Land Use Hazard & Risk Assessment & Conservation Co-Management

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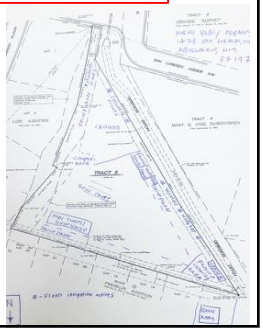
1. Source: What and where are the potential contamination hazards?

2. Pathways: How can the contaminants move?

3. Risk Mitigation: What systems and practices can minimize risk?



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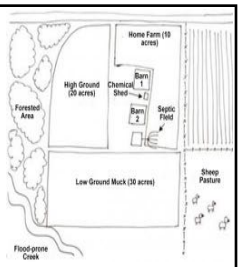
Basic Features & FOOD



- Farm name, location
- Date/or update of map
- Crop production areas with ID
- Greenhouses and high tunnels
- Postharvest and storage areas
- Buildings and infrastructure
- Roads and driveways
- Conservation: Hedgerows and trees, grass strips, diversity
- Water sources: wells, irrigation hydrants, ponds, canals, and streams
- Water Deliver Systems: Irrigation pipes, valves, gates, reservoirs, returns
- Indicate directions, N, S, E, W

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Sources of Hazards

MAP IT!

INCLUDE NEIGHBOR'S LAND IN PATHWAY SHED

- Domestic animal areas: feeding, grazing, travel lanes
- Areas pets frequent
- High levels of wild animal activity (i.e. nesting or feeding)
- Manure storage, compost production and storage
- Green waste piles
- Produce cull sites
- Gasoline storage, chemical, fertilizer, and pesticide storage
- Recent history of landfill, industrial activities, heavy metals
- Areas for washing equipment, animals, and where it flows
- Human sanitation facilities, septic leach fields, trash
- Worker break areas, parking & visitor access areas

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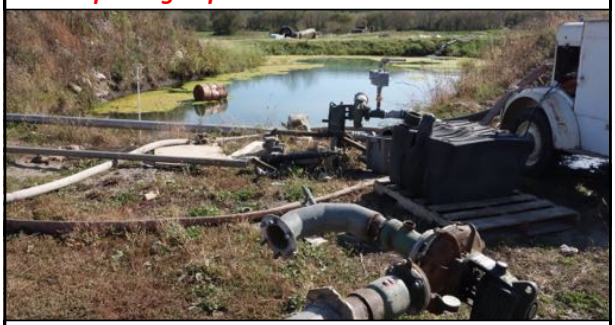
Sediments and algae blooms can be a key site for pathogen persistence in water bodies.



Biofilms can provide protection from environmental stress and predation by other microbes

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Field and Land Risk Assessment

B

Date completed:
Signature of Person Who Completed It:
Chart the issues you have identified with your drawings and maps.

Location	Potential Contaminant: Chemical, Physical, Biological	Pathways: Air, Water, Animals, Humans, Equipment	Risk Assessment: Likeliness	Risk Assessment: Severity	Action

Study your map for potential sources of contaminants.

Fill in potential risks here.

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Contamination Pathways: ANIMALS

- Draw migratory bird routes and paths of wild animals
- Indicate domestic animal movement




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Contamination Pathways: AIR

Use arrows to show air movement


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Contamination Pathways: WATER

- Indicate sloping land that water will run off

Animals on hillside above crops may increase risk when rain carries pathogens into crop fields.

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Contamination Pathways: WATER

Flood waters may be exposed to sewage, chemicals, heavy metals, pathogenic microorganisms, or other contaminants that can impact the safety of crops destined for human consumption.

The water is contaminated. Has the edible portion been exposed?

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Evaluating the Safety of Food from Flood-Affected Crops

- Flood waters contacted the edible portions of the crop

- Flood waters did NOT contact the edible portions of the crop

- Assessment of Flood-affected Fields before Replanting

- Controls to Avoid Cross-contamination after Flooding

"Guidance for Industry: Evaluating the Safety of Flood-affected Food Crops for Human Consumption (2011) FDA

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Irrigation is a common pathway for contamination.

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Animals Higher in Watershed

Animals overly impacting streams can result in polluted water downstream on the farm.

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Contamination Pathways: EQUIPMENT

-Indicate Major Equipment Pathways

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Contamination Pathways: PEOPLE

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Next to the potential sources of pathogens you've identified list the pathways the contaminants could take to your produce, water, or produce contact surfaces.

