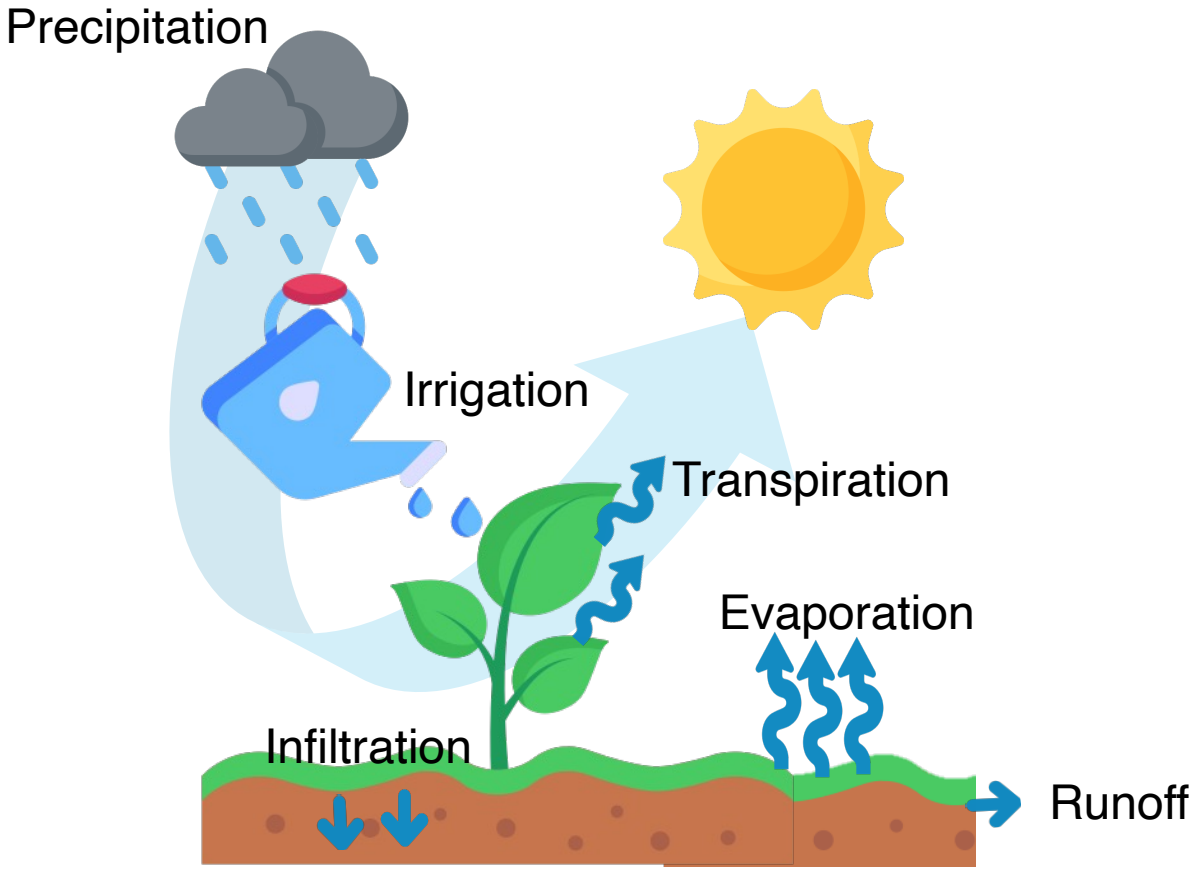
UC CE | UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources | Cooperative Extension

Best Practices for Efficient Irrigation and Water Quality

Laura Garza, Ph.D.
Water and Climate Change advisor
UC Cooperative Extension
Mendocino and Lake Counties

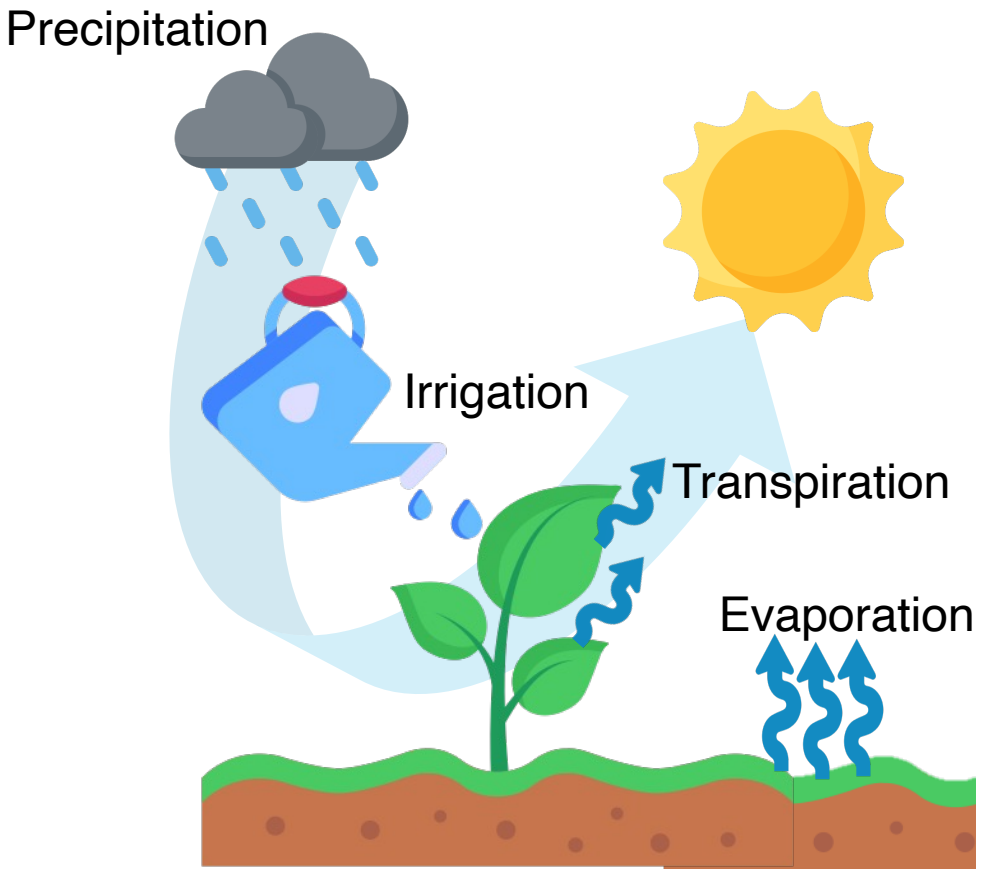
WATER BUDGET



The water budget is a way to measure how much water enters and leaves an area.

