A FIELD REPORT

THE HERPETOLOGY OF SILVER CREEK, IDAHO

by Donald S. Sias

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Preface

Although the primary purpose of the study is a specific report on the reptiles and amphibians of 479 acres the Nature Conservancy is in the process of acquiring on Siver Creek, the information contained herein is applicable to the entire borderline region of the Northern Rocky Mountain and Great Basin physiographic provinces, in the state of Idaho.

Additionally, the report was designed to be a model effort relevant to any geographic region. In this sense it is "an approach to an environment study". This is why the sample data sheet and the detailed outline were included. It is an initial attempt to define the distributions of all herptiles in relation to the natural features of the environment. These are called hunting factors because certain configurations of them predict the diversity and abundance of species within a location with specified global parameters of climate and topography. Underlying this aggregate perspective is the intimate relationship of the individual animal with the setting of its existence.

Previous studies of reptile and amphibian ecology predominantly were concerned with each species natural history or behavior. Possibly because lizards are abundant and easy to observe most of the ecology journals are filled with studies of lizard demography and communities. A paucity of literature exists about snakes, the most evolutionary successful group of herptiles.

What this type of "approach to an environment study" contributes to is the eventual isolation of the critical facets of the earths surface that limit the quantitative development of biomass. On a more mundane level, with the use of such tools as multivariate analysis we can formulate predictive equations that allow us to determine diversity and abundance of species. From this study the next stage is to expand and standardize the subjective measurement catagories.

Synopsis

The reptile and amphibian community of the Silver Creek, Idaho region is subject to a tremendous decline in the diversity of species. This is a result of the borderline physiography. The Great Basin and the Northern Rocky Mountain provinces merge into one another in the Silver Creek drainage system. Many species are at their geographic limits. The result is individual species demographies of limited productivity, patchy distribution, and low population densities.

Within the study area, twenty of the thirty possible species were found. Within the preserve sixteen of the twenty species were recorded. The Great Basin Spadefoot Toad, the Western Toad, the Chorus Frog, the Spotted Frog, and the Pacific treefrog were the amphibian species on the preserve. The Northwestern Fence Lizard, the Sagebrush Lizard, the Short-Horned Toad, the Desert Horned Toad, the Western Skink were the lizard species recorded on the preserve. The Rubber Boa, the Western Racer, the Striped Whipsnake, the Gopher Snake, the Terrestrial Garter Snake, and the Western Rattlesnake occurred on the preserve.

Amphibians were surprisingly scarce, even in the aquatic areas. Lizards are uncommon, even in the location of optimum resource configurations. Snakes, however, are strongly represented and in some localized areas abundant. They constitute 95% of the herptile biomass. As a group they possess the highest occurrence frequency.

Interherptile resource flows are minimized and not important to the survival of any species. But the Terrestrial Garter Snake and the Great Basin Gopher Snake are populous and exploited by the local avian and mammalian predators. The desert to water transect is characterized by a shift from the lizards to the amphibians as potential resource imputs for the preserve predators.

Silver Creek is a western aquatic area in a predominantly semi-arid environment. The riparian interface is composed of a sagebrush-grassland, bunchgrass praire, bush-shrub, small tree, wet meadow, marsh, and permanant aquatic vegetation zones. They indicate particular spaces of the acreage as well as plant communities. The vegetation zones of the desert to water transect are a function of the frequency, variance and mean amount of soil water. This is determined by a gradient of height above the Silver Creek water table. Distinct from the natural developmnet is the very important agricultural zone, plowed fields on the preserve.

The sagebrush-grassland zone contains the greatest diversity and abundance of species. This is the largest set of environmental conditions in the area. It is poorly represented on the preserve. One reason is the presence of plowed fields. The agricultural development exerts a many faceted negative influence on the herptiles population density and distribution.

The small tree zone contains the next greatest diversity and abundance of species. This is the area with the largest standing biomass and the greatest effective area for biological activity per ground area.

The lizards and amphibians, except for the Spadefoot Toad are separated by at least one vegetation zone. The snakes extend their ecologic range into the wet adapted vegetation where the Terrestrial Garter Snake reaches the population densities of a specialist species. The Rubber Boa exists throughout these habitats. The other snake species, the Striped Whipsnake, the Western Racer, and the Great Basin Rattlesnake have their strongholds in the northern semi-desert scrub. The Great Basin Gopher Snake is the most successful in both the sagebrush-grassland and bunchgrass praire. Closer to water it is replaced by the Terrestrial Garter Snake as the most significant species. Their was no evidence of the Common Garter Snake, although its range covers the region.

The Short-Hornd Toad, the Sagebrush Lizard, the Terrestrial Garter Snake, the Great Basin Gopher Snake, the Western Toad, the Chorus Frog, and the Spadefoot Toad possess viable breeding populations on the preserve. The remaining twelve species have such low frequencies of occurrence and population densities, as well as retricted habitat, that their reproductive capacity is questionable within the limits of the preserve. Especially in light of the environmental fluctuations the data indicates is a common phenomenon in the valley.

Total herptile diversity and abundance was measured in reference to natural features, thought of as hunting factors. A strong positive correlation existed between the total distribution of species, the proximity to a drainage formation and areas of ground water. Snake abundance was predictable over all the hunting factors of the natural features. The proximity to a vegetation zone, or botanical interface was a nutural feature that exerted an overwhelming affect on snake species diversity and abundance. The proximity of open water strongly increased abundance but exerted no incremental effect on diversity.

Lizard and amphibian diversity and abundance was determined by homogenous vegetational development. The proximity to open water had a complementary effect on each group. Amphibian distribution was associated with riparian interface paterns.

Snake sightings and diversity was clearly and strongly associated with productive soil types. The lizard species groups exhibited the opposite pattern. Amphibian species occurred in poorly drained and water formed soils.

The relationships of the number of sightings and the number of species were plotted. These were derived from a biomass estimation chart and a grazing history of the undergrowth chart within the sagebrush-grassland vegetation zone. There emerged a direct relation between diversity, abundance, physical space, and biomass. The regression equations for lizard and snake ordered pairs of diversity, abundance diverged from the total herptile regression.

The lizard slope increased and the snake slope decreased. Both correlation coefficients decreased. The explained variance for lizard abundance as a function of diversity dropped to a point where the error term became significant. Snake explained variance decreased only slightly. These mathematical patterns indicate shifts in demographies and life strategies.

They reflect the community composition and frequency distributions of the populations resource structure. The higher explained variance of the abundance counts with snake diversity rather than lizard diversity is a graphic illustration of the even spread of snakes throughout this habitat and the skewed and patchy occurrence of lizard species. It demonstrates the close dependance of thelizard resource imput structure with the environment and the relative independanće of snakes from specific physical environmental conditions.

A sample data sheet was elaborated and refined as a conclusion. The data indicates that correlation of natural features with the **distri**bution of animals results in distinctive species patterns. This details the organization of limiting factors as geographic structures and processes. A scale of intimacy, proximity, vicinity, and absent was postulated as a convienent and accurate gauge for relating the distance of the animal to a natural feature.

A theorectical manageemanent question was posed to evaluate the herptile carrying capacity of the 479 acres of the preserve. What would happen to species abundance and diversity if the surrounding area was cemented over and the preserve became an island? Agricultural development severely limits the effective biological area.

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THE METHODOLOGY OF THE STUDY

The period of data gathering lasted from May 31 to June 21, 1976. During this time my goals were to determine which species existed in the area and in particular which species on the 479 acres of the prederve. Secondly, which parts of the environment were keyed to or represented limiting factors controlling the distribution and abundance of species. The emphasis was on the animals relationship to the land, rather than interspecific or intraspecific networks of animal unit interaction.

The data collection areas consisted of the preserve, conceived in terms of vegetation zones; comparison areas scattered throughout the course of Silver Creek, but within the immediate valley; and "control areas" free of agricultural development. The latter were altitudinal isoquants at the level of the preserve 4800 to 4900 feet. They wind around the base of the Picabo Hills out into the desert. The higher elevations of the Picabo Hills up to 6583 feet were examined also. These areas are free of agricultural development, except of course, for a long history of overgrazing and the accordingly increased frequency of fire, greater erosion, higher variance in the drainage characteristics of the land, and altered vegetation.

Within this geographic framework I sampled the herptiles of the various dominant vegetation types. These are an indication of habitat since they are easily discernable and are strongly associated with the soil conditions, heat, moisture, salinity,alkalinity, land usage types, and the global parameters of climate and topography.

The plant life was classified into zones, one of which was plowed fields. The next step was to extrapolate the original condition of these fields and select a suitable area to determine what was on this land.

During the data gathering period I had an expected species list to guide my searching techniques. The list was based on Stebbins, A Field Guide to the Western Reptiles and Amphibians. I used overlapping or adjacent range distributions to derive the list.

The hunting techniques consisted of walking randomly on the preserve, combing a particular zone, night collecting on the dirt and asphalt roads, beaming and triangulation for amphibians, rock and debris lifting, and raking. Each of these methods was chosen in reference to the daily climates effect on the movements of reptiles and amphibians.

Thus each zone and location received attention during periods when surficial activity was maximized. Secondly, my daily scheduales were designed to produce the maximun number of herptiles possible in a day for a proportion of the time. Conversely, to maximize the number of species in some of the least productive areas I spent a special effort in them.

To minimize any proceedural bias due to the fact that all vegetation zones on the preserve were not equally represented in area, I collected data on a prorated basis using the percentage of zone coverage as a gauge. Thus an equal number of manhours was spent in each space, with the total size of the zone determining the total amount of time in each area.

The month of June was characterized by frequent storms, freezing periods, and a large day-night temperature differential. This shifted higher but usually maintained a spread of aproximately 35 degrees Fahrenheit. This effected the number of sightings but has to be considered an integral part of the

the climatic environment which determines each species period of activity. Although observation in the July-August period would have increased the number of sightings I do not think the diversity count would be effected. The complete diversity count was achieved in the first week of June. Thereafter it was just a question of more sightings of the same species. The reptiles apparently emerge from hibernation in the lands bordering the Northern Rocky Mountains in April.

The ultimate challenge in studying reptiles is finding them. This area was no exception. In fact it is a subjective study of scarcity.

PHYSIOGRAPHY OF THE LOCATION

The Nature Conservancy property at Silver Creek, Idaho is a western aquatic area in a predominantly semi-arid land. It is located in a valley which is a mergence zone of the Great Basin and Northern Rocky Moutain physiographic provinces. The preserve is positioned at a northwestern niche of the Eastern Snake River geomorphic province, part of the Columbia Intermontane province. Immediately north of this is the northern rocky mountain geomorphic formation.

The Picabo Hills form the southern boundary of the area and the preserve lies at the base of them. They rise to 6583 feet and are northern semi-desert mountains, with sagebrush-grassland penetrating their lithosol zone. The altitude of the preserve is between 4860 and 4950 feet. The vast majority of the acreage lies between 4860 and 4870 feet. On the northern side of the valley the "mountains"forming the boundary to the valley are in reality foothills of the Sawtooth ranges. The sagebrush-grasslands are interspaced with clumps of coniferous forest and the frequency of aspen groves increases.

The area receives aproximately nine inches of precipitation a year. This occurs in evenly distributed amounts throughout the year but with local maximums during April, May, and Jume and local minimums during July, Augest, and September.

The major soils in the area are Praire-Western Brown Forest and Grey Wooded which are very dark, subhumid grassland, sagebrush-grassland, and grassland-forest soils. Secondly, the Chestnut soils which are dark colored, semi-arid soils with sagebrush-grassland vegetation.

On the preserve the specific names of the soil series are the Picabo Loam which occurs in the moderately wet saline-alkaline meadows and is cultivated. The Hayspur formation is found along the semi-permanant and permanant aquatic areas of the preserve. Molyneux Loam occurs along the higher, better drained sites where there is a shift to shallower formations with rocks and sagebrush-grassland vegetation. Kilpatrick Loam, a fine sandy loam with wet adapted vegetation is mostly cultivated now.

On these soils the nothern semi-desert vegetation reaches an unusual diversity and development. With the high ground water table and the open flow of Siver Creek a variety of marsh-meadow types florishes. Most of the species of bushes and small trees found in the area are represented on the preserve. In general the northern dry adapted semi-desert vegetation reaches its optimim development because of the water. Then it is outcompeted by wet adapted, less hardy vegetation, much of it able to tolerate saline-alkaline conditions.

THE VEGETATION ZONES OF SILVER CREEK

The patterns of the vegetation on the land were classified to asist in organizing the distribution and abundance of herptiles in the area. Broad scale vegetation zones, each of which includes a list of important species, were defined. Each zone was created using these criteria of plant dominance; standing biomass, surficial density, and visual impact.

No rigorous percentage composition of each species for each zone was carried out. It was a qualitative catagorization. As I searched for herptiles the probability of running across and identifying the most abundant plant species in each area is greatest for the most frequently occuring plant.

Furthermore I came to use visual presence of one important species to earmark a zone. So these zones represent definite spaces as well as plant communities.

These zones were determined by the behavior of local surficial water patterns, within the set paramters of climate and topography. A profile of a typical transect across the preserve would reveal a close correlation between shifts in the schedules of plant species and the frequency of water fluctuation, the variance of water fluctuation, the mean amount of soil water. The most important gradient is altitude, or height above the Silver Creek water table.

The most diversity of plant zones and species occurs along the gentle gradients from the Picabo Hills down to the open flow of Silver Creek. Zone development is compressed and exhibits fewer combinations when there are rapid or sudden changes in the macro-topography.

The following were classified as vegetation zones:

1. northern semi-desert scrub or sagebrush-grasslands
2. bunchgrass praire
3. bush-shrub
4. small tree
5. wet meadow
6. marsh
7. permanant aquatic
8. plowed fields

Sagebrush-grassland Zone Species List

Northern semi-desert scrub:

Sagebrush (Artemisia tridentata)

Rabbit brush (Chrysothamnus nauseosus)

Hopsage (Grayia spinosa)

Bitterbrush (Purshia tridentata)

Bud Sagebrush (Artemisia spinescens)

Small Sagebrush (A. cana)

Northern Antelope Bush (Purshia tridentata)?

Shadscale (Atriplex canescens)

Winterfat (Eurotia lanata)

Horse Bush (Tetradymia glabrata)

Greasewood (Sarcobatus verimiculatus)

Grasslands and Herbs:

Lupine (Lupinus species)

Desert Buckwheat (Eriogonum species)

Spiked Wheatgrass (Agropyron spincatum)

Steppe Bluegrass (Poa sandberii)

Cheatgrass (Bromus tectorum)

Yarrow (Achillea millefolium)

Timothy (Phleum pratense)

Bunchgrass Praire Zone Species List

Hopsage (Grayia spinosa)

Giant Wild Rye (Elymus cinereus)

Spiked Wheatgrass (Agropyron spincatum)

Foxtail Barley (Hordeum jubatum)

Alkalisacaton (Sporobolus airoides)

Wild Chives (Allium sibiricum)

Smooth Brome (Bromus carinatus)

Six Weeks Fescue (Festuca octoflora)

Foxtail Brome (B. rubens)

Downy Brome Grass (B. tectorum)

Sandberg Bluegrass (Poa secunda)

Kentucky Bluegrass (Poa pratensis)

Spike Trisetum (Trisetum spicatum)

Hairgrass (Deschampsia caepitosa)

Creeping Bentgrass (Agrostis palustris)

Slender Fringe-Cup (Lithophragma bulbifera)

Crabgrass (Digitaria sanguinalis)

Sticky Geranium (Geranium viscosissimum)

Bush-Shrub Zone Species List

Fendler's Wild Rose (Rosa fendleri)

Intermountain Rose (Rosa ultramontana)

Golden Currant (Ribes aureum)

Utah Service-berry (Amelanchier utahensis)

Bud Sagebrush (Artemisia spinescens)

Western Chokecherry (Prunus melanocarpa)

Blue Elderberry (Sambucus glauca)

Black Hawthorn (Crataegus douglasii)

Columbia Hawthorn (Crataegus columbiana)

Common Snowberry (Symphoricarpos rivularis)

Rabbitbrush (Chrysothamnus nauseosus)

Small Tree Zone Species List

Water Birch (Betula occidentalis)

White Alder (Alnus rhombifolia)

Thinleaf Alder (Alnus tenuifolia)

Pacific Willow (Salix lasiandra)

Peachleaf Willow (Salix amygdaloides)

Arroyo Willow (Salix lasiolepis)

Mackenzie Willow (Salix mackenzieana)

Pussy Willow (Salix discolor)

Bebb Willow (Salix bebbiana)

Scouler Willow (Salix scouleriana)

Narrowleaf Cottonwood (Populus angustifolia)

Quaking Aspen (Populus tremuloides)

Common Chokecherry (Prunus virginiana)

Bitter Cherry (Prunus emarginata)

Black Hawthorn (Crataegus douglasii)

Blueberry Elder (Sambucus glauca)

Boxelder (Acer negundo)

Rocky Mountain Maple (Acer glabrum)

Red-osier Dogwood (Cornus Stolonifera)

Wet Meadow Zone Species List

Sedges (Carex species)

Rushes (Juncus species)

Annual Blue Grass (Poa annua)

Wild Iris (Iris species)

Common Camass (Camasia species)

Saltgrass (Distichylis stricta)

Golden Pea (Thermopsis montana)

Western Scouring Bush (Equisetum hiemale)

Marsh Zone Species List

Sedges (Carex species)

Retrose Sedge (Carex retrorsa)

Rushes (Juncus species)

Common Cattail (Typha latifolia)

Pale Spike Rush (Eleocharis macrstachya)

Tule (Scirpus acutus)

Common Arrowhead (Sagitaria latifolia)

Broad-Fruited Bur-Reed (Sparganium eurycarpum)

Americam Great Bulrush (Scirpus validus)

SPECIES PROBABLE LIST

The criteria for inclusion on this list were that the species must either have an overlapping or adjacent range distribution at Silver Creek. The geographical distributions were taken from Stebbins, A Field Guide to Western Reptiles and Amphibians .

Amphibians:

Long-Toed Salamander, northern; (Ambystoma macrodactylum krausei).

Tiger Salamander, blotched; (Ambystoma tigrinum melanostictum).

Great Basin Spadefoot; (Scaphiopus intermontanus).

Western Toad, boreal; (Bufo boreas boreas).

Woodhouse's Toad; (Bufo woodhousei woodhousei).

Chorus Frog, boreal; (Pseudacris triseriata maculata).

Spotted Frog; (Rana pretiosa).

Leopard Frog; (Rana pipiens).

Bull Frog; (Rana catesbeiana)*

Pacific Treefrog; (Hyla regilla).

*This frog was included on the list because it is expanding it's range and always turning up somewhere new.

Species probable list continued

Reptiles:

Leopard Lizard, long nosed; (Crotaphytus wislizenii wislizenii).

Collared Lizard; (Crotaphytus collaris).

Western Fence Lizard, great basin; (Sceloporus occidentalis biseriatus).

Sagebrush Lizard, northern; (Sceloporus graciosus graciosus).

Side Blotched Lizard, northern; (Uta stansburiana stansburiana).

Short Horned Lizard, pygmy; (Phrynosoma douglassi douglassi).

Desert Horned Lizard, norhtern; (Phrynosoma platyrhinos platyrhinos).

Western Skink, great basin; (Eumeces skiltonianus utahensis).

Western Whiptail, great basin; (Cnemidophorus tigris tigris).

Rubber Boa, rocky mountain; (Charina bottae utahensis).

Ringneck Snake, northwestern; (Diadophis puntatus occidentalis).

Western Racer, western yellow bellied; (Coluber constrictor mormon).

Striped Whipsnake; (Masticophis taeniatus).

Gopher Snake, great basin; (Pituophis melanoleucus deserticola).

Long-Nosed Snake, western; (Rhinocheilus leconti leconti).

Species probable list continued

Reptiles:

Common Garter Snake, valley; (Thamnophis sirtalis fitchi).

Western Terrestrial Garter Snake, wandering; (Thamnophis elegans vagrans).

Western Ground Snake; (Sonora semiannulata).

Night Snake, desert; (Hypsiglena torquata deserticola).

Western Rattlesnake, great basin; (Crotalus viridus lutosus).

SPECIES ACTUAL SIGHTING LIST

In the area:	On the preserve:
Scaphiopus intermontanus	yes
Bufo b. boreas	yes
Pseudacris triseriata maculata	yes
Rana pretiosa	yes
Hyla regilla	yes
Sceloporus occidentalis biseriatus	yes
Sceloporus g. graciosus	yes
Uta s. stansburiana	no
Phrynosoma d. douglassi	yes
Phrynosoma p. platyrhinos	yes
Eumeces skiltonianus utahensis	yes
Cnemidophorus t. tigris	no
Charina bottae utahensis	yes
Diadophis puntatus occidentalis	no
Coluber constrictor mormon	yes
Masticophis taeniatus	yes
Pituophis melanoleucus deserticola	yes
Thamnophis sirtalis fitchi	no
Thamnophis elegans vagrans	yes
Crotalus viridus lutosus	yes

		SAGEBRUSH-GRASSLAND	BUNCHGRASS PRAIRE	SHRUBS-BUSHES	SMALLTREE	WET MEADOW-PRAIRE	MARSH	PERMANENT AQUATIC	PLOWED FIELD	Environmental Heterogeneity / TOTAL
1	Scaphiopus intermontanus	5	2		2					9/9
2	Bufo b. boreas					3		CHORUS CHORUS		2/3
3	Pseudacris triseriata maculata						2	CHORUS		2 CHORUS
4	Rana pretiosa						5			5/5
5	Hyla regilla						2			2/2
6	Sceloporus occidentalis biseriatus	1			5					6/6
7	Sceloporus g. graciosus	21								7/21
8	Uta s. stansburiana	2								2/2
9	Phrynosoma d. douglassi	19								4/19
10	Phrynosoma p. platyrhinos	16								16/16
11	Eumeces skiltonianus utahensis			2	2					3 4/4
12	Cnemidophorus t. tigris	3								3/3

		SAGEBRUSH-GRASSLAND	BUNCH GRASS PRAIRE	SHRUBS-BUSHES	SMALL TREE	WET MEADOW-PRAIRE	MARSH	PERMANENT AQUATIC	PLOWED FIELD	Environmental Heterogeneity TOTAL
13	Charina bottae utahensis	1	1	1	1					3/4
14	Diadophis puntatus occidentalis				3					3/3
15	Coluber constrictor mormon	6								3/6
16	Masticophis taeniatus	4								2/4
17	Pituophis melanoleucus deserticola	12	7	3					2	14/24
18	Thamnophis sirtalis fitchi				6					6/6
19	Thamnophis elegans vagrans	4	6	5	7	6	4			27/32
20	Crotalus viridus lutosus	5	1							4/6

Species		Proximity to open water Y	Proximity to open water N	Proximity to ground water Y	Proximity to ground water N	Proximity to surficial rock formations Y	Proximity to surficial rock formations N	Proximity to drainage formation Y	Proximity to drainage formation N	Vegetational Zone Border line Y	Vegetational Zone Border line N	Vegetational Zone Patchiness Y	Vegetational Zone Patchiness N	Ground Type: soil	loam	sand	gravel	rocky	Immediate topography: flat	slope
Scaphiopus intermontanus	#	7	2	7	2	6	3	7	2	7	2	2	7	2	5	2			7	2
	%	.78	.22	.78	.22	.67	.33	.78	.22	.78	.22	.22	.78	.22	.56	.22			.78	.22
Bufo b. boreas	#	3		3			3	3		1	2		3	2	1				3	
	%	100	0	100	0	0	100	100	0	.33	.67	0	100	.67	.33				100	0
Pseudacris triseriata maculata	#	2		2			2	2		2			2	2					2	
	%	100	0	100	0	0	100	100	0	100	0	0	100	100					100	0
Rana pretiosa	#	5		5		2	3	5		5			5	3	1			1	5	
	%	100	0	100	0	.40	.60	100	0	100	0	0	100	.6	.2			.2	100	0
Hyla regilla	#	2		2		2		2		2			2	1	1				2	
	%	100	0	100	0	100	0	100	0	100	0	0	100	.5	.5				100	0
Sceloporus occidentalis biseriatus	#		6	6		6		6		6		6						6		6
	%	0	100	100	0	100	0	100	0	100	0	100	0					100		100
Sceloporus g. graciosus	#	7	14	6	15	4	17	5	16		21		21		10		2	9	14	7
	%	.33	.67	.29	.71	.19	.81	.24	.76	0	100	0	100		.48		.9	.43	.67	.33
Uta s. stansburiana	#		2		2	2			2		2		2					2		2
	%	0	100	0	100	100	0	0	100	0	100	0	100					100		100
Phrynosoma d. douglassi	#	3	16	4	15	1	18	3	16	5	14		19	2	12		5		15	4
	%	.16	.84	.21	.79	.05	.95	.16	.84	.26	.74	0	100	.11	.63		.26		.79	21
Phrynosoma p. platyrhinos	#		16	1	15	13	3	4	12		16		16			10		6	6	10
	%	0	100	.06	.94	.81	.19	.25	.75	0	100	0	100			.63		.37	.37	.63
Eumeces skiltonianus utahensis	#		4	2	2	4		4		4		4			2			2		4
	%	0	100	.5	.5	100	0	100	0	100	0	100	0		.5			.5	0	100
Cnemidophorus t. tigris	#		3	3		3		3		3			3		1		1	1		3
	%	0	100	100	0	100	0	100	0	100	0	0	100		.33		.33	.33	0	100

