REPORT NO. NYO-4649

53572

HEALTH AND SAFETY LABORATORY
Analytical Branch

STUDIES OF FACTORS IN THE UPTAKE OF Sr^{90}

SITE SURVEY - FALL 1954

Compiled by

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DISCLAIMER

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ABSTRACT

The basic problems in a study of uptake is the source or cources of entry into the food chain. In the fall of 1953, HASL began a study of this problem by setting up five (5) pastures in various parts of the United States for radiostrontium assay. NYO-4571 reports the analytical results of this survey along with some preliminary conclusions as to the uptake mechanism of radiostrontium. The present report compares the data obtained in 1953 and presents additional data from the latest survey made in 1954. Due to the large number of variables involved in uptake studies, this report is not to be considered final. Conclusions are based on trends in the available data and each pasture site is to be resurveyed at least once each year. This survey covers analyses of Sr^{89} and Sr^{90} in fallout material, soil, vagetation, and animal bone. Stable strontium and radium measurements are also to be made on this material.

SUMMARY (1954)

TABLE I

Location	Soil*	Sunshine Units Vegetation	Bone**
Raleigh, North Carolina	8.6 ± 0.4	26 ± 0.5	2.1 ± 0.2
Ithaca, New York	3.5 ± 0.1	0.15 ± .07	2.4 ± 0.2
Improved Pasture, Tifton, Georgia	11 ± 0.5	3.9 ± 0.8	2.7 ± 0.2
Native Range, Tifton, Georgia	31 ± 2.7	30 ± 1.7	7.0 ± 0.3
Robinson's Farm, Logan, Utah	1.2 ± 0.1	10 ± 0.8	4.4 ± 0.2
College Pasture, Logan, Utah	1.1 ± 0.1	6.3 ± 0.7	1.7 ± 0.2
New Brunswick, New Jersey	7.7 ± 0.3	9.1 ± 0.4	2.7 ± 0.2

* All soil values here are from 0-2" depth and Strontium values were obtained by Ammonium Acetate Leach.

** The Raleigh calf was born in February
The Ithaca sheep was born in March
The Tifton calves were born in February or March
The Logan calves were born in March
The New Brunswick sheep was born in March

I. INCREASE OF Sr^{90} CONTENT IN PRESENT SURVEY OVER 1953 SITE SURVEY

Table II gives the Sr^{90} content of animal bone in 1953 compared to the levels found in the 1954 survey. All 1953 bone samples were reanalyzed using the method in present use which is published in NYO-4617. Soil results were not compared, as all 1954 results are ammonium acetate leach extracts. 1953 results are those obtained by a complete solution method treatment of the soil. Not enough vegetation was analyzed in 1953 for comparison with the present survey.

The bone levels have increased on the average by a factor of 2.4.

TABLE II

Location	Animal Bone d/m/gm ash 1953	1954
Ithaca, New York	0.9 ± .05	1.83 ± 0.12
Native Range, Tifton, Georgia	3.0 ± 0.4	5.6 ± 0.2
Robinson's Farm, Logan, Utah	1.0 ± 0.1	3.3 ± 0.1
College Pasture, Logan, Utah	0.5 ± 0.1	1.3 ± 0.2
New Brunswick, New Jersey	0.9 ± .05	2.0 ± 0.1

II. COMPARISON OF Sr^{90} CONTENT OF SOIL WITH PREDICTED Sr^{90} CONCENTRATION FROM THE GUMMED PAPER NETWORK

Indications from the data in Report NYO-4571 were that the total radiostrontium content of soil could be predicted from total fallout results obtained from the gummed paper network. Additional sites show the prediction of Sr^{90} content of soil from total activity measurements. Figure 1 plots predicted Sr^{90} content against that actually found in soil measurements at each site. The soil measurements are based on ammonium acetate leach of the soil from each site.

This plot indicates that all of the sites are higher in Sr^{90} than that predicted by the gummed paper network, except for Logan, Utah site, which is much lower.

The low value obtained for Logan, Utah may indicate fallout near the Nevada test site is low in strontium content. The sites located on the east coast are all higher in strontium than would be predicted from the total fallout activity obtained from the gummed paper network.

Since there were no continental test series between the two collection periods, the low value for Logan, Utah is probably due to the ammonium acetate leach preparation of the 1954 soils. Logan has a calcareous soil and ammonium acetate leaches out only a small percentage of the strontium as reported in NYO-4648.