WATER BUDGET

Irrigation



Evapotranspiration (ET)

Loss of water through
Evaporation + Transpiration

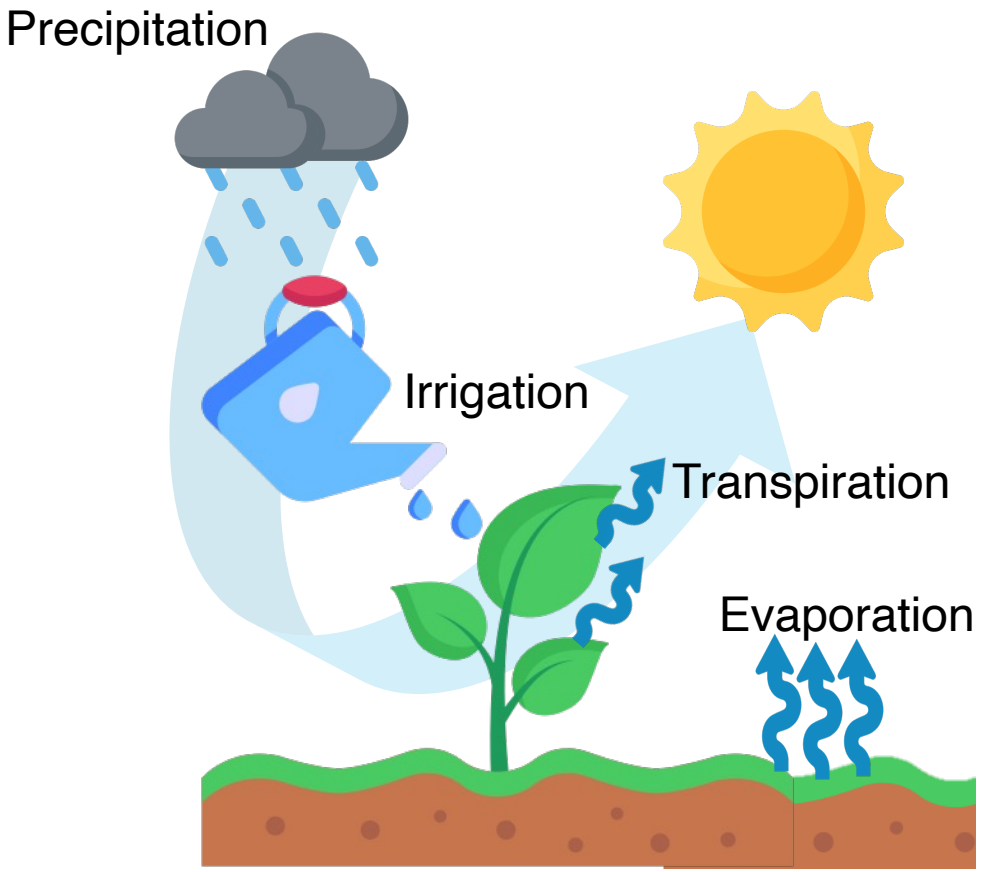
Soil

Plants

ET = Crop water needs

WATER BUDGET

Irrigation



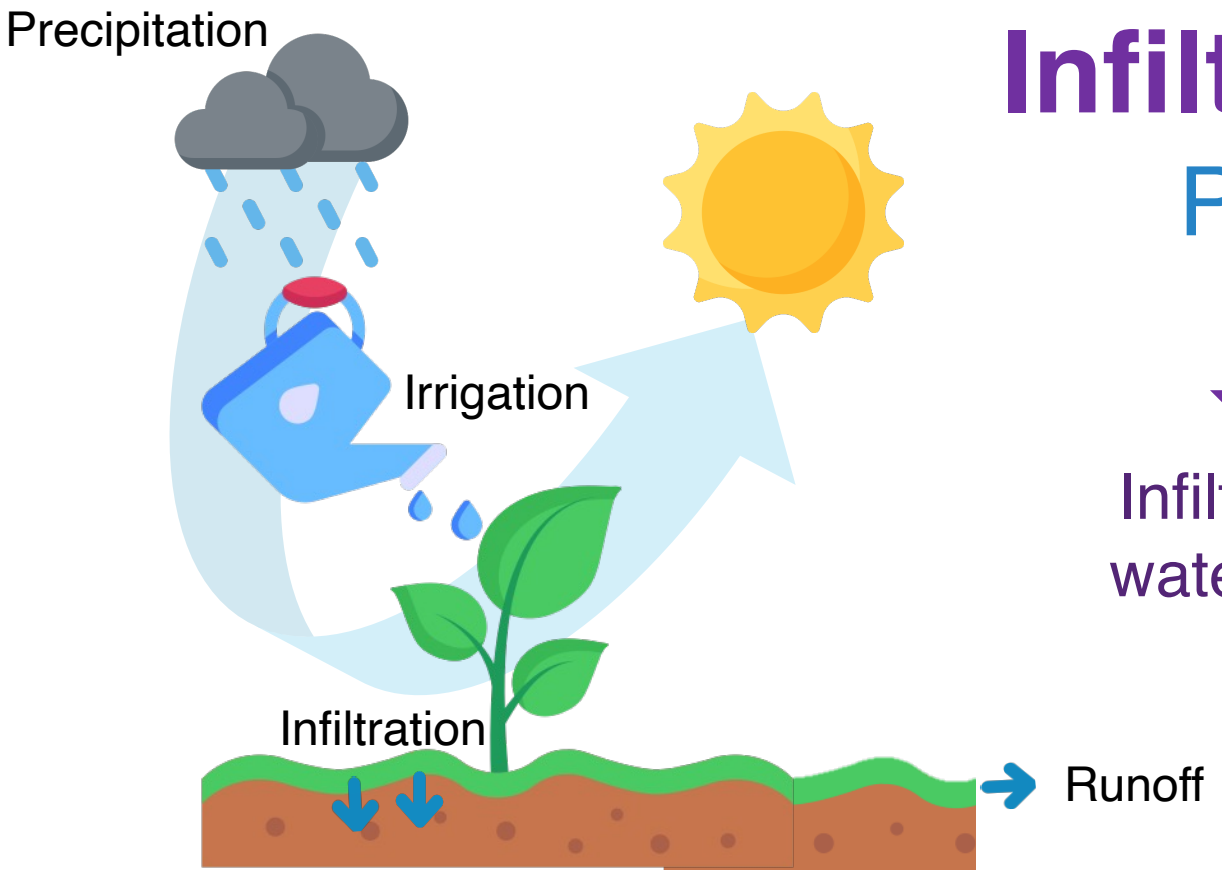
Factors Affecting Evapotranspiration (ET)

