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Statistical Studies

Concerning

The Distribution of Mining Districts and Mineral Deposits in Nevada

A thesis submitted in partial fulfillment of the  
requirements for the degree of Geological Engineer

by

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STATISTICAL STUDIES  
CONCERNING  
THE DISTRIBUTION OF MINING DISTRICTS AND MINERAL DEPOSITS IN NEVADA

INTRODUCTION

Knowledge concerning the distribution of mineral deposits is essential for the intelligent direction of exploration programs and for understanding of the processes of mineralization. If the mineral deposits of Nevada are aligned in belts or restricted to certain areas, full knowledge of the distribution limitations will substantially aid future exploration. Many geologists have commented upon the apparent alignment of mining districts in Nevada. Ralph Roberts (1964) has stated, "It is immediately apparent that the districts (in Nevada) are not randomly distributed but that some metals and nonmetals are produced mostly in certain parts of the State, and that some are aligned along belts that cut northwestward, east-west, and northeastward across the State. This distribution is not accidental; it reflects major stratigraphic and structural controls of the most fundamental kind." Billingsley and Locke (1941) described the Walker line as a northwest trending structural feature, roughly paralleling the California-Nevada border, and noted the apparent concentration of mineral deposits within the structural feature. Many of the belts proposed by Roberts, parallel the Walker line.

Before accepting statements concerning mineral belts and non-random distribution, even when agreement is expressed by many geologists working in Nevada, it would be well to test the proposed belts - the hypothesis of non-random distribution - using various methods of statistical analysis.

## RANDOM DISTRIBUTION

Miller and Kahn (1962) described a method for comparing the Chi-squared fit of an observed frequency distribution of points on a plane with a Poisson or random distribution. In the usual course of events the expected frequency does not occur every time. If a coin is tossed ten times, five heads and five tails are not expected, even though this is the most probable result. It is usual to find some deviation. Chi-squared is a measure of this deviation and compares the observed frequency distribution with the expected frequency distribution.

The observed frequency distribution for points on a plane is determined by dividing the area into a number of quadrats or cells, and counting the number of districts or deposits within each quadrat. The results are sensitive to the size of the quadrat. A method proposed by Curtis and McIntosh (1950) was used to determine the proper sized quadrat. (Quadrat area =  $2 \times \text{total area} / \text{total number of points}$ .) The observed frequency distribution is then the number of quadrats that contain no mining districts; the number of quadrats containing one district; the number containing two districts; etc.

The expected frequencies for random distribution can be calculated using the general equation for a Poisson distribution. Comparison of the observed with the expected, using the Chi-squared equation, yields a Chi-squared value that allows testing the hypotheses, "The mining districts of Nevada are randomly distributed."

Before making a statistical analysis, the probability level at which the hypothesis will be accepted or rejected should be selected. Probability values of 0.05 or 0.01 are commonly used depending upon the

degree of confidence required.

Calculations showed that for purposes of a distribution analysis of mining districts in the State each quadrat should be 40 miles by 40 miles square, and a series of quadrats of this size were superimposed on a mining district map. It was immediately apparent that there were too many quadrats that contained no mining districts. This is a common problem as the boundary of the quadrat system is not properly defined by the State boundaries. In studying a large grouping of mining districts, areas outside of the general mineralized area will contain no mining districts and inclusion of large portions of barren areas will distort the picture within the mineralized area. To minimize this problem a part of southern Nevada and that portion of northern Washoe and Humboldt Counties that are essentially unmineralized, at least as regards the present surface, were eliminated. (This area is hereafter referred to as Area 1.) Further, in order for the results to be meaningful to an exploration geologist disinterested in minor districts, only those districts that have produced 1 million dollars or more worth of metals, calculated generally at present prices, were counted. Similar statistical analyses for points on a plane were also made for some of the individual metals, using the following lower production limits: copper - 10,000 pounds; lead - 10,000 pounds; gold - 1,000 ounces; silver - 10,000 ounces.

Calculations of the Chi-squared values were made using an I.B.M. 1620 computer. The Chi-squared technique generally requires that no frequency values less than 5 be used in computing the total value of Chi-squared. For this reason frequency values less than 5 were usually

grouped to provide larger values. Table 1 contains the results, including grouping (shown in parenthesis) of the statistical analysis.

The probability values shown in Table 1 were obtained from a table of Chi-squared values. A range is given when the computed values of Chi-squared fell between values given in the Chi-squared tables. Precise probability values, rather than a range, could be computed, but to do so would indicate a precision that is not warranted.

Table 1 suggests that the mining districts, silver, copper, and lead deposits of Nevada are randomly distributed, with probability values ranging from 0.20 to 0.50. The gold deposits are not randomly distributed.

As these results are opposed to the opinions of many geologists working in Nevada, it was decided to test the specific area of the proposed mineral belts. Figure 1 illustrates the area in northern Nevada selected for further analysis. The quadrat set was oriented N. 45° W., paralleling many of the proposed mineral belts. This particular area offers two other advantages in that there are mining districts outside as well as inside the area (eliminating the problem of barren border areas that exaggerate the number of quadrats containing no mining districts) and it includes almost all the areas of current interest in exploration in Nevada.

This area, hereafter referred to as Area 2, was analyzed using a square quadrat and also using rectangular quadrats oriented N. 45° W. and N. 45° E. If mineral belts trending N. 45° W. were present all of the analyses should have shown a poor fit for random distribution and the N. 45° W. analysis in particular. Table 2 illustrates the results

obtained. Mining districts and silver deposits have high probabilities for random distribution. The gold and lead deposits have lower probabilities but are above a significance level of 0.05. Again the conclusion required by the statistical evidence is that the mining districts, gold deposits, silver deposits, and lead deposits in Area 2 are randomly distributed. Copper deposits could not be evaluated as there are too few deposits to give meaningful statistical results.

