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Working to Keep Food and Cosmetics  
Safe and Promote Good Nutrition



# QUESTION:

What are the only two things in life that money can't buy?



# ANSWER:



- 1. True love
- 2. Home-grown tomatoes

# **Tomato Outbreak Farm and Packinghouse Environmental Findings**

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# OUTLINE

- Background
- References for farm investigations
- Four sources of particular concern
- Farm and packinghouse findings
- Summary



# Summary

- We don't know exactly how contamination occurs
- Have found *Salmonella* species in the environment on the farm
- Growers and packers don't always follow GAPs and GMPs
- Research is needed



# Characteristics of Produce Outbreaks, Including Tomatoes

- Widely dispersed, individual patient-cases in many states
- Low attack rates, epidemiology is tedious
- Tracebacks are difficult due to complexity of the supply chain
- Intermittent, low-level contamination
- Implicated produce is rarely still available, the crop is no longer in the field



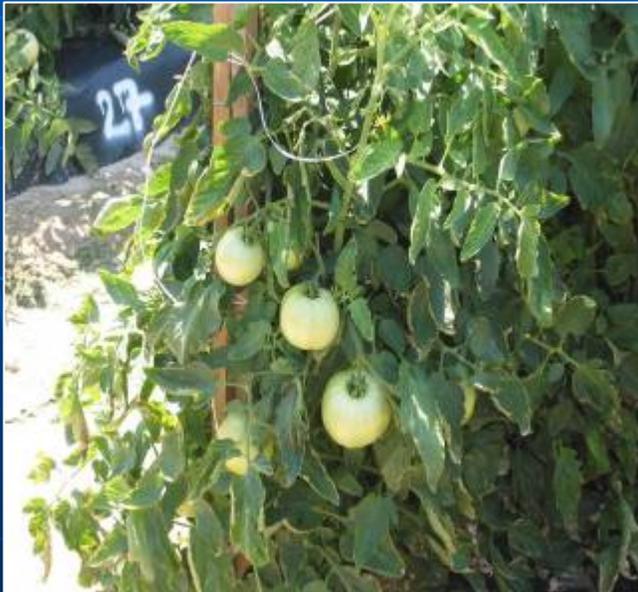
# One more characteristic... *Geography*

**Association with specific geographical locations and growing seasons where there have been multiple outbreaks**

- *Escherichia coli*
  - Lettuce/Spinach
  - California
  - Fall crop
- ***Salmonella* species**
  - **Tomatoes**
  - **Eastern United States**
    - **Late Spring – Florida**
    - **Summer and Fall - Virginia**
    - **Winter - Florida**



# Staked Tomatoes in the Field



# Bush Tomatoes in the Field California-style



# FDA Guide to Produce Farm Investigations

November 2002

## GUIDE<sup>1</sup> TO PRODUCE FARM INVESTIGATIONS

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**INTRODUCTION**

Over the last several years, the number of produce farm investigations has increased. This Guide provides detailed procedures that will better enable FDA to reach its goals in this type of investigation.

**PURPOSE**

The purpose of a farm investigation is to determine if a farm is in compliance with the requirements of the act, which are defined in 21 CFR Part 110. In the preamble to the final rule (51 FR 22454), FDA advised that because other possible sources of contamination in the distribution chain should have been fully investigated, farm investigations are just one aspect of FDA's produce safety efforts, which also include domestic and international education and outreach in Good Agricultural Practices (GAP). These efforts are intended to improve agricultural practices to reduce risks of microbial contamination of fresh fruits and vegetables. These ongoing efforts involve cooperation and collaboration with industry and trade associations, academia, and other government agencies.

**OBJECTIVES**

- Minimize the potential for illness caused by produce that is grown, harvested, packed, and transported under unsanitary conditions from entering interstate commerce.
- Document possible sources of microbial contamination that may have led to the produce associated outbreak or positive sample.
- Provide a basis for placing or lifting an import alert on imported produce.
- Build a scientific base to assess the relative microbial risk of on-farm practices.
- Refine Agency policy and guidance aimed at reducing foodborne illness related to fresh produce.

