPSHIRE

HEDGEROW FARMS WINTERS, CA

Photo:s Mace Vaughan (Xerces Society)

Audubon

CALIFORNIA

Tricolored Blackbirds: A Central Valley Specialty

Keiller Kyle
Bird Conservation Project Manager

Audubon CALIFORNIA

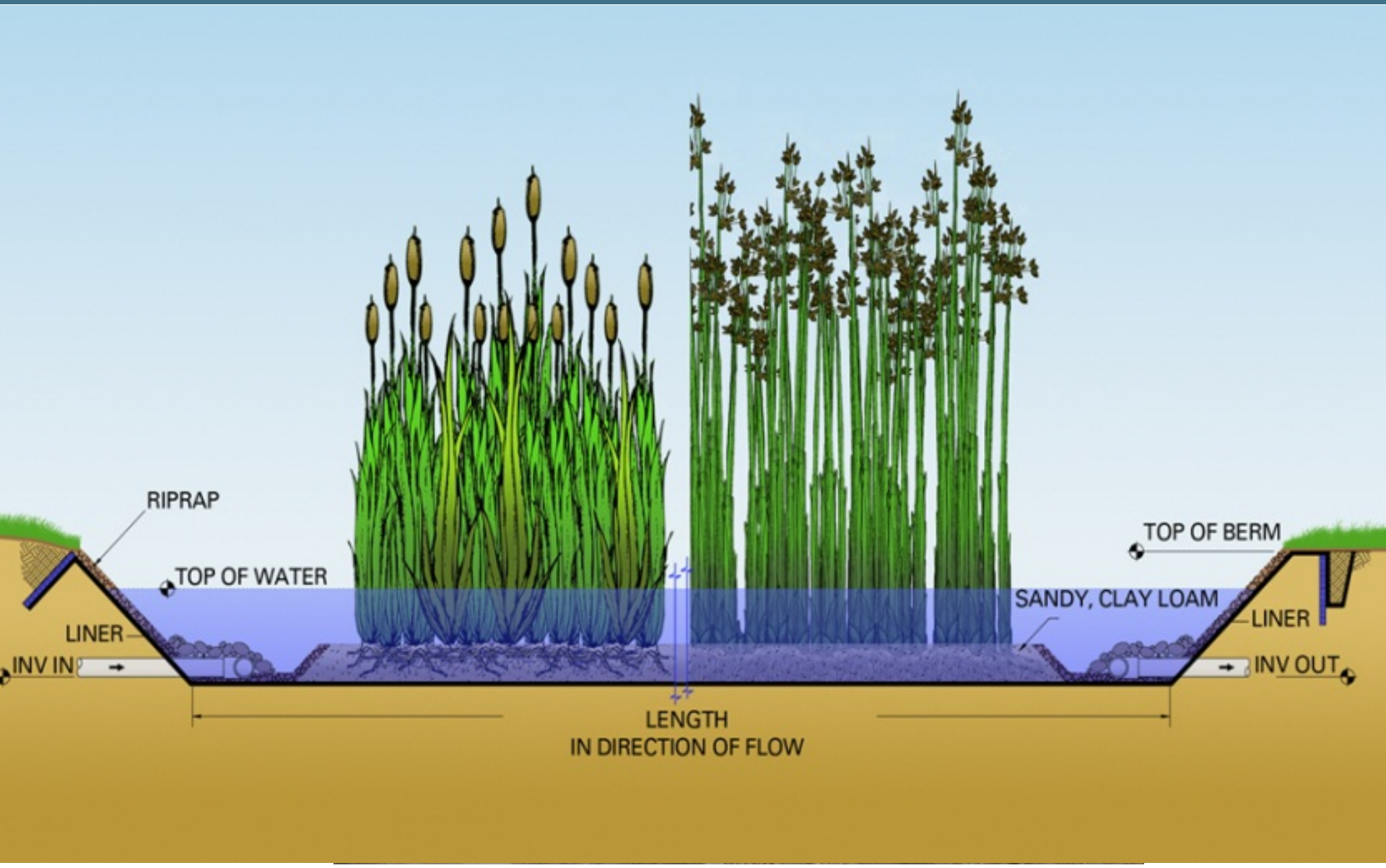
Linda Pittman


Derek Stout

Tricolored Blackbird Conservation Strategy

- Protect Tricolored Blackbird colonies that are nesting in silage fields
- Create new or enhance old habitat in crucial nesting areas

Dairy Wetlands – Habitat, Water Quality




copyright Jacob Spendelow, tringa.org

Working Waterways

Valerie Calegari

Riparian habitats support more breeding birds than any other habitat type in the western United States, even though they only make up 1% of the total land area.

Saab and Groves 1992, Knopf and Samson 1994

Water Quality

1. Trap 75-100 % sediment
2. Capture nutrients in run-off through plant uptake of nutrients
3. Promote degradation & transformation of pollutants into less toxic forms
4. Remove over 60 percent of certain pathogens from runoff

Grismer et al. 2006

UC Division of Agriculture and Natural Resources #8195

Weed Control


© 2009 Arlene Ripley

Pollination

In self-pollinating tomato plants exposed to native bee pollinators, 3X more flowers developed into fruit, and pollinated flowers developed into larger fruit.