#### EXPONENTIAL DISTRIBUTION

The persistence of observed frequencies with values of 5 or less cause concern as to the validity of grouping these lower values. In every instance, except where the observed frequency is zero, the expected frequency is lower than the observed frequency for these smaller values. This fact alone presents statistical support for not discounting the validity of the smaller values.

A semi-logarithmic graph of the frequencies - quadrats containing 'n' or more mines versus probability - provides strong evidence that the mineral distribution in Nevada is exponential rather than random. Figures 2 through 4 are graphs of the various frequencies compared to random distribution curves. The ordinate scale is logarithmic and represents the probability,  $P(n)$ , that 'n' or more districts or deposits will be found in any randomly selected quadrat. One adjustment was required in plotting. In those instances where no quadrats contained a certain number of districts - the observed frequency being zero - yet a greater number of districts were present in one or more quadrats, the frequency for the latter was substituted for the former. As an example: there are no quadrats in Area 1 that contain 7 or 8 silver

districts, but one quadrat does contain 9 silver districts. This frequency, 1, was substituted for the zero value in 7; and 8 and 9 were assigned frequency values of zero. On the various graphs the substitution is shown by an open circle.

Figure 2 is a semi-logarithmic graph of the probabilities versus number of quadrats containing 'n' or more districts or deposits in Area 1. In all instances the points best fit two straight lines, although the points for silver very nearly fit the random curve. The fact that two straight lines are required can be explained as follows. The slope of the lines is determined by the actual distribution of the districts or deposits and by the size of the quadrat used to sample the area. The smaller the quadrat the fewer the number of quadrats containing many districts and the steeper the slope of the probability line. The two lines may be the result of sampling two areas with different distribution characteristics, one area containing a concentration of mineral deposits greater than the other.

Figure 3 is a semi-logarithmic graph of the probabilities versus the number of quadrats containing 'n' or more districts in Area 2. The observed distribution best fits a straight line or exponential distribution. Lead is an exception and best fits the random distribution curve if the single quadrat containing 5 districts is included. A single line, rather than two intersecting lines, satisfies the points. Area 2 includes more districts per square mile, on the average, than does the balance of Area 1. Area 2 may then be an area of greater mineral deposit concentration than Area 1. This observation supports the reasoning as to the requirement for two lines to connect the points

plotted for Area 1. It can be wished that more districts and deposits were available to give a greater statistical accuracy, but that wish cannot be satisfied at present. Some averaging or grouping is possible, perhaps providing greater accuracy, by averaging or combining the various probability values. Figure 4 is a semi-logarithmic graph in which the values for all districts, Area 2, were computed by averaging the probability values obtained by sampling with a square quadrat and with rectangular quadrats oriented N. 45° W. and N. 45° E. The gold-silver graph, Area 2, is an average of the gold and silver probability values in Area 2. The gold, silver, lead, and copper graph, Area 1, was similarly obtained. The remarkable linearity supports the conclusion that the mining districts, gold, silver, copper, and lead deposits of Nevada have an exponential distribution.

Failure of the exponential lines to intersect the  $'n' = 0$  and  $P(n) = 1.0$  points illustrates that nonmineralized areas are not in the same category as mineralized areas. This concept, while logical, is not always appreciated nor so well illustrated as in these graphs. The probability of finding a mineralized area within a randomly selected quadrat is that shown under '1' on the graphs. Having found a mineral deposit, the probability of finding additional deposits is exponential. As an example, the number of quadrats containing no mineral deposits can be expanded to any value for the Western States by extending the sampled area across barren portions of the Great Plains or into the Pacific Ocean (not counting possible deposits on the ocean floor). The probability of finding a mineral deposit thus becomes smaller and

smaller as larger barren areas are included in the search area. However, once a deposit is found the probability of finding additional deposits within the same quadrat is that probability value determined by the exponential value of the line as plotted on the graph and is not affected in any manner by the total size of the sampled area. Further, as Slichter (1960) observed, if the distribution is exponential the probability of finding additional mines in mineralized areas is not affected by the number already discovered.

A word of caution is required to prevent the reader from jumping to the conclusion that the number of mines in a mineralized area is infinite. We are dealing with probabilities, not certainties. There is a probability of 0.5 that a coin will land heads up; likewise, there may be a probability of 0.5 that a new mine will be found in a certain mineralized area. However, there is also a probability of 0.5 that the coin will not land heads up - or that a new mine will not be found.

#### MINERAL BELTS

The existence of an ordered linear arrangement of points on a plane may be determined by using a simple two way analysis of variance test. The variance of a set of values is a measure of the general variation in the set. That is, are the values closely grouped around the mean, or are there wide variations?

If a portion of the mining districts in Area 2 are aligned along northwest trending belts, then a count of the districts within northwest aligned rectangles should show a high variance as belts of districts and barren belts alternated. The variance of this count can be

compared with a similar count taken at right angles or on a northeast alignment. This count should result in a lower variance if it is assumed that there is no ordered arrangement in a northeast direction. A statistical technique using the "F-distribution" allows the comparison of two variances to determine the probability that they came from the same family of values. It consists simply of dividing the larger variance by the smaller variance and consulting the F-distribution tables to determine if the quotient is within the statistical limits. If the quotient is close to 1 it indicates that the variances are nearly equal and there is a high probability that they came from the same family or values. Conversely, the larger the quotient the lower the probability.