On the web at:

<http://www.cfsan.fda.gov/~dms/prodques.html>



# Contamination Sources

## ■ Four Sources of Particular Concern

- Soil
- Water
- Domestic and Wild Animals
- Farm Workers



# Soils

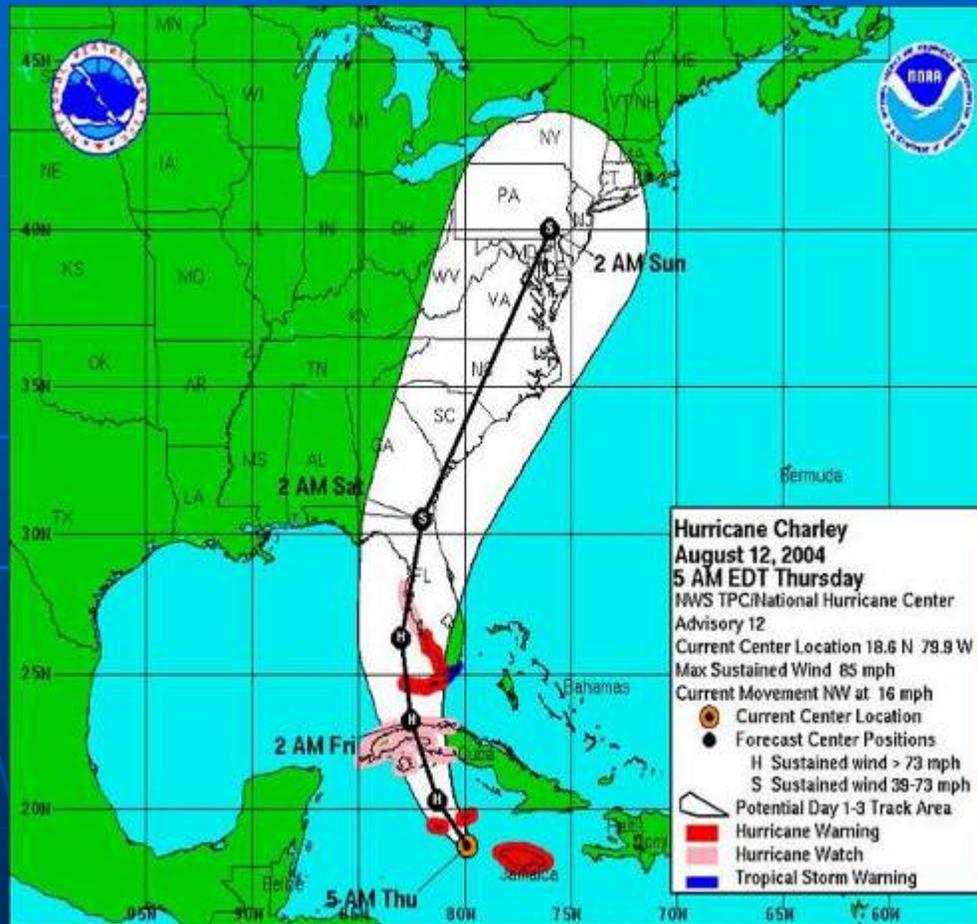
What's in the soil?

How does it drain?

Contact with the plant/fruit?