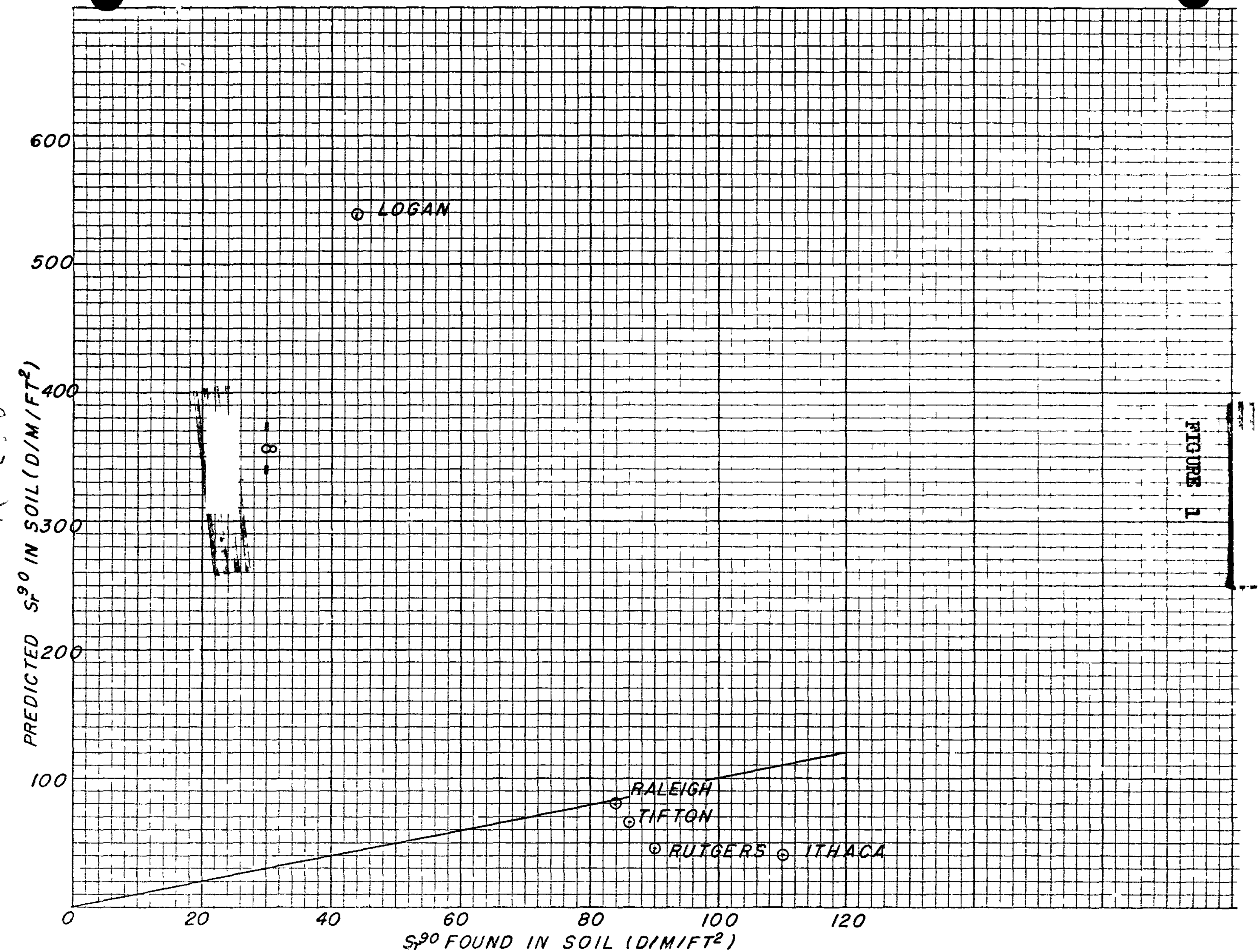
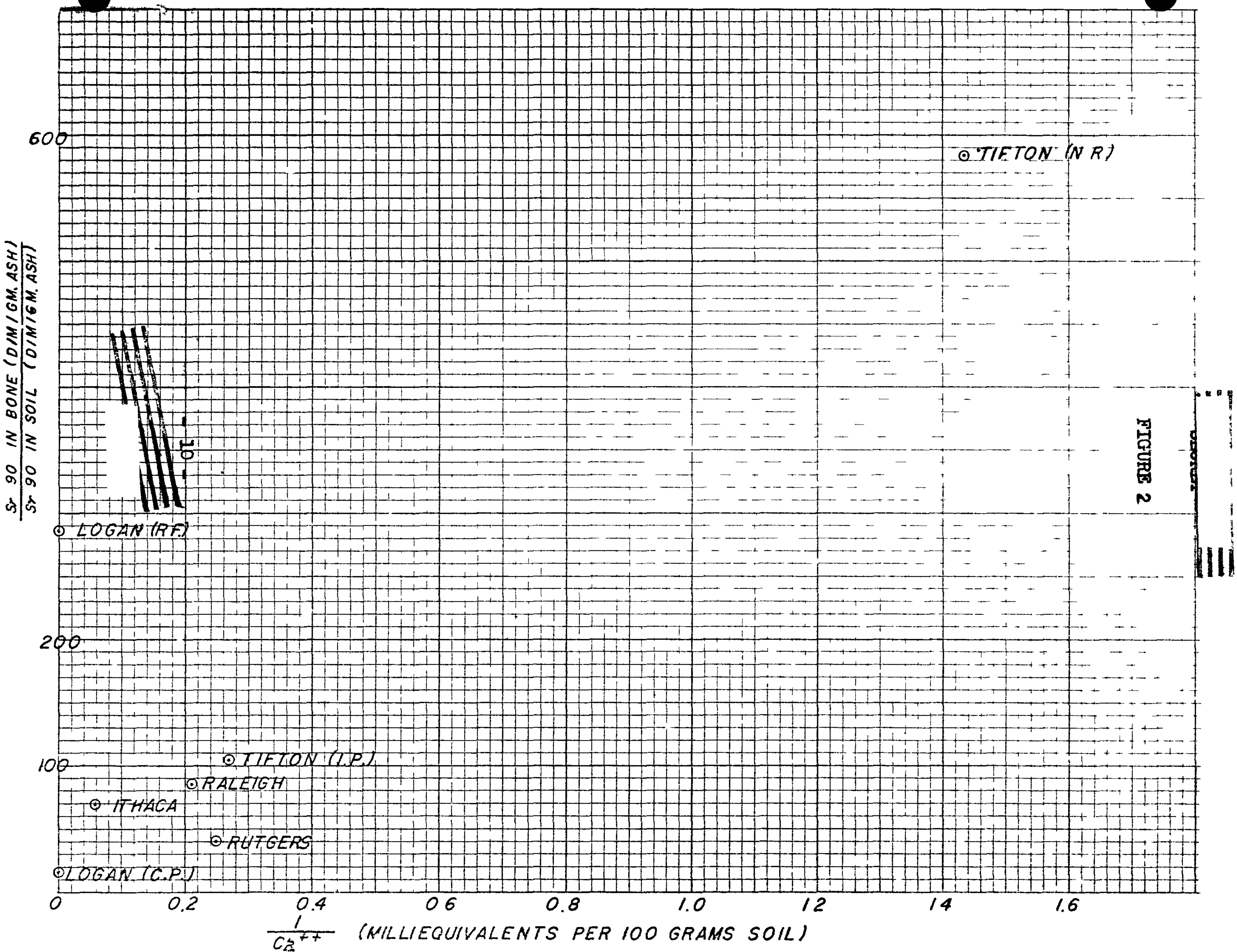

