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RR
Pine Ranges
Burgess Spring

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A STUDY OF GAINS IN ANIMAL WEIGHT
AS A MEASURE OF RANGE FORAGE VALUE
(TWO-YEAR-OLD STEERS ON A RECENTLY CUT-OVER EASTSIDE PINE RANGE)
Burgess Spring Experimental Range
1936

First Draft
Progress to Date

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OF RANGE FORAGE VALUE
(TWO-YEAR-OLD STEERS ON A RECENTLY CUT-OVER EASTSIDE PINE RANGE)
BURGESS SPRING EXPERIMENTAL RANGE
1956

I. Object

To determine value of forage on a recently cut-over pine range as reflected by gains or losses in weight of grazing animals. At the same time it is hoped to gain vital information on other experimental factors such as minimum number of animals per pasture and feasibility of bi-weekly weighings. This study is a vital part of the plan to evaluate the factors concerned in animal metabolism and plant growth, both interactive in the grazing of range lands. In other words, this study is to gain immediate practical information and to play a part in "sharpening the tools of range research."

II. Field Methods

Fifteen steers were grazed in one pasture from June 19 to September 25. Individual weights were obtained as the stock entered and left the range and at six intermediate bi-weekly periods.

Briefly, the method employed was to water the cattle in the corral holding lot so that they were familiar with it and at weighing time "rounding them up on foot" near their regular watering hours to cause minimum excitement. Near end of season when their regular watering time was after dark the practice of shutting them off from water the day preceding weighing was inaugurated so they would be more easily

"caught" the next day.

Due to several difficulties in operation of above practices some individual weights were out of line at certain weighings, necessitating reweighing. The scales were balanced before weighing each steer and careful readings were obtained as the steers quieted. Scales were sensitive to 2-pound variations.

Detailed accounts of weighing problems are in the reports prepared in the field by the men who were handling the stock. Excerpts from these with a few additions are in the following paragraphs.

It was necessary to use permitted stock this year as surplus are not yet available from the San Joaquin herd. The steers were chosen from the herd of Roy Owens manager of the Cone Ranch Company at Red Bluff. His N. F. summer range is adjacent to the experimental range. Steers were selected for this first year's trial as it was thought the results would be easier to interpret. Most of the herds using this region as summer range are mixed.

The steers were selected after arriving on the Lassen County summer range. They were a more or less "run-of-the-mill" selection from the herd. To obtain fifteen fairly uniform two-year-old steers it was necessary to use mixed breeds. Taking advantage of this the lot were evenly divided between Hereford, Shorthorn and Aberdeen Angus, five of each. The steers were not of high breeding in any of the breeds, being only fair to good beef animals.

The animals were driven more than 100 miles to the experimental area without much rest or feed and were pretty well shrunk. They were given water and rested for about three quarters of an hour before weighing. They were held near water over night and turned out onto the range

June 20. They returned for water each day taking it from a trough inside of the corral holding lot.

An indication of the immediate effect of handling and weighing the animal was reflected in the weights obtained at the weighing in mid-August. On the day scheduled for weighing, the stock were found in three groups in the main pasture. Considerable difficulty was encountered in trying to get each group into the corral. Only 10 were finally caught and the remaining 5 could not be handled. The 10 steers were weighed after standing overnight in the lane. They were then allowed to drift out to the 5 missing animals (a distance of about 1/4 of a mile) and then all were worked back to the corrals. The 10 head were reweighed along with the remaining 5. Comparing the two weighings of the same steers, it was found that there had been an average loss of 17 pounds per animal. The cattle had free access to water up to the time of weighing ^heo/time.

The cattle were shut off from water on the night of August 27. The next morning they were "waiting at the gate" and were most easily handled. Reliable weights were recorded after the animals had drunk their fill and "milled around" in the lot for a short time. Dr. Hart was present at this weighing. This method of bringing the stock in was tried later but with poorer results.

Weights obtained September 11 indicated a slight average loss for the herd since August 28. Loss of 40 pounds by one steer influenced this average, the other small losses and gains almost balancing. Believing these weights to be out of line, the steers were reweighed on September 15. These weights indicated, that on the average, substantial gains had been made up to that time.

The good record of handling the stock and obtaining reliable

weights was somewhat sullied during the last weighing. Mr. Owen's rider informed the group on the morning of September 24 that they desired to take the stock out the next day. The herd was followed that day to obtain records on species being utilized. Due to stray animals breaking into the pasture the whole herd was "flighty" and worked off some meat as they moved over the area to an extent far greater than during ordinary examinations. A few of the tamer steers came in to water in the evening and were confined in the lane. No attempt was made to corral the others as they were in a "wild mood." They were shut off from water.

The next morning an attempt was made to bring in the remainder of the herd quietly on foot. They were found to be increased by 5 steers and one wild cow. The cow was known to be in the herd for two weeks. Evidently the steers had broken in only one or two days earlier, possibly as the stock outside of the range were being rounded up by the cowboys. After difficult herding by two men on foot the herd were "shunted" past the corral but several of the wildest broke back and had to be left for the cowboys to bring in. After some racing they were brought in, by pairs and singly, the cow being the last to submit and then only at the end of a rope.

III. Data and Methods of Analysis

The results were a little difficult to analyze because some individual weights at certain weighings were out of line when compared to the average trend. These weights were known to be unreliable due to the condition to which the animals were subjected directly preceding these weighings. Such weights when grouped with the total and averaged,

mask the true gains that would be put on the animals if not subjected to bi-weekly weighings.

The weights of each individual steer during the season were analysed in October by A. L. Hervey before the averages were drawn. The method used was to plot the individual weights against time. Enough points were on each graph to determine the average trend for the season. The average curve was then drawn on each graph, being related to most of the points on the graph but disregarding the weights which were far out of line. The graphs (or copies of them) are included in this report.

Taking steer number 6 for example, the curve does not drop to the extremely low weight recorded on September 26. The reason is that this weight is not a true measure because the steer had just finished more than an hour of swift racing over the range ahead of the cowboys before weighing.

After a true curve of the trend of weights during the season was prepared for each steer, the correct weight for each steer at each date of weighing was considered as the point on which the curve crossed the horizontal line occupied by that date. These figures are shown near the curves on the following graphs.

Assuming that the above figures represent true weights they were entered into table shown on next page and from them average gains were computed.

Below the mean gains as computed from curve values are shown the mean daily gain for each 2-week period as indicated from actual recorded weights. The curve values are considered to represent more nearly the true value of the range to stock; they are not influenced by a few very poor weights.

**WEIGHTS AND GAINS (POUNDS) OF STEERS AS OBTAINED BY CURVE VALUES
BURGESS SPRING EXPERIMENTAL RANGE - 1936**

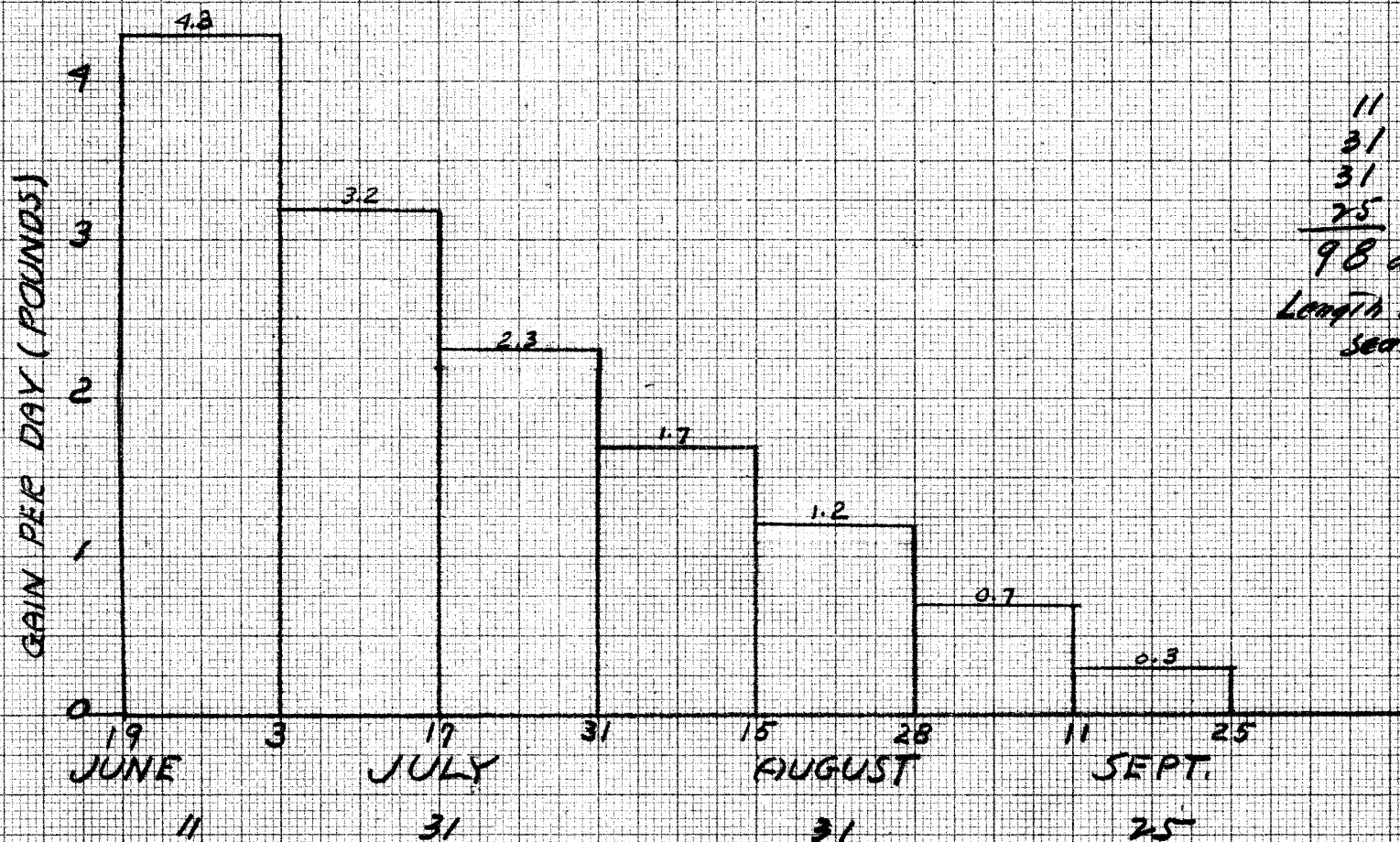
| | 6/19/36 | 7/3/36 | 7/17/36 | 7/31/36 | 8/15/36 | 8/28/36 | 9/11/36 | 9/25/36 | Gain for Season |
|--------------------|---------|--------|---------|---------|---------|---------|---------|---------|-----------------------|
| Steer | 12-wk. | 12-wk. | 12-wk. | 12-wk. | 12-wk. | 12-wk. | 12-wk. | 12-wk. | |
| No. | Weight | Weight | gain | Weight | gain | Weight | gain | Weight | gain |
| 1 | 784 | 830 | 46 | 874 | 44 | 908 | 34 | 936 | 28 |
| 2 | 844 | 922 | 78 | 980 | 58 | 1022 | 42 | 1050 | 28 |
| 3 | 878 | 932 | 54 | 968 | 36 | 988 | 20 | 1000 | 12 |
| 4 | 760 | 814 | 54 | 856 | 42 | 882 | 26 | 902 | 20 |
| 5 | 750 | 844 | 94 | 900 | 56 | 934 | 34 | 960 | 26 |
| 6 | 880 | 948 | 68 | 1000 | 52 | 1038 | 38 | 1066 | 28 |
| 7 | 766 | 850 | 84 | 900 | 50 | 930 | 30 | 950 | 20 |
| 8 | 780 | 830 | 50 | 854 | 24 | 868 | 14 | 876 | 8 |
| 9 | 730 | 792 | 62 | 846 | 54 | 884 | 38 | 916 | 32 |
| 10 | 670 | 730 | 60 | 772 | 42 | 802 | 30 | 826 | 24 |
| 11 | 680 | 718 | 38 | 758 | 40 | 792 | 34 | 820 | 28 |
| 12 | 724 | 782 | 58 | 822 | 40 | 848 | 26 | 868 | 20 |
| 13 | 652 | 694 | 42 | 732 | 38 | 764 | 32 | 792 | 28 |
| 14 | 764 | 804 | 40 | 844 | 40 | 882 | 38 | 914 | 32 |
| 15 | 708 | 766 | 58 | 818 | 52 | 858 | 40 | 884 | 26 |
| AVERAGE | 758 | 817 | 59.07 | 862 | 44.5 | 893 | 31.7 | 917 | 24 |
| Mean gain (2-wks.) | | 59.6 | | | | | | | |
| Mean gain (day) | | +4.22 | | +3.18 | | +2.26 | | +1.71 | |