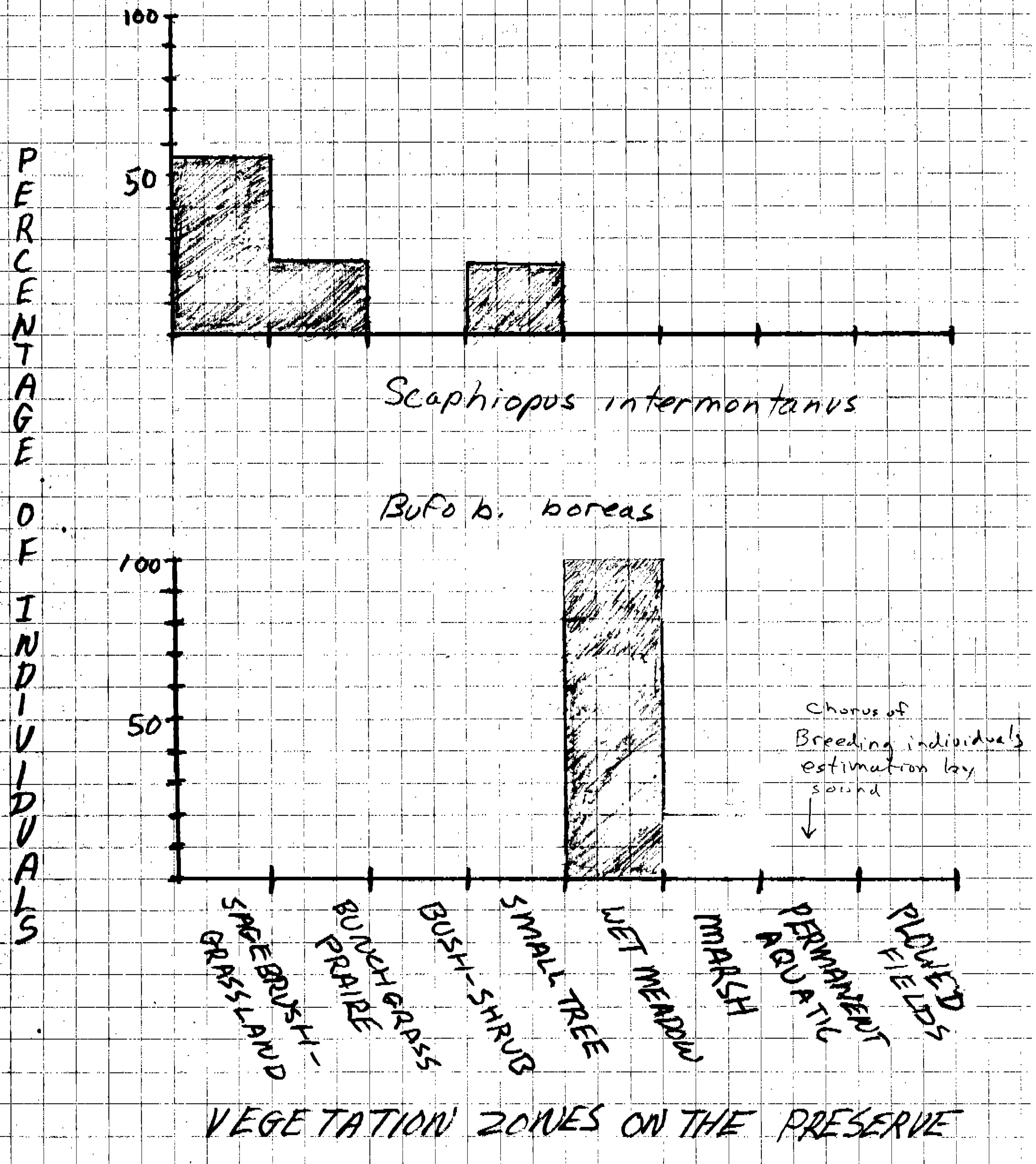
Species		Proximity to open water Y	Proximity to open water N	Proximity to groundwater Y	Proximity to groundwater N	Proximity to surficial rock formations Y	Proximity to surficial rock formations N	Proximity to Drainage Formation Y	Proximity to Drainage Formation N	Vegetational Zone Borderline Y	Vegetational Zone Borderline N	Vegetational Zone Patchiness Y	Vegetational Zone Patchiness N		GROUND TYPE: Soil	Loam	Sand	Gravel	Rock	Immediate topography: Flat	Slope	
Charina bottae utahensis	#	2	2	2	2	3	1	3	1	2	2	1	3			3			1	1	3	
	%	.5	.5	.5	.5	.75	.25	.75	.25	.5	.5	.25	.75			.75			.25	.25	.75	
Diadophis puntatus occidentalis	#		3	3		3			3	3		3			3						3	
	%	0	100	100	0	100	0	0	100	100	0	100	0		100					0	100	
Coluber constrictor mormon	#	2	4	3	3	3	3	2	4	3	3	1	5		1	2	3			2	4	
	%	.33	.66	.5	.5	.5	.5	.33	.66	.5	.5	.16	.83		.16	.33	.5			.33	.66	
Masticophis taeniatus	#		4		4	2	2	2	2	1	3		4		1	3				3	1	
	%	0	100	0	100	.5	.5	.5	.5	.25	.75	0	100		.25	.75				.75	.25	
Pituophis melanoleucus deserticola	#	13	11	17	7	8	16	6	18	12	12	7	17		5	12	1	3	3	22	2	
	%	.54	.46	70	30	33	67	.33	.67	.5	.5	30	70		.20	.5	.04	.13	.13	92	8	
Thamnophis sirtalis fitchi	#	6		6			6	6		6		6			4	1	1			1	5	
	%	100	0	100	0	0	100	100	0	100	0	100	0		.67	.16	.16			.16	.83	
Thamnophis elegans vagrans	#	32		6	26	10	22	32		32		17	15		18	8	3		3	4	28	
	%	100	0	.19	.81	31	69	100	0	100	0	53	47		56	.25	.9		.9	13	.87	
Crotalus viridus lutosus	#	2	4	2	4	4	2	2	4	3	3	2	4		1	4		1		1	5	
	%	33	67	33	67	67	33	33	67	.5	.5	33	67		17	.66		.17		17	83	

SAGEBRUSH - GRASSLAND VEGATATION ZONE

	OVERSTORY: DENSE	SPACED	SCATTERED			UNDERSTORY: HERBS	PERENNIALS	ANNUALS	
Scaphiopus intermontanus	5			HIGH 37" UP MED 15-36" LOW 15"	PROTECTED GRAZED OVERGRAZED	3	2		
Bufo b. boreas									
Pseudacris triseriata maculata									
Rana pretiosa									
Hyla regilla									
* Sceloporus occidentalis biseriatus	5	1				4	2		
Sceloporus g. graciosus		5 7 1	5 3			3 6	4	1 7	
Uta s. stansburiana			1 1				2		
Phrynosoma d. douglassi	8 3 2	4 2				13	6		
Phrynosoma p. platyrhinos	4		4 5 3				3	13	
* Eumeces skiltonianus utahensis	4					2	2		
* Cnemidophorus t. tigris		3					3		

	Dense	Spaced	Scattered			HERBS	PERENNIALS	ANNUALS	
* Charina bottae utahensis	1		2	high 77"-up med 16"-36" low 15"	PROTECTED GRAZED OVERGRAZED	1	2		
Diadophis puntatus occidentalis									
Coluber constrictor mormon	1 1	 1 	1 1 1			 2	 1 1	 2 	
Masticophis taeniatus	1 	1 1	 1				3	1	
Pituophis melanoleucus deserticola	3 	 3 	1 3 2			 1 	4 3	 4 	
Thamnophis sirtalis fitchi									
Thamnophis elegans vagrans	4					1	3		
Crotalus viridus lutosus	1 	1 1	1 1			 2	 1 1	 1 	

SPECIES DISTRIBUTION BY HABITAT
"DESERT TO WATER TRANSECT"



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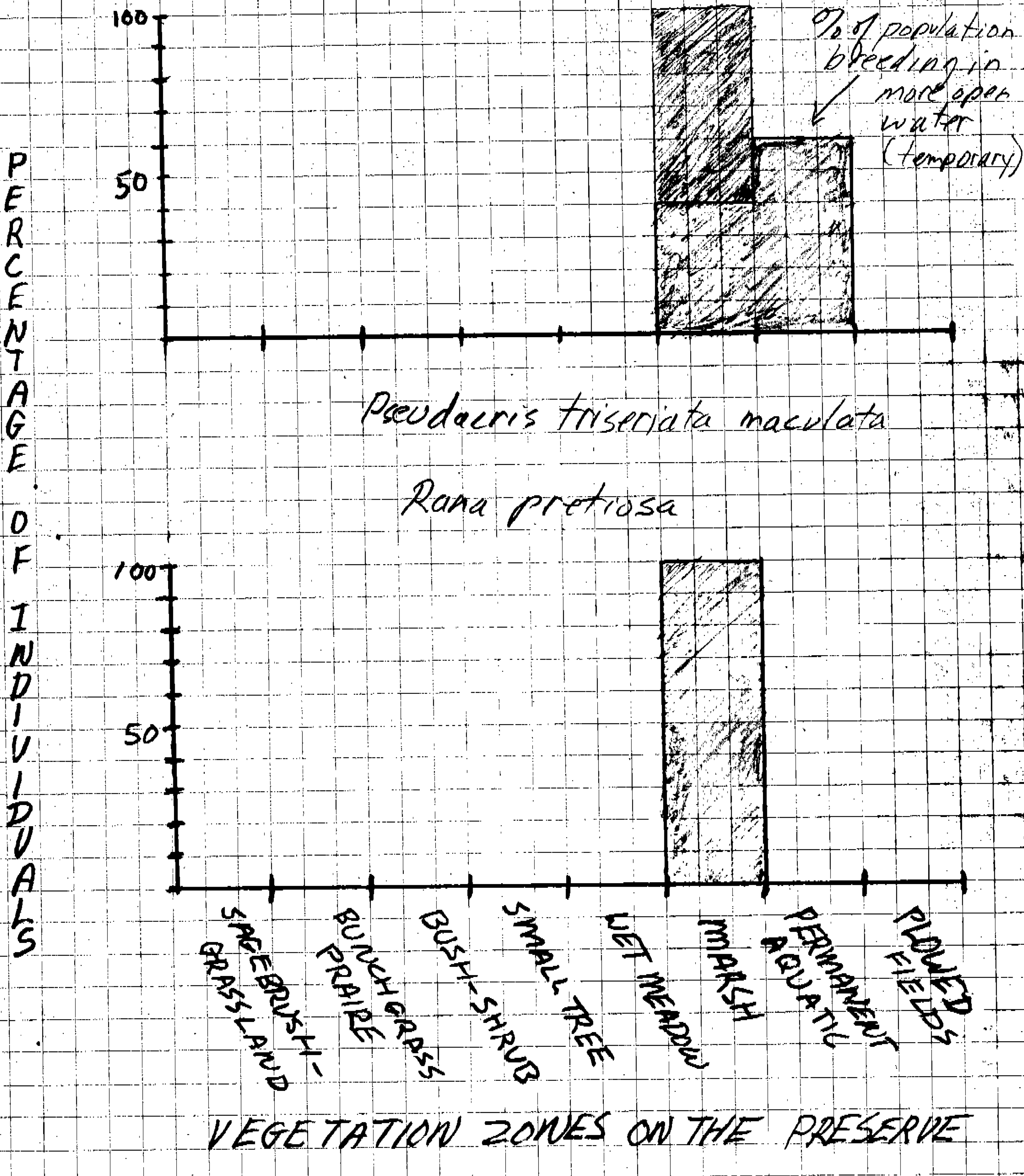
"DESERT TO WATER TRANSECT"



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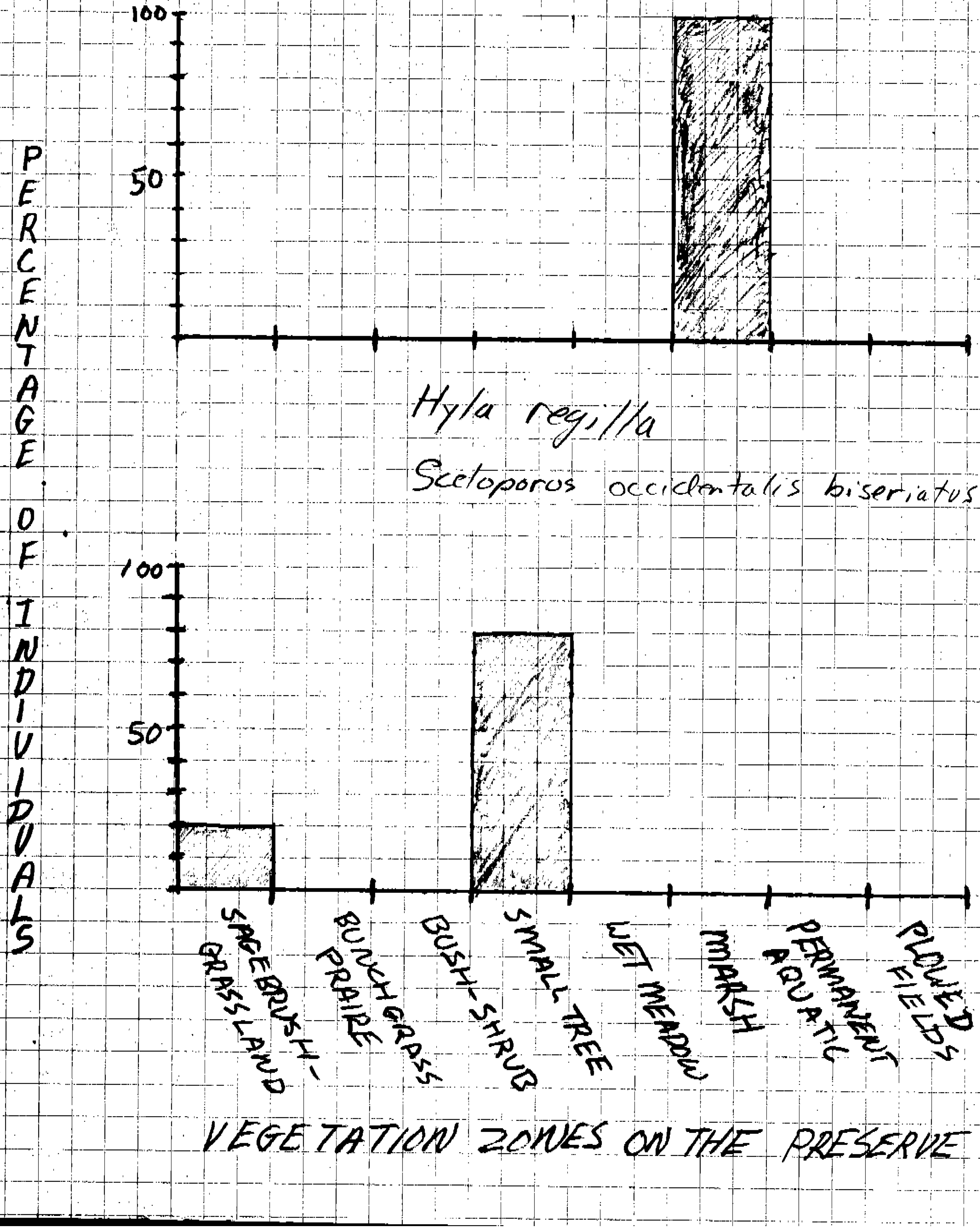
"DESERT TO WATER TRANSECT"



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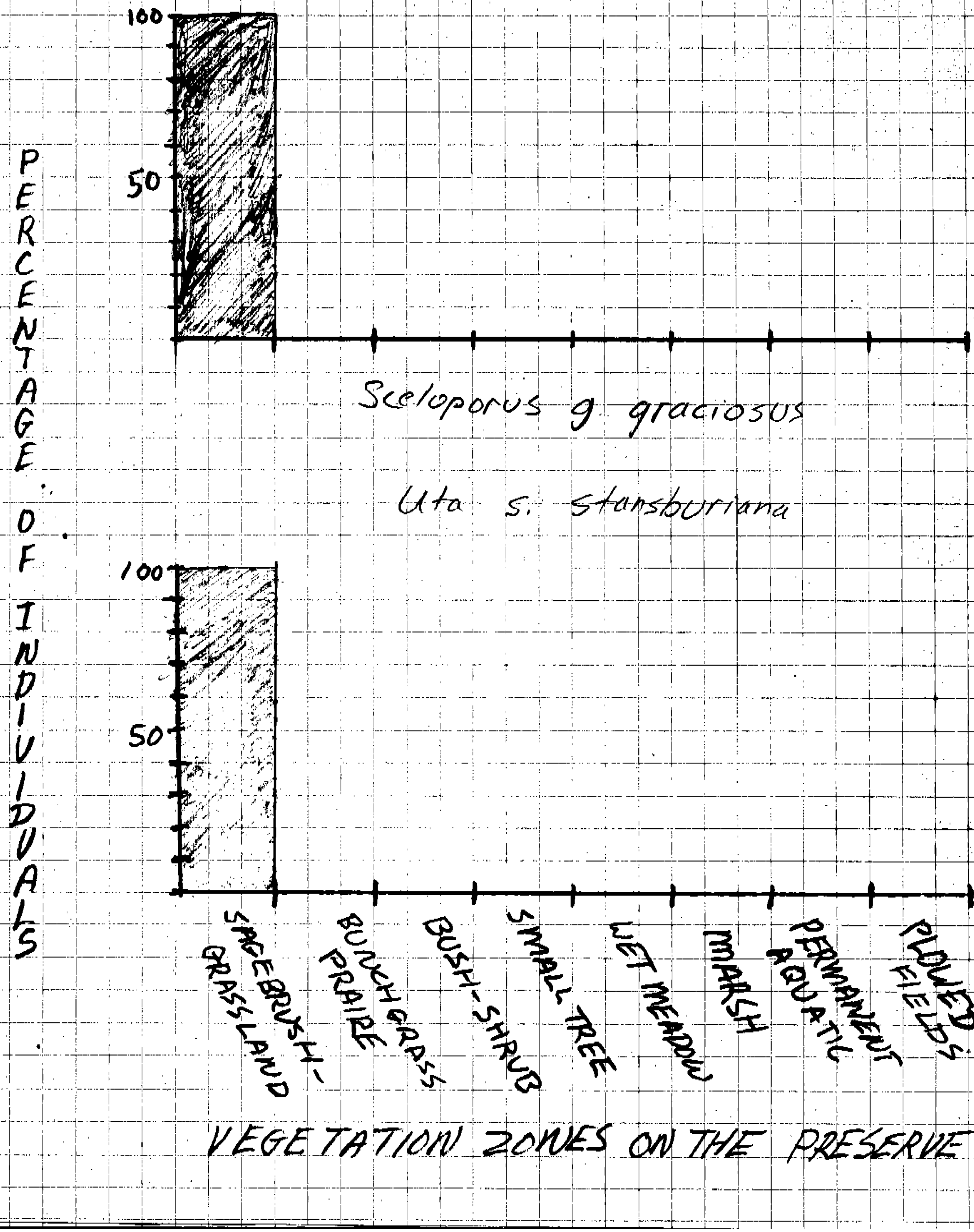
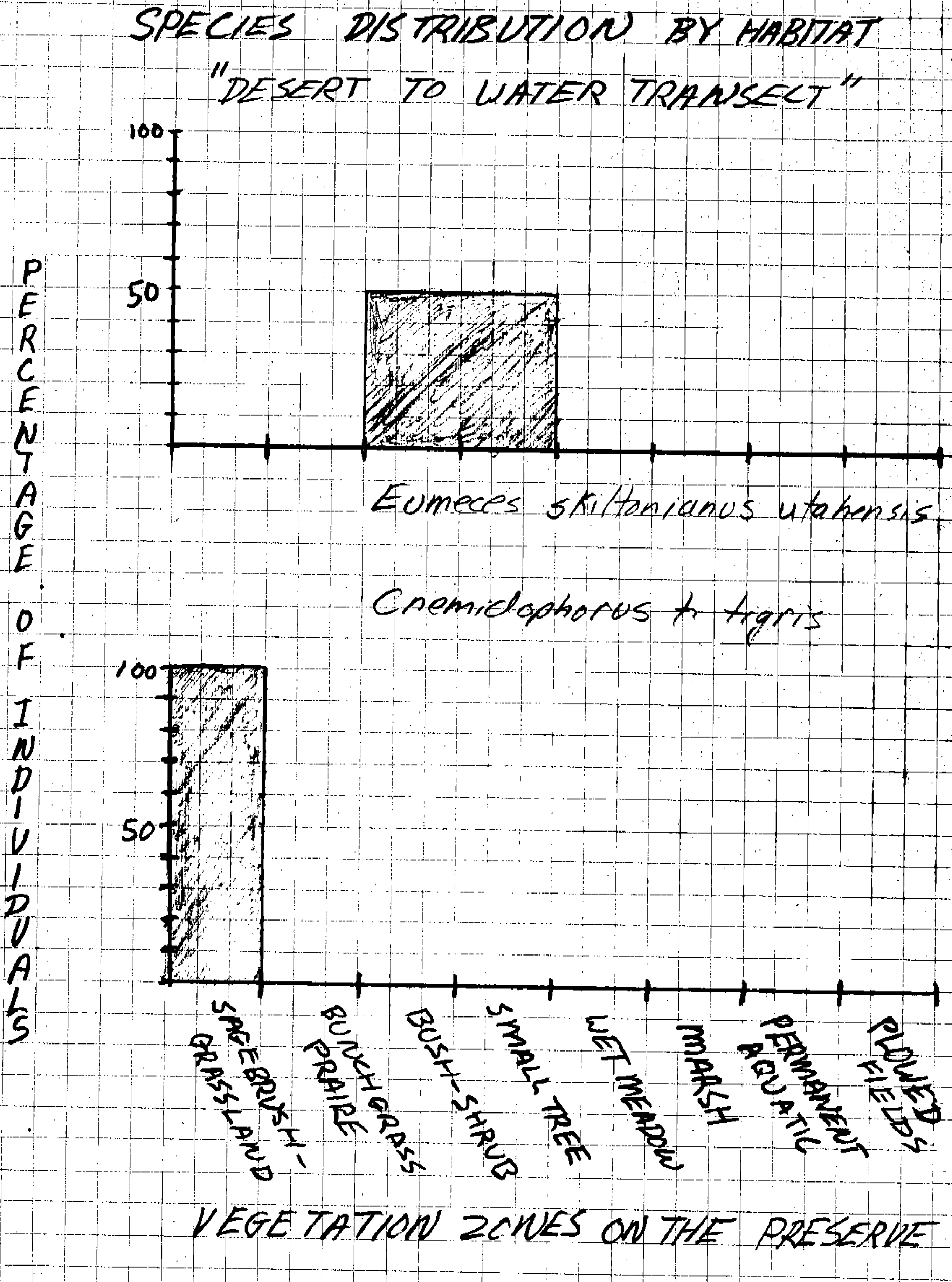
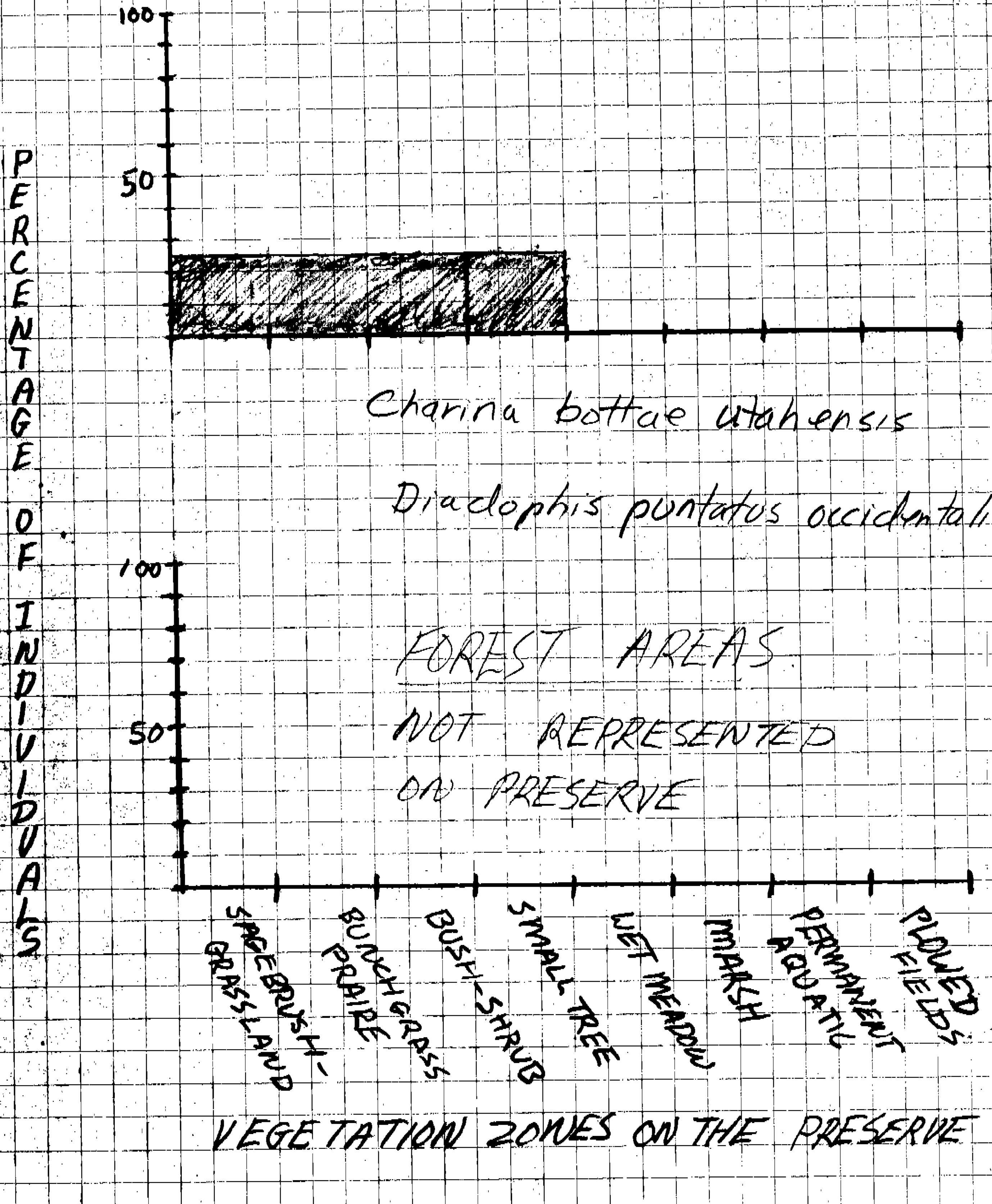




SPECIES DISTRIBUTION BY HABITAT
"DESERT TO WATER TRANSECT"
100
50
Eumeces skiltonianus utahensis
Cnemidophorus t. tigris
100
50
PERCENTAGE OF INDIVIDUALS
SAGEBRUSH-GRASSLAND
BUNCHGRASS PRAIRE
BUSH-SHRUB
SMALL TREE
WET MEADOW
MARSH
PERMANENT AQUATIC
PLOWED FIELDS
VEGETATION ZONES ON THE PRESERVE

SPECIES DISTRIBUTION BY HABITAT
"DESERT TO WATER TRANSECT"



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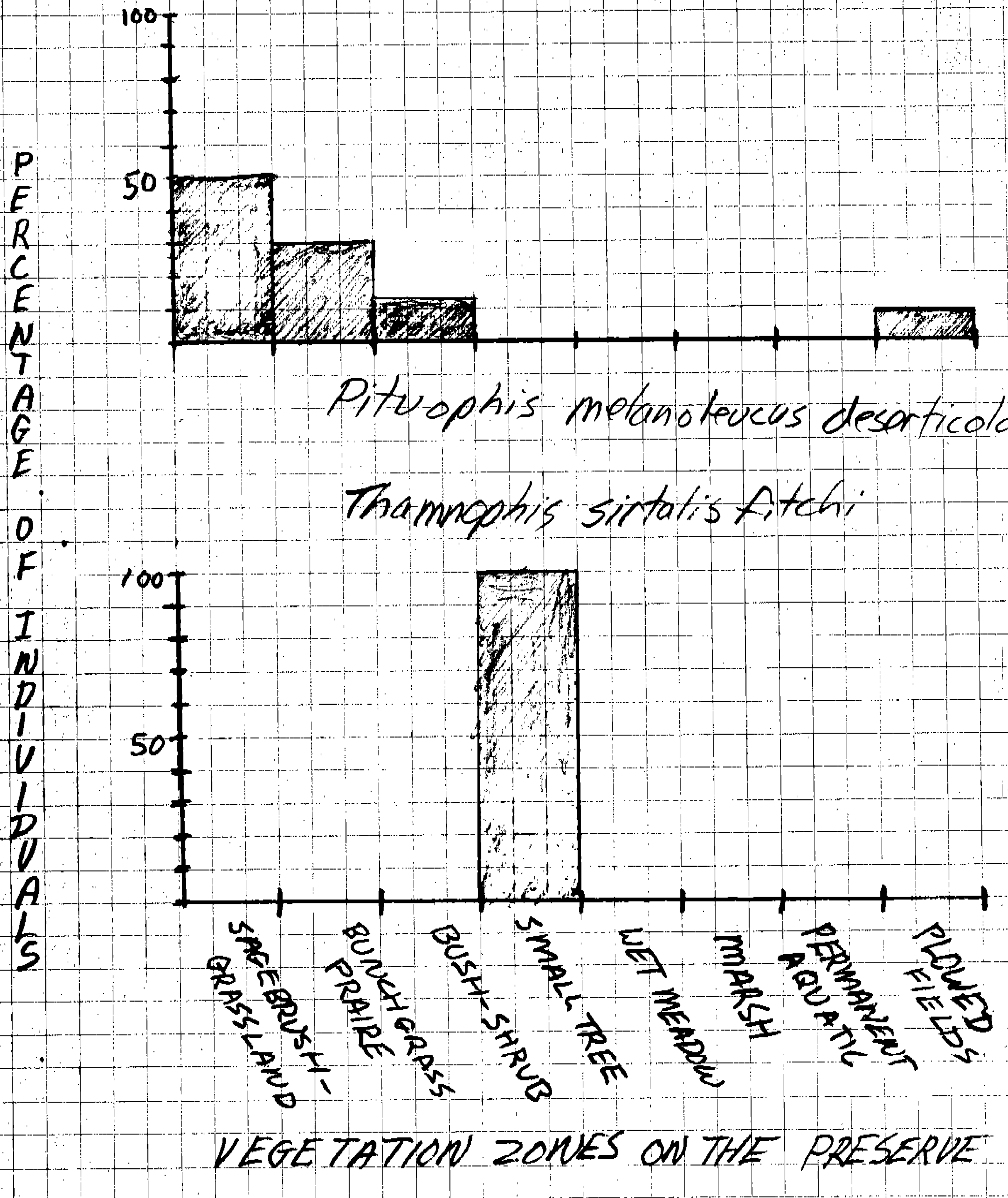

