BALD EAGLE COMMUNAL NIGHT ROOST SURVEYS FOR THE SKAGIT AND NORTH FORK NOOKSACK RIVERS, WASHINGTON WINTER 1988-89

Submitted To:

U.S. Fish & Wildlife Service
Endangered Species
Olympia Field Office
2625 Parkmont Lane SW, B-2
Olympia, WA. 98502

Under:

Contract Nos. 13410-88-00295/00296

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September 15, 1989

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I. INTRODUCTION

During the 1988-89 winter season (December 7, 1988-February 22, 1989) the Mt. Baker Ranger District, Mt. Baker-Snoqualmie National Forest, with assistance from various agencies, groups and individuals, conducted surveys of bald eagle night roost activity from 23 viewpoints (Fig. 1) in the Skagit River area, between Bacon Creek (RM 82.9) downstream to the Ross Island area (RM 66.0), in the Cascade River area from RM 12.3 downstream to RM 10.5, and the North Fork Nooksack River area from Glacier Creek downstream to the Warnick (State Highway 540) Bridge (RM 55).

The primary objectives of the surveys were to:

1. Meet bald eagle consultation requirements under Section 7(a)(2) of the Endangered Species Act of 1973, as amended. The bald eagle was classified as threatened in the state of Washington by the USDI Fish and Wildlife Service (FWS) in 1978 (USDI Fish and Wildlife Service 1978) which requires consultation with the USFWS on any federal action which may affect a threatened species.

2. Respond to concerns by the Washington Department of Game and the Nature Conservancy (Skagen 1980) about the locations of night roosts in relation to planned timber sale activity on National Forest lands adjacent to the Skagit River.

3. Assist the USDA Forest Service (FS), FWS, USDI National Park Service (NPS), Washington Department of Wildlife (WDW), The Nature Conservancy (TNC) and other interested agencies and groups, in maintaining and enhancing important bald eagle habitat within, and adjacent to the Wild and Scenic River corridor, including the "Skagit River Bald Eagle Natural Area" (SRBENA) that is jointly managed by TNC and WDW.

4. Assist the FS in meeting management direction for the Skagit River, River Management Plan, National Wild and Scenic River System (USDA Forest Service 1983) and the unofficial action plan developed to initiate the proposed management plan (Smith 1984). This includes conducting an assessment of the impacts of the proposed action on bald eagles prior to implementing the management plan. Bald eagle habitat management is an important part of the Skagit Wild and Scenic River Management Plan and a major reason for the Skagit River being designated as Wild and Scenic in 1978.

5. Meet direction provided for in the "Pacific States Bald Eagle Recovery Plan (Draft)-August 1984."

Wintering bald eagles typically, roost communally in mature/old growth trees which often are located some distance from the bodies of water which they use for feeding. Bald eagle communal roosts have been defined by Anderson and Ichisaka (1986) as stands of trees used by three or more eagles for two or more consecutive nights. Often the location of these areas is not known resulting in roost sites sometimes unintentionally being destroyed by logging and other forms of human disturbance (Hansen 1978).

The Skagit River Basin contains many stands of timber with significant economic value and logging has been a major industry in the area for years. Hansen (1978) found that no eagles returned to the vicinity of a communal night roost in the Nooksack River Basin, previously used by 12-15 eagles during the winter of 1976, that was totally removed by logging the following spring and summer. Previous surveys conducted by the Forest Service (Hamer 1984, Hamer and Green 1985, Green, Hamer and Goldner 1986, Green, Cde Baca and Wharton 1988) located a number of communal night roosts and associated staging areas in the Skagit and North Fork Nooksack River drainages. Communal night roosts in the Skagit River have been described previously by Servheen (1975), Biosystems Analysis, Inc. (1980), Skagen (1980) and Keister (1981b).

FWS guidelines and regulations (USDI Fish & Wildlife Service 1981; Stalmaster et al. 1985) define core area and buffer zones for bald eagle roosting/staging areas and the Washington Department of Natural Resources (DNR), with assistance from the WDW, are developing management guidelines for communal night roosts in the Nooksack River area (Washington Dept. of Natural Resources 1985).

II. BACKGROUND

The first scientific study of eagles on the Skagit River was conducted by Servheen (1975) during the winters of 1973-74 and 1974-75. Since 1976, several persons have yearly served as "stewards" of TNC preserve (SRBENA). Eagle censuses are now conducted annually by various resource agencies. In 1979-1980 and 1980-1981, Seattle City Light Co. funded an intensive study of the Skagit River to assess the impacts of a proposed Copper Creek Dam on bald eagles (Hunt and Johnson 1981; Biosystems Analysis, Inc. 1980). This study substantially increased the knowledge of bald eagle habitat and behavior in the Skagit River.

It is well documented that winter concentrations of bald eagles in the Skagit River Basin are among the largest in the continental US, reaching peaks of from 200 to 450 individuals per day (Servheen 1975; TNC 1976; Wiley 1977; Skagen 1979; Biosystems Analysis, Inc. 1980). Eagle radio-tracking and related studies conducted so far, indicate that eagle populations wintering in the Skagit Basin are a combination of resident and migrant birds coming from the San Juan Islands, coastal areas in Puget Sound, coastal and interior areas of British Columbia, the Strait of Georgia and southeast Alaska (Servheen and English 1979; Biosystems Analysis, Inc. 1980; Hunt and Johnson 1981).

Many of these eagles winter along the Skagit River corridor, 150 miles of which have been designated by Congress as the Skagit Wild and Scenic River System (USDA Forest Service 1983). Eagles are usually in the area between October and March, reaching peak numbers in January and February (Biosystems Analysis, Inc. 1980). The greatest concentrations of eagles are usually reported between Rockport (RM 68) and Rocky Creek (RM 73.5), which includes the SRBENA. Their occurrence coincides with spawning of chum salmon (Servheen 1975) in the river, although other salmon species, including coho (Stalmaster 1975; Biosystems Analysis, Inc. 1980; Hamer 1984), pink (Servheen 1975) and chinook (Servheen

1975) salmon are also used. After spawning, these salmon die and their carcasses are deposited on sand and gravel bars where they are available as an abundant, easily exploited food source for eagles (Servheen 1975; Stalmaster et al. 1979; Biosystems Analysis, Inc. 1980; Russell 1980). A correlation between the number of eagles counted, annually and the total chum salmon escapement in the Skagit River, has been noted by a number of researchers (Servheen 1975; Biosystems Analysis, Inc. 1980; Mills 1986). Winter movements and distribution of eagles along rivers in the Pacific Northwest are greatly dependent upon the availability of salmon carcasses (Servheen 1975; Stalmaster 1976, Stalmaster et al. 1985). Servheen (1975) observed eagles feeding on deer carcasses on two occasions during February 1975, but attributed this to flood conditions in the Skagit River, at the time, that limited the availability of salmon carcasses to the eagles.

Bald eagle communal night roost surveys have been conducted by the US Forest Service in the Skagit River area since 1984. Early efforts focused primarily on the Illabot Creek area (Hamer 1984) and then each winter since, have been expanded to include other areas in the Skagit River and North Fork Nooksack River basins in 1984-85 (Hamer and Green 1985), 1985-86 (Green, Hamer and Goldner 1986) and in 1986-87 (Green, Cde Baca and Wharton 1988).

For more background information on bald eagle communal night roost and related ecology refer to Green, Cde Baca and Wharton (1988).

III. METHODS AND PROCEDURES

A. Census Procedures:

During the survey period, a total of 23 viewpoints (Figs. 1-13) were used to observe bald eagle movement toward areas suspected as being communal night roosts. Roost areas were located by observing the direction of eagle flights just before or at dusk, and by one aerial (helicopter) reconnaissance. Census methods were similar to those used by Stalmaster (1976), Hansen (1978), and Hamer and Green (1985). Bald eagles that displayed adult characteristics (white head and tail) were classified as adults. Eagles that didn't exhibit adult characteristics were classified as immature. No attempt was made to break them down further into age classes. Eagles that were too far away for proper identification, or were not distinguishable, because of poor visibility, were classified as "unknown". Some golden eagles were observed wintering in the area by Mills (1986), D. Drummond (pers. comm.), and WDW personnel. It is possible that some of the eagles classified as immature and/or unknown were golden eagles, but the probability is low. Every effort was made to ensure that observers were able to distinguish between immature bald and golden eagles.

Forty-three different observers participated in the survey during the 1988-89 winter survey. Eagle identification experience of the participants was variable. Their experience ranged from being professional birders to very

inexperienced. However, every effort was made to ensure that all observers could distinguish between bald eagles, golden eagles, other raptors, ravens and crows that might be found in the survey area. All observation form packets (Appendices 1 & 2) included diagrams that showed key differences between bald and golden eagles.

The following information was collected at each of the viewpoints on each date:

1. Number of eagles using each roost.

2. Ratio of immatures to adults in the roosting population.

3. Timing of movement to the roosts and location of the roosts.

4. Weather observations (wind speed and direction, precipitation).

5. Ambient air temperature (every half hour).

6. Direction and time of flight.

7. Visibility and cloud cover.

8. Notes on eagle behavior.

An example of the data collection form is included in Appendices 1 and 2 and is a modification of the forms used by Hamer (1984) and Hamer and Green (1985).

Observations were timed to correspond to the time of day when eagle movement toward night roosts, based upon past experience (Hamer 1984, Hamer and Green 1985, Green, Hamer and Goldner 1986, Green, Cde Baca and Wharton 1988), was suspected to be the greatest. Generally observations began at 3:00 PM and ended when visibility was no longer possible due to darkness. Sunset times reported are from the National Weather Service, Olympia, Washington. Observation methods used were based on information collected by Hamer (1984) and Hamer and Green (1985) for the Illabot Creek night roost over a two year period during the winters of 1983-84 and 1984-85. Observations were conducted at most viewpoints one day per week, usually taking place on Wednesdays, to correspond with the Skagit River interagency daytime bald eagle population census conducted by TNC (Mills 1986), NPS, FS, Puget Power and Light Co., and WDW. The exception was Corkindale Creek where surveys were conducted 2 times per week in order to get better coverage of a suspected roost area. These night roost activity data were then compared to the total TNC count reported by Mills (1989) for same dates.

More than one observer was used at certain viewpoints (ie., Barnaby, Mile Post 100 and Illabot Creek) where heavy eagle activity occurred, in order to more adequately record the observations. Observers were in radio contact with each other so that eagle movements from one area to another could be monitored. This strategy previously helped locate the Illabot Creek night roost in 1985 and sort out activity from one roost area to another (Hamer and Green 1985).

Not all viewpoints were surveyed on every date due to limitations on availability of personnel. Those locations that consistently had low eagle counts were usually replaced by other, more likely, observation points in order to get better overall coverage of the area. However, major activity areas were covered each week throughout the survey period.

Depending upon the circumstances encountered, all observations were made using one or more of the following methods: the naked eye, binoculars, or a spotting scope.

B. Observation Locations and Related Information For Skagit River

1. Cascade River-Spur Road (RM 12.3)

Follow FS road 15 to MP 7. The site is located approximately 60 feet south of the Irene Creek Bridge and 150 feet from the river (SE 1/4, Sec. 21, R12E, T35N) (Fig. 2).

2. Cascade River-Lower (Irene Creek) Bridge (RM 12.2)

Observations were made from the bridge at MP 1 on FS road 1550 (SW 1/4, Sec. 21, R12E, T35N) (Fig. 2).

3. Cascade River-Sibley Creek (RM 11.3)

The observation site is located at MP 6 on FS road 15 (E 1/2, on the line between Sec. 16 & 21, R12E, T35N) (Fig. 2).

