West Valley Probabilistic Performance Assessment (PPA) Exposure Scenarios

Neptune and Company, Inc.

August 26, 2026

QPM Exposure Scenario Topics

August 2026 QPM

1. Summary of modeling approach, development of parameter values, and exposure routes
2. On-Site Resident Farmer exposure scenario
3. Off-Site Resident Farmer exposure scenario and recreational activities

Future QPM

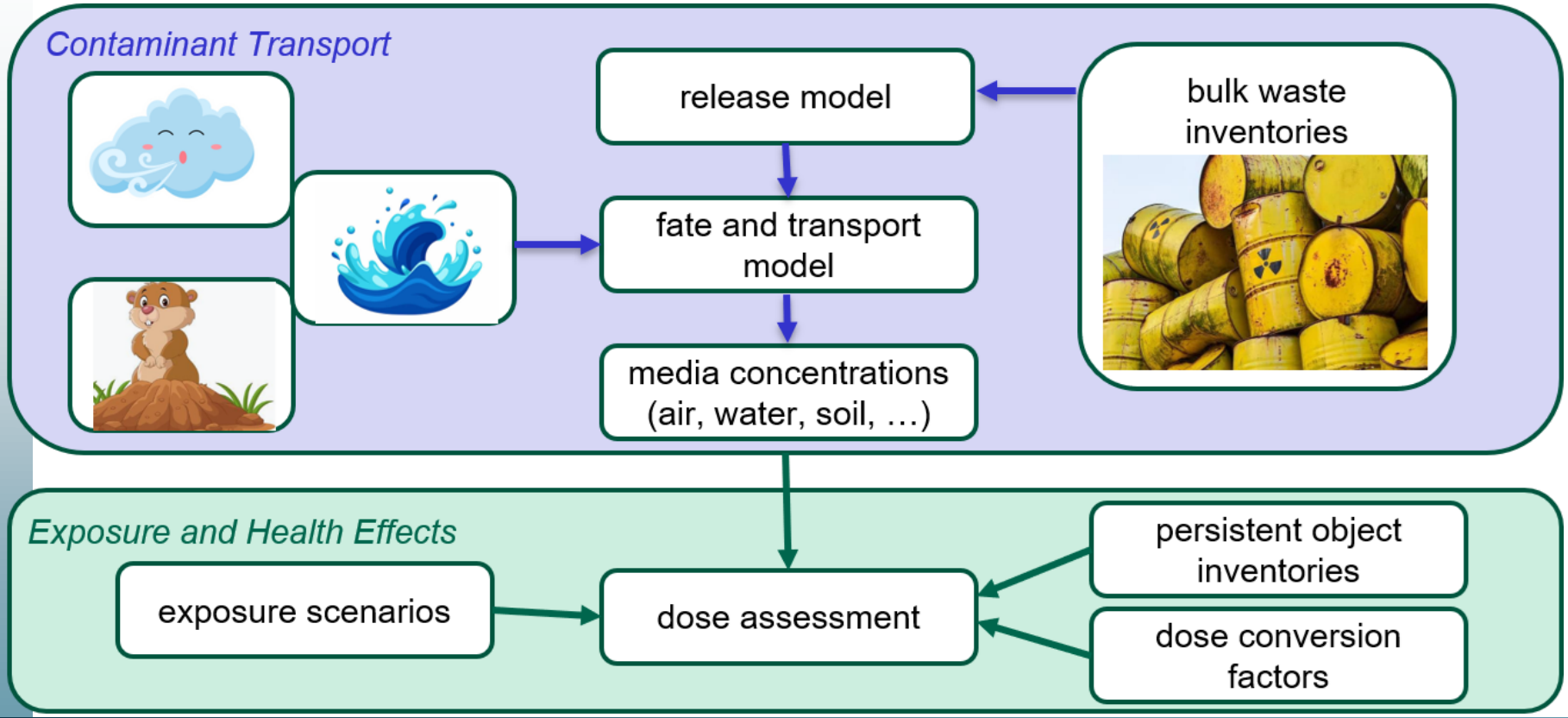
1. Development of the Seneca Nation traditional lifeways exposure scenario
2. Evaluation of Lake Erie and Niagara River drinking water supply exposures

Focus of August QPM Exposure Scenario Topics

Address request to discuss several specific topics:

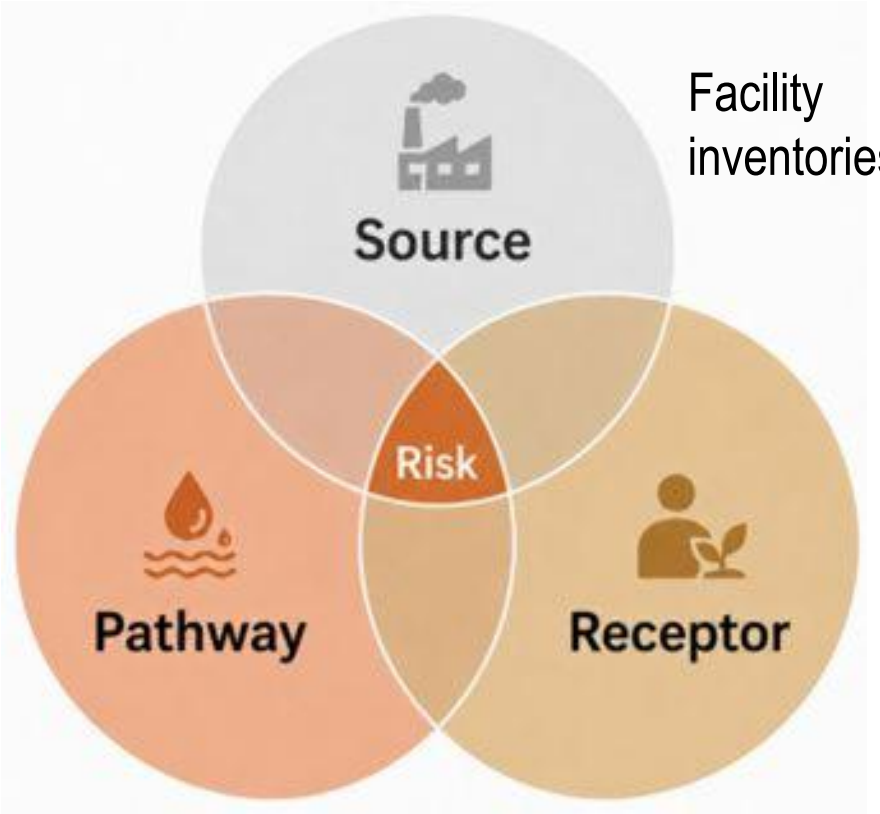
- exposure parameter values, and which are probabilistic vs. deterministic
- exposure routes, and relationship to gamma, beta, and alpha radiation types
- primary exposure pathways and On-Site and Off-Site exposure scenarios
- primary transport pathways
- consideration of recreational exposures in the Zoar Valley

