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Atlas of Discovery Rate Profiles Showing Oil and Gas Discovery Rates by Geological Province in the United States

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Introduction

In this study, we constructed and interpreted a set of graphs describing the historical pattern of the discovery of oil and gas in each of 35 geologic provinces within the United States. Each usually includes graphs showing both incremental and cumulative rates of discovery. Other graphs show the contribution made by different size classes of oil and gas fields to the cumulative level of discovery in each geologic province. A composite of the general form of these graphs across geologic provinces supports earlier conclusions about the pattern of oil and gas discovery rates in the Permian basin (Root and Drew, 1979). We also expanded the conclusions of the Permian basin study concerning methods for forecasting future rates of discovery at the province level. In particular, we focused on the contribution of the largest field(s) to the total oil and gas reserves of a province and to the discovery portion of the wildcat drilling time series.

The overall purpose of this study was not only to present an interpretation of a very large volume of data but also to present the results in atlas form so that other analysts can draw their own conclusions.

Data sources and analytic scheme

The two main data sources used in the study were: 1) the LORENDAS oil and gas field file and 2) the Petroleum Information Inc. well file. The LORENDAS oil and gas field file contains information on more than 10,000 oil and gas fields in the United States, including the location, year of discovery, ultimate productivity, and depth of each field. Selected data items were retrieved for each of the more than one million wells of all types which are contained in the Petroleum Information well file.

The locations of fields and wells are in accordance with the AAPG-CSD geologic province code map (Meyer, 1979; Figure 1 and Table 1). Each province is made up of one or more complete counties in order to facilitate computer processing. Retrievals from both data files were first partitioned by provinces and then screened to determine which ones contained enough data to make meaningful discovery rate graphs. For thirty-five provinces, it is possible to construct at least the first three types of graphs listed below:

1. The incremental volume of oil and gas discovered per exploratory well.

2. The cumulative volume of oil and gas discovered as a function of cumulative number of exploratory wells.

3. The cumulative volume of oil and gas discovered as a function of cumulative exploratory footage.

4. A suite of graphs showing the cumulative volume of oil and gas discovered by field size class as a function of cumulative exploratory drilling.

The particular graphs were selected because they are either identical to, or very similar to, those constructed previously by many investigators to study historical rates of discovery and to forecast the ultimate productivity and rate of discovery at the province and even national level.

Results

This section contains a brief discussion of the conclusions reached from comparing graphs across geologic provinces and then comparing them to corresponding graphs from a previous study of the Permian basin (Root and Drew, 1979, Figure 3) and the United States as a whole (Hubbert, 1967, Figure 2). In many provinces the historical discovery rate patterns are very similar and in others nearly identical to those in the Permian basin. In other provinces the behavior is more complex, which is attributed in some cases to the complex unfolding of multiple exploratory plays and in others to small sets of highly variable data.

Figures 4a through 4j show the discovery rate graphs for the Mid-Gulf Coast basin (Province 210 in figure 1). Figures 4a and 4b show the incremental discovery rate graphs. Comparison of the two graphs shows that they both exhibit the same general form as well as much of the finer detail. This same high degree of correlation between incremental discovery rate graphs exists in most of the geologic provinces studied. We conclude that, in general, both types of graphs contain the same information and will therefore produce the same forecasts of the volume of oil and gas remaining to be discovered and the rate at which it will be discovered.

Comparison of the incremental-discovery rate graphs in figures 4a and 4b shows that the conclusion drawn in the Permian basin study (Root and Drew, 1979) about the general form of the incremental discovery rate curves also holds for the Mid-Gulf Coast basin. The discovery process moves through several phases, beginning with the tall spikes close to the y-axes in figures 4a and 4b. This initial phase is followed by a second phase in which the rate of discovery falls rapidly to a low but stable rate (the third phase) which persists for a long period. Once this third phase is established in a region it can be interrupted at least temporarily, as it was in Province 210 where a major discovery (the Jay field) occurred in 1970. This discovery appears as the spike at about 55 million cumulative feet of drilling (figure 4a) and at about 7000 cumulative wildcat wells (figure 4b). It is judged to be a rare event, however, for it is one of the largest onshore discoveries made in the entire United States within the last 12 years. It appears as the significant jump (at 7000 wells) in the cumulative discovery rate curve for the province (figure 4c).

The graph shown in figures 4d through 4j display cumulative discovery rate graphs by field size class for the Mid-Gulf basin. These graphs have been constructed to analyze the contributions of discoveries in each field size class to the cumulative discovery of oil and gas, as for example, the

contribution of giant fields (fields larger than 100 million BOE) or by small fields (e.g., smaller than 1.5 million BOE). It appears that small fields have been discovered at approximately a constant rate throughout the exploration history of the province. If this were found to be true in general, it would be an important element in the development of a method to estimate the aggregate volume of oil and gas remaining to be discovered in a region, and also the future rate of discovery. This type of information will also be useful in helping to explain why wildcat drilling levels remain at high levels when relatively little oil and gas is being discovered. The explanation of this phenomenon depends on the fact that the level of wildcat drilling is much more closely related to a minimum economic field size than to the total aggregate oil and gas being discovered. Therefore, as long as fields which are larger than the minimum economic field size are being discovered, wildcat drilling will continue at levels which might superficially appear to be abnormally high.

It can be concluded further that the commonly observed, nearly constant rate of discovery of small fields implies that a large number of these small fields remain to be discovered based upon the extrapolation of their historic rates of discovery. Using a discovery process model yields a realistic picture of this trend because it uses the size of fields, the search area, the efficiency of exploratory drilling, the level of wildcats, and the number of discoveries to explain the discovery process and form the basis for forecasts of future rates of discovery (Arps and Roberts (1958), Drew, Schuenemeyer, and Root, 1980).

Figures 5a through 5n are for the Gulf Coast basin (Province 220). This basin is one of the most prolific in the United States, with approximately 70 billion barrels of oil and gas equivalent discovered in 2095 oil and gas fields as of the end of 1975, compared to 4.5 billion BOE discovered in the 236 fields in the Mid-Gulf Coast basin discussed above. This much larger discovery data series produces smoother set of graphs than those for the Mid-Gulf Coast basin, as is immediately obvious from a comparison of the cumulative discovery rate curve shown in figure 5c with figure 4c. The form of this graph is almost identical to that for the Permian basin (figure 2). Figures 5d through 5n show the contribution of each field size class to the cumulative discovery rate curve. This set of graphs is similar in form to the graphs shown in figure 2 for the Permian basin (Root and Drew, 1979), especially for fields larger than approximately 100 million BOE (figures 5k through 5n). We conclude that the strongly diminishing rate of return observed in both the Gulf Coast and Permian basin means that few oil and gas fields of this size or larger remain to be discovered in either basin even if new plays are developed.

The cumulative discovery rate graphs for the smaller field size classes become more linear with decreasing field size (figures 5d through 5k; the last flat line segment at the top of each of these graphs should be disregarded; it is caused by the incomplete recording of discoveries in the most recent years due to lack of data).

The suite of discovery rate graphs displayed in figures 6a through 6m are for the Gulf of Mexico, combining Provinces 951 and 954. In this region, approximately 30 billion BOE have been discovered in the combined federal and state waters. The graphs show what is commonly referred to as multiple exploration play behavior.

From figures 6a and 6b, it could be concluded initially that the exploration history has progressed along a path similar to the two onshore provinces discussed above (that is, there was a high initial rate of discovery followed by a rapid transition to a third phase where a low but stable rate of discovery persisted for a long time), but such a generalization is only cursory. Offshore provinces have been explored differently than onshore basins because they have been explored progressively or in stages which are related to water depth and many other factors which are peculiar to the offshore province. Much of this information is captured by the discovery rate curves displayed in figures 6a through 6n. For example, the initial high rate of discovery (figures 6a and 6b) is attributable to the discovery of four very productive Miocene salt domes which were discovered close to shore in very shallow water. As another example, the major gas discoveries in the Pleistocene trend in the early 1970's appear as a sharp break in the slope in the cumulative discovery rate graph at about 3000 wildcat wells (figure 6c). This sharp increase in the cumulative discovery rate curve involves the discovery of over 6 billion BOE, mostly in moderate to large sized fields. The impact of these discoveries on the incremental discovery rate curves is also visible in both figures 6a and 6b. For example, in figure 6b the incremental rate of discovery jumps from less than 2 million BOE per wildcat well to nearly 8 million BOE per wildcat well in the interval between 3000 and 3500 wildcat wells. The effect of this play upon the cumulative discovery rate curves for each field size class is evident in figures 6g through 6j as increases in slope within the 3000-4000 wildcat well region. The range in field sizes which these graphs cover (6.1 to 97.2 million BOE) is the range within which almost all the Pleistocene discoveries fell.

The discovery rate graphs for the Arkla basin (Province 230) are displayed in figures 7a through 7k. The cumulative discovery graph for all field sizes (figure 7c) shows two major discovery events in this geologic province. The first of these occurred during the 1920's and involved the discovery of approximately 4.0 billion BOE and the second major discovery event started in the mid-1930's and resulted in the discovery of another 6 billion BOE.

The historical pattern of oil and gas discoveries for the East Texas basin (Province 260) are shown in figures 8a through 8i. The discovery history of this basin is the most unusual among the geologic provinces discussed so far. This is linked to the fact that nearly one half of all the oil and gas discovered in the entire basin (13.2 billion BOE) is contained in one field, the supergiant East Texas field, discovered in 1930. Two discoveries made in 1939 and 1940 together contain over a billion additional barrels. The discovery of these three largest fields are clearly identifiable as the there major spikes in both figures 8a and 8b. The other 229 discoveries contain less than 45 percent of the total volume of oil and gas in the basin.

A somewhat different historical pattern of discovery is revealed for the Michigan basin (Province 305) in figures 9a through 9i. As in the graphs for the East Texas basin, three distinct spikes appear in the incremental discovery rate graphs (figures 9a and 9b), but they are more widely dispersed across the drilling history. The first is a composite spike caused by the discovery of several large fields between 1931 and 1945, a period when only several hundred wildcat wells were drilled in the entire basin, whereas the second spike was caused by the discovery of two large fields in 1958. The third spike is the consequence of a pinnacle reef play, which started during the late 1960's.

Figures 10a through 10i show discovery rates for the Illinois basin (Province 315). This basin has experienced a simple exploration history similar to the single exploration play described by Drew (1975). In the strict sense of this model the play is initiated by the discovery of a surprisingly large field. Shortly after the play begins, most of the remaining large and intermediate size fields are discovered. After these larger fields are discovered the play does not stop, but continues for a relatively long period of exploratory drilling during which many discoveries may be made, most of which are small.

In the Illinois basin most of the oil and gas was discovered before the first 500 wildcat wells had been drilled (by 1944). Exploratory drilling did not stop at this point, but continued at a fairly steady pace, and by 1975 more than 16,000 exploratory wells had been drilled. This effort resulted in the discovery of a large number of small fields between the end of World War II and 1975.

The graphs for the Arkoma basin (Province 345) are shown in figures 11a through 11j. More than 3000 wells have led to the discovery of over 400 million barrels of oil and approximately 2 billion barrels of oil-equivalent in natural gas. The discoveries proceeded according to a modified single play model, the modification being a secondary rejuvenation during the late 1950's. The individual spikes in figures 11a and 11b are for the most part the result of the discovery of single large fields. Note that these spikes decrease in both frequency and magnitude as the exploratory drilling process progressed.

Figures 12a through 12i display the discovery rate history for the South Oklahoma folded belt (Province 350). The cumulative discovery graph in figure 12c contains two sharp jumps, both of which were caused by single large discoveries, Sho-Vel-Tum in 1923 and Golden Trend in 1946. Otherwise, its discovery history is similar to the single exploration play model.

The pattern of discovery on the Chautauqua platform (Province 355) is similar in form to that of the Permian basin (figures 13a through 13j). As with the Permian basin, the Chautauqua Platform experienced an initial high discovery rate of short duration which was complete by 1930 (fewer than 2000 wildcat wells) during which over 7 billion BOE were discovered. This is approximately 85 percent of all the oil and gas found in this geologic province. From 1930 through 1975 another 11,500 wildcat wells were drilled, which resulted in the additional discovery of only about 1 billion BOE. The discovery rate graphs for each field size (figures 13d through 13j) show the typical discovery rate of returns to exploratory drilling with increasing field size that has been discussed in detail by Drew and others (1982).

The graphs displaying the discovery history for the Anadarko basin (Province 360) are ahown in figures 14a through 14k. Figures 14a through 14c show that almost half of the 12.6 billion BOE found in this basin was discovered at the very start of the exploration. This is a consequence of the 1918 discovery of Hugoton, the largest gas fields in the United States. Further examination of figure 14c reveals that a new exploration play may have begun in the basin after about 9000 wildcat wells had been drilled (in the mid-1960's). This increase in the slope of the cumulative discovery rate curve was, in fact, caused by a new exploration play in which the pay zones were primarily in the Houton and Simpson formations at depths below 10,000 feet.

The three graphs in figures 15a through 15c display the aggregate discovery rate curves for the Cherokee basin (Province 365). This basin is very small and is located mostly in southeastern Kansas. Nearly 1600 exploratory wells resulted in only 24 discoveries through the end of 1975. Even though the historical discovery rate for this basin is sparse, it was included in the analysis to show that even here the discovery rate profiles follow the typical pattern.

The Nemaha anticline (Province 370) is a long, linear feature which trends in a north-south direction across southeastern Nebraska and most of eastern Kansas. The volume of oil and gas discovered in this geologic province is rather small, less than 800 million BOE through the end of 1975. While this volume is credited to a total of 77 fields, nearly 40 percent of it occurs in the El Dorado field, which was discovered in 1915. Note that the cumulative discovery profile for the area (figure 16c) exhibits the pattern of a continually declining rate of return to exploratory drilling throughout time.

The Sedgwick basin (Province 375) is also located in Kansas. Its 139 oil and gas fields discovered through 1975 contained 1.3 billion BOE, with the first discovery having been made in 1919 (figures 17a through 17h). Over 400 million barrels was found in a single year (1949) when four discoveries were made, including Spivey-Grabs-Basil. The discovery of this field appears in the cumulative discovery rate curve (figure 17c) as a jump at around 1500 wildcat wells, and as the tallest spike in figure 17b. Subsequently, the basin has gone through a long phase of low and declining rates of return to exploratory drilling.

The discovery rate data for the Salina basin (Province 380) has been included here even though only a very small amount of oil and gas has been discovered in order to show again that at the regional level, declining rates of return to exploratory drilling prevail (figures 18a through 18c).

The cumulative discovery rate graphs (figures 19a through 19h) for the central Kansas uplift (Province 385) display a pattern similar to that observed in the Permian basin and in most of the geologic provinces discussed above. The trend from an approximately linear growth of cumulative discoveries, i.e. constant incremental discovery rate, for the smallest field size (figure 19d) toward an increasingly nonlinear growth of cumulative discoveries for larger field sizes (figures 19e through 19h) is obvious and is again identified as the driving force behind the ever-declining rate of returns to exploratory drilling in this and most other geologic provinces.

The discovery rate graphs for the Williston basin (Province 395) are displayed in figures 20a through 20h. No particular analysis for this basin is offered because the discovery history is nearly identical to those already observed in most of the geologic provinces already examined.

While very little oil and gas has been discovered in the Ouachita tectonic belt province (Province 400) its discovery rate history was included simply to expand the coverage (figures 21a to 21c).

The discovery rate graphs (figures 22a through 22h) for the Fort Worth syncline (Province 420) are atypical because they exhibit less of a diminishing rate of return to exploratory drilling than commonly observed. It is true that the largest field was discovered early, before the completion of the 2000th wildcat well, but the volume of oil and gas discovered per unit of exploratory drilling did not then diminish as fast (relatively) as it did in many of the other geologic provinces examined. Part of this is a result of the fact that nearly 1 billion BOE was discovered in 176 fields after the largest field was discovered, i.e. the largest field contained a relatively small proportion of the total oil and gas discovered in this province.

The Bend Arch (Province 425) covers an area approximately the same size as the Chautauqua platform, but it has been drilled more intensively, with 20,700 exploratory wells through the end of 1974 versus 13,400 exploratory wells on the Chautauqua platform during the same period. However, only about one-fourth of the oil and gas has been discovered in the Bend Arch province as has been discovered on the Chautauqua platform. Such differences are of course commonly observed, but only rarely do they have much effect on the pattern of discovery rates: the graph in figure 23c is nearly identical in form to the graph shown in figure 13c.

The discovery rate graphs for the Permian basin (Province 430) are displayed in figures 24a through 24m. The incremental and cumulative discovery rate profiles for all field sizes (figures 24a through 24c) and the cumulative discovery rate profiles for individual field sizes (figures 24d through 24m) are nearly identical to those from an earlier, much more detailed study by Root and Drew (1979). The small differences which exist have arisen because ultimate productivity data on nearly 3000 very small fields were available to Root and Drew which are not recorded in the LORENDAS field file. The results of this earlier study of the pattern of discovery in the Permian basin led to the current effort, where the purpose is to determine whether the results obtained from the study of one basin are applicable to other basins and geologic provinces.

The Palo Duro basin (Province 435) stretches from central New Mexico across the Texas Panhandle into southern Oklahoma. A little more than 2.1 billion BOE had been discovered through the end of 1975. Twenty-eight percent of this total occurs as Wichita County Regular, which includes the first discovery made in the basin in 1911. The next two discoveries occurred in 1915 and 1918. The volume of oil and gas in these two fields combined with the first discovery gives a total of over 1 billion BOE. Approximately half of the known oil and gas in this basin is accounted for by the first three discoveries, all of which were made by 1918, and they were made with only 59 wildcat wells. Between 1918 and 1975, 4100 wildcat wells discovered an additional billion BOE in 78 fields. Thus the pattern of discovery exhibits a more severely declining rate of returns to exploratory drilling, and earlier in the basin's exploration, than in the Permian basin with its archetypal basin profile (see, for example, figure 25c and figure 24c).

The aggregate discovery rate curves for the Sweetgrass Arch region (Province 500) are shown in figures 26a through 26c. The pattern of discovery for this region exhibits the typical pattern of discovery; see specifically figure 26c.

The next eight sets of discovery rate graphs are for eight Rocky Mountain area basins, and the last province is the Cook Inlet basin in Alaska (Province 820; not shown in figure 1). Most of the eight Rocky Mountain basins exhibit

the typical diminishing rate of return to exploratory drilling phenomenon. Only two of these basins appear to have compound cumulative discovery rate curves: the Powder River basin (figure 27c) and the Denver basin (figure 31c). The six other Rocky Mountain basins have cumulative discovery rate curves which exhibit the more commonly observed simple declining rate of returns to exploratory drilling. The compound form of the cumulative discovery rate curve for the Powder River basin is a consequence of the multiple exploratory plays which unfolded in the basin. Several of these plays occurred during totally isolated time periods and, therefore, the behavior of the plays can be separated easily from the total record of drilling and discovery. In the Denver basin there has been basically only a single exploration play, but it unfolded in a compound fashion because a large block of acreage in the exploration play was withheld by the Union Pacific Railroad. Some fifteen years after the main exploration play had ended, the Union Pacific released the sequestered acreage, and subsequent drilling on this acreage led to a mini-play which in turn gives the cumulative discovery curve its compound form (figure 31c).

Acknowledgements

The writers wish to acknowledge the complex computer code written by Roger Bowen of the Branch of Resource Analysis which allocated the wells in the Petroleum Information Well History Control file according to the AAPG-CSD county codes.

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Table 1.--Geologic provinces of United States (to accompany AAPG-CSD geologic provinces map)

100 New England province
110 Adirondack uplift
120 Atlantic Coast basin
130 South Georgia-North Florida sedimentary province
140 South Florida province
150 Piedmont-Blue Ridge province
160 Appalachian basin

200 Warrior basin
210 Mid-Gulf Coast basin
220 Gulf Coast basin
230 Arkla basin
240 Desha basin
250 Upper Mississippi embayment
260 East Texas basin

300 Cincinnati arch
305 Michigan basin
310 Wisconsin basin
315 Illinois basin
320 Sioux uplift
325 Iowa shelf
330 Lincoln anticline
335 Forest City basin
340 Ozark uplift
345 Arkoma basin
350 South Oklahoma folded belt province
355 Chautauqua platform
360 Anadarko basin

365 Cherokee basin
370 Nemaha anticline
375 Sedgwick basin
380 Salina basin
385 Central Kansas uplift
390 Chadron arch
395 Williston basin

400 Ouachita tectonic belt province
405 Kerr basin
410 Llano uplift
415 Strawn basin
420 Fort Worth syncline
425 Bend arch
430 Permian basin
435 Palo Duro basin
440 Amarillo arch
445 Sierra Grande uplift
450 Las Animas arch
455 Las Vegas-Raton basin
460 Estancia basin
465 Orogrande basin
470 Pedregosa basin
475 Basin-and-Range province
500 Sweetgrass arch
505 Montana folded belt province
510 Central Montana uplift
515 Powder River basin
520 Big Horn basin
525 Yellowstone province
530 Wind River basin
535 Green River basin
540 Denver basin
545 North Park basin
550 South Park basin
555 Eagle basin
565 San Juan Mountain province
565 San Juan Mountain province
570 Uinta uplift
575 Uinta basin
580 San Juan basin
585 Paradox basin
590 Black Mesa basin
595 Piceance basin

600 Northern Cascade Range-Okanagan province
605 Eastern Columbia basin
610 Idaho Mountains province
615 Snake River basin
620 Southern Oregon basin
625 Great Basin province
630 Wasatch uplift
640 Mojave basin
645 Salton basin
650 Sierra-Nevada province

700 Bellingham basin
705 Puget Sound province
710 Western Columbia basin
715 Klamath Mountains province
720 Eel River basin
725 Northern Coast Range province
730 Sacramento basin
735 Santa Cruz basin
740 Coastal basins
745 San Joaquin basin
750 Santa Maria basin

755 Ventura basin
760 Los Angeles basin
765 Capistrano basin

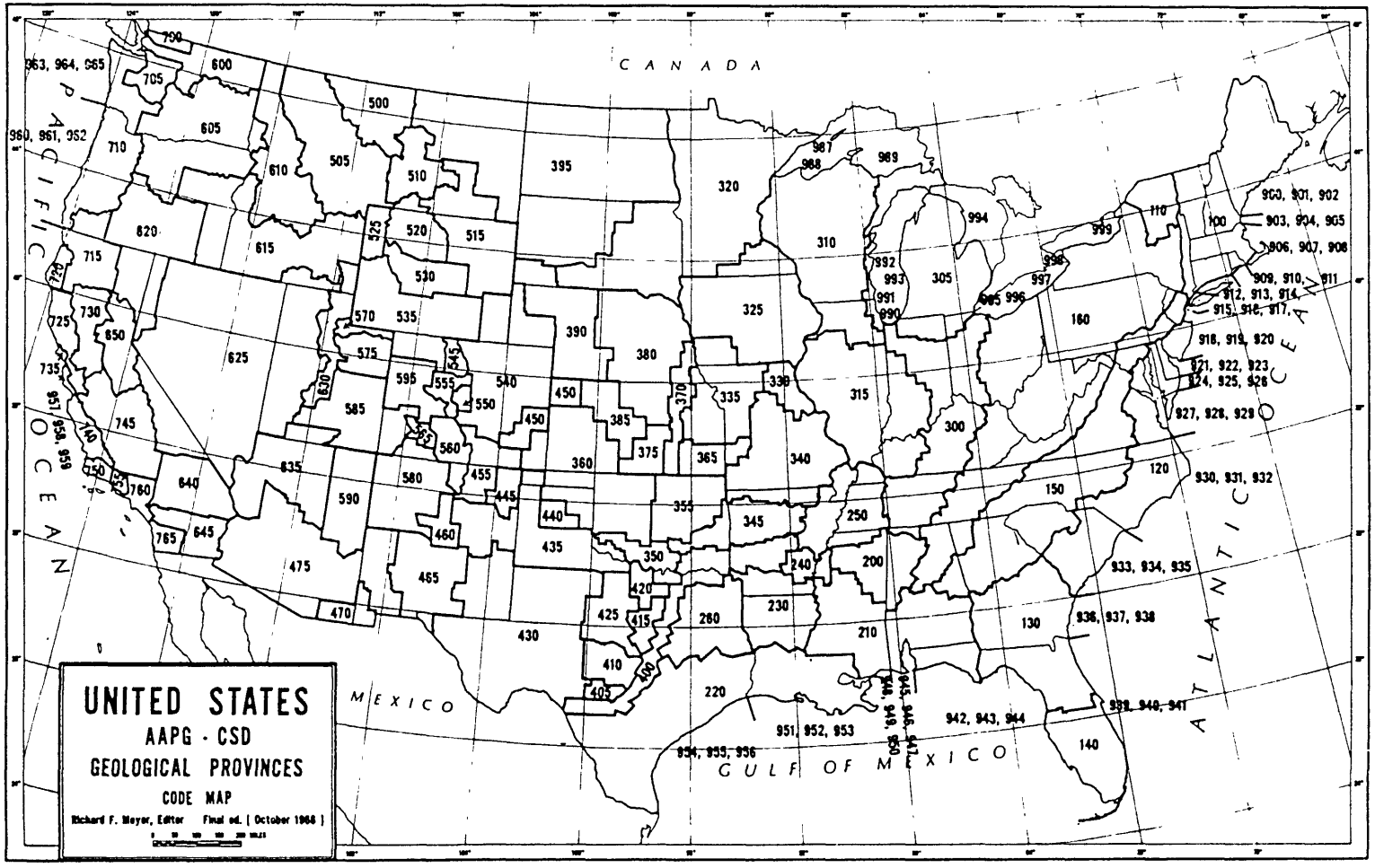

FIG. 1

Figure 1.--Map of United States showing AAPG-CSD geological provinces as listed in table 1.

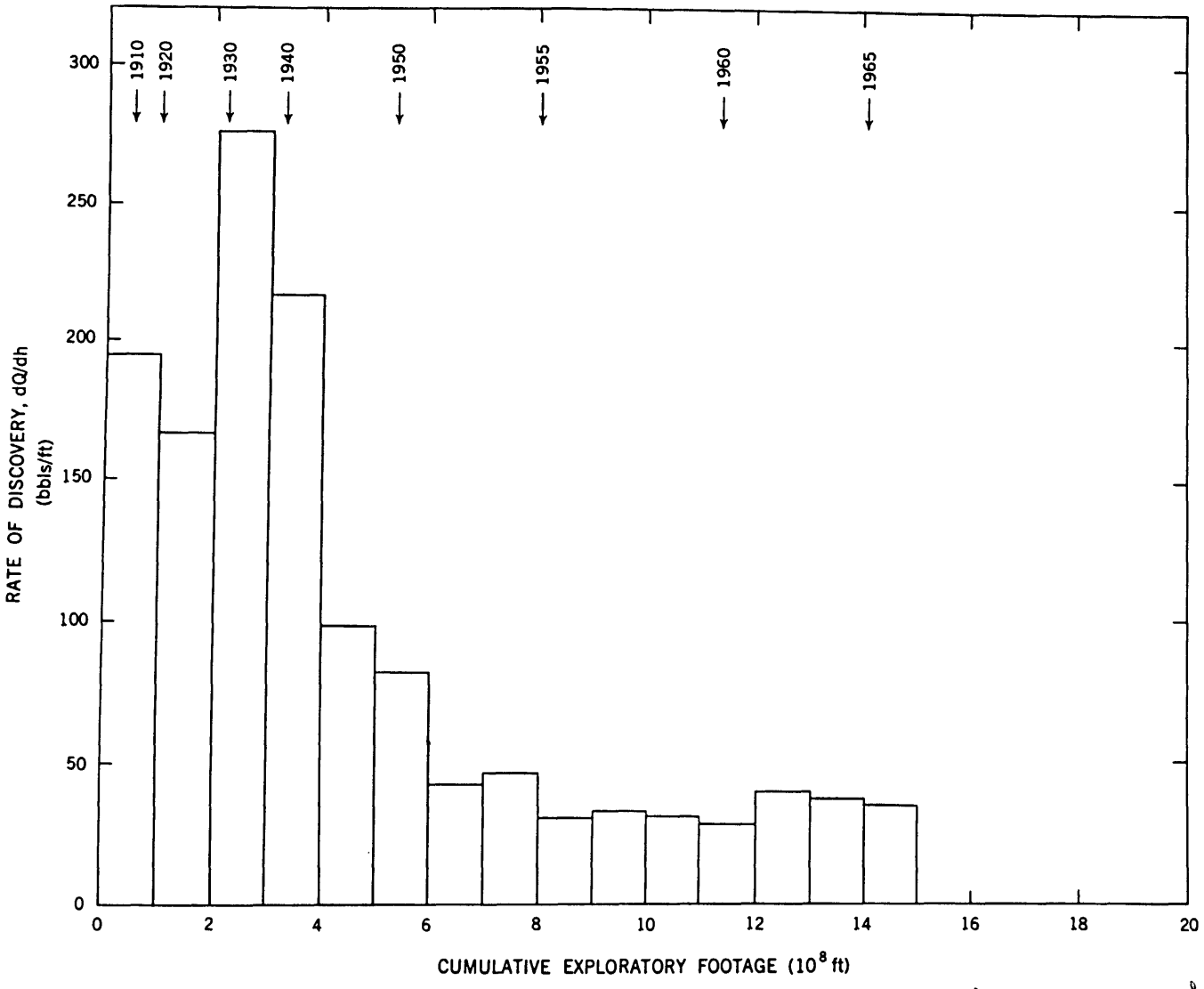

Figure 2.--Incremental discovery rate curve for the United States (Hubbert, 1967).

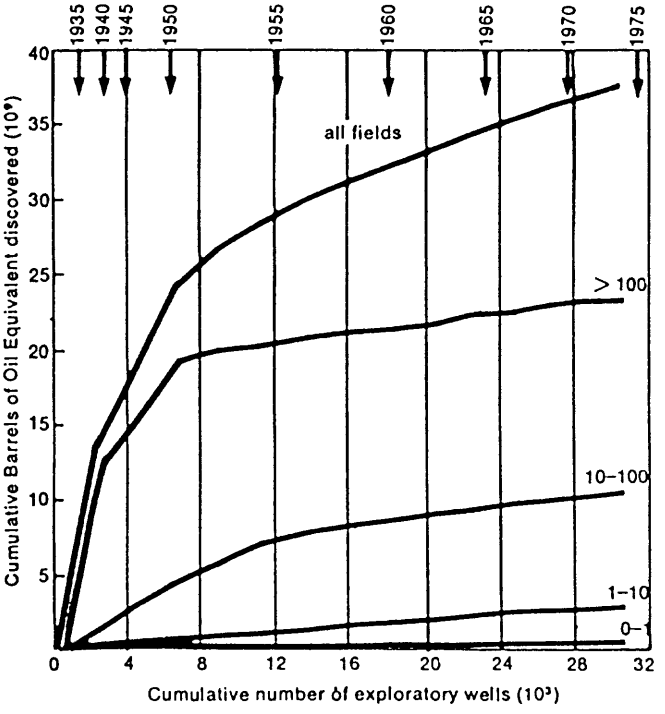

Figure 3.--Cumulative discovery rate graphs for the Permian Basin (after Root and Drew, 1979).

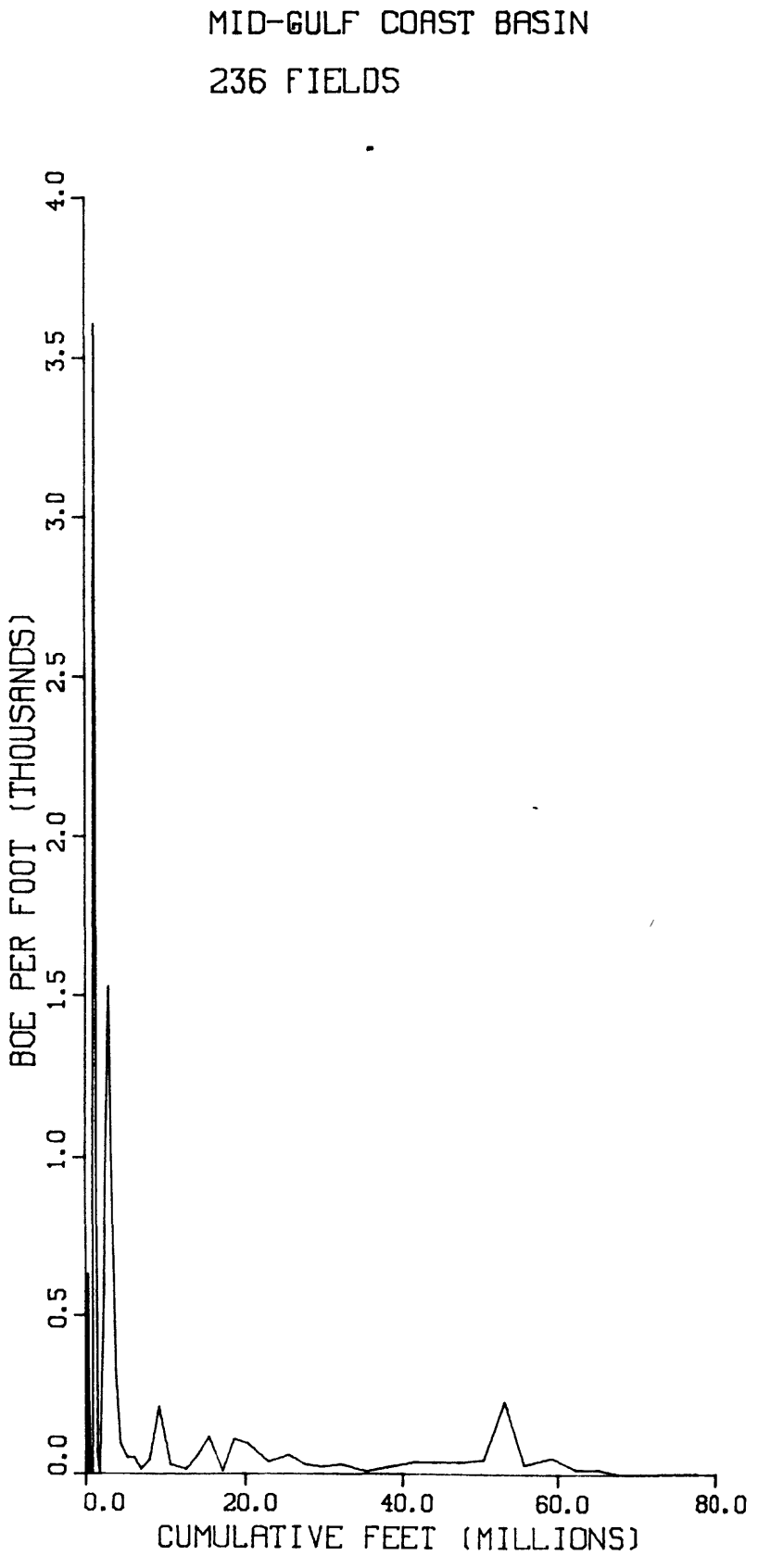

Figure 4a.--Graph for the Mid-Gulf Coast Basin showing: BOE per foot vs. cumulative footage drilled.

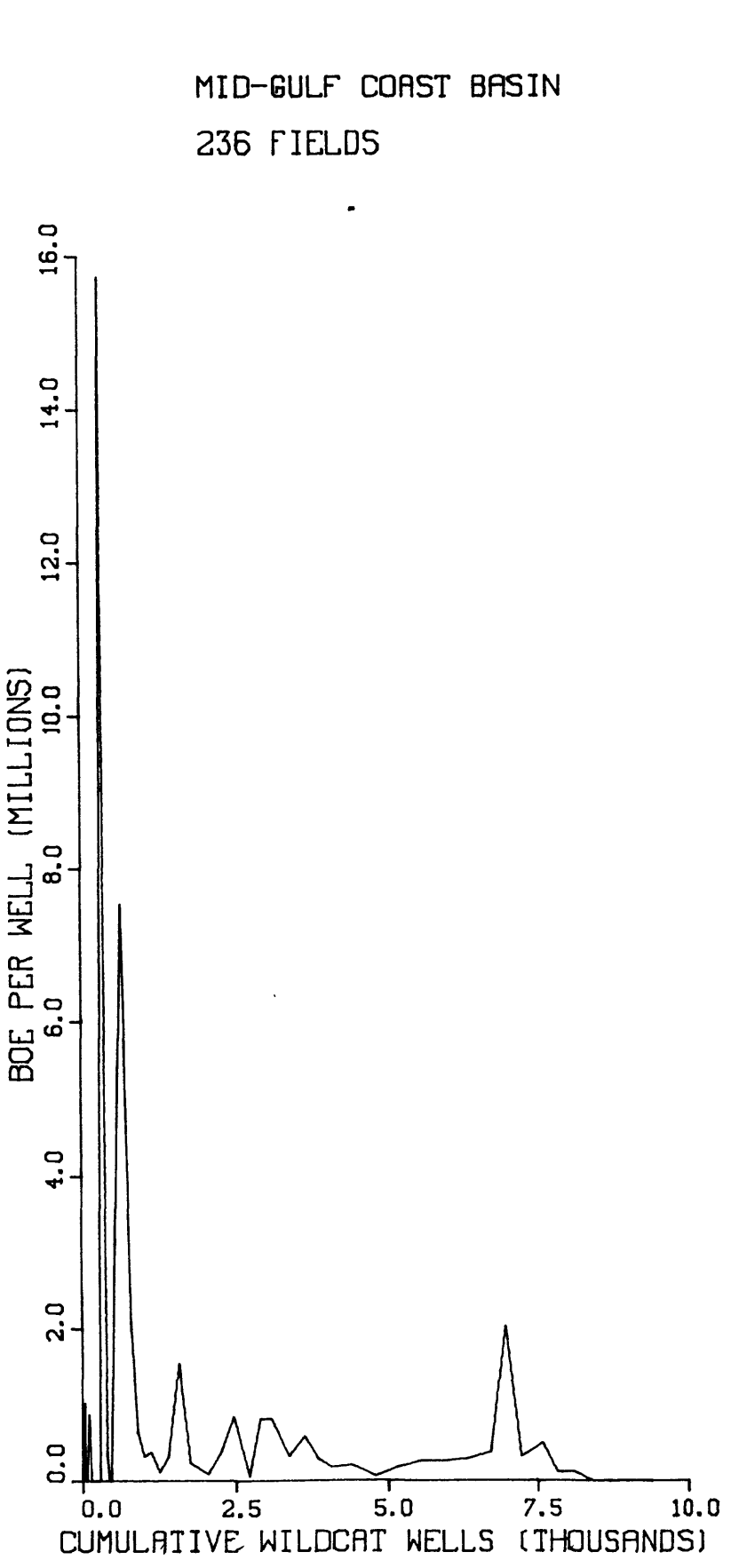

Figure 4b.--Graph for the Mid-Gulf Coast Basin showing: BOE per well vs. cumulative wells drilled.

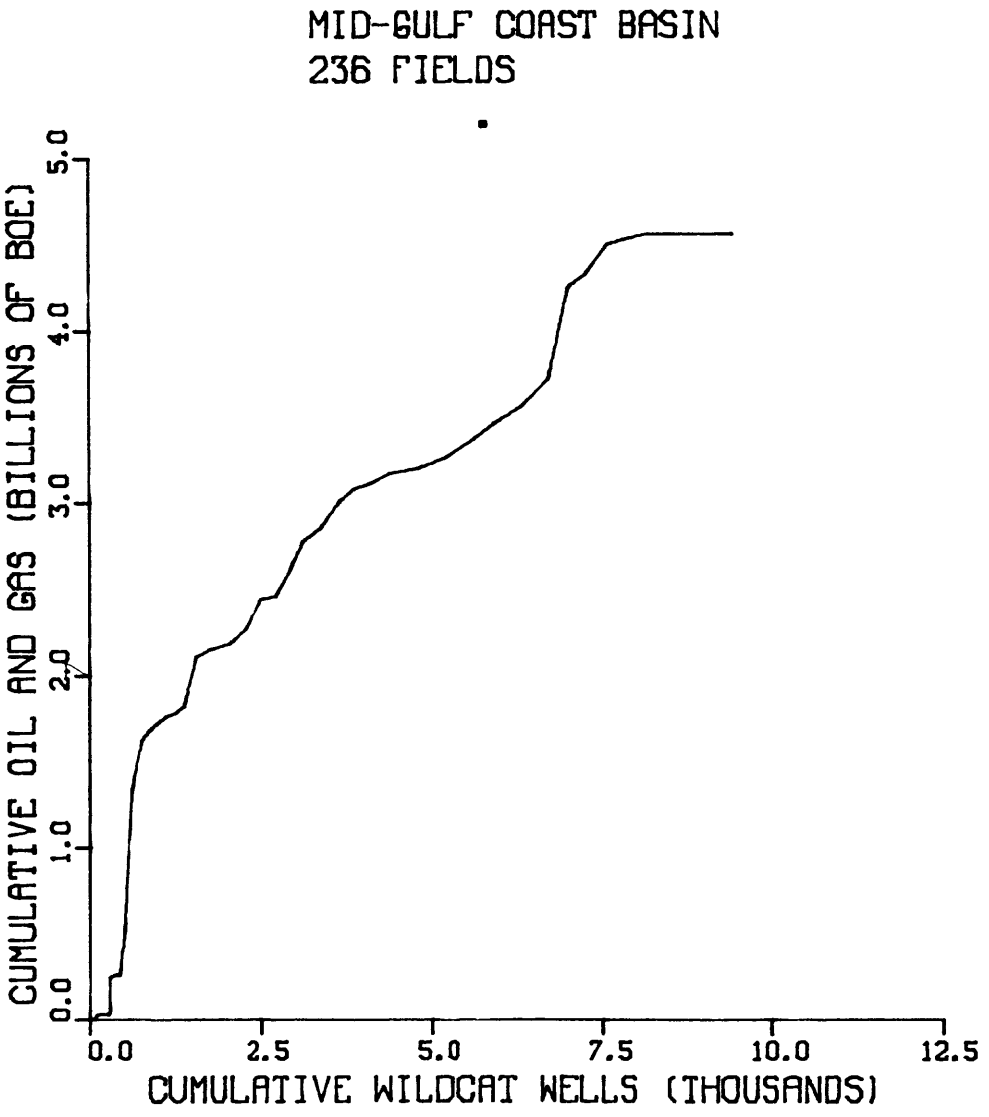

Figure 4c.--Graph for the Mid-Gulf Basin showing: cumulative oil and gas vs. cumulative wells drilled for all fields.

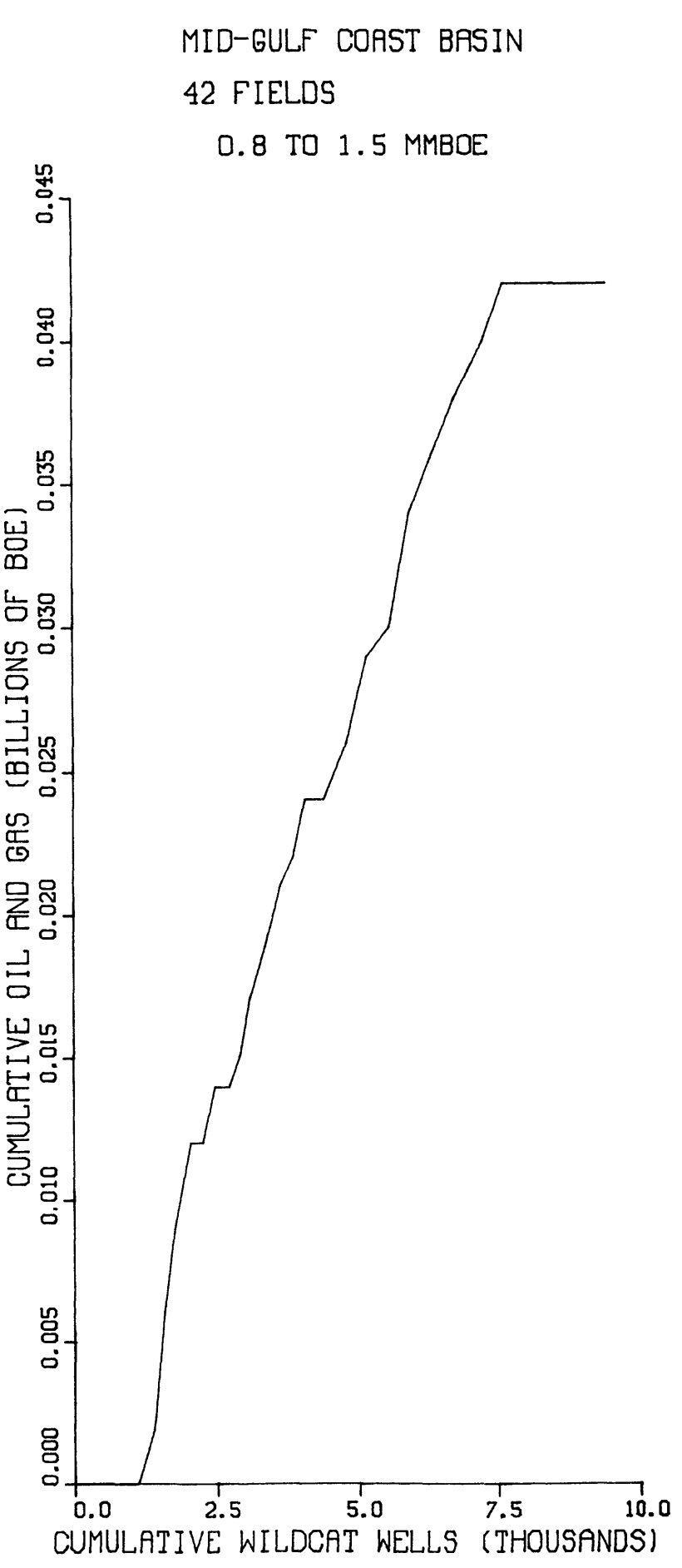

Figure 4d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

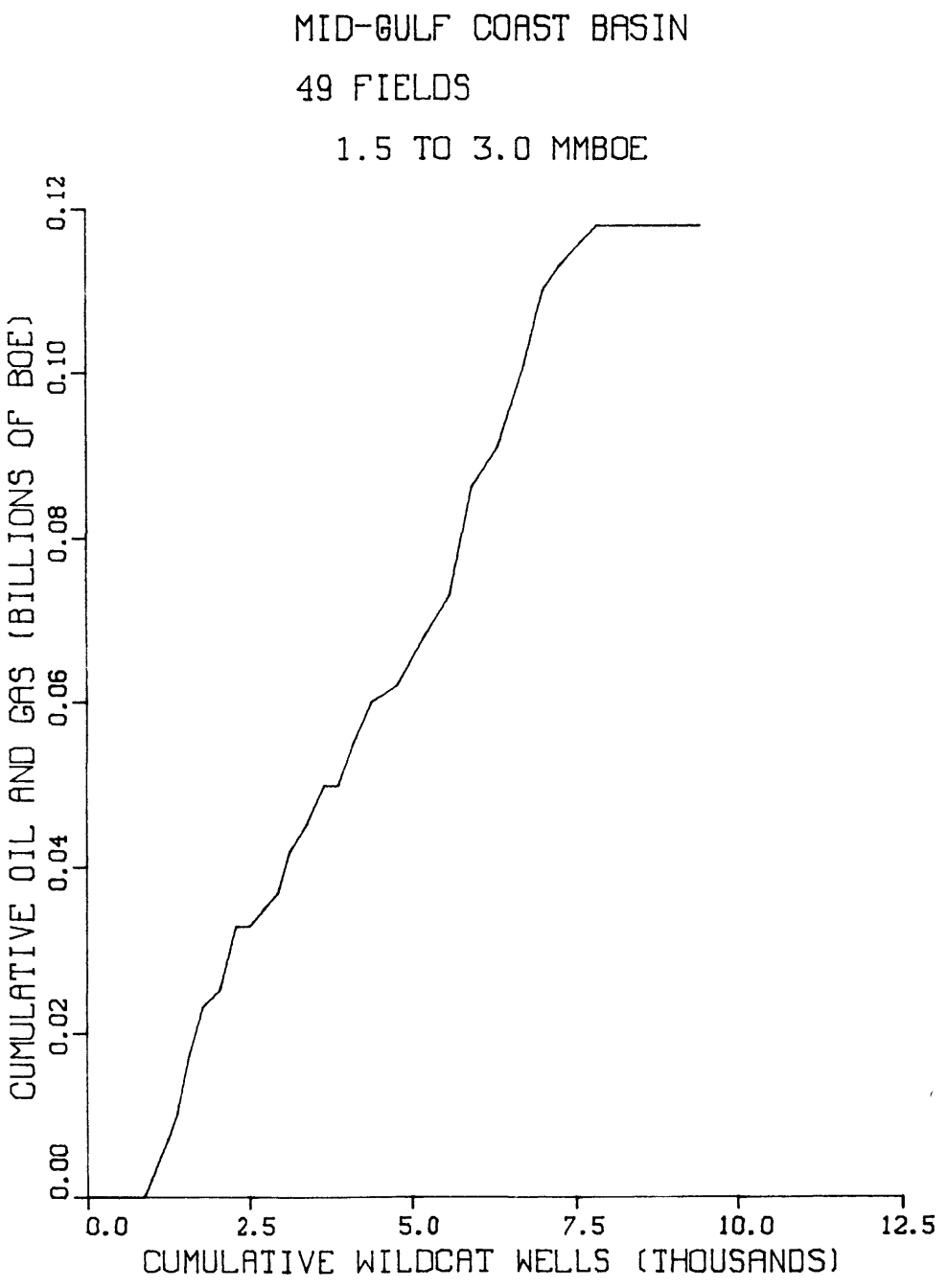

Figure 4e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

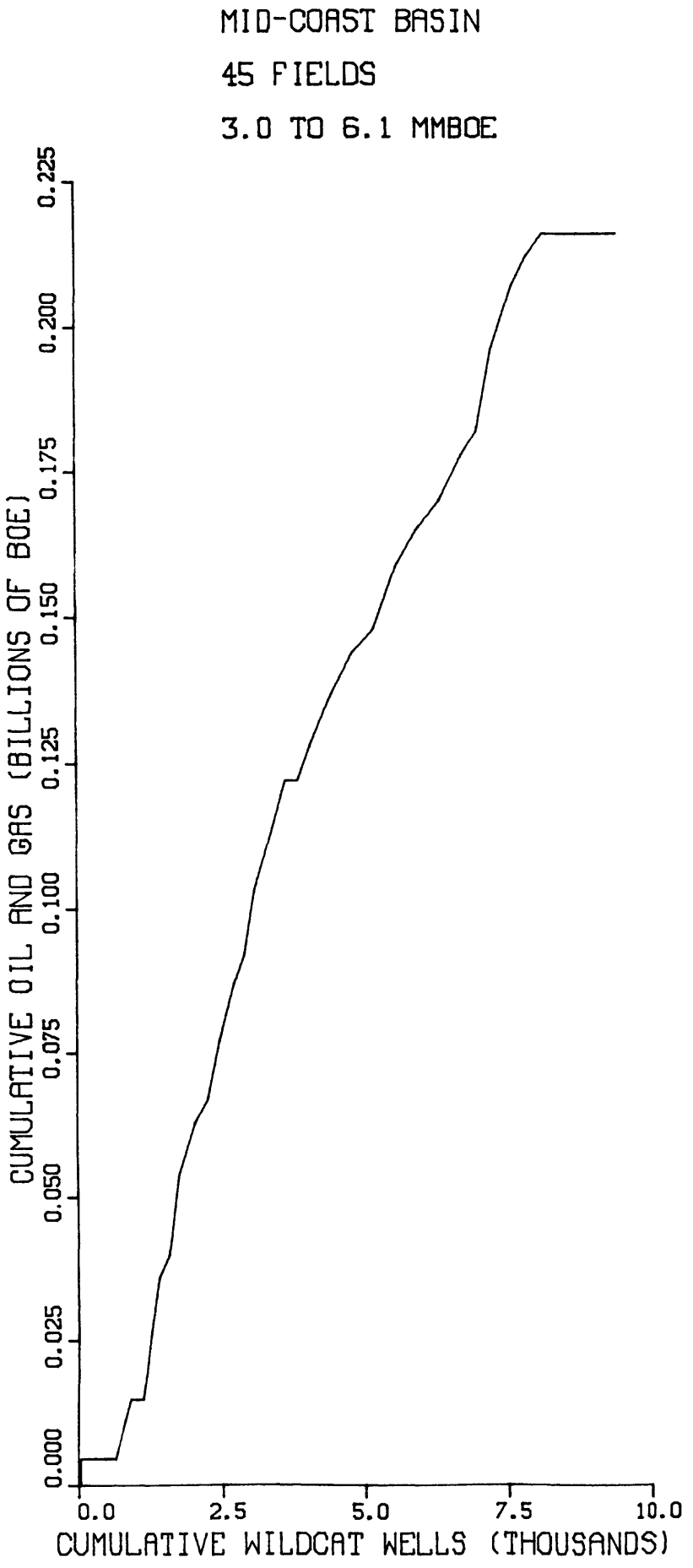

Figure 4f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0.6.1 MMBOE.

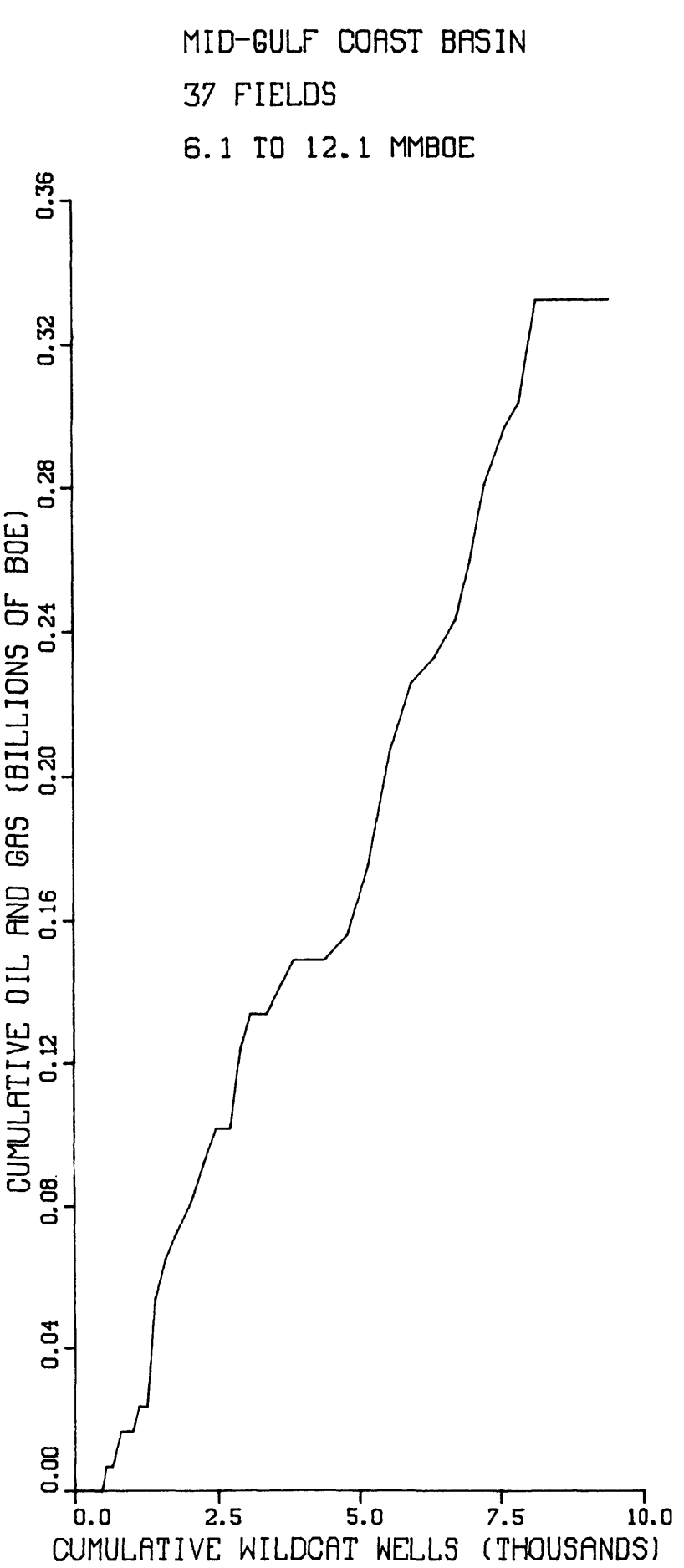

Figure 4g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

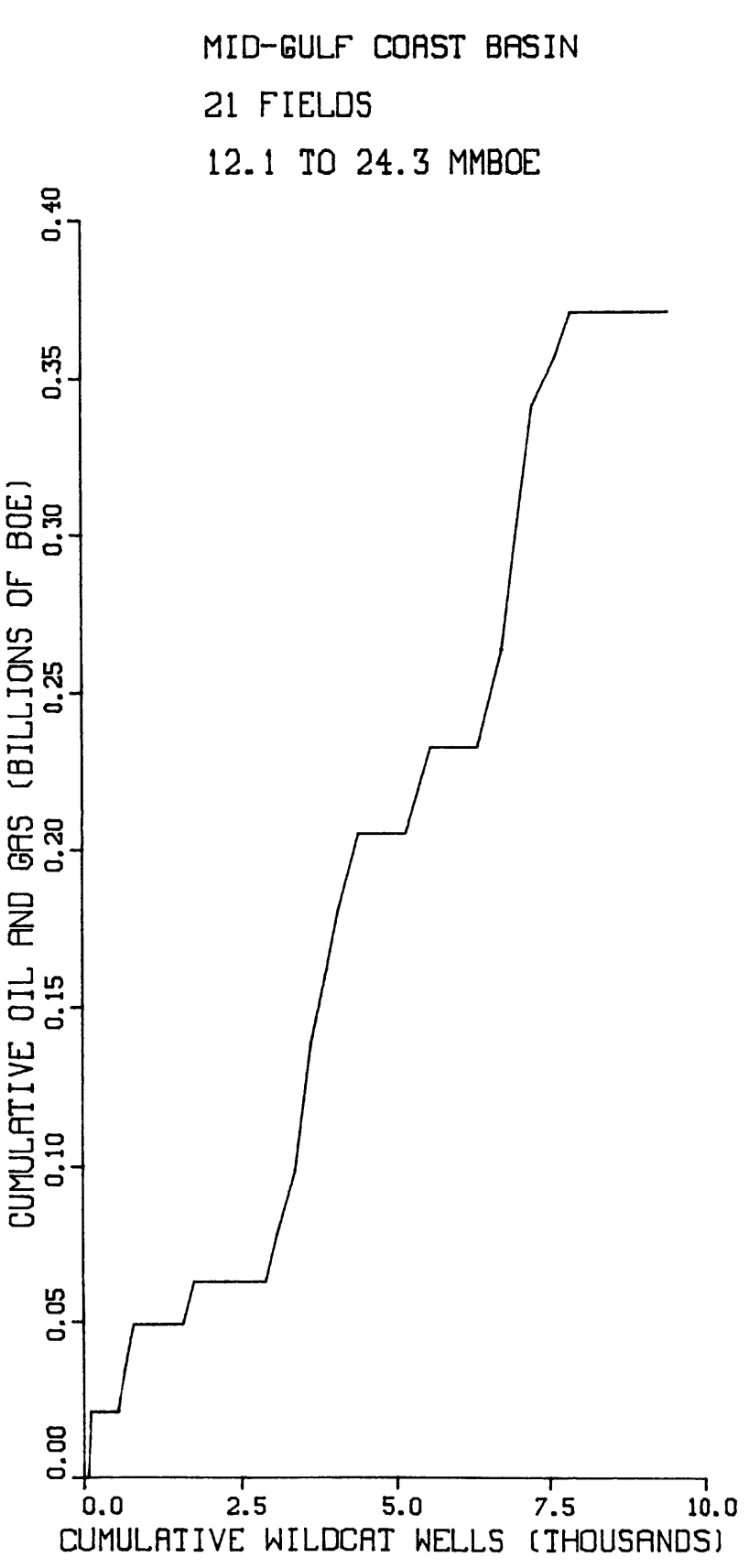

Figure 4h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

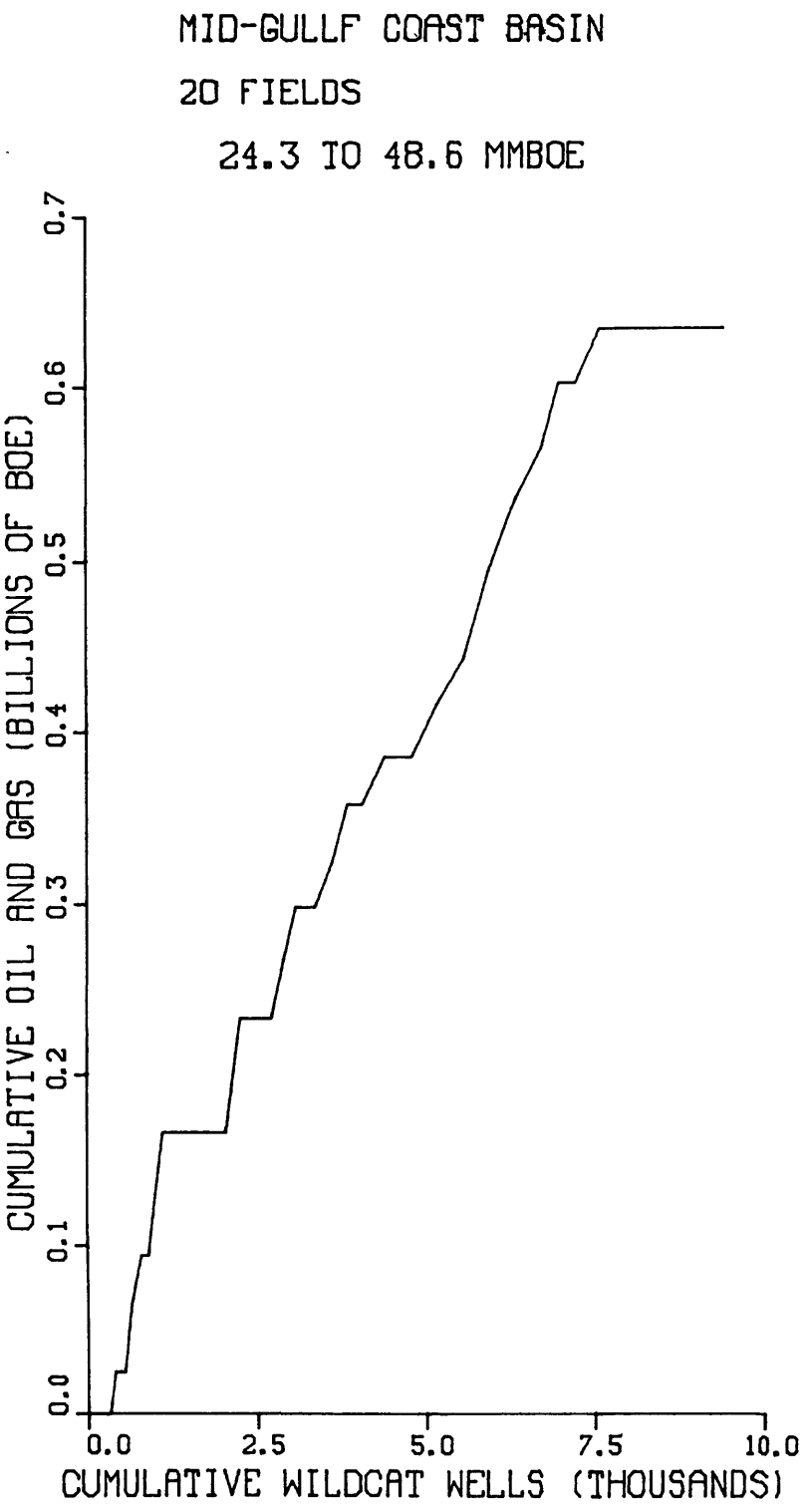

Figure 4i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

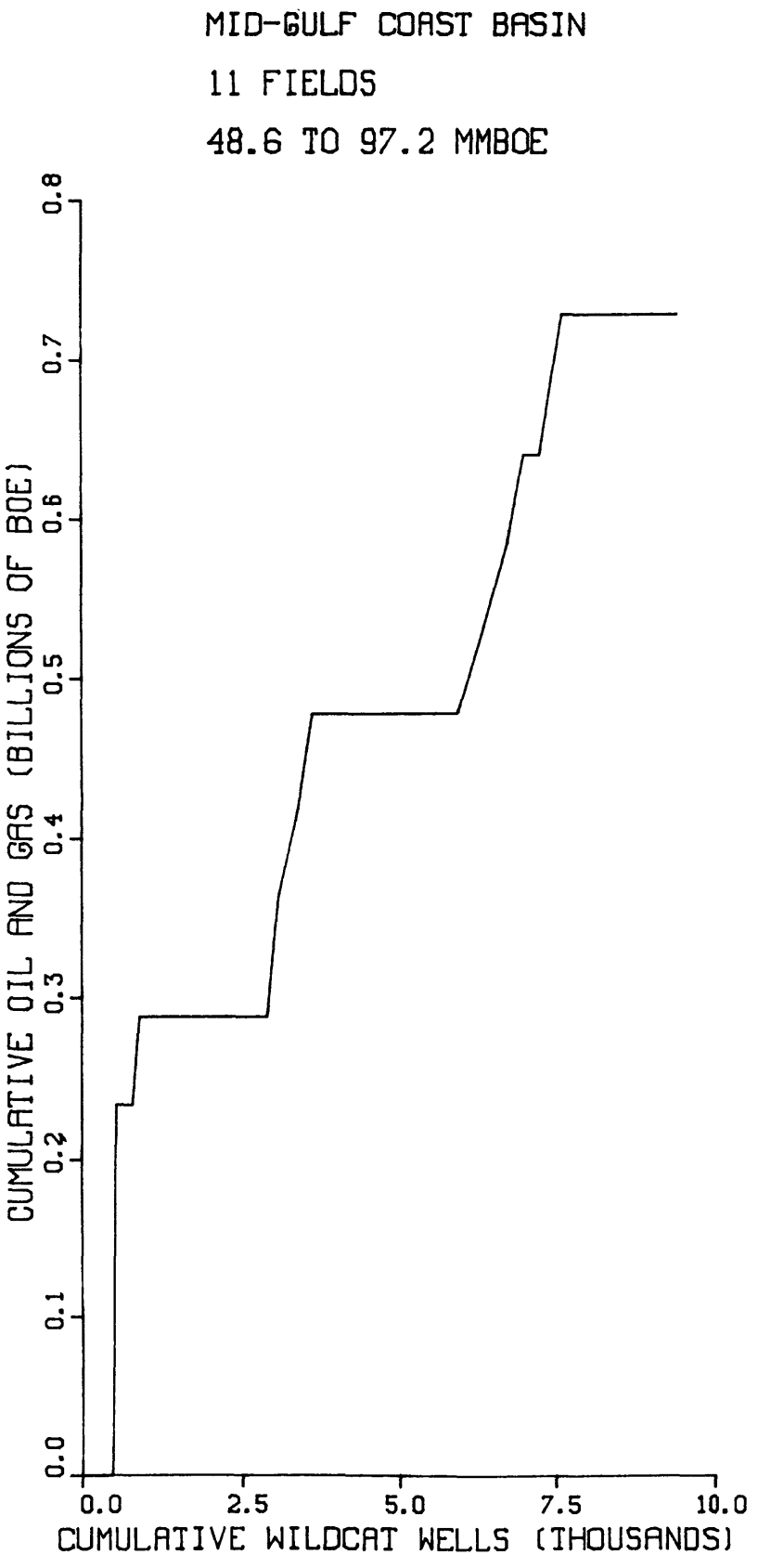

Figure 4j.--Cumulative oil and gas vs. cumulative wells for fields in the size range 48.6-97.2 MMBOE.

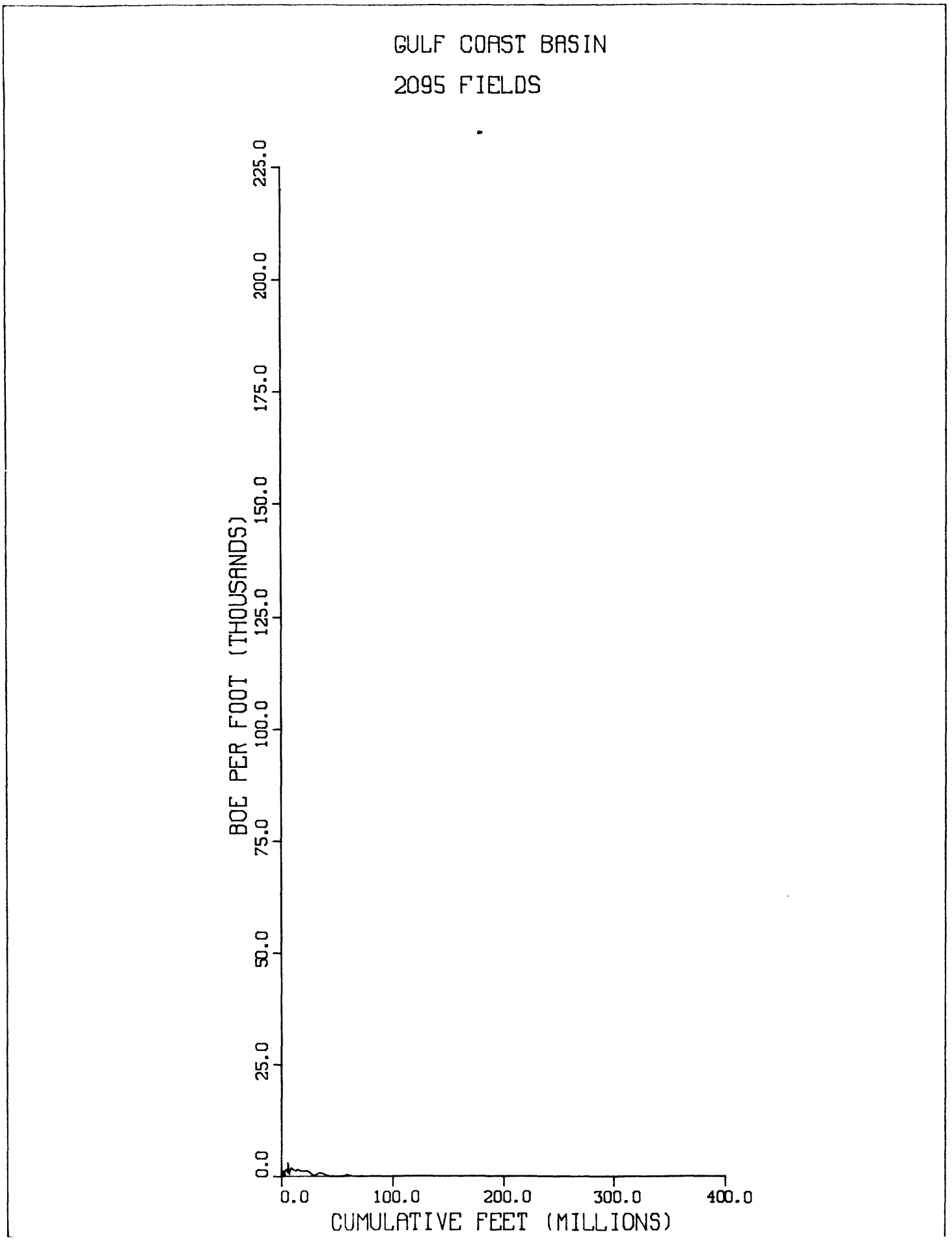

Figure 5a.--BOE per foot vs. cumulative footage drilled.

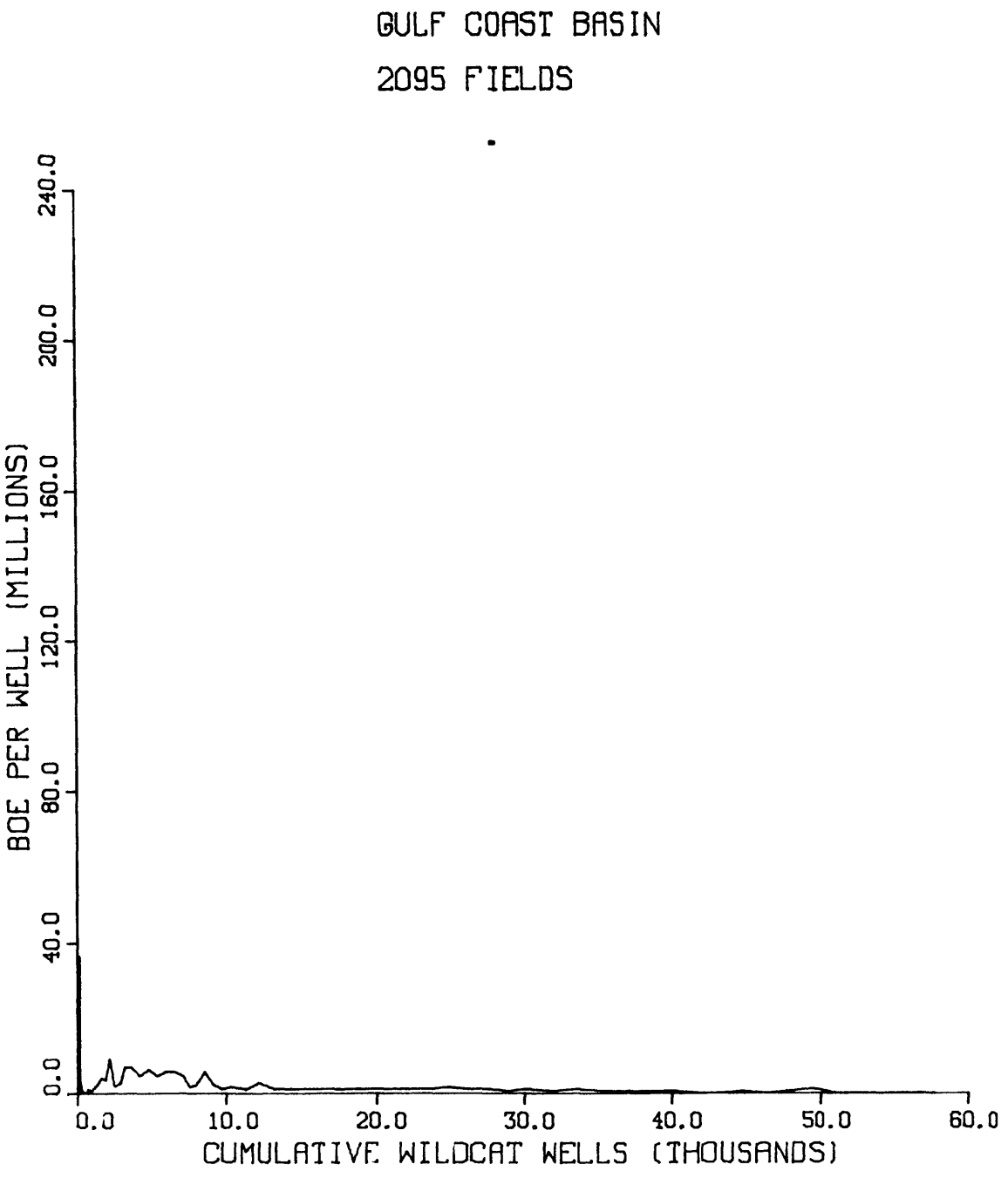

Figure 5b.--BOE per well vs. cumulative wells drilled.

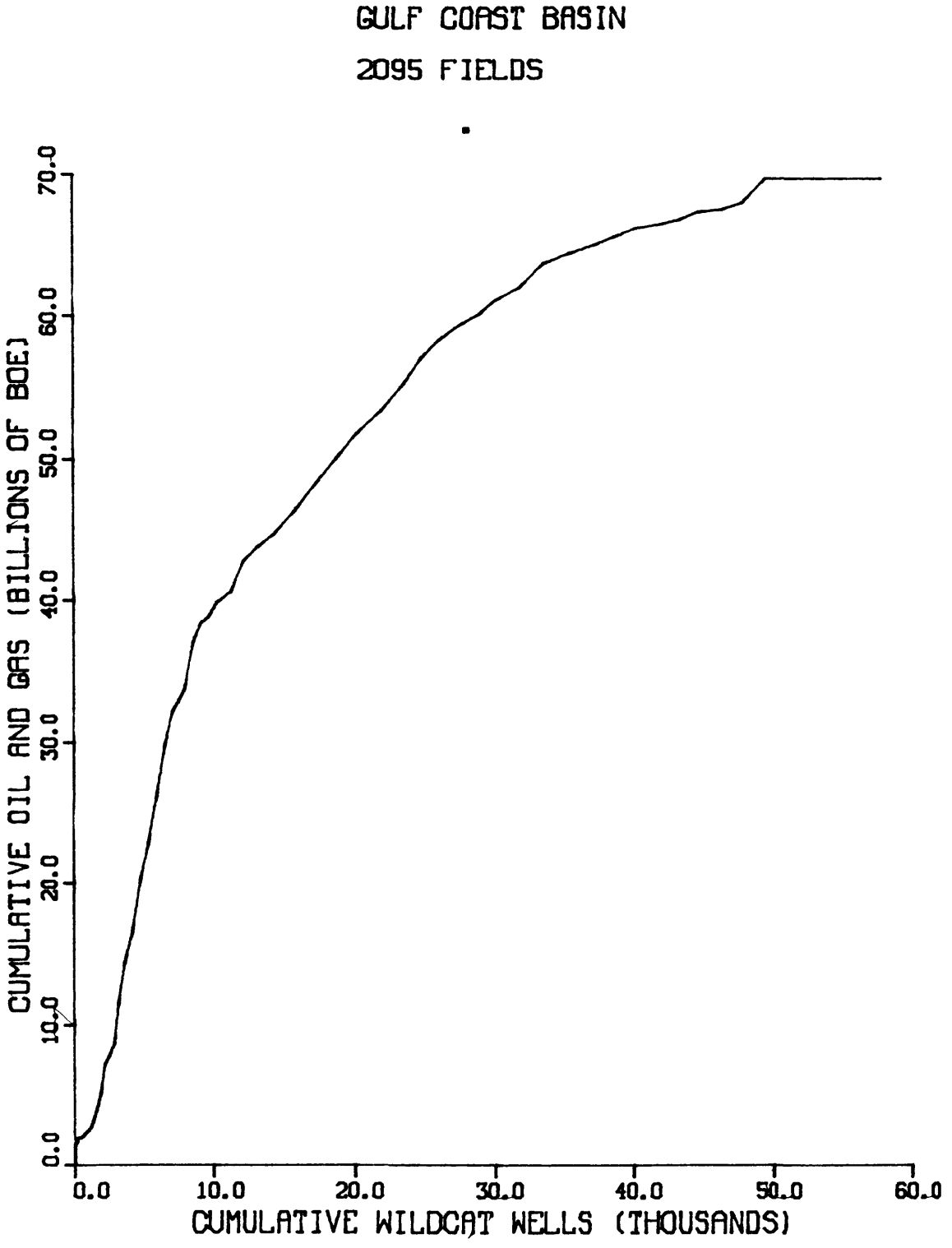

Figure 5c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

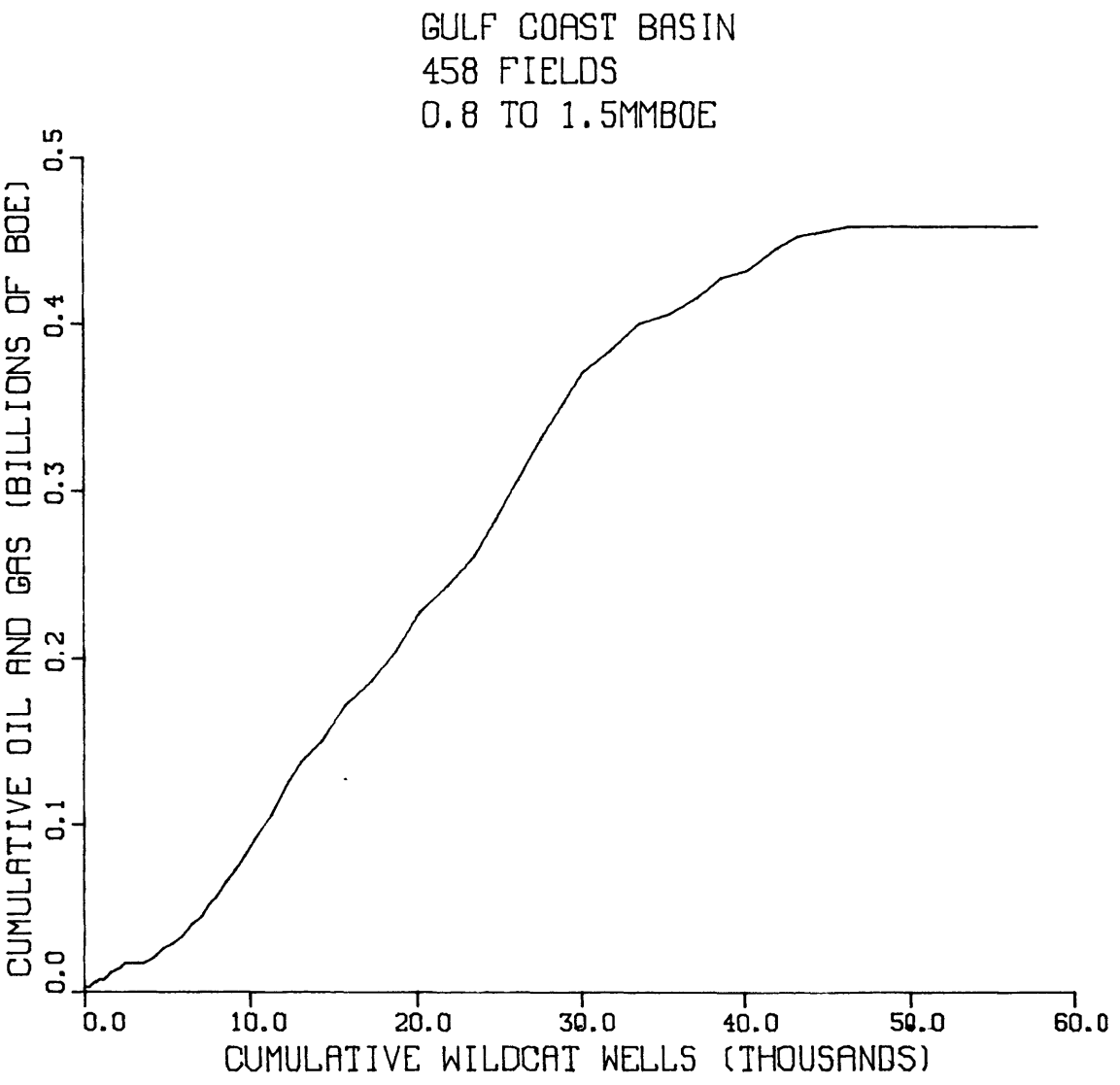

Figure 5d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

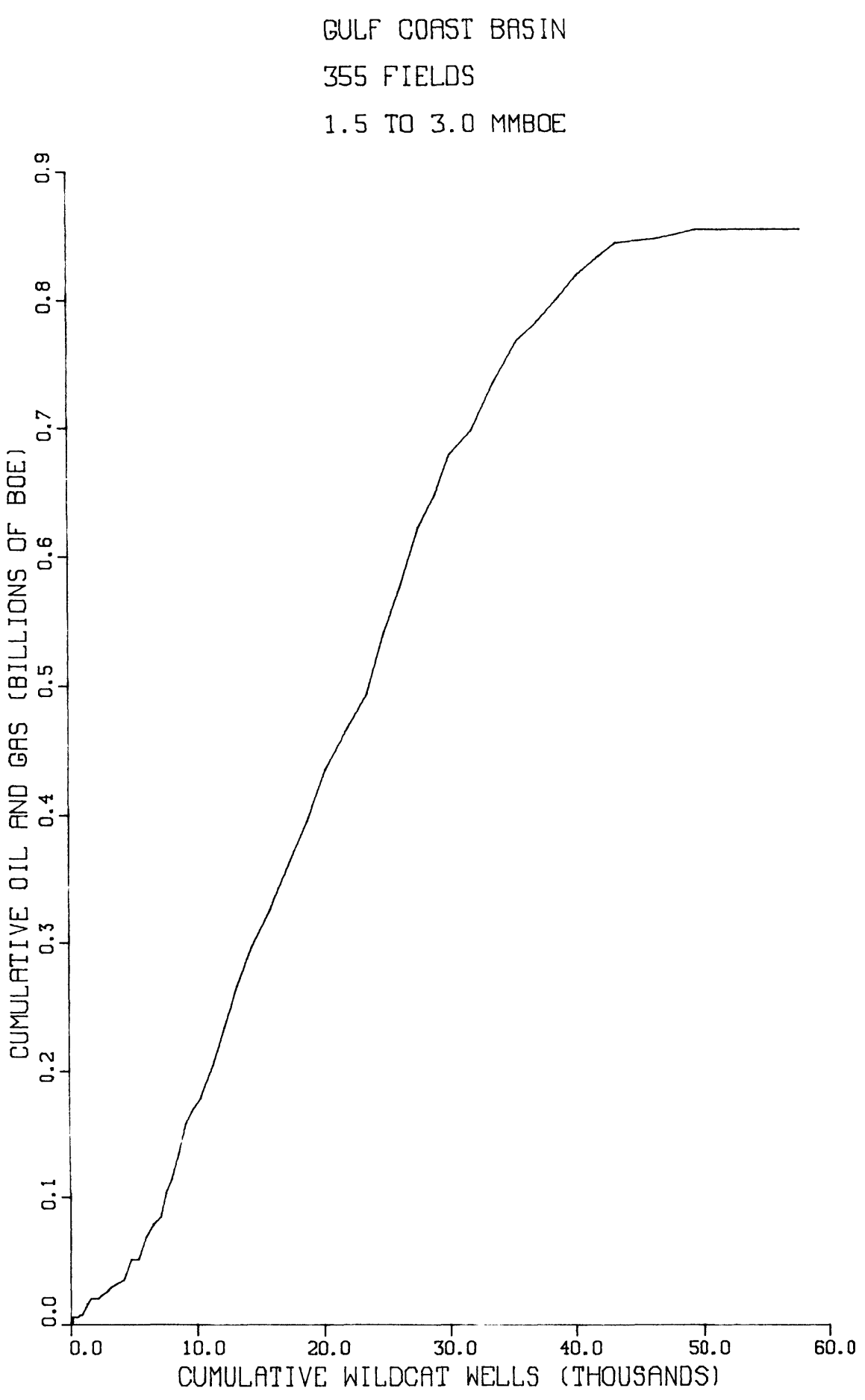

Figure 5e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

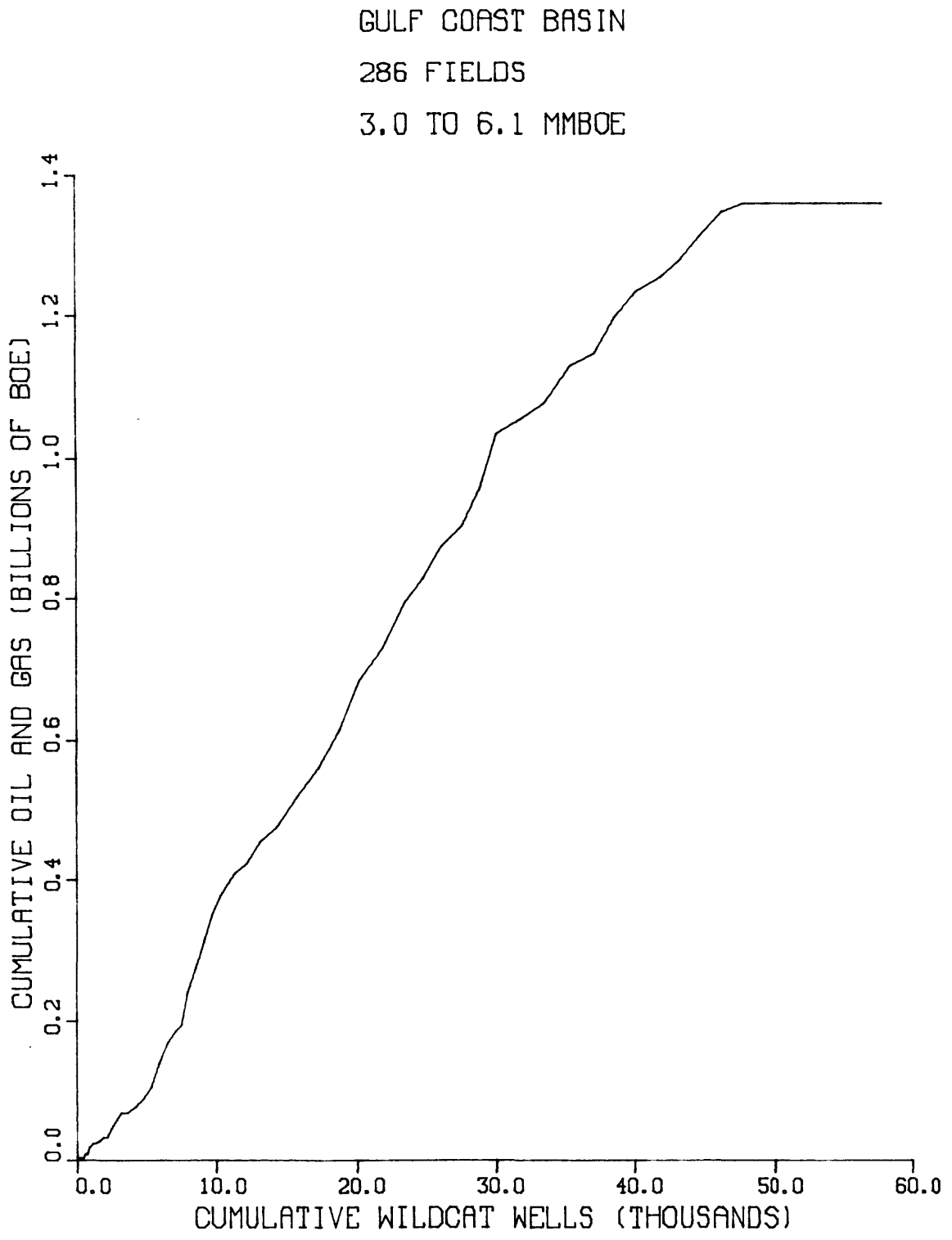

Figure 5f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0.6.1 MMBOE.

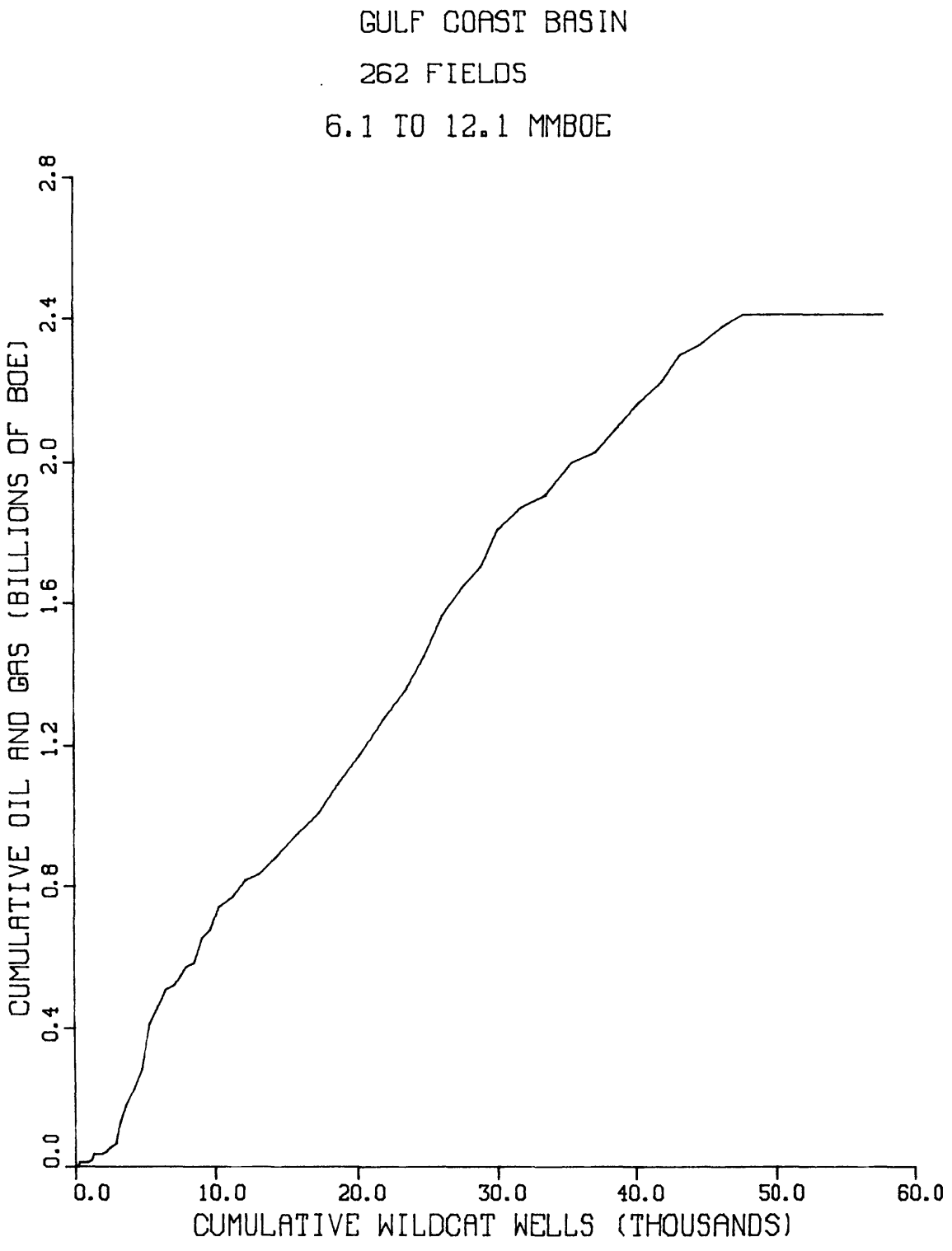

Figure 5g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

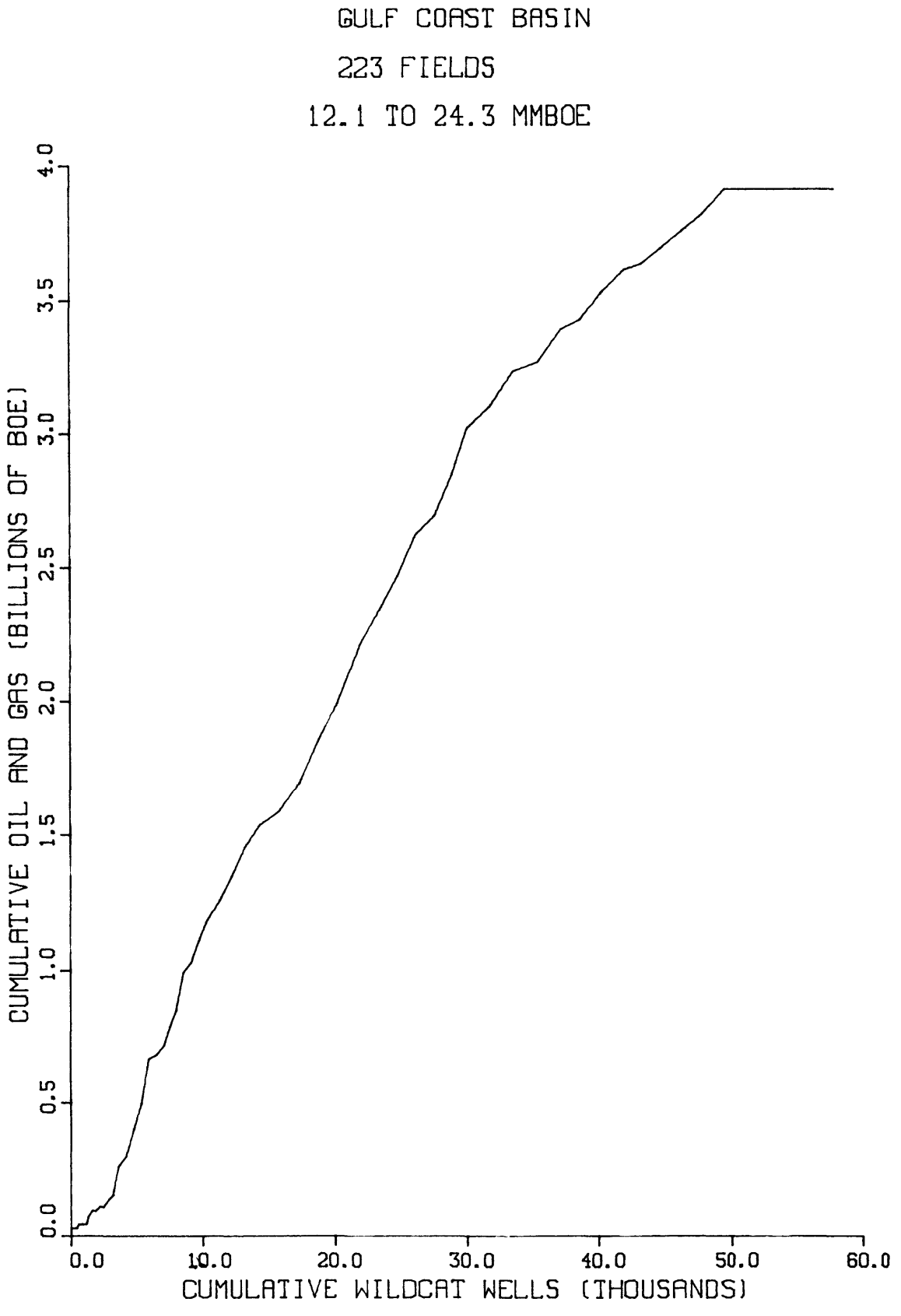

Figure 5h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

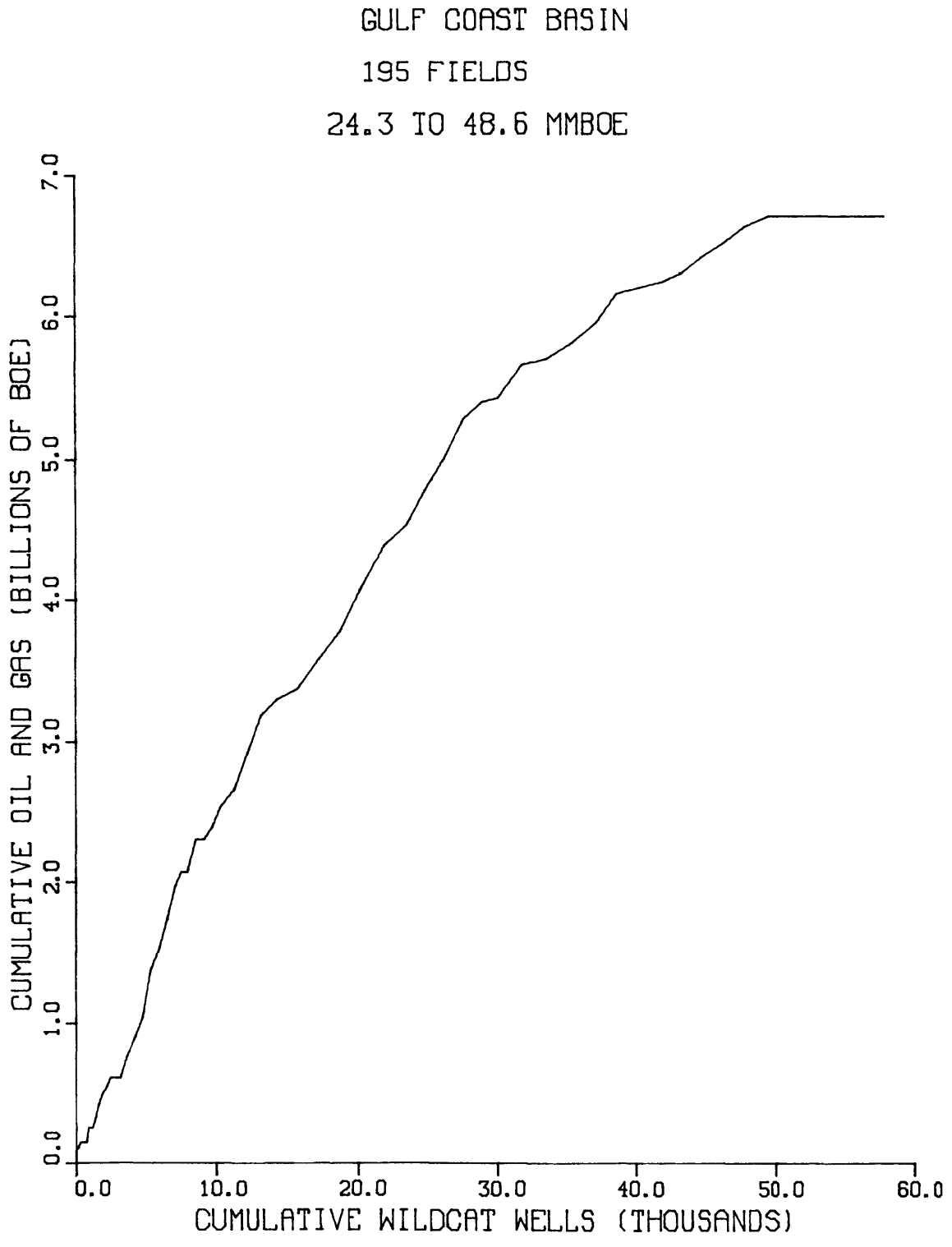

Figure 5i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

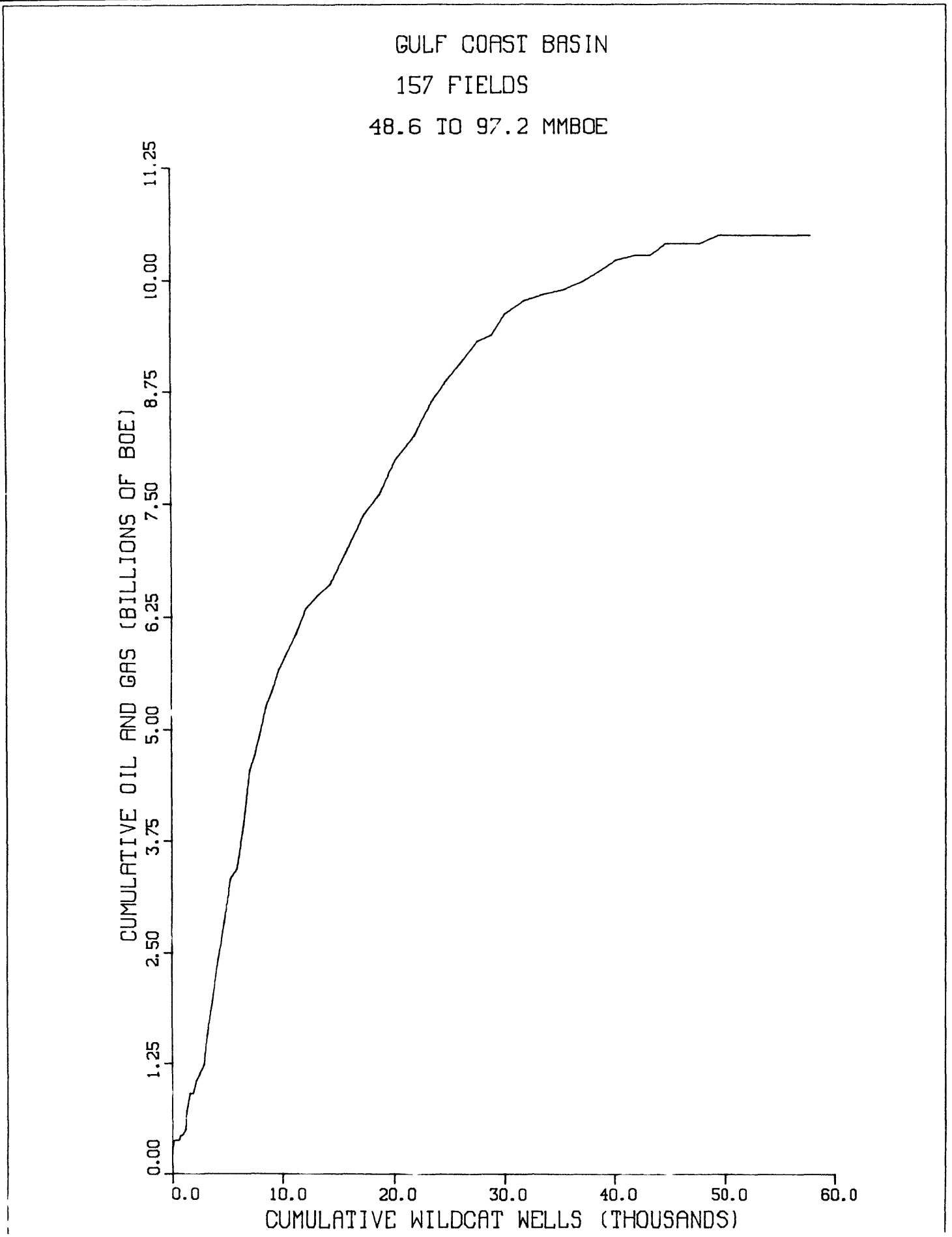

Figure 5j.--Cumulative oil and gas vs. cumulative wells for fields in the size range 48.6-97.2 MMBOE.

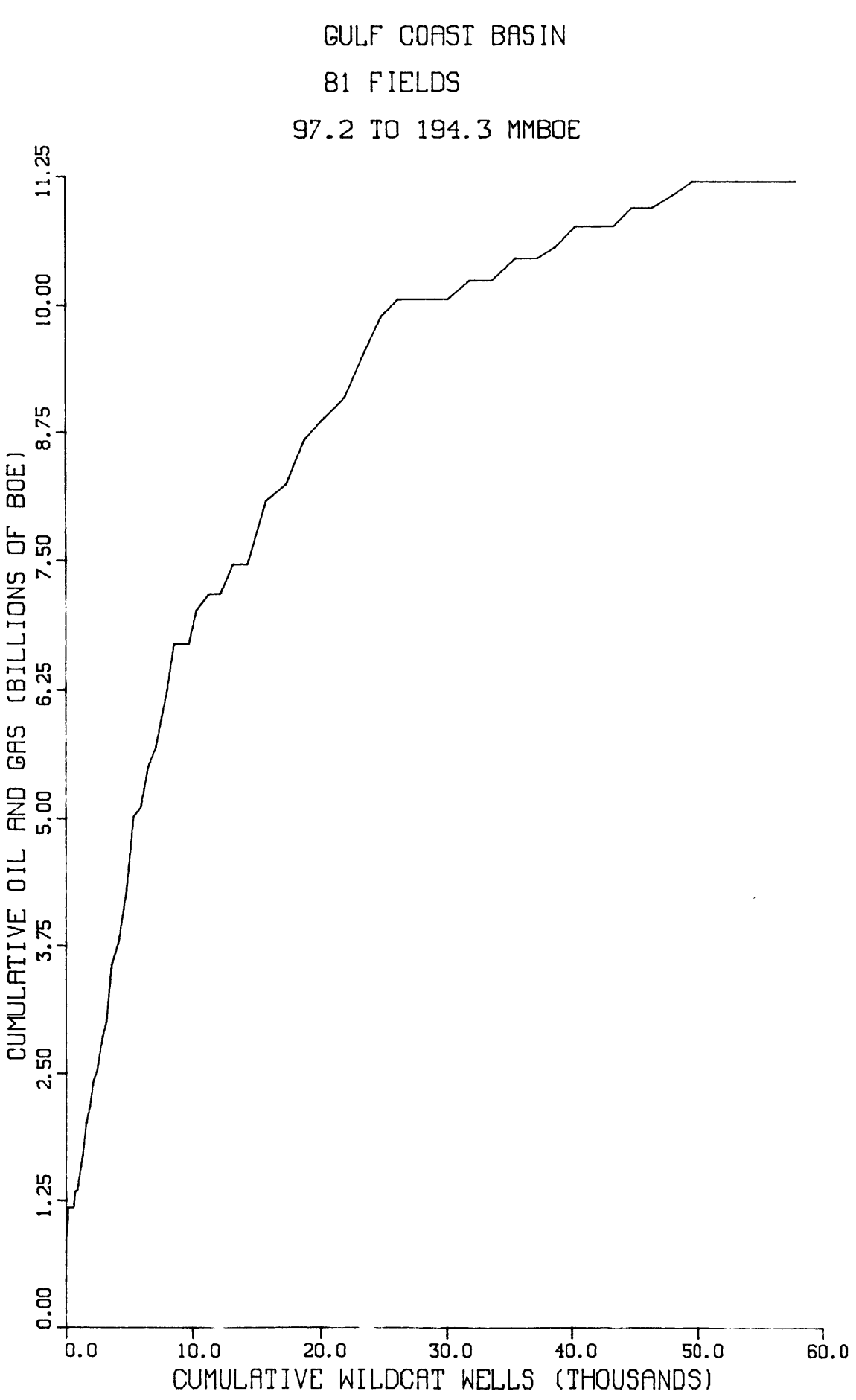

Figure 5k.--Cumulative oil and gas vs. cumulative wells for fields in the size range 97.2-194.3 MMBOE.

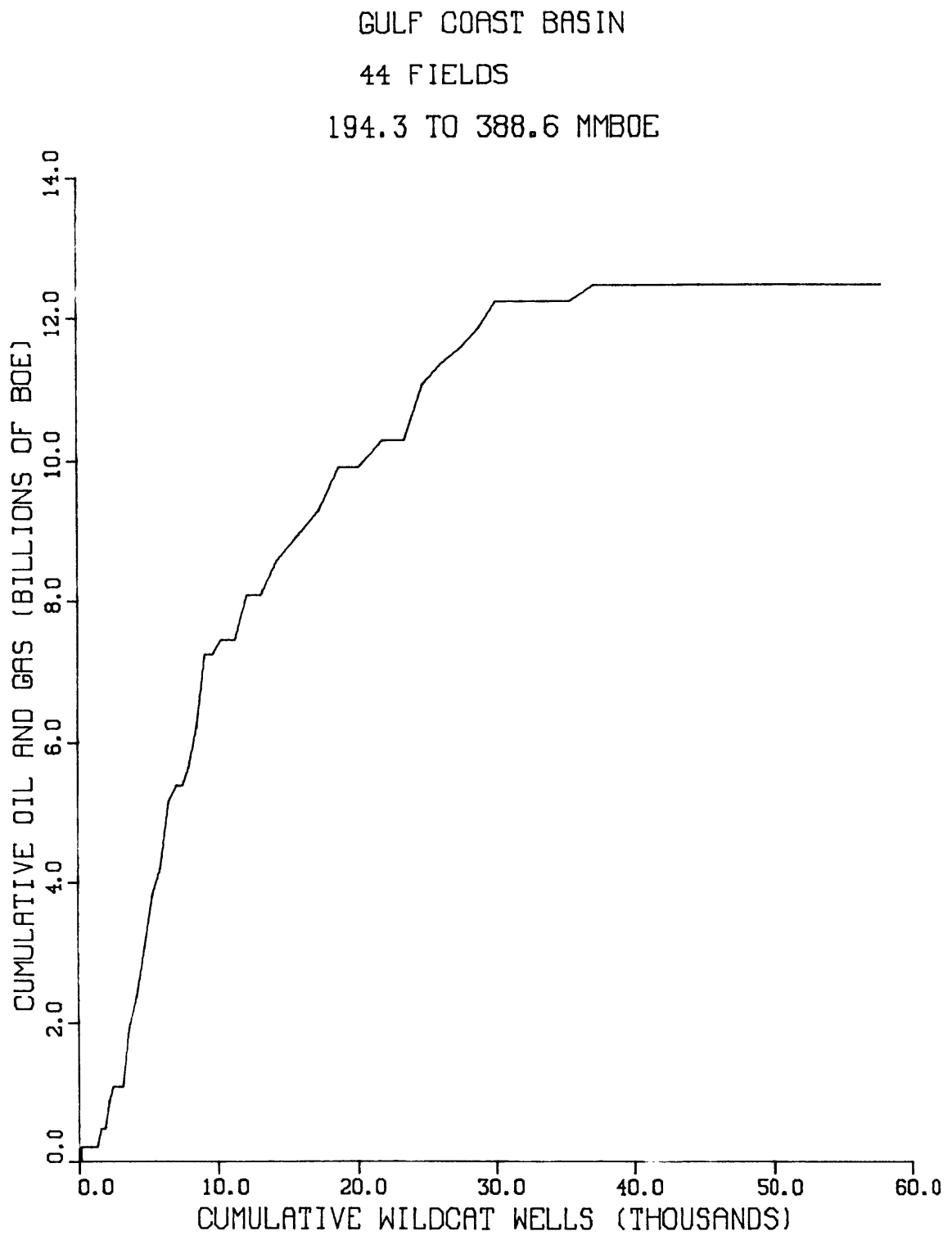

Figure 51.--Cumulative oil and gas vs. cumulative wells for fields in the size range 194.3-388.6 MMBOE.

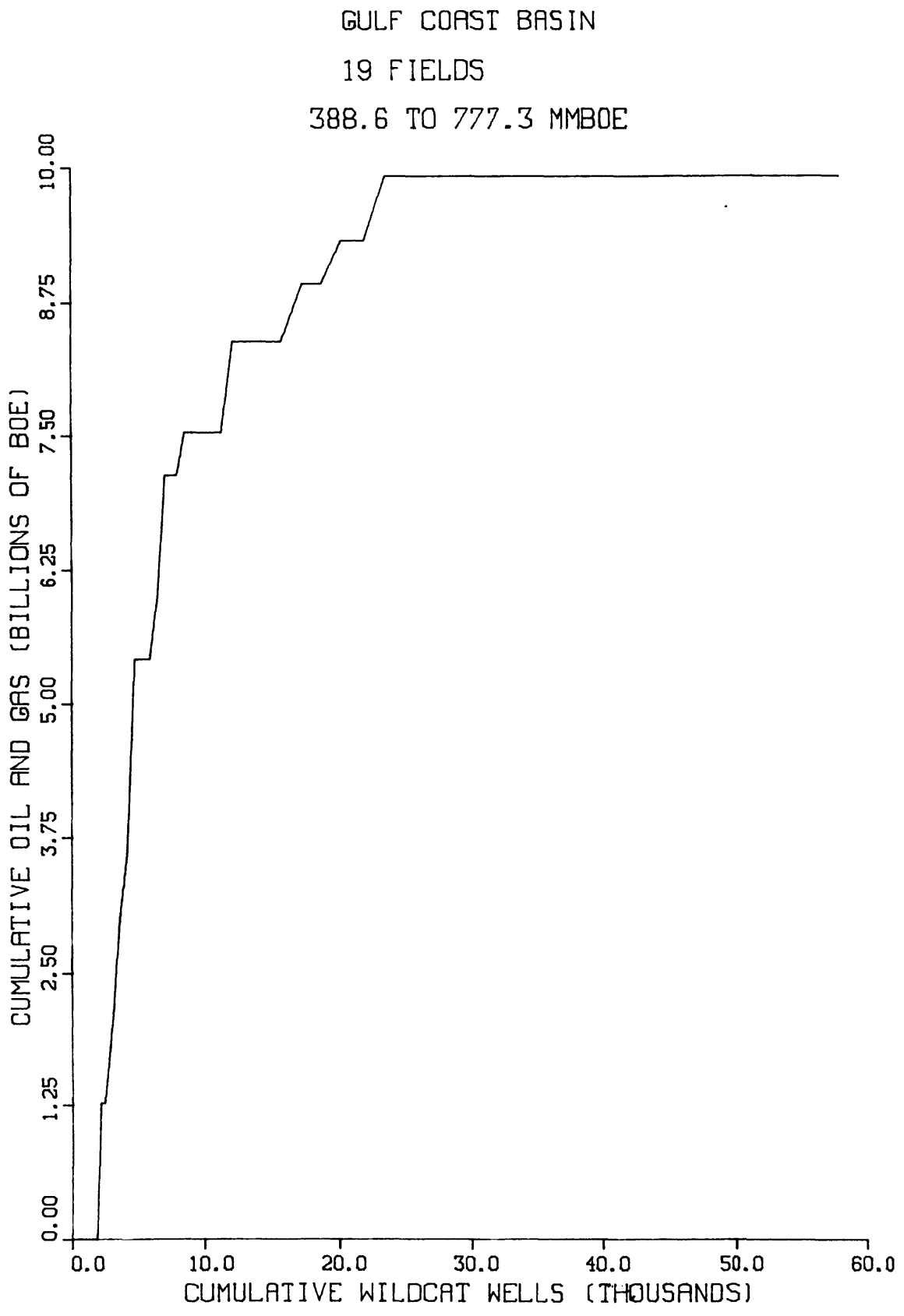

Figure 5m.--Cumulative oil and gas vs. cumulative wells for fields in the size range 388.6-777.3 MMBOE.

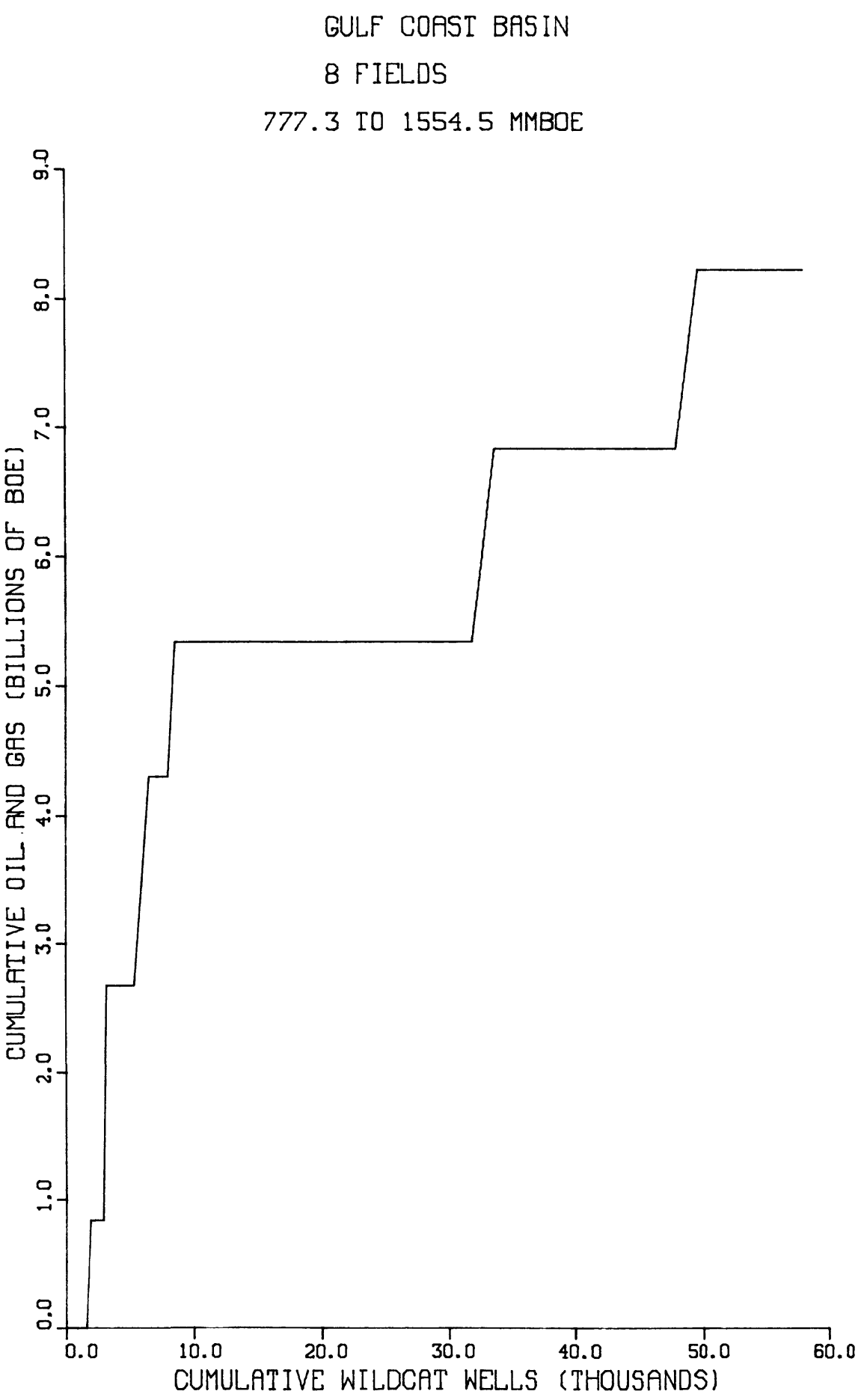

Figure 5n.--Cumulative oil and gas vs. cumulative wells for fields in the size range 777.3-1554.5 MMBOE.