4. Cascade River-Irene Creek Road Overlook (RM 10.5)

Observations were made at a site located at MP 2.5 on FS road 1550 (SE 1/4, Sec. 17, R12E, T35N) (Fig. 2).

5. Bacon Creek (RM 82.9)

Refer to Green, Hamer, and Goldner (1986) for more details on the description of this site. Observations were conducted by NPS personnel. This observation site was changed to incorporate a roving count by vehicle in addition to the standard still count done previously in order to get better coverage of the upper portions of Bacon Creek. All previous counts were made only from the viewpoint in the vicinity of the Bacon Creek bridge at State Highway 20 (Fig. 3).

6. Corkindale (RM 74.1)- Bridge

Observations were made from the vicinity of the Corkindale Bridge across State Highway 20 (MP 103). Refer to Green, Hamer, and Goldner (1986) for a more detailed description of this site (Fig. 4).

Additional observation dates were conducted for the all the Corkindale area observation locations (Corkindale Creek Bridge, Roost and Powerline) in order to more intensively monitor eagle activity related to a suspected bald eagle night roost area that potentially could be impacted by a proposed road on Forest Service land for the Corkindale timber sale. This data was being collected specifically to coincide with a roost microclimate study. Through formal consultation since then with the US Fish & Wildlife Service, it has been determined that the microclimate portion of the study will be discontinued. This decision was based on results obtained from eagle observations for the area over the last 4 years. Eagle observations will continue in the Corkindale area.

7. **Corkindale- Roost**

Observations were made from the ridge (NW 1/4 Sec. 22, R10E, T35N) above the suspected roost area in order to verify whether eagles are using the roost (Fig. 4). This location was added to coordinate with a bald eagle night roost microclimatic study being conducted by the Forest Service through contracts with James L. Kaiser and Comstock Instruments Company to determine whether tree removal for a proposed road would alter the microclimate and ultimately affect bald eagle use of the area.

8. **Corkindale-Powerline (RM 74.0)**

This site (SE 1/4 NE 1/4, Sec. 22, R10E, T35N) is located approximately 150 feet south along the powerline corridor from the Corkindale Creek bridge observation location. This site was selected to get a different view of the Corkindale roost (Fig. 4).

9. **Illabot (Creek) (RM 71.6)**

Refer to Green, Hamer, and Goldner (1986) for this site description (Fig. 5).

10. **Mile Post 100 (Cascadian Farm) (RM 71.0)**

Refer to Green, Hamer, and Goldner (1986) for this site description (Fig. 5).

11. **Barnaby (Slough) (RM 70.2)**

Refer to Green, Hamer, and Goldner (1986) for this site description (Fig. 5).

12. **Shular Road (RM 69.0)**

Starting in during the winter of 1988-89 this observation point was moved approximately 1/4 mile across State Highway 20 to the south in a field. The previous two winters the observation point was located on the north side of Shular Road (at Hwy. 20 MP 98) near a residence (NE 1/4, Sec. 25, R09E, T35N) (Fig. 6).

13. **Hilt Creek (RM 4.0)**

Follow the Rockport-Darrington Road to MP 104. Turn off onto FS road 16 and proceed to MP 1 (SE 1/4, Sec. 12, R09E, T34N) (Fig. 7).

14. **Eagle Wash (RM 3.5)**

This observation site is located near a residence at MP 13 on the Concrete-Sauk Valley Road (SE 1/4, Sec. 11, R09E, T34N) (Fig. 8).

15. **Rockport State Park (RM 67.0)**

Follow State Highway 20 to the park at MP 96. The site is located on the footpath approximately 100 feet west of the south side access (SE 1/4, Sec. 27, R09E, T35N) (Fig. 9).

16. **Sauk Mountain (RM 66.0)**

Refer to Green, Hamer, and Goldner (1986) for this site description (Fig. 9).

17. **Big Eddy Osprey (RM 60.0)**

Follow Hwy. 20 to MP 84 to the Concrete-Sauk Road; turn south. The site is located 3 miles east of the Dalles Bridge on the Sauk/Concrete (South Skagit) Road (SE 1/4, Sec. 24, R8E, T35N) (Fig. 10).

18. **O' Toole Creek (RM 43.5)**

This is a new observation location (Fig. 11) that was added after James L. Kaiser observed eagle activity up O' Toole Creek during his float trips on the Skagit River for the bald eagle human disturbance study being conducted by Dr. Mark Stalmaster. Two observation locations (NW 1/4 Sec. 21, R7E, T35N) were used in order to get a better view of eagle feeding areas on the Skagit River in relation to the O' Toole Creek basin. Observations were made from 1) the north side of the Skagit River opposite from the confluence with O' Toole Creek and 2) on the O' Toole Creek bridge on the South Skagit Highway at MP 15.6.

19. **Lyman (Ross Island)(RM 34)**

This was a new observation location added to get better coverage of the lower Skagit River area (Fig. 12). The site (SW 1/4 Sec.13, R5E, T35N) was located on the north side of the Skagit River where Utopia Road intersects the river (RM 34.5). It is also north of Ross Island.

C. Observation Locations and Related Information For North Fork Nooksack River

1. **Glacier Creek (RM 57.5)**

Follow the Mt. Baker Highway (Hwy. 542) to MP 59; turn north and follow the road to the river bank (SE 1/4, Sec. 6, R7E, T39N) (Fig. 13). The Glacier Creek team also observed eagles along Glacier Creek to the Glacier Creek Road Bridge and 1/2 mile of Thompson Creek along Road #3910 (SW 1/4, Sec. 9, R7E, T39N).

2. **Humpy Unit #2 (RM 56.5)**

Observations from this site were made from FS Rd. # 31-028 below the Canyon Creek Rd. (FS #31) in Unit #2 of the Humpy Timber Sale (NW 1/4 Sec. 6, R7E, T39N)(Fig. 13). This is located on the north side of the North Fork Nooksack River and is opposite the mouth of Cornell Creek.

3. **Foster's (RM 55.6)**

All observations were made near a residence north of the Mt. Baker Hwy. (Hwy. 542) at MP 57 (NW 1/4, Sec. 1, R06E, T39N) (Fig. 13).

4. **Warnick Bridge (RM 55.0)**

Observations were made from the bridge north of the Mt. Baker Highway (Hwy. 542) at MP 55 (NE 1/4, Sec. 2, R6E, T39N) (Fig. 13).

IV. SKAGIT RIVER RESULTS AND DISCUSSION

Maximum cloud cover (%), maximum wind speed (mph) and maximum, minimum and mean temperature was recorded for all observation sites. These data are included in the Appendices.

1. **Cascade River - Spur Road**

This site was surveyed previously during January 1988. Observations during the winter of 1988-89 were conducted on 4 dates, totalling 8 person-hours (Fig. 14). Only one eagle was observed on December 21, 1988 from this location, unlike 1988 when a peak count of 5 eagles was made on January 21, 1988.

2. **Cascade River - Lower (Irene Creek) Bridge**

A total of 10 observation dates, comprising 20 person-hours, was conducted. A peak count of 3 adult eagles was made on December 14 (Fig. 15). Two eagles (one adult and one immature) were observed on February 1. Single eagles were observed on December 28, January 1 and 11 and February 8. This was

significantly less than the peak count of 23 eagles made previously on February 5, 1988. A total of only 9 eagles was counted at this site.

3. **Cascade River - Sibley Creek**

Nine observation dates, totalling 18 person-hours, were conducted. Only one adult eagle was observed on December 14 (Fig. 16). This compares with peak counts of 2 eagles during the winters of 1986-87 and 1987-88.

4. **Cascade River - Irene Creek Overlook**

Observations were conducted on 7 dates, totalling 14 person-hours. A peak count of 6 eagles (2 adults, 1 immature, and 3 unknowns) was made on January 4 (Fig. 17). Four eagles (3 adults, 1 immature) were observed on December 14. This count is similar to the maximum count made on January 29, 1988.

Two adults were observed on December 21, with single adults observed on december 28, January 1 and February 16. A total of 15 eagles (10 adults and 2 immatures, 3 unknowns) was reported for this site.

5. **Bacon Creek**

Observations were conducted by NPS employees on 9 dates, totalling 18 person-hours. Peak counts of 4 eagles were reported on December 14 (4 adults) and February 22 (3 adults, 1 immature)(Fig. 18). Three eagles (2 adults, 1 immature) were observed on January 18), while two eagles were observed on December 21 (1 adult, 1 immature), January 4 (2 adults) and 26 (1 adult, 1 immature). A single adult was observed from this site on January 11 (Fig. ?). A total of 18 eagles was observed at Bacon Creek. This total count was less than in the previous 2 winters, with 34 and 80 eagles, respectively being counted during 1986-87 and 1987-88.

6. **Corkindale Creek Bridge**

A total of 20 observation dates, totalling 80 person-hours were conducted at this site. A maximum count of 5 adult eagles was made on Febuaruy 8 (Figs. 19 & 20). Single adults were observed on December 14 and 21 and January 11. No eagles were observed in the vicinity of the suspected eagle night roost from this location.

A total of 8 adult eagles was reported for this location. This is less than the peak counts of 16 and 11 eagles reported during the winters of 1986-87 and 1987-88, respectively.

7. **Corkindale - Roost**

A total of 19 observation dates, totalling 76 person-hours were conducted at this site. One immature bald eagle was observed to fly over the suspected roost area at 1634 hours on January 26 (Figs. 21 & 22), and land in a large

snag upslope from the roost area and the observer. A bald eagle microclimatic instrumentation study has been conducted in the suspected night roost for the past 2 winters. Refer to discussion in "Observation Location" section for more information on this study.

8. **Corkindale - Powerline**

A total of 22 observation dates and 88 person-hours were conducted at this site. A maximum count of 7 eagles (6 adults, 1 immature) was made on December 28. Six eagles were observed on December 29 (5 adults, 1 immature) and January 6 (6 adults)(Figs. 23 & 24). Four adult eagles were observed on December 22. Three eagles were observed on December 7 (3 adults) and February 8 (2 unknowns, 1 immature). Two adult eagles were observed on December 21, with single adults being observed on January 25 and February 22. A total of 44 eagles (38 adults, 4 immatures, 2 unknown) was observed from this location. The eagles observed from this location were seen in the vicinity of the Skagit River and not the area around the suspected Corkindale eagle roost.

9. **Illabot (Creek)**

Observations were conducted on 11 dates for a total of 44 person-hours. A total of 468 eagles (197 adults, 195 immatures and 76 unknowns) was observed comprising 22% of the total TNC count. Peak eagle counts occurred on December 28 with 109 eagles (54 adults, 41 immatures and 14 unknowns) or 34% of the TNC count and January 4 with 104 eagles (39 adults, 43 immatures and 22 unknowns) or 38% of the TNC count (Fig. 25). Other peak counts occurred on December 7 with 60 eagles (30 adults, 28 immatures and 2 unknowns) or 56% of the TNC count, December 21 with 43 eagles (16 adults, 14 immatures and 13 unknowns) or 15% of the TNC count, January 18 with 30 eagles (8 adults, 17 immatures and 5 unknowns) or 9% of the TNC count, February 8 with 30 eagles (17 adults and 13 immatures) or 42% of the TNC count. Only one date had a total count less than 15 eagles.

