TITLE: RADIONUCLIDE CONTENT OF PINON NUTS IN THE VICINITY OF THE LOS ALAMOS SCIENTIFIC LABORATORY

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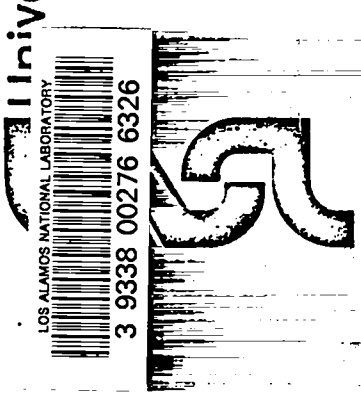

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RADIONUCLIDE CONTENT OF PIÑON NUTS IN THE VICINITY OF THE LOS ALAMOS SCIENTIFIC LABORATORY

by

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ABSTRACT

Over half of the Los Alamos Scientific Laboratory's 11 km^2 (27,500 acres) land area contains the piñon pine tree (pinus edulis) that bears a specialty food of the Southwest - the piñon nut. Since employees and some members of the public harvest piñon nuts on Laboratory lands, the environmental surveillance group undertook a study to assess the radionuclide pathways to man through piñon nuts.

Introduction

As part of the routine environmental surveillance program of Los Alamos Scientific Laboratory (LASL), radioactive pathways of foodstuffs are evaluated. Included in this evaluation are piñon nuts, which are a food source to many people.

The piñon pine tree (pinus edulis) is indigenous to the southwestern United States. The piñon nut, which grows in the cone of the piñon tree, is a small nut (~1 cm long) encased in a hard shell, like sunflower seeds. When the nuts are ripe, the cone splits open spreading the nuts on the ground beneath the tree. Nut colors vary from light brown to dark red with some yellows. The nuts are prized as a specialty food in the Southwest. Nuts are harvested by picking them off the ground. Annual harvests, some 1,500,000[1] pounds, principally come from New Mexico and Arizona.

Figure 1 shows Los Alamos County and surrounding area. The area shaded in red supports the piñon pine. The faint dashed line indicating the National Environmental Research Park boundary is the boundary line for lands owned by LASL. As can be seen, >50% of Laboratory land is covered with the piñon pine tree as is adjacent land outside the LASL boundary.

Methods

Six sampling areas were chosen inside the lands owned by LASL and three others outside the boundaries to provide for background samples. The areas were chosen on the basis of piñon abundance, accessibility and public pressure. About 1/2 kilogram of nuts were picked from the ground in each area, which consisted of approximately one acre (0.4 hectare).

Analyses were made for ^{90}Sr, $^{238,239}Pu$, total U, ^{137}Cs, ^{7}Be and ^{3}H. These radionuclides were selected for analysis (except for ^{7}Be) as the nuclides most likely to have been released to the environment by past and/or present laboratory operations. All samples were crushed, weighed, and submitted for analyses. Unwashed whole nuts were prepared for analysis because some people eat unwashed whole nuts. However, most people prefer to discard the shell and eat only the meat as with sunflower seeds.

Doses for the various radionuclides were calculated by using:

1. An assumed annual piñon nut consumption of 1500 g/person.
2. Area with the highest activity.
3. Ingestion dose factor for adults as from the NRC Regulatory guide 1.109 (1977).[2]

Results

All values in the next tables 1 and 2 are reported in the usual terms of activity per dry weight. When ashed, the samples were 90% to 98% water. Eating 1.5 kg of whole unwashed nuts from the area with the maximum concentration of ^{90}Sr would give a 50 yr dose commitment to bone of 0.45 mrem. The higher concentration of tritium occurred in nuts from an area with known tritium contamination. Eating 1.5 kg of nuts from this area would give a whole body dose of 0.002 mrem. $^{238,239}Pu$ and ^{137}Cs analyses yielded values below detection limits,

(i.e., where twice the counting error is greater than the principal value). One composite sample was high in uranium. The nuts from these locations were harvested in areas with no record contamination and no noticed increase of these contaminants in soil. We believe the ^{90}Sr was due to fallout and the uranium was in soil present on the shell. Due to inclement weather and a poor crop, no more piñon nuts were picked for further analysis.