Three linear counts were made in Area 2 using elongated rectangles - or bands - oriented northwest and northeast. The widths of the rectangles were 10, 20 and 40 miles. The length extended completely across the area. Different width rectangles were used to avoid the possibility of selecting a width that included a mineralized belt and a barren belt, thus averaging the values and lowering the variance. Table 3 illustrates the variances and the F-values obtained. If the quotient (F-value) for the test is below the F-value shown in the left-hand column, the variances are from the same family. The significance level for the F-value was chosen as 0.05.

All of the computed F-values are well within the 0.05 significance level with the exception of the copper distribution in a 20-mile wide rectangle. Mining districts as a group are well within the statistical limits regardless of the width of the rectangles and show remarkable

little divergence in a 20-mile wide rectangle.

Although the analysis of variance tests give no reason to suspect a series of mineral belts with widths of 10, 20, or 40 miles, it is not possible to state that broader belts or belts of varying widths do not exist. A nonparametric test exists that will determine if the values of the individual elongate rectangles are random or non-random. This simple test consists of establishing the median and noting the persistence of counts above or below the median. The total number of the groupings above and below the median can be statistically evaluated to determine if the individual groups are randomly distributed or have an ordered arrangement.

Figure 5 is a series of graphs representing the total number of districts or deposits within successive 10 mile wide by 240 mile long rectangles oriented northwest-southeast across Area 2. Counts for "all districts" and "districts with production of over one million dollars" are within the critical limits and are assumed to be randomly distributed. These counts include all metals - mercury, tungsten, and iron - as well as other base and precious metals. The evidence supports the conclusion that the mining districts in Area 2 are not in belts.

The gold and copper distributions are also non-critical and assumed not to be in belts. The distributions of silver and lead are outside the critical limits and are probably (above 0.05 probability) in belts. Examination of the graphs shows a series of high counts, a long series of low counts, a short series of high counts, and a series of mixed counts for silver and lead. The patterns for gold and copper are similar. The zones of high counts outline the Walker line and the Eureka-

Battle Mountain belt as proposed by Roberts. There is thus some statistical evidence to support the presence of these two mineral belts or zones.

#### SAMPLING

The statistical inference that might be derived from the foregoing is, "exploration should be concentrated within the mineral belts as there are more mineral deposits within the belts and thus a greater probability of finding additional deposits." This inference, as well as all of the preceding statistical arguments, is based upon the assumption that the known mineral deposits in Nevada represent an accurate random sampling. The validity of this assumption can be tested by examining the rate at which discoveries were made within and outside the mineral belts. There are approximately the same number of districts within the belts as outside the belts. If the total area were randomly prospected the same number of districts should be discovered per unit of time in the belts as outside the belts. An analysis of the discoveries in Area 2 shows this to be true. From 1859 to 1879 twenty-nine districts were discovered in the belts and twenty-nine districts outside the belts. From 1879 to 1899 two districts were discovered in the belts and two districts outside the belts. From 1899 to 1919 thirteen districts were discovered in the belts and fourteen districts outside the belts. Too few districts have been discovered since 1919 to allow a valid statistical comparison for later years. The number of districts and date of discovery for each district were obtained from an available map showing location and discovery date. No effort was made to include all the known districts or to limit the count using

production criteria. However, the data presented give a representative sample which is assumed to be valid.

The rate of discovery within and outside the mineral belts followed the laws of probability concerning random events. Therefore the prospecting was random and it may be assumed that the present mining district distribution in Area 2 represents a random sampling. Further, as the area of mineral belts is half the size of the area outside the belts, and remembering that they both contain the same number of districts, the probability of finding additional districts per unit area within the belts has historically been twice that of finding districts outside the belts.

#### COVER PROBLEMS

Although the sampling, as mentioned above, appears to have been random, physical features in Nevada prohibit truly random prospecting. Large areas of Nevada are covered by post-mineral volcanic rocks, sediments, and alluvium. These areas were included in the statistical tests. The principal effect of this inclusion is to reduce the derived probability values. If only areas of pre-mineral rocks were included the probability values would be much higher.

Post-mineral rocks can not be accurately excluded as a geologic map of Nevada is not yet available. It is estimated that at least half of Area 2 contains post-mineral cover. The true probability values for areas of pre-mineral rocks is therefore at least twice that shown on the various graphs.

It is reasonable to expect the same probability for mineral occurrences beneath much of the covered areas as for the uncovered

areas. The adjusted probability values can thus be used to predict exploration success in the covered areas. The thickness of the cover must be considered as the depth of burial may prevent mining

operations.

SUMMARY

The mining districts and mineral deposits of Nevada have an exponential probability distribution. The discoveries made so far have not substantially altered the probability of finding additional deposits. The difficulty experienced in finding new deposits is not because there are fewer to be found but rather that they are less obvious.

There is some statistical evidence to support the argument that the mineral deposits in Nevada tend to be concentrated in at least two belts. Additional evidence may be found to support the "mineral belt theory" with the application of more sophisticated statistical tests.

All workers in the geological sciences would be well advised to use statistical tests, when possible, to determine the validity of proposed theories. What may be "obvious" to the eye may not be "obvious" to statistical tests, and if it is not "obvious" to statistical tests then there is little validity in declaring the observed "obvious".

TABLE 1. Observed and computed statistical values, State.