10. **Mile Post 100**

Eagles were observed on 11 observation dates, totalling 22 person-hours. A total of 214 eagles (173 adults, 38 immatures, and 3 unknowns) or 10% of the total TNC count, was observed (Fig. 26). A peak count of 80 eagles (74 adults, 6 immatures) or 63% of the TNC count occurred on December 14. Other high counts occurred on December 7 with 20 eagles (17 adults, 3 immatures) or 19% of the TNC count, on December 28 with 22 eagles (19 adults, 3 immatures) or 7% of the TNC count and on January 25 with 20 eagles (12 adults, 8 immatures) or 9% of the TNC count. There were 8 dates which 10 or more eagles were observed.

11. **Barnaby (Slough)**

Observations were conducted on 10 dates, totalling 20 person-hours. A total of 405 eagles (268 adults, 62 immatures and 75 unknowns) or 19% of the total TNC

count was observed (Fig. 27). Peak counts of 41 or more eagles were reported on 6 dates: January 18 with 97 eagles (64 adults, 24 immatures and 9 unknowns) 29% of the TNC count, January 25 with 84 eagles (63 adults, 21 immatures) or 39% of the TNC count, January 4 with 76 eagles (38 adults, 2 immatures and 36 unknowns) or 28% of the TNC count, January 11 with 49 eagles (44 adults, 3 immatures and 2 unknowns) or 18% of the TNC count, December 21 with 48 eagles (23 adults, 5 immatures and 20 unknowns) or 17% of the TNC count, and December 28 with 41 eagles (29 adults, 6 immatures and 6 unknowns) or 13% of the TNC count.

There was only one day (February 8) when eagles were not observed in the Barnaby Roost area.

12. **Shular Road**

Observations were conducted on 11 dates for a total of 22 person-hours. Observations totalled 89 eagles (74 adults, 6 immatures and 9 unknowns) or 4% of the total TNC count (Fig. 28). Peak counts occurred on January 25 with 29 eagles (23 adults, 2 immatures and 4 unknowns) or 13% of the TNC count and on February 8 with 20 eagles (18 adults, 1 immature and 1 unknown) or 28% of the TNC count. In addition there were 6 other dates in which 5 or more eagles were counted.

13. **Hilt Creek**

Observations were conducted on 7 dates comprising 14 person-hours for this site. A total of 8 eagles (5 adults and 3 unknowns) was recorded (Fig. 29). A peak of 3 adult eagles was recorded on January 18 (3 adults) and February 8 (3 unknowns). Two adult eagles were reported for December 21.

14. **Eagle Wash**

Observations were conducted on 8 dates comprising 16 person-hours. A total of 31 eagles (16 adults, 13 immatures, 2 unknowns) or 1% of the total TNC count were observed. A peak count of 16 eagles (6 adults, 9 immature and 1 unknown) was observed on February 22 (Fig. 30). There were 4 other days when eagles were observed. These are January 4 with 8 eagles (6 adults and 2 immatures), January 26 with 5 eagles (2 adults, 2 immatures and 1 unknown), and January 11 and 18 with single adults observed.

15. **Rockport State Park**

Observations were conducted on 11 dates, totalling 22 person-hours for this site. A total of 378 eagles (290 adults, 87 immatures and 1 unknowns) or 18% of the total TNC count was reported (Fig. 31). Peak counts exceeding 23 or more eagles were reported for 9 dates. Four dates having 41 or more eagles reported were: December 14 with 86 eagles (64 adults and 22 immatures) or 67% of the TNC count, December 21 with 65 eagles (48 adults, 17 immatures) or 23% of the TNC count, January 11 with 51 eagles (39 adults, 12 immatures) or 24% of the TNC count, and January 4 with 41 eagles (39 adults and 2 immatures) or 15% of the TNC count. Five dates had 23 or more eagles reported were: December 28

with 26 eagles (23 adults and 3 immatures) or 8% of the TNC count, January 18 with 26 eagles (16 adults and 10 immatures) or 8% of the TNC count, January 25 with 26 eagles (20 adults and 6 immatures) or 12% of the TNC count, December 7 with 23 eagles (19 adults, 3 immatures and 1 unknown) or 21% of the TNC count, and February 8 with 23 eagles (14 adults and 9 immatures) or 32% of the TNC count.

16. **Sauk Mountain**

Observations were conducted on 11 dates, totalling 22 person-hours, at this site. A total of 25 eagles (10 adults, 15 immatures) were observed on only 3 of the observation dates (Fig. 32). A peak count of 17 eagles (5 adults and 12 immatures) or 8% of the TNC count, occurred on January 25. On the two other dates, 6 eagles (3 adults and 3 immatures) were observed on February 8 and 2 adults were counted on January 18.

17. **Big Eddy Osprey**

Observations were conducted on only 3 dates with a total of 6 person-hours. A total of 60 eagles (27 adults, 14 immatures and 19 unknowns) was reported (Fig. 33). A peak count was recorded on December 14 with 23 eagles (12 adults, 7 immatures and 4 unknowns). The other dates when observations were made were: December 7 with 18 eagles (8 adults, 4 immatures and 6 unknowns) and December 21 with 19 eagles (7 adults, 3 immatures and 9 unknowns).

18. **O' Toole Creek**

Observations were conducted on 5 dates with eagles being observed on each of the dates at this site. A total of 15 eagles (12 adults, 3 immatures) were observed (Fig. 34). A maximum count of 7 eagles (6 adults and 1 immature) was made on January 26. Three eagles (2 adults and 1 immature) were observed on February 16, 2 eagles were observed on January 18 (1 adult and 1 immature), 2 adult eagles were observed on February 8, and one adult eagle was observed on February 22.

In addition to our observations, Jim Watson, WDW bald eagle biologist, reported seeing 16 eagles during an airplane flight over O' Toole Creek on January 19 and 7 eagles from a ground observation point on January 21. 21.

19. **Lyman**

Observations were conducted on 9 dates at this site. Eagles were observed on 7 of those dates. A total of 110 eagles (76 adults, 37 immatures, 6 unknowns) were observed (Fig. 35). Ten or more eagles were counted on 4 dates with five or more counted on 6 of the dates (Fig. 35). A maximum count of 45 eagles (28 adults, 14 immatures and 3 unknowns) occurred on January 4. The lowest count of 2 adult eagles was on December 28.

In addition to our observations, Jim Watson from WDW reported seeing 67+ eagles, 25+, 26+ and 18 on January 10, 12, 18 and 19, respectively. He also located a roost area on the south side of the Skagit River in the vicinity of Ross Island.

V. SKAGIT RIVER SUMMARY AND RECOMMENDATIONS

Eight areas were found to be the most important as communal night roosts during the 1988-89 survey. These are in ascending order in descending order of importance: 1) Illabot Creek, with a total count of 468 eagles comprising 22% of the TNC count; 2) Barnaby Slough with a total count of 405 eagles, comprising 19% of the TNC count; 3) Rockport State Park, with a total counts of 378 eagles, comprising 18% of the TNC count; 4) Mile Post 100, with a total count of 214 eagles, representing 10% of the TNC count; 5) Lyman, with a total count of 110 eagles; 6) Shular Road, with a total count of 89 eagles, comprising 4% of the TNC count; 7) Big Eddy Osprey, with a total count of 60 eagles (on only 3 dates observed), and 8) Eagle Wash, with a total count of 31 eagles, comprising 1% of the total TNC count.

Other possible roosts may exist on the Sauk and Suiattle Rivers and the lower Skagit River. These areas will be explored this coming winter.

1. **Cascade River** sites - Observations need to be continued to refine the roost area on the south side of the Cascade River from Found Creek downstream to the Irene Creek Bridge.

2. **Bacon Creek** - Observations need to be continued to better define the area being used by eagles up Bacon Creek.

3. **Corkindale** - Observations need to continue at either the Corkindale Creek bridge at State Highway 20 or the powerline observation site. This is required as part of the formal consultation agreement with the US Fish & Wildlife Service. The microclimatic instrumentation study of the suspected roost area will be discontinued by the Mt. Baker Ranger District as agreed to by the US Fish & Wildlife Service. The Pacific North West Forest and Range Experiment Station will be approached to see if they are interested in picking up the study.

4. **Illabot Creek - Continue observations** from the powerline corridor to maintain **baseline monitoring.** Also coordinate with WDW and DNR on the proposed DNR timber **sales in the vicinity** of the Illabot Creek and O' Brian Creek roosts.

5. **Mile Post 100** (Cascadian Farm Roost) - Continue monitoring and coordinate with WDW and Crown Pacific as related to the proposed Crown Pacific Corp. timber harvest in the Sutter Creek and Bark (Swift)Creek areas.

6. **Barnaby Slough** - Continue observations from the vicinity of the roost so that long term counts can be maintained.

7. **Hilt Creek** - Continue observations to determine eagle use of the area and to correlate with proposed eagle observation sites on the Sauk and Suiattle Rivers to be ccordinated by the Darrington Ranger District.

8. **Eagle Wash** - Continue observations at this site since it is being conducted by a local resident in the vicinity of his house.

9. **Rockport State Park** - Continue observations from this site which provides an excellent view of the Mc Leod roost across the Skagit River. This roost is consistently among the top 3 roost each year and the data collected by the Skagit Chapter of the Audubon Society provides excellent long-term information on this valuable roost.

10. **Sauk Mountain** - Continue observations and also try to find out if there is a better observation point closer to Jackman Creek.

11. **Big Eddy Osprey** - Continue observations using volunteers.

VI. NORTH FORK NOOKSACK RIVER RESULTS AND DISCUSSION

Maximum cloud cover (%), maximum wind speed (mph), and maximum, minimum and mean air temperatures were recorded for all sites and are included in the Appendices.

1. Glacier Creek

A total of 9 observation dates, totalling 18 person-hours, was conducted at this site. There was a total of 2 adult eagles observed at this site with single birds observed on December 14 and January 26 (Fig. 36).

2. Humpy Unit #2

A total of 7 observation dates, totalling 14 person-hours, was conducted at this site. Eagles were observed on 5 of these dates. A total of 7 adult eagles was observed, with 2 eagles on January 11 and February 22, and single eagles seen on December 14, January 26 and February 16 (Fig. 37).

3. Foster's

Observations were conducted on 11 dates for a total of 22 person-hours. A total of 18 eagles (16 adults, 2 immatures) was reported for the site (Fig. 38). Eagles were observed on 7 of the dates with a peak of 4 eagles (3 adults and 1 immature) observed on February 8. Three eagles were observed on 3 dates,

with 3 adults observed on January 11 and 26 and 2 adults and 1 immature observed on February 22. A single adult eagle was observed on January 18.

4. **Warnick Bridge**

There were 3 observation dates conducted, comprising 6 person-hours, at this site and no eagles were reported (Fig. 39).

VII. NORTH FORK NOOKSACK RIVER SUMMARY AND RECOMMENDATIONS

Bald eagle use of the North Fork Nooksack River above Warnick, Washington, is primarily confined to the Foster's and Humpy Unit #2 areas, with 18 and 7 total eagles, respectively, being counted. Glacier Creek, located approximately 1 mile further upriver had a total count of only 2 eagles.

1. **Glacier Creek** - Continue observations.

2. **Humpy Unit #2**- Continue observations from this location.

3. **Foster's** - Continue observations and try to refine the staging/roost area located on the north side of the North Fork Nooksack River across from Cornell Creek.

4. **Warnick Bridge** - Periodically check for eagle activity from this site as time allows.

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IX. ACKNOWLEDGEMENTS

A project of this magnitude would not have been possible without the tremendous cooperative effort and support given by the following agencies, groups and individuals:

Paul Ausbeck, Andris Vezis, Ben Hurtig, Virginia Naeff, S. Mann, J. Brewer, T. Coralene, Paul Morehead, The Rose Family, A. Olson and Rich Royston who all volunteered their time as individuals for the survey.