Mean gain per day from recorded weights

+ 4.44 + 3.37 + 2.13 + .30 + 3.02 -.44 -.86

AVERAGE DAILY GAIN IN WEIGHT OF FIFTEEN TWO-YEAR-OLD STEERS

BURGESS SPRING EXPERIMENTAL RANGE
1936



11
31
31
25

98 days
Length of
season

URB on Hwy
3/29/57
from GLH 11/12/36

The average daily gains per period are shown on the diagram following the table.

IV. Summary

The steers made phenomenal gains during this first year. The average daily gain per steer for the entire season was over 1.9 pounds, comparable to feed lots.

Most outstanding were the early season gains. The average daily gain of 4.3 pounds during the first two weeks could be attributed easily to "fill" after the hard 100-mile drive; the record of 3.2 pounds per day during the next bi-weekly period must be taken as gains accrued from the forage on the experimental range.

Results of 1936 indicate that the Eastside cut-over pine lands must be ranked high among the beef-producing ranges of the State.

The value of these lands to the stock industry warrants more study of them.

More study is warranted to find actual worth of the 1936 results as several factors undoubtedly influenced them.

Some of the factors are: (1) succession of forage on cut-over lands, (2) season of use, (3) economic net gain, (4) class of stock, and (5) breed and grade of stock.

(1) Forage crop undergoes marked changes due to logging and then without doubt, goes through several stages of succession as the under-cover tends to come into equilibrium with the changing tree cover. This may be a slow process under semi-arid low-site conditions. Little is known on this subject but it is being attacked on the experimental ranges.

The pasture was logged in 1934 and was practically ungrazed until the experimental stock were placed in it during the 1936 season. Its present stage of succession may be near the peak for grazing capacity.

- (2) Stock were in the pasture during only the period when gains were being made. They were taken off when "holding their own," neither gaining nor losing appreciably. Probably they could have made gains as early as June under 1936 conditions.
- (3) No record was obtained showing the net gains per animal from time of leaving home range to return. The losses during driving, cost of driving and cost of range allotment may indicate that even such phenomenal gains made when actually on the summer range are over-balanced by other economical factors under present methods of handling.
- (4) The 1936 results were obtained with long two-year old steers. Different results probably would be secured using only breeding animals or the mixed herd commonly grazed on summer ranges in this region.
- (5) The average gains recorded are probably indicative of steers on the range as a whole because most of the herds are of mixed breeds and grades. Common assumption would be that higher grade animals would do better. The 1936 results make the common assumption of best range breed uncertain.

This year the Sherborns made the greatest gains, Angus second and Herefords third. Such a trial probably is not indicative of breed value. However, the relatively easy terrain and open conditions of this type may make it quite as well adapted to

the breeds always considered inferior to Herefords under rugged range conditions. The quieter temperaments of the 1936 animals of the other breeds, not so much at weighing time as during their regular unrestricted grazing, probably influenced gains considerably. Gains (or losses) of stock correlate with composition of forage when abundance of feed and water are both available and climate is not critical.

As stock weights tended to "level out" there was still an abundance of feed on the ground. This feed was not dry in the sense applicable to a pure annual type after maturity. Lack of gains must be caused by a change (march) of the nutrients, or maybe only a few specific compounds, during the life-cycle of the plants. This chemical field involving not only plant analysis but animal metabolism as well must be studied further.

Grazing capacity estimates for pine lands may have to be revised, at least for recently cut-over timber.

To estimate number of stock to put into the experimental pasture a figure of forty acres to the head in the pine type for the summer season was taken as that being commonly used by administration on the Lassen N. F. Actual stocking was 16 animals for approximately 535 acres, or slightly over 35 acres per head. Under the 1936 conditions and length of season the pasture was evidently understocked. More study is vital.

The following conclusions relate to experimental planning rather than practical application.

More careful selection is needed to gain uniformity in the experimental animals. This applies equally to temperament as well as to breed, age, conformity, etc. Expert advice is needed on this point.

It is most difficult to obtain reliable weights for each animal at all weighings even when possible to handle them on foot with least excitement.

Perhaps the factor most favorable to successful weighings at the Gene Troughs corral is that cattle regularly water in the holding lot. They have a reason for coming into the vicinity of the corrals as well as less fear of actually entering.

It may be possible to offer some other "entice ment" that will make the stock more easily handled. A mouthful of concentrate as a reward for entering the scale crate has been suggested as one answer.

The factor most immediately operative in making it difficult to obtain reliable weights is that cattle do not always take a "normal fill" of water before entering the weighing pen.

For sake of uniformity it seemed best to always water stock just before weighing, penning them in by water-trough for about three quarters of an hour. This affected the amount of water they drank and naturally varied recorded weight by several pounds. Here again uniform temperament of experimental stock is most important.

Above difficulties in weighing would seem to discourage bi-weekly weighings. However, the 1936 records are considered as most satisfactory and the shorter periods enable the experimenter to pick out quickly the few weights which are out of line. The graphic analysis is very satisfactory. Only two or three weights per season would not allow placing of adequate points on the graphs to draw a curve of seasonal trends. Retention of only a few bad records influences the averages considerably.

Careful selection of animals combined with a sufficient number of weight records, enough to determine seasonal trends and to make com-

prehensive analysis, will make it possible to lower the minimum number of animals per lot now considered necessary to keep experimental error within desired limits.

More information on correct season of use is vital. From the purely research point of view it is most desirable, for at least one season, to put the animals on the one pasture at an early date and to remove them as late as possible. This would make it possible to secure a seasonal trend of weights that would probably start low, rise abruptly as range reached readiness, level off towards end of season and then drop rapidly. From this the correct starting and stopping dates, could be determined for that season, effects on vegetation not considered, and then be correlated with other factors. Recent word from ^{r/}Homay in the statistical school at Washington has indicated that this is most highly desirable for next year. He also desires a mixed herd of certain classes. Other factors of animal metabolism which cannot be foreseen now might invalidate results of above trend.

Curve of gains during 1936 season show almost a straight line, highest on June 19 and reaching nearly zero by September 25. Above study would undoubtedly show other results.