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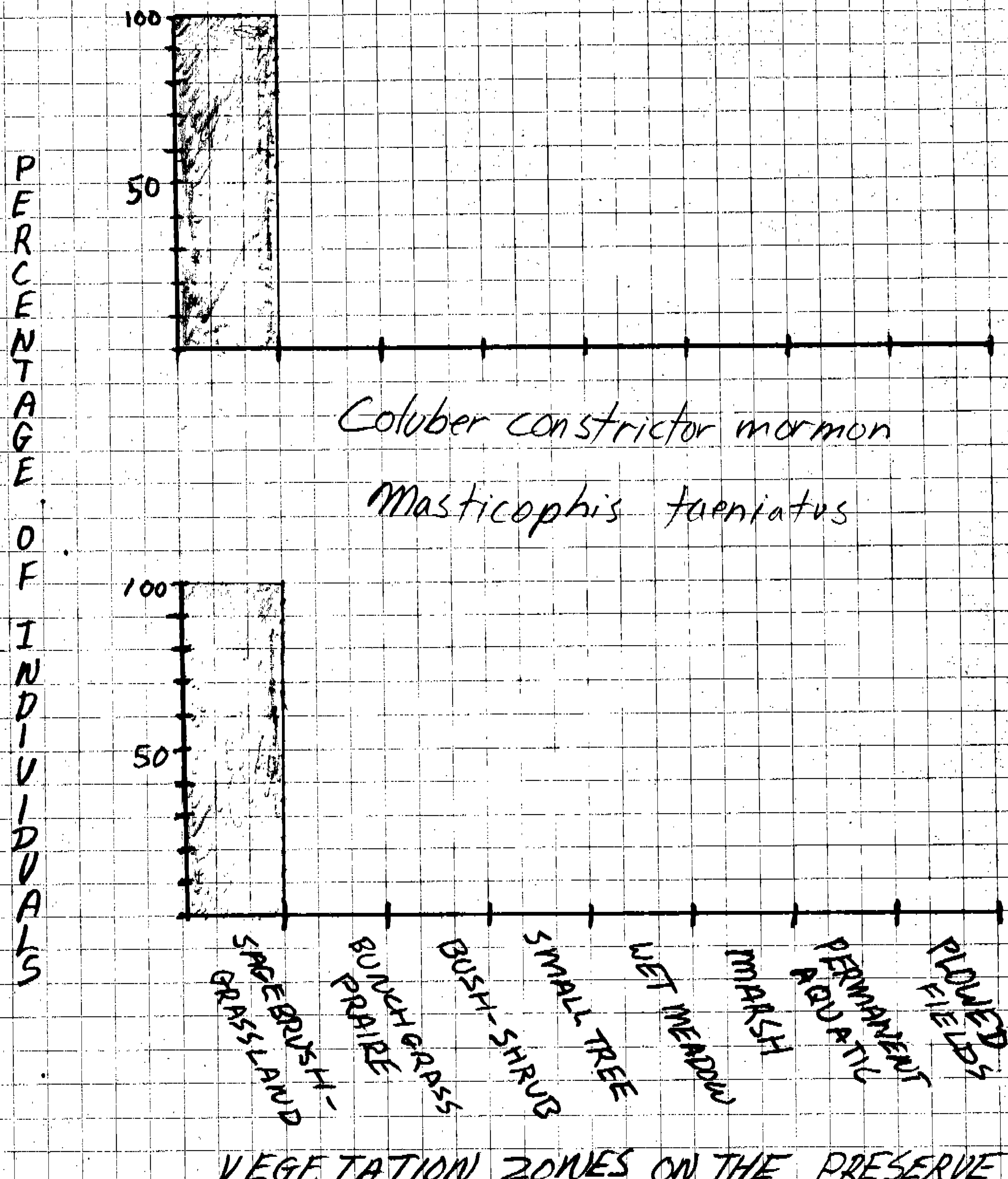

SPECIES DISTRIBUTION BY HABITAT

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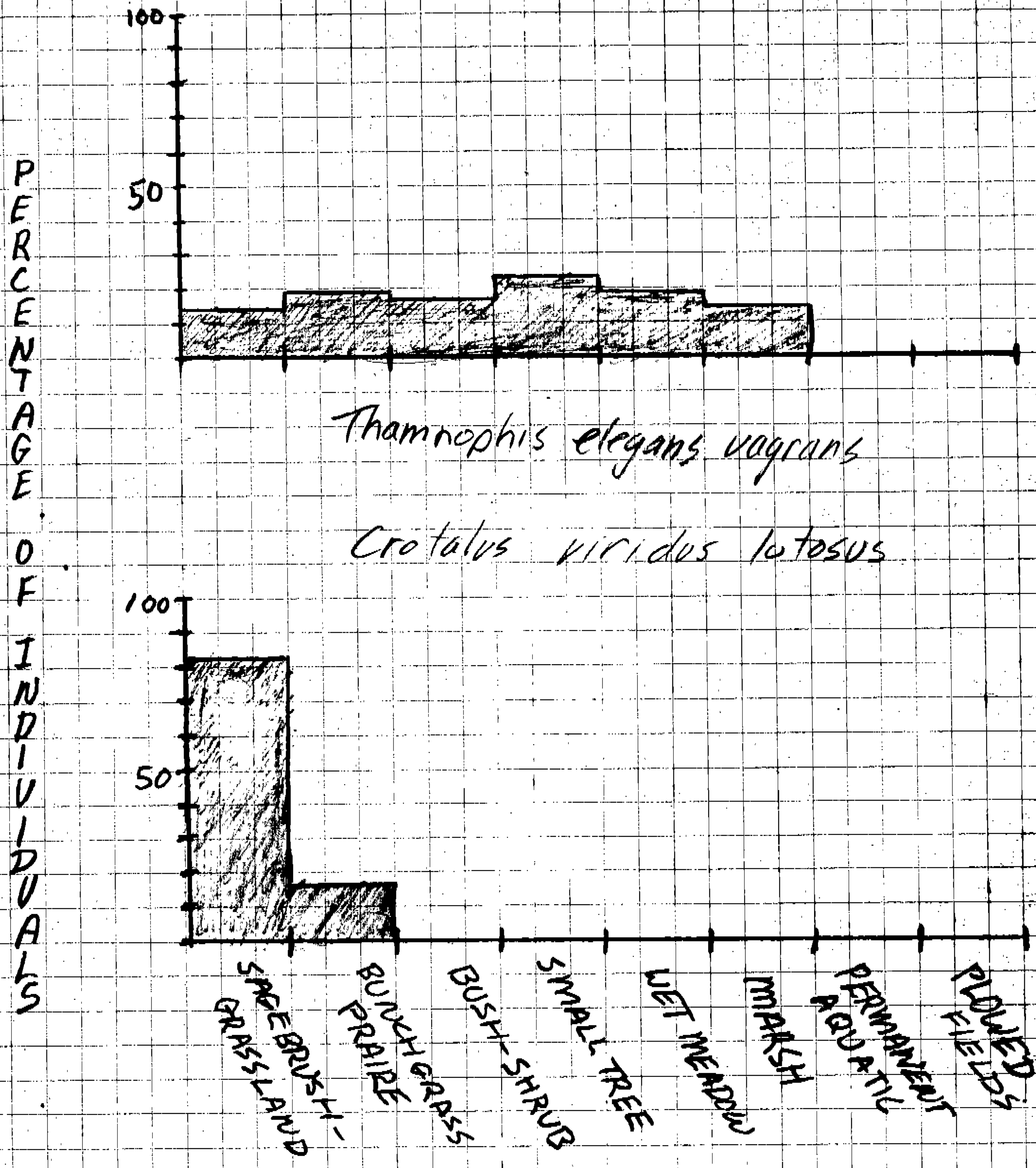
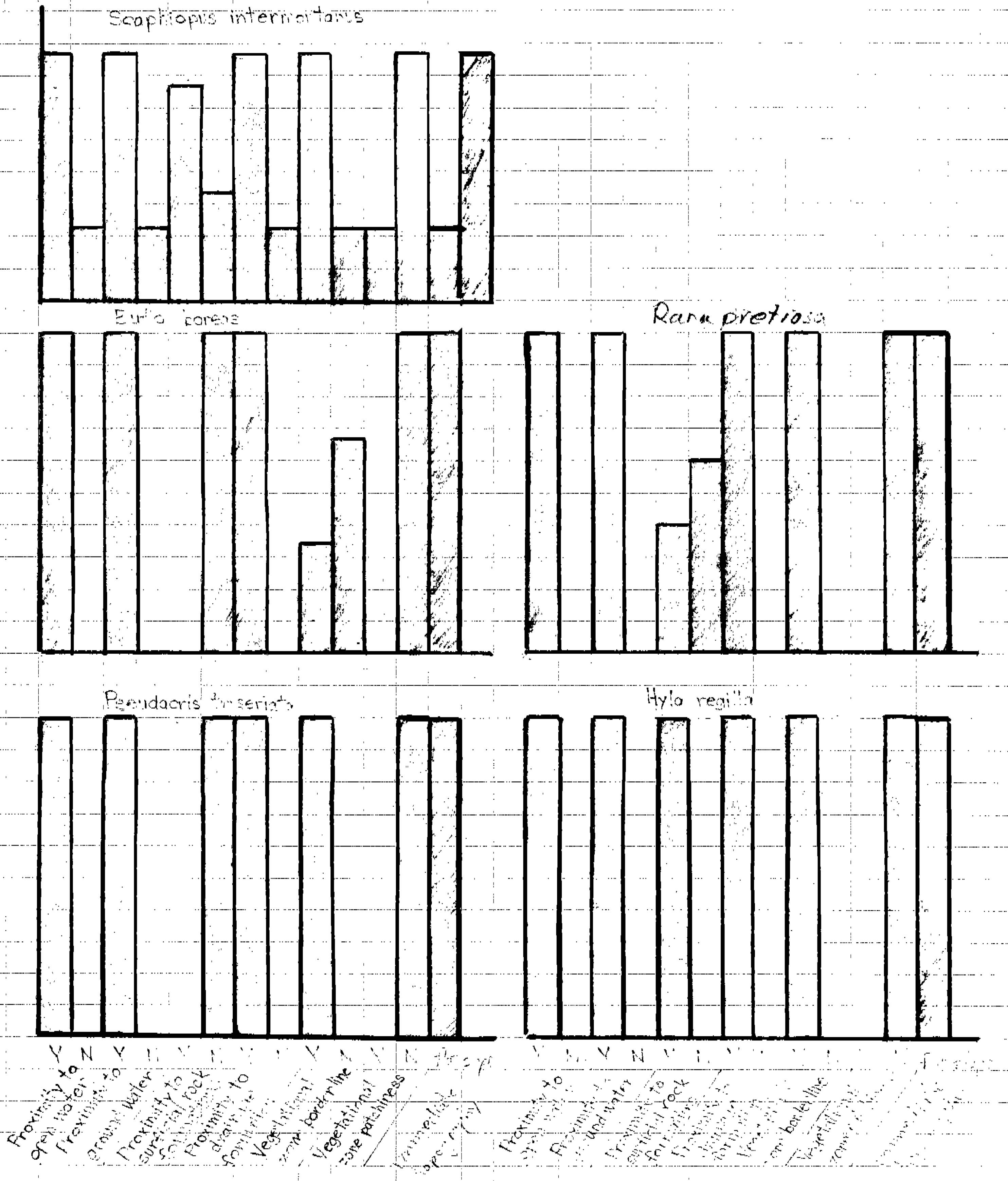
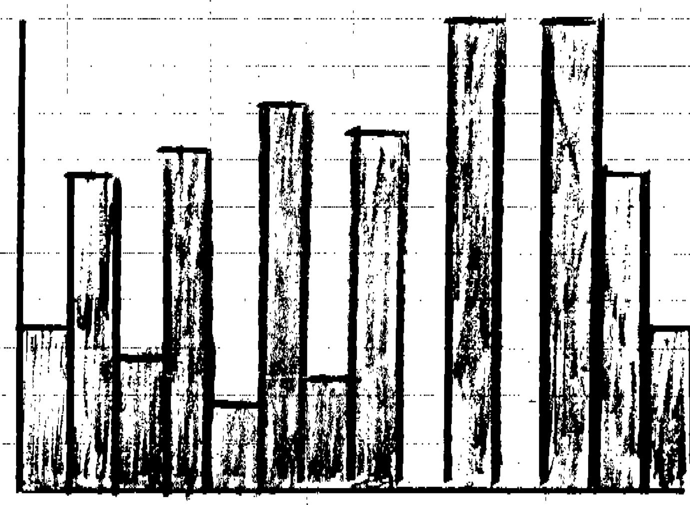




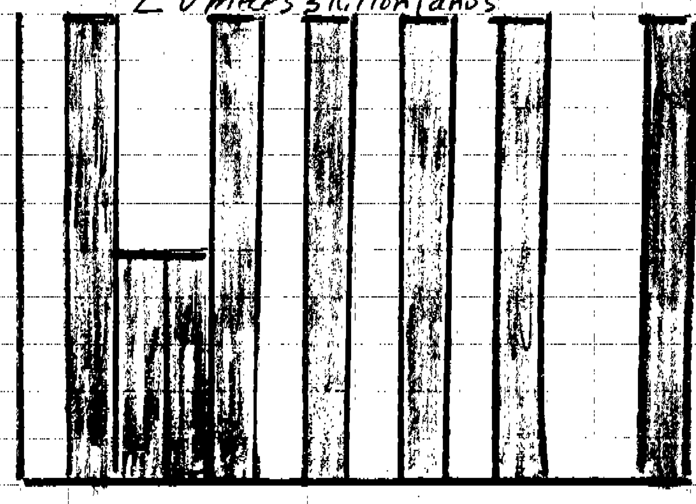
NATURAL FEATURES AND SPECIES DISTRIBUTION
BY PERCENTAGE OF POPULATION
WHERE YES, proximity to feature + NO, proximity to feature = TOTAL SIGHTINGS