The Skagit Chapter of the Audubon Society including: Chuck Wheeler, Gee Gandy, Jon Almack, Roy Dubisch, L. Lazzari, B. Kerr, C. Eaglesfield, Keith and Jan Wiggers, Murphy, Fields, John Douglas, Janet Morgan, and D. Thompson.

The Wildcat Steelheaders including: Lanny Morgan, Bill Reinard, Dennis Cook, David Richter and Mike Ovenell.

B. Sisson from the Padilla Bay Wildlife Sanctuary.

Art Stendal from the WDW.

Jonathan Bjorkland and Bob Kuntz of the North Cascades National Park for surveying Bacon Creek each week and Gary Mason and the Marblemount Ranger Station for listening in on the radio.

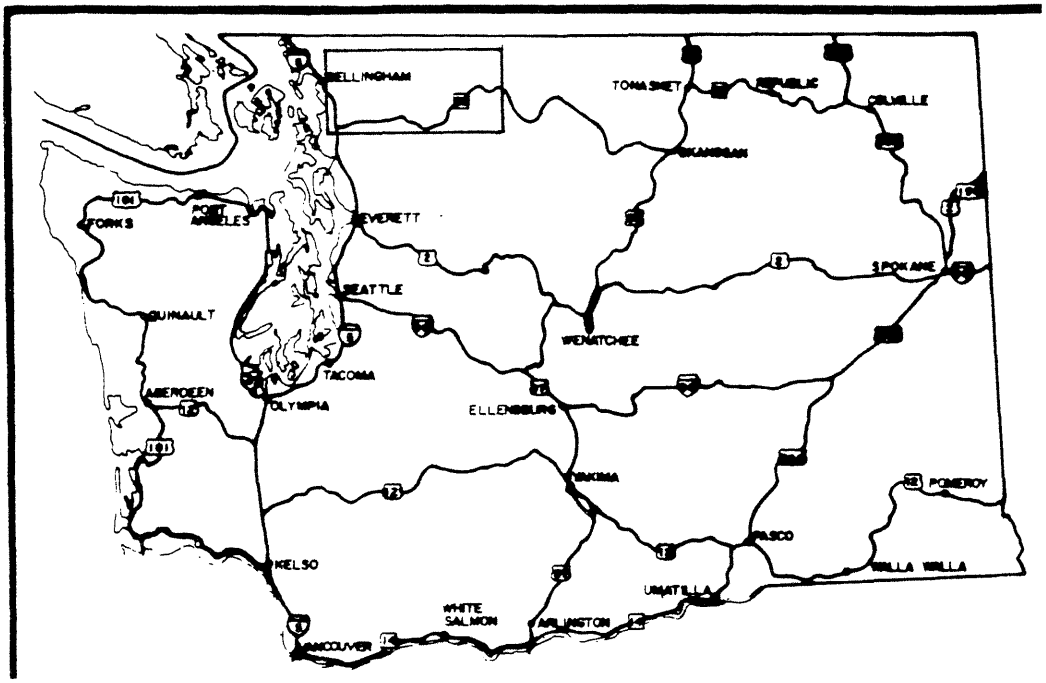
To The Nature Conservancy and Libby Mills for providing daytime TNC eagle census data.

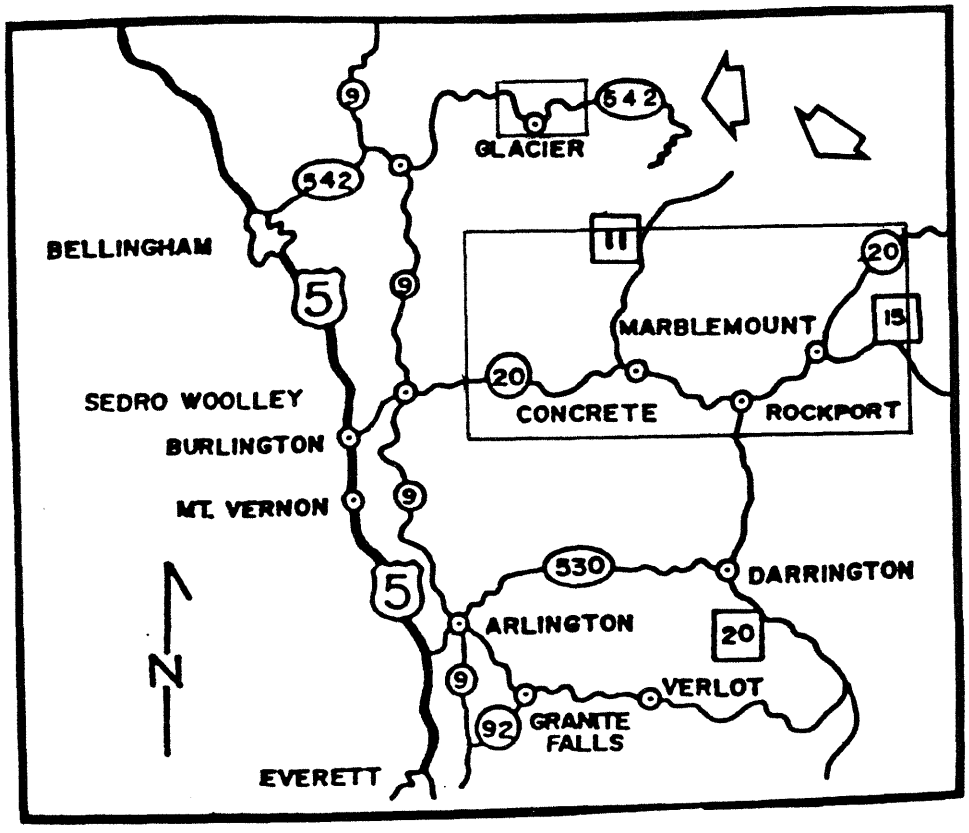
Dr. Mark Stalmaster and Jim Kaiser who were conducting a research project in the same general area and were able to alert us of new eagle concentration and suspected roost areas.

Forest Service personnel, that assisted in the fieldwork and radio effort, including: Otis Allen, Bill Harteloo, Lori Farrow, Christy Fairchild, Sue Sherman, Ken Paul, Stan Zyskowski, John Szulc, Jerry Ainscough, Lew Schilling, David Longstreet, Barb Richey, Kathy Anderson, George Newman, Michelle Fisher, Gerry Fisher, Regan Eivers, Melanie Grahm, Tom Langley, Shari Mitchell, and Buzz Linde.

Last of all, we thank Jim Michaels from the FWS for his assistance in the field and for his dogged pursuit of the USFWS financial support that was instrumental in broadening the scope of the project.