Because of the very low doses, which, incidentally, are among the highest in foodstuff ingestion about LASL, there should be no concern over consumption of piñon nuts harvested on LASL lands. However, Laboratory programs can change and piñon nuts have been shown to contain radionuclides. Therefore, future piñon crops will be sampled to insure that they are safe for consumption. Soil samples near the sampled trees will also be taken. In several samples we hope to separate nut meats and shells and analyze them separately.

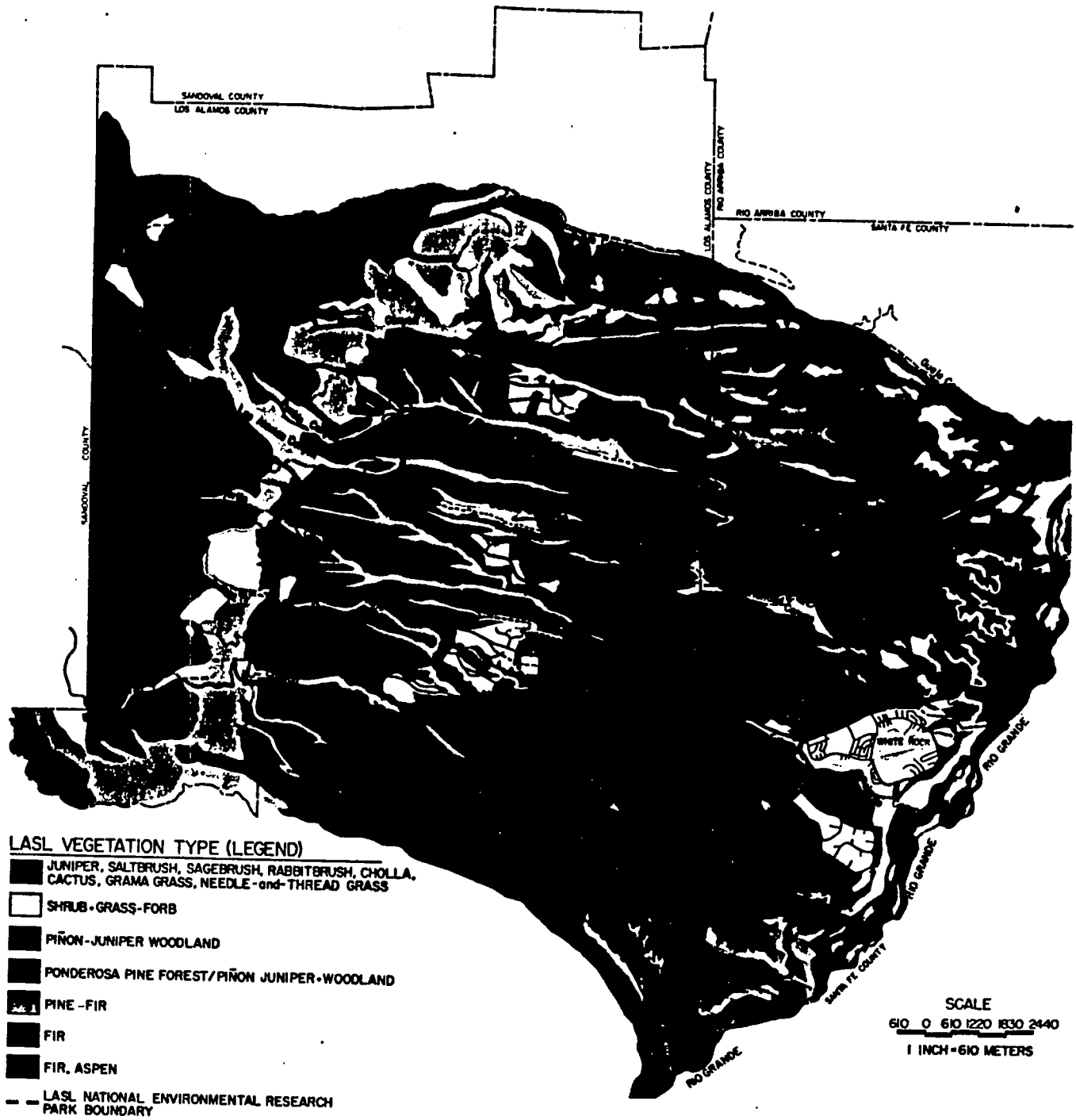
SANDOVAL COUNTY
LOS ALAMOS COUNTY
LOS ALAMOS COUNTY
RIO ARRIBA COUNTY
RIO ARRIBA COUNTY
SANTA FE COUNTY
SANDOVAL COUNTY
WHITE ROCK
RIO GRANDE
RIO GRANDE
SANTA FE COUNTY
RIO GRANDE
LASL VEGETATION TYPE (LEGEND)
JUNIPER, SALTBRUSH, SAGEBRUSH, RABBITBRUSH, CHOLLA, CACTUS, GRAMA GRASS, NEEDLE-and-THREAD GRASS
SHRUB-GRASS-FORB
PIÑON-JUNIPER WOODLAND
PONDEROSA PINE FOREST/PIÑON JUNIPER-WOODLAND
PINE-FIR
FIR
FIR, ASPEN
LASL NATIONAL ENVIRONMENTAL RESEARCH PARK BOUNDARY
LIMITED PUBLIC ACCESS AREA
SCALE
610 0 610 1220 1830 2440
1 INCH=610 METERS