Sceloporus occidentalis

Sceloporus graciosus

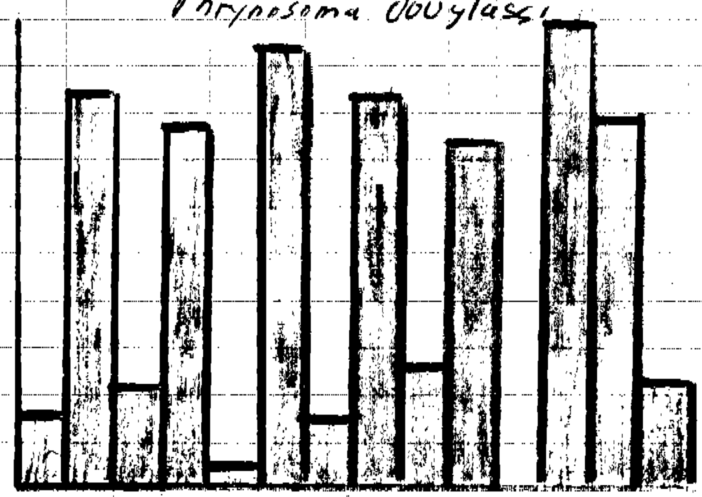


Eumeces skiltonianus



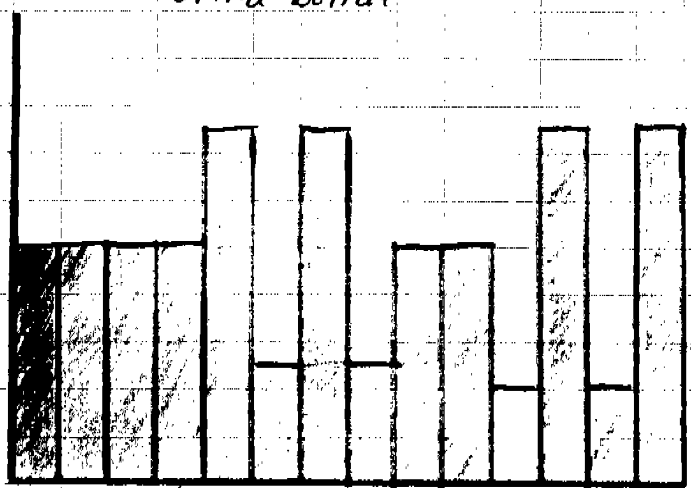
Uta stansburiana

Phrynosoma douglassi

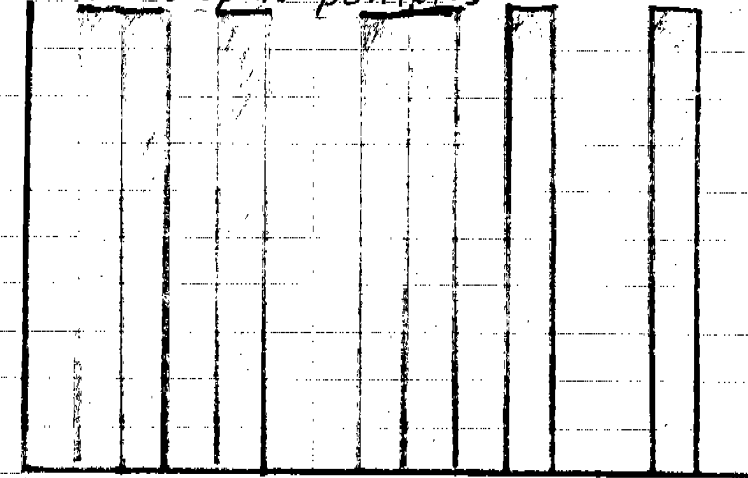


Phrynosoma platyrhinos

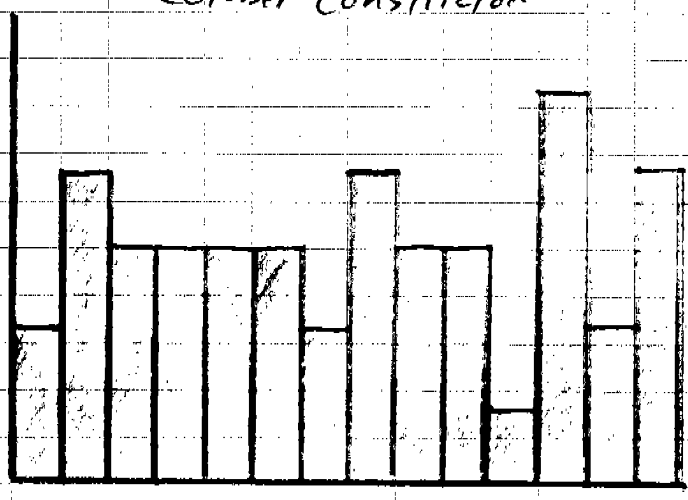
Charina bottae



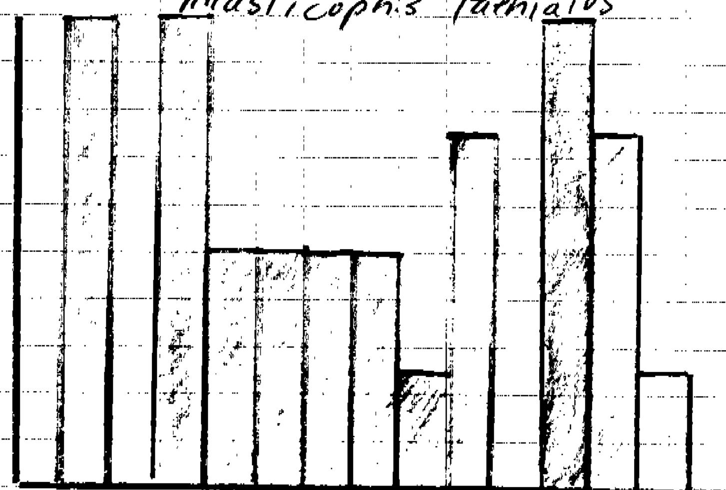
Diadophis puntatus



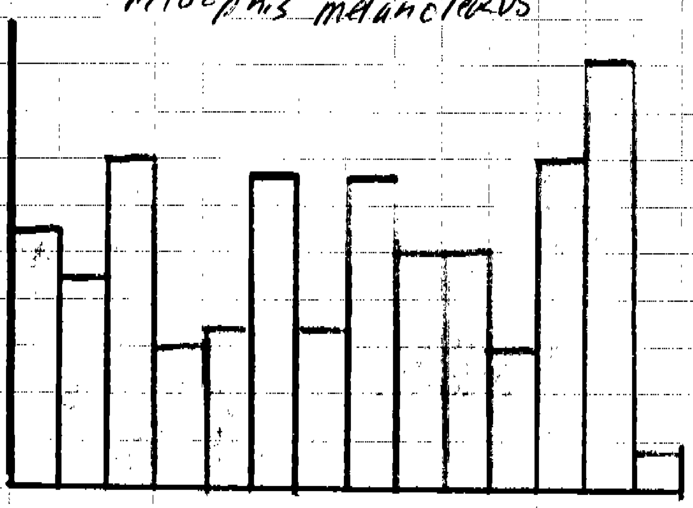
Coluber constrictor



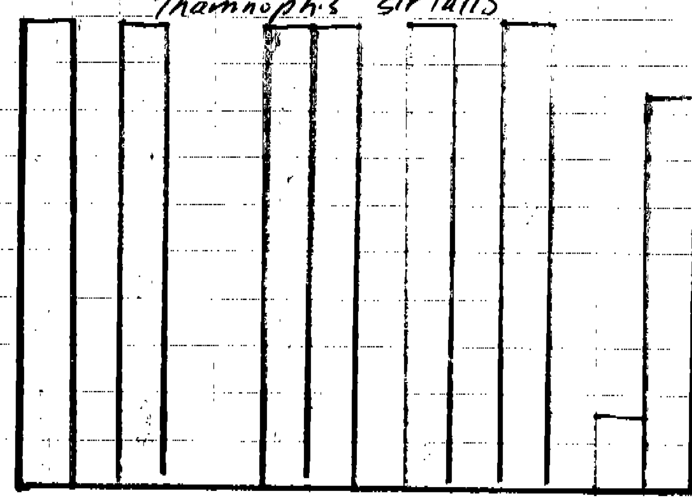
Masticophis taeniatus



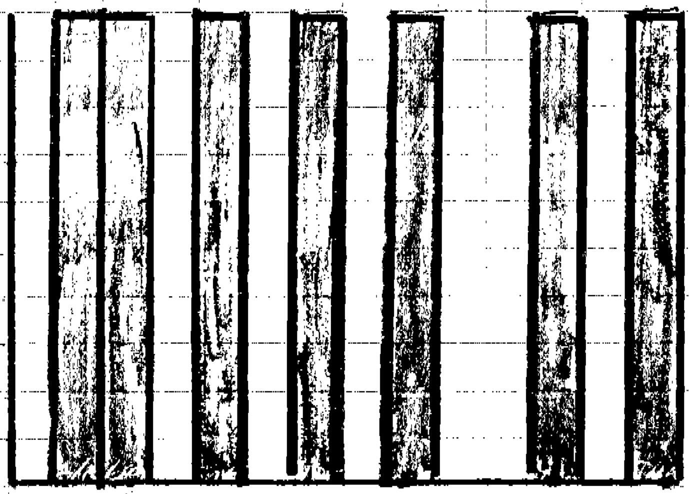
Pituophis melancleucus

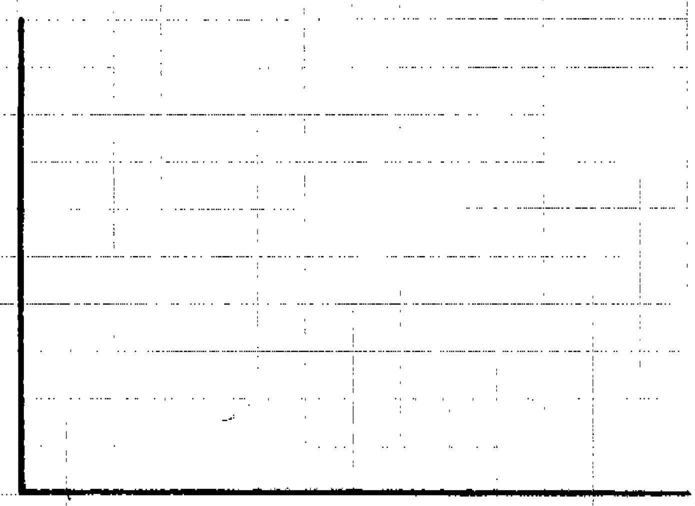


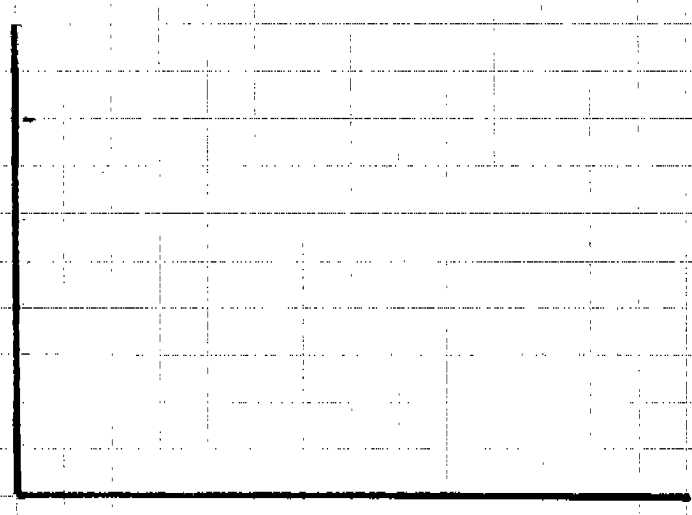
Thamnophis sirtalis

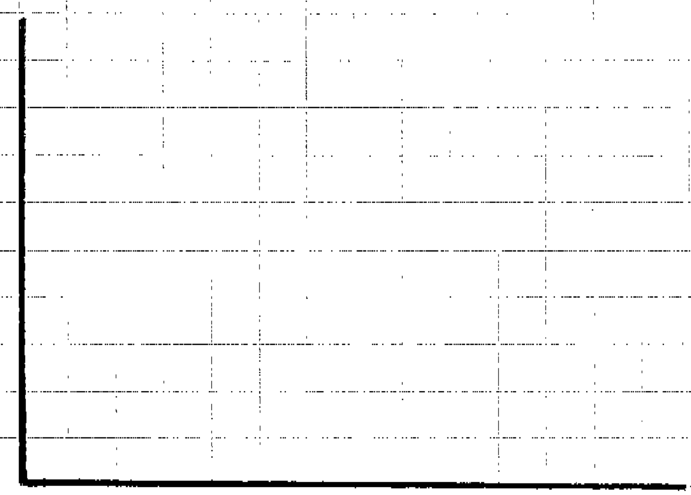


Cnemidophorus tigris

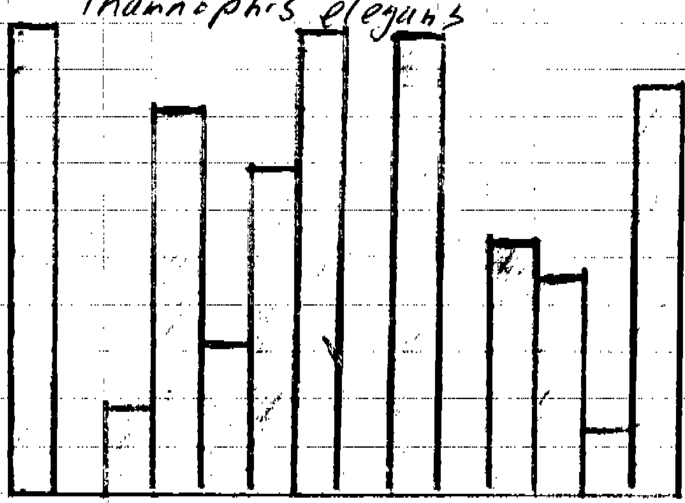




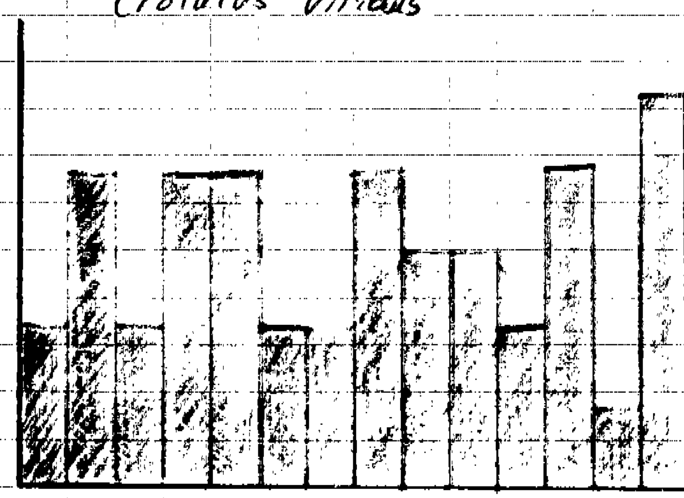




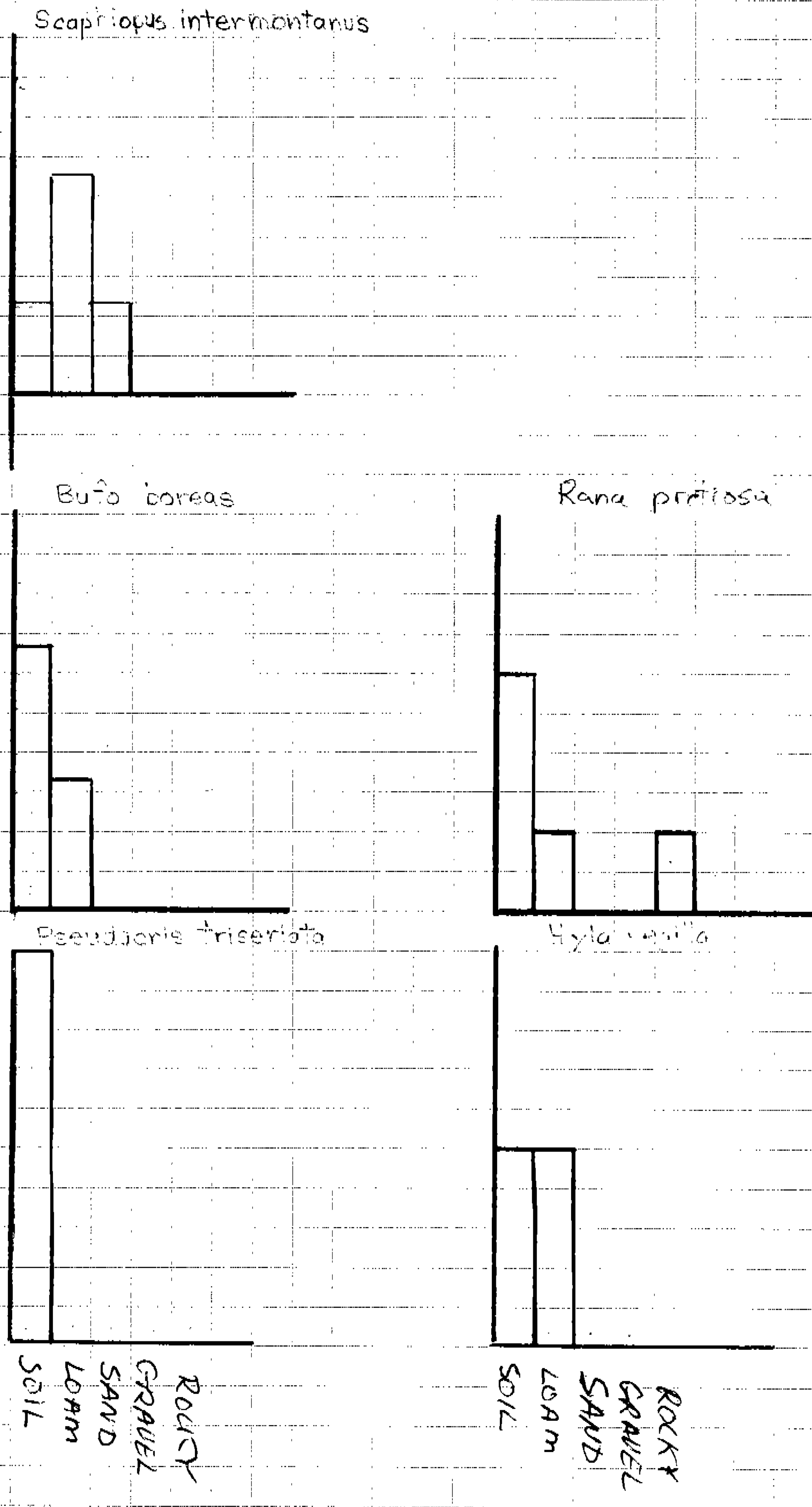
Thamnophis elegans

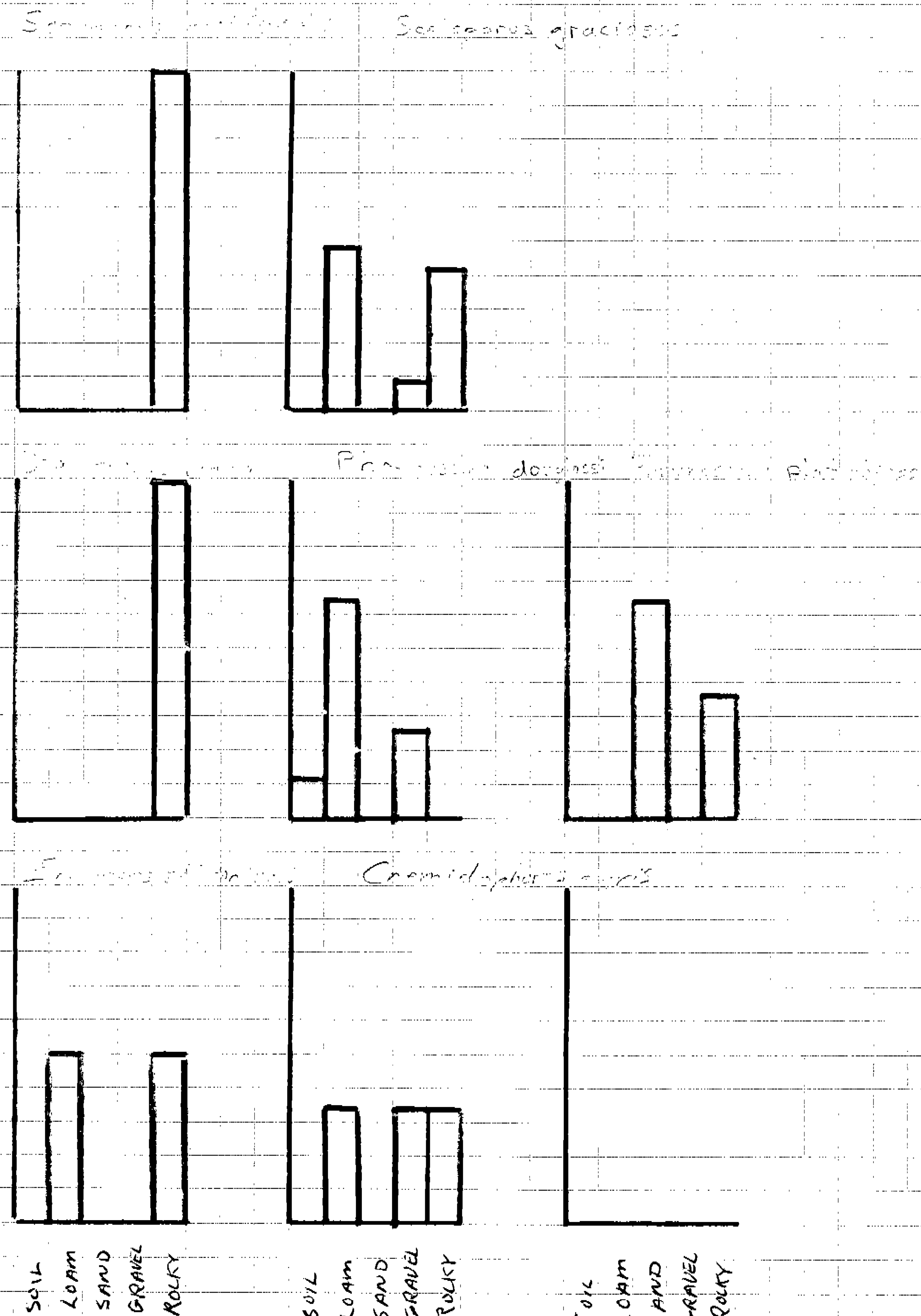


Crotalus viridus



GROUND TYPE AND SPECIES DISTRIBUTION

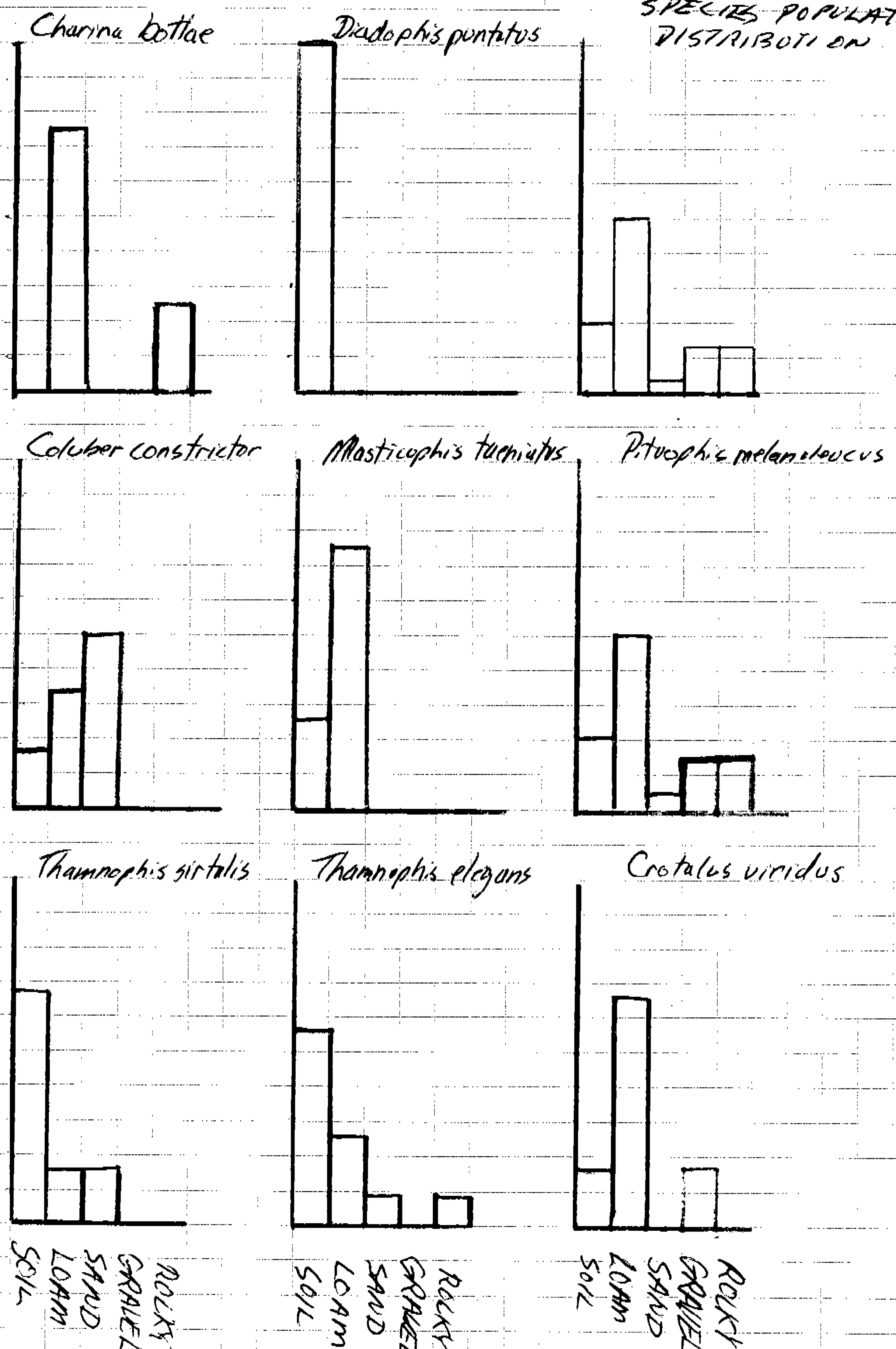




SOIL
LOAM
SAND
GRAVEL
ROCKY
SOIL
LOAM
SAND
GRAVEL
ROCKY
SOIL
LOAM
SAND
GRAVEL
ROCKY

GROUND TYPE VERSUS PERCENT OF POPULATION

SPECIES POPULATION DISTRIBUTION



INDIVIDUAL SPECIES DISCUSSION

Scaphiopus intermontanus: This is the most widespread amphibian in the northern semi-desert scrub, with special adaptations to arid land survival problems. However, it does reach its geographic limits in the area. In areas of greater moisture, such as Silver Creek, it has a greater period of surficial activity and the populations are higher. As the data indicates it is restricted to a ground type suitable for burrowing.

Bufo b. boreas: This creature reaches the largest individual size of any amphibian in the area. It is restricted to areas of wet adapted vegetation. At the very least, requires open bodies of water to breed, and the presence of ground water and frequent dews to maintain a suitable macro climate around it's body.

Pseudacris triseriata maculata: The populations of this frog are centered around the marsh type vegetation zone. This species is a borderline distribution case. The abundance of this frog should increase as the populations react to the irrigation developments in the valley. Especially the creation of a more moist surficial environment and the decrease in the soil salinity-alkalinity.

Rana pretiosa: This species range in the immediate area seems to be primarily in the Northern Rocky Mountains. It is a borderline case of distribution. The occurance is restricted to the marshy areas that form around areas of permanent water. On the preserve this means the tule and cattail areas.

Hyla regilla: I think the presence of these individuals constitutes an easterly range extension. They are also a borderline case of distribution. The populations are centered in the marsh areas that are in immediate proximity to the tree zone. This species is probably the most insignificant amphibian on the preserve, because although I saw the same number of Pseudacris triseriata I also heard their breeding chorus. Hyla breeding on the preserve would probably have to be determined earlier in the season, most likely in April.

Sceloporus occidentalis biseriatus: This species is on the borderline of its geographic range in the area. They occurred in one and only one type of situation; a rocky outcrop that effects drainage in such a way as to have common chokecherry, aspen, hawthorn, and or currents growing in it. This situation can occur in the "desert to water transect" or as patches in the northern semi-desert srub.

Sceloporus g. graciosus: The most abundant lizard on the preserve but it is restricted to the sagebrush-grassland zone which is not well represented on the preserve. It is closely associated with the sagebrush species in the area, as distinct from it's close relative Sceloporus occidentalis. The optimum conditions for this species are away from the proximity to the rapid change in vegetation zones produced by the aquatic-desert interface. The highest populations are reached in areas of homogenous sagebrush-grassland development. The lower population densities near the riparian interface could possibly be due to an increase in the frequency of predation and competition for food from the specialized amphibians, and a structural shift to the Sceloporus occidentalis "niche".

Uta s. stansburiana: This species is another case of geographic limits. The sightings were in rocky ground types deeply within the sagebrush-grassland zone. Competition is probably minimized with the similar in size and shape, Sceloporus graciosus by the extreme rarity of Uta stansburiana and it's close association with rocky ground types and surficial rock formations. I do not expect this species to be found on the preserve.

Phrynosoma d. douglassi: This species is a close second in order of abundance on the preserve. It is found on soil, loam, and gravel compared to the Phrynosoma p. platyrhinos which occurs on sandy and rocky ground types. Both these species local distributions are in the sagebrush-grassland zone. When disturbed they run toward the center of the nearest bush where as the Sceloporus graciosus climbs into the branches.

Phrynosoma p. platyrhinos: This species is at the geographic limits of its range. Because it is found on different ground types than Phrynosoma douglassi it is associated with different vegetation species and different quantitative characteristics within the sagebrush-grassland zone. It has a patchy, discontinuous range in the area. Two were found in the preserve and 14 within the collection area, all concentrated in a sandy area, with scattered piles of sandstone, and widely scattered medium-to large rabbitbrush and cheat-grass.

Eumeces skiltonianus utahensis: This species seems to require the conditions earmarked by the bush and small tree zones. Its ecological occurrance is similar to that of the Sceloporus occidentalis in this area. Eumeces skiltonianus has secretive habits and Sceloporus occidentalis has open behavior.

Cnemidophorus t. tigris: This animal is not on the preserve. It reaches its geographic limits in the area, within the sagebrush-grassland zone. The sightings were clustered around surficial rock formations that formed part of a drainage formation. It seems to be capable of surviving equally well in a large variety of ground types within the area.

Charina bottae utahensis: This snake is spread throughout Idaho and in four zones of the preserve; the sagebrush-grassland, the bunch grass praire, the bush-shrub, and the small tree. It is morphologically adapted to a life of burrowing and has secretive habits. Not enough information is indicated by the data to determine the patterns of coexistence with other rodent eating snakes, because, in general they all spend a great deal of time underground. A tenetive hypothesis would place Charina bottae, Pituophis melanoleucus, and Crotalus viridis in a competitive situation over large areas of their ranges. Their differences in behavior would allow them to exploit distinct segments of the rodent population.

Diadophis punctatus occidentalis: This species does not occur on the preserve or in the study area, just in the vicinity.

Coluber constrictor mormon: This species is of limited occurrance on the preserve, most likely because of the lack of suitable lizard habitat. The sightings were exclusively in the sagebrush-grasslands in the area. But this snake is found in a wide variety of vegetation types throughout it's geographic range. In the more heavily vegetated regions of it's distribution, this snake often takes refuge in large bushes and dense trees. It's escape behavior was markedly different at Silver Creek. The fleeing animal would eratically change directions and after intense pursuit would crawl under the center of the nearest bush, resting until the predator rediscovers it.

Masticophis taeniatus: This species reaches its geographic limits in the area. It is an active, alert, and agile snake like the Coluber constrictor. They are probably each others closest competitors where they coexist. The number of sightings is enough to indicate the interspecific competition with Coluber constrictor but not specific dynamics of their relative efficiencies over the resource configurations of the northern semi-desert scrub. This snake does seem to prefer more homogenous sections of the sagebrush-grasslands that are located further away from the botanical development of the riparian interface.

Pituophis melanoleucus deserticola: This species is widely spread throughout Idaho. It was the second most abundant snake, by a large margin over the other species. It has a cross habitat representation in the sagebrush-grassland, bunch grass praire, and shrub-bush zone. Two individuals were even on top of the plowed fields. It's optimum resource configuration is the sagebrush-grassland areas that have the greatest biomass. This occurs where the northern semi desert scrub merges into the wet adapted vegetation of the valley. It also occurs in drier areas of productive soils. Significant population densities are also found in the vegetation zones with different moisture requirements. The populations of Pituophis melanoleucus are positively influenced by the population densities of the smaller rodents. Not a single specimen of the 24 obtained spewed the contents of their cloaca when caught. This is a common phenomenon in the subspecies that exist in areas of environmental moisture. It is an example of phenotypic variation that goes beyond the regional differences in pattern and scalation. This is an obvious behavioral adaptation to the sere conditions of the Great Basin.

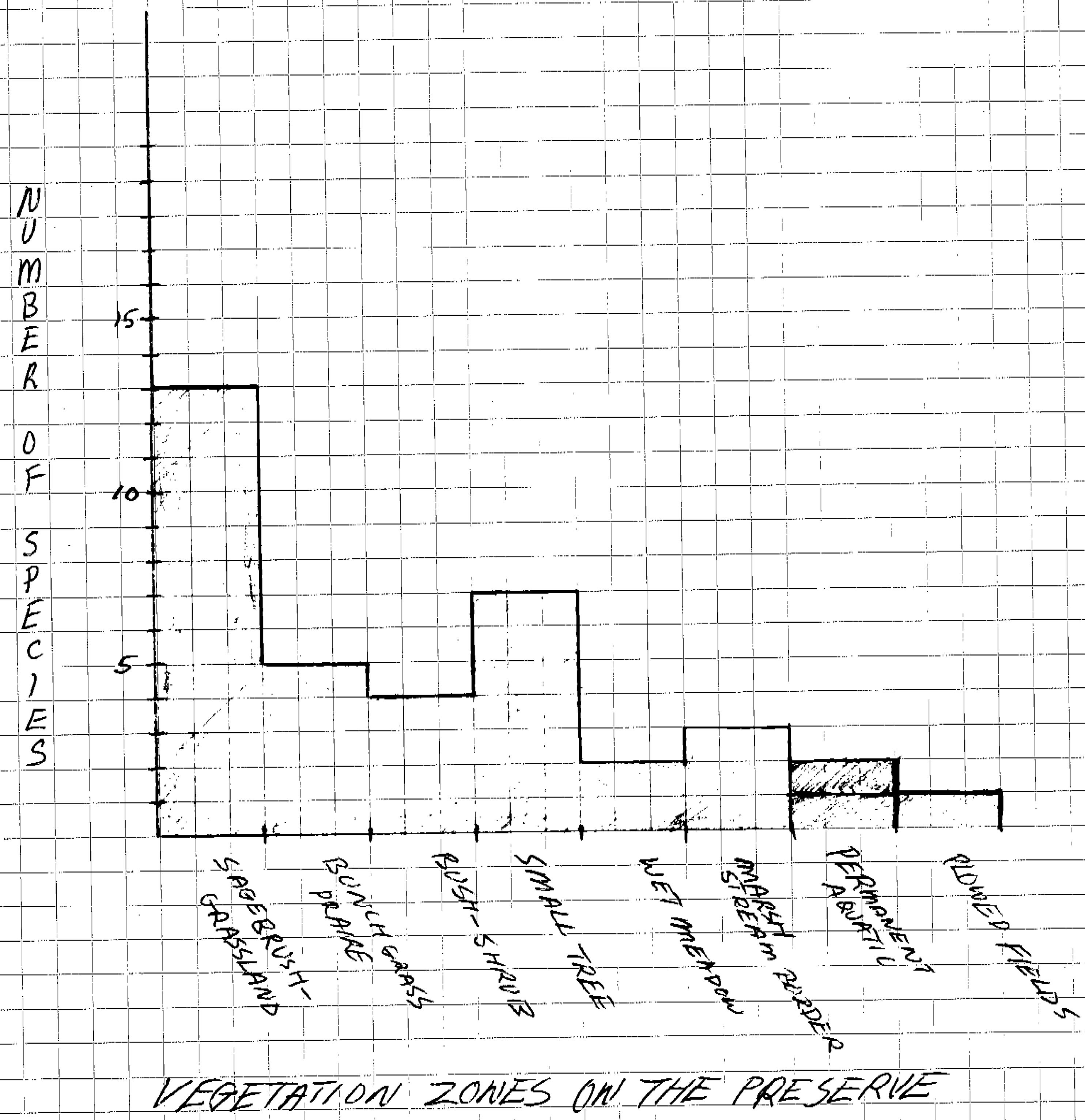
Thamnophis sirtalis fitchi: This species is not on the preserve. It is in the Big Wood River drainage and might spread into the Siver Creek area due to the irrigation ditches and the switch to crop agriculture. This snake seems to out compete Thamnophis elegans in the higher altitudes within the vicinity. More research is needed to ecologically separate these two extremely similar species.

Thamnophis elegans vagrans: The most abundant snake on the preserve. It is present in every vegetation zone on the preserve. The critical limiting factor is the proximity to ground water. The proximity to open water drastically increases this species populations, in any area. The small tree zone contains the greatest percentage of the population and the greatest population density. This species is strongly represented in all the wet adapted vegetation zones and ranges into the sagebrush-grasslands only when they occur as part of the riparian interface. It is so abundant that it is an important component of avian and mammalian predators diets.

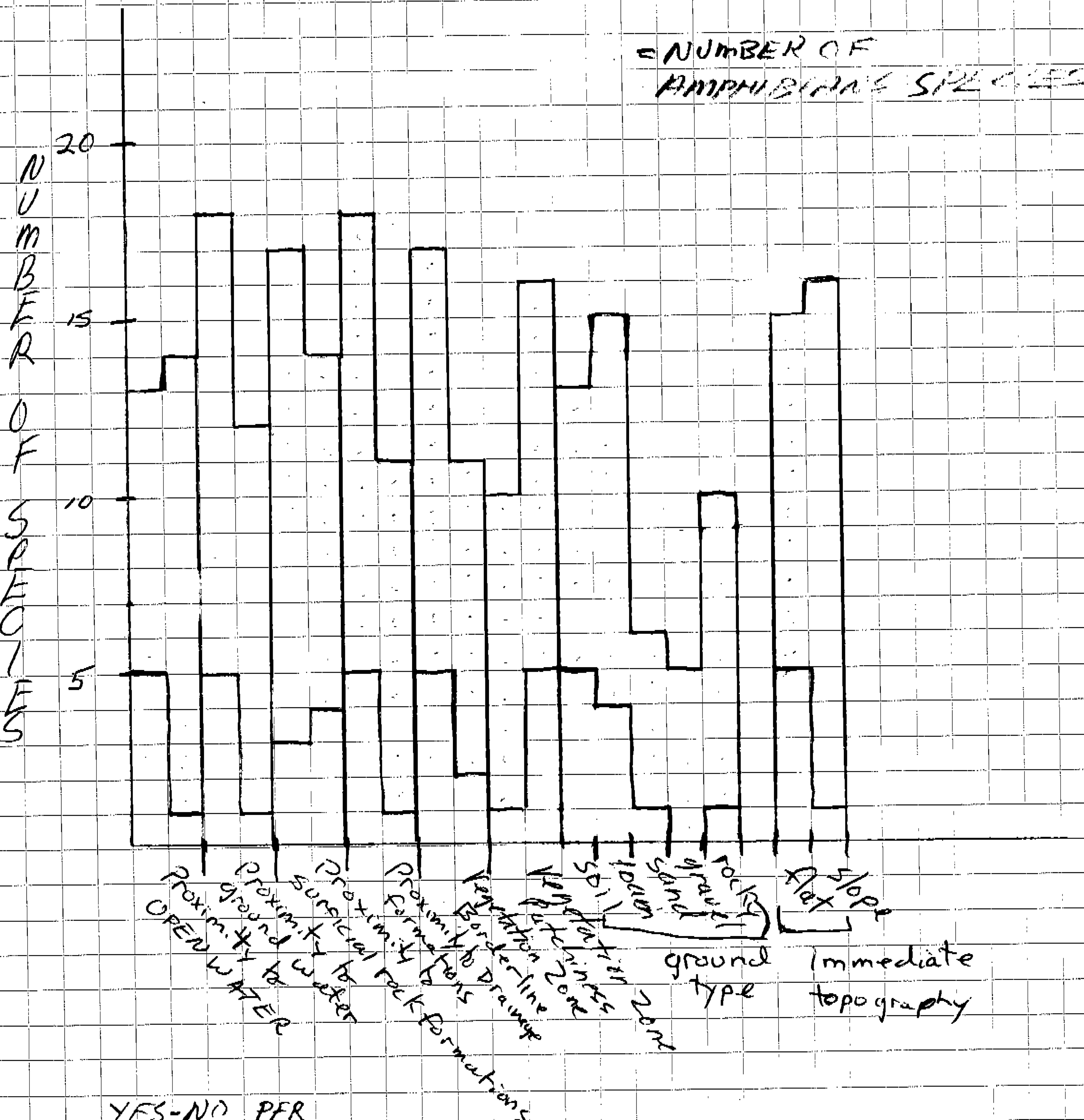
Crotalus viridus lutosus: This species has three subspecies in Idaho. The geographic race around Silver Creek is close to the species limits for the area.