- Temperature
- Wind
- Soil Moisture
- Solar Radiation
- Region / Altitude

ET = Crop water needs

WATER BUDGET

Water Quality



Infiltration and Runoff

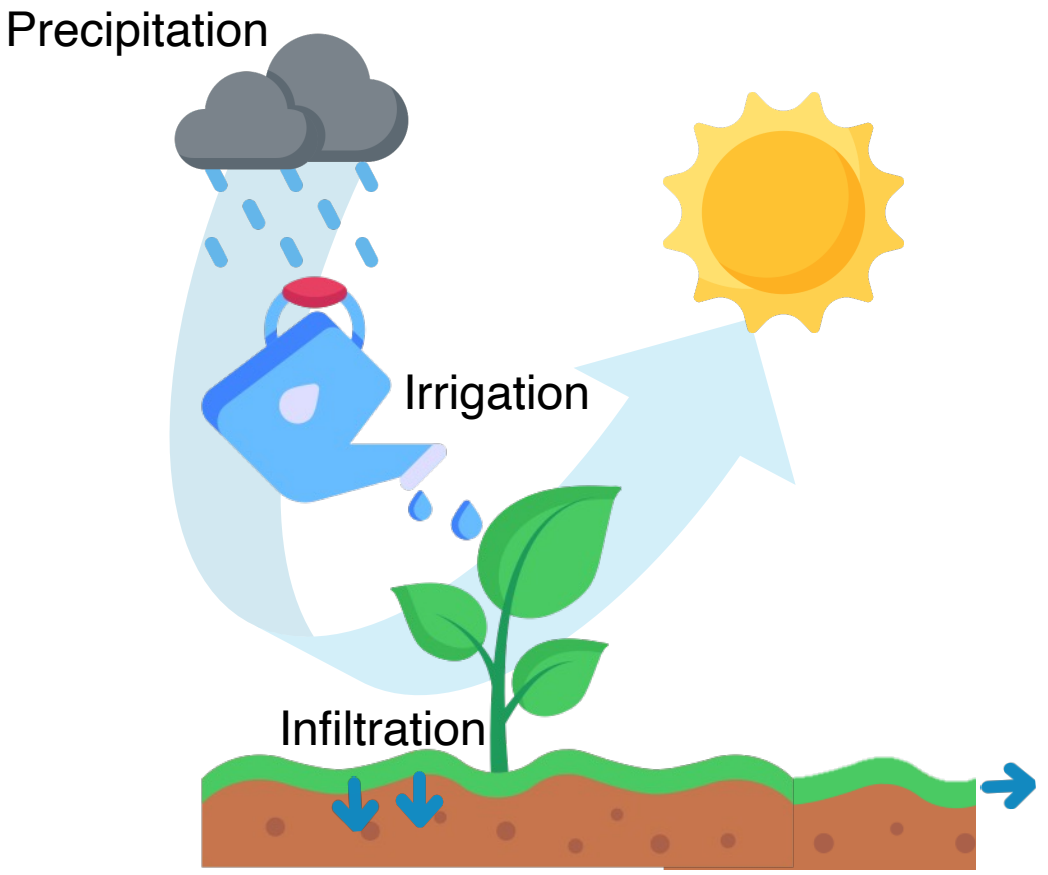
Pollutant Transport

Infiltrate in water table

Runoff to streams, lakes, ocean

WATER BUDGET

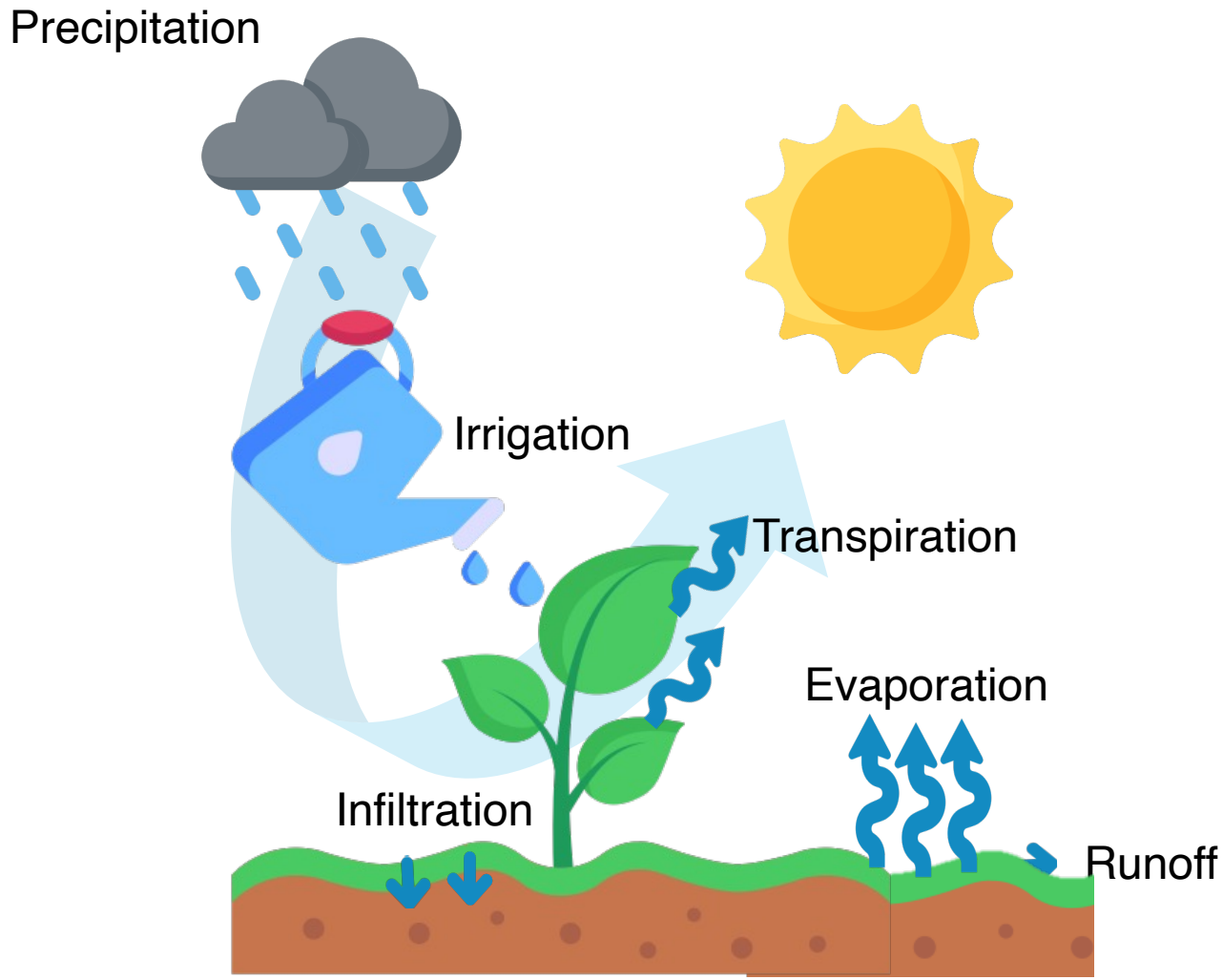
Water Quality



Factors Affecting Infiltration and Runoff

- Slope
- Permeability
- Saturation of soil
- Vegetation cover

WATER BUDGET

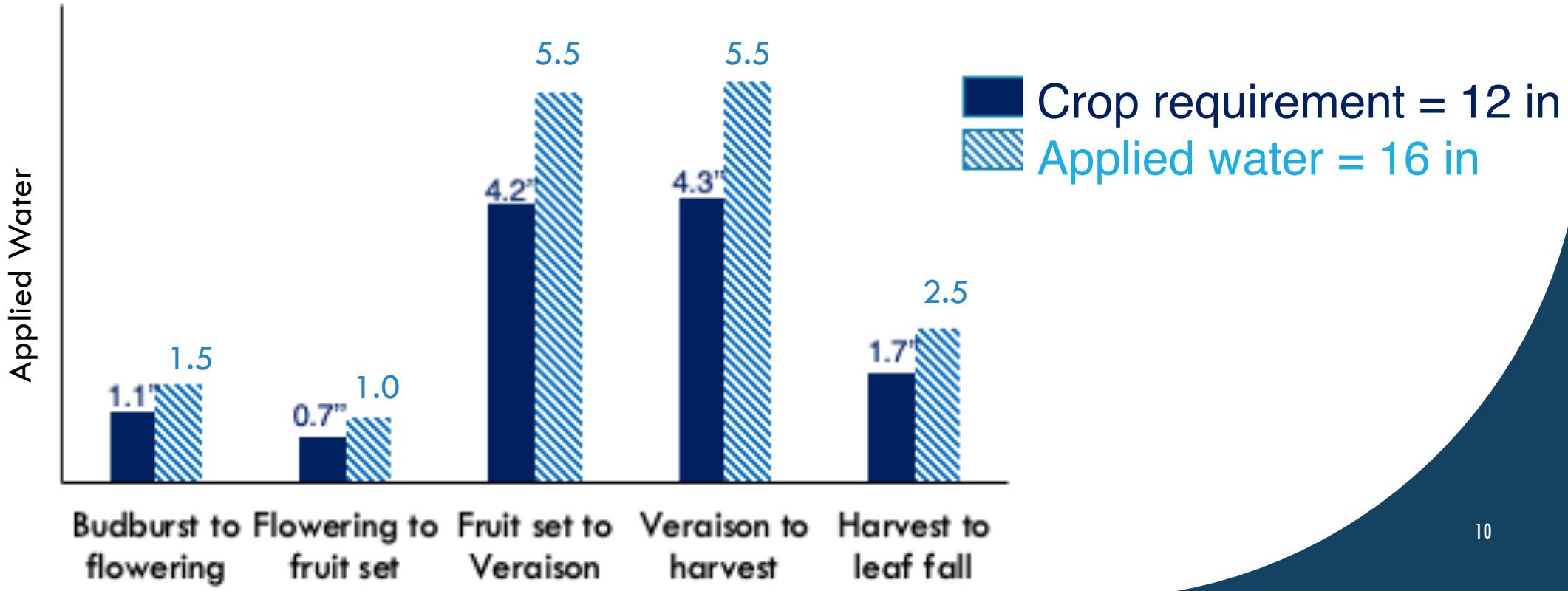


BEST PRACTICES FOR IRRIGATION AND WATER QUALITY