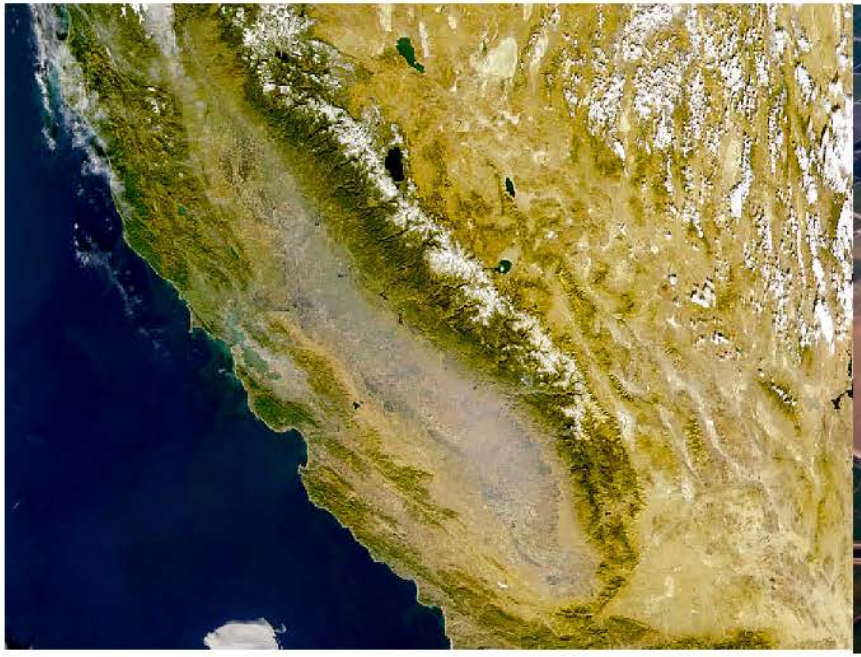
Greenleaf et al. 2006

Home for birds

California hedgerows harbor more beneficial insects than pest species


Swainson's Hawk (AZ) Copyright 2009 - Monte M. Taylor

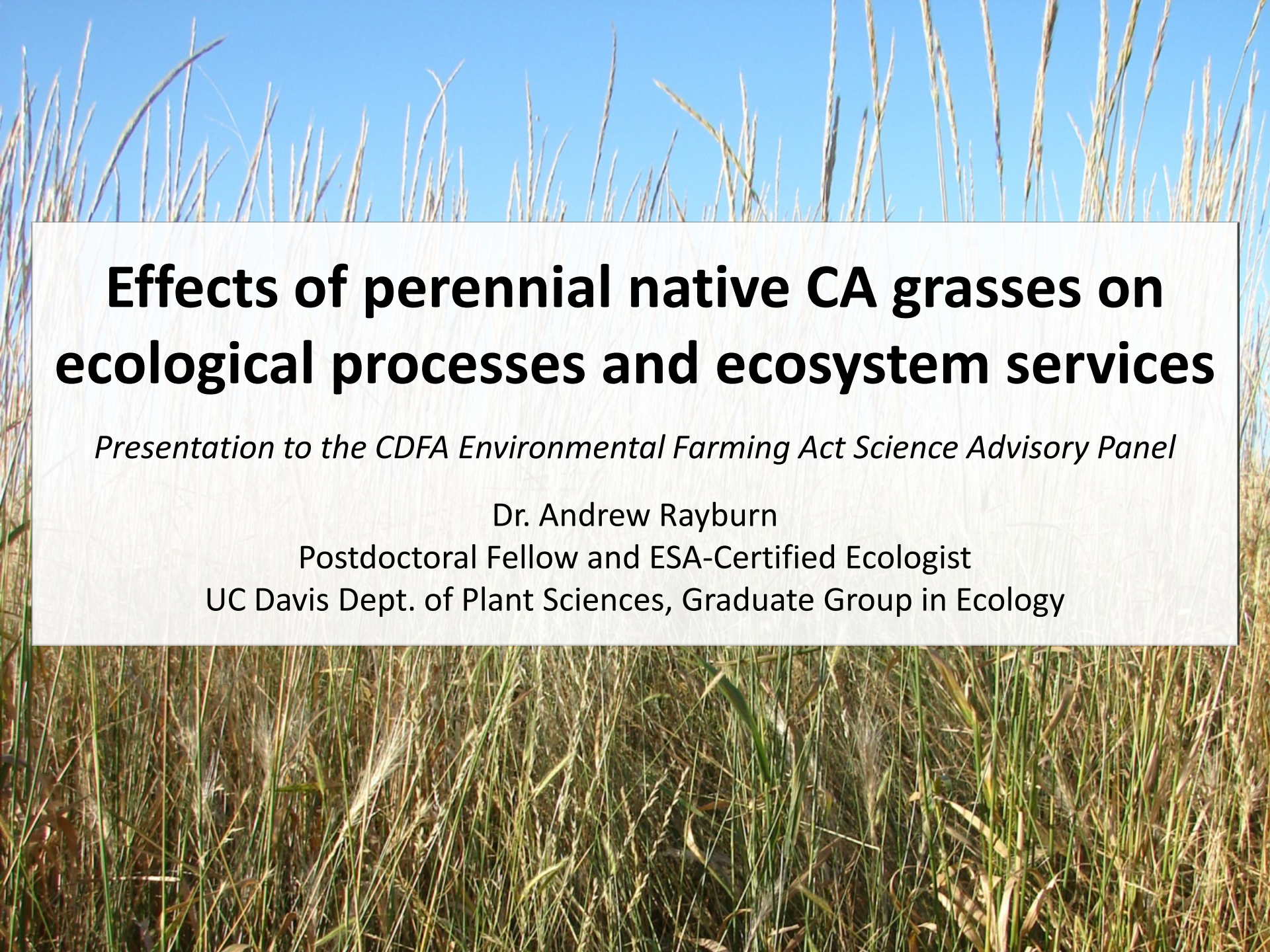
Opportunities



Audubon

CALIFORNIA

Valerie Calegari
vcalegari@audubon.org



Effects of perennial native CA grasses on ecological processes and ecosystem services

Presentation to the CDFA Environmental Farming Act Science Advisory Panel

Dr. Andrew Rayburn
Postdoctoral Fellow and ESA-Certified Ecologist
UC Davis Dept. of Plant Sciences, Graduate Group in Ecology

Perennial Native CA Grasses

- 300+ species of native CA grasses
- Vast reduction in past 200 years, replaced by exotic annuals
- Only 2% of CA grasslands contain native perennials (USDA, ARS)
- Degradation of grasslands, loss of valuable ecosystem services
- Justifies use of native grasses in conservation and restoration

www.library.ca.gov

Native grass seedlings, CA

Ecosystem services

- Ecosystem Services: natural processes and products that support human existence and enhance human well-being (Daily 1997)

- Extended by MEA (2005) to distinguish:
  - **Supporting services** (maintain conditions for humans; nutrient cycling)
  - **Provisioning services** (direct inputs to human economy; food and water)
  - **Regulating services** (flood and disease control)
  - **Cultural services** (opportunities for recreation)

www.metrovancouver.org

- Science Panel: "the multiple benefits we gain from farming and ranching including crop and livestock production”
  - open space, wildlife habitat, environmental quality, recreation, social benefits

Processes and Ecosystem Services

Native grasses influence ecological processes that in turn enhance ecosystem services with associated benefits for people

Process	Ecosystem Service	Benefit
Increased infiltration	Reduced runoff	Water storage, increased production

- **WILDLIFE HABITATS (View Image)**
  - **Provide habitats for resident and transient wildlife populations**
- **NUTRIENT CYCLING (View Image)**
  - **Provide nutrient storage and cycling**
- **FOOD, FIBER AND FUEL PRODUCTION (View Image)**
  - **Provide food, fiber, and fuel to sustain a growing global population**
- **RECREATION AND CULTURAL (View Image)**
  - **Provide opportunities for recreational activities**
- **SOIL STRUCTURE, FORMATION AND FERTILITY**
  - **Provide opportunities for enhancing the soil system, promotes organic matter buildup/carbon sequestration, and prevent disturbances**
- **BIODIVERSITY CONSERVATION**
  - **Promote biodiversity**
- **WATER CYCLING**
  - **Maintain soil moisture and regulate water movement/cycling**
- **ATMOSPHERIC GAS/CLIMATE REGULATION**
  - **Regulate atmospheric chemical composition.**
- **PEST CONTROL**
  - **Control pests and weeds by natural enemies and weed seed predators, respectively**
- **POLLINATION SERVICES (View Image)**

CA Energy Commission
California & 2012 Farm Bill
Planting Seeds: The CDFA Blog
California Agricultural Vision 2030
Invasive Pests & Diseases