It seems to avoid the moist areas of the valley and is more abundant around surficial rock formations as a percentage of its population than Pituophis melanoleucus. As a primarily nocturnal animal the populations in the area are hard to determine. But it is probably less populous than Pituophis melanoleucus becase the warm periods at night are shorter and less frequent than in the daytime. Thus the period of activity is shorter and foraging, mating, and other facets of the life reaction are restricted. But these snakes exhibit as great as adaptability, if not greater, than their competitors throughout their entire range, when undisturbed by man.

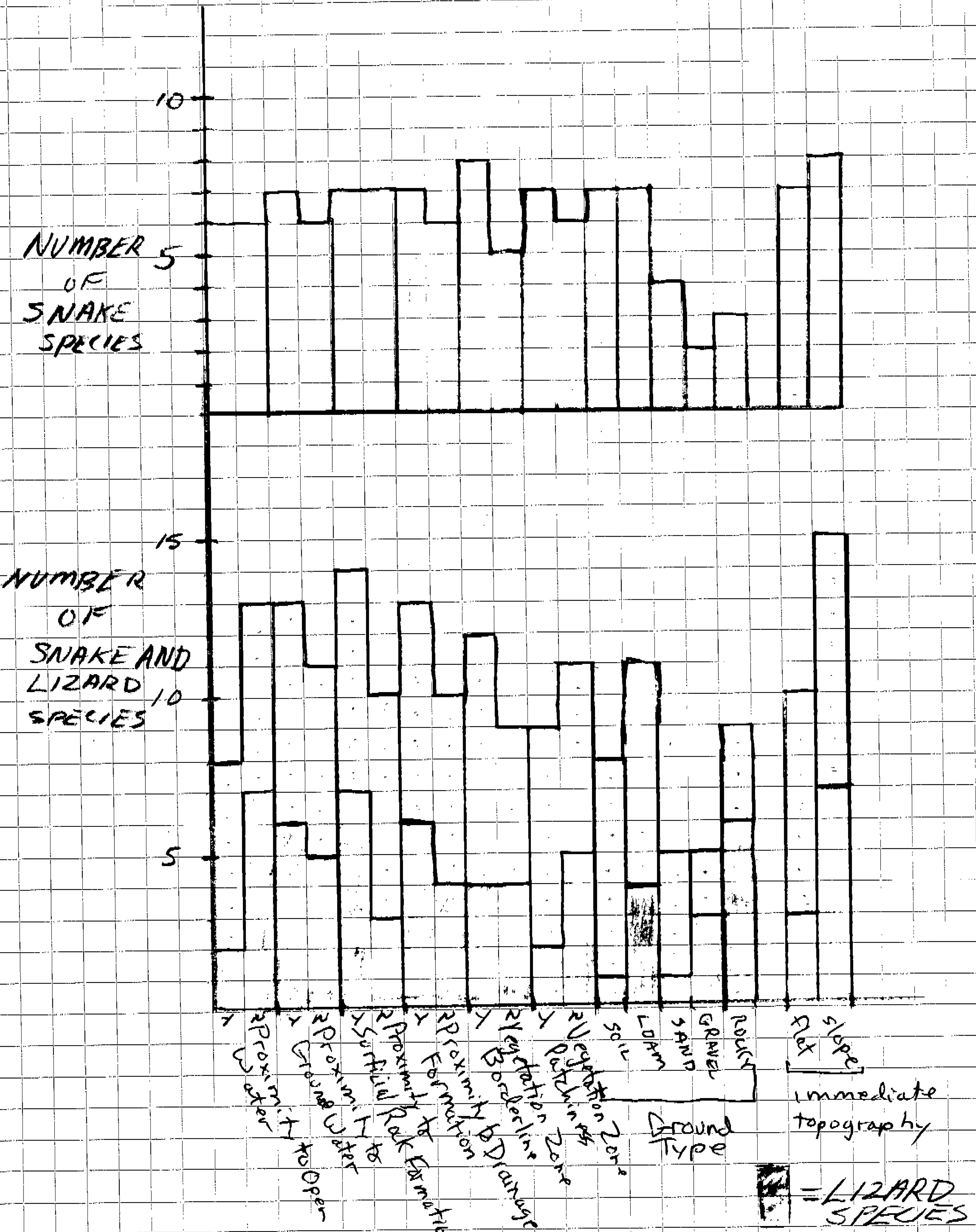
DIVERSITY OF SPECIES BY HABITAT



NATURAL FEATURES VERSUS DIVERSITY OF SPECIES



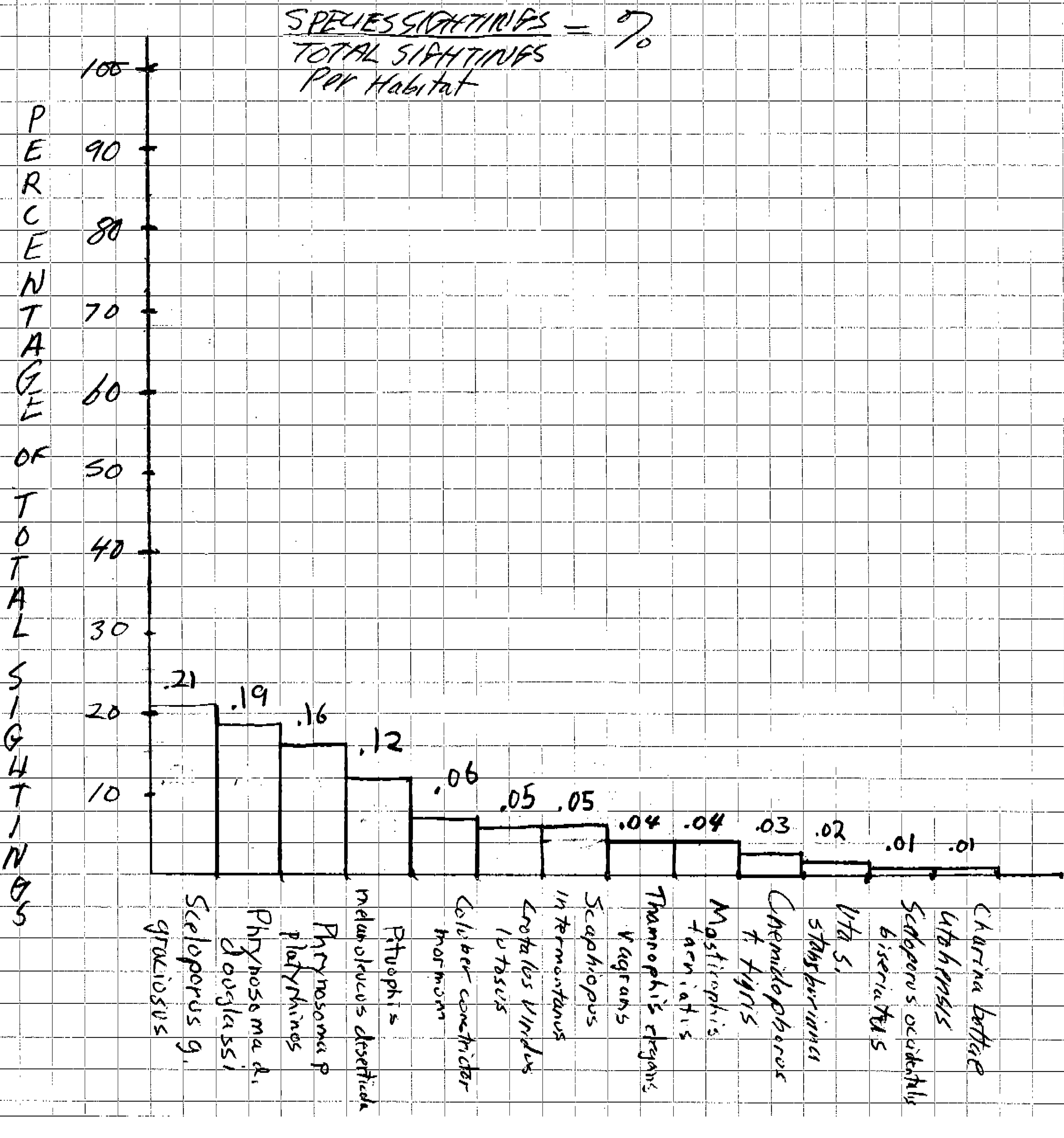
YES-NO PER CATEGORY


NUMBER OF SNAKE SPECIES
10
5
NUMBER OF SNAKE AND LIZARD SPECIES
15
10
5
Y
N Proximity to Open Water
Y
N Proximity to Ground Water
Y
N Proximity to Surficial Rock Formations
Y
N Proximity to Formation
Y
N Proximity to Drainage
Y
N Vegetation Borderline Zone
Y
N Vegetation Patchiness Zone
SOIL
LOAM
SAND
GRAVEL
ROCKY
Ground Type
flat
slope
immediate topography
= LIZARD SPECIES

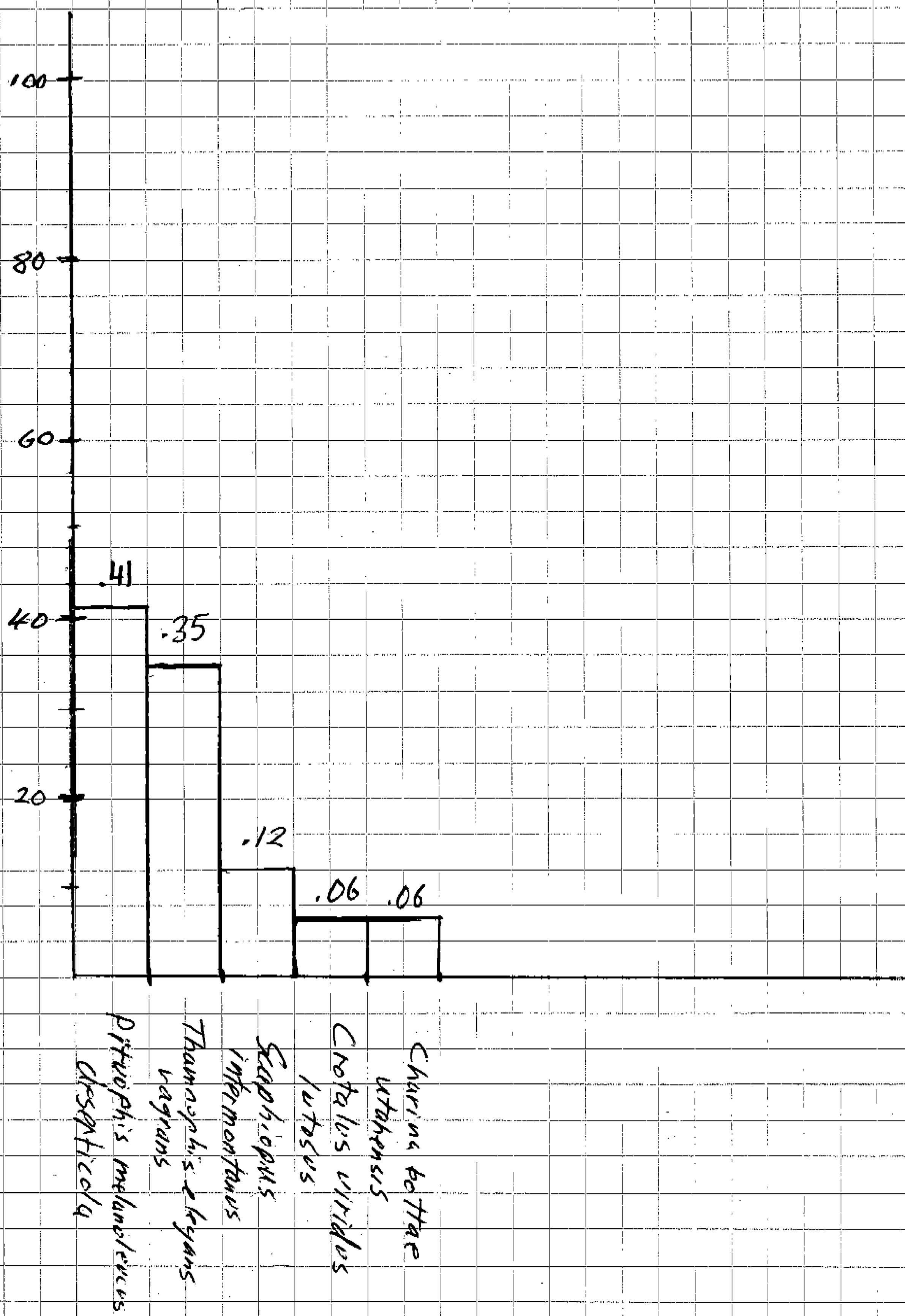
RELATIVE ABUNDANCE OF POPULATIONS BY VEGETATION ZONES OF THE PRESERVE

"SIGHTING FREQUENCIES"

