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REPORT NO. NYO-4649

53572

HEALTH AND SAFETY LABORATORY Analytical Branch

STUDIES OF FACTORS IN THE UPTAKE OF Sr90

SITE SURVEY - FALL 1954

Photostat Price \$_4.80
Microfilm Price \$ 2,70

Available from the Office of Technical Services Department of Commerce Washington 25, D.C.

Compiled by

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Chief, Declassification Brunch for

June 6, 1955

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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 Sr⁸⁹ and Sr⁹⁰ in fallout material, soil, vagetation, and animal bone. Stable strontium and radium measurements are also to be made on this material.

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SUMMARY (1954)

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TABLE I

Location	<u>Soil*</u>	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

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- * 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

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I. INCREASE OF Sr⁹⁰ CONTENT IN PRESENT SURVEY OVER 1953 SITE SURVEY

Table II gives the Sr⁹⁰ 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.

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TABLE II

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Location	â mimal Bone d <u>1953</u>	d/m/gm ash <u>1954</u>	
Ithaca, New York	0.905	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	

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II. COMPARISON OF Sr⁹⁰ CONTENT OF SOIL WITH PREDICTED Sr⁹⁰ CONCENTRATION FROM THE GUMMED PAPER NETWORK

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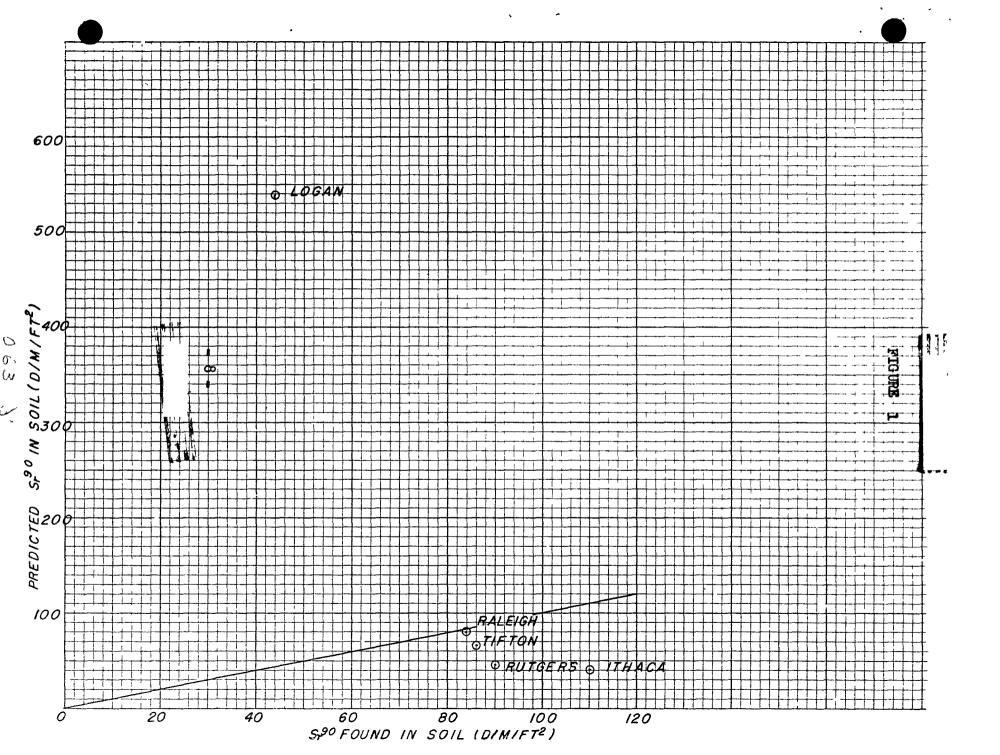
Indications from the data in Report NYO-4571 were that the total radiostrontium content of soil could be predicted from total fallout results obtained from the gummed paper network. Additional sites show the prediction of Sr^{90} content of soil from total activity measurements. Figure 1 plots predicted 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.