Number of dists. in quadrat (n)	OBSERVED VALUES		POISSON VALUES		Chi-squared $\frac{(\text{Obs.}-\text{Exp.})^2}{\text{Exp.}}$	Sum of Chi-Squared	Probability for Random Distribution
	Obs. Frequency	Probability of quadrat content $\bar{x}$ (n)	Exp. Frequency	Probability of quadrat content $\bar{x}$ (n)			
ALL MINING DISTRICTS >\$1,000,000 PRODUCTION							
0	9	1.000	7.45	1.000	3.19	[ ( ) = ] grouped values (4.15)	0.2-0.3
1	14	0.827	14.48	0.857	0.16		
2	11	0.558	14.06	0.578	0.67		
3	14	0.346	9.11	0.308	2.63		
4	2(5.72)	0.0769	4.42(7.74)	0.132	1.33(0.52)		
5	0	0.0385	1.72	0.0474	1.71		
6	0	0.0385	0.556	0.0144	0.56		
7	1	0.0385	0.154	0.00367	4.63		
8	1	0.0192	0.037	0.000711	24.73		
GOLD DEPOSITS >1,000 ozs. PRODUCTION							
0	13	1.000	6.51	1.000	6.47	(25.26)	<0.001
1	15	0.745	13.40	0.872	0.19		
2	4	0.451	13.79	0.609	6.95		
3	4	0.373	9.47	0.338	3.16		
4	8	0.294	4.87	0.152	2.01		
5	5(7.60)	0.137	2.01(3.11)	0.0564	4.46(6.48)		
6	1	0.0392	0.668	0.0170	0.14		
7	1	0.0196	0.202	0.0034	3.14		
SILVER DEPOSITS >10,000 ozs. PRODUCTION							
0	4	1.000	4.07	1.000	0.00	(3.54)	0.3-0.5
1	13	0.923	10.28	0.920	0.72		
2	13	0.667	13.01	0.718	0.00		
3	6	0.412	10.97	0.463	2.25		
4	8	0.294	6.93	0.248	0.16		
5	5(8.00)	0.137	3.51(6.38)	0.112	0.63(0.41)		
6	1	0.0392	1.48	0.0436	0.16		
7	0	0.0196	0.534	0.0147	0.53		
8	0	0.0196	0.168	0.00421	0.17		
9	1	0.0196	0.047	0.000921	19.10		
LEAD DEPOSITS >10,000 lbs. PRODUCTION							
0	8	1.000	5.56	1.000	1.07	(3.38)	0.3-0.5
1	13	0.843	12.33	0.891	0.04		
2	9	0.588	13.66	0.649	1.59		
3	10	0.412	10.09	0.380	0.00		
4	6	0.216	5.59	0.182	0.30		
5	3(5.60)	0.0980	2.48(3.98)	0.0723	0.11(0.66)		
6	1	0.0392	0.914	0.0236	0.01		
7	1	0.0196	0.289	0.00567	1.74		
COPPER DEPOSITS >10,000 lbs. PRODUCTION							
0	7	1.000	3.96	1.000	2.34	(2.58)	0.2-0.3
1	7	0.788	8.39	0.880	0.23		
2	9	0.576	8.90	0.625	0.00		
3	3(15.00)	0.303	6.29(14.6)	0.356	1.72(0.01)		
4	4	0.212	3.34	0.165	0.13		
5	1	0.0909	1.42	0.0638	0.12		
6	0	0.0606	0.500	0.0209	0.50		
7	1	0.0606	0.151	0.00578	4.74		
8	1	0.0303	0.040	0.00121	22.90		

TABLE 1. Observed and computed statistical values, State.

Number of dists. in quadrat (n)	OBSERVED VALUES		POISSON VALUES		Chi-squared $\frac{(Obs.-Exp.)^2}{Exp.}$	Sum of Chi-Squared	Probability for Random Distribution
	Obs. Frequency	Probability of quadrat content $\bar{x}$ (n)	Exp. Frequency	Probability of quadrat content $\bar{x}$ (n)			
MINING DISTRICTS >\$1,000,000, SQUARE QUADRAT							
0	4	1.000	3.80	1.000	0.01	[ ( ) = ] grouped values (2.44)	0.3-0.5
1	11	0.888	8.54	0.894	0.71		
2	8	0.583	9.61	0.655	0.27		
3	5	0.361	7.21	0.385	0.67		
4	4(9.75)	0.222	4.05(7.36)	0.184	0.00(0.78)		
5	1	0.111	1.82	0.0702	0.37		
6	3	0.0833	0.68	0.0191	7.84		
MINING DISTRICTS >\$1,000,000, RECTANGULAR QUADRAT, AXIS N.45°E.							
0	3	1.000	3.52	1.000	0.08	(3.27)	0.5-0.7
1	12	0.919	8.29	0.902	1.66		
2	7	0.595	9.74	0.697	0.77		
3	6	0.405	7.64	0.415	0.35		
4	5	0.243	4.49	0.208	0.58		
5	2(4.60)	0.108	2.11(3.49)	0.0869	0.00(0.35)		
6	1	0.0541	0.83	0.0298	0.04		
7	1	0.270	0.28	0.00743	1.88		
MINING DISTRICTS >\$1,000,000, RECTANGULAR QUADRAT, AXIS N.45° W.							
0	4	1.000	3.80	1.000	0.11	(0.17)	0.5
1	9	0.888	8.54	0.886	0.24		
2	13	0.639	9.61	0.649	1.20		
3	3(15.35)	0.278	7.20(17.01)	0.382	2.45(0.17)		
4	1	0.194	4.05	0.182	2.30		
5	3	0.167	1.82	0.0696	0.76		
6	3	0.0833	0.68	0.0189	7.84		
GOLD DEPOSITS >1,000 ozs. PRODUCTION							
0	23	1.000	19.79	1.000	0.52	(7.74)	0.1
1	27	0.681	25.56	0.725	0.08		
2	10	0.306	16.51	0.370	2.57		
3	6	0.167	7.11	0.141	0.17		
4	3(7.00)	0.0833	2.29(3.23)	0.0419	0.22(4.40)		
5	2	0.0416	0.59	0.00998	3.34		
6	1	0.139	0.13	0.00176	5.96		
SILVER DEPOSITS >10,000 ozs. PRODUCTION							
0	20	1.000	14.58	1.000	2.02	(4.18)	0.3-0.5
1	19	0.722	23.29	0.796	0.79		
2	16	0.458	18.60	0.473	0.36		
3	10	0.236	9.90	0.215	0.00		
4	3(8.50)	0.0972	3.95(6.03)	0.0771	0.23(1.01)		
5	2	0.0556	1.26	0.0222	0.43		
6	2	0.0278	0.34	0.00467	8.23		
LEAD DEPOSITS >10,000 lbs. PRODUCTION							
0	25	1.000	19.52	1.000	1.54	(6.53)	0.05-0.1
1	19	0.653	25.48	0.726	1.65		
2	16	0.389	16.63	0.372	0.02		
3	6	0.167	7.24	0.142	0.21		
4	5(6.25)	0.0833	2.36(3.13)	0.0414	2.94(3.11)		
5	1	0.0139	0.62	0.00855	0.24		