Wildlife Habitat

- Grasslands provide habitat for 90% of rare California spp. (Alvarez 2011)
- Native grasses enhance wildlife habitat
  - A diverse array of mammals, amphibians, reptiles, birds
  - Forage, cover, burrowing and nesting sites
  - Direct value for people (hunting, wildlife viewing)
  - Passive uses (e.g. existence values, Kroeger et al. 2009)

www.starrranch.org

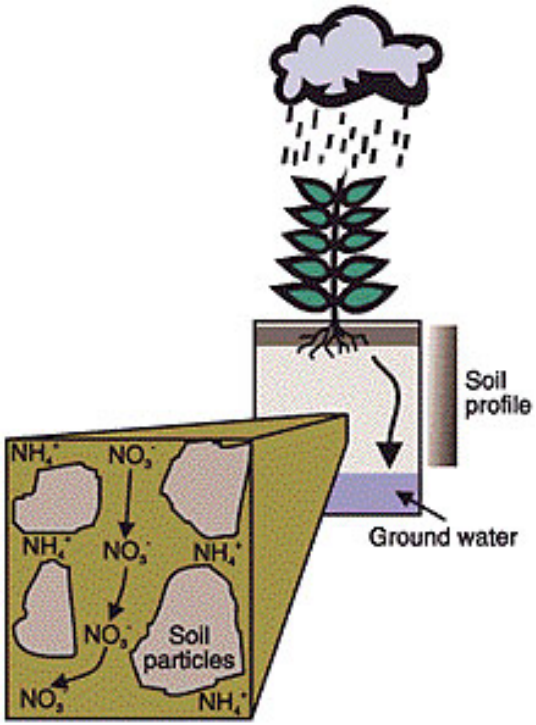
Grasshopper sparrow
www.sonoma.edu

Giant garter snake
www.californiaherps.com

White-tail kite
www.sonoma.edu

Nutrient Cycling - Nitrogen

Lower N loss (higher retention)
with native grasses *(Eviner and Chapin 2001)*
vs. annual, exotic communities



extension.missouri.edu

Nutrient Cycling - Carbon

- Loss of native grasses estimated to cause soil C losses of **7.1–21.2 tons/ac** in top 50 cm of soil (Koteen 2005, 2007)
- Addition of perennial native grasses should increase C uptake and net gains in soil C (Potthoff et al. 2005; Kroeger et al. 2009)
- At 2008 price of \$6.9 / ton CO_2, sequestering 7.1–21.2 tons C/ac through native grass addition could generate **\$49-147/ac** over decades required for uptake (Kroeger et al. 2009)

Nutrient Cycling - Carbon

If 5% of grasslands in Butte, Glenn, Shasta and Tehama counties were restored, soil C would increase by an estimated 288-865 thousand tons (1.06-3.17 million tons CO_2) (Kroeger et al. 2009)

Kroeger et al. 2009

Food, Fiber and Food Production

- Forage production in grasslands and oak savannas critical for CA livestock industry
- 34 million grazed acres of CA rangeland (Stewart et al. 2003)

Lynn Huntsinger

- Native perennial grasses should increase forage value (Dyer 2002; Bartolome 2007; Malmstrom et al. 2009)
  - Longer green period extends the foraging season
- More research needed
  - Analysis of forage impacts from perennial grass restoration*
  - Nutrient analyses of perennial grasses versus nonnative annuals*
  - Animal preference trials

Recreation and Culture

- Annual grasslands at extreme risk of fire in summer and fall
- Longer green period of native grasses reduces risk and spread of catastrophic wildfires and associated costs
- E.g. reduced flash point fires along highways (Young and Claassen 2008)

www.swrnn.com

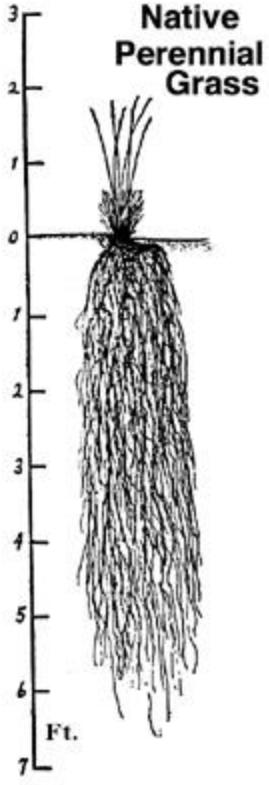
Soil Structure, Formation and Fertility

- Deeper roots help stabilize soil and reduce erosion by wind and water
- Native grasses often used in land-scaping, roadside stabilization, critical area reclamation

Native grass sod for erosion control
dot.ca.gov

Water cycling

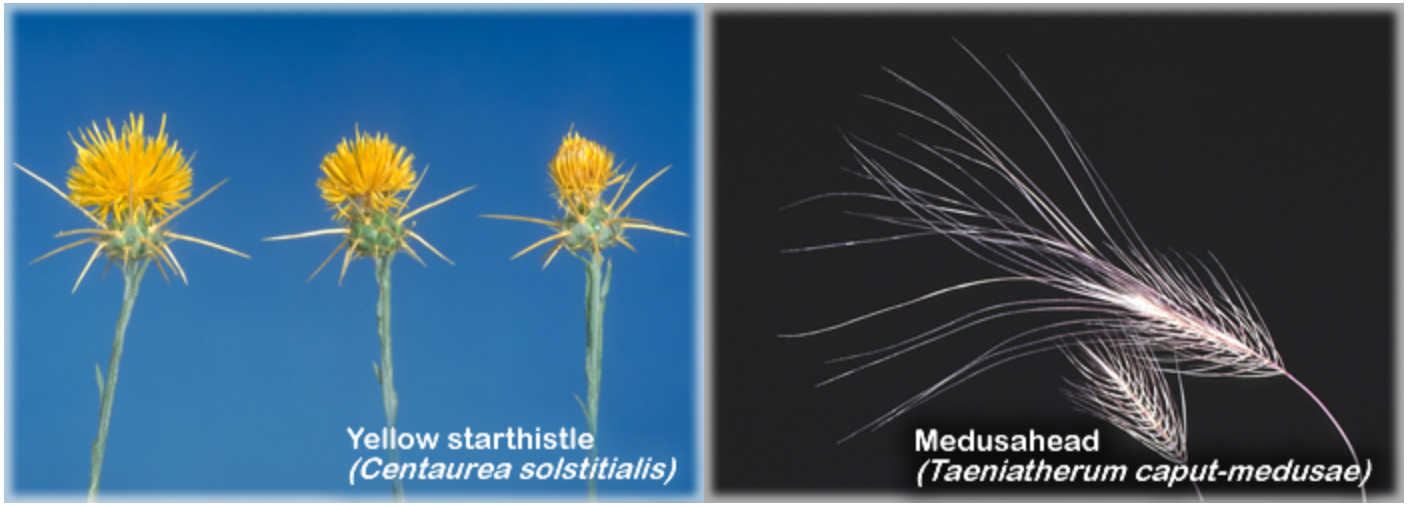
- Deep native grass roots increase infiltration
  (CNGA, Mondeshka et al. 1988; Van Noordwijk et al. 1991)
  - Deeper roots aerate soil, creating pockets and pores for water infiltration and storage
  - Potential interactions with SOM
- Little if any actual rate data from CA
- Additional research needed to understand perennial grass effects on infiltration*



www.sonoma.edu

Pest Control

- Research has shown that more diverse plant communities are often more resistant to weed invasion
  - Basic mechanism
- Native grasses may compete strongly with functionally similar weeds (e.g., yellow starthistle; Young and Claassen 2008)



Insect Habitat and Pollination Services

Native grasses enhance insect habitat

- California oatgrass (*Danthonia californica*)
  - Eaten by caterpillars of skipper butterflies (Robinson et al. 2007; plants.usda.gov)
  - Important component of habitat for other vulnerable and endangered butterflies (Chappell 2006, Collins 2006)

- Hedgerows with native grasses benefit pollinators (Morandin 2011) and birds (White et al. in press)*

ucanr.org

Restoration Research at UC Davis

- Developed and funded (USDA) in response to stakeholder concerns over the high cost and limited success of rangeland restoration efforts in California