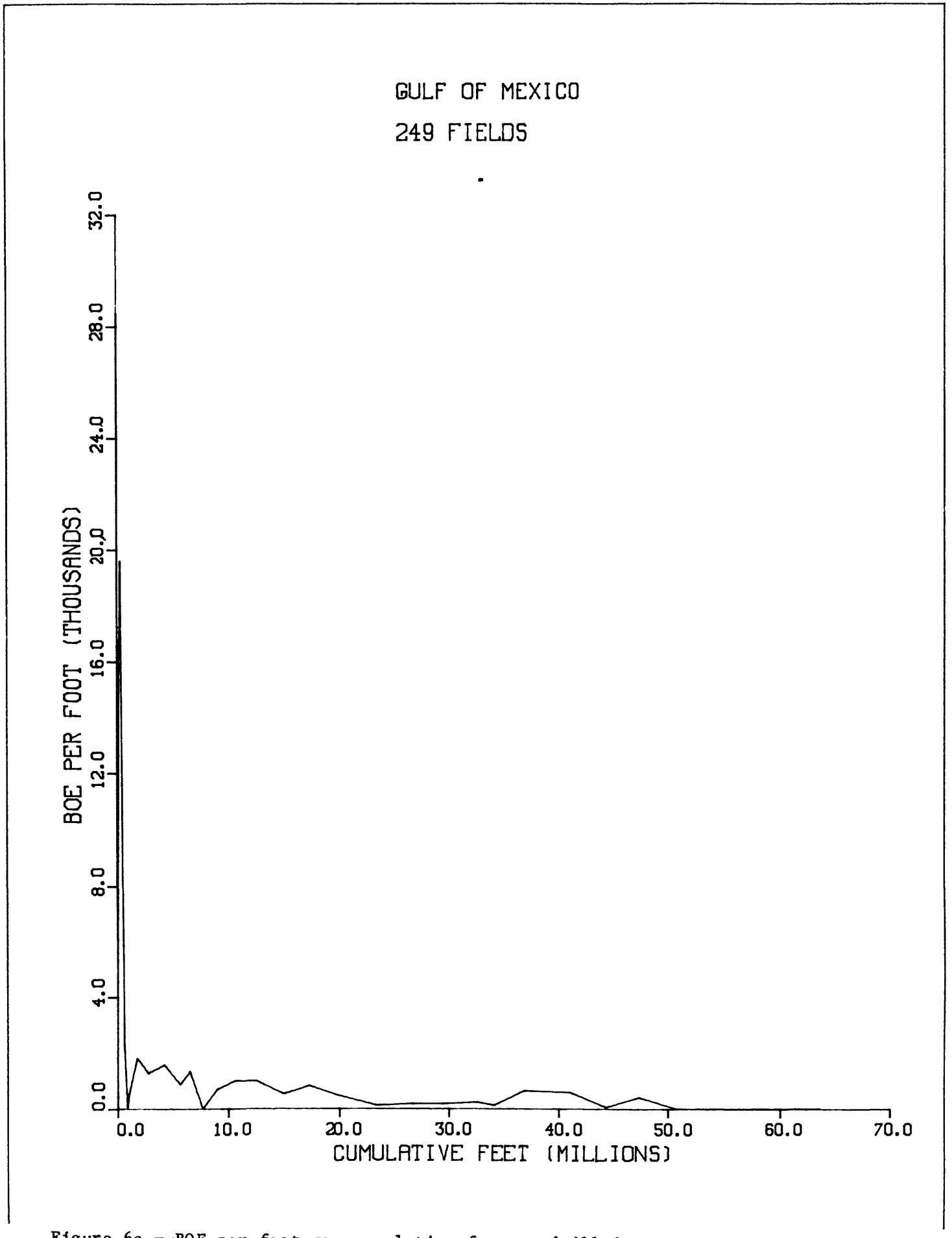

Figure 6a.--BOE per foot vs. cumulative footage drilled.

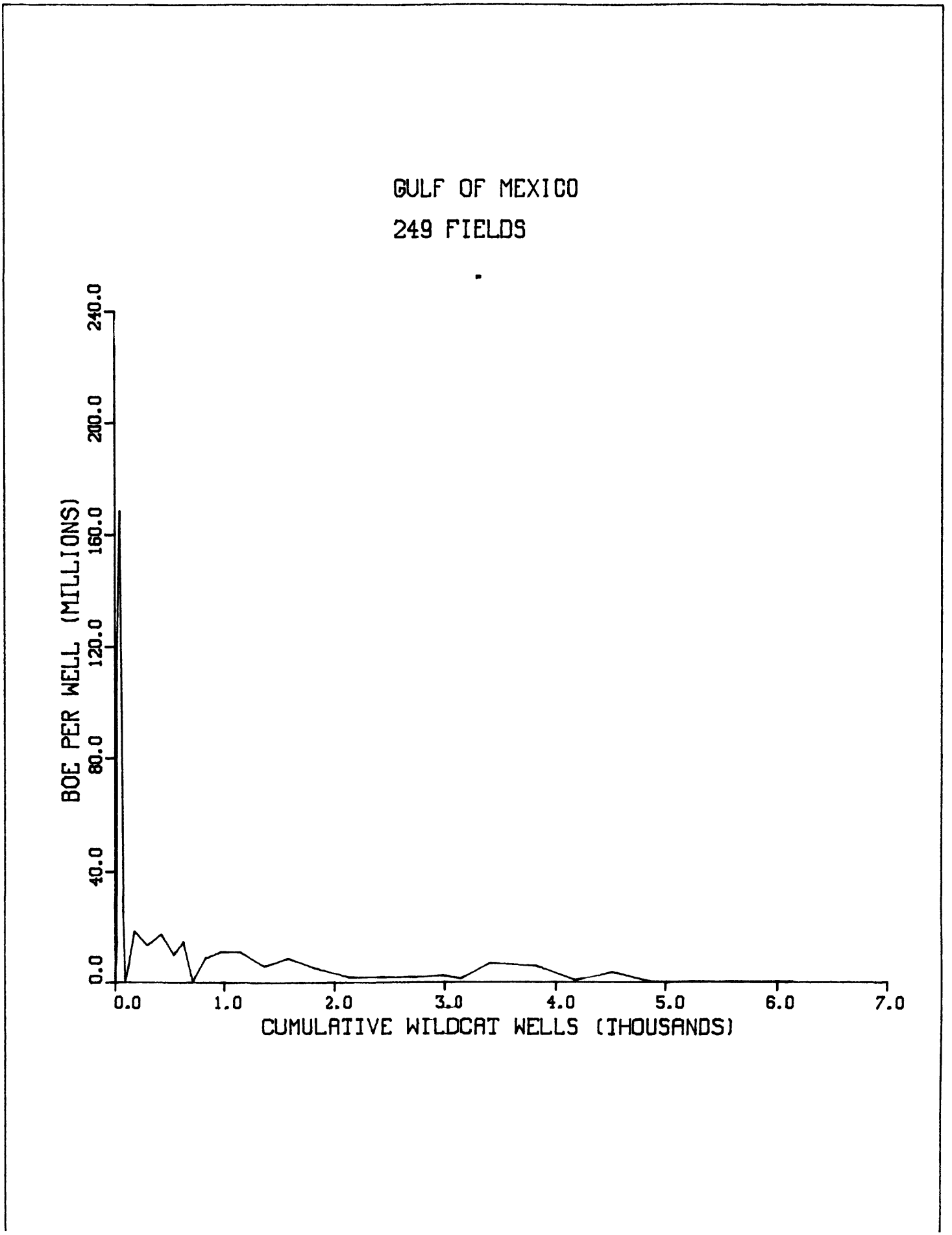

Figure 6b.--BOE per well vs. cumulative wells drilled.

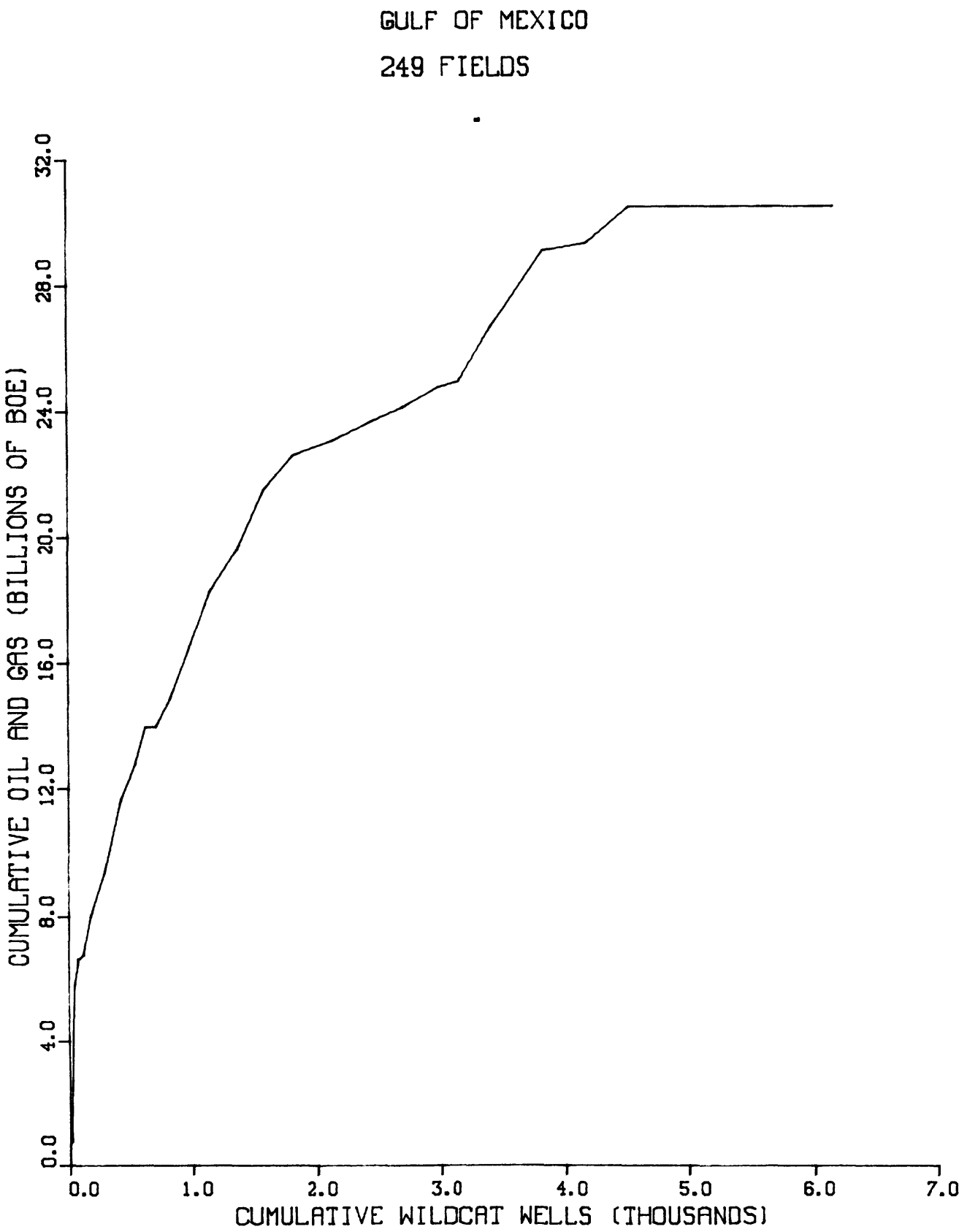

Figure 6c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

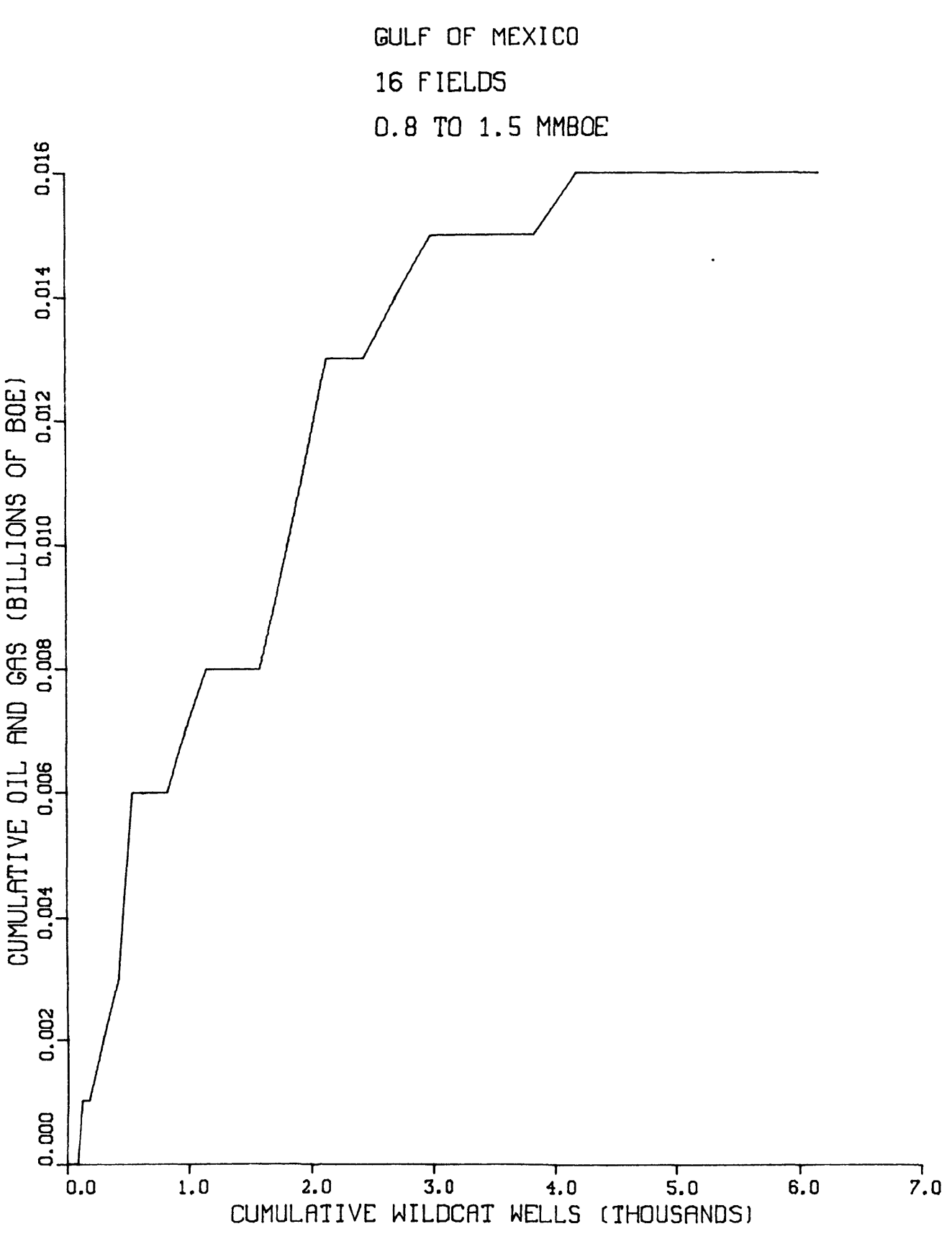

Figure 6d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

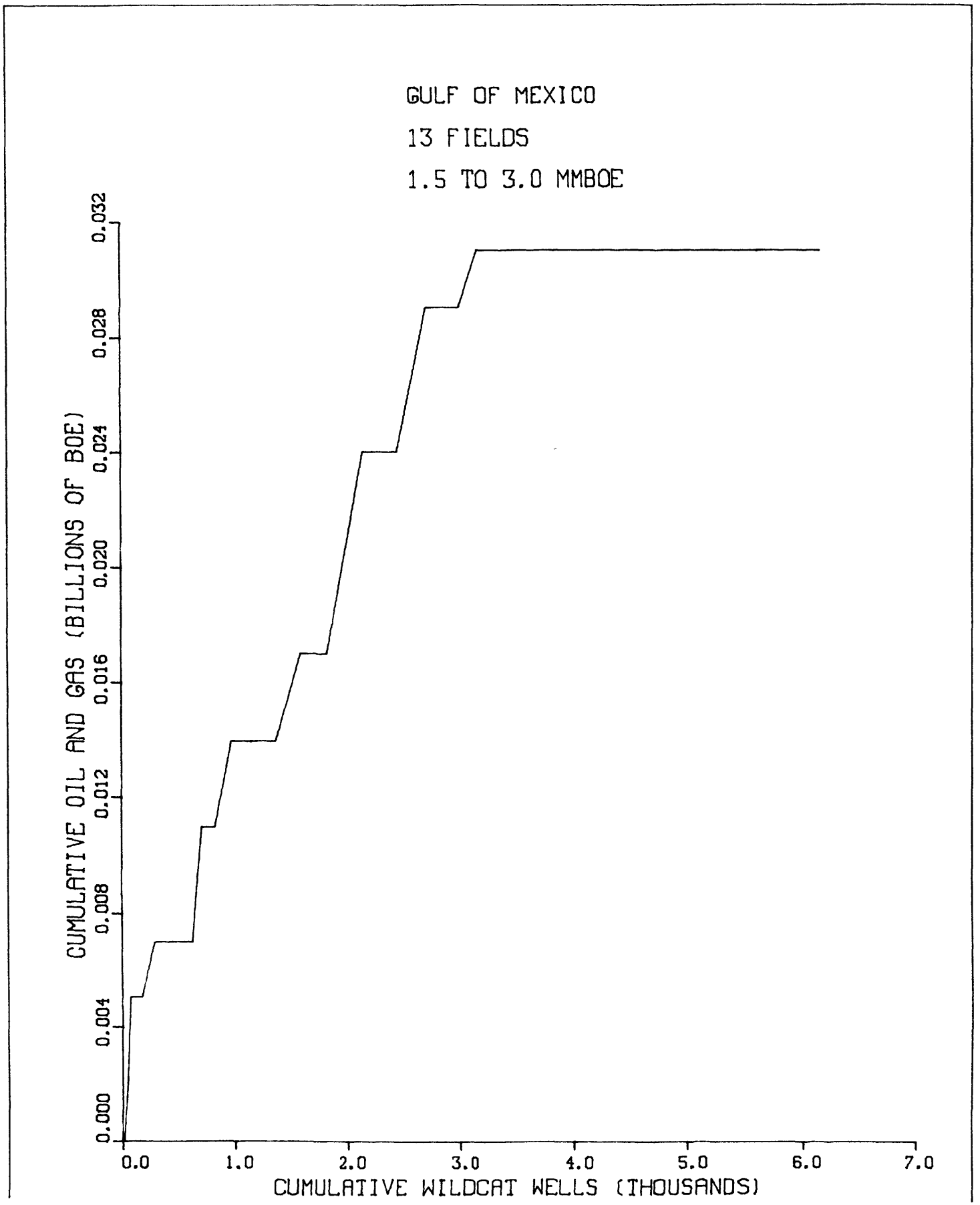

Figure 6e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

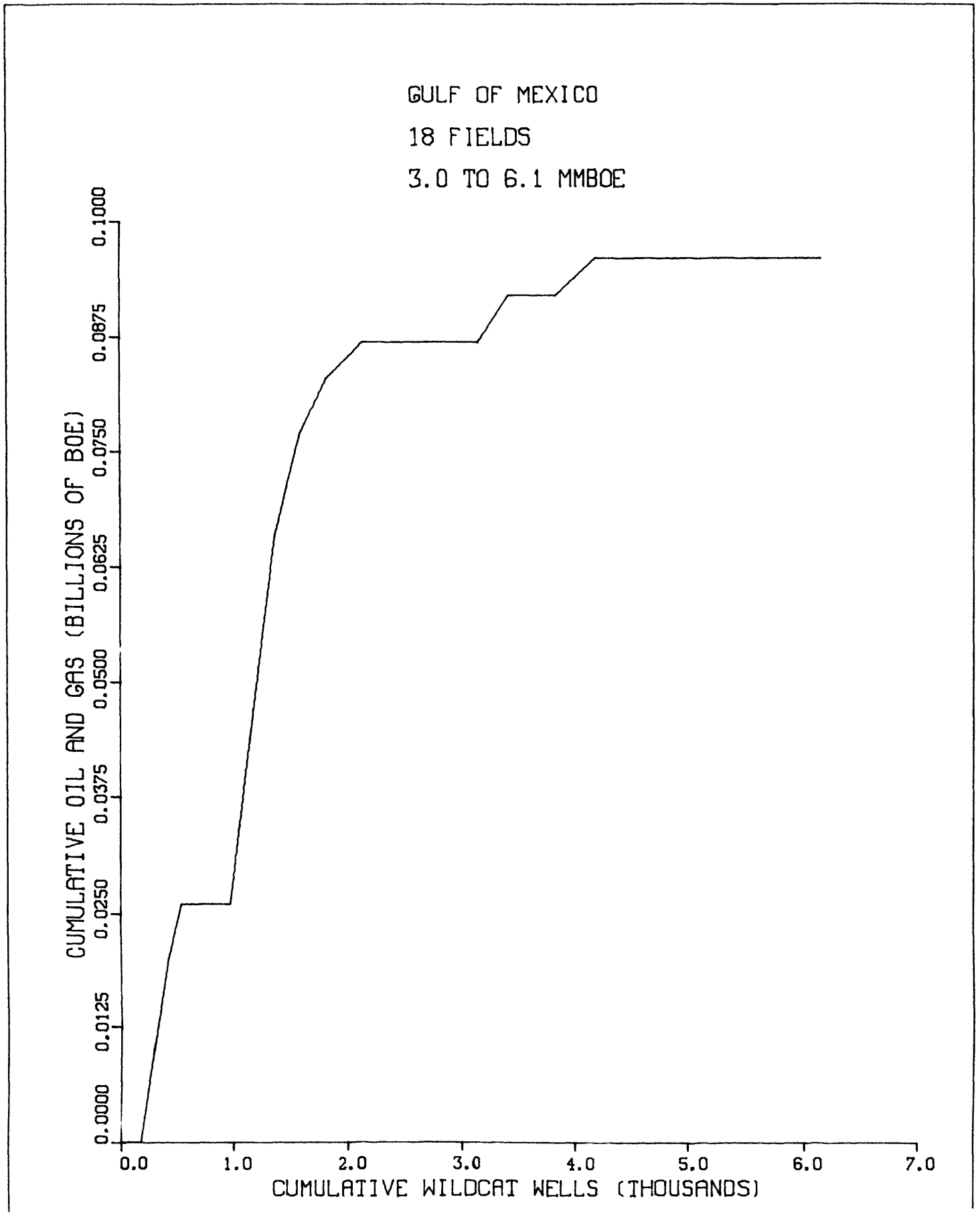

Figure 6f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0.6.1 MMBOE.

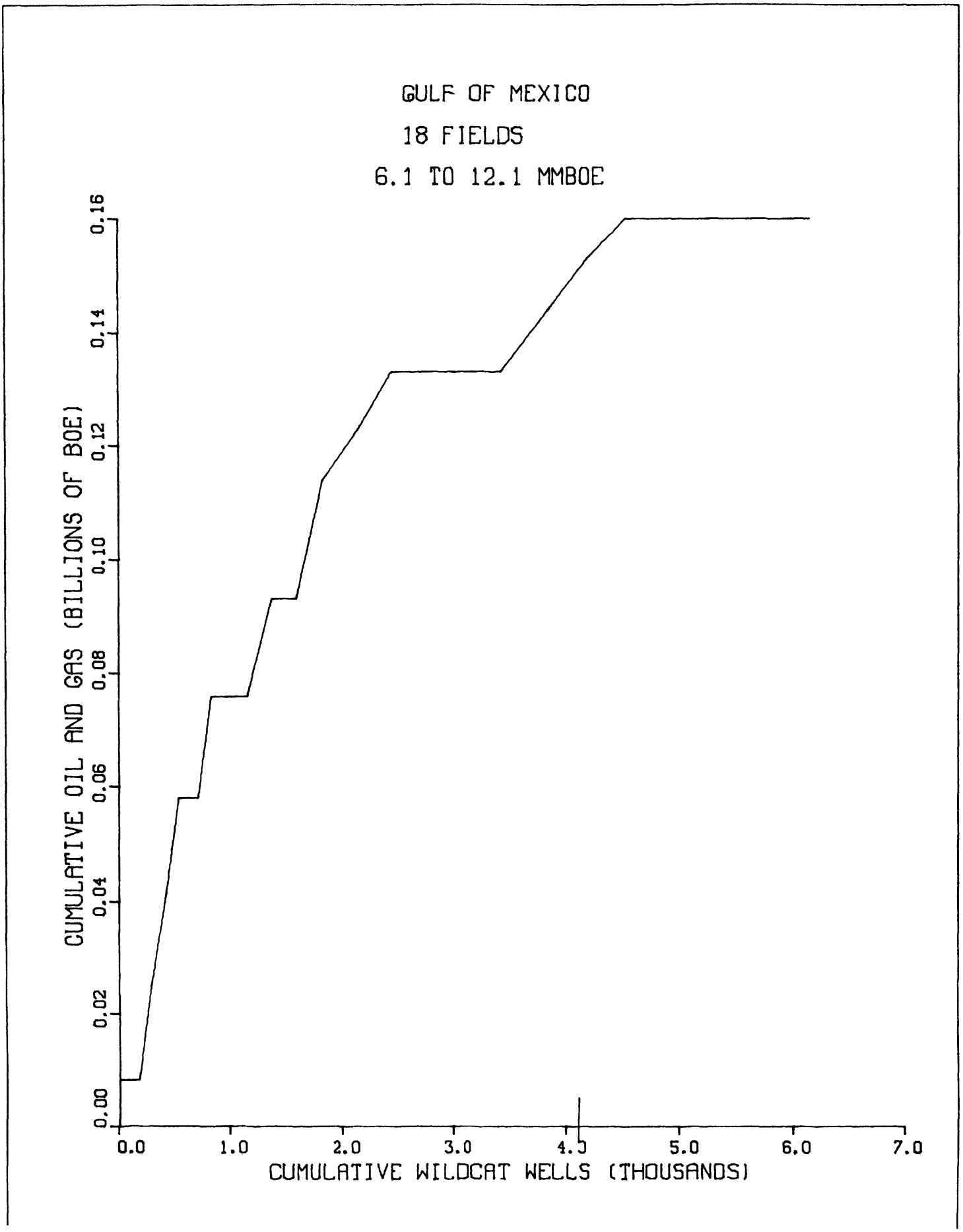

Figure 6g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

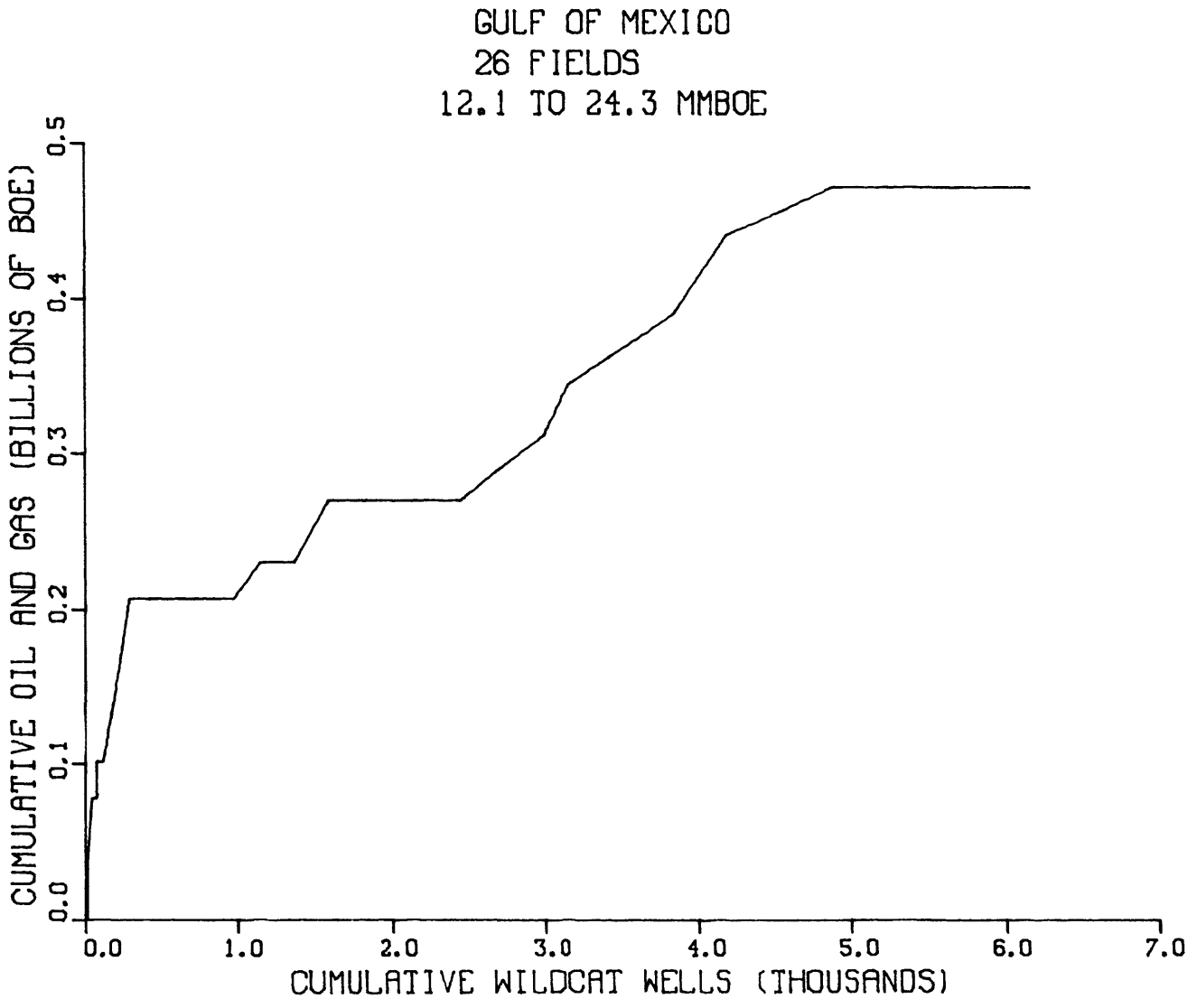

Figure 6h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

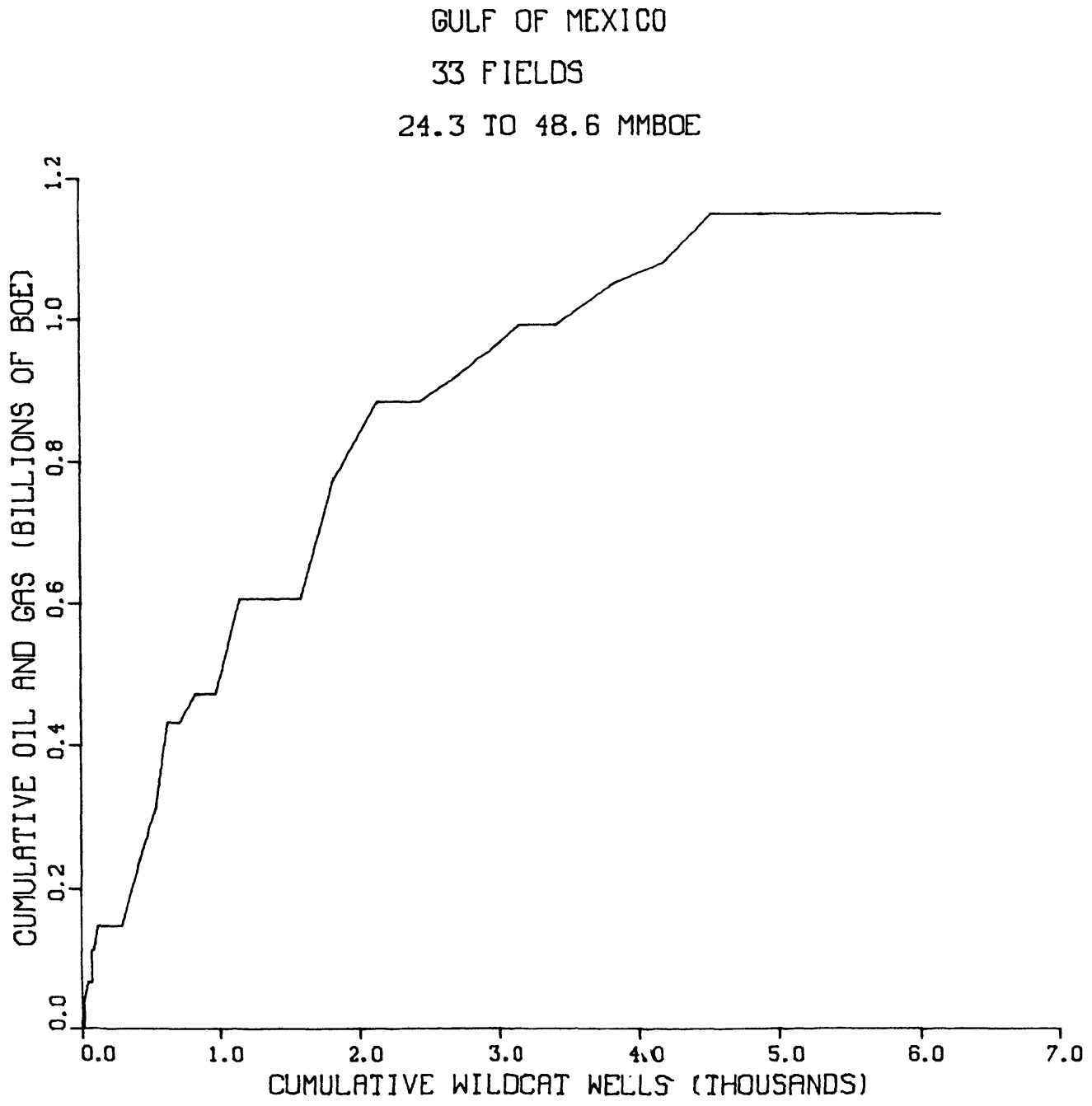

Figure 6i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

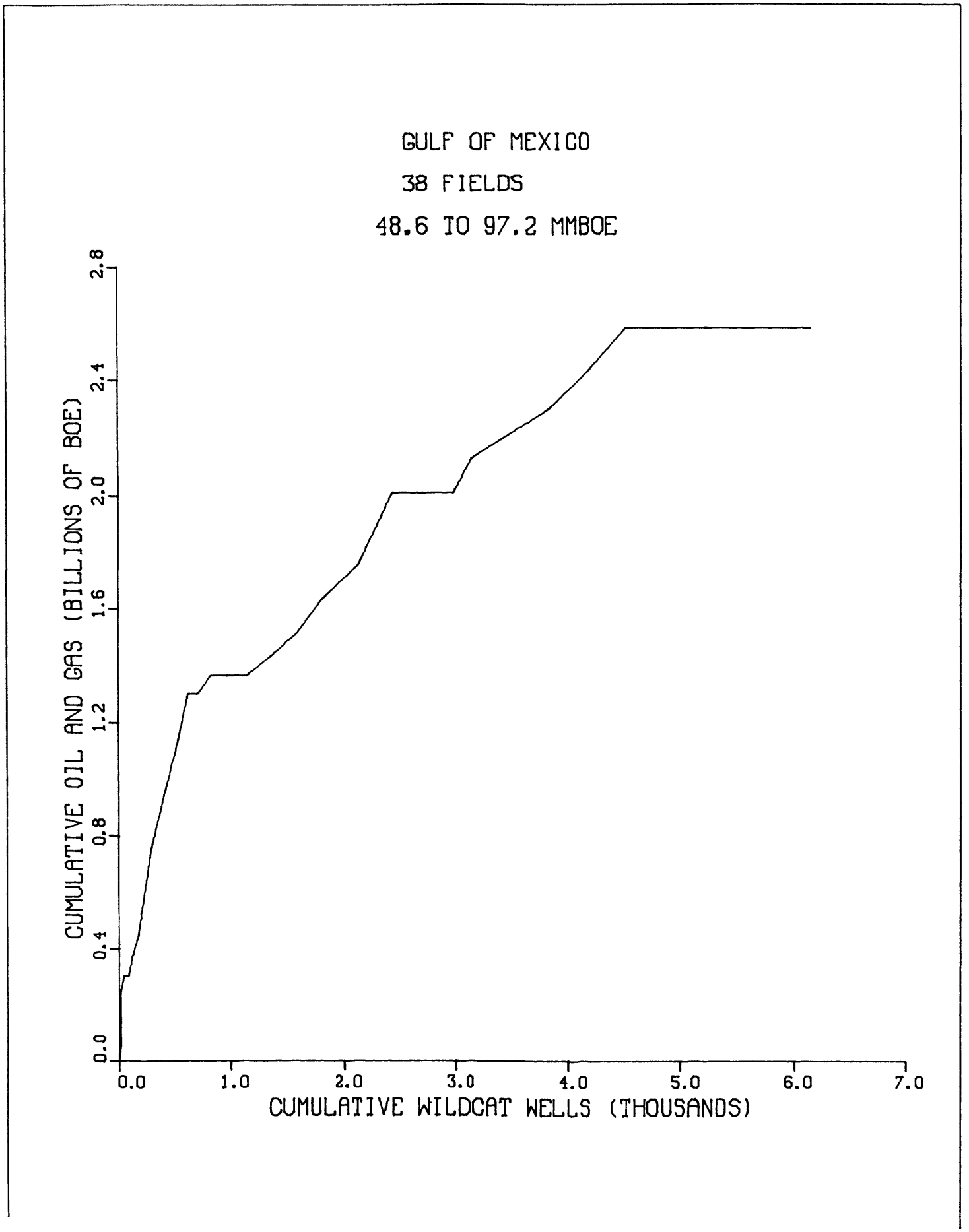

Figure 6j.--Cumulative oil and gas vs. cumulative wells for fields in the size range 48.6-97.2 MMBOE.

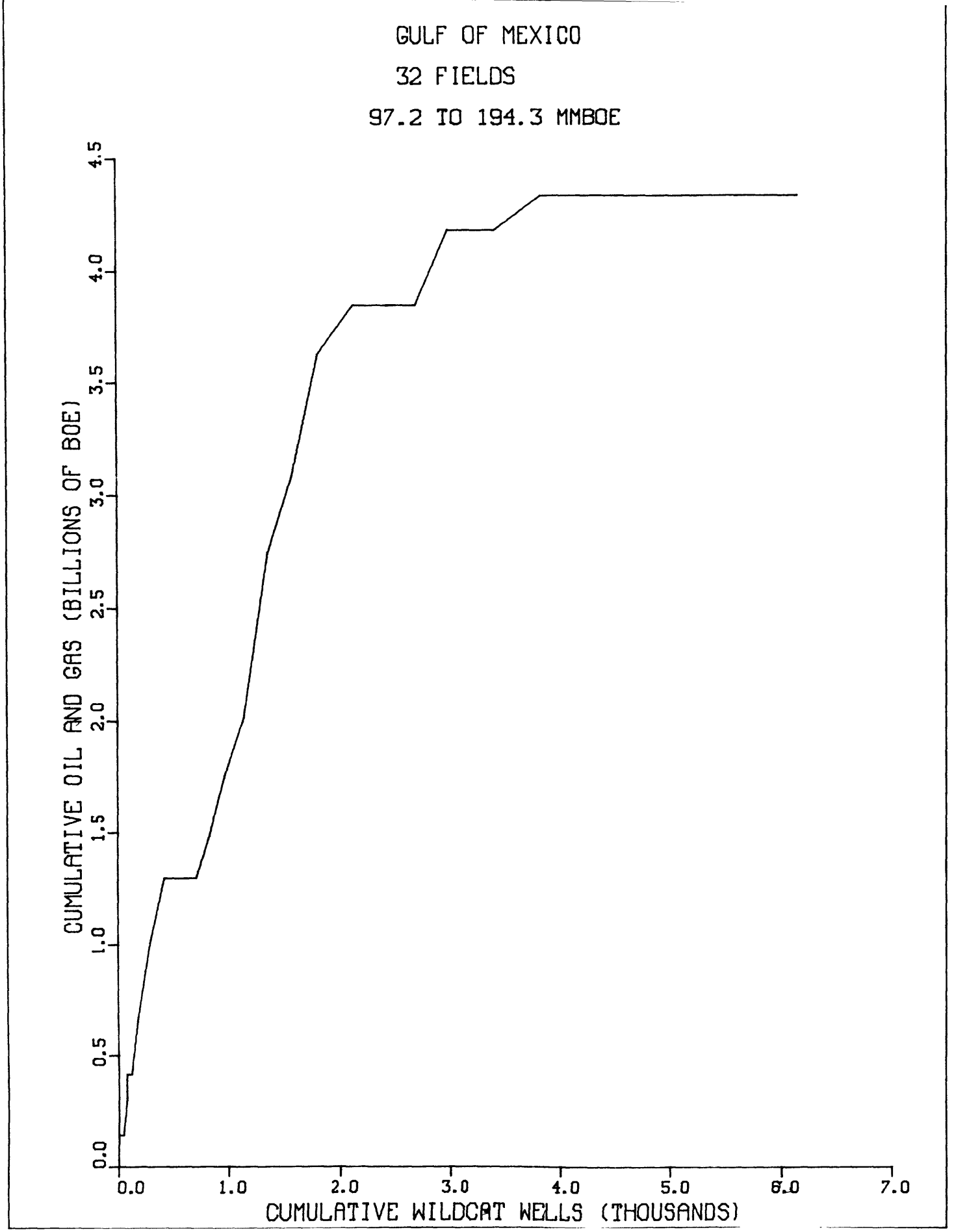

Figure 6k.--Cumulative oil and gas vs. cumulative wells for fields in the size range 97.2-194.3 MMBOE.

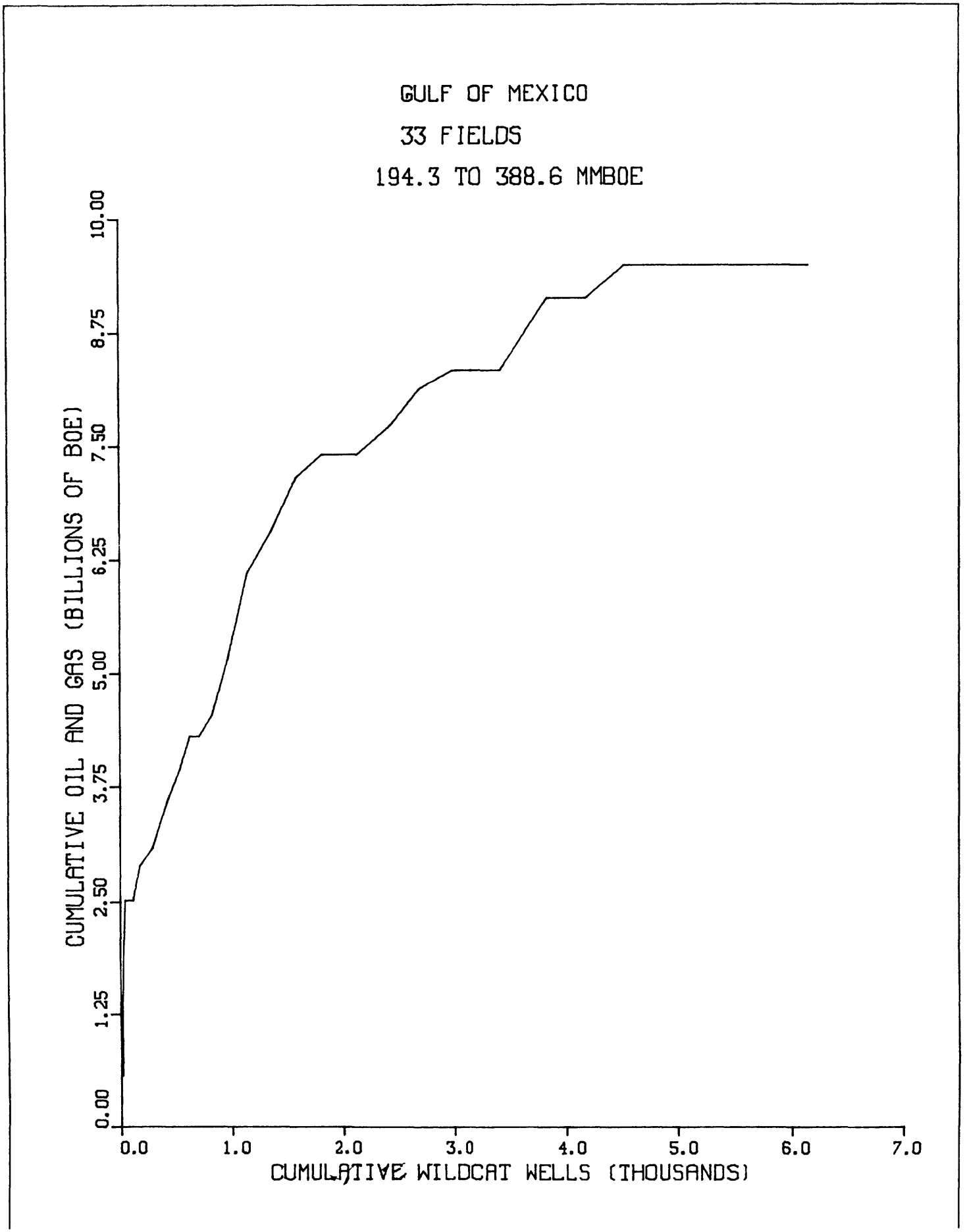

Figure 61.--Cumulative oil and gas vs. cumulative wells for fields in the size range 194.3-388.6 MMBOE.

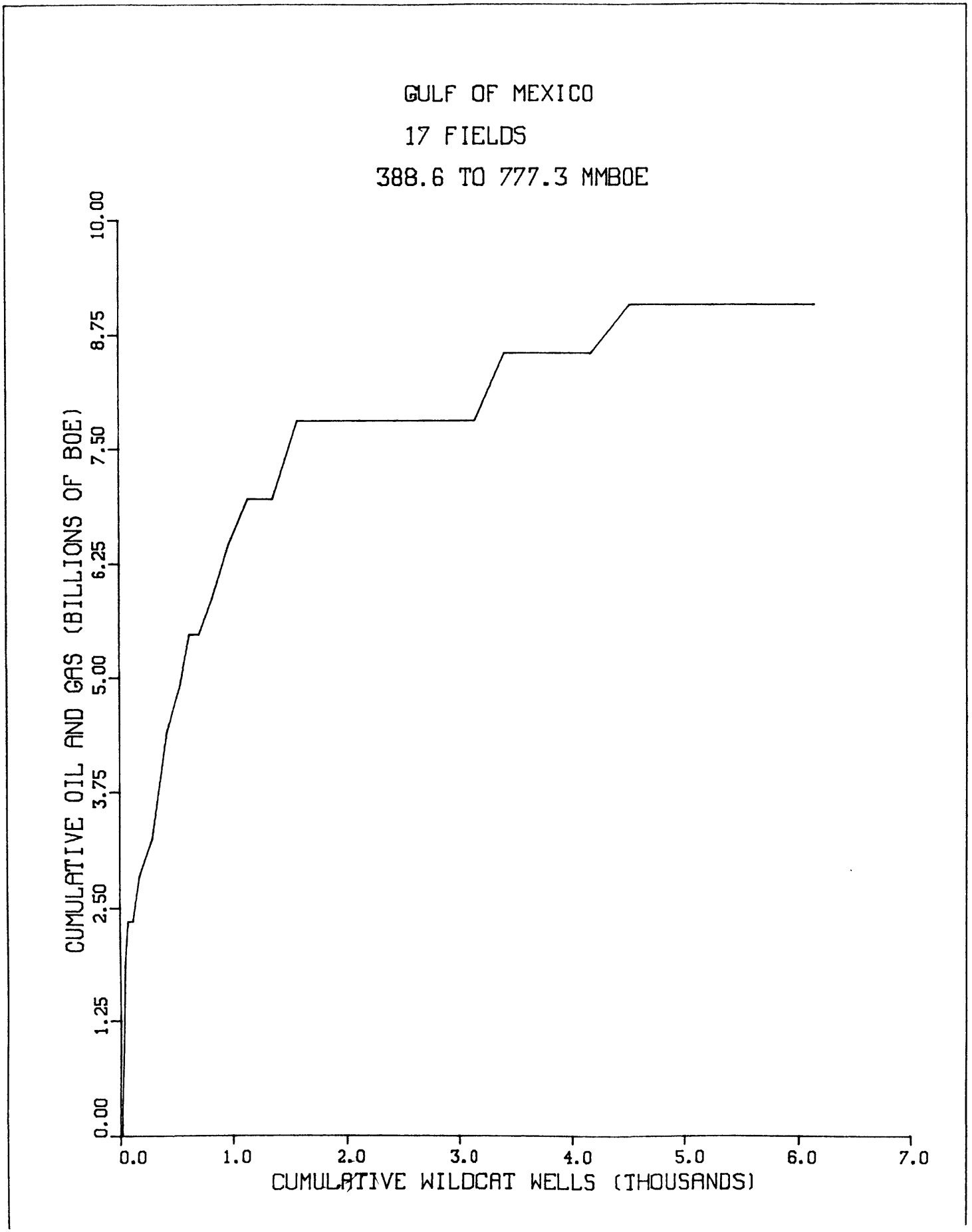

Figure 6m.--Cumulative oil and gas vs. cumulative wells for fields in the size range 388.6-777.3 MMBOE.

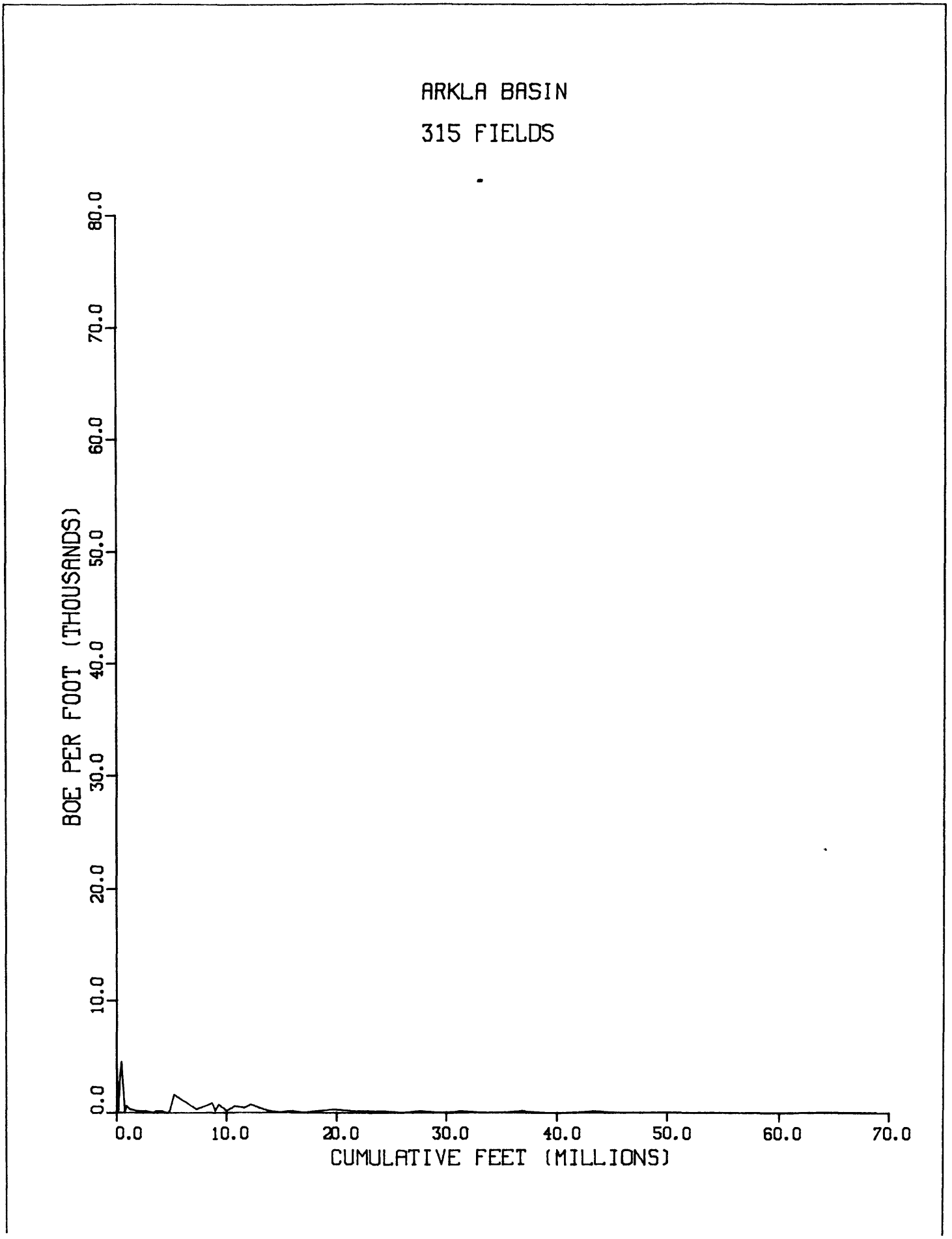

Figure 7a.--BOE per foot vs. cumulative footage drilled.

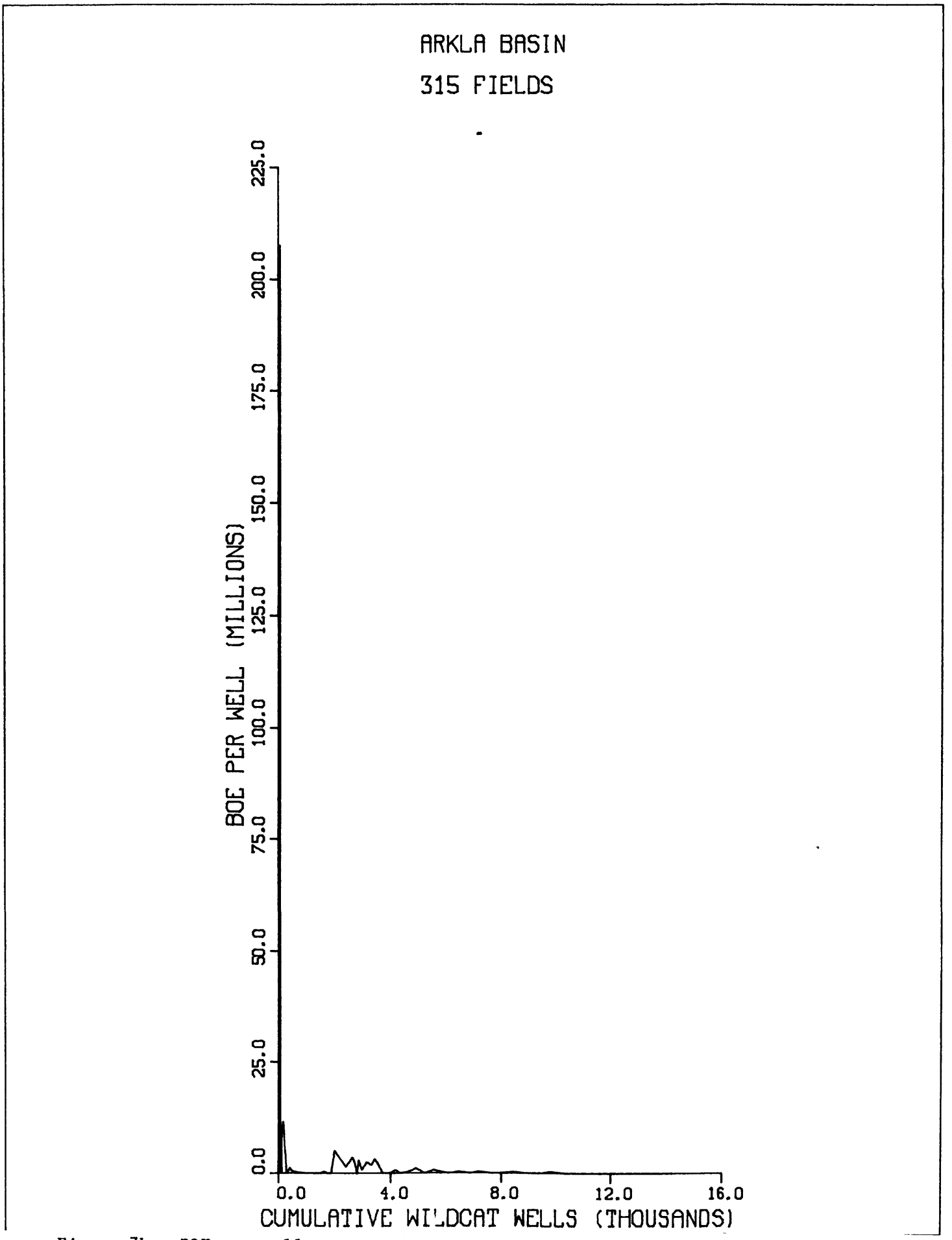

Figure 7b.--BOE per well vs. cumulative wells drilled.

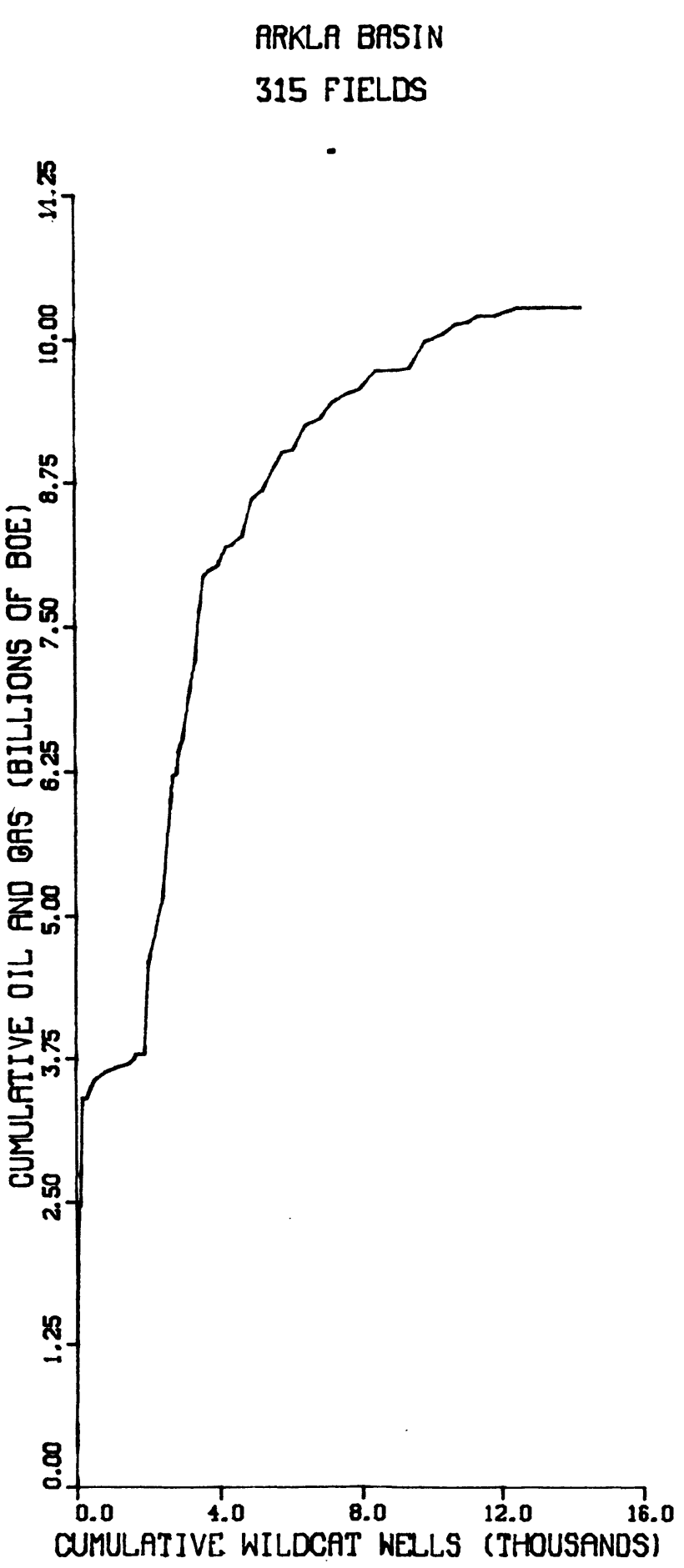

Figure 7c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

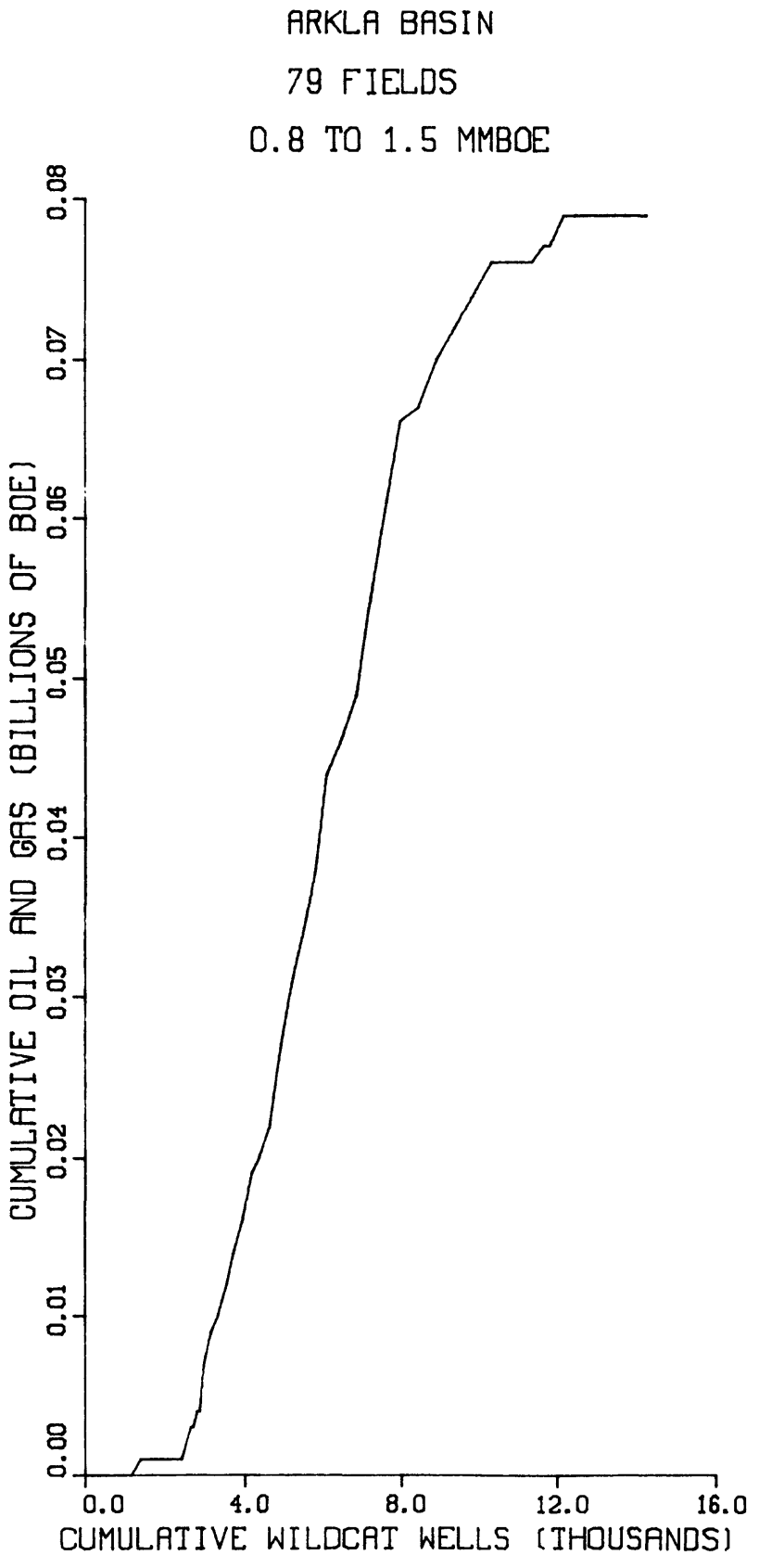

Figure 7d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

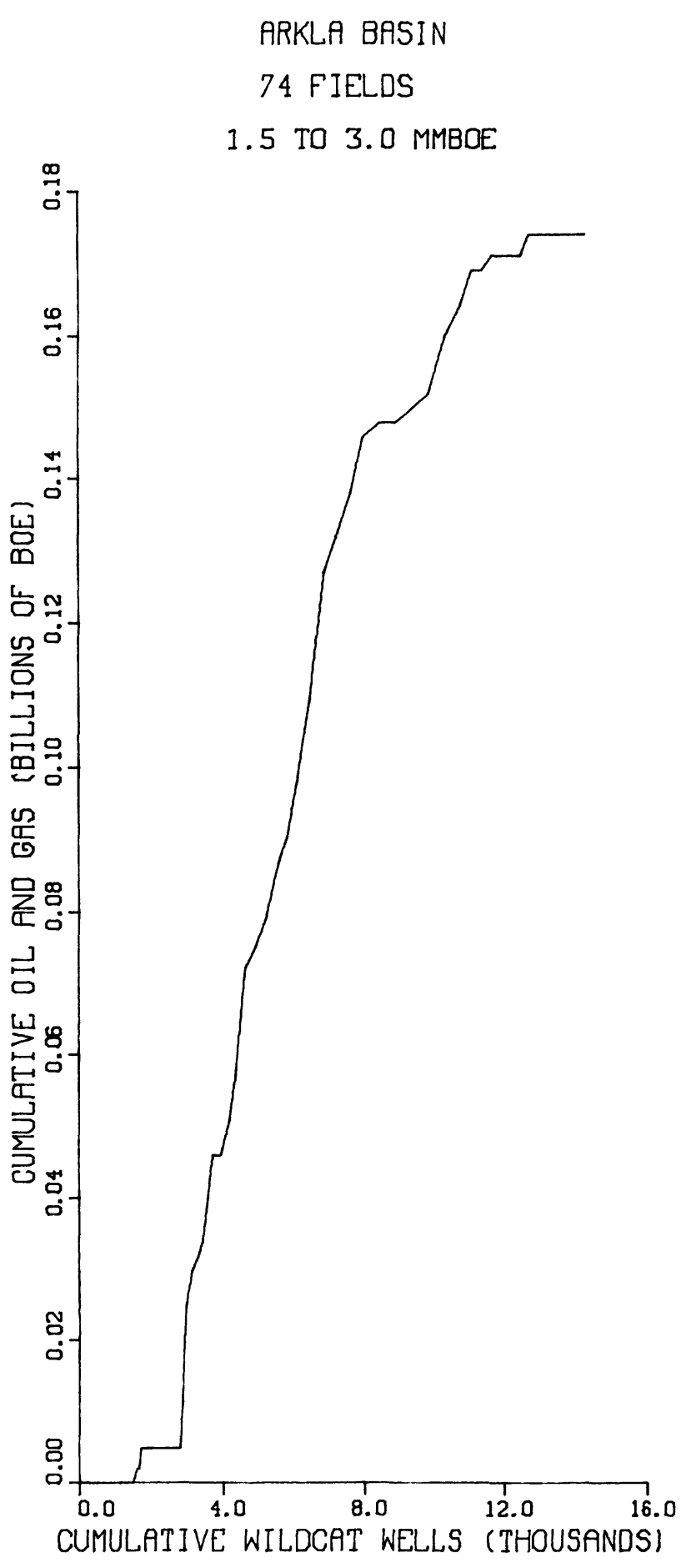

Figure 7e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

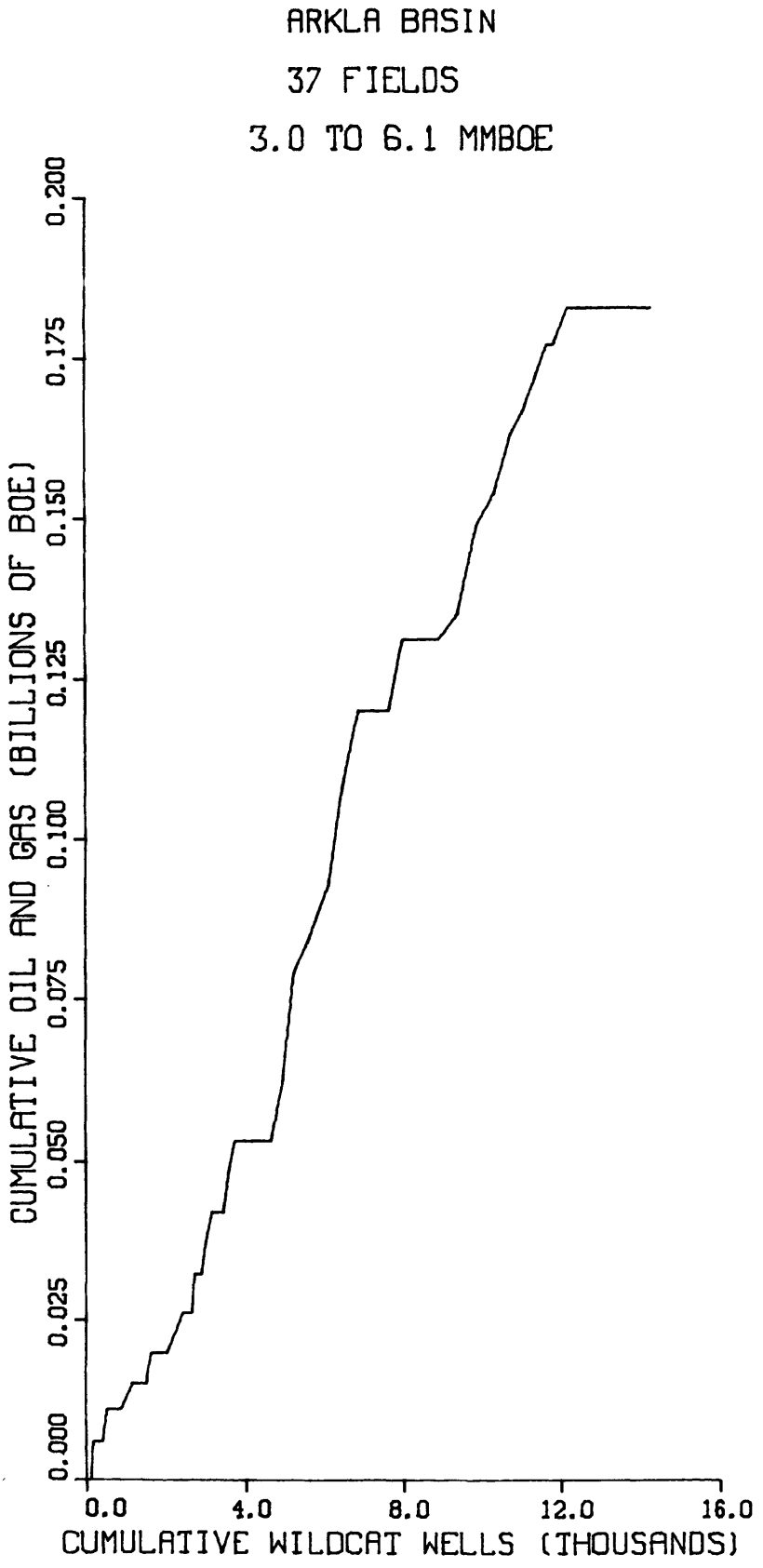

Figure 7f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0.6.1 MMBOE.

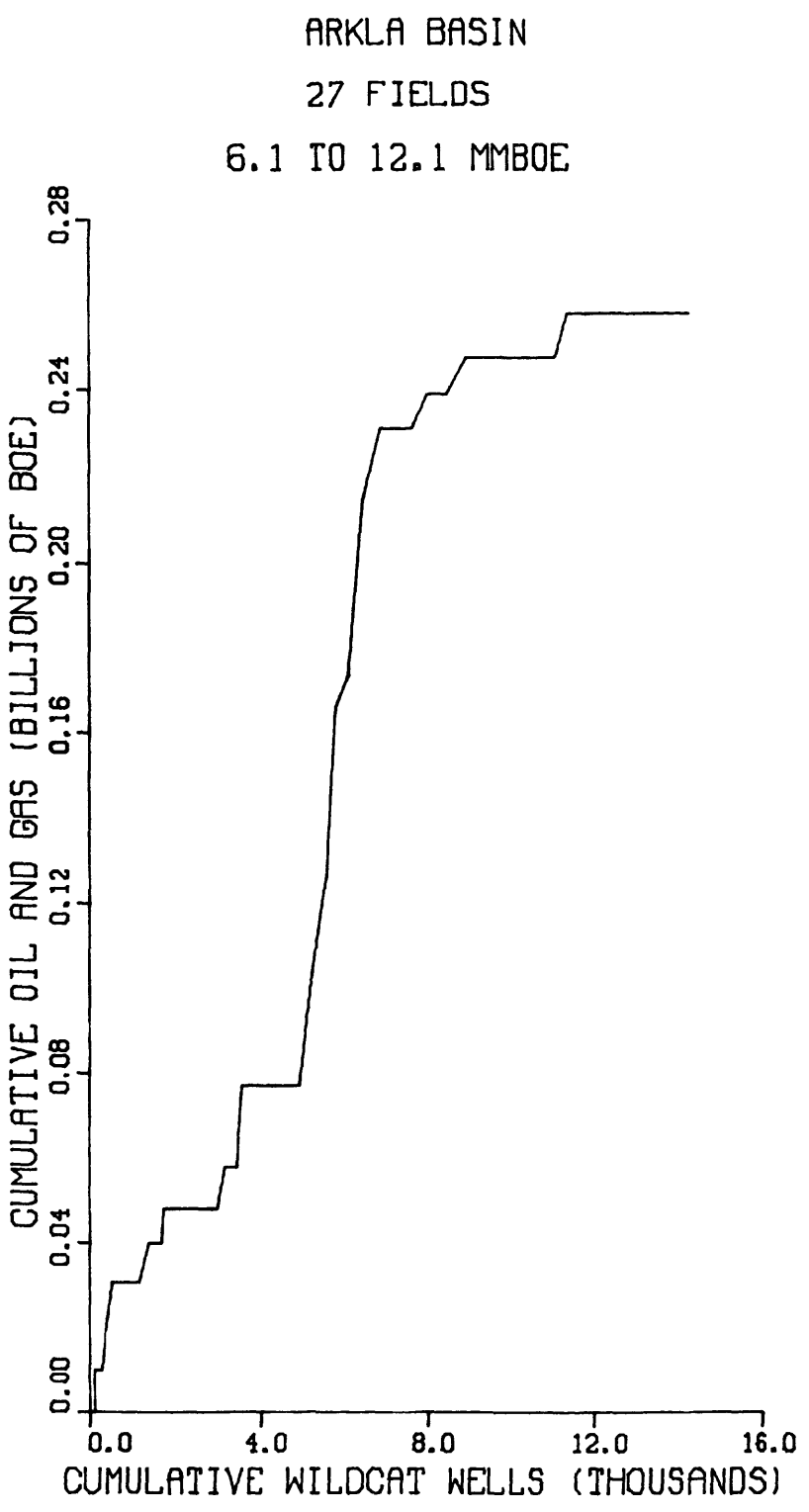

Figure 7g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

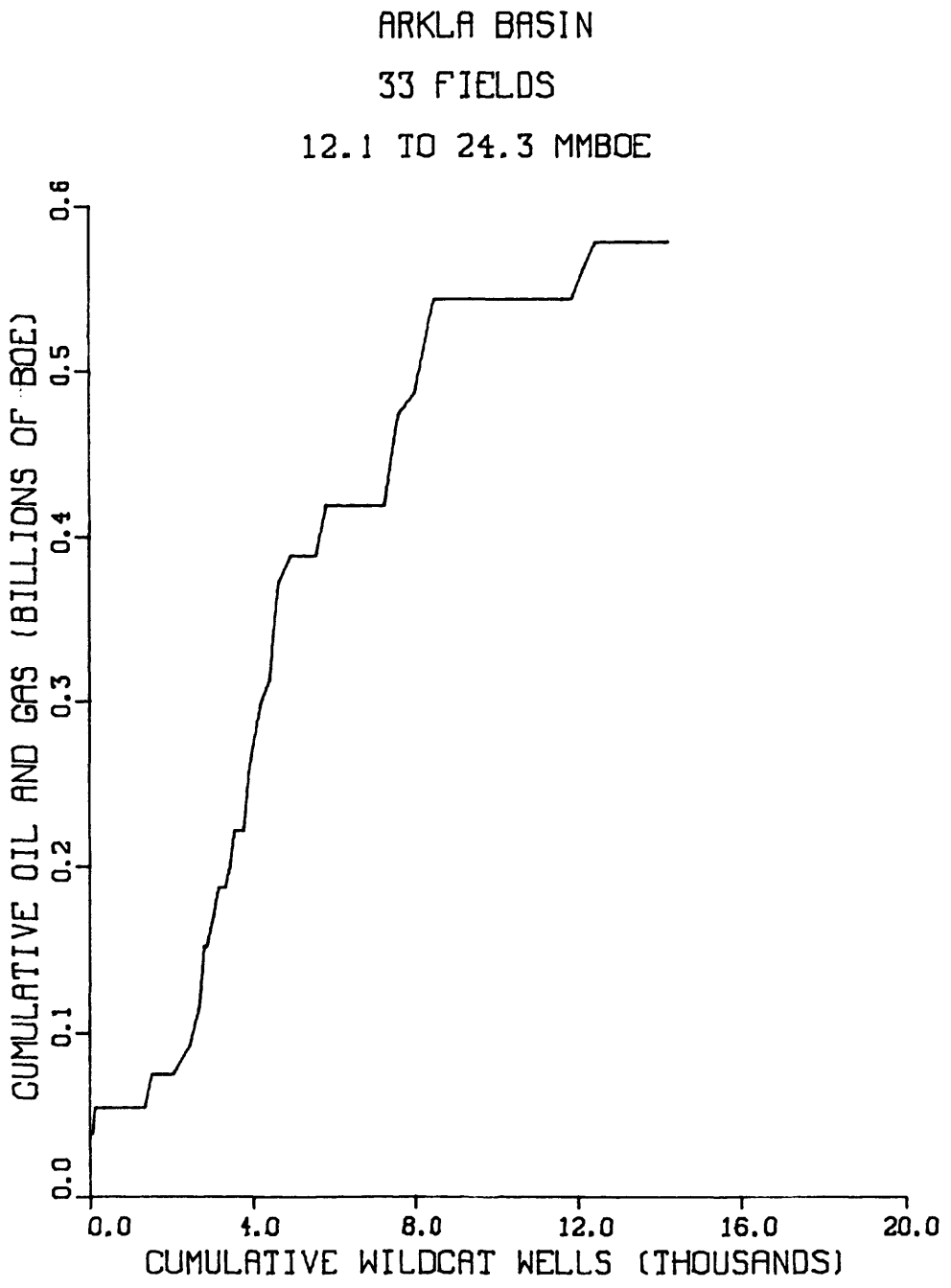

Figure 7h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

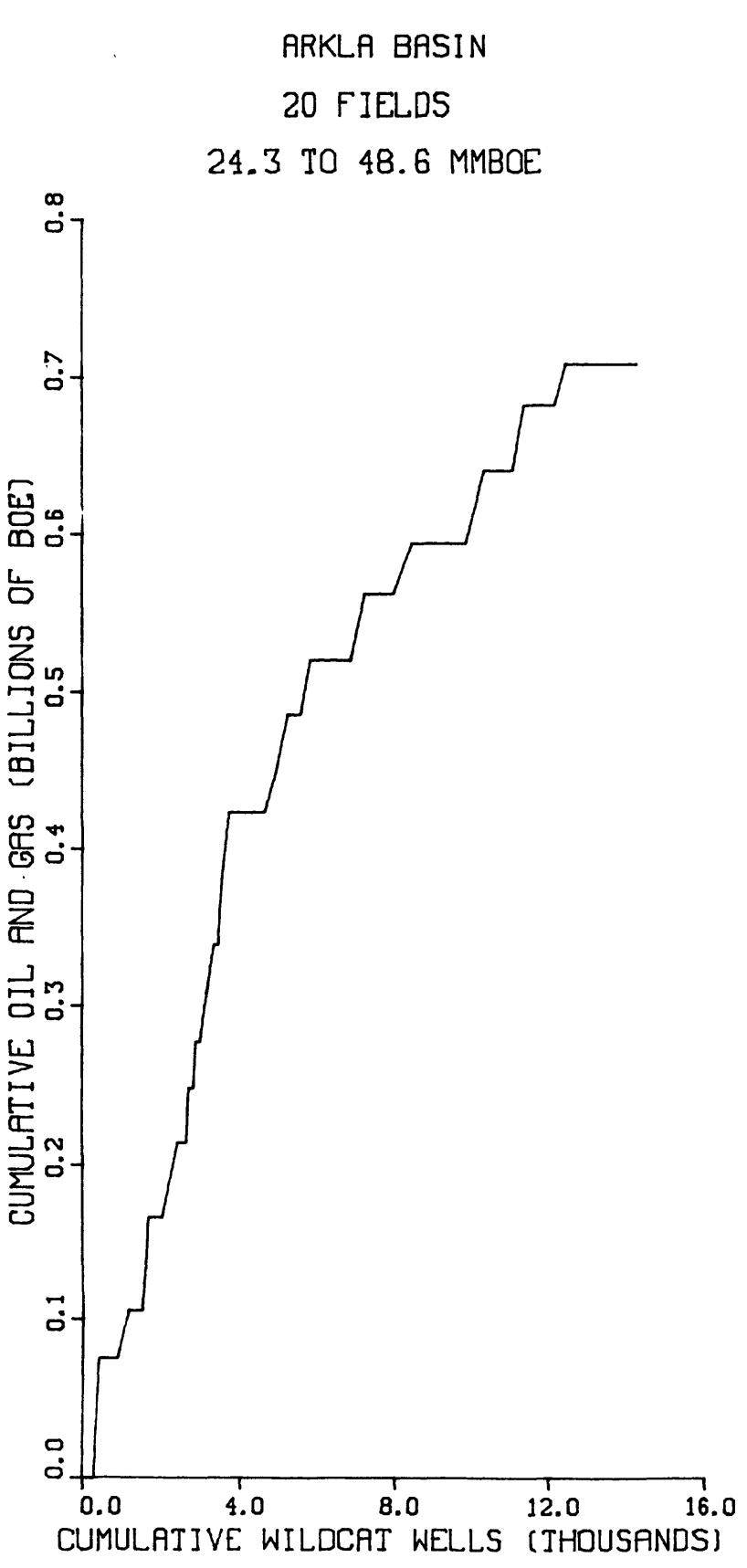

Figure 7i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

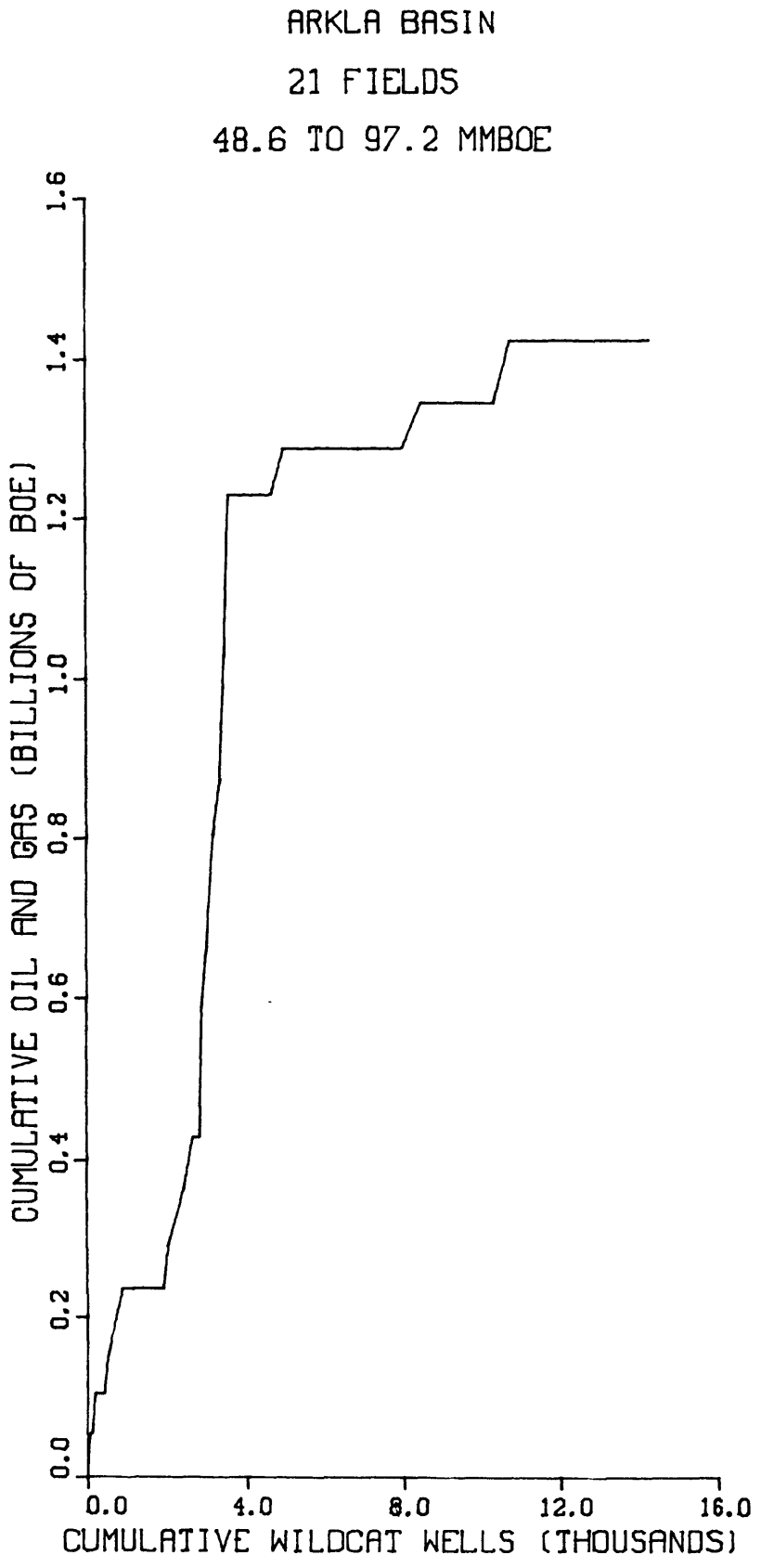

Figure 7j.--Cumulative oil and gas vs. cumulative wells for fields in the size range 48.6-97.2 MMBOE.

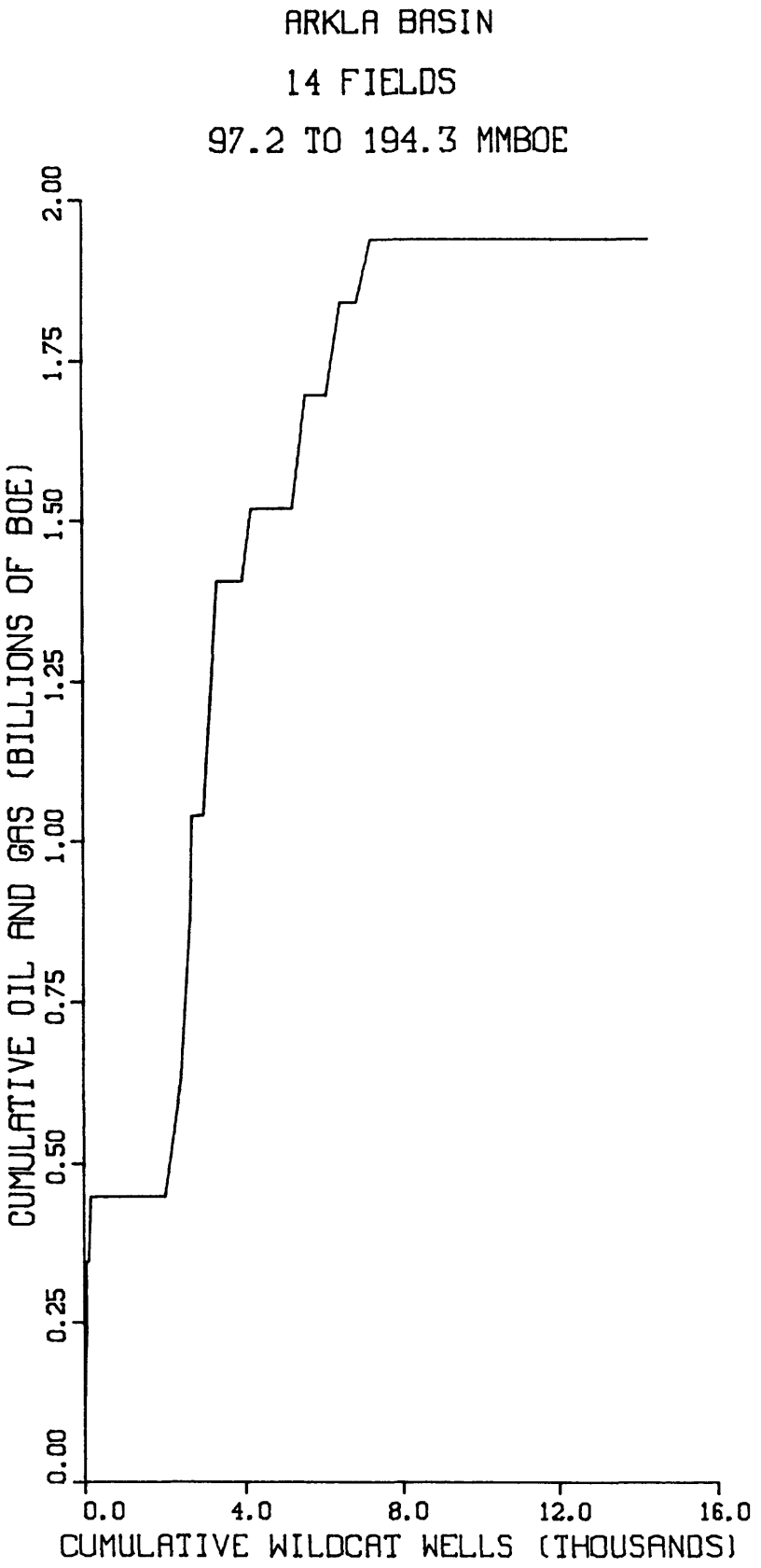

Figure 7k.--Cumulative oil and gas vs. cumulative wells for fields in the size range 97.2-194.3 MMBOE.

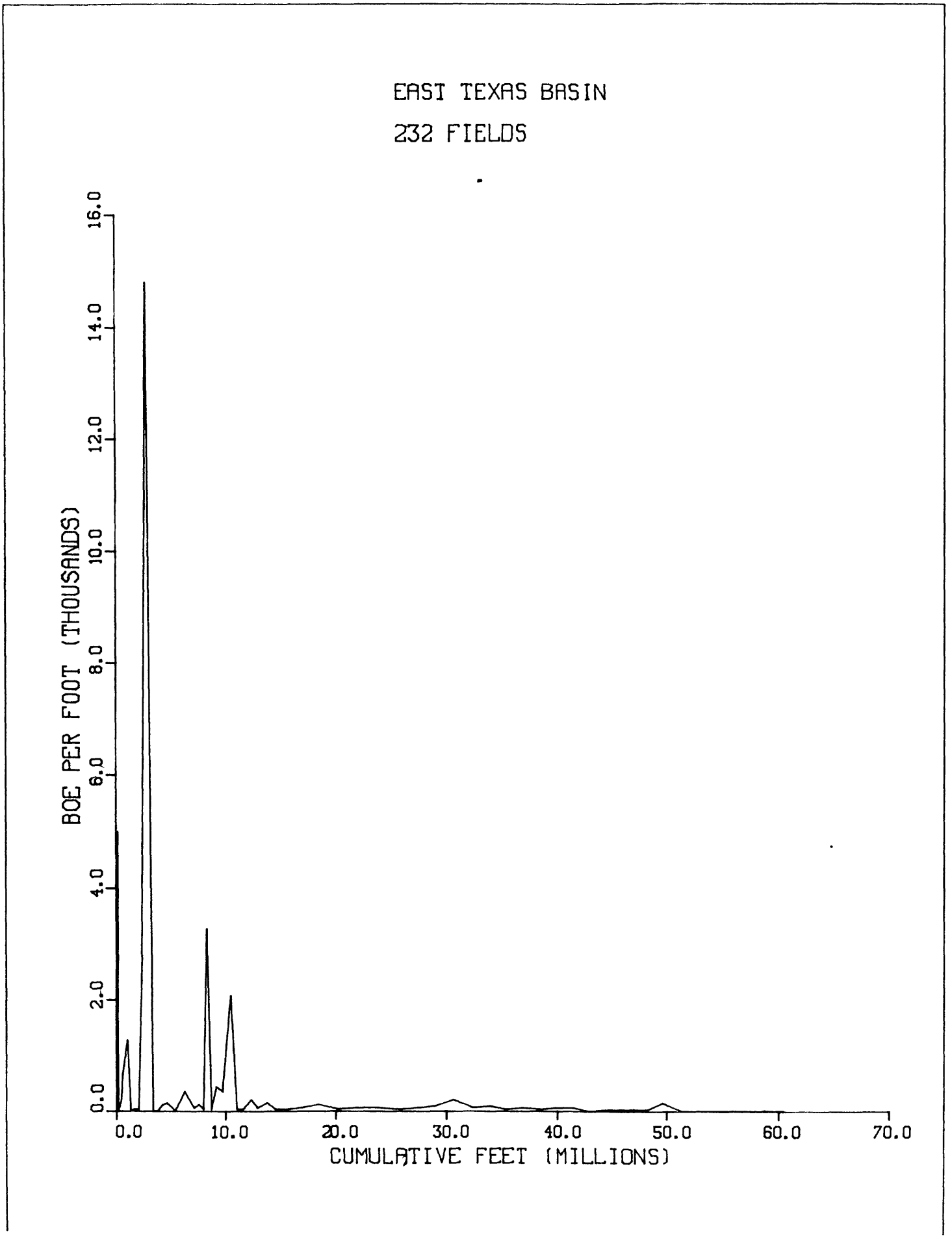

Figure 8a.--BOE per foot vs. cumulative footage drilled.

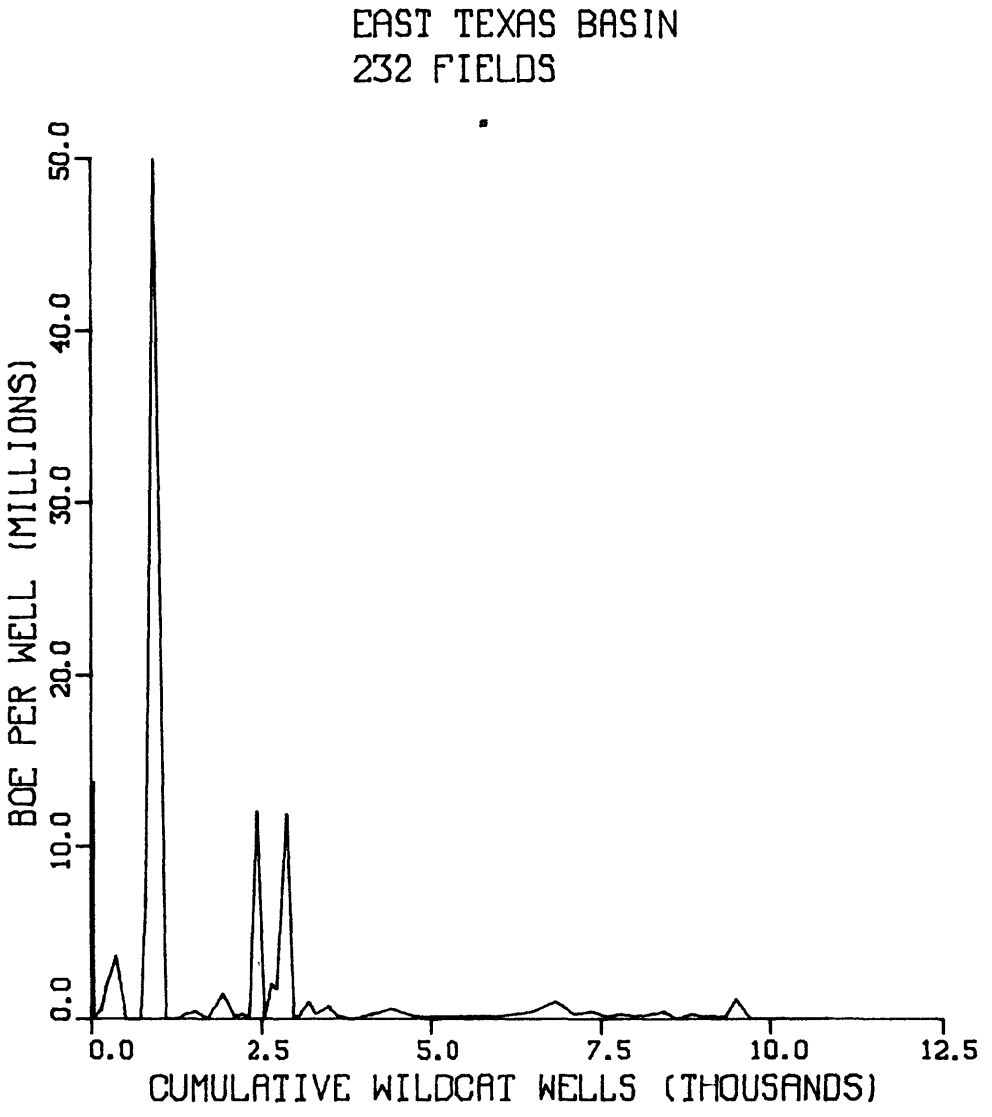

Figure 8b.--BOE per well vs. cumulative wells drilled.

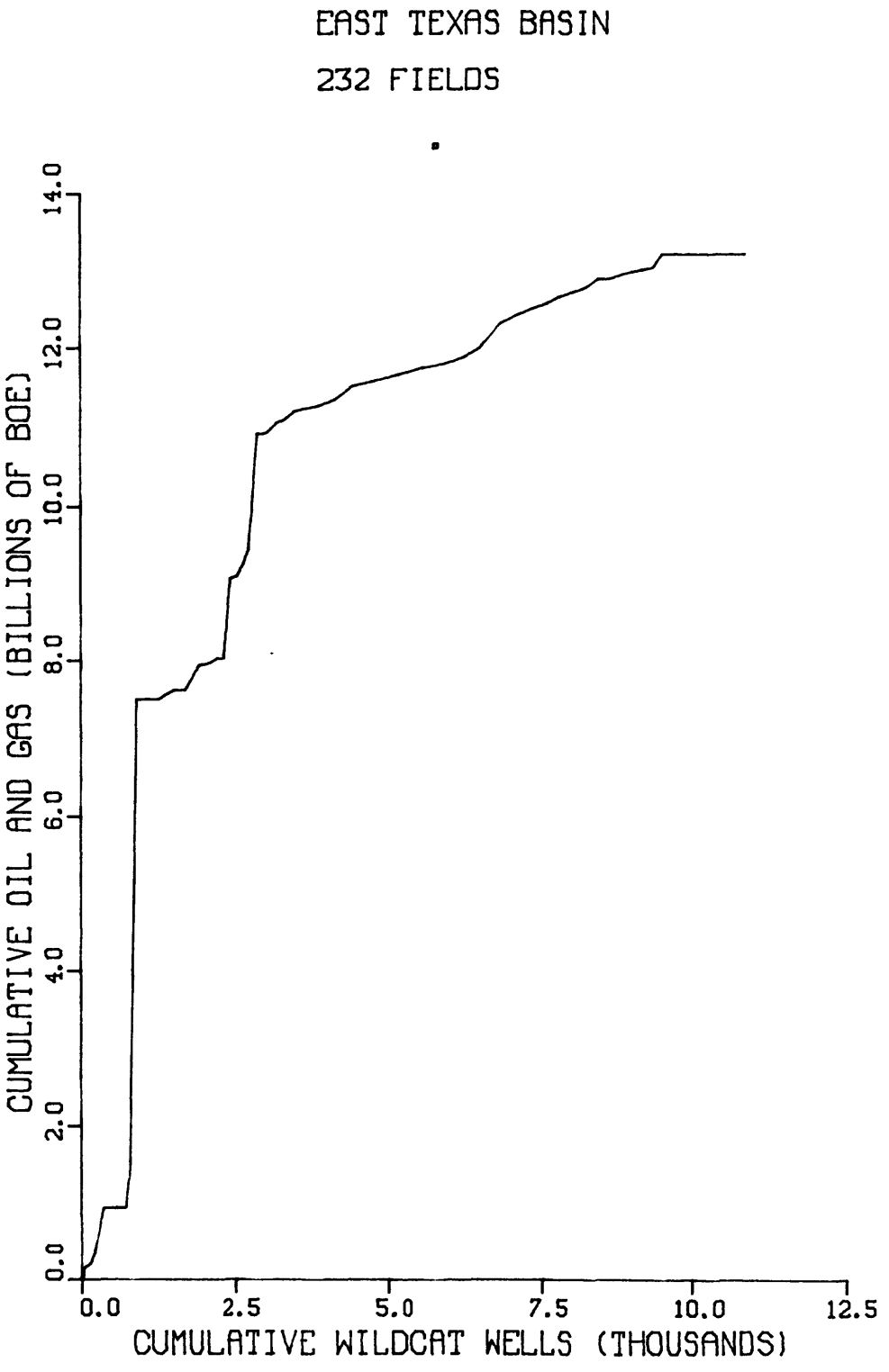

Figure 8c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

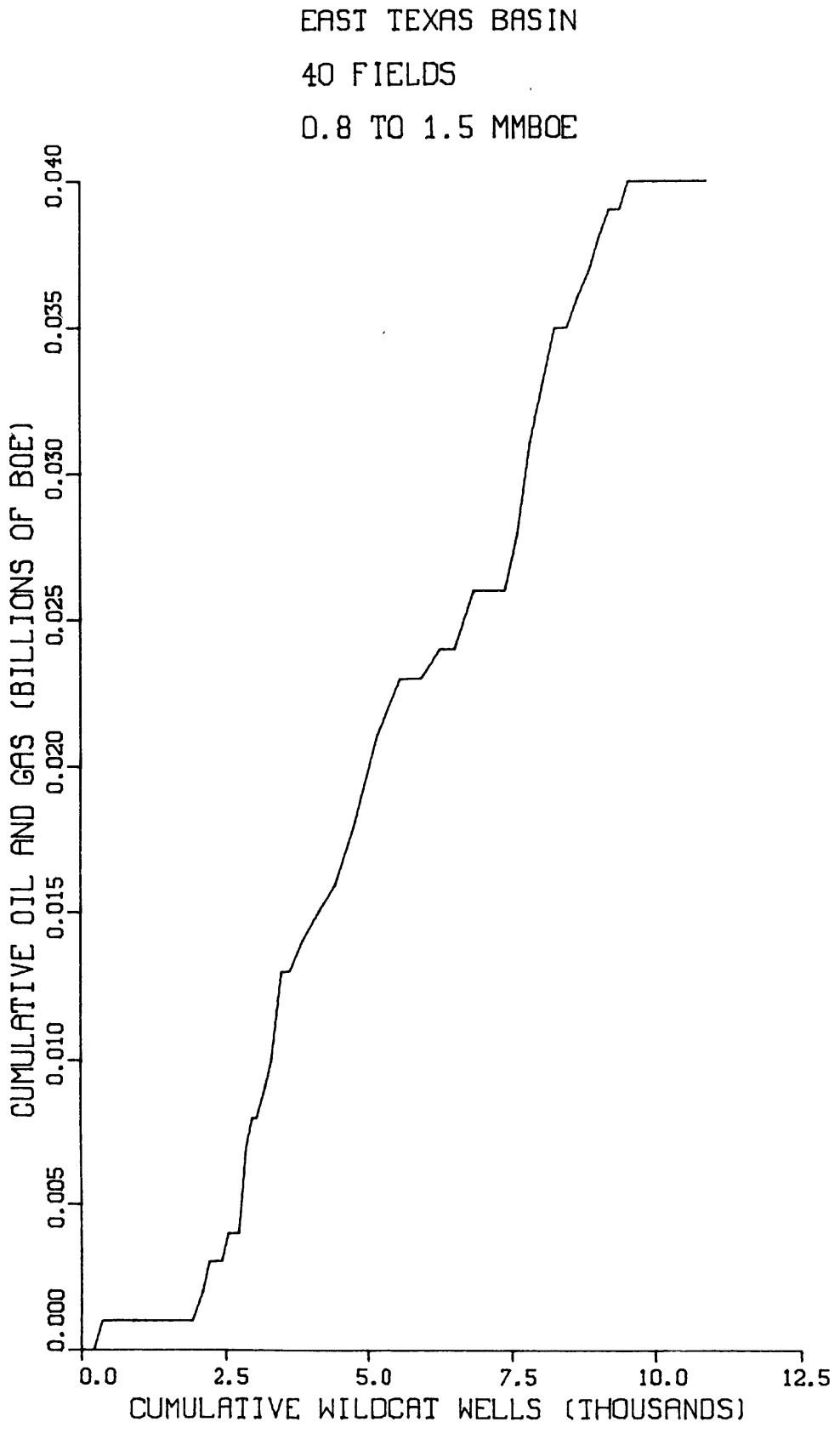

Figure 8d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

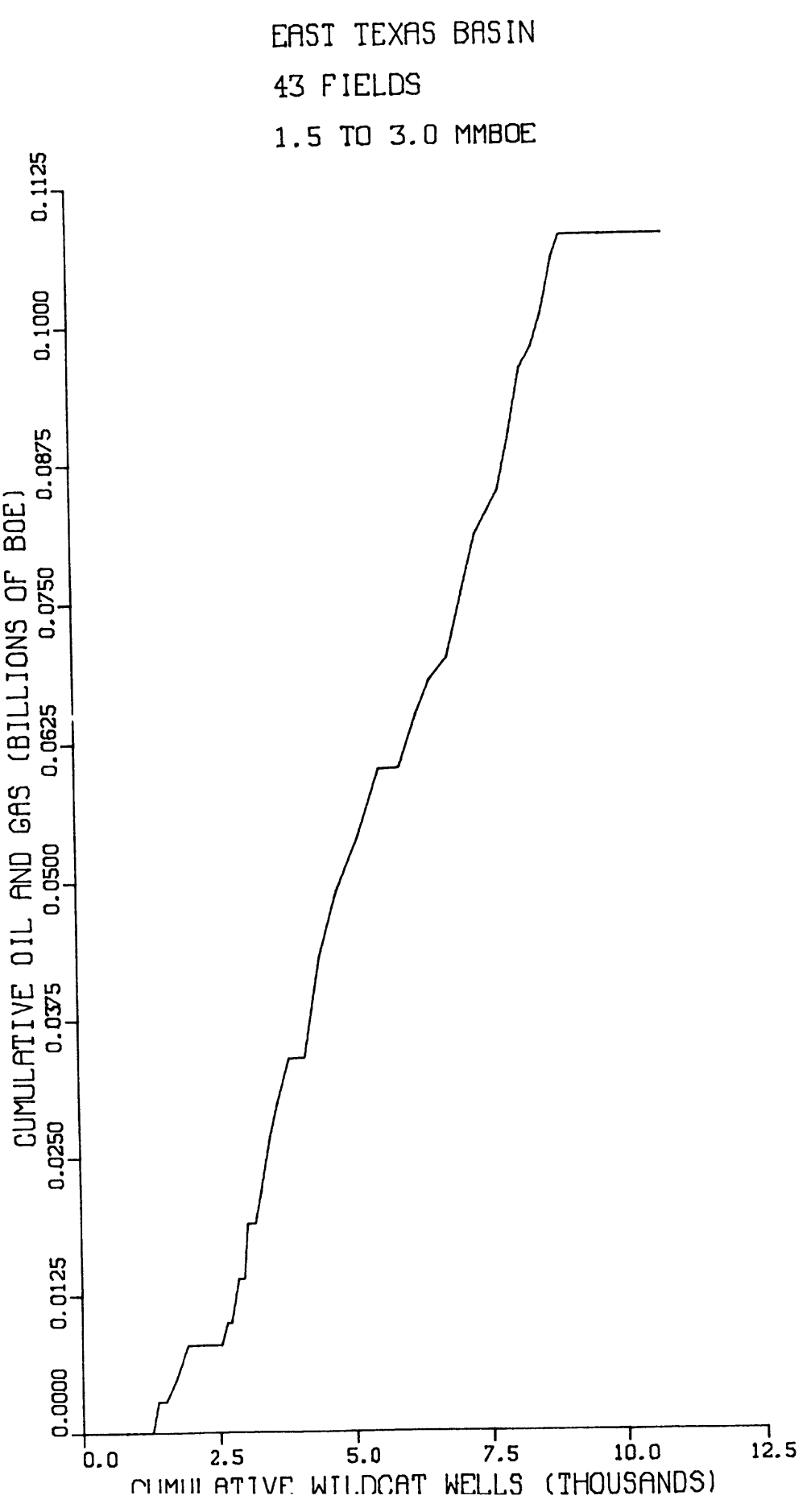

Figure 8e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

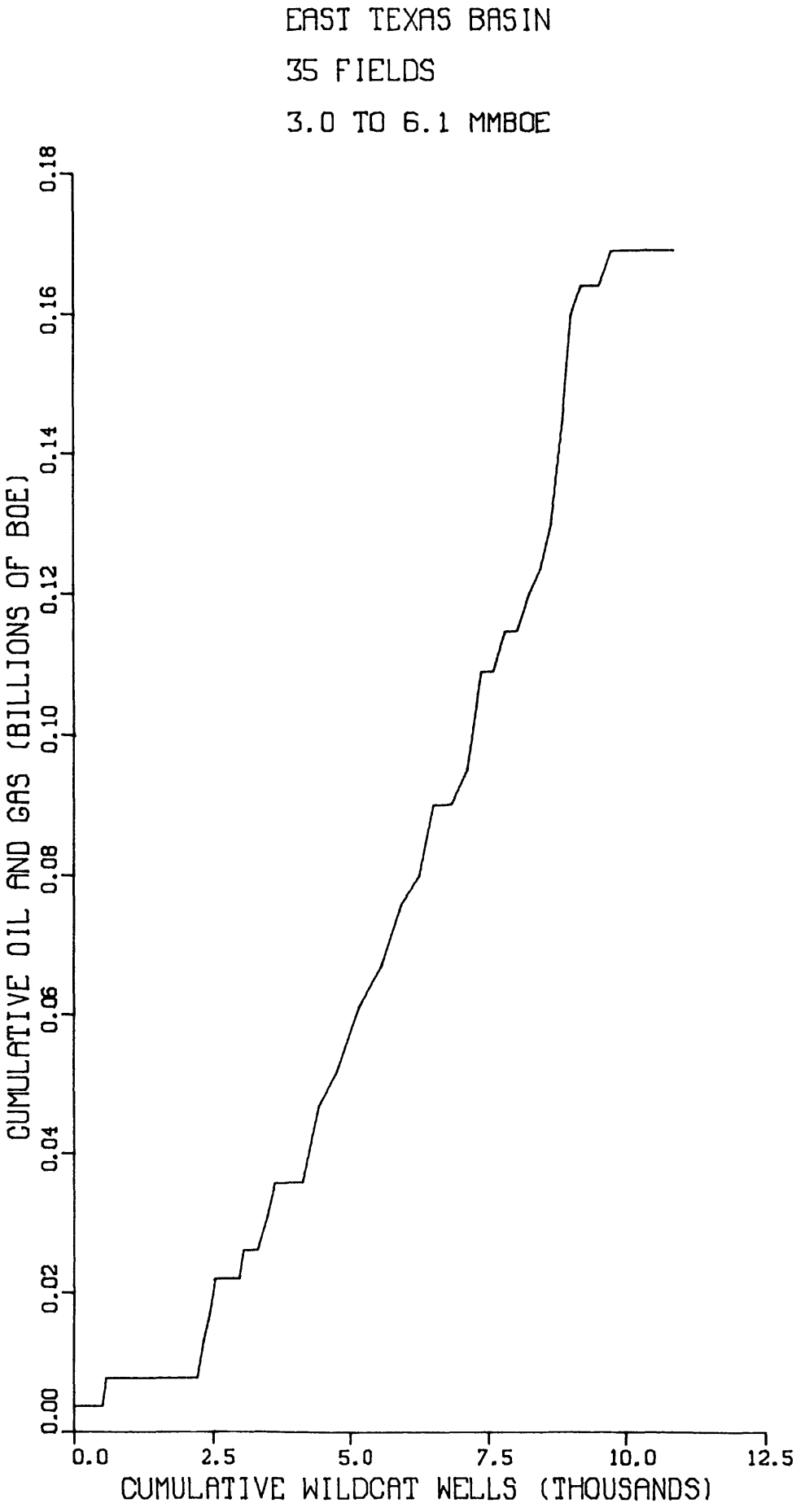

Figure 8f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0.6.1 MMBOE.