Performance Assessment Modeling Framework



Risk Assessment Modeling Framework

Facility inventories



Ex: groundwater → irrigation → plant uptake → produce ingestion

Ex: resident farmer; activities and lifestyle

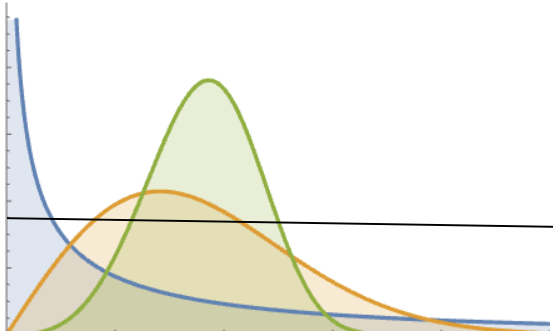
Deterministic vs. Probabilistic Parameters

Deterministic Parameters (a single value):

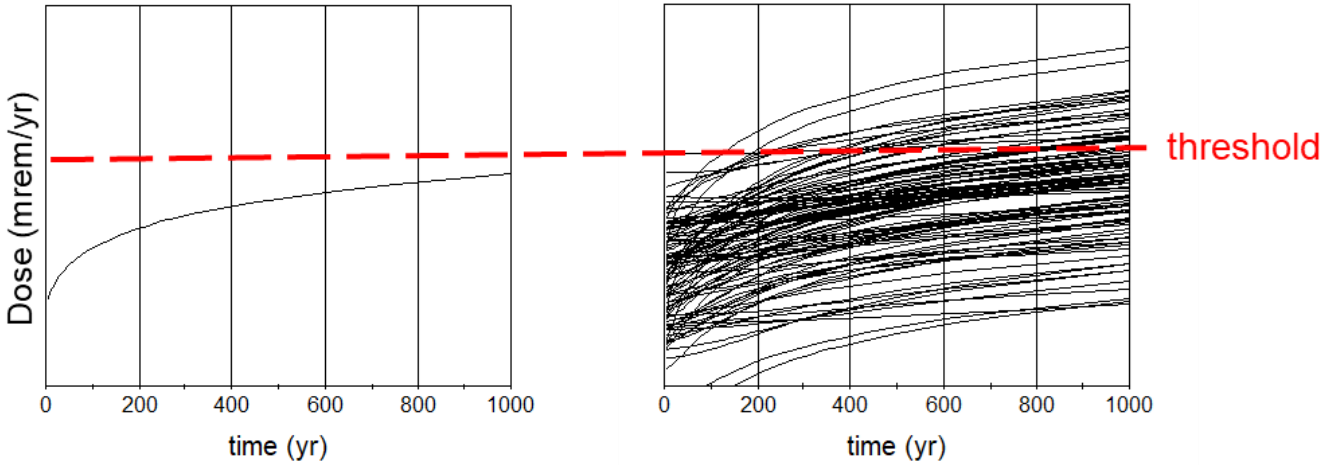
- Dose-response values (Ex: radiological dose coefficients)

Probabilistic Parameters (a distribution of values):

- Exposure variables (Ex: food and water ingestion rates, indoor and outdoor exposure times)
- Transfer factors (Ex: plant-to-soil concentration ratios)
- Almost everything else in the Probabilistic Performance Assessment model!



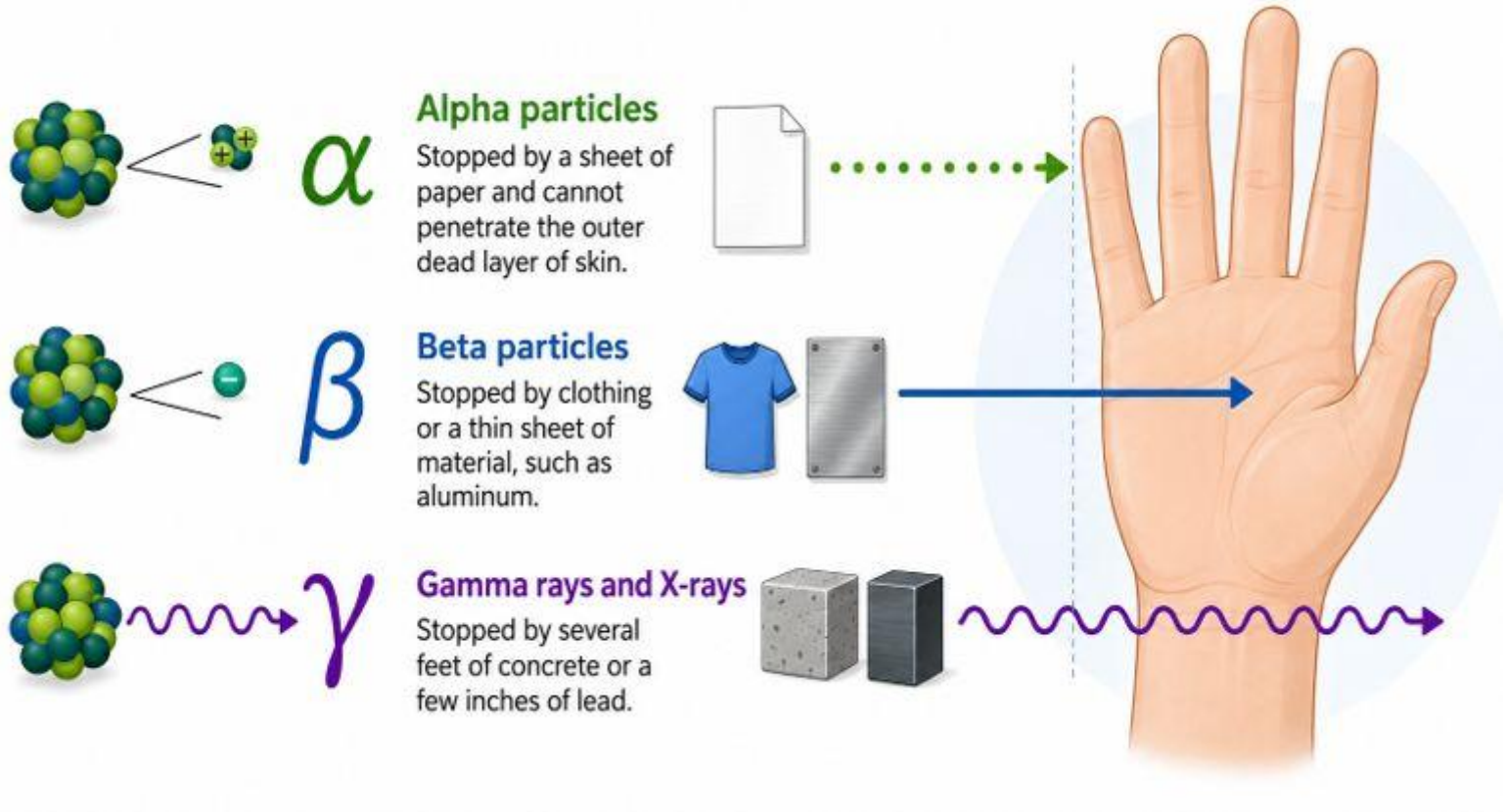
Output of Deterministic vs. Probabilistic Methods