TABLE 2. Observed and computed statistical values, Area 2.

	All Mng. Dists.	Mng. Dists. > 1 x 10 <sup>6</sup> \$	Mng. Dists. > 1 x 10 <sup>7</sup> \$	Gold > 1,000 ozs.	Silver > 10,000 ozs.	Copper > 10,000 lbs.	Lead > 10,000 lbs.
<b>1. 10 Mile Wide Rectangles</b>							
NE Variance	79.77	3.04	0.870	4.27	4.45	2.78	3.60
NW Variance	134.97	3.45	0.609	5.39	6.19	4.61	4.54
Quotient	1.69	1.14	1.428	1.26	1.39	1.66	1.26
<i>F</i> <sub>0.05</sub> = 2.00 d.f. = 23 x 23							
<b>2. 20 Mile Wide Rectangles</b>							
NE Variance	43.91	9.42	1.4545	6.36	5.95	3.70	8.00
NW Variance	43.81	9.24	1.4545	13.42	13.16	13.65	11.45
Quotient	1.00	1.02	1.0000	2.11	2.21	3.68	1.43
<i>F</i> <sub>0.05</sub> = 2.82 d.f. = 11 x 11							
<b>3. 40 Mile Wide Rectangles</b>							
NE Variance	13.86	24.3		17.5	20.4	14.6	10.7
NW Variance	14.51	17.1		35.1	47.6	42.9	34.3
Quotient	1.047	1.42		2.05	2.33	2.95	3.25
<i>F</i> <sub>0.05</sub> = 5.05 d.f. = 5 x 5							

TABLE 3. Two way analysis of variance, Area 2.