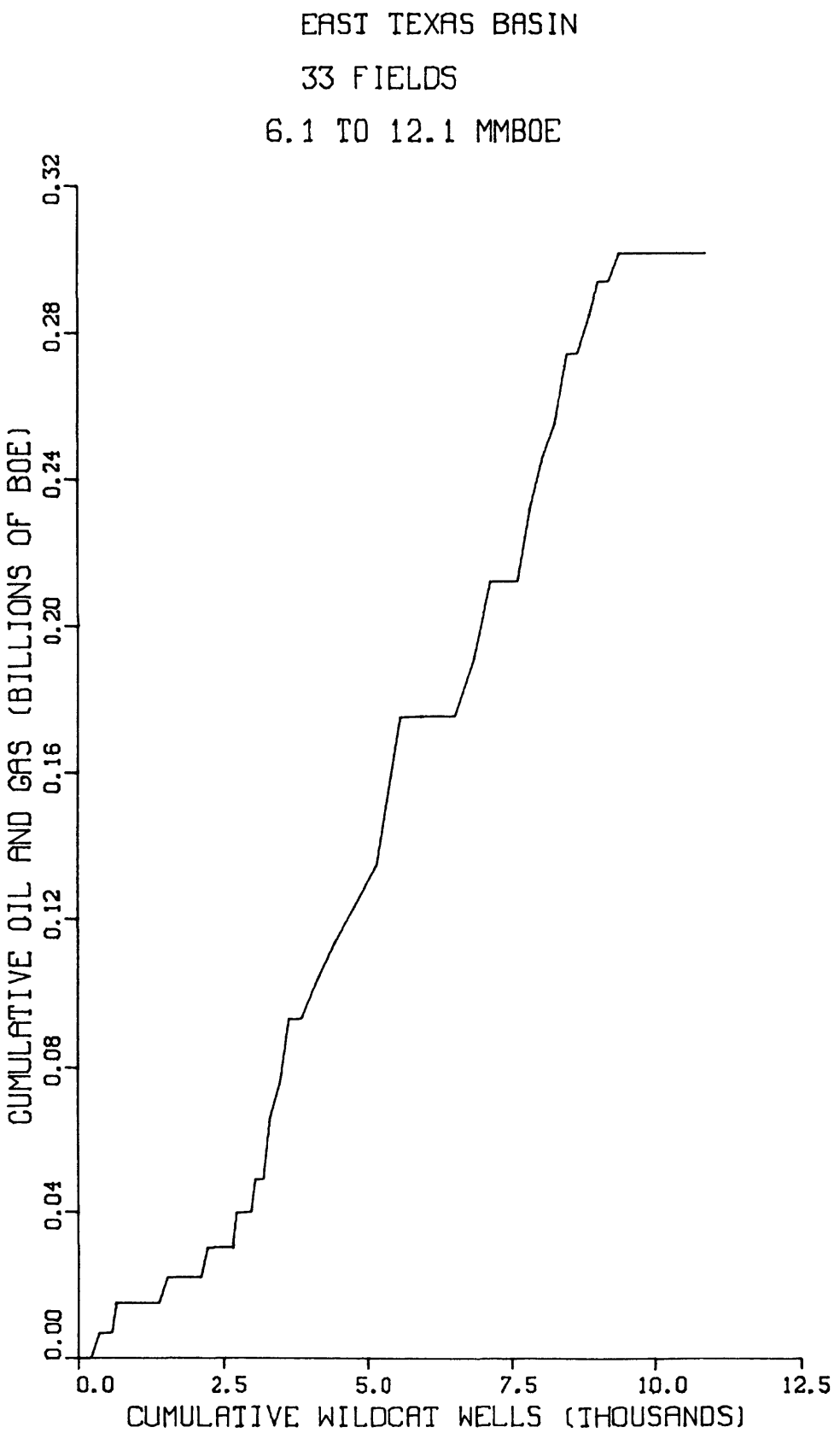

Figure 8g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

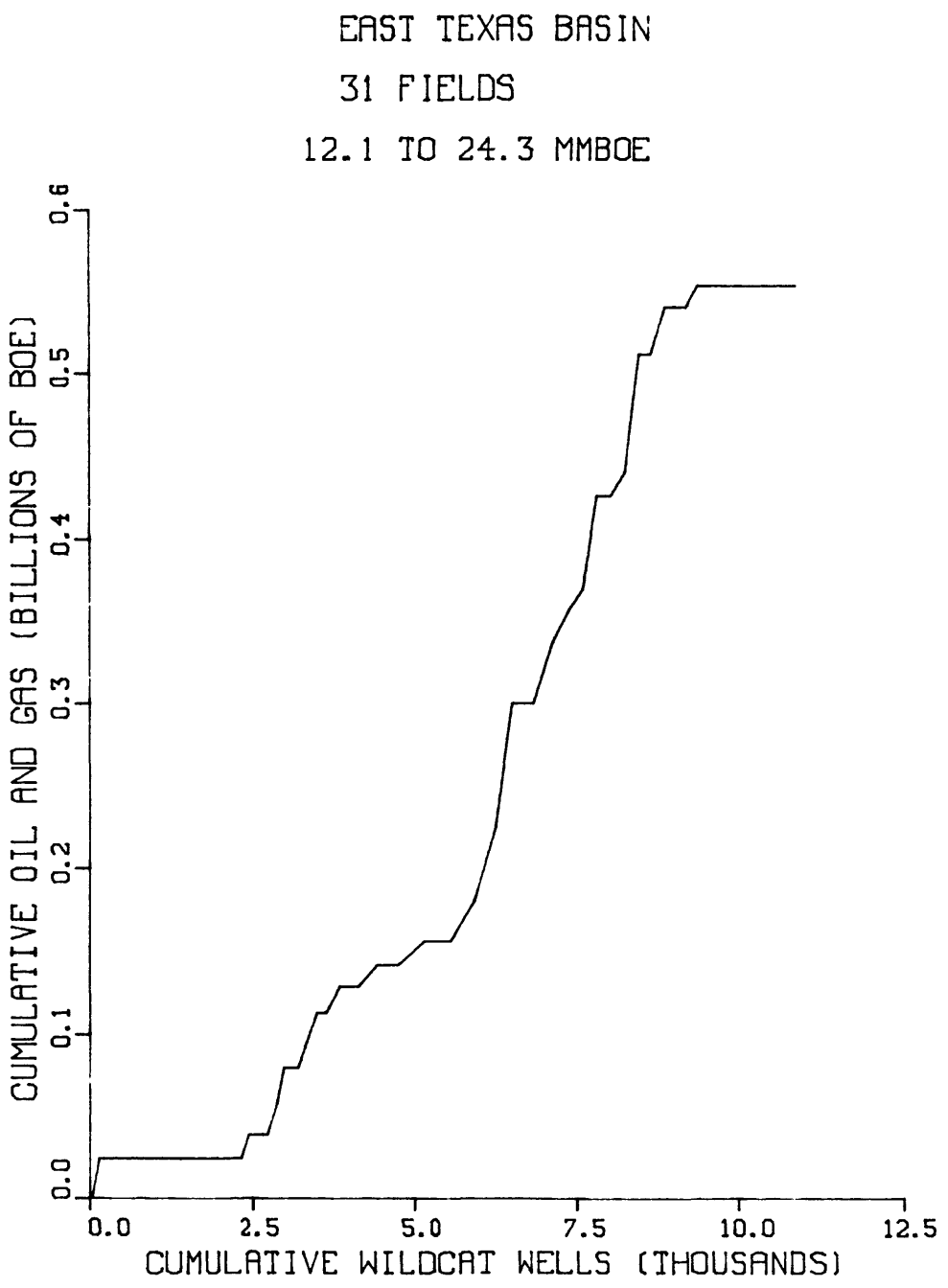

Figure 8h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

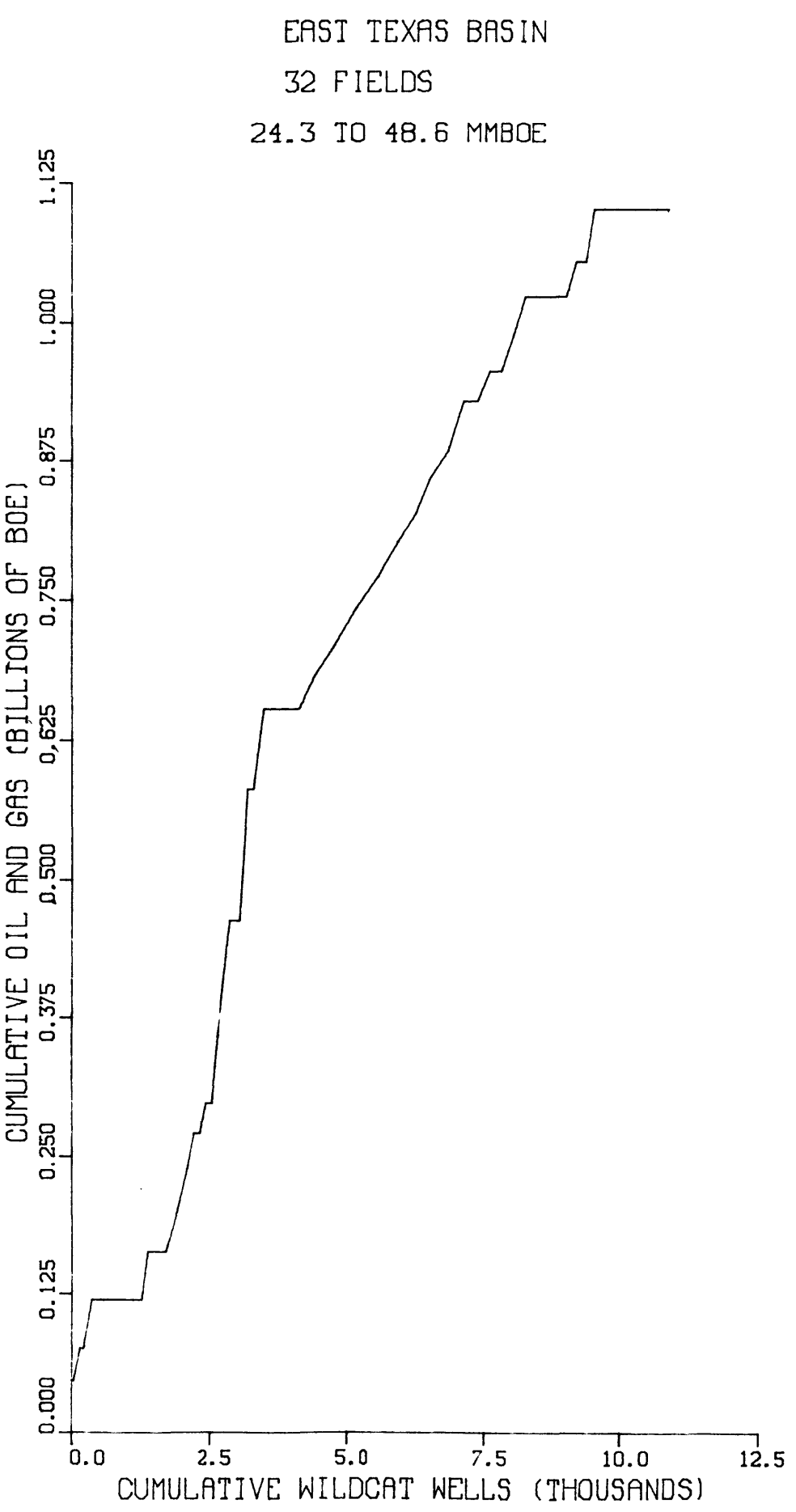

Figure 8i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

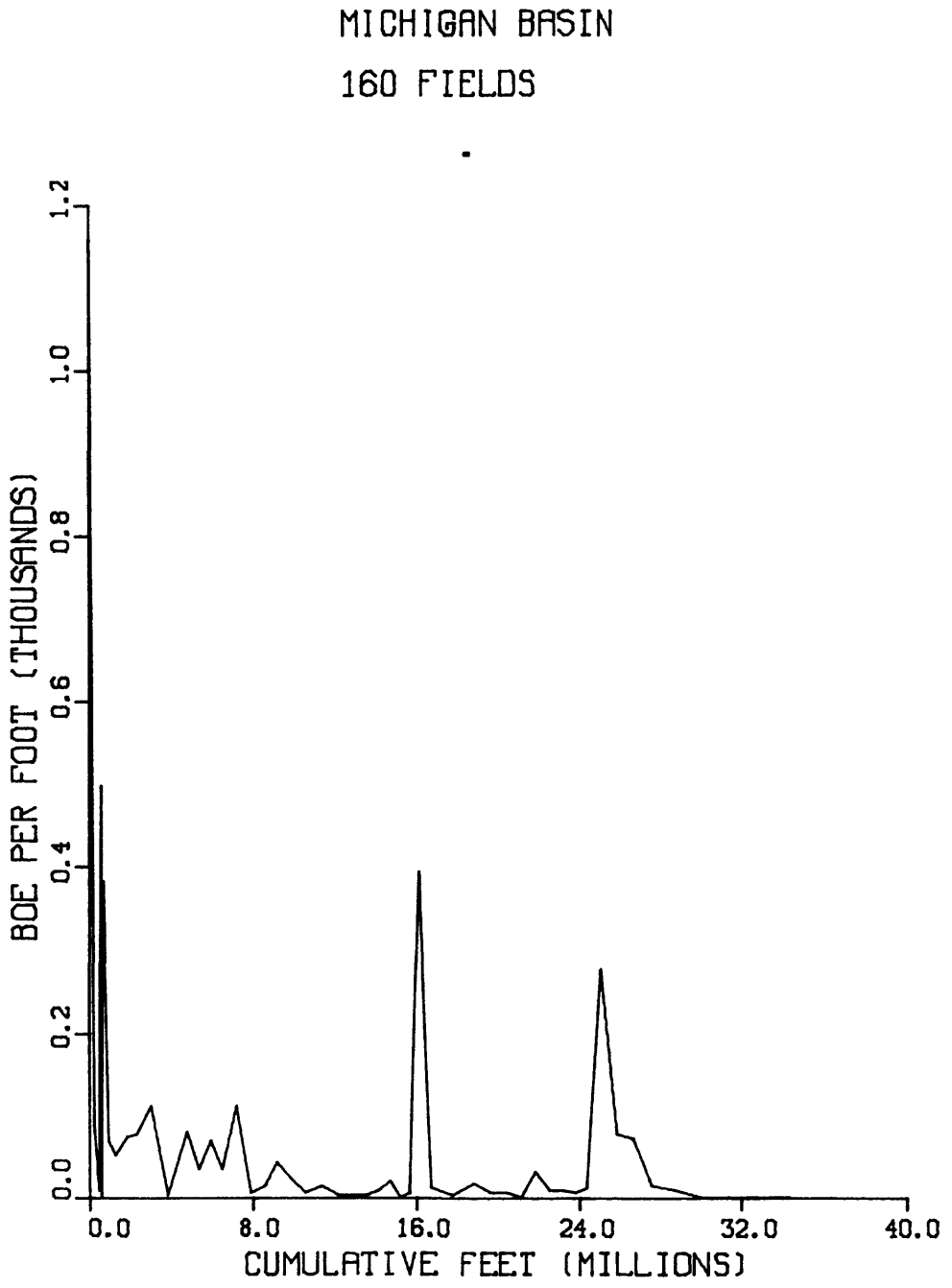

Figure 9a.--BOE per foot vs. cumulative footage drilled.

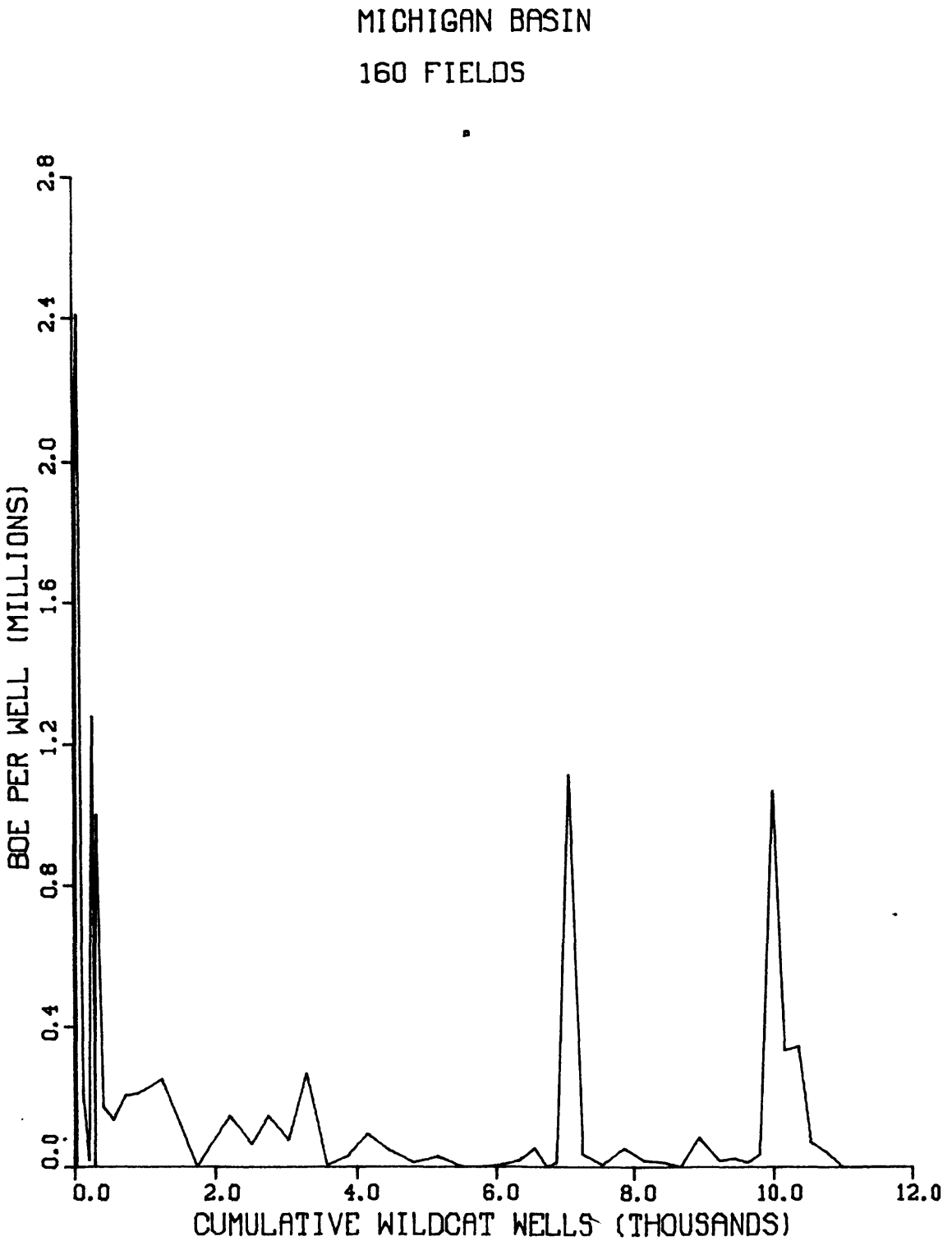

Figure 9b.--BOE per well vs. cumulative wells drilled.

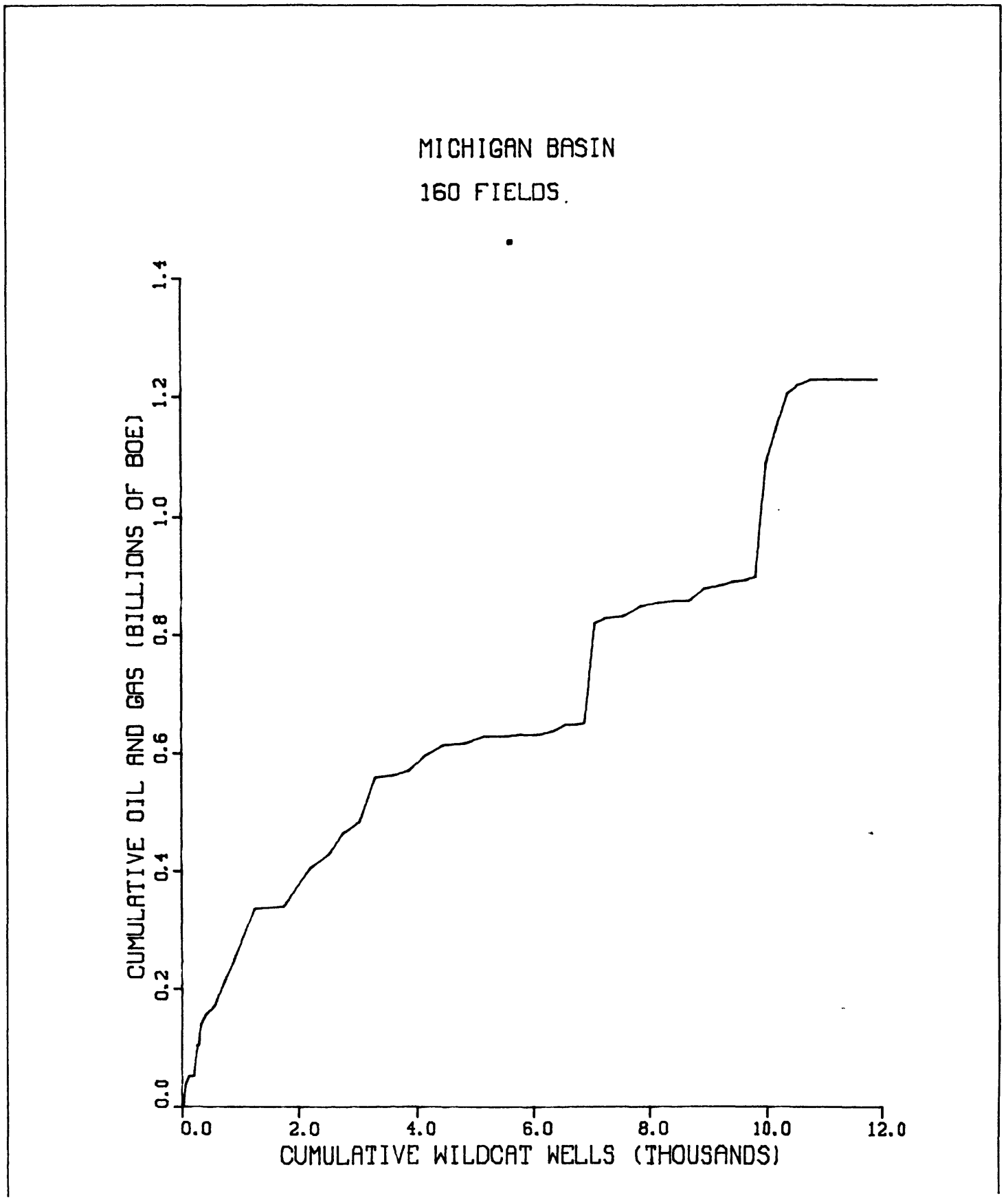

Figure 9c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

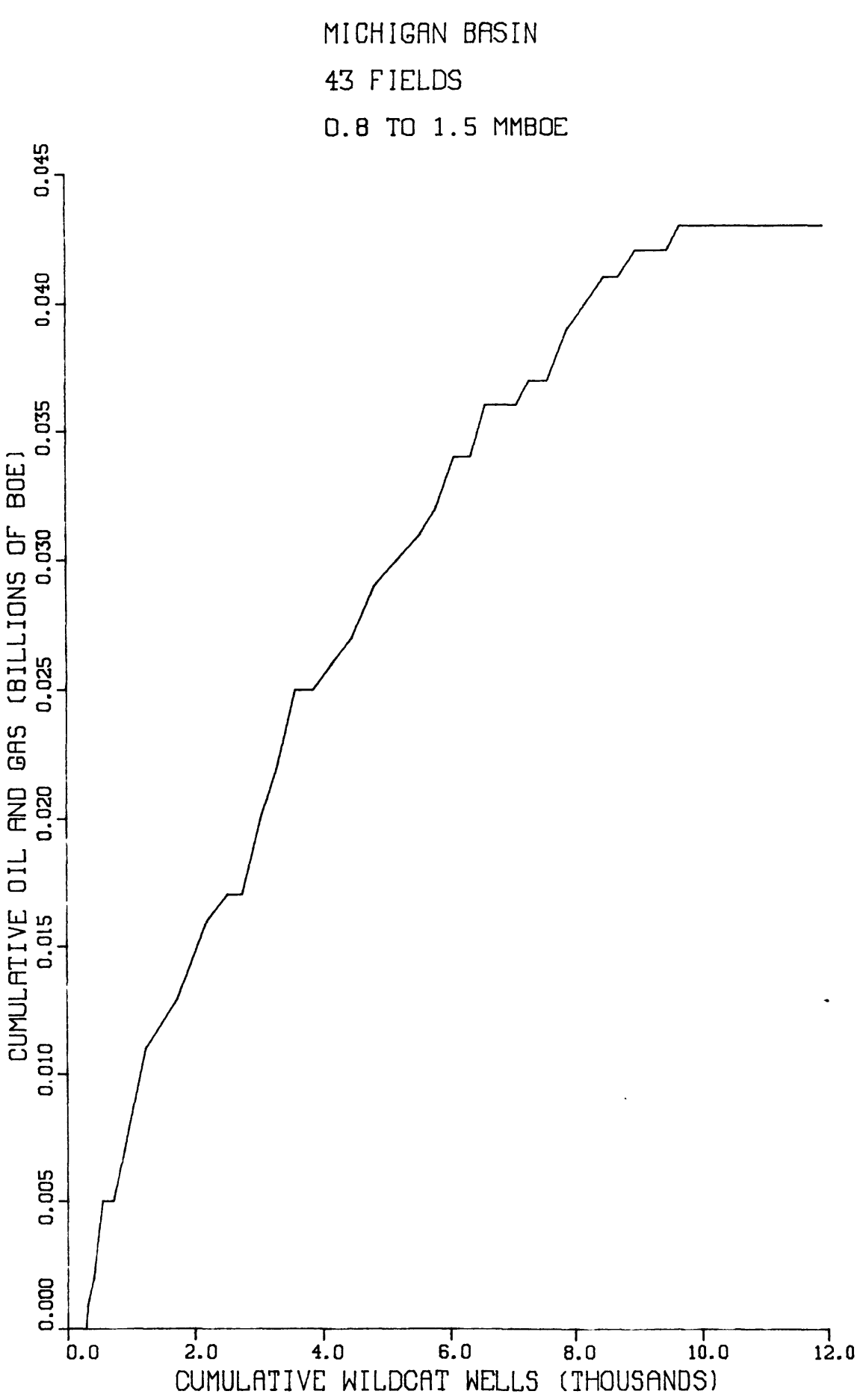

Figure 9d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

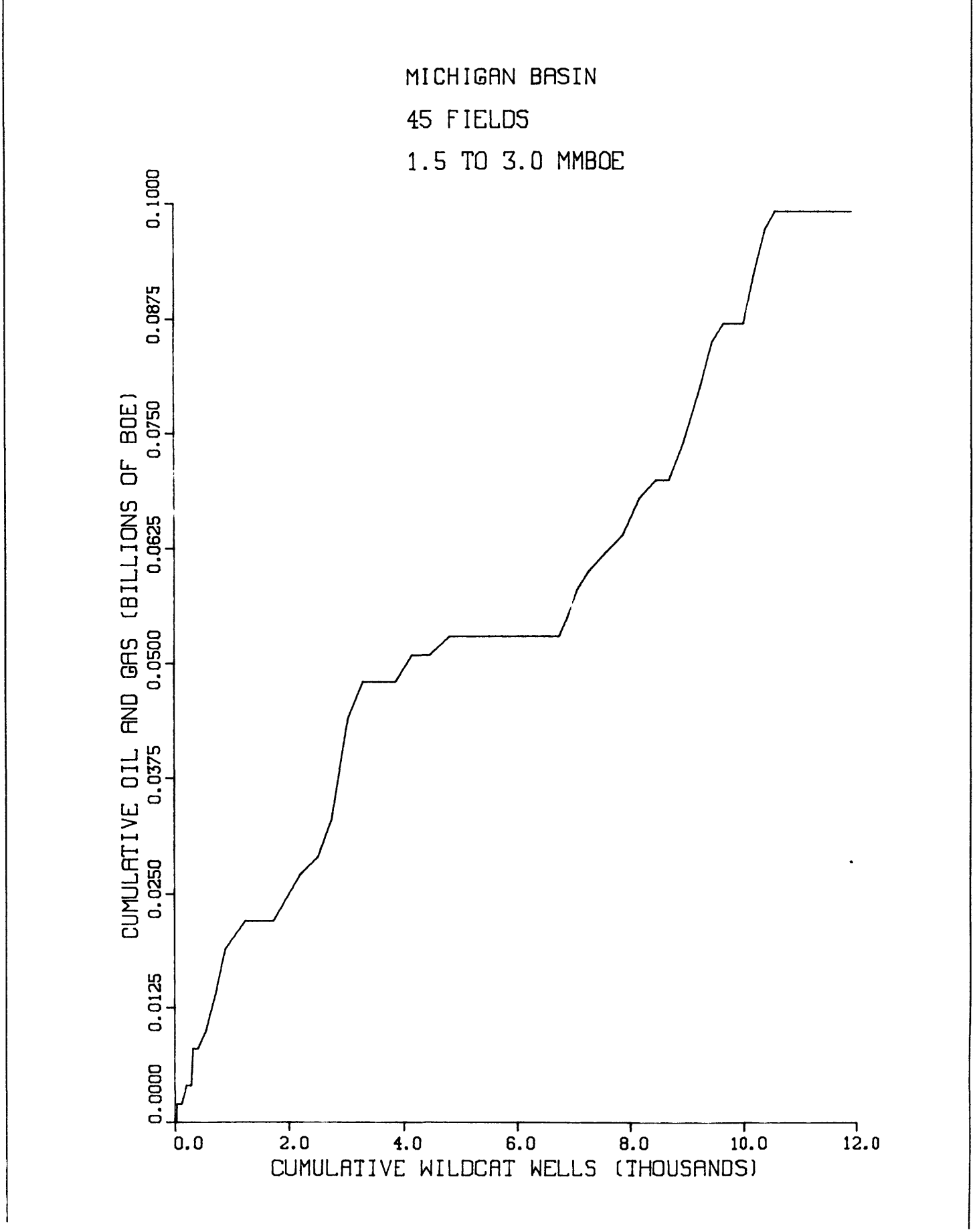

Figure 9e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

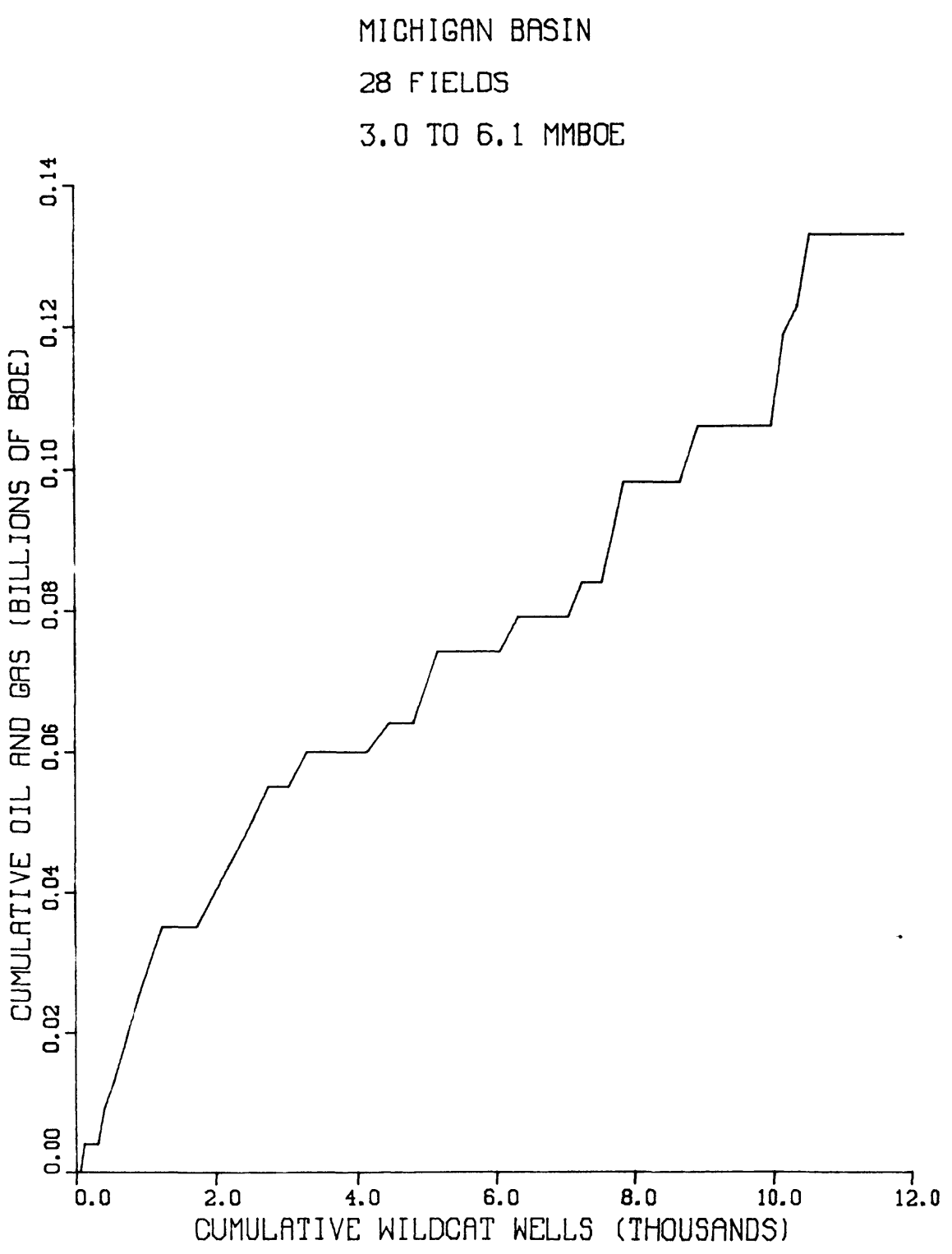

Figure 9f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0.6.1 MMBOE.

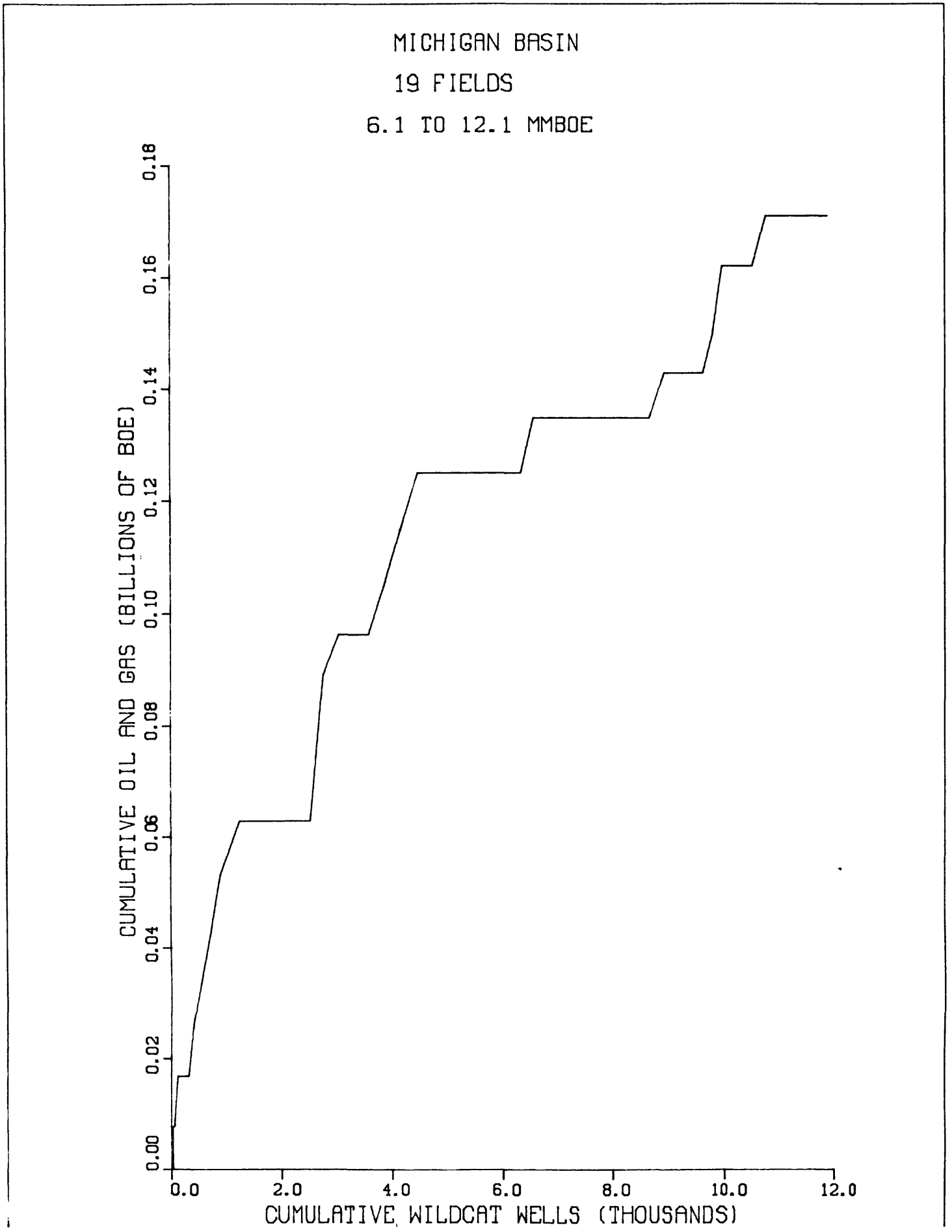

Figure 9g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

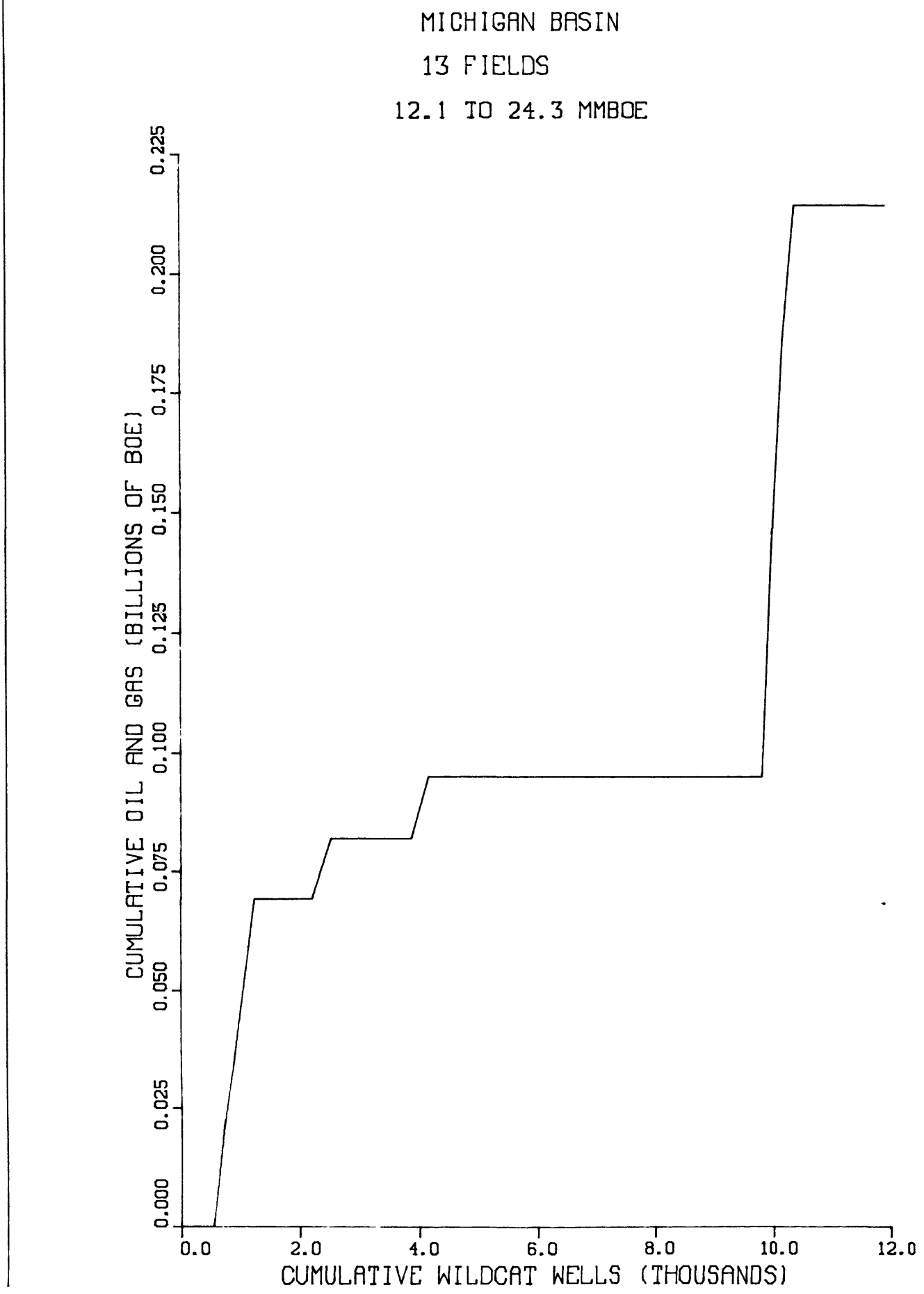

Figure 9h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

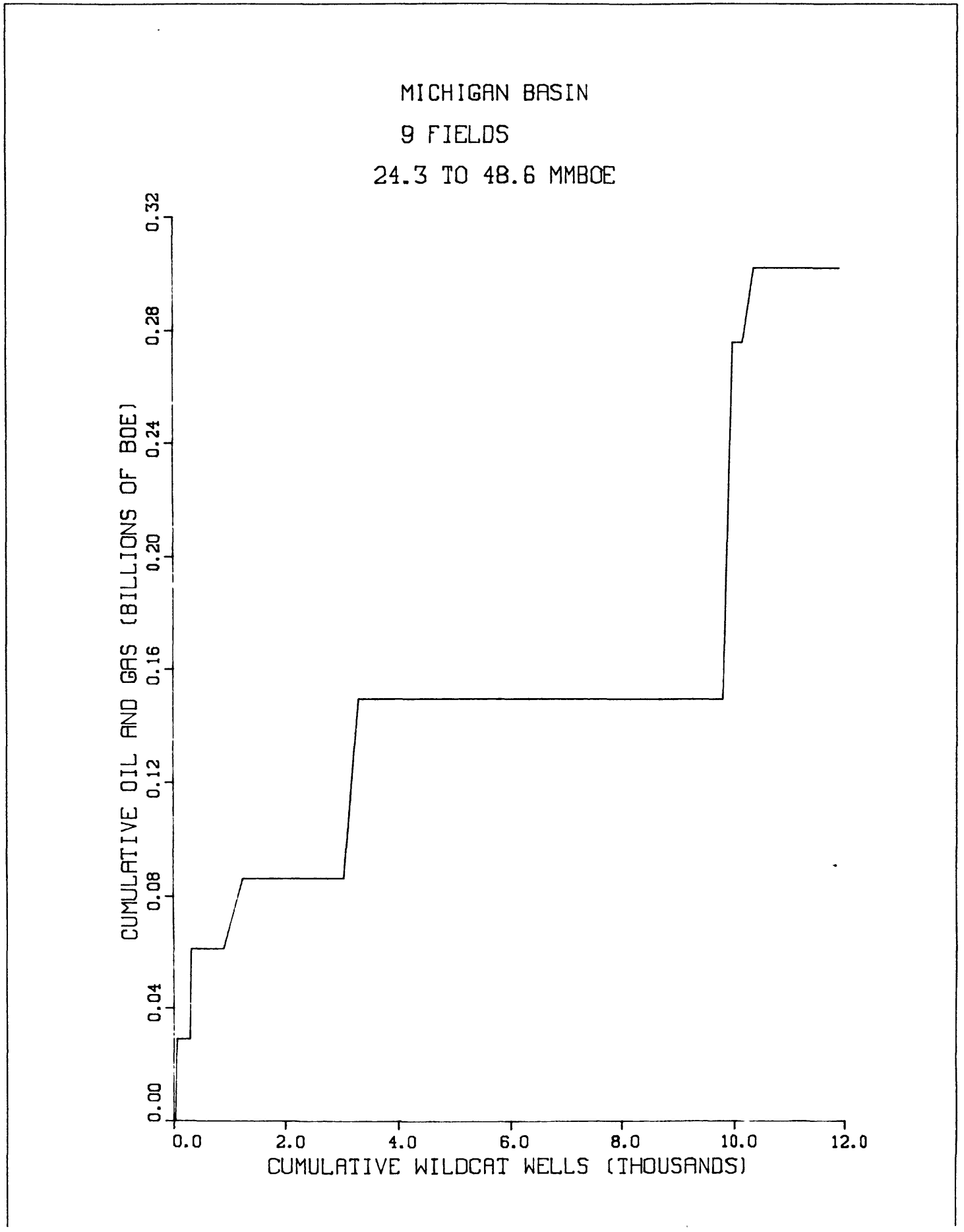

Figure 9i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

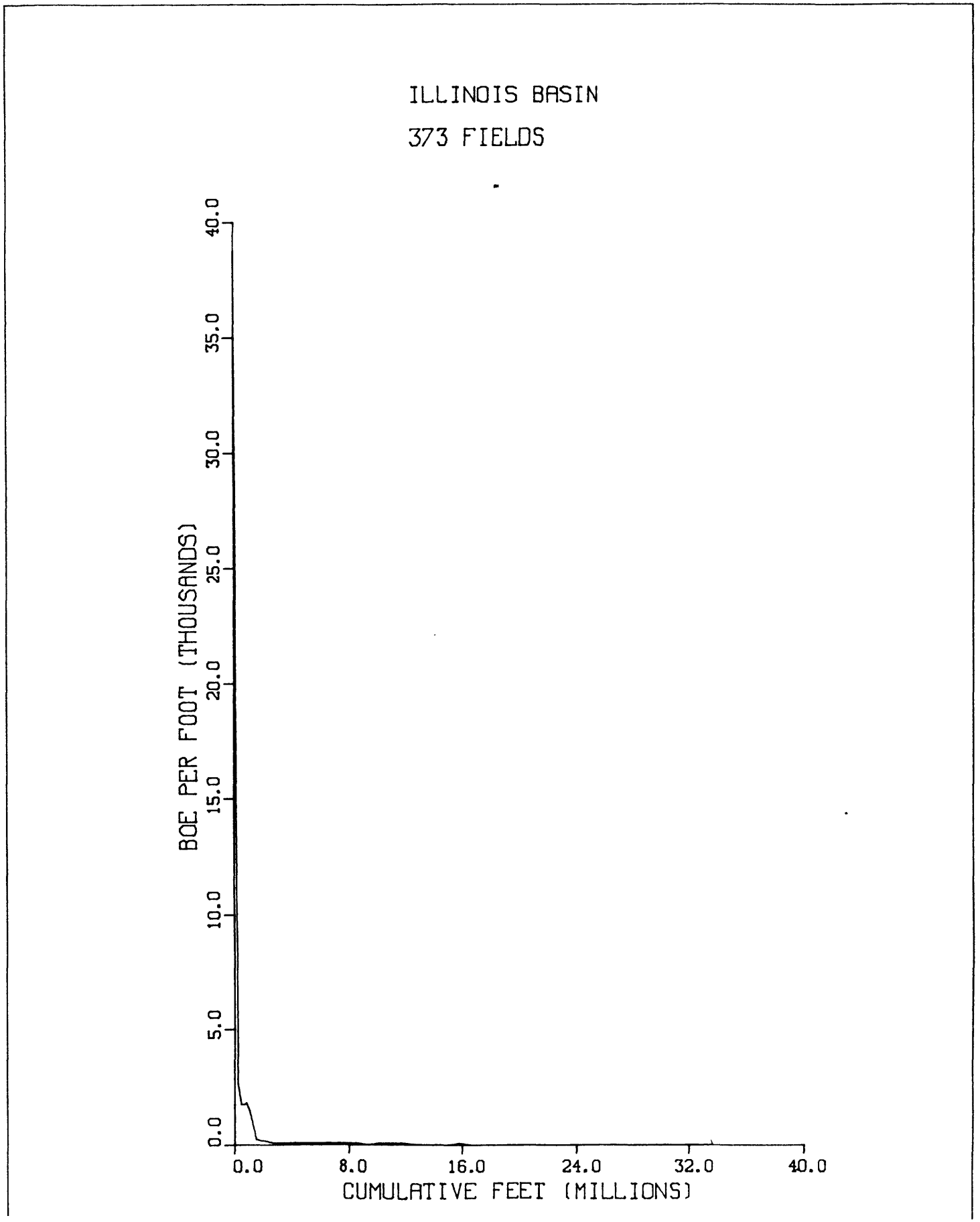

Figure 10a.--BOE per foot vs. cumulative footage drilled.

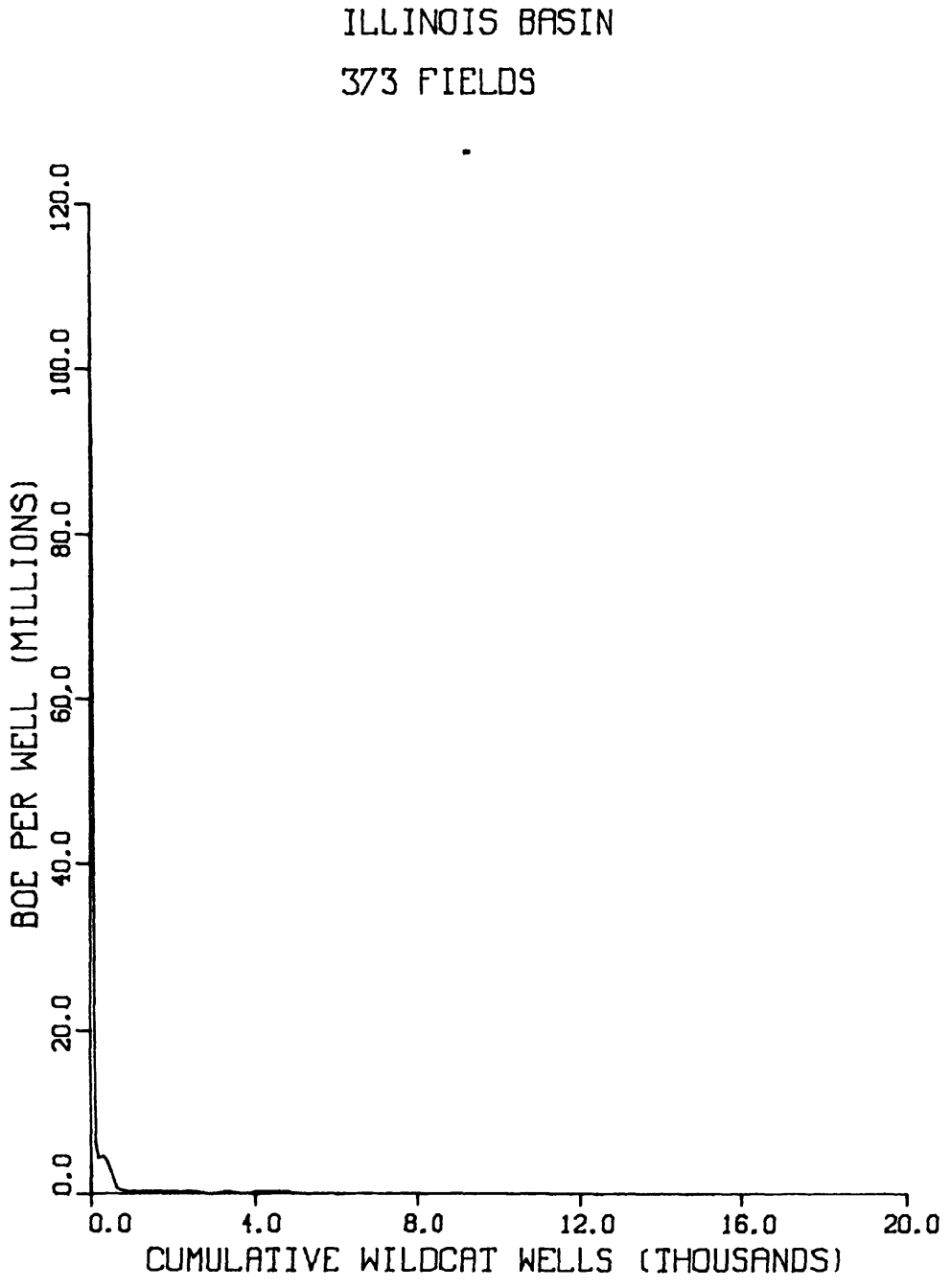

Figure 10b.--BOE per well vs. cumulative wells drilled.

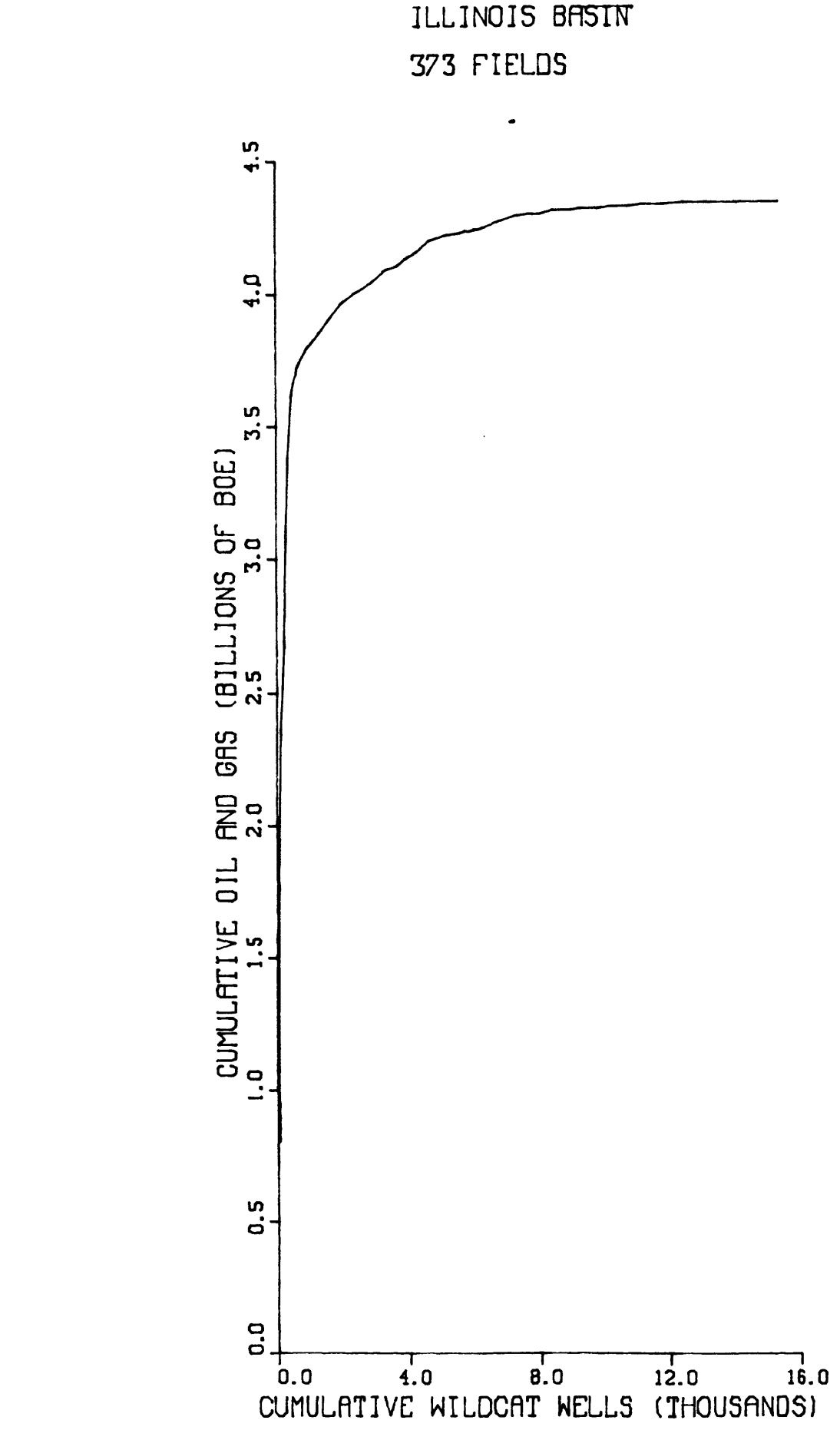

Figure 10c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

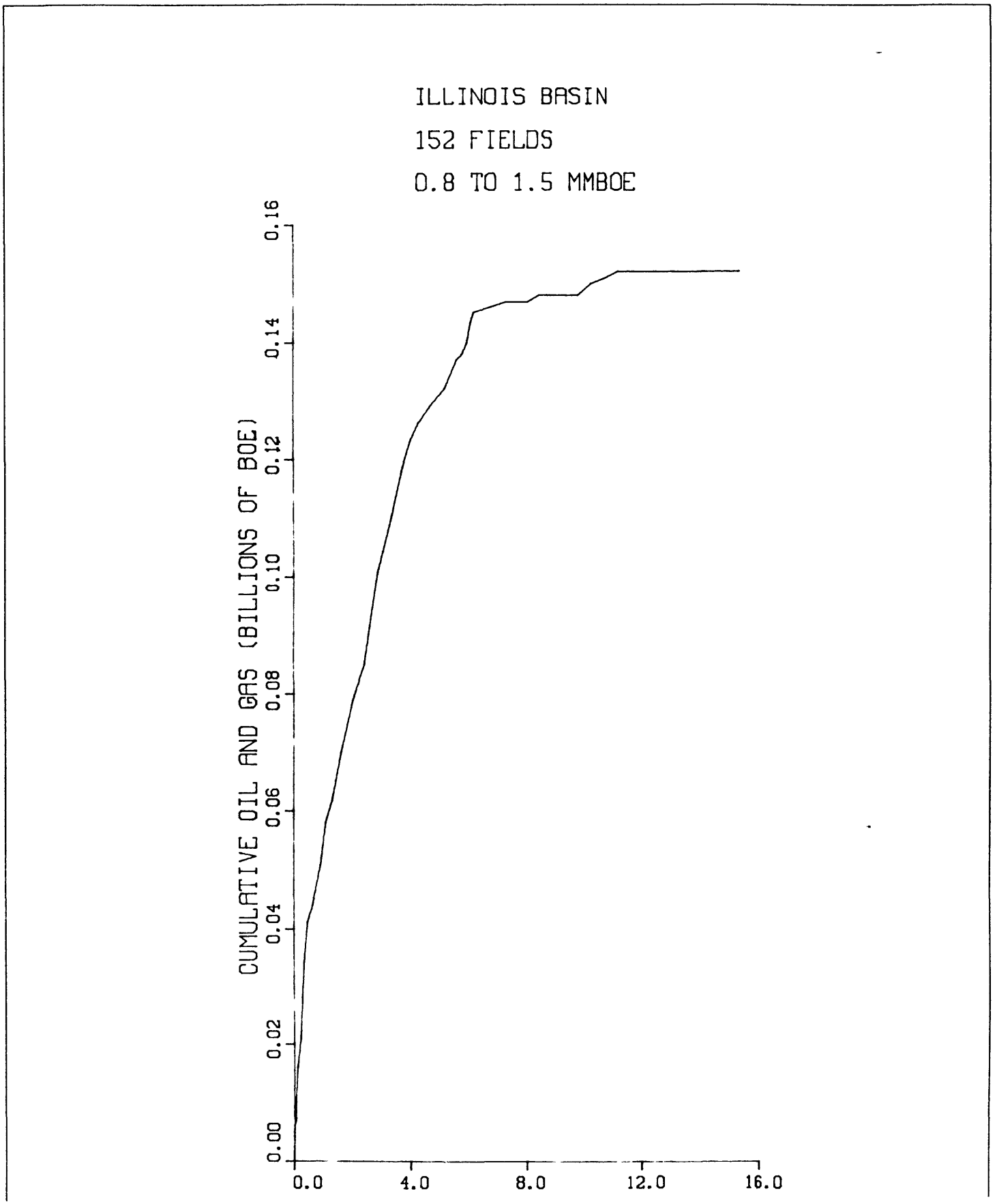

Figure 10d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

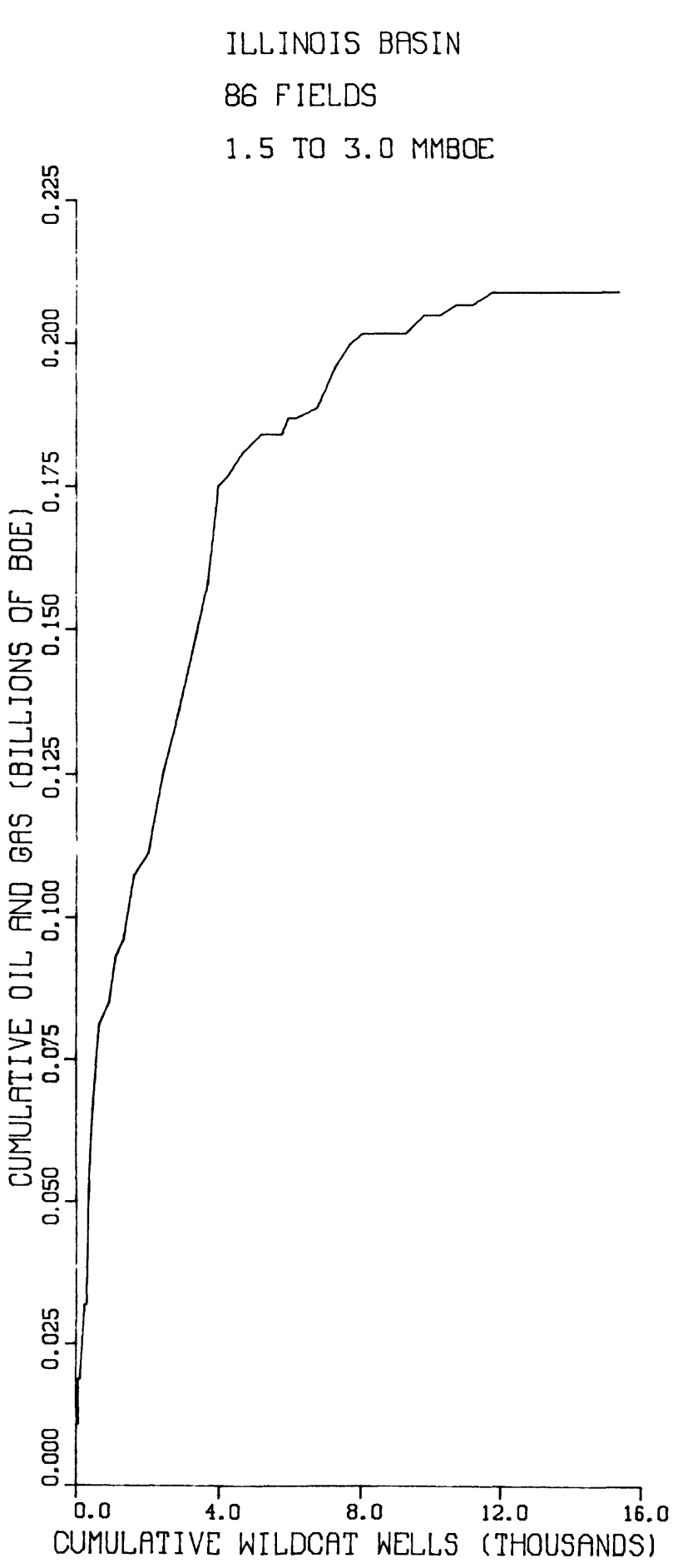

Figure 10e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

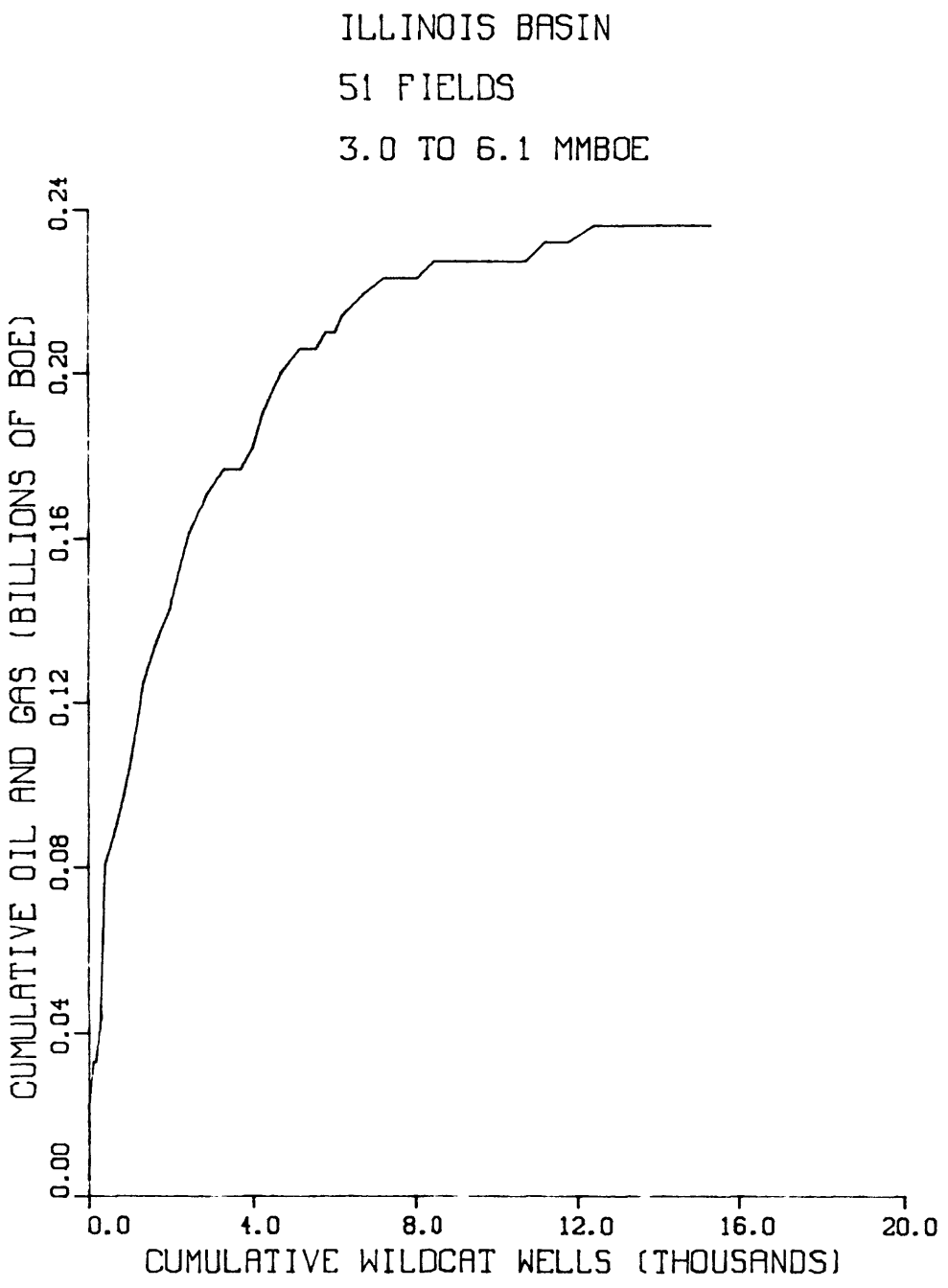

Figure 10f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

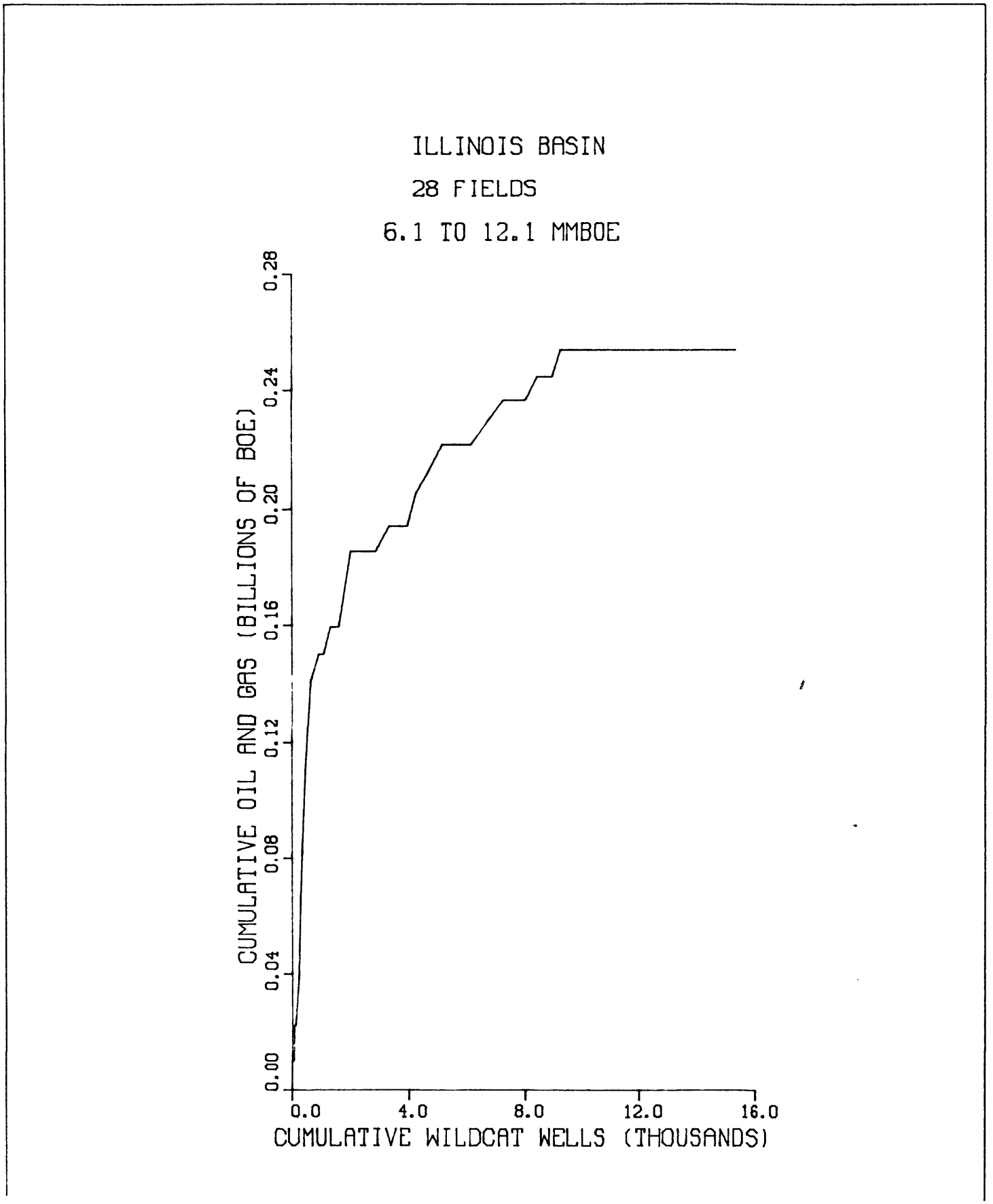

Figure 10g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

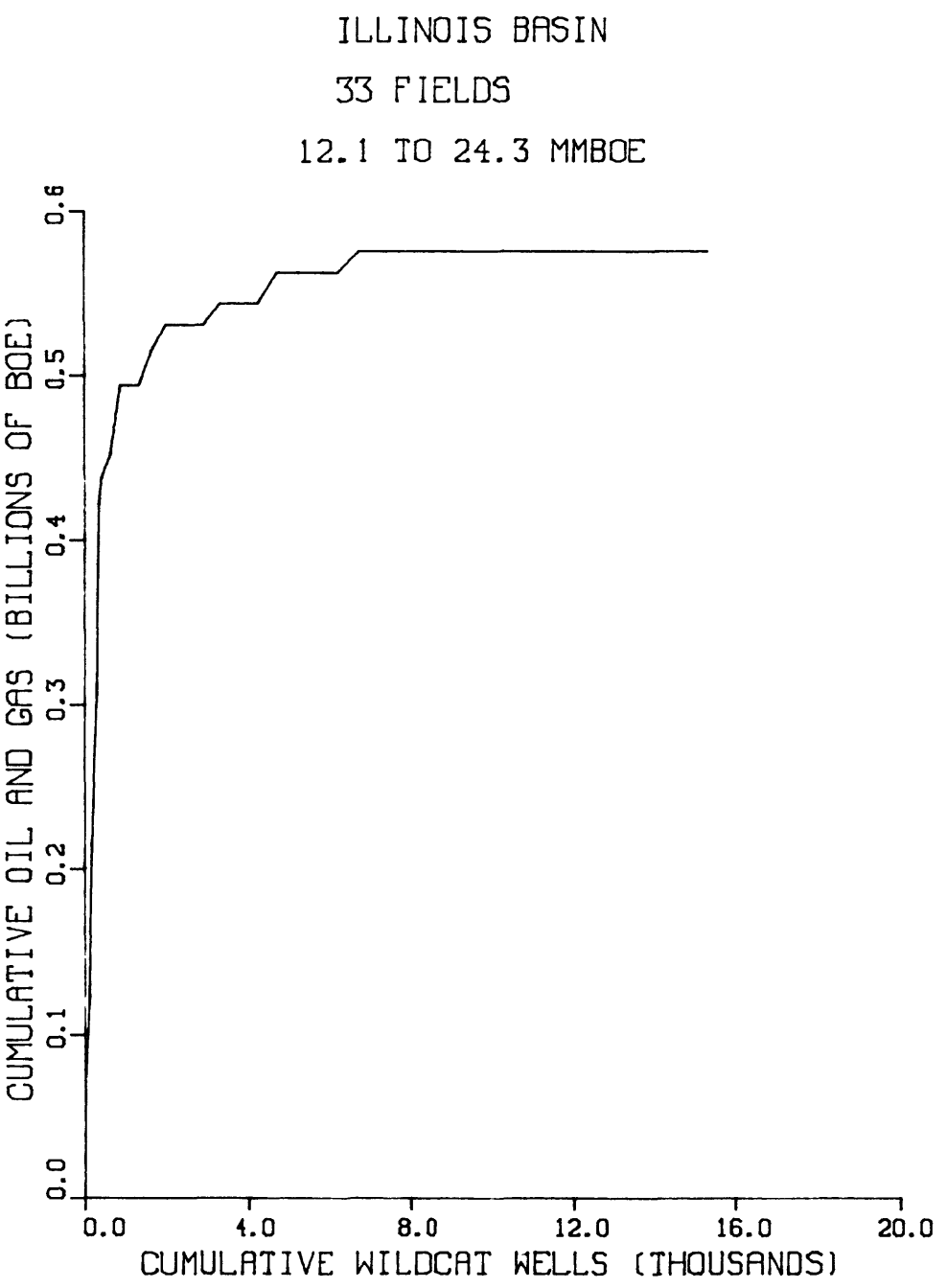

Figure 10h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

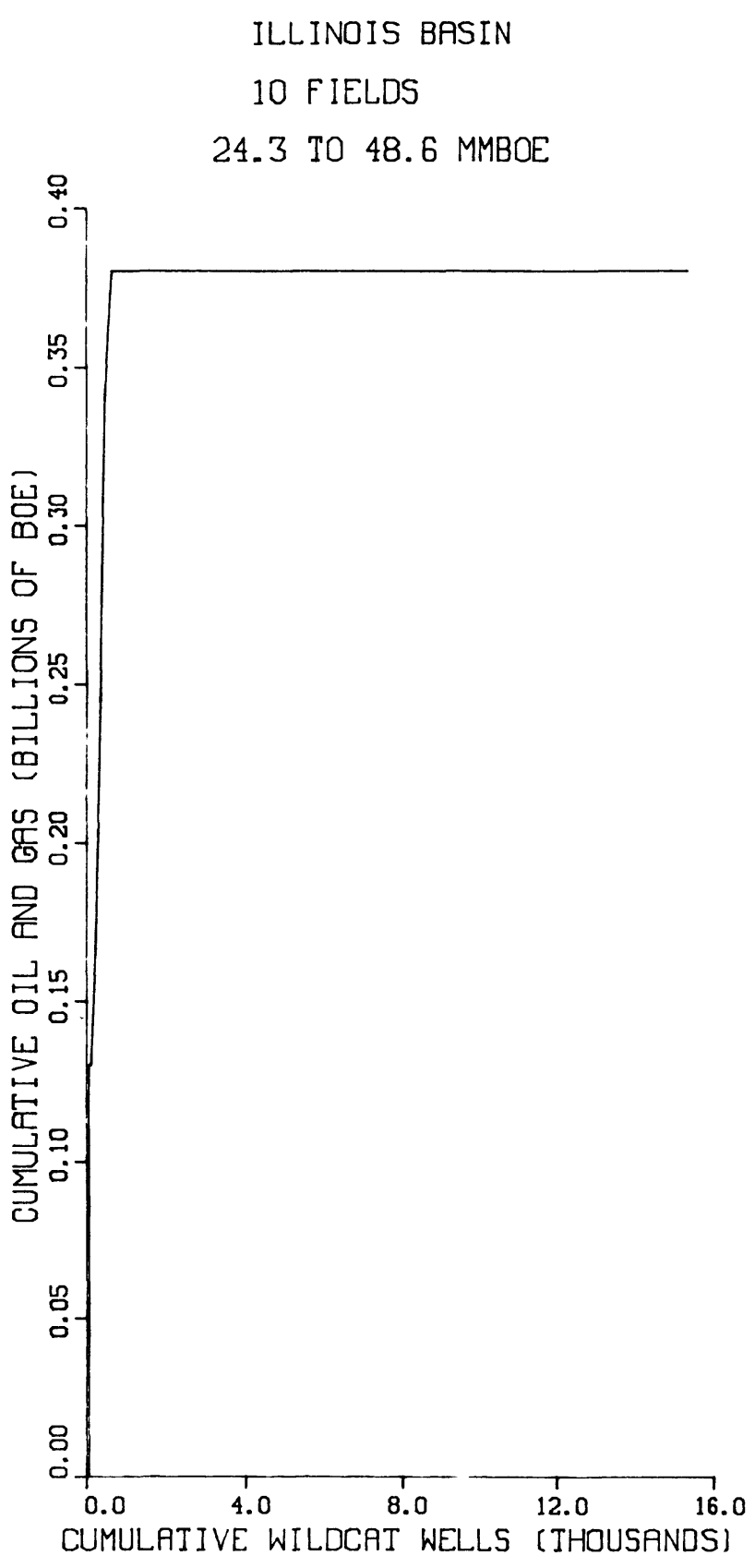

Figure 10i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

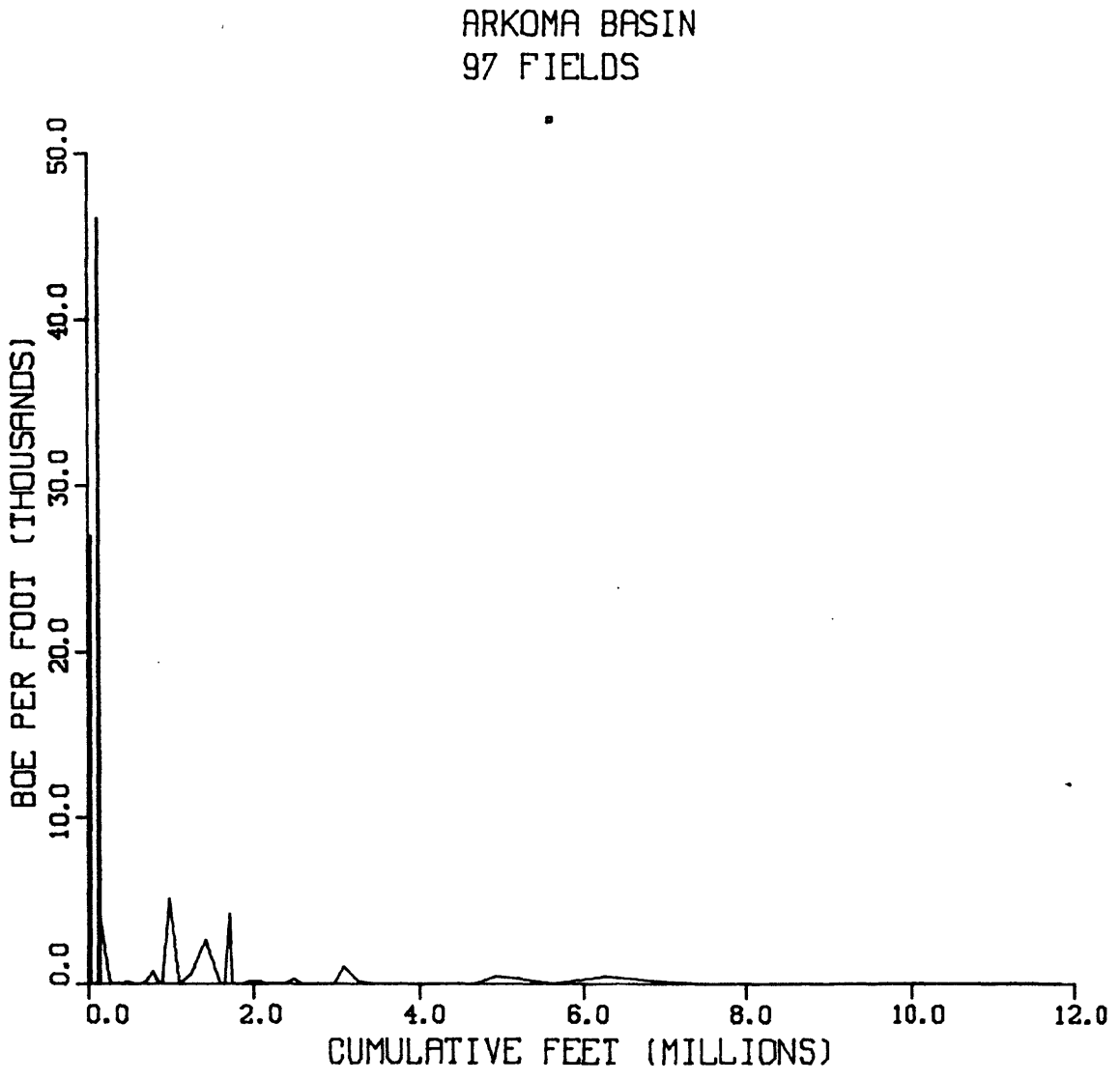

Figure 11a.--BOE per foot vs. cumulative footage drilled.

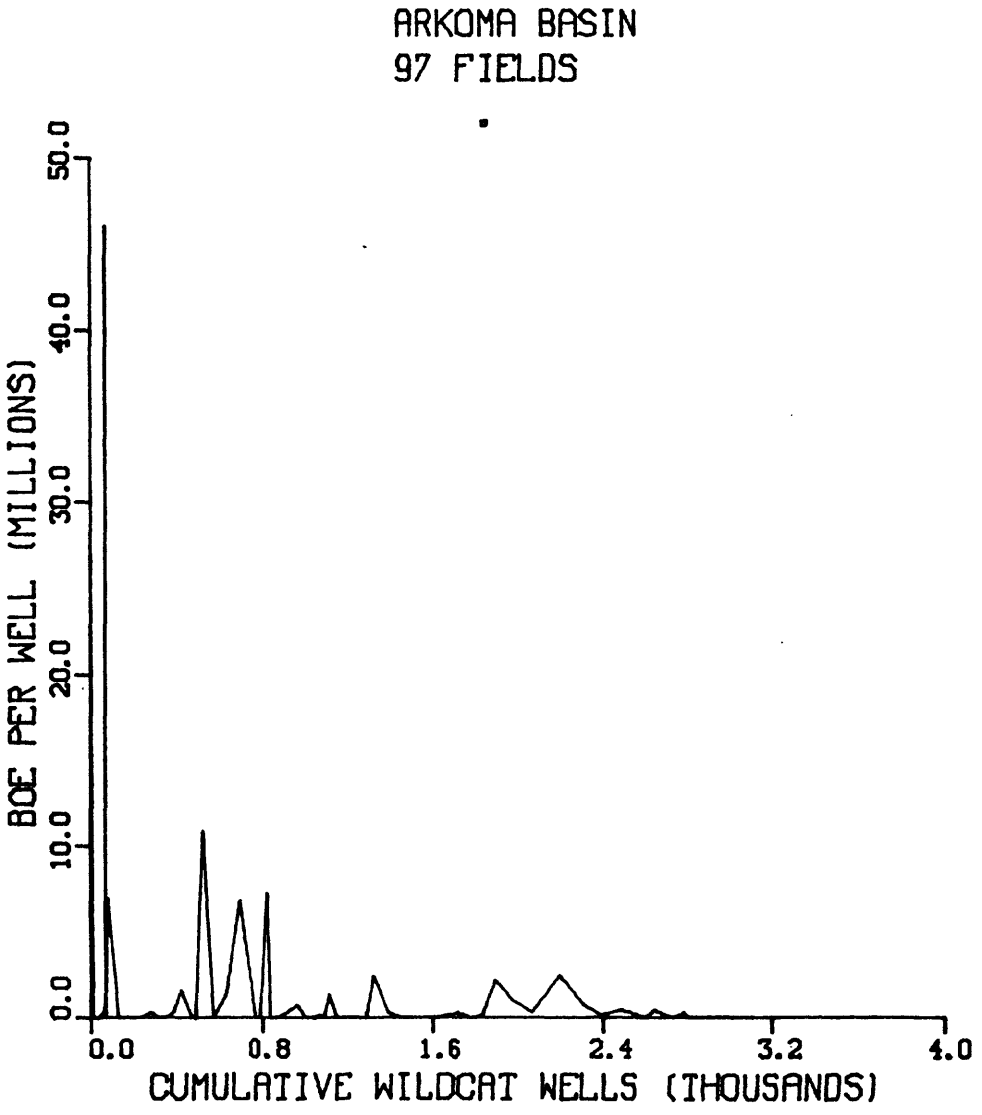

Figure 11b.--BOE per well vs. cumulative wells drilled.

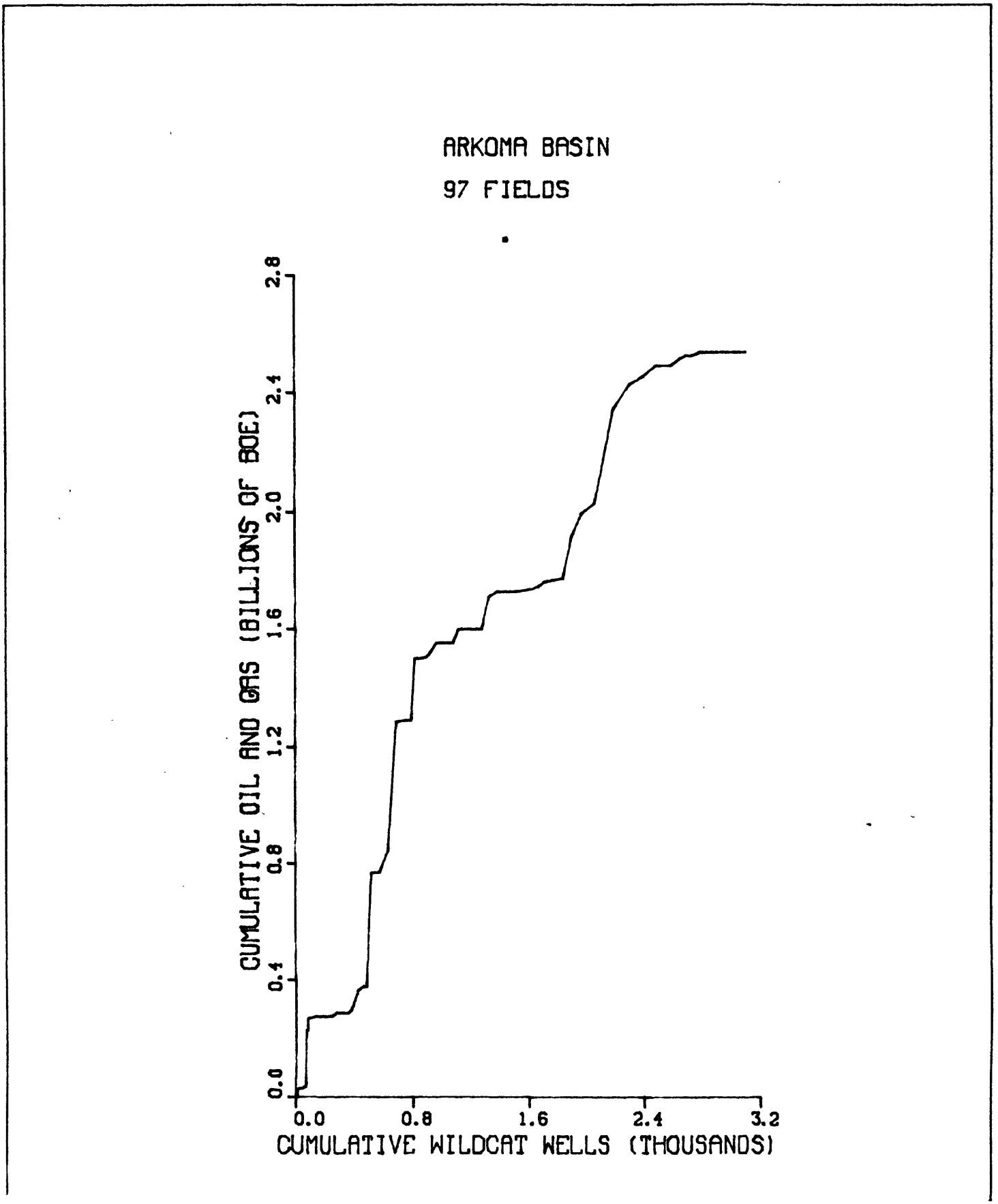

Figure 11c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

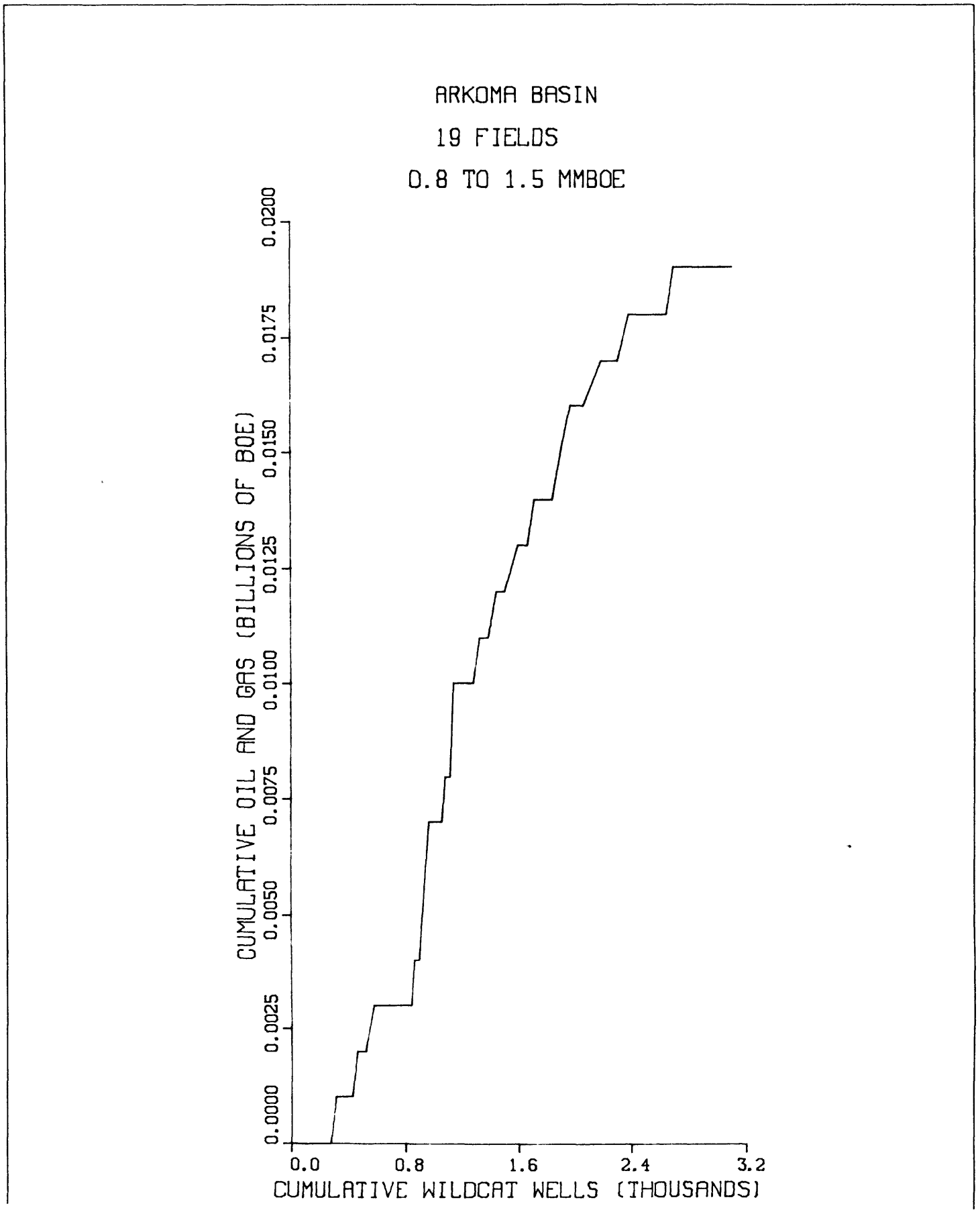

Figure 11d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

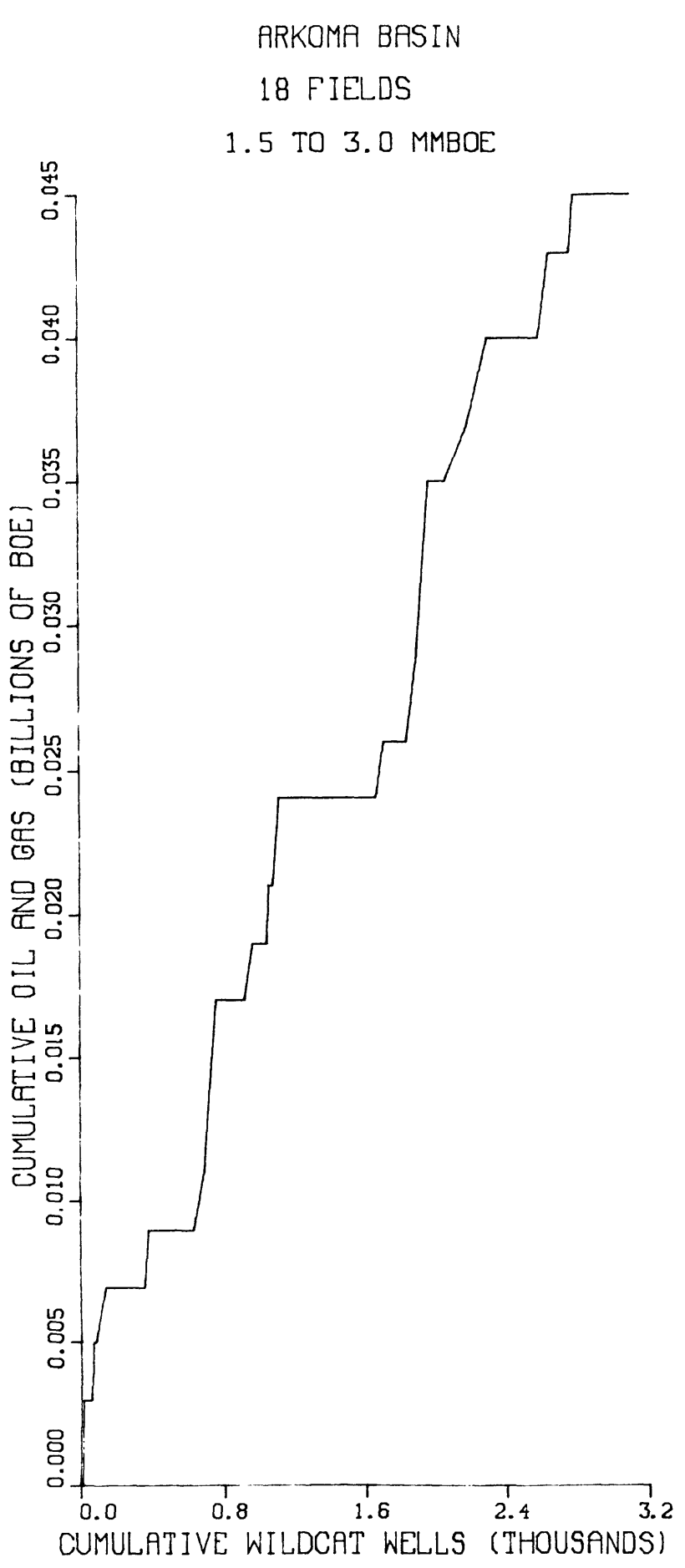

Figure 11e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

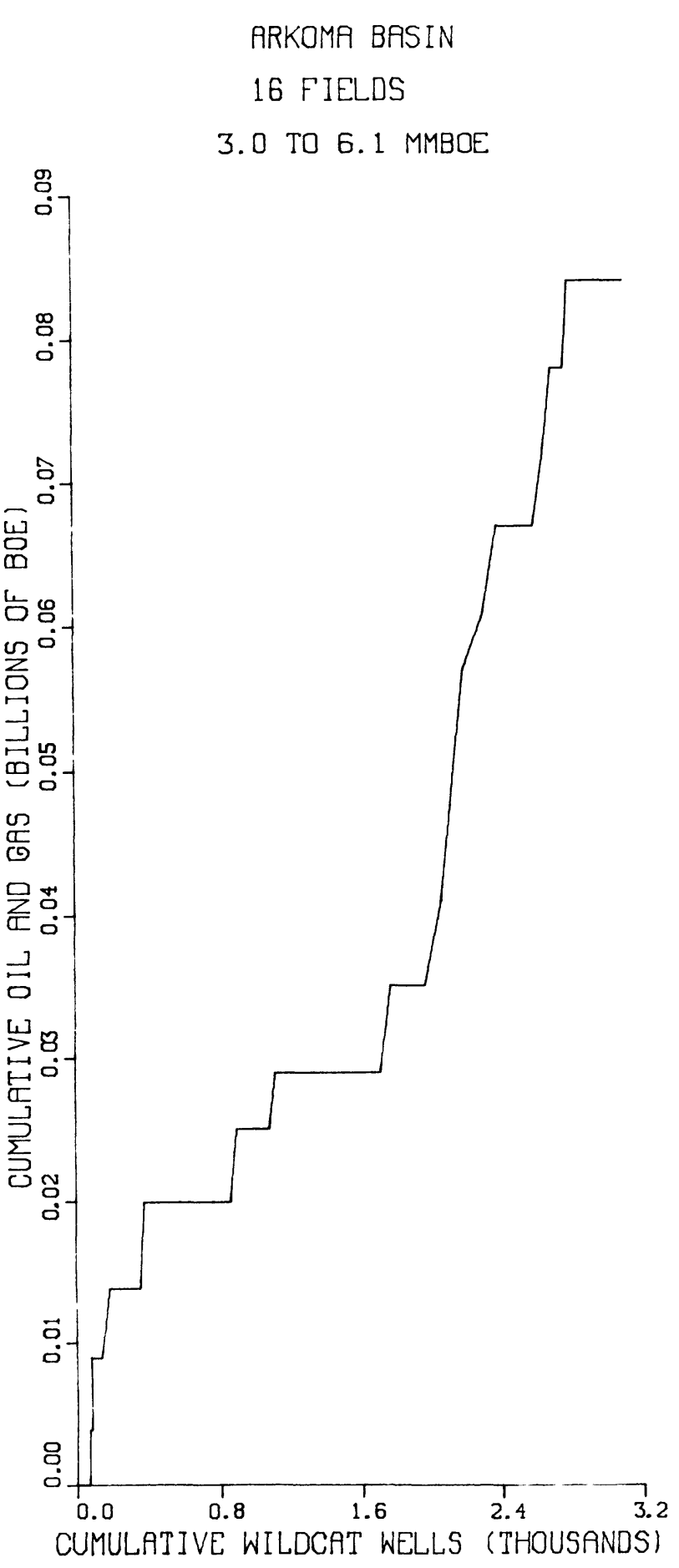

Figure 11f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

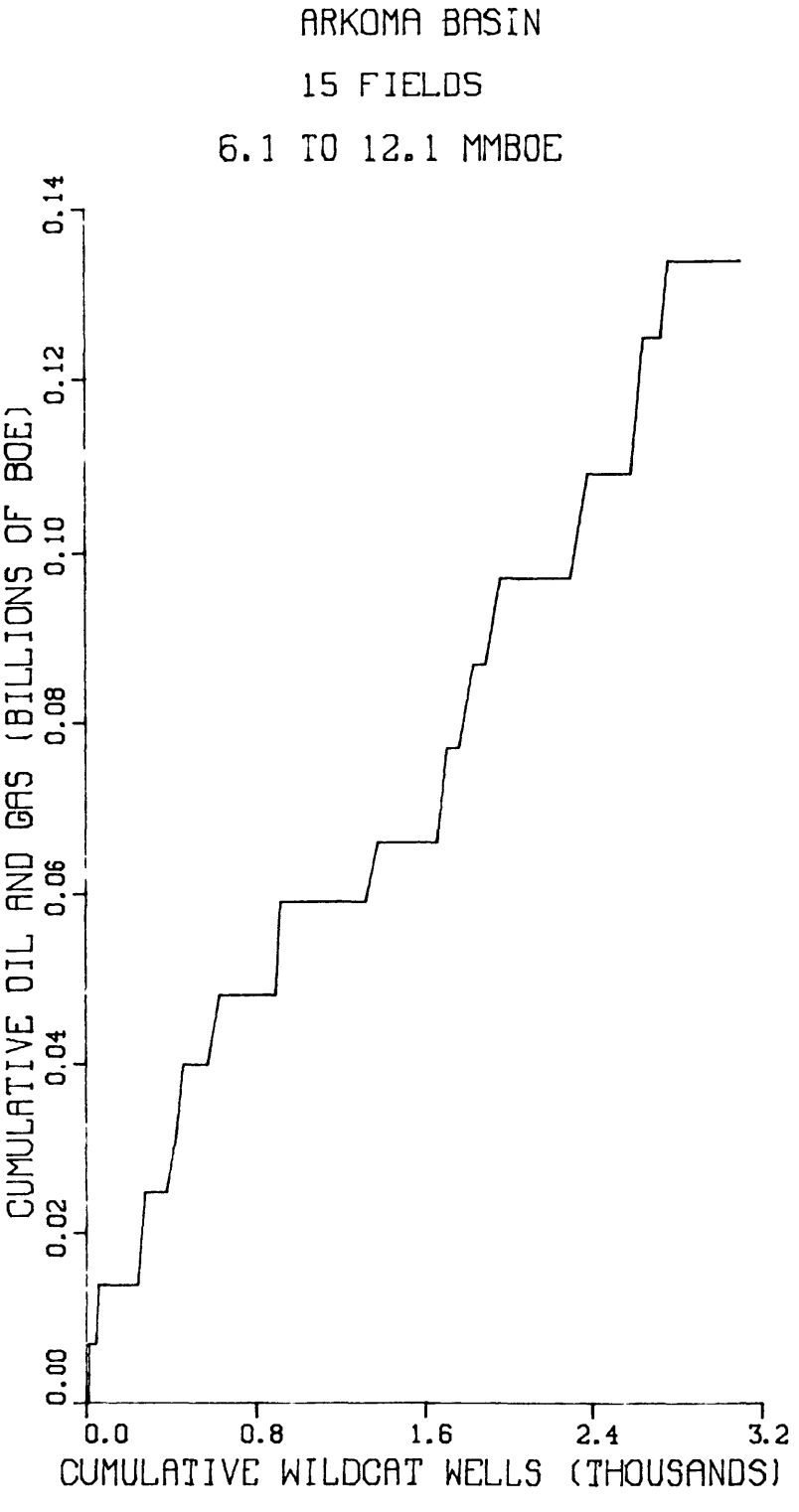

Figure 11g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

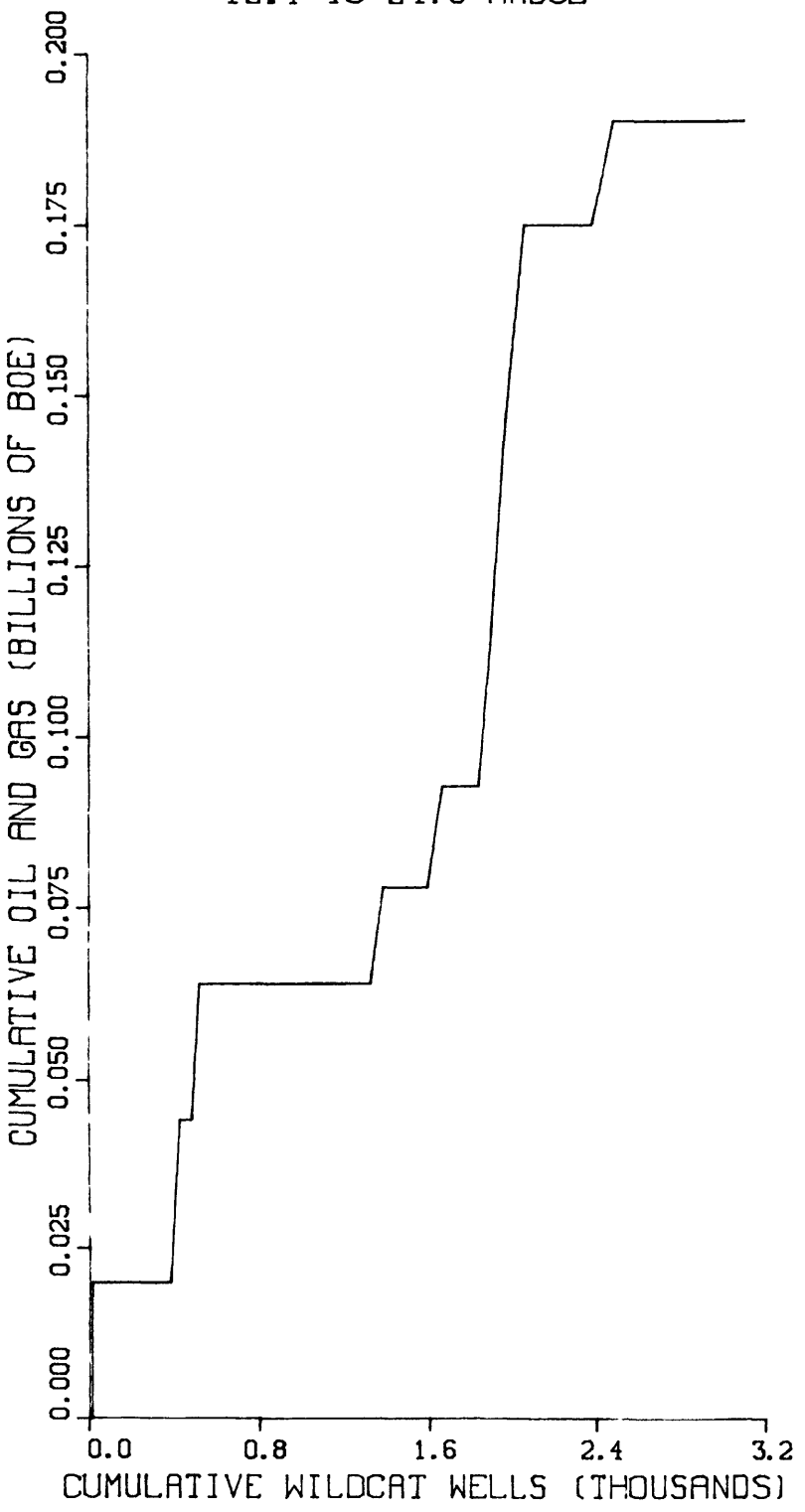

Figure 11h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

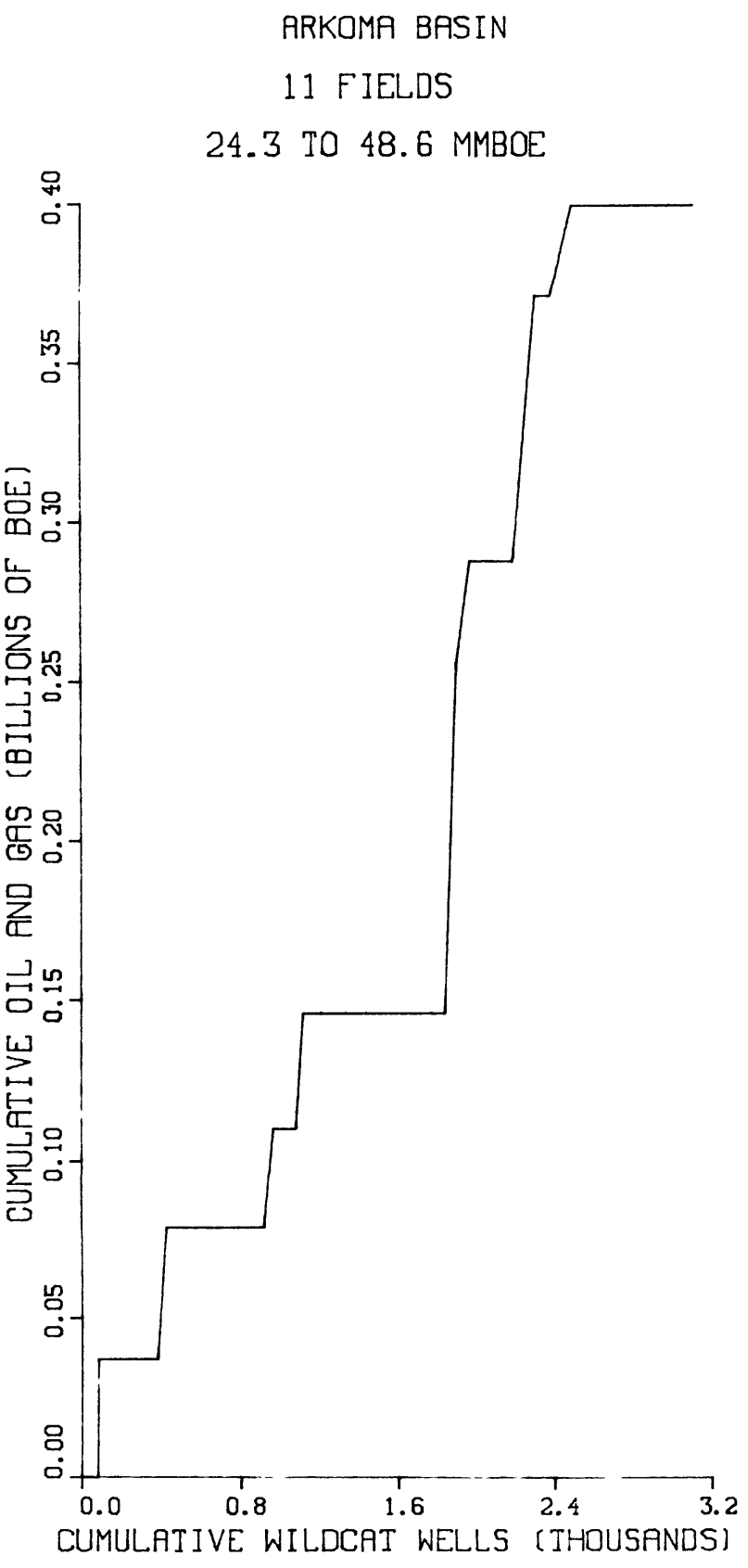

Figure 11i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

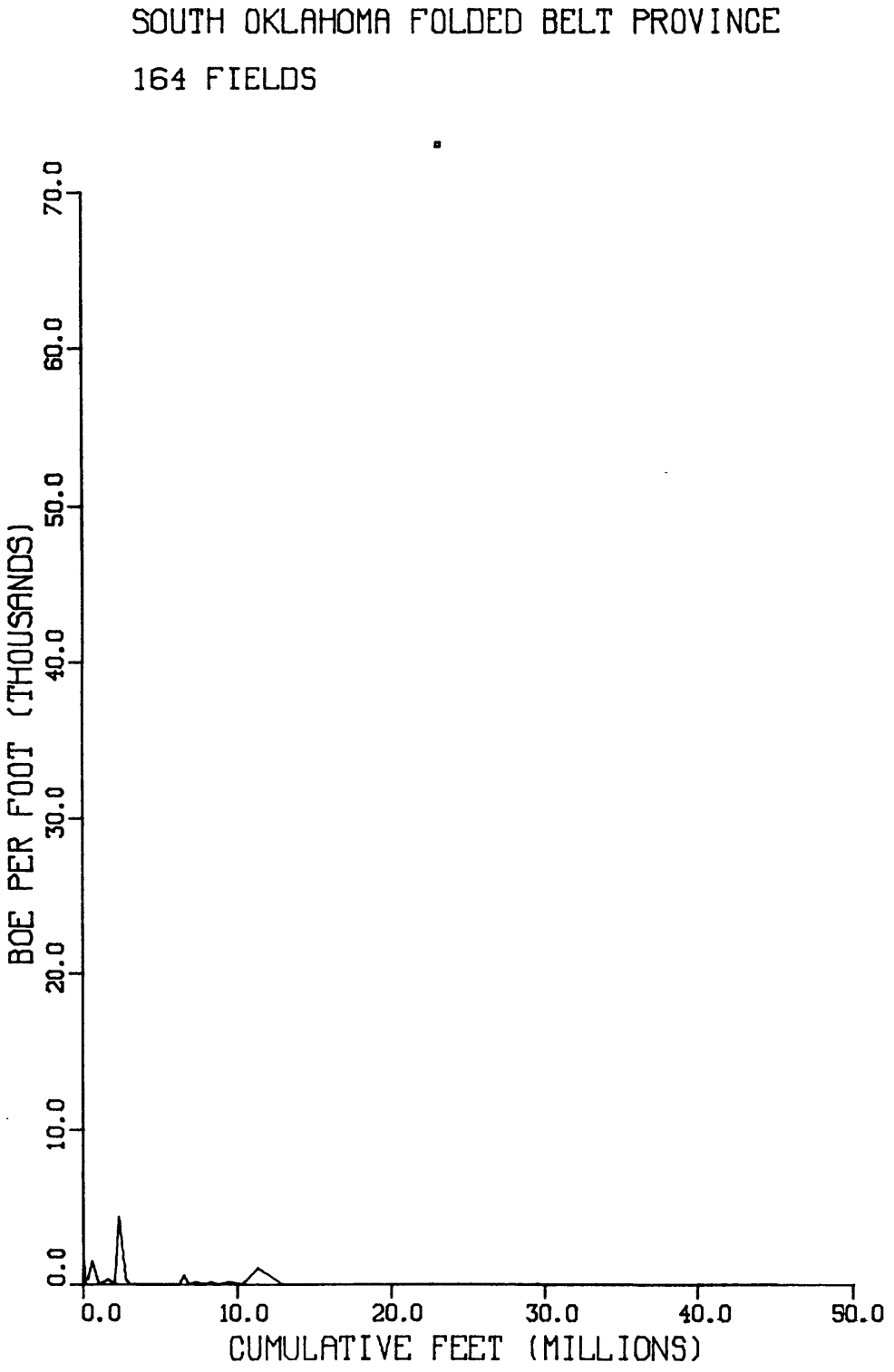

Figure 12a.--BOE per foot vs. cumulative footage drilled.

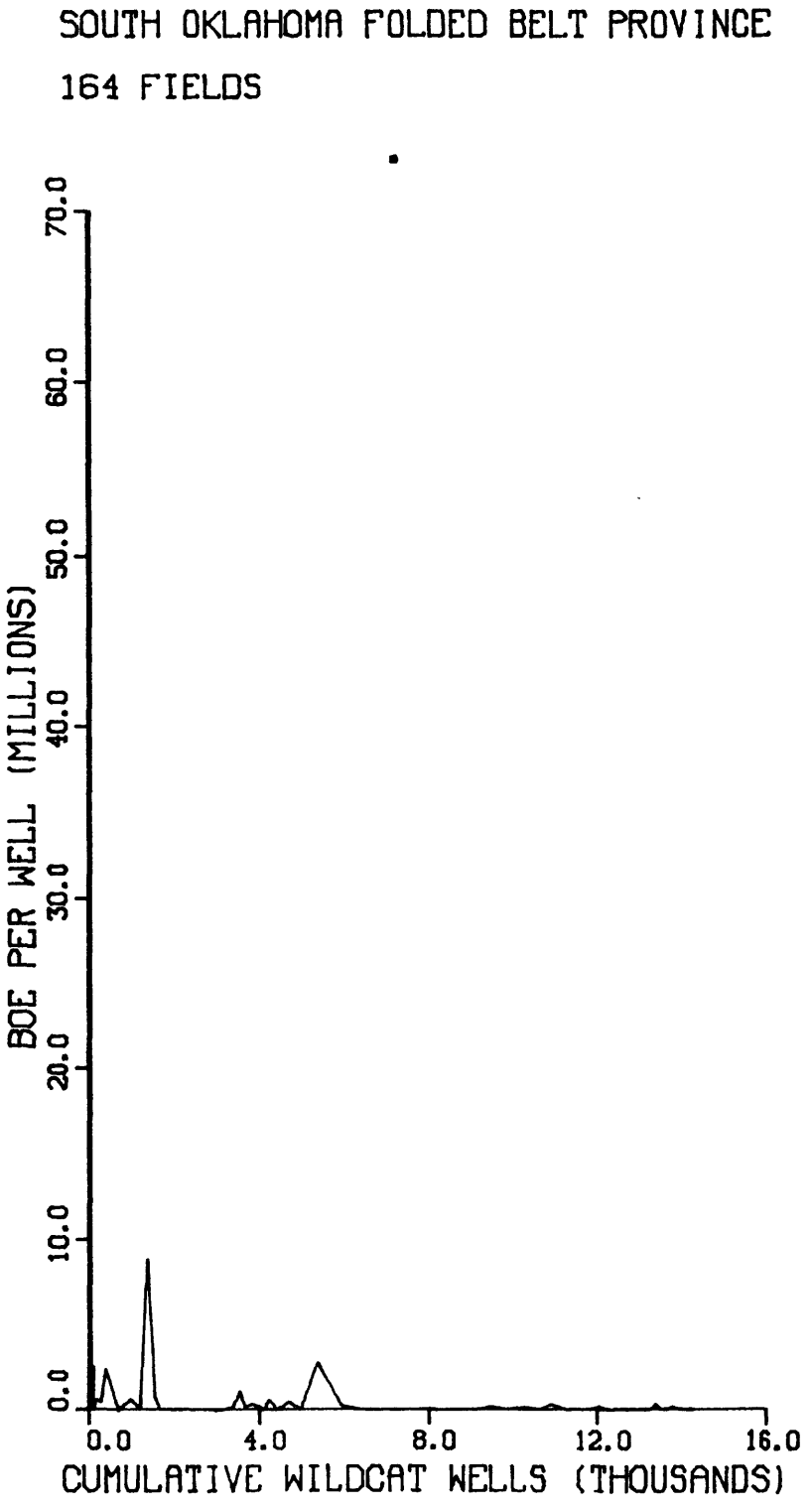

Figure 12b.--BOE per well vs. cumulative wells drilled.