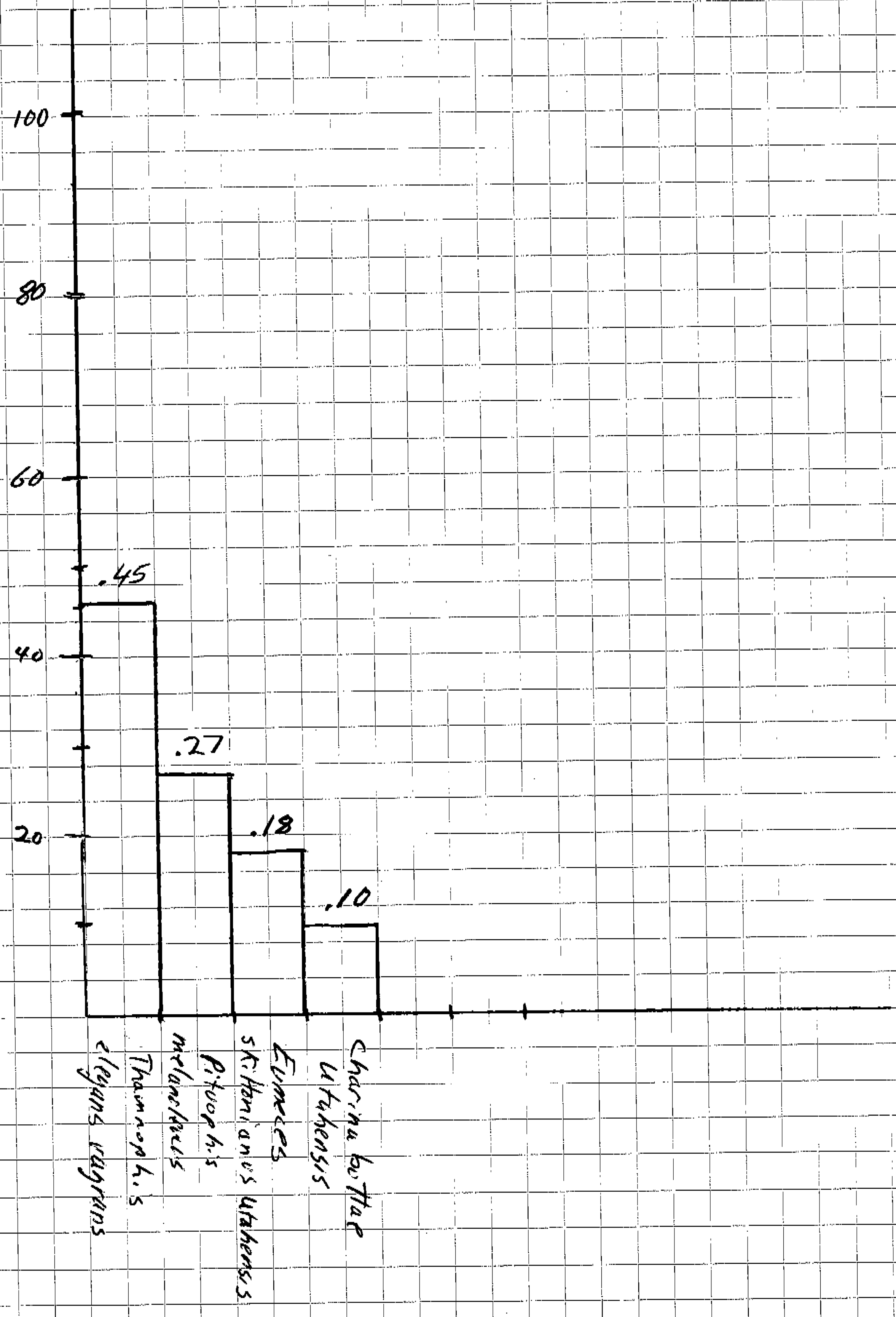
SAGEBRUSH - GRASSLAND ZONE



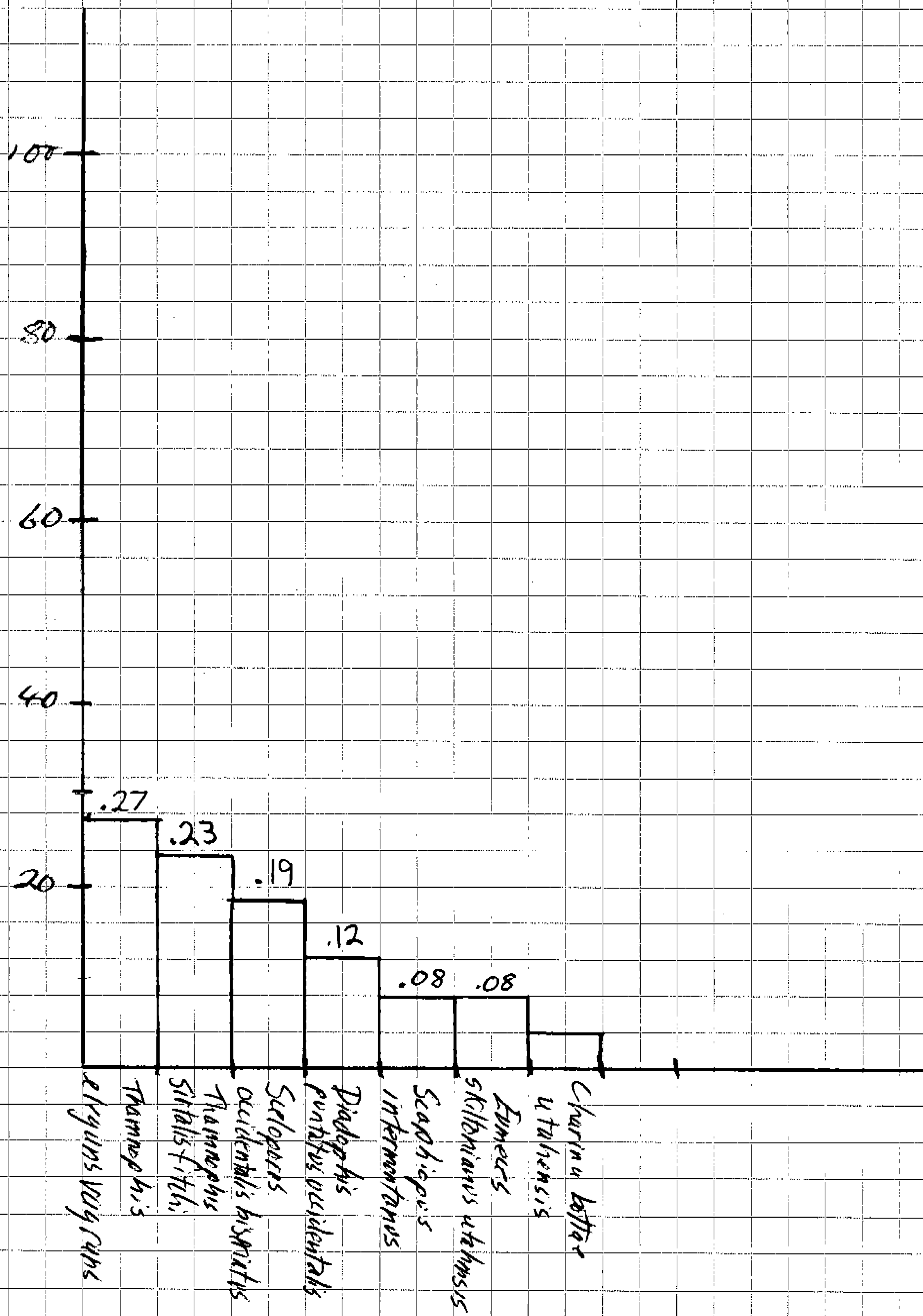
BUNCH GRASS PRAIRE ZONE



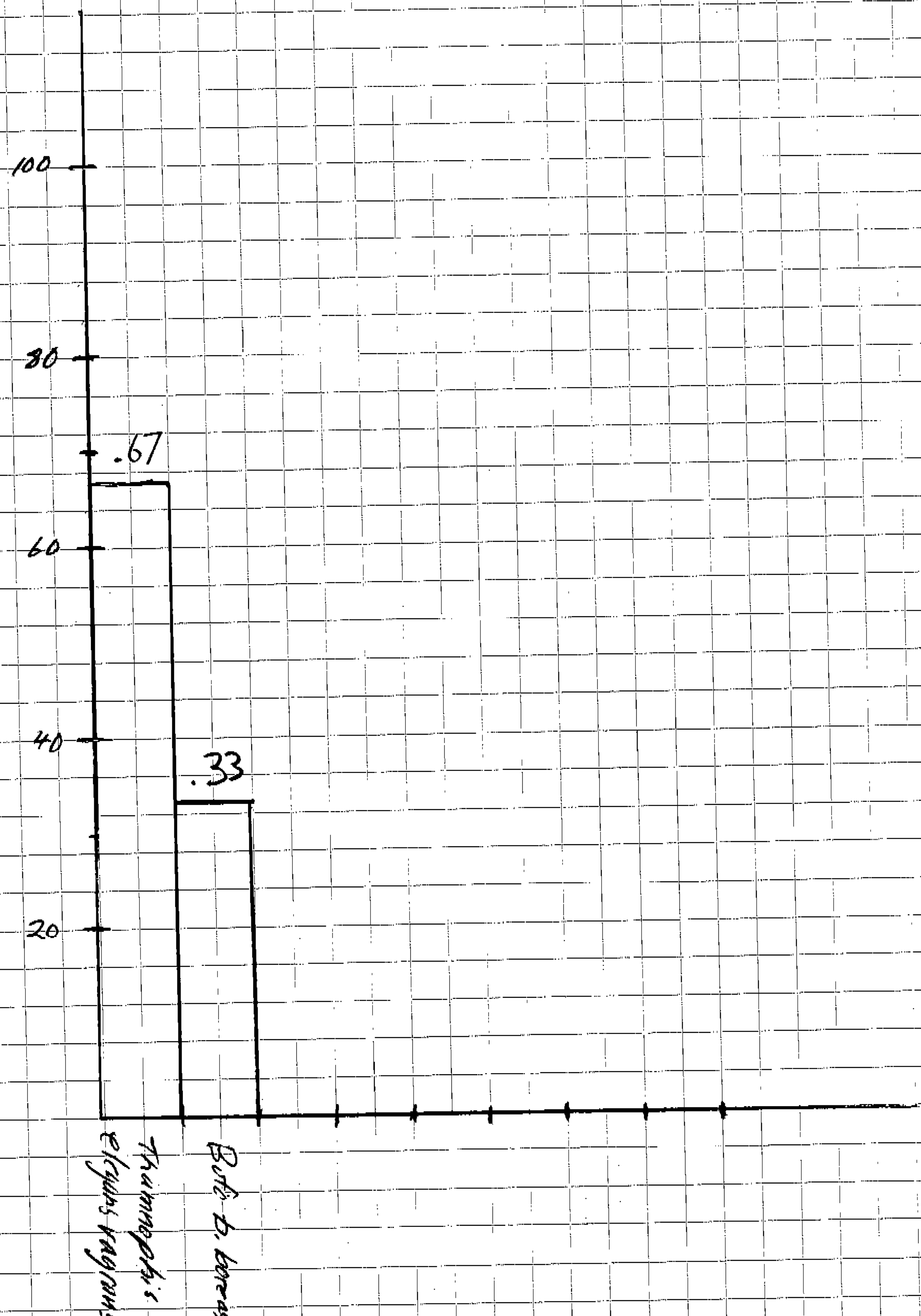
SHRUBS-BUSHES ZONE



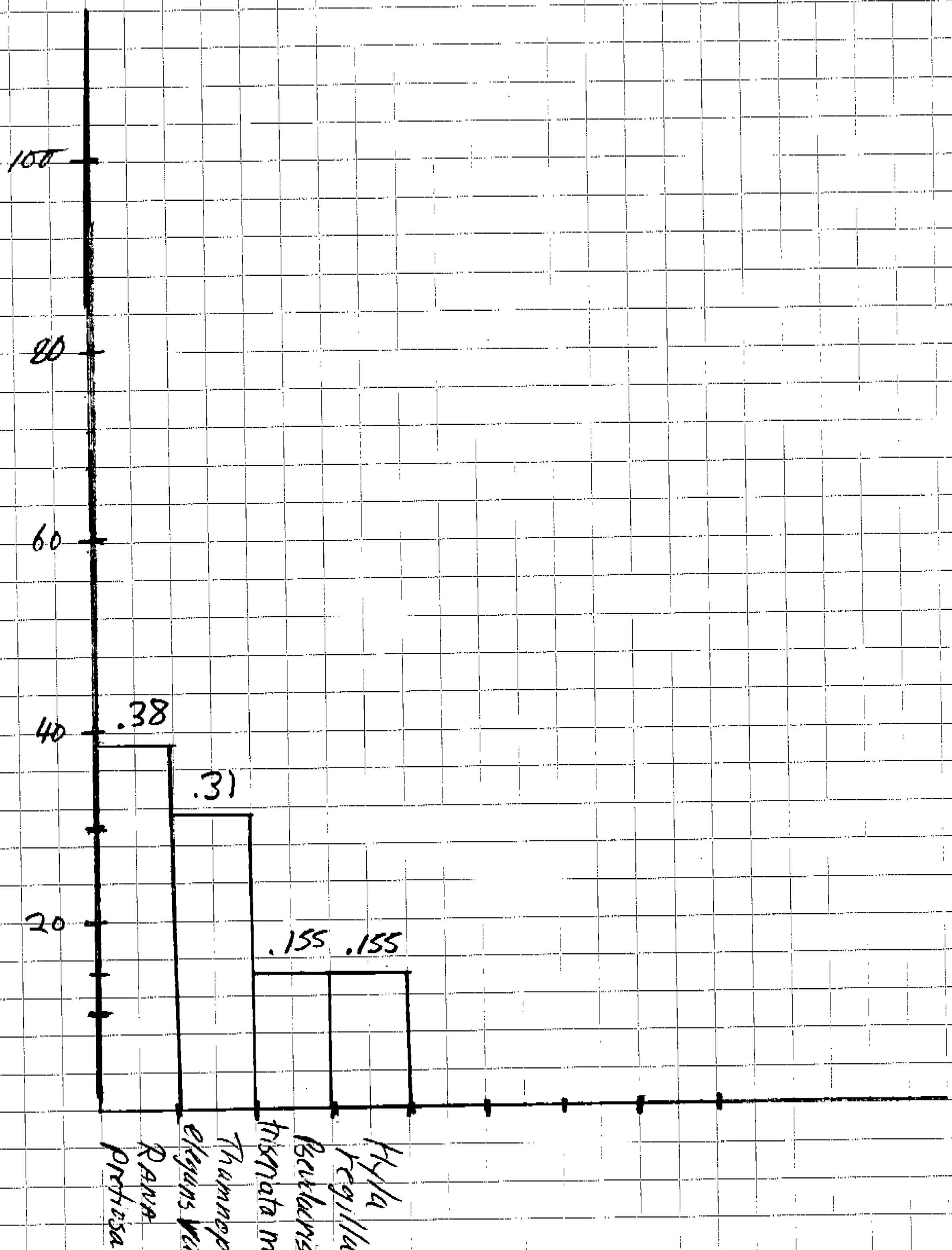
SMALL TREE ZONE



WET MEADOW ZONE

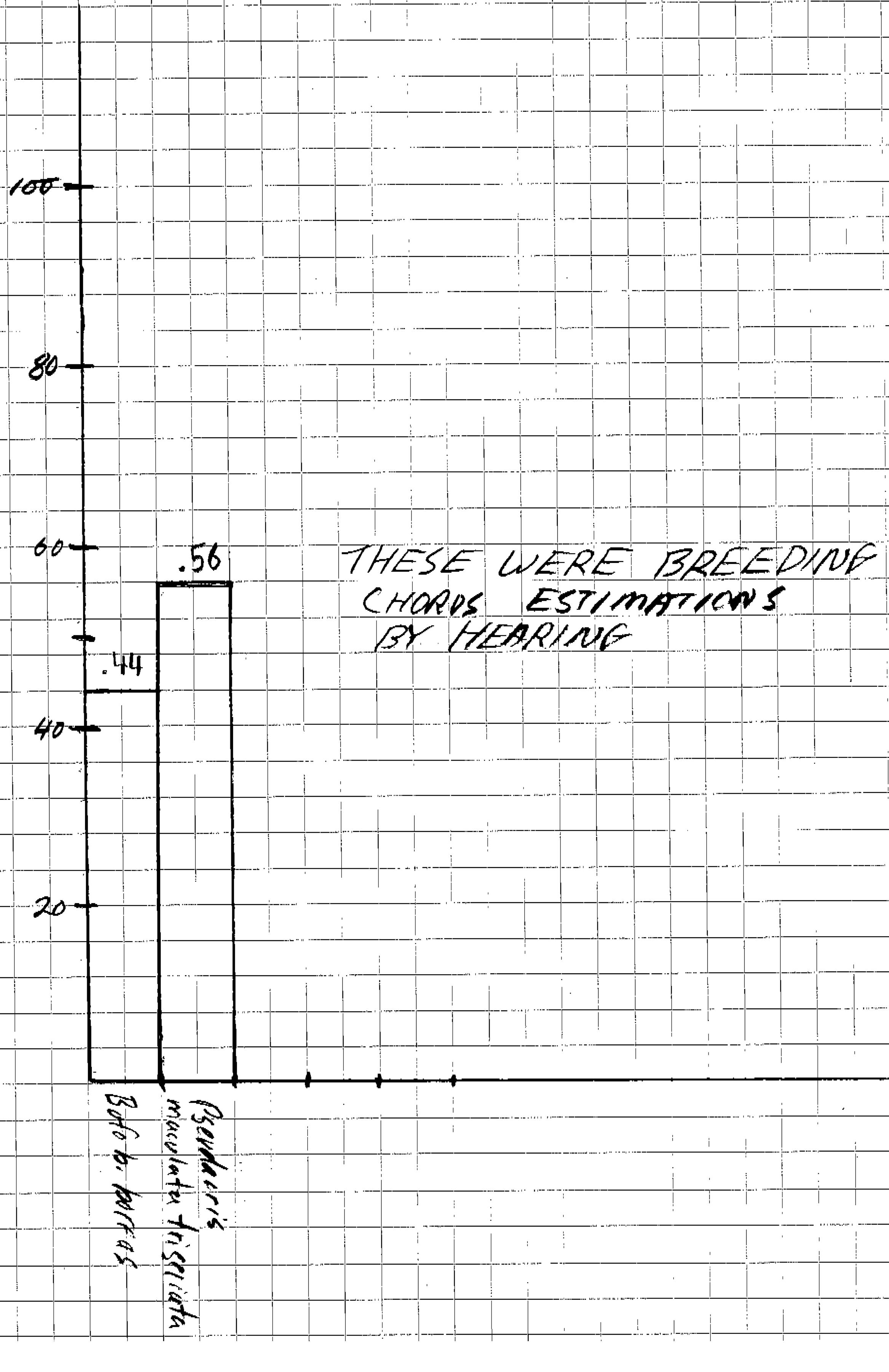


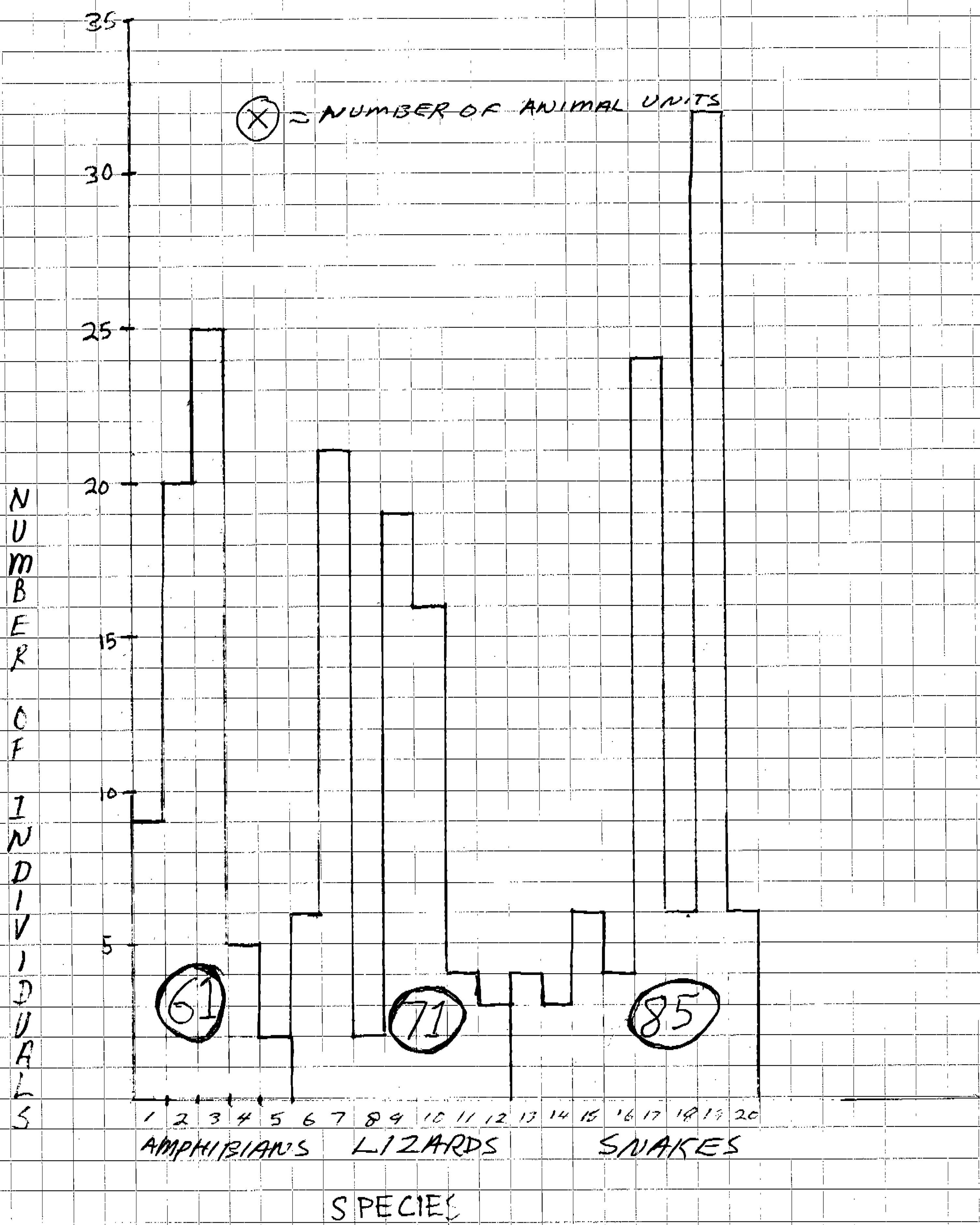
MARSH ZONE



100
80
60
40
20
.38
.31
.155
.155
Rana pretiosa
Thamnophis elegans vagrans
Ambystoma maculata
Bufo boreas
Hyla regilla

PERMANENT AQUATIC ZONE





(X) = NUMBER OF ANIMAL UNITS
35
30
25
20
15
10
5
NUMBER OF INDIVIDUALS
61
71
85
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
AMPHIBIANS
LIZARDS
SNAKES
SPECIES

RELATIVE BIOMASS OF HERPTILES

ANIMAL UNIT ADJUSTMENTS FOR SIZE DIFFERNCES BETWEEN SPECIES

A) The lizard UNIT IS the standard $\sum = 71$

B) Amphibian UNIT CONVERSION

9 X 1 = 9
20 X 3 60
25 X .5 13
5 X 2 10
2 X .5 1

$\sum = 93$

C) Snake UNIT CONVERSIONS

4 X 5 = 20
3 X 1 = 3
6 X 10 = 60
4 X 10 = 40
32 X 5 = 160
6 X 5 = 30
24 X 100 = 2400
6 X 60 = 360

$\sum = 3073$

D) Percentage RATE COMPUTATION OF THE RELATIVE BIOMASS OF HERPTILES

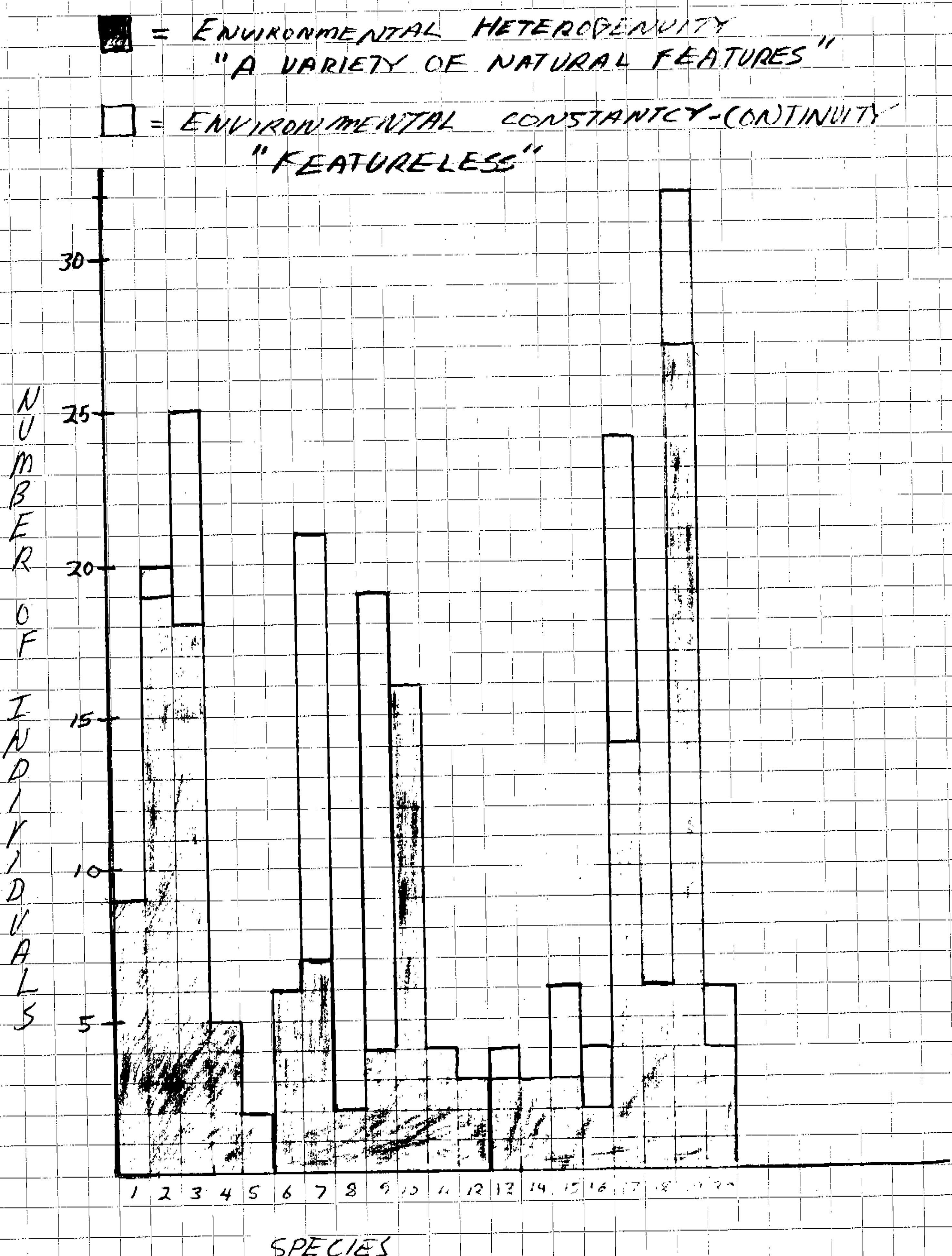
Amphibians = $93/3237$ = 3%

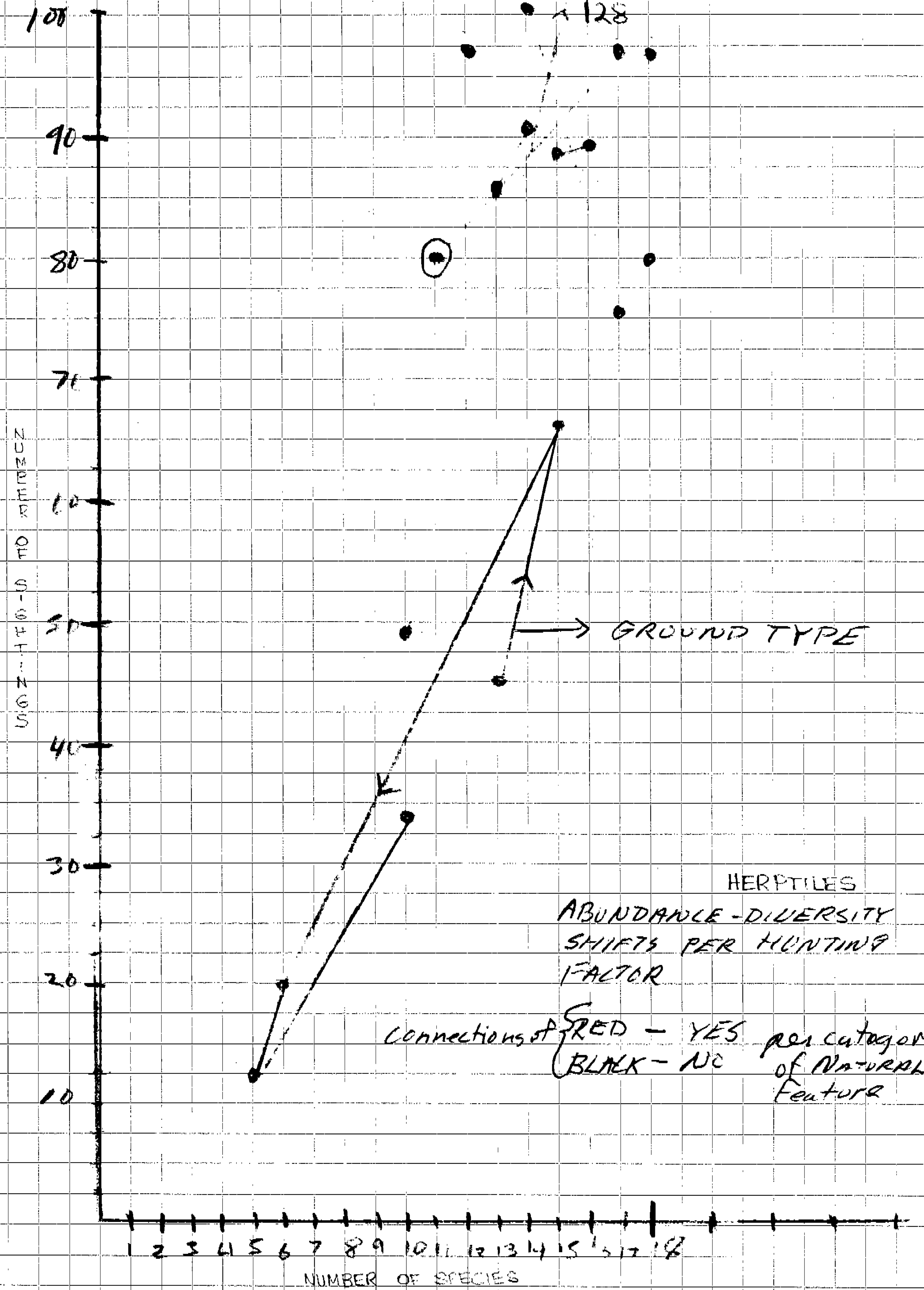
Lizards = $71/3237$ = 2%

Snakes = $3073/3237$ = 95%

71
93
3073

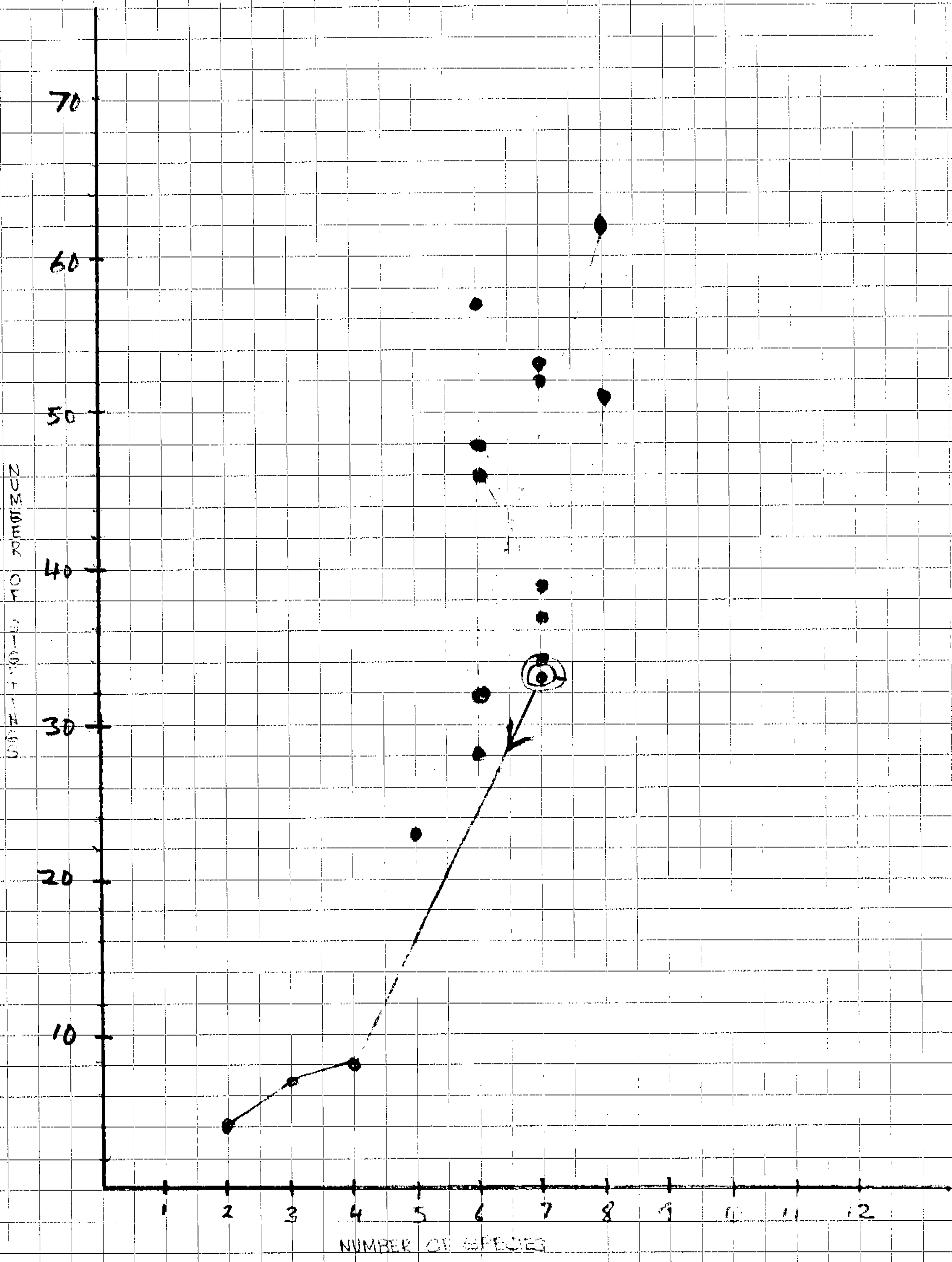
$\sum = 3237$


= ENVIRONMENTAL HETEROGENUITY
"A VARIETY OF NATURAL FEATURES"
= ENVIRONMENTAL CONSTANTCY-CONTINUITY
"FEATURELESS"
NUMBER OF INDIVIDUALS
30
25
20
15
10
5
1 2 3 4 5 6 7 8 9 10 11 12 13 14
SPECIES


100
128
90
80
70
60
50
40
30
20
10
NUMBER OF SIGHTINGS
GROUND TYPE
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
NUMBER OF SPECIES
HERPTILES
ABUNDANCE - DIVERSITY
SHIFTS PER HUNTING
FACTOR
Connections of RED - YES
BLACK - NO
per category of NATURAL Feature

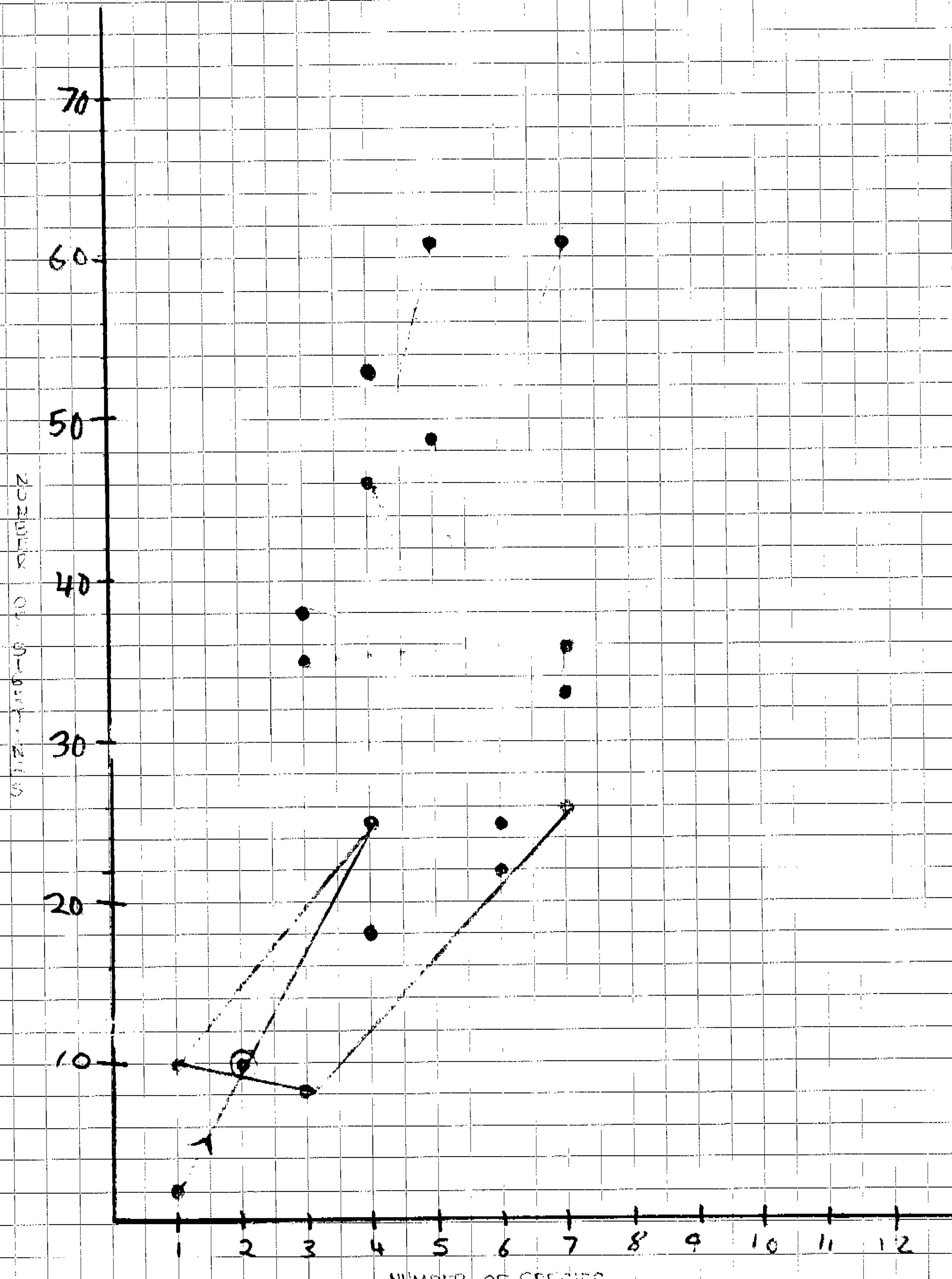
(5)

