A photograph of a lush green forest. In the foreground, there are various trees, including a prominent one with reddish-brown bark. The background shows a misty, mountainous landscape under a grey sky. The text is overlaid on the lower half of the image.

*You did not weave the web of life, you are merely a strand in it. Whatever you do to the web, you do to yourself. You may think you own the land. You do not. It is God's. The earth is precious to God and to harm the earth is to heap contempt upon its creator. – ?*

# IPM

## Integrated Pest Management

Steven Swain

Environmental Horticulture Advisor  
UCCE Marin & Sonoma Counties



# Chief Sealth (Seattle)

~ 1786 – 1866

Spoke in Lushootseed  
language, translated into  
Chinook Indian Trade  
language and then into  
English

Pled for Native American and  
Environmental rights  
...but nothing written down.

*Quote: Ted Perry (1971)  
Hollywood  
as: Chief Seattle (1854)  
Washington*



# IPM has a long history

- Two of the four horsemen:
  - Pestilence
    - Ignis sacer (St. Anthony's fire)
      - Gangrenous ergotism
      - *Claviceps purpurea*
      - Hallucinations: LSD
  - Famine
    - Irish potato famine
      - *Phytophthora infestans*
    - Prehistoric famines recorded in bones





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# Cottony cushion scale on citrus

- Biological control vs. IPM
- Problem emerged in California in 1880's
  - *Icerya purchasi*
    - (Not native)
  - Desperate growers cutting and burning trees
  - Orchard land values plummet
- Vedalia beetle introduced winter of 1888-89 (514)
  - *Rodolia cardinalis*
  - Australian
  - Amazingly fast recovery
    - Defoliated orchards on brink of bankruptcy in March had full harvest in August
  - Redistributed ~11,000 beetles by June 12, 1889



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# Pesticide Impact

- DDT use functionally eliminated vedalia from central valley (1950's)
  - 3 years for re-establishment
  - \$1/beetle
- IGR's used on California red scale (molt inhibitor)
  - *Aonidiella aurantii*
  - IGR kills cushion scale slowly, at applied concentration
  - IGR kills vedalia quickly at much lower concentration
  - CCS outbreaks severe on neighboring orchards in 1999
  - Malathion for control
  - > 9 month recovery

# Most important paper of 20<sup>th</sup> century (?)

- Hilgardia 1959 (29)  
81:101
  - Stern, Smith, van den Bosch, Hagen
- Founding of “IPM”
- Rachel Carson
  - Silent Spring 1962

# HILGARDIA

*A Journal of Agricultural Science Published by  
the California Agricultural Experiment Station*