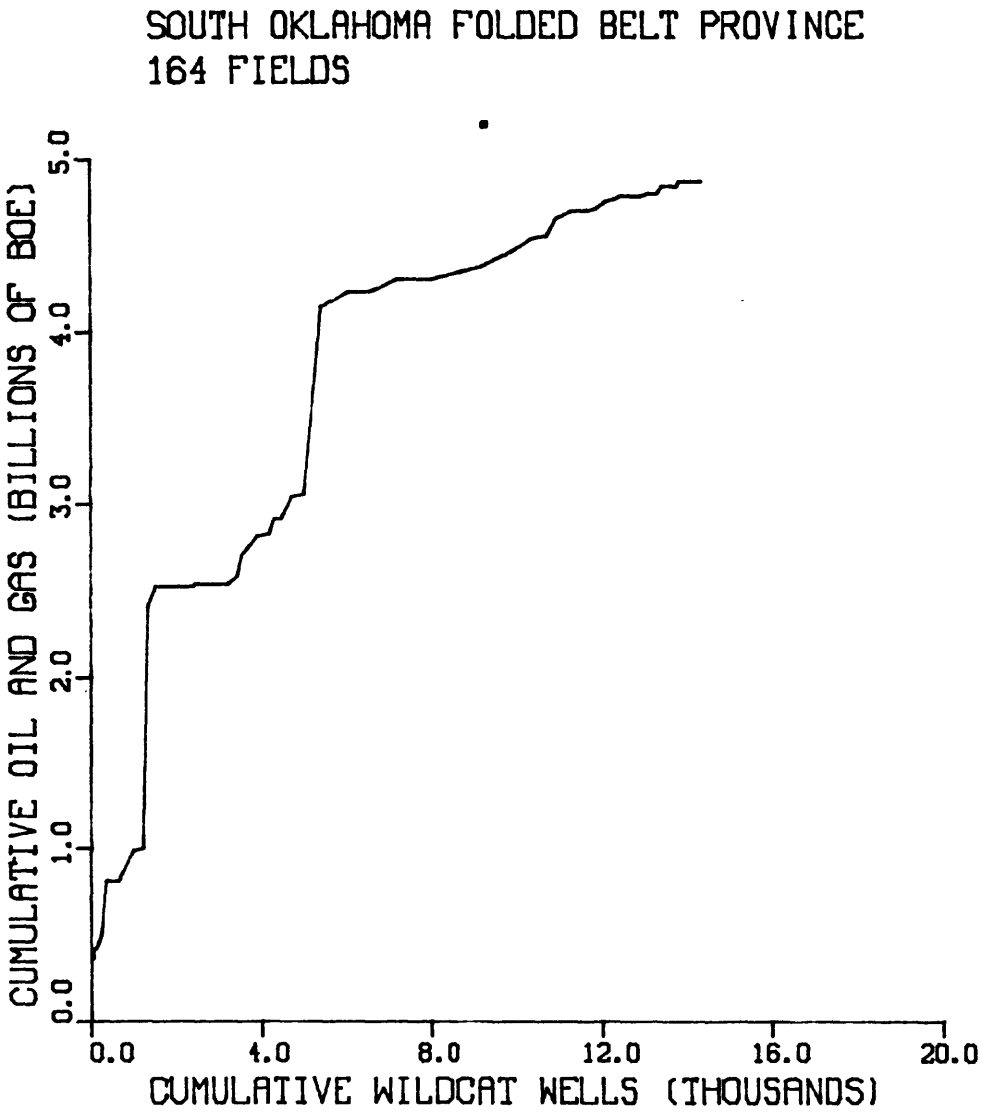

Figure 12c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

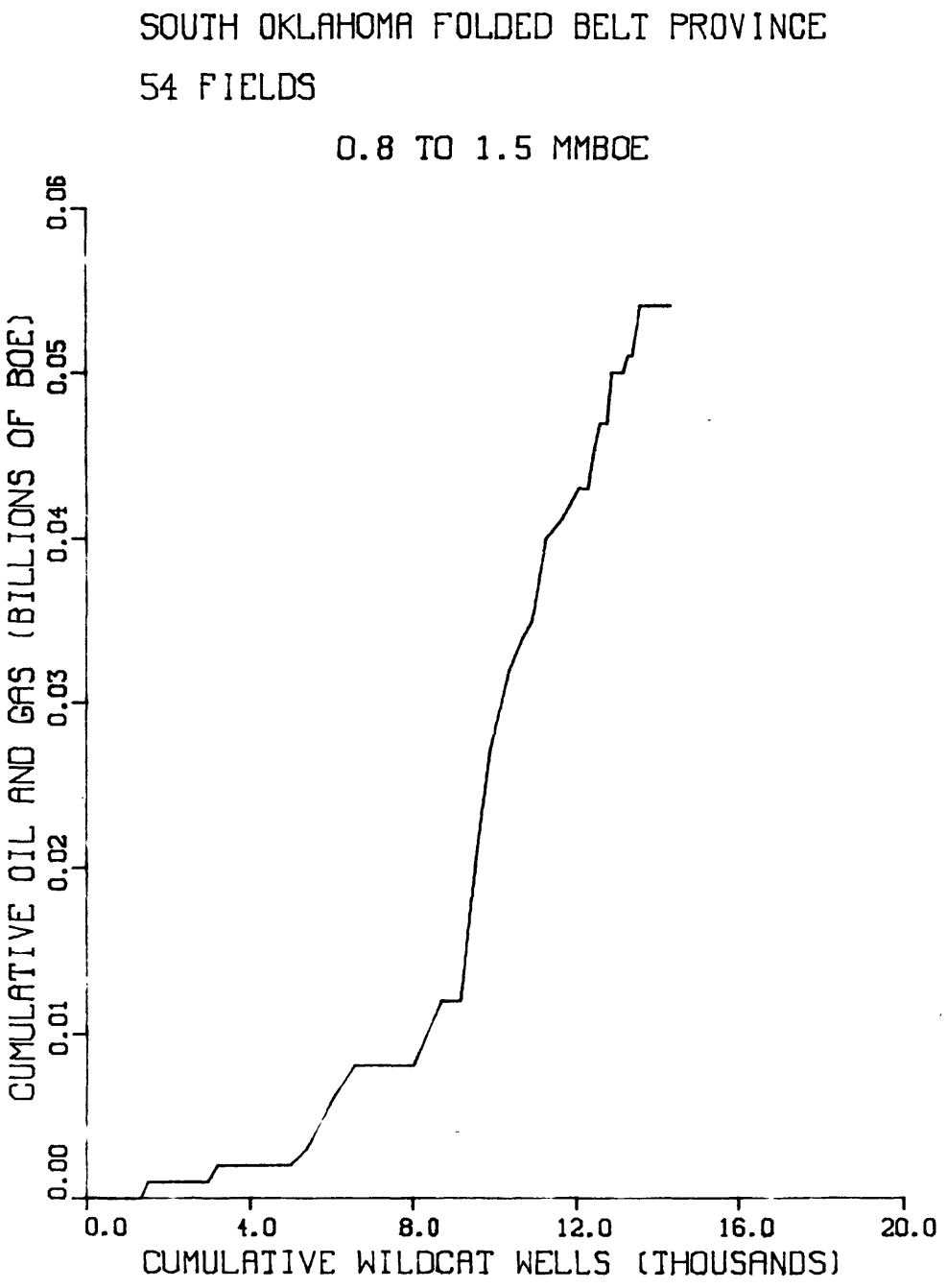

Figure 12d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

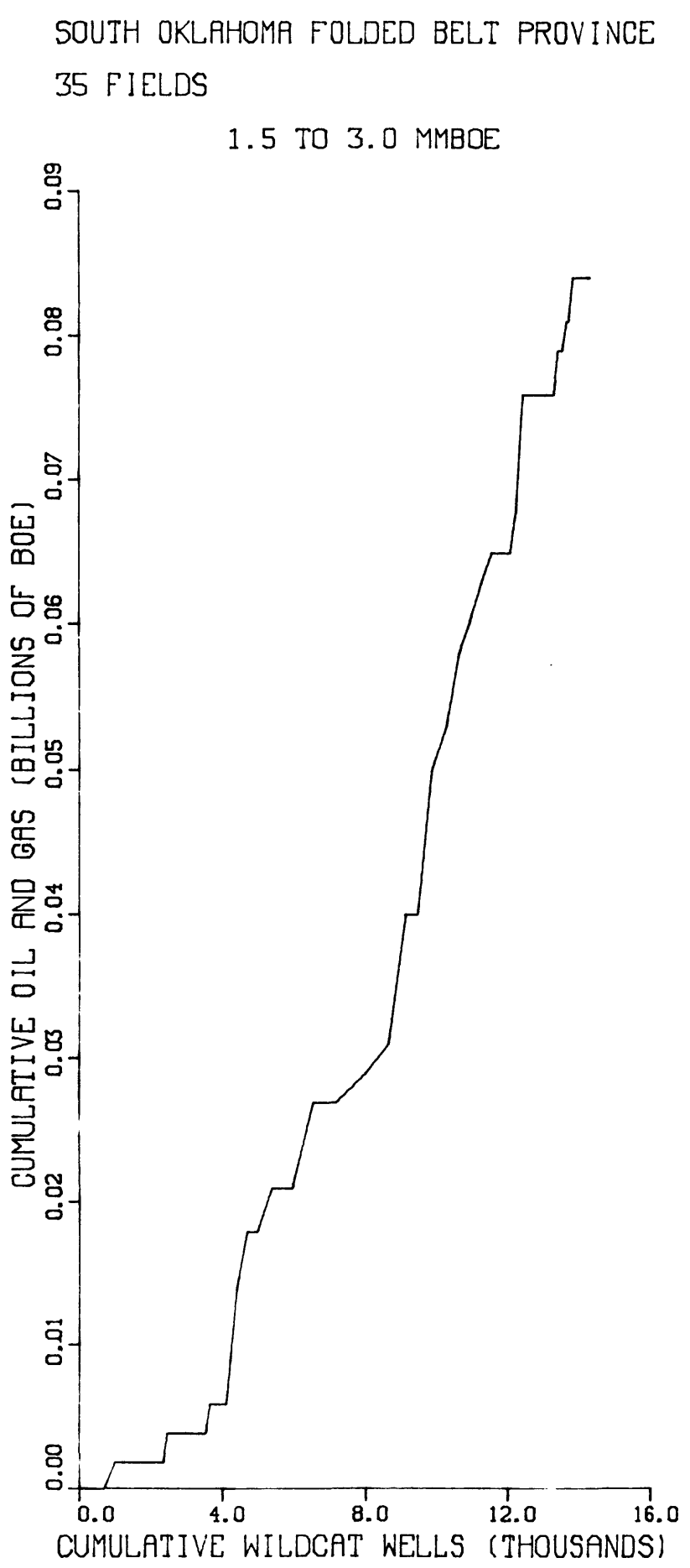

Figure 12e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

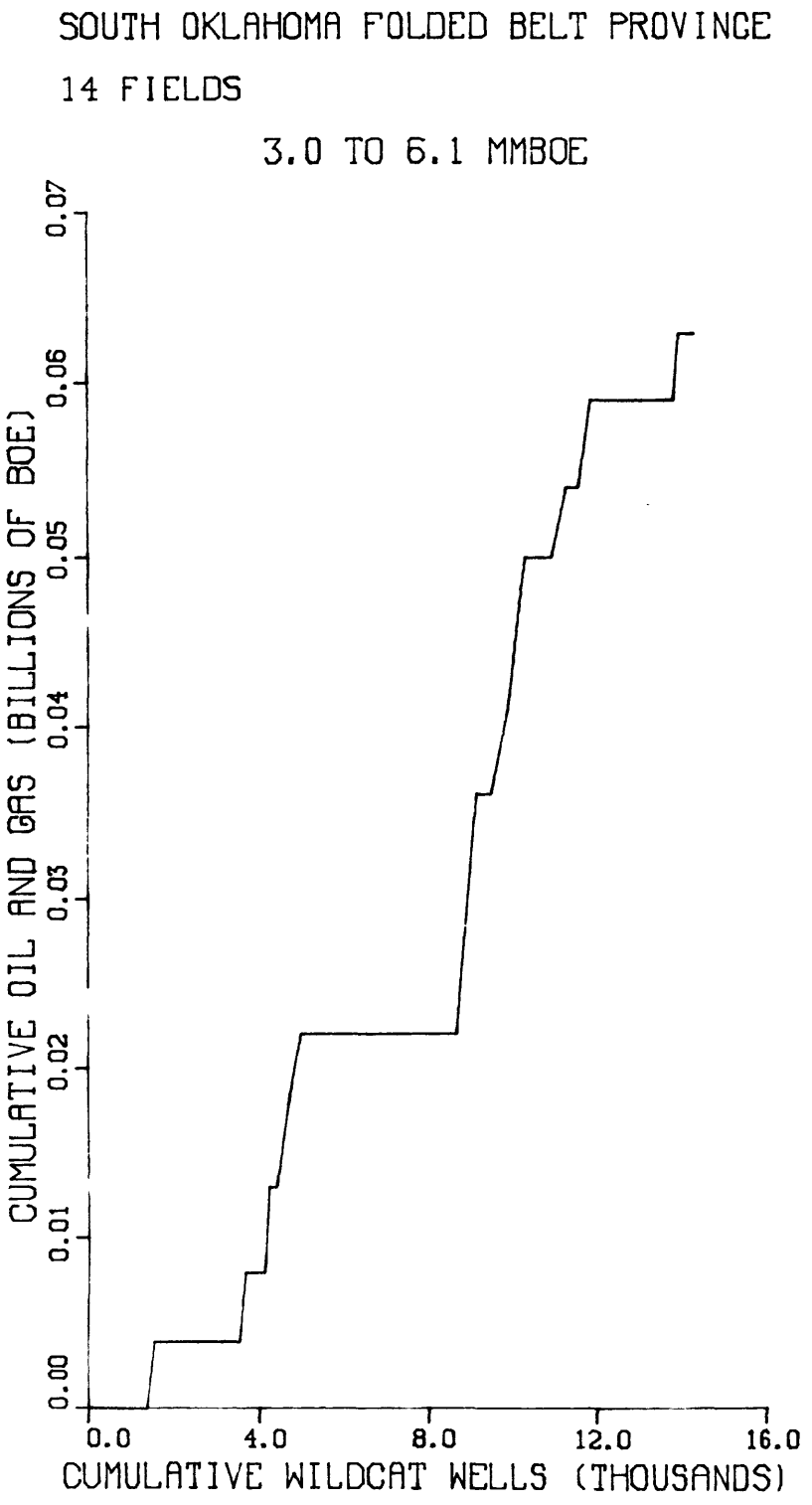

Figure 12f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

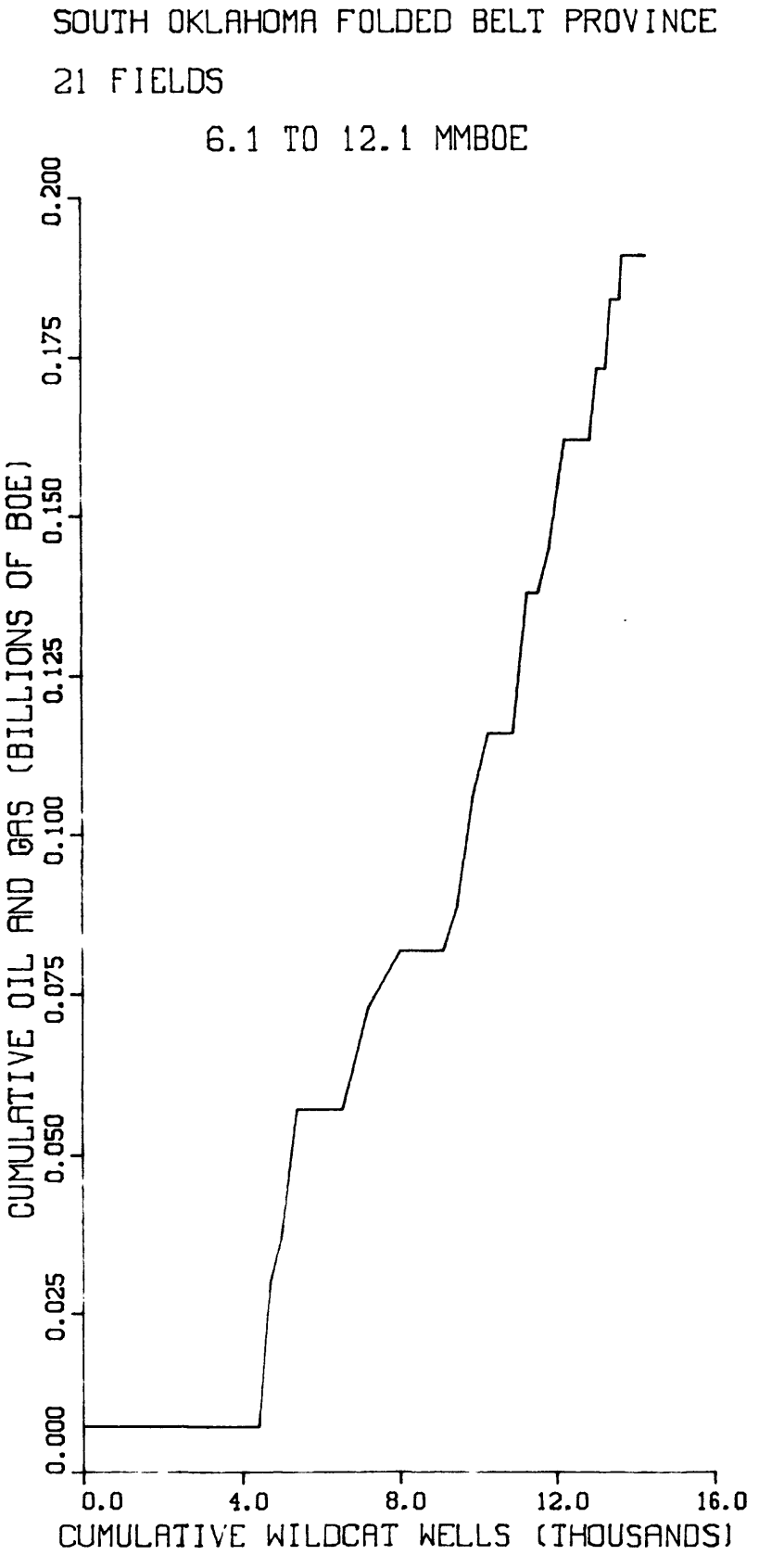

Figure 12g.—Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

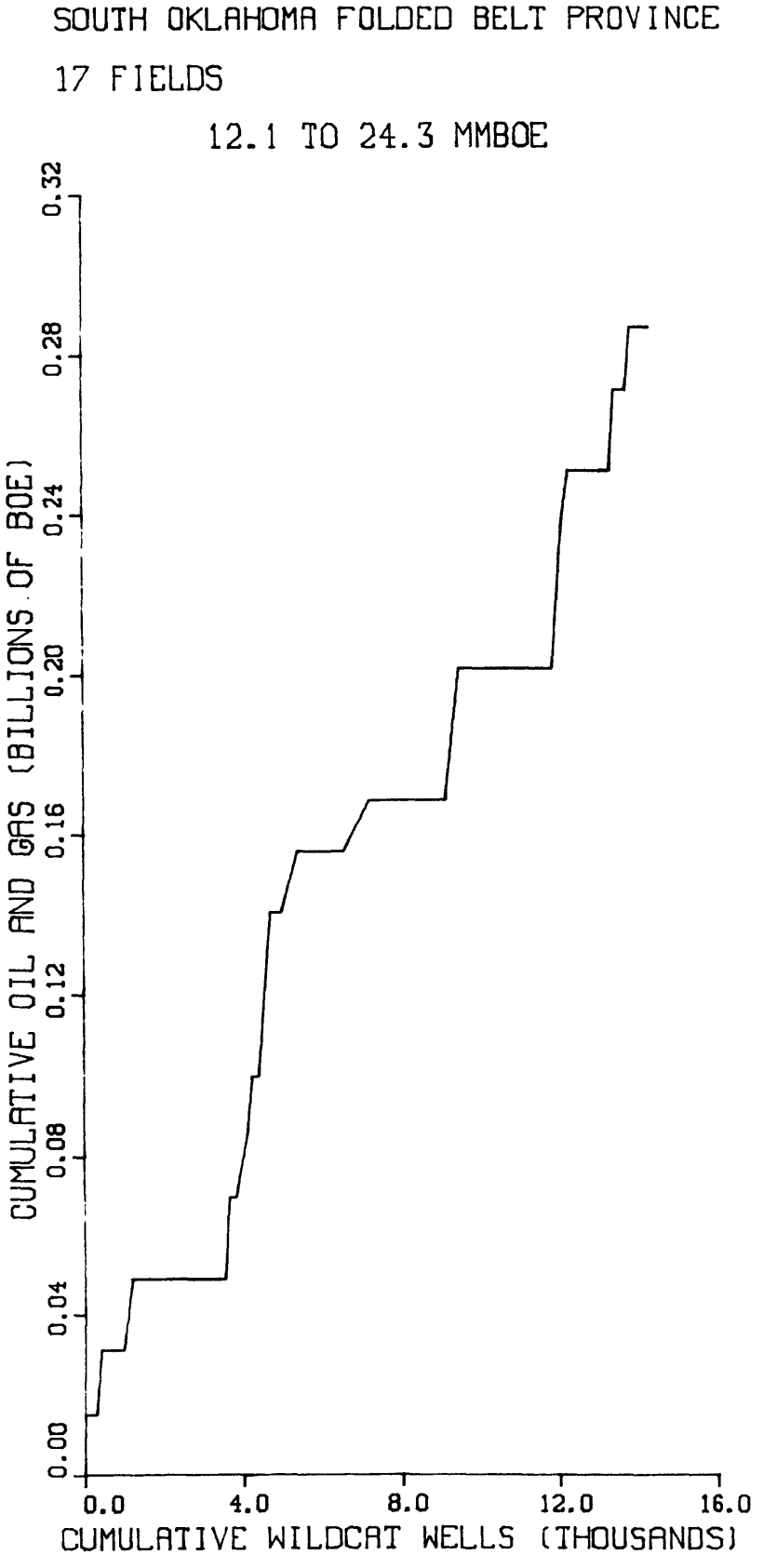

Figure 12h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

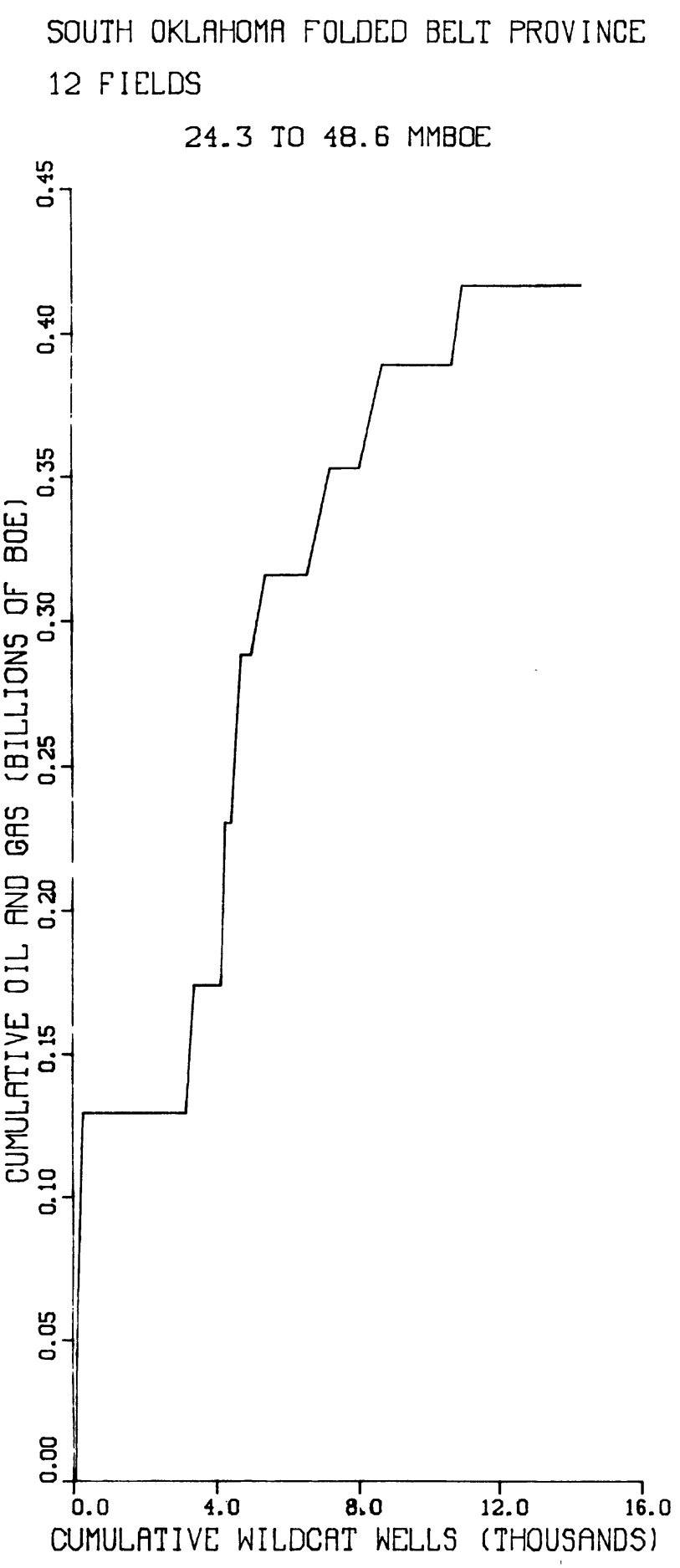

Figure 12i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

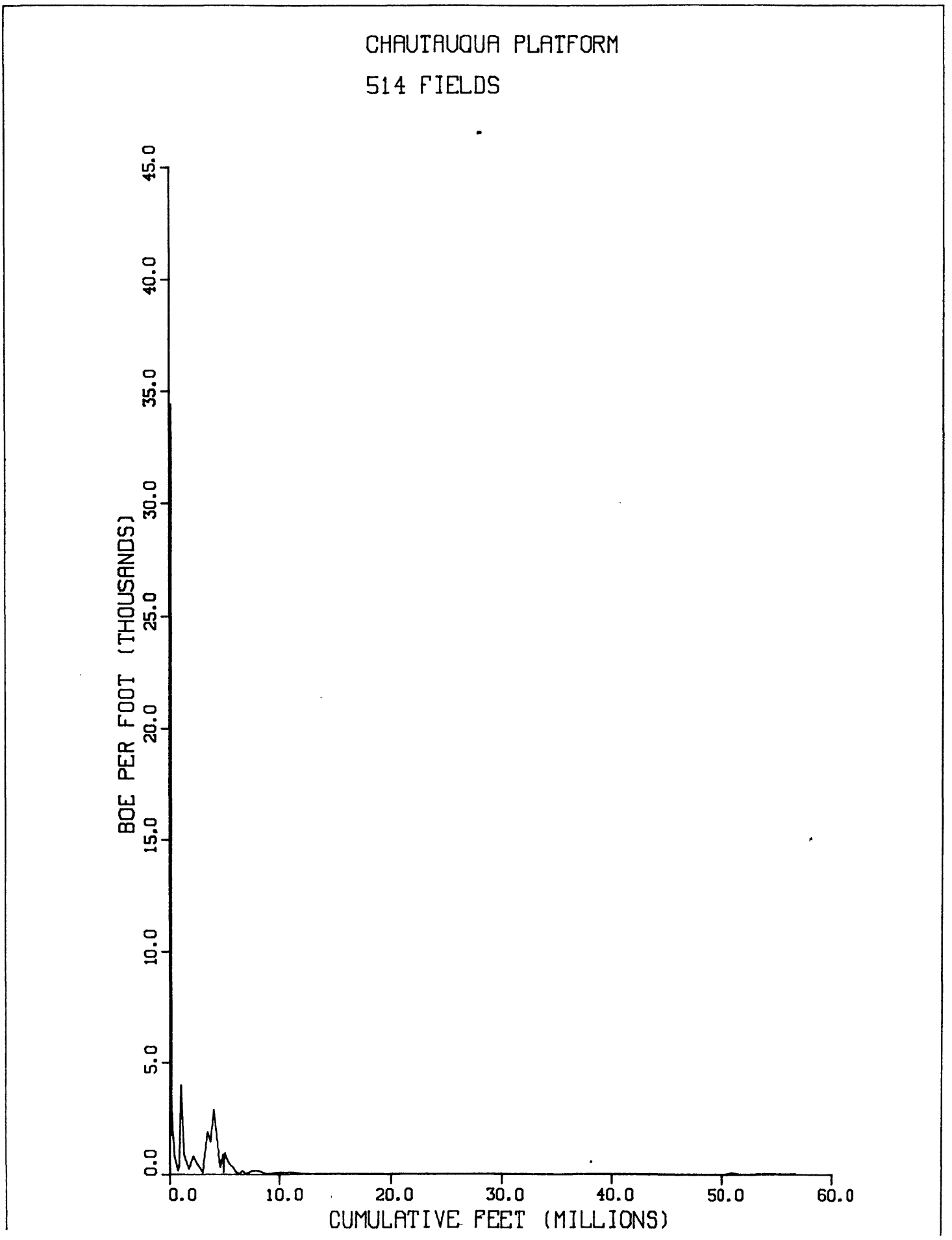

Figure 13a.--BOE per foot vs. cumulative footage drilled.

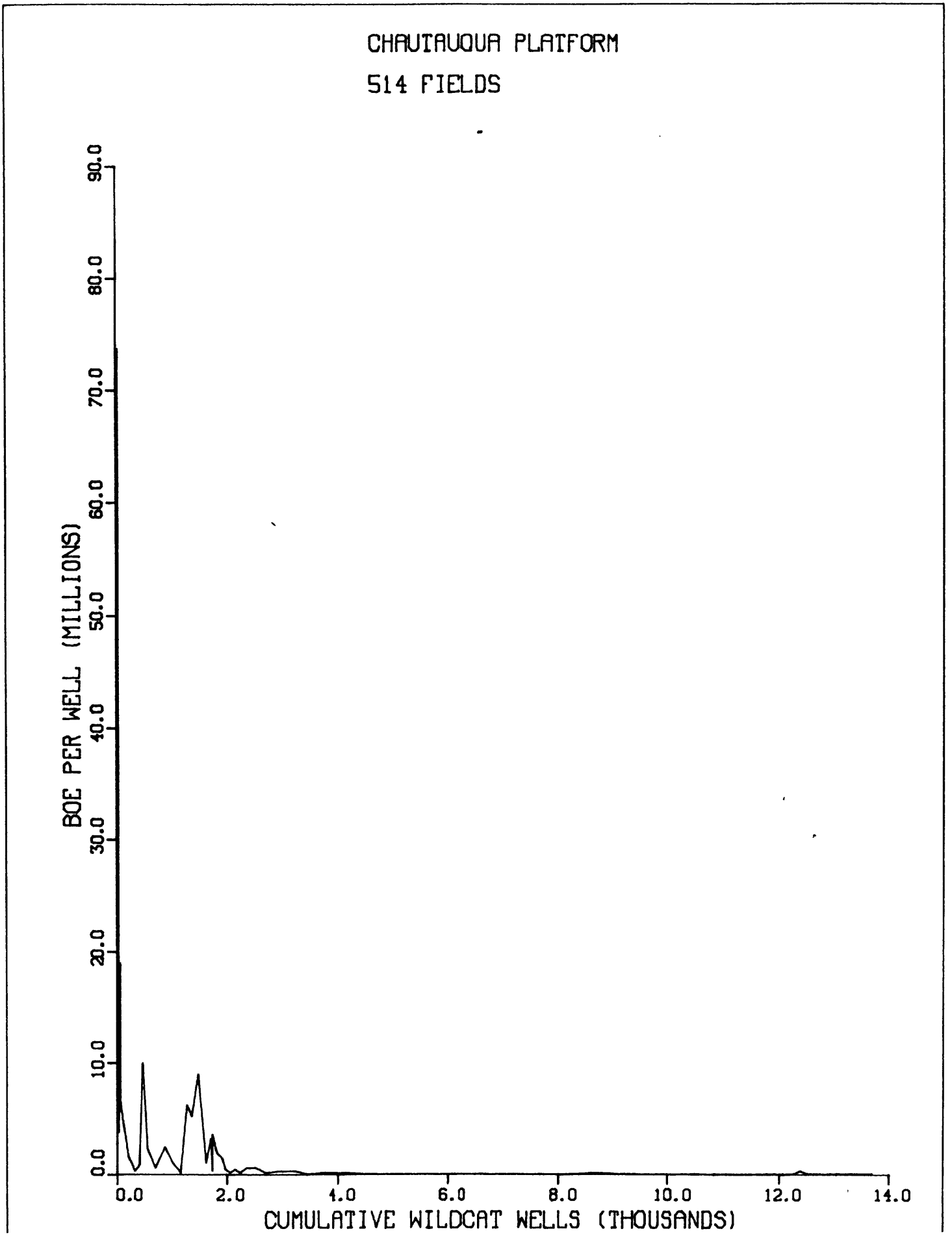

Figure 13b.--BOE per well vs. cumulative wells drilled.

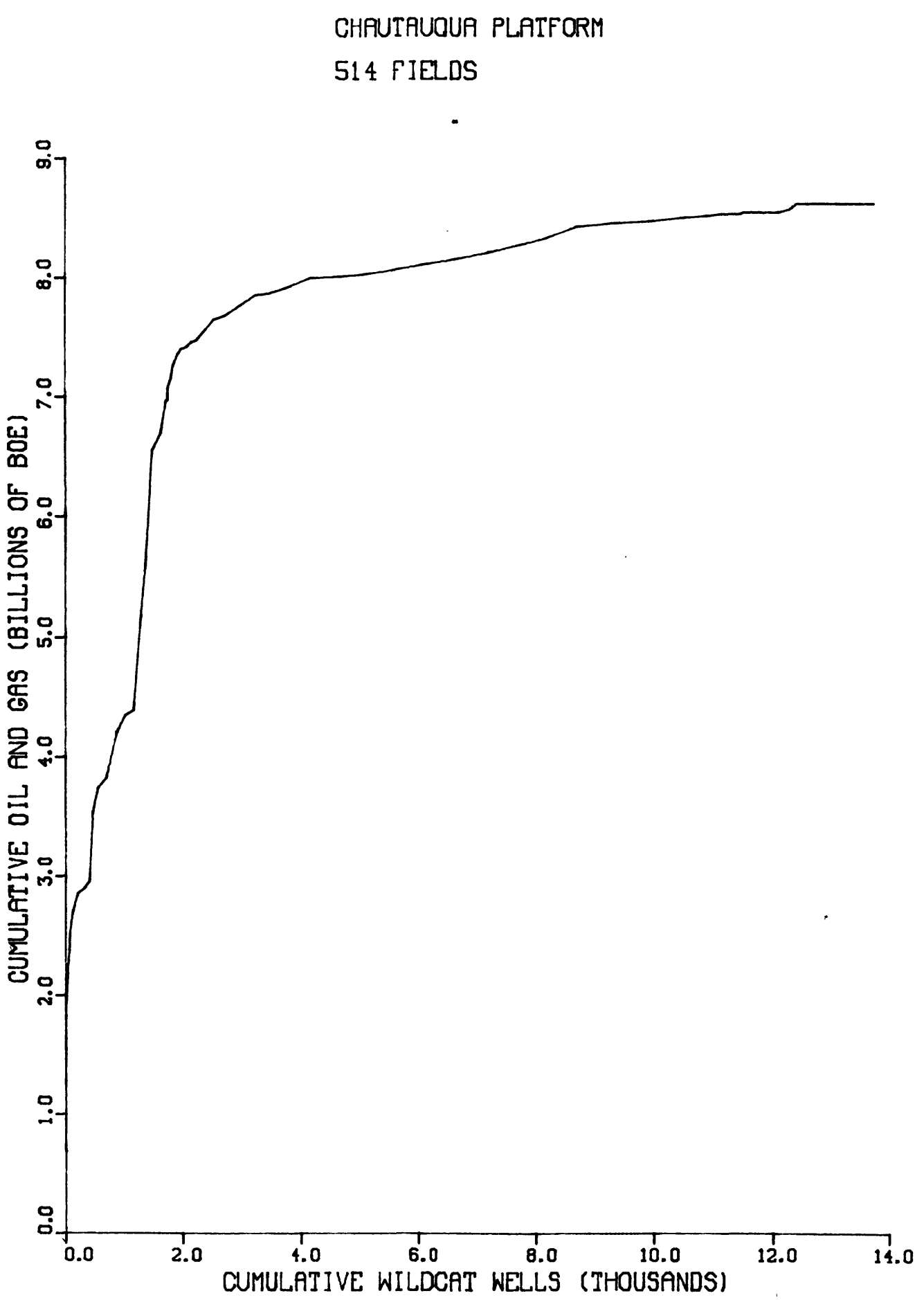

Figure 13c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

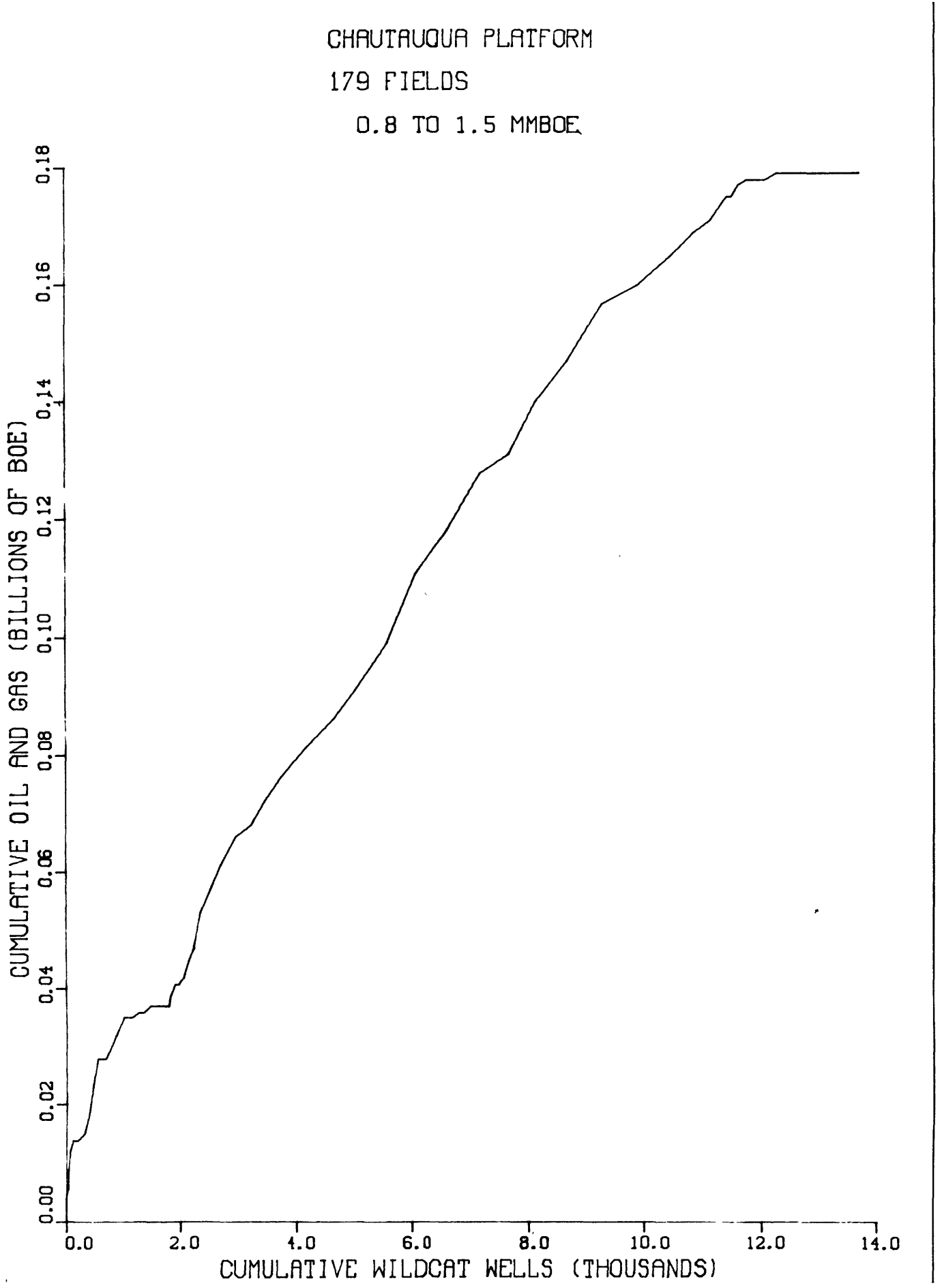

Figure 13d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

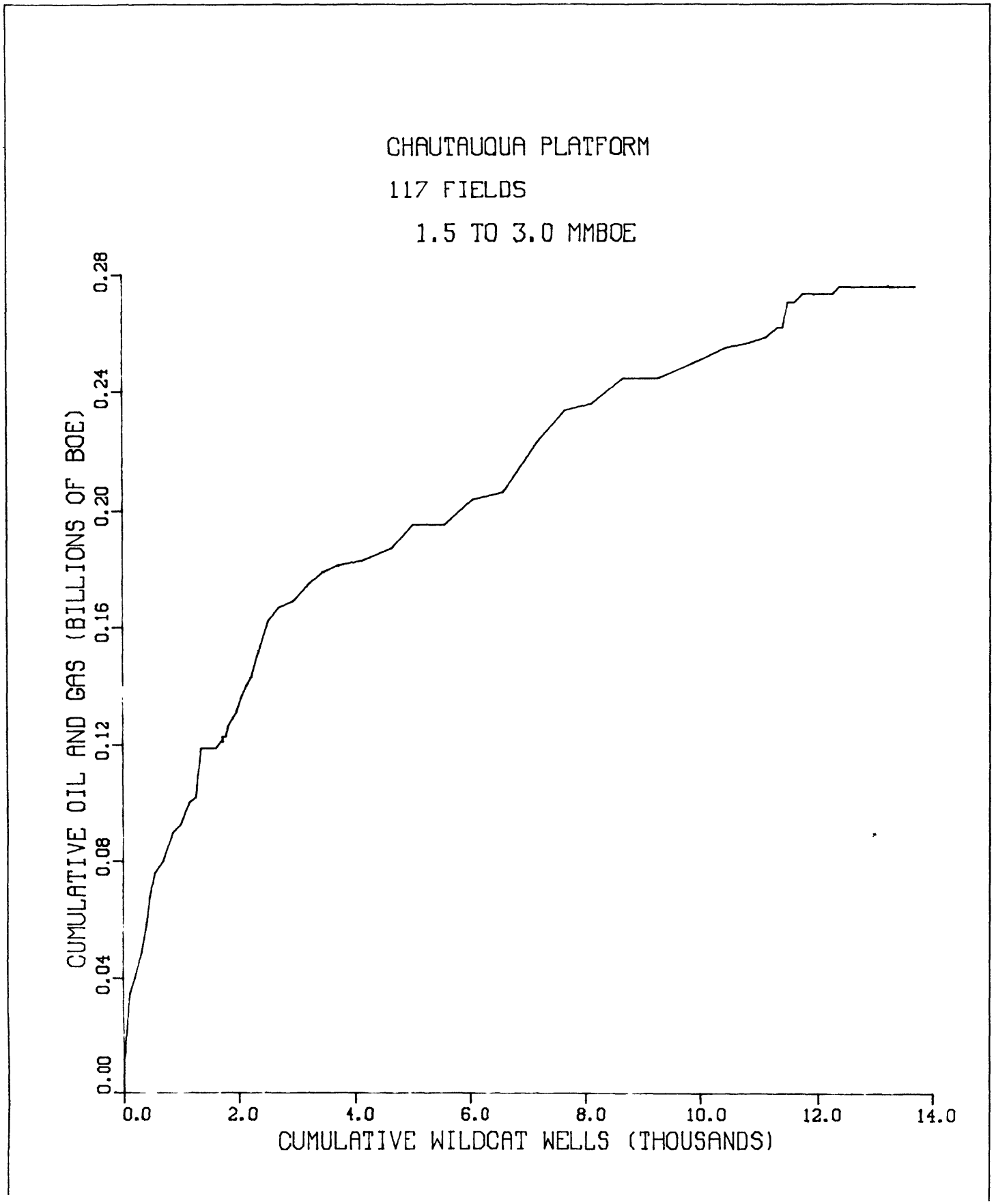

Figure 13e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

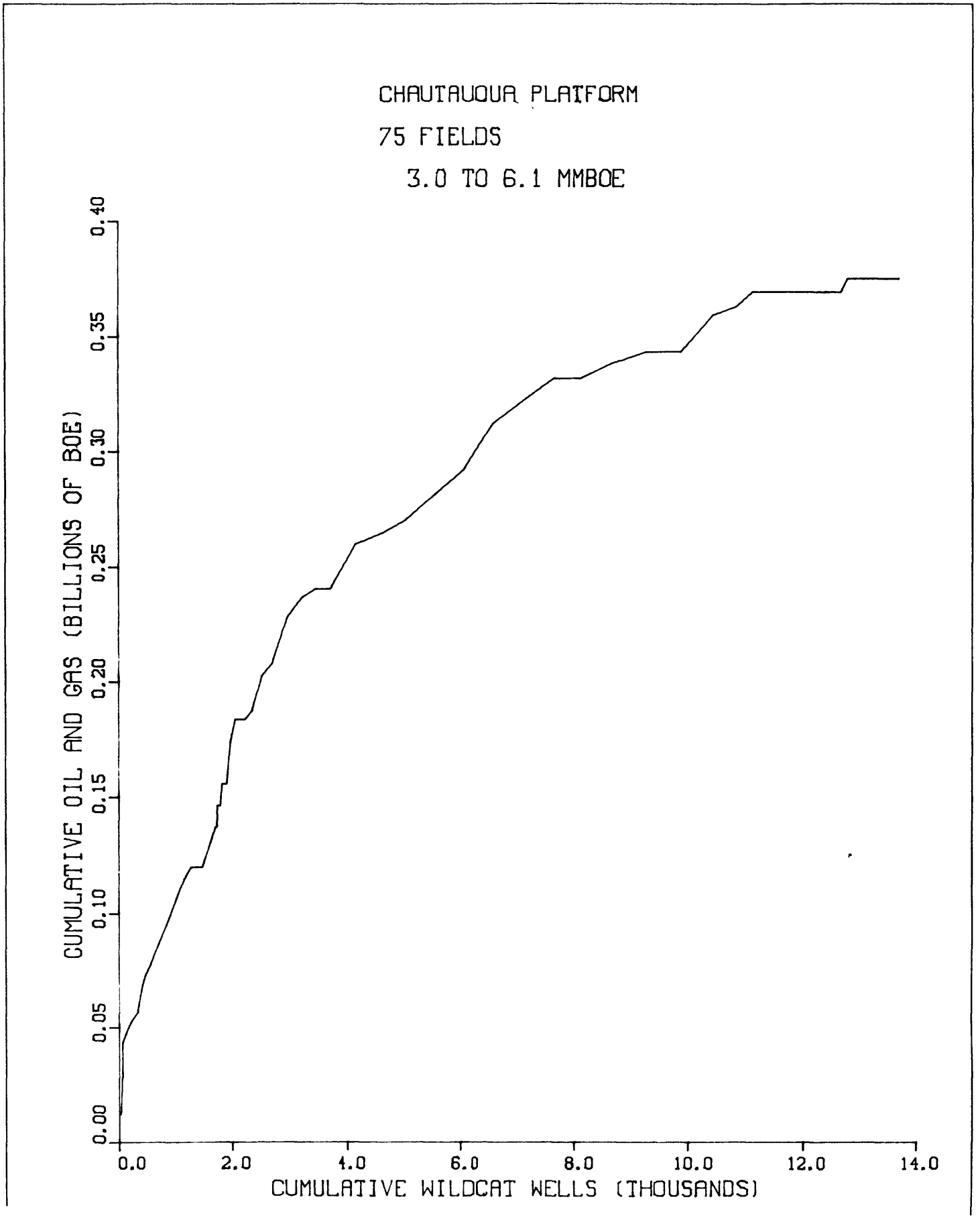

Figure 13f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

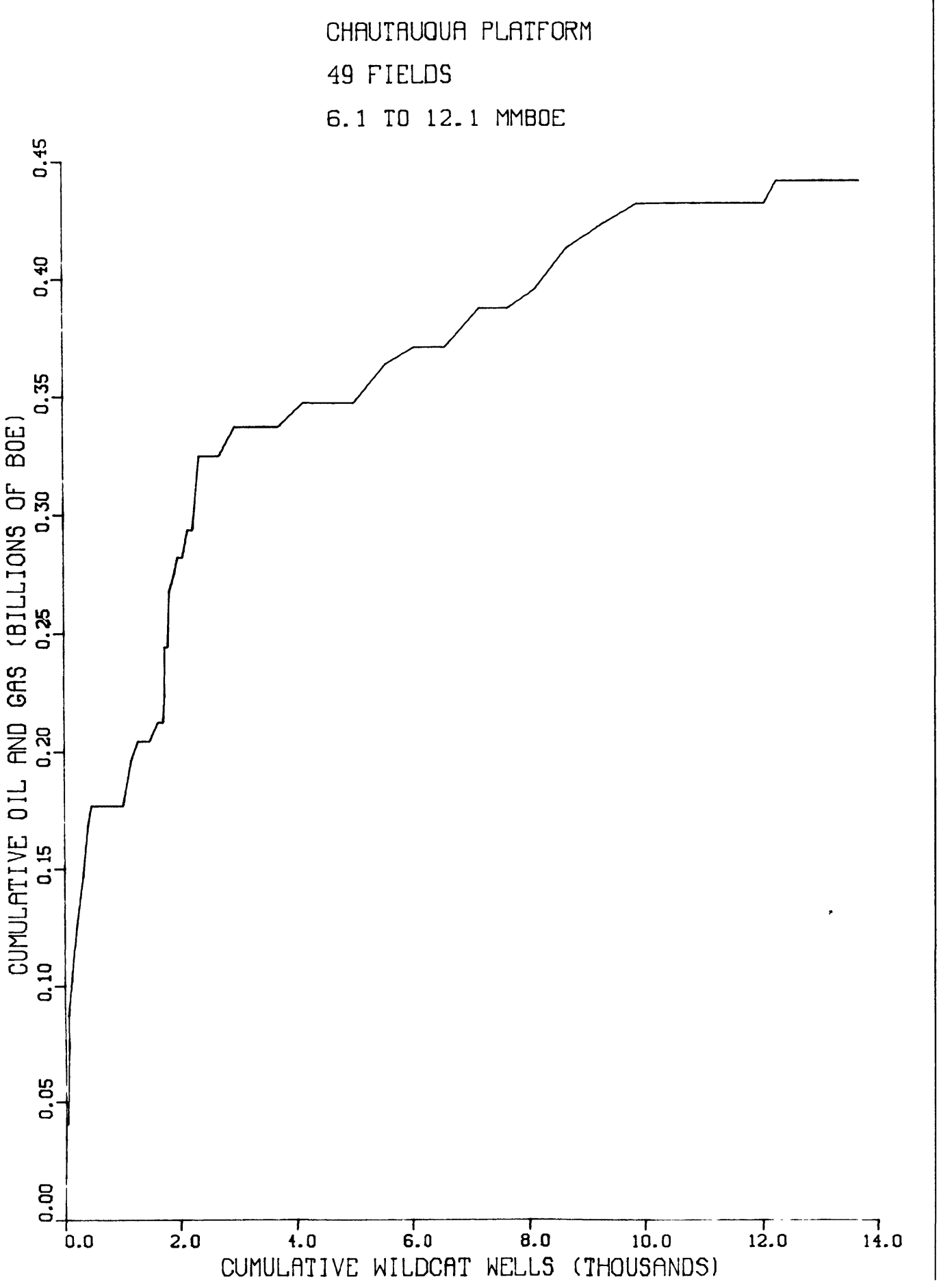

Figure 13g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

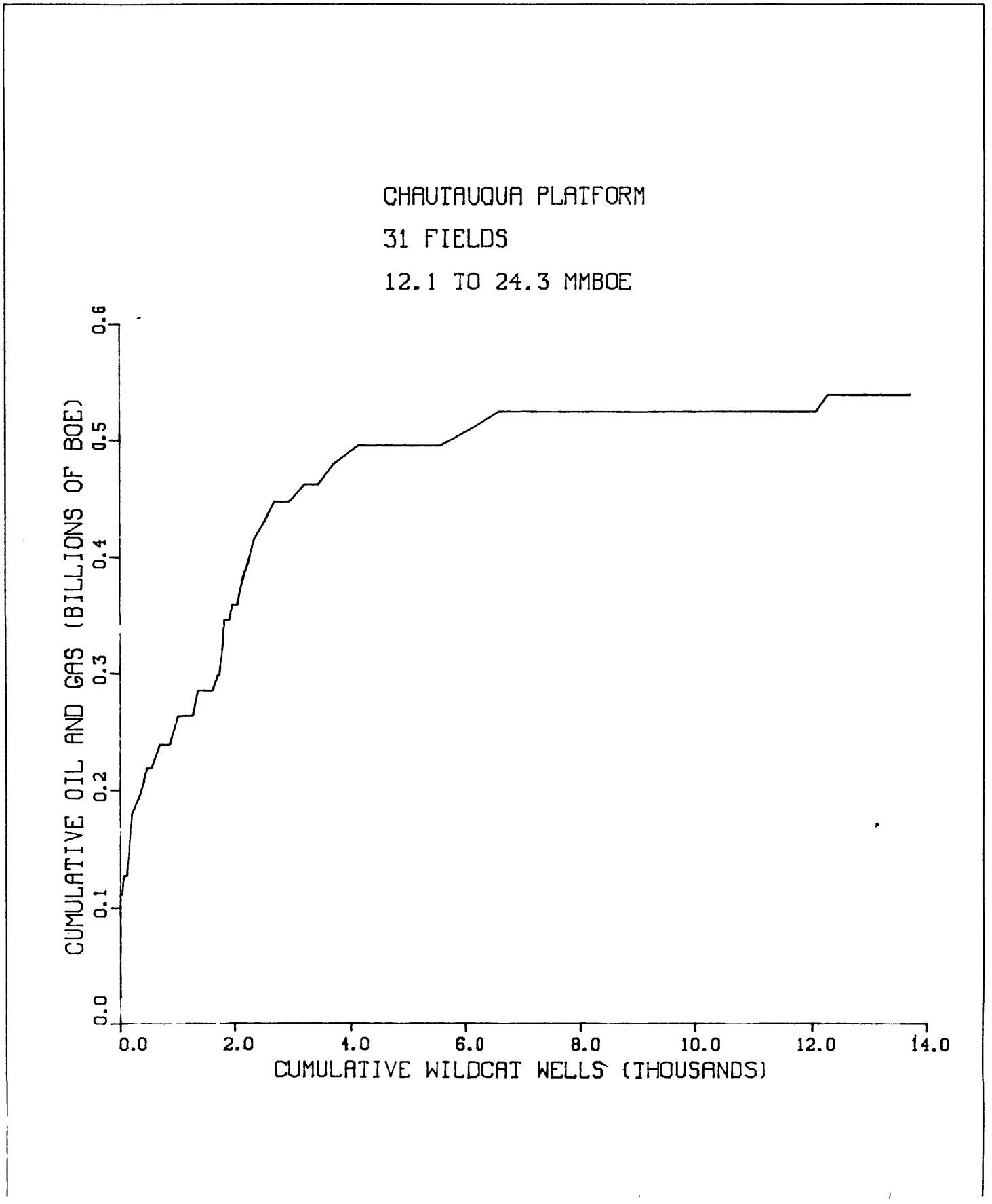

Figure 13h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

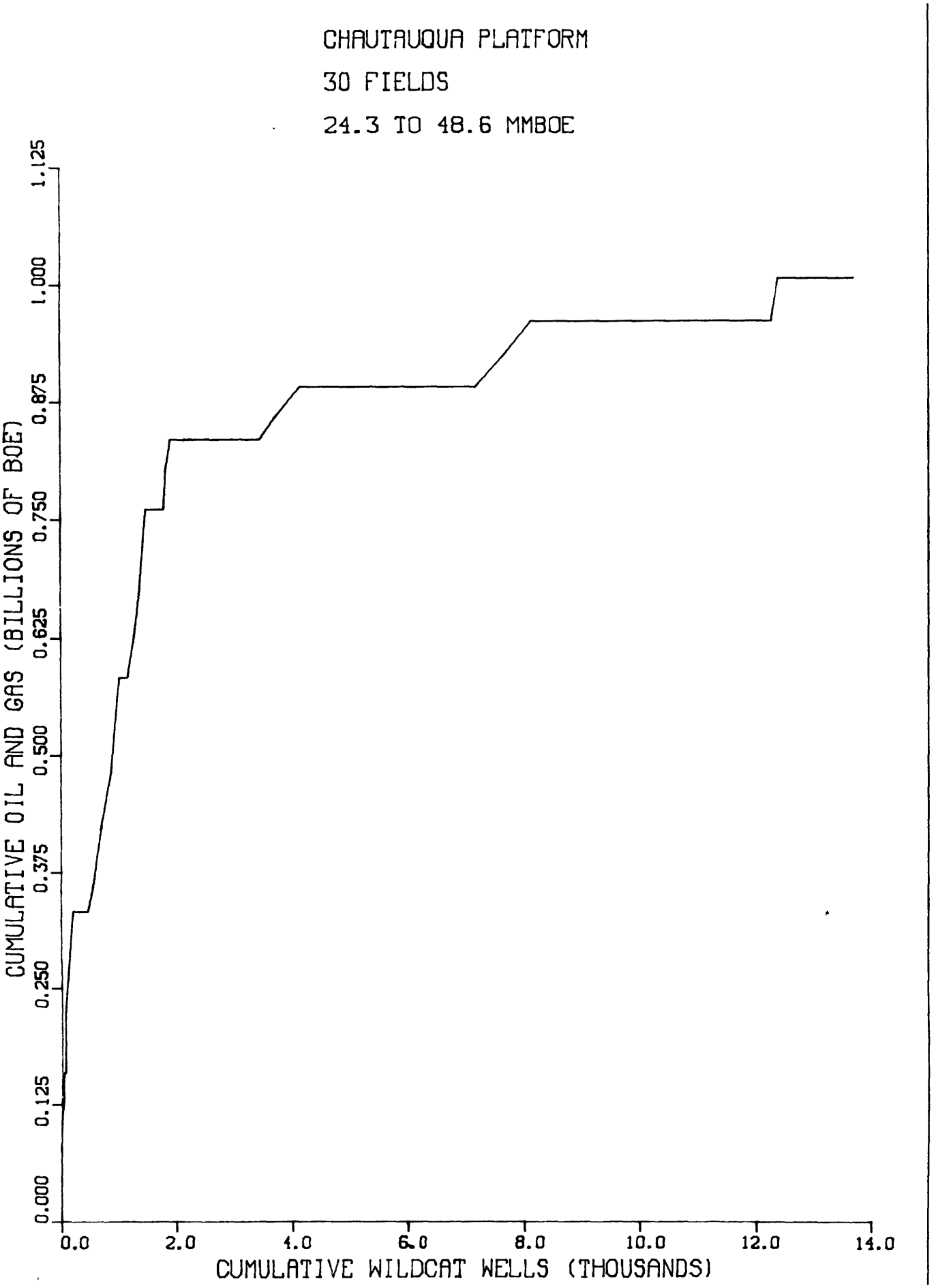

Figure 13i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

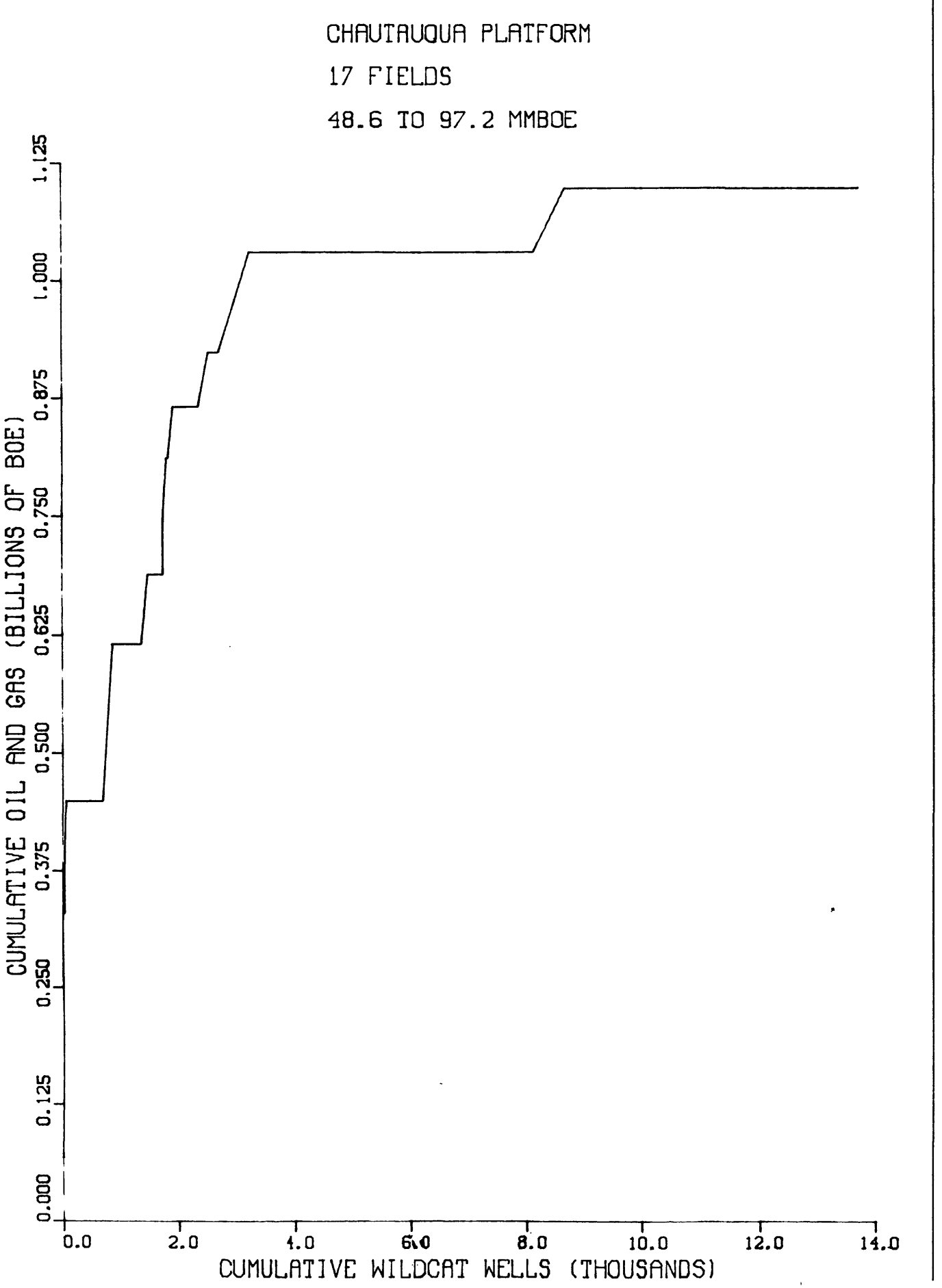

Figure 13j.--Cumulative oil and gas vs. cumulative wells for fields in the size range 48.6-97.2 MMBOE.

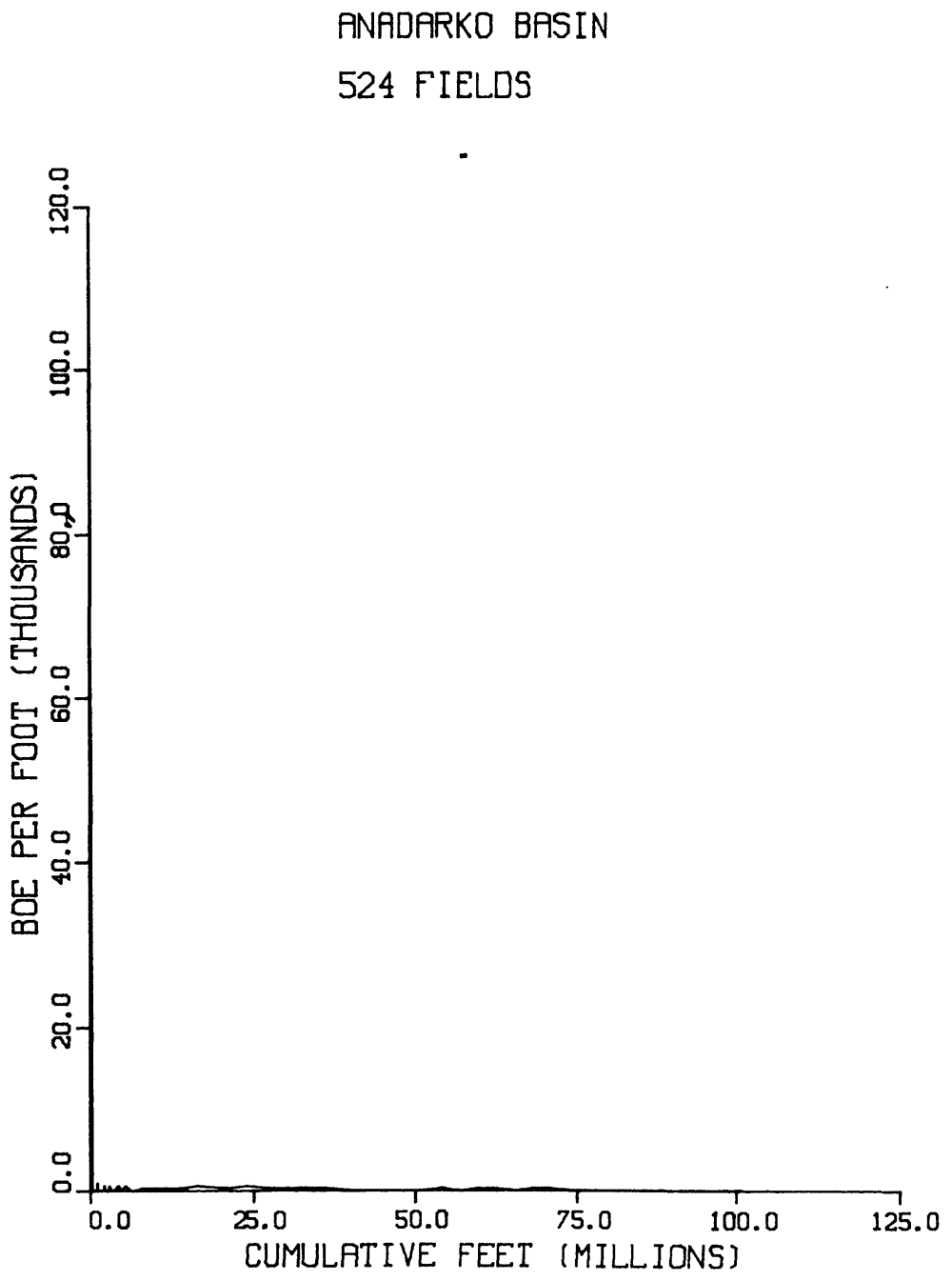

Figure 14a.--BOE per foot vs. cumulative footage drilled.

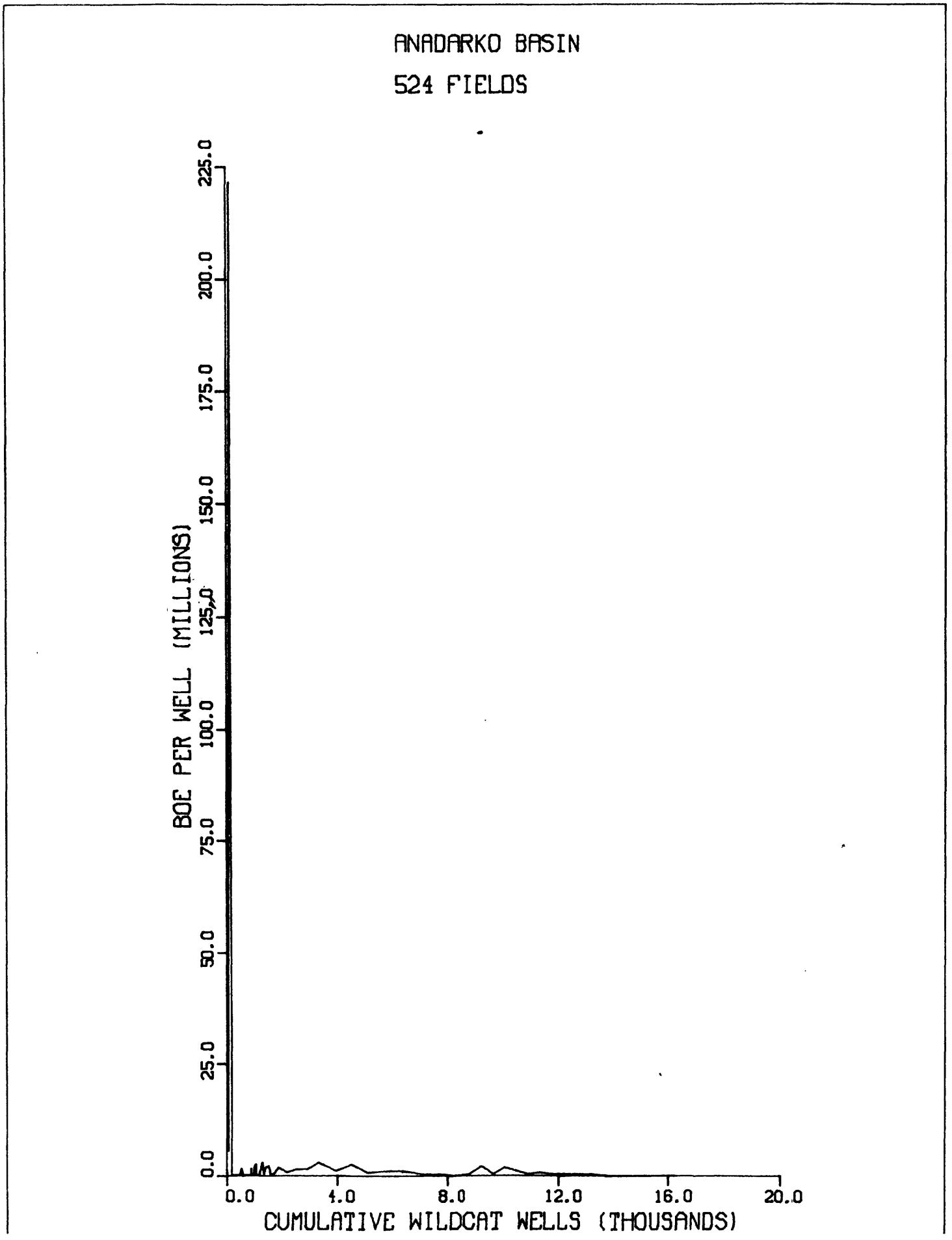

Figure 14b.--BOE per well vs. cumulative wells drilled.

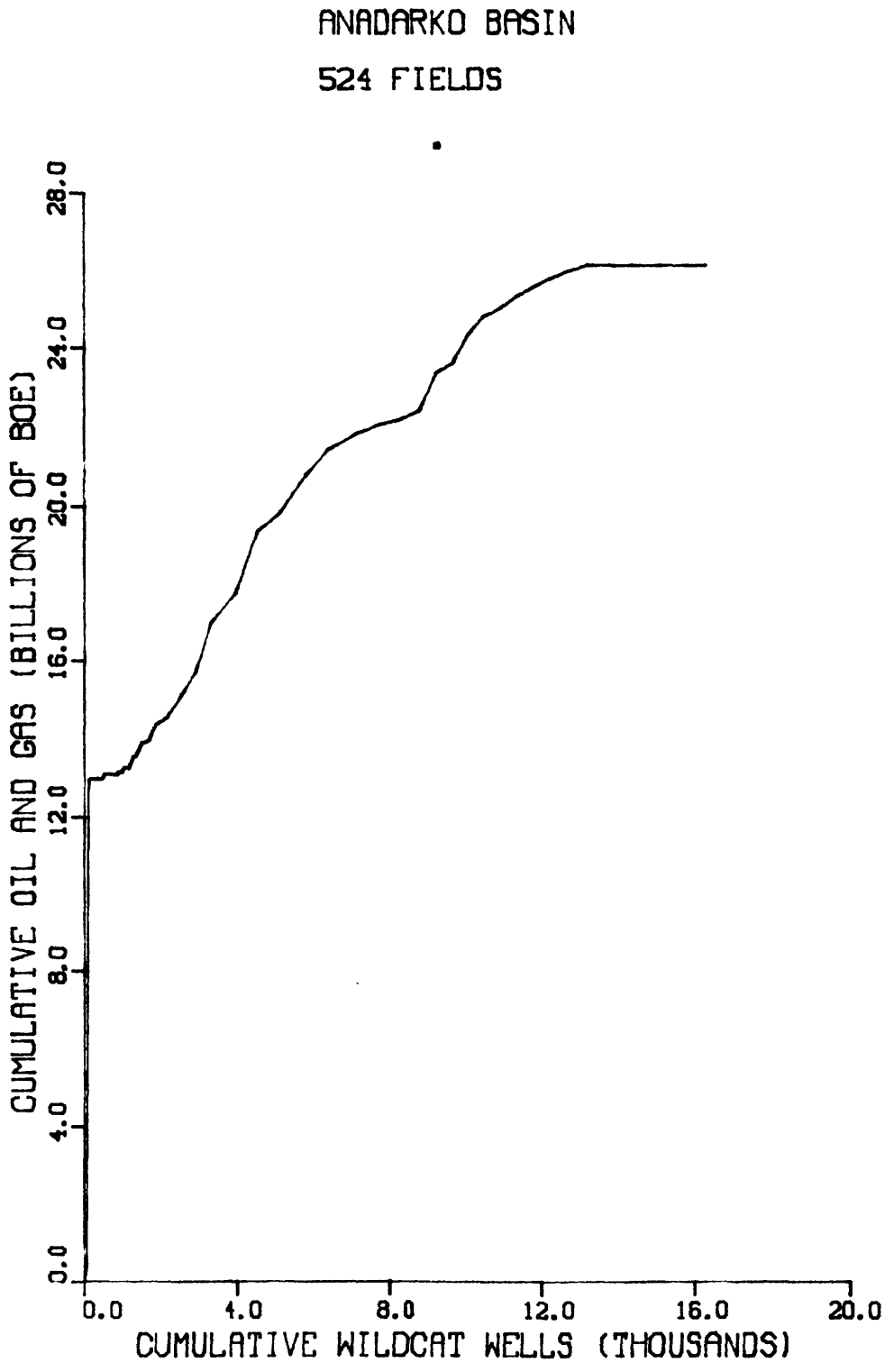

Figure 14c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

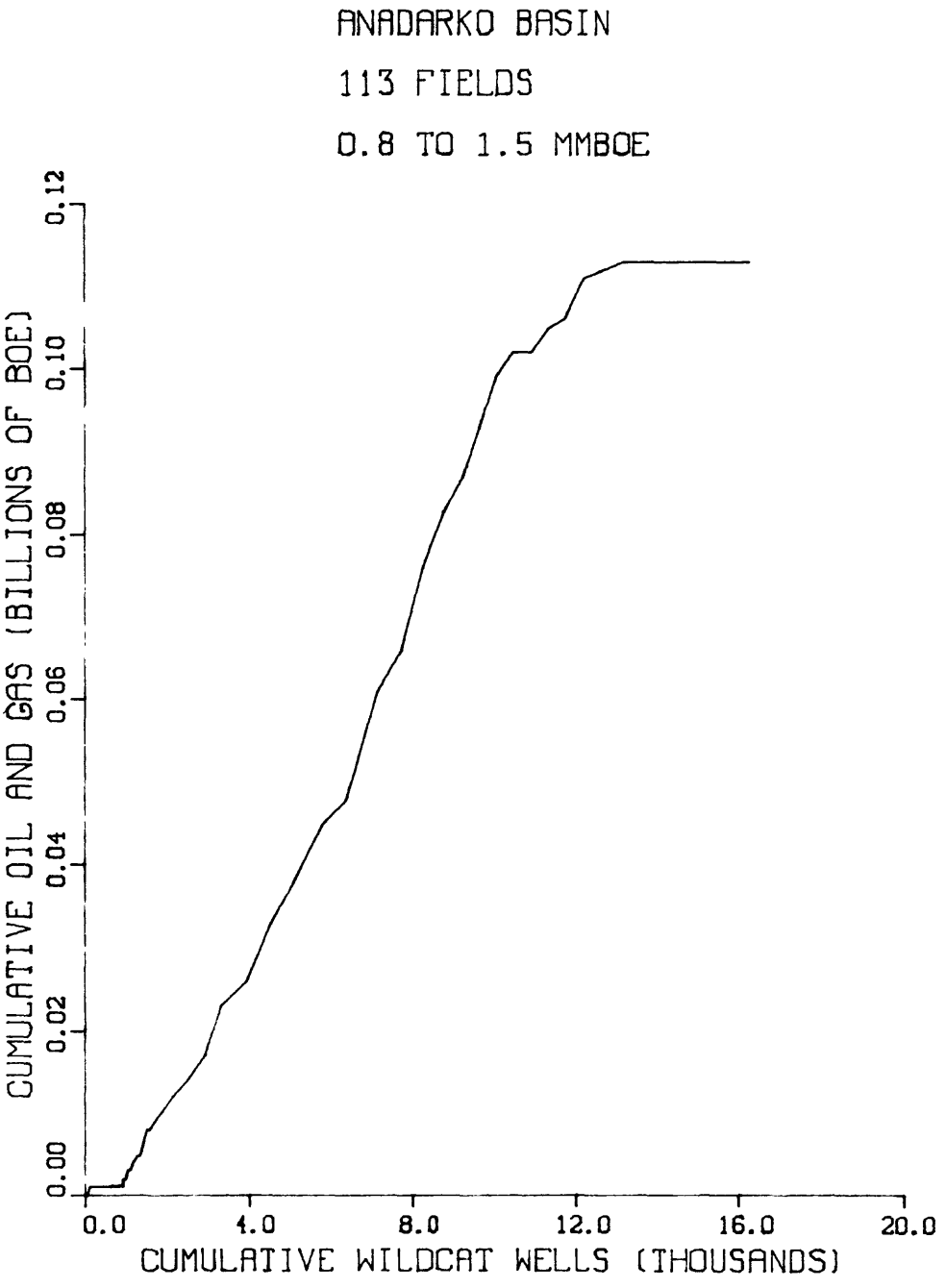

Figure 14d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

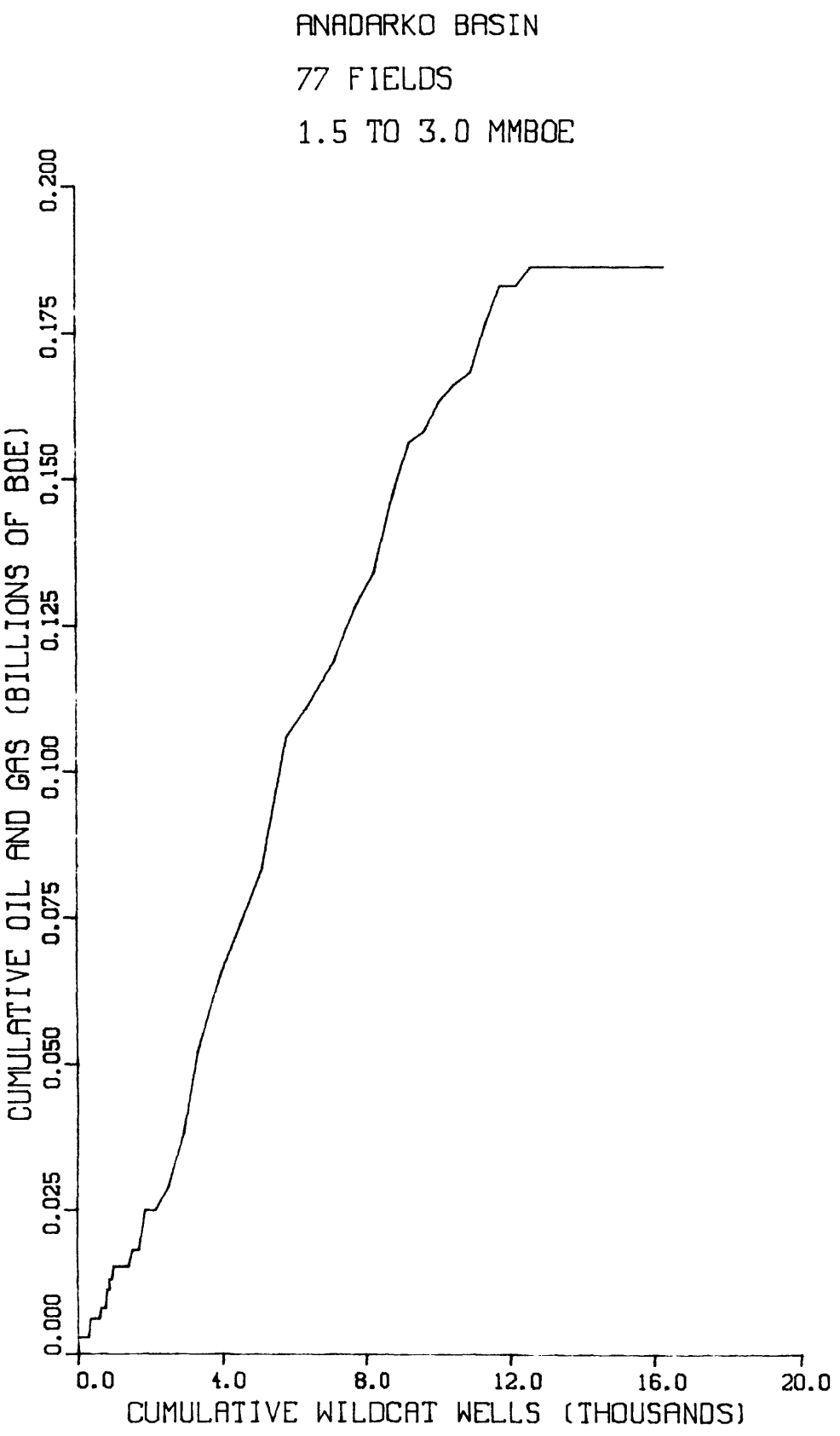

Figure 14e.—Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

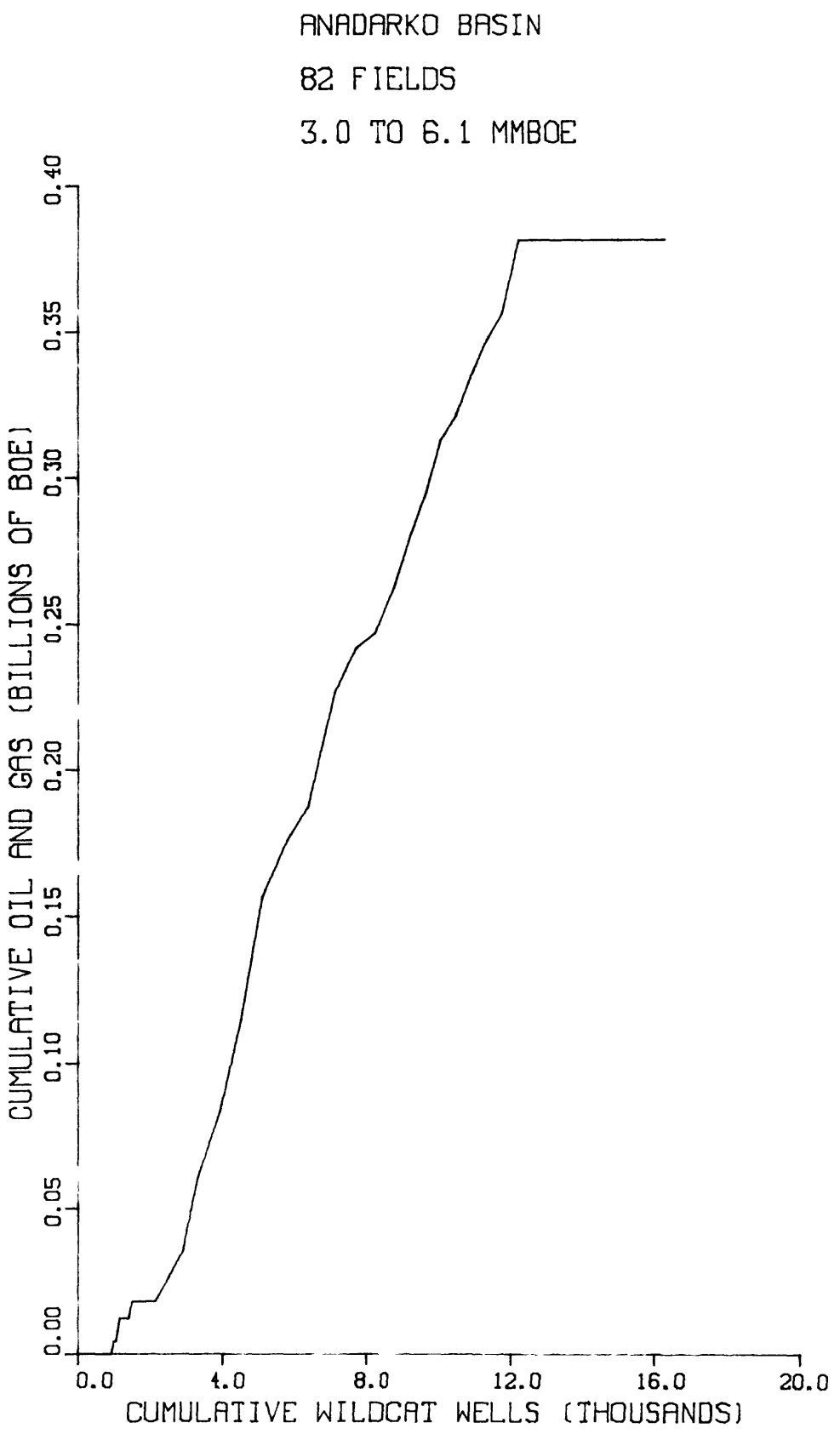

Figure 14f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

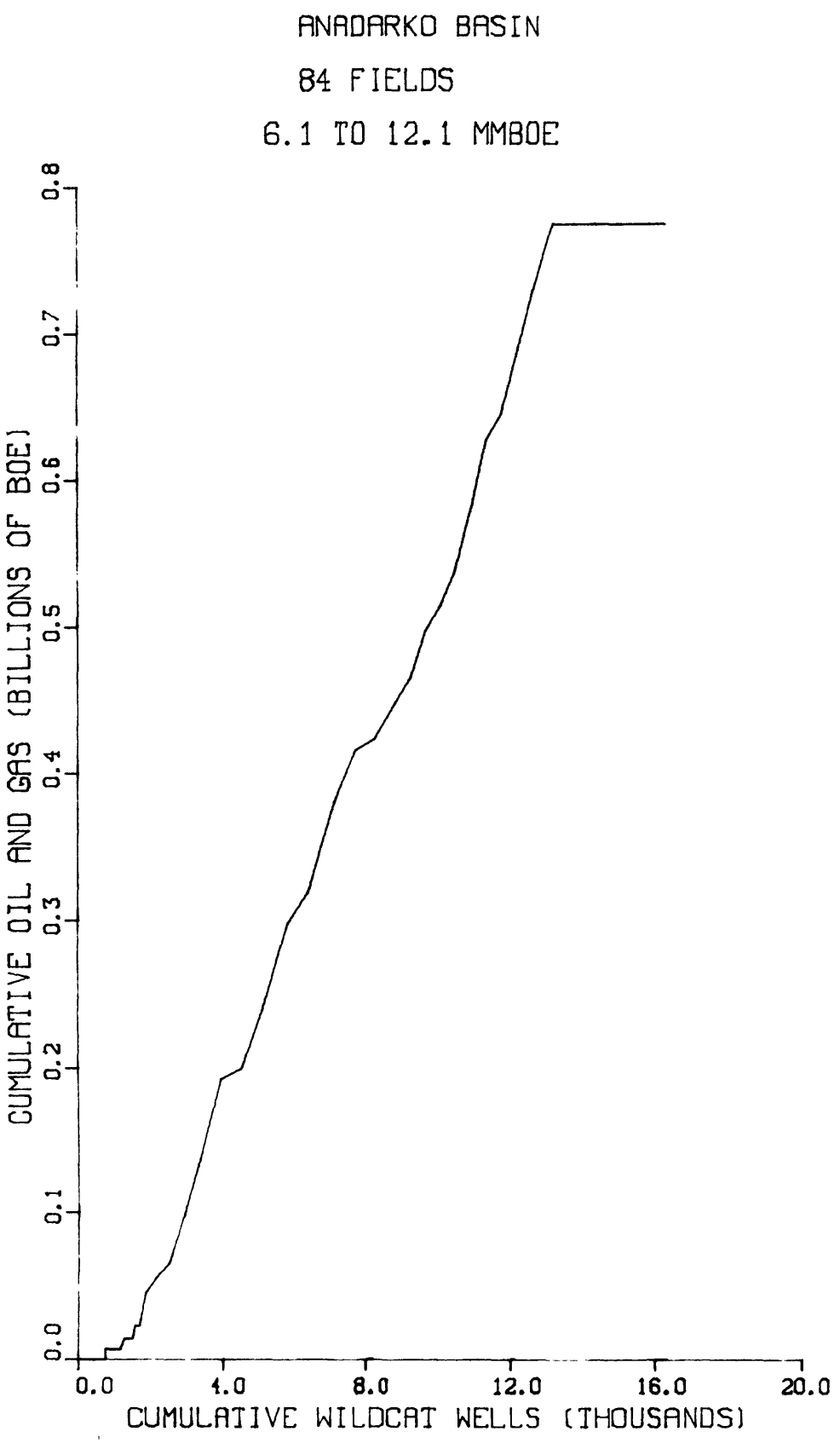

Figure 14g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

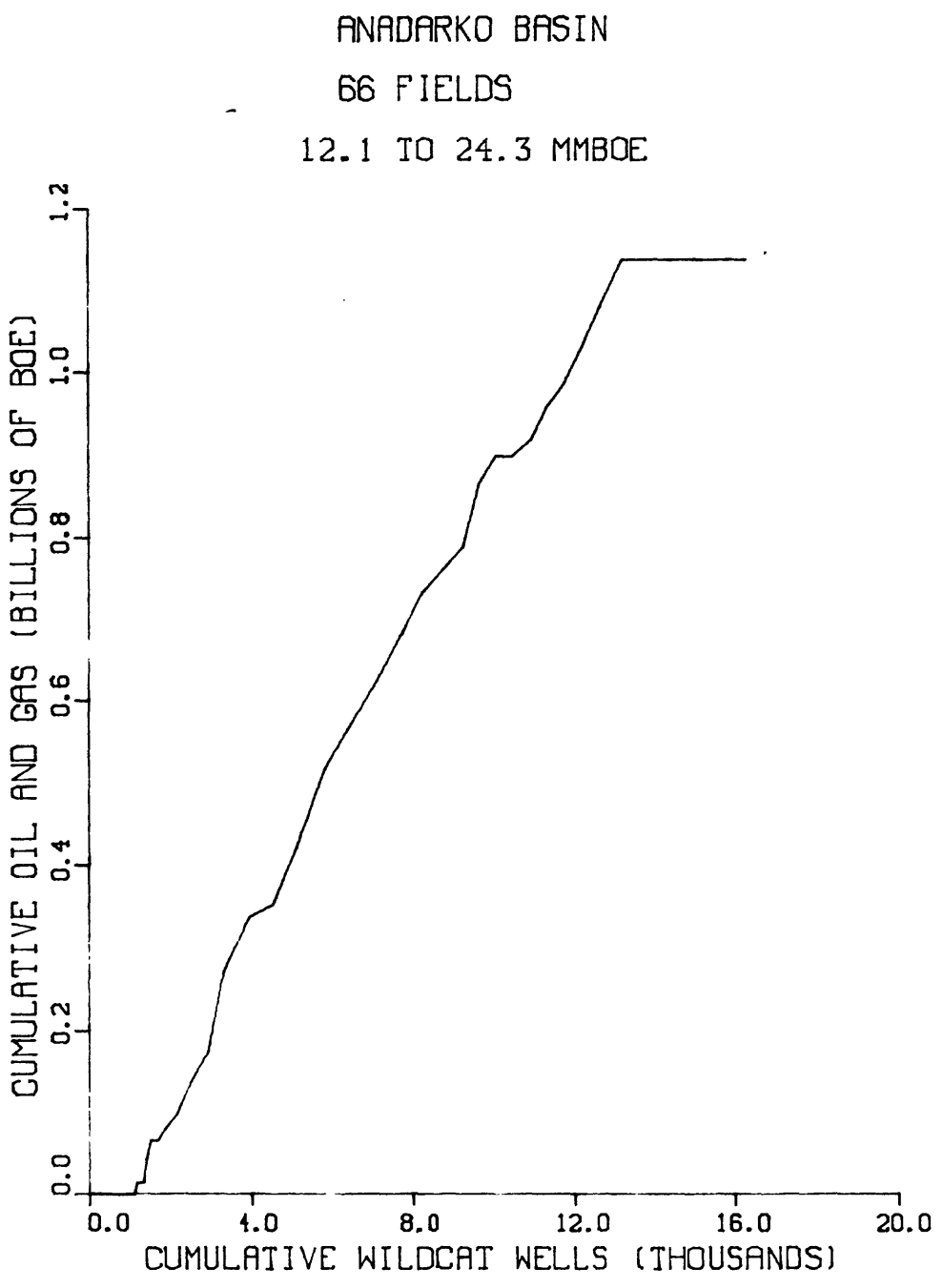

Figure 14h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

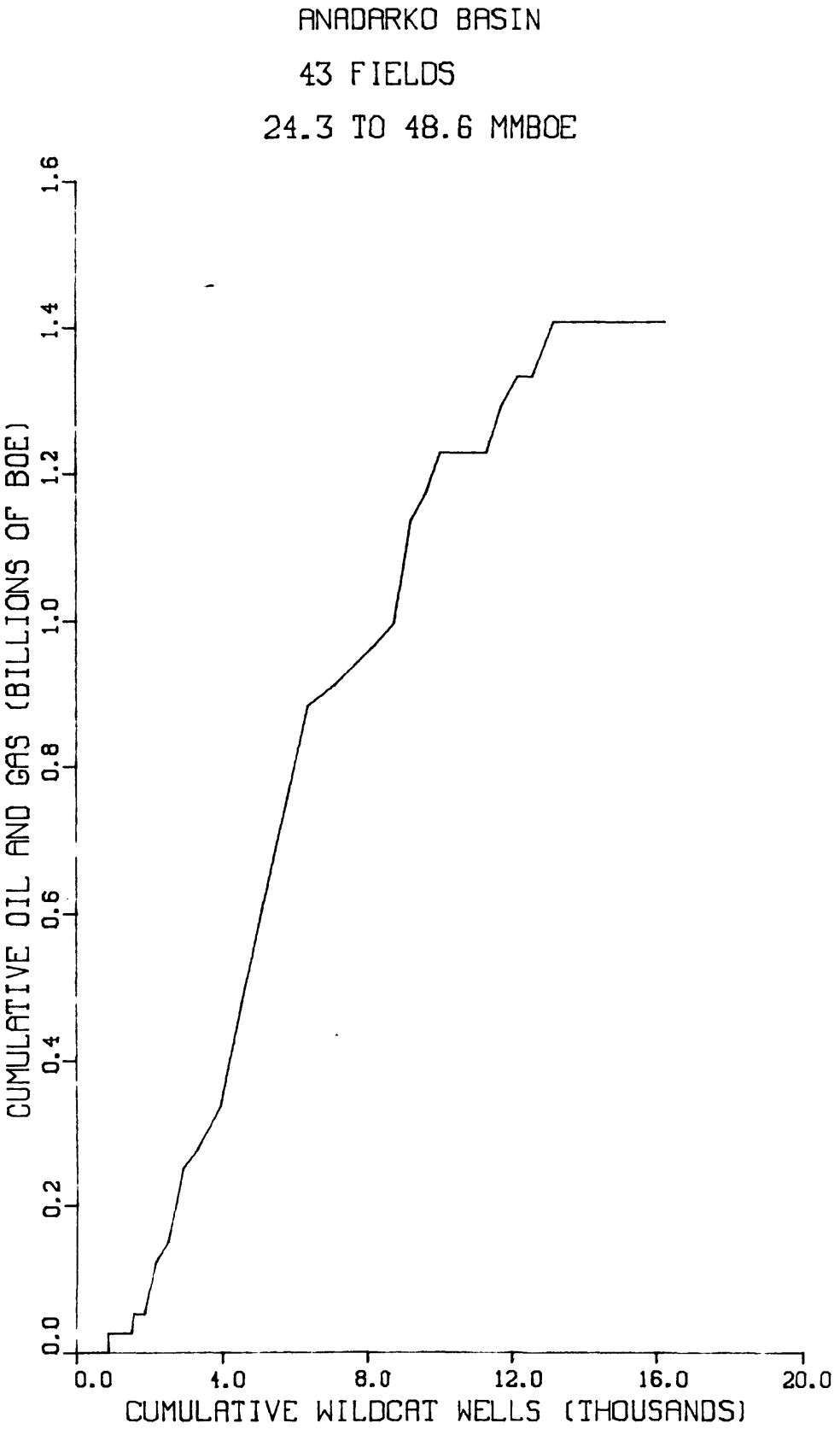

Figure 14i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

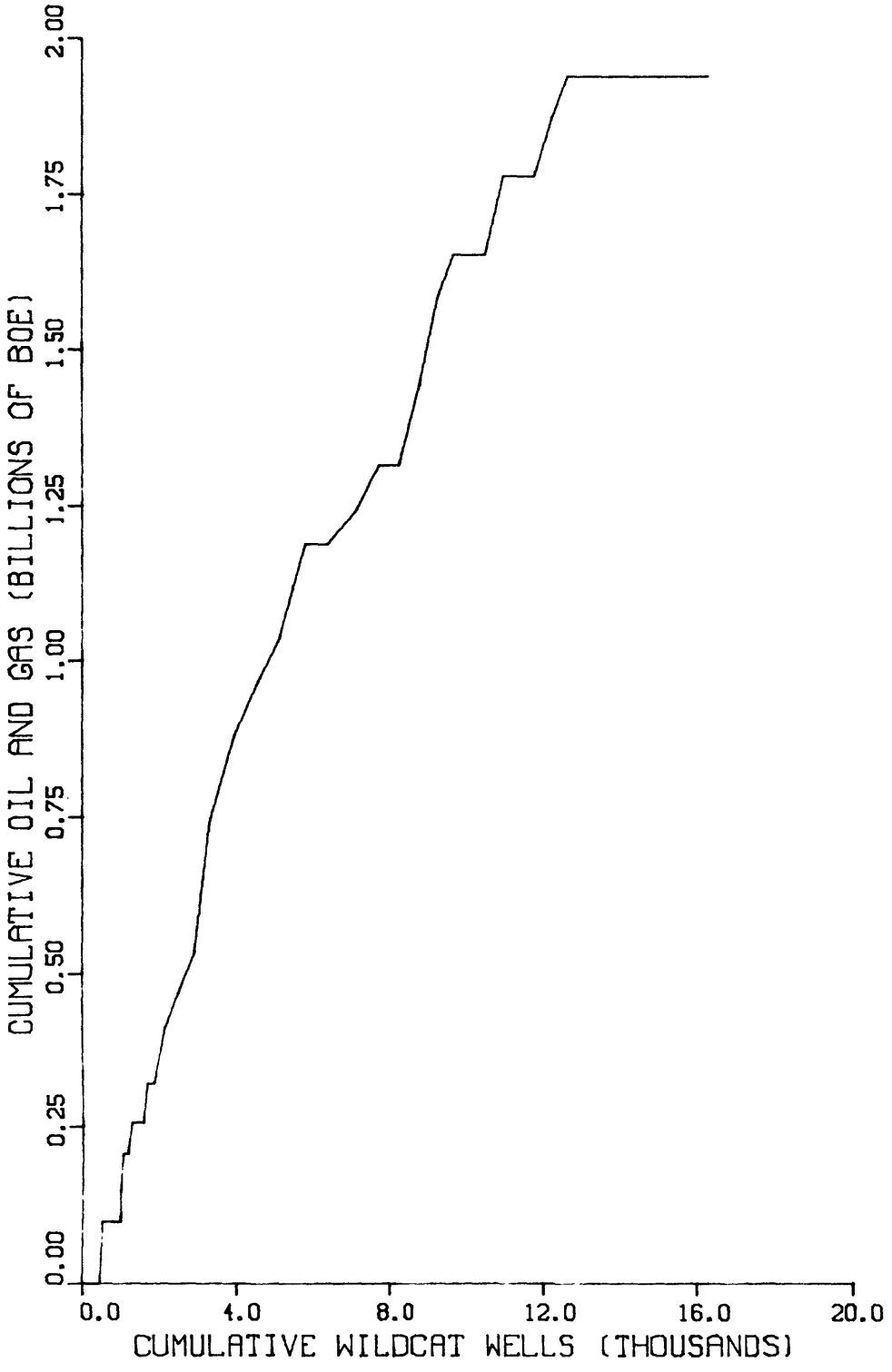

Figure 14j.--Cumulative oil and gas vs. cumulative wells for fields in the size range 48.6-97.2 MMBOE.

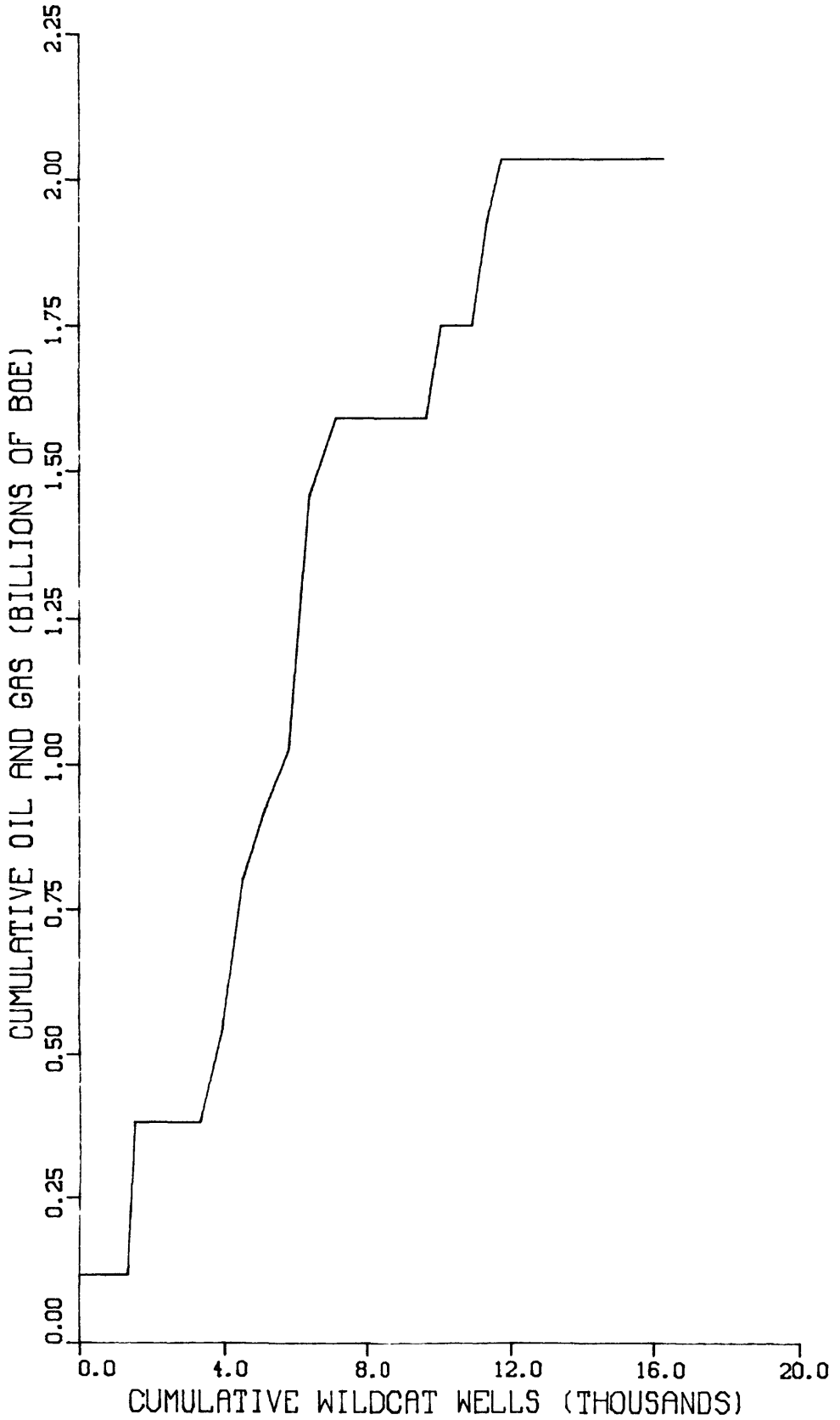

Figure 14k.--Cumulative oil and gas vs. cumulative wells for fields in the size range 97.2-194.3 MMBOE.

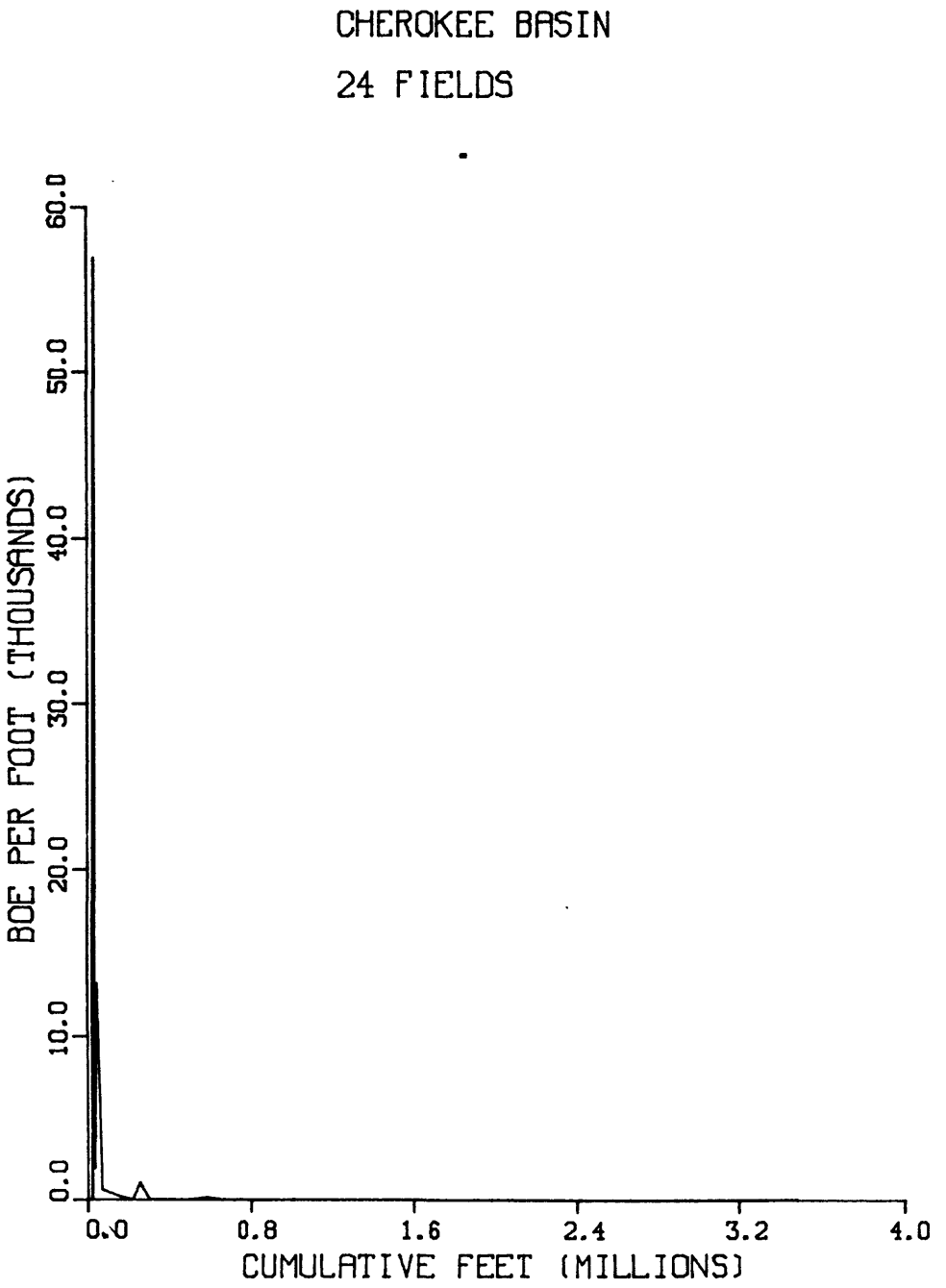

Figure 15a.--BOE per foot vs. cumulative footage drilled.

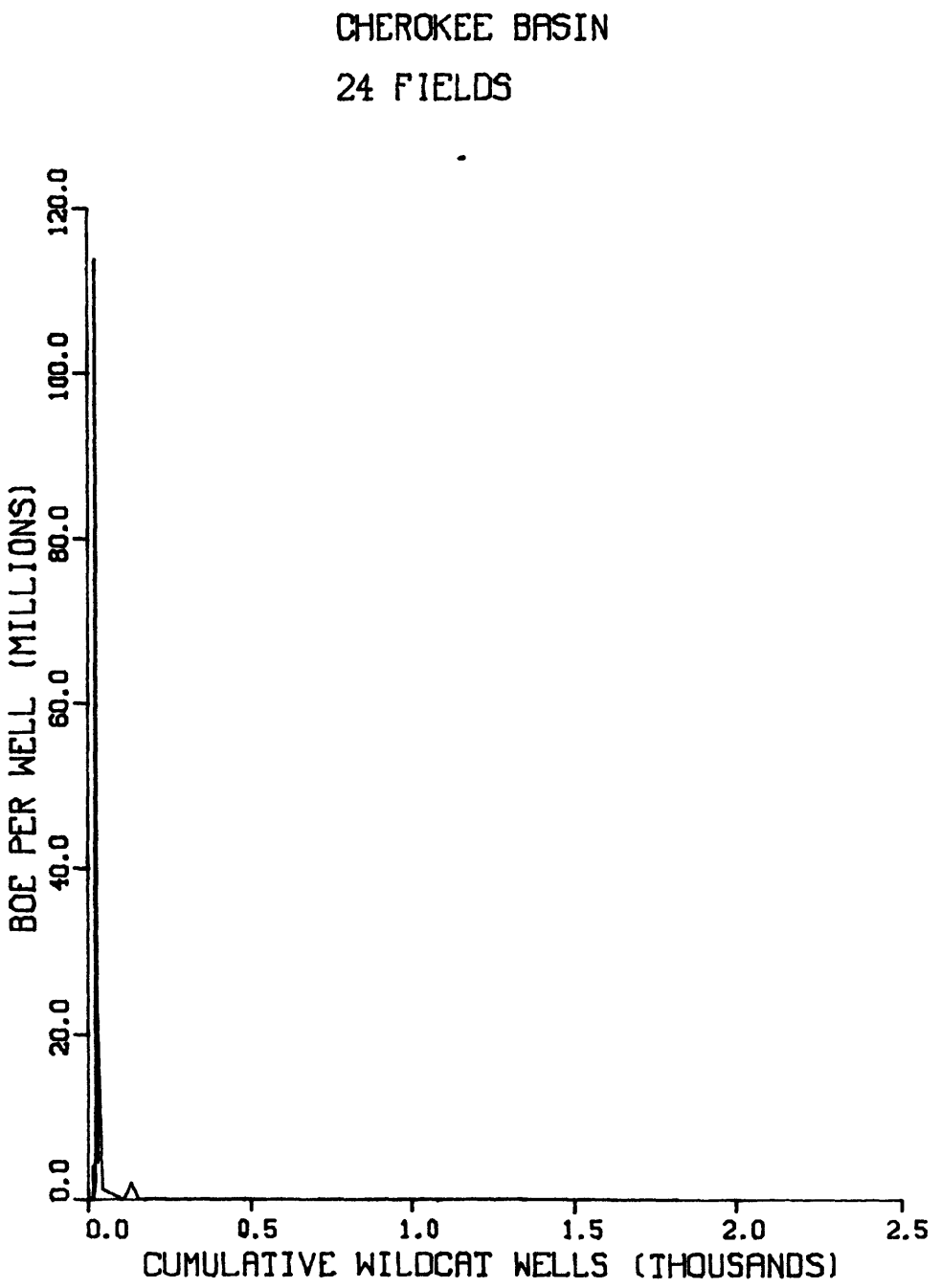

Figure 15b.--BOE per well vs. cumulative wells drilled.

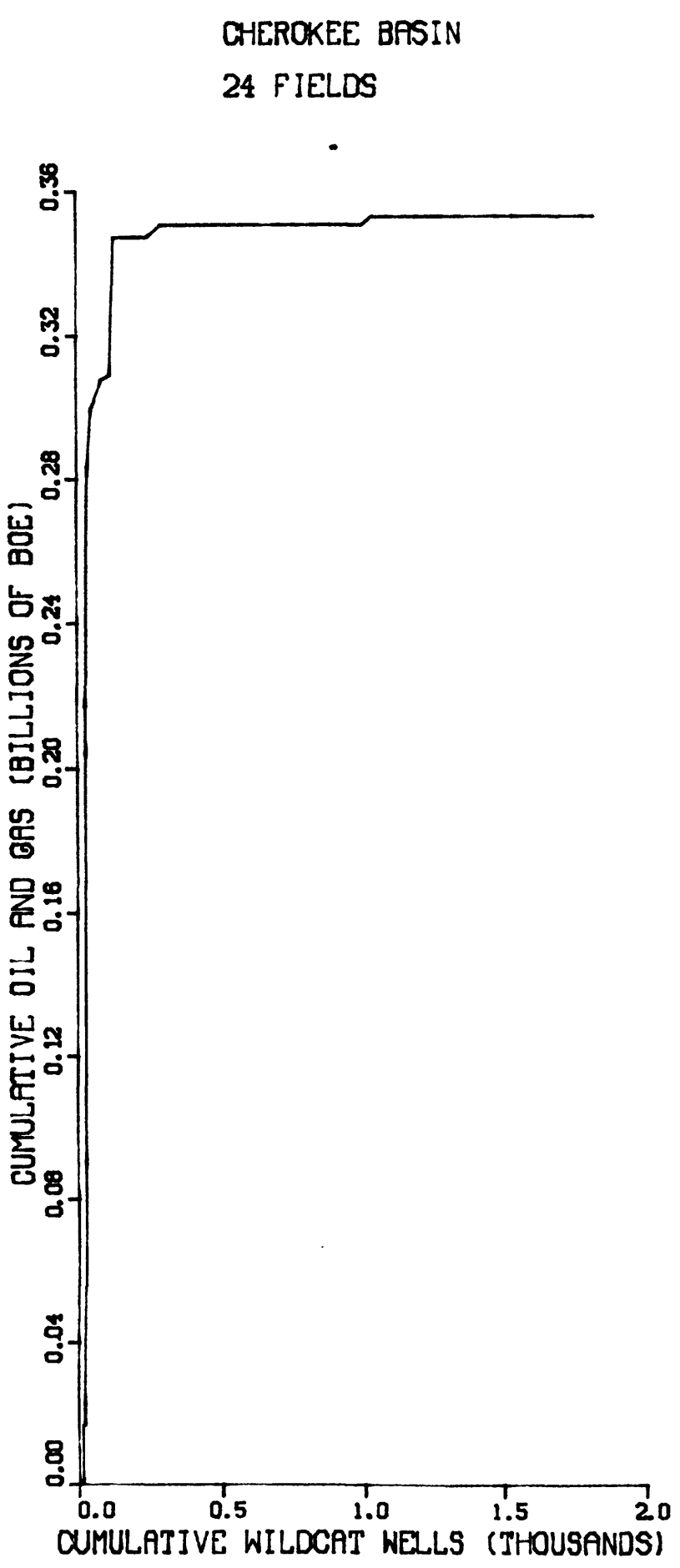

Figure 15c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

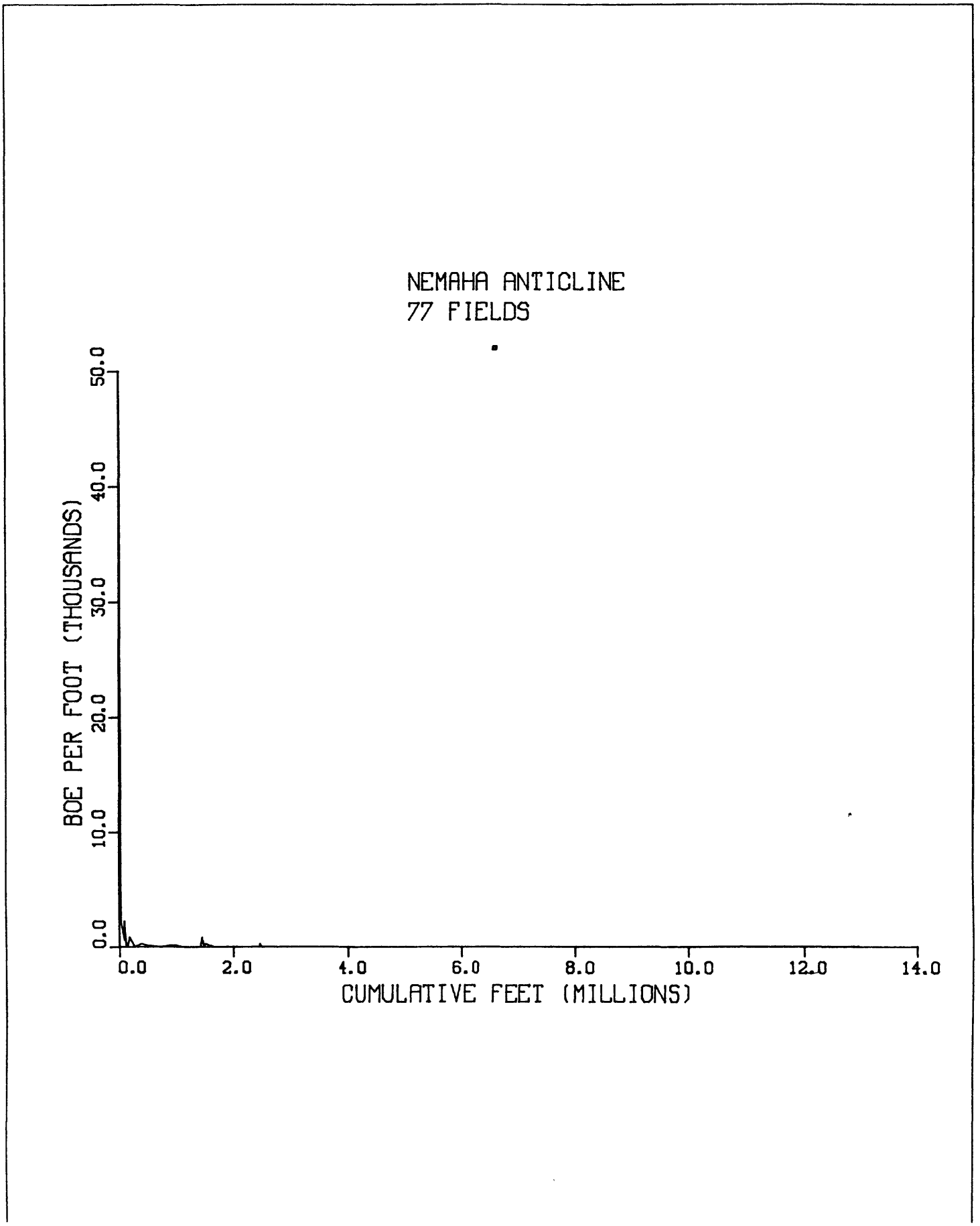

Figure 16a.--BOE per foot vs. cumulative footage drilled.

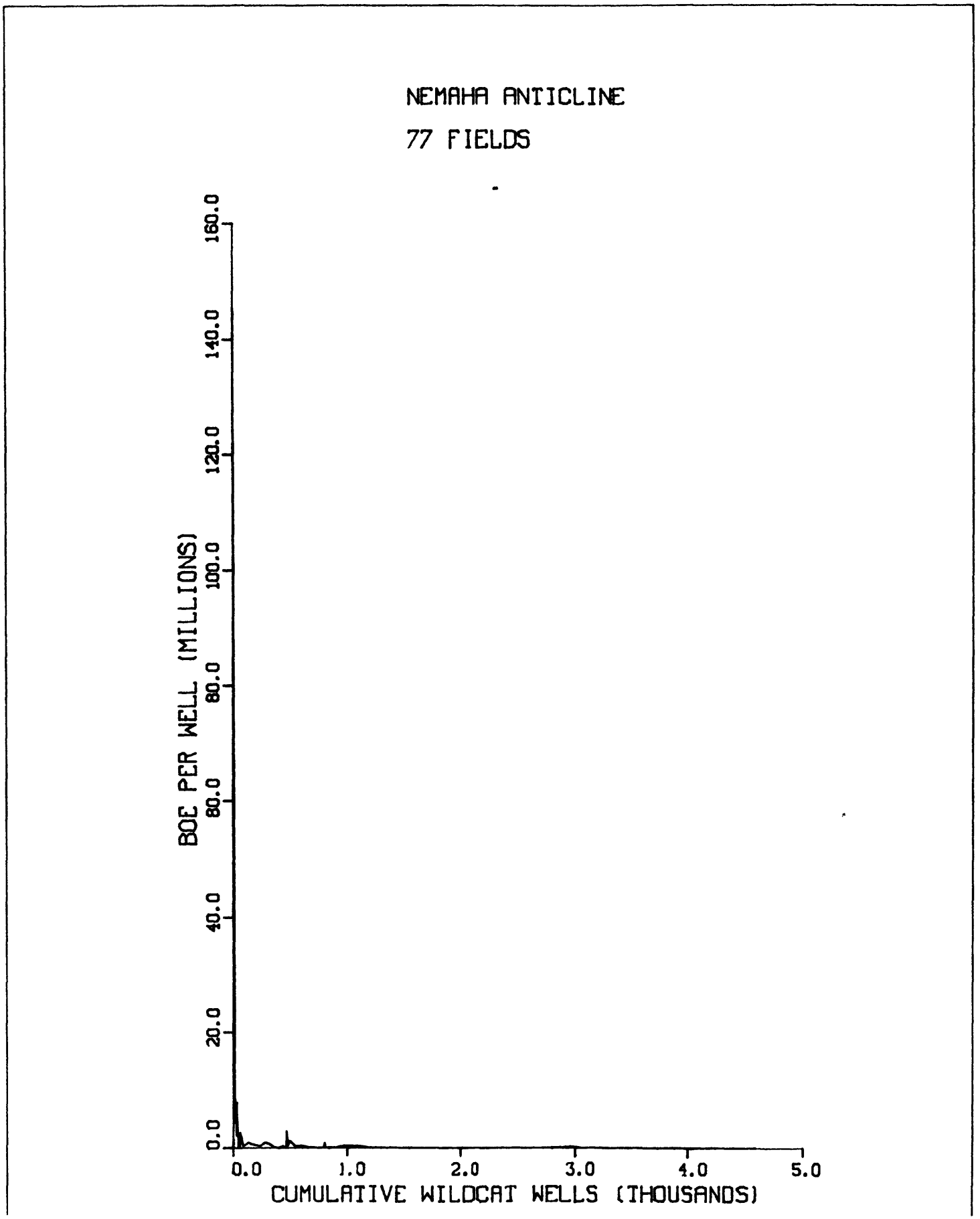

Figure 16b.--BOE per well vs. cumulative wells drilled.