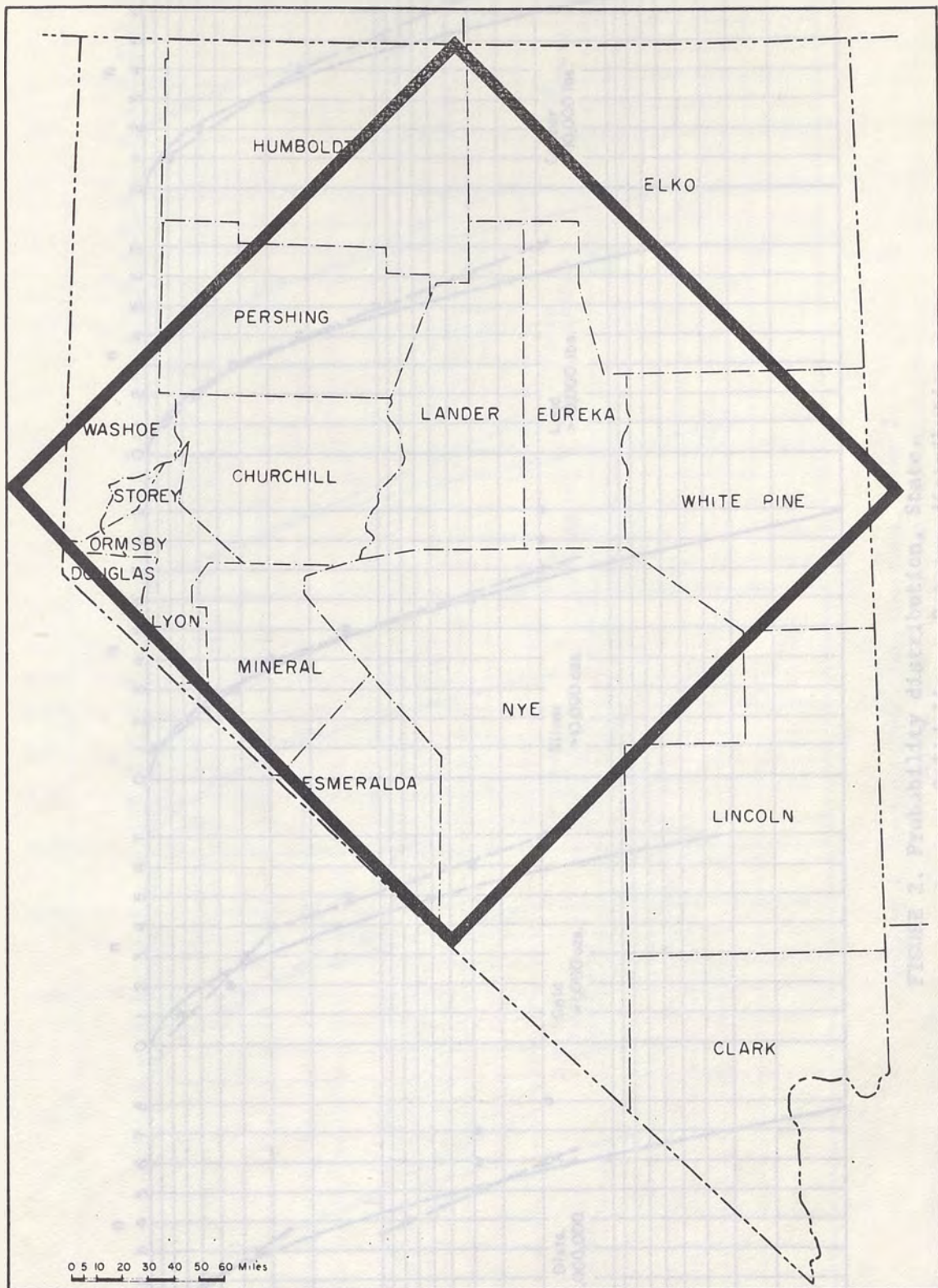


FIGURE 1. Map of Nevada showing location of Area 2.

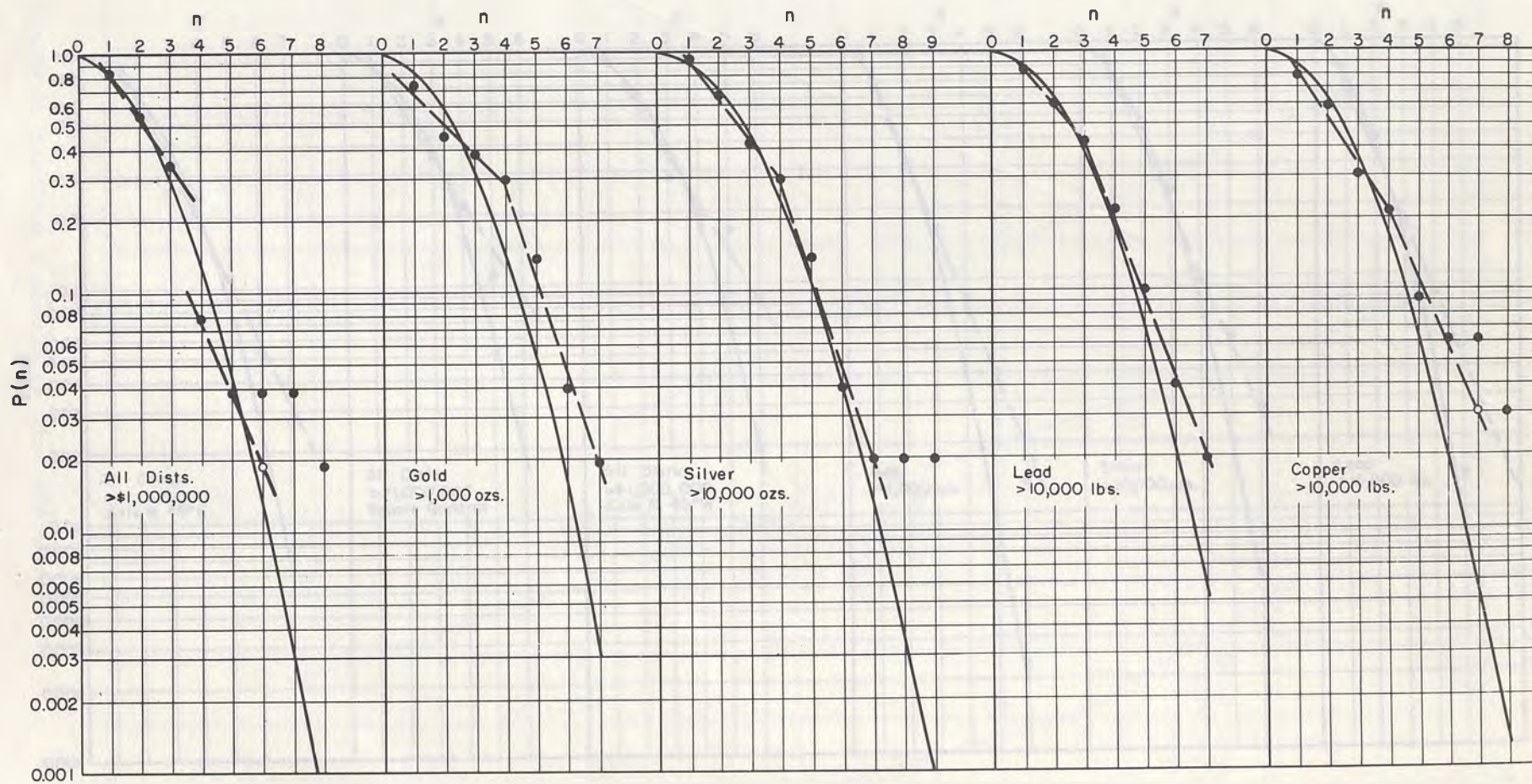


FIGURE 2. Probability distribution, State.  
 Solid line - Poisson distribution  
 Dashed line - exponential distribution