- Does not represent uncertainty
- Decision appears clearer than it really is

- Reflects uncertainty clearly
- Decision accommodates state of knowledge

Types of Radiation



Exposure Routes and Radiation

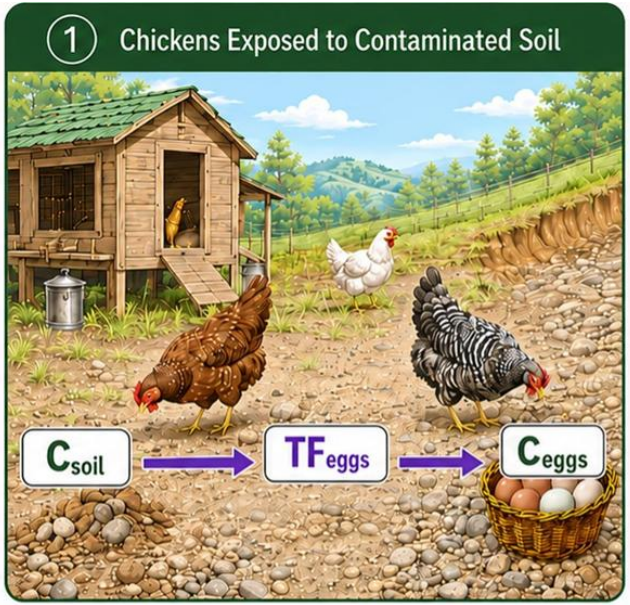
External Radiation Exposure Route

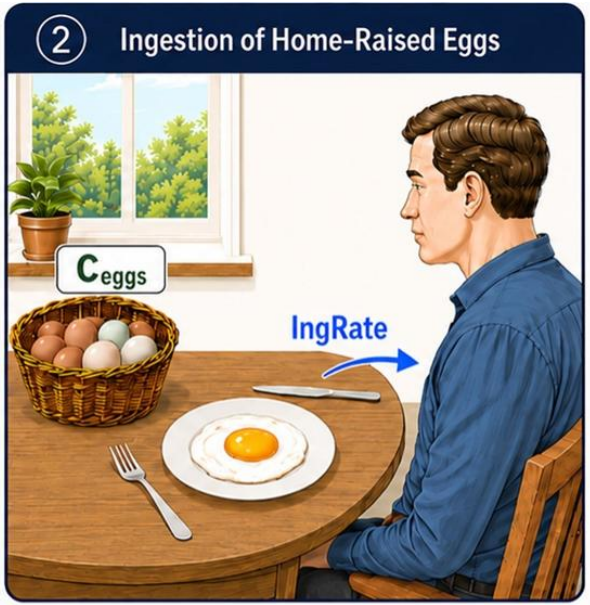
- Surface soil and sediment, subsurface soil (basement exposure), and persistent objects such as pieces of activated metal like fuel cladding hulls
- Primarily gamma and x-ray radiation, and skin dose for beta radiation

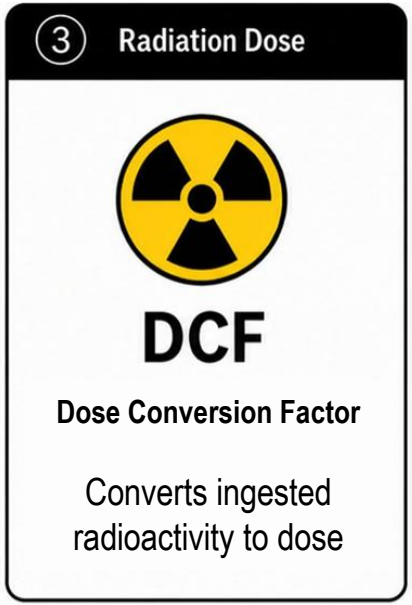
Ingestion and Inhalation Exposure Routes

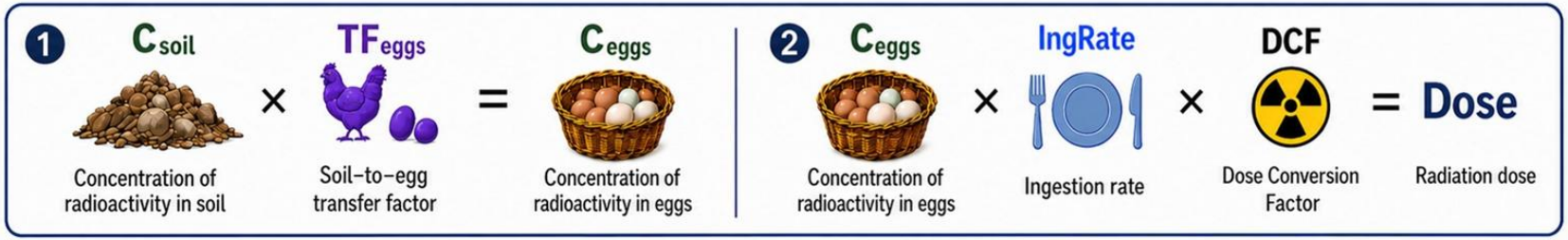
- Surface soil and sediment (ingestion), surface and well water (ingestion), home-produced foods (ingestion; produce, chicken meat and eggs, milk, fish), and air (inhalation of fine particulates and gases)
- Alpha, beta, and gamma/x-ray radiation, with alpha being the most damaging