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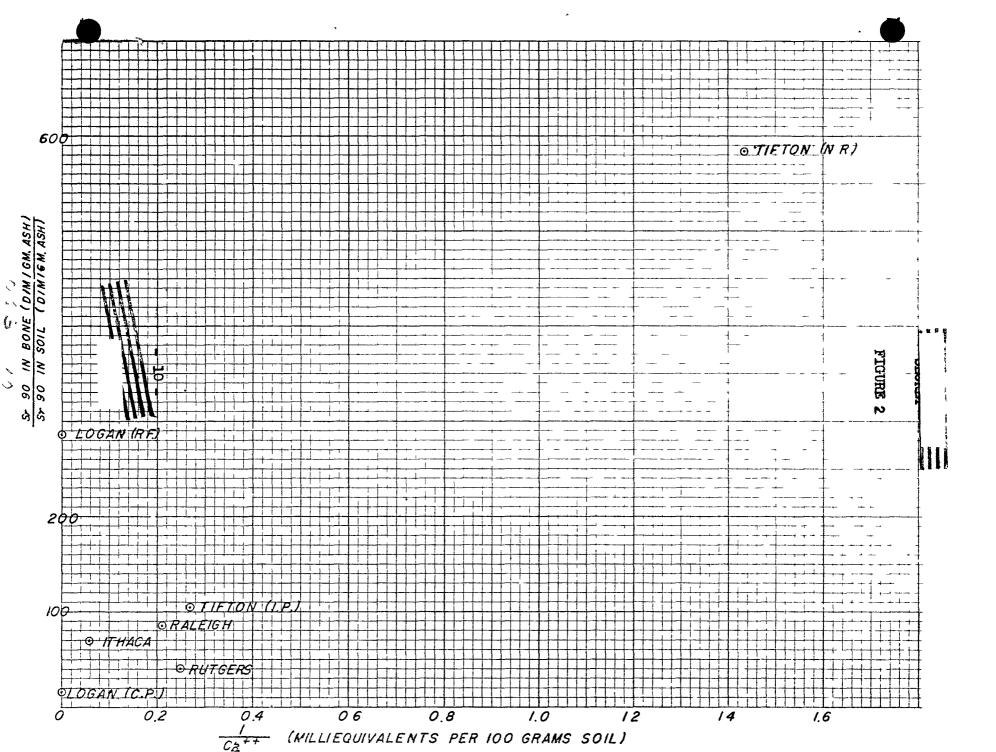
III. INFLUENCE OF IONIC CALCIUM IN THE SOIL ON THE UPTAKE OF Sr⁹⁰

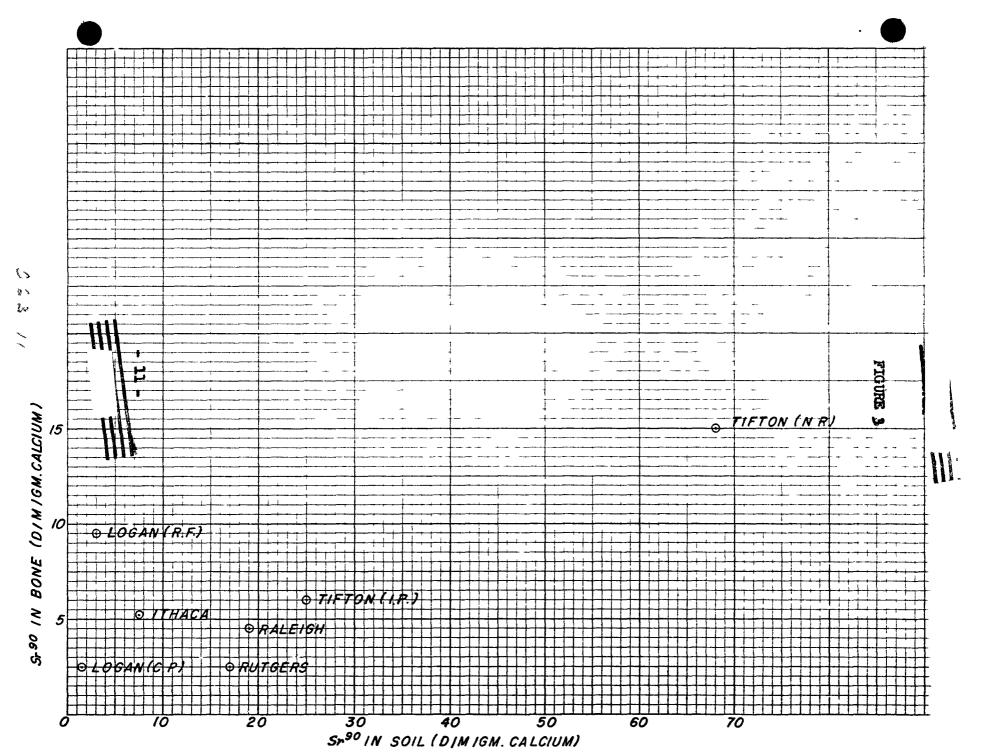
The relationship between ionic calcium in the soil and the radiostrontium content of bone from animals which grazed at each site was demonstrated in " Annual Sunshine Report " NYO-4571. Figures 2 and 3 show the relationship of the calcium content in soil to Sr⁹⁰ uptake in animal bones.