LOGAN
RALEIGH
TIFTON
RUTGERS
ITHACA
100
200
300
400
500
600
0
20
40
60
80
100
120
PREDICTED Sr^{90} IN SOIL ($D/M/FT^2$)
Sr^{90} FOUND IN SOIL ($D/M/FT^2$)

FIGURE 1

III. INFLUENCE OF IONIC CALCIUM IN THE SOIL ON THE UPTAKE OF Sr^{90}

The relationship between ionic calcium in the soil and the radiostrontium content of bone from animals which grazed at each site was demonstrated in " Annual Sunshine Report " NYO-4571. Figures 2 and 3 show the relationship of the calcium content in soil to Sr^{90} uptake in animal bones.

Several plots of vegetation to soil and vegetation to bone ratios failed to show any relationship. Additional study is required on the subject. A comparison of the Sr^{90}/Sr^{89} ratio in vegetation to the ratio in bone and soil indicates that vegetation activity is comparatively fresher. This, along with the lack of correlation with soil calcium, seems to point to leaf retention as the dominant factor in strontium uptake by animals from vegetation.



600
200
100
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
Sr 90 IN BONE (D/M/GM. ASH) / Sr 90 IN SOIL (D/M/GM. ASH)
1/Ca++ (MILLIEQUIVALENTS PER 100 GRAMS SOIL)
TIFTON (N.R.)
LOGAN (R.F.)
TIFTON (I.P.)
RALEIGH
ITHACA
RUTGERS
LOGAN (C.P.)

