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Assessing Food Chain Pathways in Biosphere Models

Bruce Napier
Pacific Northwest National Laboratory

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Biosphere Models: Food-Chain Pathway Parameter Assessment

- Support for estimation of radiation doses in the biosphere from radionuclides in contaminated ground water release scenarios for NRC's performance assessments of waste disposal facilities and decommissioning sites
- Research results provide independent basis for:
  - Development of regulatory criteria and guidance
  - Evaluation of applicants' biosphere data, information, and computer codes

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Biosphere Models: Project Description

- Review studies of radionuclide uptake in vegetation and animal products
- Determine radionuclide uptake factors for plants; regional variation of soils and water quality
- Investigate radionuclide transfer coefficients for animal products
- Evaluate alternative conceptual models for food-chain pathway assessments
- Participate in international radioecology studies with IAEA, Russia, and other countries

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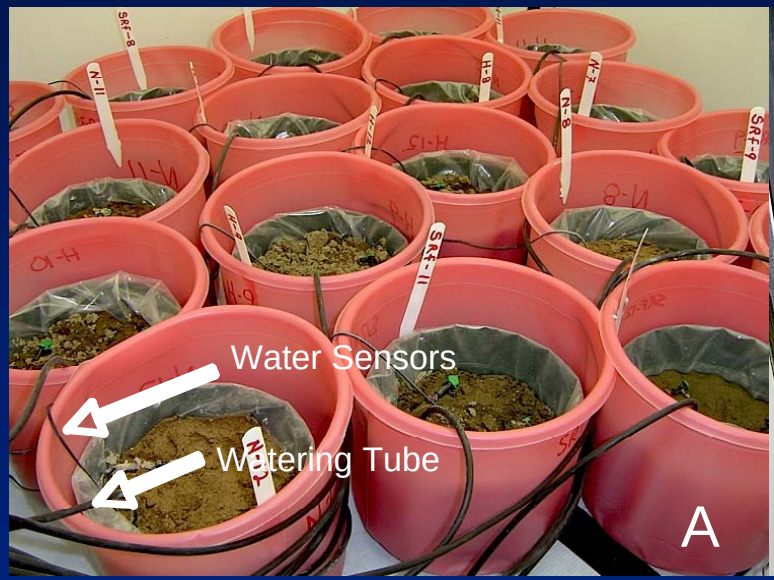
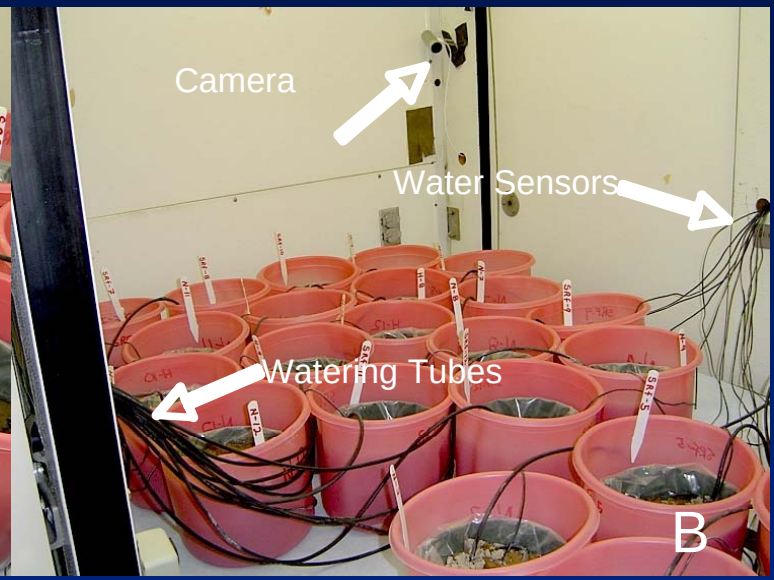
Radionuclide Uptake Studies





Tc	Hanford, WA	Onion
Am	Savannah River/Barnwell, SC	Corn
Pu	Amargosa Valley, NV	Potato
		Alfalfa