VOLUME 29

OCTOBER, 1959

NUMBER 3

## **THE INTEGRATION OF CHEMICAL AND BIOLOGICAL CONTROL OF THE SPOTTED ALFALFA APHID**

### **The Integrated Control Concept**

**Yves M. Stern, Roy F. Smith, Robert van den Bosch,  
and Kenneth E. Hagen**

### **Field Experiments on the Effects of Insecticides**

**Yves M. Stern and Robert van den Bosch**

### **Impact of Commercial Insecticide Treatments**

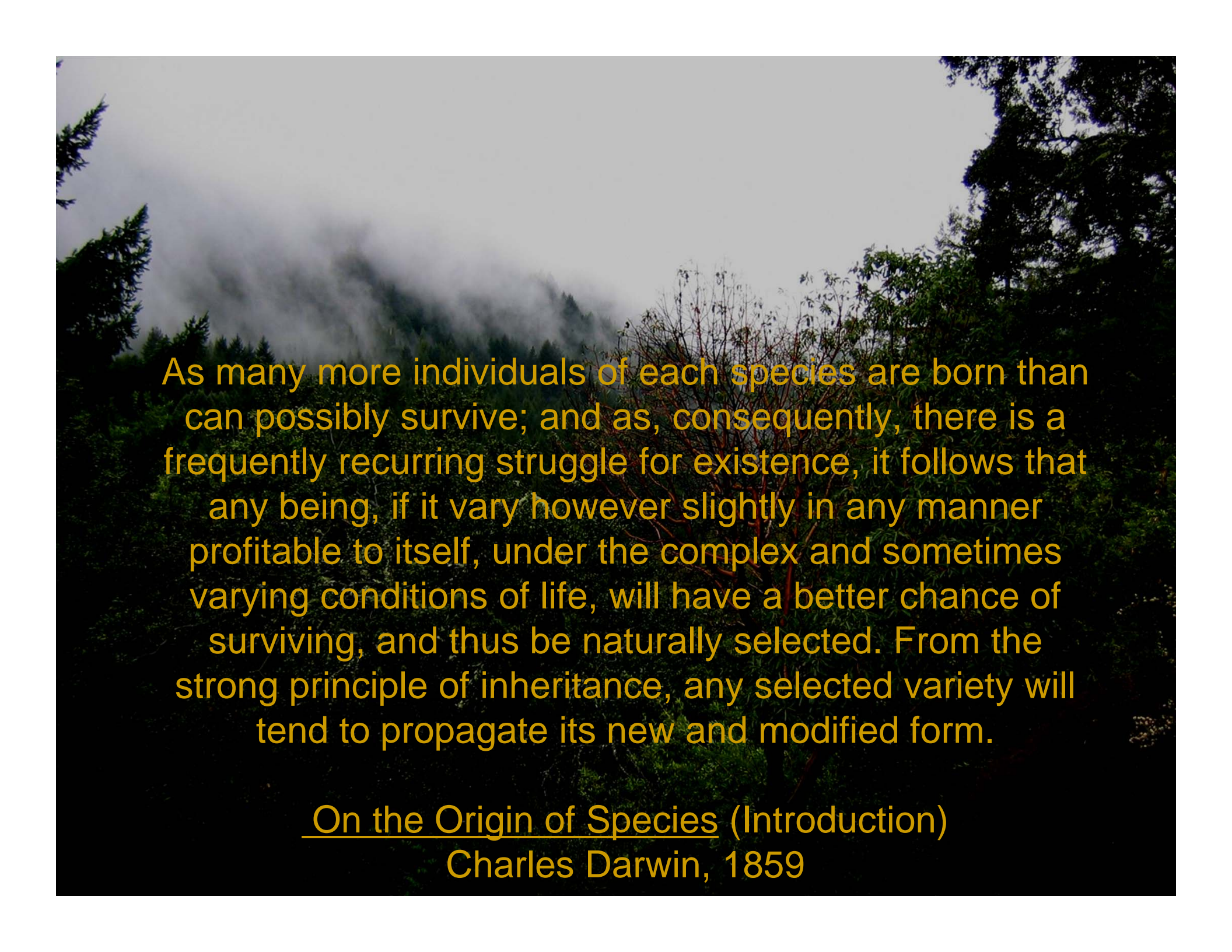
**Roy F. Smith and Kenneth E. Hagen**

UNIVERSITY OF CALIFORNIA • BERKELEY, CALIFORNIA

# Original goal: resistance management

EIT: Economic Injury Threshold  
AIT: Aesthetic Injury Threshold



A photograph of a dense forest with a misty or foggy atmosphere. The trees are mostly green, and the sky is overcast and grey. The text is overlaid on the image in a yellow font.

As many more individuals of each species are born than can possibly survive; and as, consequently, there is a frequently recurring struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be naturally selected. From the strong principle of inheritance, any selected variety will tend to propagate its new and modified form.

On the Origin of Species (Introduction)

Charles Darwin, 1859

# Original goal: resistance management

EIT: Economic Injury Threshold  
AIT: Aesthetic Injury Threshold



# ***IPM tools and techniques***

- Synergy**



## **Prevention**

**Physical/  
mechanical**

## **Cultural practices**

## **Biological control**

## **Pesticides, only if needed**

**Monitor to detect and assess problems**

**Use least-toxic materials**

# What exactly is a Pesticide?

EPA: A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.



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# **When are pesticides needed?**

**When pests are causing intolerable damage**

**Non-chemical methods aren't effective**

**How to know?**

**Identify your pest**

**Assess the problem**

**Research and consider alternatives**

# Does IPM = organic?

- IPM

- “Least toxic” approach
- Based on knowledge of
  - pest
  - biology
  - habitat
- Right plant, right place
- Emphasis on prevention
- Pesticides limited
  - Synthetics allowed
    - Low toxicity
    - Degrade slower
      - » Bio
      - » Photo
      - » Thermo
- A technique

- Organic (pest mgmt.)

- “Natural” approach
- Based on knowledge of
  - pest
  - biology
  - habitat
- Right plant, right place
- Emphasis on prevention
- Pesticides limited
  - No synthetics
    - Natural = rapidly biodegradable
    - Highly toxic?
- A legal classification

# IPM/Organic overlap

IPM, non-organic:  
Effective control  
achieved using  
synthetic (and  
potentially  
non-sustainable)  
inputs

Overlap: effective  
control using  
organically approved  
methods

Organic, non-IPM:  
Ineffective control  
or  
Control at high  
environmental or  
safety costs  
(non-sustainable)