X. APPENDICES





KEY MAP OF WASHINGTON SHOWING LOCATION OF PROJECT

Figure 1

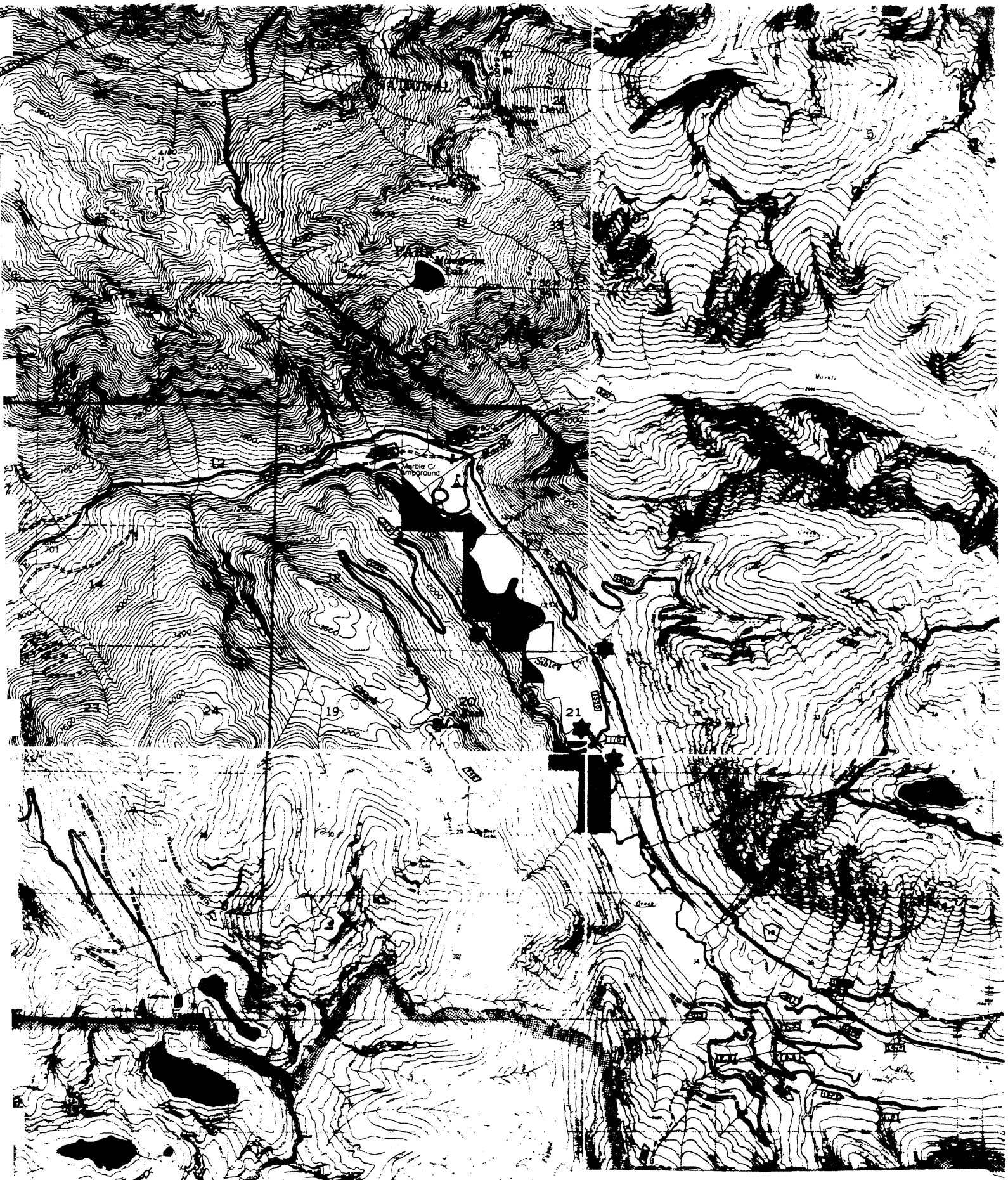


Figure 2

CASCADE SPUR RD, IRENE CR BRIDGE,
SIBLEY CR, IRENE CR OVERLOOK

★ OBSERVATION SITE

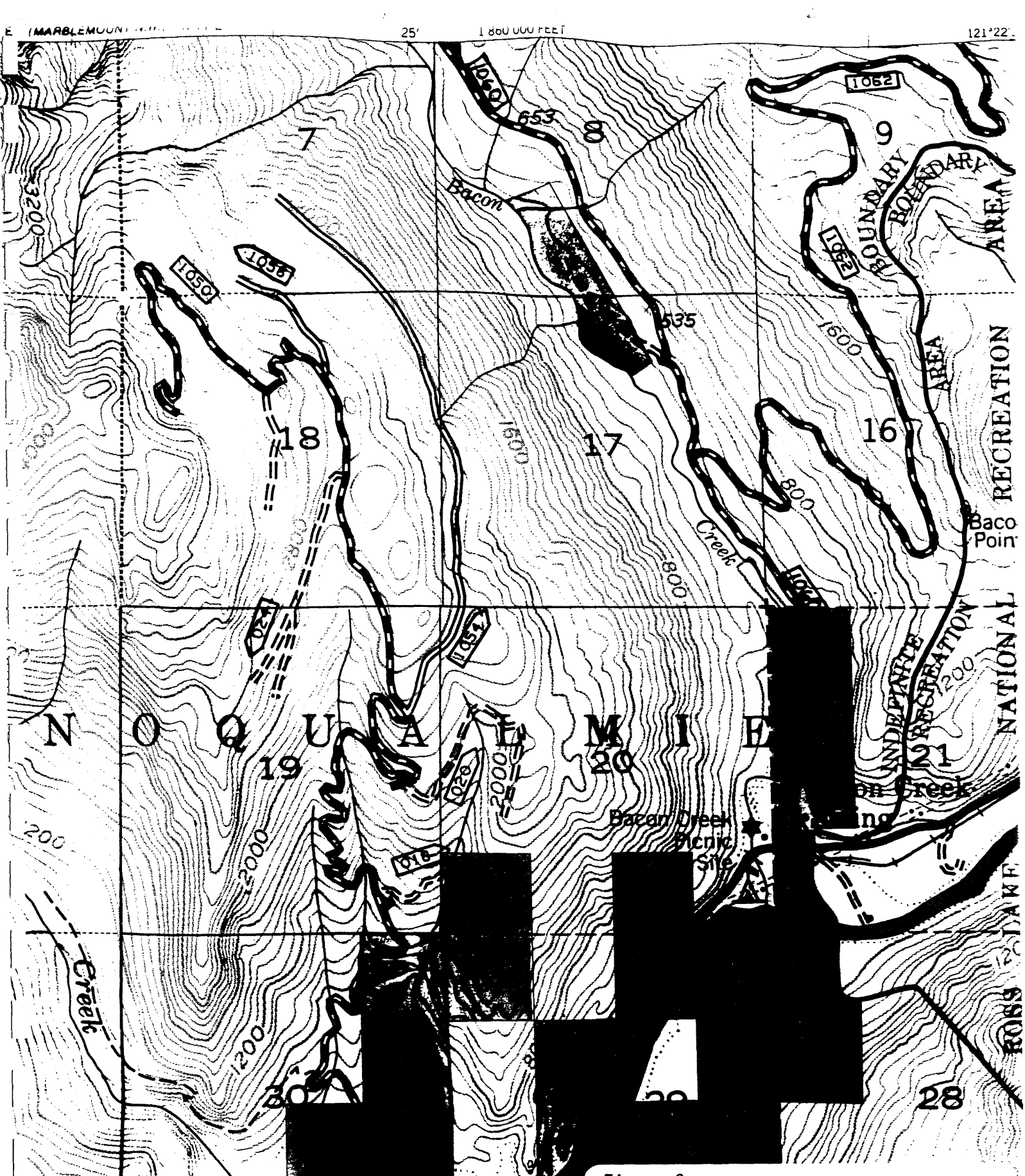


Figure 3

BACON CREEK

OBSERVATION SITE

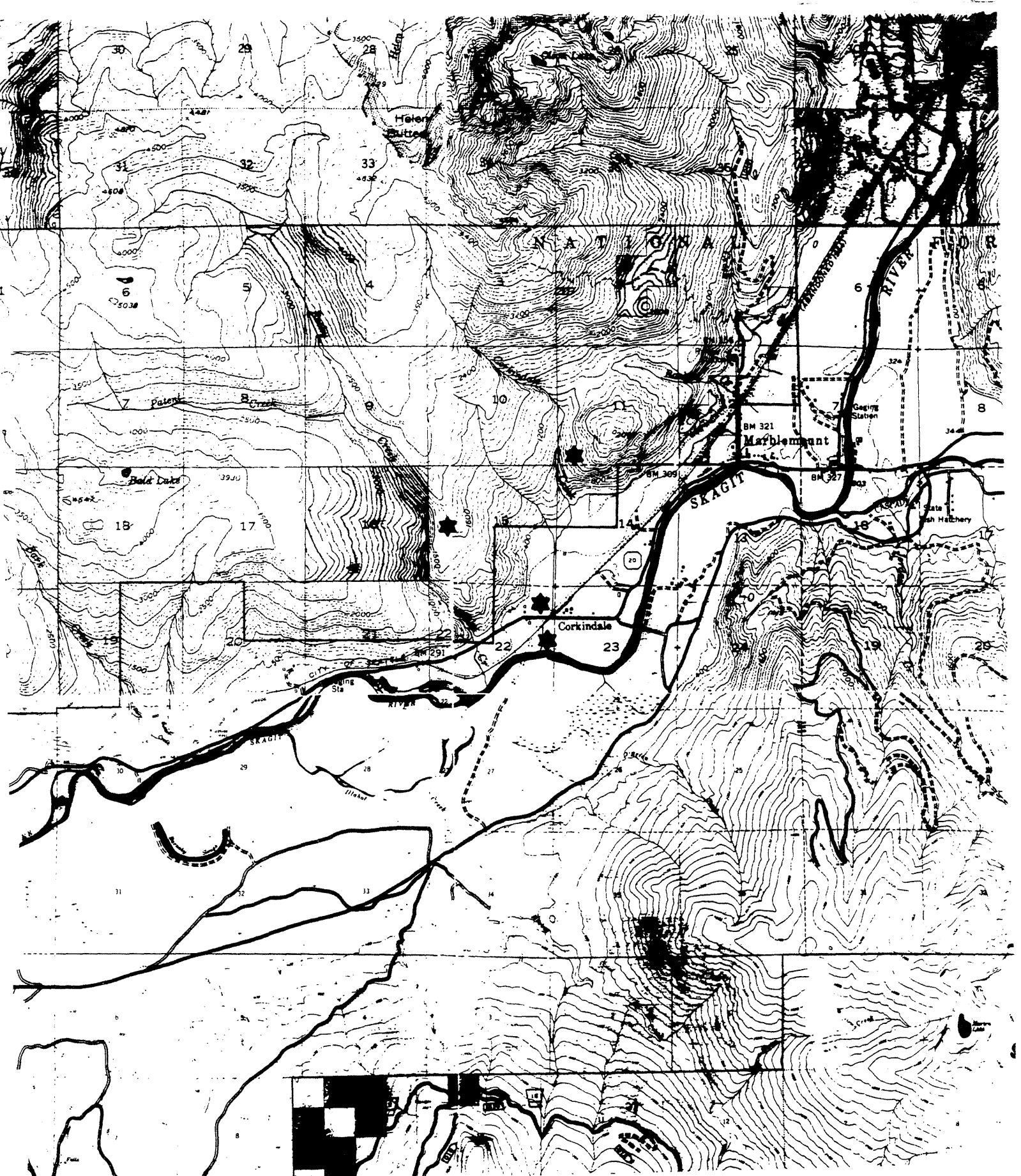


Figure 4

CORKINDALE, CORKINDALE POWERLINE, CORKINDALE ROOST SITE.