# Weather





**Tomato plants at the end of rows dwarfed by standing water from heavy rains and or poor drainage**



**Drainage Ditch**

# De-Watering



# Drought Conditions

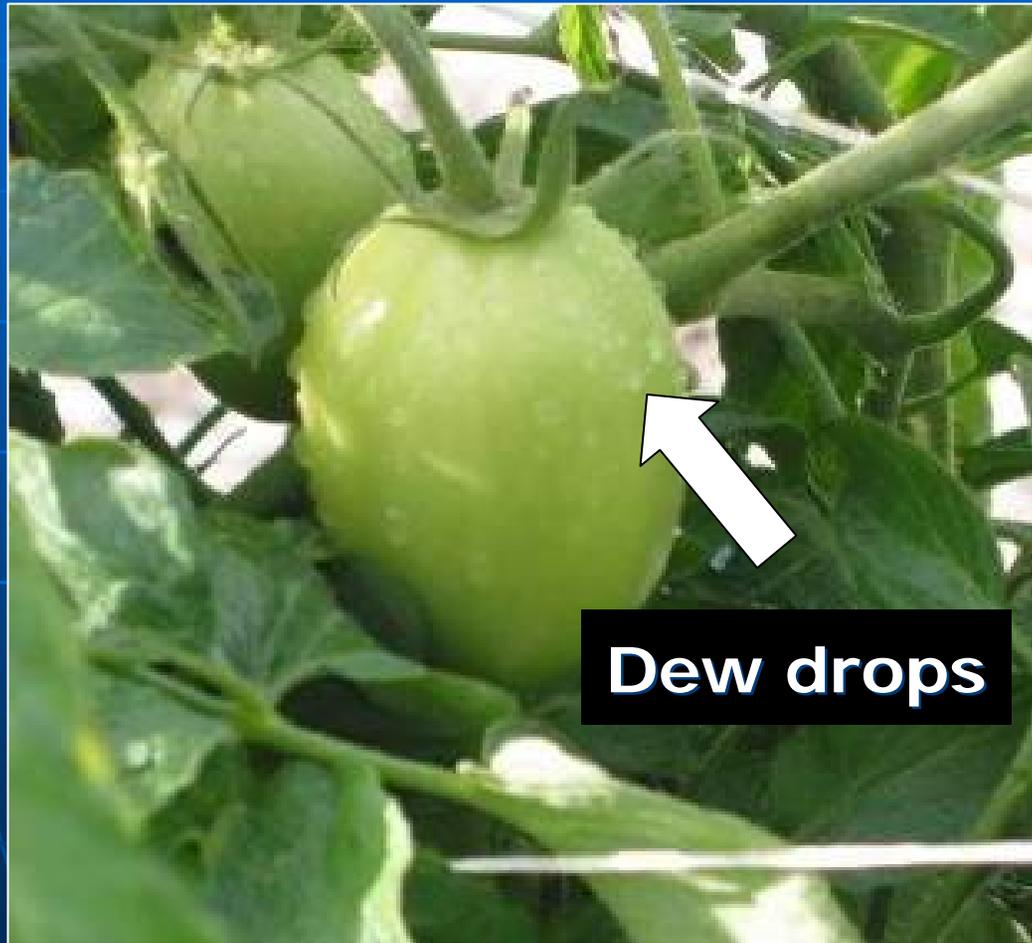
Water line in a “dry ditch”