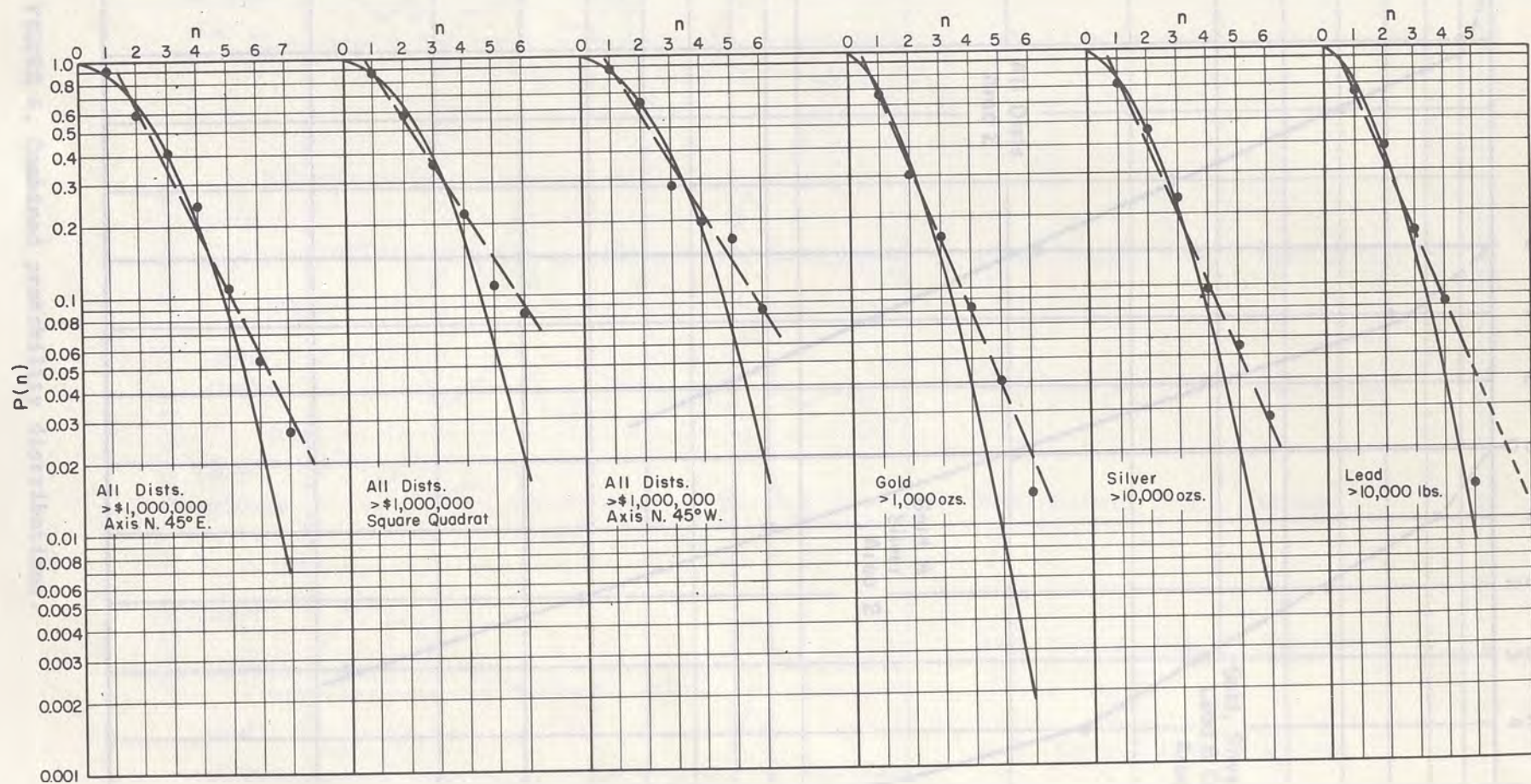


FIGURE 3. Probability distributions, Area 2.  
 Solid line - Poisson distribution  
 Dashed line - exponential distribution