★ OBSERVATION SITE

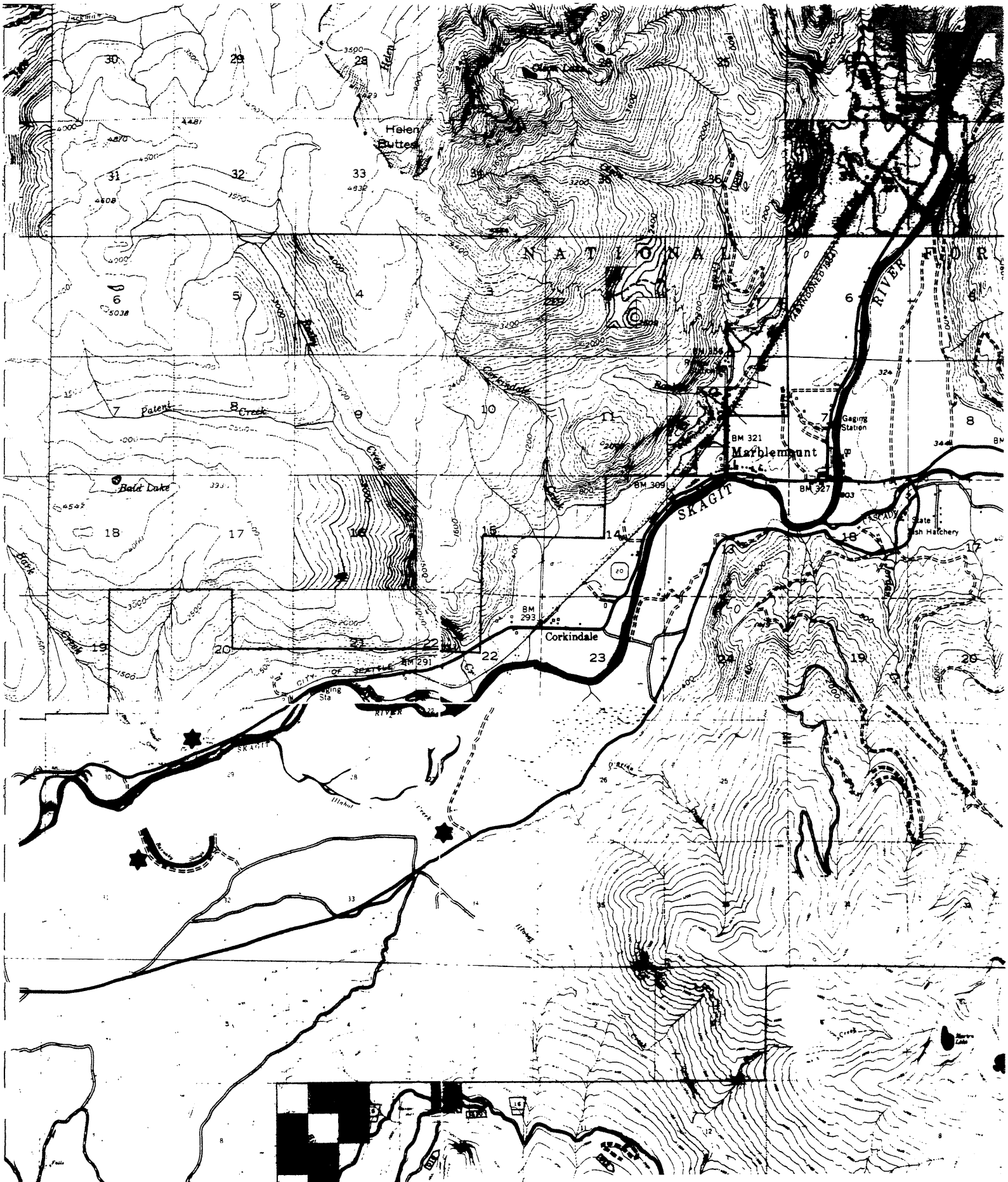


Figure 5

ILLABOT, M.P. 100, BARNABY SLOUGH

★ OBSERVATION SITE

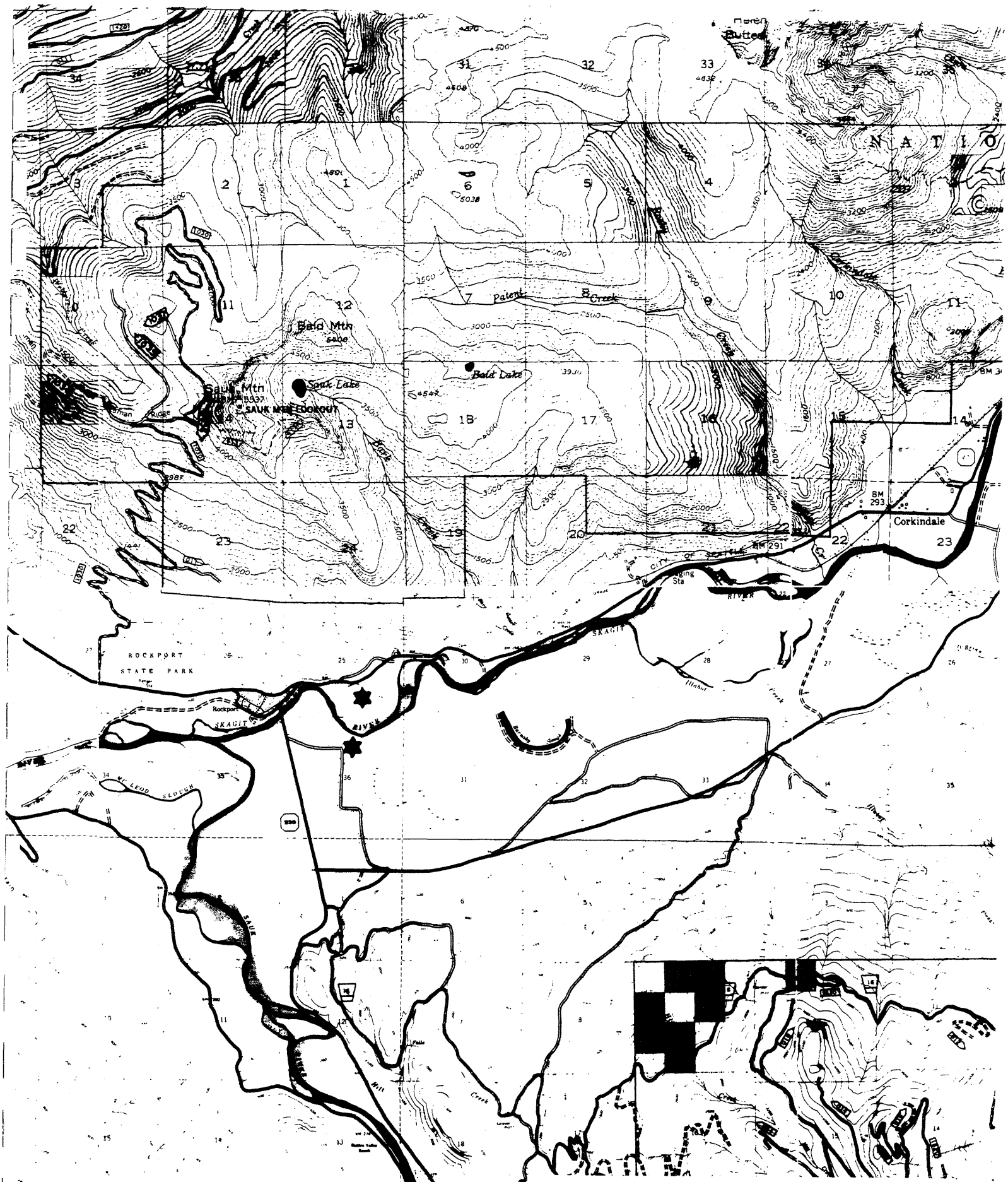
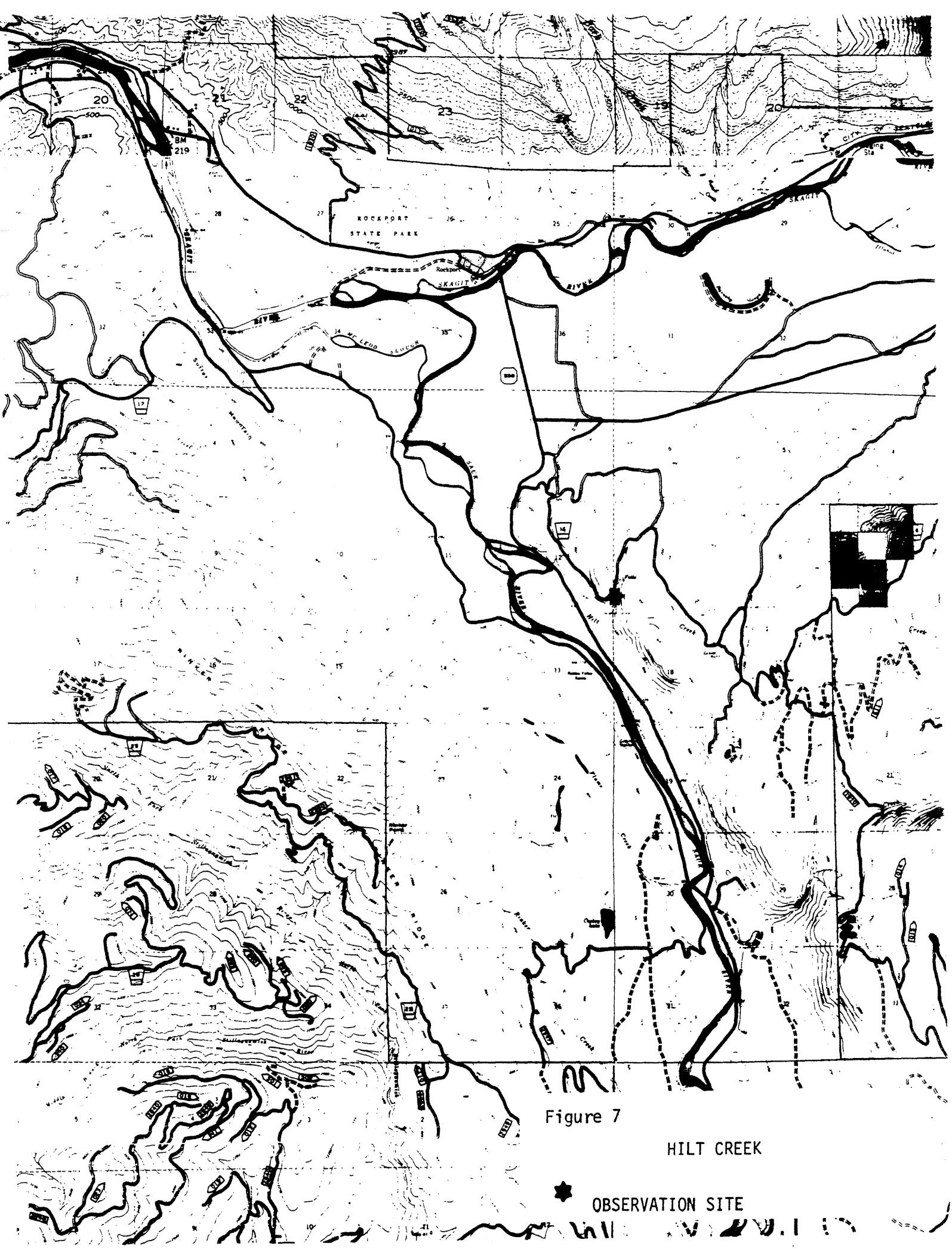

Bald Mtn
Sauk Lake
Bald Lake
Corkindale
ROCKPORT
STATE PARK
Rockport
SKAGIT
RIVER
SHULAR ROAD
OBSERVATION SITE

Figure 6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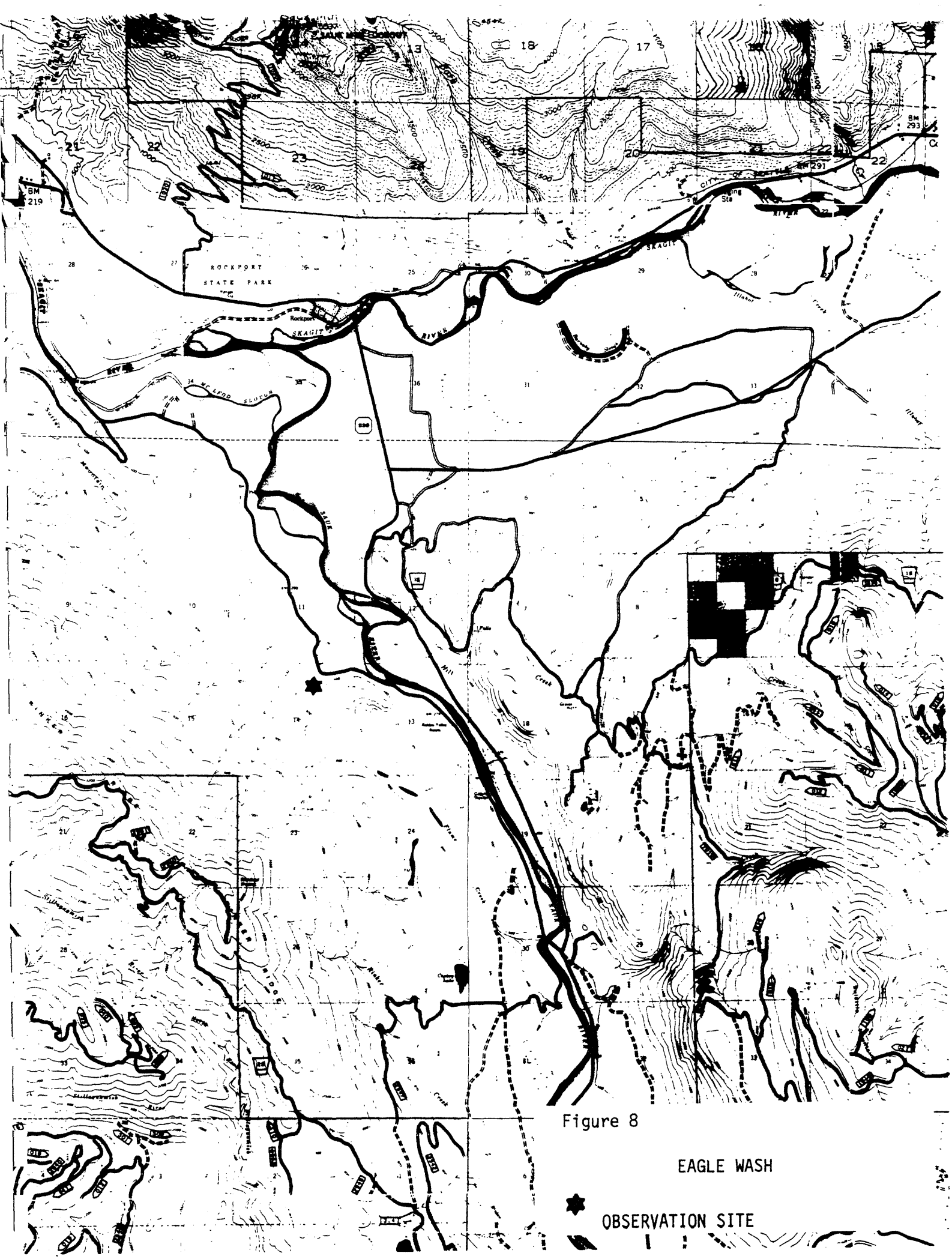
SKAGIT
RIVER
McLEOD SLOUGH
Rockport
BM 219
HILT CREEK
OBSERVATION SITE

Figure 7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STATE PARK
SKAGIT
RIVER
McLEOD SLOUGH
Rockport
Hill Creek
EAGLE WASH
OBSERVATION SITE