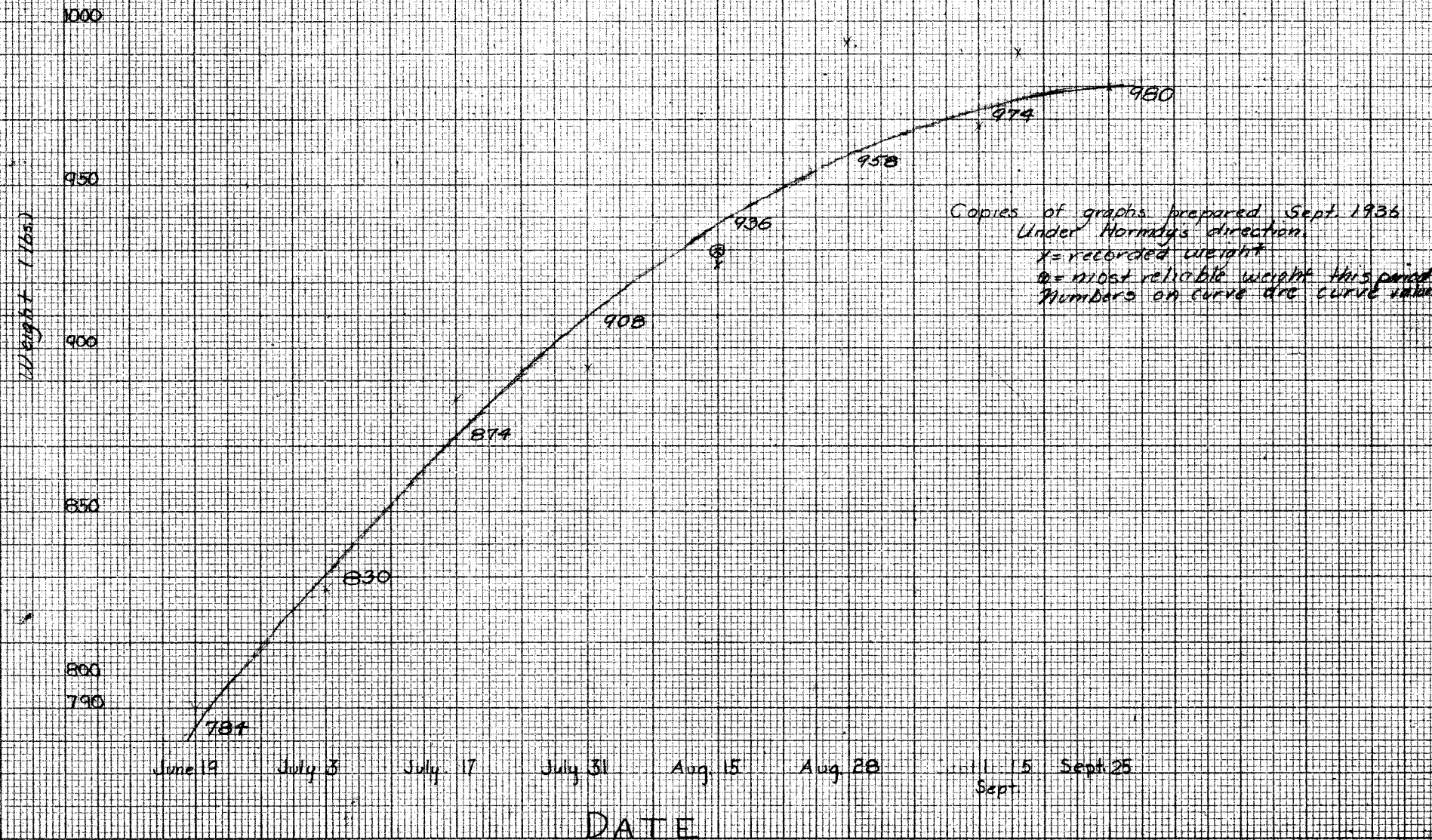
It would be preferable to own the experimental herd so that it could be handled as desired. Some sacrifice in animal condition during the preliminary study on one pasture could be made in order to gain information highly needed in the research studies. No private owner can be expected to furnish the stock and take the loss without recompense. Legal agreements to make up such loss are difficult to frame and do not eliminate the griefs which always accompany detailed understandings between experimental agencies and owners of borrowed stock.

One point in favor of using permitted stock is that it offers a possible chance to make an economic study of the net gains of stock from leaving the home ranch until returning in the fall. A perfect agreement with the owner as well as facilities for weighing at the home ranch would be necessary for this plan to operate. Last year the permittee showed little interest in obtaining such information. If the stock cannot be obtained before the regular 1937 season opens, an effort should be made to gain this economic information for at least one season.

*Graphs of weights for each steer follow ; also
copy of original data is included*

RR
Mine Ranges

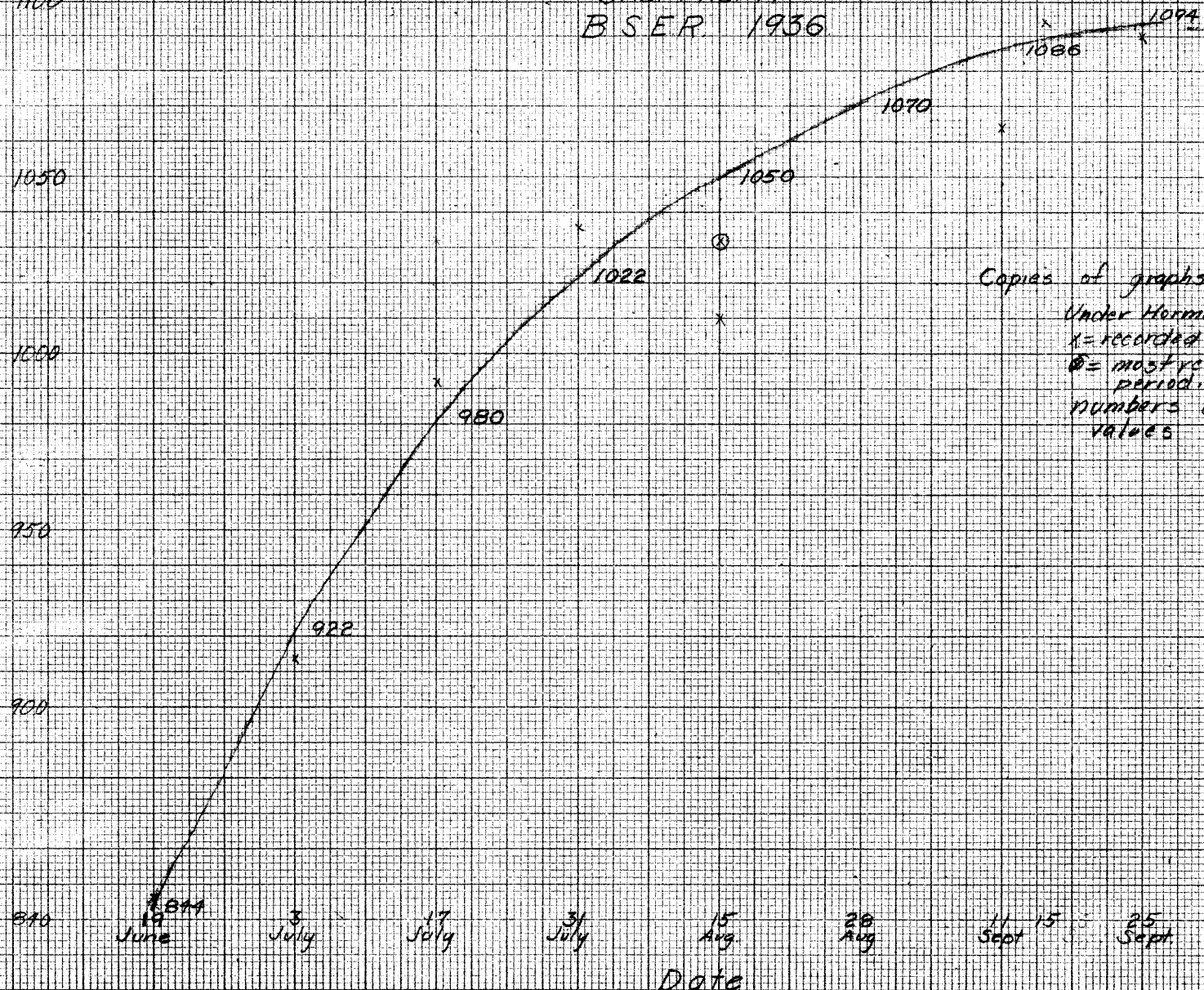
Weight of Steer No. 1
Hereford
B.S.E.R. 1936



RR
Pine Ranges
1100

Weight of Steer No. 2
Shorthorn
BSER 1936

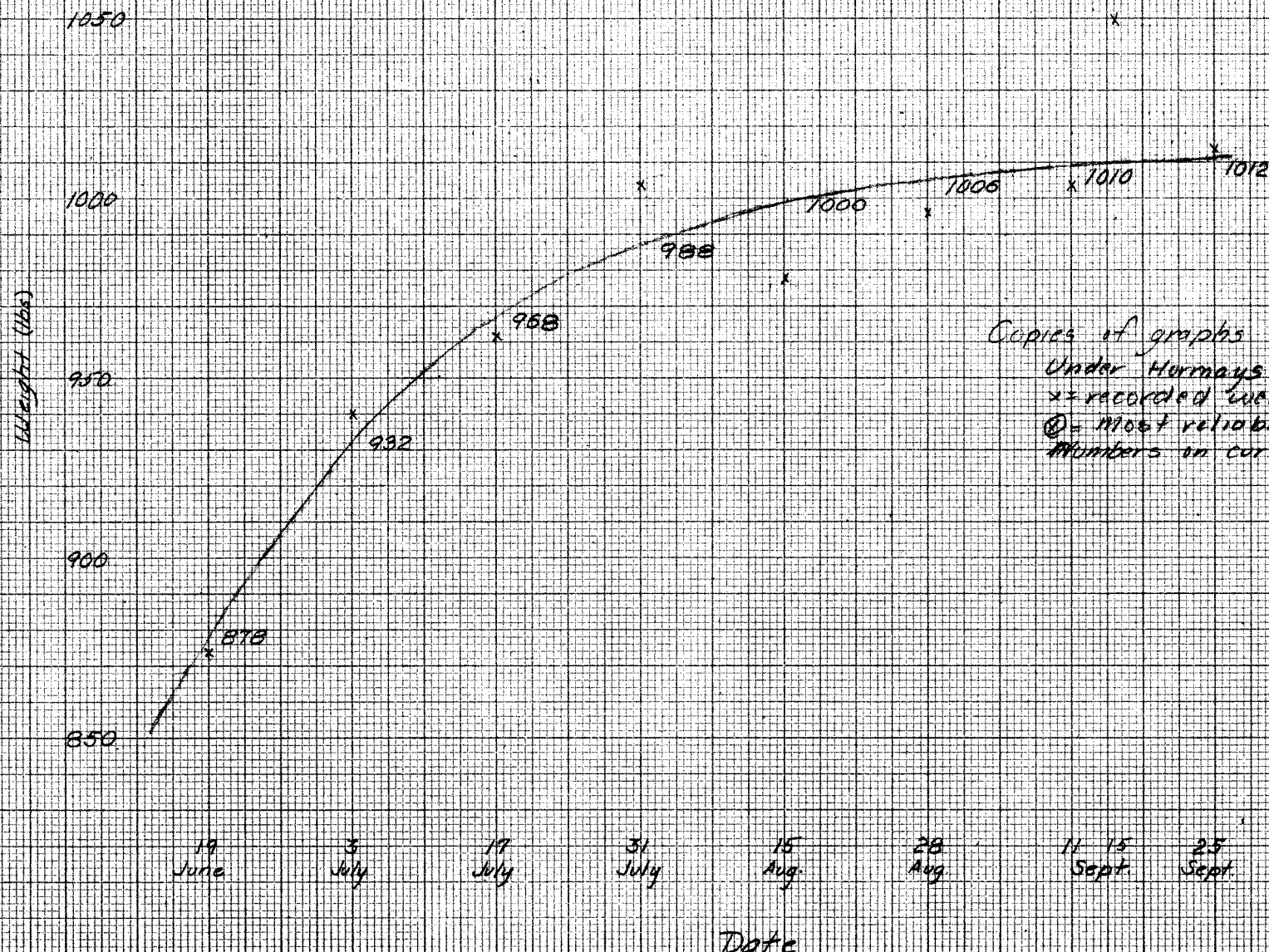
Weight (lbs.)