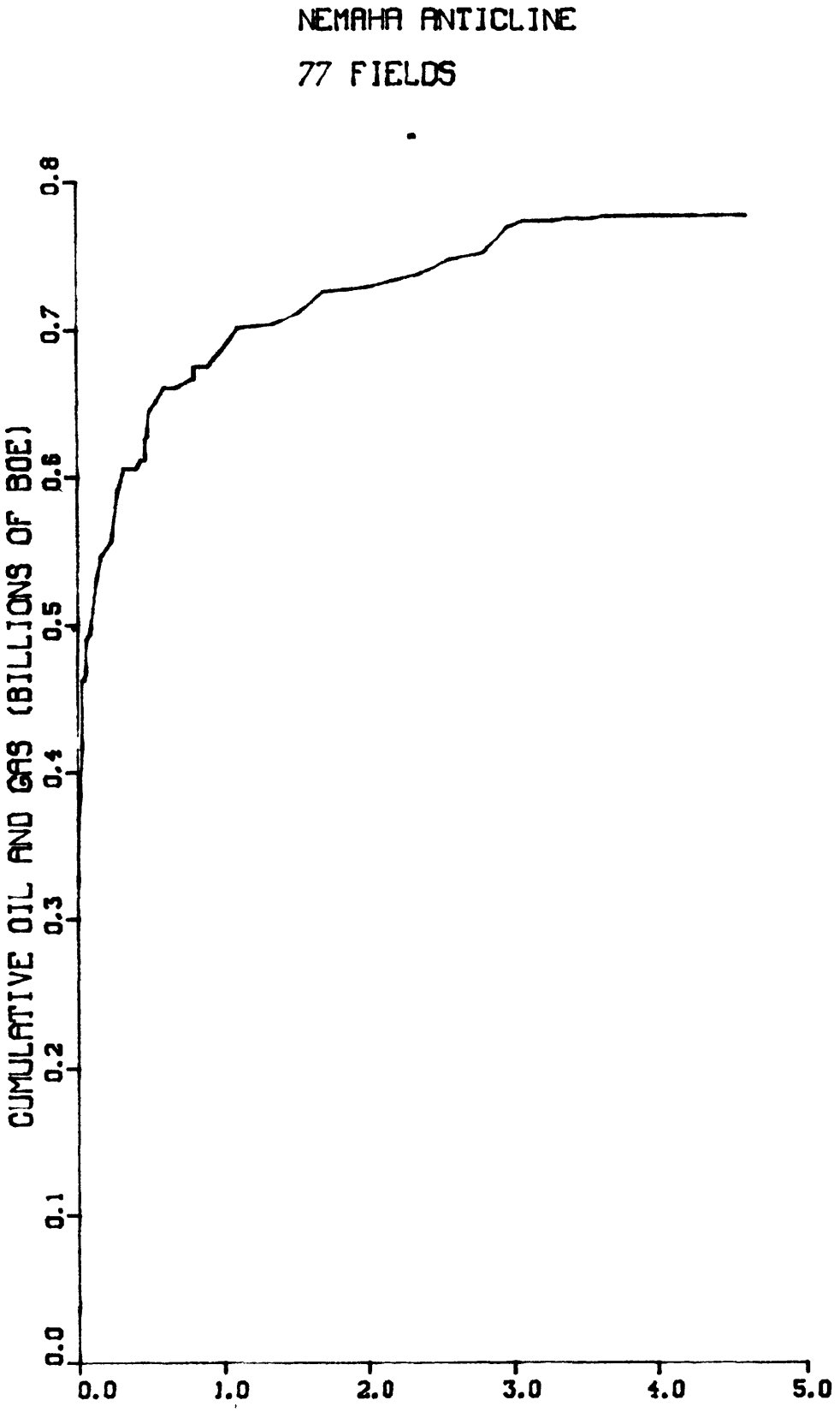

Figure 16c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

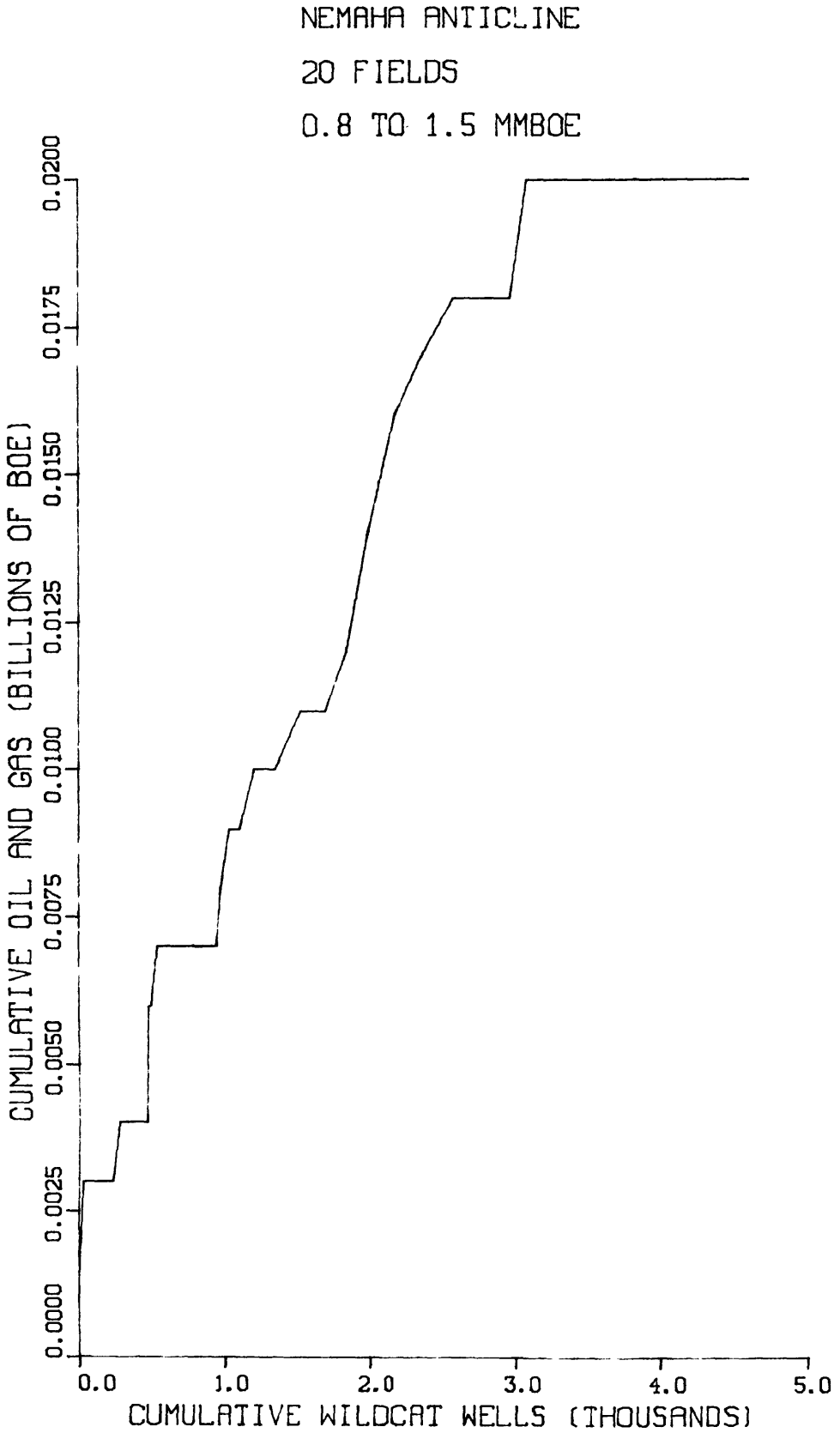

Figure 16d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

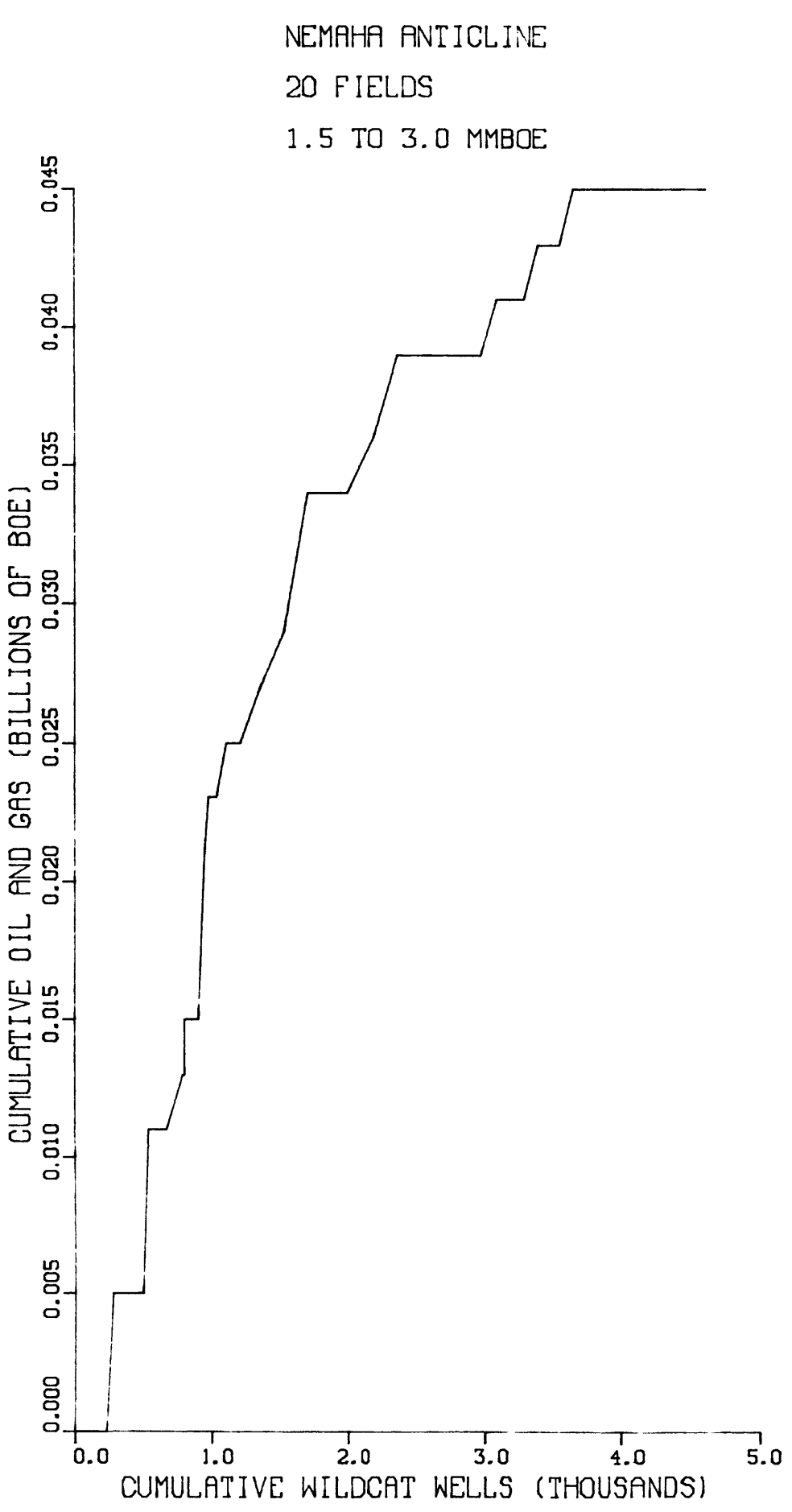

Figure 16e.—Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

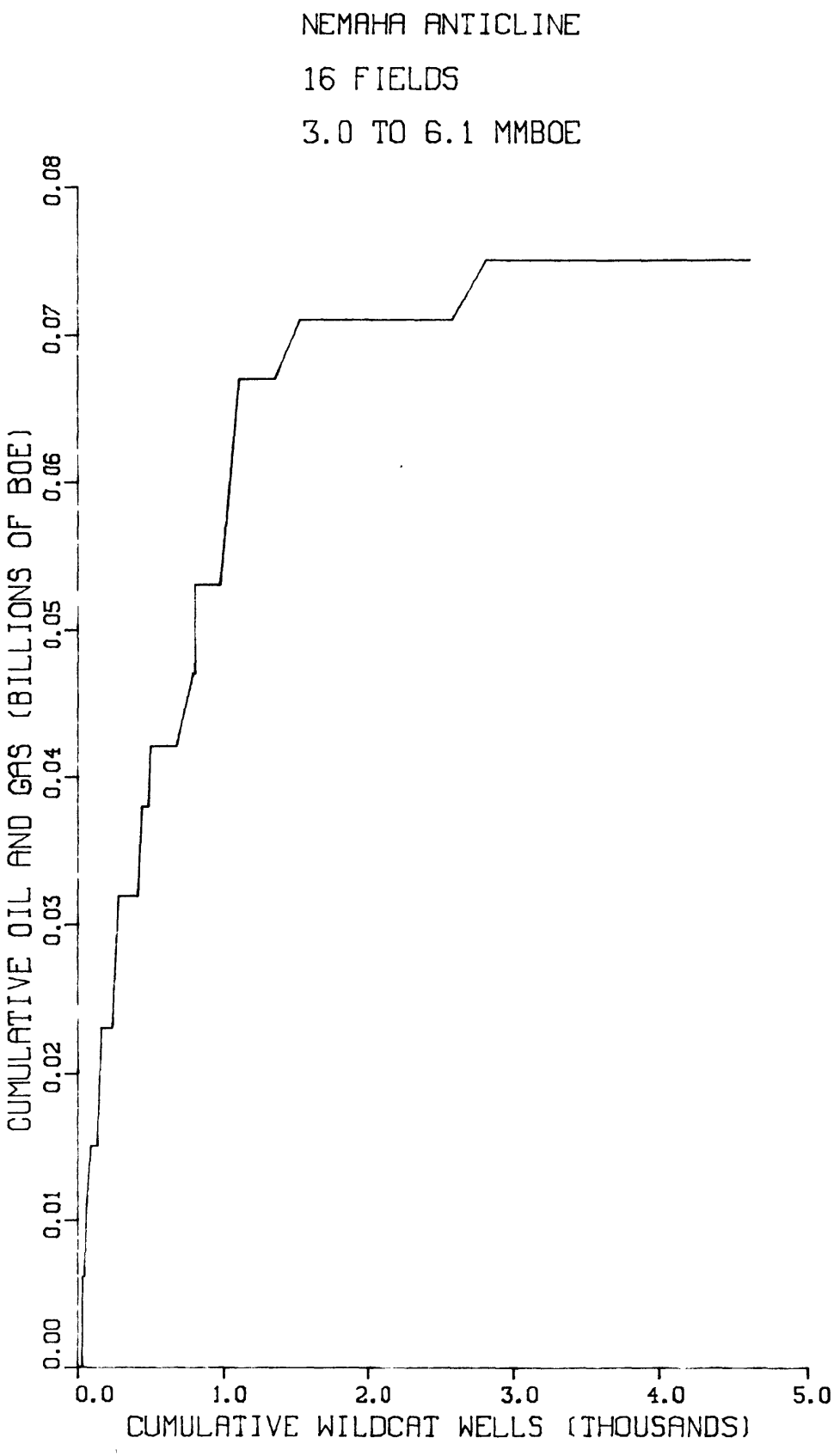

Figure 16f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

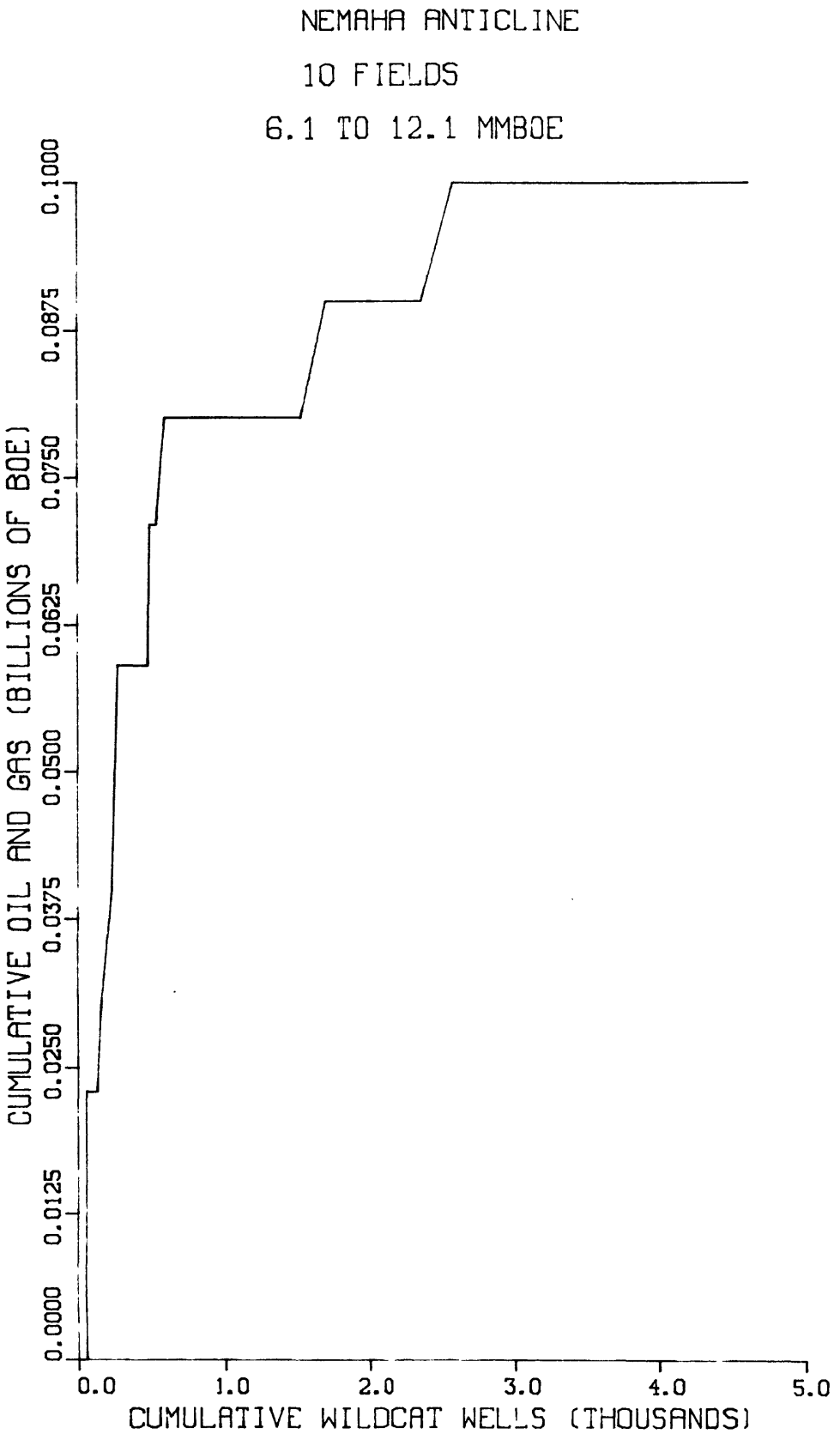

Figure 16g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

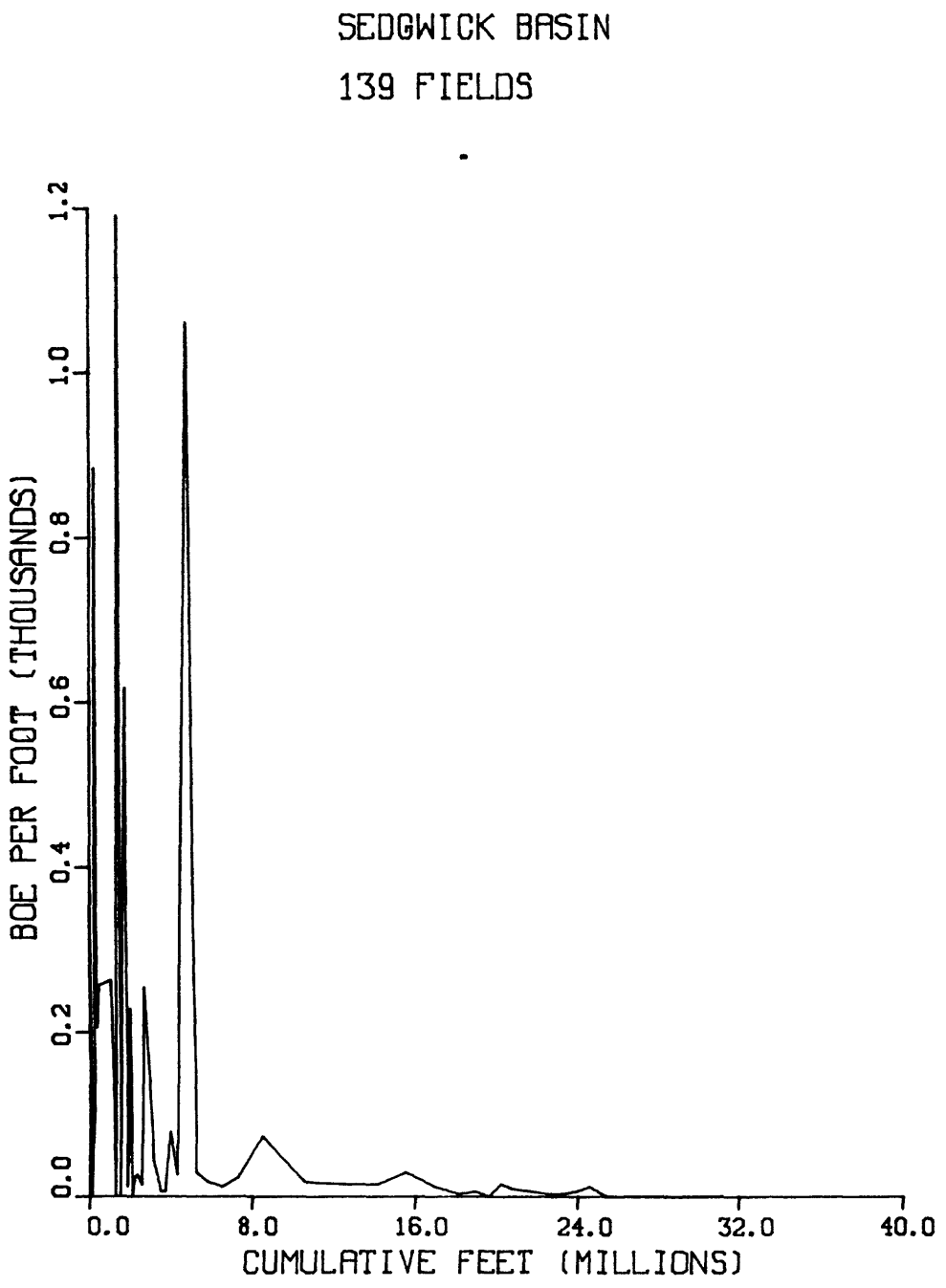

Figure 17a.--BOE per foot vs. cumulative footage drilled.

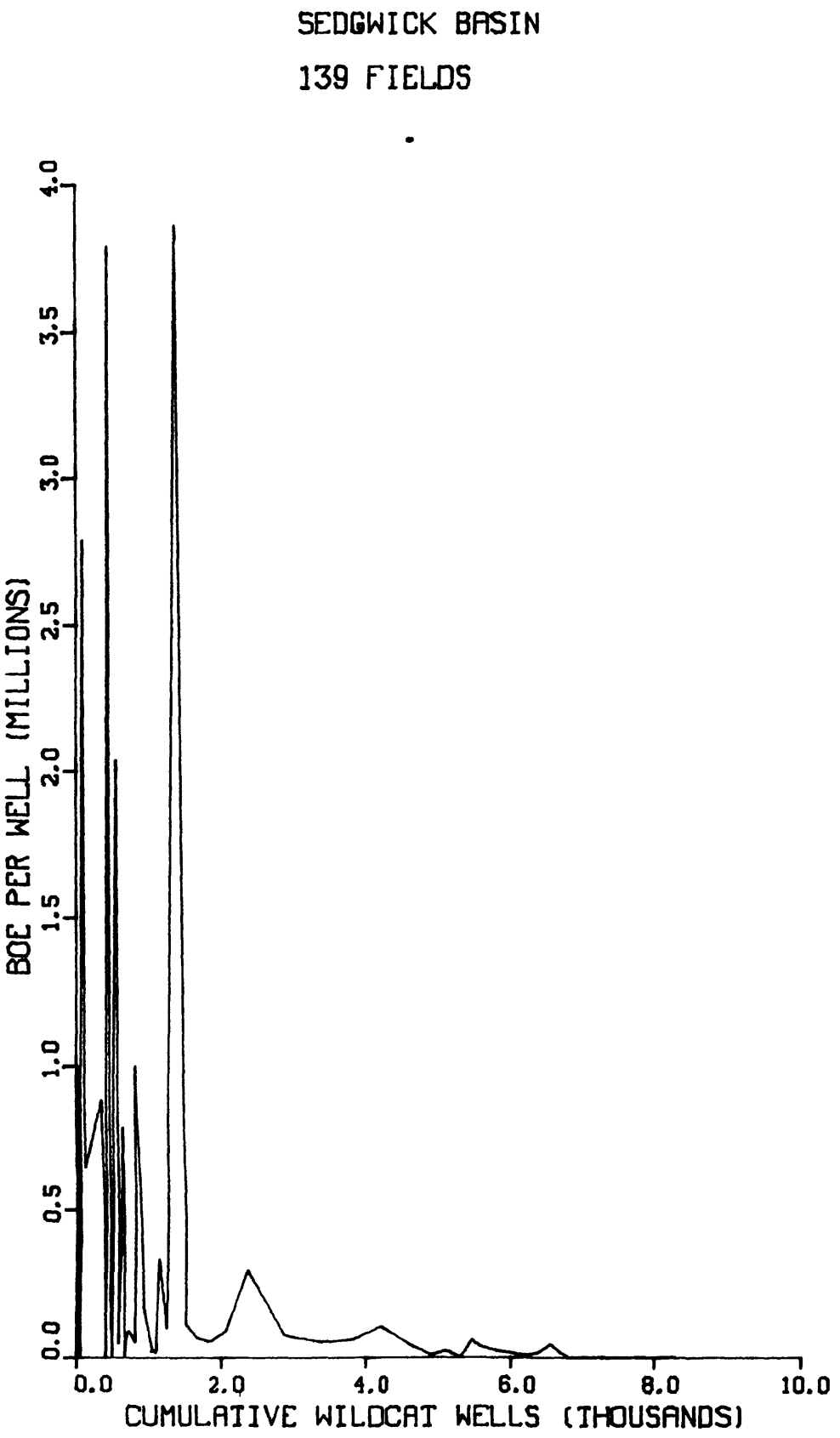

Figure 17b.--BOE per well vs. cumulative wells drilled.

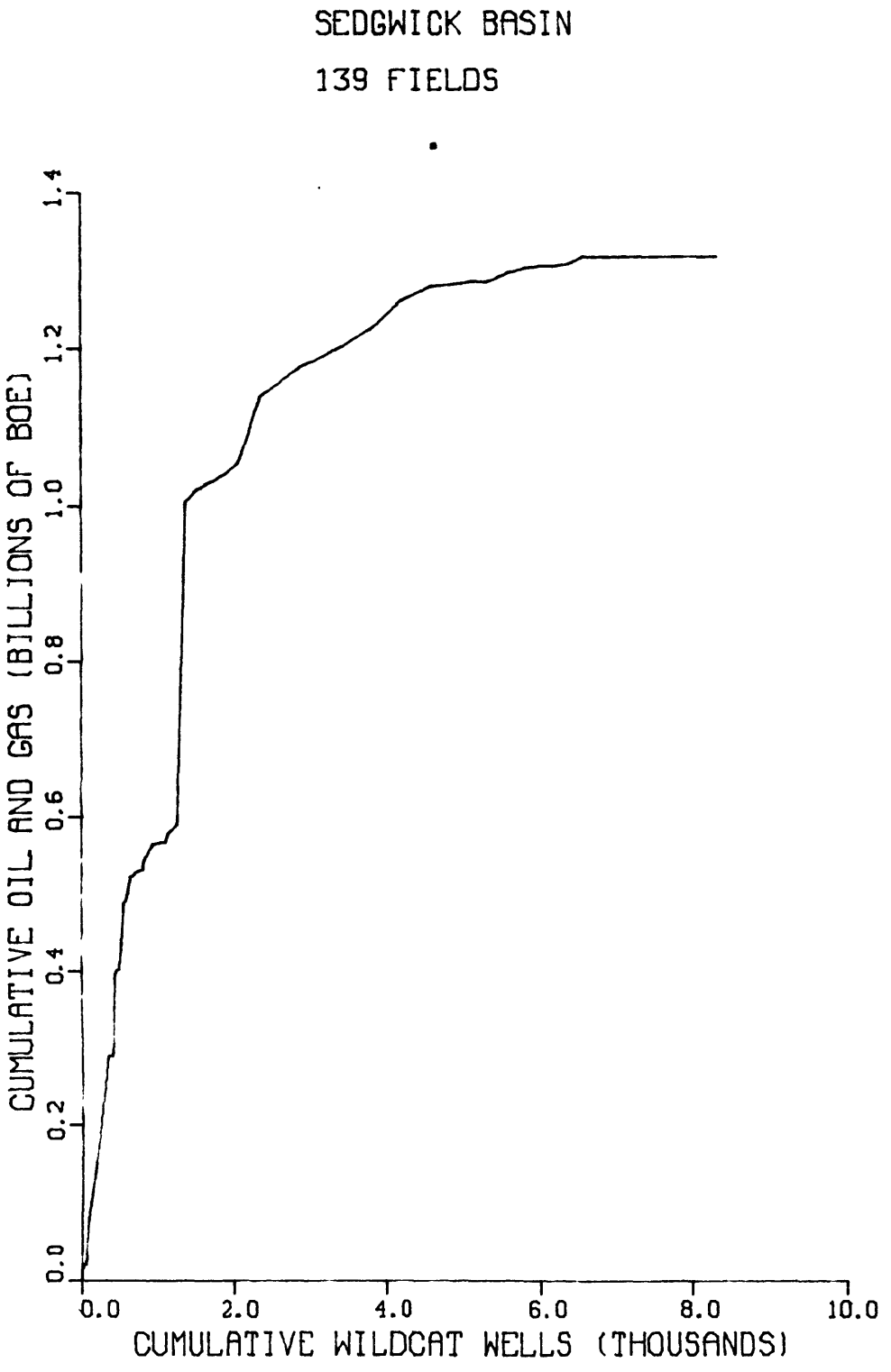

Figure 17c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

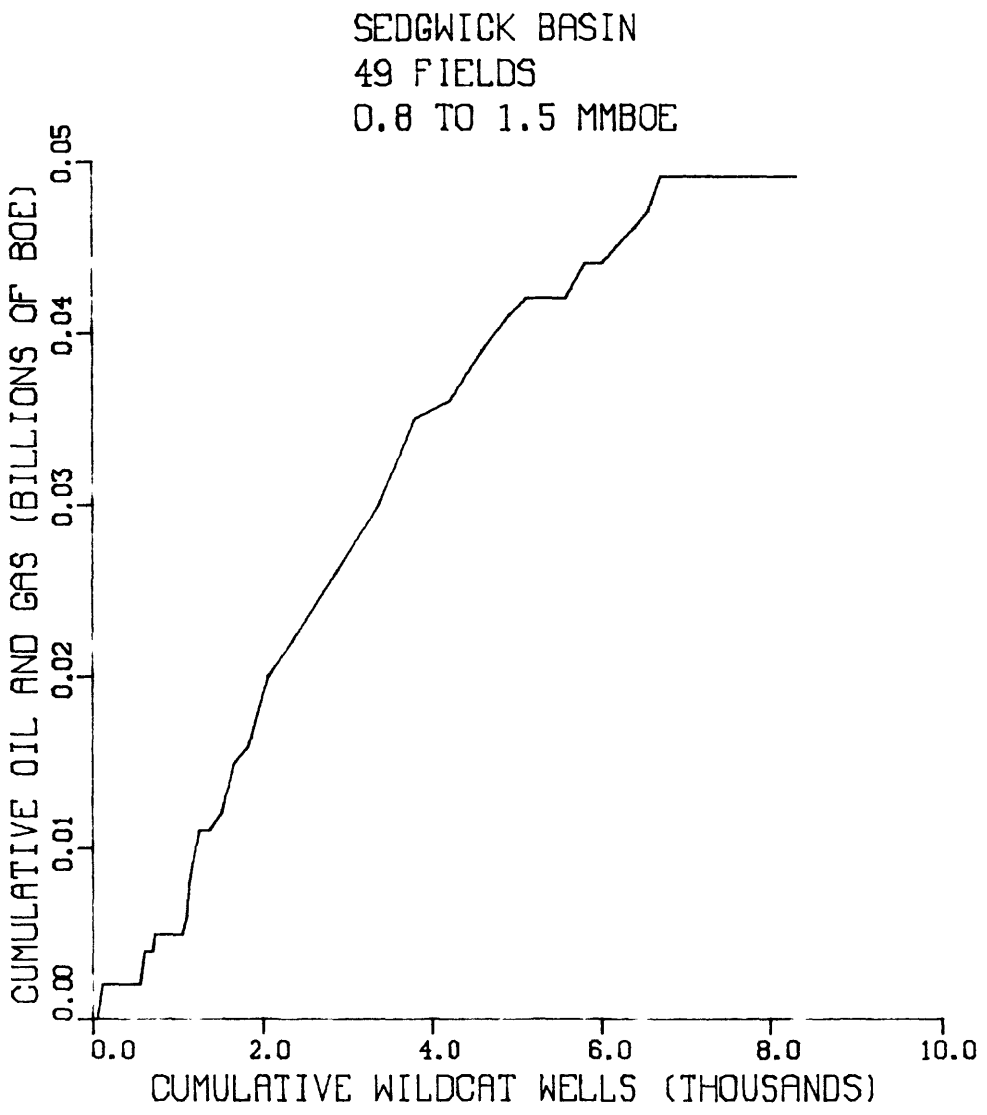

Figure 17d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

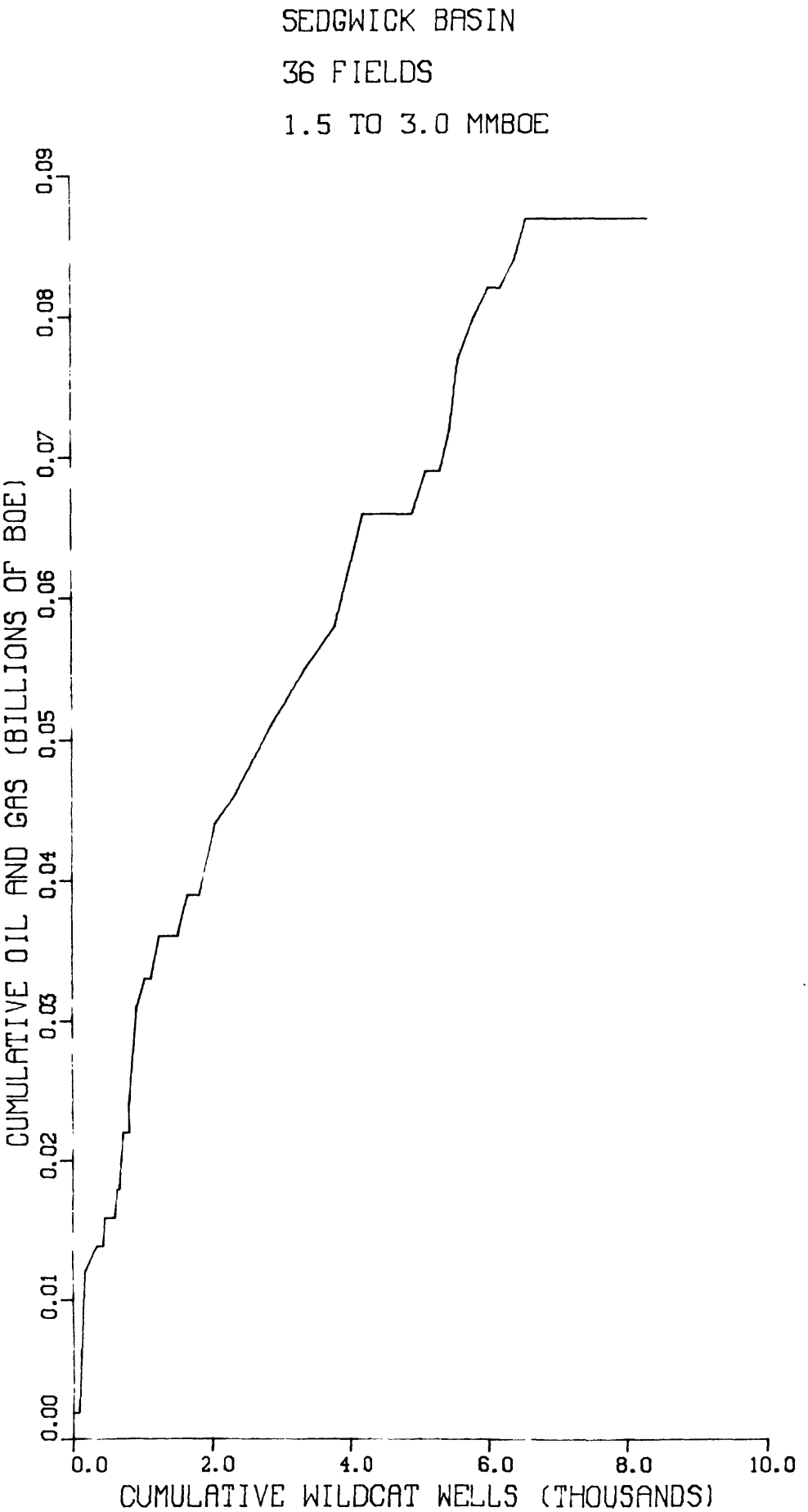

Figure 17e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

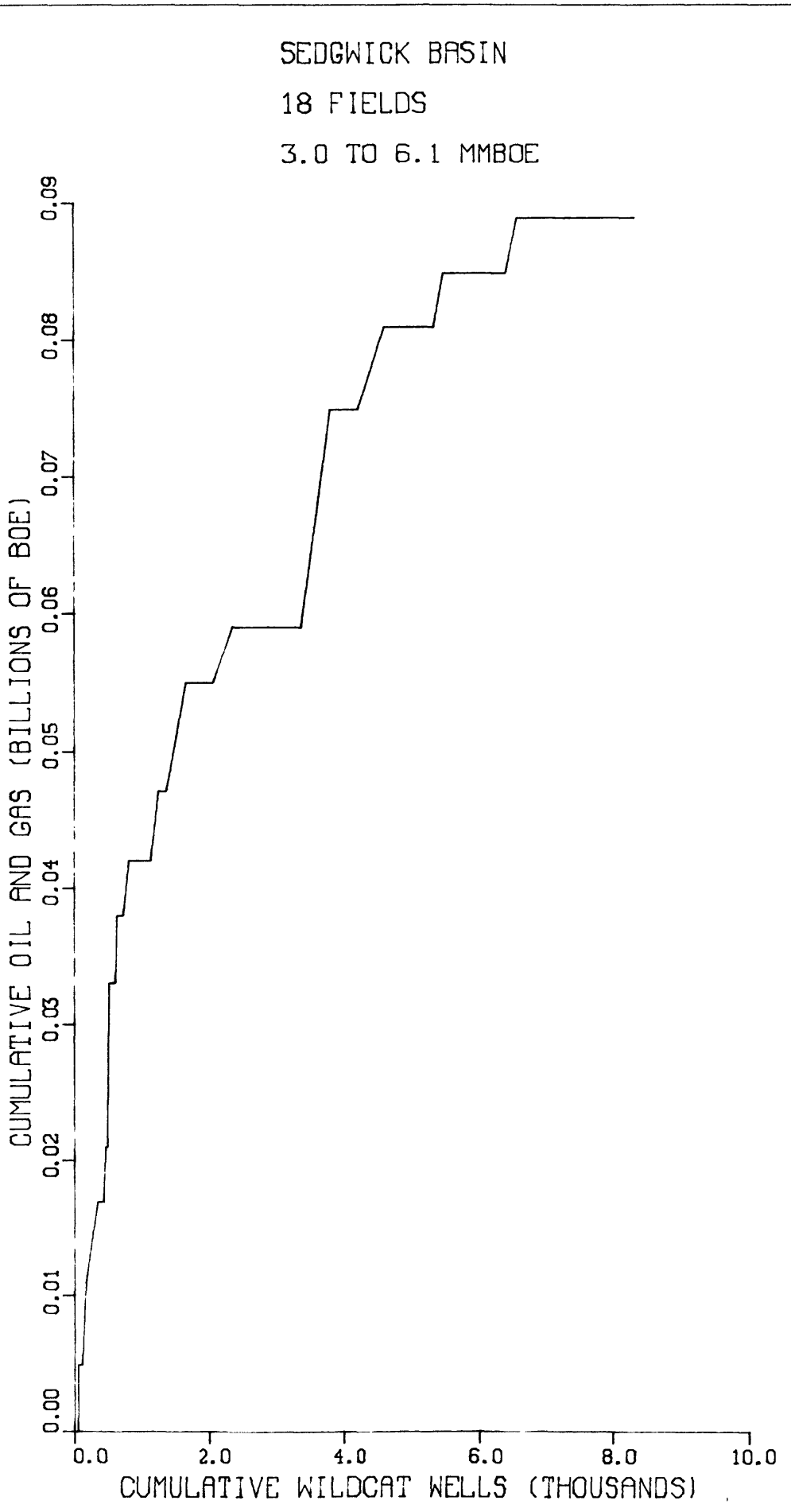

Figure 17f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

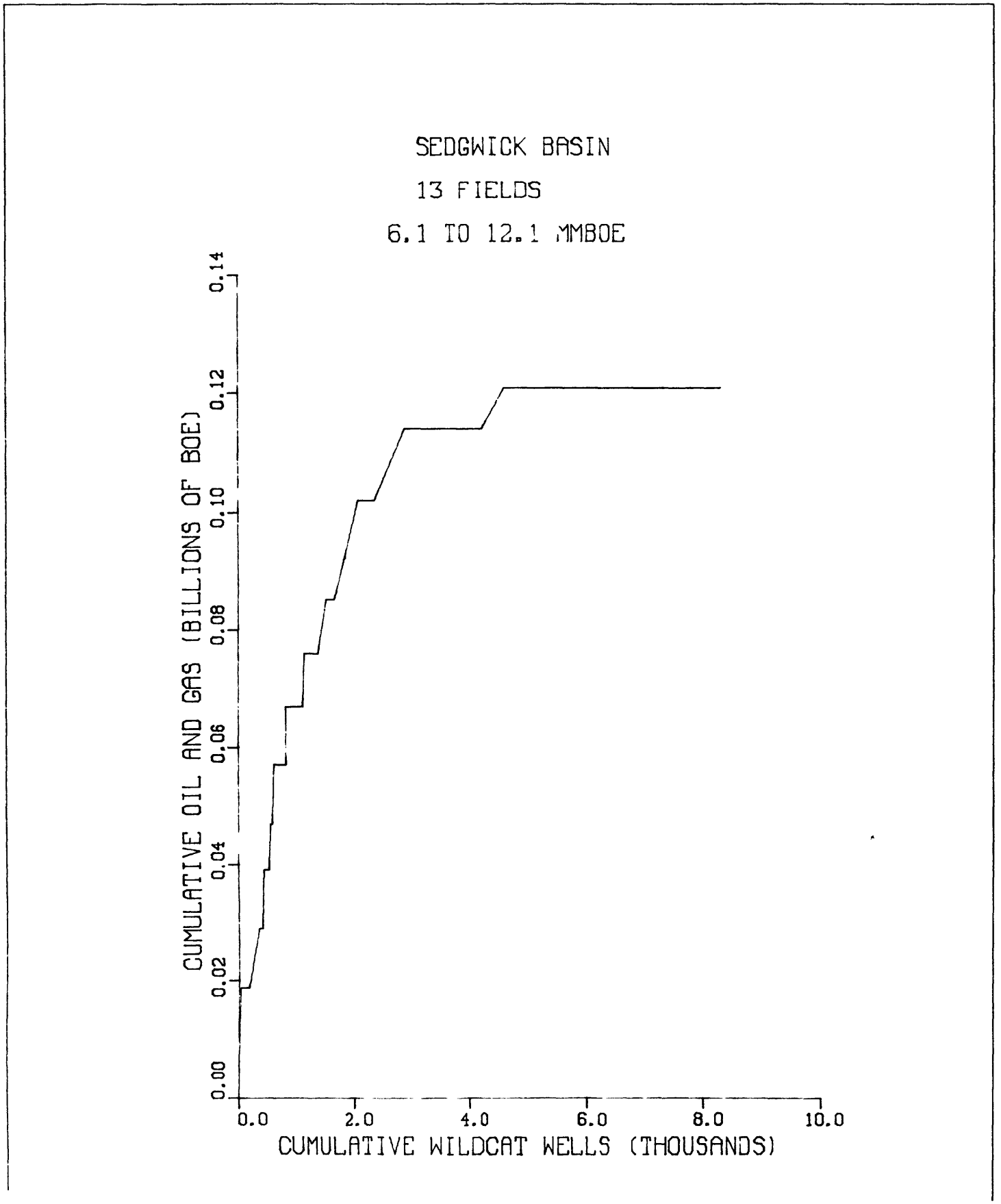

Figure 17g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

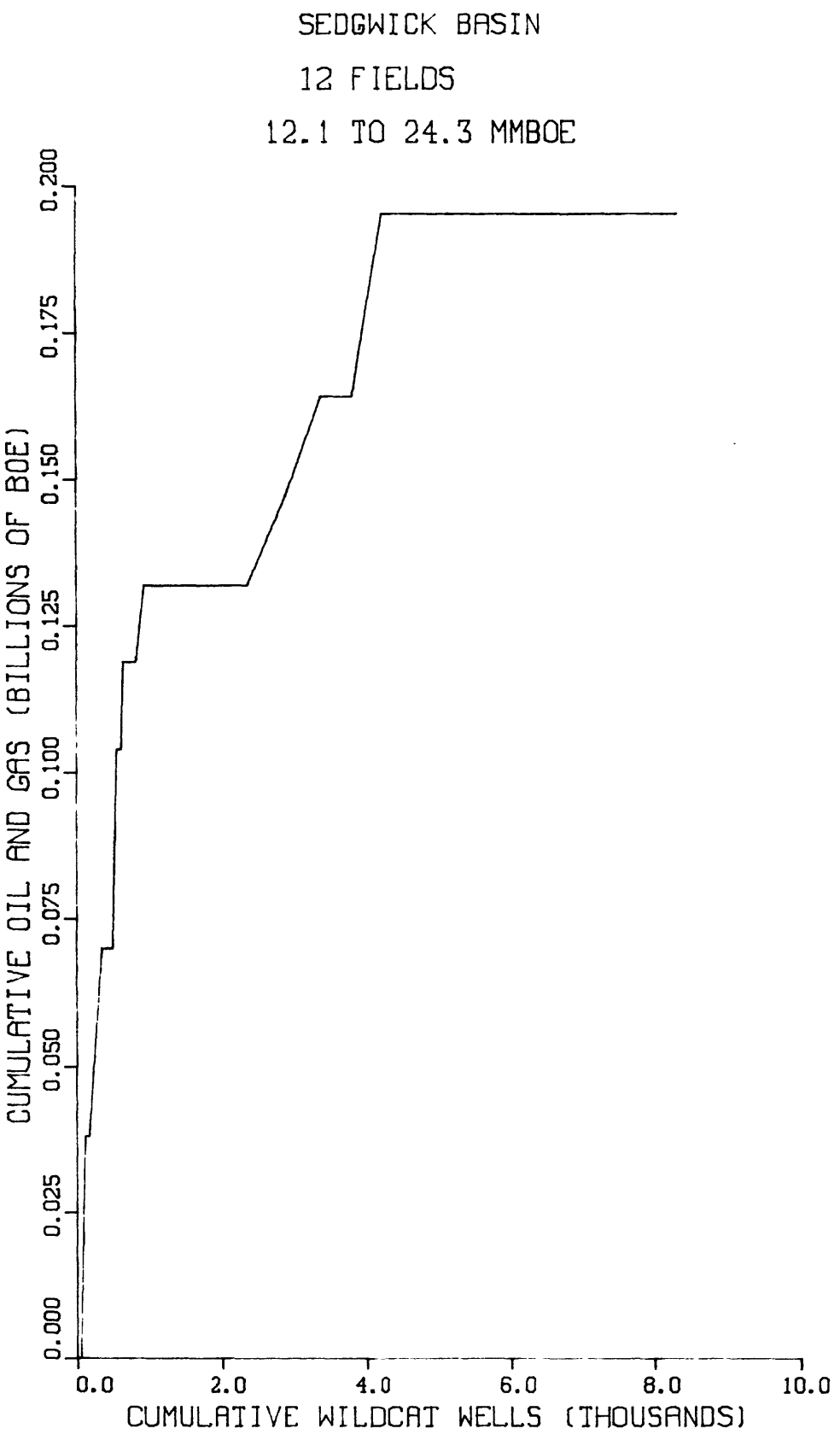

Figure 17h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

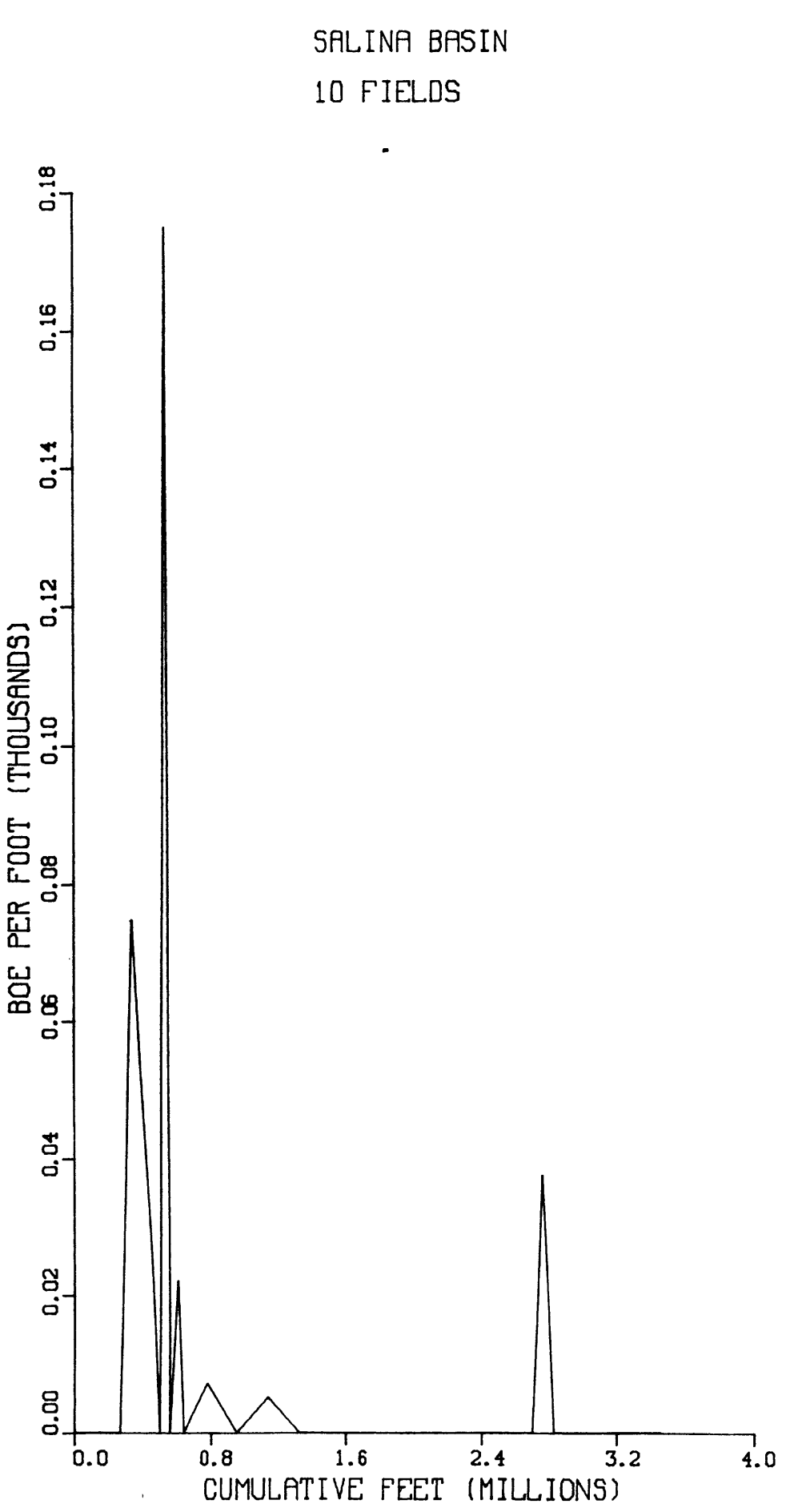

Figure 18a.--BOE per foot vs. cumulative footage drilled.

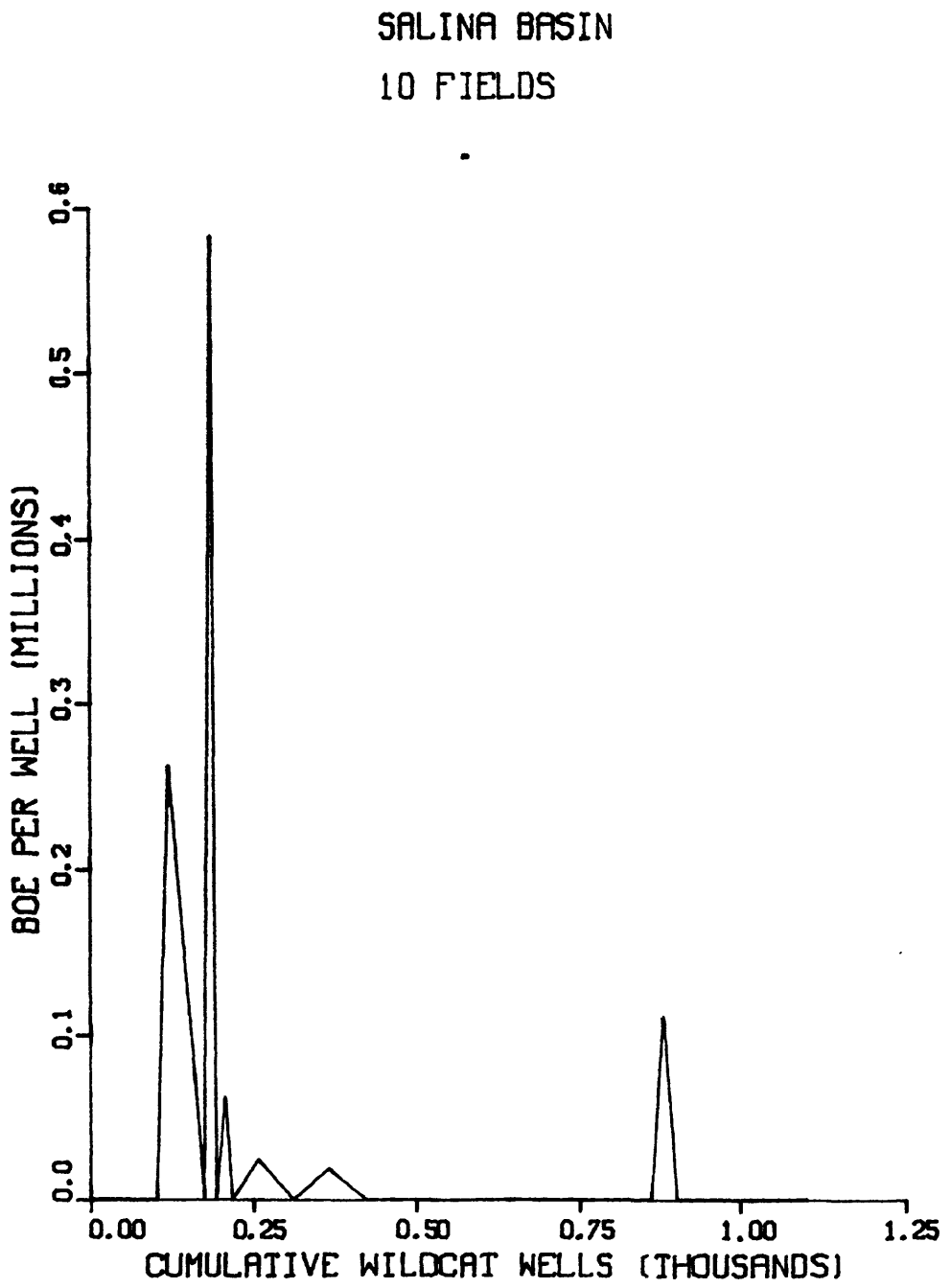

Figure 18b.--BOE per well vs. cumulative wells drilled.

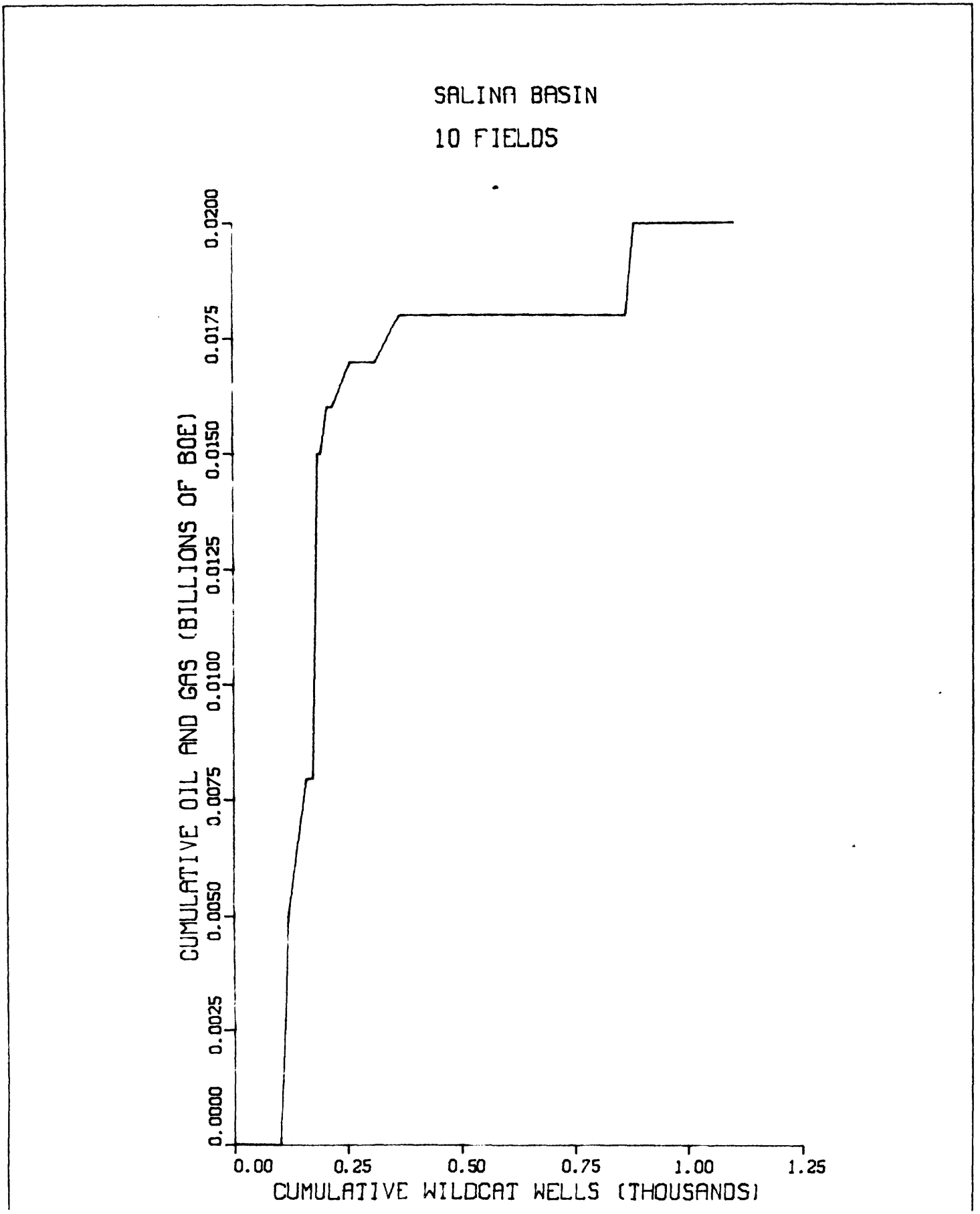

Figure 18c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

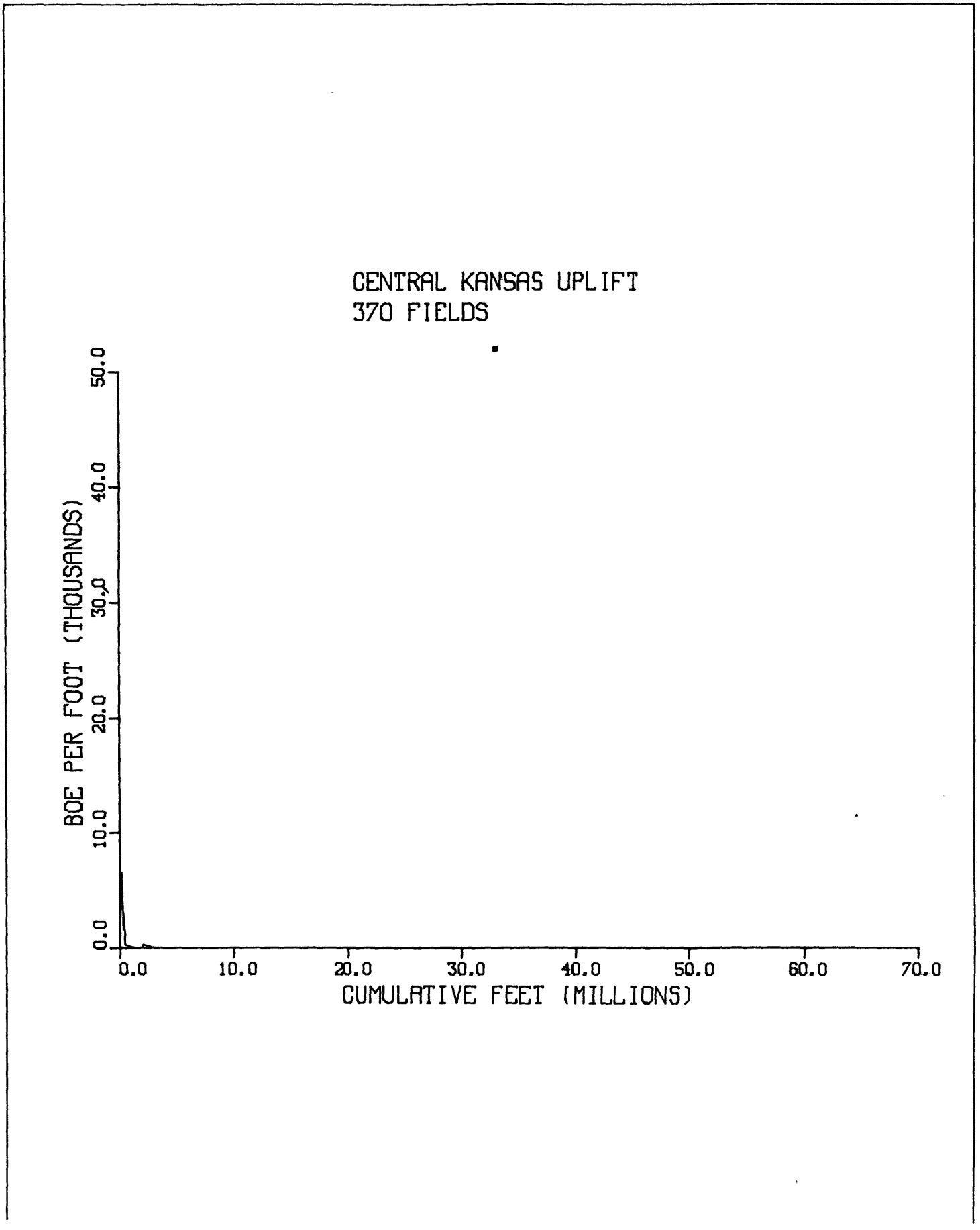

Figure 19a.--BOE per foot vs. cumulative footage drilled.

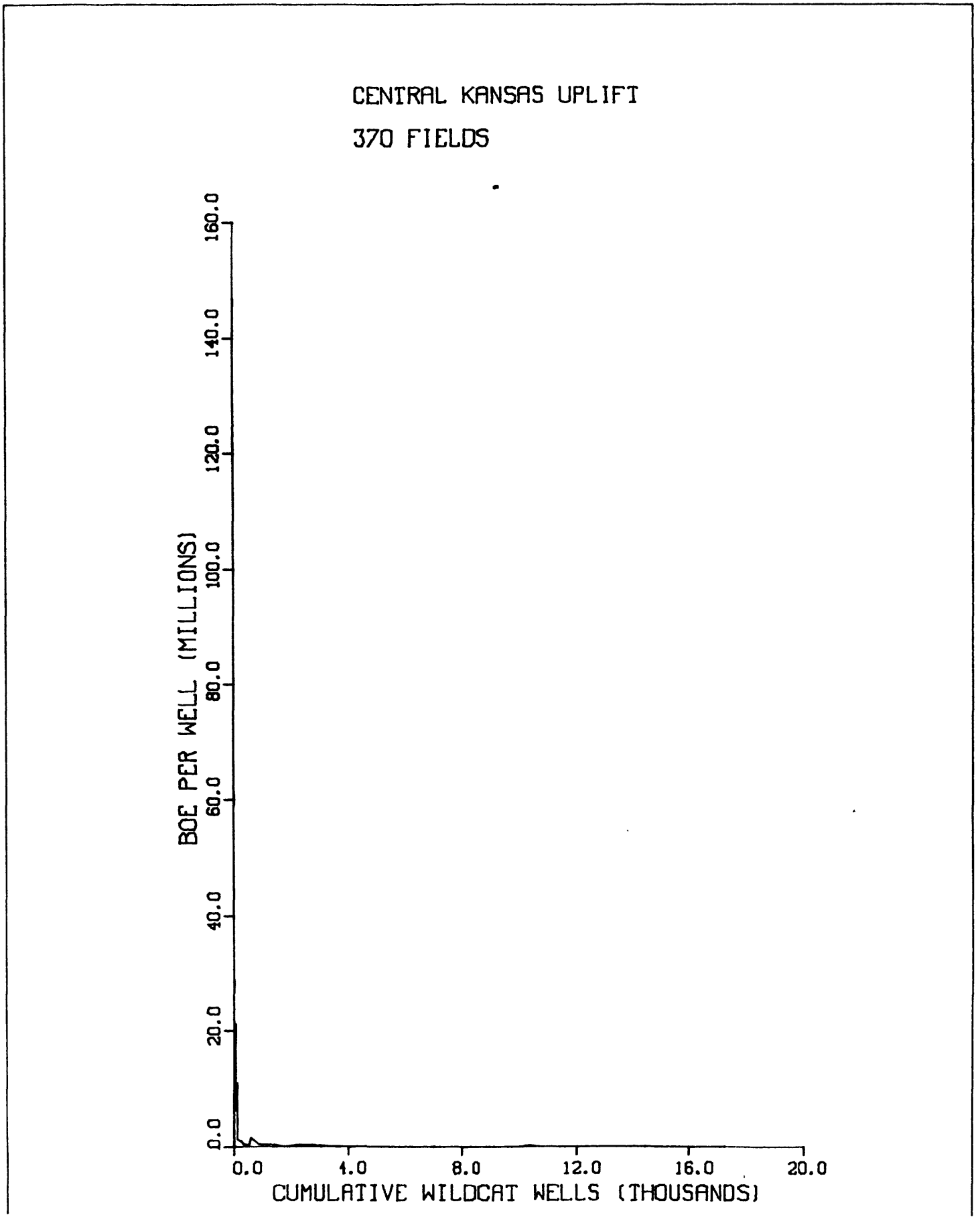

Figure 19b.--BOE per well vs. cumulative wells drilled.

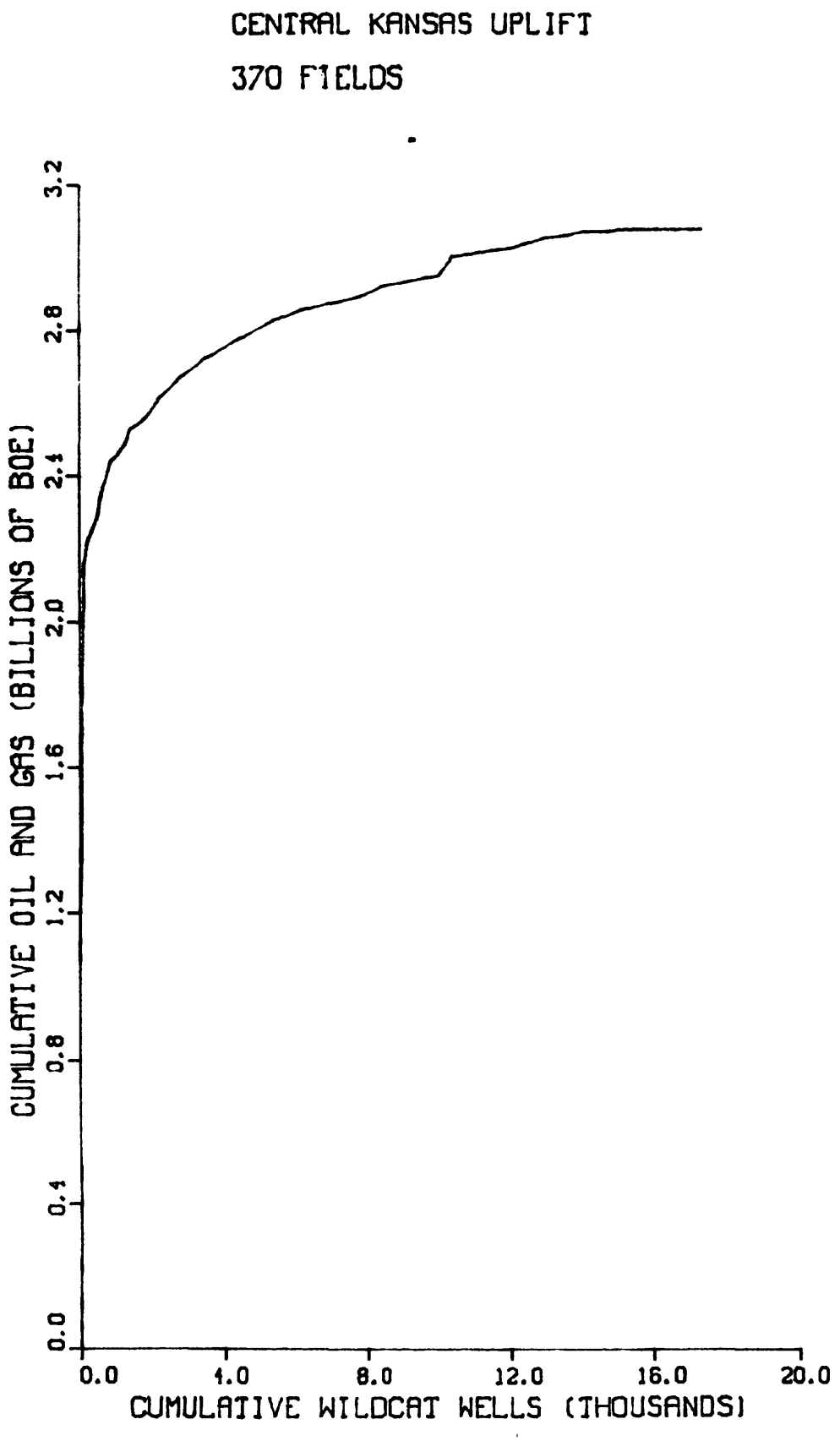

Figure 19c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

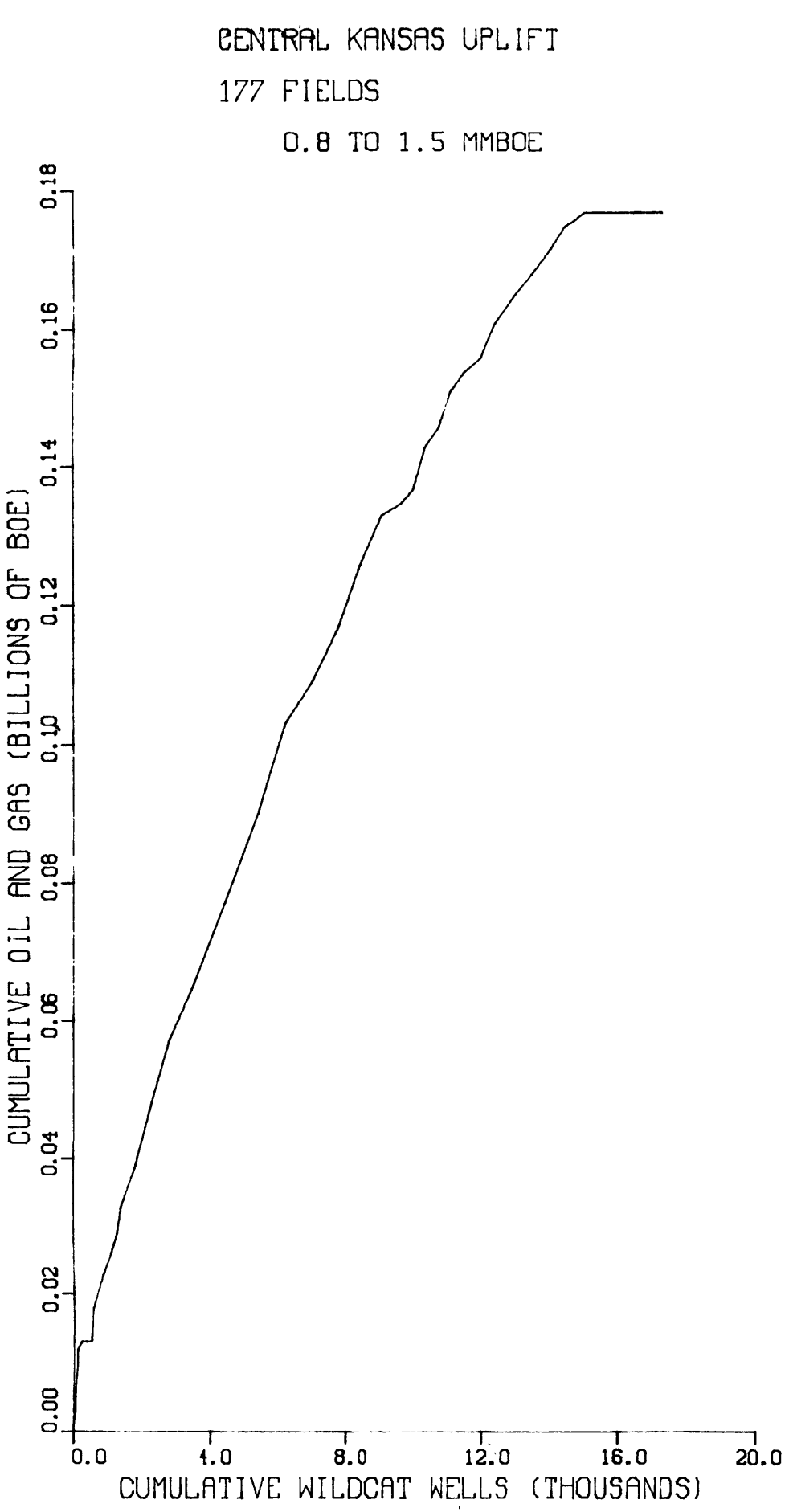

Figure 19d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

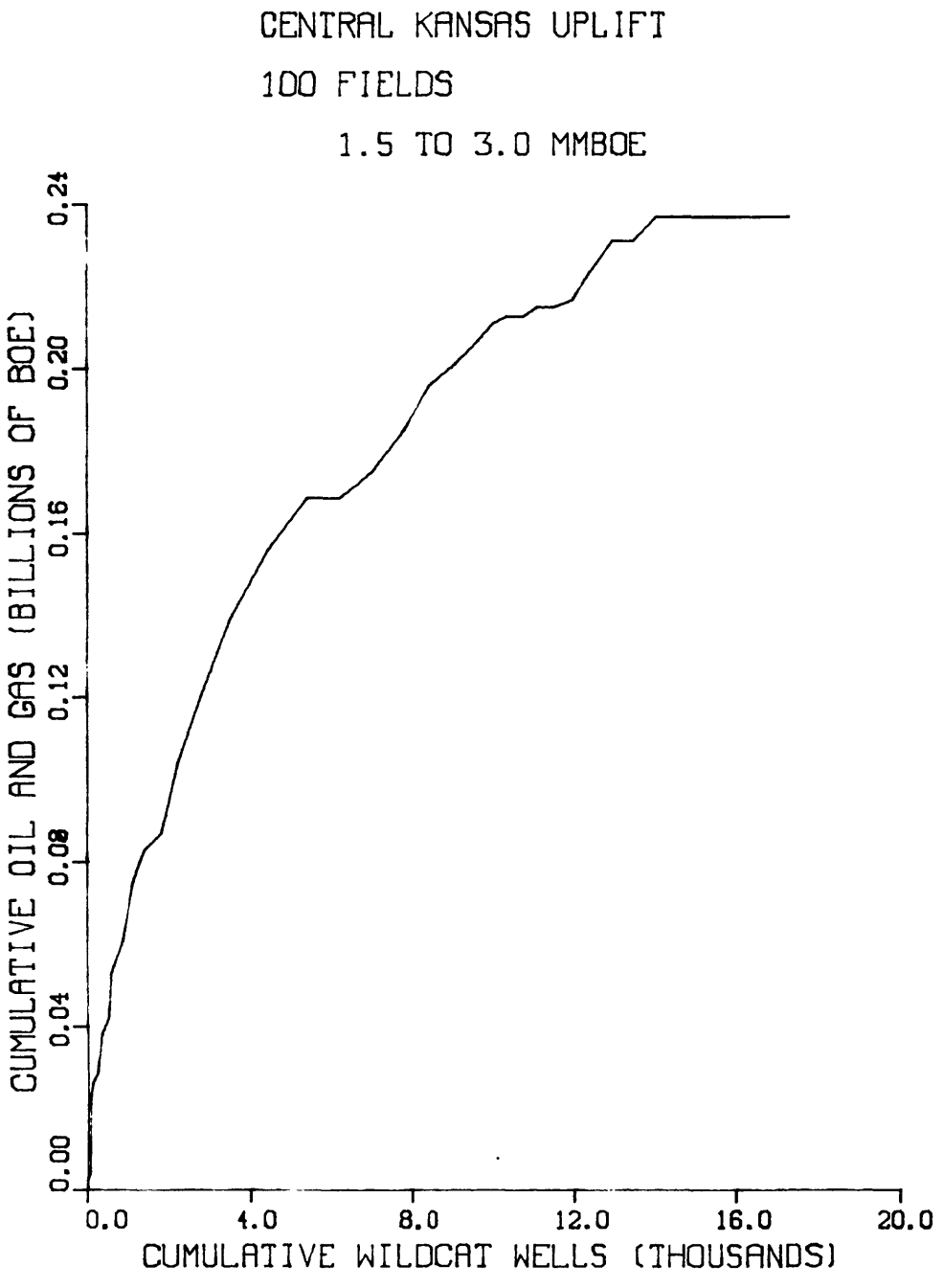

Figure 19e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

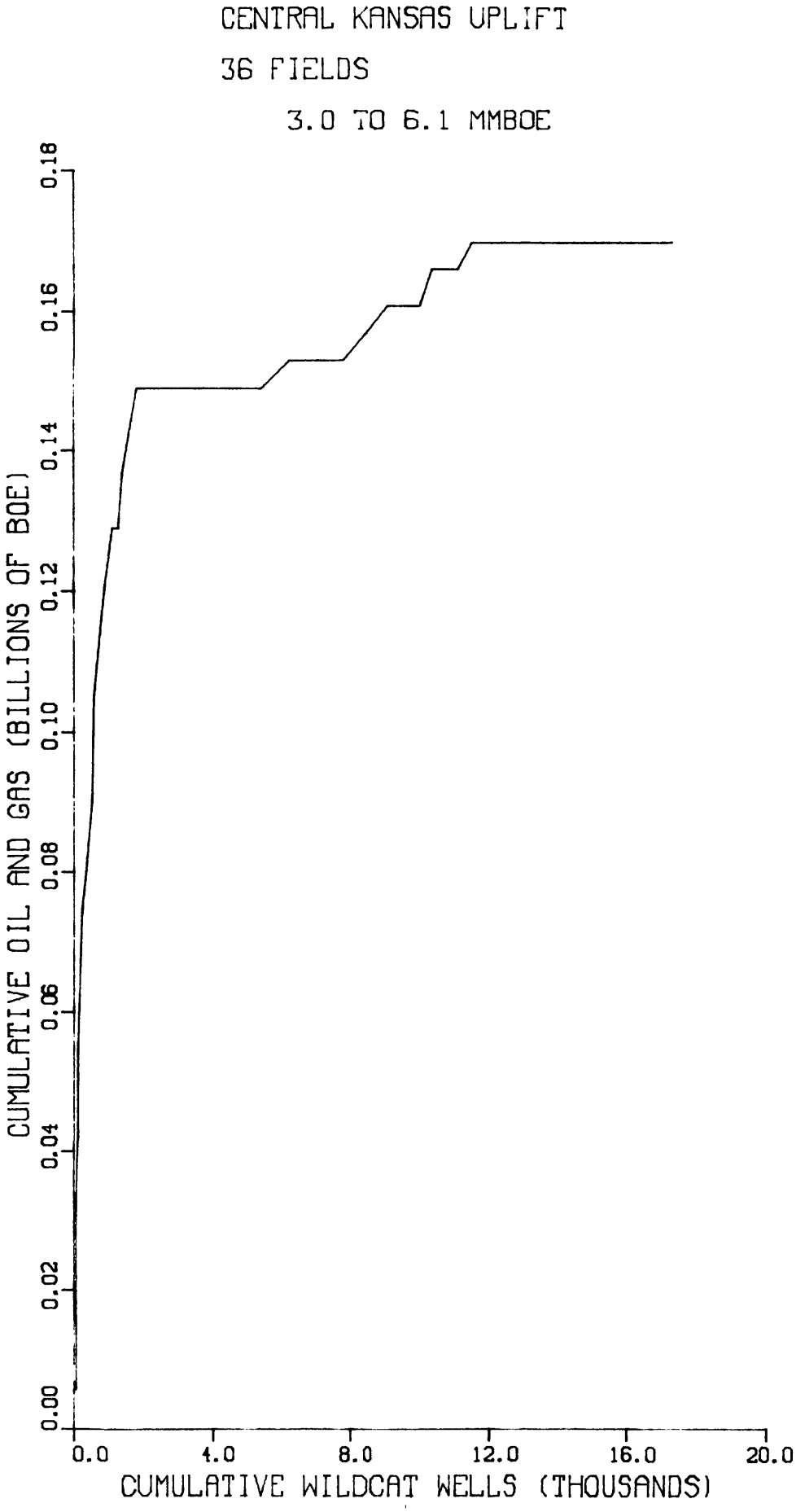

Figure 19f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

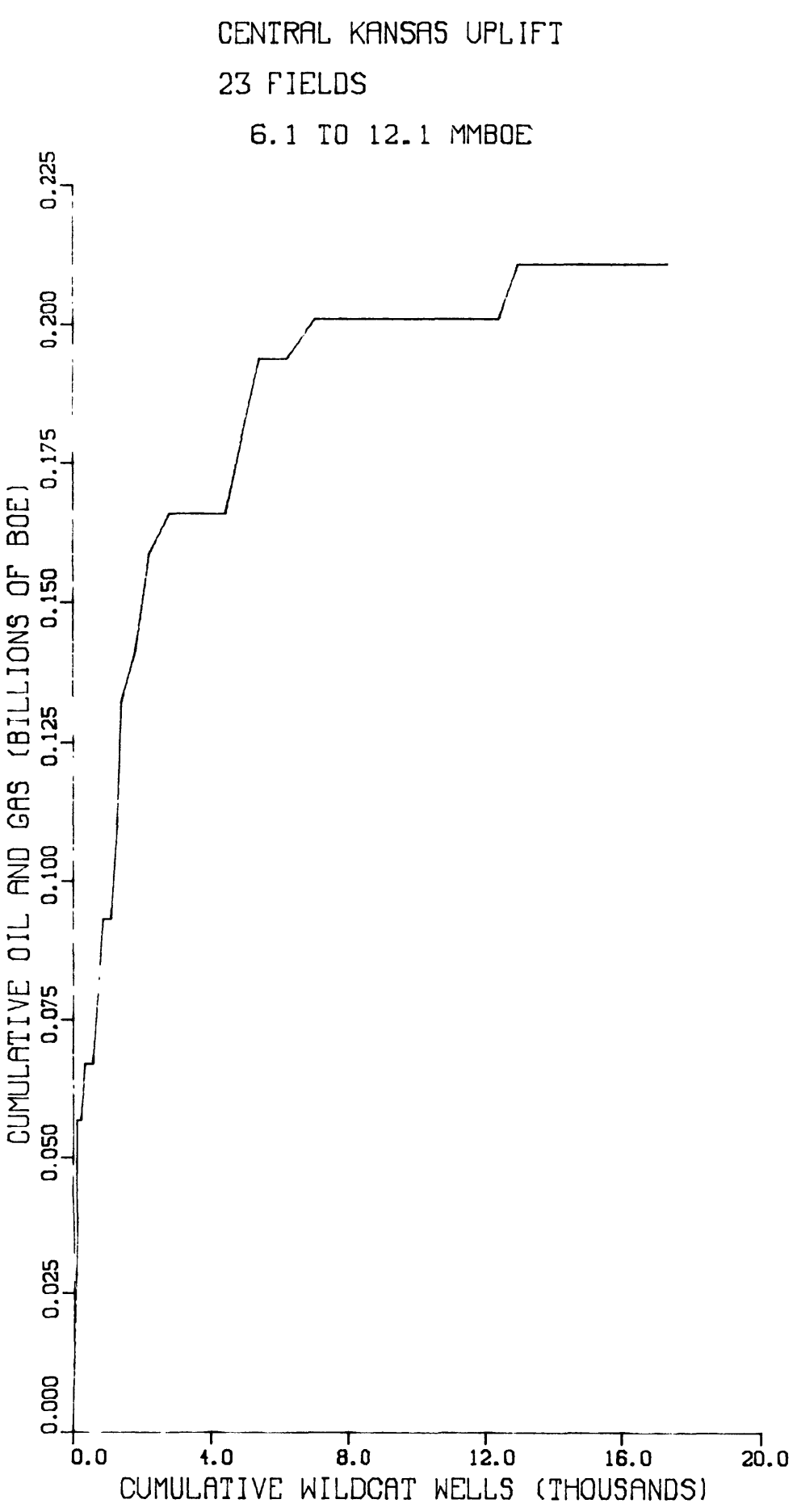

Figure 19g.—Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

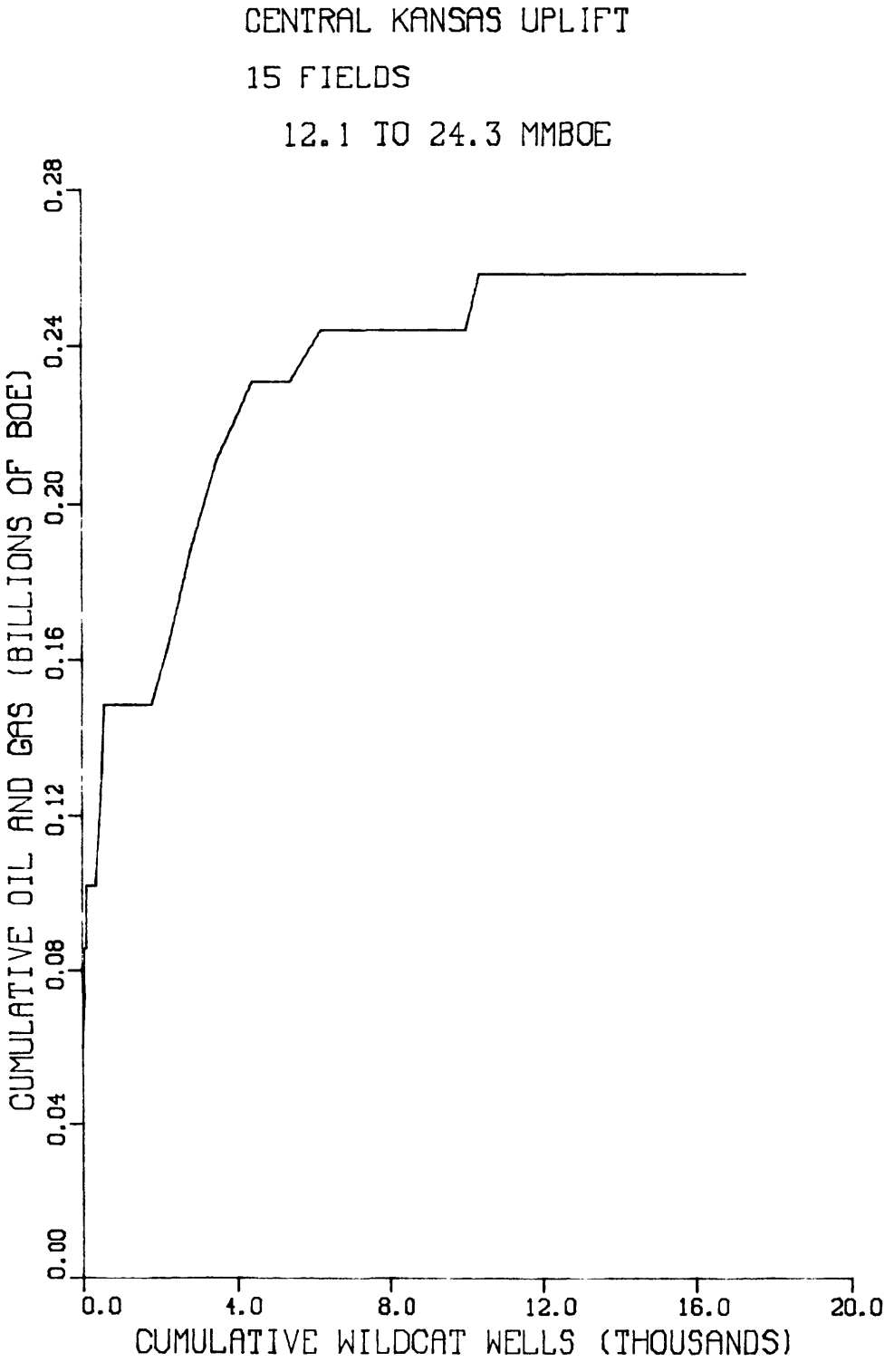

Figure 19h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

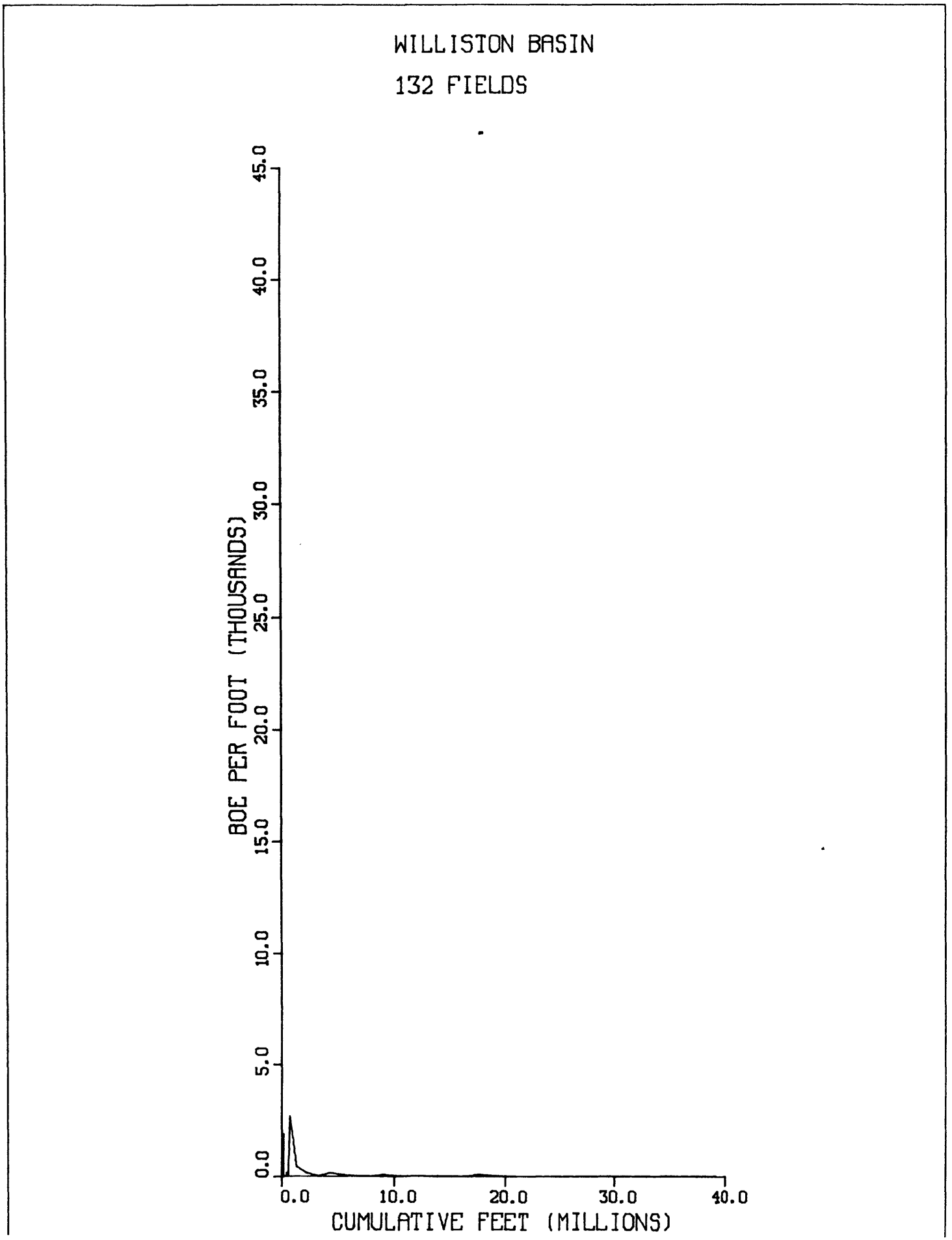

Figure 20a.--BOE per foot vs. cumulative footage drilled.

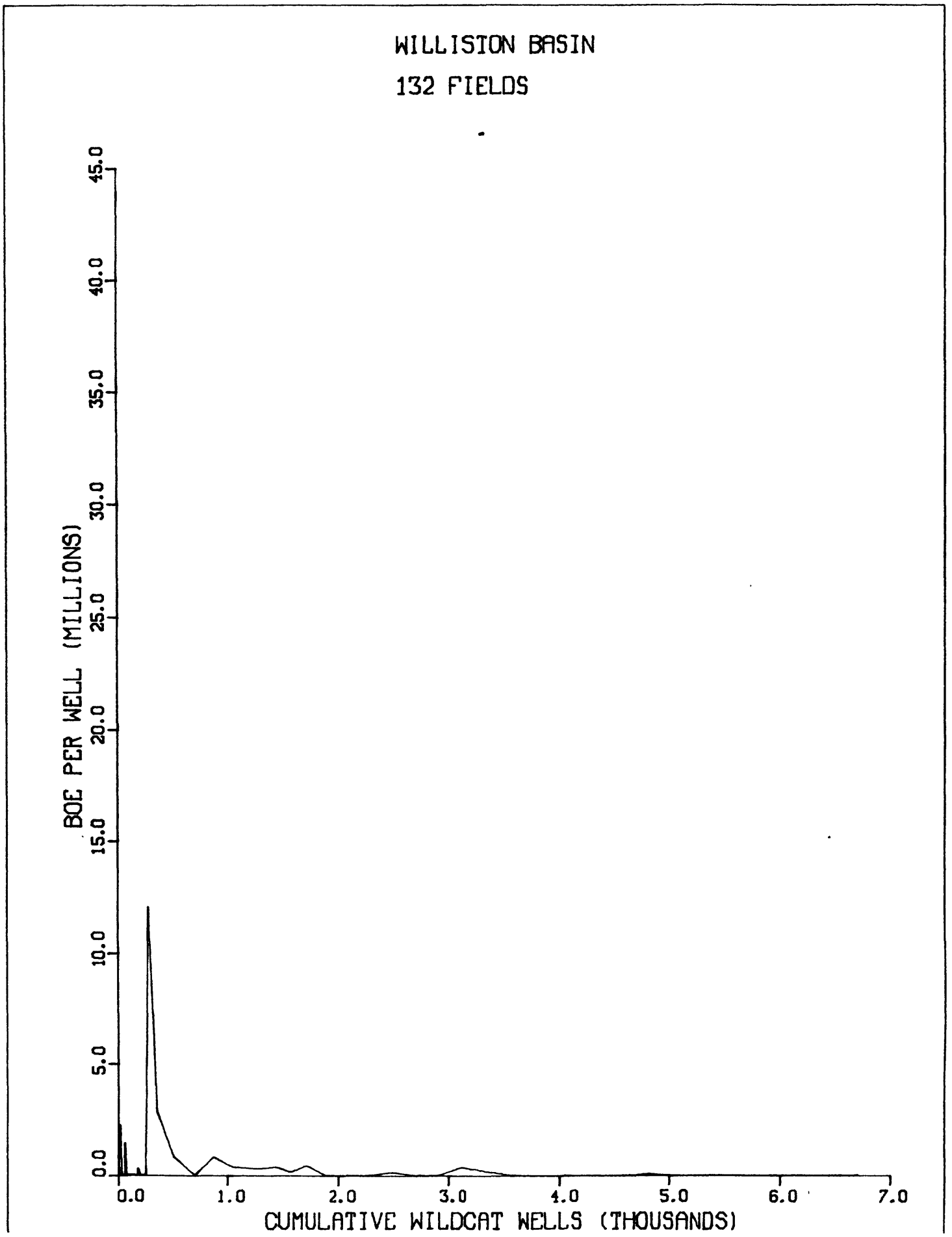

Figure 20b.--BOE per well vs. cumulative wells drilled.

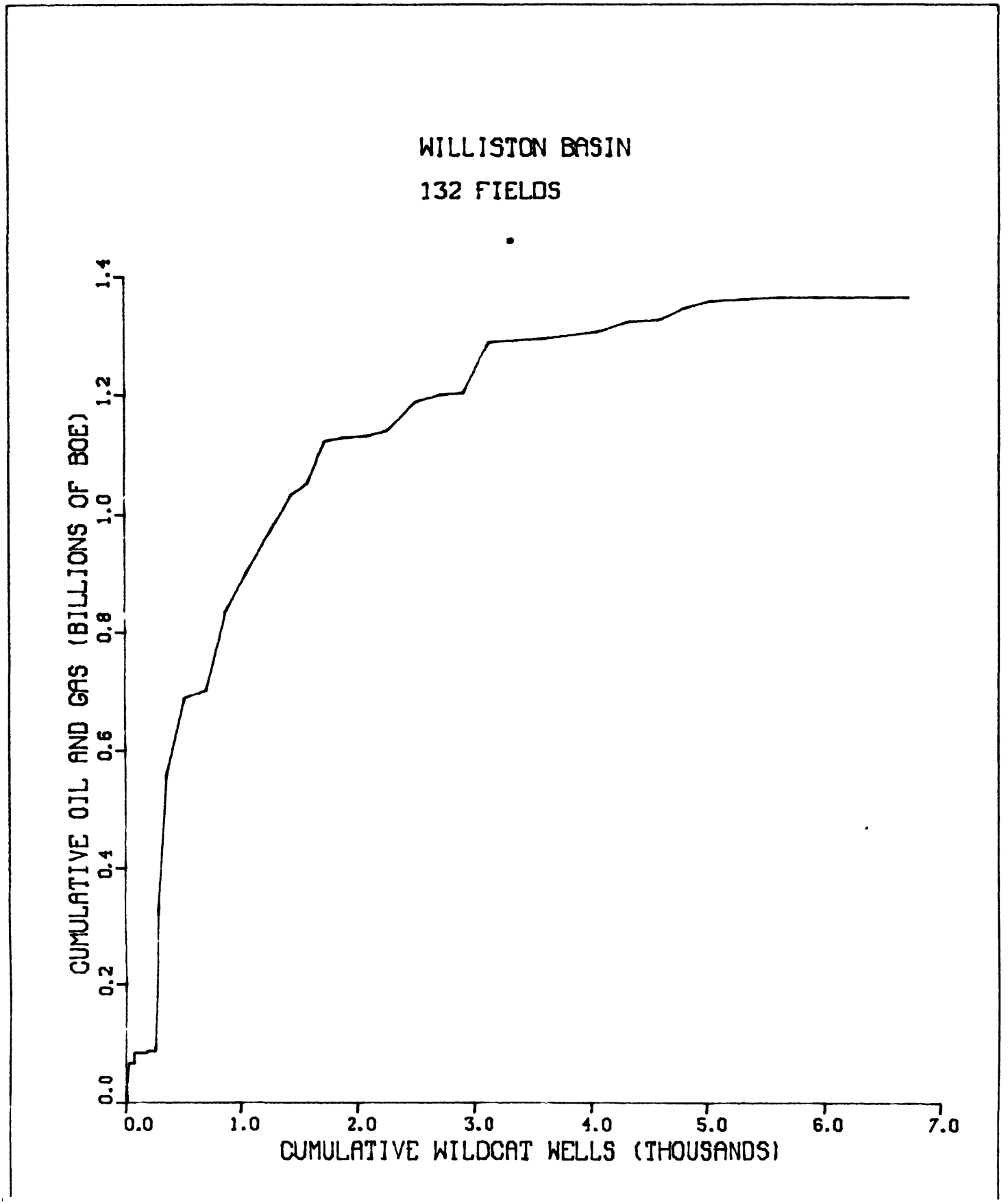

Figure 20c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

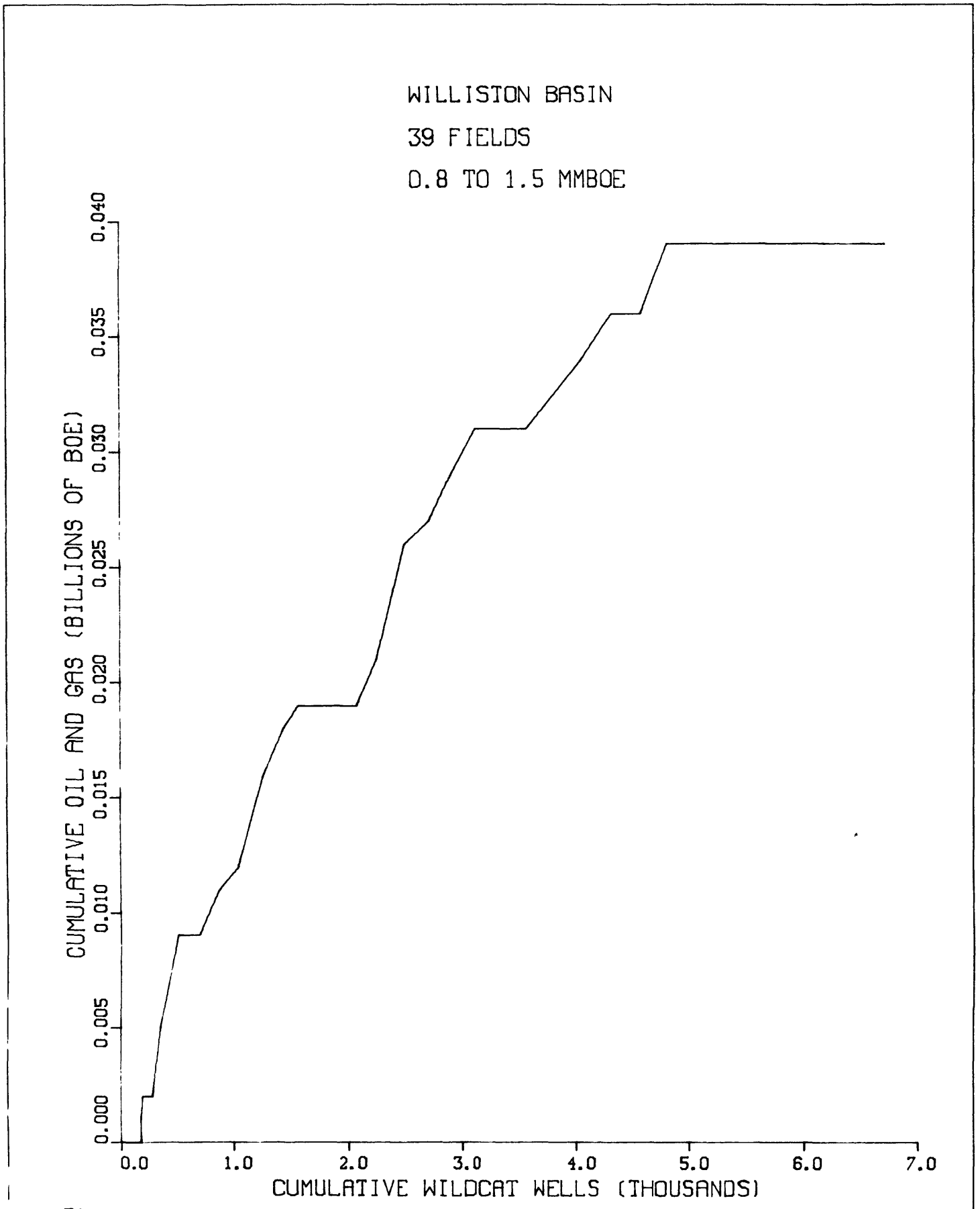

Figure 20d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

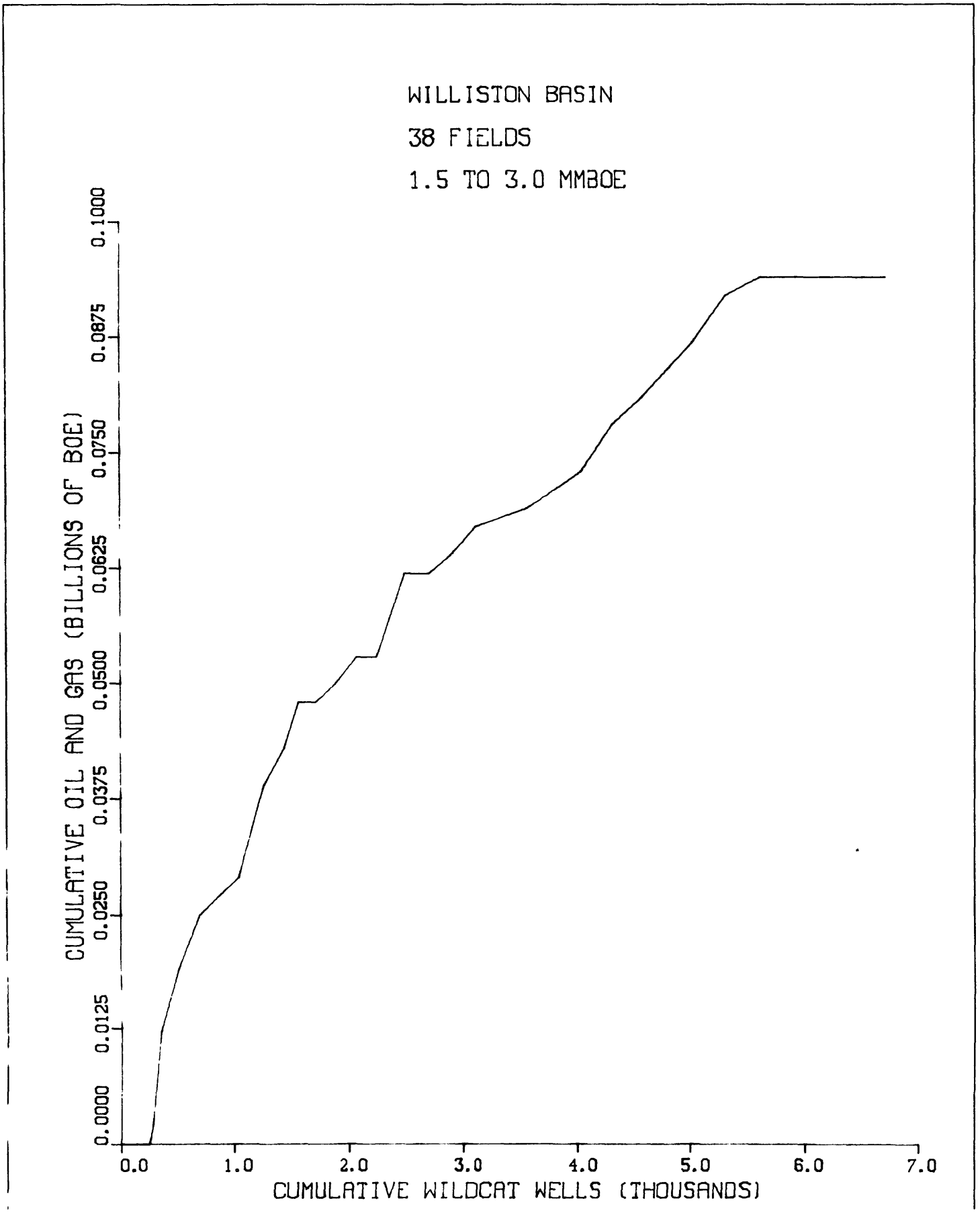

Figure 20e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

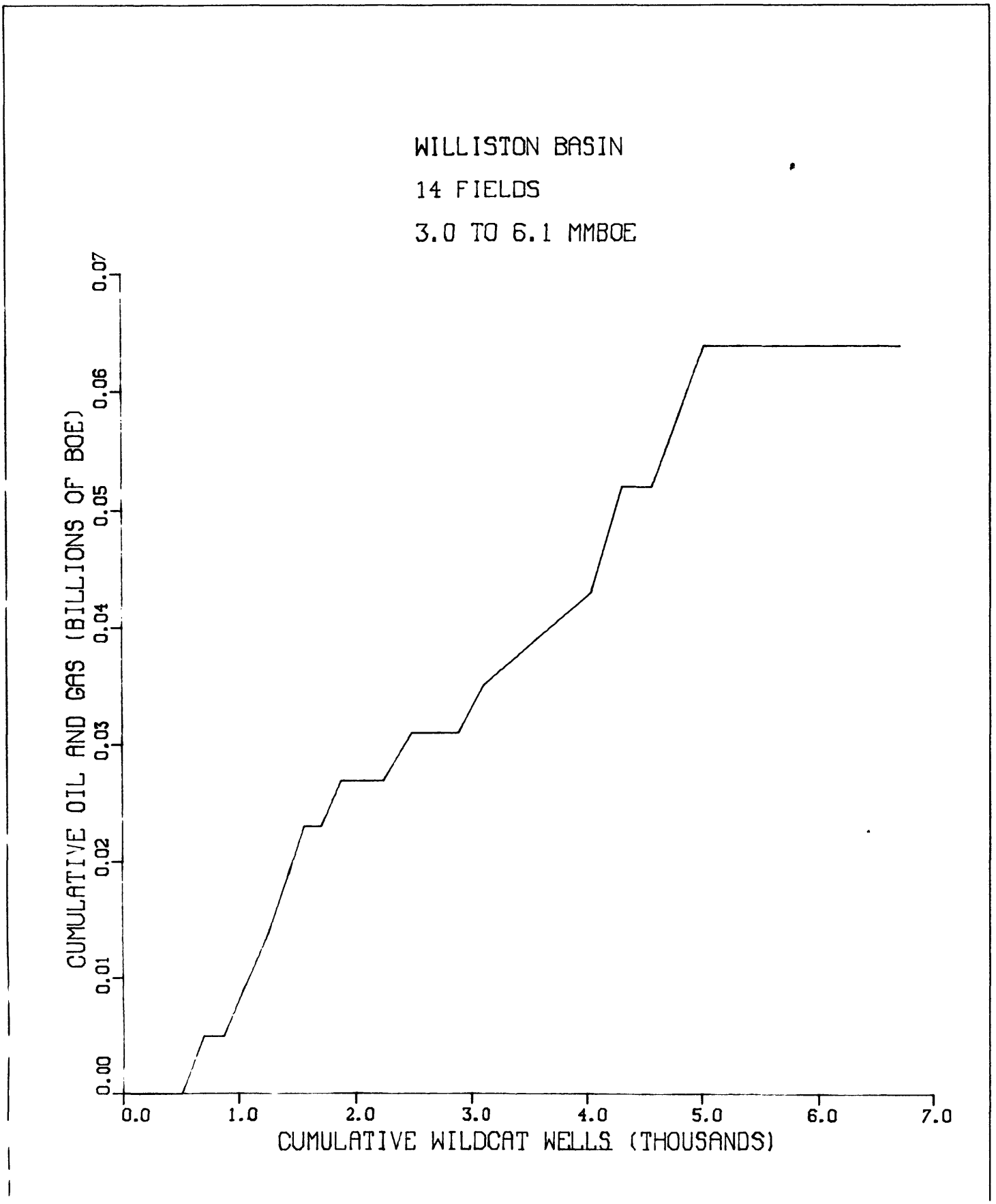

Figure 20f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

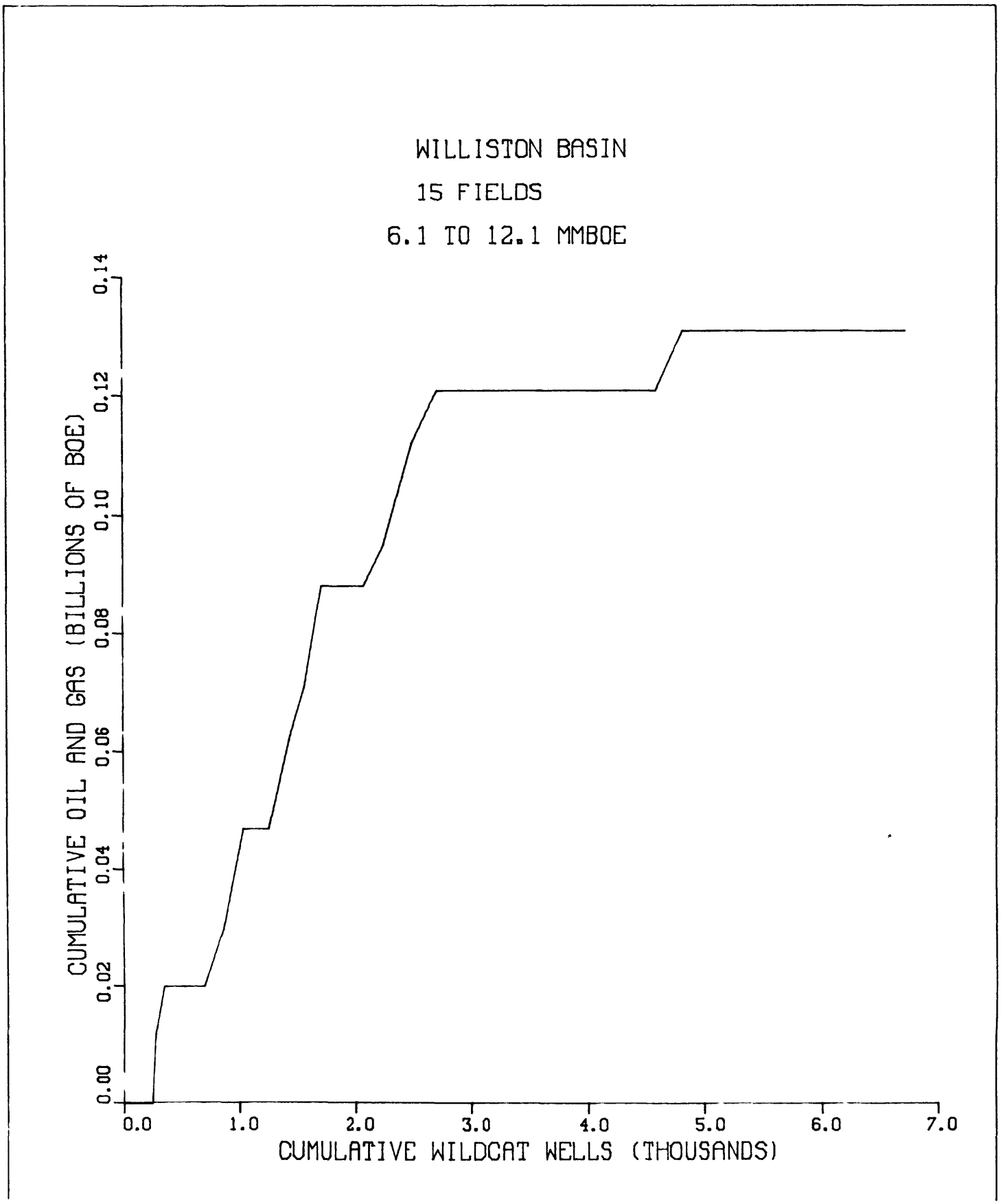

Figure 20g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

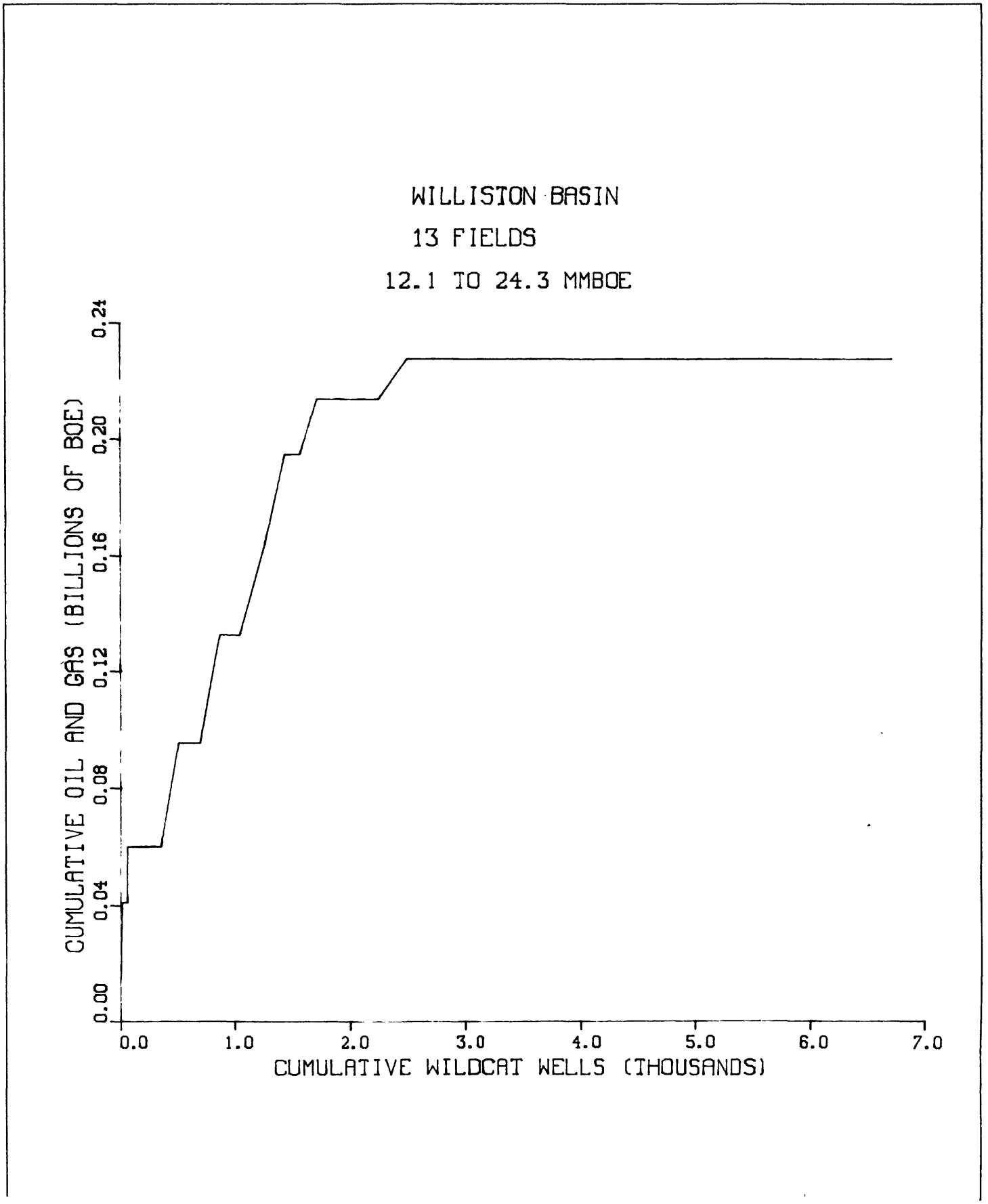

Figure 20h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

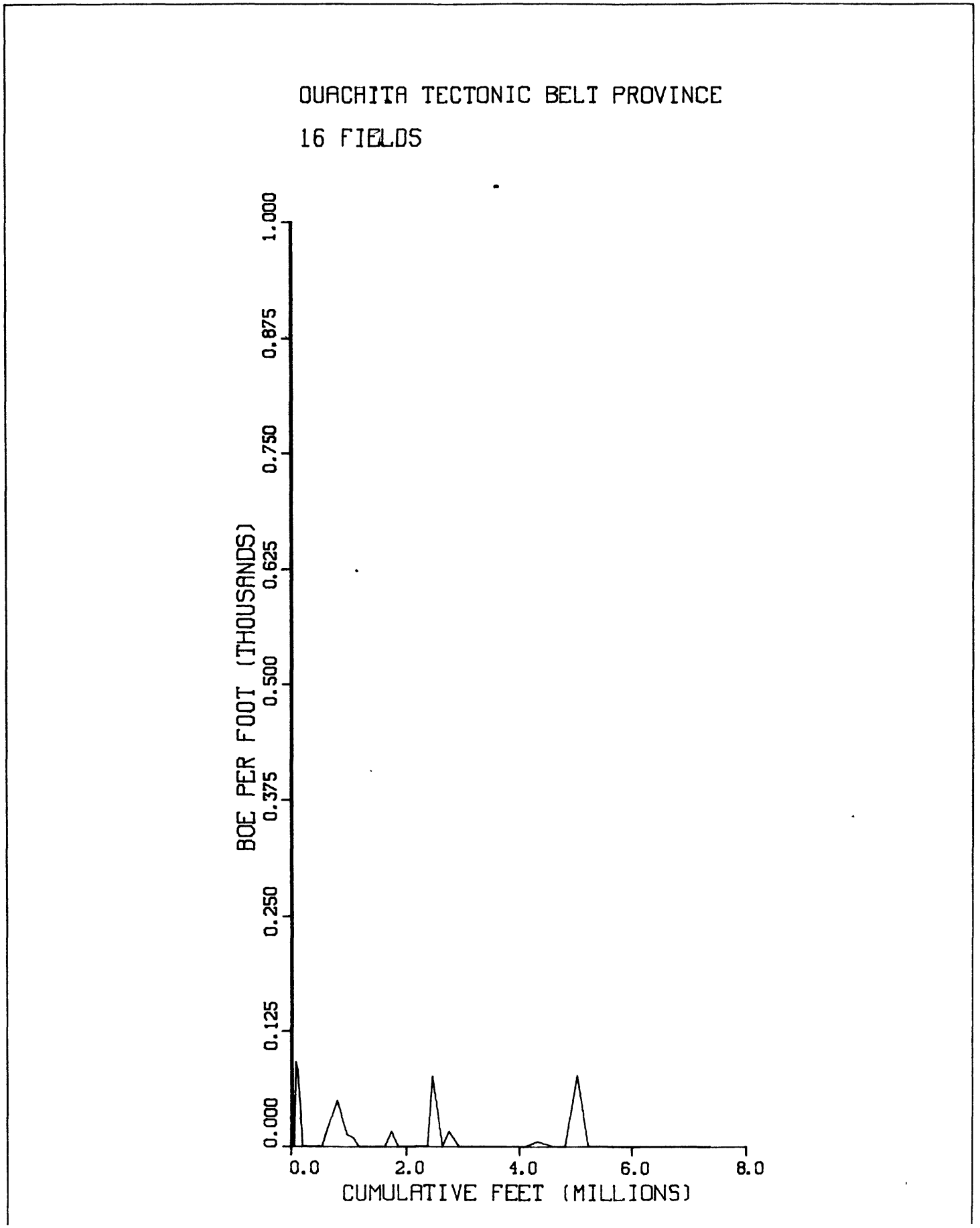

Figure 21a.--BOE per foot vs. cumulative footage drilled.