Simplified Dose Calculation: Egg Ingestion Dose from Contaminated Soil

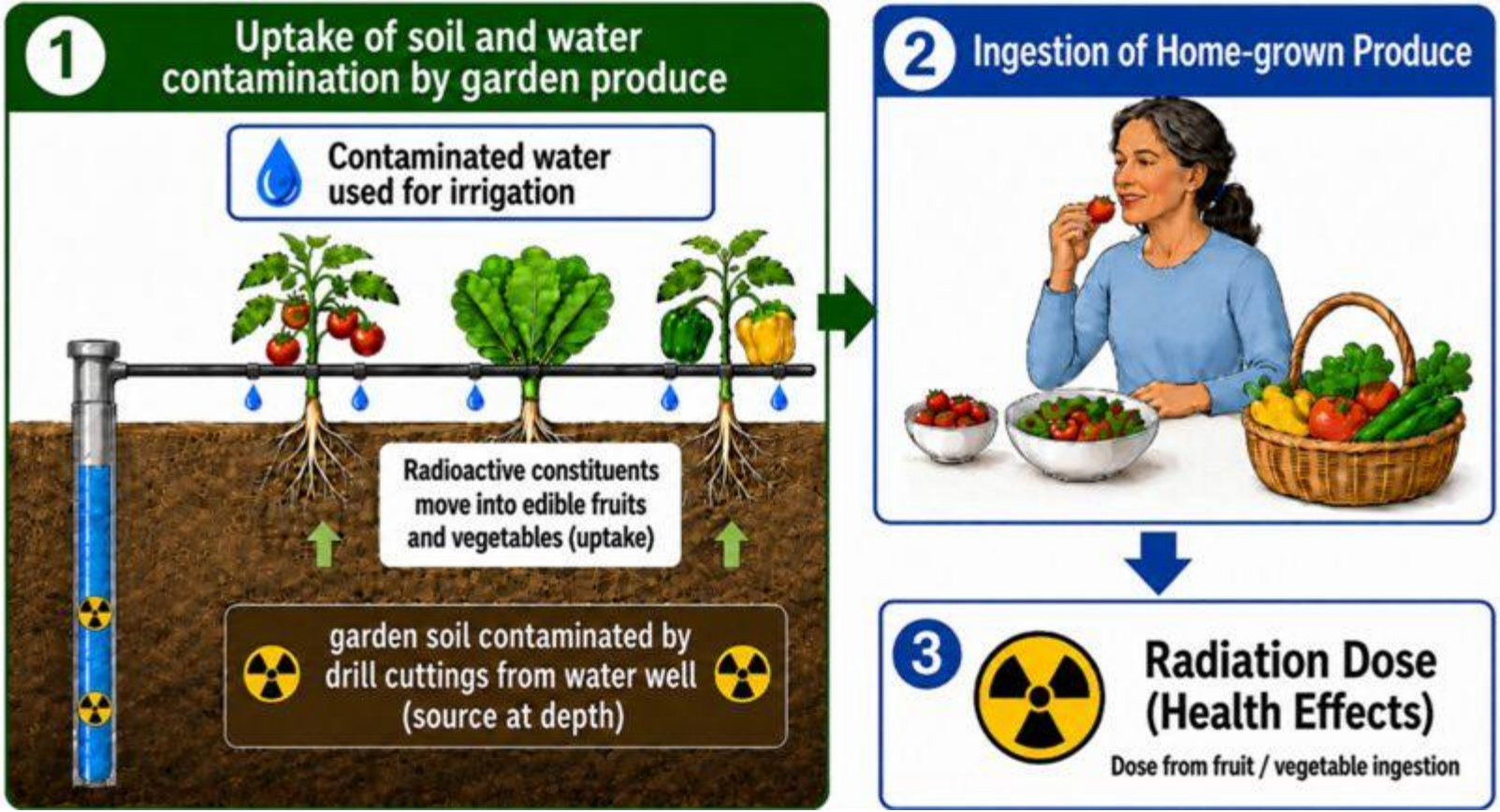