Copies of graphs prepared Sept. 1936
Under Hormay's direction
x = recorded weight
O = most reliable weight this period.
numbers on curve are curve values

RR
Pine Ranges

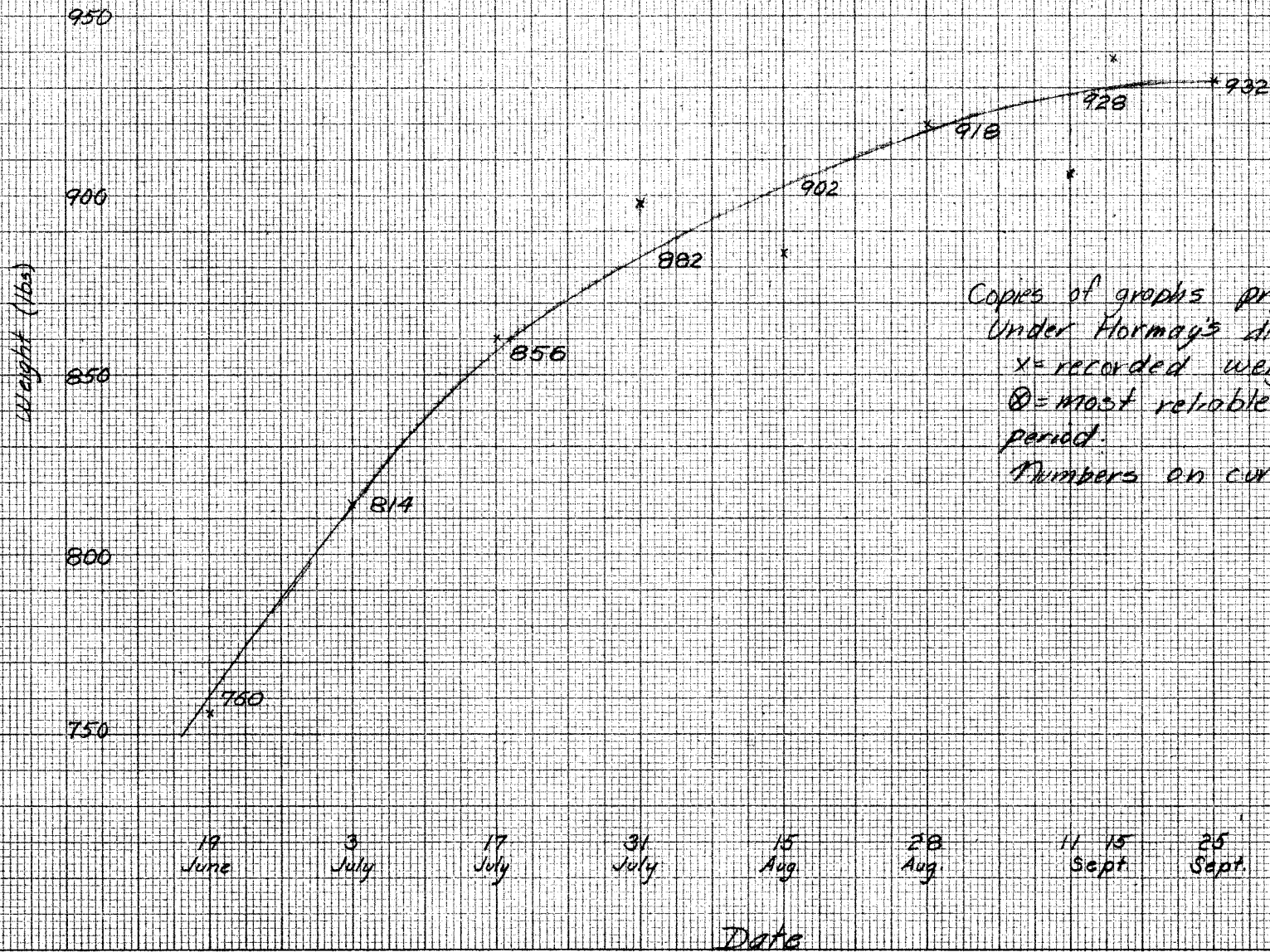
Weight of Steer No 3
Hereford
B.S.E.R. 1936



Copies of graphs prepared Sept. 1936
Under Hermans direction
x = recorded weight
⊙ = most reliable weight this period
Numbers on curve are curve values.

K.R.
Pine Ranges

Weight of Steer No. 4
Angus
B.S.F.R. 1936.



Copies of graphs prepared Sept. 1936.
Under Flormay's direction
x = recorded weight
⊗ = most reliable weight this
period.
Numbers on curve are curve values.

Pine Ranges

1000

Weight of Steer No 5
Short horn
BSER 1936.

Weight (lbs.)

950

900

850

800

750

740

June

July

July

July

Aug.

Aug.

Sept

Sept.

Date

750

844

900

934

960

974

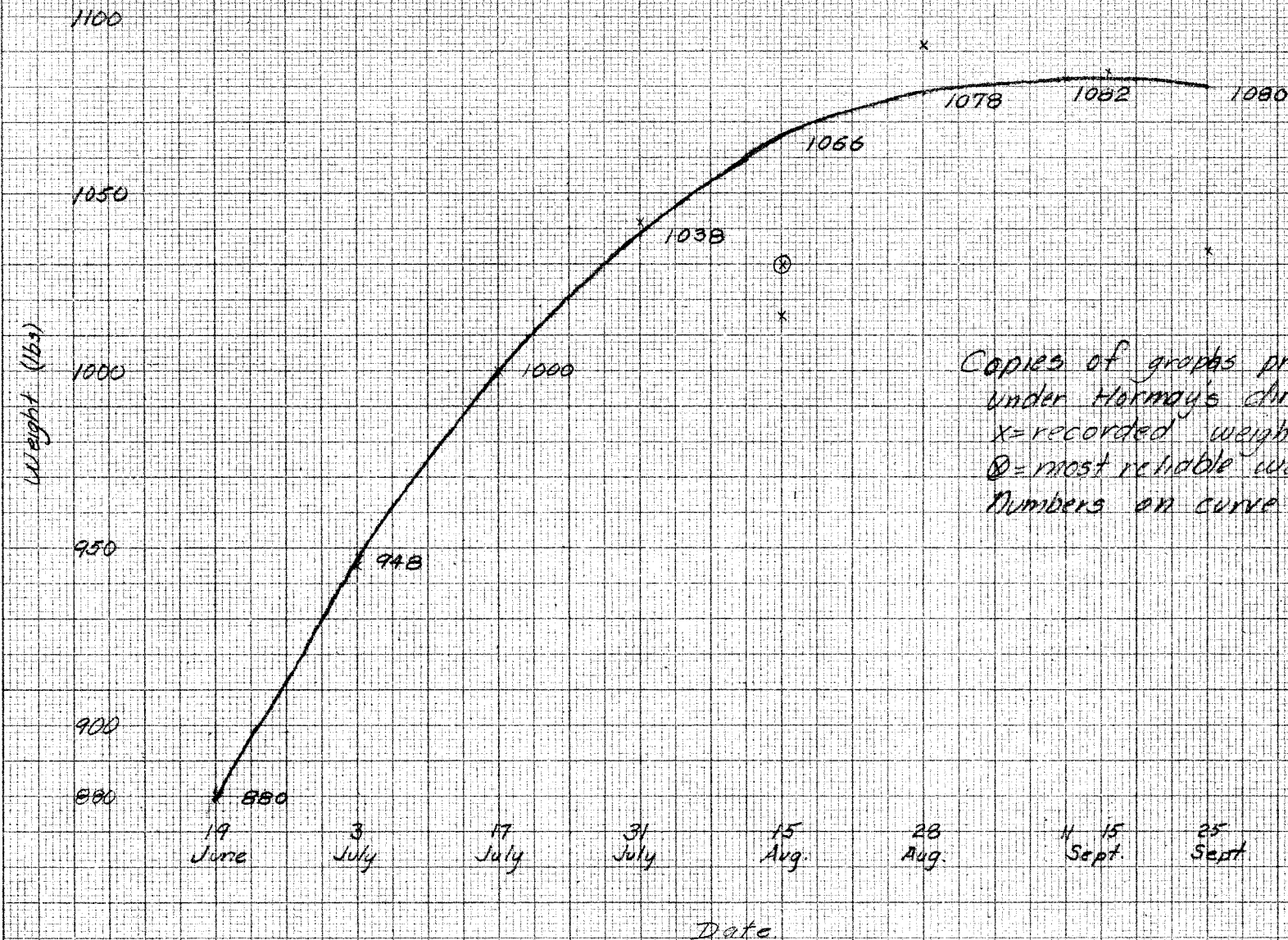
978

978

Copies of graphs prepared Sept. 1936
Under Hormays direction
x = recorded weight
⊙ = most reliable weight this period
Numbers on curve are curve values