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RISK ASSESSMENT: Prioritize

EXAMPLE RISK		Probability: Very High	High	Medium	Low	Very Low
Consequence	Very High	Very High	Very High	Very High	High	High
	High	Very High	High	High	Medium	Medium
	Medium	High	High	Medium	Medium	Low
	Low	High	Medium	Medium	Low	Very Low
	Very Low	Medium	Low	Low	Very Low	Very Low

Listeria Example

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Field and Land Risk Assessment

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Low
Medium
High

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Actions To Minimize Risk

Location	Potential Contaminant: Chemical, Physical, Biological	Pathways: Air, Water, Animals, Humans, Equipment	Risk Assessment: Likeliness	Risk Assessment: Severity	Action

Co-Management:
Practices & Systems that minimize microbiological hazards associated with food production while also conserving and protecting soil, water, air, wildlife, and other natural resources.

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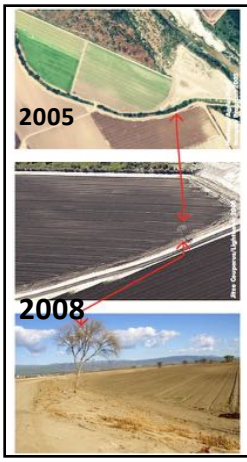

California's Salinas Valley—the nation's salad bowl, is also the heart of the leafy green food safety crisis.

Tree lines that served as windbreaks and habitat for beneficial insects and rodent-eating raptors in the past were rapidly removed because of the unfounded fear that native birds are significant vectors of E. coli 0157.

WILD FARM ALLIANCE

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The Produce Rule and Domestic and Wild Animals

PR Guidance: *Farms are not required to exclude animals from outdoor growing areas, destroy habitat, or clear borders around growing or drainage areas. Nothing in the rule should be interpreted as such.*

Predatory animals, such as hawks, or owls, can manage rodents and squirrels and can be good for food safety.

- A crop should not be planted directly under a raptor nest box, or roost.
- Farm activities should not carry
-predator feces into produce areas

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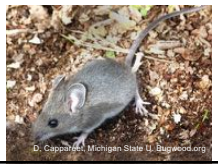
Biodiversity Loss May Increase Pathogen Prevalence

- A study conducted in California suggests that a reduction in rodent species diversity may cause increased pathogen prevalence in the individuals that remain.
- Other research shows that biodiversity loss frequently increases disease transmission.



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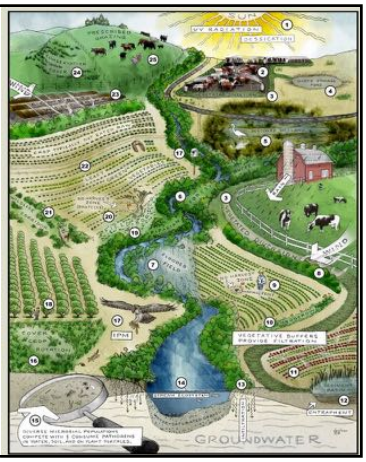
Healthy Diverse Ecosystems Help Keep Pathogens in Check



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Vegetation's Filtering Capacity

MAP IT

UC Davis researchers found grass and wetlands can filter up to 99% of E coli during rain events.

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Map Riparian Vegetation

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Contamination Pathways: WATER-Rain

Potential Risk: Animals on hillside above crops may increase risk when rain carries pathogens into crop fields.

MAP IT

Possible Strategies
- Diversion Ditch
- Grass strips

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Vegetation's Filtering Capacity

Windbreaks and hedgerows reduce the potential of dust-borne pathogen movement from contaminated areas.

MAP IT

S. Earnshaw

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Contamination Pathways: AIR

How can vegetation reduce these risks?

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Crop Placement

Crops should not be planted near, down wind, or down water of manure piles or other sources of contamination.

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MAP IT: Conservation Habitat to Reduce Risk

- Vegetated Water Diversion Ditches
- Grass Water Way
- Sediment Basin
- Hedgerows And Windbreaks
- Riparian Vegetated Areas
- Grass Filter Strip Beside Fields Or Water Or Roads
- Wetlands
- Forestlands

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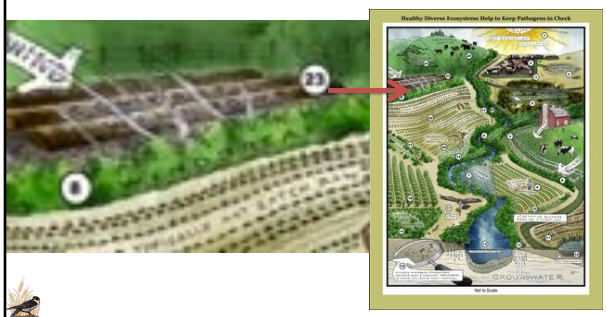
Map Compost Making Area and Windbreak