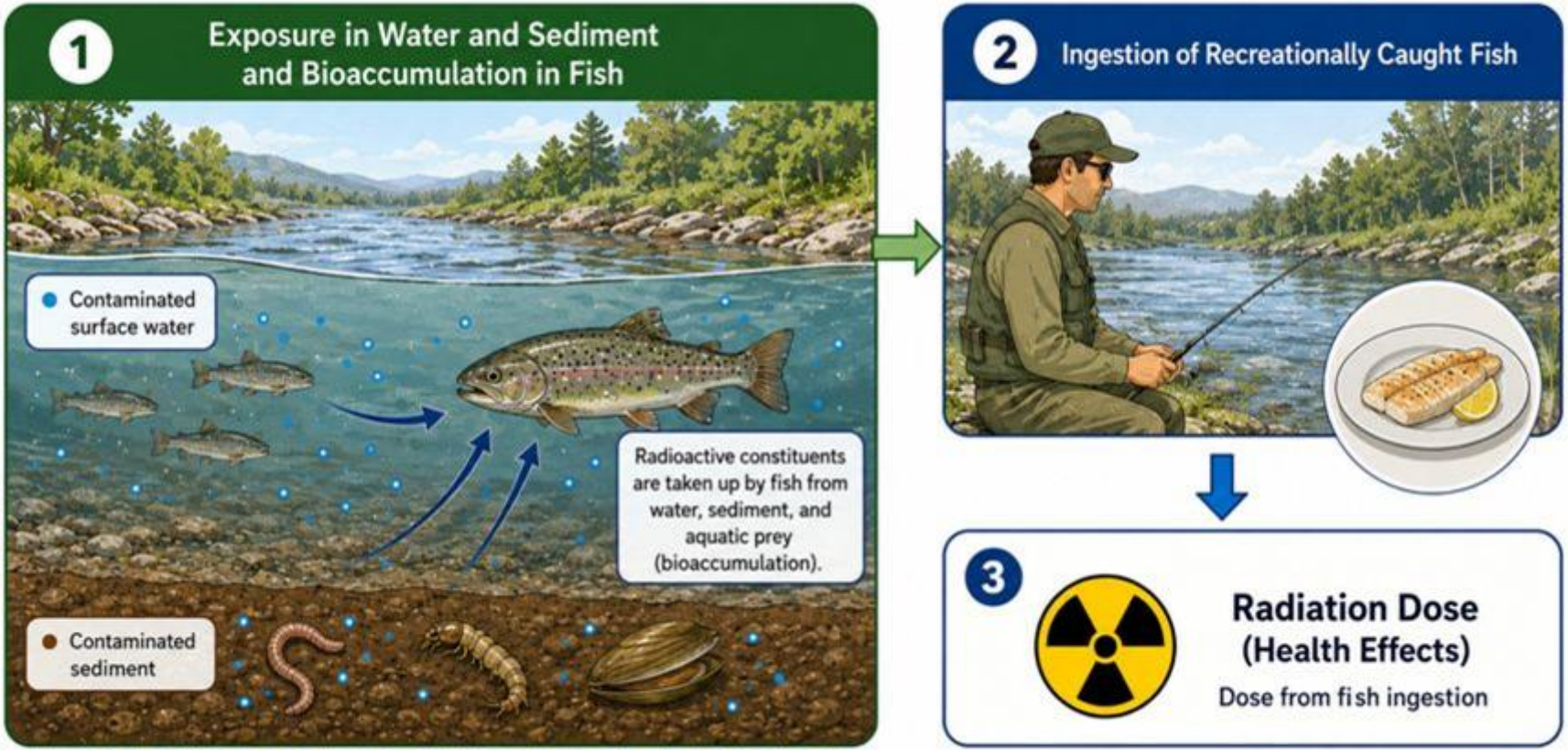




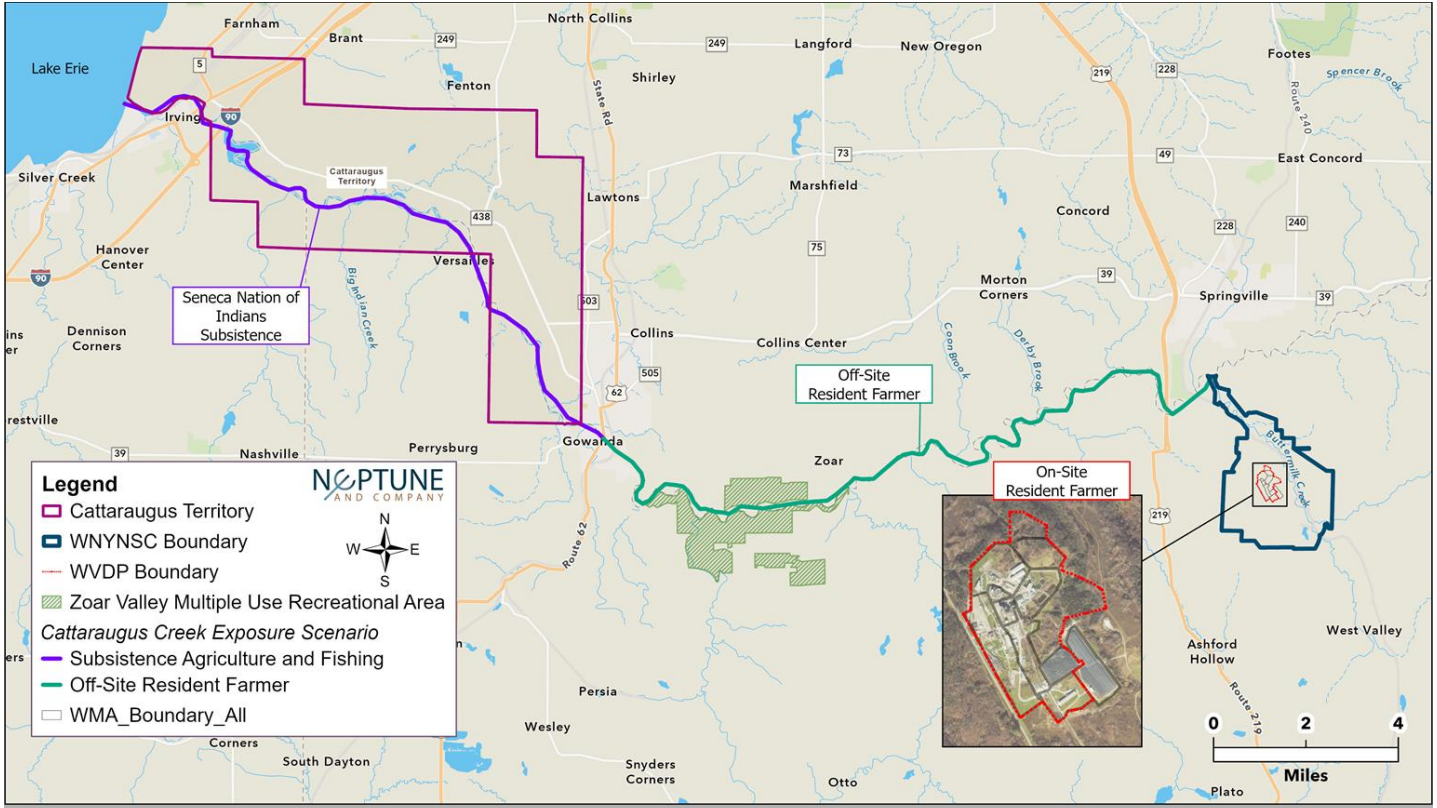
Example Dose Pathway: Fruit and Vegetable Ingestion