RR
Rae Ranges

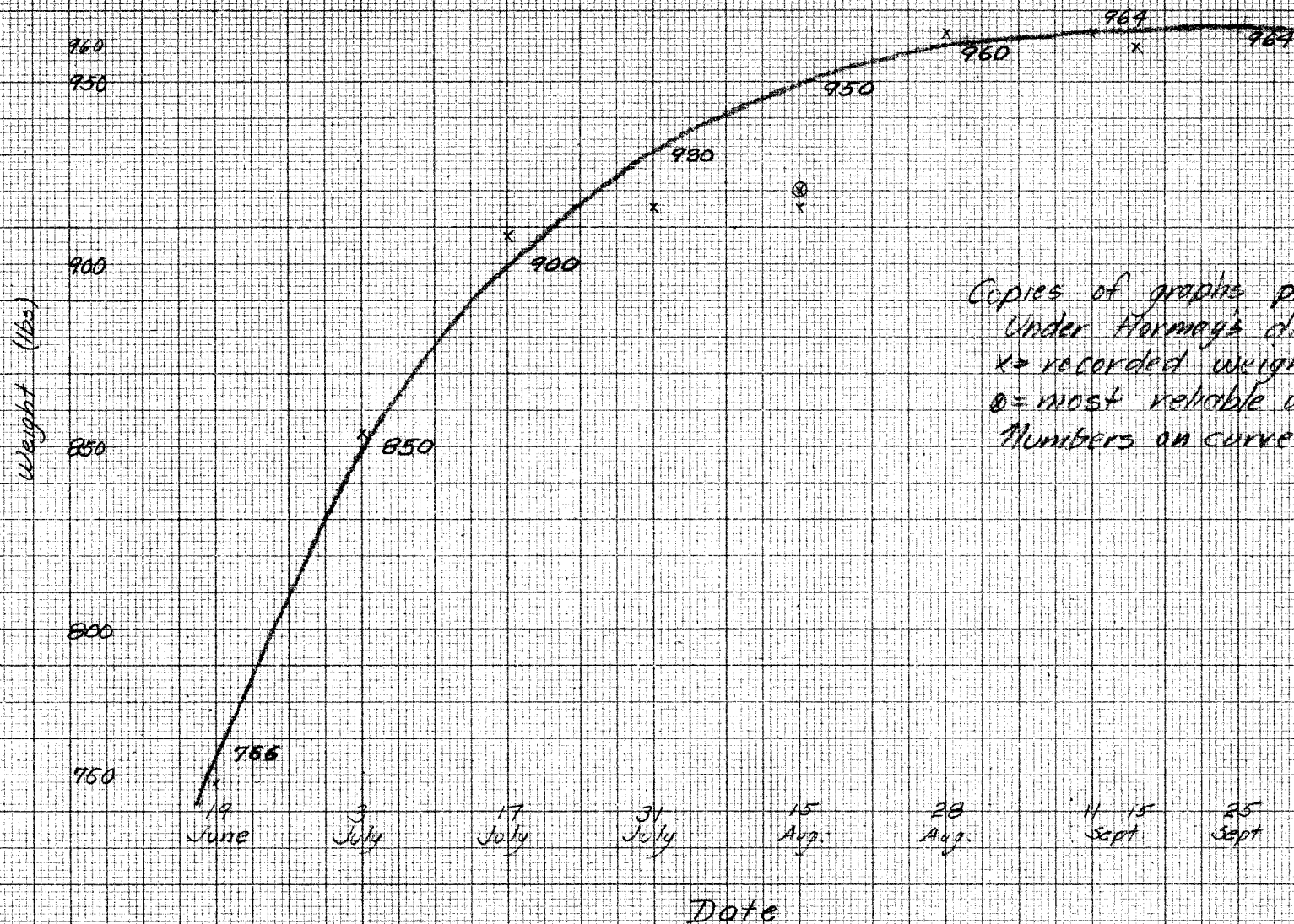
Weight of Steer No 6
Shorthorn
B.S.E.R. 1936



Copies of graphs prepared Sept. 1936
under Hormay's direction
x = recorded weight
⊗ = most reliable weight this period
Numbers on curve are curve values

Pine Ranges

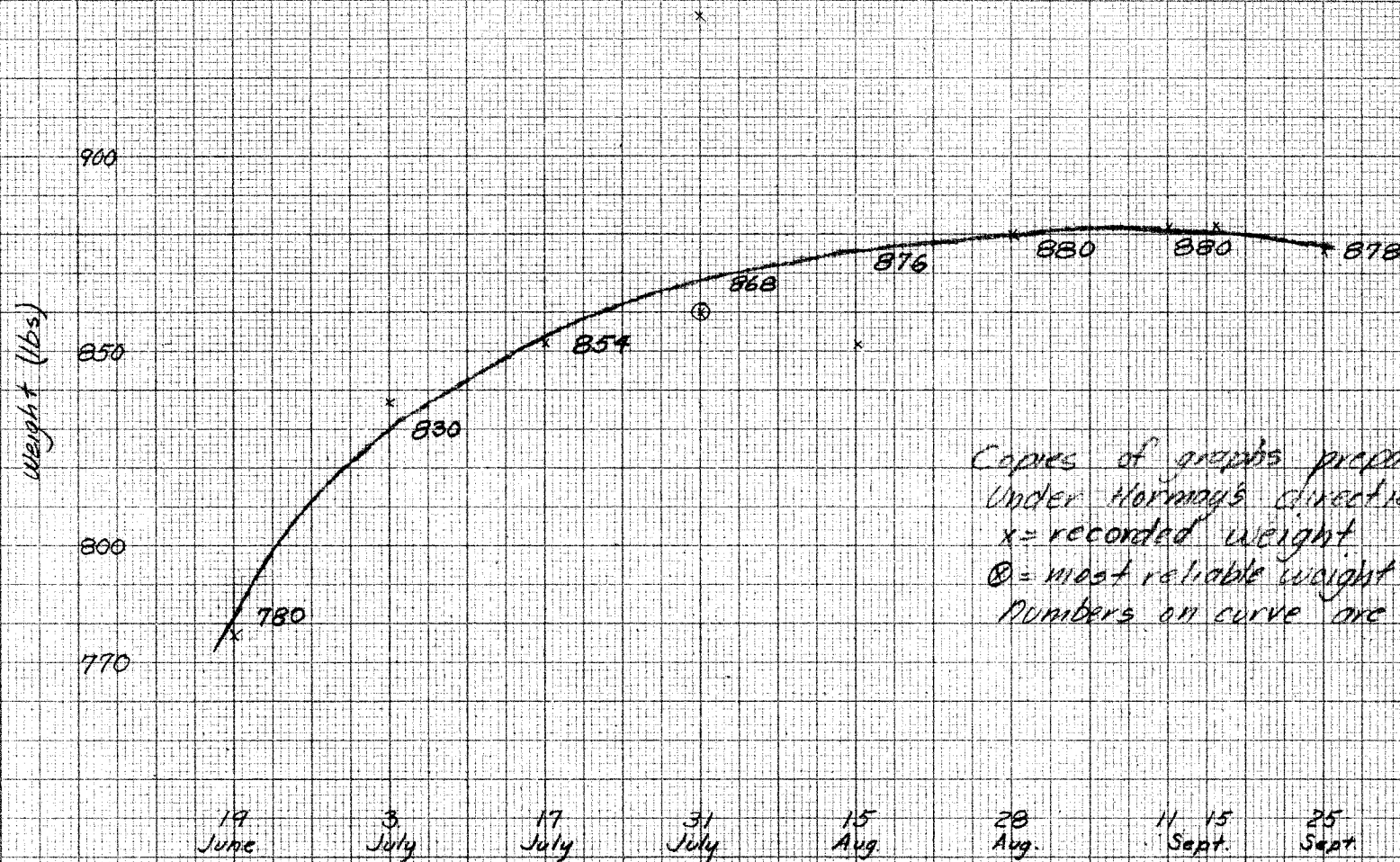
Weight of Steer No. 1
Hereford
B.S.E.R. 1936



Copies of graphs prepared Sept. 1936
Under Hormay's direction.
x = recorded weight
⊗ = most reliable weight this period
Numbers on curve are curve values