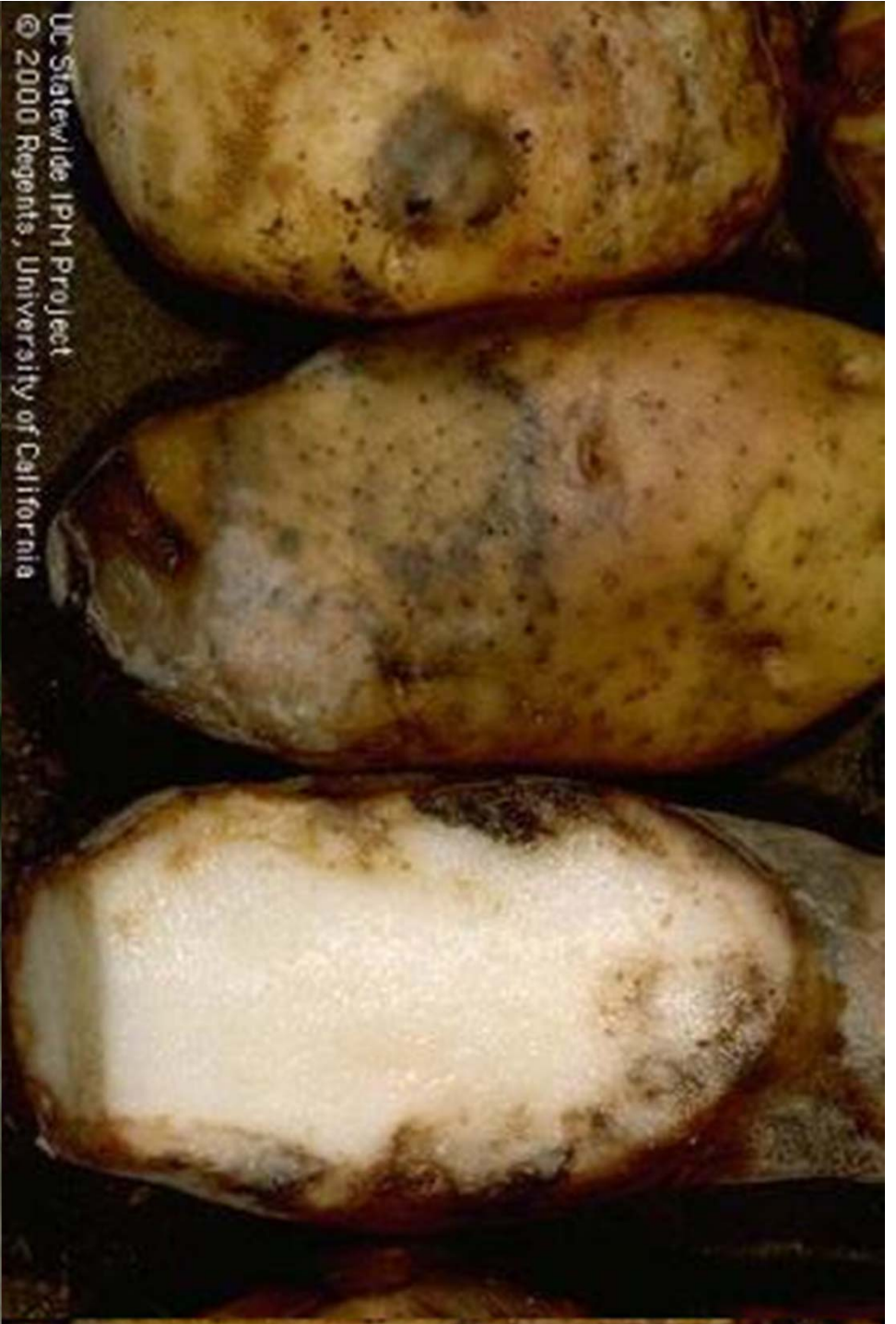
# Sustainability: The 3 E's

- Ecological
  - Does it cause lasting damage to the biological systems on which it's based?
- Economic
  - Can it be done profitably?
- Equitable
  - Is the system unjust to others?

# 2009 east coast tomato and potato failure

- Late blight
  - *Phytophthora infestans*
  - Afflicts
    - Tomatoes
    - Potatoes
    - Others in Solanaceae
- In a well-managed farm:
  - Typically shows up late in the season
  - More of an annoyance than a problem
  - Organics: manageable

UC Statewide IPM Project  
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## When it's not so well managed ...

- Poor quality control at one (?) big nursery
  - Thousands of infected tomato starts
  - Small gardens > farms
    - 36 million gardens 2008
    - >43 million as of Aug 2009
    - Not a lot of education
    - Pathogen can travel 40 mi
  - Early start to late blight
  - Impact on tomato and potato crops:
    - Conventional: barely manageable
    - Organic: crop loss

Thanks!

- UC IPM: <http://www.ipm.ucdavis.edu/>
- Presentation on-line at:
  - <http://ucanr.edu/MarinIPM>
- Steven Swain: [svswain@ucanr.edu](mailto:svswain@ucanr.edu)  
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