SNAKES

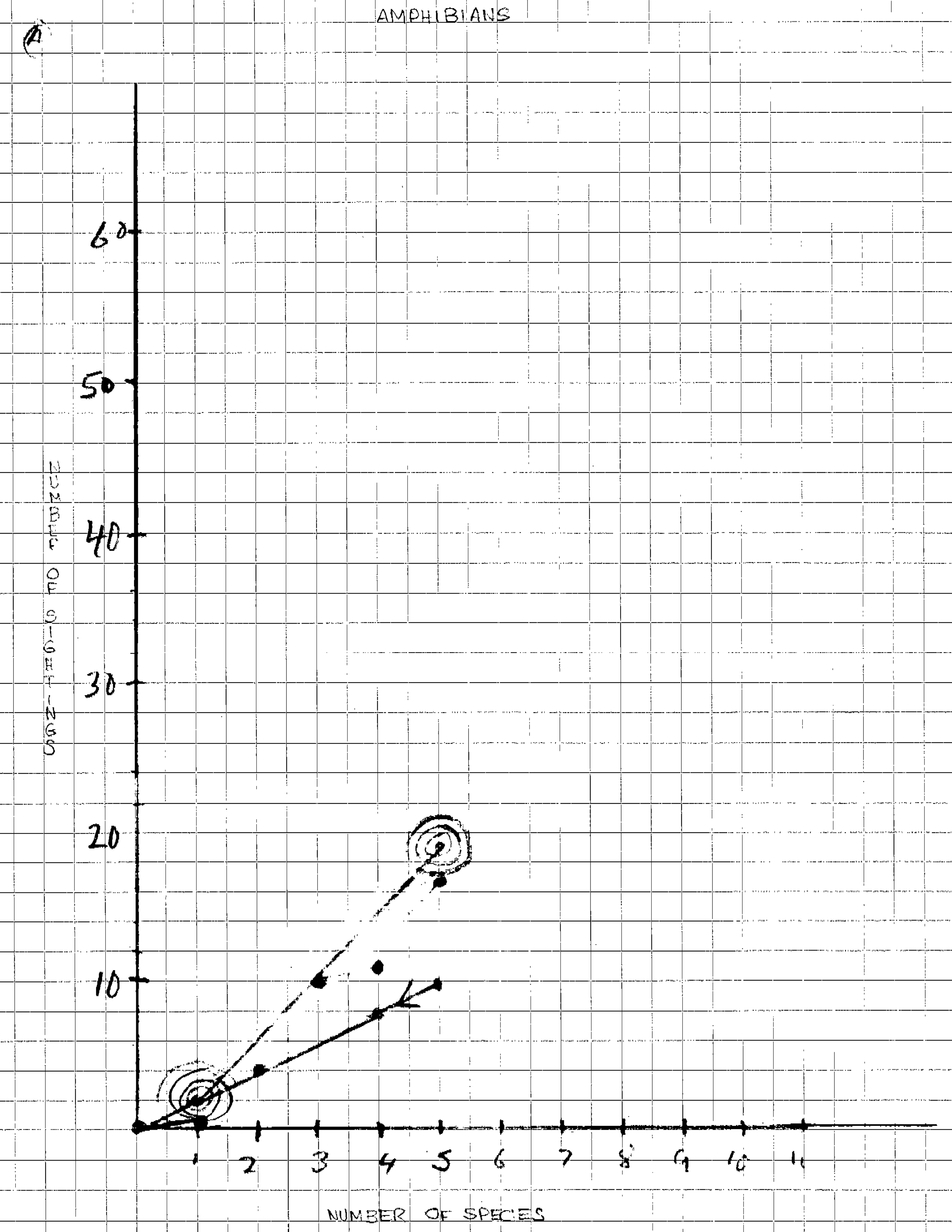


(L

LIZARDS



NUMBER
70
60
50
40
30
20
10
1
2
3
4
5
6
7
8
9
10
11
12
NUMBER OF SPECIES


AMPHIBIANS
A
NUMBER OF SIGHTINGS
60
50
40
30
20
10
1
2
3
4
5
6
7
8
9
10
11
NUMBER OF SPECIES

STANDING BIOMASS AND DIVERSITY OF POPULATIONS NORTHERN SEMI-DESERT SCRUB ENVIRONMENT

"Sagebrush-grasslands"

X = NUMBER [illegible] SPECIES

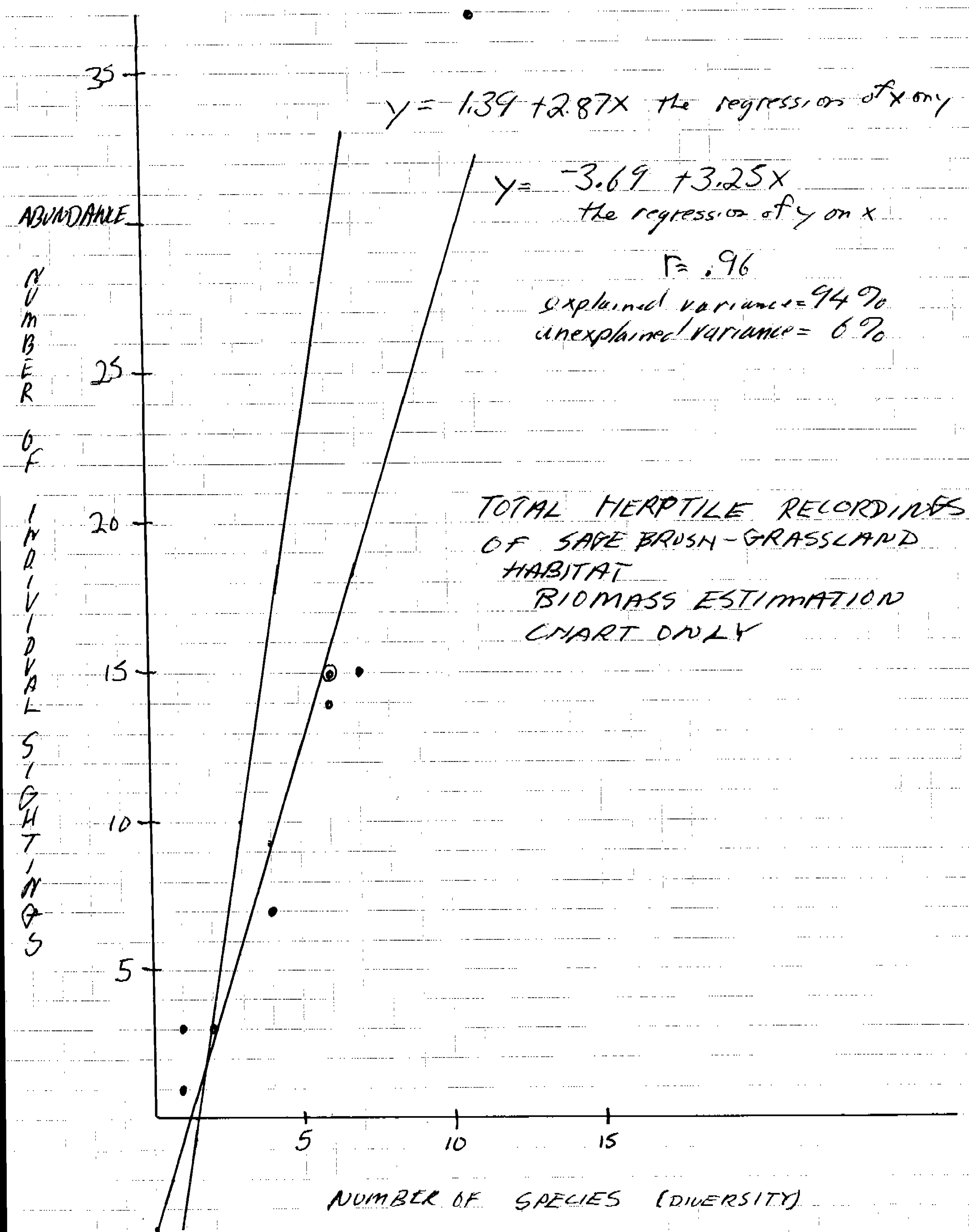
Y = TOTAL H[illegible] POPULATION IN CATEGORY

Σ	DENSE	SPACED	SCATTERED	
23 66	11 37	6 15	6 14	HIGH 37"–UP
14 32	1 3	6 15	7 15	MEDIUM 16"–36"
7 11	2 3	1 1	4 7	LOW 0"–15"
	14 43	13 31	17 [illegible]	

OVERSTORY BRUSH PROPERTIES

UNDERSTORY

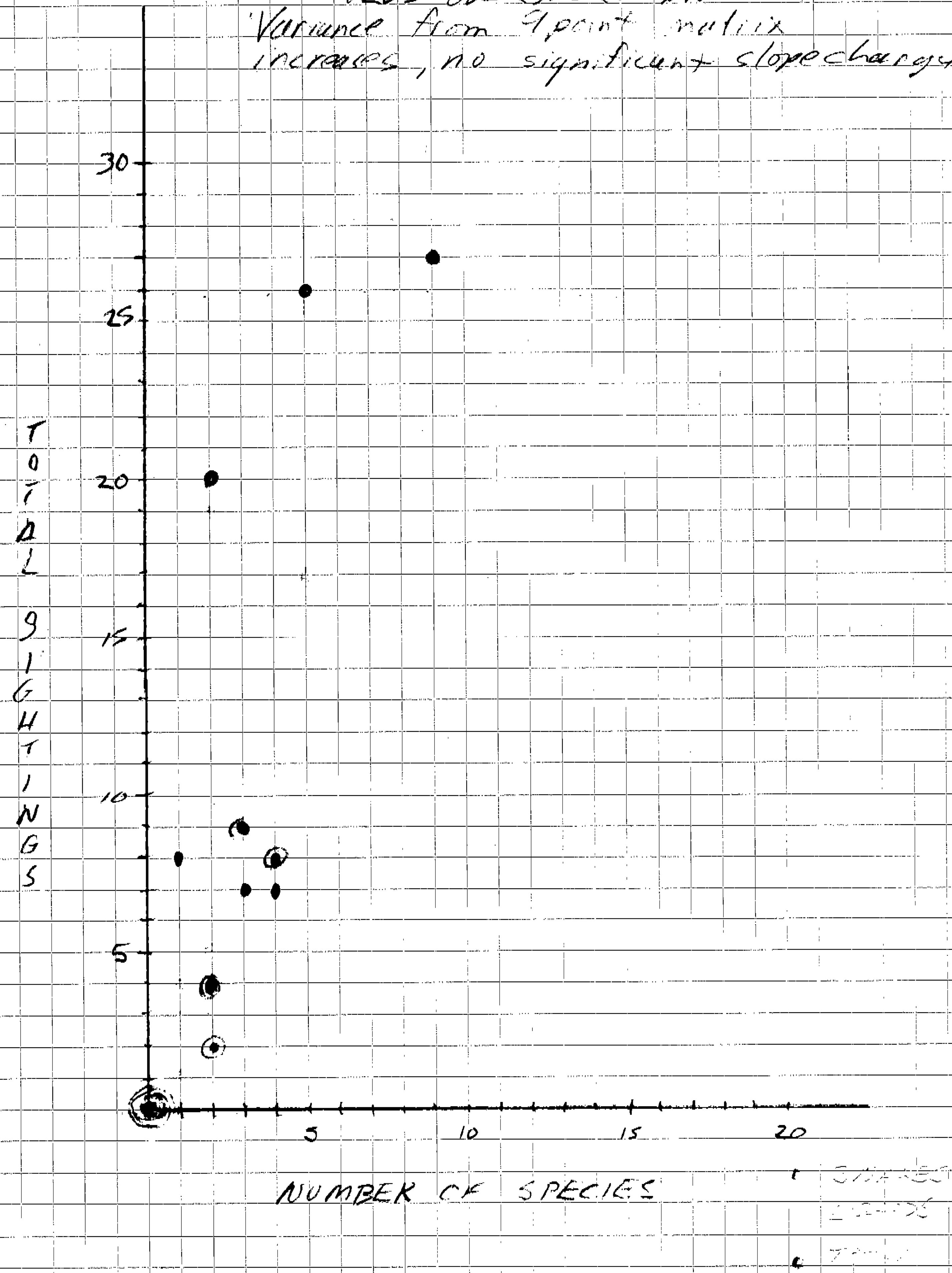
Σ	HERBS 11 38	PERENNIALS 16 43	ANNUALS 3 25	GRAZING HISTORY
7 17	4 8	3 9	0 0	PROTECTED
7 19	2 4	4 7	1 8	GRAZED
16 73	5 26	9 27	2 20	OVERGRAZED



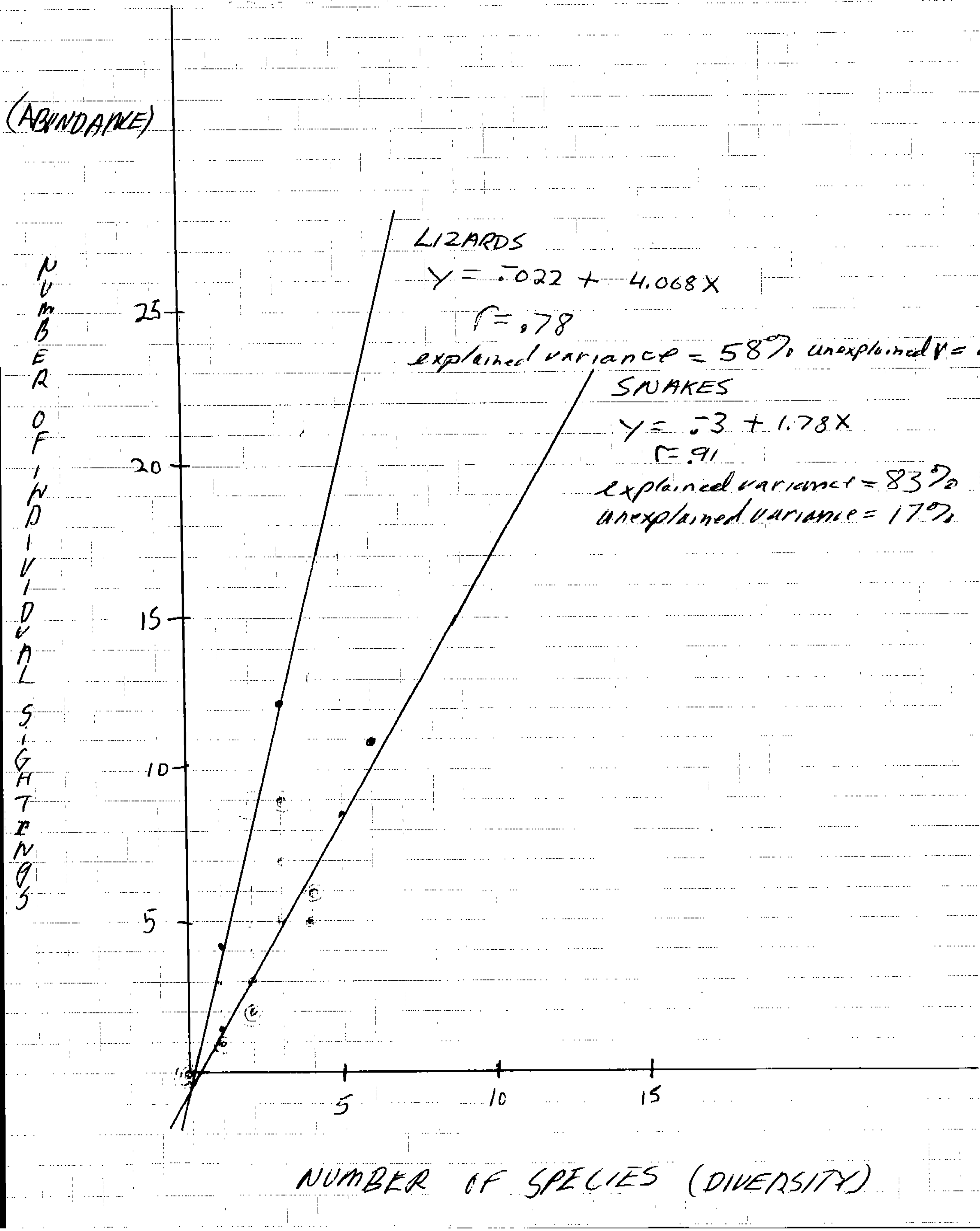
y = 1.39 + 2.87x the regression of x on y
y = -3.69 + 3.25x
the regression of y on x
r = .96
explained variance = 94%
unexplained variance = 6%
TOTAL HERPTILE RECORDINGS
OF SAGE BRUSH - GRASSLAND
HABITAT
BIOMASS ESTIMATION
CHART ONLY
ABUNDANCE
NUMBER OF INDIVIDUAL SIGHTINGS
NUMBER OF SPECIES (DIVERSITY)
35
25
20
15
10
5
5
10
15

GRAZING OF UNDERSTORY
PLUS OVERSTORY MATRIX

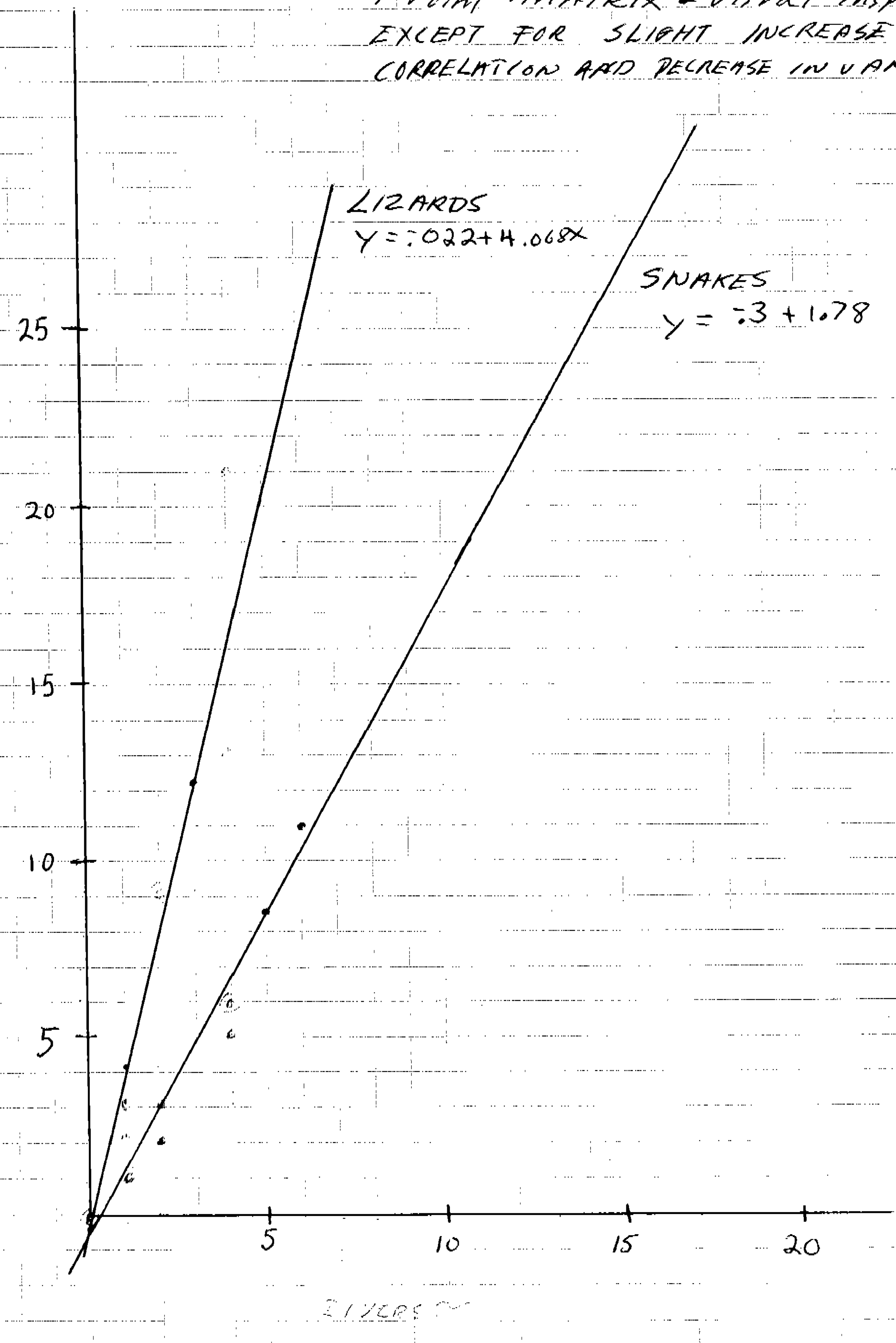
Variance from 9 point matrix increases, no significant slope change



BIOMASS OF OVERSTORY – UNDERSTORY "GRAZING" TOTALS



NO SIGNIFICANT DIFFERENCES
WITH THE USE OF BIOMASS
9 Point MATRIX - visual inspection
EXCEPT FOR SLIGHT INCREASE IN
CORRELATION AND DECREASE IN VARIANCE



COMMUNITY COMMENTARY
THE DISTRIBUTION AND ABUNDANCE OF SPECIES

A wildlife community can be considered a species grouping within a given locality where each animal, each population is engaged in productive interactions. The qualities of the community can be analyzed as various expressions involving the number of animal unit interactions.

In Silver Creek the snakes are the most populous herptiles, with the greatest number of species. They constitute 95 percent of the herptile biomass. Amphibians are not as diverse in the area as lizards but their populations comprise 3 percent of the herptile biomass as compared to the lizrds 2 percent.

As a result the interherptile resource flows are minimized and are not important to the survival of any of the species. This means that although a garter snake will not refuse an amphibian, arthropoda, worms, and fish constitute the primary components of its diet. The rest of the snakes are all predators of lizards, insects, rodents, and snakes but the most important food resource in the area is the rodents. The amphibians and lizards are dependant on the insect populations in their respective areas of existence.

Silver Creek is characterized by a shift from lizards to amphibians as resources for all types of predators. The snakes, especially the gopher and garter snakes form an important component of the avian and mammalian fauna. The conditions in the valley increase the population density of these species and dictate the presence of garter snakes which are characterized by the demography of density.

The vegetation zone of the sagebrush-grassland contains the greatest diversity of species. Where this merges into the bunchgrass praire and the small tree zone the highest population densities are found. This is the largest environmental type in the entire region and most of the animal species are specifically adapted to its set of conditions.

The small tree zone contains the next greatest diversity. This is the area with the largest standing biomass and the greatest effective area for biological activity per ground area.

Most of the amphibians are separated from the lizards by a vegetation zone. The garter snakes penetrate the wet area the amphibians are adapted to. The remaining snake species have a solid basis in the northern semi-desert scrub and extend their ecologic range along the desert to water transect to the small tree zone. The garter snake populations peter out in the reverse fashion.

Because of the nature of the study area all of the species and a majority proportion of the populations of all but two species were found in areas of environmeantal heterogenuity, subjectively measured as a variety of natural features and vegetation zones.

The distribution of each species population over the natural features of the land shows a comple-- mentary occurrance of amphibians and lizards. The snake species are spread over these features in a surprisingly even fashion. This is a graphic illustration of the generalist aspects of the snakes in the region.

The extreme fluctuations in some of the individual species bar graphs showing the proportion of population per natural feature are indications of the low abundance of the species in the area, or demonstrate niche specialization. They demonstrate the patchy distribution of populations as they reach the limits of their geographic range. Unfortunately, this leads to insufficient sample sizes.

Looking at the natural features as hunting factors the aggregate distribution, or diversity and abundance is shown for situations in the region. These are the keyed scatter diagrams. This same matrix of data can be organized in a form suitable for multivariate analysis but the paucity of sightings makes every individual in each population too large a proportion of the total species population to justify the mathematics involved. But the scatter diagrams can be used for factor isolation. Which exert the most potent quantitative force on diversity and abundance of species?

Considering the entire herptile biomass the greatest diversity is associated with drainage formations and areas of ground water. These are the most productive spots in the environment. Vegetational patchiness exerts the greatest combined effect on diversity and abundance. The environment of Silver Creek must be subject to severe fluctuations because the number of species and abundance increase in well defined homogeneous plant communities.

Snake abundance is offected rather than diversity over the hunting factors. The proximity to a vegetational zone borderline strongly increases diversity and abundance. An open body of water does not change diversity but jacks up abundance because it usually predicts the presence of garter snakes which occur in dense populations. Both diversity and the number of sightings are strongly keyed to the productive soil types.

Both lizard diversity and abundance is shifted apart in reference to these features. The lack of proximity to open water and lack of vegetational patchiness increases species counts and sightings. There is specialization and separation of species with respect to ground types. The better drained areas and loam, the type with the largest coverage contain the high diversity counts.

Amphibian diversity and abundance is a simple and strong pattern. The proximity to open water and the according riparian interface patterns that characterize this situation are the basic keys. There is a strong association with the poorly drained and water formed soils.

In general this data indicates what are the important variables of the earths surface for wildlife; these need a more detailed classification and definition than any specific animal-feature associations. One reason is that natural features are not all independant variables. Secondly what is the distance from animal to feature that is relevant to catagorize. Thirdly, how does the distribution of feature configurations influence the probability of sighting.

A classification of the primary regional habitat, the northern semi-desert scrub into an estimation of the overstory biomass and the understory grazing history reveals a positive relation between biomass, physical area, diversity, and abundance.

The highest species count and the largest number of individual sightings were recorded at the greatest brush height and density measurement. Interestingly, sagebrush over three feet tall indicates that the land is suitable for crop agriculture. In this environment this is the most productive area, the situation were the scrub is outcompeted, and one of the scarcest vegetation types because of the agricultural development. The overgrazed perrennials constitute the catagory with the greatest spacial coverage and both high counts were recorded there.

Plotting these point relationships between diversity and abundance and curve fitting a linear regression equation generates a correlation coefficient between aggregate abundances and species counts of r=.96. The axis intercepts demonstrate that this is an aproximation and that a more complex curvilinear equation would increase the accuracy of the relation. Never the less, the explained variance is 94 percent. This means that in consideration of the total herptile biomass of this vegetation zone, a count of diversity is sufficient to explain abundance as an even spread of species through the macro habitats.

Breaking down the overstory biomass estimation counts into lizard and snake totals, and including grazing data the degree of explained variance and the correlation decreases. The slope of the lizrd line increases and the slope of the snake line decreases from the total herptile regression.

This indicates a shift in the demographies and the life strategies. The steep slope of the lizard curve reflects a tendency of higher population densities per species of lizard than snakes. Snakes seem to be able to survive under conditions of less intense demographic interaction. This relates to the larger individual size, lower reproduction rates, longer lifespans, and equal distributions of age groups.

The high degree of unexplained variance of abundance as a function of diversity, 42 percent, in the lizard regression is a result of the patchy population patterns in the area which is due to environmental specialization and geographic limits of the species in the region.

The explained variance, 83 percent for snakes reflects the similarity of different species populations for this environment. There seems to be an equal distribution of abundance for these generalist species. The dominance of the gopher snake increases the variance. The equal distribution in this environment of the snake species is a result of the generalist life strategies and the dependance on rodents as a resource.

The species compositions in each area of the sagebrush-grasslands seen to be skewed for the lizards and balanced for the snakes. Thus we can explain species groupings of the short horned toad and the sagebrush lizard, the great basin fence lizard and the great basin skink, and the desert horned toad. The areas that produce these groupings have homogenous snake species compositions.

This type of data is most useful when used in comparison with other regions. Slopes, explained variances, and correlation coefficients are illustrative of differences in the herptile communities. These figures also demonstrate and test the validity of the variables chosen to measure diversity and abundance. Thus the sample data sheet can be refined and elaborated as a conclusion of the study.

SAMPLE DATA SHEET

Species type:

Physiographical description of the sighting locality:
- geomorphology
- surficial geology
- soils
- topography
- exposure
- longitude
- latitude
- altitude
- climate
- daily climate
- seasonal climate
- human development

Physical Structures in the environment:

rotten logs	
surficial rock formations	intimacy
holes in the ground	proximity
open water bodies	vicinity
drainage formations	absent
human debris, junk and garbage	

Properties of the ground:
- ground water
- ground type; soil,loam, sand, gravel, rocky, clays, silts
  humus versus exposed A horizon

Characteristics of the botanical development
- species composition
- species groupings, communities
- quantitative community description
  - density of ground cover; scattered, spaced, dense, canopy
  - layers of canopy, height distribution of biomass
  - canopy complexity

SUBJECTIVE SCALE: THE GAUGE OF THE ANIMALS DISTANCE TO A NATURAL FEATURE.

intimacy: direct contact with the feature

proximity: feature within the everyday situation of the fundamental life reaction of growth, maintence, and reproduction.

vicinity: feature in visual range of observer, and having potential of coming into contact with creature on a seosonal-annual basis.

absent: feature lacking in the environmental configuration of the sighting locality

definition of each feature

THE EFFECT OF AGRICULTURAL DEVELOPMENT ON THE HERPTILES IN THE PRESERVE

The majority of the better drained acreage in the preserve is plowed. The open fields disrupt the optimun development of the desert to water transect. This is exactly where the main element of herptile biomass would be centered. The greatest abundance and diversity of species exists in this type of area as shown in the preceding overstory-understory sagebrush-grasslands analysis.