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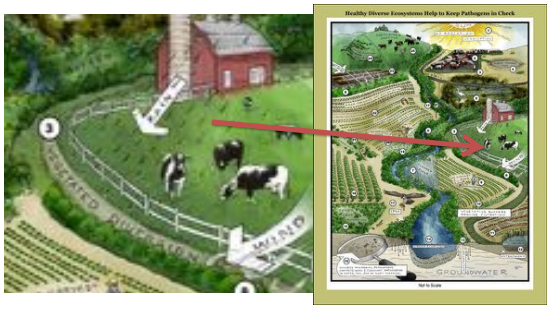
1a. Map Prevailing Wind Direction, Pathogen Source and Windbreak



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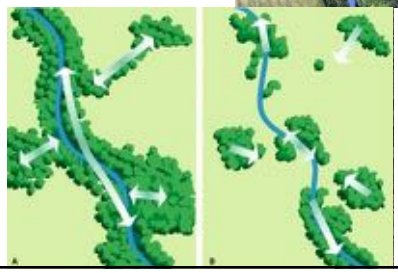
Wildlife Corridors

Allow wildlife to access resources without having to walk across crop fields or leave their preferred habitat



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Encourage Raptors to Deter Pests on the Farm Contaminating Crops

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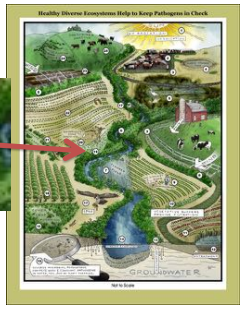
2c. Map Areas of Overhanging Vegetation



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Factors in Survival of Human Pathogens

Survival/Reproduction: Safe niche, nutrients, water

- **Direct Sunlight**: UV rays and drying can decrease pathogens
- Pathogens persist longer **in cool/moist conditions**
- **Freezing** by itself does not completely kill pathogens (E coli 015 stored at -80° to preserve viability)
- **Rapid freeze-thaw cycles** can cause rapid death of pathogens in soil
- **Desiccation** in dry soils, wind, sun retention

Source: Wild Farm Alliance: *A Farmer's Guide to Food Safety and Conservation*

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Non-Pathogenic Beneficial Microbes Generally Prevail if Diverse Populations are Present

- Outcompete the pathogens for food, water, and space
- Kill and consume the pathogens
- Make conditions unfavorable by tying up critical growth nutrients

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Soil Management Affects the Survival of Human Illness Pathogens

Microbial diversity helps to reduce pathogen survival

Cover crops significantly reduced e-coli in a field with raw dairy manure solids

E-coli declined faster in organic systems than non-organic

A.D. van Diepeningen, O.J.de Vos, and A.H.van Bruggen 2005

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Farm Conservation Practices That Support Public Health – Specifically Food Safety

MAP IT

- Grassed Waterways, Riparian Buffers, Wetlands → Water Quality
- Cover crops, Compost → Soil Microbes Outcompete and Kill Human Pathogens
- Windbreaks, Hedgerows → Air Quality

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Land Use Food Safety Action Plan – Co-Management Strategy & Examples

Examples for Land Use Action Plan

The following examples are divided into four categories that help to minimize pathogens from a) entering the farm, b) contaminating crops, c) spreading from livestock to crops, and d) moving to the wider landscape. The farmer can pick and choose from the examples in these categories, and/or use their own experiences to appropriately fill out their Land Use Action Plan with the three-page template that follows these examples.

1st Barrier—Assess Risk of Pathogens Entering the Farm

1a. **Area of Food Safety Action**

- **Airborne Pathogens (coming from surrounding area)**
  - Compost or manure piles
  - Domestic animal areas
  - Industrial waste
- **What: Policy/ Actions to Reduce Risk**
  - Reduce the risk of airborne pathogens getting on the farm by intercepting them with a Windbreak and/or
  - Hedgerow.
- **How Is this Done?**
  - Determine parameters of planting (height, width, species) and strength of wind.

WILD FARM ALLIANCE

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Actions To Minimize Risk

Location	Potential Contaminant: Chemical, Physical, Biological	Pathways: Air, Water, Animals, Humans, Equipment	Risk Assessment: Likeliness	Risk Assessment: Severity	Action

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Break Out

B

1. **Share your map** and Land Use Hazard and Risk Assessment.
2. **Explain the potential hazards** you've identified and the pathways they might take to get on the food.
3. **An Action Step** that you are thinking about taking to minimize the risk.

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