FIGURE 2

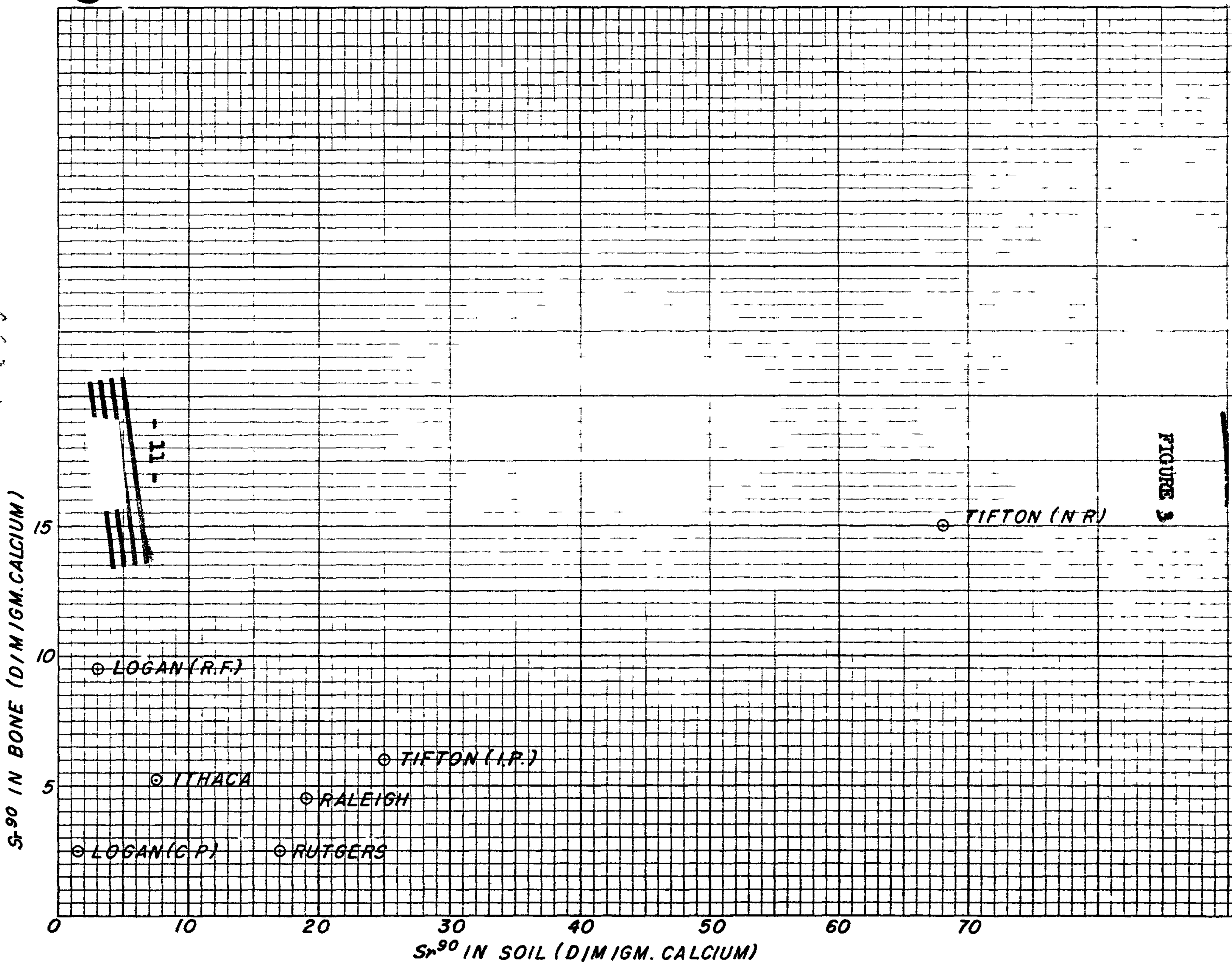

TIFTON (N R)
LOGAN (R.F.)
TIFTON (I.P.)
ITHACA
RALEIGH
LOGAN (C P)
RUTGERS
0
10
20
30
40
50
60
70
5
10
15
Sr^{90} IN SOIL (D/M/GM. CALCIUM)
Sr^{90} IN BONE (D/M/GM. CALCIUM)

FIGURE 3

IV. DISCRIMINATION FACTORS INVOLVED IN THE UPTAKE OF Sr^{90}

A knowledge of the discrimination factors involved in the transfer of Sr^{90} from fallout materials to animal bone should lend valuable information concerning the safety measures that could be used in cases of high fallout activity. The values obtained from this survey are listed in Table III and from the present studies, seem to be scattered and inconclusive. Discrimination factors between soil, vegetation, and bone differ in each site studied.