IRRIGATION EFFICIENCY

Volume of water applied to the crop compared to the volume of water required by the crop for its irrigation requirement.

IRRIGATION EFFICIENCY

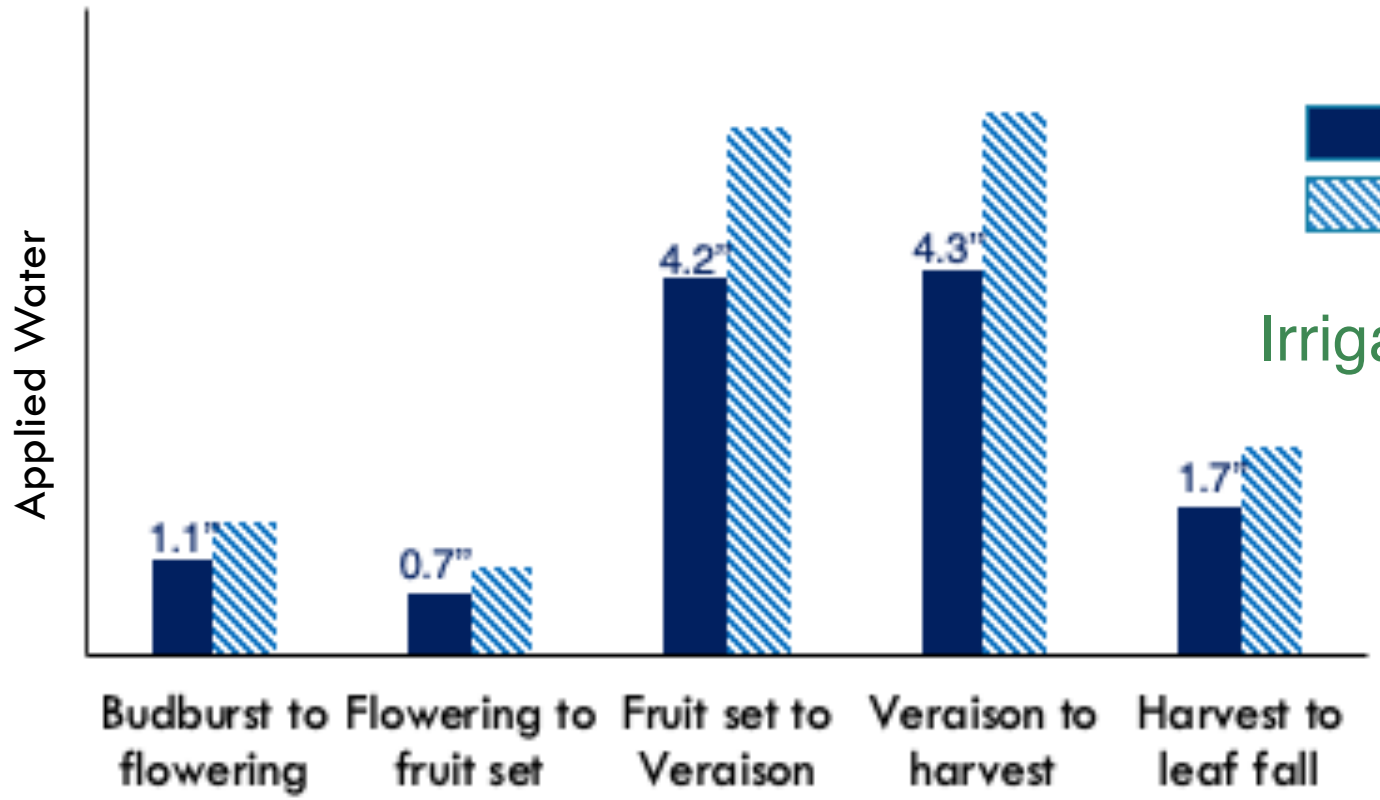


IRRIGATION EFFICIENCY

How <u>efficient</u> was our <u>irrigation</u> application?

Crop requirement = 12 in
Applied water = 16 in

IRRIGATION EFFICIENCY



Crop requirement = 12 in

Applied water = 16 in

$$\text{Irrigation efficiency} = \frac{12\ inches}{16\ inches} = 75\%$$

IRRIGATION EFFICIENCY

Can we improve our irrigation efficiency?