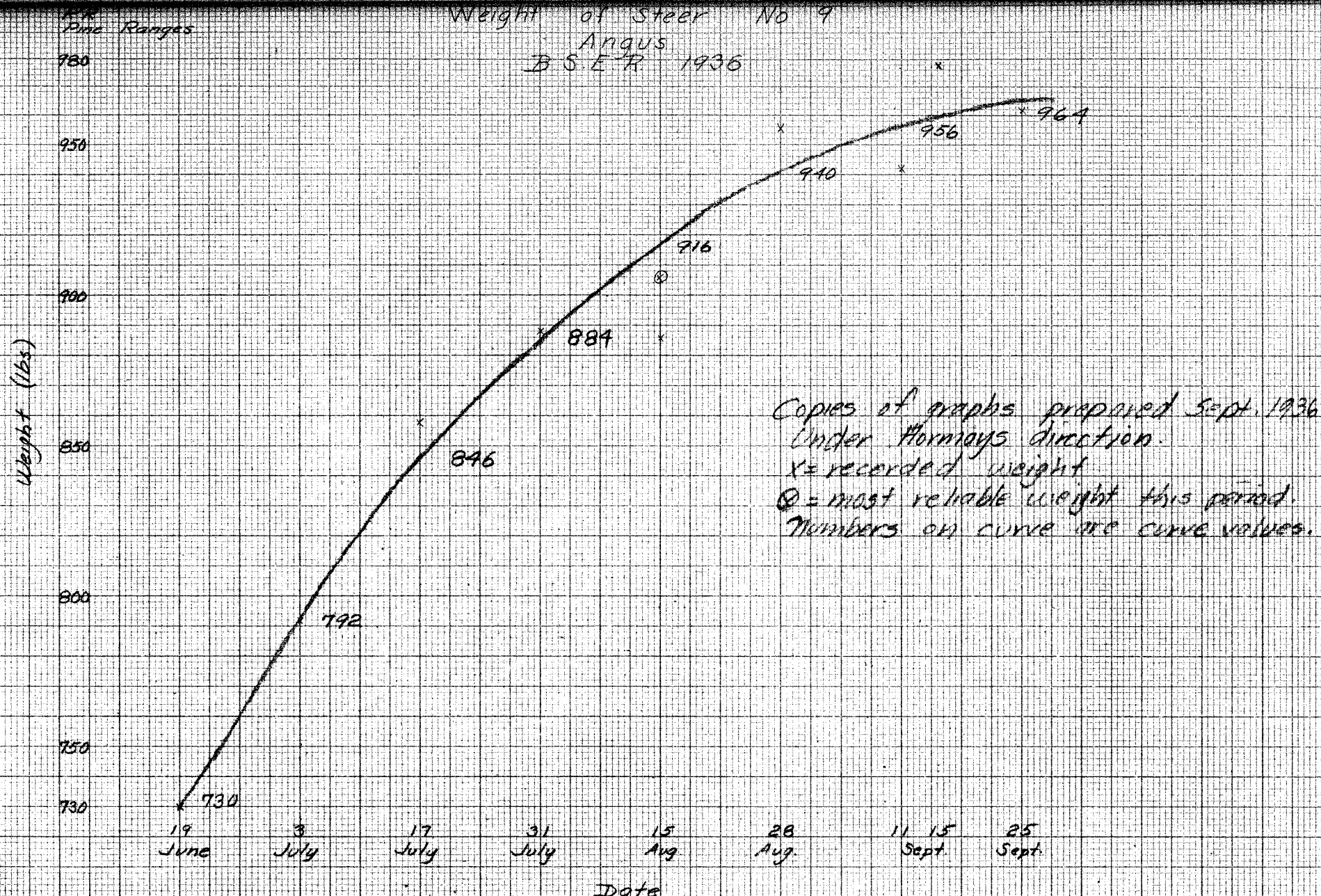
Pine Ranges

Weight of Steer No 8
Hereford
B.S.E.R. 1936



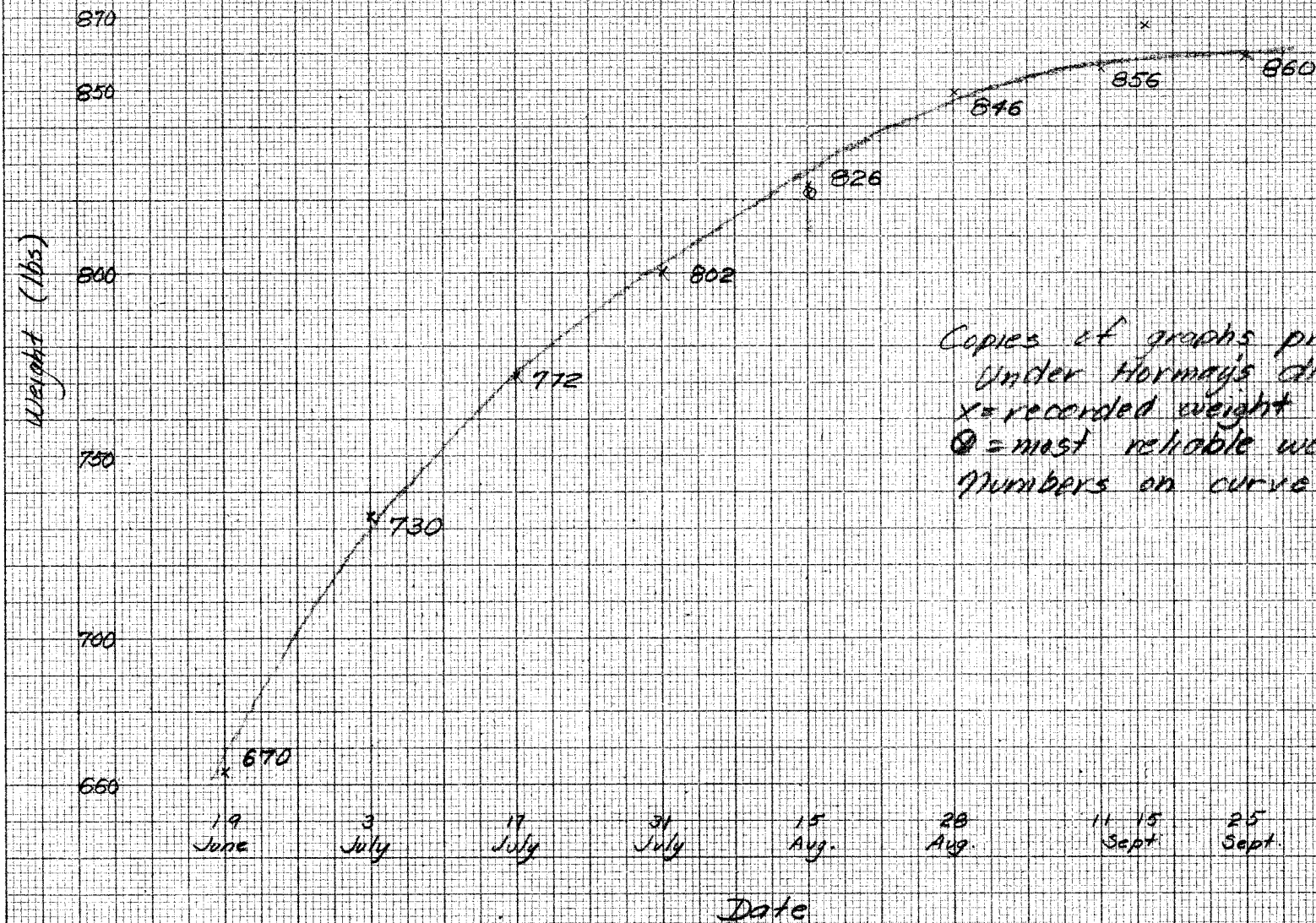
Copies of graphs prepared Sept. 1936
Under Hormay's direction.
x = recorded weight
⊗ = most reliable weight this period.
Numbers on curve are curve values

Weight of Steer No 9
Angus
B S E R 1936



R.R.
Bar Ranges

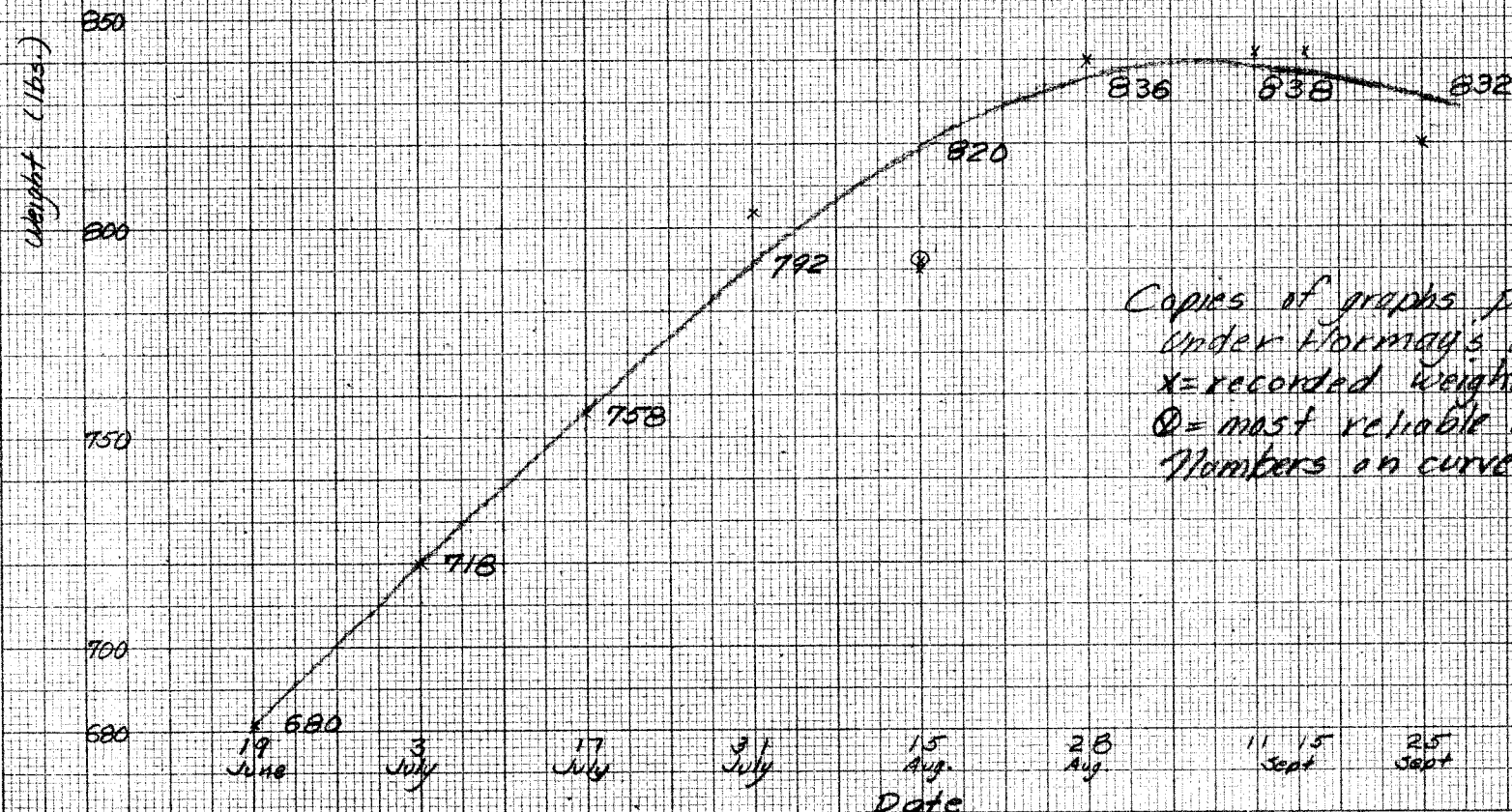
Weight of Steer No 10
Short horn
B.S.E.R. 1936



Copies of graphs prepared Sept. 1936
Under Hormay's direction,
x = recorded weight
o = most reliable weight this period
Numbers on curve are curve values.