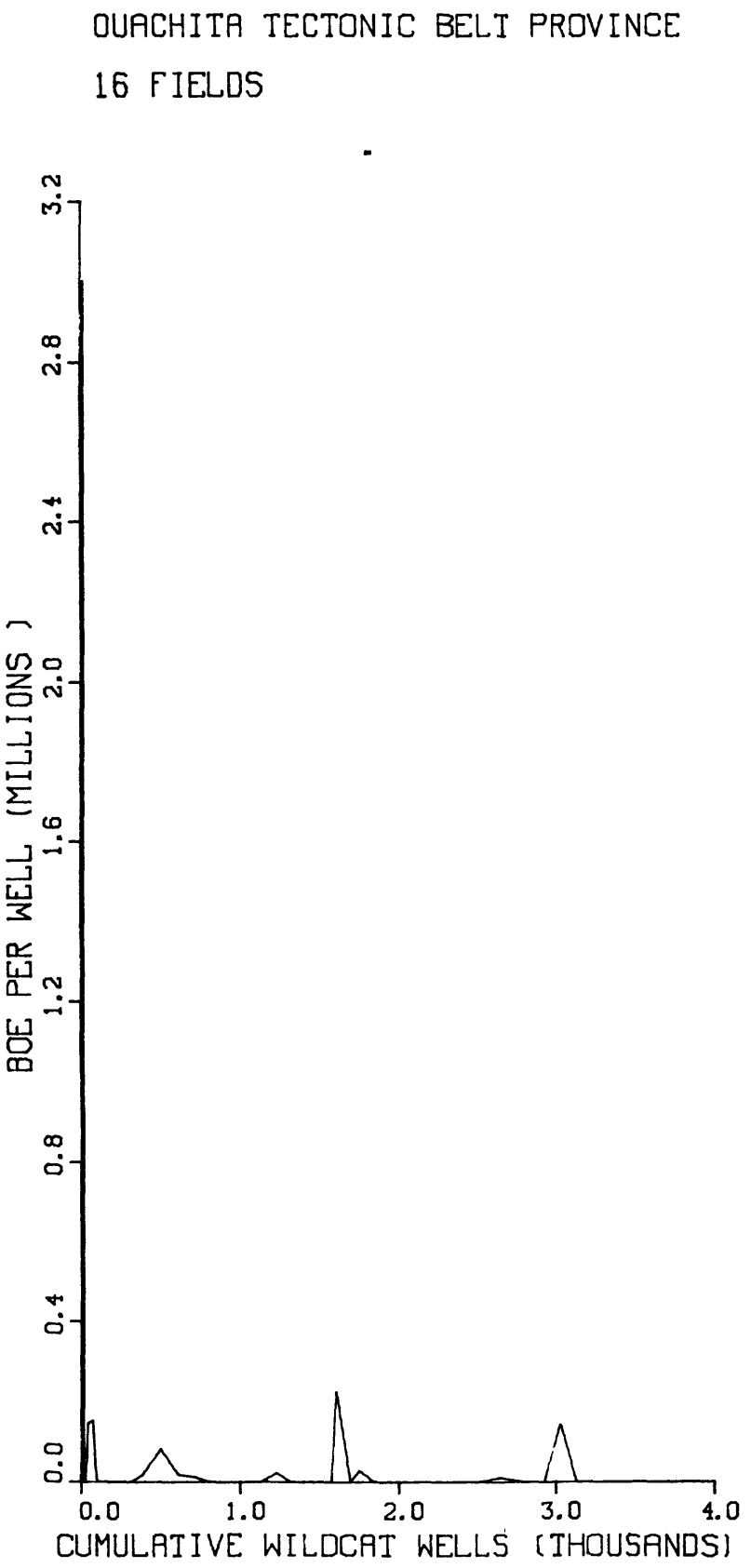

Figure 21b.--BOE per well vs. cumulative wells drilled.

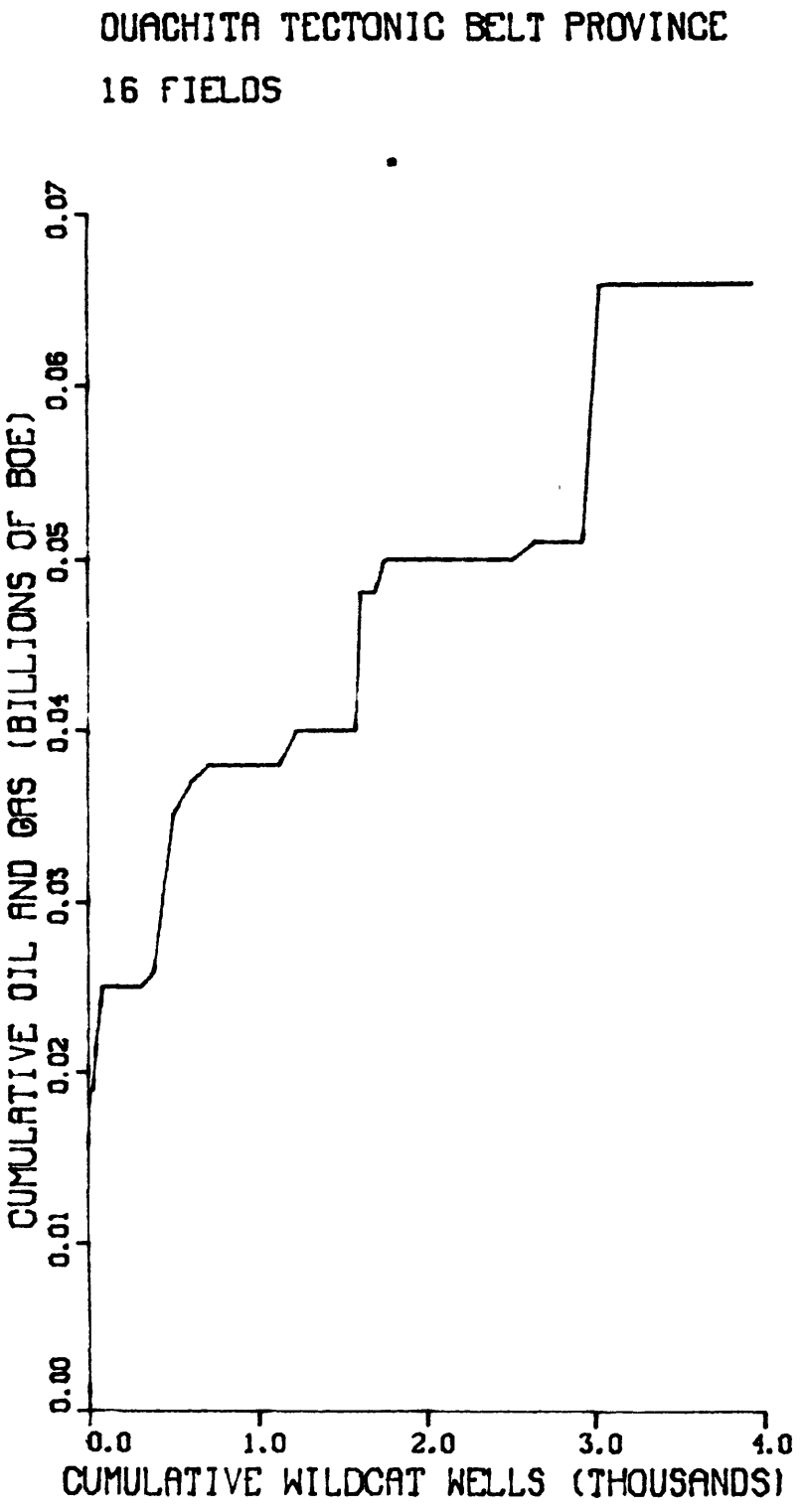

Figure 21c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

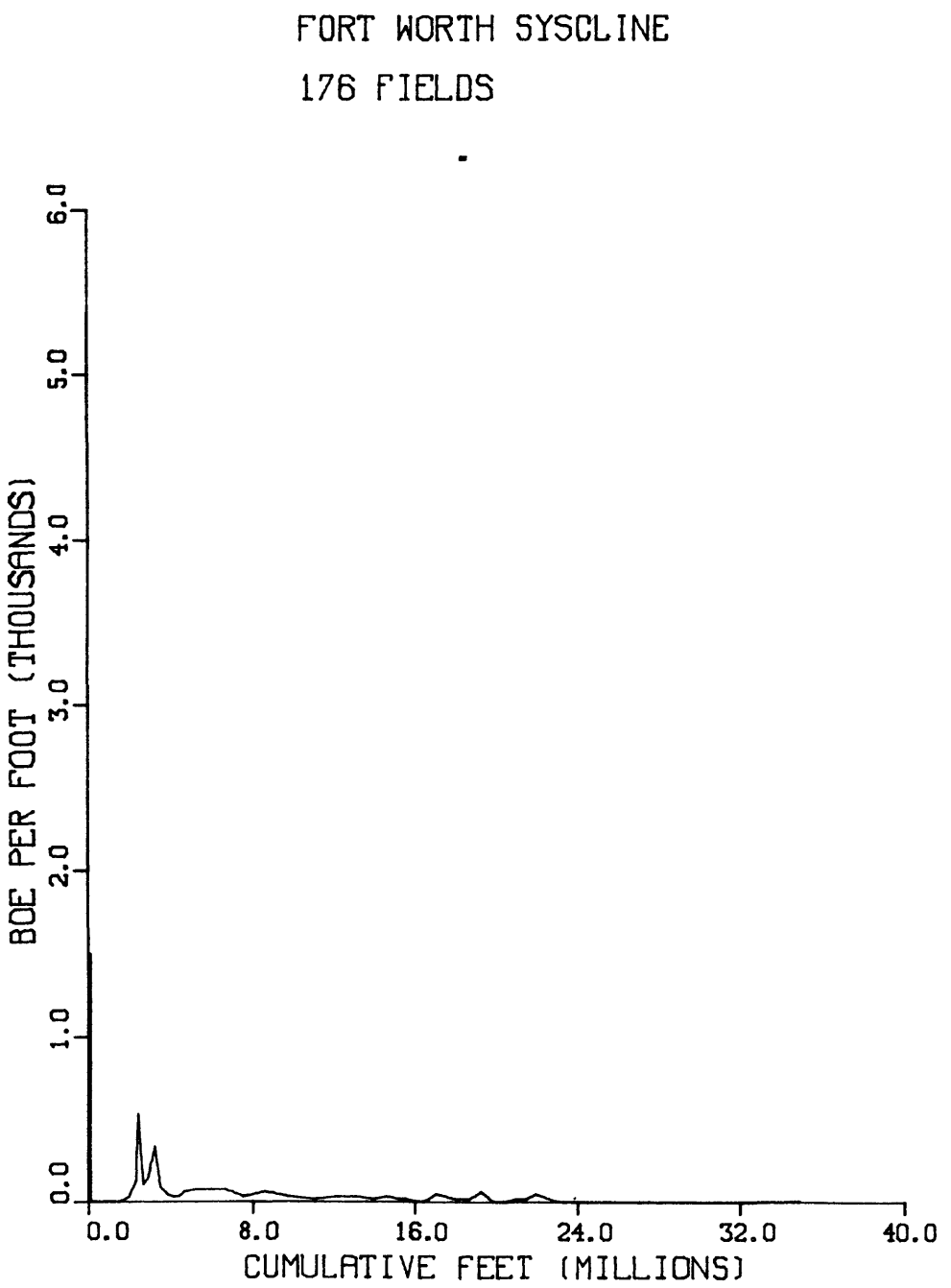

Figure 22a.--BOE per foot vs. cumulative footage drilled.

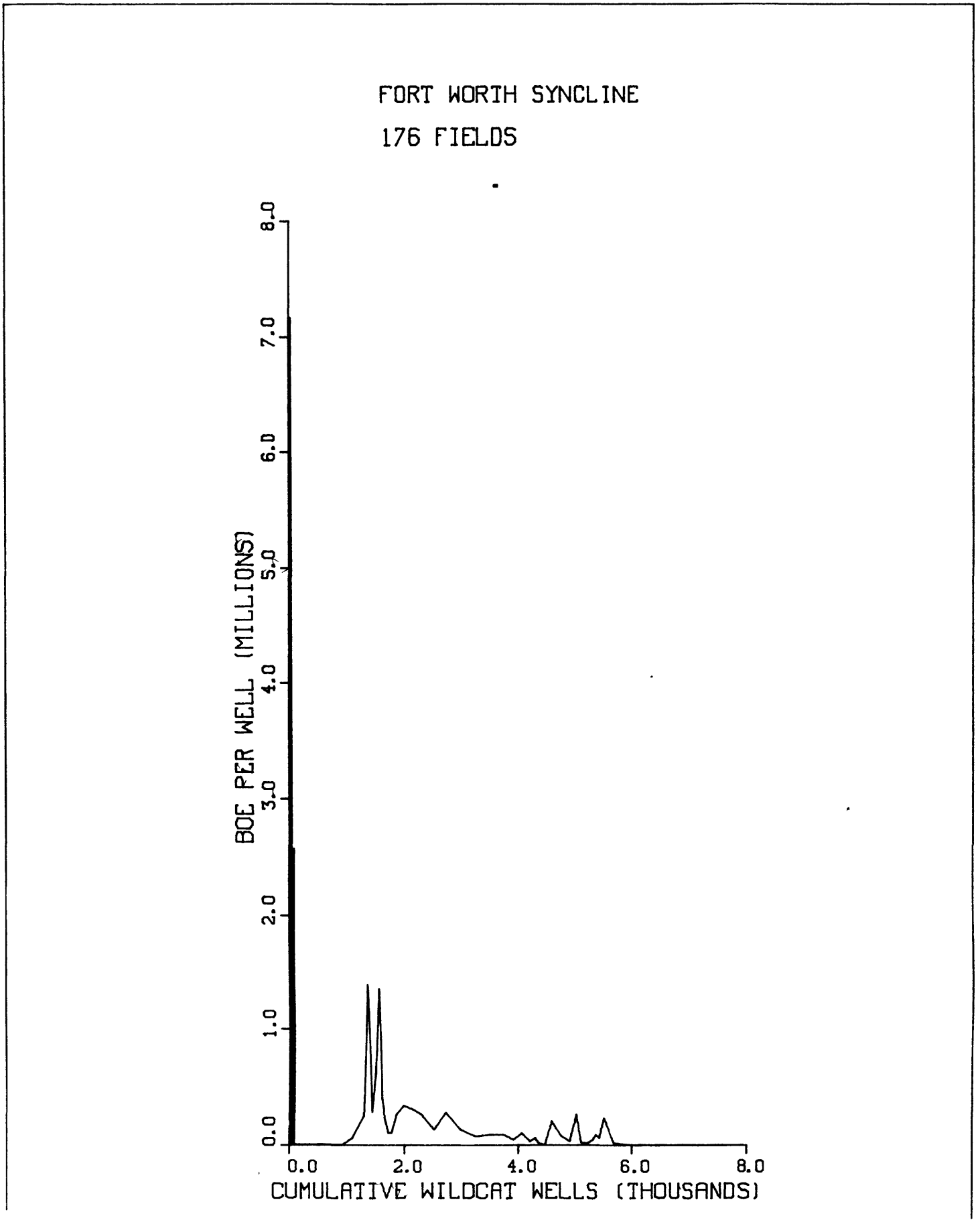

Figure 22b.--BOE per well vs. cumulative wells drilled.

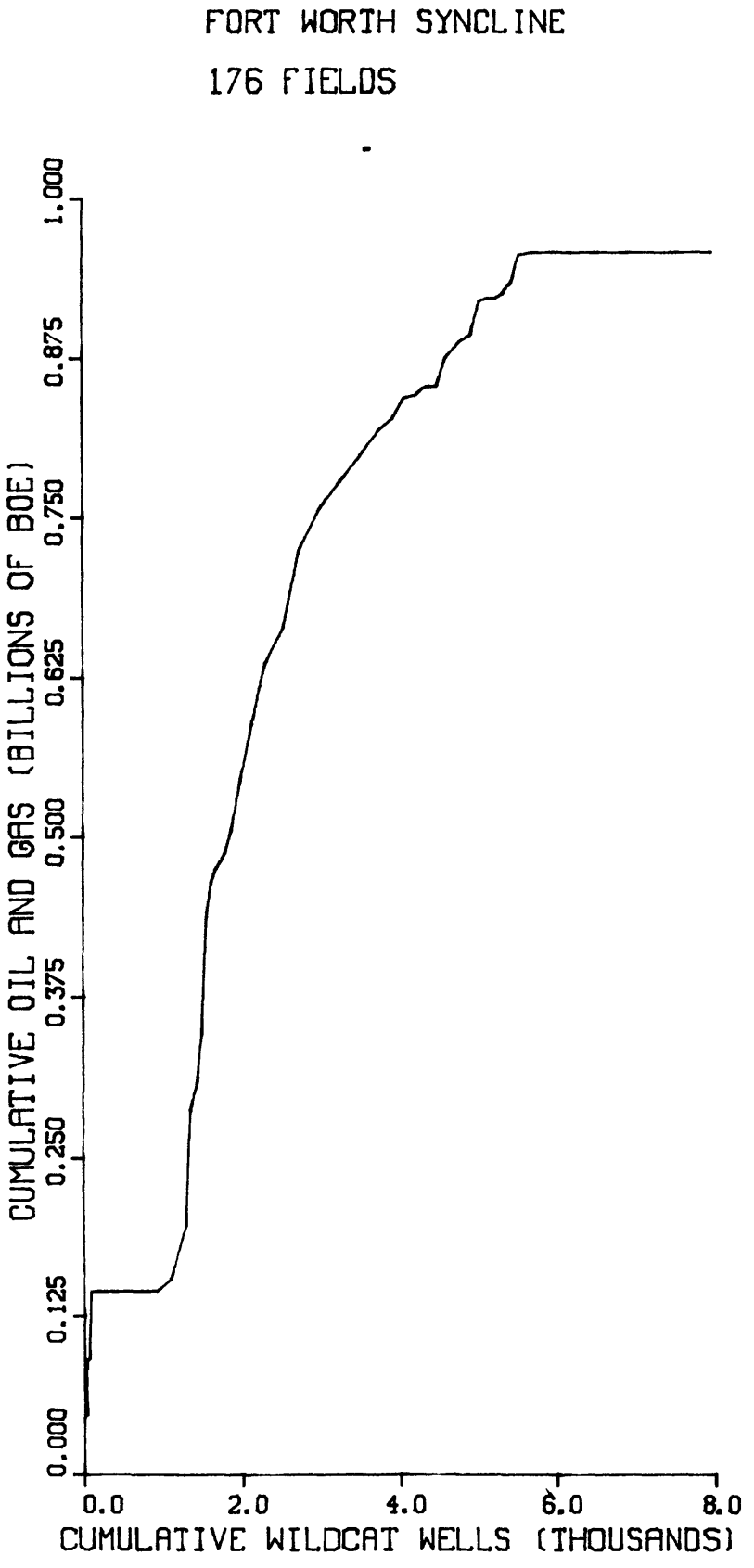

Figure 22c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

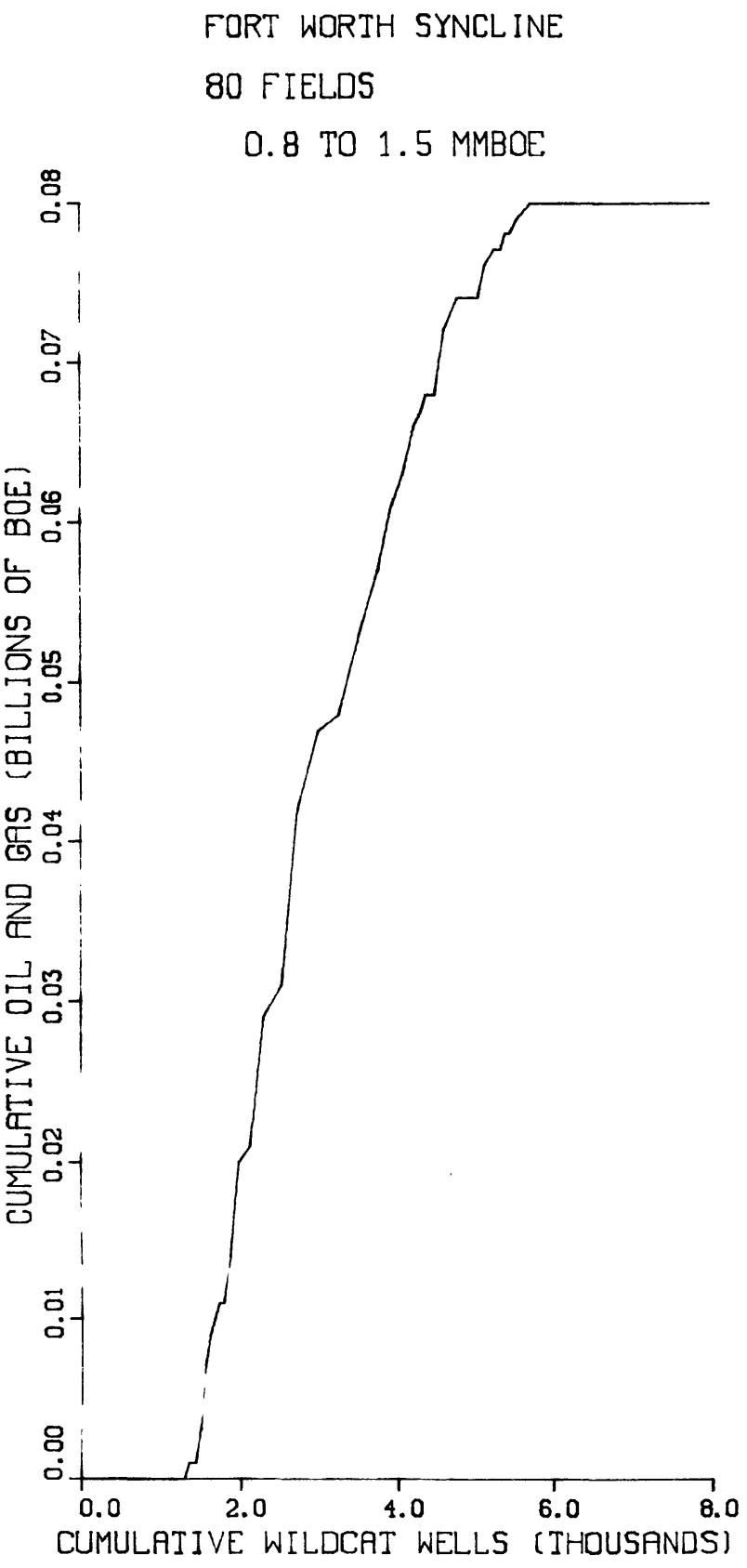

Figure 22d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

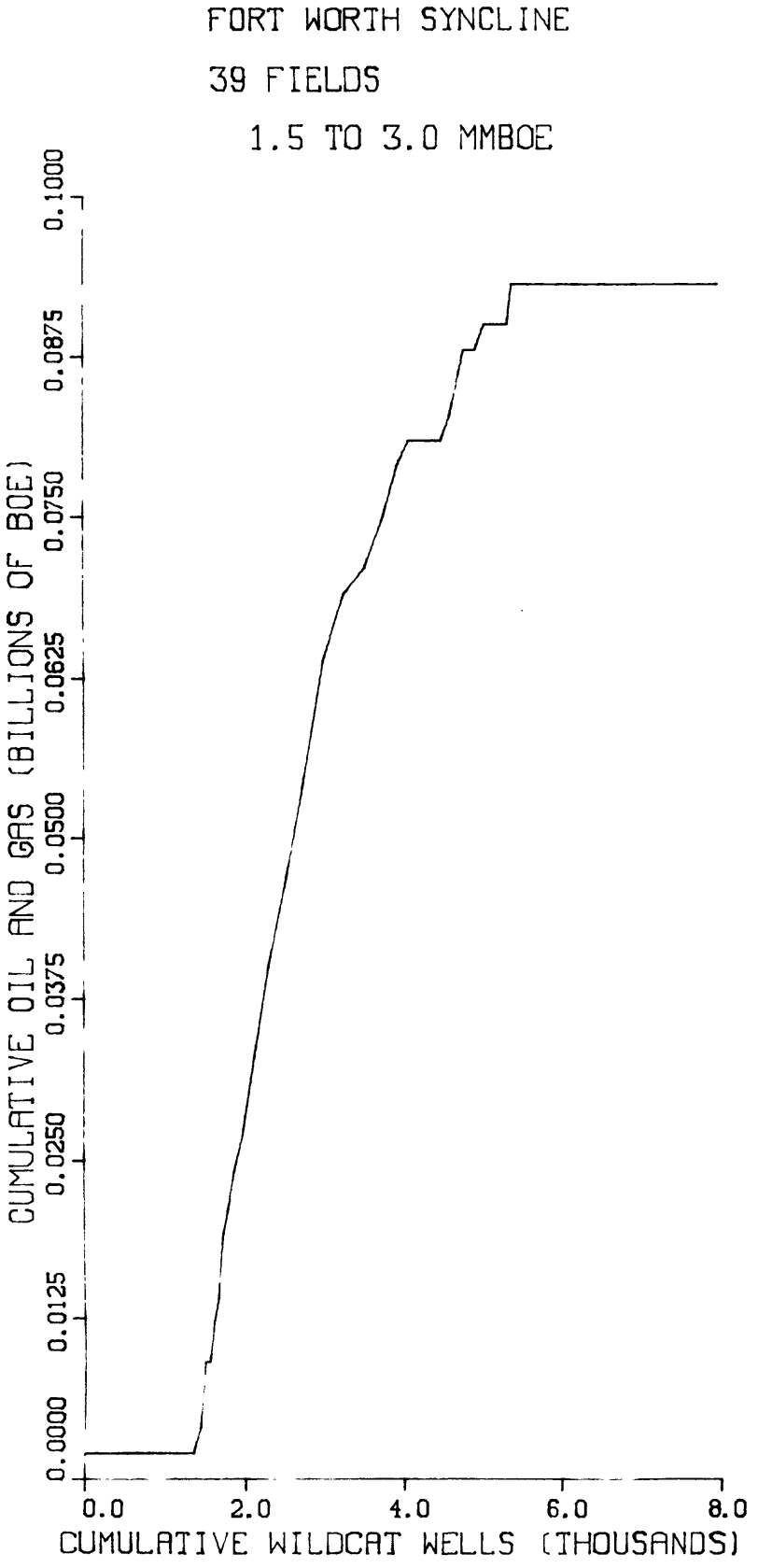

Figure 22e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

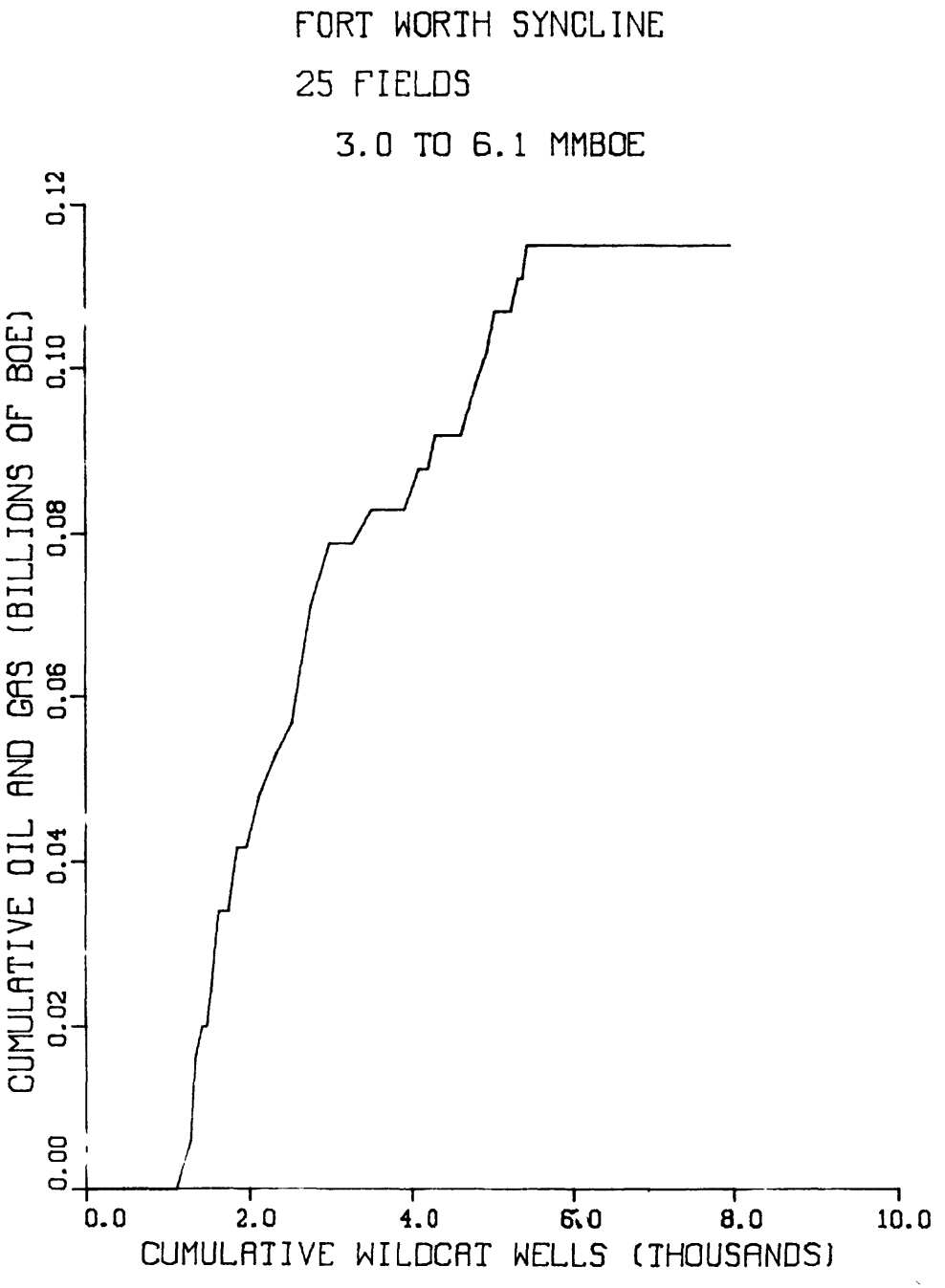

Figure 22f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

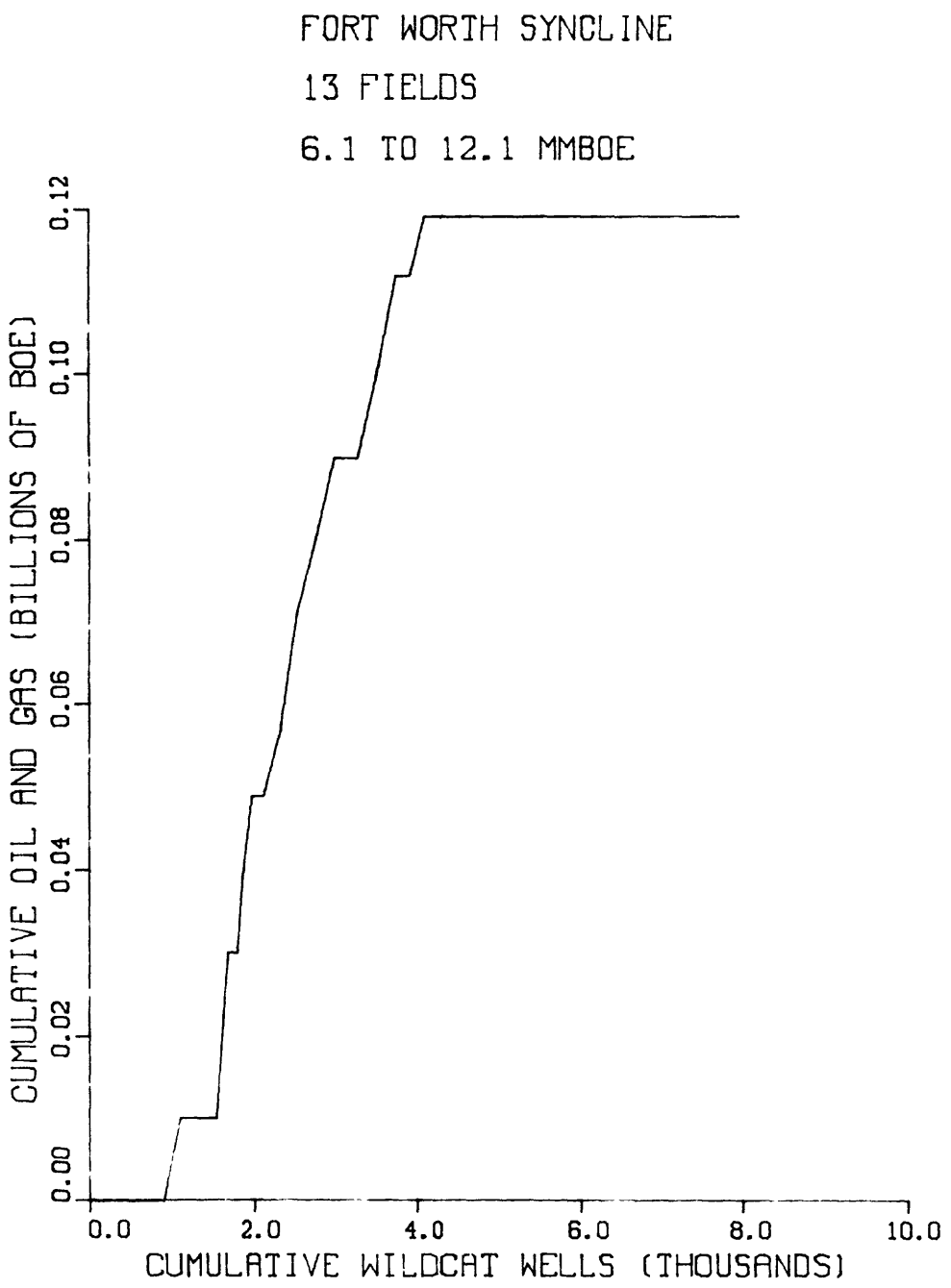

Figure 22g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

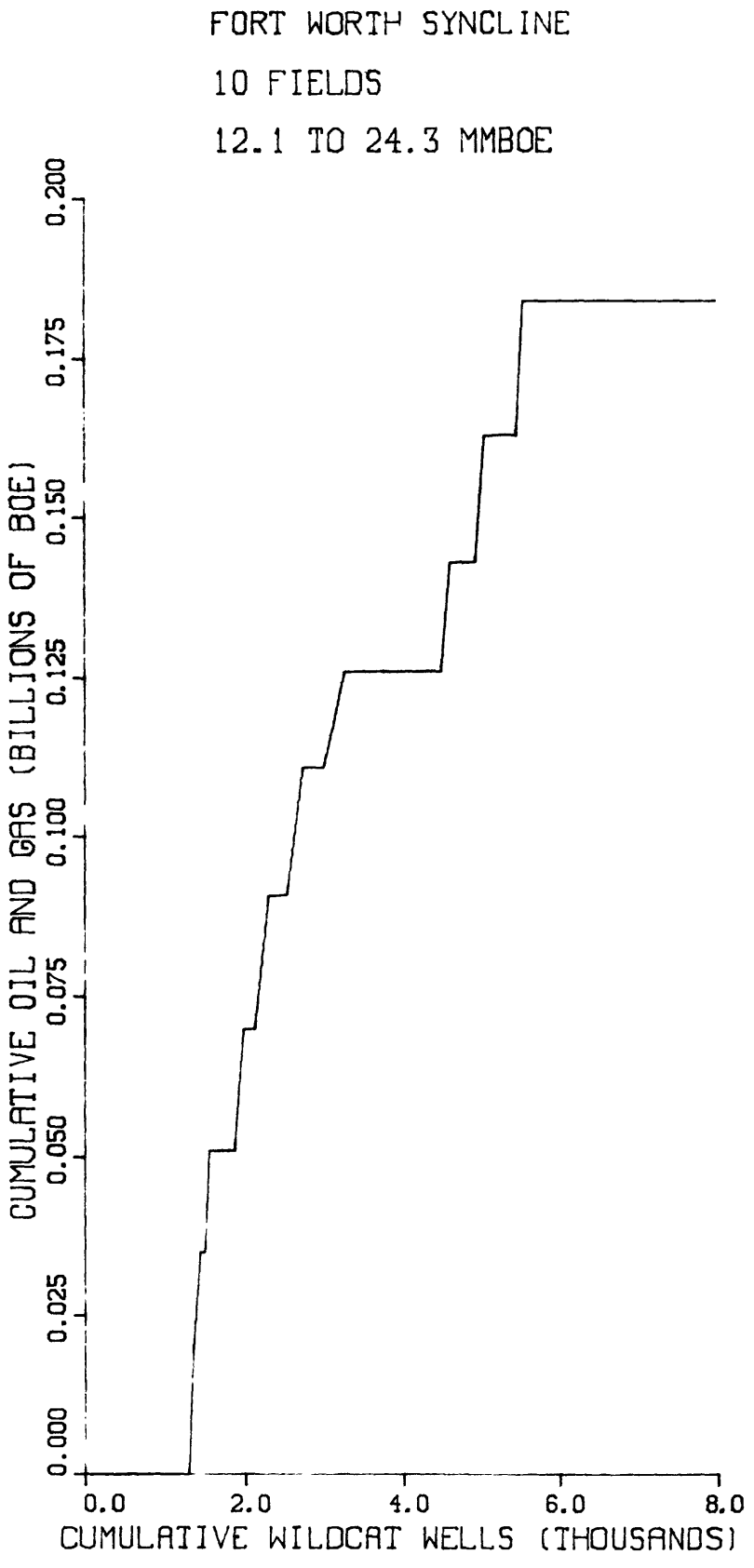

Figure 22h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

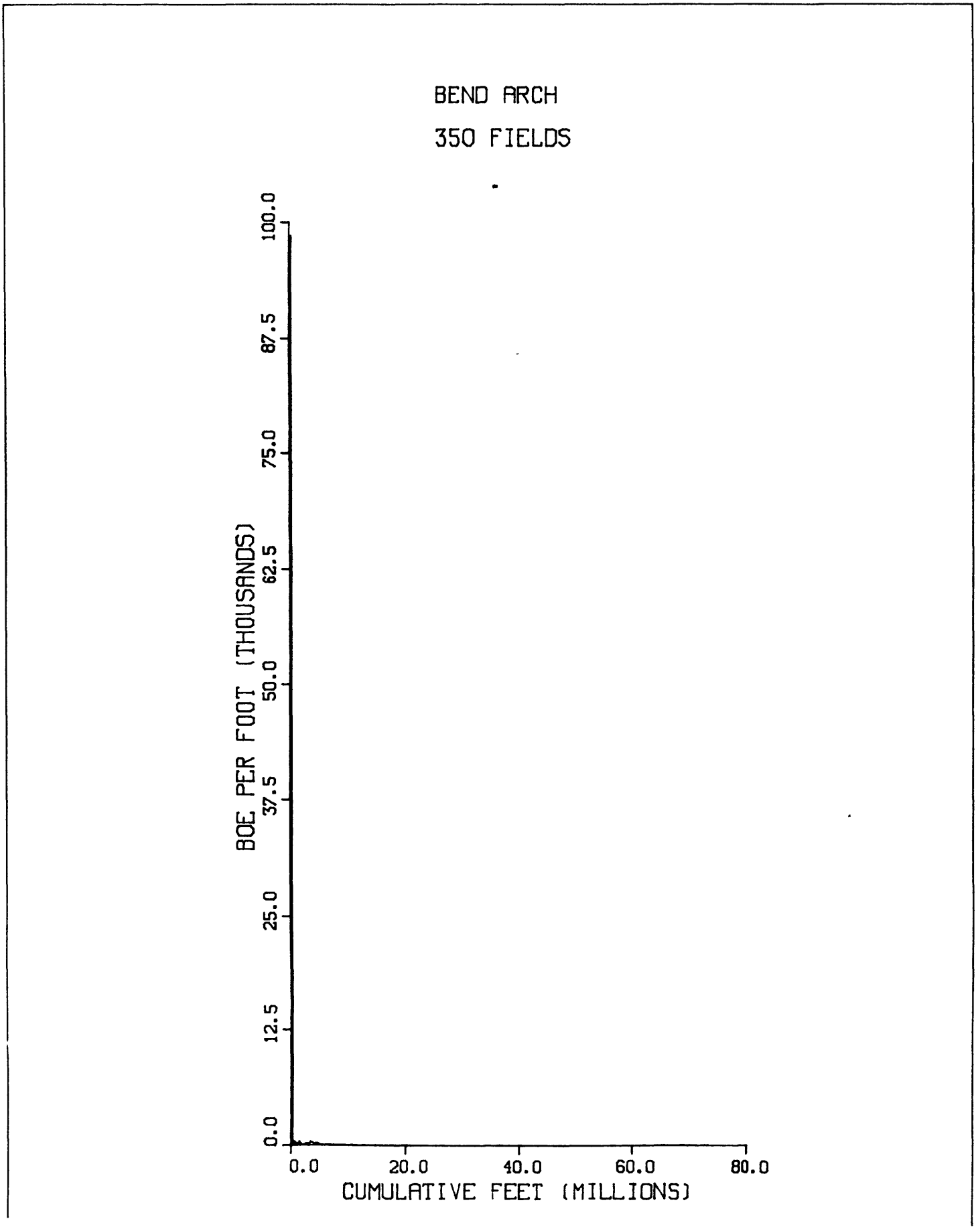

Figure 23a.--BOE per foot vs. cumulative footage drilled.

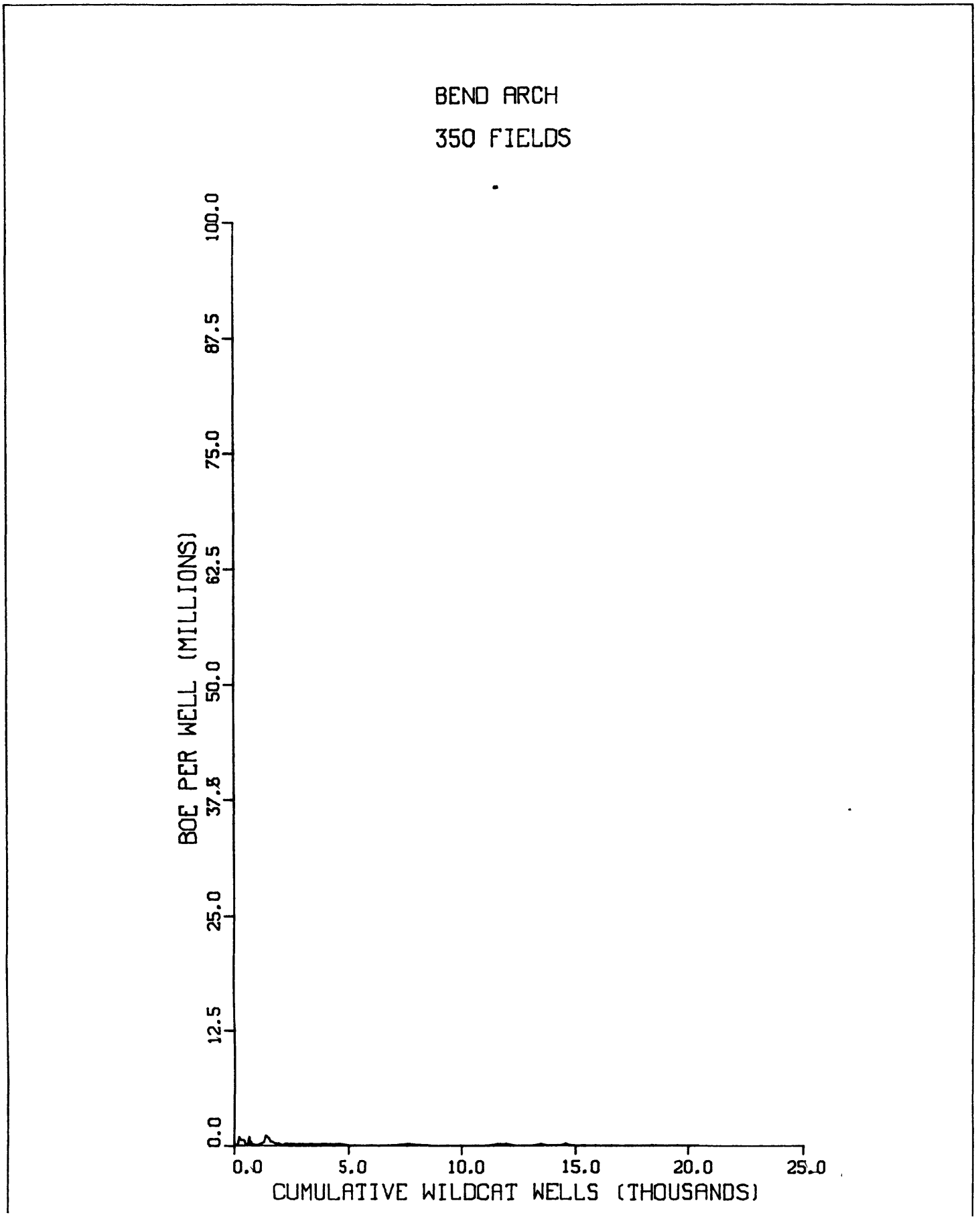

Figure 23b.--BOE per well vs. cumulative wells drilled.

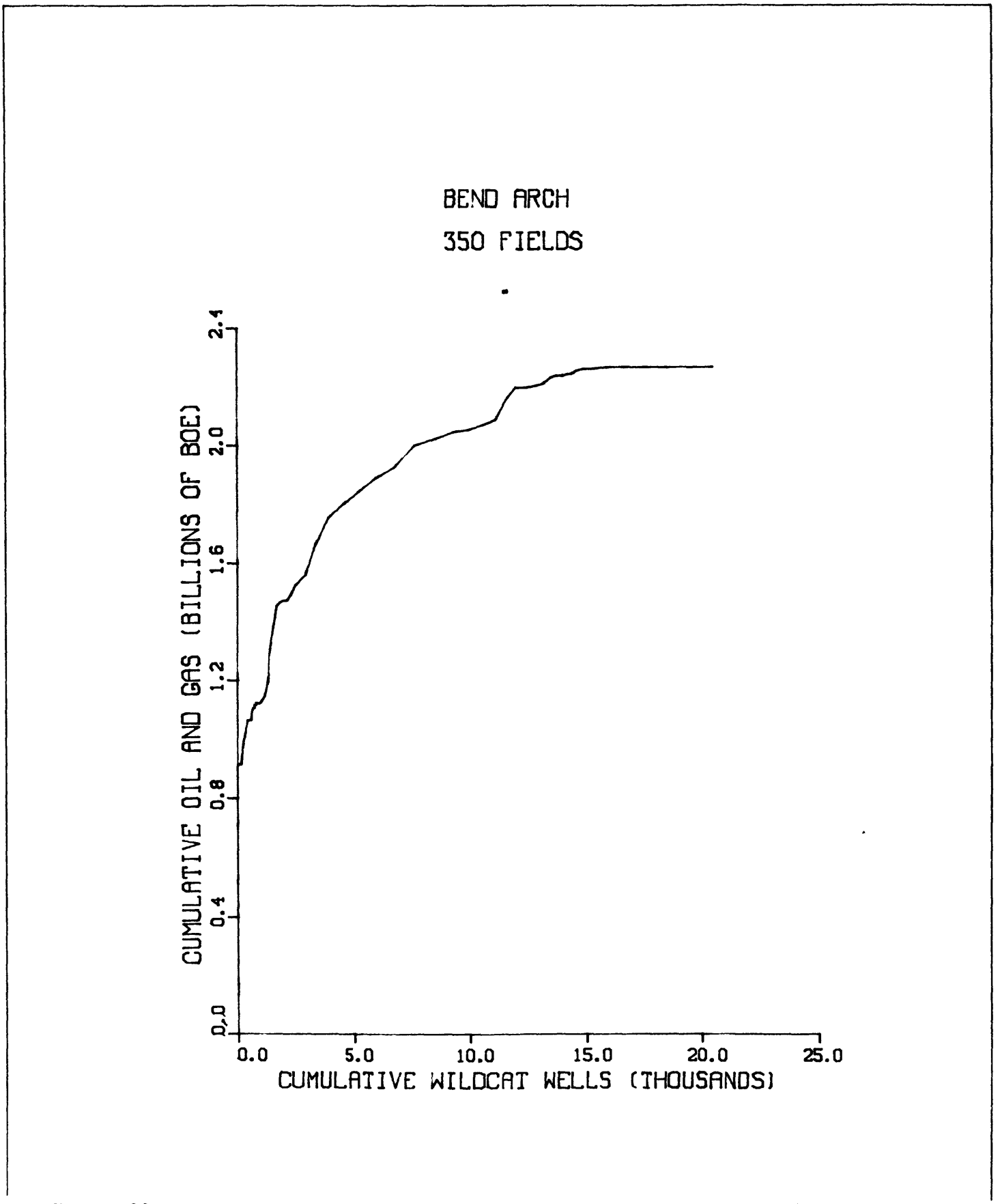

Figure 23c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

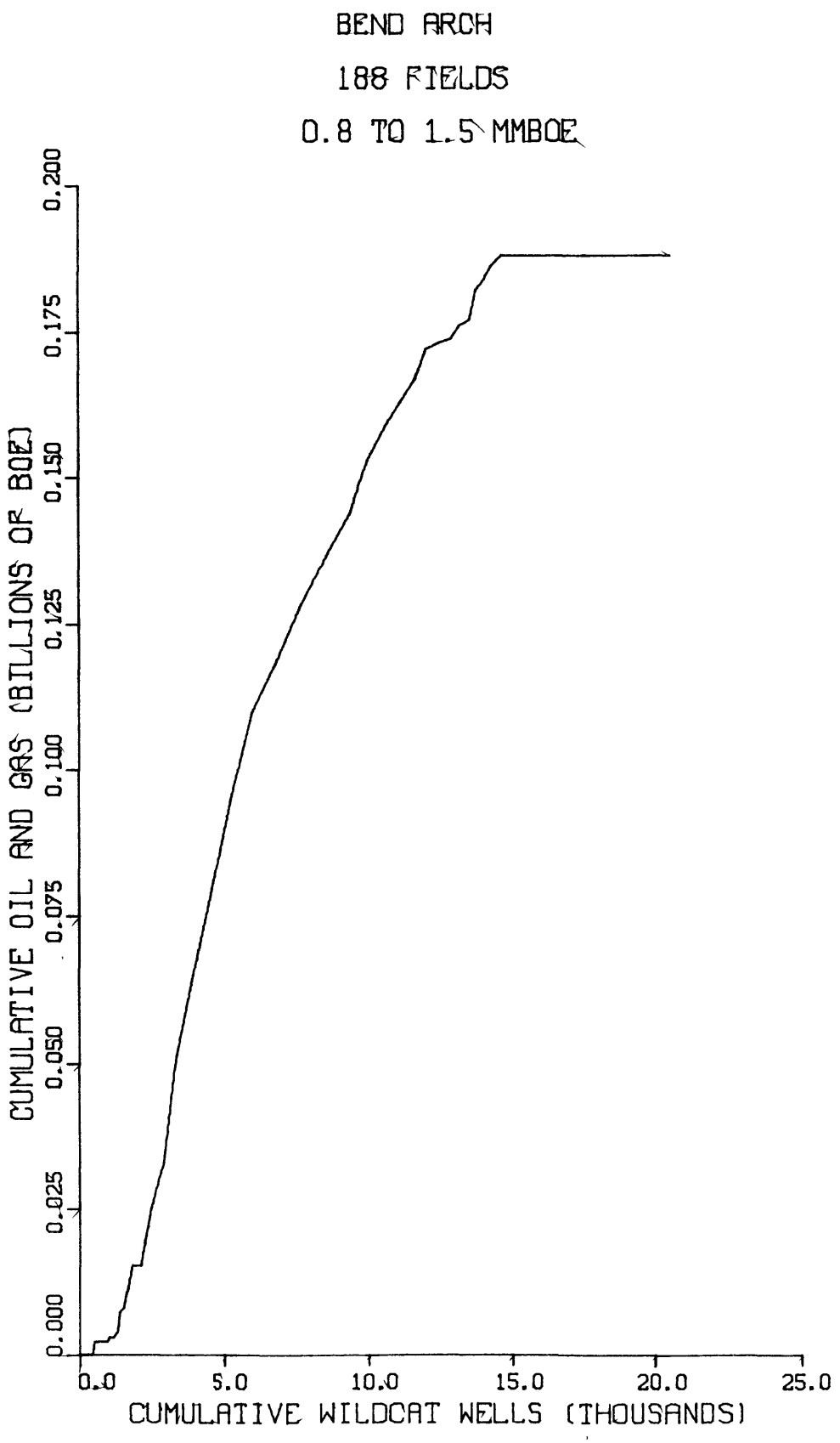

Figure 23d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

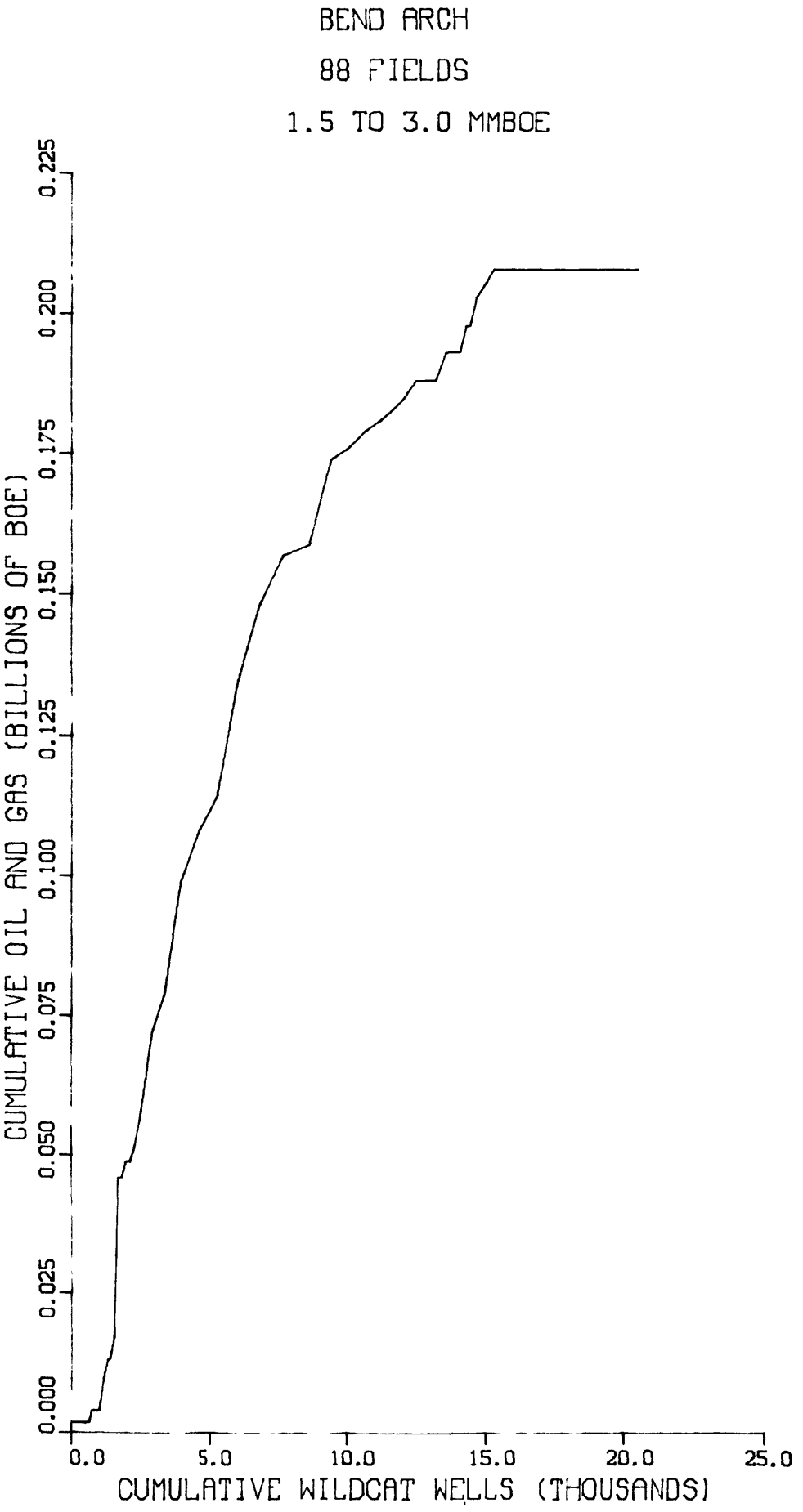

Figure 23e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

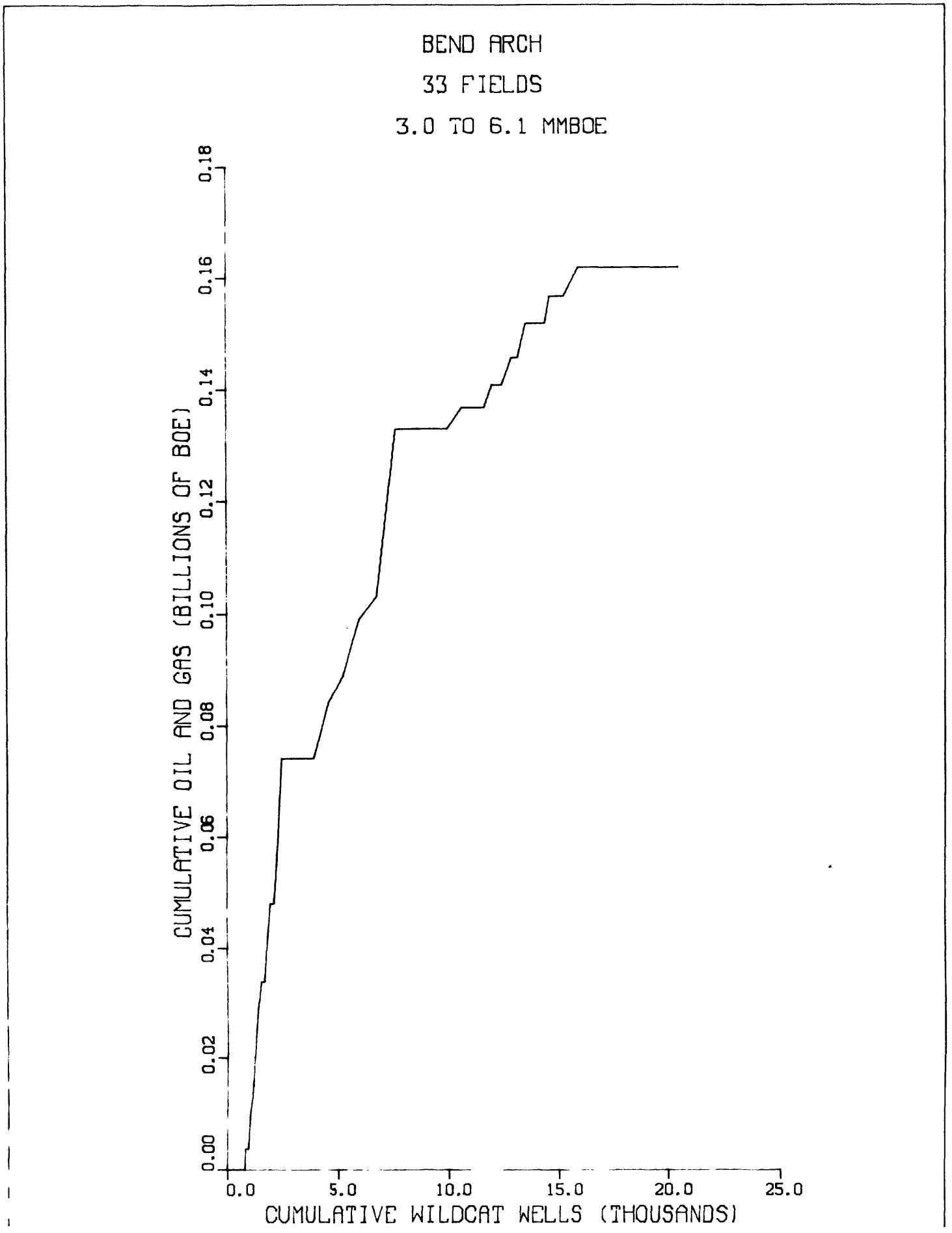

Figure 23f.—Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

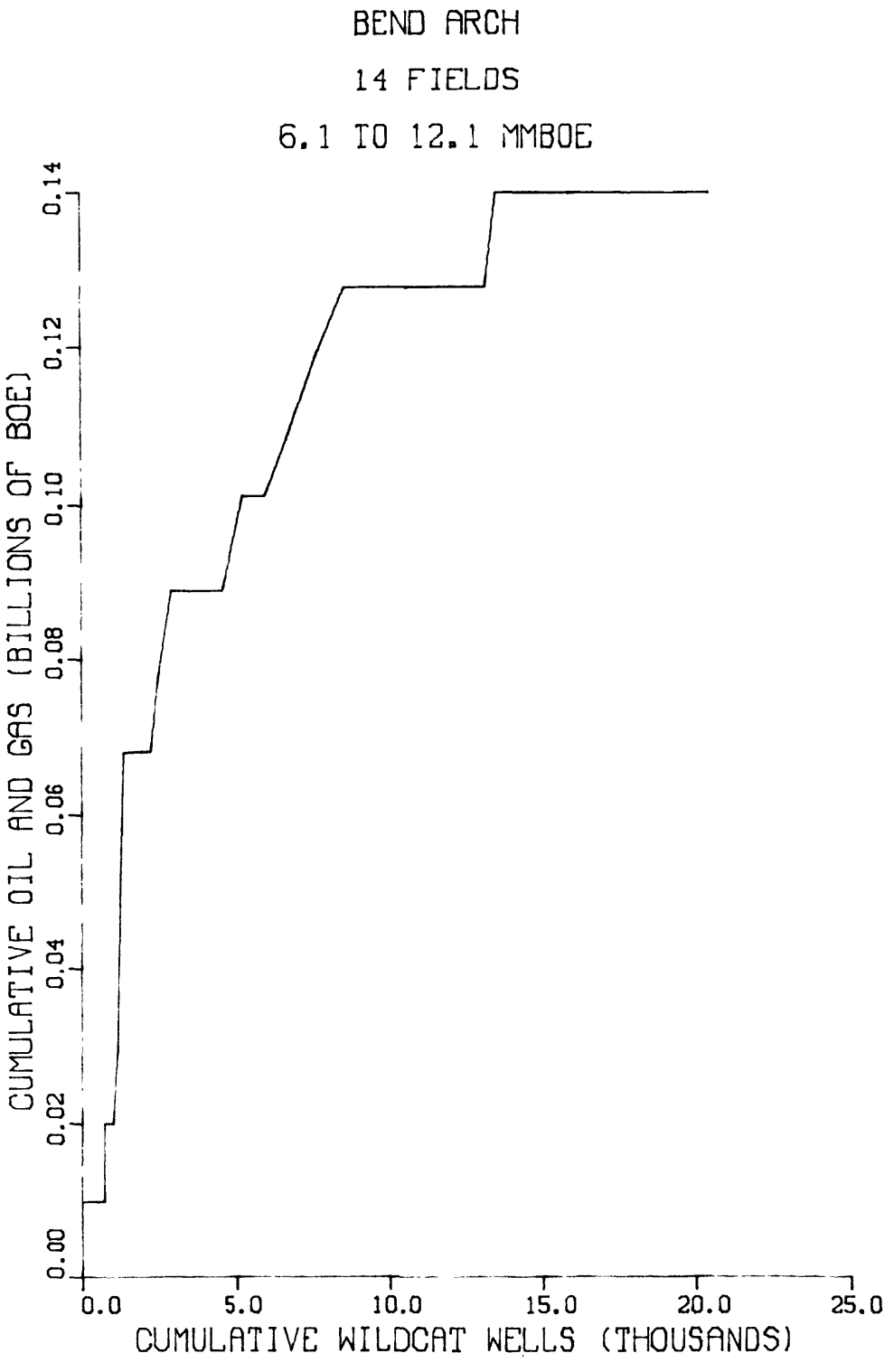

Figure 23g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

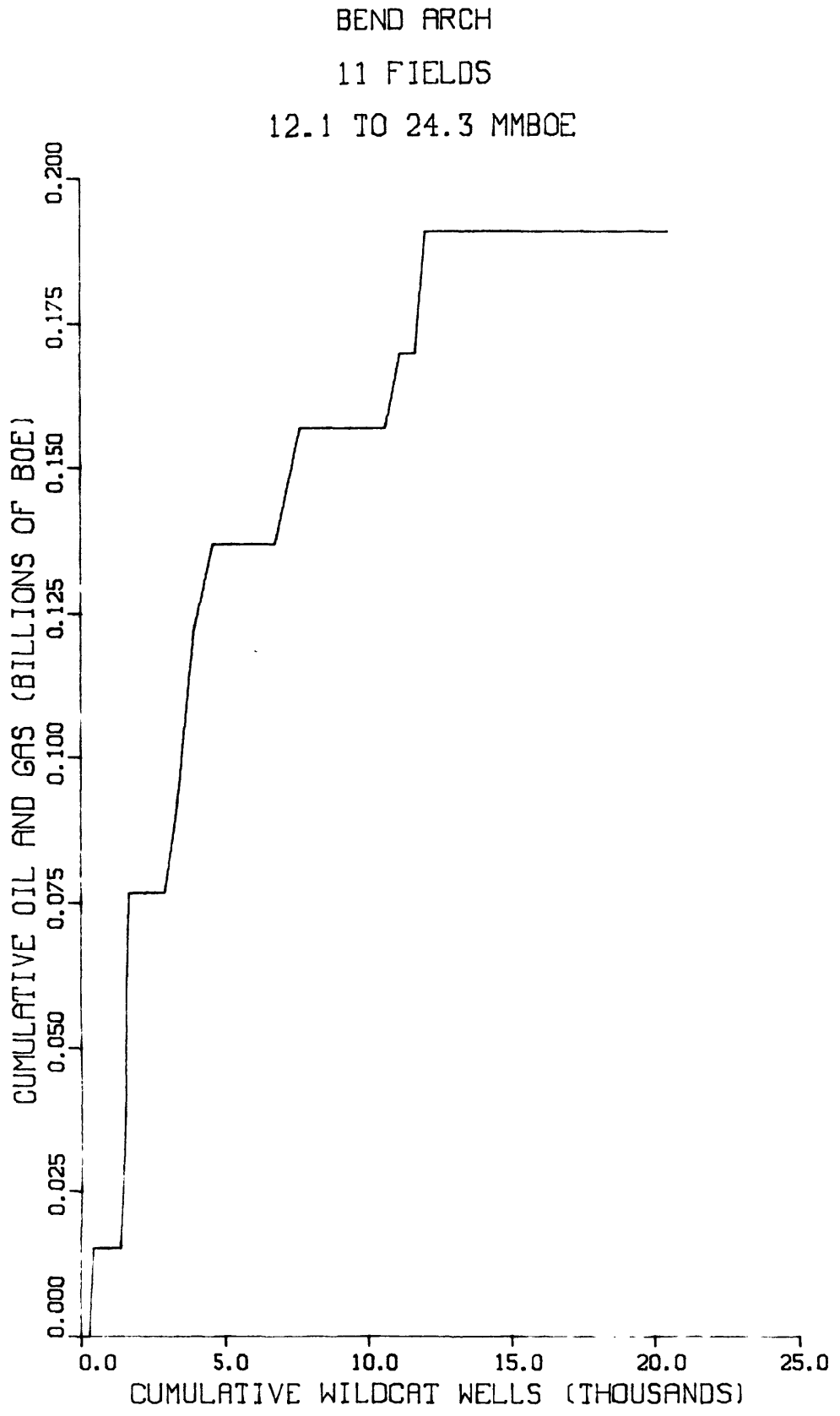

Figure 23h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

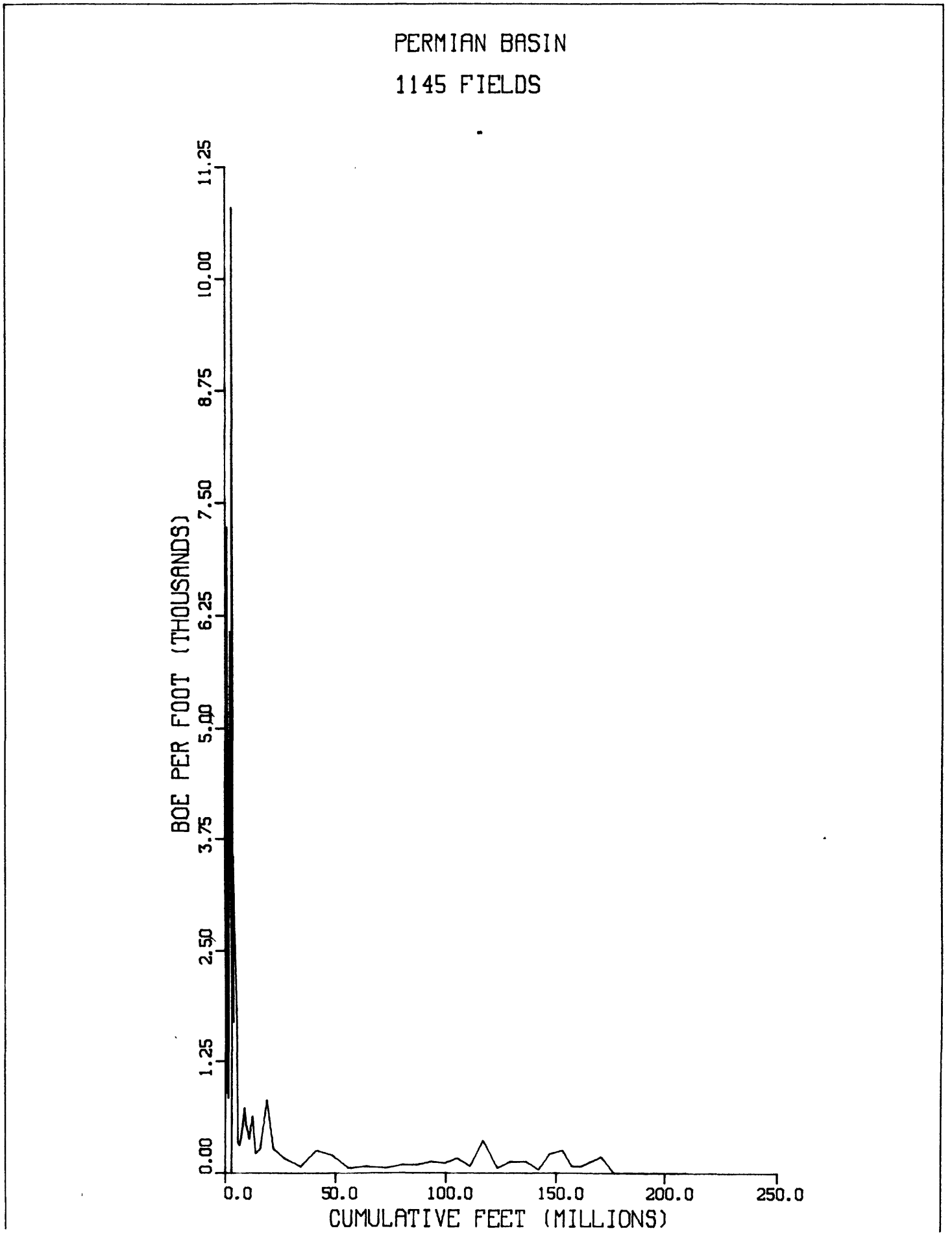

Figure 24a.--BOE per foot vs. cumulative footage drilled.

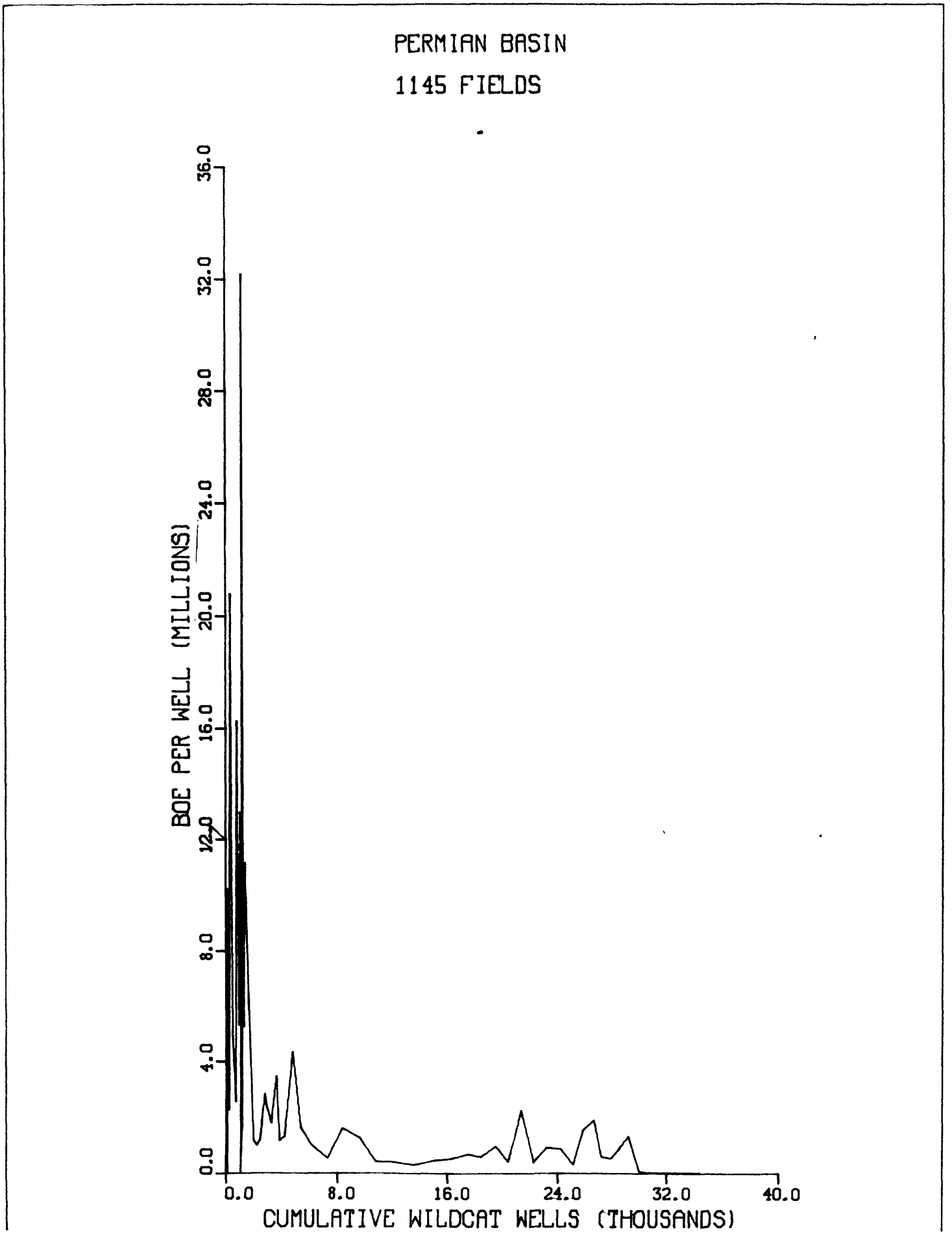

Figure 24b.--BOE per well vs. cumulative wells drilled.

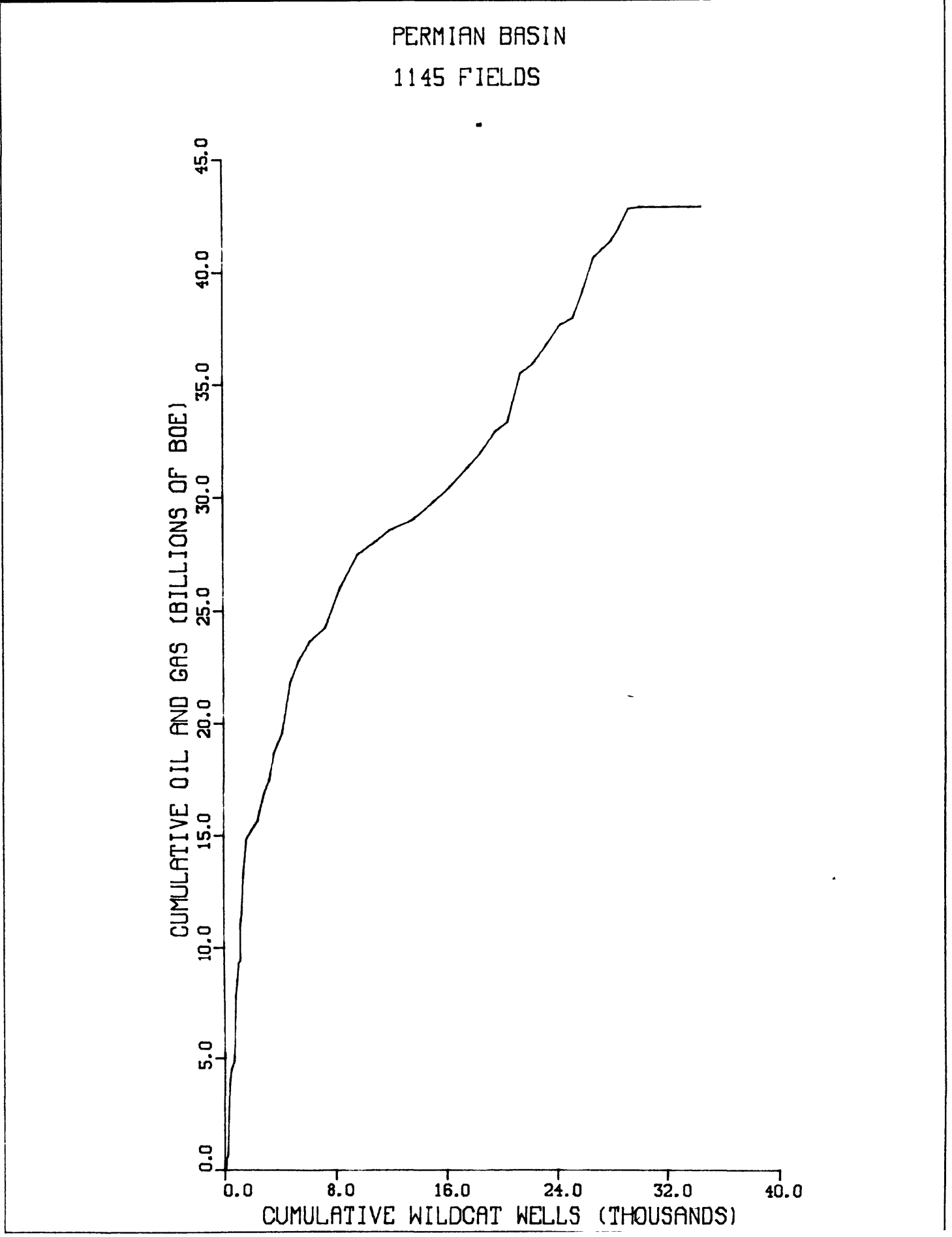

Figure 24c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

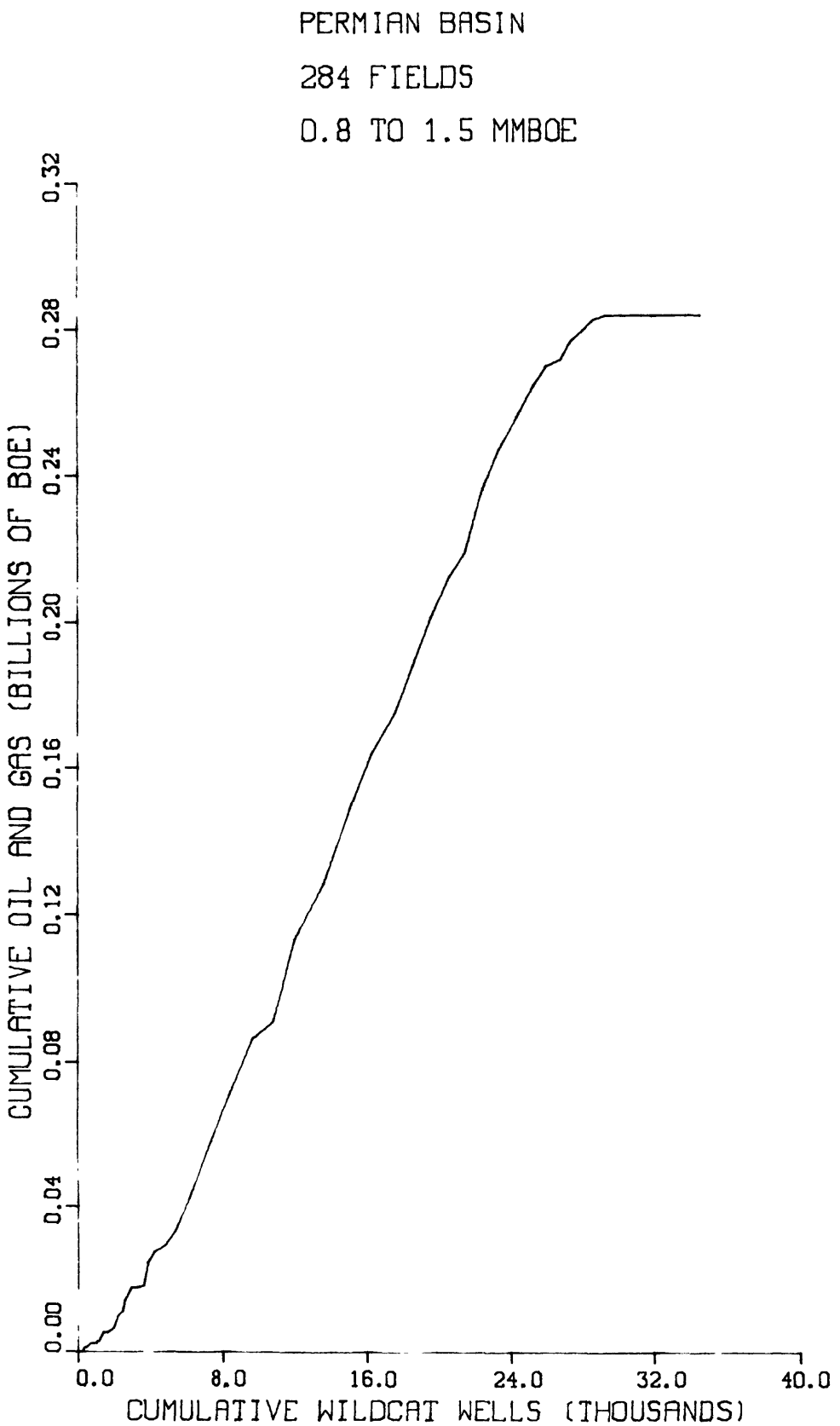

Figure 24d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

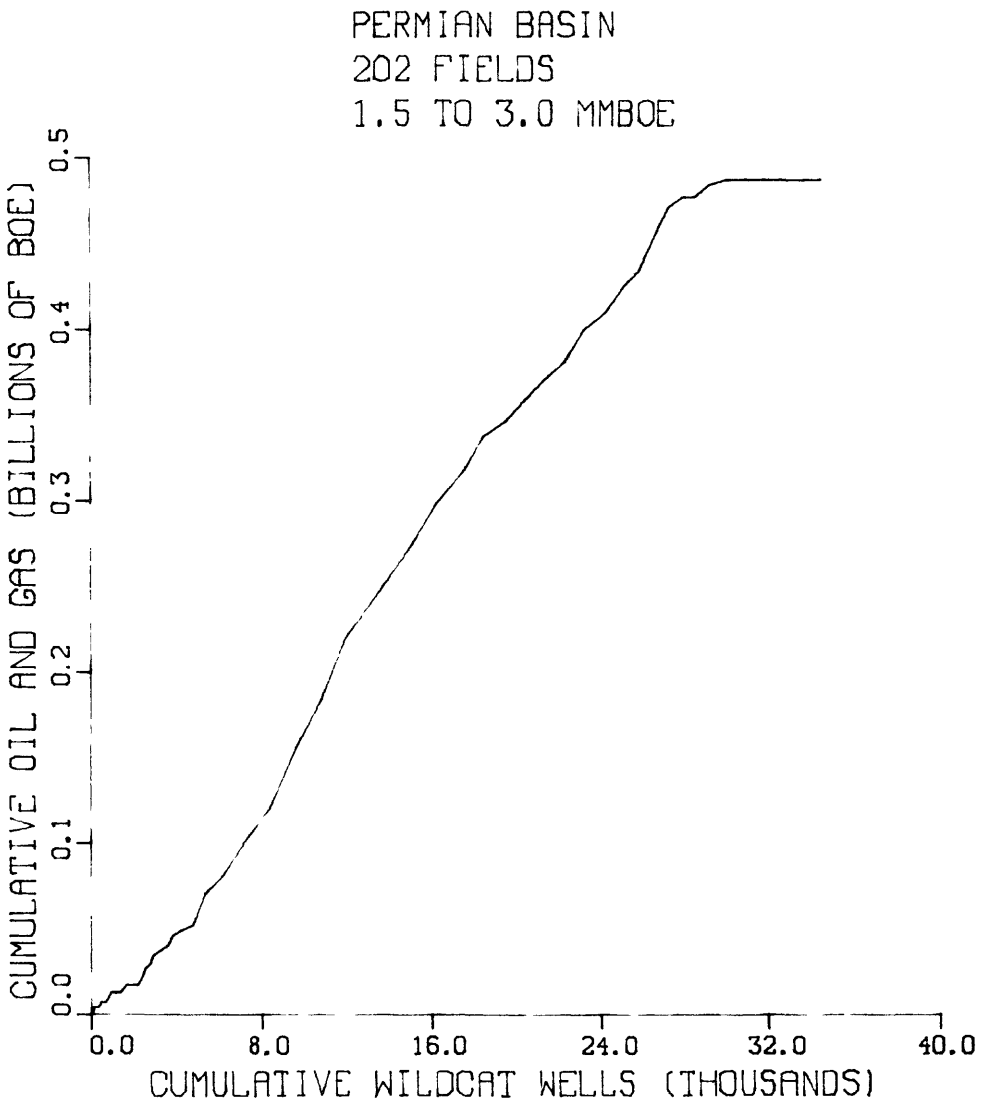

Figure 24e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

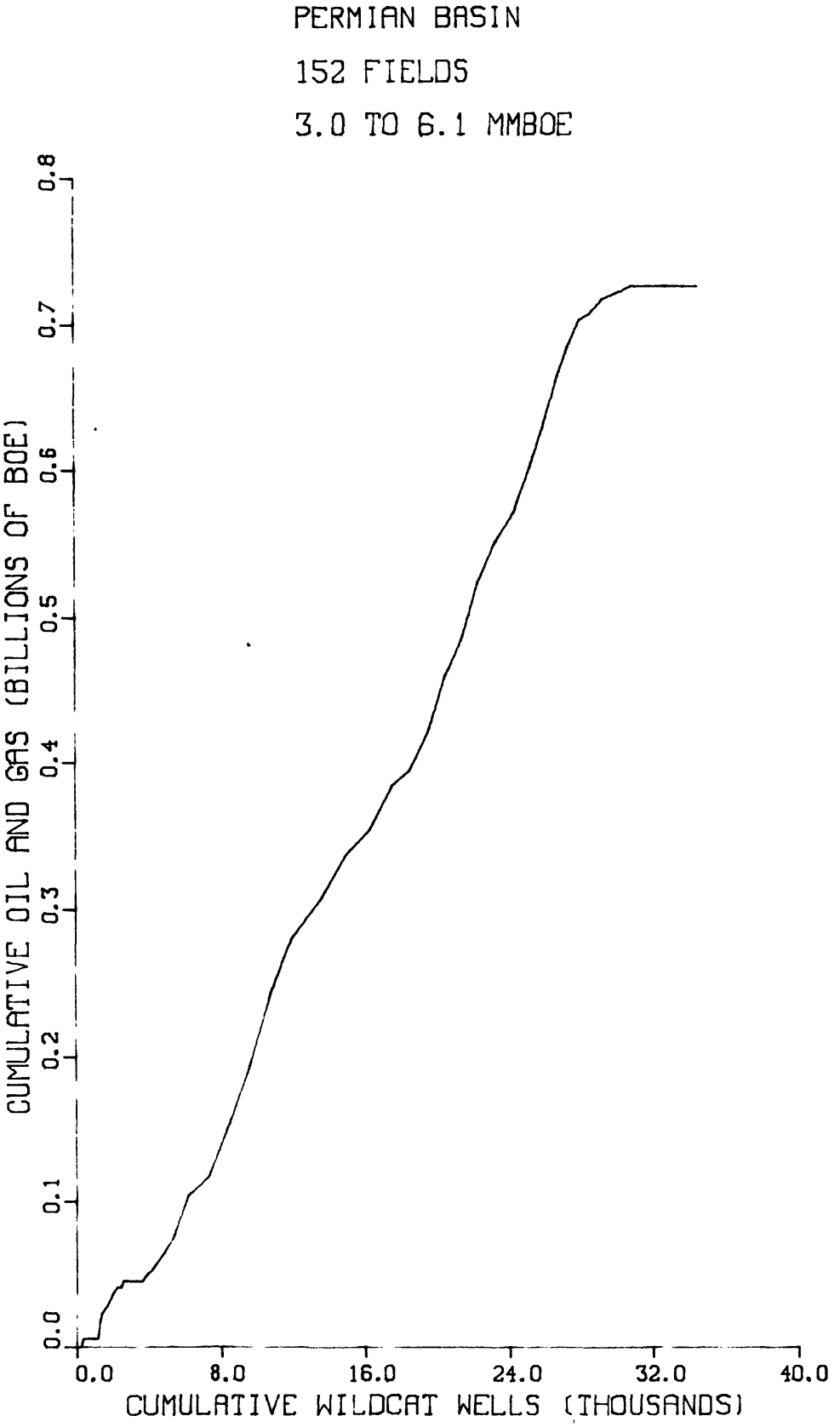

Figure 24f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

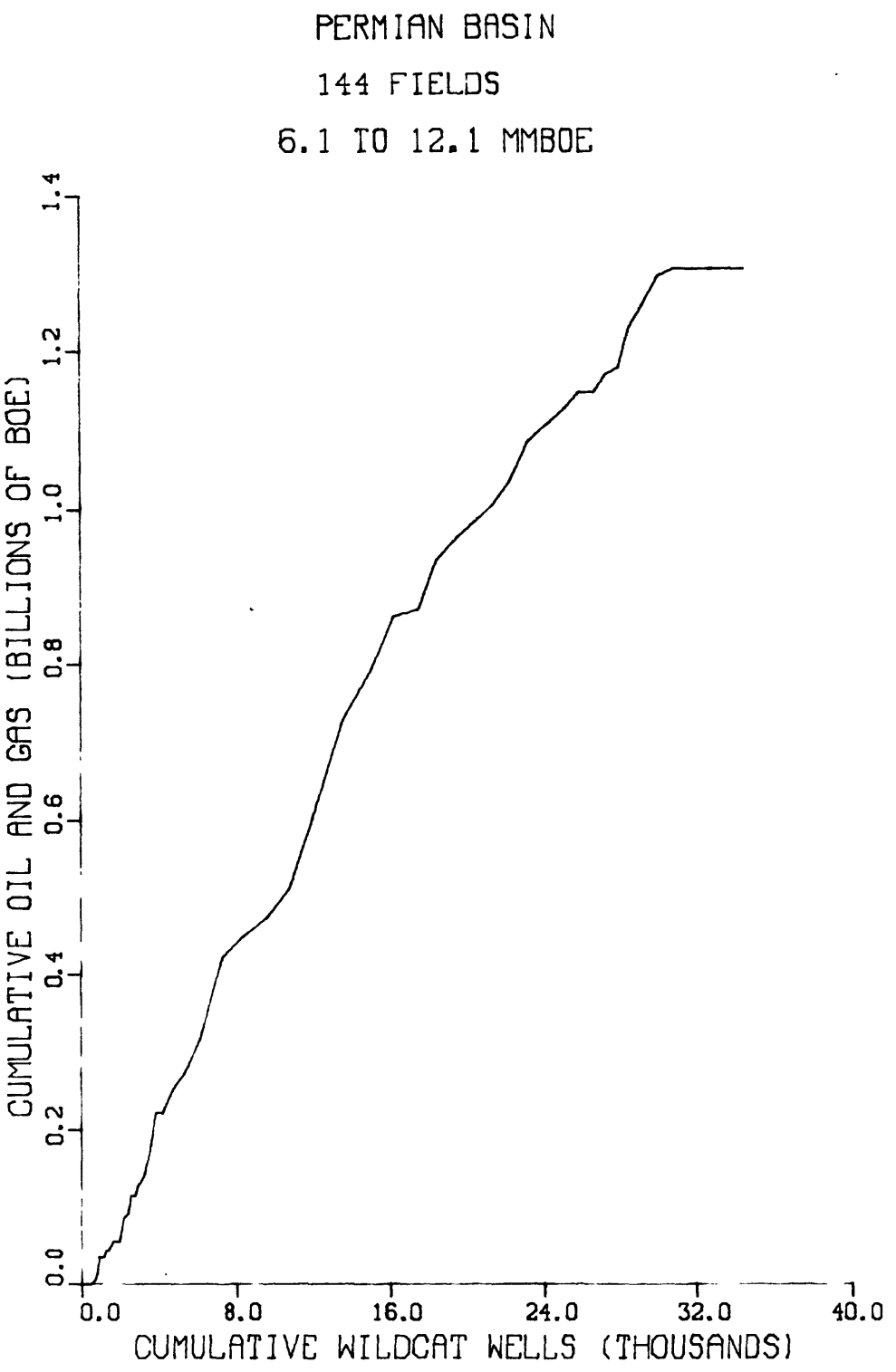

Figure 24g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

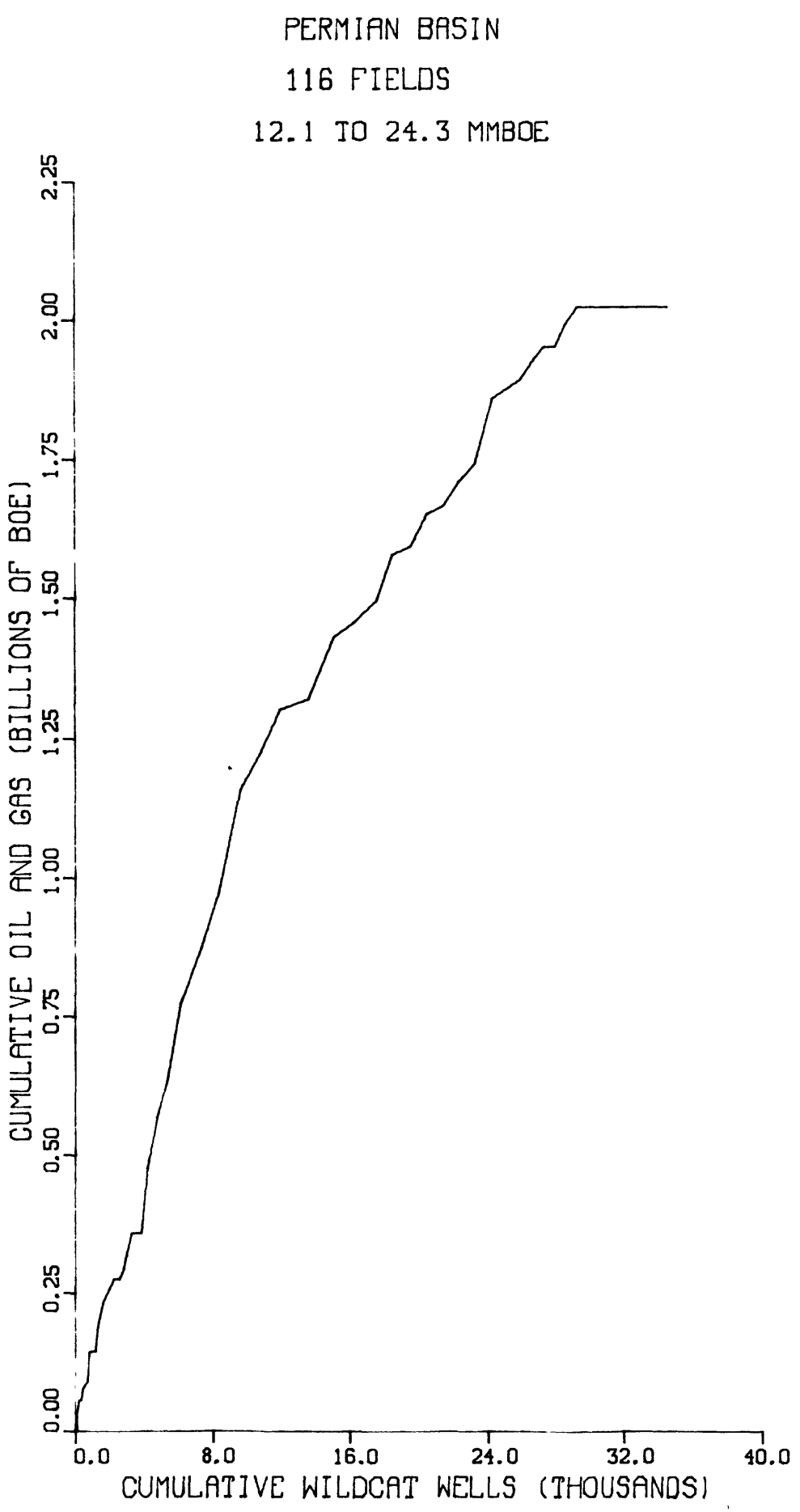

Figure 24h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

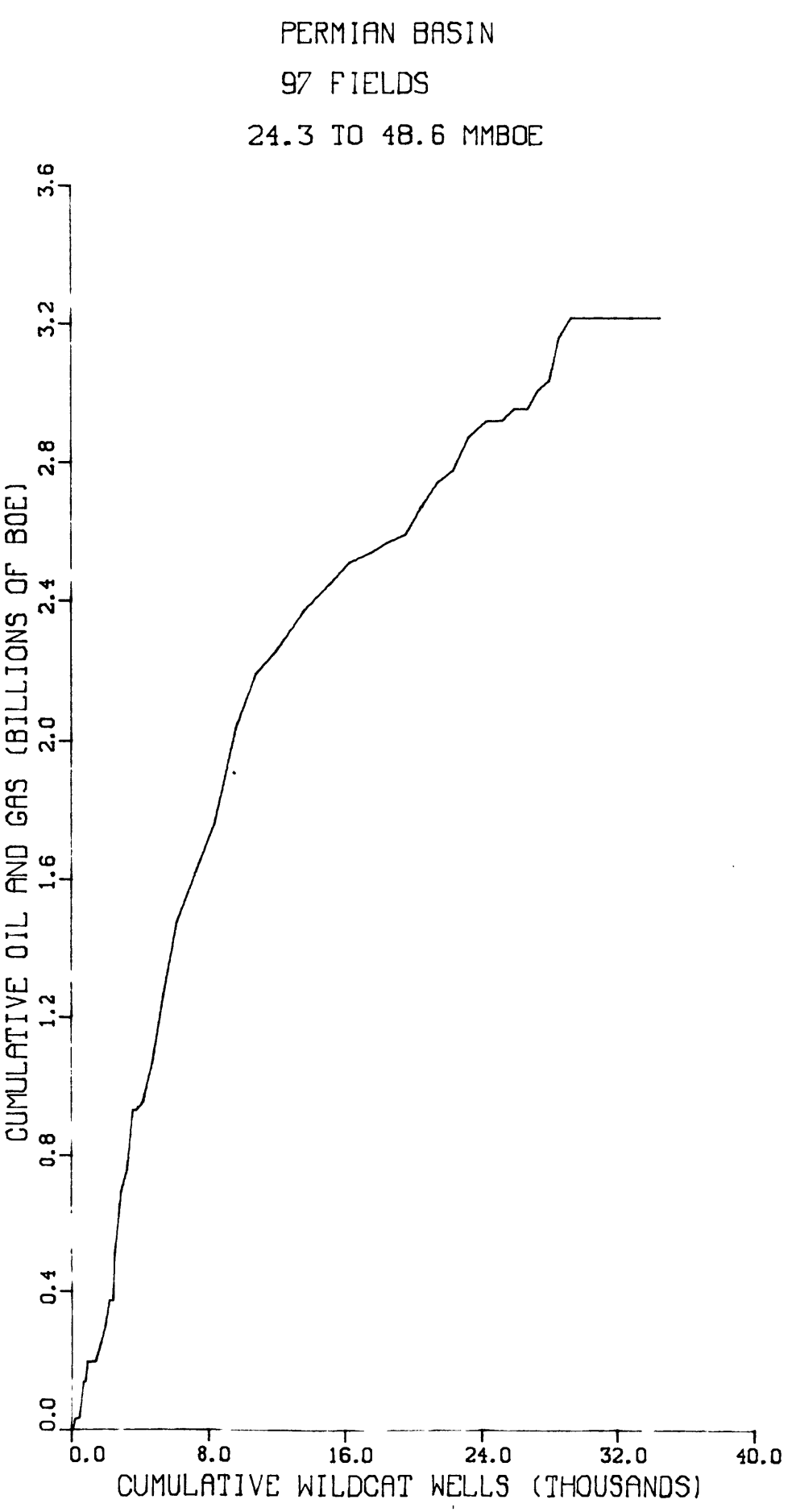

Figure 24i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

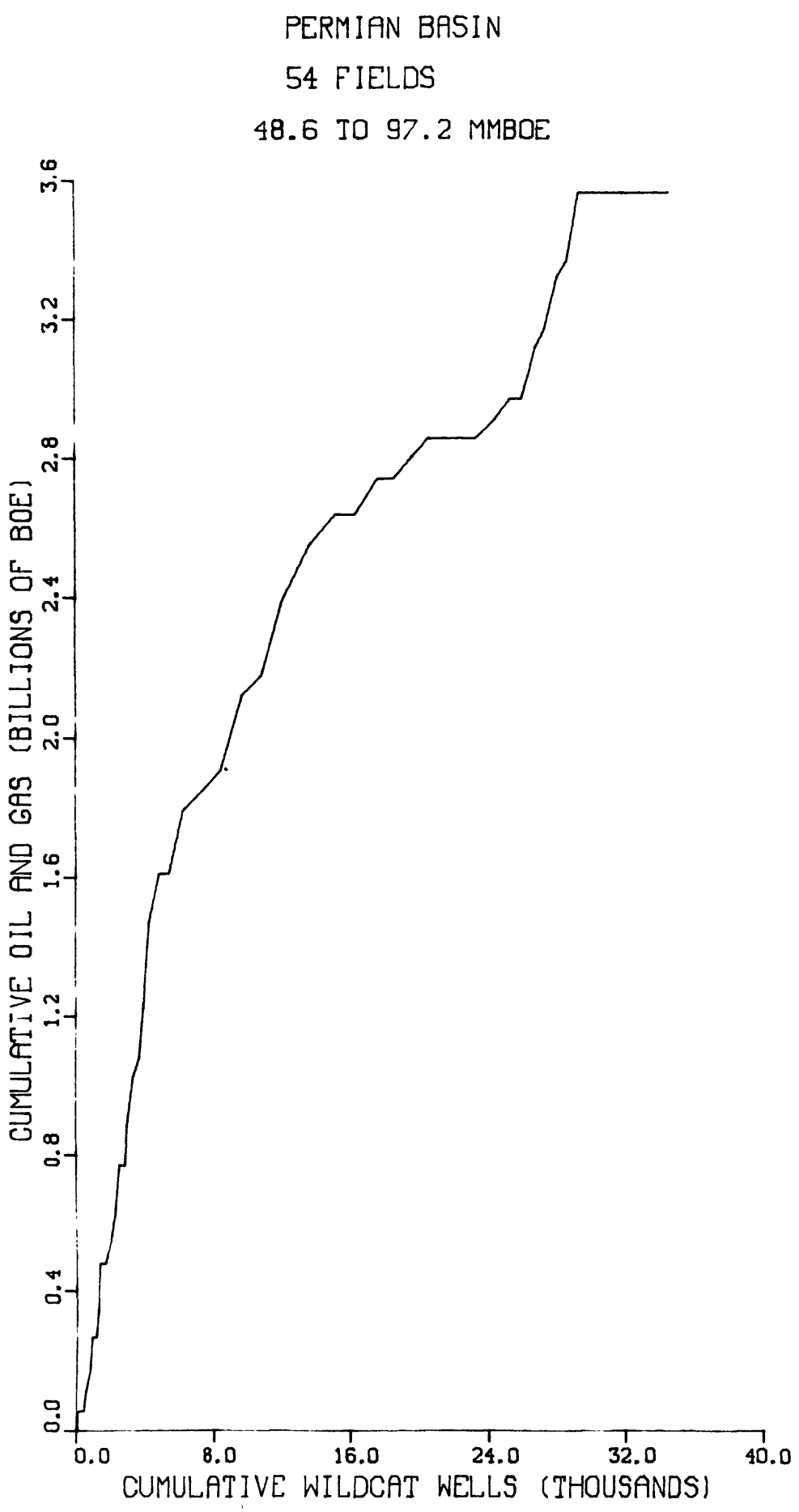

Figure 24j.—Cumulative oil and gas vs. cumulative wells for fields in the size range 48.6-97.2 MMBOE.

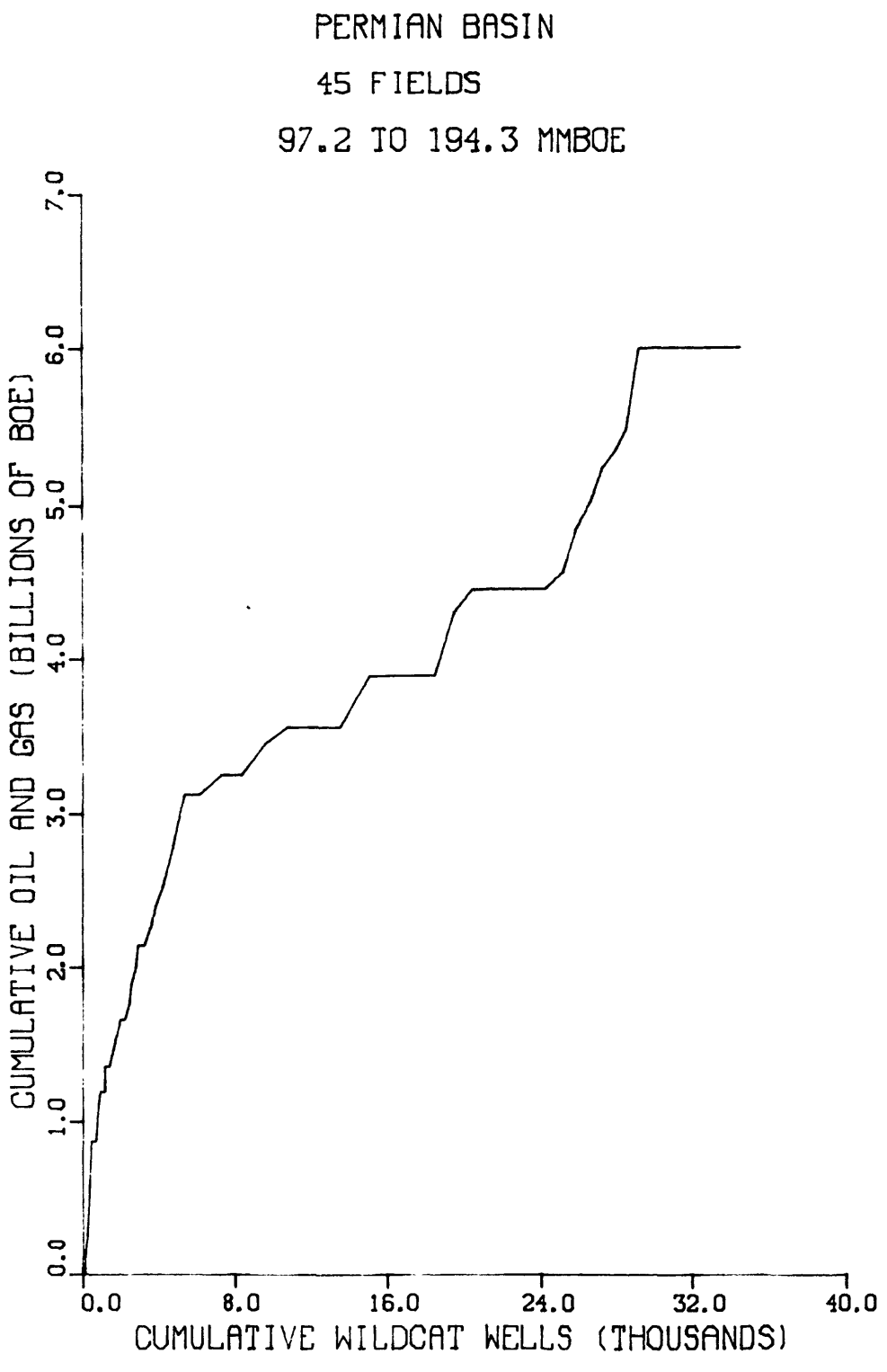

Figure 24k.--Cumulative oil and gas vs. cumulative wells for fields in the size range 97.2-194.3 MMBOE.

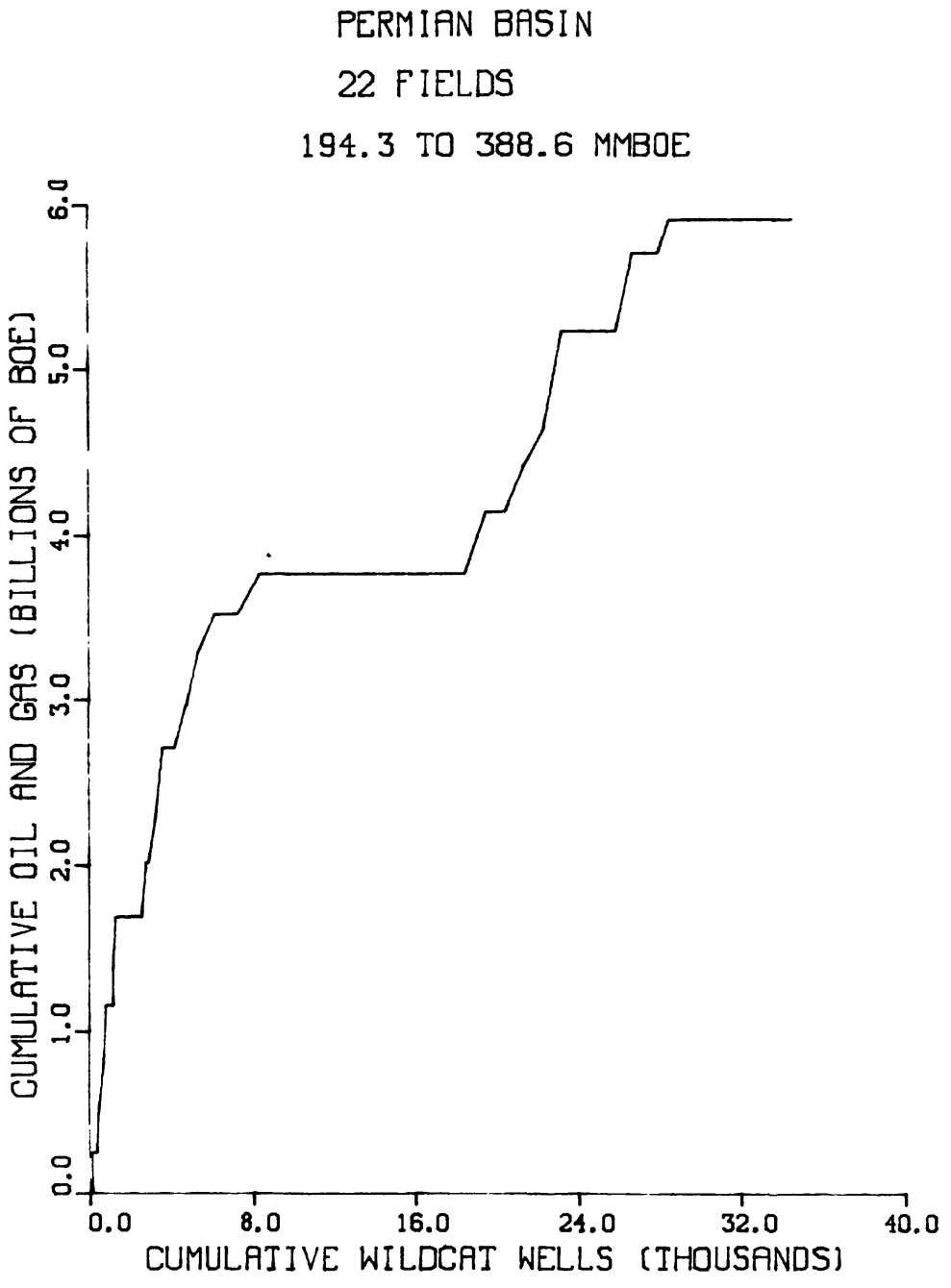

Figure 241.--Cumulative oil and gas vs. cumulative wells for fields in the size range 194.3-388.6 MMBOE.

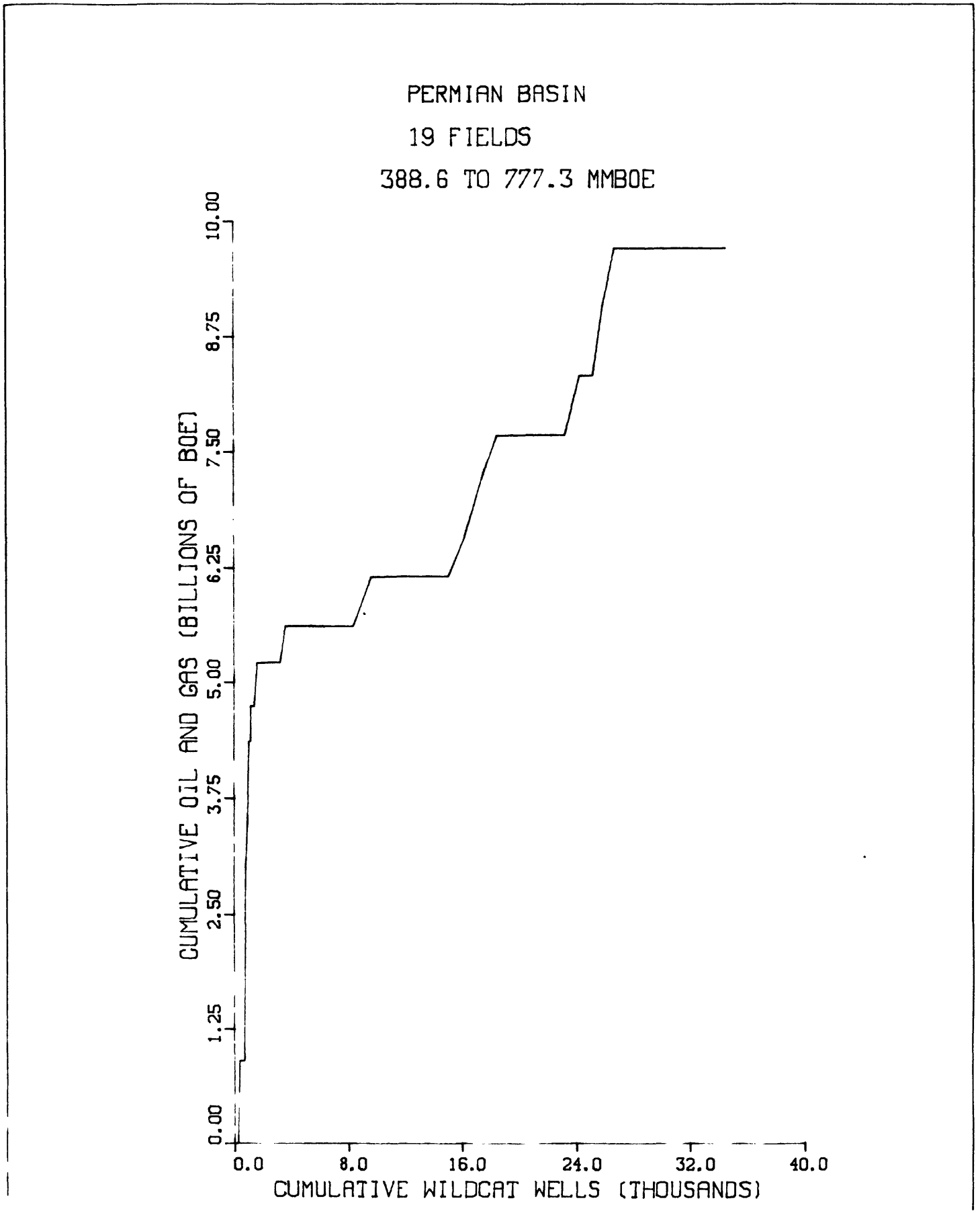

Figure 24m.--Cumulative oil and gas vs. cumulative wells for fields in the size range 388.6-777.3 MMBOE.

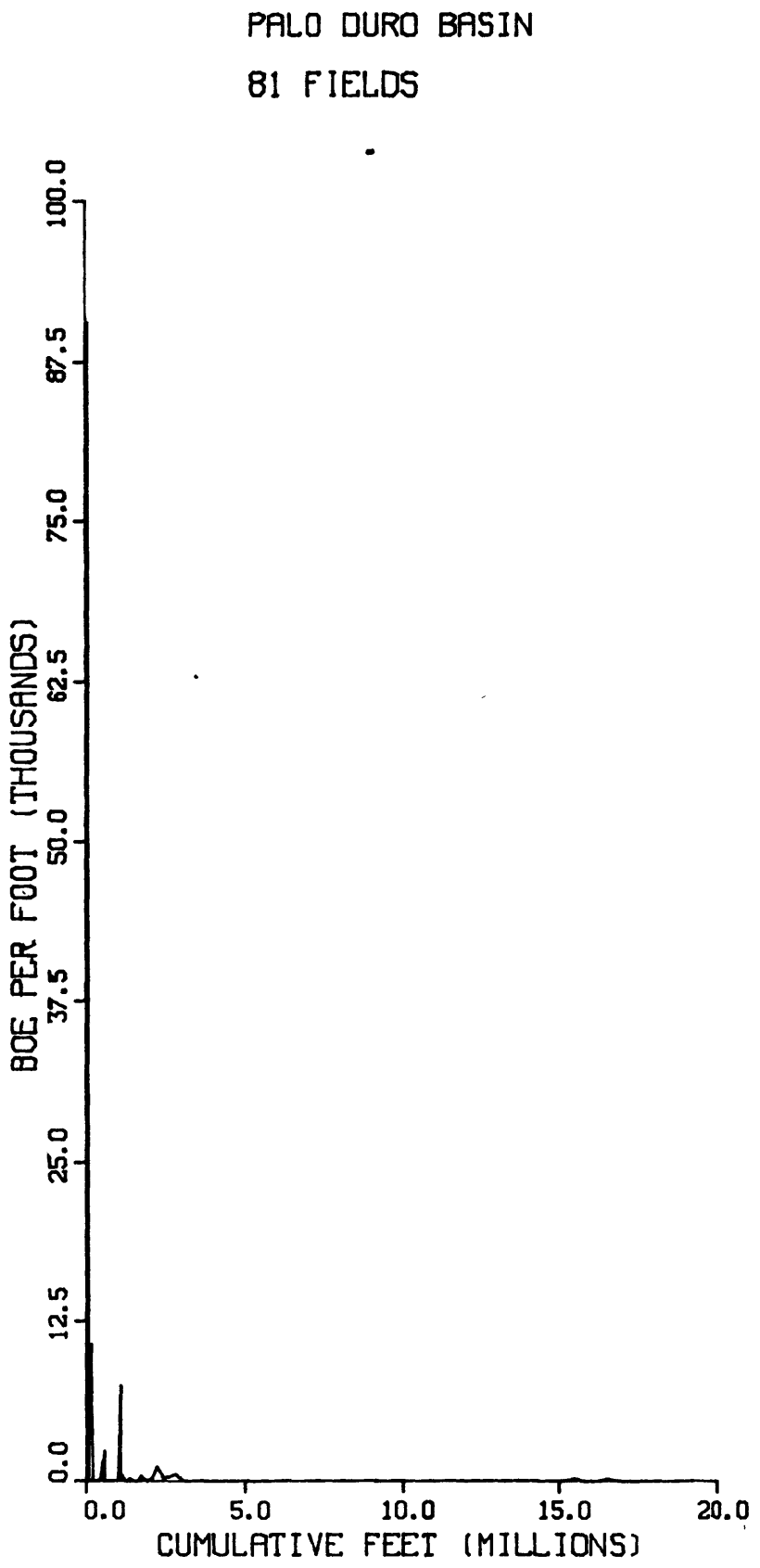

Figure 25a.--BOE per foot vs. cumulative footage drilled.