Crop requirement = 12 in
Applied water = 16 in

$$\text{Irrigation efficiency} = \frac{12\ inches}{16\ inches} = 75\%$$

Irrigation Systems

Surface

Application efficiency: 50 – 75%

Sprinklers

Application efficiency: 70 – 90%

Microirrigation

Application efficiency: 85 – 95%

Factors to think about:

- natural conditions
- type of crop
- type of technology
- previous experience
- required labor inputs
- costs and benefits.

Irrigation Scheduling

Irrigation scheduling involves planning when and how much water to apply

Irrigation Scheduling

Irrigation scheduling involves planning when and how much water to apply

Soil-based

Weather ET-based

Irrigation Scheduling

Weather ET-based

Crop water Needs

$$ET_{crop} = ET_{ref} \times K_{crop}$$

Evapotranspiration of my crop = is my crop water needs

Irrigation Scheduling

Weather ET-based

Crop water Needs

$$ET_{crop} = ET_{ref} \times K_{crop}$$

Reference ET is the water needs of grass

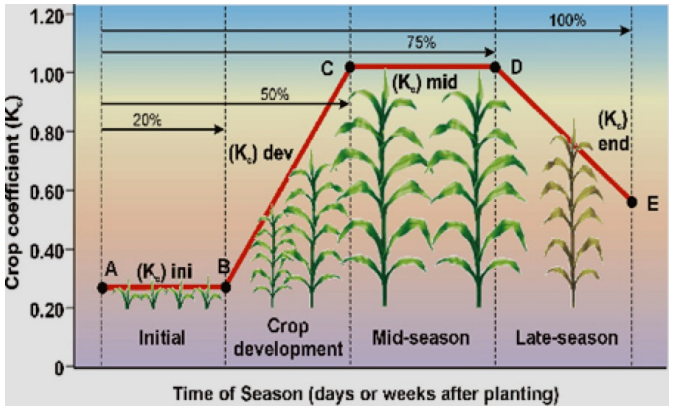
Irrigation Scheduling

Weather ET-based

Crop water Needs

$$ET_{crop} = ET_{ref} \times K_{crop}$$

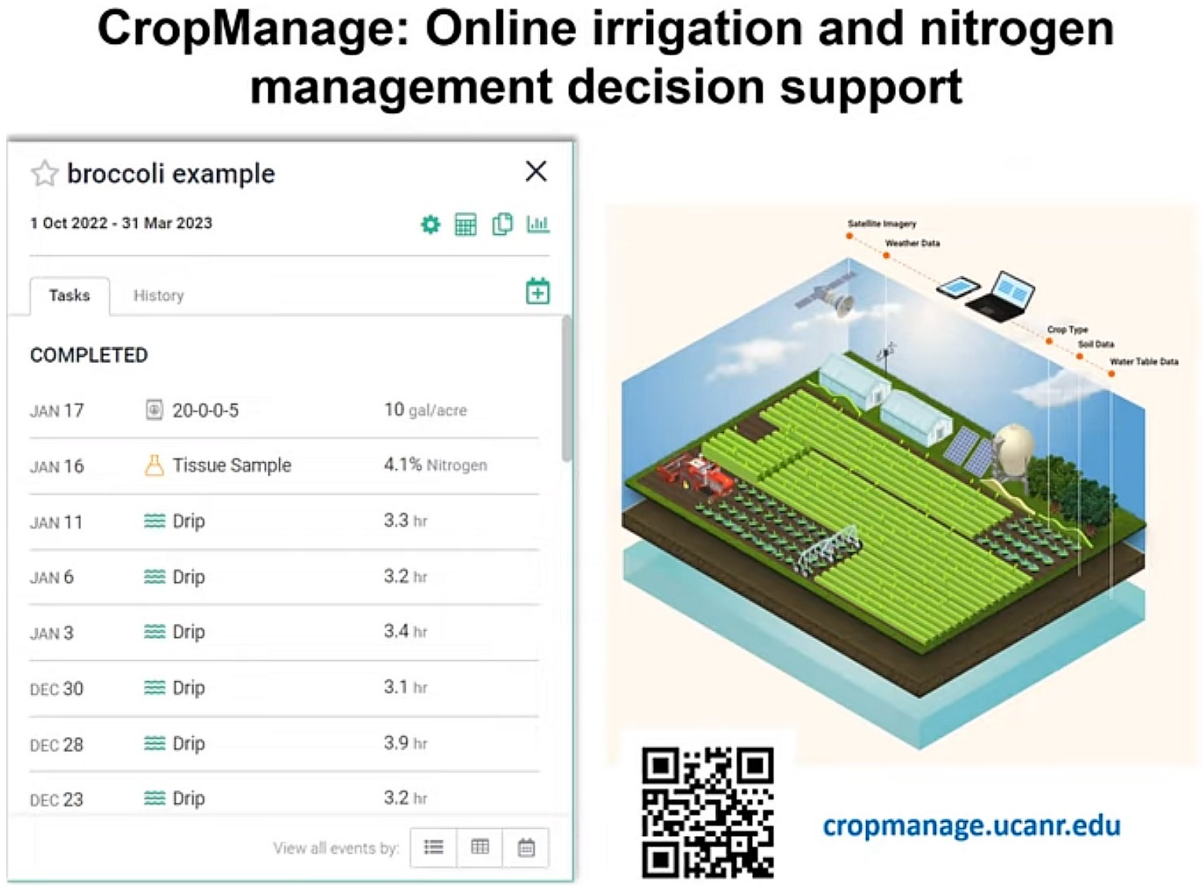
Kc is the crop coefficient. It represents the integrated changes in plant development



Date	K_c (W. Gape)
Mar 16-31	0.32
Apr 1-15	0.41
Apr 16-30	0.50
May 1-15	0.59
May 16-31	0.69
June 1-15	0.78
Jun 16-31	0.82
July 1-15	0.82
July 16-31	0.82
Aug 1-15	0.82
Aug 16-31	0.77
Sep 1-15	0.66
Sep 16-30	0.55
Oct 1-15	0.44

Crop Coefficient Values of Wine Grapes (UC Cooperative Extension)