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.

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IV. DISCRIMINATION FACTORS INVOLVED IN THE UPTAKE OF Sr⁹⁰

A knowledge of the discrimination factors involved in the transfer of Sr⁹⁰ 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.

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TABLE III

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	Vegetation	Bone to
Location	to Soil*	Vegetation*
Raleigh, North Carolina	3.02	.081
Ithece, 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	0-111
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

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V. THE RATIO OF Sr⁹⁰/Sr⁸⁹ IN THE UPTAKE CYCLE AT EACH SITE STUDIED

Sr⁹⁰ to Sr⁸⁹ 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 Sr⁹⁰ to Sr⁸⁹ ratio indicated fresher fallout. In all cases, the strontium ratio in vegetation indicated fresh fallout material. This is also evidence pointing toward leaf retention.

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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

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- 15 -

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.

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TABLE V

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	<u>Site</u>	Sampling Date	Totel ** Activity	Total Activity <u>C-date</u>	Sr ⁹⁰ d/m/ft ²	Sr ⁸⁹ * d/m/ft ²	Sr ⁹⁰ Total Activity
	Robinson's Farm, Logen, Utah	7/25/54-9/19/54	2100	10/ 1 9/54	24.1	35.0	.011
063 -17	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/ 5 4	1100	10/13/54	8,8	20.6	.008
	Rutgers, New Jersey	7/15/54-9/9/ 5 4	1200	10/19/54	9•7	12.9	•00 8
	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

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C		(Deckard)
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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

* Sr⁸⁹ extrapolated to 1-1-55

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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 Sr⁸⁹ results are extrapolated to 1-1-55. Total activity measurements are the activities as of counting dates.

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SOIL - Received as Calcium Oxalate (NH4Ac Leach)

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	HASL No.	Wt. of Ca Ex- tract- ed	<u>Depth</u>	Sr ⁸⁹ d/m/s <u>at_C-date</u>	Sr ⁸⁹ Soil <u>C-date</u>	d/m/gm <u>Soil 1/1/55</u>	Sr ⁹⁰ d/m/s	Sr ⁹⁰ d/m/gm Soil <u>Ca</u>	Sr ⁹⁰ S• U+	Sr ⁹⁰ d/m/ft ²
	726	3+4	0-2"	0•0 <u>±</u> 2•3	0.0x10 ⁻⁴ ±8.7x10 ⁻⁴	0.0x10 ⁻⁴ +9.9x10 ⁻⁴	64•7±3•4	1.78x10 ⁻² 19.0: ±9.4x10 ⁻⁴	±1.0 8.6±0.4	84.1+4.4
2	727	2•6	2-6 ¹¹	0•2 <u>+</u> 2•3	0.5x10 ⁻⁴ ±8.7x10 ⁻⁴	0.6x10 ⁻⁴ ±9.9x10 ⁻⁴	15•0 <u>+</u> 2•8	4•13x10 ⁻³ 5•8± ±7•0x10 ⁻⁴	1.1 2.6 <u>+</u> 0.5	67•7 <u>+</u> 12•6
	BONE									
2	HASL <u>No</u> .	发 Ca	Wt. C	Sr ⁸⁹ d/m/s <u>a at C-dat</u>	Sr ^a e <u>ash C-da</u>	⁹ d/m/gm te <u>ash 1/1/5</u>	Sr ⁹⁰ 5 <u>d/m/s</u>	Sr ⁹⁰ d/m/gm ash	Sr ⁹⁰ d/m/gm_Ca	Sr ⁹⁰ S. U.
	681	33•5	8+38	g 0.0 <u>+</u> 2.3	0•0 <u>+</u> 0•1	0.0 <u>+</u> 0.1	38•5±3•1	1•54±0+12	4•59±0•4	2.1±0.2
	VEGET	ATION (A	lfalf a (Hay) Sr ⁸⁹						
	HASL <u>No.</u>	Weight <u>Dry A</u>	C sh %		Sr ⁸ ash C-da	⁹ d/m/gm te <u>ash 1/1/5</u>	Sr ⁹⁰ 5 <u>d/m/s</u>	Sr ⁹⁰ d/m/gm ash	Sr ⁹⁰ d/m/gm_Ca	Sr ⁹⁰ S• U•
	732	2180g 9	9g 8.4	4.2g 754±7.	6 15 .1<u>+</u>0. 2	17•2 <u>+</u> 0•2	242 <u>+</u> 4,5	4•84±0+90	57•6 <u>+</u> 1•1	26•2 <u>+</u> 0•5
	<u>GUMME</u>	<u>D FILM</u> (No gumm	ed film was c	ollected at t	his station)				