Figure 8

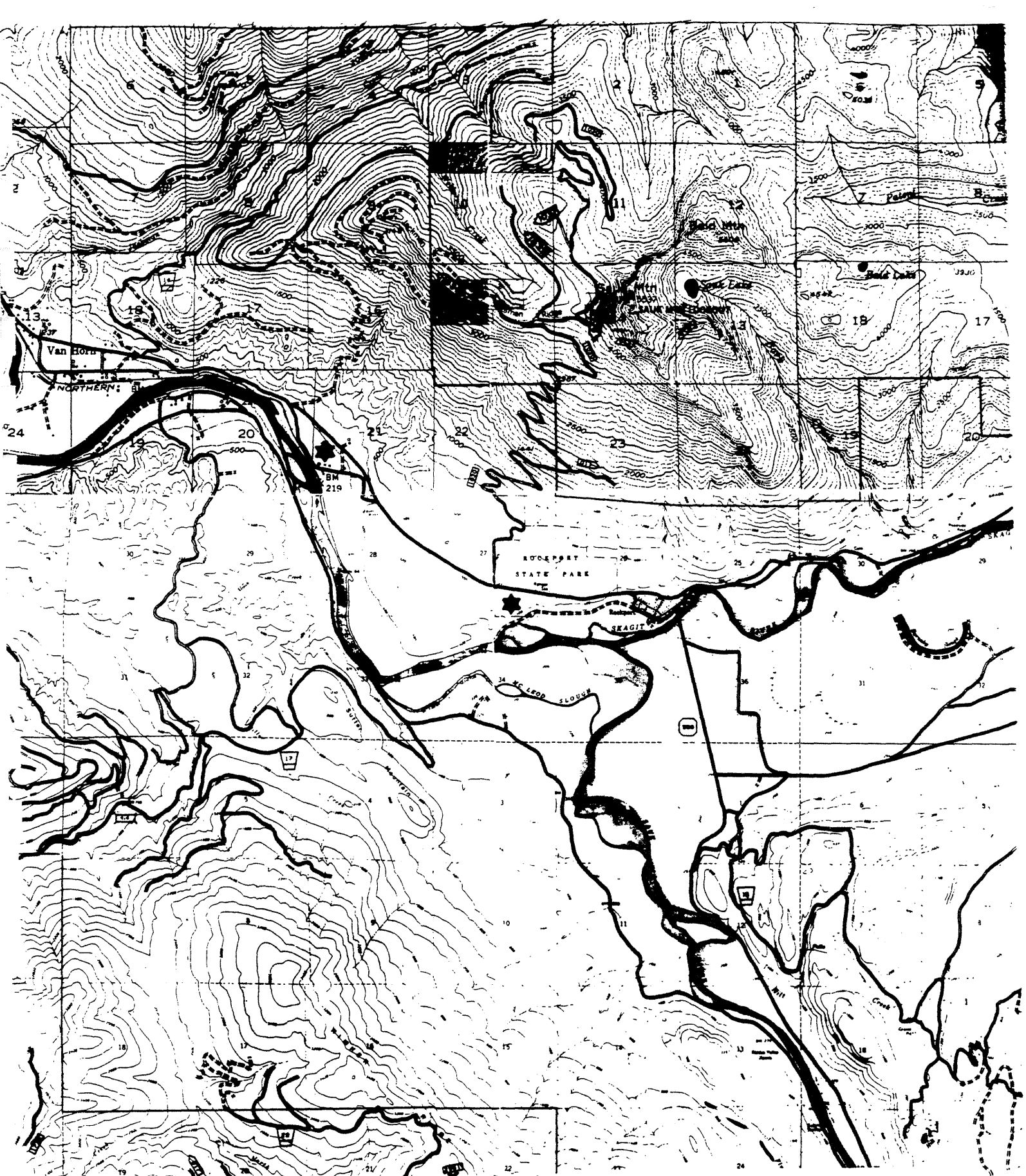

Figure 9

ROCKPORT STATE PARK
SAUK MOUNTAIN

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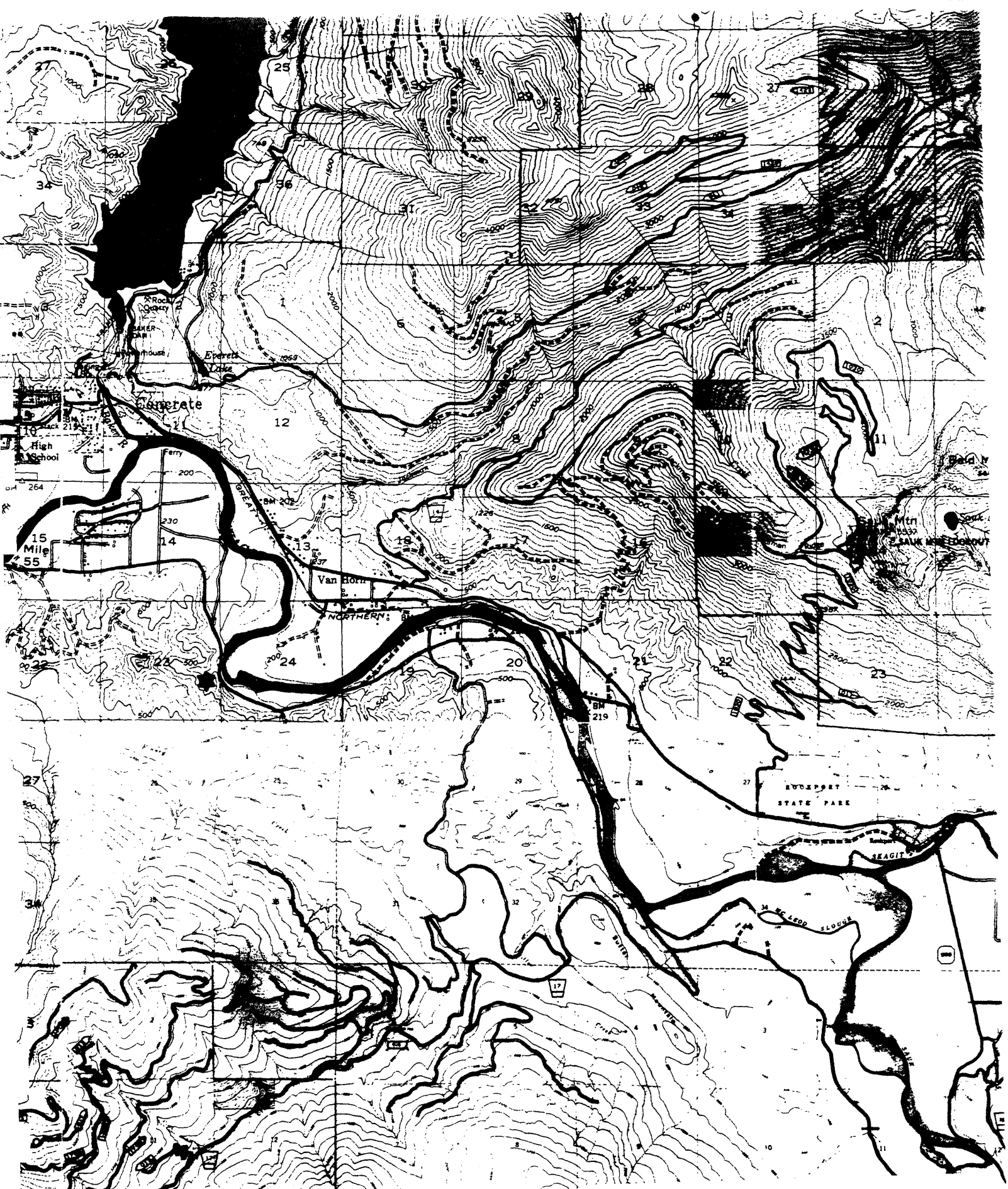


Figure 10

BIG EDDY OSPREY

★ OBSERVATION SITE

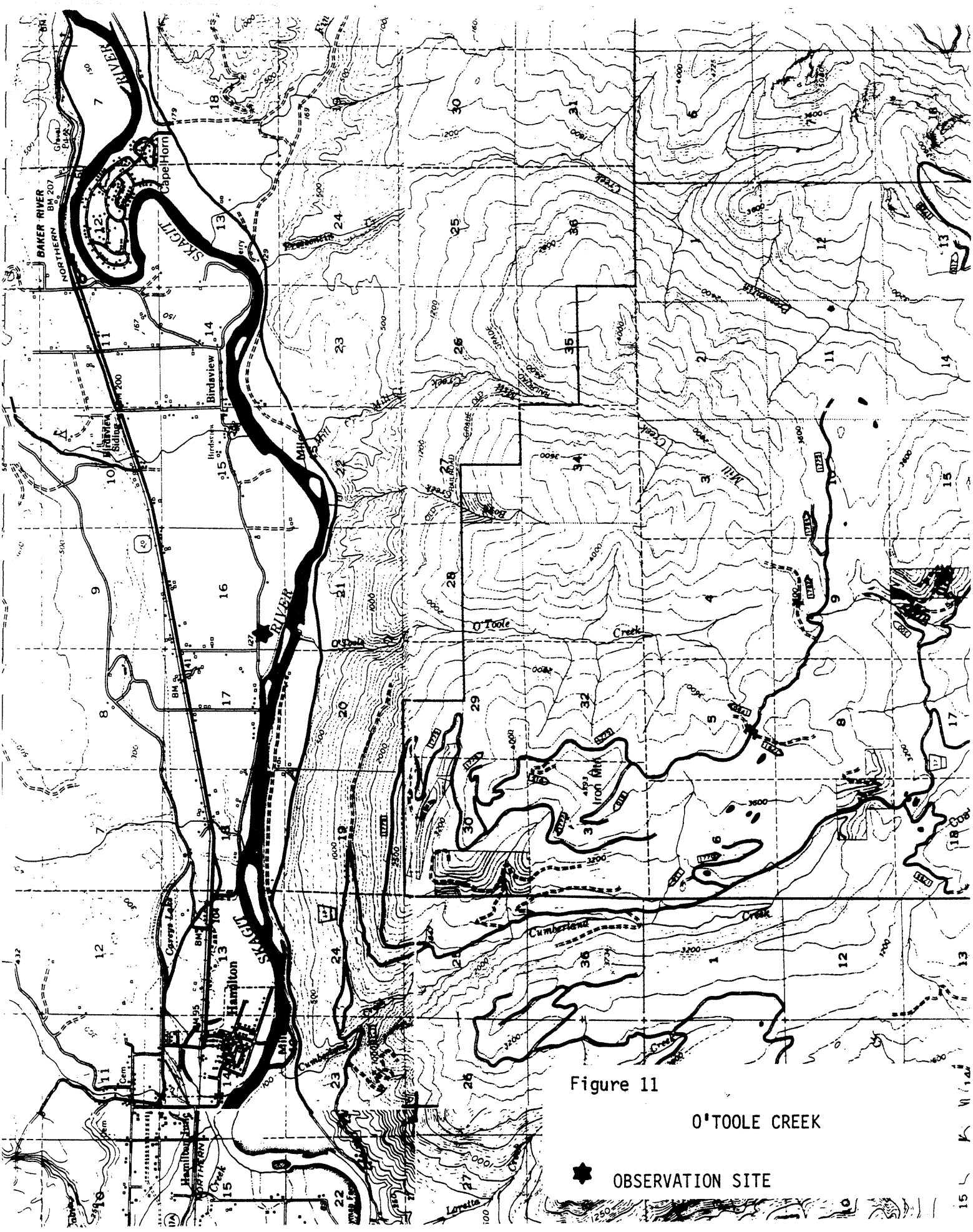
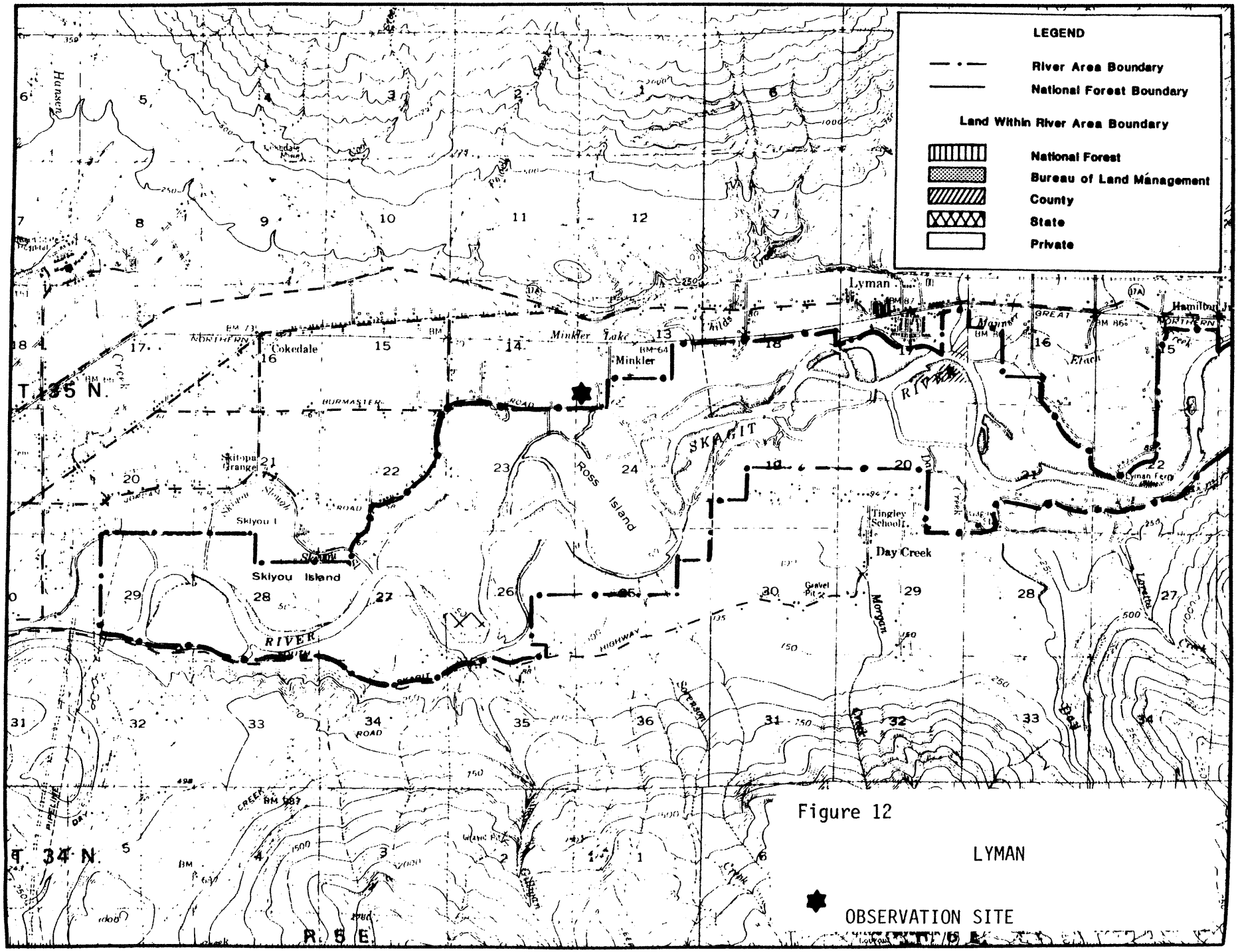