Example Dose Pathway: Fish Ingestion

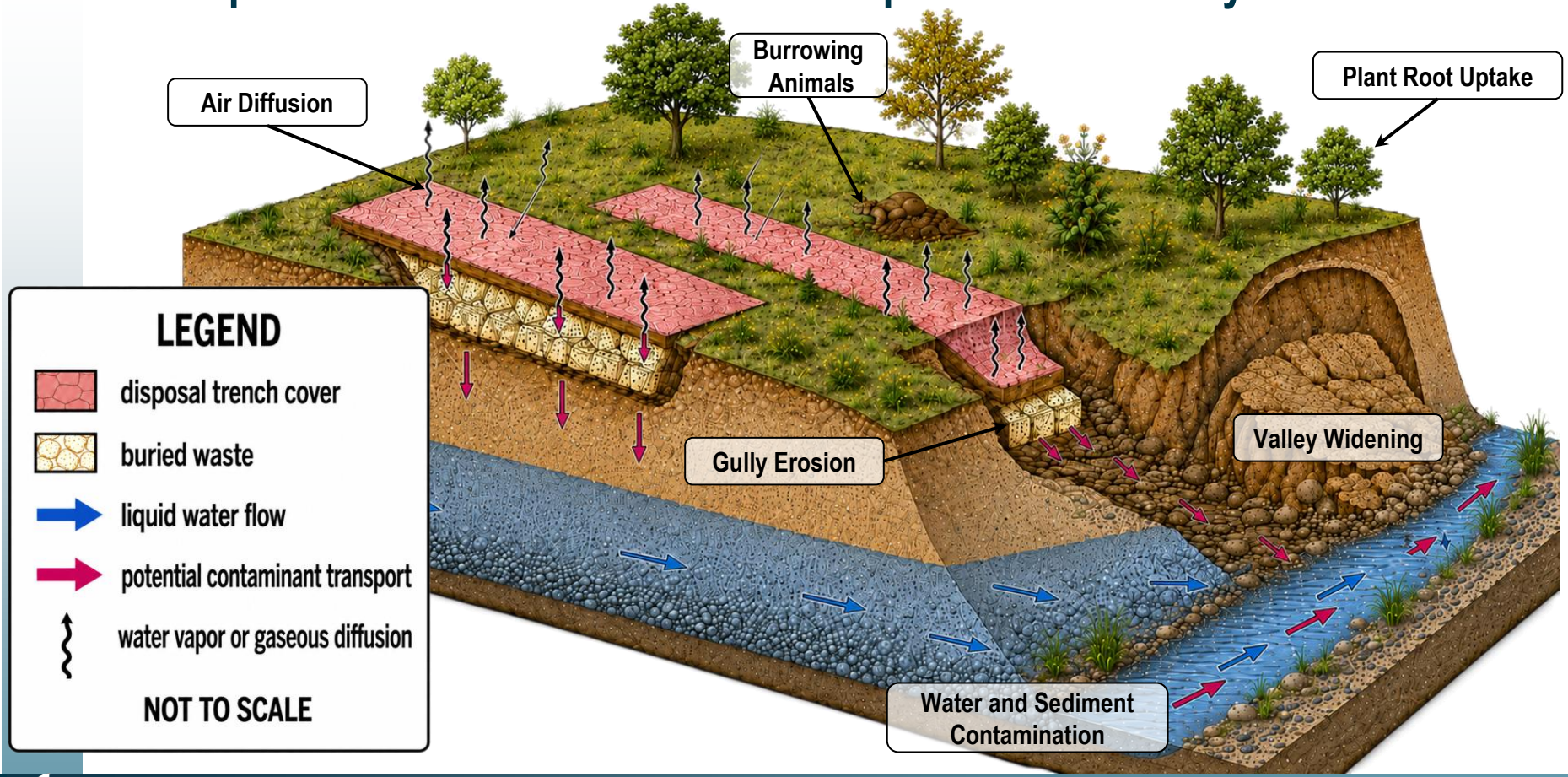


Exposure Scenarios and Locations

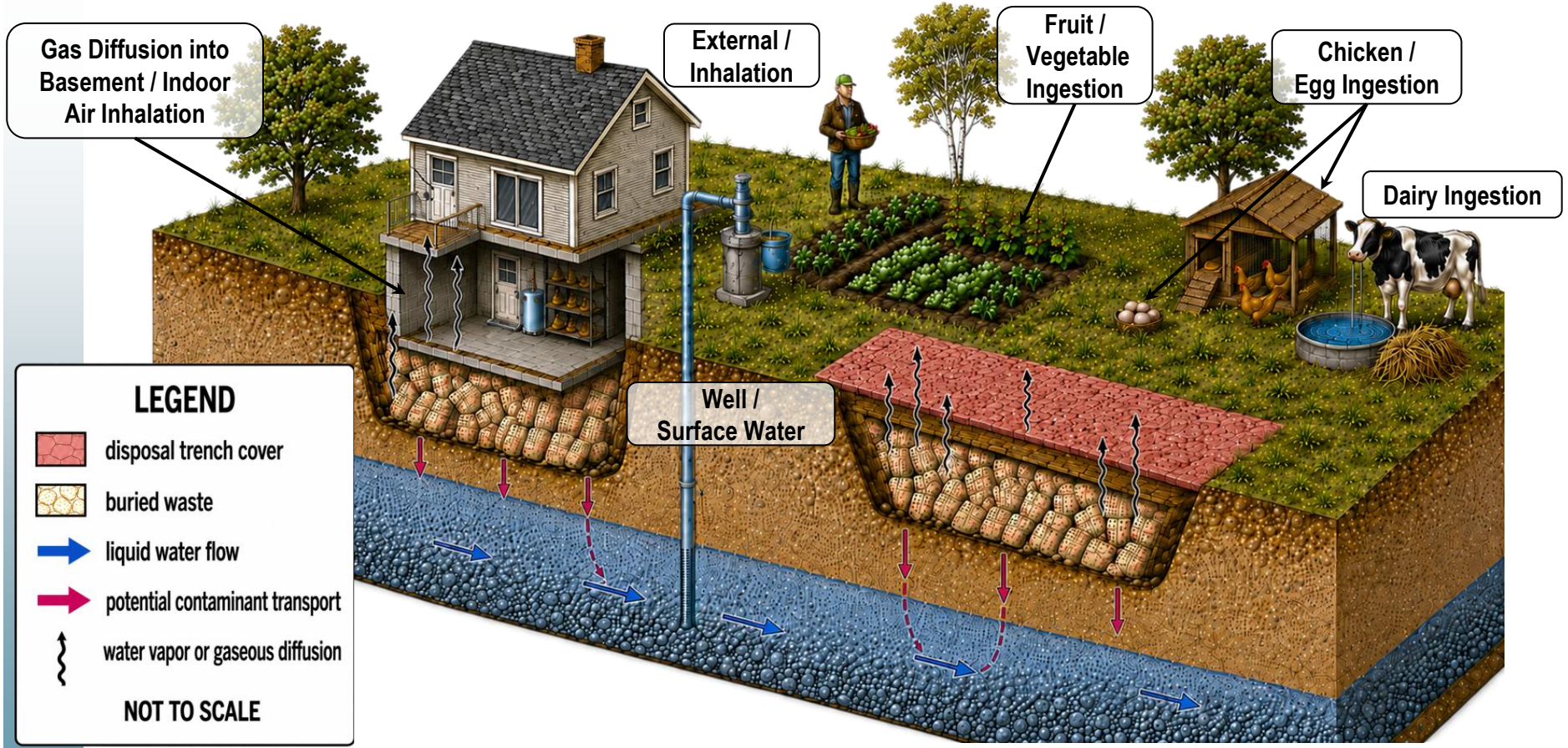


Locations of Cattaraugus Creek Exposure Scenarios

