

Title: **BASELINE TRITIUM CONCENTRATIONS
IN SOILS AND VEGETATION:
THE TSHIREGE WOODLAND SITE AT TA-54**

Author(s): **P.R. Fresquez**

Submitted to:

<http://lib-www.lanl.gov/la-pubs/00418808.pdf>



Los Alamos
NATIONAL LABORATORY

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the University of California for the U.S. Department of Energy under contract W-7405-ENG-36. By acceptance of this article, the publisher recognizes that the U.S. Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. The Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; therefore, the Laboratory as an institution does not endorse the viewpoint of a publication or guarantee its technical correctness.

BASELINE TRITIUM CONCENTRATIONS IN SOILS AND VEGETATION: THE TSHIREGE WOODLAND SITE AT TA-54

by

P.R. Fresquez

ABSTRACT

In compliance with Department of Energy Order 5400.1, a preoperational environmental survey was conducted for the Tshirege woodland site—an experimental area managed by the Earth and Environmental Science Group (EES-15)—where radioactive tritium (^3H) will be injected ten cm deep in and around the base of pinyon (*Pinus edulis*) and one-seeded juniper (*Juniperus monosperma*) trees during the summer of 1990. The site is located at the lower end of Canada del Buey close to the intersection of Pajarito and State Road 4. Baseline values of ^3H were measured in soil and plant samples from five locations immediately surrounding the study area. Mean values of ^3H in soils collected from the 0 to 5 and 25 to 30 cm depths were 1.24 (± 0.22) and 1.08 (± 0.41) pCi mL⁻¹, respectively. Pinyon needles averaged 1.68 (± 0.18) pCi mL⁻¹ and blue grama grass (*Bouteloua gracilis*) averaged 1.16 (± 0.95) pCi mL⁻¹.

1. INTRODUCTION

A preoperational environmental survey is required by the Department of Energy (DOE) for all new facilities or operations that will process, release, or dispose of radioactive materials (DOE 1988). Radioactive tritium (^3H) has been employed in a field experiment conducted by the Earth and Environmental Science Group (EES-15) during the summer of 1990. Plans were to spike tritium 10 cm deep in and around the base of pinyon (*Pinus edulis*) and one-seeded juniper (*Juniperus monosperma*) trees for the purpose of tracing the movement of water; a process pertinent to issues in waste management (Breshears 1989). The study will require the injection of 1 mCi (37 MBq) ^3H (as tritiated water) per experimental plot. Up to 30 plots have been spiked during the

study. Therefore, in accordance with DOE Order 5400.1, a preoperational study was conducted at the proposed study site to establish baseline concentrations of ^3H in soils and plants prior to the commencement of the experiment. This paper reports those results.

2. MATERIALS AND METHODS

The Tshirege woodland study site is located within Los Alamos National Laboratory (LANL) Technical Area (TA) 54—close to the intersection of Pajarito Road and NM State Road 4 (Figure 1). The site is classified as a pinyon/one-seeded juniper/blue grama (*Bouteloua gracilis*) habitat type (Foxy and Bennett 1990). There are no endangered or threatened plant or animal species known to exist in the area. The area occurs on a Penistaja sandy loam soil which consists of deep, well-drained soils (Nyhan et al. 1978). Water erosion is low and annual precipitation amounts to nearly 45 cm (DOE 1979). Most of the precipitation (75%) falls between May and October. The predominant wind directions at the Area G meteorological tower are southwesterly during the day and northwesterly during the night (ESG 1989).

On June 1, 1990, soil and plant samples were collected from five locations immediately surrounding the field study site. Soils were collected at the 0 to 5 and at the 25 to 30 cm depth with a 14 by 5 cm stainless steel ring and bucket auger, respectively. Approximately 1200 to 1400 grams of pinyon shoot tips (needles) and blue grama grass topgrowth were also collected. Individual samples of soils and vegetation were placed into 1 quart glass jars and double bagged into Ziplock plastic containers to protect against moisture loss. The samples were placed into ice chests for transport to the laboratory and kept frozen until analysis. Samples were submitted to the Health and Environmental Chemistry Group (HSE-9) for the analysis of ^3H . Tritium was reported as activity per unit volume of soil water. Detailed descriptions of quality assurance/quality control procedures applicable to the collection and chemical analysis of soil and vegetation samples can be found in Quality Assurance Projected Plans (ESG 1987) and in Gautier et al. (1987).