Irrigation Scheduling Tools



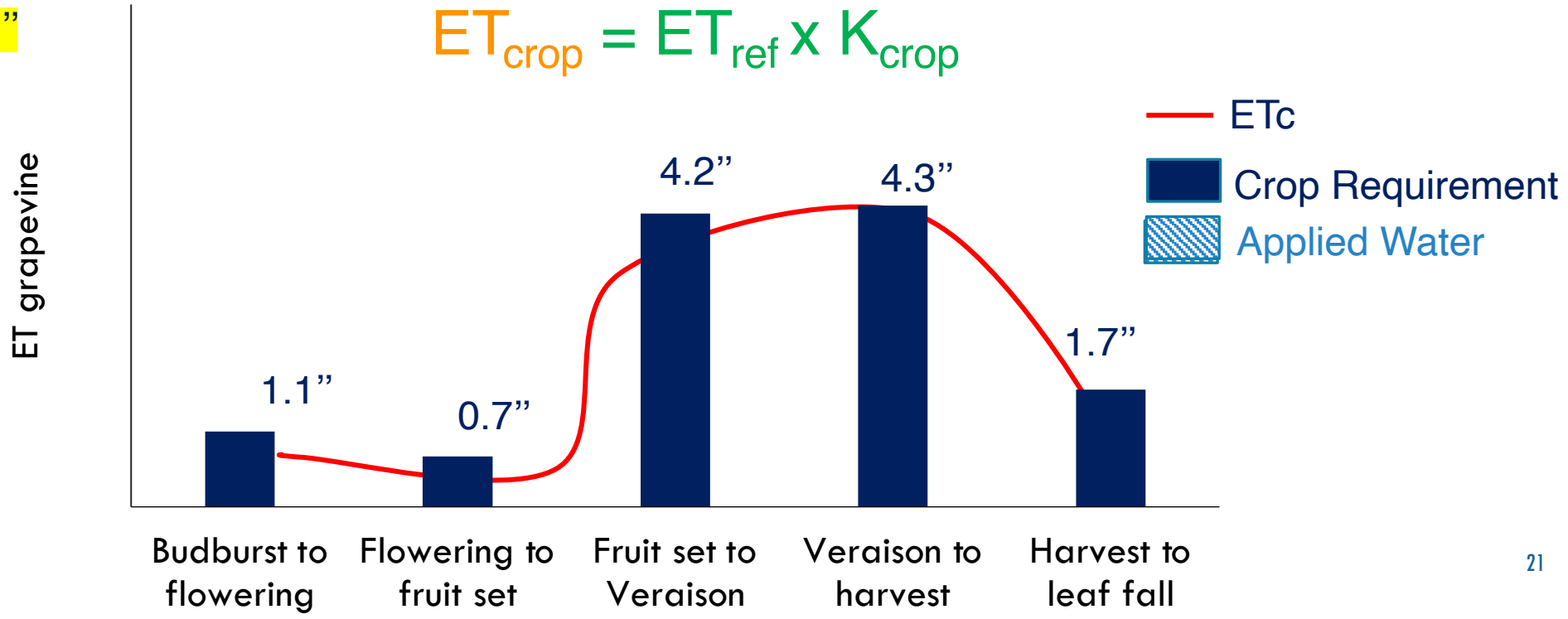
Irrigation Scheduling

Weather ET-based

Crop requirement is 12”

Crop water Needs

$ET_{crop} = ET_{ref} \times K_{crop}$



Irrigation Scheduling

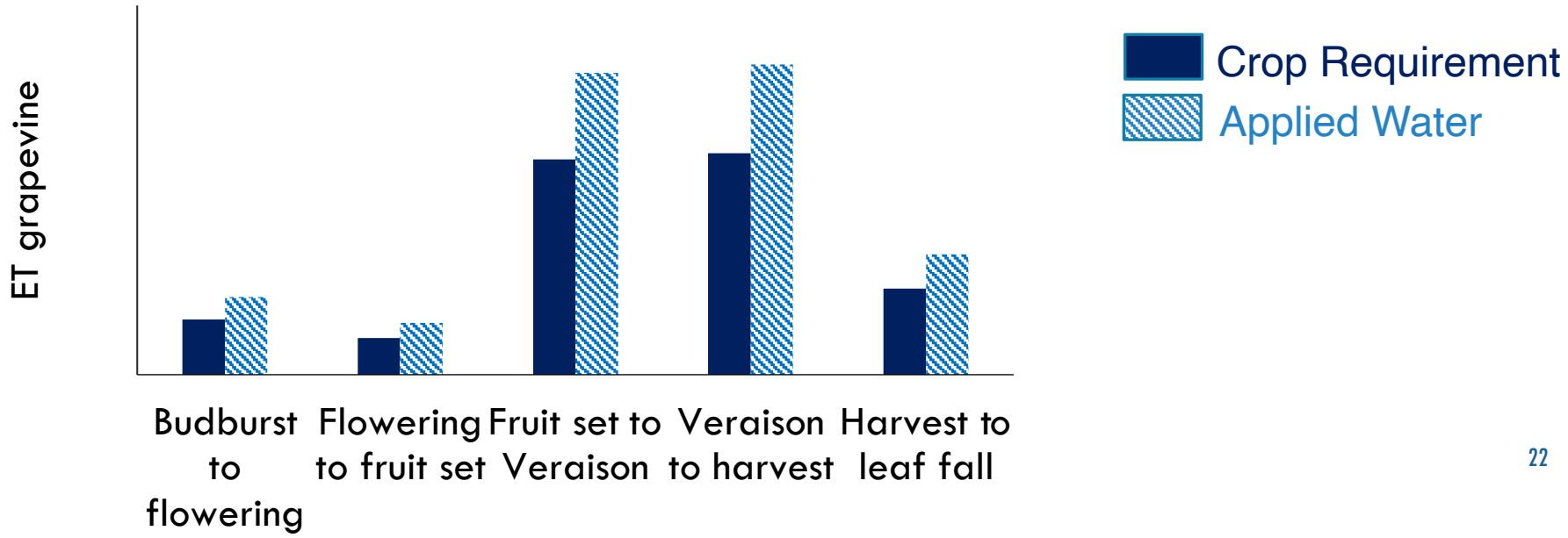
Weather ET-based

Crop requirement is 12" but initially we applied 16"