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ITHACA, NEW YORK

SOIL - Received as Calcium Oxalate (NH4Ac Leach)

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	HASL <u>No.</u>	Wt. of Ca Ex- tract- ed	Depth	Sr ⁸⁹ at_Cr	d/m/s <u>date</u>	<u>Soi</u>	Sr ⁸⁹ 1 C-date	d/m/gm <u>Soil 1/1/55</u>	5r ⁹⁰ <u>d/m/s</u>	Sr ⁹⁰ Soil	d/m/gn <u>Ca</u>	1	Sr ⁹⁰ S• U∗		Sr ⁹⁰ d/m/ft ²
	801	8•7	0-2*	11•9 ±	2•8	3∙2 ±0∙	x10 ⁻³ 7x10 ⁻³	9.0x10 ⁻³ ±2.1x10 ⁻³	87 ± 3•8	24x10 ⁻² ±1.0x10	- 3 7.6±	0•3	3,5±0 1		110±4•8
5	<u>BONE</u> HASL <u>No.</u>	% Ca	Grams <u>Wt. Ca</u>	Sr ⁸⁹ d/m/ <u>at C</u>		<u>ash</u>	Sr⁸⁹ d , <u>C-date</u>	/m/gm ash 1/1/55	Sr ⁹⁰ d/m/s	Sr ⁹⁰ d/m/gm a		Sr ⁹⁰ d/m/gm	Ca	Sr ⁹⁰ S• 1	
- 21 -	676 677 678	35+0 34+1 34+7	8•75 8•75 8•68	0≉0	±2.5)±2.3)±2.3	0•0	<u>+</u> 0.1 ±0.1 ±0.1	1•0±0•1 0∘0±0•1 0≈0±0•1	46•1 <u>+</u> 3•1 55•1+3•2 36•1+3•0	1.84±0. 2.20±0. 1.44±0.	L2	5•27±0* 6•46±0* 4•16±0*	40	2.9	±0•2 ±0∘2 ±0∘2
	VEGET	ATION (A	lfalfa	Hay)	TR	٠ t	Sr ⁸⁹								
	HASL <u>No</u> .	Area <u>Sq.Yds</u>	-		% (ms.	d/m/s <u>C-date</u>	Sr ⁸⁹ d <u>Ash C-date</u>	/m/gm <u>ash 1/1/55</u>	Sr ⁹⁰ d/m/s	Sr ⁹⁰ d/m/gn	ash	Sr ⁹⁰ d/m/gm C	a	Sr ⁹⁰ S <u>-</u> 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•	1 6	0 .15+0 .07
	GUMME	D FILM	Exposed	from	7/17/5	4 to	9/14/54)	- 14 sheets	analyzed						
	HASL <u>No.</u> 391 -	397		T 	otal A d/m/ 11		ty 		Sr ⁸⁹ * <u>d/m/ft²</u> 20.6			Sr ⁹⁰ <u>d/m/ft</u> 8.8	2		

*Extrapolated to 1/1/55

IMPROVED PASTURE GEORGIA

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SOIL - Received as Calcium Oxalate (NH4Ac Leach)