RR
Dad Ranges

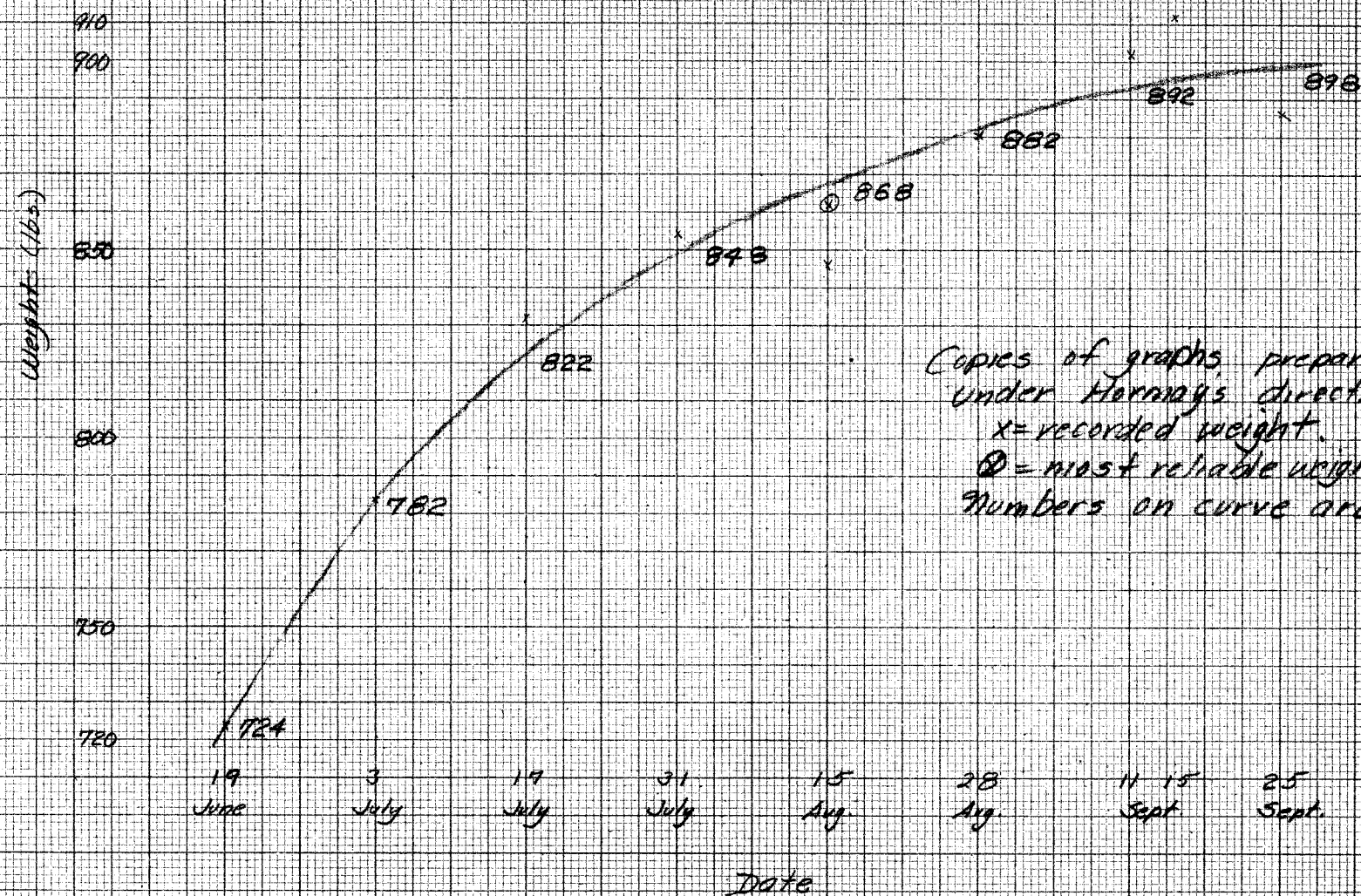
Weight of Steer No. 11
Hereford
B. S. F. R. 1936



Copies of graphs prepared Sept. 1936
under Normay's direction.
x = recorded weight
o = most reliable weight this period
Numbers on curve are curve values

RR
Blue Range

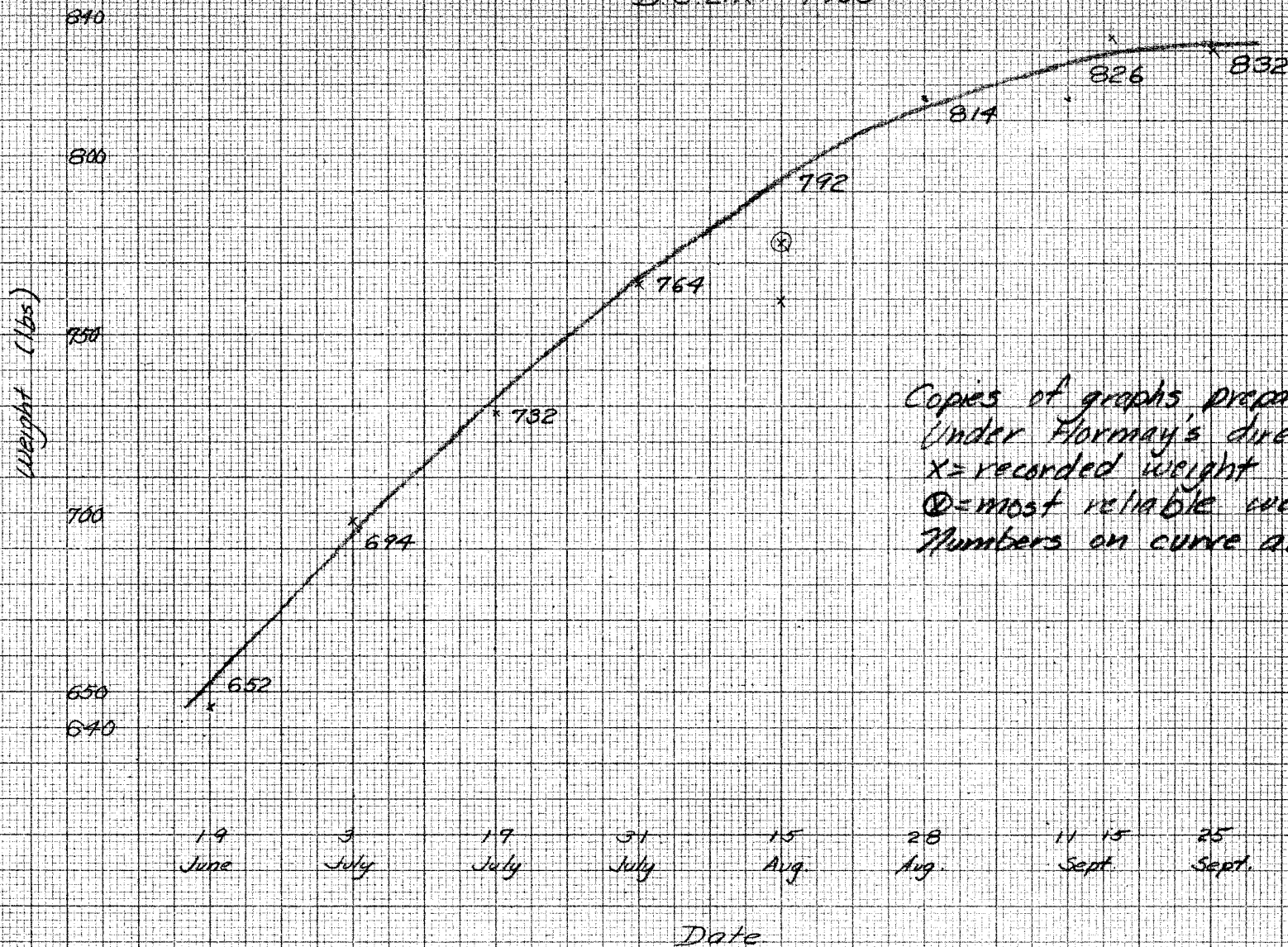
Weight of Steer No 12
Angus
B.S.E.R 1936



Copies of graphs prepared Sept. 1936
under Hormay's direction
x = recorded weight.
⊗ = most reliable weight this period.
Numbers on curve are curve values

R.R.
Pine Ranges

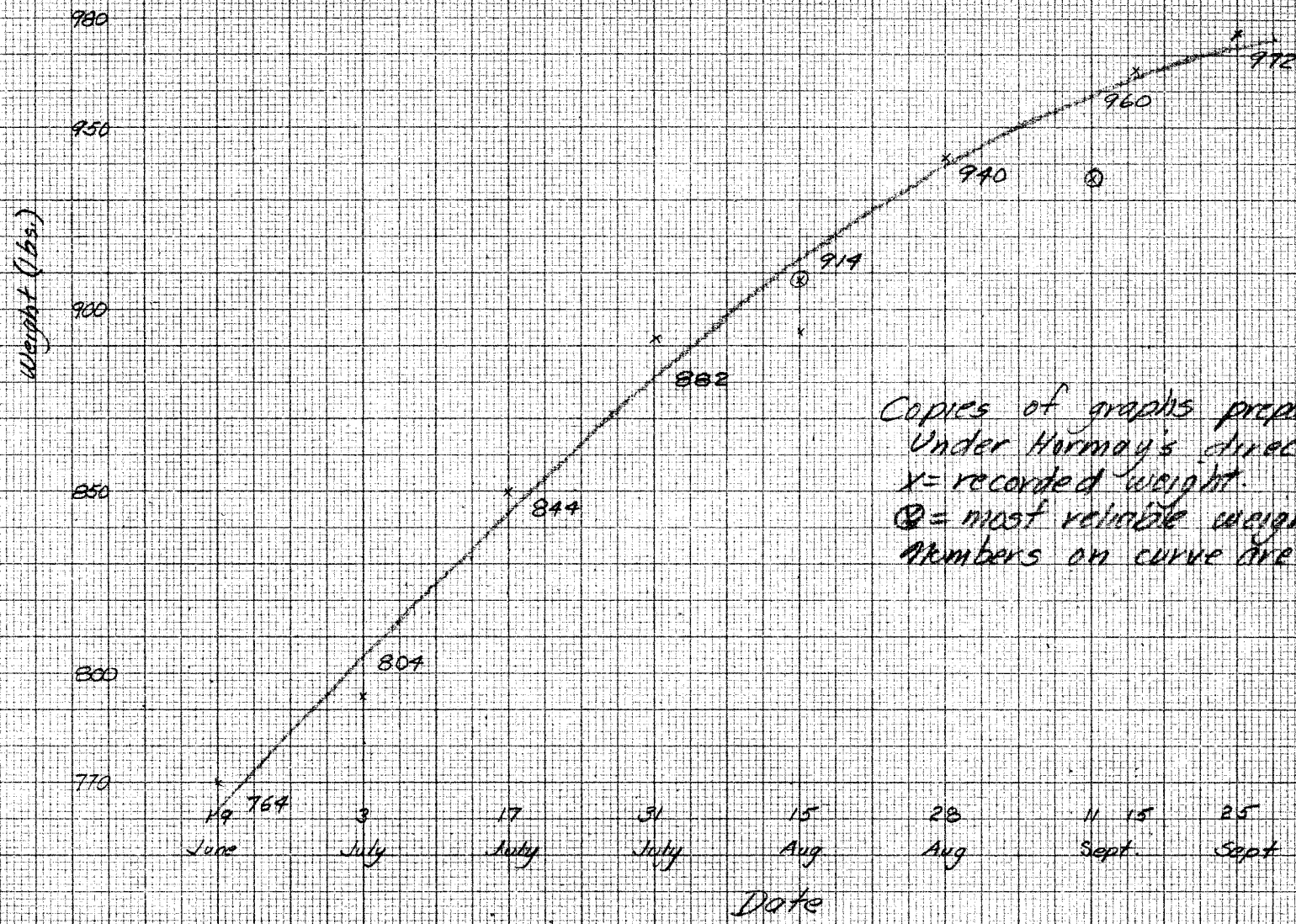
Weight of Steer No 13
Angus
B.S.E.R. 1936