**Collecting a water sample in a drainage ditch**

# Attractants During Drought



# Microbial Quality of Water



**WELLS**



**PONDS**



**IRRIGATION**



**CROP SPRAY**



**WASH**

# Wells



# Pond re-charge well set-up

Fill line to the pond 25 ft away

Well

Crop chemicals mixed in  
sprayer tank

Hose to fill spray tank ; potential cross-connection



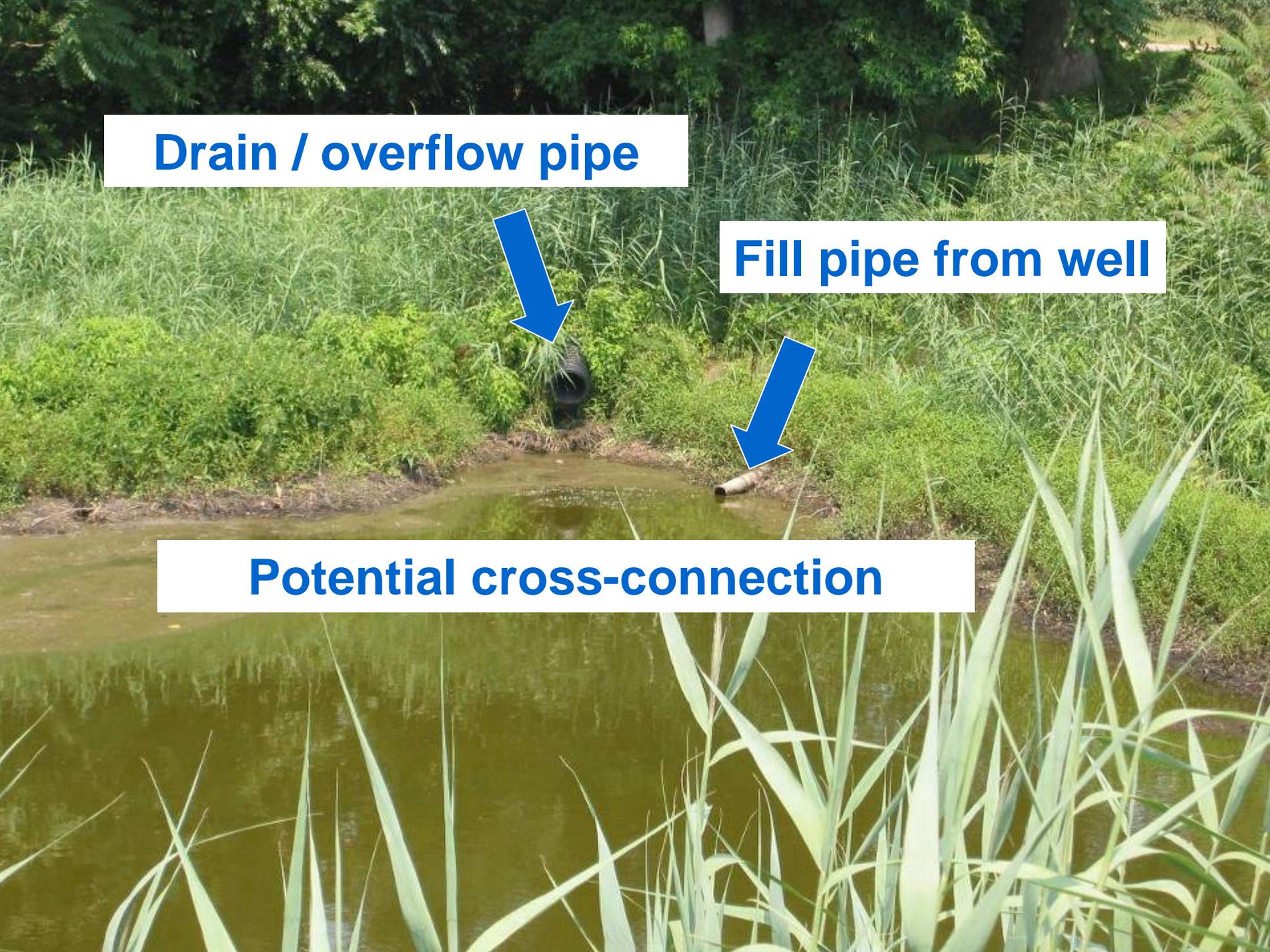
**Drain / overflow pipe**



**Fill pipe from well**



**Potential cross-connection**





**Fill line to pond**



**Re-charge well 10 ft from pond**

**Fill hose to sprayer tank**

# Ponds











# Crop Sprays



# Source water for sprayers



Surface water - ponds



Pump from pond to fill sprayer



Well water and hose to fill sprayer



**Coupling for the hose to fill a sprayer tank**

**Irrigation pipeline from a pond**



**Close-up of a portable pump used to fill sprayer tanks from a pond**

**Close-up of a Roma tomato. Note dried residue on surface possibly from rain, dew or crop spray. Some chemicals can be sprayed up to 1 day before harvest.**



# Potential Sources of Contamination





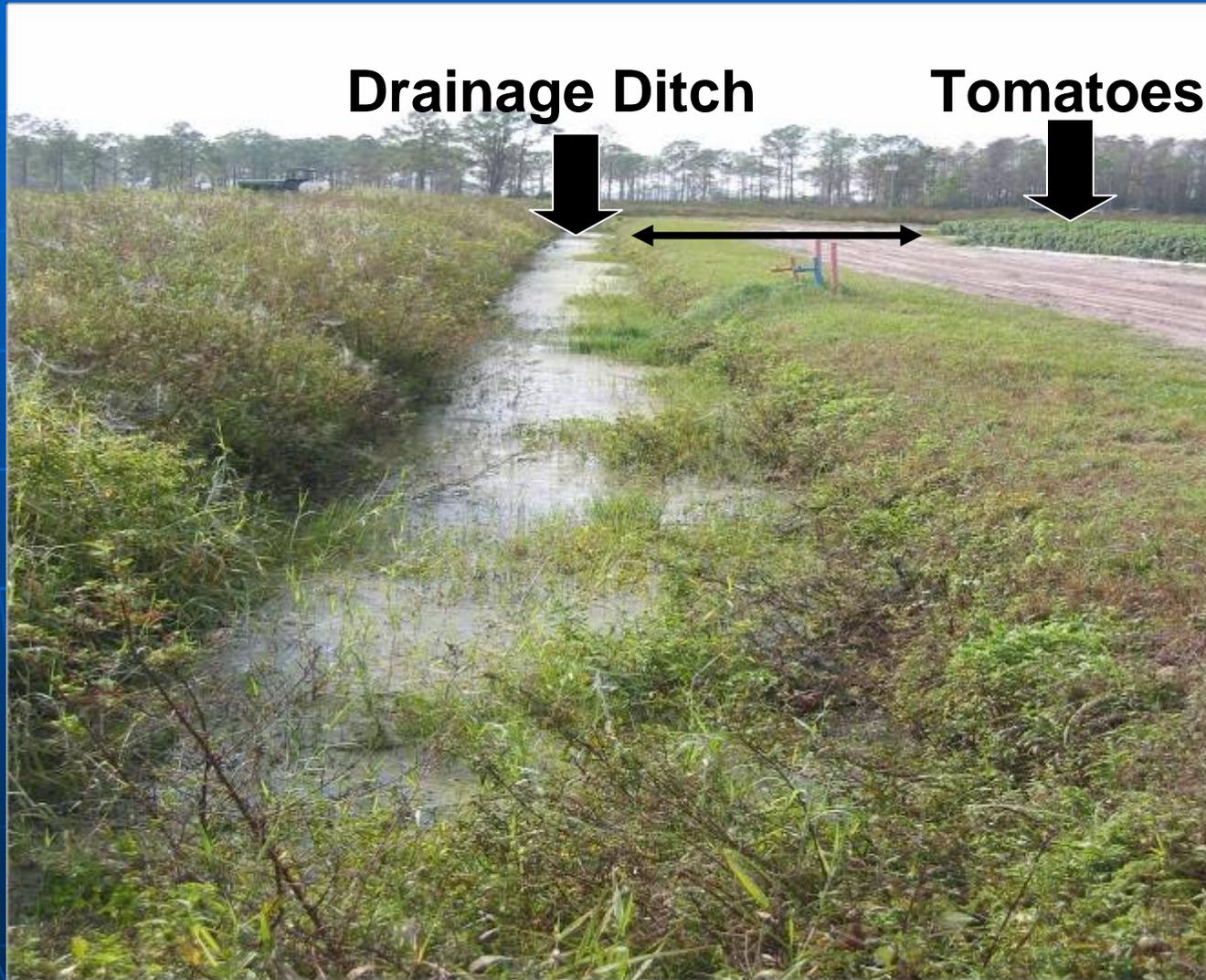
**Close-up of standing water in a drainage ditch**