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	HASL No.	Wt. of Ca Ex- tract- ed	<u>Depth</u>	Sr ⁸⁹ d/m/s <u>at_C-date</u>	Sr ⁸ Soil_C-dat	⁹ d/m/gm e <u>Soil 1/1/55</u>	Sr ⁹⁰ d/m/s	Sr ⁹⁰ d/ <u>Soil</u>	′m∕gm <u>Ca</u>	Sr ⁹⁰ , <u>S. U.</u>	Sr ⁹⁰ d/m/ft ²
	730	1.9	0–2"	59*0±3*1	1.6x10 ⁻² ±8.5x10 ⁻⁴	1.8x10 ⁻² ±9.5x10 ⁻⁴	67.4±3.1	1.36x10 ⁻² ±8.5x10 ⁻⁴	25‡1.1	11±0.5	115 <u>+</u> 5•3
c	BONE										
じょく	HASL <u>No</u> .	Z Ca	<u>Wt. Ca</u>	Sr ^{a9} d/m/s <u>at_C-date</u>	Sr ⁸⁹ d <u>ash C-date</u>	/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 1 <u>S. U</u>	
# 22	68 2	36.1	9 • 03g	0 *0±2 *3	0 +0± 0•1	0+0 <u>+0</u> +1	53+4 <u>+</u> 3+3	2 .14<u>+</u>0.1 2	5*91 <u>+</u> 0*4	2*7	<u>+</u> 0₀2
8	HASL	<u>TION</u> (Al Weight D ry As		Sr ⁸⁹ a d/m/s	S: e ash C-	r ^{sə} d/m/gm <u>date ash 1/1/</u>	Sr ⁹⁰ 55 <u>d/m/s</u>	Sr ⁹⁰ d/m/gm_a	Sr ⁹⁰ .sh d/m/s	<u>zm Ca</u>	Sr ⁹⁰ S•_U•
		2519g 94		1.25g 6.2 <u>+</u> 2							3•94 <u>+</u> 0•78
	<u>GUMMED</u>	FILM (E	xposed f	rom 7/19/54 t	0 9/23/54) -	16 sheets ana	lyzed				
	HASL <u>No</u> .			Total Act d/m/ft		S d	r ⁸⁹ * /m/ft ²		Sr ⁹⁰ d/m/ft ²		
	531 -	550		800			8.1		108		
	*Ex	trapolat	ted to 1/	'1/55			Tarana katalar Alasar Bagar Arit Jang				

	Filling Contraction	
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	SOIL ·	- Receiv	ed as C	alcium Oxalat	e (NH4Ac Leac	h)					
	HASL <u>No</u> .	Ca Ex- tract- ed	<u>Depth</u>	Sr ⁸⁹ d/m/s <u>at_C-date</u>	Sr ⁸⁹ Soil C-date	d/m/gm <u>Soil 1/1/55</u>	Sr ⁹⁰ <u>d/m/s</u>	Sr ⁹⁰ d/ <u>Soil</u>	m/gm <u>Ca</u>	Sr ⁹⁰ S•_U₊	Sr ⁹⁰ d/m/ît ²
	738	15-4	0-2"	49 -0± 5-5	1.35x10 ⁻² ±1.5x10 ⁻³	1.6x10 ⁻² ±1.8x10 ⁻³	41.9 <u>+</u> 3*9	1 15x10 ⁻² ±1.1x10 ⁻³	2 ∗72<u>+</u>0 ∘25	1.2+0.1	51+0 <u>+</u> 4+8
, ` <i>s</i> *	739	12.2	2-6"	5. 7± 4.1	1.6x10 ⁻³ +1.1x10 ⁻³	1.9x10 ⁻³ ±1.3x10 ⁻³	2•7 <u>+</u> 3•1	7 4x10 ⁻⁴ ±3 3x10 ⁻⁴	0 _* 22 <u>+</u> 0*26	0.10 <u>+</u> 0.1	2 11.0 <u>+</u> 12.7
the state of the s	<u>BONE</u>			Sr ⁸⁹							
ہ 2	HASL <u>No</u> :	% Ca	<u>Tit.</u> Ca	d/m/s	Sr ⁸ ash C-da	⁹ d/m/gm <u>te ash 1/1/55</u>	Sr ⁹⁰ <u>d/m/s</u>	3 r⁹⁰ <u>d/m/e</u> m	Sr ash d/	90 m/gm Ca	Sr ⁹⁰ S <u>- U</u> *
ربن و	679	34.0	8-50g	0-0 <u>+</u> 2-3	0.0 <u>+</u> 0+1	0.0 <u>+</u> 0.1	82 ∘1<u>+</u>3 -	6 3 -28<u>+</u>0	-14 9:	66 <u>+</u> 0.4	4.4+0.2
	VEGET	ATION (A	lfalfa	Hay)							
	HASL No:	Weight Dry A	<u>sh 🕺</u>	Ca d/m/s Wt _z C-dat	s ash C-	er ⁸⁹ d/m/gm date ash 1/1/	Sr ⁹⁰ 55 <u>d/m/s</u>	Sr ⁹⁰ d/m/gm		90 m/gm_3a	Sr ⁹⁰ S: U.
	773	6	32g 7.0	0 1.75g 46.3	<u>±</u> 3-9 1-85±0	20 5.61±0.61	. 40₊0 <u>+</u> 3	.∗3 1.60 ±0	-13 22	-9±1 -85	10=41±0=84
	GUMME	<u>D_FILM</u> ()	Exposed	from 7/25/54	to 9/19/54)	- 8 sheets ana	lyzed				
	hasl <u>No:</u>			Tota d	l Activity /m/ft ²	Sr <u>d/</u>	89 _* m/ft ²		Sr ⁹⁰ d/m/ft ²		
	480 -	487		:	2 100	3	5.0		24.1		
		*Extrap	olated	to 1/1/55		epcatz.					