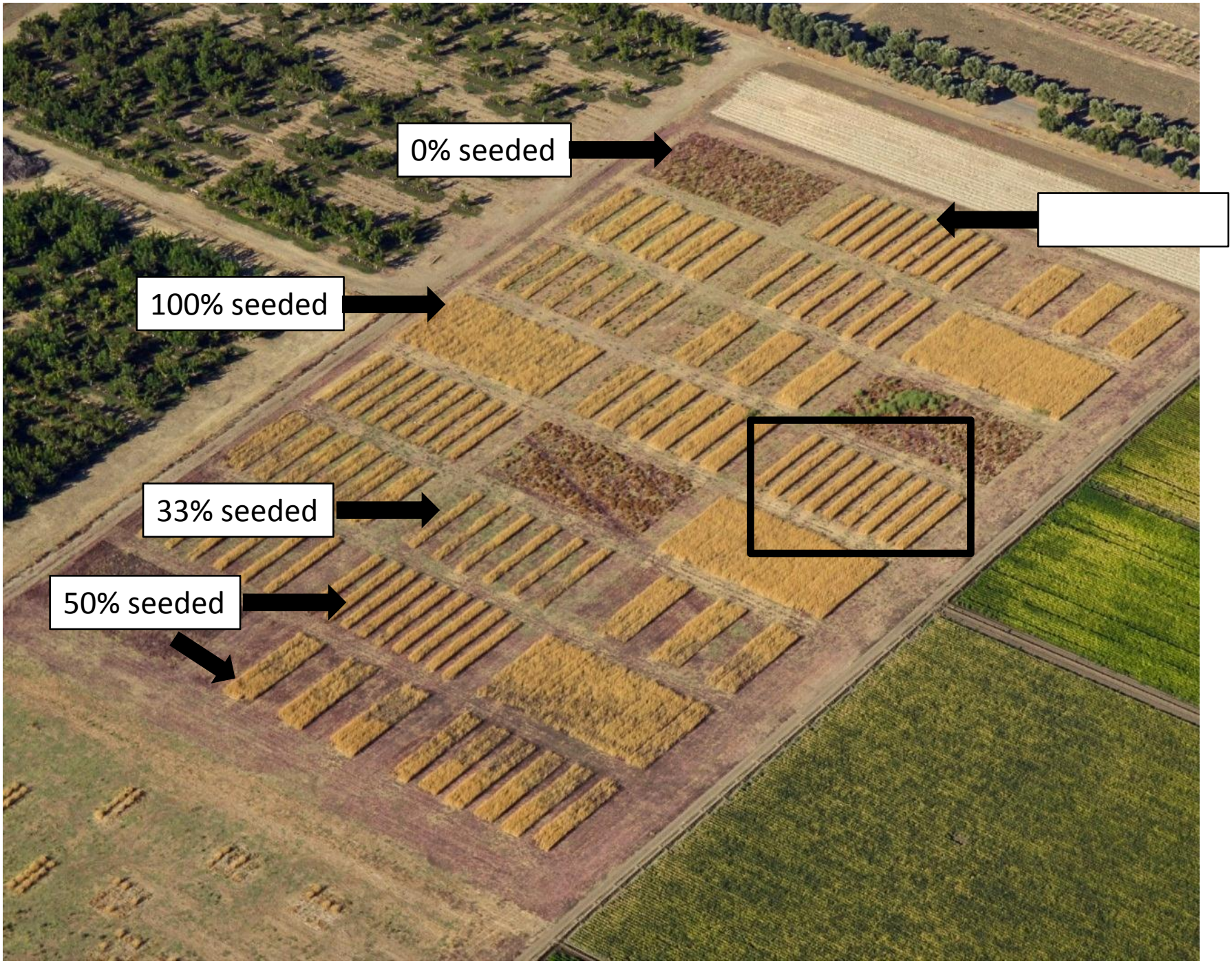
- We seek to:
  a) quantify effects of past restoration efforts on ecological processes and ecosystem services in cost:benefit framework
  b) test novel, cost-effective methods of restoration based on spatial theories of vegetation dynamics and precision agriculture

Restoration Effects on Ecosystem Services

- Goal: quantify effects of past restoration efforts on ecological processes and ecosystem services in cost:benefit framework
- In paired restored (native) and unrestored (exotic annual) grasslands, we measure:
  - Native and exotic plant diversity
  - Forage quality, production and utilization
  - Soil C and N
  - Infiltration
  - Seed bank composition
  - Arthropod diversity (above and below-ground)
- Translate differences into ecosystem services (benefits)
- Compare restoration costs to benefits

Strip-seeding: Cost-effective Restoration

- Goal: test novel, cost-effective methods of restoration based on spatial theories of vegetation dynamics and precision ag
- Strip-seeding: plant some fraction of total field area to concentrate effort, increase establishment, and reduce cost
  - Targeted restoration to minimize cost:benefit ratios
- Manage seeded and unseeded areas to facilitate spread of natives
- Cost:benefit analysis
- Primary site near UC-Davis, others being established at land preserves and wildlife refuges


0% seeded
100% seeded
33% seeded
50% seeded

Conclusion

- Native California grasses enhance the provision of many valuable ecosystem services
- Ongoing research seeks to quantify effects to inform payment-for-ecosystem service markets
- Contact Andrew Rayburn (aprayburn@ucdavis.edu) for more information

The Blue Orchard Bee as a Commercial Crop Pollinator

Steve Peterson
AgPollen LLC
Waterford, CA

Osmia lignaria

- Commonly called the blue orchard bee or the orchard mason bee
- Native to North America
- One generation per year
- Solitary (not social)
- Nests in pre-existing holes in wood
- Will nest near other nesting females
- Does not make honey or wax

Biology

- Pollen gathered is the food source for offspring
- Sex ratio: 2 males for every female
- Unfertilized eggs become males
- Females do all the pollinating
- Pollen is carried dry on the underside of the abdomen
- Nectar is used by the adult and mixed with pollen for the offspring

Nesting

- Mud is used for partitions between cells and to cap the hole
- A female can live up to 6 weeks and lay up to 32 eggs
- On a good day, she can construct one cell and lay an egg
- One pollen load usually requires 75 flower visits
- One cell takes 15-35 loads
- One cell represents 1,875 flower visits


BOB Nest in a Reed
Old cocoon
mud
pollen
egg
males

Pollination

- Every female collects pollen on every trip
- They are hairier than honey bees and more efficient at pollination per bee
- Fly at cooler temperatures than honey bees
- Studies have shown that 300 nesting females will pollinate an acre of apples or cherries

Stinging

- Blue orchard bee females have a stinger but rarely use it
- Her stinger is not barbed, so she doesn’t die after stinging
- Not as painful as a honey bee if it happens
- No protective gear is needed when working with blue orchard bees

Wintering

- Overwinter as adults inside the cocoon
- Our population originated in Utah
- These bees need a long wintering period (6 months)
- By pushing development in the summer, we begin wintering in mid-August so they are ready to emerge in February

Crops Pollinated

- Apples
- Pears
- Cane berries
- Cherries
- Plums
- Almonds


01/27/2011


02/22/2011


03/14/2011

With Honey bees

- Blue orchard bees work well with honey bees
- Recent studies show that honey bees move more between rows when blue orchard bees are present
- Blue orchard bees have their own pests and diseases and none are found in honey bees


02/23/2011


02/28/2011


03/07/2011


03/11/2011


SCHMEISER
10/12/2011


04/02/2012


04/02/2012


04/02/2012

Pesticides in Almond Pollen 2011

Compound Name	Trade Name	Type	PPB
Acetamiprid	Assail	insecticide	30.5
Carbendazim	Benomyl	fungicide	8.3
Cyhalothrin	Karate	insecticide	1.2
Imidacloprid	Admire, Gaucho	insecticide	3.8
Thiacloprid	Alanto, Bariard	insecticide	15
THPI	Captan (metabolite)	fungicide	352