# Alligators in drainage ditches





# Proximity to the Environment





**Tomato field close to  
drainage ditch**

# Cattle pasture



**Drainage ditch with very little  
standing water**

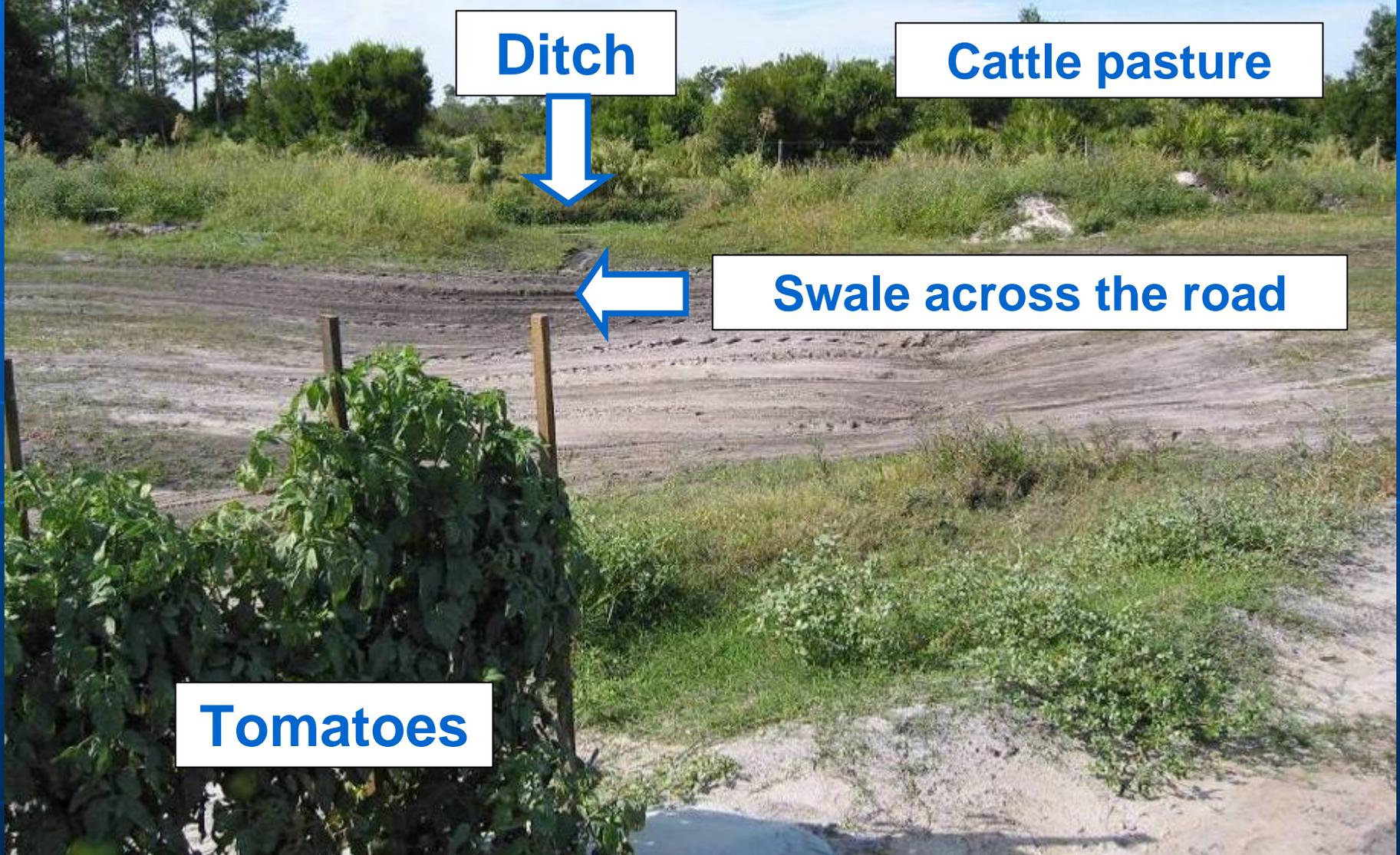
# End of a tomato row in close proximity to a drainage ditch