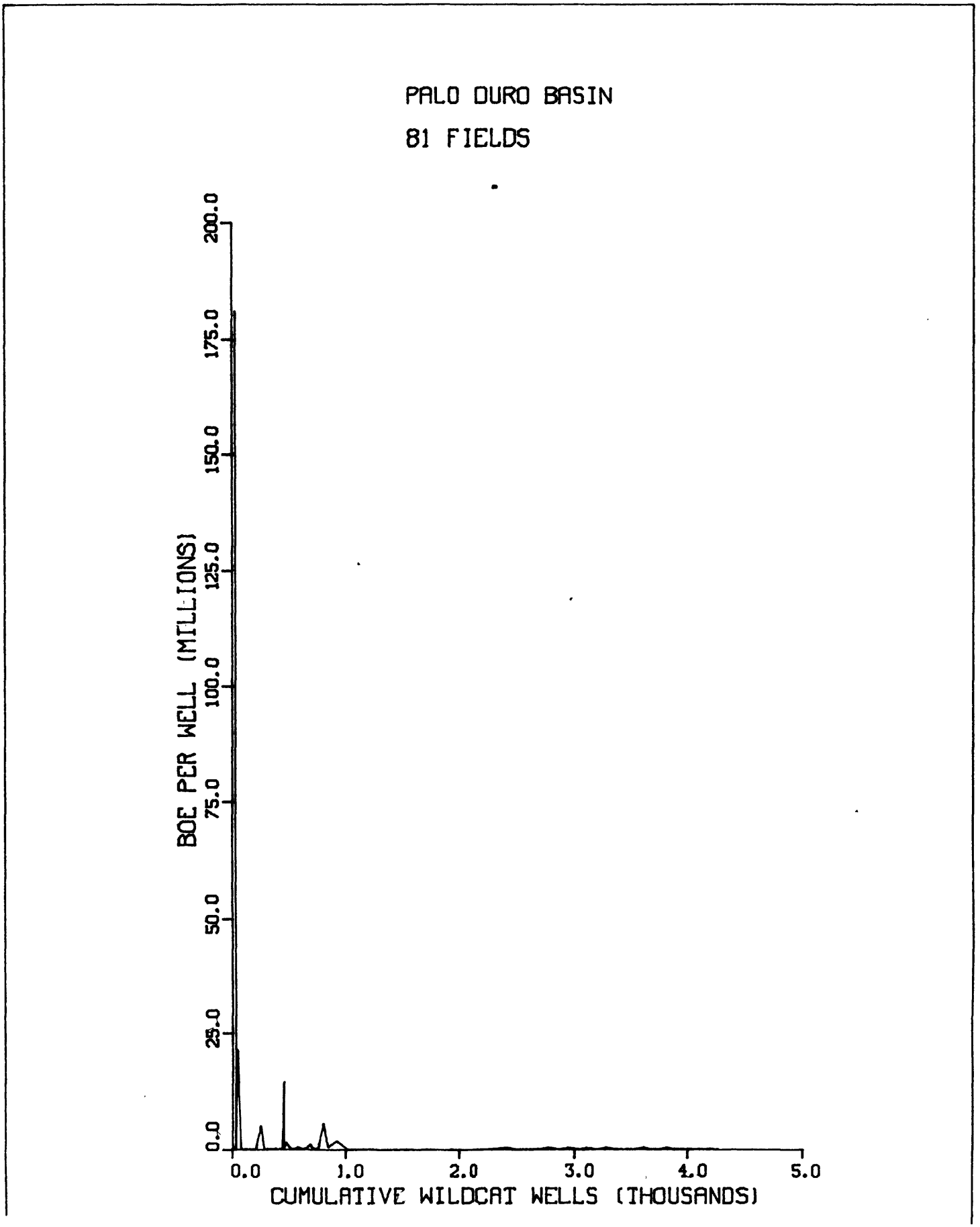

Figure 25b.--BOE per well vs. cumulative wells drilled.

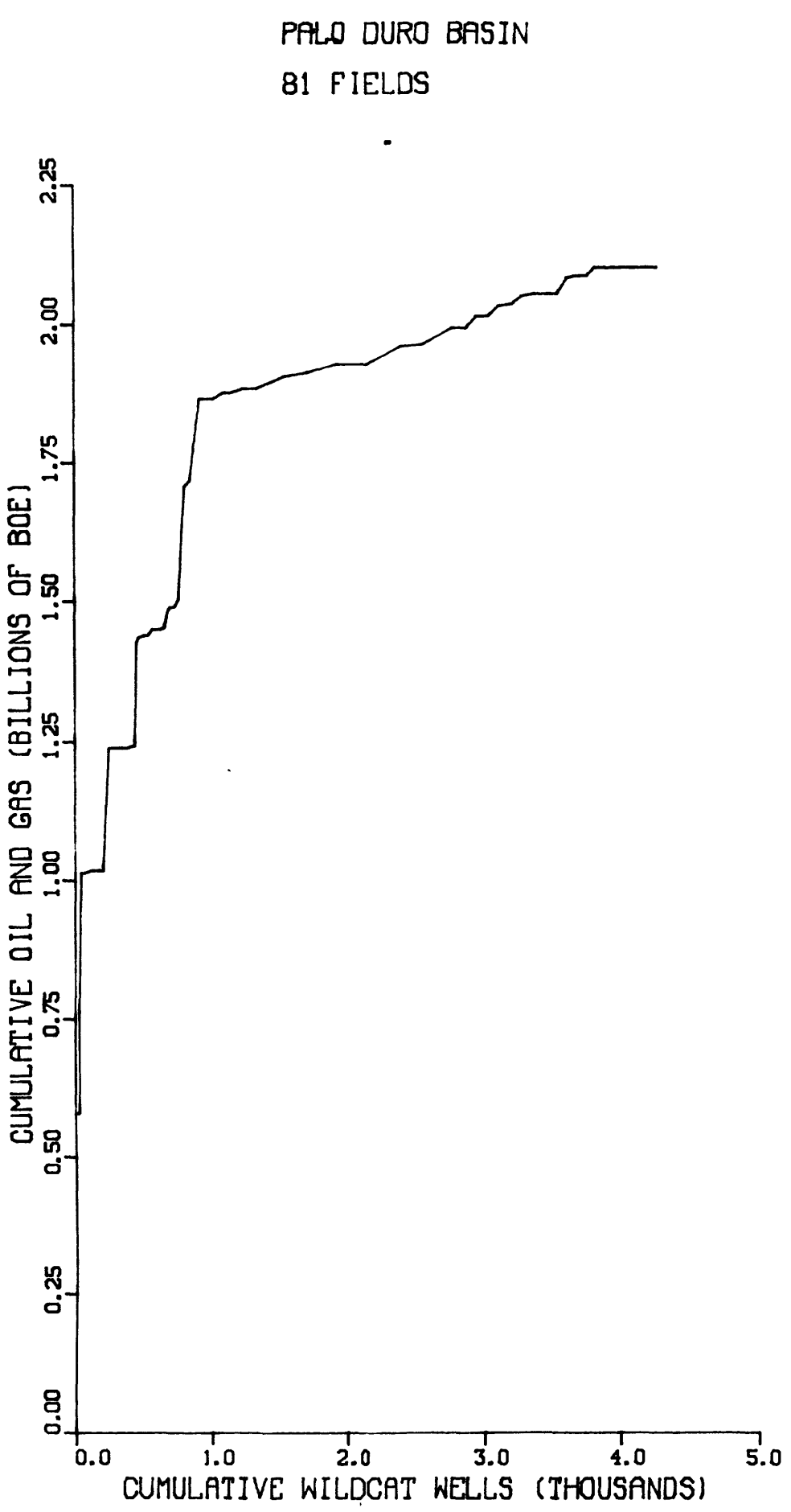

Figure 25c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

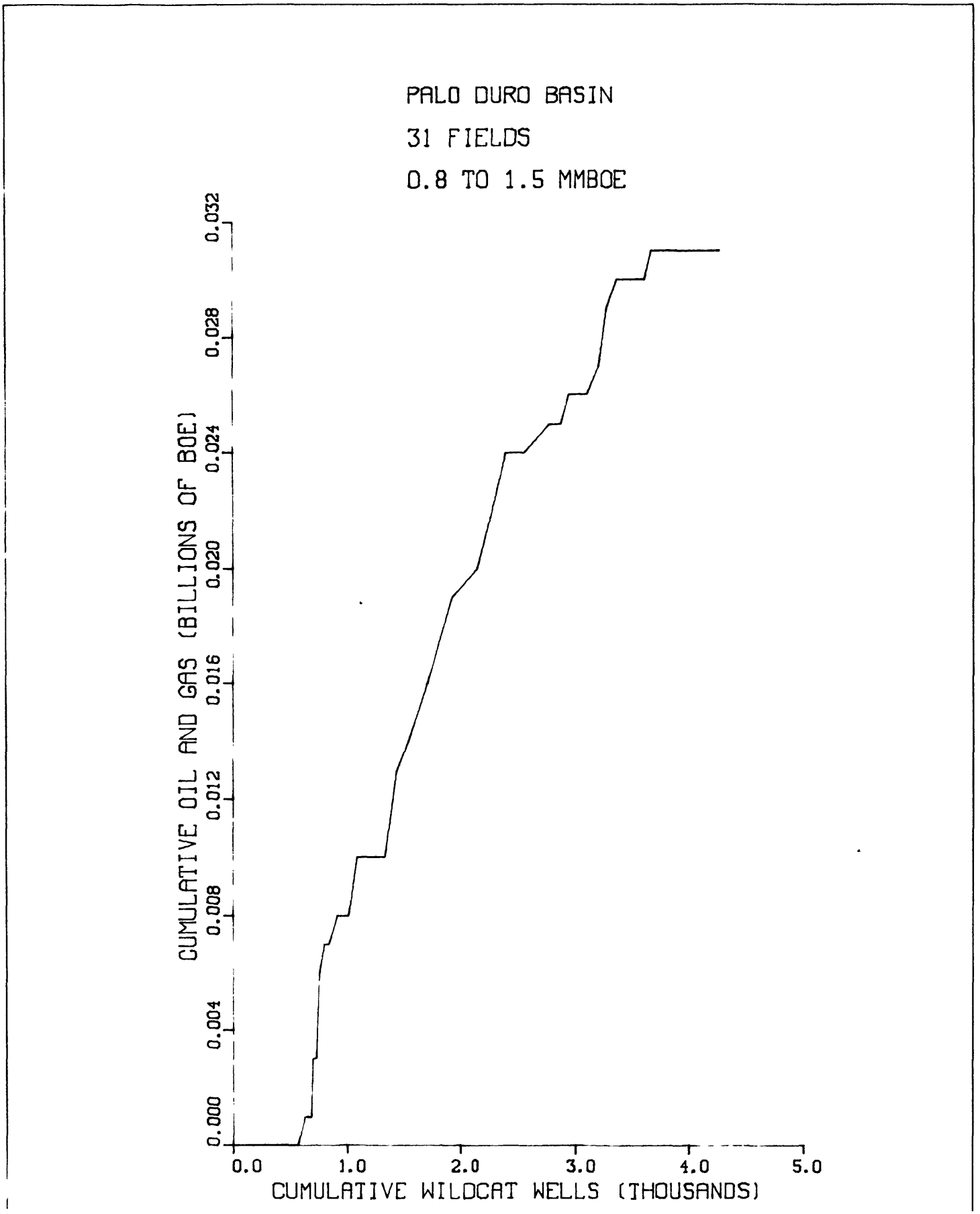

Figure 25d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

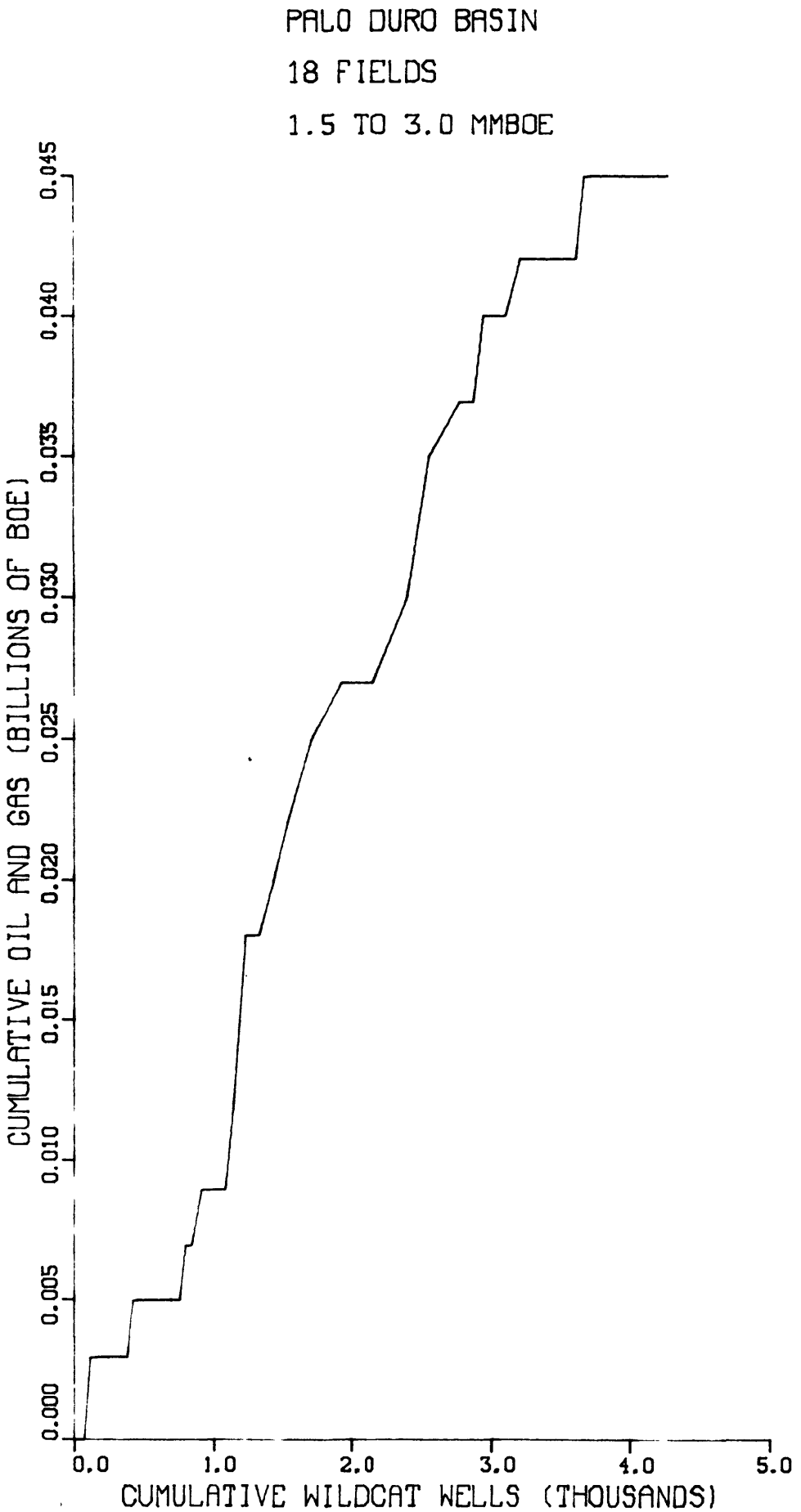

Figure 25e.—Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

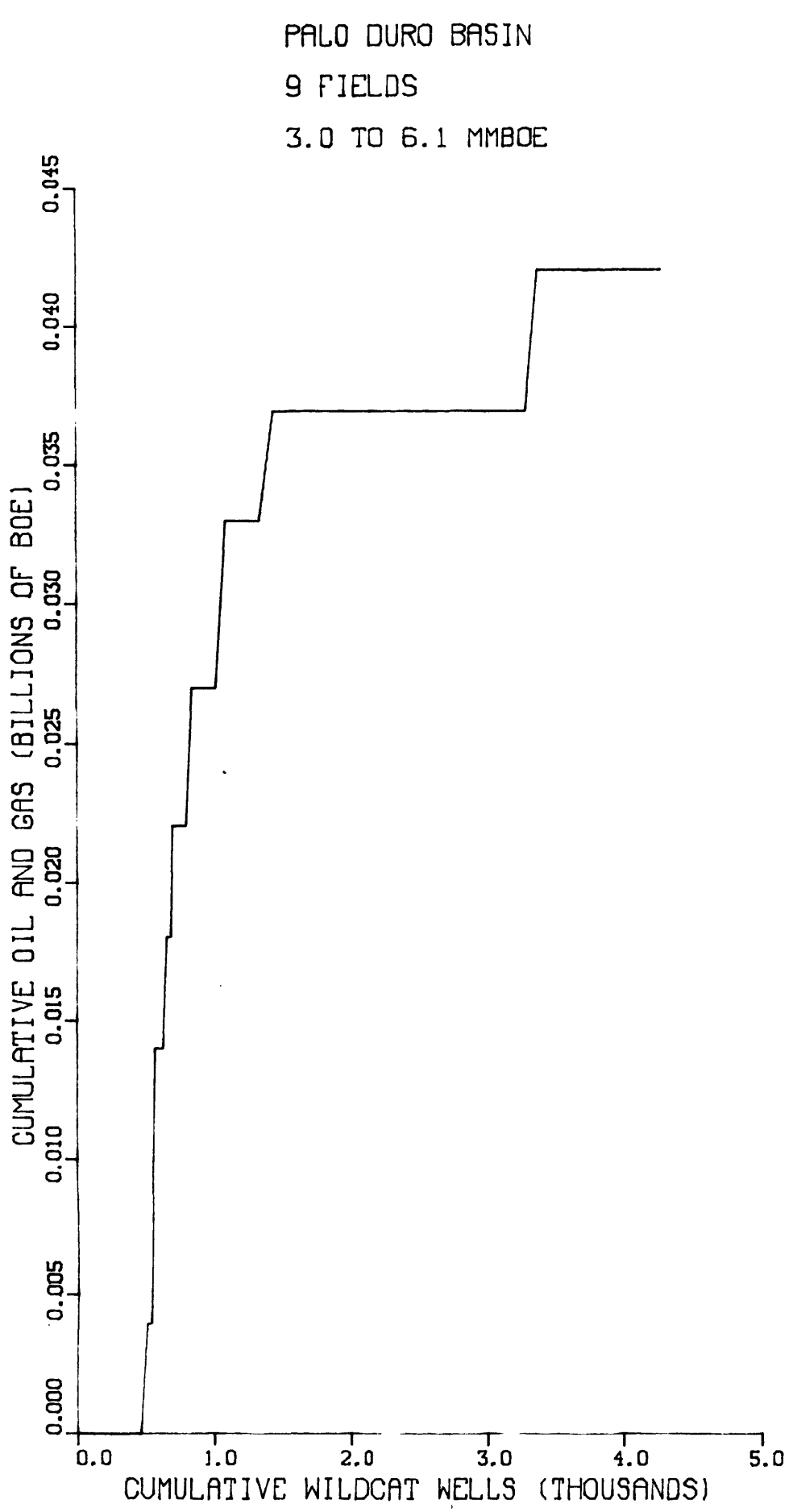

Figure 25f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

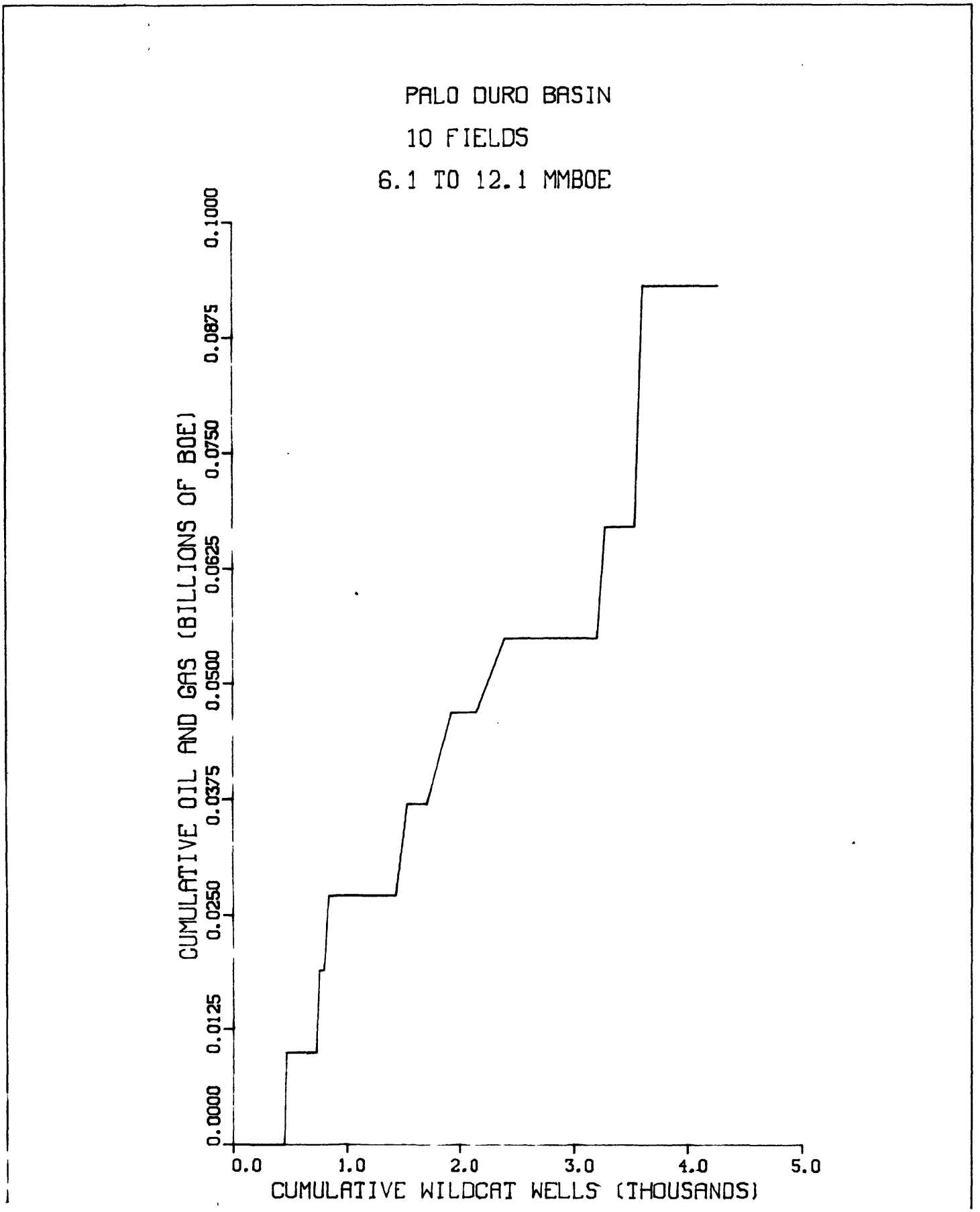

Figure 25g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

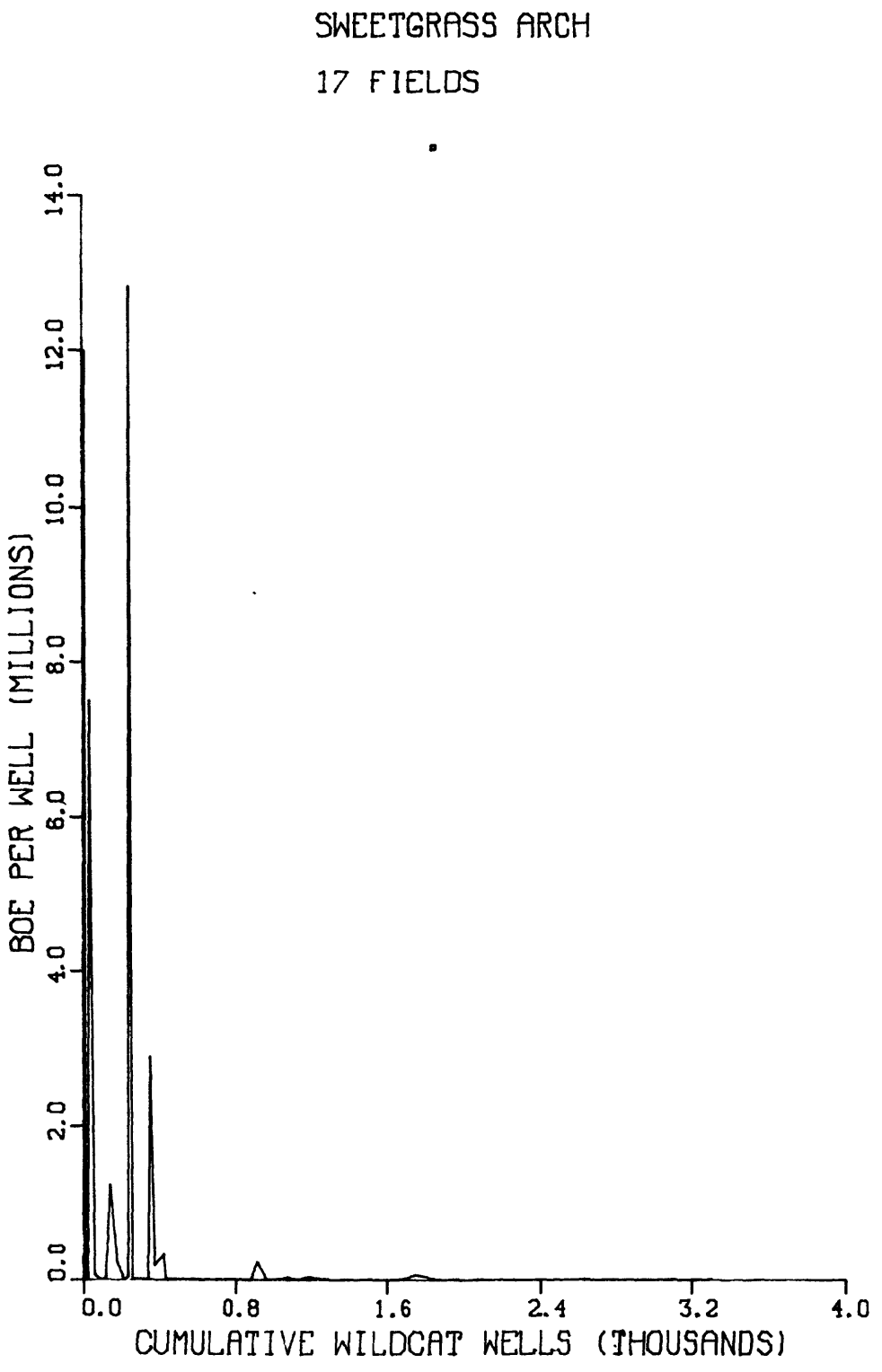

Figure 26a.--BOE per foot vs. cumulative footage drilled.

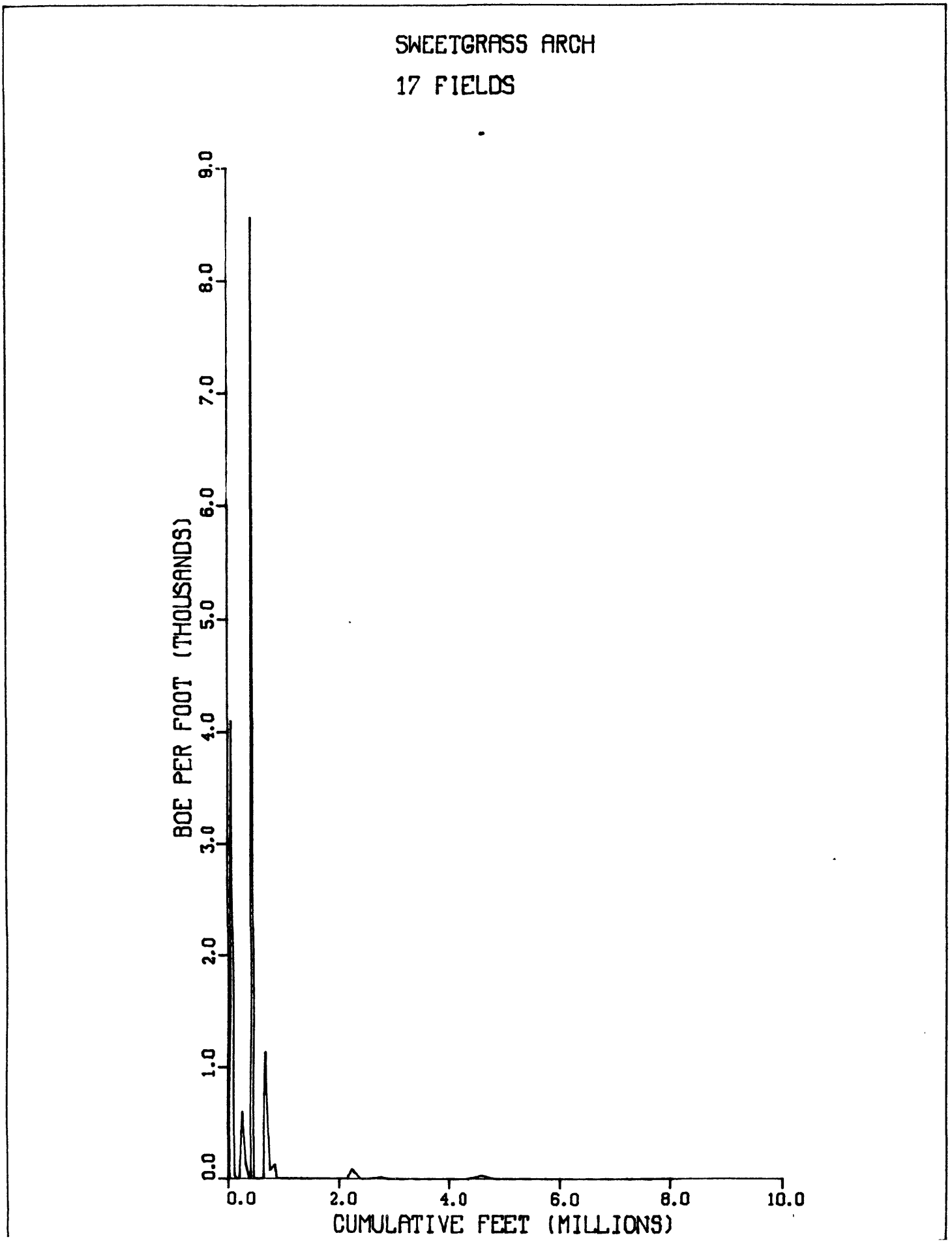

Figure 26b.--BOE per well vs. cumulative wells drilled.

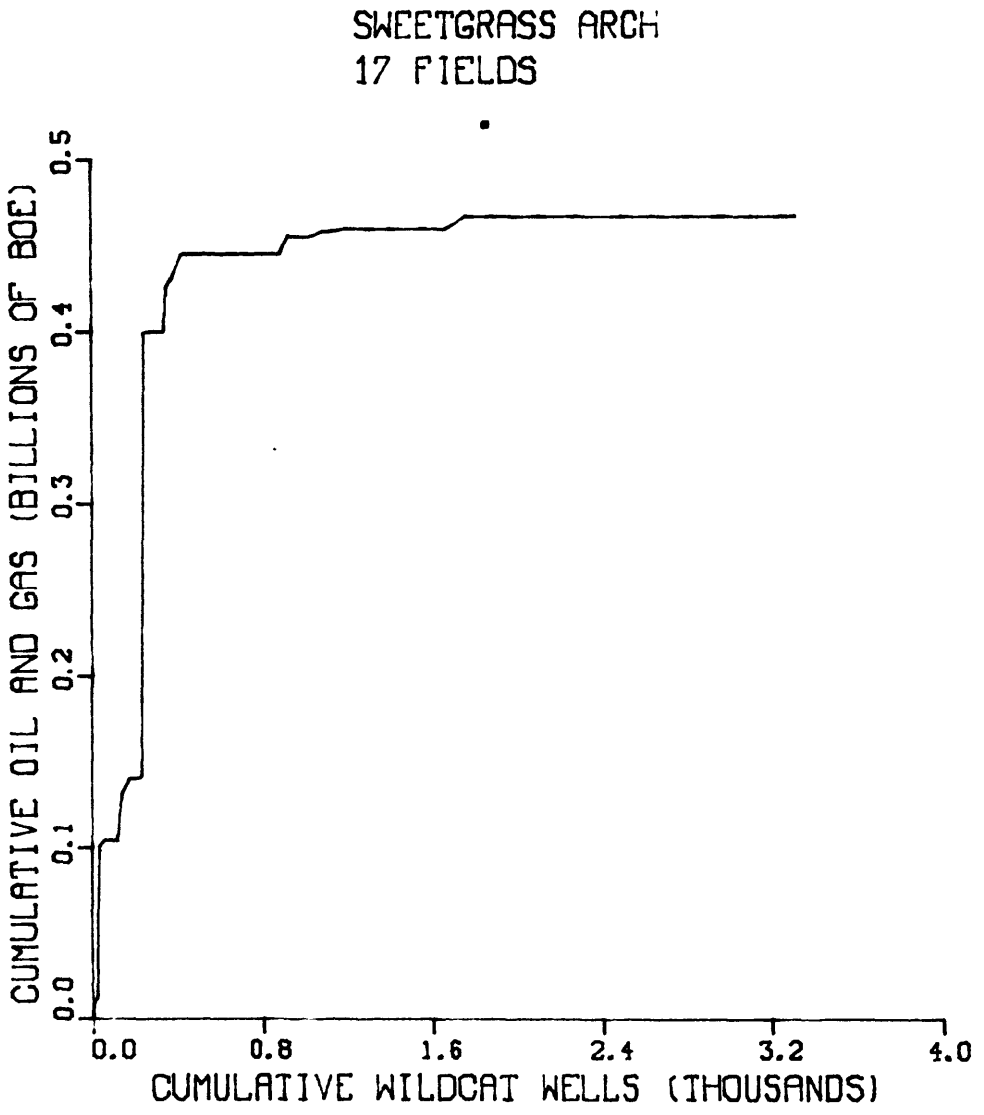

Figure 26c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

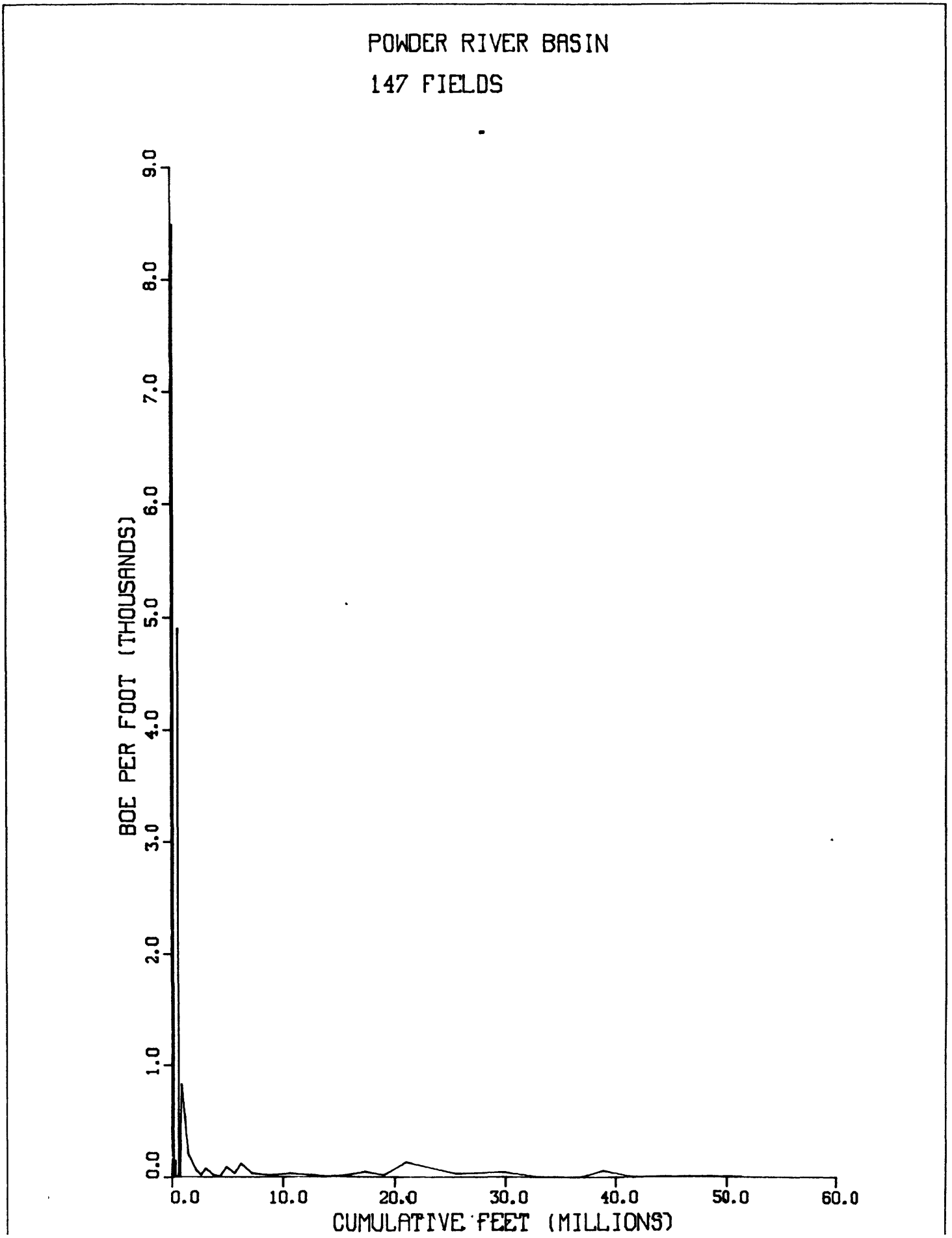

Figure 27a.--BOE per foot vs. cumulative footage drilled.

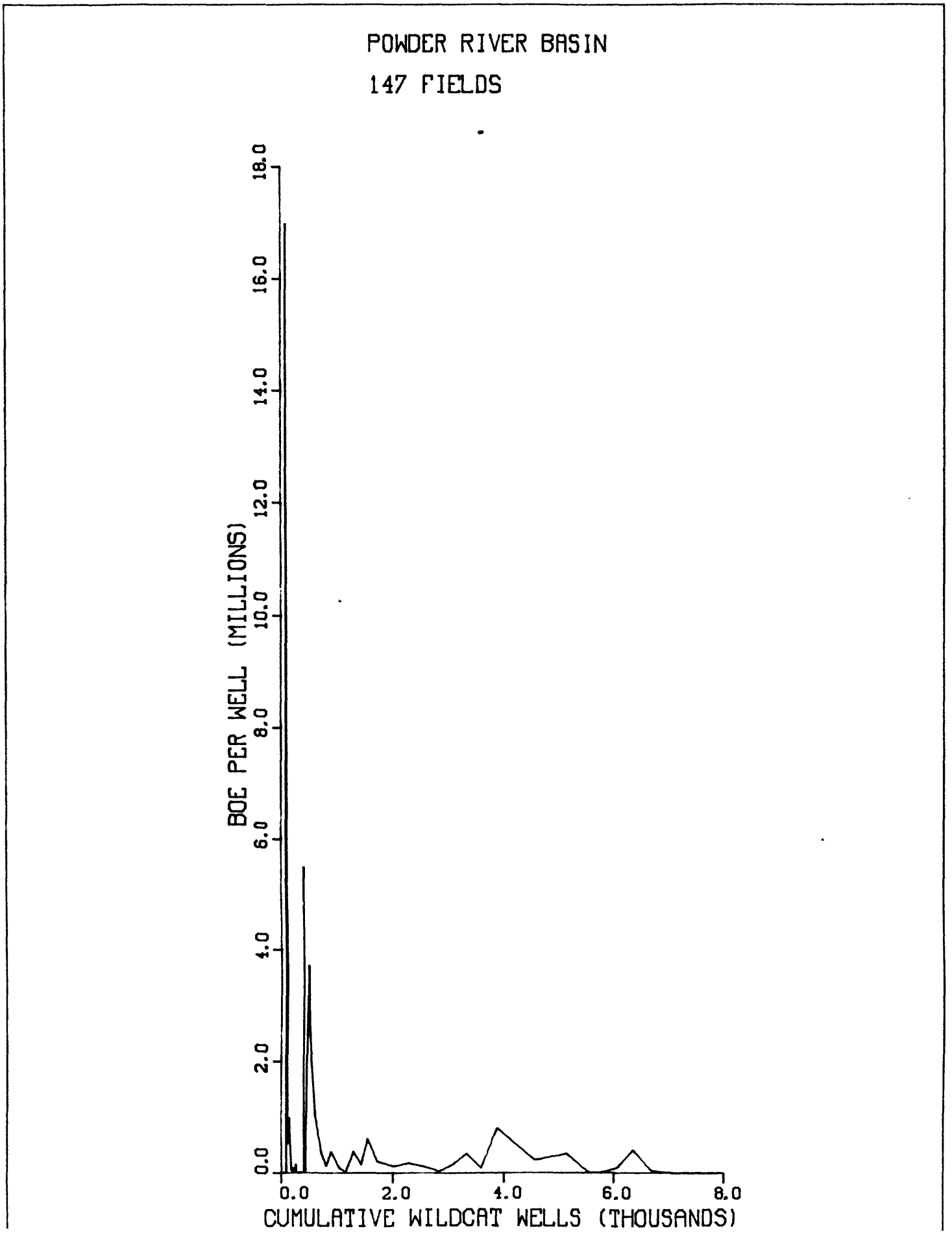

Figure 27b.--BOE per well vs. cumulative wells drilled.

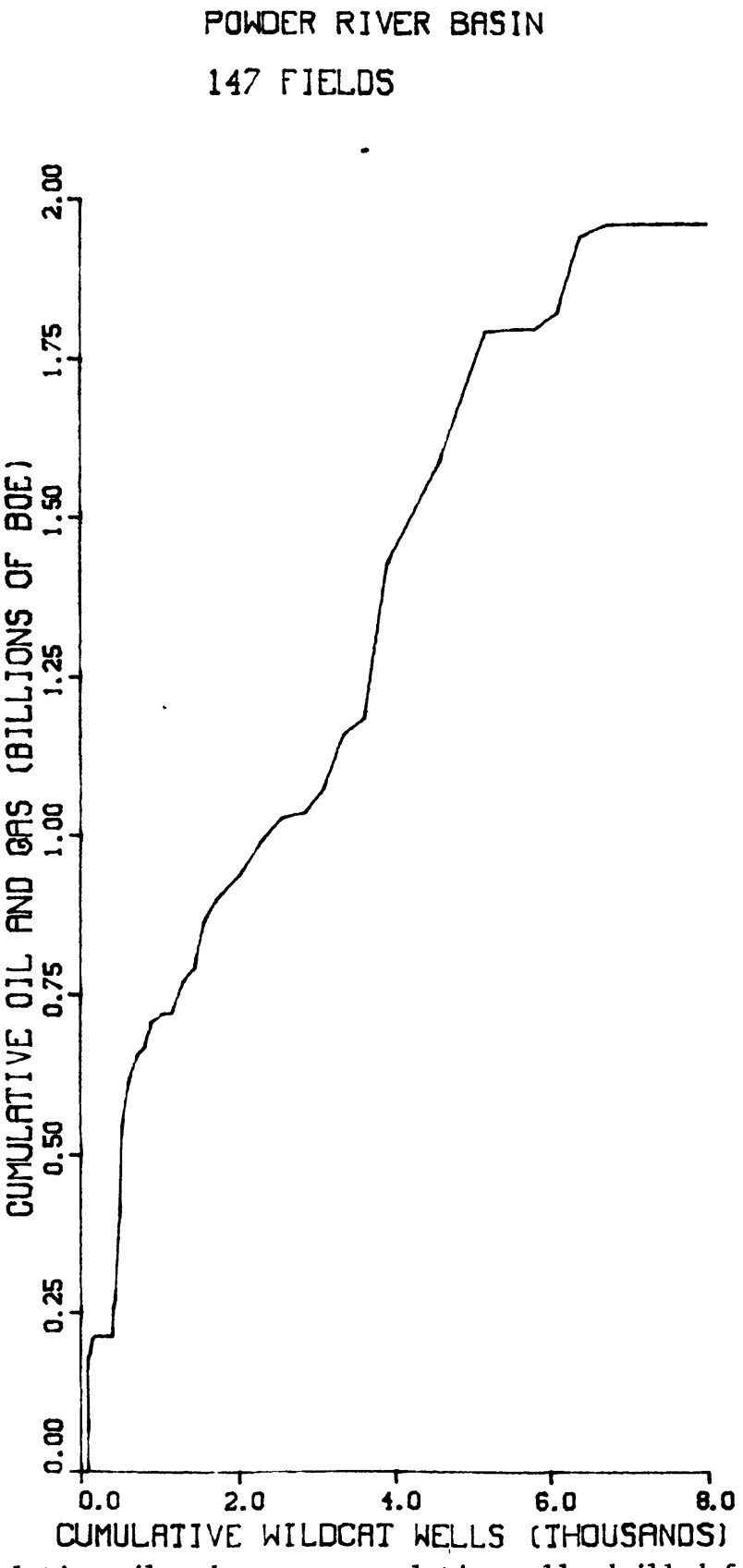

Figure 27c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

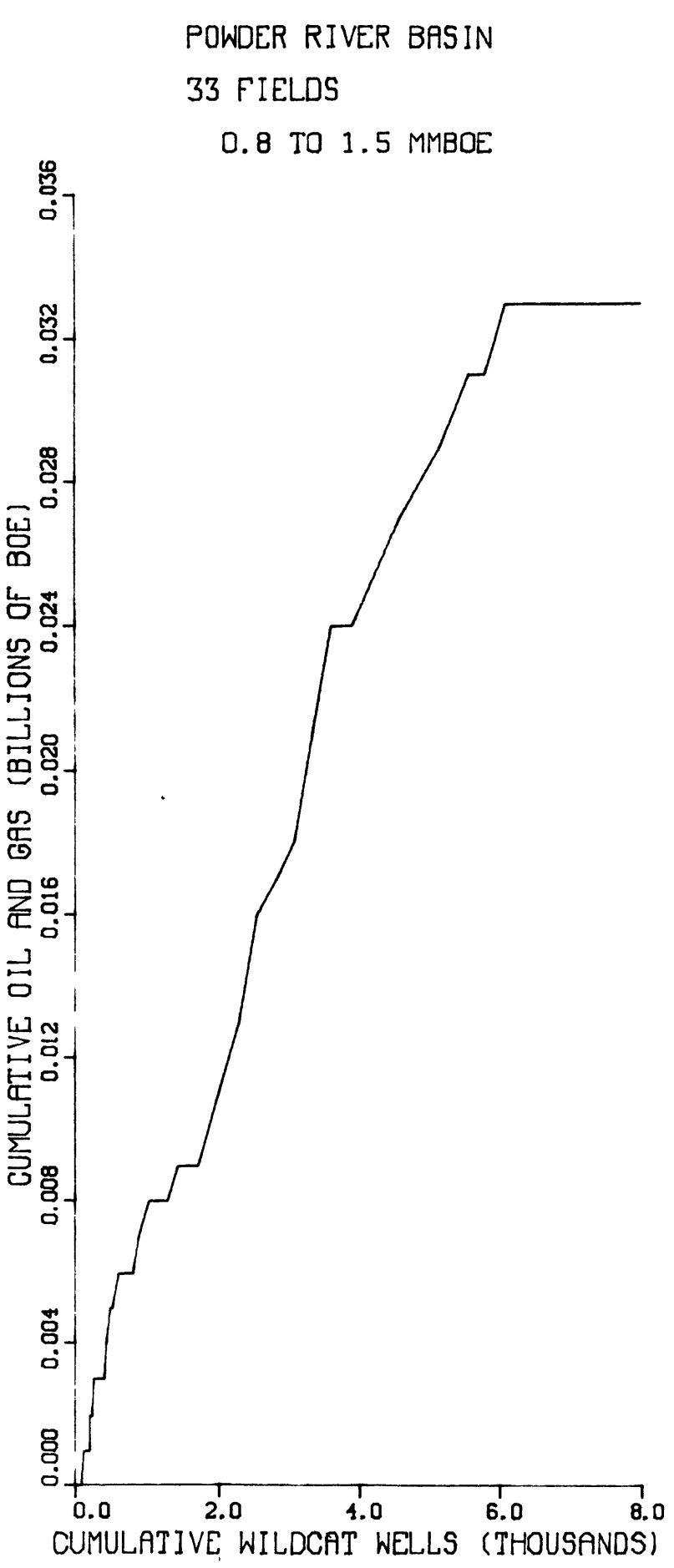

Figure 27d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

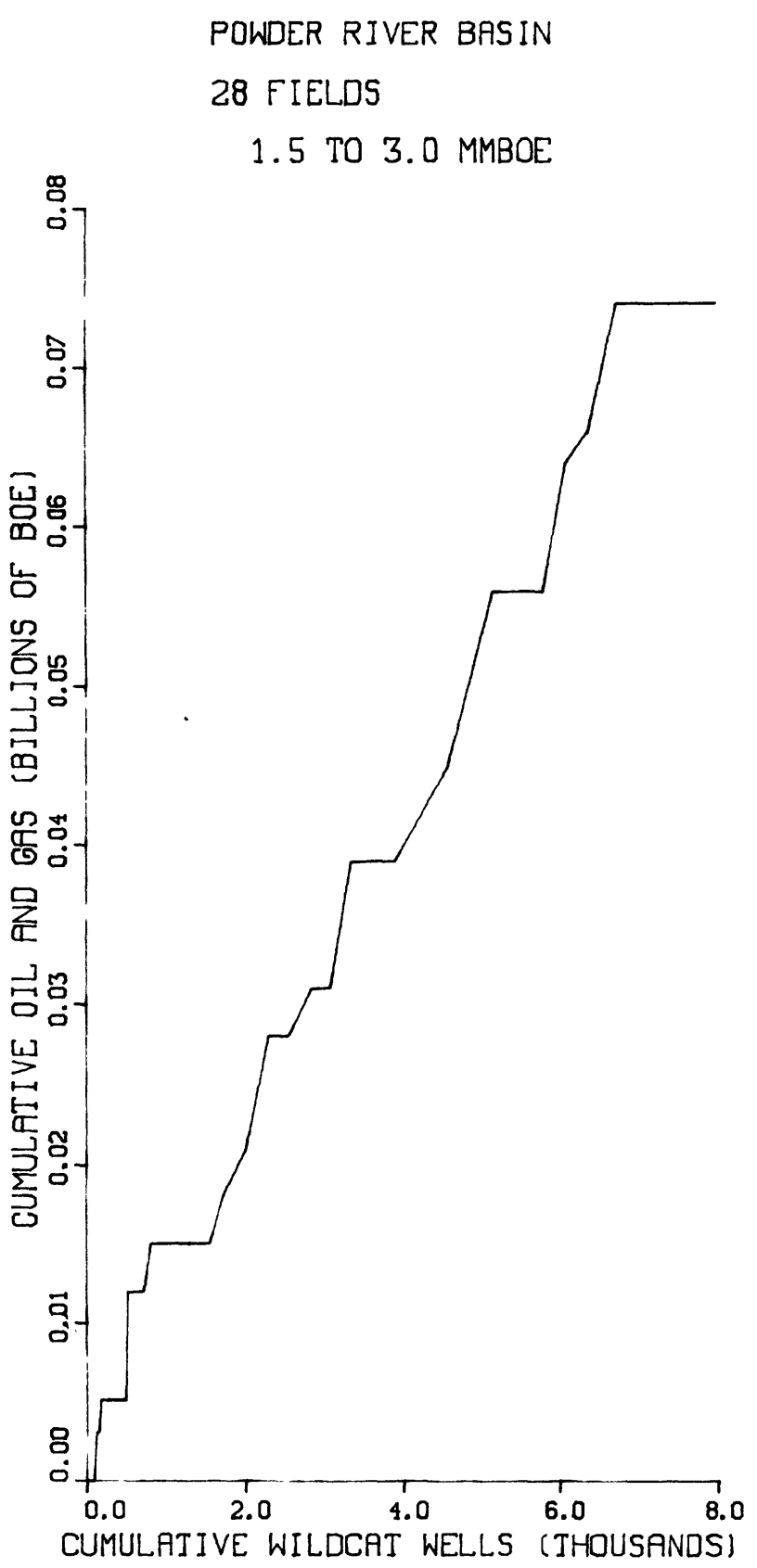

Figure 27e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

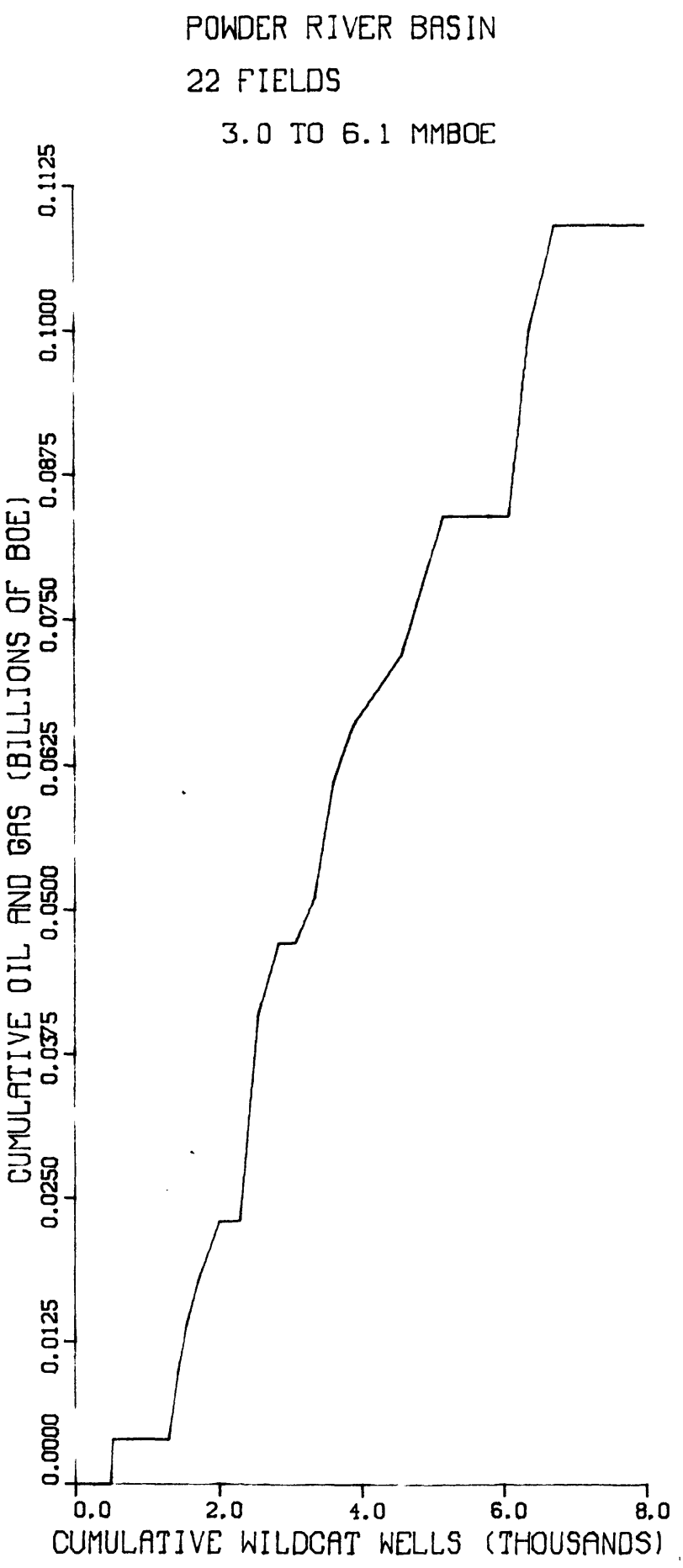

Figure 27f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

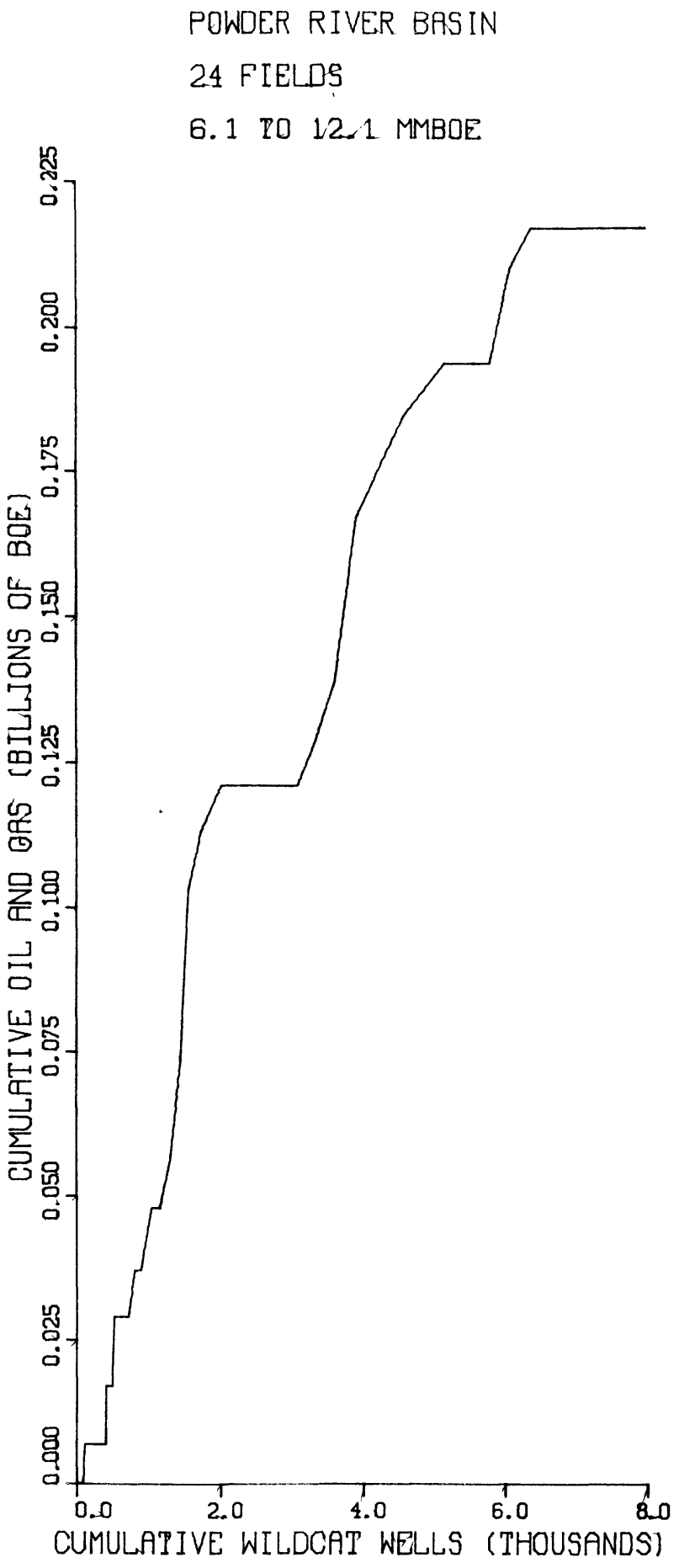

Figure 27g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

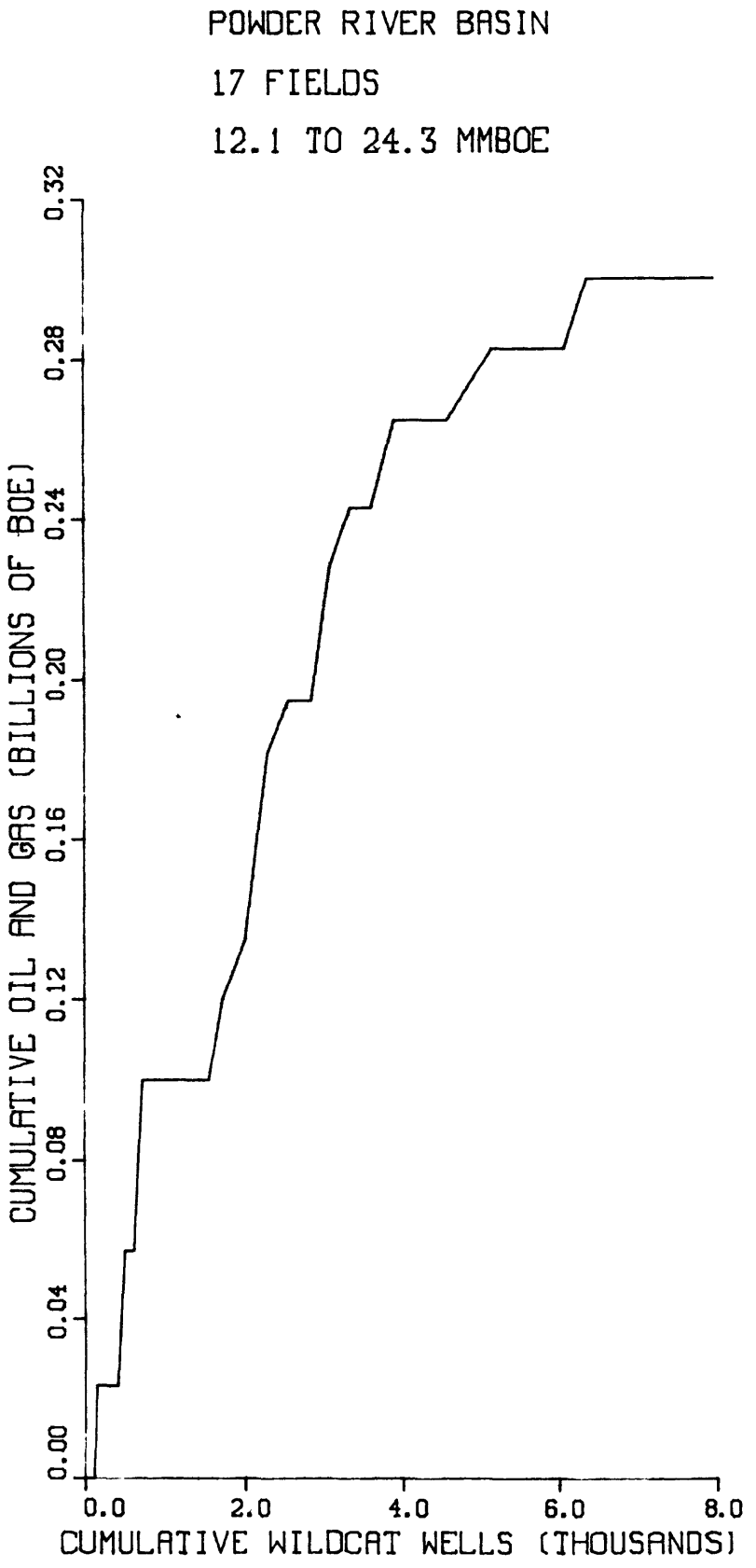

Figure 27h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

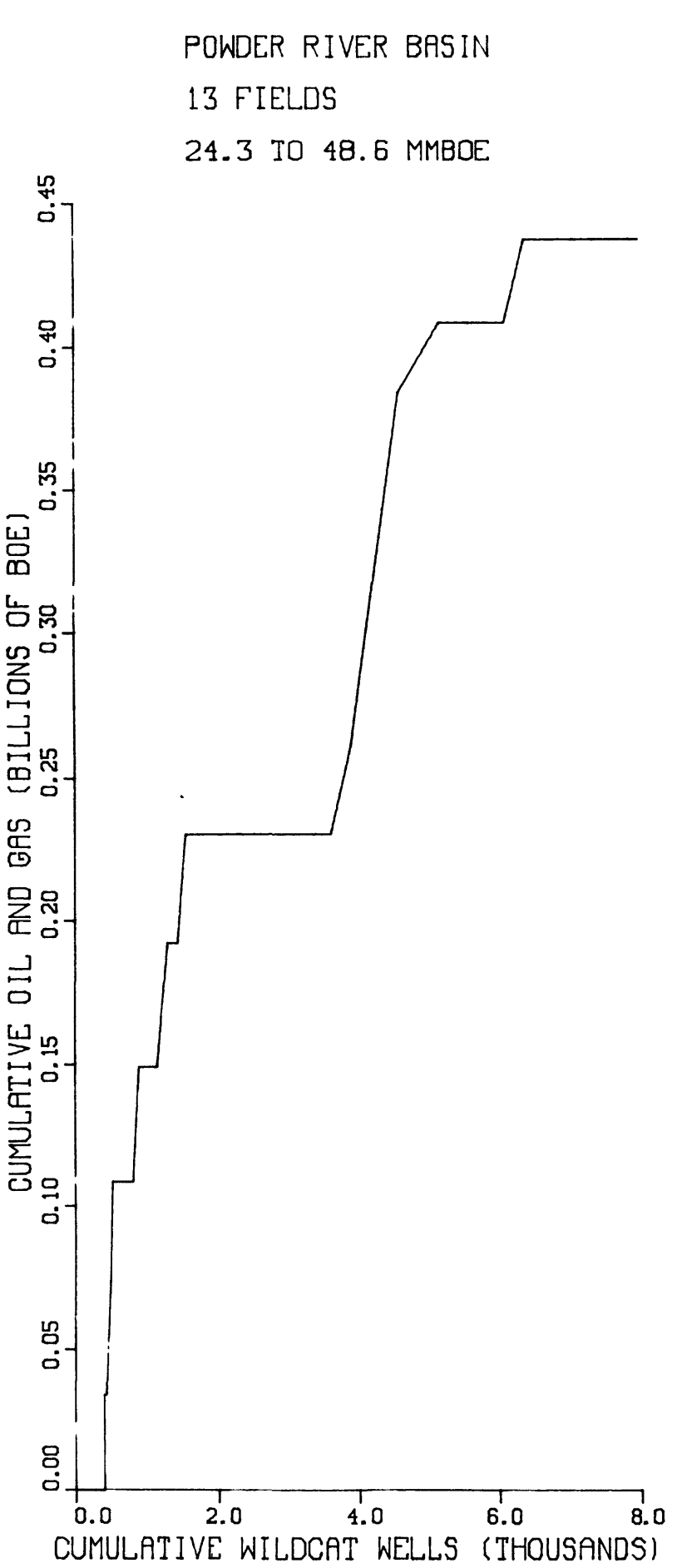

Figure 27i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

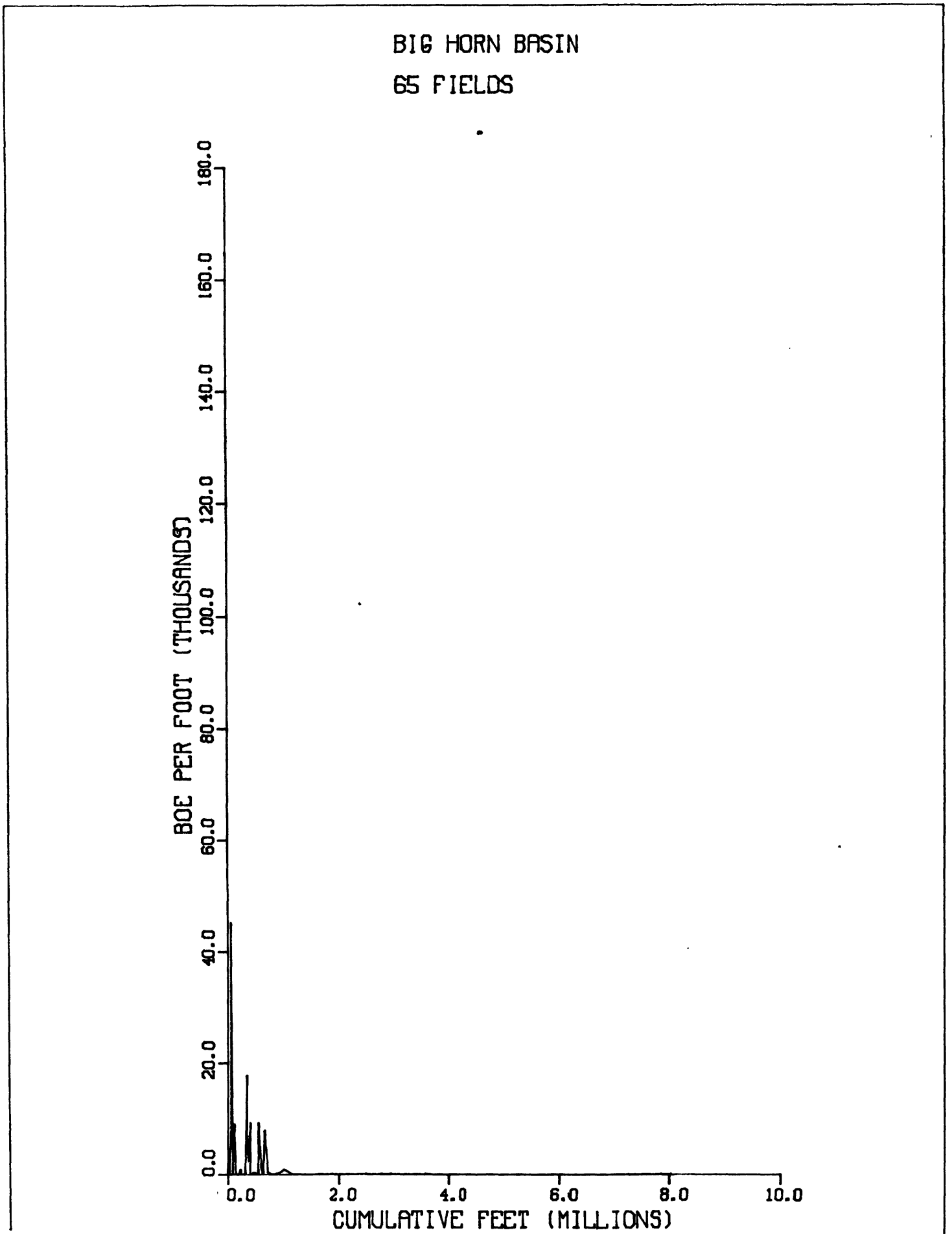

Figure 28a.--BOE per foot vs. cumulative footage drilled.

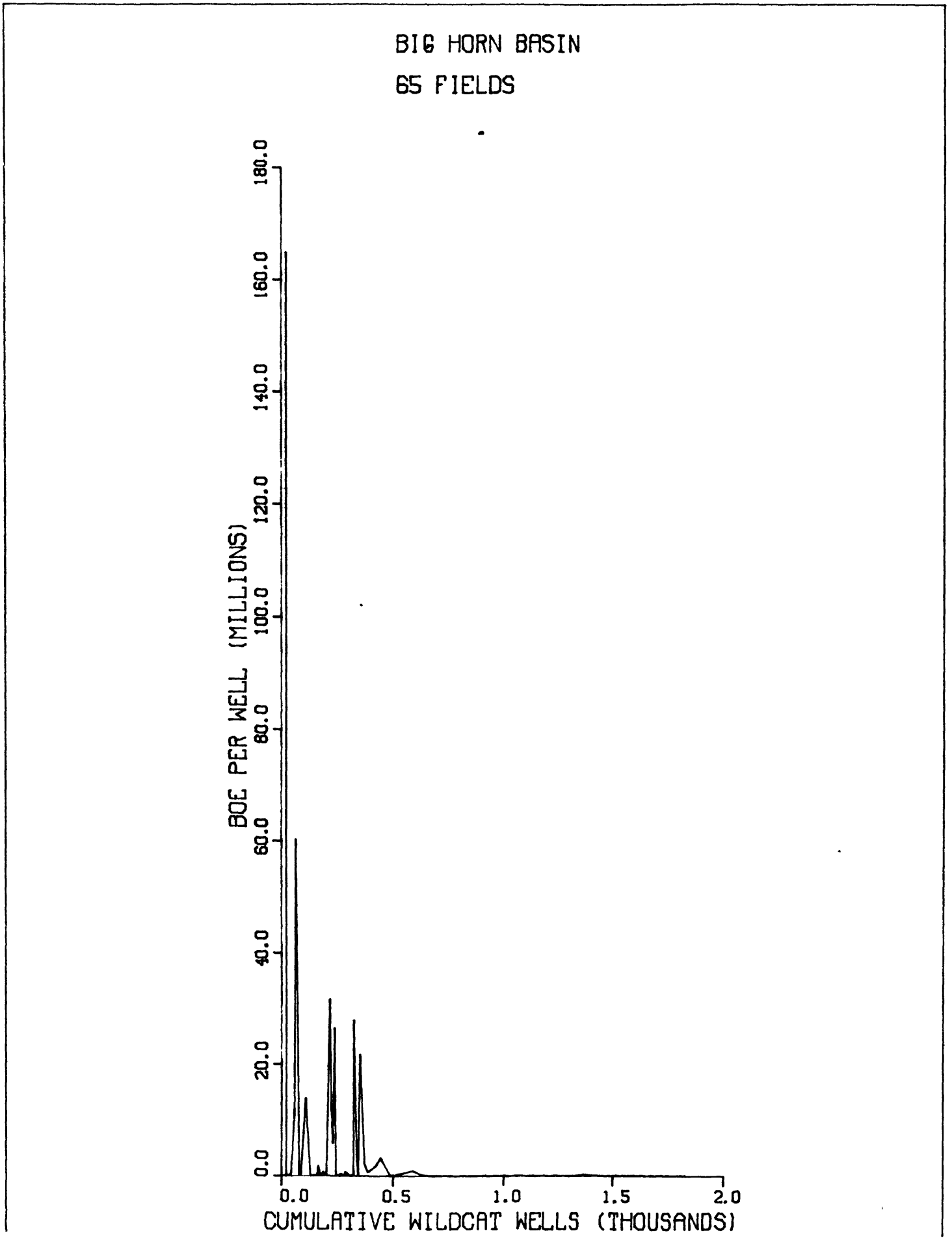

Figure 28b.--BOE per well vs. cumulative wells drilled.

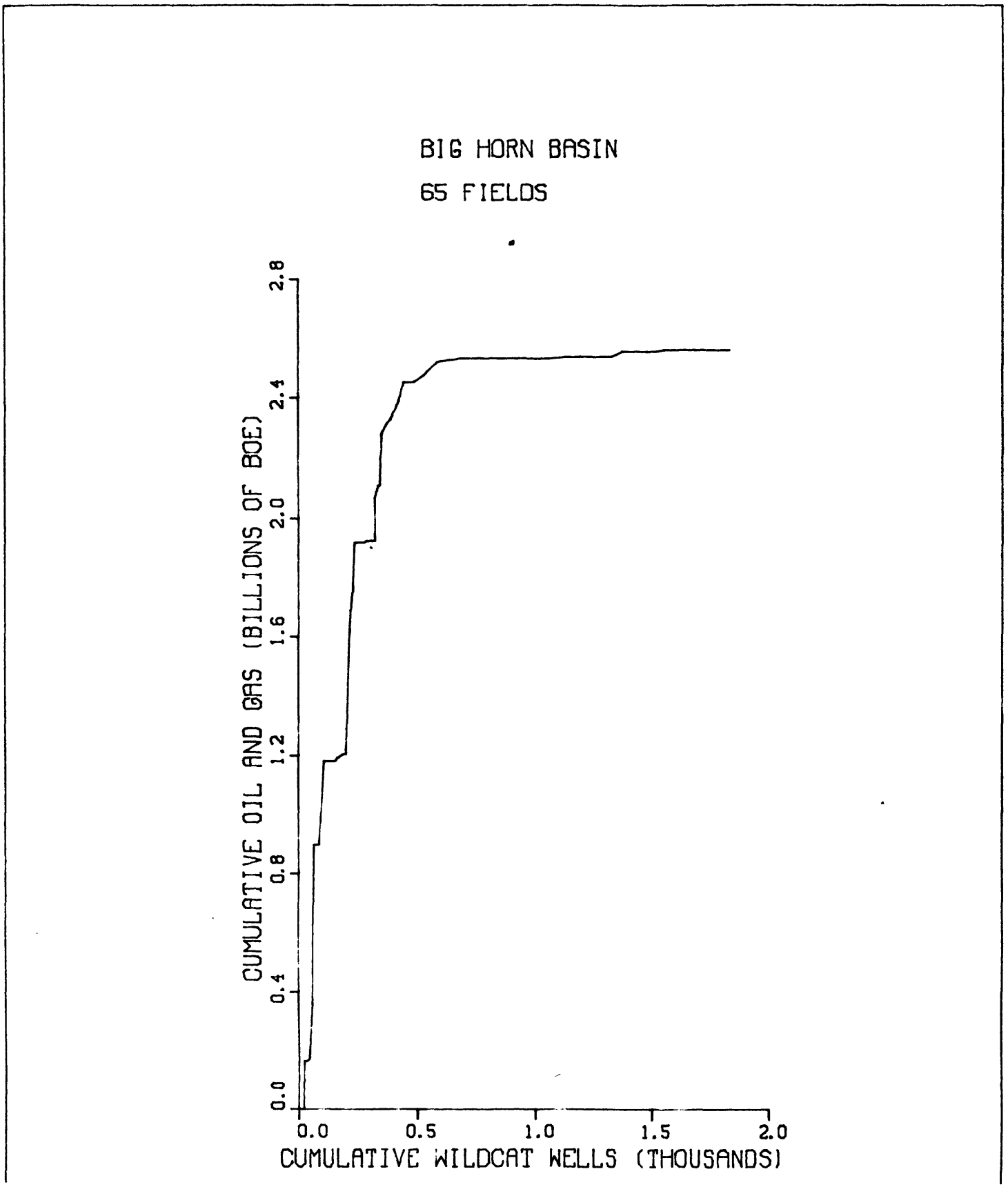

Figure 28c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

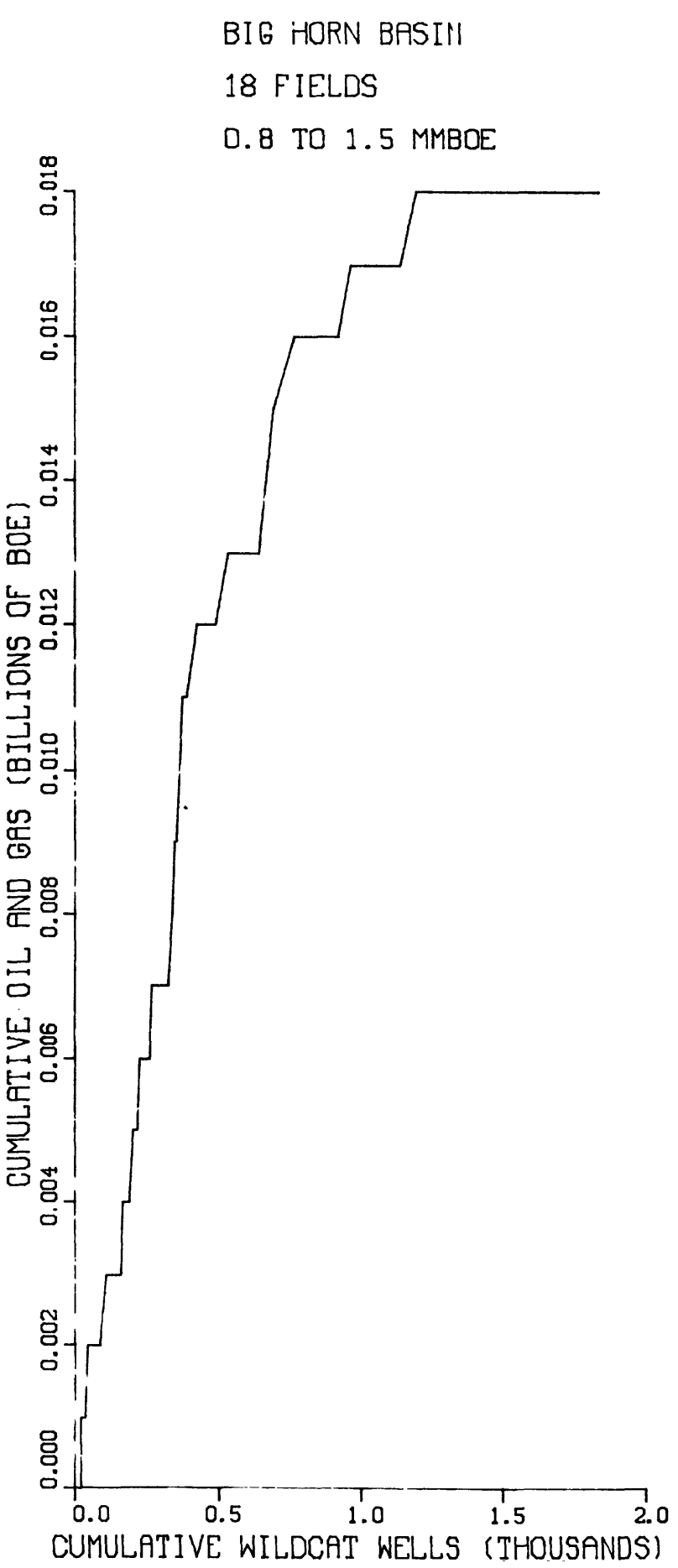

Figure 28d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

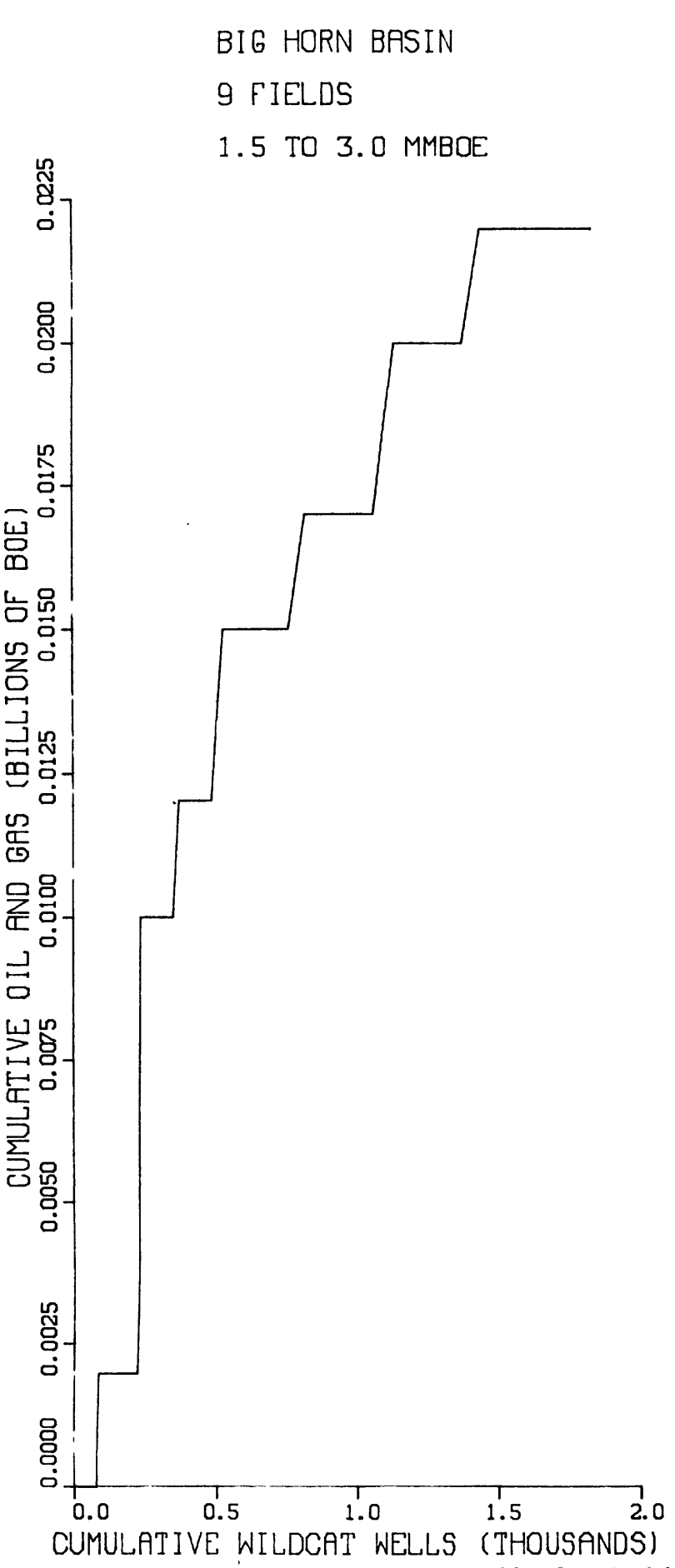

Figure 28e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

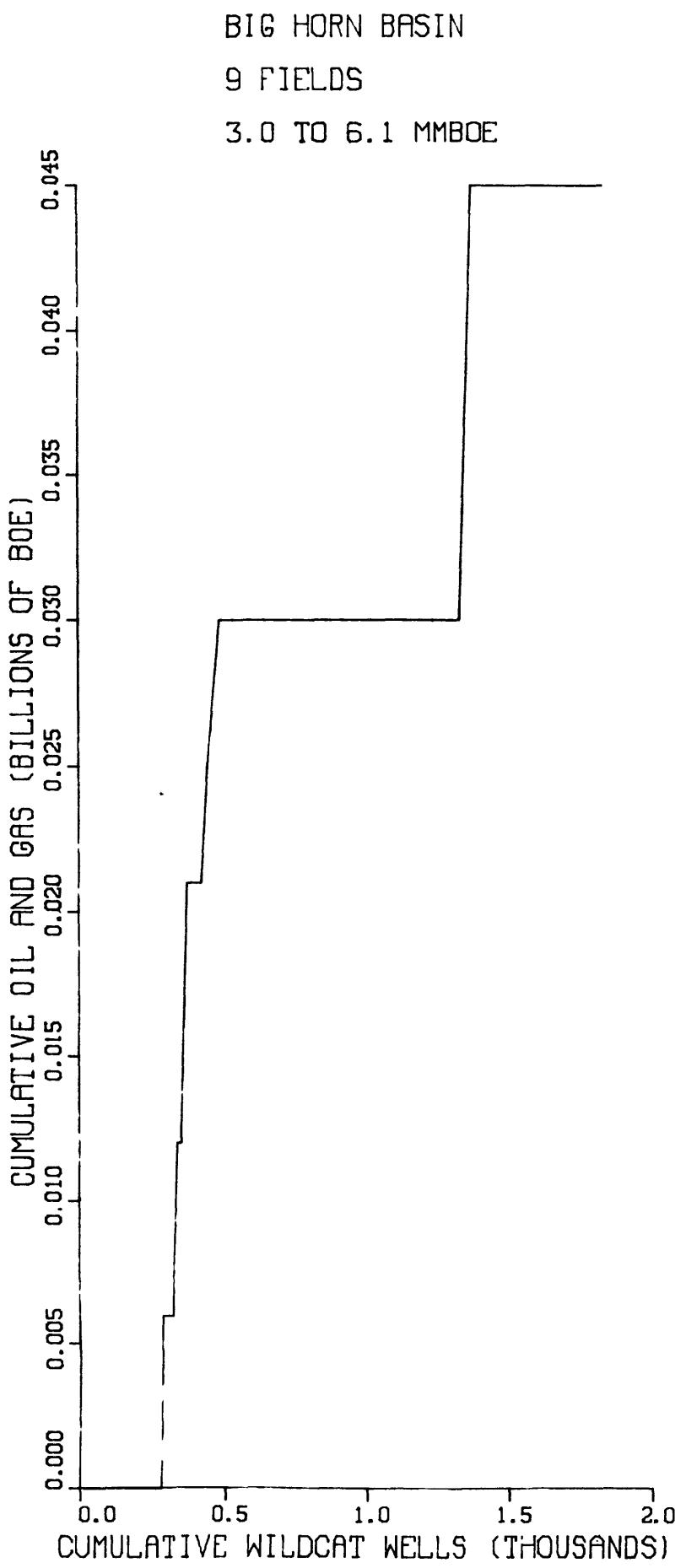

Figure 28f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

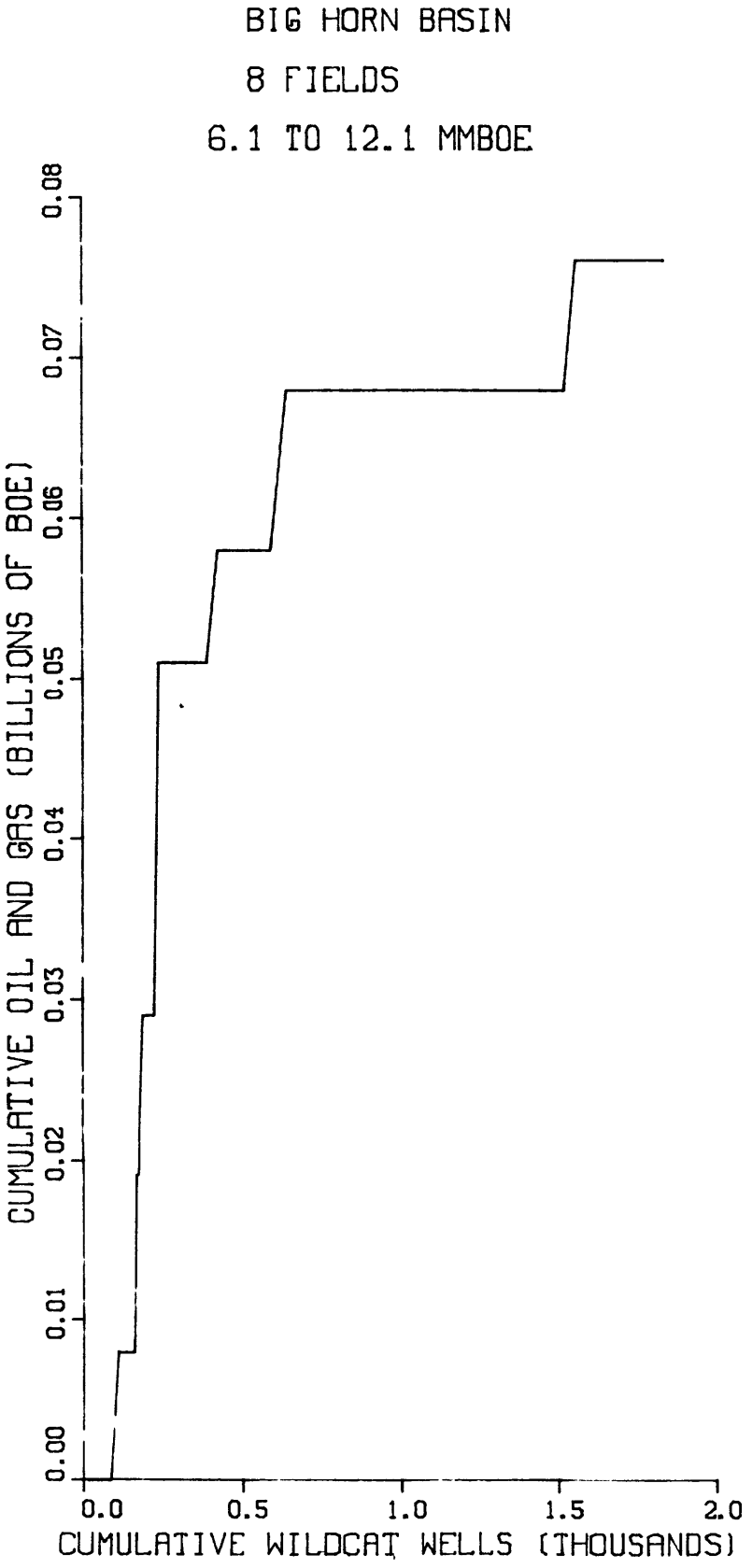

Figure 28g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

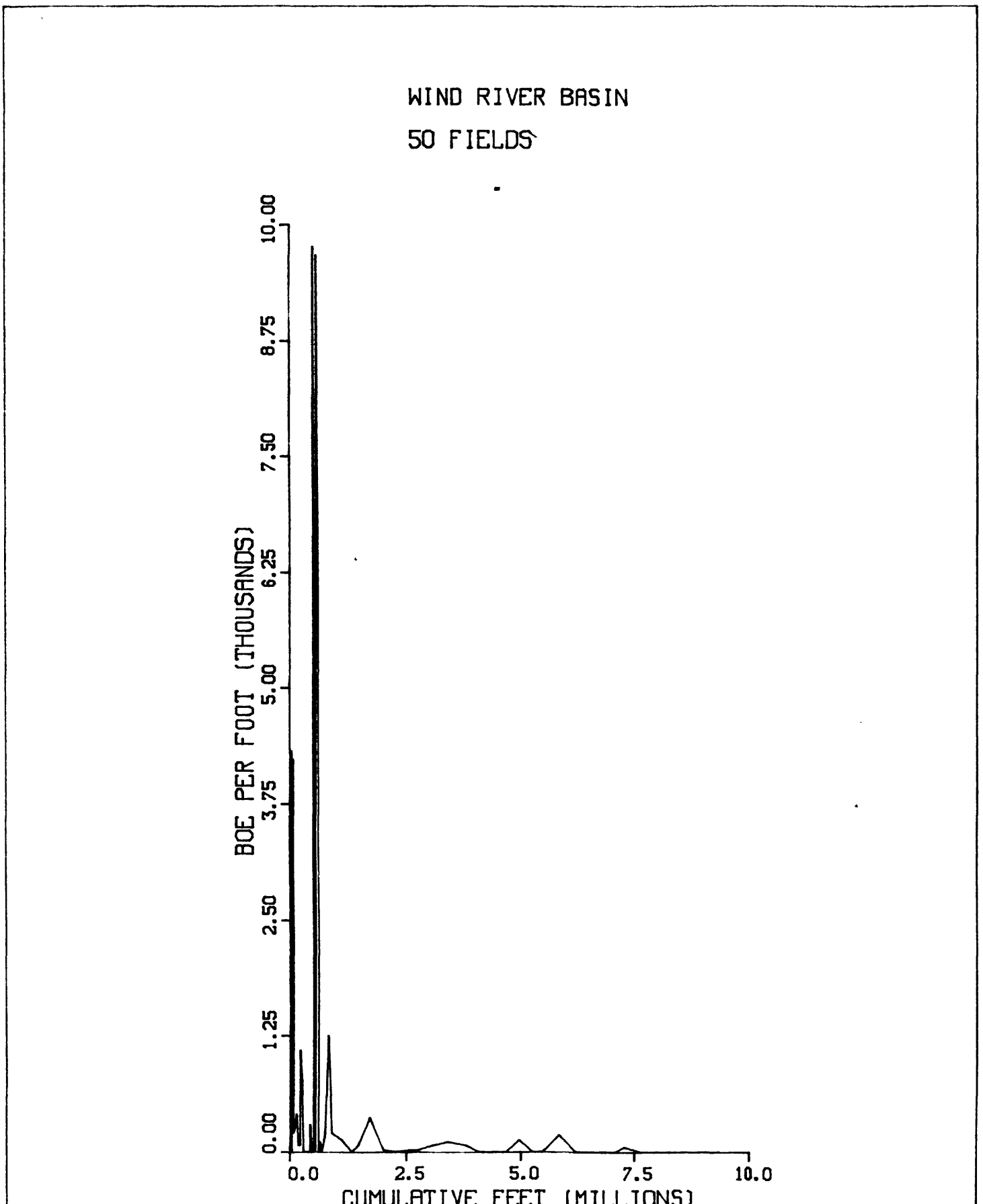

Figure 29a.--BOE per foot vs. cumulative footage drilled.

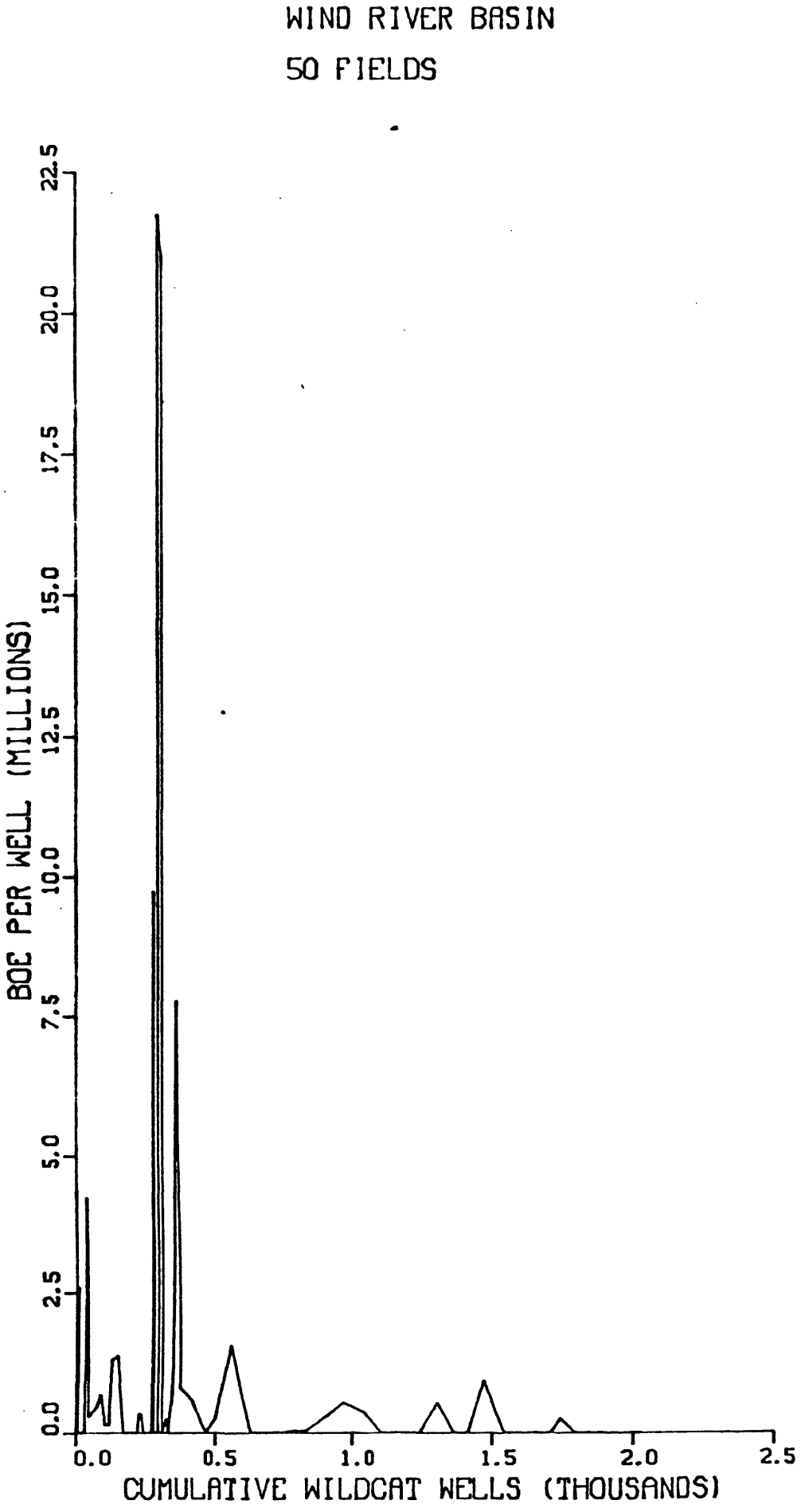

Figure 29b.--BOE per well vs. cumulative wells drilled.

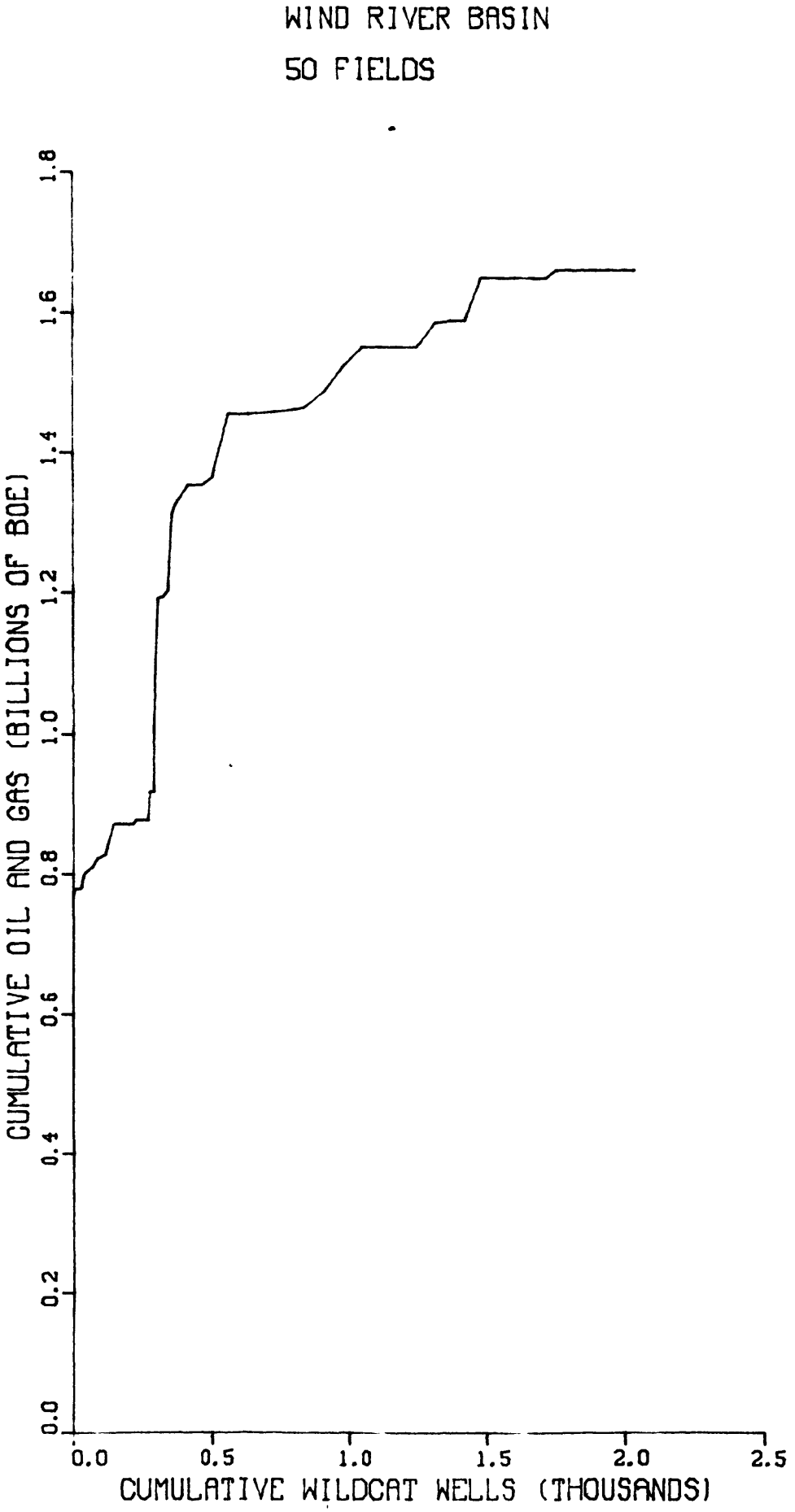

Figure 29c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

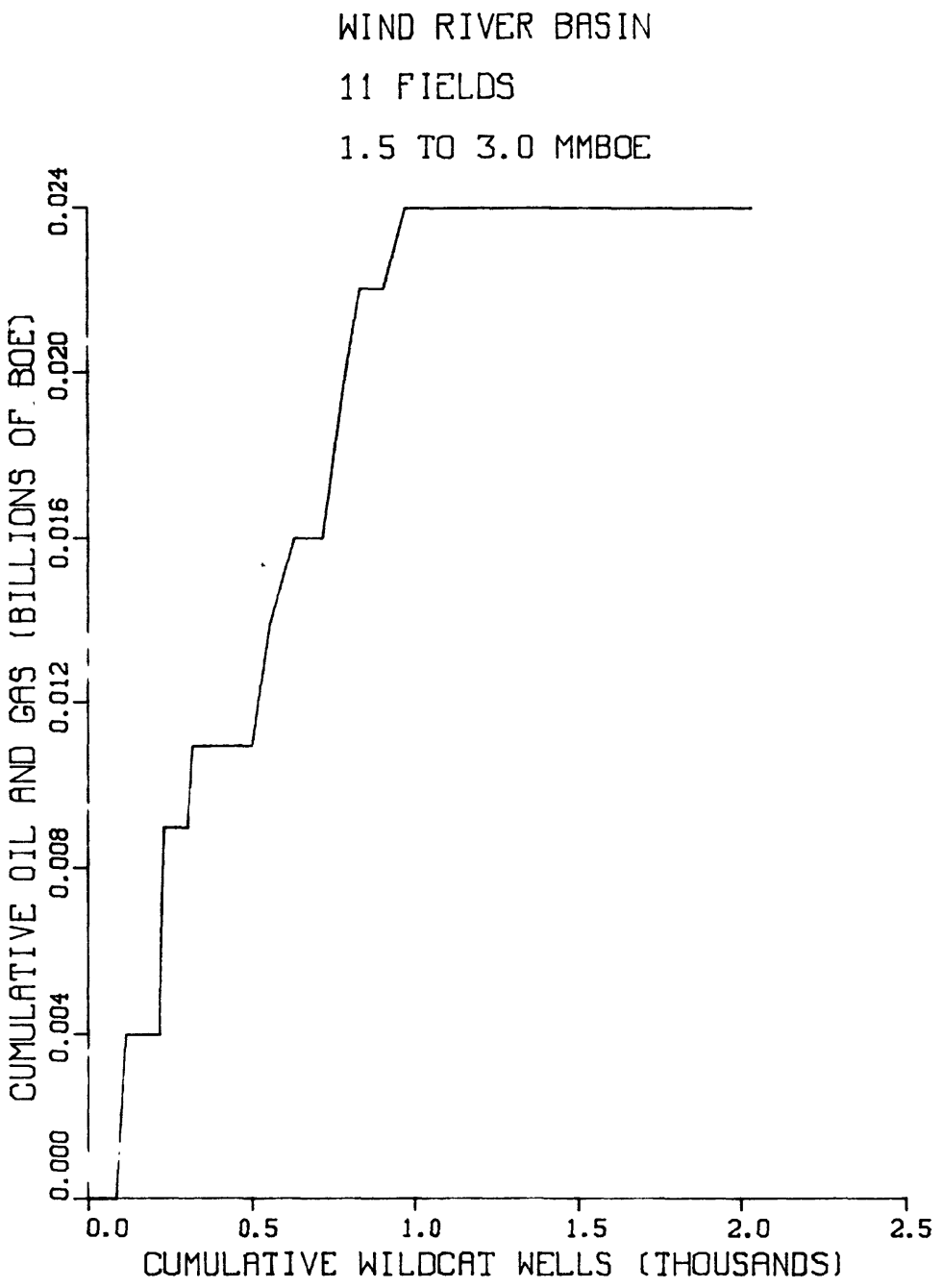

Figure 29d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

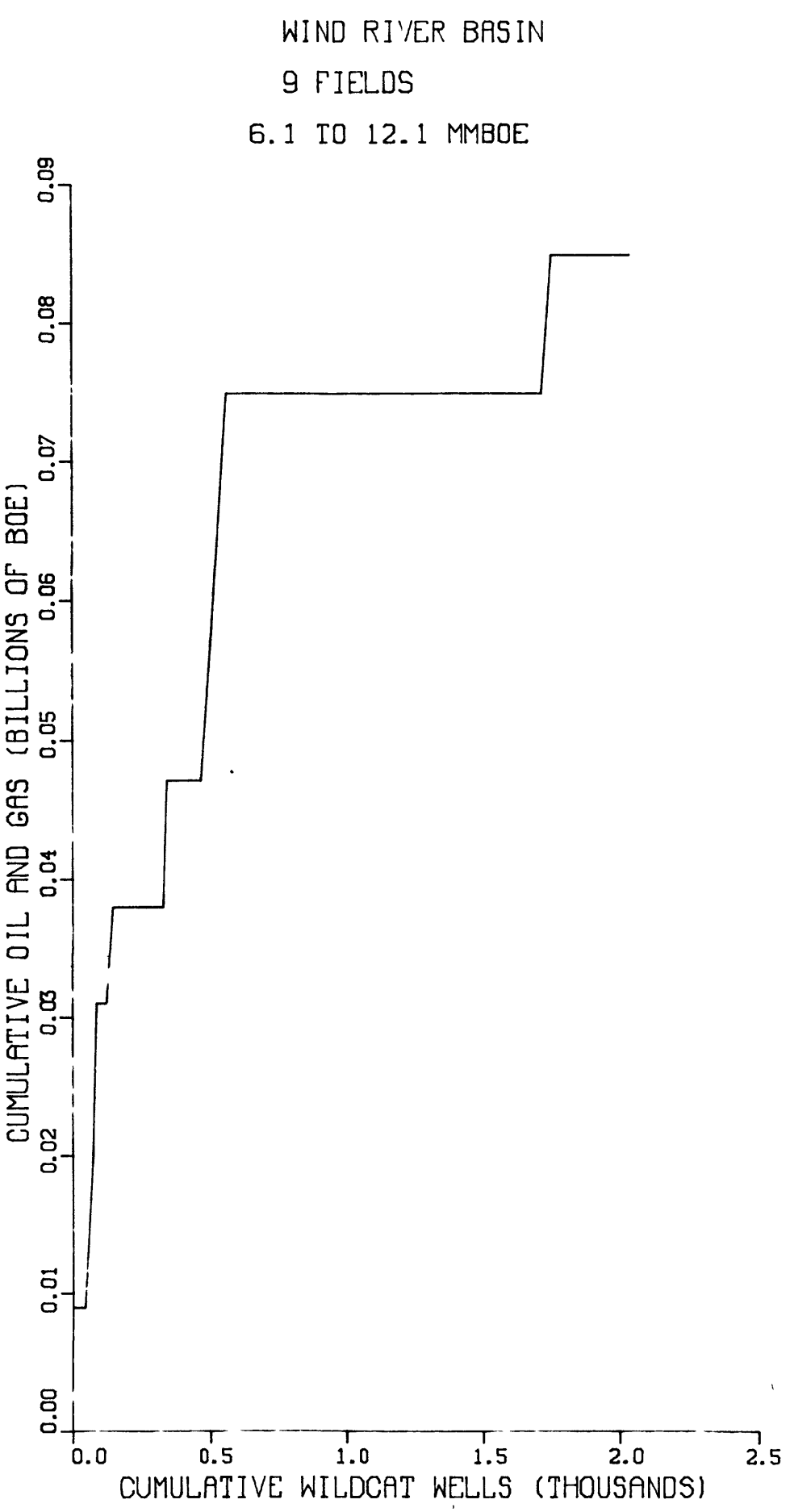

Figure 29e.—Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

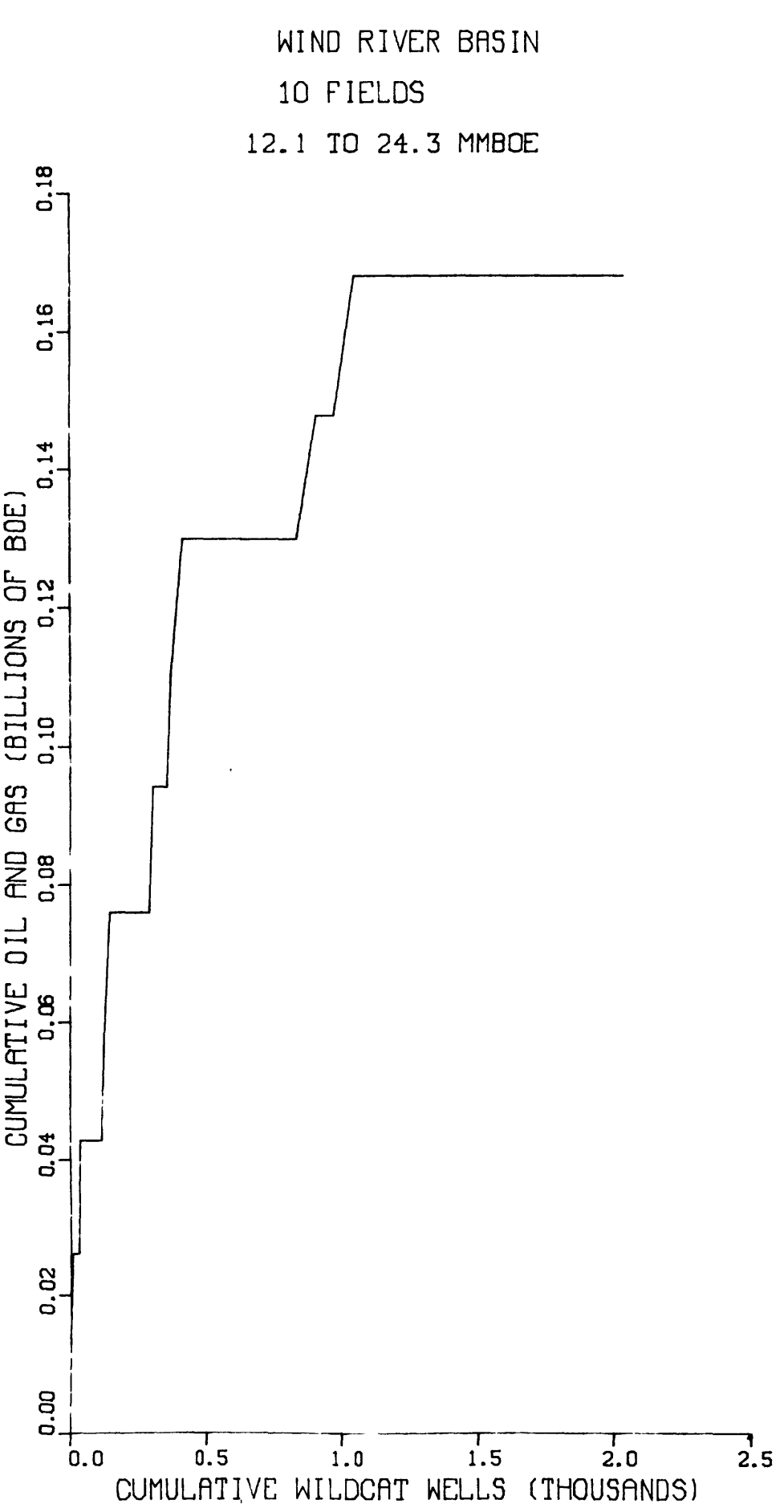

Figure 29f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

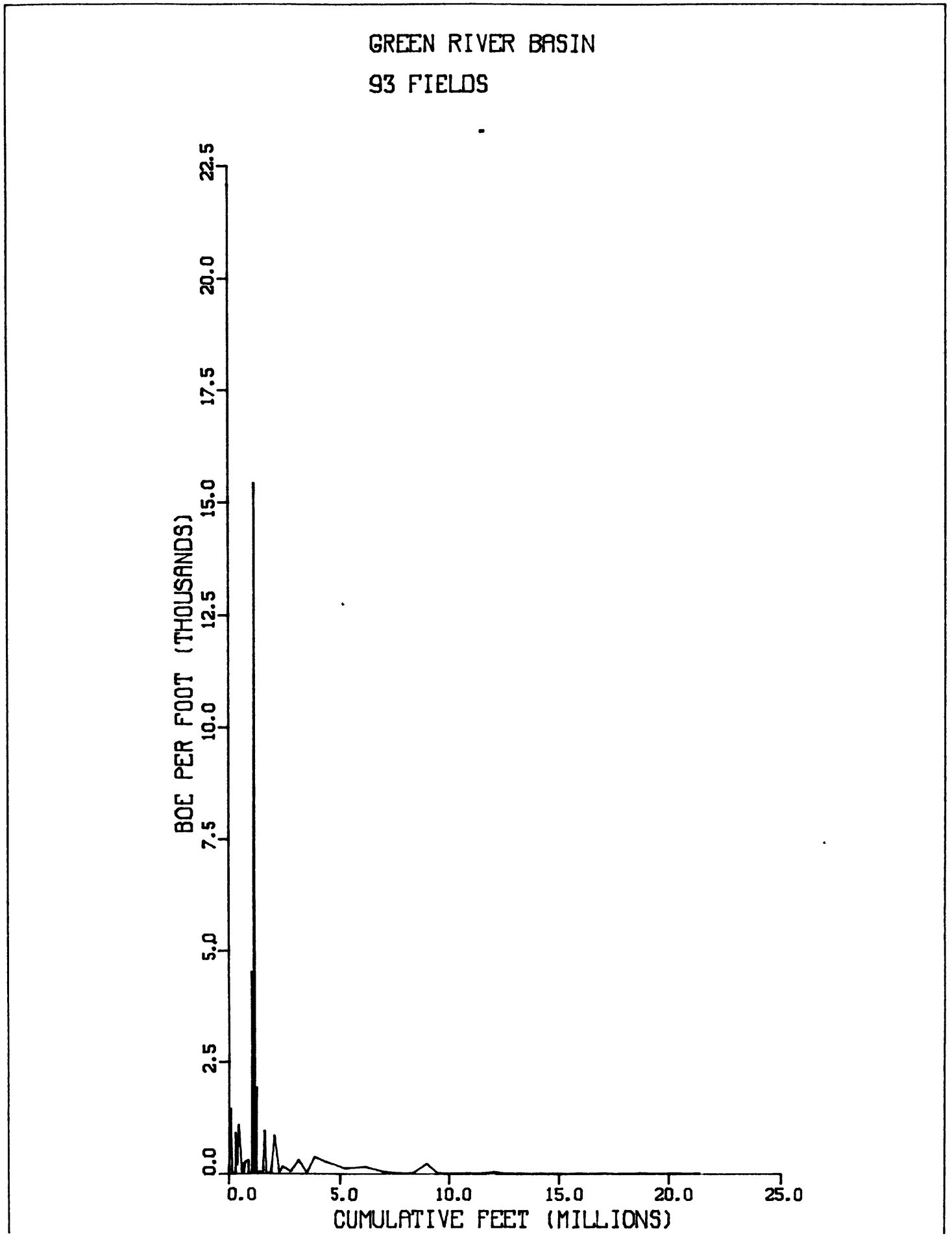

Figure 30a.--BOE per foot vs. cumulative footage drilled.