The lack of reptiles and amphibians in this environmental type is a demonstration of the intimate relation of herptile and habitat. Initially the repeated use of heavy machinery and continual plowing destroys the structure of the ground. Passageways such as burrows, root mats and humus are compacted into dirt clods. On the microscopic level the soil is altered so as to adversely effect its long term fertility. For herptiles this makes it extremely difficult to control their spacial relationship to the surface of the ground. Amphibians are unable to maintain the proper macro climate and reptiles are unable to regulate their exothermic behavior.

In conjunction with the open quality of the fields the probability of predation is increased because the probability of a predator sighting prey is larger and the probability of escape is smaller.

In reference to the snakes and lizards and amphibians as predators the transfer of the soil's productivity to the economic system from the ecologic system allocates the plant resources to mankind. This lowers the populations of rodents which are the most important food item of snakes in the region. The use of herbacides, pesticides, and mammal poisons, like tainted grains destroys the potential food resouces of herptiles also.

Amphibian and fish breeding success is adversely affected by the runoff of these chemicals into the streams. Furthermore there is strong evidence that the sensitive and delicate membranes of amphibians are subject to irratation, leading to the death of the animal.

MANAGEMENT DECISIONS AND THE HERPTILE POPULATIONS

Certain types of human land usage of the area and and of the preserve adversly effect the distribution and demography of the reptiles and amphibians in the region. With the power of ownership the Nature Conservancy can increase the population densities of the herptiles on the preserve. By increasing the frequency of ocurrance the effective diversity is augmented.

If the surrounding area was cemented over, what would the herptiles chances of success on the preserve be,in its present condition? Bufo boreas, Pseudacris triseriata, Pituophis melanoleucus, Thamnophis elegans, would be able to establish long term breeding populations of a vialbe nature. Sceloporus graciosus, Phrynosoma douglassi, Scaphiopus intermontanus, Charina bottae would be able to breed on a probalistic basis. The chances for this latter group surviving the climatic and mammalian fluctuations are remote, except for the Scaphiopus intermontanus which is specially adapted to fluctuations.

To increase the diversity and to establish a larger number of breeding populations the basic decision would be to phase out the plowed fields. This should create conditions favorable to the immigration of species from the sagebrush-grassland and to a lesser extent the remaining environments. In turn, enough acreage is involved so the establishment of at least the short term breeders is possible. No information is available on the land area requirements and minimum population size of the remaining sagebrush-grassland species and the small tree species. They would be able to repopulate the area slowly. Animals from the Picabo Hills moving downward into the preserve encounter a huge intensively worked field in the valley where there should be optimim desert development. There is also a road cut into the hill which creates a cliff that is a barrier to the movement of both snakes and lizards. On the other side of the preserve the reptiles and amphibians would have no problem entering the area, but the development on this side has made all but the gopher and garter snakes rare.

My guess is that all of the occurring species could establish short term breeding populations on a problalistic basis for periods of up to ten years. Most of the species could establish definite long term populations if the plowed field area was consolidated into one space. Since this is impossible the environmental fluctuations are more significant per area.

Since it is highly doughtful that the surroundings will be cemented the restablishment of the original vegetation of the plowed fields will initially increase the concentration of animal biomass. This will attract predators to an area where they can be protected. The lizards and snakes should remain on the fields as soon as the cover is developed to about eight inches in height. Their overwintering success will increase as the rodents and roots loosen the dirt clods.

The addition of beaver to the preserve would increase amphibian habitat and breeding success. The species in the area all prefer quiet water for laying eggs. The salubrious effect on the fisheries and avian, not to mention the mammalian productivity can be traced. There would be some decrease in the drier habitat of the reptiles, but the primary attraction of the area is its aquatic nature.

The real beauty of the area is how the mobile species such as the birds can ultilize a productive area in the environment before other creatures. The isolated nature of the creek restricts the diversity of many species groups at the same time it allows them to develop.

BIBLIOGRAPHY

Brockmen, Frank; Trees of North America; Golden Press; New York; 1968.

Brown, Vinson; Yocum, Charles; Starbuck Aldine; Wildlife of the Intermountain West; Natuuregraph Publishers Inc.; Healdsburg, Calif.; 1958.

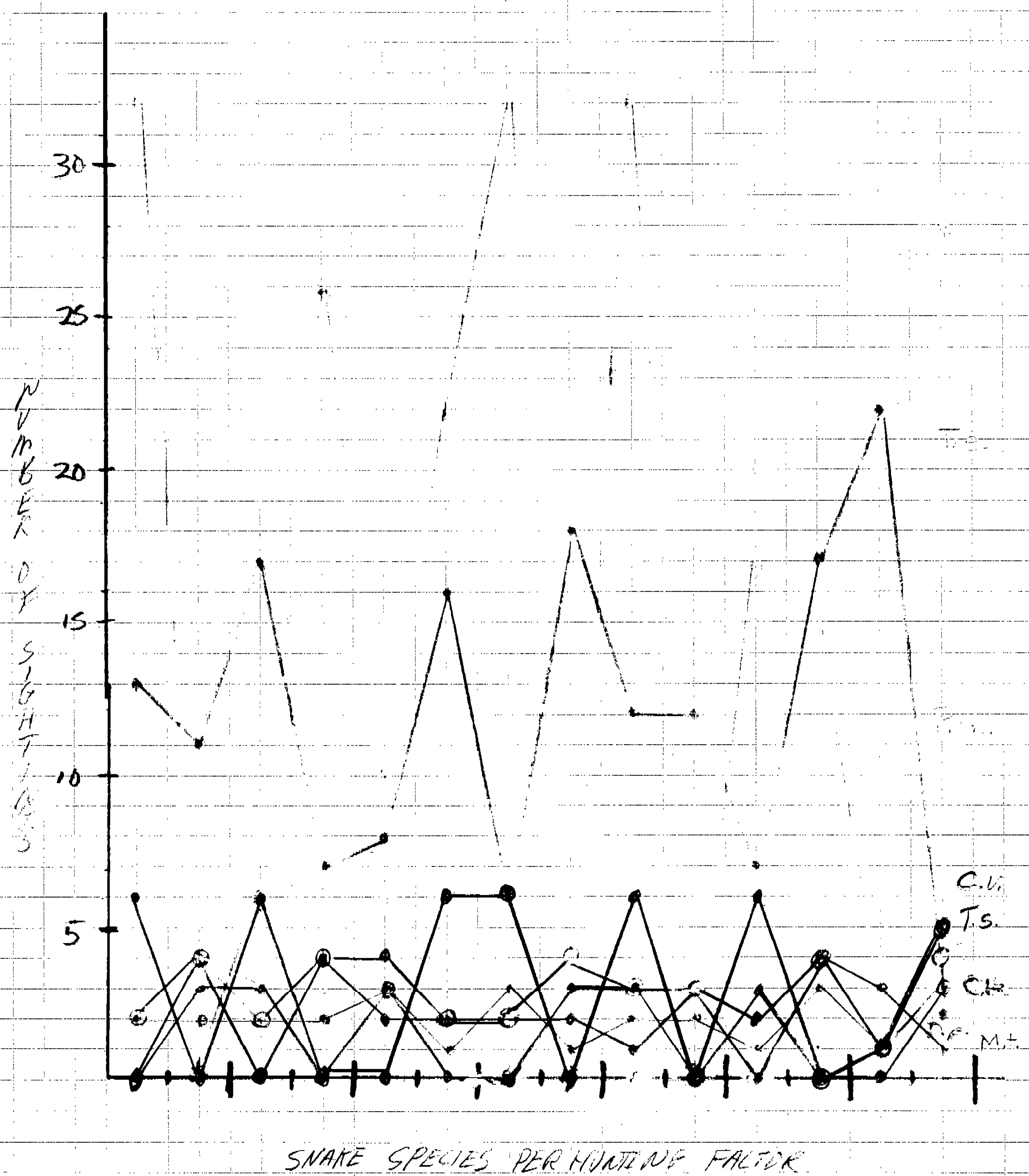
Peattie, Donald; A Natural History of Western Trees; Houghton Mifflin Company; Boston; 1953.

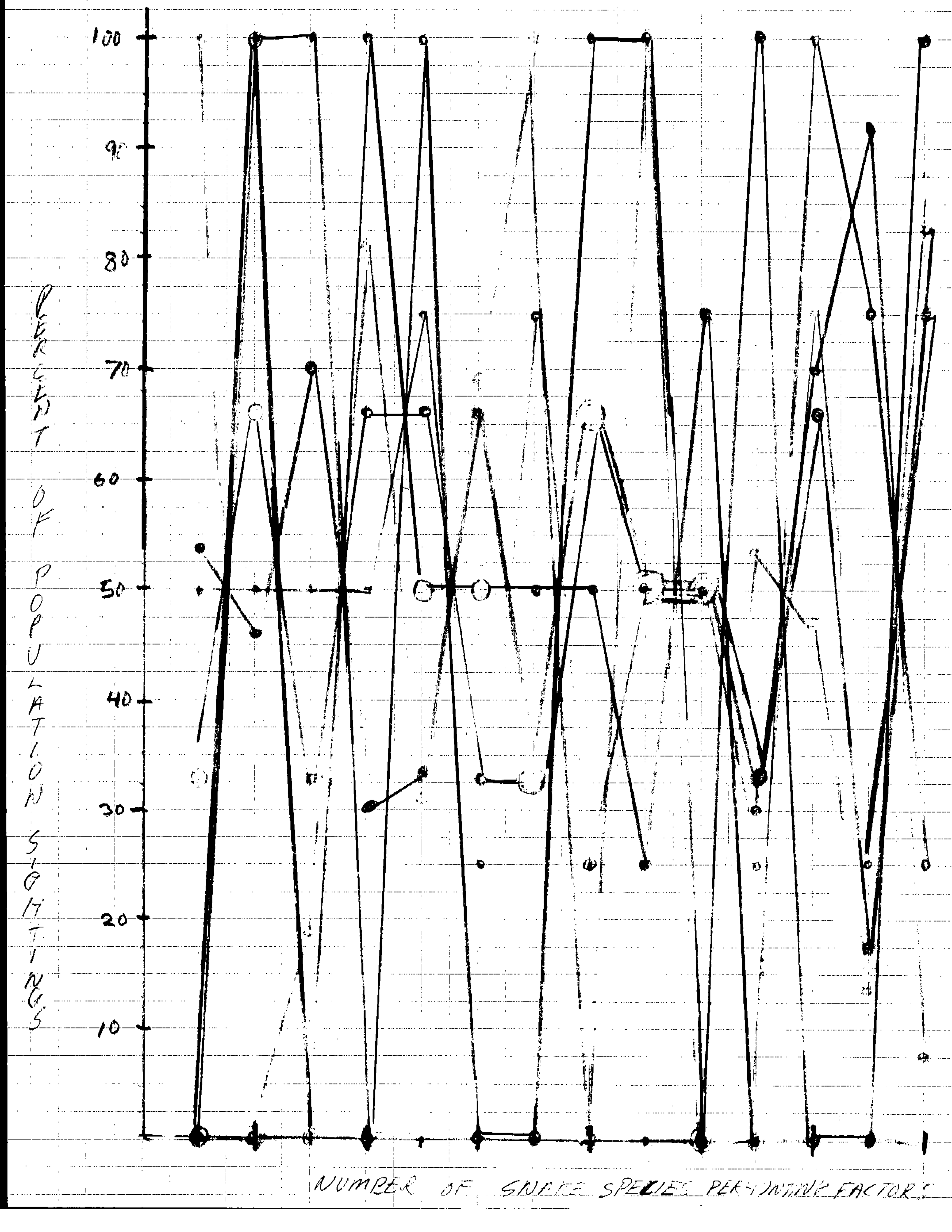
Stebbins, Robert; A Field Guide to Western Reptiles and Amphibians; Houghton Mifflin Company; Boston; 1966.

Taylor, Ronald; Valum, Rolf; Sagebrush Country; The Touchstone Press; Beaverton; Oregon; 1974.

Tisdale , E; Hironaka, M; Fosberg , M; The Sagebrush Region in Idaho; Bulletin 512; Agricultural Experiment Station; University of Idaho; Moscow; Idaho; 1969.

APPENDIX OF DATA MANIPULATIONS


30
25
20
15
10
5
NUMBER OF SIGHTINGS
C.V.
T.s.
C.R.
M.t.
SNAKE SPECIES PER HUNTING FACTOR


100
90
80
70
60
50
40
30
20
10
PERCENT OF POPULATION SIGHTINGS
NUMBER OF SNAKE SPECIES PERTAINING FACTORS

A_D	5	1	5	1	3	4	5	1	5	2	1	5	5	4	1	0	1	5	1
L_D	2	7	6	5	7	3	6	4	4	4	2	5	1	4	1	3	7	3	7
S_D	6	6	7	6	7	7	7	6	8	5	7	6	7	7	4	2	3	7	8
A_A	19	2	19	2	10	11	19	2	17	4	2	19	10	8	2	0	1	19	2
L_A	10	61	22	49	33	38	25	46	18	53	10	61	2	25	10	8	26	35	36
S_A	57	28	39	46	33	52	53	32	62	23	37	48	33	33	8	4	7	34	51
Σ_A	86	91	80	97	76	101	97	80	97	80	49	128	45	66	20	12	34	88	89
Σ_D	13	14	18	12	17	14	18	11	17	11	10	16	13	15	6	5	10	15	16

BIOMASS OF SAGEBRUSH-GRASSLAND REGION

Overstory Regression Equation

$Y = a + bx$ $\quad$ y = abundance, x = diversity

N=9	X	Y	X^2	Y^2	XY
	11	37	121	1369	407
	6	15	36	225	90
	6	14	36	196	84
	1	3	1	9	3
	6	15	36	225	90
	7	15	49	225	105
	2	3	4	9	6
	1	1	1	1	1
Totals	4	7	16	49	28
	44	110	300	2308	814

$$a = \frac{(300)(110) - (44)(814)}{9(300) - 1936} = -3.685$$

$$b = \frac{9(814) - (44)(110)}{9(300) - 1936} = 3.253$$

$$Y = -369 + 3.25X$$

$$r = \frac{9(814) - (44)(110)}{\sqrt{[9(300) - (44)^2][9(2308) - (110)^2]}} = .96 = r$$

"Overstory" Biomass

Explained and Unexplained Variance

$s^2 = s_Y^2 + s_e^2$

$b^2 = 10.56$

$N = 9$

$X_i - \bar{X}$	$(X_i - \bar{X})^2$	$b^2(X_i - \bar{X})^2$
6.2	38.44	405.92
1.2	1.44	15.20
1.2	1.44	15.20
3.8	14.44	152.48
1.2	1.44	15.20
2.2	4.84	51.11
2.8	7.84	82.79
3.8	14.44	152.48
.8	.64	6.75
		897.13

$s_Y^2 = \frac{897.13}{9} = 99.68$

$s_e^2 = \frac{58.05}{9} = 6.45$

$99.68 + 6.45 = 106.13$

$\frac{99.68}{106.13} = .939 \cong .94$ % explained

$\frac{6.45}{106.13} = .06$ unexplained

s_e^2

$a+bx_i$	y_i	$y_i-(a+bx_i)$	$(y_i-(a+bx_i))^2$
32.07	37	4.93	24.30
15.85	15	.85	.72
15.85	14	1.85	3.42
-.43	3	2.57	6.60
15.85	15	.85	.72
19.07	15	4.07	16.56
2.82	3	.18	.032
-.43	7	.57	.032
9.32	7	2.32	5.38
			58.05

$Y = a + bx$

Abundance = X

Diversity = Y

N=9

X	Y	X^2	Y^2	XY
37	11	1369	121	407
15	6	225	36	90
14	6	196	36	84
3	1	9	1	3
15	6	225	36	90
15	7	225	49	105
3	2	9	4	6
1	1	1	1	1
7	4	49	16	28
Totals 110	44	2308	300	814

$$a = \frac{(2308)(44) - (110)(814)}{9(2308) - (110)^2} = 1.385 \cong 1.39$$

$$b = \frac{9(814) - (44)(110)}{9(2308) - (110)^2} = .2866 \cong .287$$

$Y = 1.39 + .287X$

correlation, the coefficient of

$$r = \frac{N\sum xy - \sum x \sum y}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - (\sum y)^2]}}$$

$$r = \frac{9(814) - (110)(44)}{\sqrt{[9(2308) - (110)^2][9(300) - (44)^2]}} = +.96$$

Explained and Unexplained Variance

$$s^2_{Y'} = \frac{1}{N} \sum b^2 (X_i - \bar{X})^2$$

$$s^2_{Y} = s^2_{e} + s^2_{Y'}$$

$$s^2_{e} = \frac{1}{N} \sum [Y_i - (a + bX_i)]^2$$

($s^2_{Y'}$)

$b^2 = .082$

$\bar{X} = 12.22$

X_i	$X_i - \bar{X}$	$(X_i - \bar{X})^2$	$b^2(X_i - \bar{X})^2$
37	24.78	614.04	50.35
15	2.78	7.72	.63
14	1.78	3.16	.259
3	-9.22	85.00	6.97
15	2.78	7.72	.633
15	2.78	7.72	.633
3	-9.22	85.00	6.97
1	-11.22	125.88	10.32
7	-5.22	27.45	2.25
110			79.015

$$\frac{79.015}{9} = 8.78$$

$\textcircled{s_e^2}$

$a = 1.39$
$b = .287$

X_i	Y_i	$a + bx_i$		$Y_i - (a+bx_i)$	$(Y_i - a+bx_i)^2$
37	11	12.009	12.00	1.0	1
15	6	5.695	5.70	.3	.09
14	6	5.40	5.40	.60	.36
3	1	2.251	2.25	1.25	1.56
15	6	5.695	5.70	.30	.09
15	7	5.695	5.70	1.30	1.69
3	2	2.251	2.25	.25	.063
1	1	1.677	1.68	.32	.102
7	4	3.399	3.40	.6	.36
					5.32

$\frac{5.32}{9} = .591$

8.78
.591
9.37

$\frac{.591}{9.37} = .06 = s_e^2$ = unexplained variance

$= \frac{8.78}{9.37} = .94 = s_{y'}^2$ = explained variance

SNAKE SPECIES

Regression Line Equation $y = a + bx$

N= 18	X	Y	Y^2	X^2	XY
	6	11	121	36	66
	2	2	4	4	4
	4	5	25	16	20
	0	0	0	0	0
	4	6	36	16	24
	4	6	36	16	24
	1	1	1	1	1
	0	0	0	0	0
	2	3	9	4	6
	2	2	4	4	4
	3	9	81	9	27
	0	0	0	0	0
	1	1	1	1	1
	2	2	4	4	4
	3	7	49	9	21
	2	4	16	4	8
	3	5	25	9	15
	0	0	0	0	0
Totals	39	64	133	412	225

$$a = \frac{(133)(64) - (39)(225)}{(18)(133) - (39)^2} = -.30126$$

$$b = \frac{(18)(225) - (39)(64)}{(18)(225) - (39)^2} = 1.78007$$

Correlation Coefficient

$$r = \frac{(18)(225) - (39)(64)}{\sqrt{[(18)(133) - 39^2][(18)(412) - (64)^2]}}$$

$r = .913$

SNAKE SPECIES

Explained and unexplained variance

(s_Y^2) $\qquad s^2 = s_Y^2 + s_e^2$

$b^2 = 3.17$ $\qquad s_Y^2 = \frac{1}{N} \sum b^2 (X_i - \bar{X})^2$

$\bar{X} = 2.17$ $\qquad s_e^2 = \frac{1}{N} \sum [Y_i - (a + bX_i)]^2$

X_i	$X_i - \bar{X}$	$(X_i - \bar{X})^2$	$b^2 (X_i - \bar{X})^2$
6	3.83	14.67	46.5
2	-.17	.029	.091
4	1.83	3.35	10.62
0	-2.17	4.71	14.93
4	1.83	3.35	10.62
1	1.83	3.35	10.62
0	-1.17	1.37	4.34
2	-2.17	4.71	14.93
	-.17	.029	.091
2	-.17	.029	.091
3	.83	.69	2.18
0	-2.17	4.71	14.93
1	-1.17	1.37	4.34
2	-.17	.029	.091
3	.83	.69	2.18
2	-.17	.029	.091
3	.83	.64	2.18
0	-2.17	4.71	14.93
			153.755

$$s_Y^2 = \frac{153.755}{18} = 8.54$$

Ae^2

X_i	Y_i	$a+bx_i$	$Y-(a+bx_i)$	$[Y_i-(a+bx_i)]^2$
6	11	10.38	.62	.38
4	2	3.26	-1.26	1.59
2	5	6.82	-1.82	3.31
0	0	-.3	.3	.09
4	6	6.82	.82	.67
4	6	6.82	.82	.67
1	1	1.48	-.48	.23
0	0	-.3	.3	.09
2	3	3.26	-.26	.068
2	2	3.26	-1.26	1.59
3	9	5.04	3.96	15.68
0	0	-.3	.3	.09
1	1	1.48	-.48	.23
2	2	3.26	-1.26	1.59
3	7	5.04	1.96	3.84
2	4	3.26	.74	.55
3	5	5.04	-.04	.0016
0	0	-.3	.3	.09
				30.76

$\frac{30.76}{18} = 1.708$

$1.708 + 8.54 = 10.25$

$\frac{1.71}{10.25} = .17$ unexplained variance

$\frac{8.54}{10.25} = .83$ explained variance

LIZARDS Regression Line Equation

X	Y	X^2	Y^2	XY
4	21	16	441	84
4	13	16	169	52
2	9	4	81	18
1	3	1	9	3
2	9	4	81	18
3	9	9	81	27
1	2	1	4	2
1	1	1	1	1
2	4	4	16	8
2	6	4	36	12
0	0	0	0	0
0	0	0	0	0
1	3	1	9	3
2	5	4	25	10
1	1	1	1	1
2	19	4	361	38
5	17	25	284	85
2	20	4	400	40
TOTALS 35	142	99	2004	402

$$a = \frac{(99)(142) - (35)(402)}{(18)(99) - (35)^2} = -.022$$

$$b = \frac{(18)(402)-(35)(142)}{(18)(99)-(35)^2} = 4.068$$

$$y = .022 + 4.068X$$

Correlation Coefficient

$$r = \frac{(18)(402)-(35)(142)}{\sqrt{[(18)(99)-(35)^2][(18)(2004)-(142)^2]}}$$

$$r = .76$$

LIZARDS Explained and Unexplained Variance

$s^2_{Y'}$ = explained variance

$b^2 = 16.55$

$\bar{X} = 1.94$

X_i	$X_i - \bar{X}$	$(X_i - \bar{X})^2$	$b^2(X_i - \bar{X})^2$
4	2.06	4.24	70.17
4	2.06	4.24	70.17
2	.06	.0036	.06
1	-.94	.88	14.56
2	.06	.0036	.06
3	1.06	1.12	18.54
1	-.94	.88	14.56
1	-.94	.88	14.56
2	.06	.0036	.993
2	.06	.0036	.06
0	-1.94	3.76	62.23
0	-1.94	3.76	62.23
1	-.94	.88	14.56
2	.06	.0036	.06
1	-.94	.88	14.56
2	.06	.0036	.06
5	3.06	9.36	154.91
2	.06	.0036	.06
			512.403

$\frac{512.403}{18} = 28.47$ $\frac{28.47}{49.11} = .58$ explained $= s^2_{Y'}$

$s^2 = s^2_{Y'} + s^2_e$ $\frac{20.64}{49.11} = .42$ unexplained $= s^2_e$

LIZARDS

s_e^2 = unexplained variance

$a = -.022$
$b = 4.068$

X_i	Y_i	$a+bX_i$	$Y_i - (a+bX_i)$	$[Y-(a+bX_i)]^2$
4	21	16.25	4.75	22.56
4	13	16.25	3.25	10.56
2	9	8.12	.88	.77
1	3	4.05	-1.05	1.10
2	9	8.12	.88	.77
3	9	12.18	-3.18	10.11
1	2	4.05	-2.05	4.2
1	1	4.05	-3.05	9.3
2	4	8.12	-4.12	16.97
2	6	8.12	-2.12	4.49
0	0	-.022	.022	.00048
0	0	-.022	.022	.00048
1	3	4.05	-1.05	1.10
2	5	8.12	-3.12	9.73
1	1	4.05	-3.05	9.3
2	19	8.12	10.88	118.37
5	17	20.32	-3.32	11.02
2	20	8.12	11.88	141.13
				371.48

$$\frac{371.48}{18} = 20.64$$

Silver Creek Animals

1. Short horned toad - most common lizard of preserve
2. Sagebrush Lizard, another common lizard of preserve
3. Northwester Fence Lizard, rarer lizard on preserve, orange hind legs distinctive from sagebrush lizard
4. Running into Crevice for protection
5. Close view of a male Fence lizard
6. Western Skinks under a rock
7. Male (red) and Female (plain)
8. Juvenile Western Skink, bright blue tail, rare on preserve
9. Desert horned Toad on cowplop
10. Desert horned Toad on Cowplop
11. Desert horned Toad on favorite ground type
12. Alert, ready to flee behavior
13. Taking shelter under a sagebrush
14. Juvenile note lack of collar
15. Adult basking on rock, collar
16. Close up, note well developed horns
17. Pygmy rabbit on field
18. Spotted frog in root mat by waters edge
19. Pacific treefrog on chokecherry
20. Spadefoot Toad, a burrowing creature

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Animals

26. Jerusalem Cricket, or Potatoe Bug

27. Thistle - a product of overgrazing

28. Western Terrestrial Garter Snake
most abundant snake on preserve

29. Garter Snake prowling in Bush zone

30-35 Hunting Sequence for
minnows

30. border of stream basking

31-34 prowling in gravel for
small minnows in rock crevices

35 swallowing a Western brook trout
they do not have to restrict
themselves to small fish, eat amphibians
and trout also

36. Adult Western Rattlesnake

37. Front View of Western Rattlesnake

38. Dingy Color due to

39. emergence from hibernation

40. has not had time to shed.
Basking in late afternoon sun

41 Rubber Boa - inhabitat of
entire state of Idaho

42. Rubber boa in bunch

43. grass zone of preserve

44. Great Basin Gopher snake
in Sage brush, also a constrictor

45. Close up of head

46. An individual crossing a

SIAS

Silver Creek Slides Scenery

1. Loving Creek - Silver Creek junction
2. Approach to Silver Creek going north on highway 95
3. Eastern Snake River Plain, Silver Creek is on the borderline of this geomorphic province
4. Silver Creek thunderstorm in the Valley looking north at the Sawtooth foothills
5. fly fishing, telephoto from same scene
6. fields being pushed out into the desert along Silver Creek flow
7. Agricultural development to the banks of the stream
8. Rocky Mountains view from Silver Creek looking east
9. Desert Mountains from same view point looking west
10. Sunset over portion of stream by bridge
11. MacMahons Aspen Groove, key wild life area in valley, next to preserve
12. Heron Rookery, Aspen groove, Sullivan Lake Desert to Water transect
13. Intensive farming of valley
14. Slower wider water of Silver Creek a result of a farmers dam.
15. Picabo Hills to Sawtooths, Silver

49. Striped Whipsnake crawling across human debris by some shacks on the preserve

50. Western Racer, another fast active, alert, snake, a behavioral competitor of the Whipsnake, niether one is a constrictor.

51. Important head sculation of Western Racer

52. Western Racers eat insects Monach Butterfly Cutapillar. Presence of water on preserve increases insect popotations