Additional data and further study may add to an understanding of this mechanism. This information in Table III is offered as a basis for the beginning of a long-term study.

TABLE III

Location	Vegetation to Soil*	Bone to Vegetation*
Raleigh, North Carolina	3.02	.081
Ithaca, New York	.043	16.0
Improved Pasture, Tifton, Georgia	0.35	0.69
Native Range, Tifton, Georgia	0.97	0.23
Robinson's Farm, Logan Utah	8.33	0.44
College Pasture, Logan, Utah	5.72	0.27
New Brunswick, New Jersey	1.18	0.30

* d/m/gm Ca values were used to obtain these factors

V. THE RATIO OF Sr^{90}/Sr^{89} IN THE UPTAKE CYCLE AT EACH SITE STUDIED

Sr^{90} to Sr^{89} ratios were computed for each site in soil, bone, and vegetation. The higher ratios are obtained within bone samples indicating that the strontium in bone is older.

Except for Raleigh, North Carolina, the soil Sr^{90} to Sr^{89} ratio indicated fresher fallout. In all cases, the strontium ratio in vegetation indicated fresh fallout material. This is also evidence pointing toward leaf retention.

TABLE IV

Station	Soil Sr^{90}/Sr^{89}	Bone Sr^{90}/Sr^{89}	Vegetation Sr^{90}/Sr^{89}
Raleigh, North Carolina	18	15	0.28
Ithaca, New York	2.7	18	0.66
Improved Pasture, Tifton, Georgia	1.0	21	0.61
Robinson's Farm, Logan, Utah	0.64	33	0.29
Native Range, Tifton, Georgia	2.8	56	0.34
College Pasture, Logan, Utah	0.49	10	0.32
New Brunswick, New Jersey	0.16	20	0.37

VI. FALLOUT DURING THE SAMPLING PERIOD AT EACH SITE

In order to measure tha fallout at each site during the animal grazing period and the vegetation growth period, gummed paper was exposed for weekly intervals at each site. Raleigh, North Carolina did not participate in this phaze of the program. Table V gives the total fallout, Sr^{89}, and Sr^{90} for this period, obtained by analyzing duplicate gummed papers at each site, and totaling the averages of the duplicates for the period.

Table VI gives a comparison of the Sr^{90} to Sr^{89} ratios obtained from the fallout material and the Sr^{90} to Sr^{89} ratios from the vegetation at each site. An abnormally high result was obtained for the Sr^{90} content of Tifton, Georgia fallout material. This value is reported here, but will be compared with the regular fallout system for confirmation.

The vegetation collected at the end of the growth period has a Sr^{90} to Sr^{89} ratio similar to that of the fallout material for this period. This is also considered evidence of leaf retention.

TABLE V

Site	Sampling Date	Total ** Activity	Total Activity C-date	Sr^{90} d/m/ft²	Sr^{89}* d/m/ft²	Sr^{90} / Total Activity
Robinson's Farm, Logan, Utah	7/25/54-9/19/54	2100	10/19/54	24.1	35.0	.011
College Sheep Pasture, Logan, Utah	7/23/54-9/18/54	2200	10/19/54	20.7	30.9	.009
Cornell, New York	7/17/54-9/4/54	1100	10/13/54	8.8	20.6	.008
Rutgers, New Jersey	7/15/54-9/9/54	1200	10/19/54	9.7	12.9	.008
Tifton, Georgia	7/19/54-9/28/54	800	11/5/54	108	8.1	.135

* Extrapolated to 1-1-55
** Activity as of Counting Date

[redacted]

TABLE VI

Location	Sr^{90}/Sr^{89}* Vegetation	Sr^{90}/Sr^{89} Fallout
Robinson's Farm, Logan, Utah	0.29	0.69
College Pasture, Logan, Utah	0.32	0.67
Ithaca, New York	0.66	0.42
Rutgers, New Jersey	0.37	0.75
Tifton, Georgia	0.34	13.3

* Sr^{89} extrapolated to 1-1-55

[redacted]

APPENDIX

A tabulation of analytical results are collected in this appendix for each of the sites surveyed in the fall of 1954. All samples were collected by Dr. Lyle T. Alexander of the Department of Agriculture. Preliminary processing was done at Beltsville, Maryland. Bone was received as the ash, soil as the oxalate of the ammonium acetate leach, and vegetation as ash. Gummed paper was exposed for weekly intervals in duplicate at most stations. These reported values are summations for the entire grazing and vegetation growth periods. All Sr^{89} results are extrapolated to 1-1-55. Total activity measurements are the activities as of counting dates.