Irrigation efficiency 75%

Crop water Needs

$ET_{crop} = ET_{ref} \times K_{crop}$



Irrigation Scheduling

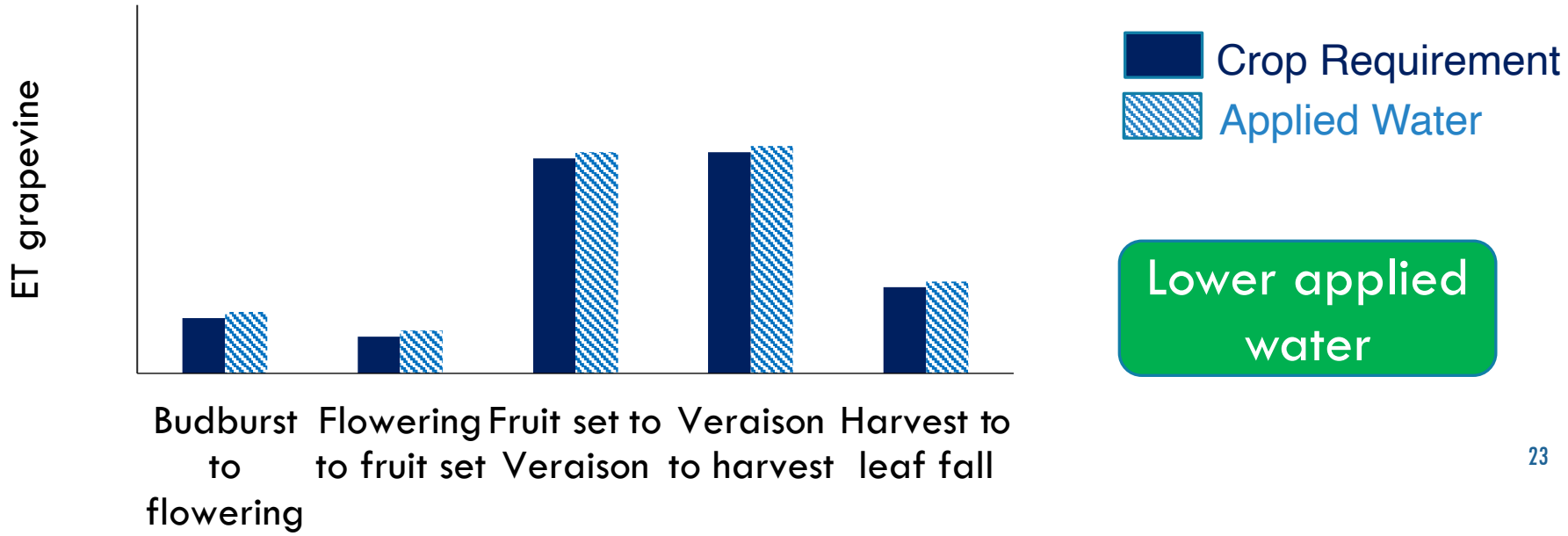
Weather ET-based

Crop requirement is 12" but now we applied 12.7"

Irrigation efficiency 95%

Crop water Needs

$ET_{crop} = ET_{ref} \times K_{crop}$



Lower applied water

Efficient Practices

Irrigation Scheduling

Water Quality Practices

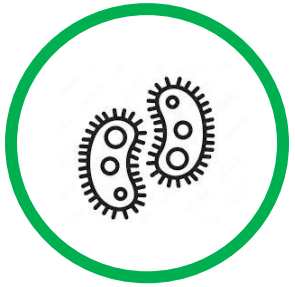
Monitoring and Maintenance

WATER QUALITY

How clean or safe water is based on chemical, physical, and biological properties that determine its suitability for drinking, irrigation, or supporting aquatic life.