3. RESULTS

3.1 Soils

Tritium concentrations in soils collected at the 0 to 5 cm depth ranged from a low of 1.0 to a high of 1.6 pCi mL⁻¹ (Table 1). Overall, mean soil concentrations of tritium at the 0 to 5 cm depth was 1.24 (±0.22) pCi mL⁻¹. Long-term regional background data for tritium at the 0 to 5 cm depth has been reported to average around 2.6 pCi mL⁻¹ (Purtymun et al. 1987). Tritium concentrations at the 25 to 30 cm depth averaged around 1.08 (±0.41) pCi mL⁻¹. These soils ranged from 0.6 to 1.7 pCi mL⁻¹ in tritium contents.

3.2 Plant Materials

Concentrations of tritium in vegetation are shown in Table 2. Pinyon ranged from 1.5 to 1.9 pCi mL⁻¹ with an overall average of 1.68 (±0.18) pCi mL⁻¹. Results from pinyon needles were very stable. Blue grama results, on the other hand, were more variable ranging from 0 to 2.2 pCi mL⁻¹ with an average ³H concentration of 1.16 (±0.95) pCi mL⁻¹.

Table 1. Concentration of tritium (pCi mL⁻¹) in soils collected at the 0 to 5 and the 25 to 30 cm depth from the Tshirege woodland study site on June 1, 1990.

Sample location	Depth (cm)	
	0–5	25–30
#1	1.20	0.90
#2	1.00	1.20
#3	1.60	1.00
#4	1.20	1.70
#5	1.20	0.60
<i>Mean (± std dev)</i>	1.24 (±0.22)	1.08 (±0.41)

Table 2. Concentration of tritium (pCi mL⁻¹) in pinyon and blue grama plant tissues growing within the Tshirege woodland study site on June 1, 1990.

Sample location	Pinyon	Blue grama
#1	1.80	0.00
#2	1.50	0.40
#3	1.50	2.20
#4	1.90	1.30
#5	1.70	1.90
<i>Mean (± std dev)</i>	1.68 (±0.18)	1.16 (±0.95)

4. REFERENCES

Breshears, D., "Action Description Memorandum: Water and Nutrient Dynamics in a Pinyon/Juniper Community," Los Alamos National Laboratory memorandum ADM 89-11 (1989).

Department of Energy (DOE), "Final Environmental Impact Statement: Los Alamos National Laboratory Site," Los Alamos, New Mexico, DOE/EIS0018 (1979).

Department of Energy (DOE), U. S. Department of Energy Order 5400.1, General Environmental Protection Program (1988).

Environmental Surveillance Group (ESG), "Quality Assurance Project Plans, Environmental Surveillance Group, HSE-8," Los Alamos National Laboratory report LA-UR-87-1076 (1987).

Environmental Surveillance Group (ESG), "Environmental Surveillance at Los Alamos During 1988," Los Alamos National Laboratory report LA-11628-ENV (1989).

Foxx, T.S., and K.D. Bennett, "Ecological Survey Report for the Proposed Location of the Meteorological (MET) Station," Los Alamos National Laboratory report BIO-90-2 (1990).

Gautier, M.A., E.S. Gladney, W.D. Moss, M. Phillips, and B.T. O'Malley, "Quality Assurance for Health and Environmental Chemistry: 1986," Los Alamos National Laboratory report LA-11114-MS (1987).

Nyhan, J.W., L.W. Hacker, T.E. Calhoun, and D.L. Young, "Soil Survey of Los Alamos County, New Mexico," Los Alamos Scientific report LA-6779-MS (1978).

Purtymun, W.E., R.J. Peters, T.E. Buhl, M.N. Maes, and F.H. Brown, "Background Concentrations of Radionuclides in Soils and River Sediments in Northern New Mexico, 1974-1986," Los Alamos National Laboratory report LA-11134-MS (1987).