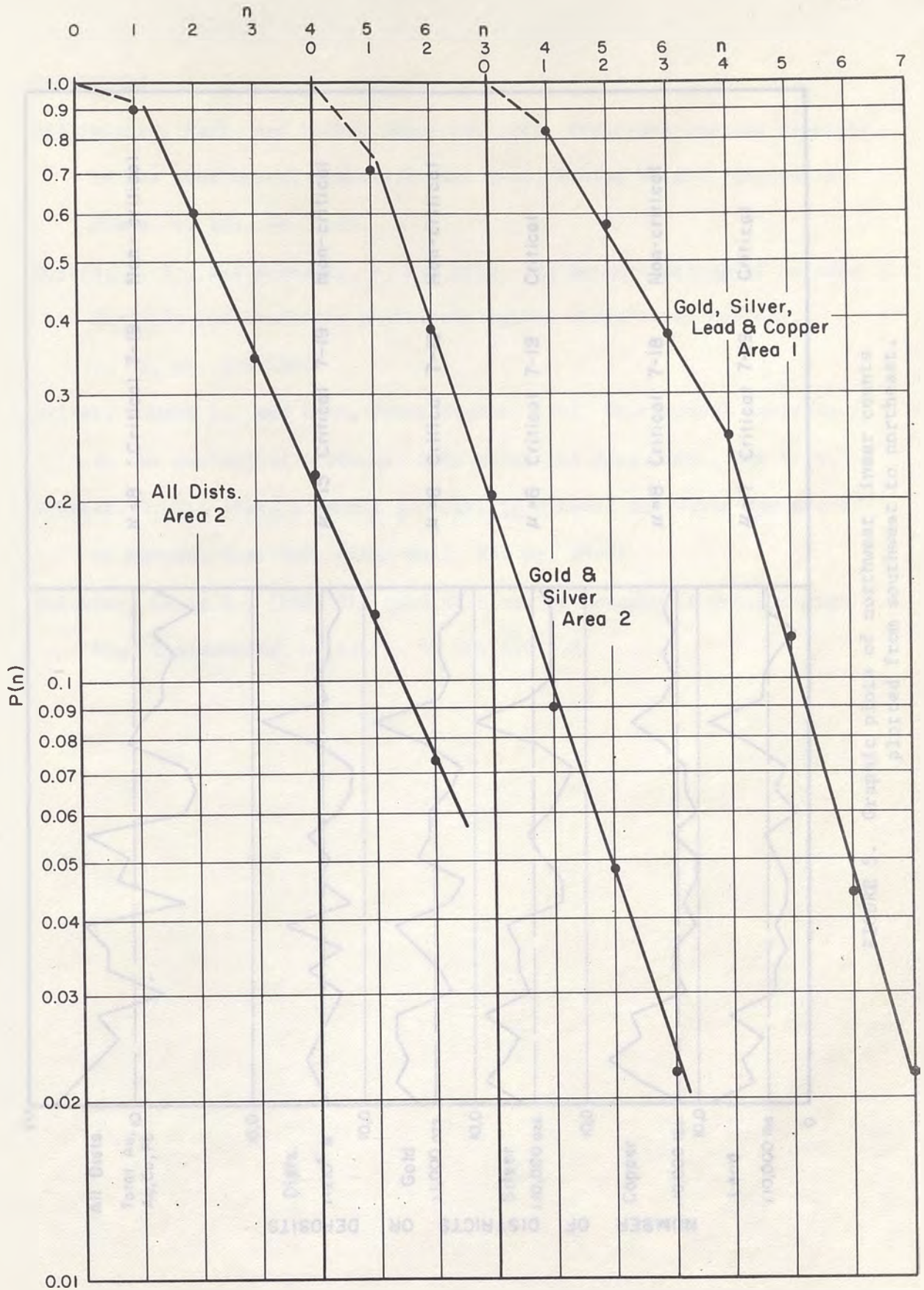


FIGURE 4. Combined probability distributions.

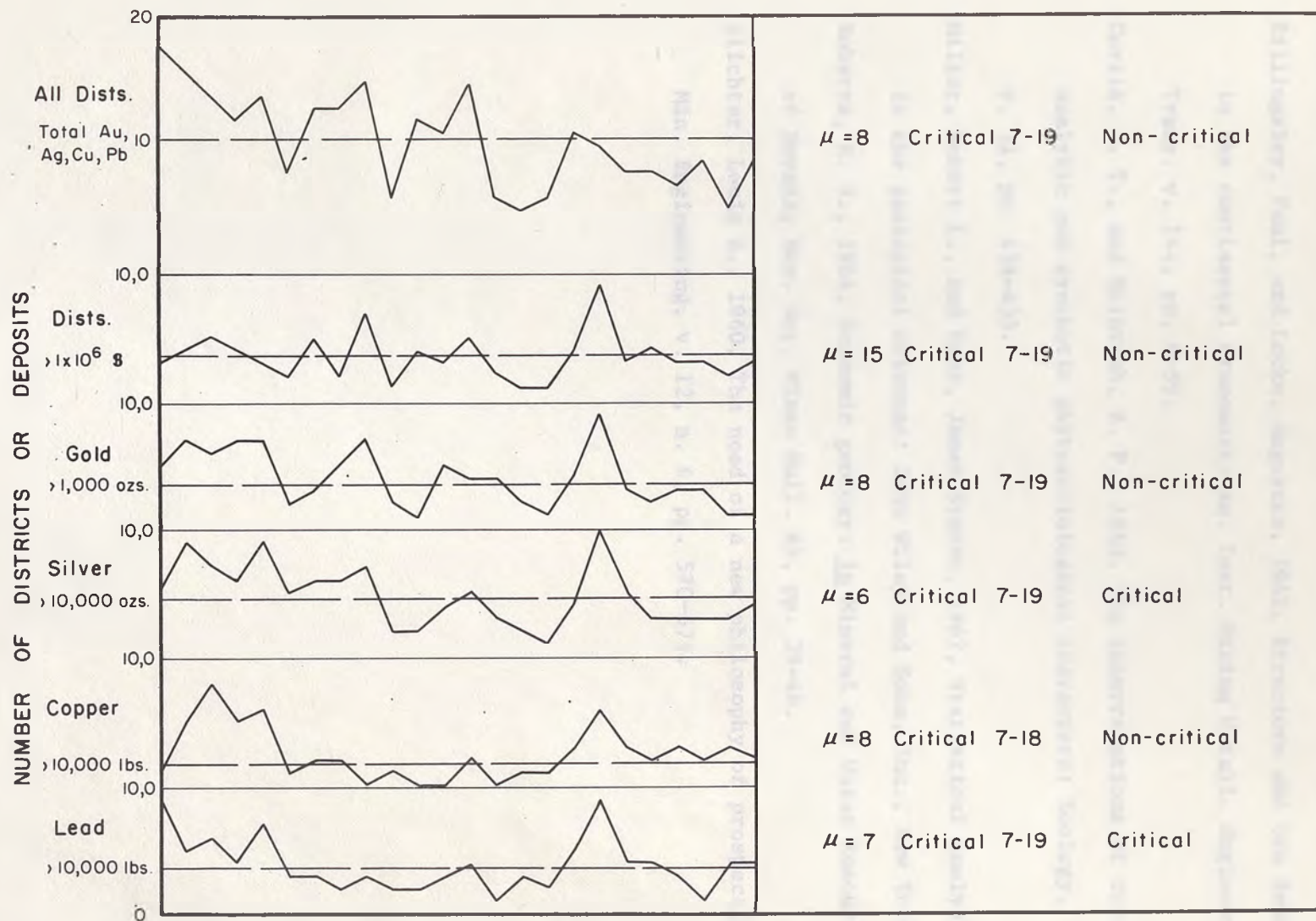


FIGURE 5. Graphic plots of northwest linear counts plotted from southwest to northeast.

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