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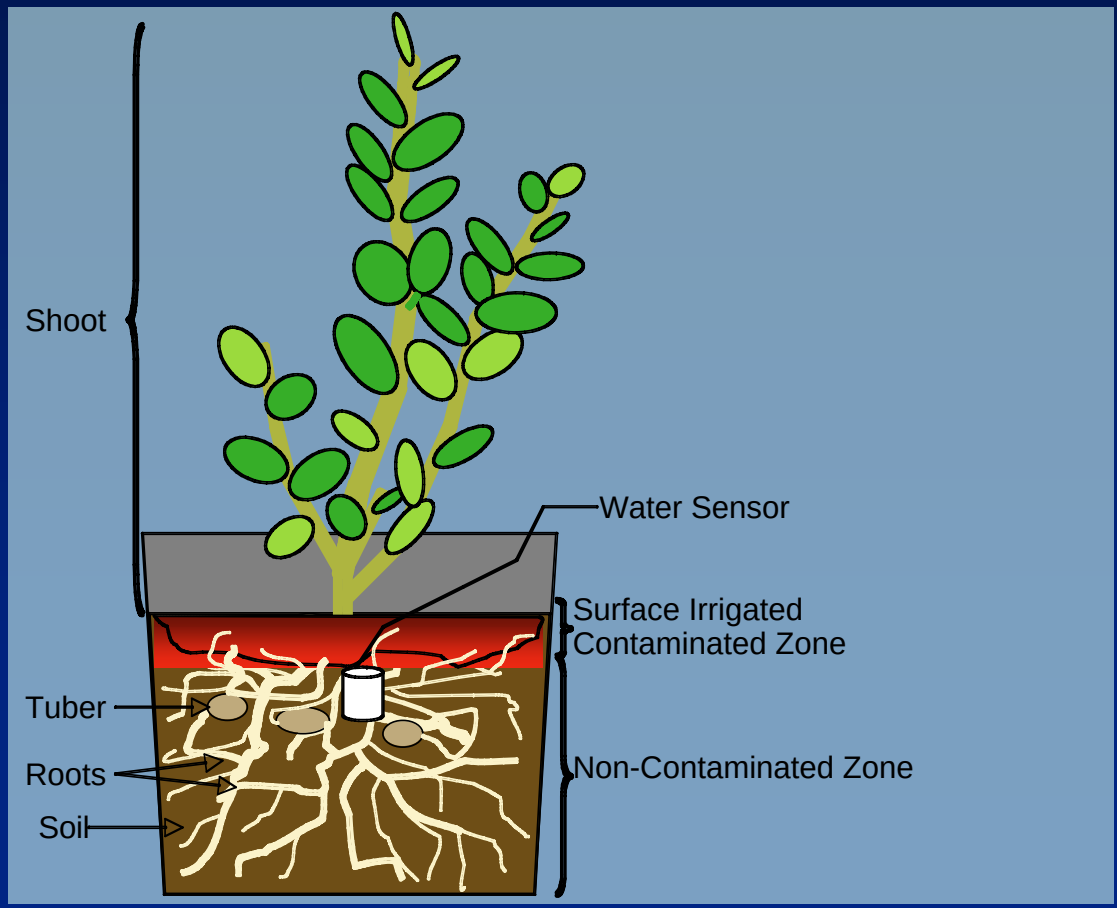
Radionuclides added with water



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Uptake Studies: Typical Results

Technetium-99 concentration ratios (shoot pCi ^{99}Tc/g dry wt./soil pCi ^{99}Tc/g dry wt.) for the above-ground foliage for the four plant species and the four soil types tested. Data are averages ± S.D. (N=5).

Soil Type	**Avg. ^{99}Tc Shoot Concentration Ratio[1]** (Shoot pCi/gdw /Soil pCi/gdw)			
	Onion	Alfalfa	Corn	Potato
Hanford	239±124	52±17	228±131	265±160
Nevada	232±78	120±31	397±82	294±18
Savannah River Pine Forest	154±15	502±199	-[2]	-[2]
Savannah River Agricultural Field[3]	340±109	775±170	245±89	1779±350

1. Includes all above ground foliage.
2. Experiment not performed because of soil allelopathy. (natural plant toxins)
3. Clemson University research field, grown in corn and soybeans for last 20 years.

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International and Other Activities

- Mayak plutonium production site (Russia)
- Semipalatinsk Test Site (Kazakhstan)
- IAEA working group on updating transfer parameters (TRS-364)
- Oregon State University (fruit and nut trees)

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Biosphere Models: Products

- NUREG/CR-6825 (2003) on literature review of plant and animal uptake factors
- NUREG/CR-6881 (2005) on characterization of soils and groundwater and agricultural practices in northwest, southwest, and southeast US locations
- NUREG/CR-6910 (2006) on alternative conceptual biosphere models
- Determining radionuclide uptake in plants and leaves (Soon… 2007)
- Training on GENII V.2 computer code
- Cooperative studies involving NRC, PNNL, and Oregon State University of uptake in fruit and nut trees