Pesticides in Almond Pollen 2012

Compound Name	Trade Name	Type	ppb
Boscalid	component of Pristine	fungicide	233
Carbendazim (MBC)	Benomyl	fungicide	5.3
Chlorpyrifos	Lorsban	insecticide	2.5
Cyprodinil	Vangard	fungicide	18.2
Fenbuconazole	Indar	fungicide	16.2
Methoxyfenozide	Intrepid	insecticide - IGR	6.3
Pendimethalin	Prowl	herbicide	32
Pyraclostrobin	component of Pristine	fungicide	88

Conclusions

- The blue orchard bee is well suited for management as a pollinator of several important fruit and nut crops in California
- Planting native wildflowers may help improve establishment and reproduction orchards
- We need to understand the effects of sublethal doses of pesticides on larvae and adult behavior

Performance-Based Conservation Incentives in the Pajaro Valley: Lessons from a public-private partnership

Nik Strong-Cvetich

Program Development Manager
RCD of Santa Cruz County
November 8th, 2012

RESOURCE CONSERVATION DISTRICT OF SANTA CRUZ COUNTY

Introduction

- A 2-year+ pilot project looking at performance-based incentives in the Pajaro Valley
- Resource Conservation District, Driscoll's and Sustainable Conservation
- Funded by CDFA Specialty Crop Block Grant

RESOURCE CONSERVATION DISTRICT OF SANTA CRUZ COUNTY

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

Sustainable Conservation

Driscoll's ONLY THE FINEST BERRIES™

Resource Conservation District of Santa Cruz County (RCDSCC)

Watershed Restoration and Protection

Stewardship in Agriculture

Local Solutions. Real Results.

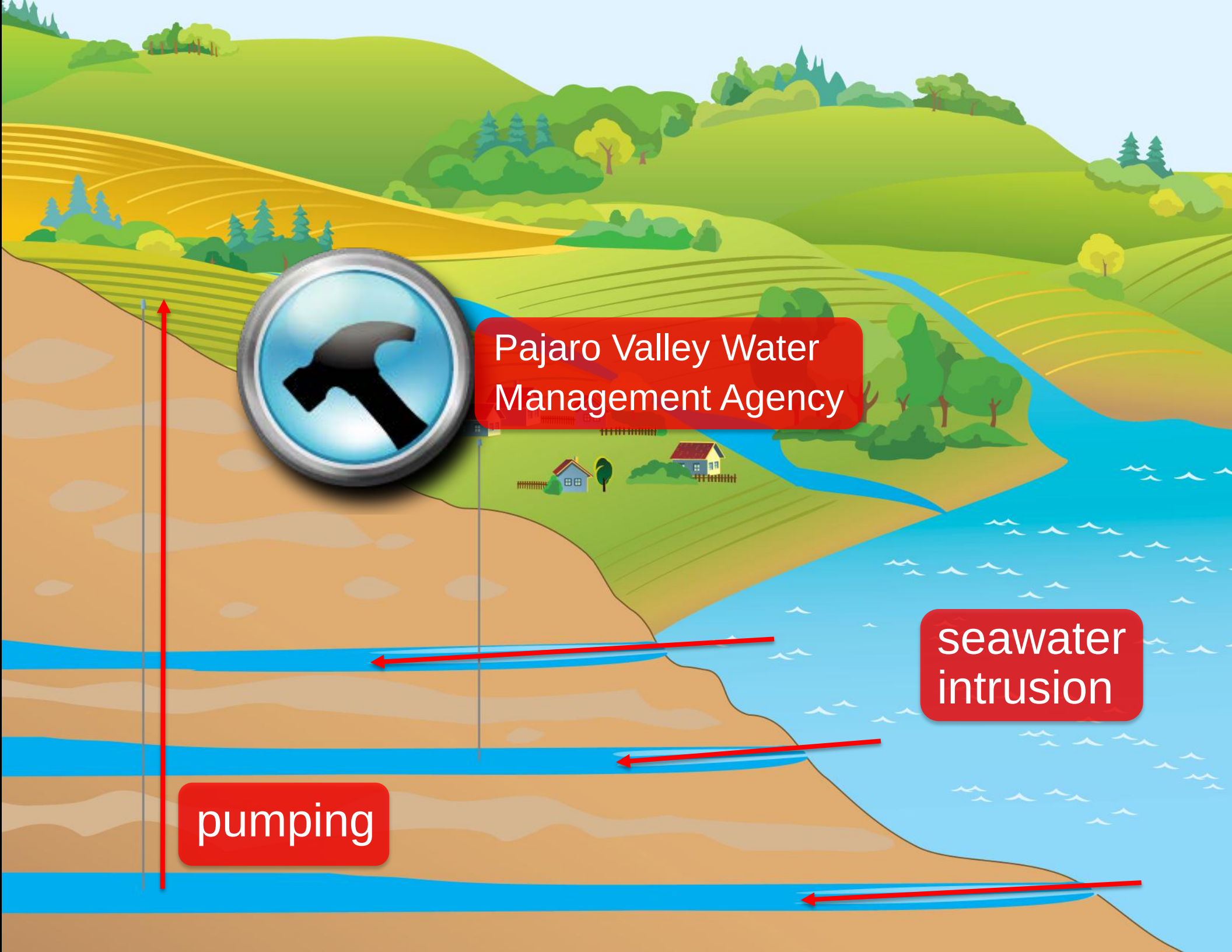
What are the challenges?