Copies of graphs prepared Sept. 1936
Under Flormay's direction.
x = recorded weight
⊙ = most reliable weight this period.
Numbers on curve are curve values

Pine Ranges

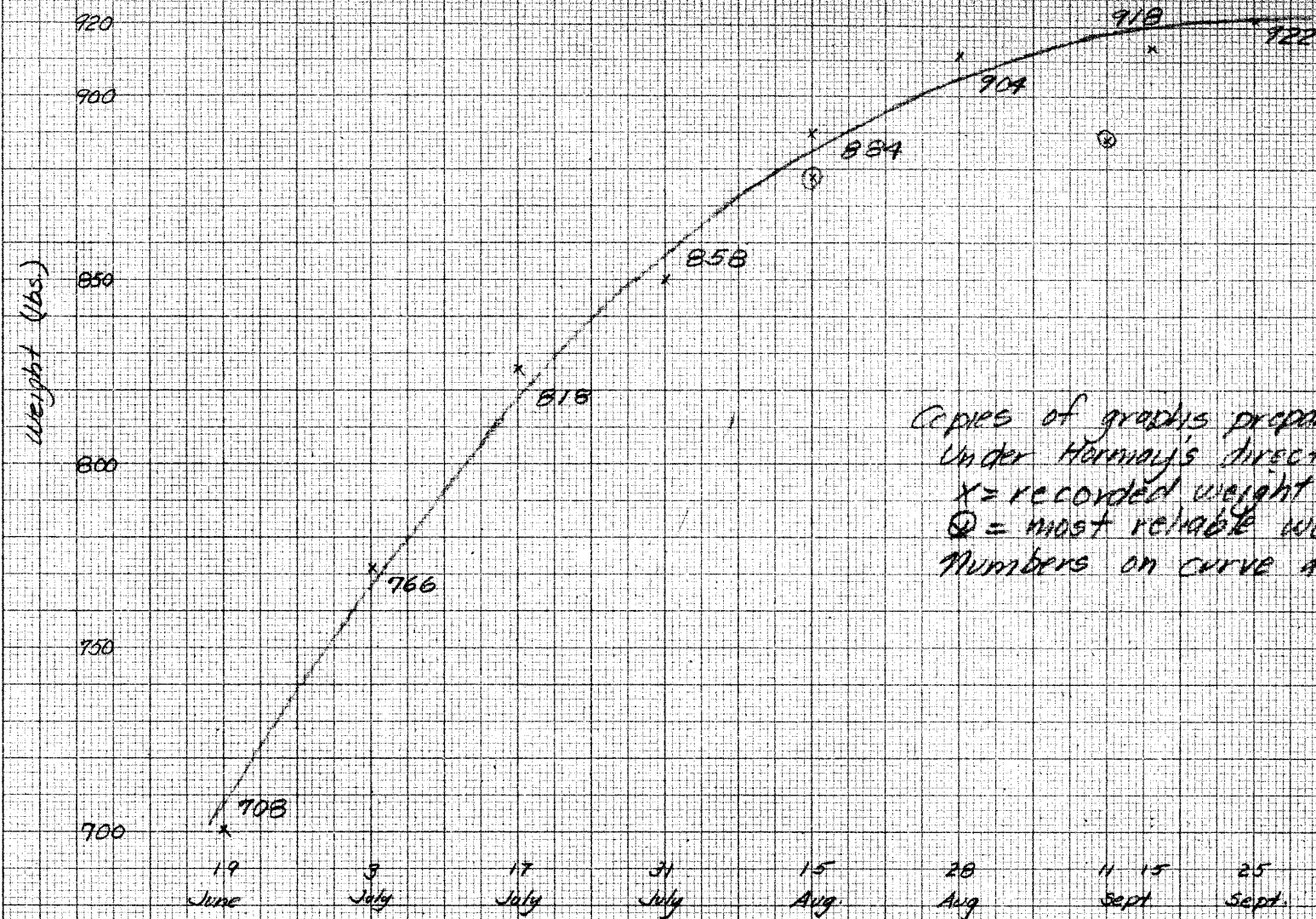
Weight of Steer No 19
Shorthorn
B.S.E.R. 1936



Copies of graphs prepared Sept. 1936
Under Hormay's direction.
x = recorded weight.
⊙ = most valuable weight this period
Numbers on curve are curve values.

Ark Pine Ranges

Weight of Steer No. 13
Angus
B.S.E.R. 1936



Copies of graphs prepared Sept. 1936
Under Hermal's direction.
x = recorded weight.
O = most reliable weight this period
Numbers on curve are curve values.

CATTLE WEIGHTS - D. & E. R. - 1936

| June 19 | | July 3 | | July 17 | | July 31 | | August 15 | | August 29 | | Sept. 11 | | Sept. 15 | | Sept. 25 | |
|----------|--------|----------|--------|----------|--|-----------|--|-----------|--------|-----------|--------|-----------|---------------------------------|-----------|--------|-----------|--|
| Original | 2nd | Diff. | 3rd | Diff. | 4th | Diff. | 5th | Diff. | 6th | Diff. | 7th | Diff. | 8th | Diff. | Last | Diff. | |
| Weight | Weight | 6/19-7/3 | Weight | 7/3-7/17 | Weight | 7/17-7/31 | Weight | 7/31-8/15 | Weight | 8/15-8/29 | Weight | 8/29-9/11 | Weight | 9/11-9/15 | Weight | 9/15-9/25 | |
| lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | |
| 720 | 828 | +36 | 884 | +58 | 894 | +10 | 928 950 ² / ₃ | +36 | 994 | +64 | 968 | -26 | 990 | +22 | 980 | -10 | |
| 848 | 914 | +68 | 992 | +78 | 1038 | +44 | 1010 1032 ² / ₃ | -4 | 1104 | +72 | 1064 | -40 | 1094 | -50 | 1090 | -4 | |
| 874 | 940 | +66 | 962 | +22 | 1004 | +42 | 978 | -26 | 996 | +18 | 1004 | +8 | 1080 | +46 | 1014 | -56 | |
| 788 | 814 | +68 | 880 | +46 | 898 | +38 | 884 | -14 | 920 | +36 | 906 | -14 | 938 | +32 | 958 | +6 | |
| 744 | 880 | +106 | 908 | +52 | 928 | +26 | 924 936 ² / ₃ | +8 | 980 | +44 | 980 | 0 | 990 | +10 | 978 | -14 | |
| 880 | 946 | +66 | 1000 | +55 | 1042 | +42 | 1050 1018 ² / ₃ | -26 | 1092 | +76 | 1082 | -10 | 1094 | +2 | 1054 | -50 | |
| 758 | 864 | +96 | 906 | +54 | 916 | +8 | 918 920 ² / ₃ | +4 | 964 | +44 | 964 | 0 | 960 | -4 | 964 | +4 | |
| 777 | 837 | +60 | 882 | +15 | 880 ² / ₃ 936 ¹ / ₃ | | 882 | -4 | 880 | +26 | 882 | +2 | 882 ¹ / ₃ | 0 | 876 | -6 | |
| 730 | 792 | +62 | 858 | +66 | 888 | +30 | 886 906 ² / ₃ | +18 | 956 | +50 | 942 | -14 | 978 | +36 | 962 | -16 | |
| 684 | 754 | +70 | 772 | +38 | 800 | +28 | 824 822 ² / ₃ | +22 | 848 | +24 | 858 | +7 | 868 | +12 | 860 | -8 | |
| 682 | 720 | +38 | 756 | +36 | 804 | +48 | 790 792 ² / ₃ | -12 | 840 | +48 | 842 | +2 | 842 ¹ / ₃ | 0 | 820 | -22 | |
| 724 | 784 | +60 | 832 | +48 | 854 | +22 | 846 862 ² / ₃ | +8 | 880 | +18 | 902 | +22 | 912 | +10 | 886 | -26 | |
| 646 | 698 | +52 | 728 | +30 | 764 | +36 | 760 776 ² / ₃ | +12 | 816 | +60 | 816 | 0 | 834 | +18 | 850 | +4 | |
| 770 | 794 | +24 | 850 | +66 | 892 | +42 | 894 908 ² / ₃ | +16 | 942 | +34 | 958 | +6 | 966 | +30 | 976 | +10 | |
| 700 | 772 | +72 | 826 | +54 | 850 | +24 | 890 878 ² / ₃ | +28 | 912 | +34 | 888 | -24 | 914 | +26 | 922 | +8 | |

1. Hereford (two dewlaps)
2. Shorthorn (red)
3. Hereford (101)
4. Angus
5. Shorthorn (gentle, brindle markings)

6. Shorthorn (big roan)
7. Hereford (side dewlap)
8. Hereford (wild)
9. Angus (white eyes)
10. Shorthorn

11. Hereford
12. Angus (black, nervous)
13. Angus (white face, side dewlap)
14. Shorthorn
15. Angus (gentle, wart on dewlap)

- 1/ Omit - scales evidently in error
- 2/ Interpolated value
- 3/ This weight used August 16
- 4/ Was September 11 weight used?