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RALEIGH, NORTH CAROLINA

SOIL - Received as Calcium Oxalate (NH_4Ac Leach)

HASL No.	Wt. of Ca Extracted	Depth	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm Soil C-date	Sr^{89} d/m/gm Soil 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm Soil	Sr^{90} d/m/gm Ca	Sr^{90} S. U.	Sr^{90} d/m/ft²
726	3.4	0-2"	0.0±2.3	0.0×10^{-4} $\pm 8.7 \times 10^{-4}$	0.0×10^{-4} $\pm 9.9 \times 10^{-4}$	64.7±3.4	1.78×10^{-2} $\pm 9.4 \times 10^{-4}$	19.0±1.0	8.6±0.4	84.1±4.4
727	2.6	2-6"	0.2±2.3	0.5×10^{-4} $\pm 8.7 \times 10^{-4}$	0.6×10^{-4} $\pm 9.9 \times 10^{-4}$	15.0±2.8	4.13×10^{-3} $\pm 7.0 \times 10^{-4}$	5.8±1.1	2.6±0.5	67.7±12.6

BONE

HASL No.	% Ca	Wt. Ca	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
681	33.5	8.38g	0.0±2.3	0.0±0.1	0.0±0.1	38.5±3.1	1.54±0.12	4.59±0.4	2.1±0.2

VEGETATION (Alfalfa Hay)

HASL No.	Weight Dry	Weight Ash	Ca %	Ca Wt.	Sr^{89} d/m/s C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
732	2180g	99g	8.4	4.2g	754±7.6	15.1±0.2	17.2±0.2	242±4.5	4.84±0.90	57.6±1.1	26.2±0.5

GUMMED FILM (No gummed film was collected at this station)

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ITHACA, NEW YORK

SOIL - Received as Calcium Oxalate (NH_4Ac Leach)

HASL No.	Wt. of Ca Extracted	Depth	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm Soil C-date	Sr^{89} d/m/gm Soil 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm Soil	Sr^{90} d/m/gm Ca	Sr^{90} S. U.	Sr^{90} d/m/ft^2
801	8.7	0-2"	11.9±2.8	3.2×10^{-3} $\pm 0.7 \times 10^{-3}$	9.0×10^{-3} $\pm 2.1 \times 10^{-3}$	87±3.8	24×10^{-2} $\pm 1.0 \times 10^{-3}$	7.6±0.3	3.5±0.1	110±4.8

BONE

HASL No.	% Ca	Grams Wt. Ca	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
676	35.0	8.75	23.2±2.5	0.9±0.1	1.0±0.1	46.1±3.1	1.84±0.12	5.27±0.40	2.4±0.2
677	34.1	8.75	0.0±2.3	0.0±0.1	0.0±0.1	55.1±3.2	2.20±0.12	6.46±0.40	2.9±0.2
678	34.7	8.68	0.0±2.3	0.0±0.1	0.0±0.1	36.1±3.0	1.44±0.12	4.16±0.40	1.9±0.2

VEGETATION (Alfalfa Hay)

HASL No.	Area Sq. Yds.	Wt. Gms. Dry	Wt. Gms. Ash	% Ca	Wt. Gms. Ca	Sr^{89} d/m/s C-date	Sr^{89} d/m/gm Ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
741	50	2437	222	32.8	16.4	6.4±4.0	0.128±.08	0.16±0.10	5.3±2.7	0.106±.054	0.324±0.16	0.15+0.07

GUMMED FILM (Exposed from 7/17/54 to 9/14/54) - 14 sheets analyzed

HASL No.	Total Activity d/m/ft^2	Sr^{89}* d/m/ft^2	Sr^{90} d/m/ft^2
391 - 397	1100	20.6	8.8

*Extrapolated to 1/1/55

[redacted]

IMPROVED PASTURE [redacted] GEORGIA

SOIL - Received as Calcium Oxalate (NH_4Ac Leach)