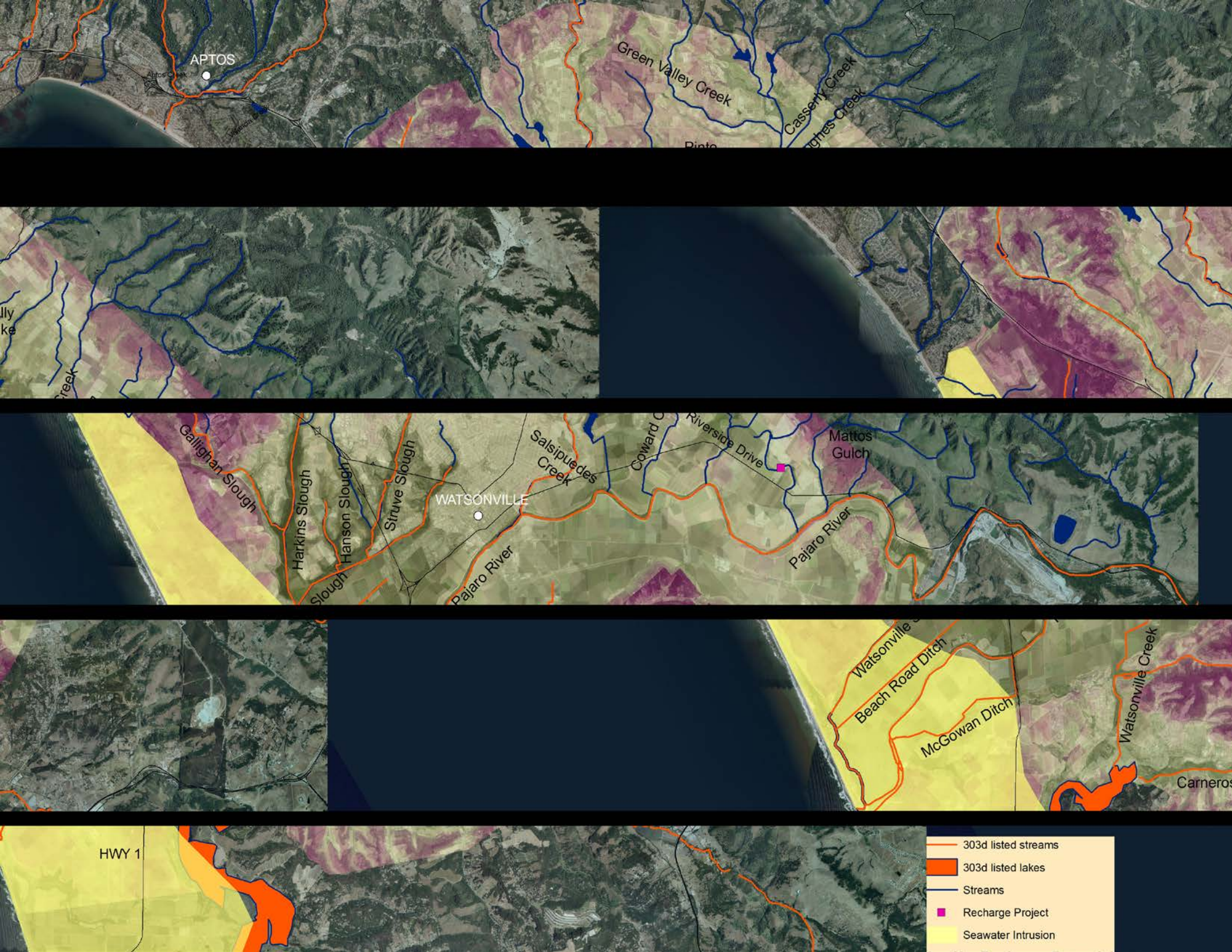
Water Supply

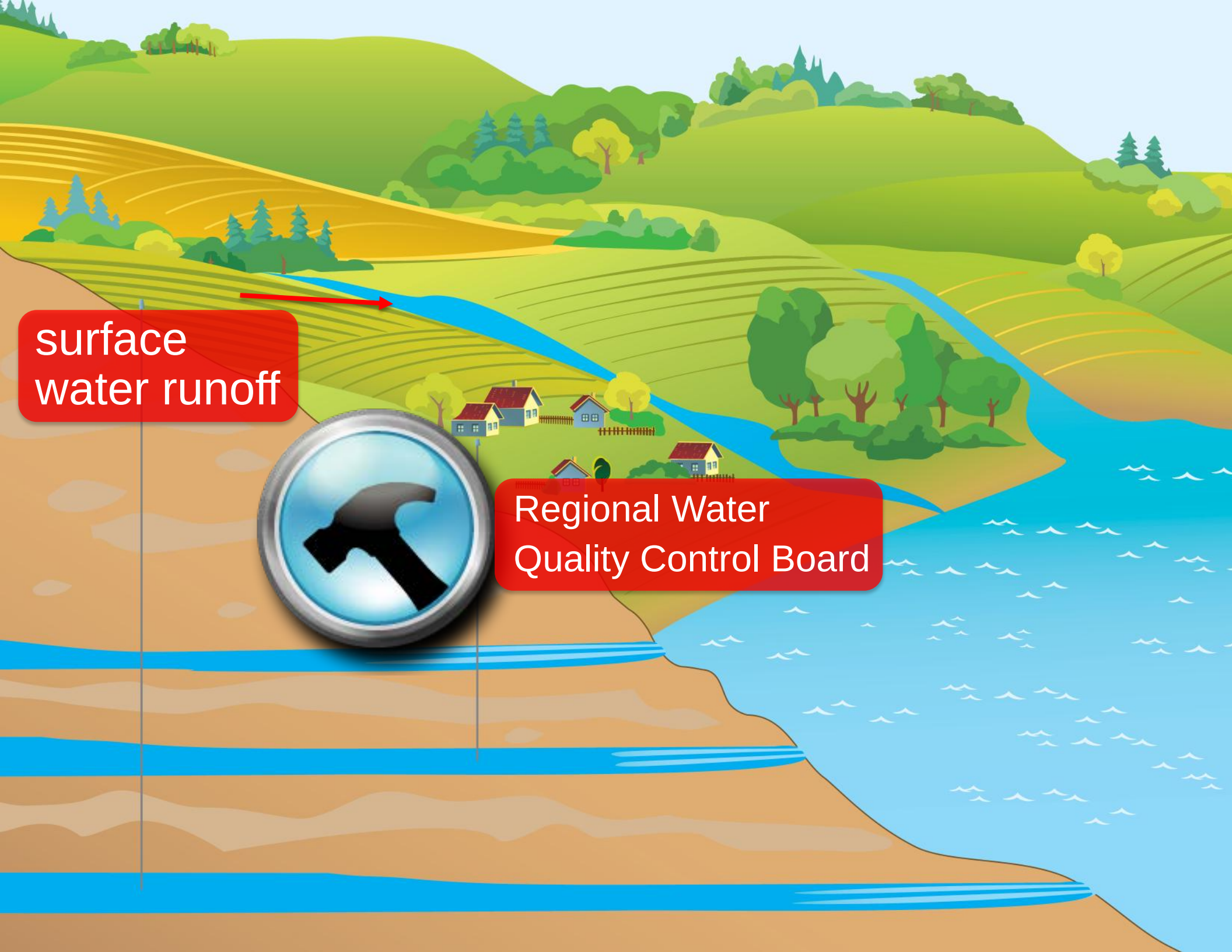
- Aquifer overdraft and resulting saltwater intrusion