Chemical

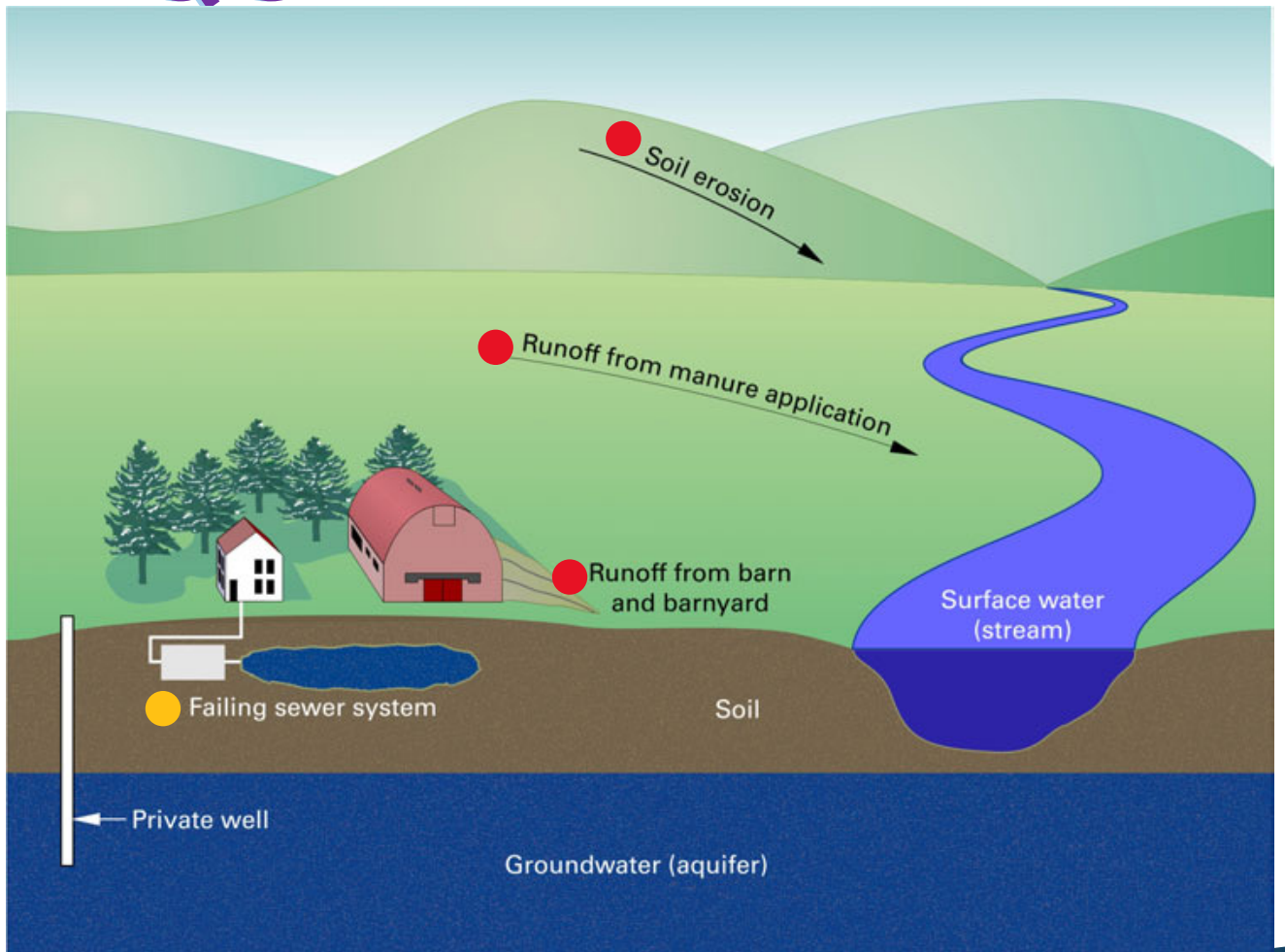
Physical



Biological

WATER QUALITY

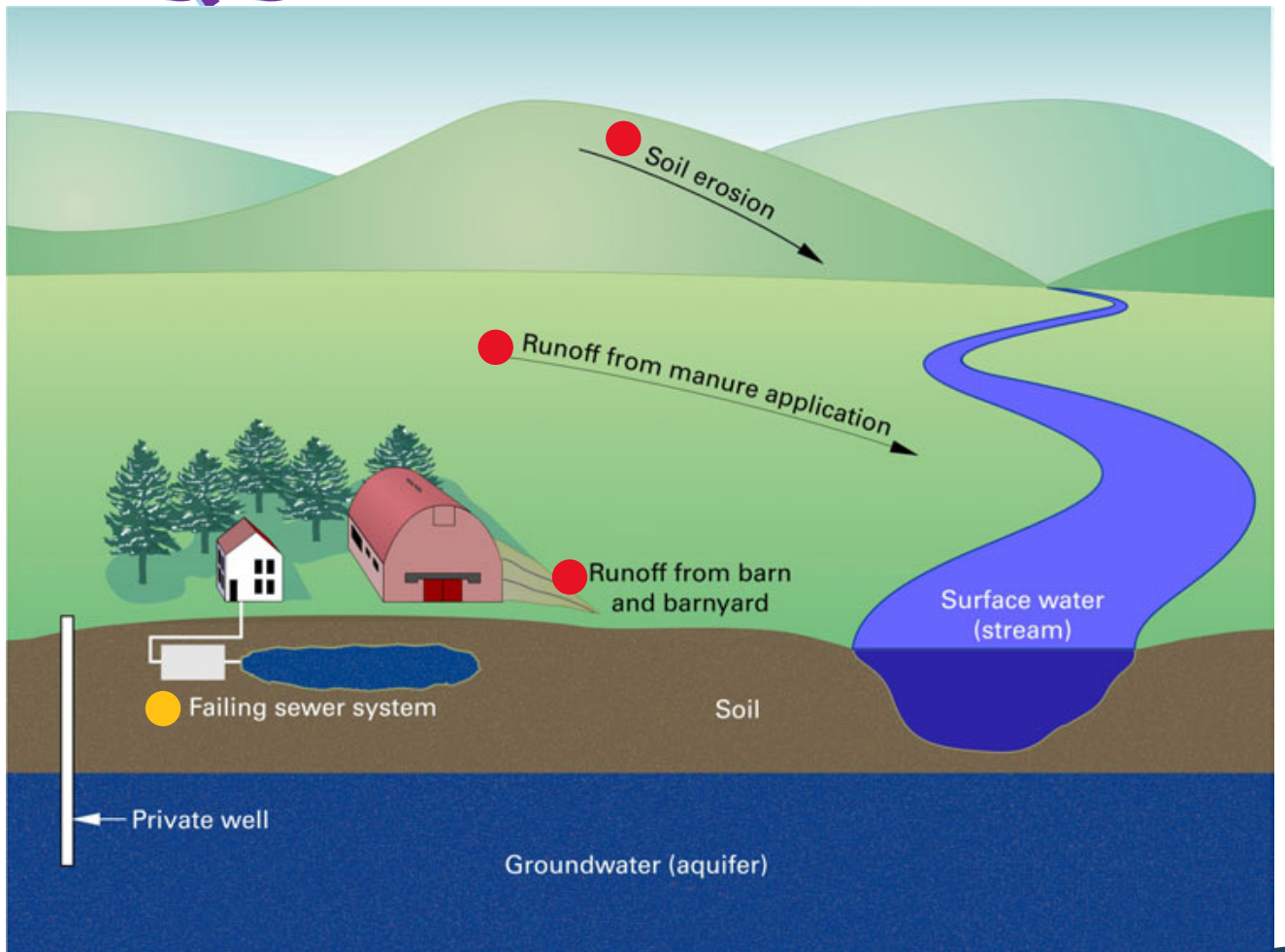
Point Source Pollution



Non Point Source Pollution

WATER QUALITY

Point Source Pollution



Non Point Source Pollution

Prevent Erosion

- Conservation Tillage
- Cover Crops

Efficient Practices

Irrigation Scheduling | Water Quality Practices | Monitoring and Maintenance

Prevent Erosion

- Conservation Tillage
- Cover Crops

Enhance Management

- Integrated Pest and Nutrient Management
- Efficient Irrigation Techniques

Prevent Erosion

- Conservation Tillage
- Cover Crops

Enhance Management

- Integrated Pest and Nutrient Management
- Efficient Irrigation Techniques

Improve Filtration

- Riparian buffers
- Cover crops/Filter strips

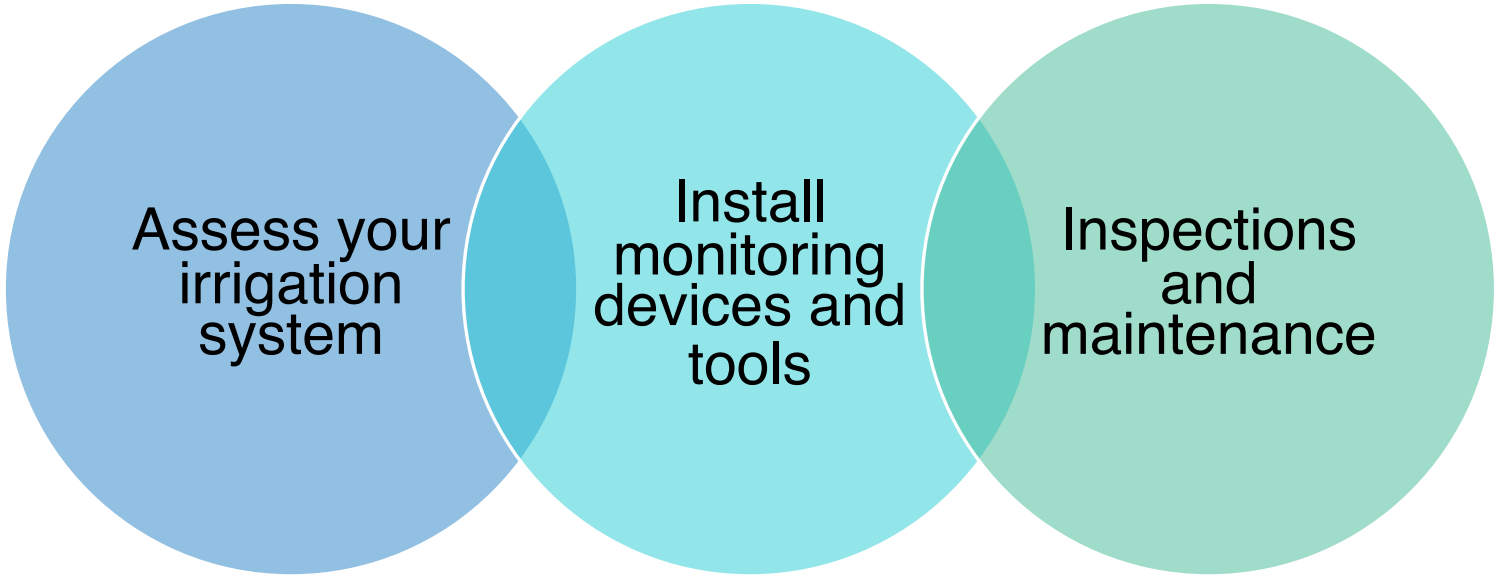
Efficient Practices

Irrigation Scheduling

Water Quality Practices

Monitoring and Maintenance

Monitoring and Maintenance



Efficient Practices

Irrigation System Design

Irrigation Scheduling

Monitoring and Maintenance

BENEFITS OF EFFICIENT PRACTICES

- Increase yields
- Conserve Water
- Enhance Water Quality
- Reduced costs
- Drought Adaptation

THANK YOU!

Laura Garza
Water and Climate Change advisor
Mendocino and Lake Counties

legarza@ucanr.edu