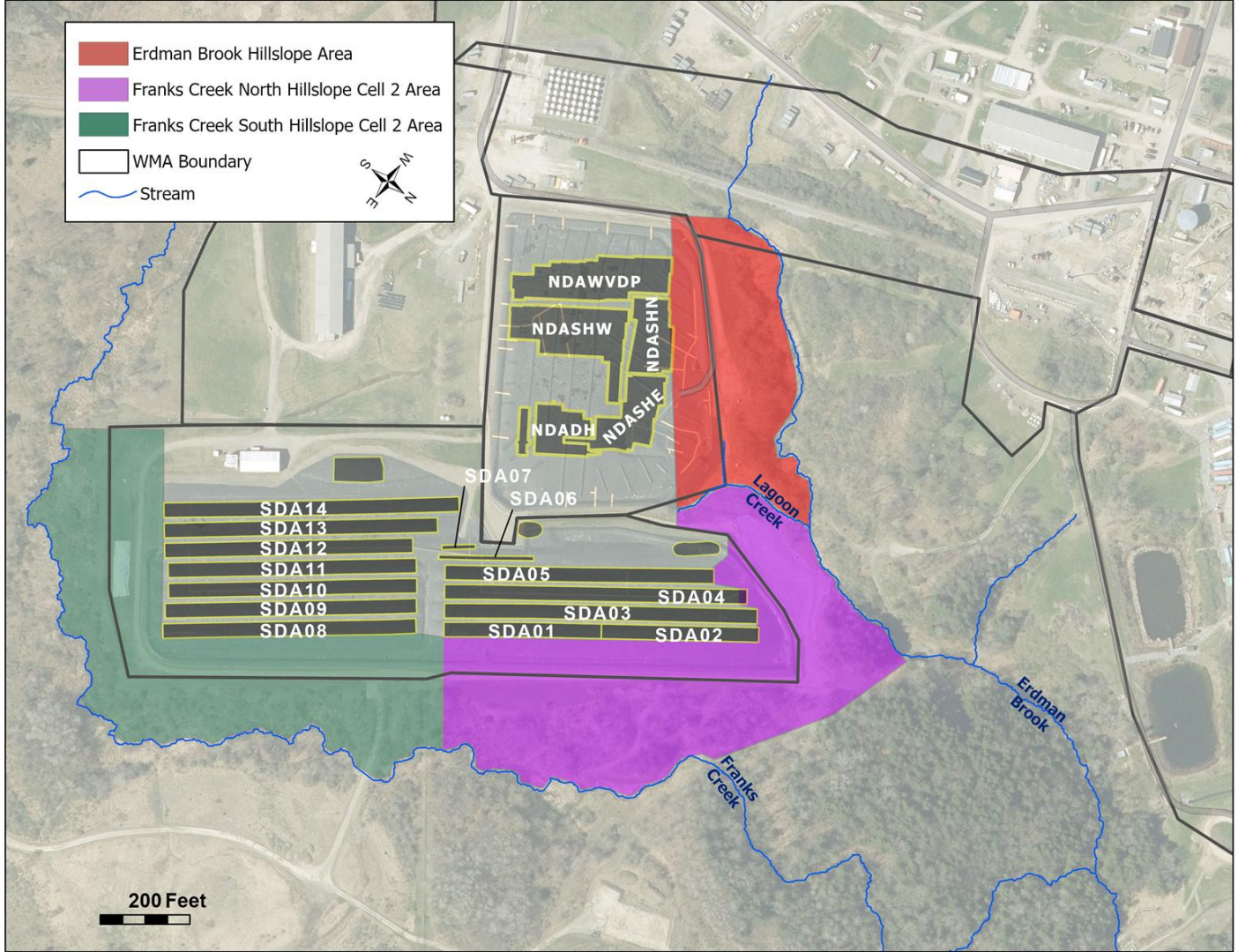
Conceptual Model of Contaminant Transport at West Valley Site Facilities



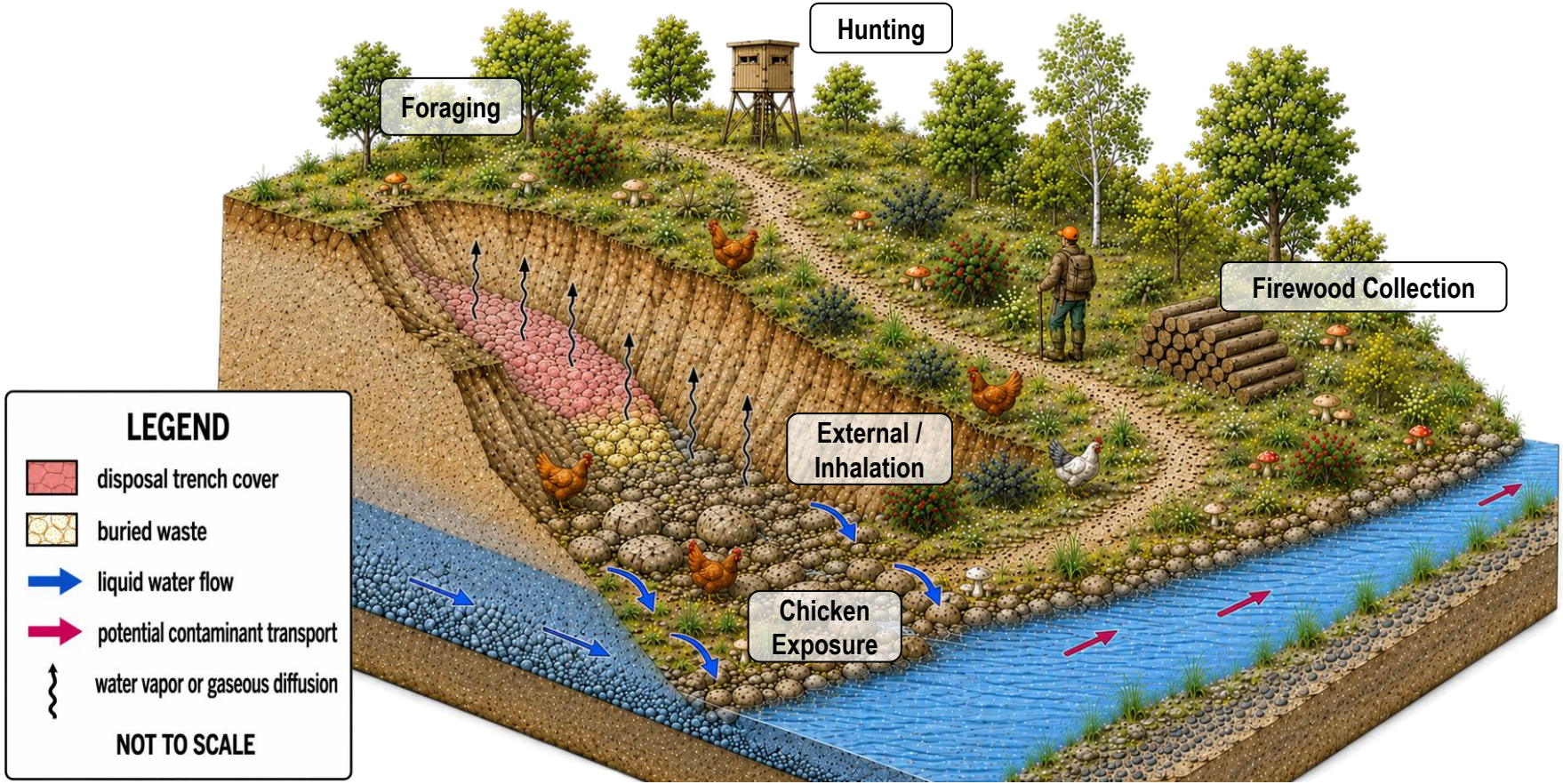
On-Site Resident Farmer Exposure Scenarios