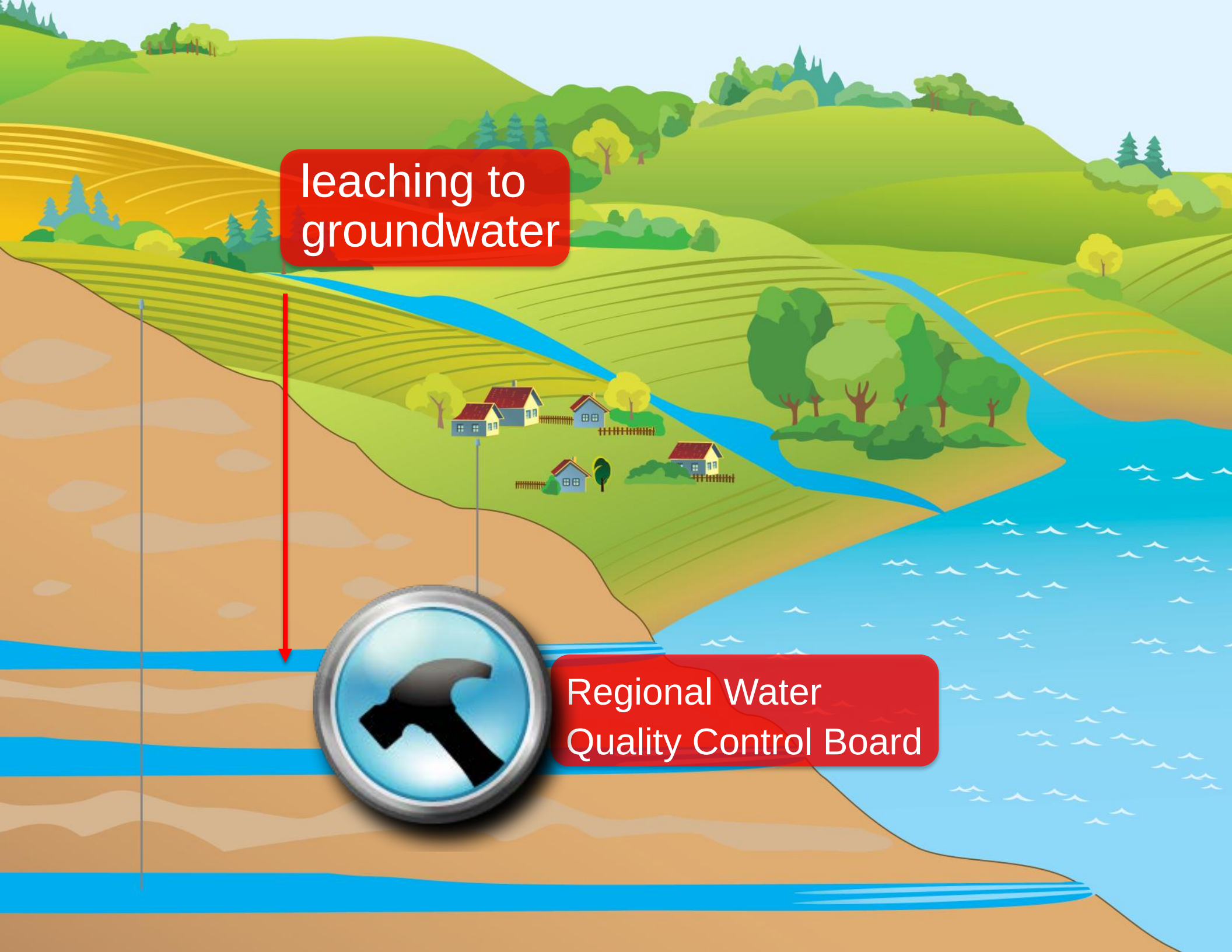
Water Quality

- Nitrate contamination in ground water and surface water

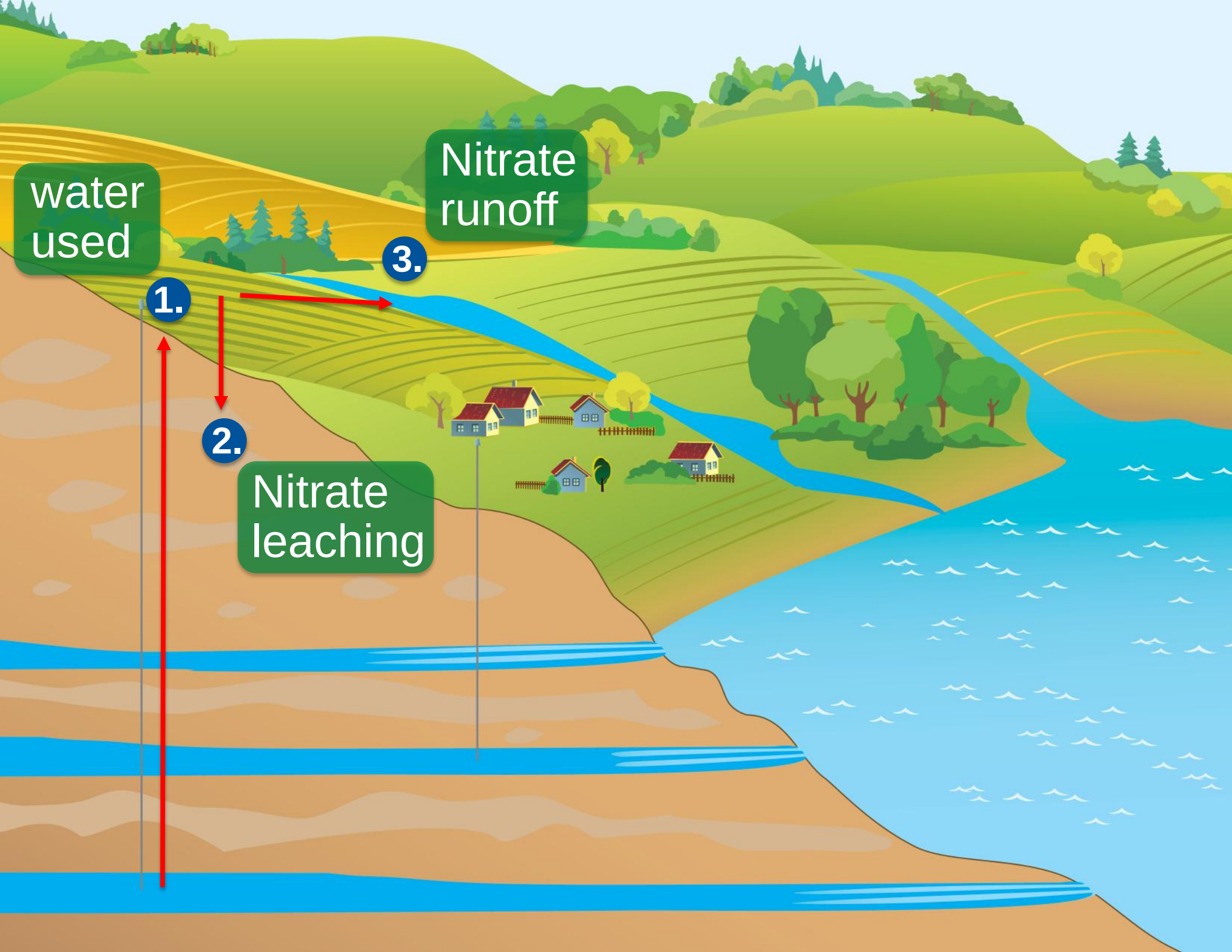

Pajaro Valley Water Management Agency
seawater intrusion
pumping

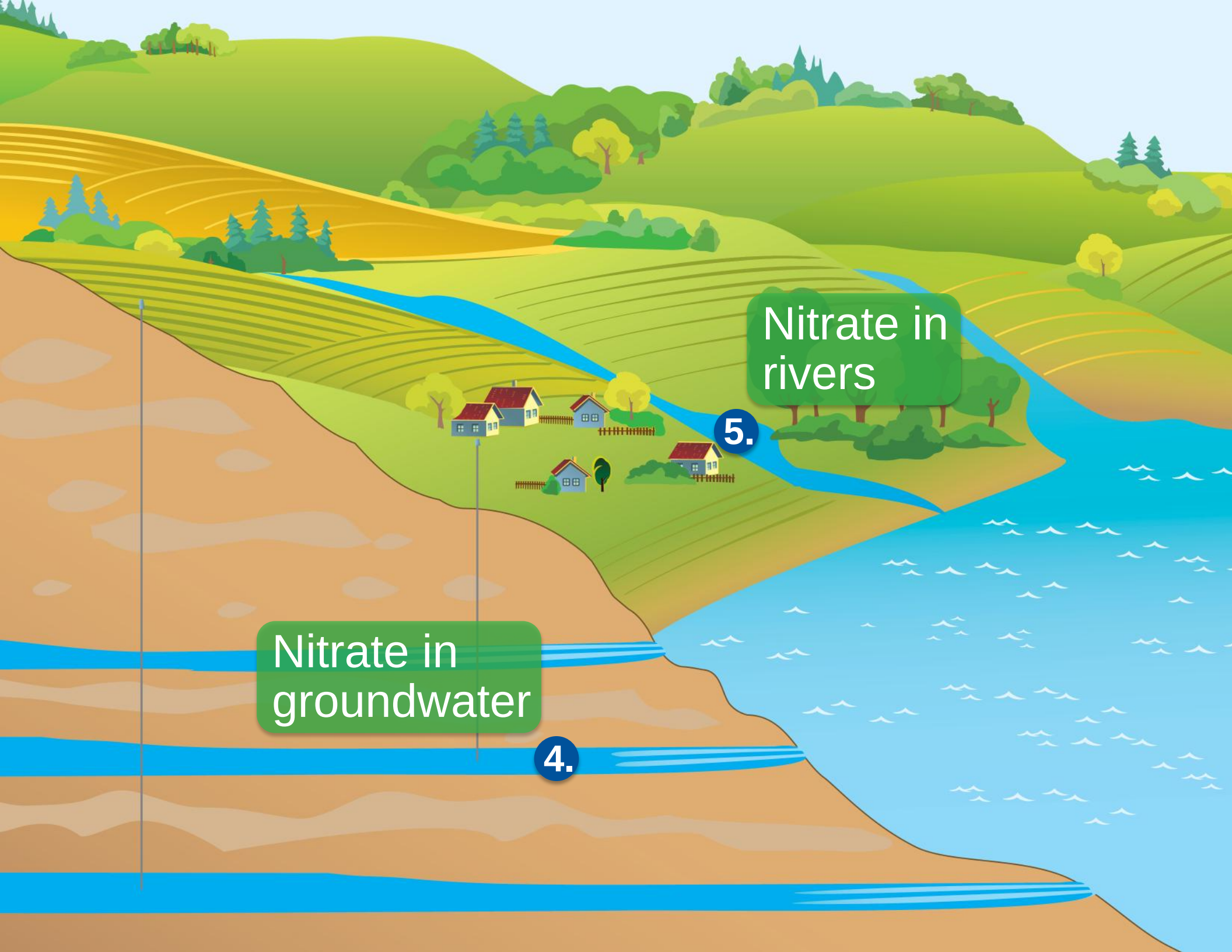

APTOS
Green Valley Creek
Casserly Creek
Pinto
Galligan Slough
Harkins Slough
Hanson Slough
Struve Slough
Slough
WATSONVILLE
Salsipuedes Creek
Coward
Riverside Drive
Mattos Gulch
Pajaro River
Pajaro River
Watsonville
Beach Road Ditch
McGowan Ditch
Watsonville Creek
Carneros
HWY 1
303d listed streams
303d listed lakes
Streams
Recharge Project
Seawater Intrusion


surface
water runoff
Regional Water
Quality Control Board


leaching to groundwater
Regional Water Quality Control Board

Why Performance-based Incentives?


water used
1.
2.
Nitrate leaching
3.
Nitrate runoff

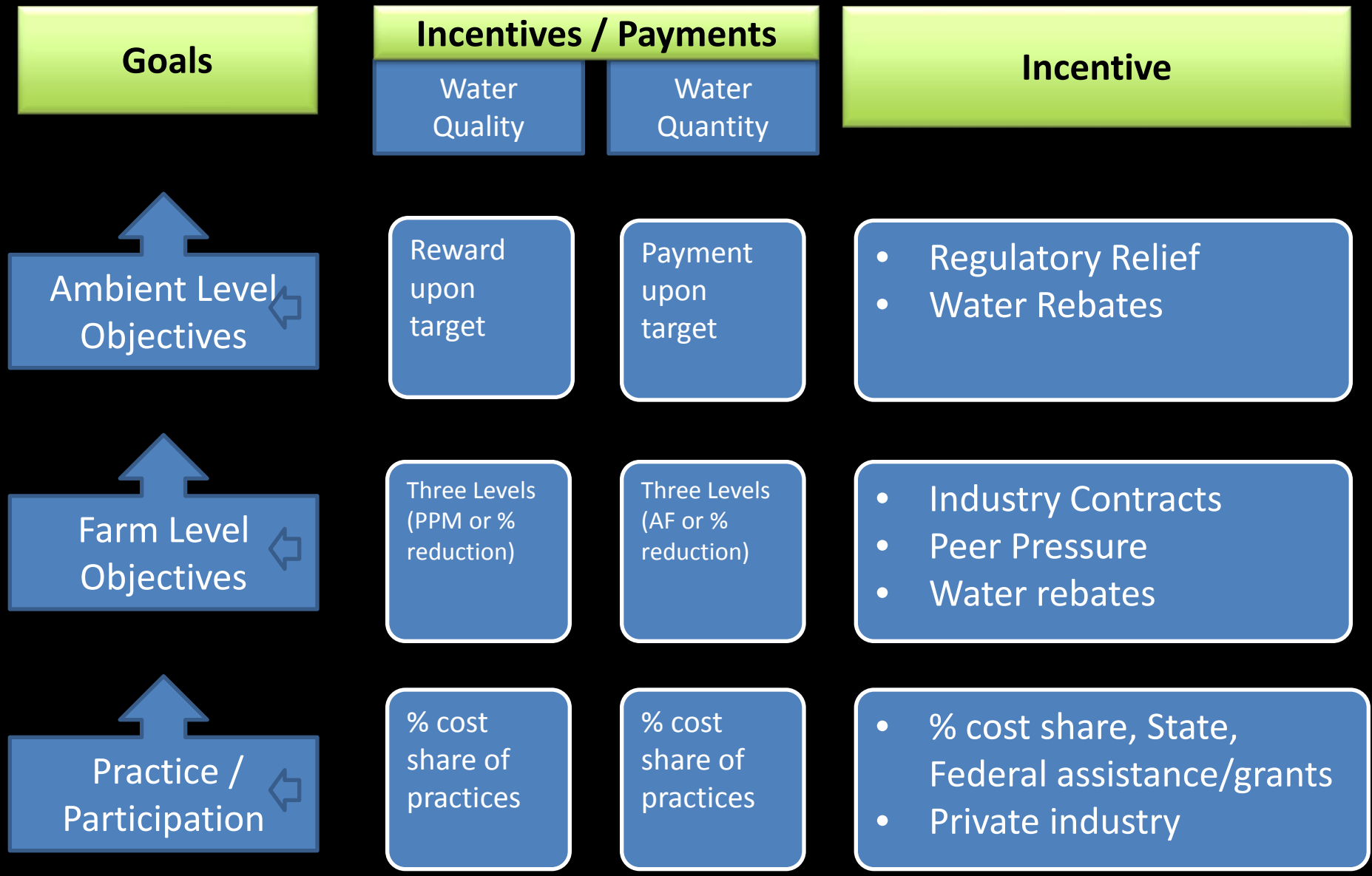

Nitrate in rivers
5.
Nitrate in groundwater
4.

Performance-based Conservation Incentive Structure

Range of Incentives

- Cost share for practices
- Peer to peer pressure
- Direct payments
- Industry contracts
- Water rebates
- Regulatory relief

Performance-based Conservation Incentive Structure



Regulatory relief as incentive

- RWQCB Ag Order places growers in 3 tiers based on risk.
- Similar sustainability certifications allow growers to be placed in the lowest tier.
- If growers demonstrate third party-verified performance on water quality targets, they can move tiers.

Water rates/rebates as incentives

- PVWMA will be evaluating tiered price structure.
- Can further enhance conservation efforts by rewarding performance.
- Independent verification needed.

Public Private Partnership

Lessons Learned…

- Incentives can be more than cash…
- Agriculture is extremely complicated, even more so on the Central Coast…
- To correctly reward performance, it must be precisely measured…

Next Steps

- More research with more farms participating
- Adoption of Incentives Policies
- Regional Expansion
- Expansion to New Industries


Questions?
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