HASL No.	Wt. of Ca Extracted	Depth	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm Soil C-date	Sr^{89} d/m/gm Soil 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm Soil	Sr^{90} d/m/gm Ca	Sr^{90} S. U.	Sr^{90} d/m/ft^2
730	1.9	0-2"	59.0±3.1	1.6×10^{-2} $\pm 8.5 \times 10^{-4}$	1.8×10^{-2} $\pm 9.5 \times 10^{-4}$	67.4±3.1	1.86×10^{-2} $\pm 8.5 \times 10^{-4}$	25±1.1	11±0.5	115±5.3

BONE

HASL No.	% Ca	Wt. Ca	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
682	36.1	9.03g	0.0±2.3	0.0±0.1	0.0±0.1	53.4±3.3	2.14±0.12	5.91±0.4	2.7±0.2

VEGETATION (Alfalfa Hay)

HASL No.	Weight Dry	Weight Ash	Ca %	Ca Wt.	Sr^{89} d/m/s C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
771	2519g	94g	5.2	1.25g	6.2±2.8	0.25±0.11	0.74±0.32	11.3±2.2	0.45±0.09	8.66±1.73	3.94±0.78

GUMMED FILM (Exposed from 7/19/54 to 9/28/54) - 16 sheets analyzed

HASL No.	Total Activity d/m/ft^2	Sr^{89}* d/m/ft^2	Sr^{90} d/m/ft^2
531 - 550	800	8.1	108

*Extrapolated to 1/1/55

[redacted]

ROBINSON'S FARM - LOGAN, UTAH

SOIL - Received as Calcium Oxalate (NH_4Ac Leach)

HASL No.	Wt. of Ca Extracted	Depth	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm Soil C-date	Sr^{89} d/m/gm Soil 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm Soil	Sr^{90} d/m/gm Ca	Sr^{90} S. U.	Sr^{90} d/m/ft²
738	15.4	0-2"	49.0±5.5	$1.35x10^{-2}$ $\pm1.5x10^{-3}$	$1.6x10^{-2}$ $\pm1.8x10^{-3}$	41.9±3.9	$1.15x10^{-2}$ $\pm1.1x10^{-3}$	2.72±0.25	1.2±0.1	51.0±4.8
739	12.2	2-6"	5.7±4.1	$1.6x10^{-3}$ $\pm1.1x10^{-3}$	$1.9x10^{-3}$ $\pm1.3x10^{-3}$	2.7±3.1	$7.4x10^{-4}$ $\pm3.3x10^{-4}$	0.22±0.26	0.10±0.12	11.0±12.7

BONE

HASL No.	% Ca	Wt. Ca	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
679	34.0	8.50g	0.0±2.3	0.0±0.1	0.0±0.1	82.1±3.6	3.28±0.14	9.66±0.4	4.4±0.2

VEGETATION (Alfalfa Hay)

HASL No.	Weight Dry	Weight Ash	Ca %	Ca Wt.	Sr^{89} d/m/s C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
773		632g	7.0	1.75g	46.3±3.9	1.85±0.20	5.61±0.61	40.0±3.3	1.60±0.13	22.9±1.85	10.41±0.84

GUMMED FILM (Exposed from 7/25/54 to 9/19/54) - 8 sheets analyzed

HASL No.	Total Activity d/m/ft²	Sr^{89}* d/m/ft²	Sr^{90} d/m/ft²
480 - 487	2100	35.0	24.1

*Extrapolated to 1/1/55

[redacted]

NATIVE RANGE, TIFTON, GEORGIA

SOIL - Received as Calcium Oxalate (NH_4Ac Leach)

HASL No.	Wt. of Ca Extracted	Depth	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm Soil C-date	Sr^{89} d/m/gm Soil 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm Soil	Sr^{90} d/m/gm Ca	Sr^{90} S. U.	Sr^{90} d/m/ft²
728	0.2	0-2"	10.8±2.4	.003±0.0008	.0034±.00099	34.7±3.1	9.56×10^{-3} $\pm8.5\times10^{-4}$	68±6.0	31±2.7	56.9±5.8
729	0.03	2-6"	0.9±2.3	2.5×10^{-4} $\pm8.7\times10^{-4}$	2.8×10^{-4} $\pm9.9\times10^{-4}$	2.8±2.4	7.72×10^{-4} $\pm6.6\times10^{-4}$	40±34	18±15	10.0±8.6

BONE

HASL No.	% Ca	Wt. Ca	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
683	36.5	9.13g	0.0±2.3	0.0±0.1	0.0±0.1	139.9±4.2	5.60±0.17	15.3±0.5	7.0±0.3