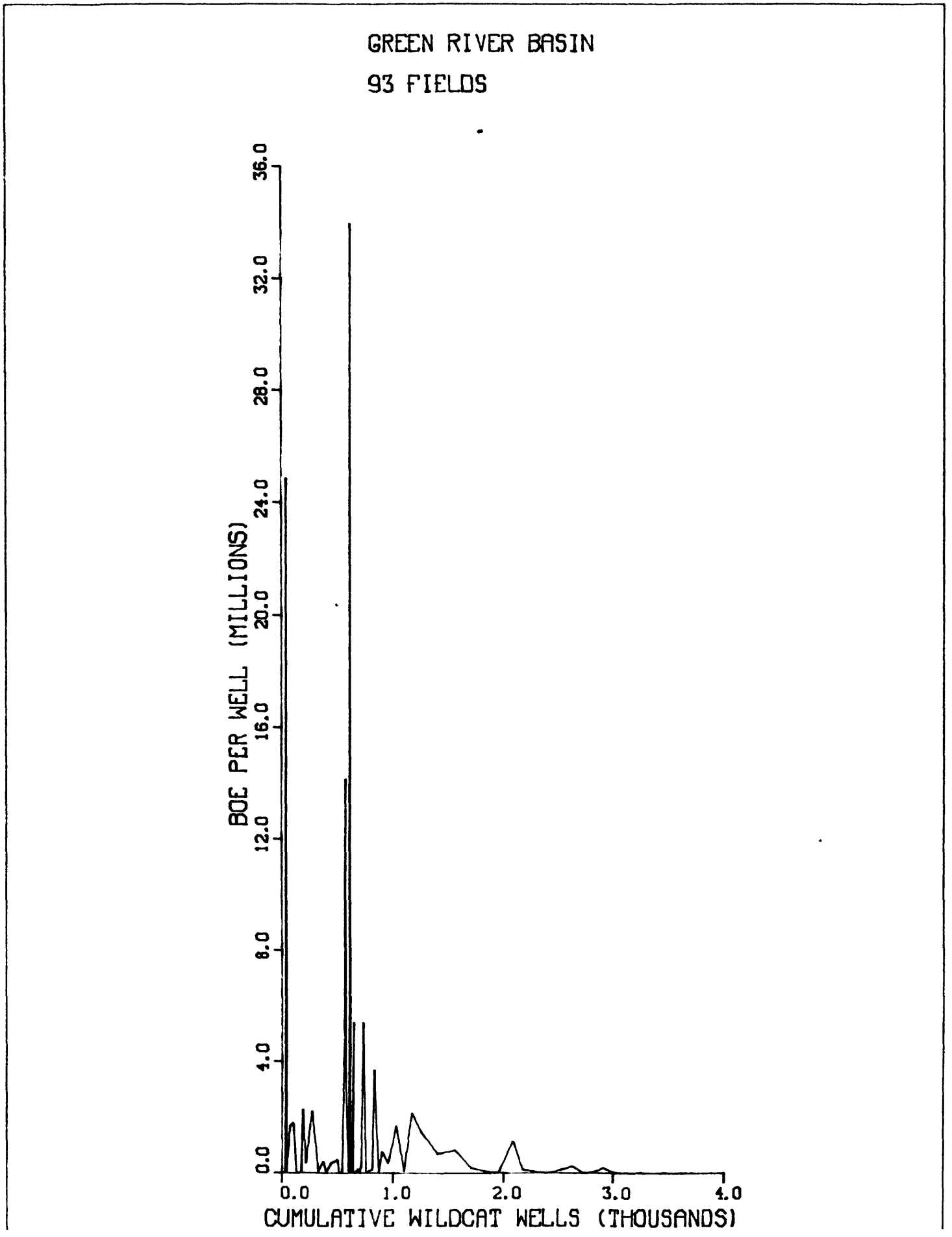

Figure 30b.--BOE per well vs. cumulative wells drilled.

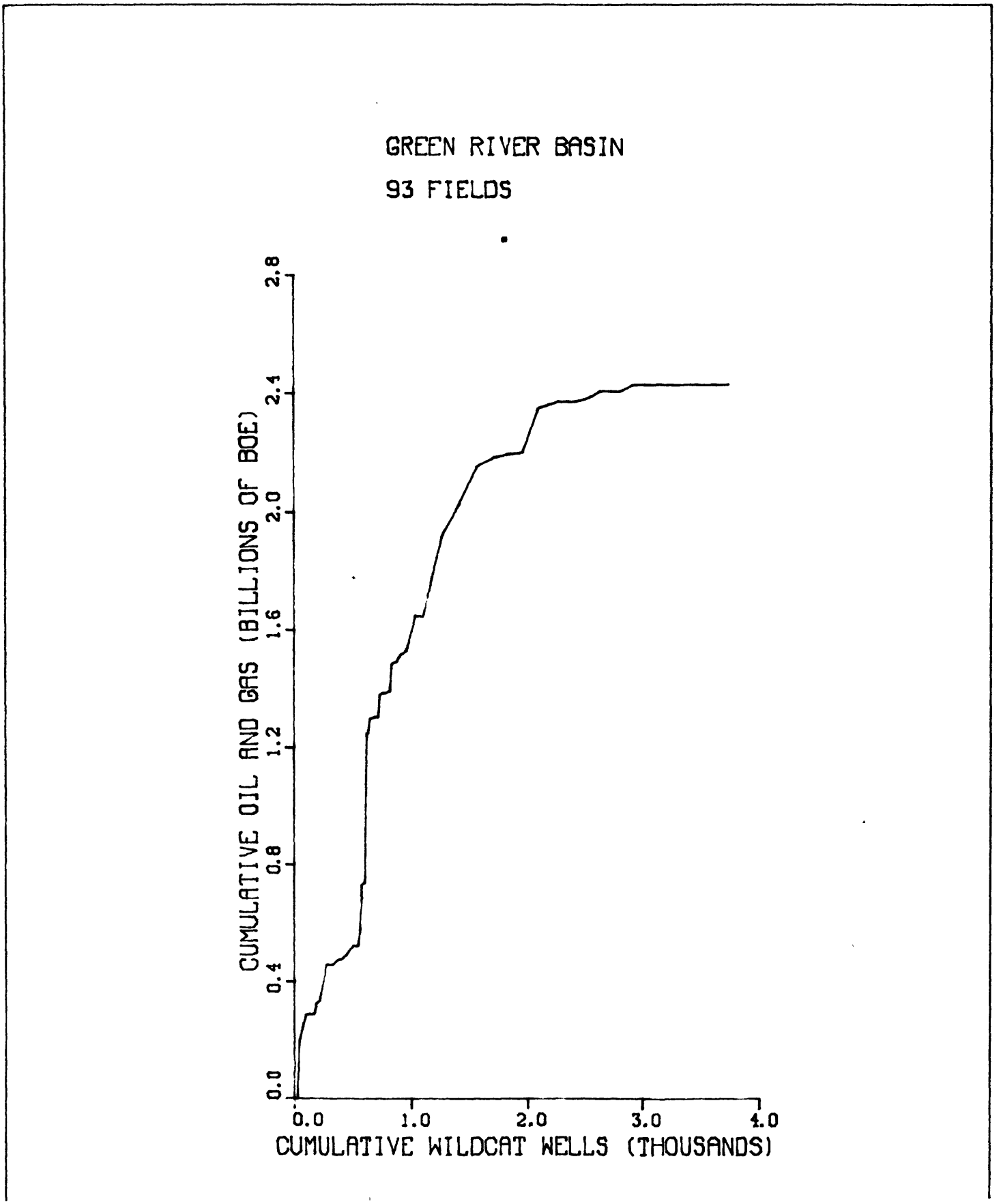

Figure 30c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

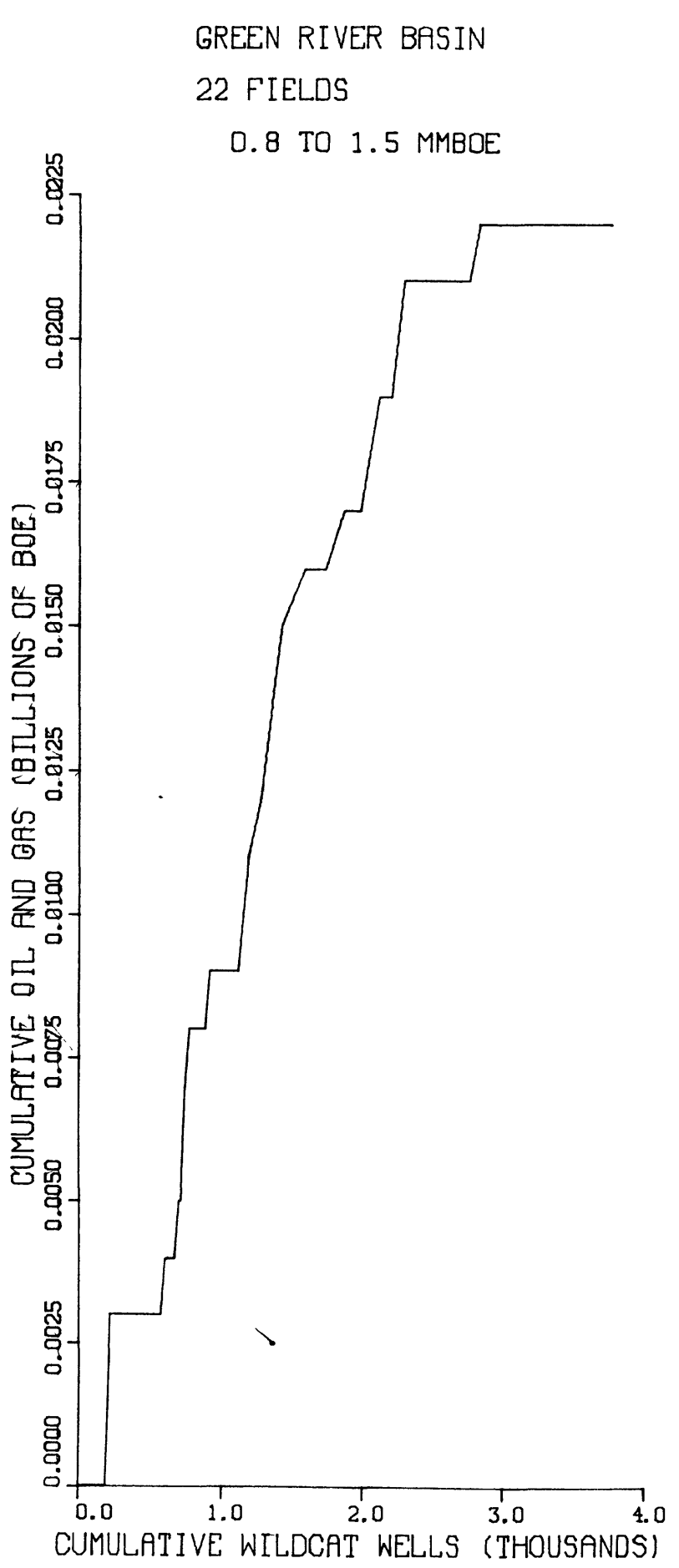

Figure 30d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

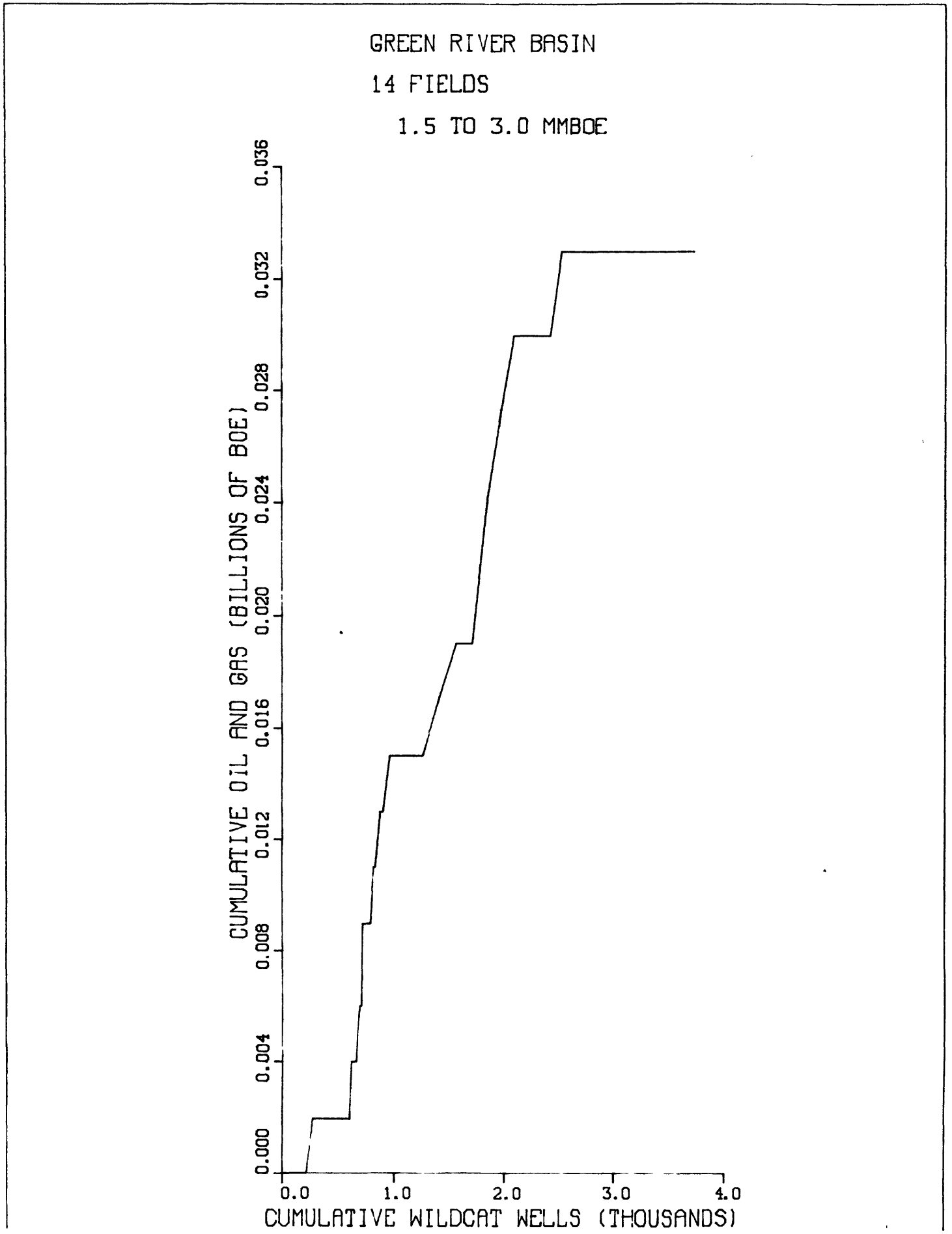

Figure 30e.--Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

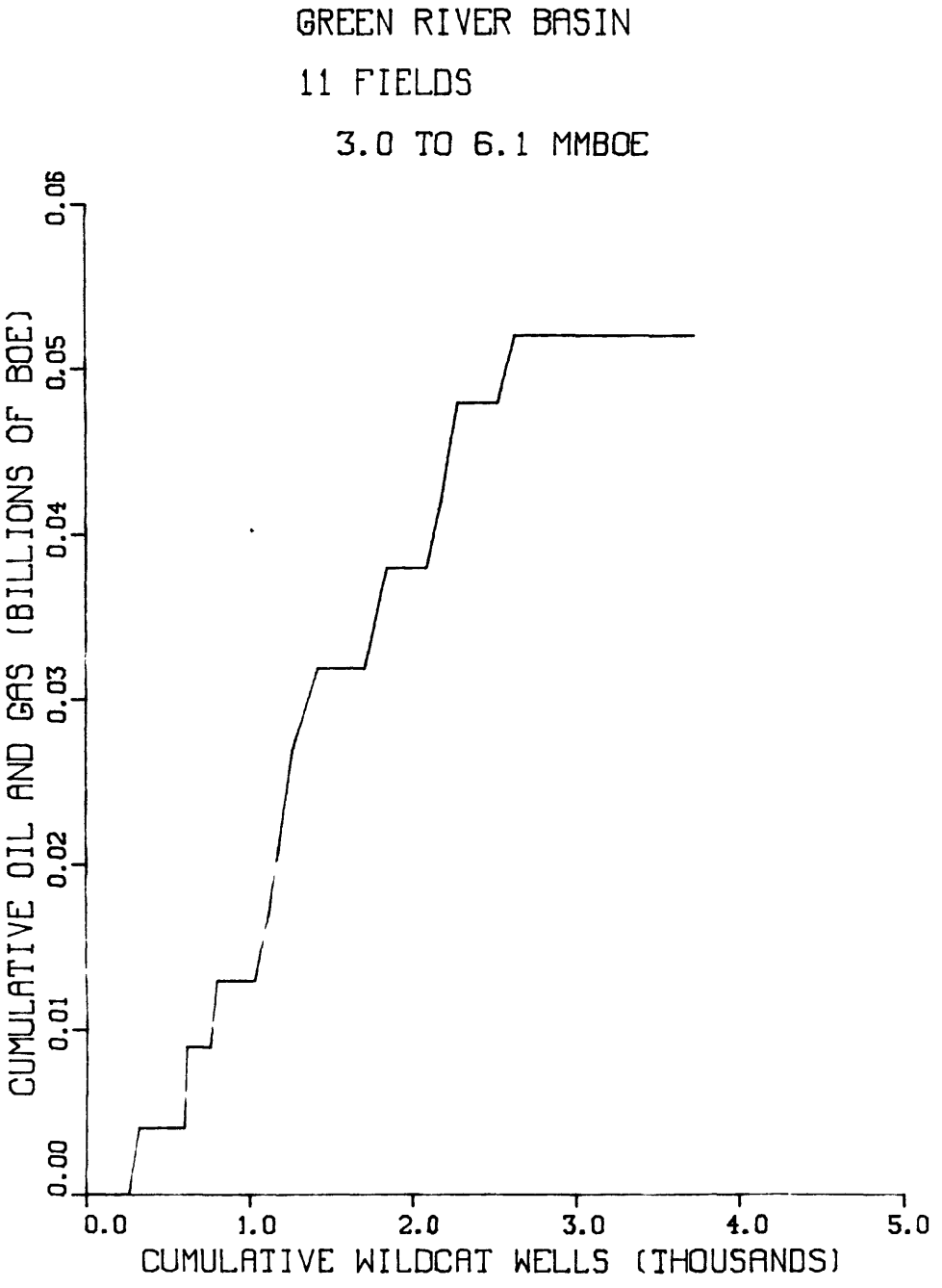

Figure 30f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

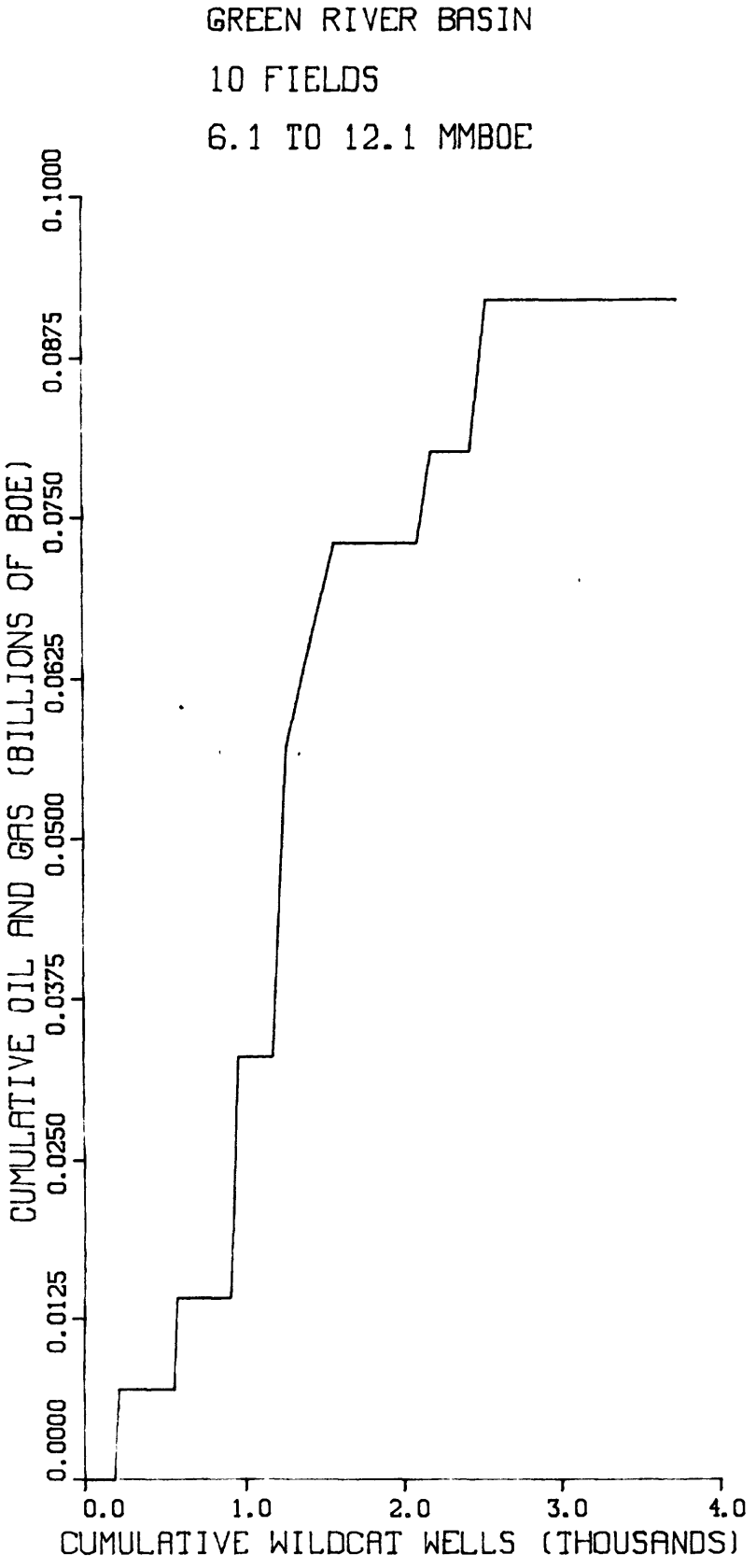

Figure 30g.—Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

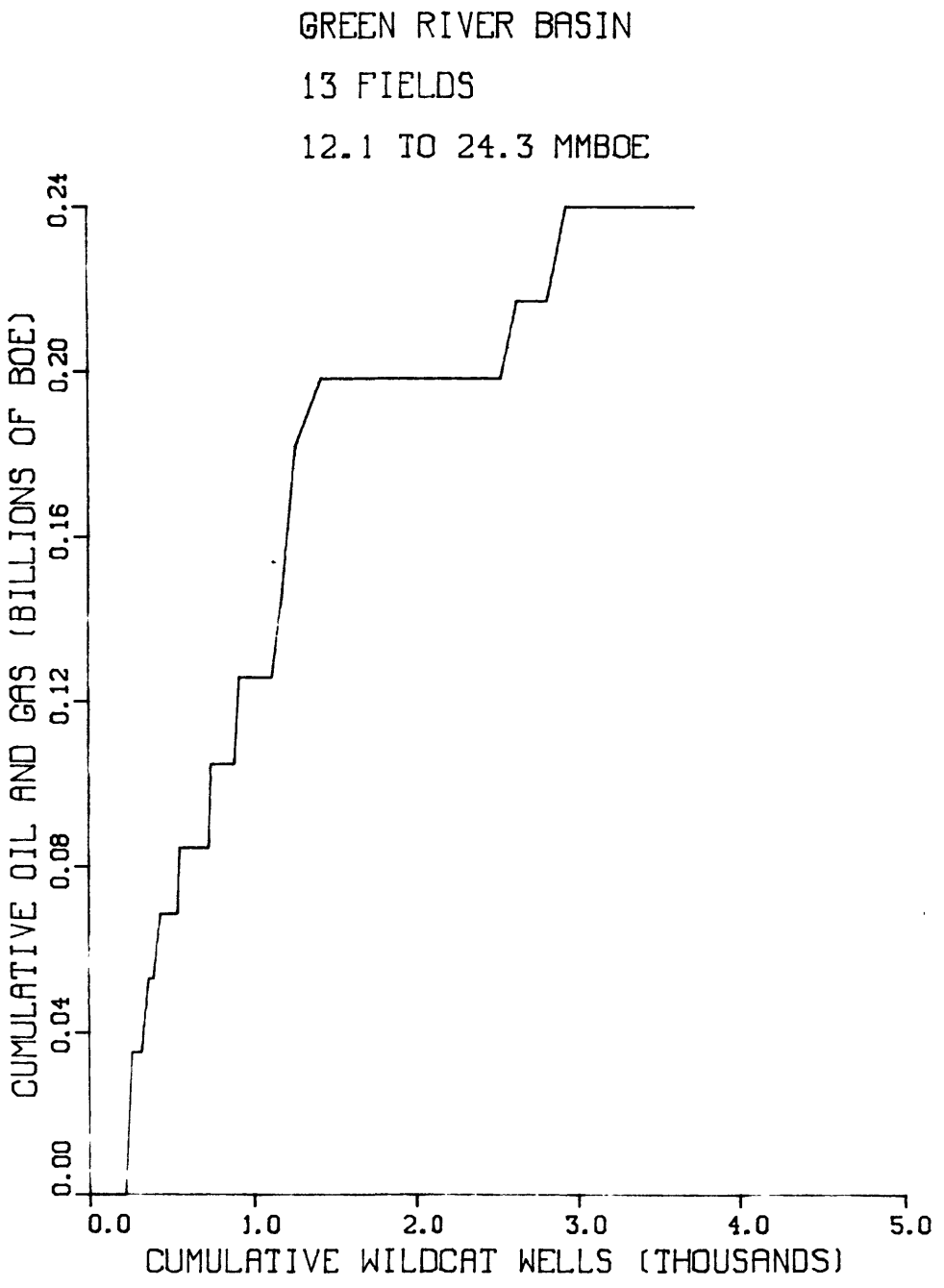

Figure 30h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

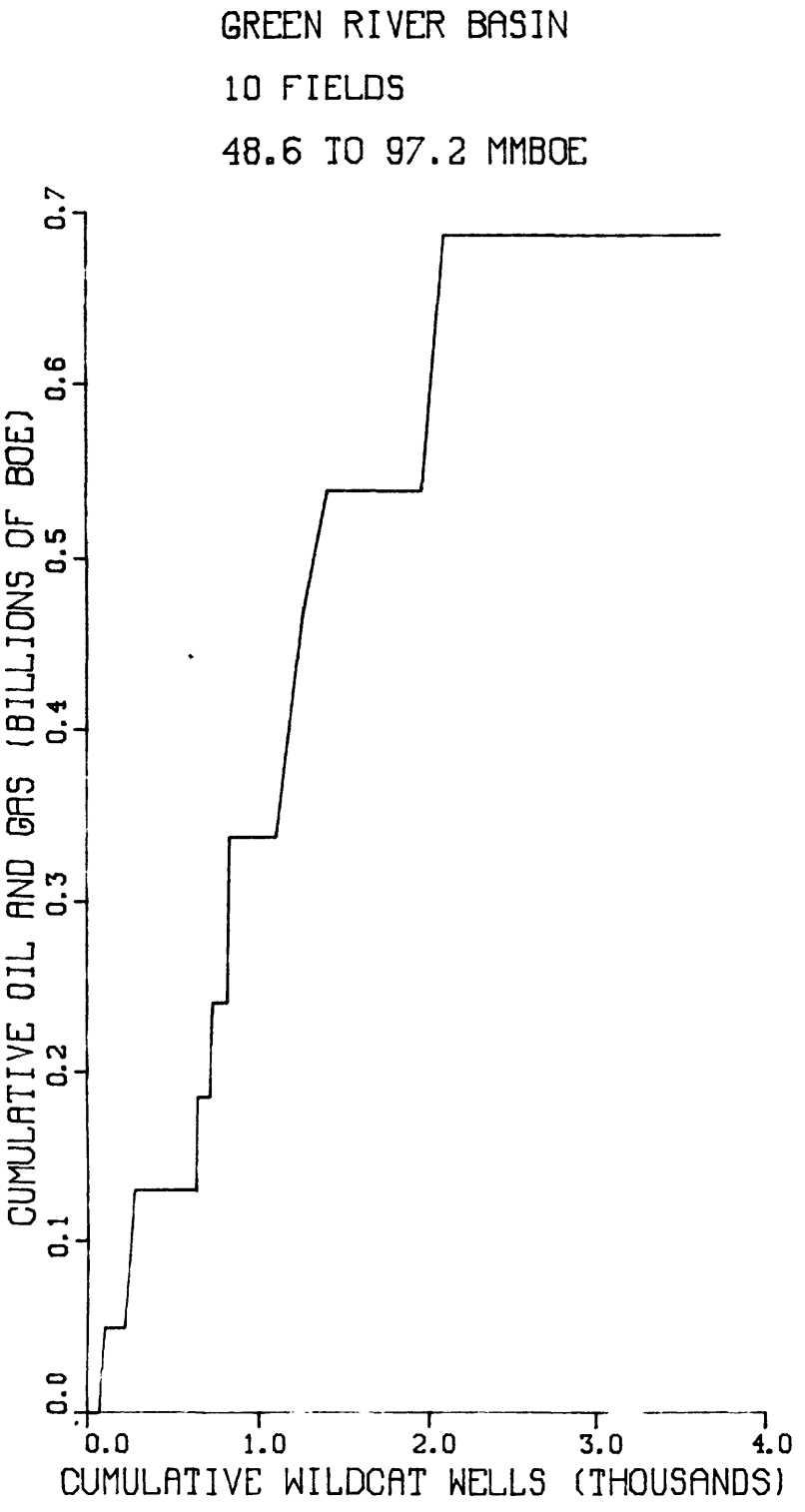

Figure 30i.--Cumulative oil and gas vs. cumulative wells for fields in the size range 24.3-48.6 MMBOE.

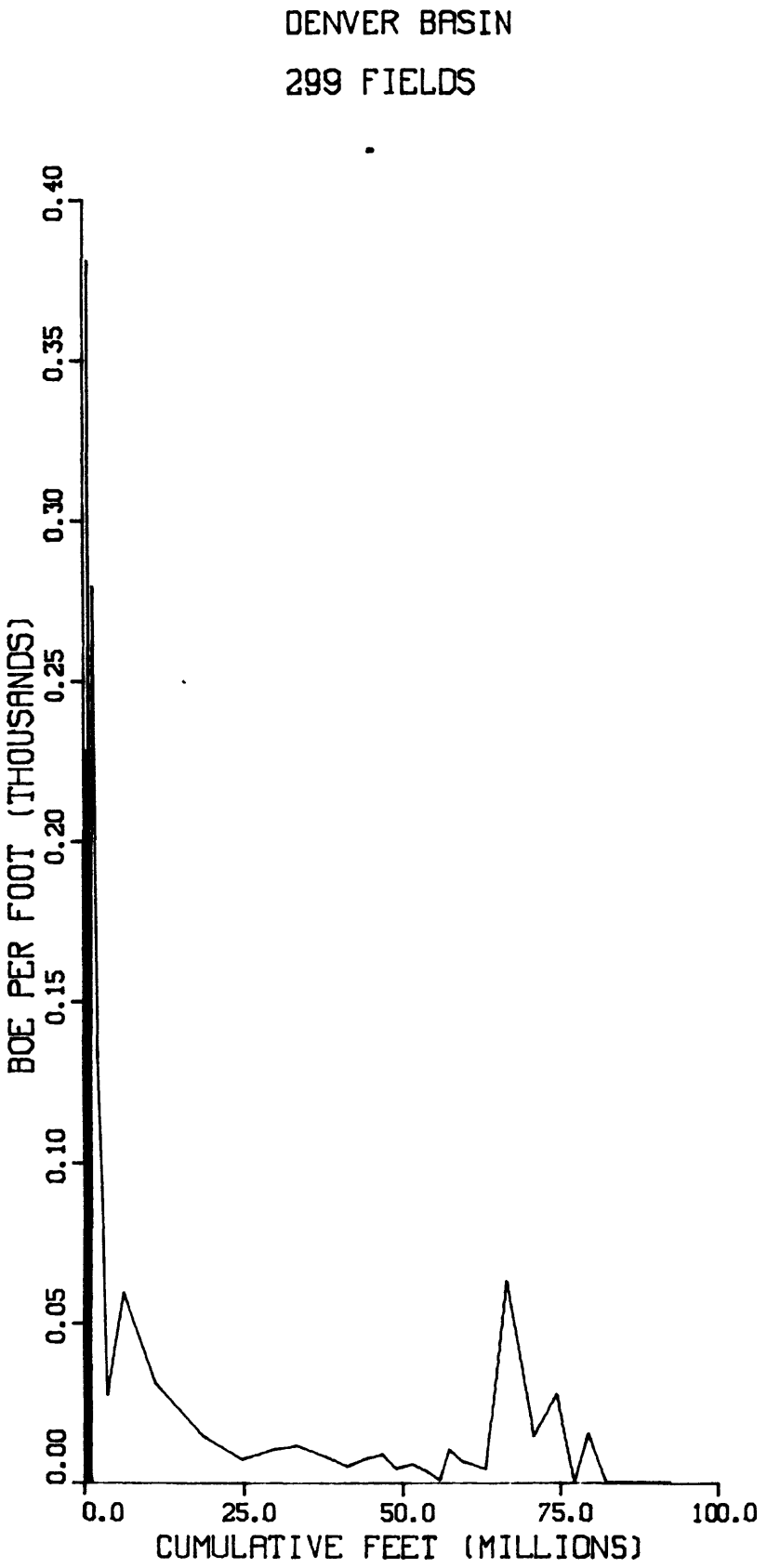

Figure 31a.--BOE per foot vs. cumulative footage drilled.

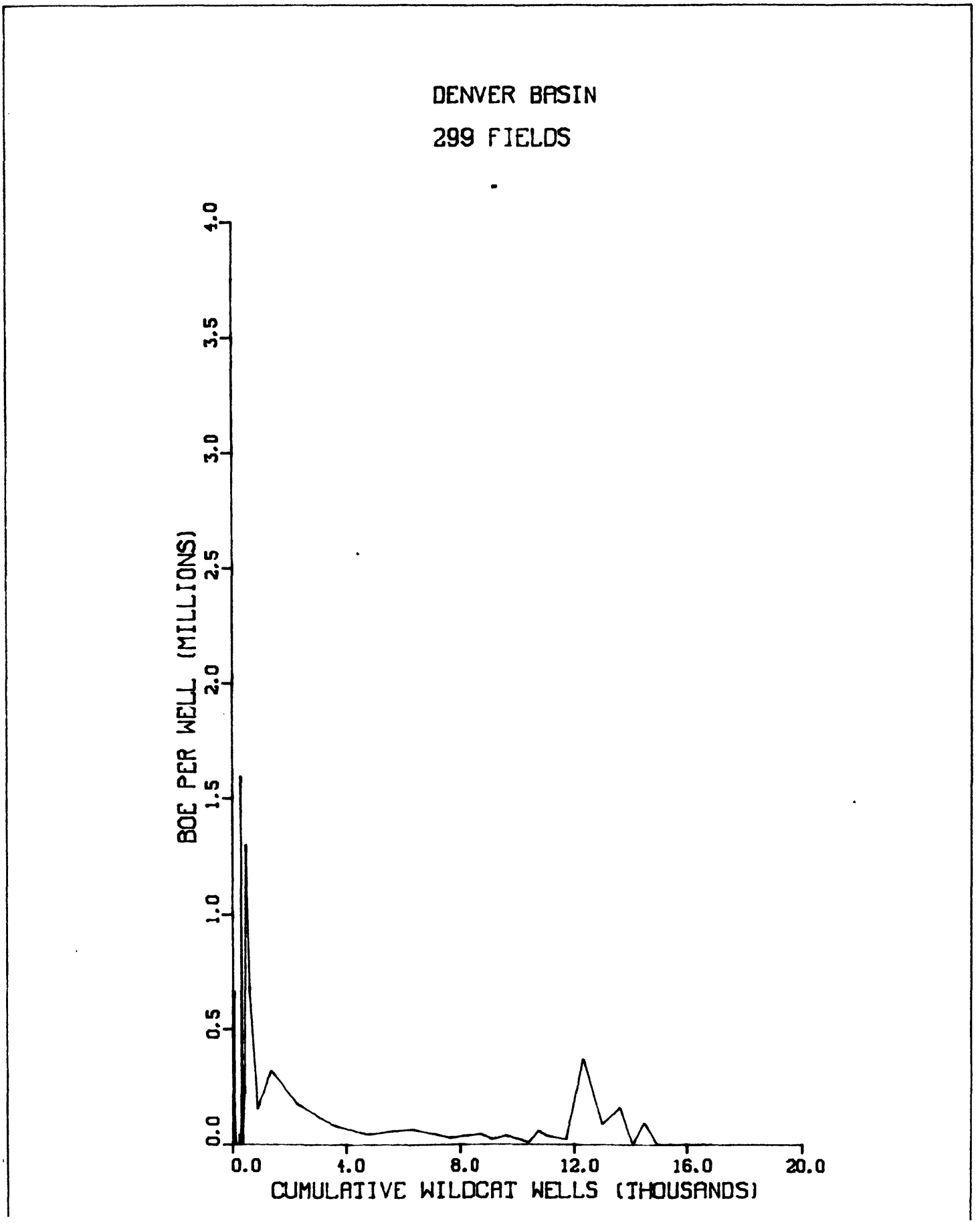

Figure 31b.--BOE per well vs. cumulative wells drilled.

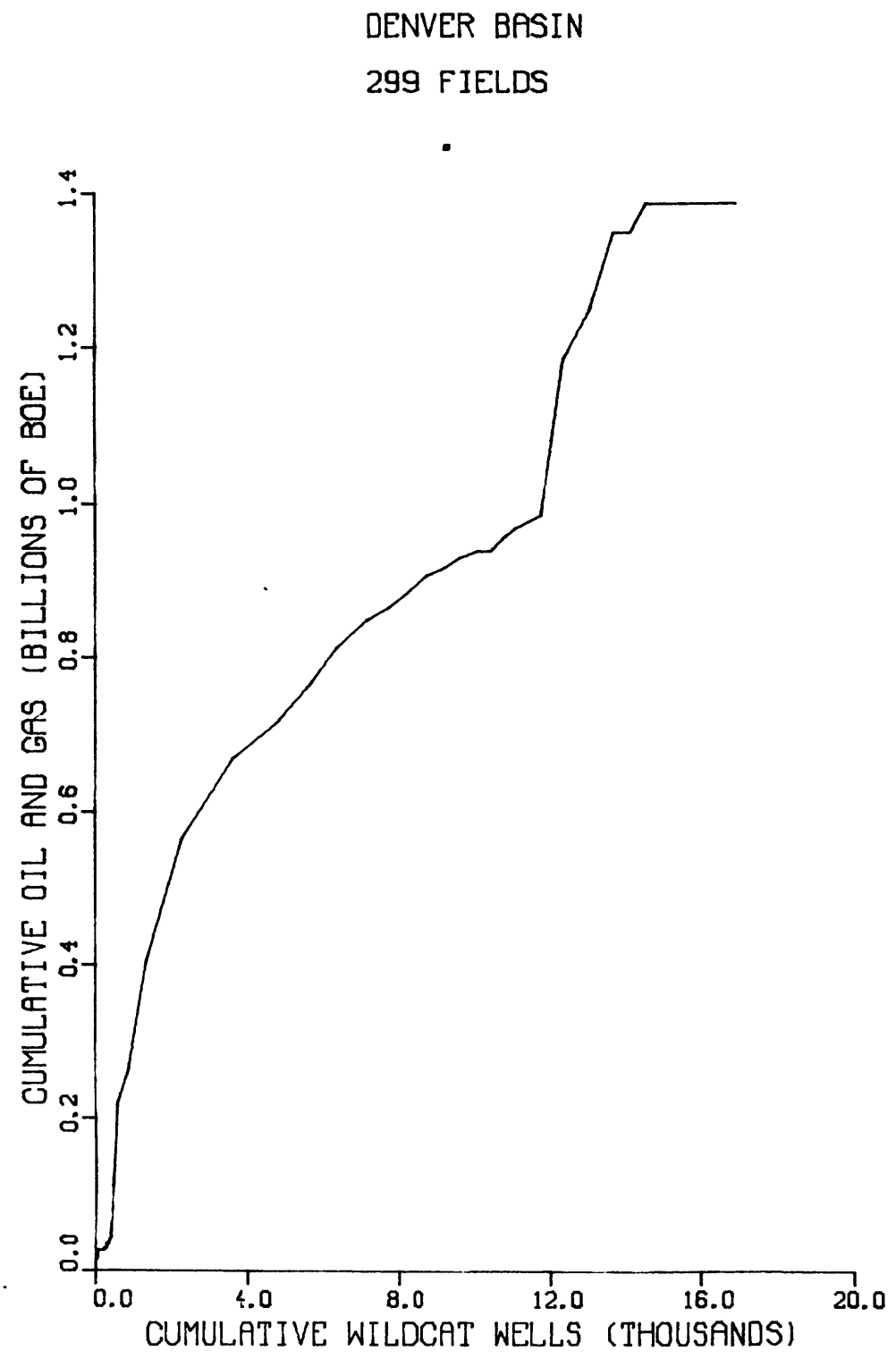

Figure 31c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

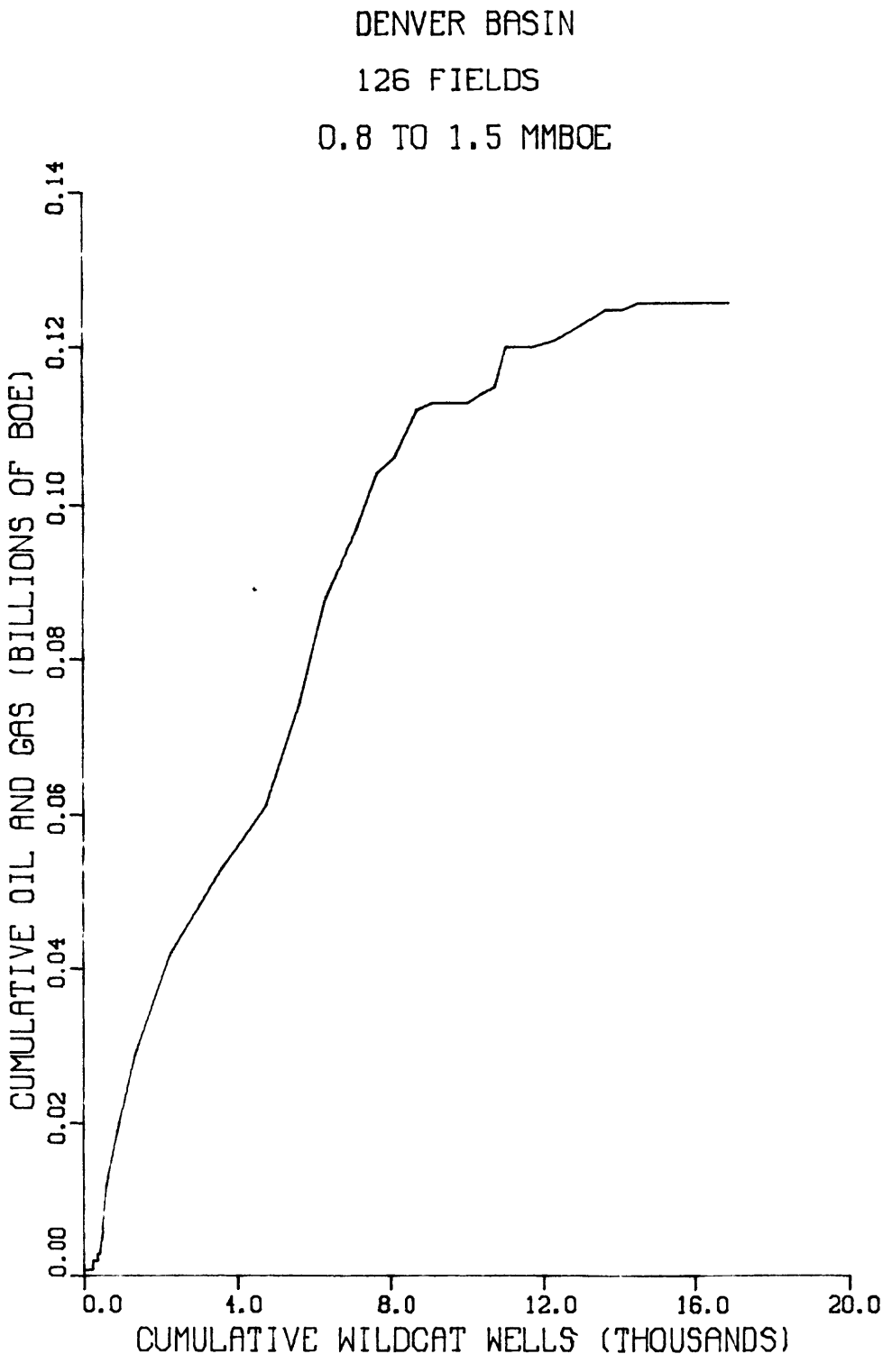

Figure 31d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

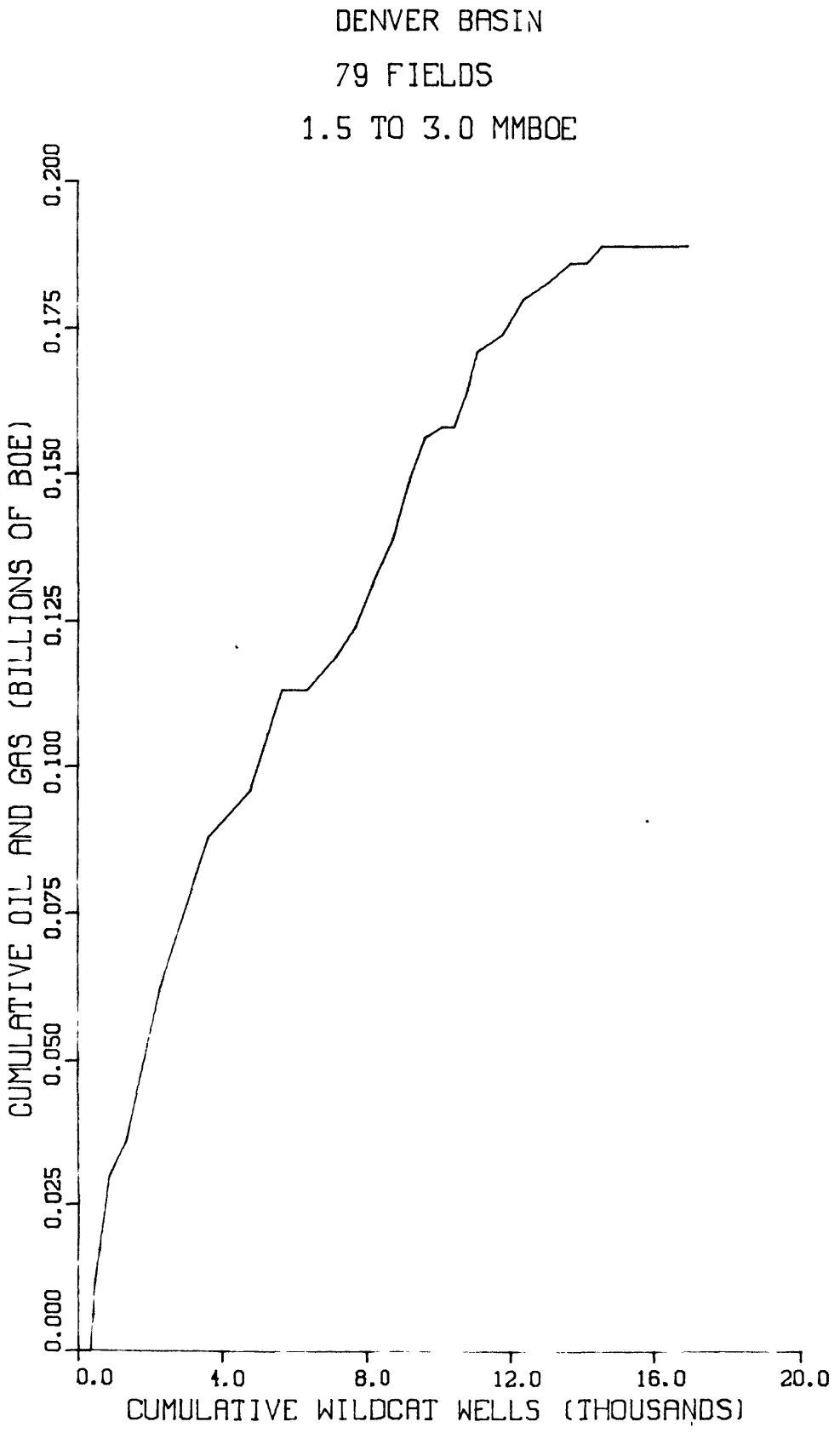

Figure 31e.—Cumulative oil and gas vs. cumulative wells for fields in the size range 1.5-3.0 MMBOE.

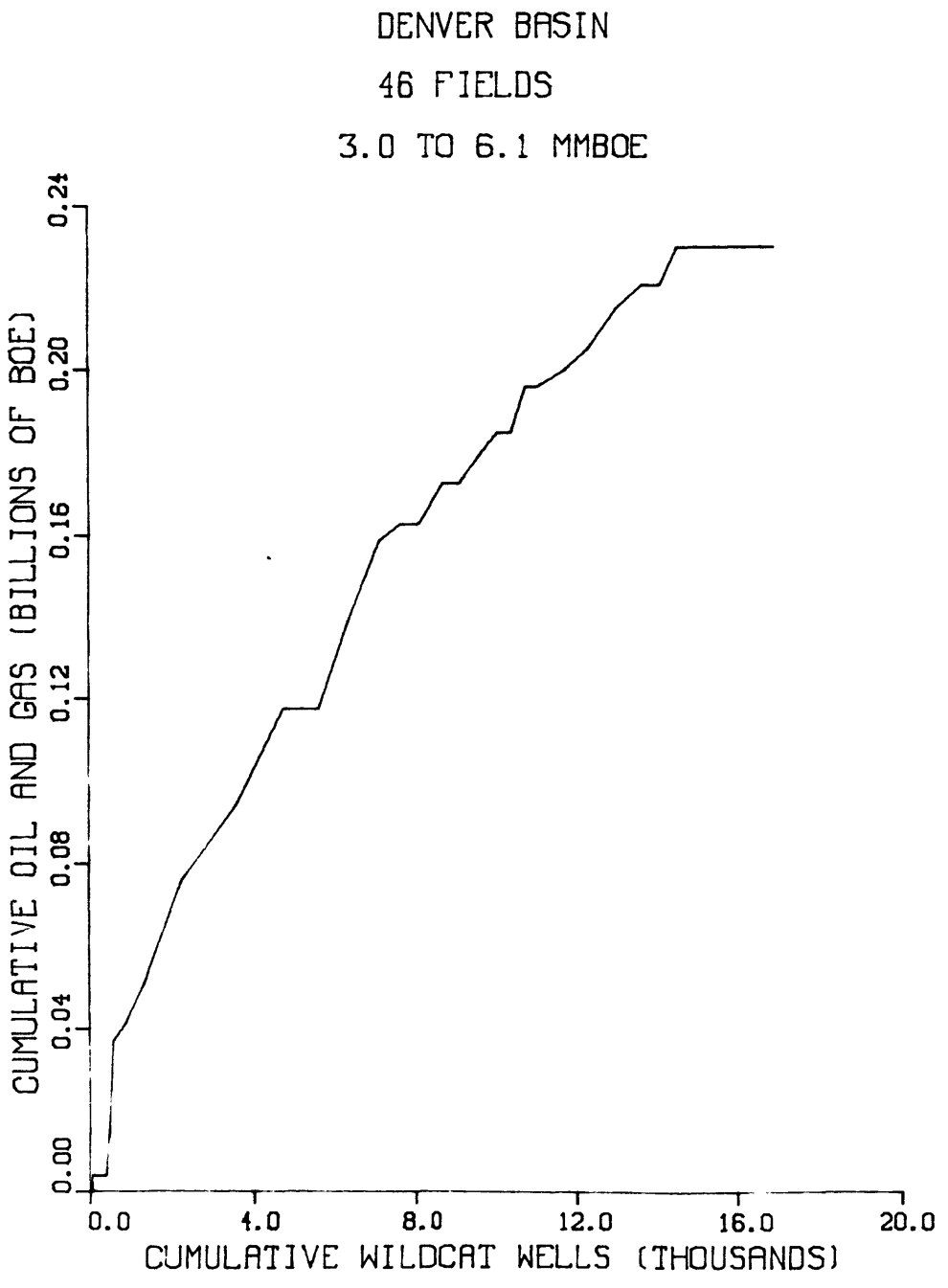

Figure 31f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

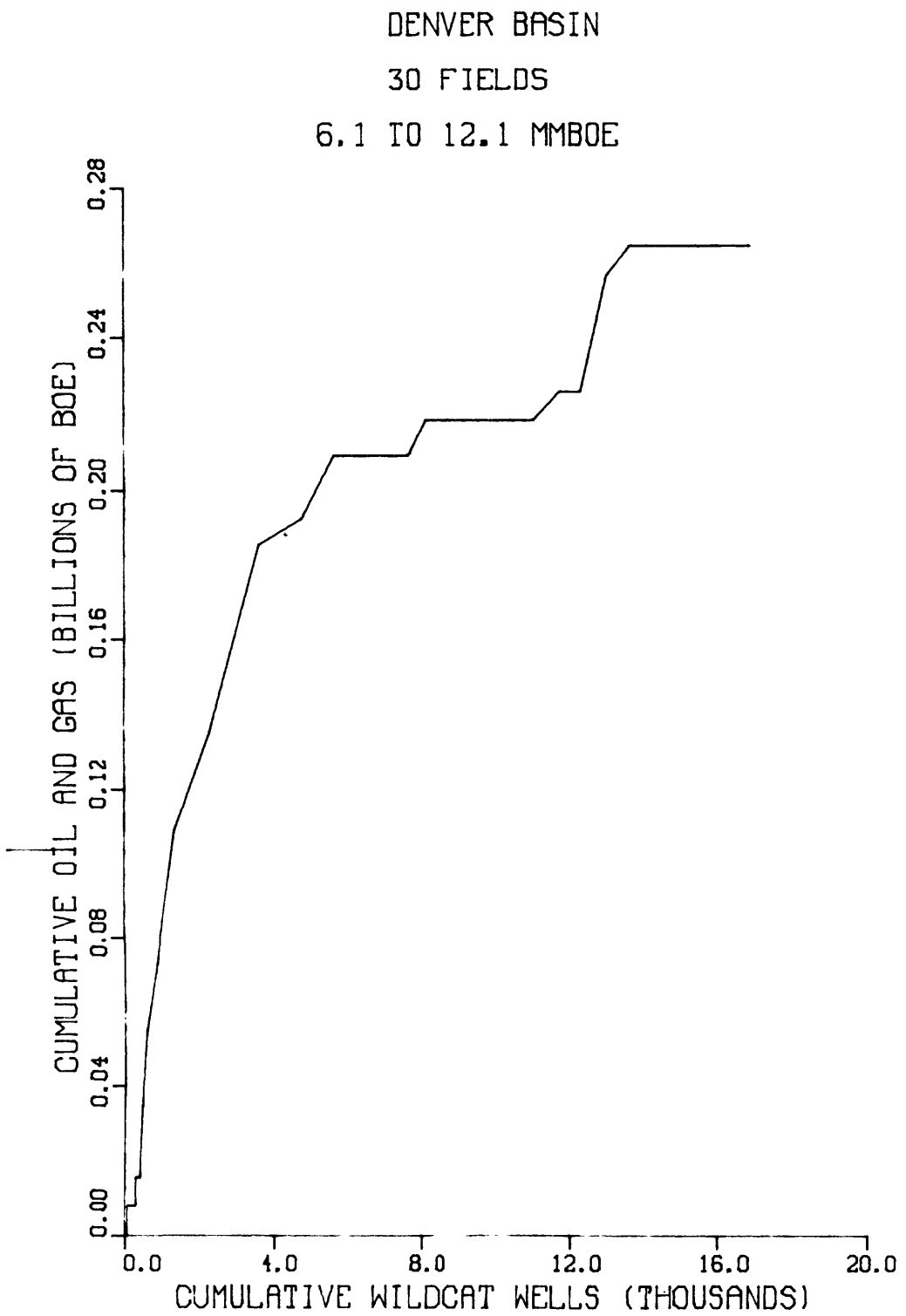

Figure 31g.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

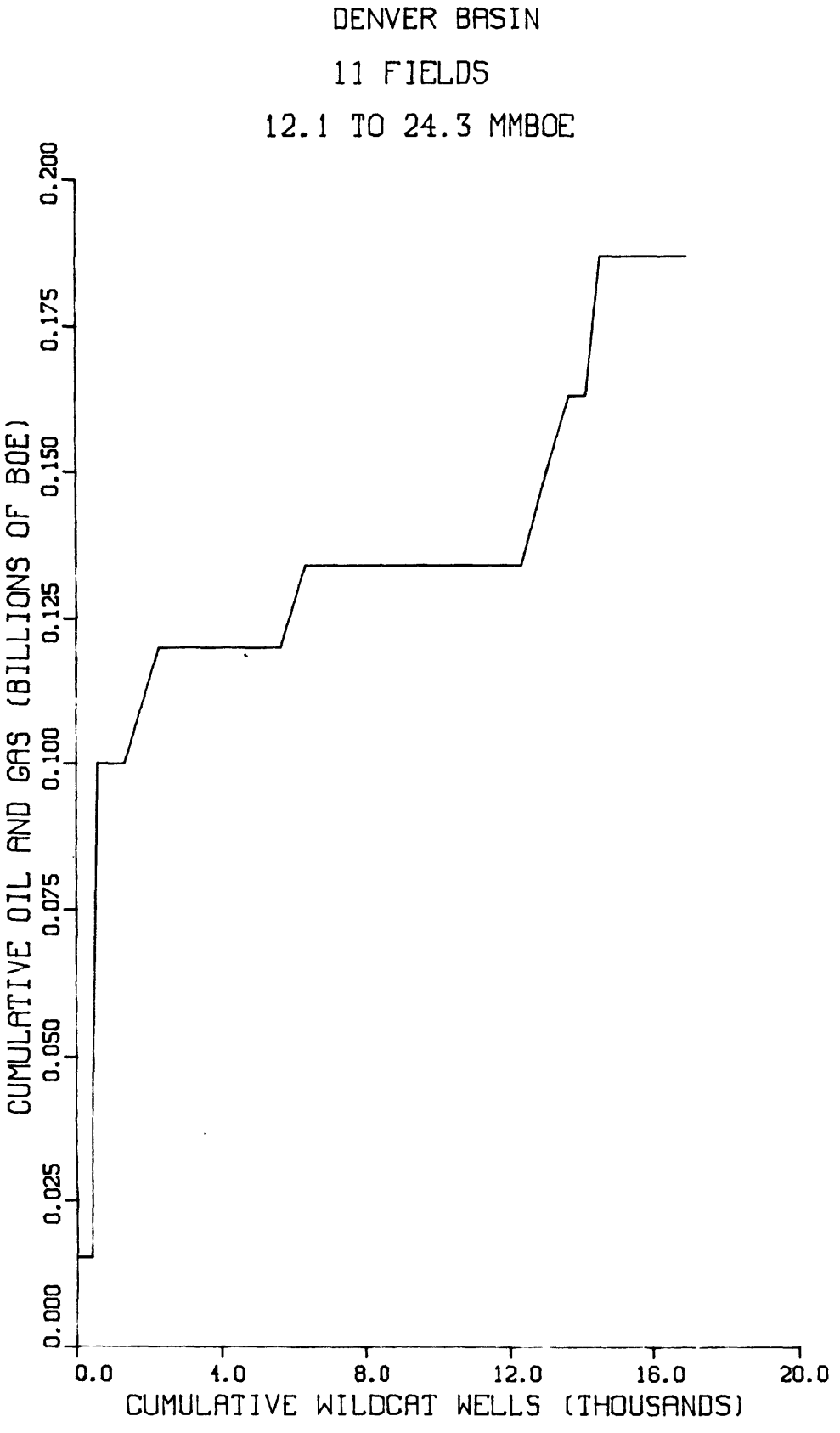

Figure 31h.--Cumulative oil and gas vs. cumulative wells for fields in the size range 12.1-24.3 MMBOE.

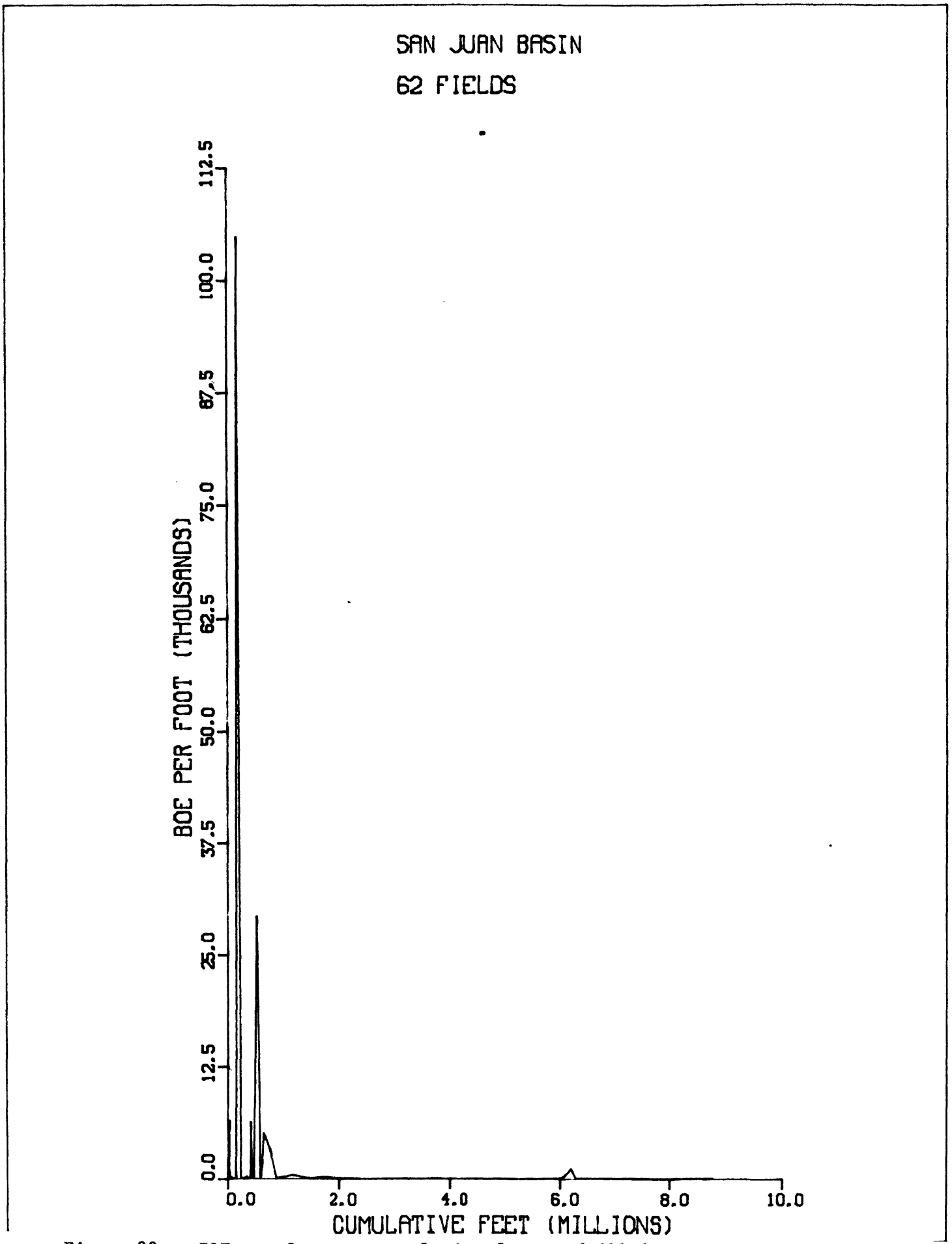

Figure 32a.--BOE per foot vs. cumulative footage drilled.

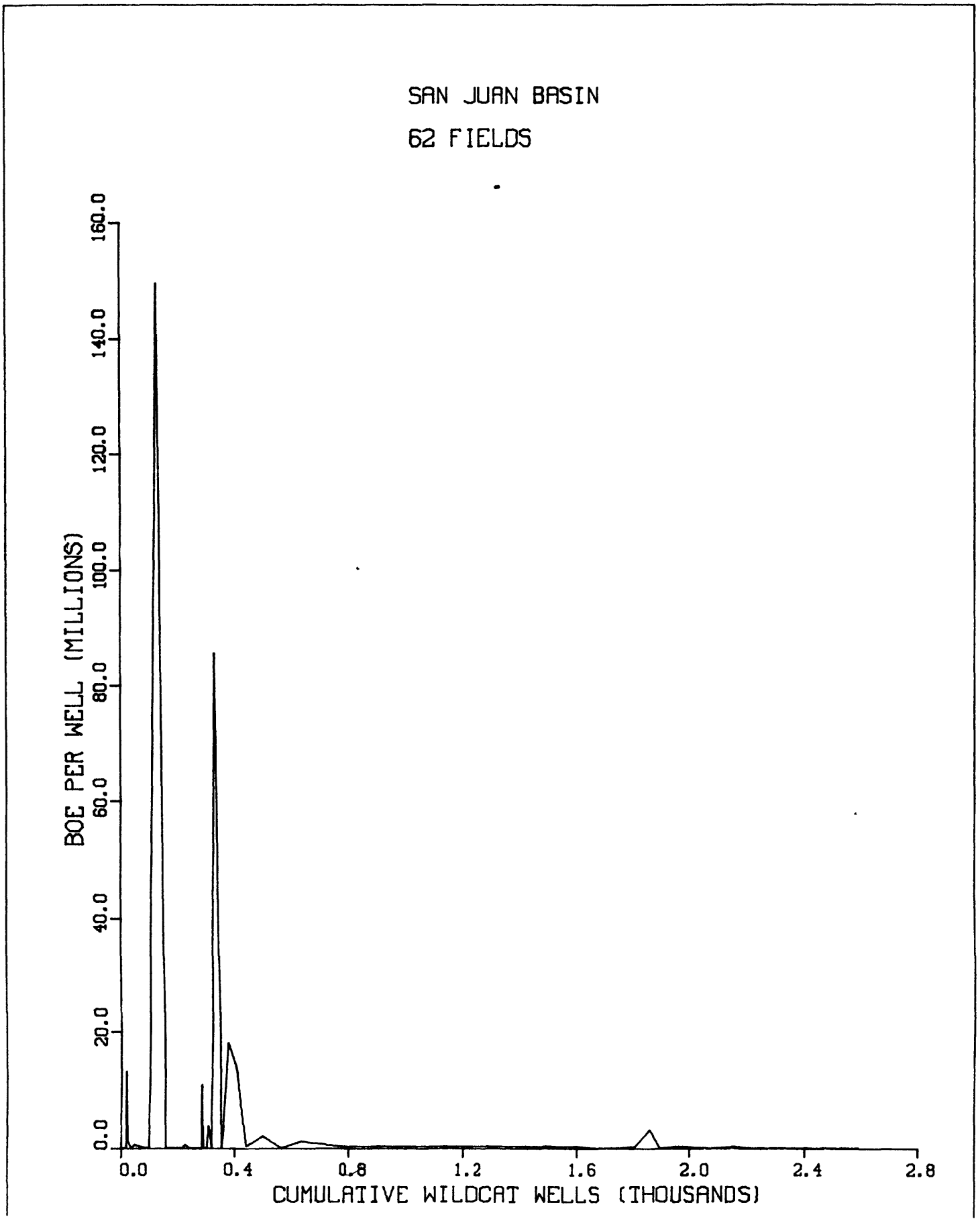

Figure 32b.--BOE per well vs. cumulative wells drilled.

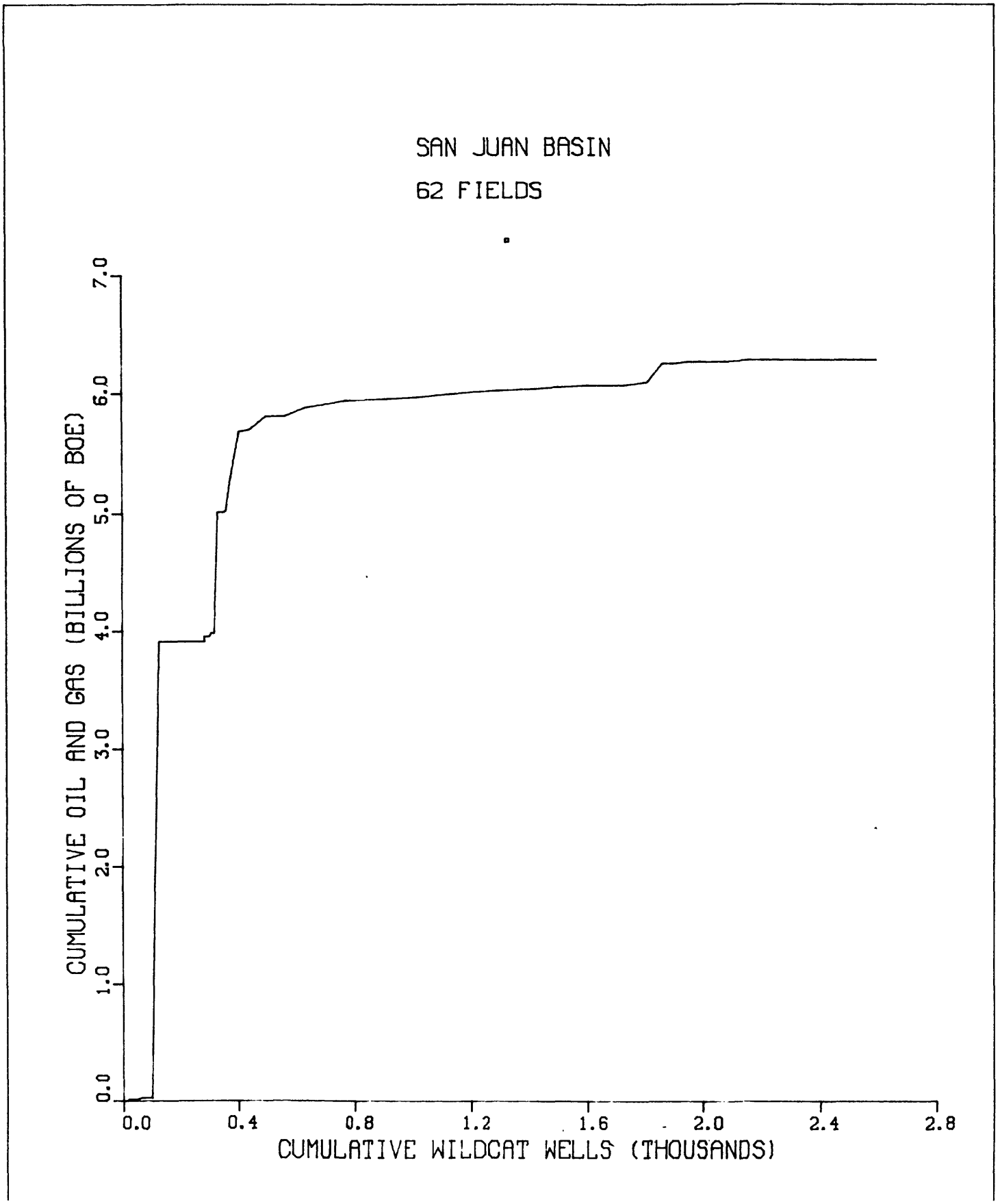

Figure 32c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

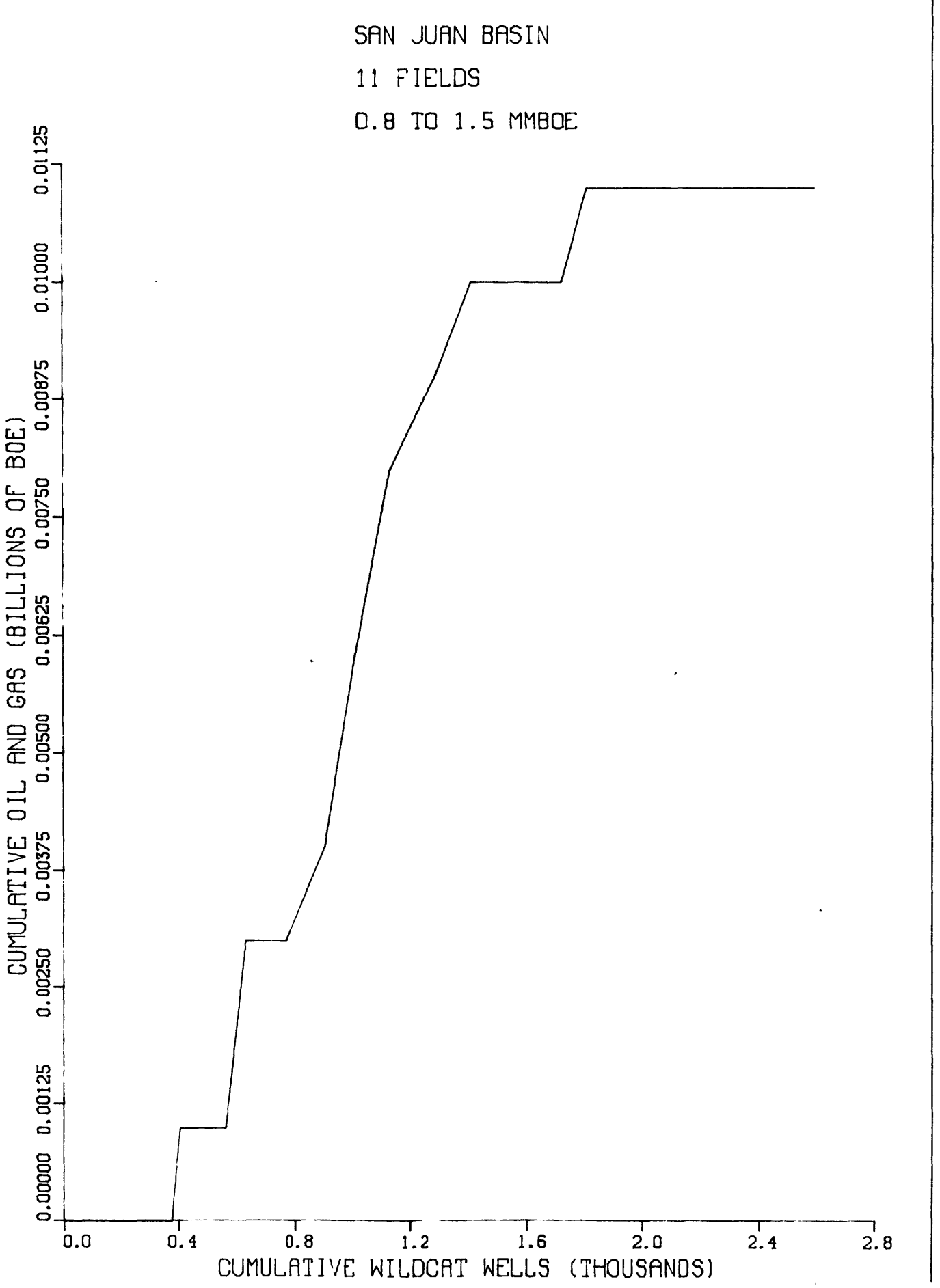

Figure 32d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

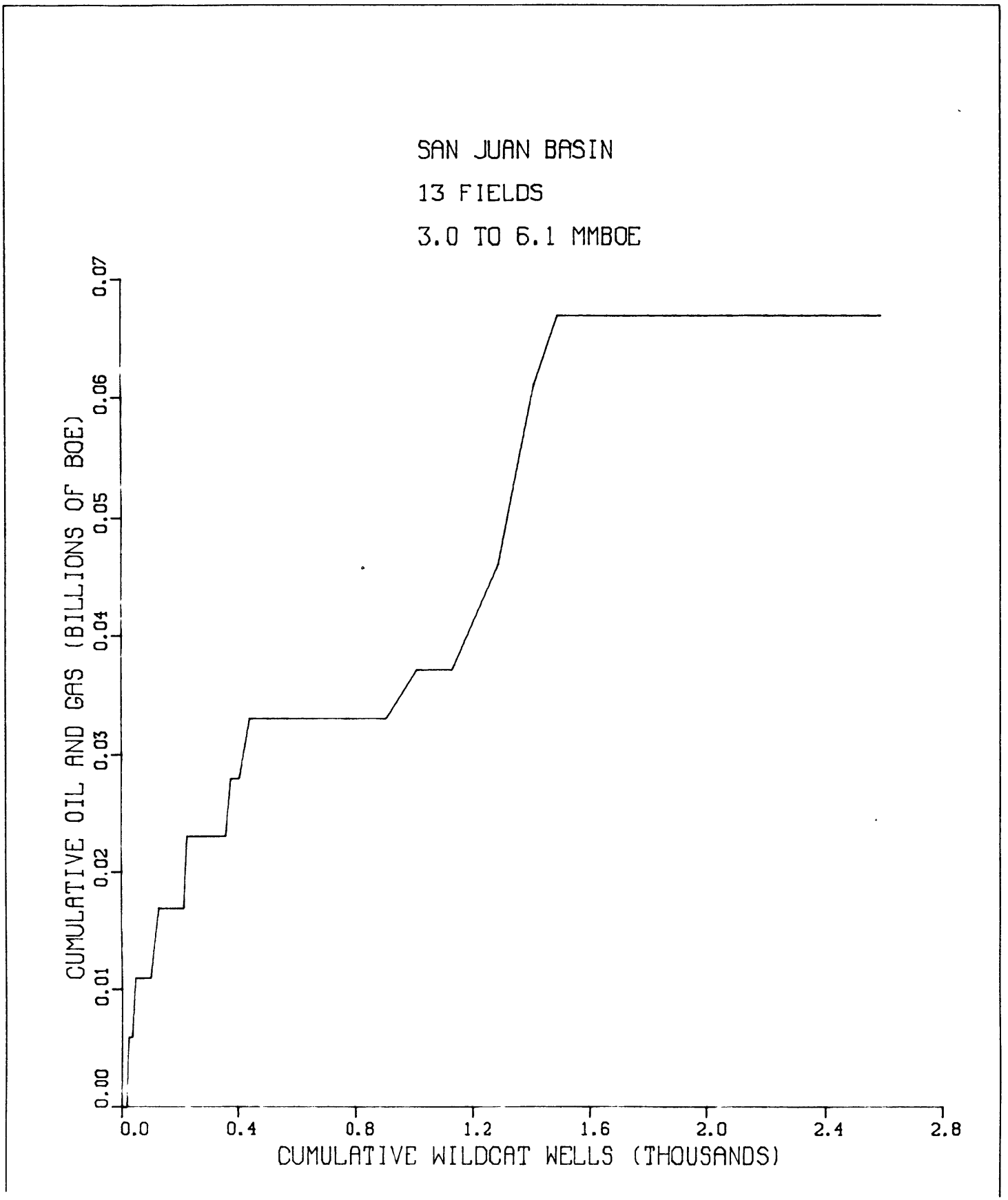

Figure 32e.—Cumulative oil and gas vs. cumulative wells for fields in the size range 3.0-6.1 MMBOE.

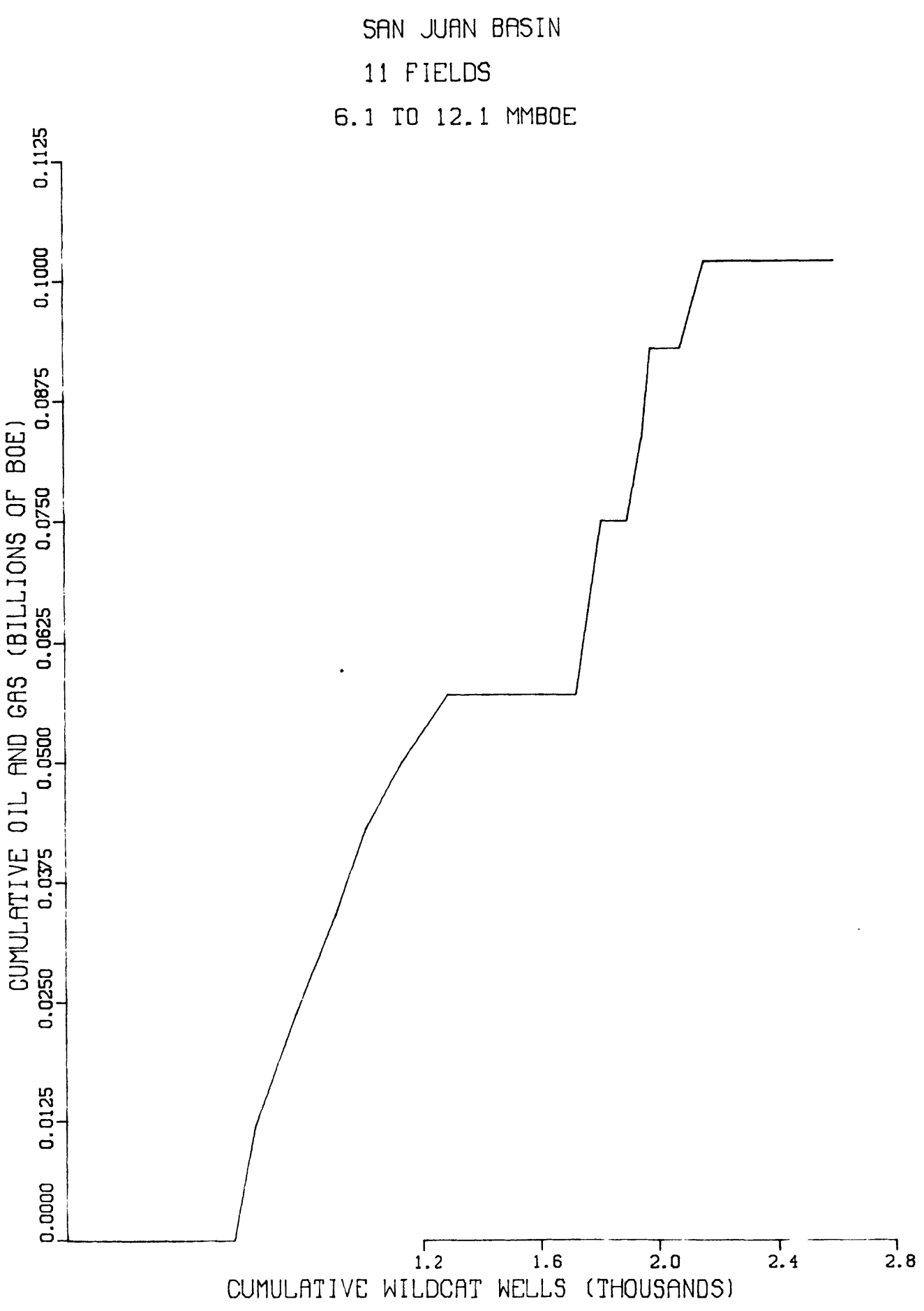

Figure 32f.--Cumulative oil and gas vs. cumulative wells for fields in the size range 6.1-12.1 MMBOE.

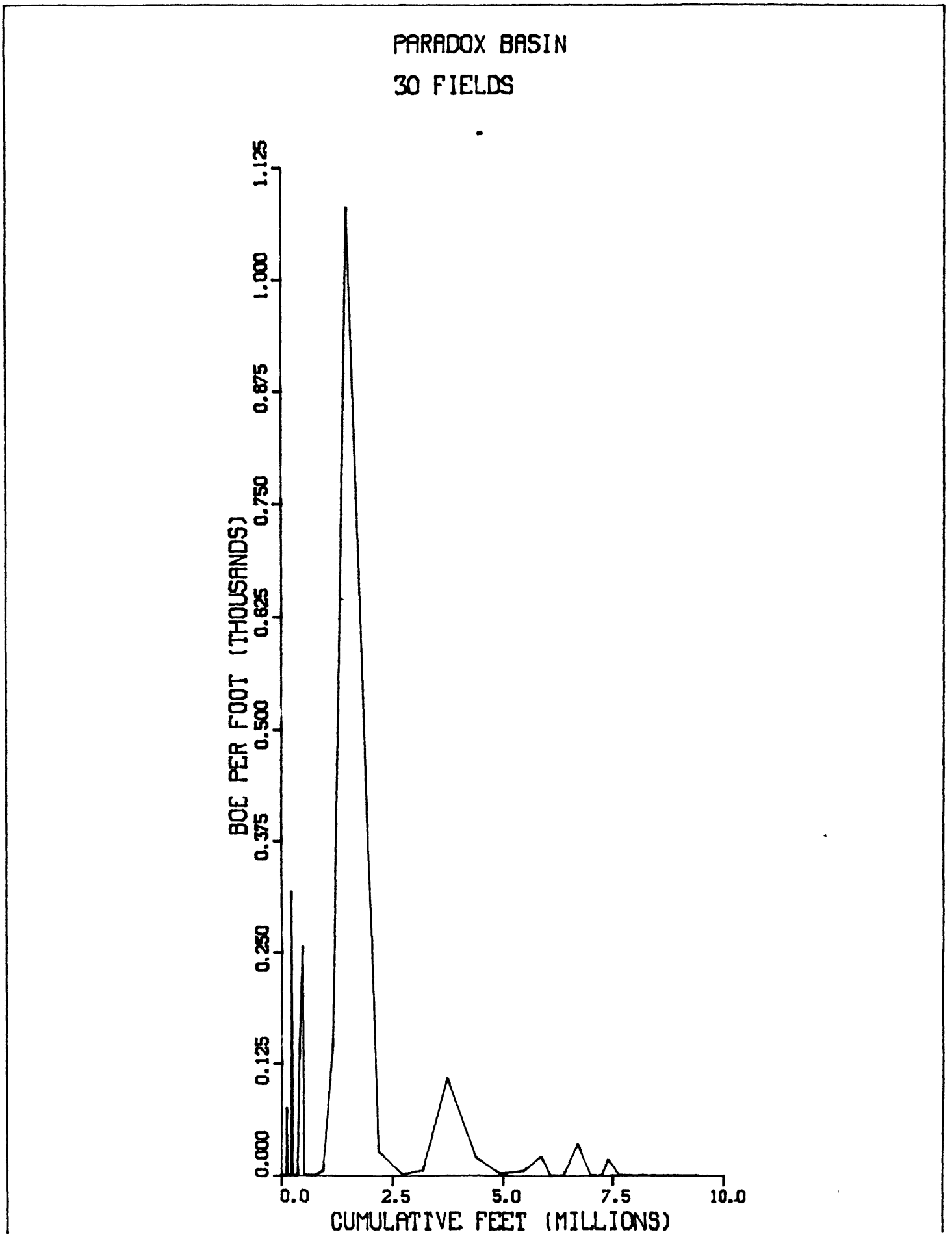

Figure 33a.--BOE per foot vs. cumulative footage drilled.

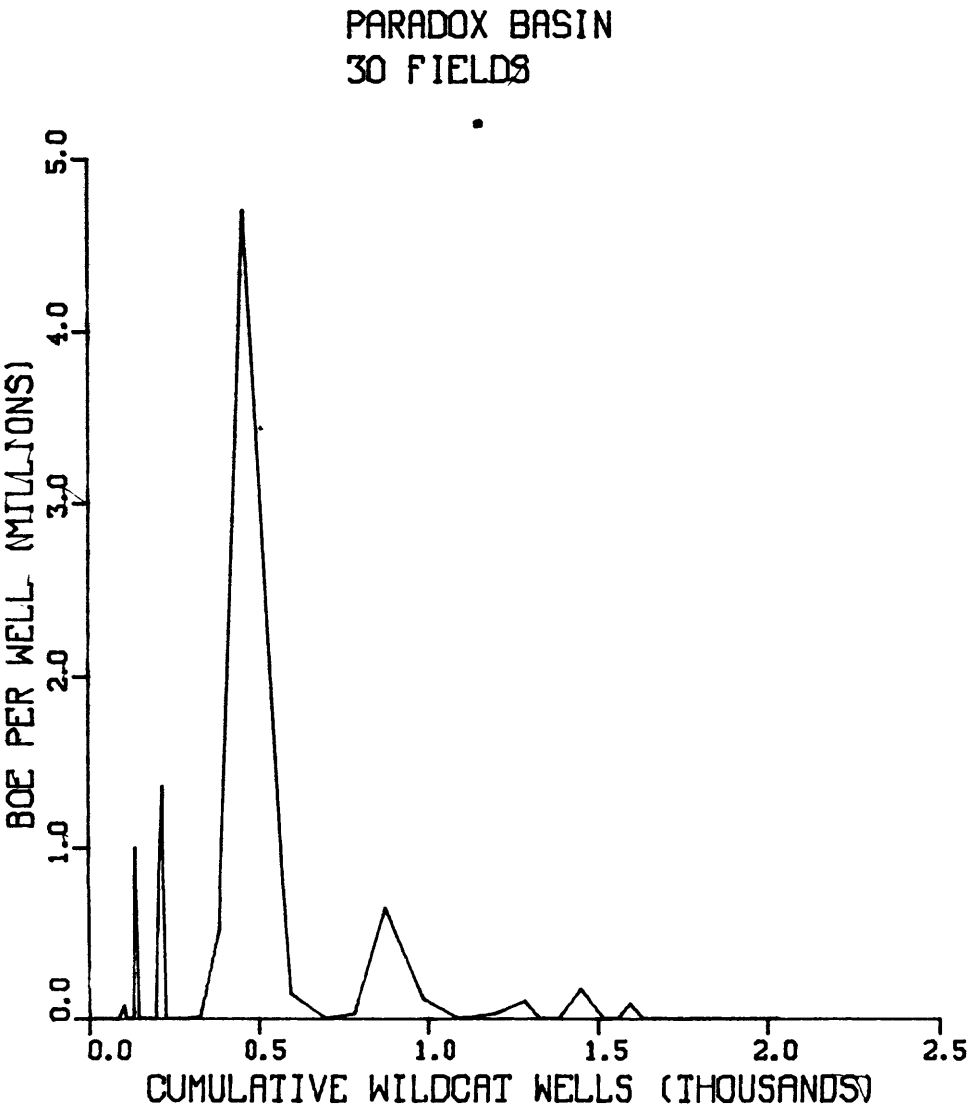

Figure 33b.--BOE per well vs. cumulative wells drilled.

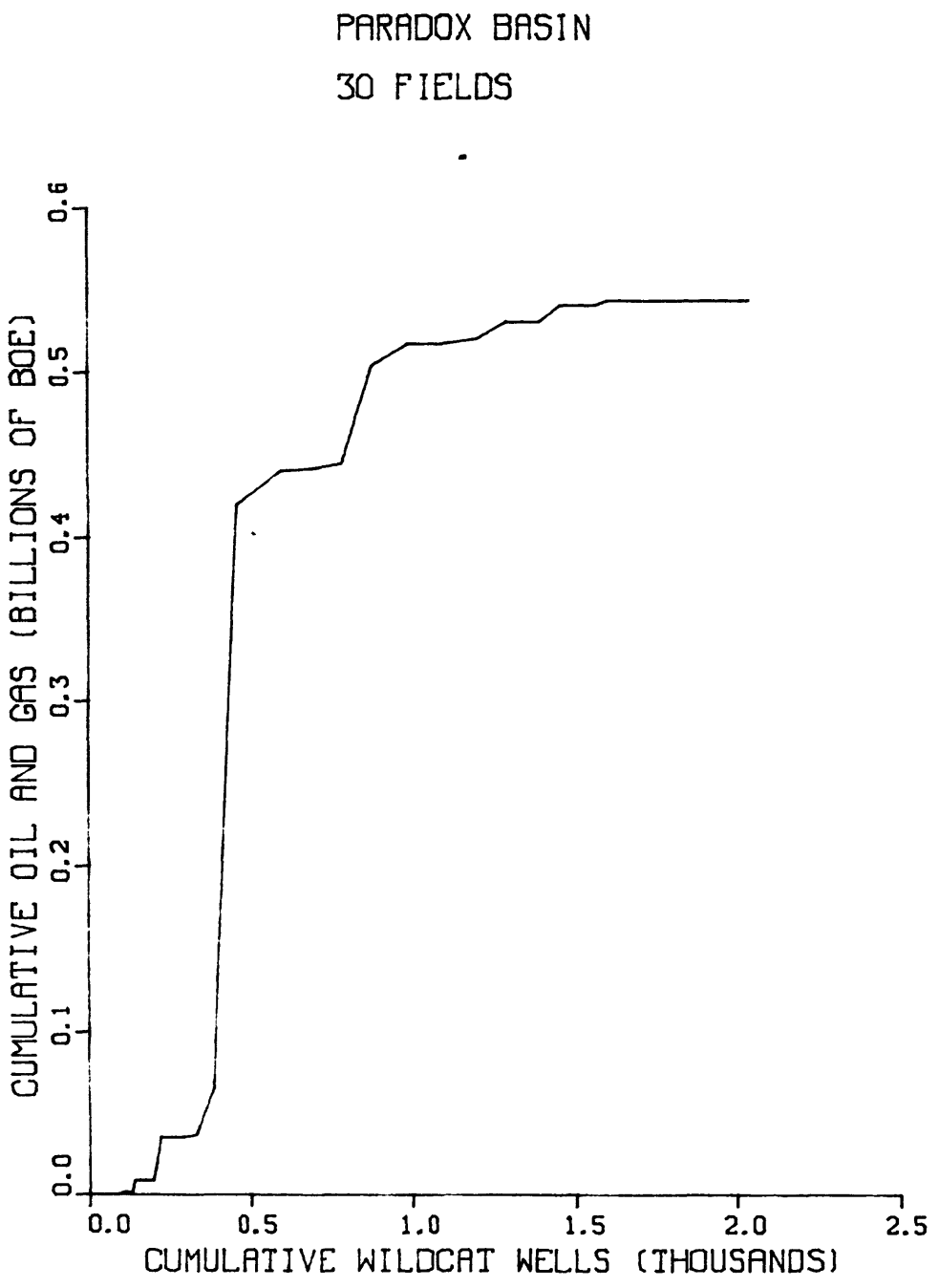

Figure 33c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

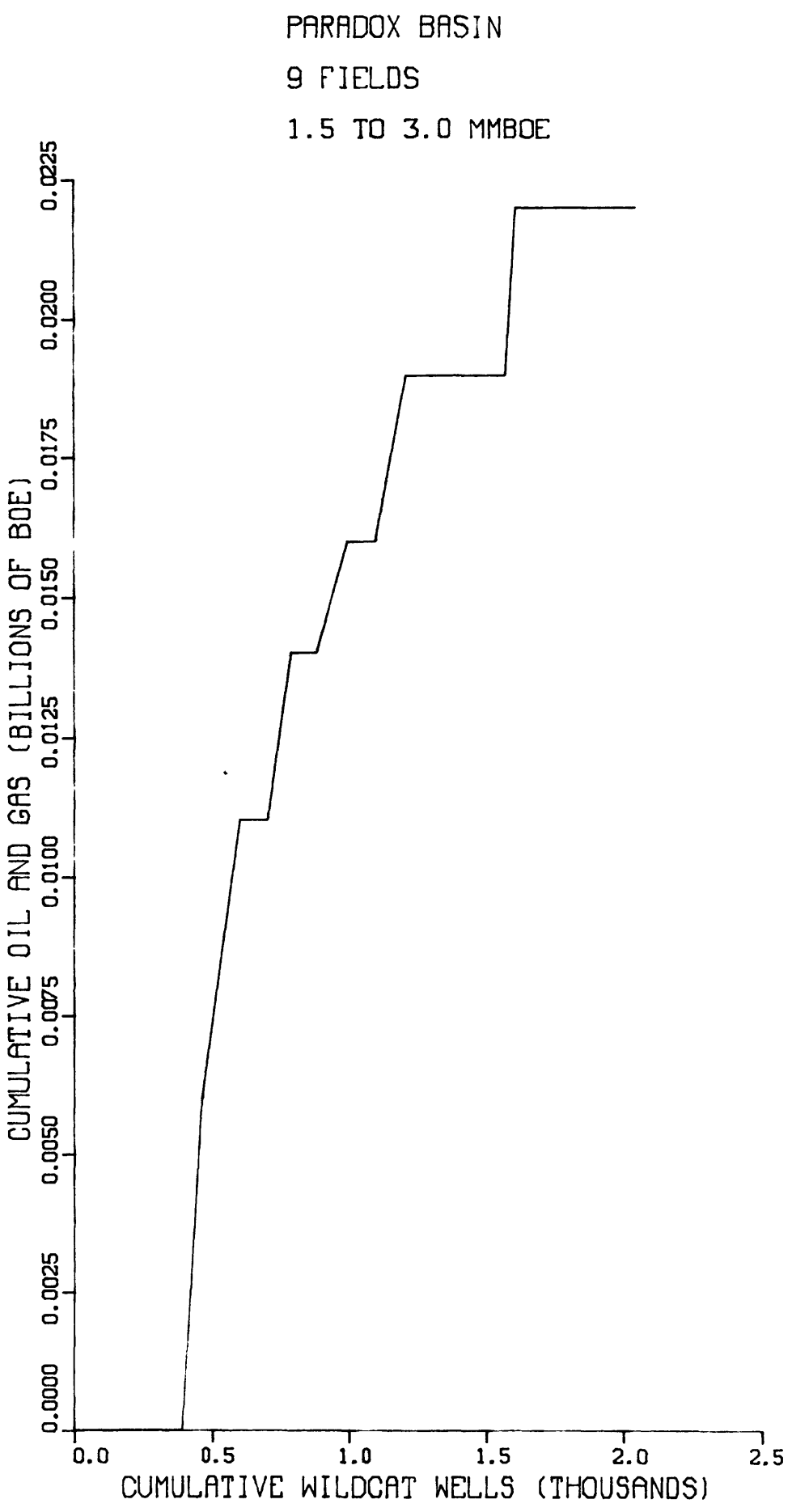

Figure 33d.--Cumulative oil and gas vs. cumulative wells for fields in the size range 0.8-1.5 MMBOE.

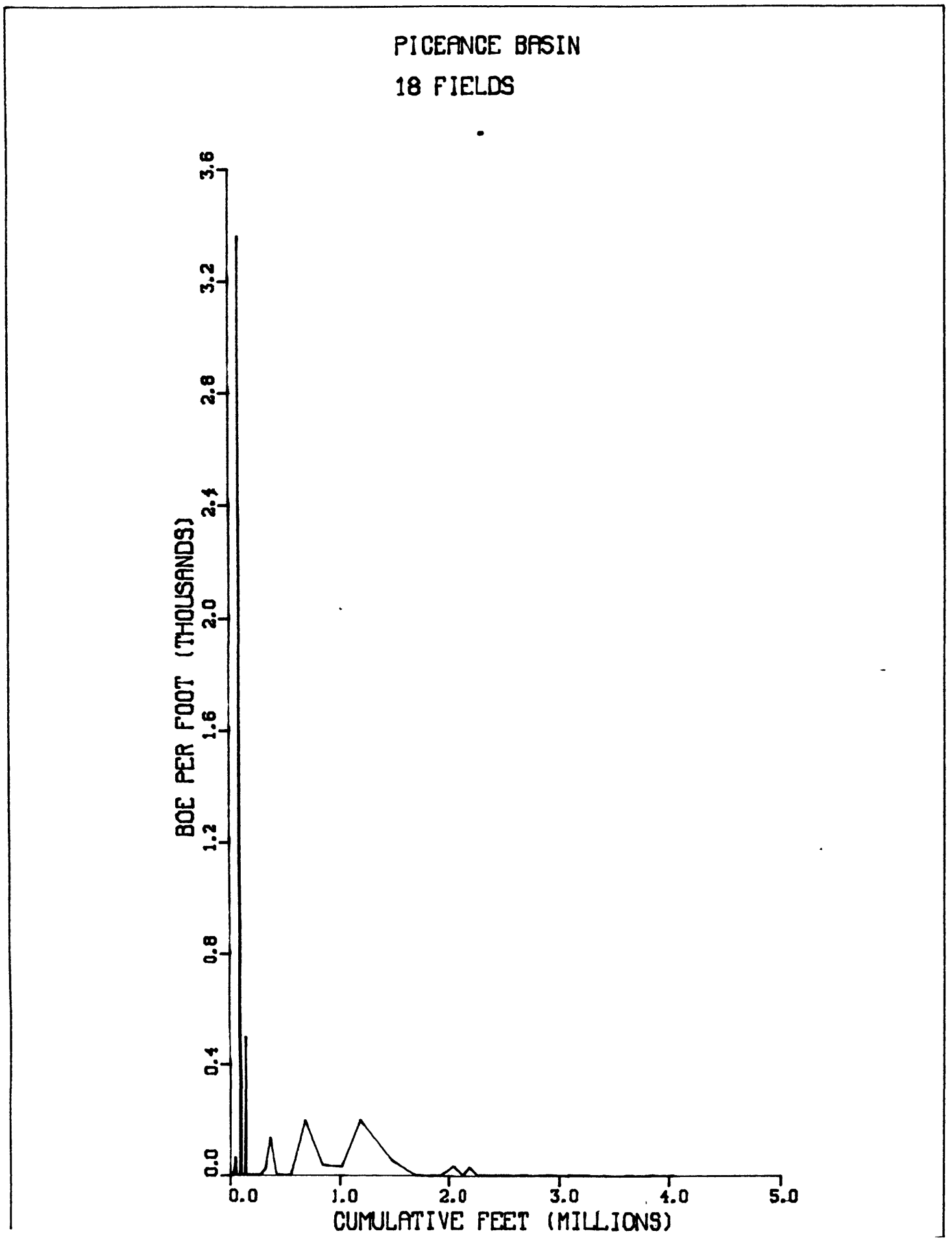

Figure 34a.--BOE per foot vs. cumulative footage drilled.

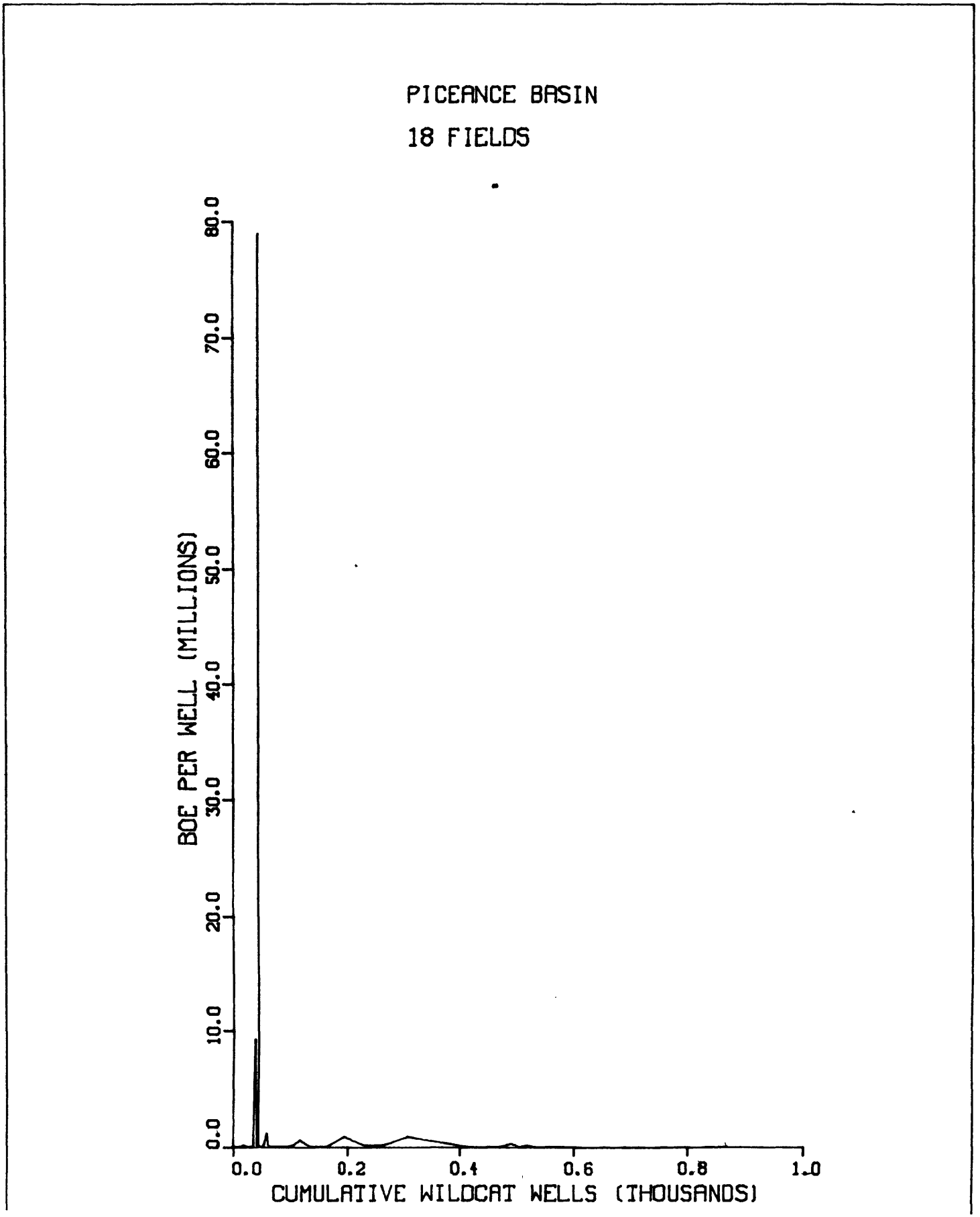

Figure 34b.--BOE per well vs. cumulative wells drilled.

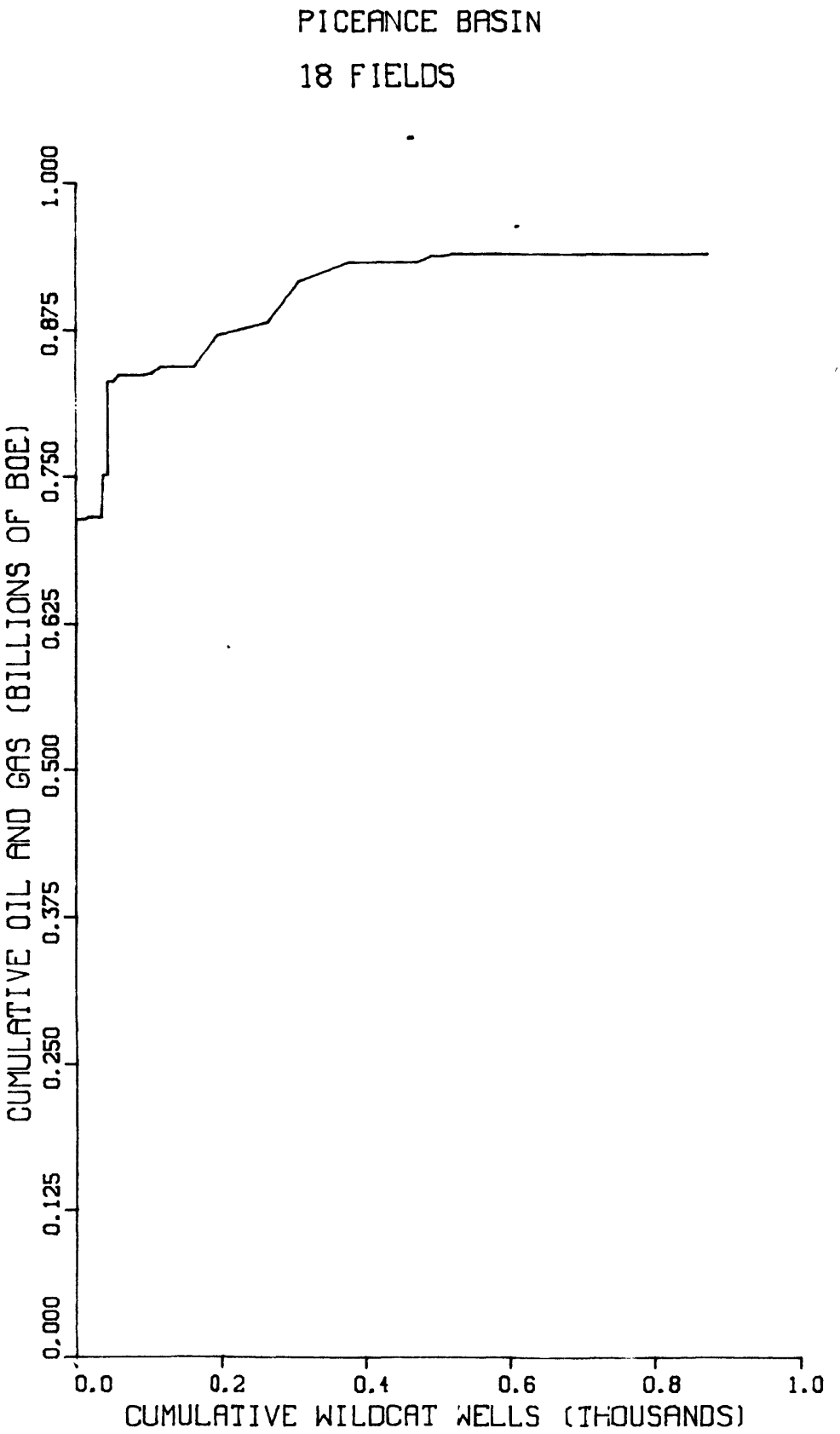

Figure 34c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.

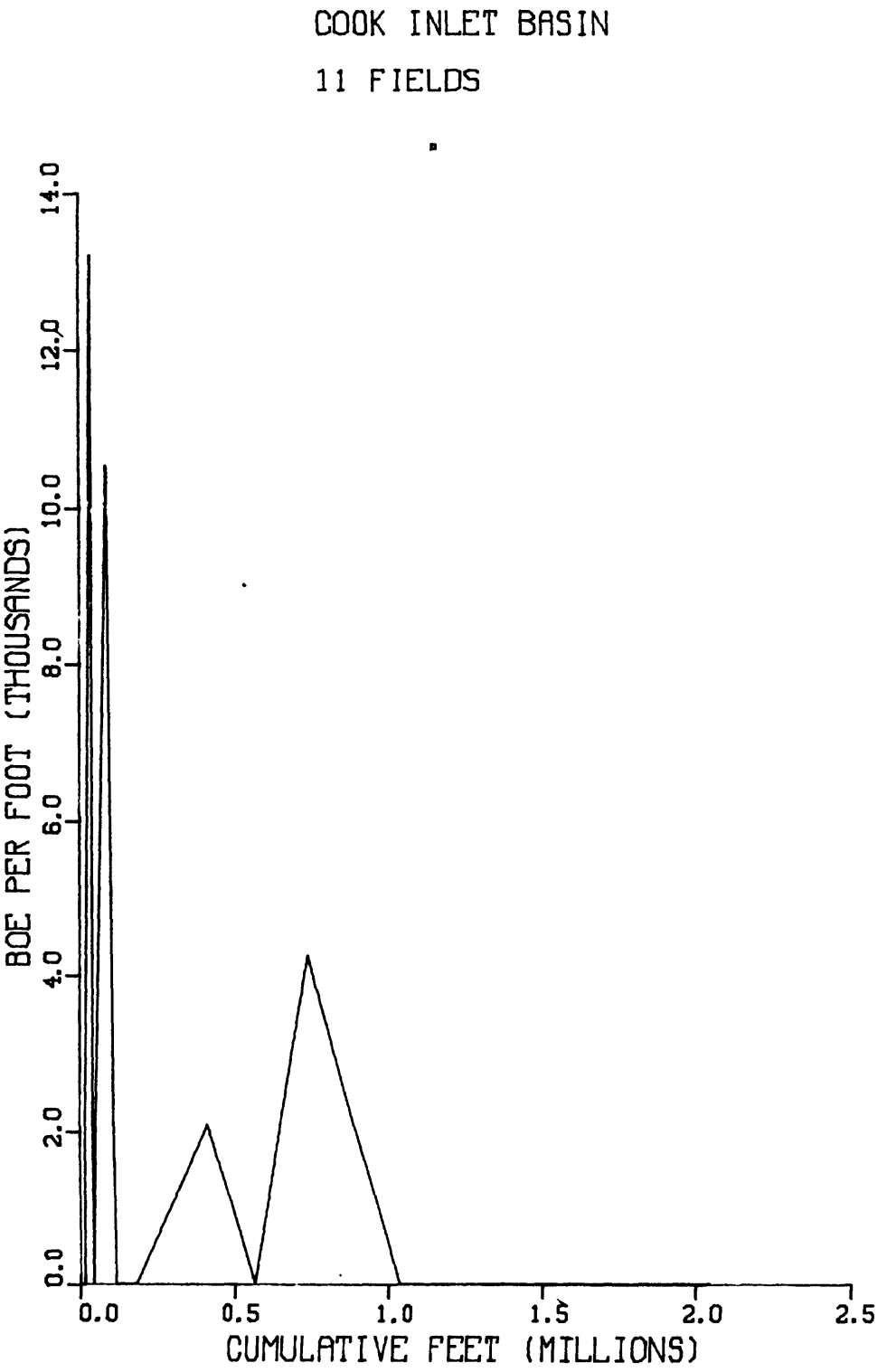

Figure 35a.--BOE per foot vs. cumulative footage drilled.

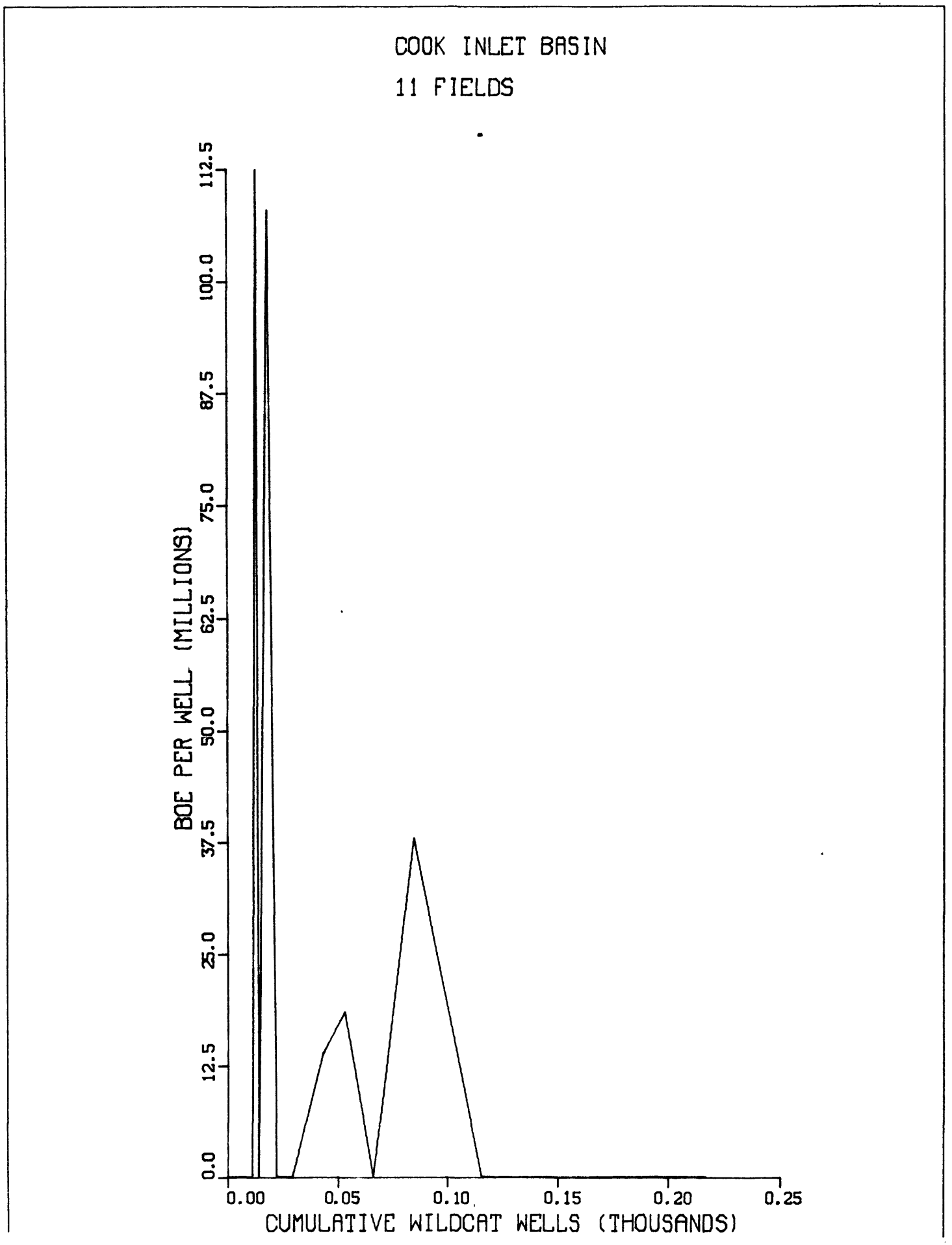

Figure 35b.--BOE per well vs. cumulative wells drilled.

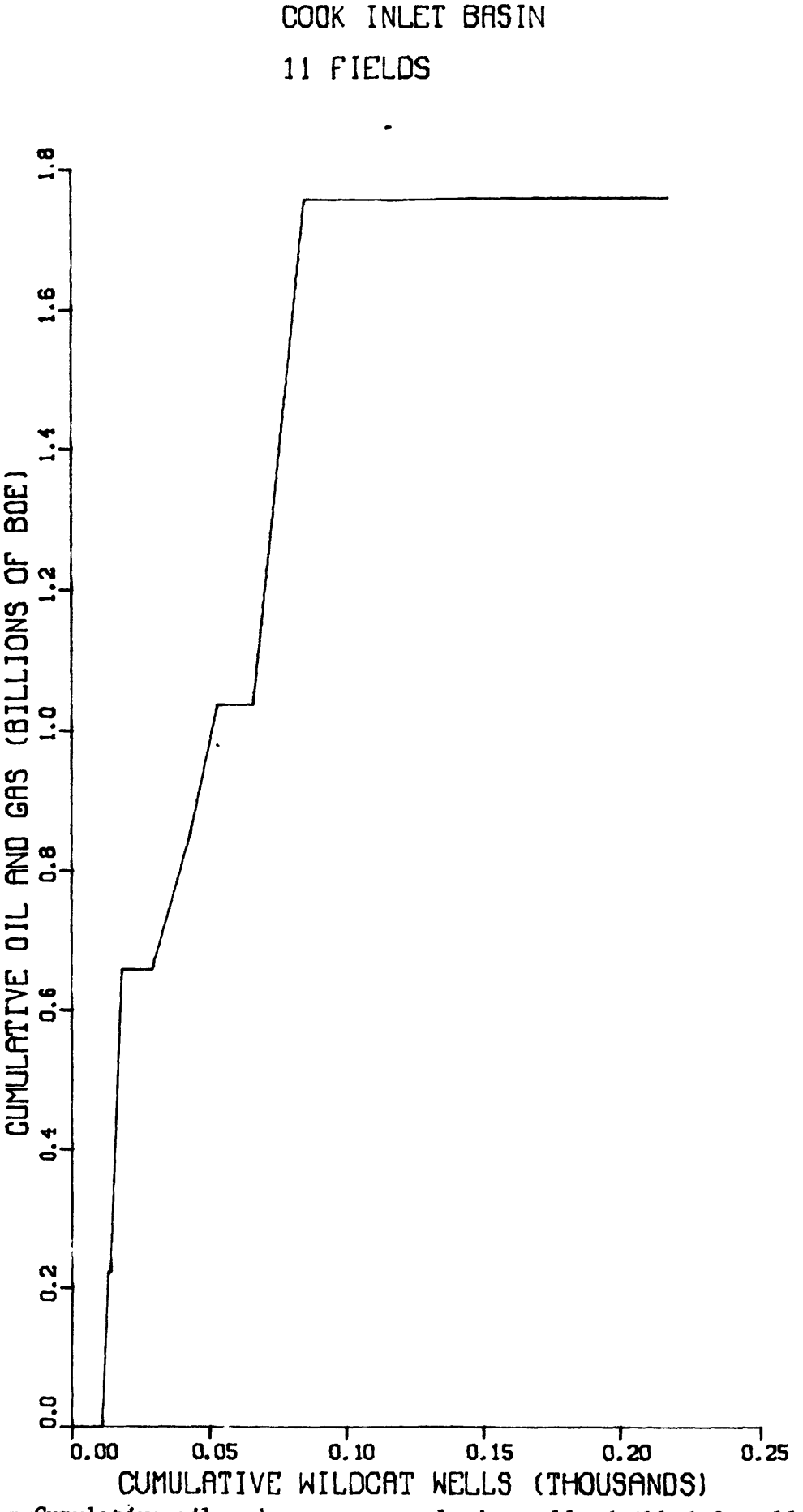

Figure 35c.--Cumulative oil and gas vs. cumulative wells drilled for all fields.