Ditch

Cattle pasture

Swale across the road

Tomatoes



**Break in the electric fence in the drainage ditch allows wild pigs access to both tomato fields and the cattle ranch.**





**Tomato field**

**Wild pig tracks**

**A place where wild pigs rooted in a  
dry ditch**

Environmental sample	Salmonella serotype isolated	Comments
Anuran	S. Mississippi	
Anuran	S. Aqua	
Anuran	S. Saintpaul	
Anuran	S. Gaminara	
Lizard	S. Newport	
Feces	S. Gaminara	
Feces	S. Manhattan	
Ditch water	S. Manhattan	
Ditch water	S. New	
Ditch water		
Ditch water	S. Waenderup	Different PFGE
Ditch	S. Java	
	S. Florida	
in water	S. Miami	
Ditch water	S. Anatum	Different PFGE
Ditch water	S. Tallahassee	
Ditch water	S. Group D untyped	Different PFGE
Sand filter media	S. Iverness	

**Example of environmental sample results**

# Harvesting





# Sampling tomatoes and flowers



**Tomatoes leaving the dump tank. Note plant debris in water.**



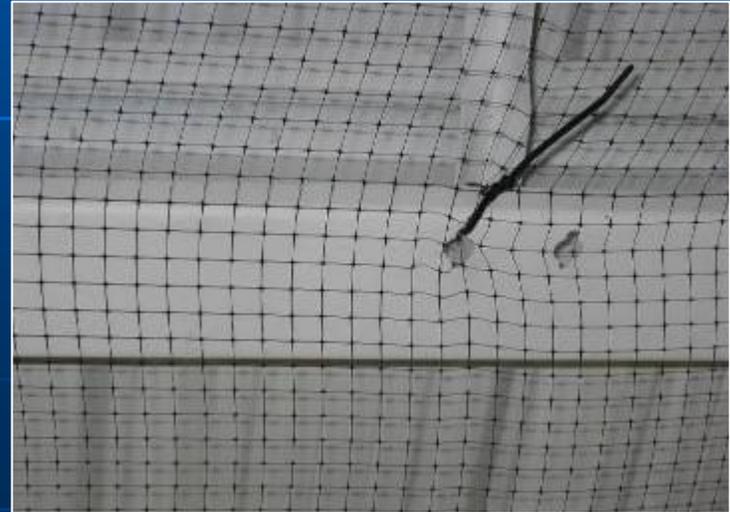
# Heavy Organic Load in the Dump Tank







# Birds



# Chill to Improve Slicing (33-35°F)



# Summary

- Don't know exactly how contamination occurs
- *Salmonella* species in the environment on the farm
- Growers / packers don't always follow GAPs / GMPs
- Research is needed
- FDA is committed to improving produce safety
- Improving produce safety requires collaboration and cooperation between Federal, State, and Local Governments, Academia, Industry, Trade Associations, and Consumers



A photograph featuring a slice of tomato in the upper left, a silver fork in the center, and fresh green lettuce leaves in the lower right, all set against a solid black background. The text "Thank you!" is overlaid in the center-right area.

**Thank you!**