TABLE II

RADIONUCLIDE CONTENT[a] OF PIÑON NUTS IN VARIOUS TECHNICAL AREAS

Technical Area	^{90}Sr pCi/g	^{3}H pCi/ml(±1SD)	^{7}Be pCi/g(±1SD)
BKG[b]	0.17 ± 0.06	4.9 ± .4	0.023 ± 0.06
TA-15	0.15 ± 0.13	5.6 ± .4	0.024 ± 0.007
TA-18	0.2 ± 0.2	12.9 ± .5	0.005 ± 0.009
TA-21/TA-53	0.47 ± 0.08	14.5 ± .6	0.012 ± 0.009
TA-49	0.84 ± 0.16	NS	0.012 ± 0.007
TA-52	0.29 ± 0.10	5.7 ± .4	0.020 ± 0.007
TA-54	0.01 ± 0.25	24.2 ± .8	0.006 ± 0.007

[a] ±Values represent 2 standard deviation.
[b] Background station being a composite of Santa Fe, Nambe, and Abiquiu.

TABLE II

RADIONUCLIDE CONTENT[a] OF PIÑON NUTS IN VARIOUS TECHNICAL AREAS

Technical Area	^{238}Pu pCi/g	^{239}Pu pCi/g	^{137}Cs pCi/g(±1SD)	U ng/g(±1SD)
BKG[b]	.007 ± .010	.003 ± .010	0.004 ± 0.008	80 ± 0.01
TA-15	−.003 ± .025	.025 ± .075	0.005 ± 0.009	130 ± 0.01
TA-18	−.016 ± .013	−.009 ± .009	0.000 ± 0.012	100 ± 0.01
TA-21/TA-53	−.023 ± .054	−.054 ± .030	0.003 ± 0.011	790 ± 0.08
TA-49	−.037 ± .075	.019 ± .043	0.015 ± 0.009	110 ± 0.01
TA-52	−.057 ± .036	.007 ± .036	0.019 ± 0.010	50 ± 0.01
TA-54	−.08 ± .22	.22 ± .24	0.004 ± 0.010	80 ± 0.01

[a] ±Values represent 2 standard deviation.
[b] Background station being a composite of Santa Fe, Nambe, and Abiquiu.

LITERATURE CITED

1. Little, E.L., Jr., Profits in Pinon 1938a.

2. NRC Regulatory Guide 1.109 1977.