Sanat Tanat 102.17 NATIVE RANGE, TIFTON, GEORGIA

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SOIL - Received as Calcium Oxalate (NH4Ac Leach)

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	HASL <u>No•</u>	Wt. of Ca Ex- tract- ed	Depth	Sr ⁸⁹ d/m/s <u>at_C-date</u>	Sr ⁸⁹ Soil C-date	d/m/gm <u>Soil 1/1/55</u>	Sr ⁹⁰ <u>d/m/s</u>	Sr ⁹⁰ d/m		Sr ⁹⁰ Sr <u>S• U• d/</u>	.90 /m/ft ²
	728	0•2	0-2"	10•8±2+4	•003±0•0008	•0034±•00099	34•7±3•1	9•56x10 ⁻³ ±8•5x10 ⁻⁴	68 ± 6,0	31 42.7 56.	9 ±5 •8
l.	729	0•03	2 - 6"	0•9 <u>+</u> 2•3	2•5x10 ⁻⁴ ±8•7x10 ⁻⁴	2.8x10 ⁻⁴ ±9.9x10 ⁻⁴	2•8 <u>+</u> 2•4	$7 \cdot 72 \times 10^{-4}$ $\pm 6 \cdot 6 \times 10^{-4}$	40±34 1	18 -15 10.	0 <u>+</u> 8*6
	BONE										
- 24	HASL No.	<u>% Ca</u>	<u>Wt. Ca</u>	Sr ⁸⁹ d/m/s <u>at C-date</u>	Sr ⁸⁹ ash C-date	d/m/gm <u>ash 1/1/55</u>	Sr ⁹⁰ <u>d/m/s</u>	Sr ⁹⁰ d/m/gm ash	Sr ⁹⁰ d/m/gm_C a	Sr ⁹⁰ S•_U•	
	683	36•5	9 .13g	0.0 <u>+</u> 2.3	0.0±0.1	0.0 <u>+</u> 0.1	139•9 <u>+</u> 4•2	5•60 <u>+</u> 0•17	15•3 <u>+</u> 0•5	7.0<u>+</u>0. 3	
	VEGETA	TION		Sr ⁸⁹							
	HASL <u>No</u> .	Weight Dry As	Ca h <u>%</u>	, ,	Sr ash_C-d	^{s9} d/m/gm ate ash 1/1/59	Sr ⁹⁰ 5 <u>d/m/s</u>	Sr ⁹⁰ <u>d/m/gm_as</u>	Sr ⁹⁰ h <u>d/m/gm C</u>	Sr ⁹⁰ a <u>S• U</u> •	
	770	2962g 12	8g 3.8	0.95g 61.2±4.	5 2.44±0.	18 7•3 9 <u>+</u> 0•61	63•5±3•5	2:54±0+14	66•8 <u>+</u> 3•7	30. 3 <u>+</u> 1.7	7
	GUMMED) FILM (E	xposed f	rom 7/19/54 to	9/28/54) - 1	16 sheets analy	7zed				
						- 8	a	~	90		