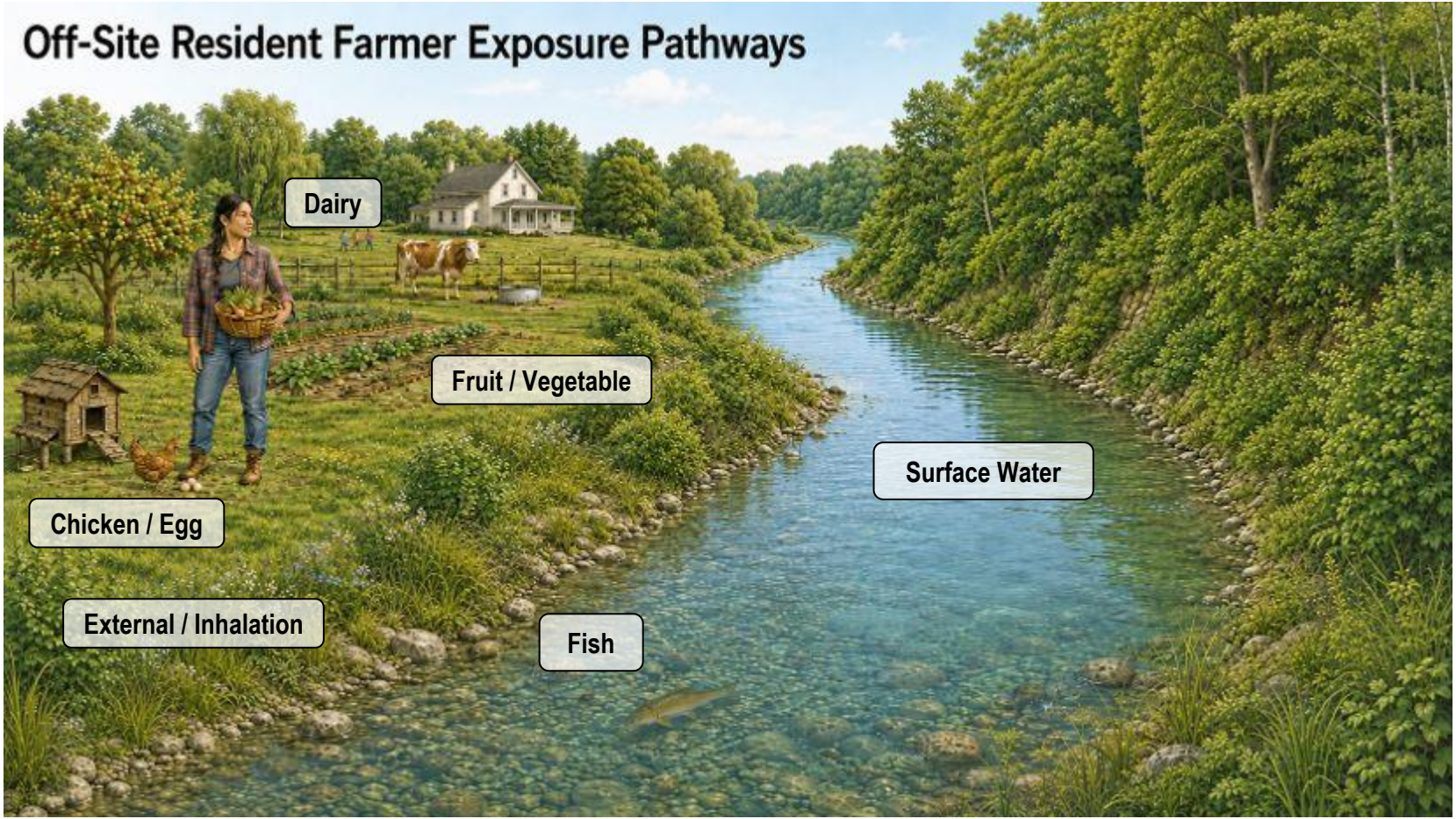


Hillslopes Visualization South Plateau



Hillslope Exposure to On-Site Resident Farmer

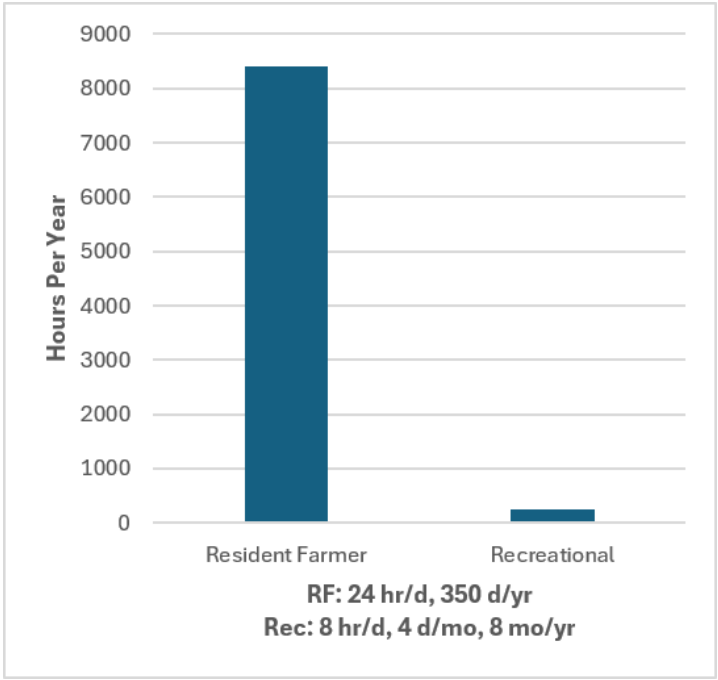



Off-Site Resident Farmer Exposure Pathways
Dairy
Fruit / Vegetable
Surface Water
Chicken / Egg
External / Inhalation
Fish

Hikers in Zoar Valley (Recreational)

The Off-Site resident farmer (RF) scenario serves as a highly protective proxy for recreational exposure scenarios, such as hikers, because:

- Cattaraugus Creek water and floodplain concentrations from the first Cattaraugus Creek reach downstream of Buttermilk Creek are evaluated for Off-Site RF.
- The Off-Site RF scenario assumes use of creek water for the home, and 40% of calories from fish and homegrown foods.



Review of QPM Exposure Scenario Topics

Future QPM

1. Development of the Seneca Nation traditional lifeways exposure scenario
2. Evaluation of Lake Erie and Niagara River drinking water supply exposures
3. Overview of population dose calculations