VEGETATION

HASL No.	Weight Dry	Weight Ash	Ca %	Ca Wt.	Sr^{89} d/m/s C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
770	2962g	128g	3.8	0.95g	61.2±4.5	2.44±0.18	7.39±0.61	63.5±3.5	2.54±0.14	66.8±3.7	30.3±1.7

GUMMED FILM (Exposed from 7/19/54 to 9/28/54) - 16 sheets analyzed

HASL No.	Total Activity d/m/ft²	Sr^{89}* d/m/ft²	Sr^{90} d/m/ft²
Same series as Improved Pasture, Tifton, Ga.	800	8.1	108

*Extrapolated to 1/1/55

[redacted]

COLLEGE PASTURE - LOGAN, UTAH

SOIL - Received as Calcium Oxalate (NH_4Ac Leach)

HASL No.	Wt. of Ca Extracted	Depth	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm Soil C-date	Sr^{89} d/m/gm Soil 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm Soil	Sr^{90} d/m/gm Ca	Sr^{90} S.U.	Sr^{90} d/m/ft^2
731	11.6	0-2"	52.6±2.9	1.4×10^{-2} $\pm8.7\times10^{-4}$	1.6×10^{-2} $\pm9.8\times10^{-4}$	28.8±2.7	7.93×10^{-3} $\pm8.0\times10^{-4}$	2.5±0.2	1.1±0.1	37.4±3.5

BONE

HASL No.	% Ca	Wt. Ca	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
1125	36		13.7±3.7	0.55±0.1	2.04±0.4	32.0±4.8	1.28±0.19	3.56±0.53	1.62±0.24
1126	36		0.0±2.3	0.0 ±0.1	0.0 ±0.1	40.8±4.1	1.63±0.16	4.53±0.44	2.00±0.20
1127	36		2.64±3.6	0.10±0.14	0.37±0.50	29.1±4.5	1.16±0.18	3.22±0.72	1.46±0.29
1128	36		6.9±4.0	0.28±0.16	1.0±0.57	31.2±4.8	1.25±0.19	3.47±0.53	1.58±0.24

VEGETATION (Orchard Grass)

HASL No.	Area Sq.Yds.	Weight Dry	Weight Ash	Ca %	Ca Wt.	Sr^{89} d/m/s C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
772	27	5463g	612g	8.2		29.8±3.5	1.19±0.14	3.61±0.43	28.6±3.1	1.14±0.12	13.9±1.5	6.32±0.68

GUMMED FILM (Exposed from 7/23/54 to 9/18/54) - 8 sheets analyzed

HASL No.	Total Activity d/m/ft^2	Sr^{89}* d/m/ft^2	Sr^{90} d/m/ft^2
488 - 495	2200	30.9	20.7

*Extrapolated to 1/1/55

NEW BRUNSWICK, NEW JERSEY

SOIL - Received as Calcium Oxalate (NH_4Ac Leach)

HASL No.	Wt. of Ca Extracted	Depth	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm Soil C-date	Sr^{89} d/m/gm Soil 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm Soil	Sr^{90} d/m/gm Ca	Sr^{90} S.U.	Sr^{90} d/m/ft^2
1208	2.99	0-2"	70.4±7.1	0.0194± 0.00195	0.088± 0.0088	51±5.6	0.014± .0015	17±1.8	7.7±0.8	89.8±4.6

BONE

HASL No.	% Ca	Wt. Ca	Sr^{89} d/m/s at C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
680	33.4	8.35g	0.0±2.3	0.0±0.1	0.0±0.1	49.6±3.2	1.98±0.12	5.94±0.4	2.7±0.2

VEGETATION (Trefoil and Ryegrass)

HASL No.	Area Sq.Yds.	Weight Dry	Weight Ash	Ca %	Ca Wt.	Sr^{89} d/m/s C-date	Sr^{89} d/m/gm ash C-date	Sr^{89} d/m/gm ash 1/1/55	Sr^{90} d/m/s	Sr^{90} d/m/gm ash	Sr^{90} d/m/gm Ca	Sr^{90} S. U.
733			180g	o.0	3.0g	143±3.8	2.86±0.1	3.25±0.1	60.3±3.1	1.21±0.60	20.1±1.0	9.14±0.4

GUMMED FILM (Exposed from 7/15/54 to 9/9/54) - 16 sheets analyzed

HASL No.	Total Activity - d/m/ft^2	Sr^{89*} d/m/ft^2	Sr^{90} d/m/ft^2
496-511	1200	12.9	9.7

* Extrapolated to 1/1/55