HASL	Total Activity	Sr ⁸⁹ *	Sr ⁹⁰
No.	d/m/ft ²	<u>d/m/ft²</u>	<u>d/m/ft²</u>
Same series as Improved Pasture, Tifton, Ga.	800	8.1	108

*Extrapolated to 1/1/55 ۰.

					an and the second se					
				COL	LEGE PASTURE	- LOGAN. UT.	AH			
<u>soil</u> -	Receive	ed as Ca	lcium Oxalat	e (NH4Ac Lead	ch)					
HASL No.	Wt. of Ca Ex- tract- ed	Depth	Sr ⁸⁹ d/m/ <u>at C-date</u>		r ^{se} d/m/gm ate <u>Soil 1/1</u>	Sr ⁹⁰ /55 <u>d/m/s</u>	Sr ⁹ Soil	o d/m/gm <u>Ca</u>	Sr ⁹⁰ S+U•	Sr ⁹⁰ d/m/ft ²
731	11.6	0-2 [#]	52•6<u>+</u>2 •9	1.4x10 ⁻² ±8.7x10 ⁻¹	1.6x10 ⁻² ±9.8x10 ⁻	28 •8<u>+</u>	2•7 7•93x1 <u>+</u> 8•0x1	0 ⁻³ 2,5 <u>+</u> 0.2 0 ⁻⁴	1.1.1.0.1 3	7.4+3.5
BONE			Sr ⁸⁹							
HASL <u>No</u> .	<u>% Ca</u>	<u>Wt. Ca</u>	d/m/s at C-date	Sr ⁸⁹ d, <u>ash C-date</u>	/m/gm ash 1/1/55	Sr ⁹⁰ <u>d/m/s</u>	Sr ⁹⁰ d/m/gm_ash	Sr ⁹⁰ <u>d/m/gm_Ca</u>	Sr ⁹⁰ 5	
1125	36		13•7+3•7	0•55 <u>+</u> 0•1	2•04 <u>+0•4</u>	32•0 <u>+</u> 4•8	1.28+0.19	3•56 <u>+</u> 0•53	1.62+0.24	
1126	36		0•0 <u>+</u> 2•3	0.0 <u>+</u> 0.1	0.0 <u>+</u> 0.1	40=8 <u>+</u> 4-1	1•63 <u>+</u> 0•16	4•53±0•44	2 *0 0±0*20)
1127	36		2.64 <u>+</u> 3.6	0•10 <u>+</u> 0•14	0•37 <u>+</u> 0•50	29.1 <u>+</u> 4.5	1.16 <u>+</u> 0.18	3•22 ±0•72	1.46±0.29	l l
1128	36		6•9 <u>+</u> 4•0	0.28 <u>+</u> 0.16	1•0±0•57	31.2 <u>+</u> 4.8	1.25 <u>+</u> 0.19	3•47±0•53	1.58:0.24	:
VEGETA	TION (Or	chard G	rass)	Sr ⁸⁹						
	Area Sq.Yds.	Weigh Dry	t Ca Ash <mark>& W</mark> t	d/m/s	Sr ⁸⁹ ash C-date	d/m/gm <u>ash 1/1/5</u>	Sr ⁹⁰ 5 <u>d/m/s</u>	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 <u>+</u> 0.14	3•61 <u>+</u> 0•43	28•6 <u>+</u> 3•1	1 .14±0.1 2	13*9±1*5	6-32 ±0-68

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NORTH STORE

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

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HASL No.	Total Activity d/m/ft ²	5r ⁶⁹ * <u>d/m/ft²</u>	Sr ⁹⁰ d/m/ft ²
488 - 495	2200	30 .9	20.7
	*Extrapolated to 1/1/55	e - s second	

· ATTACK AND A FILL	Max .
- ARTICLE	PRODUCT 2
distance of the second s	-d20.0
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NEW BRUNSWICK, NEW JERSEY