Figure 11

O'TOOLE CREEK

★ OBSERVATION SITE


LEGEND
River Area Boundary
National Forest Boundary
Land Within River Area Boundary
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Bureau of Land Management
County
State
Private
Lyman
Hamilton
Cokedale
Minkler
Minkler Lake
Skiyou Island
Ross Island
Tingley School
Day Creek
Gravel Pit
SKAGIT RIVER
HIGHWAY
BURMASTER ROAD
T. 35 N.
T. 34 N.
R. 5 E.
Figure 12
LYMAN
OBSERVATION SITE

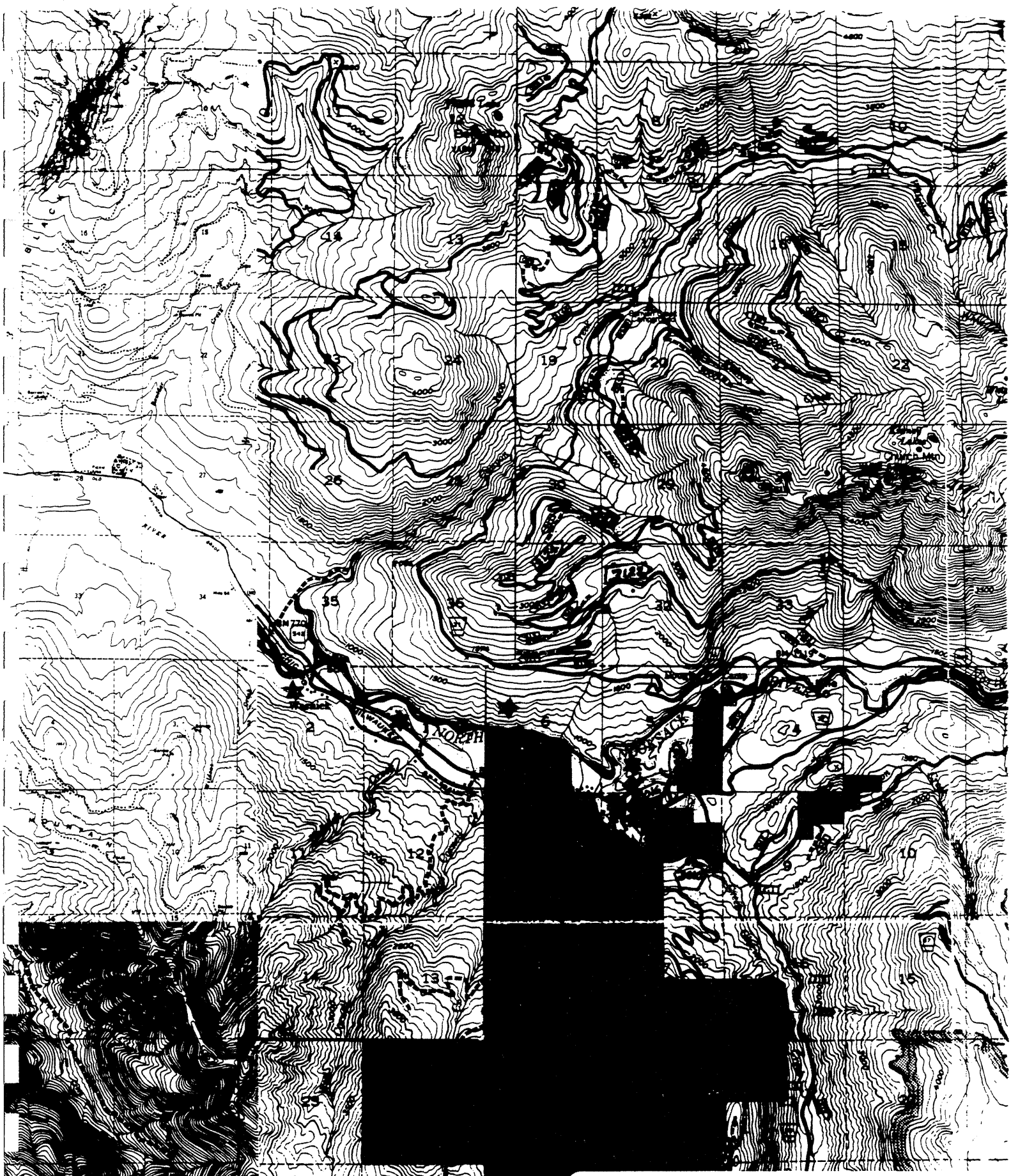
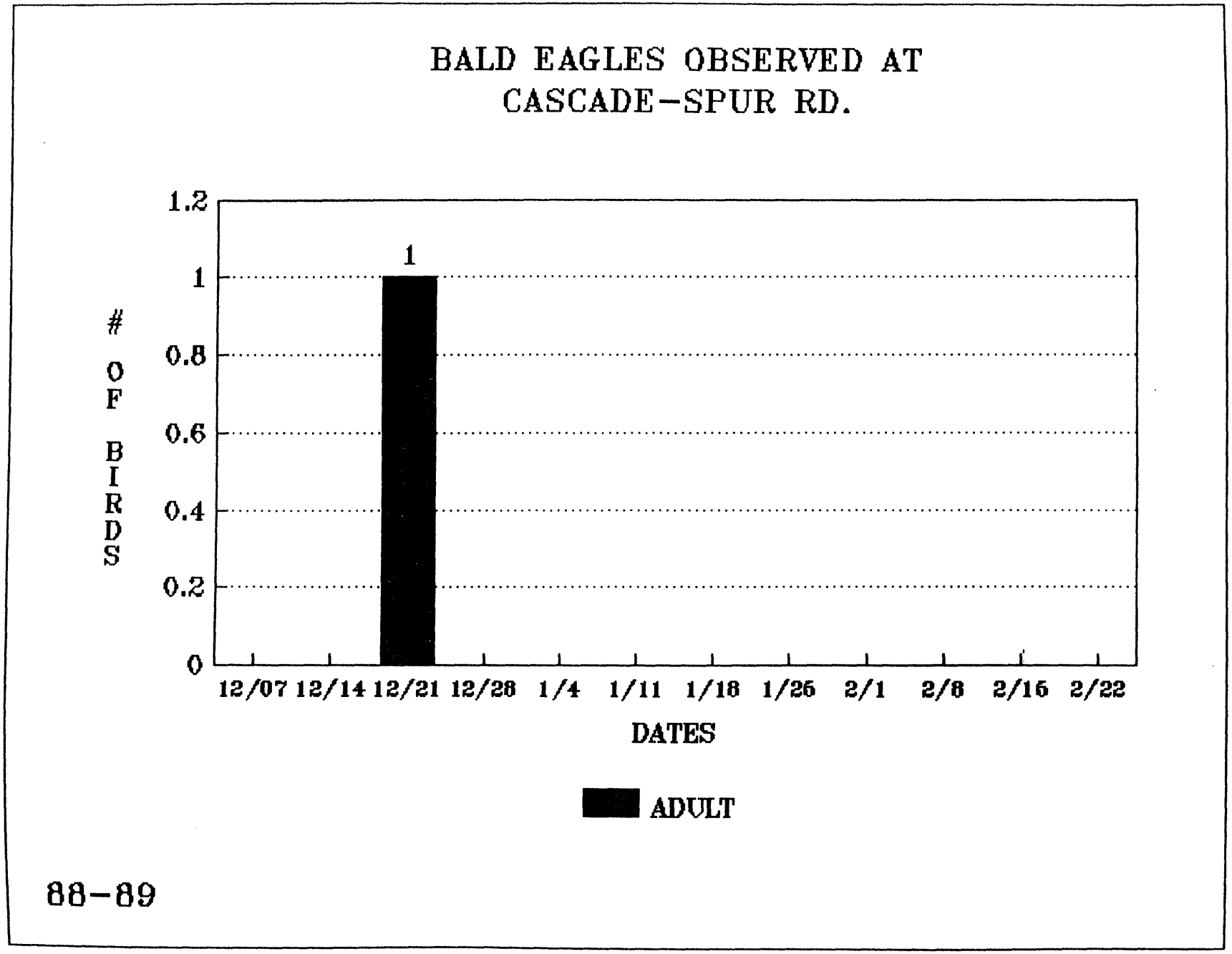


Figure 13

NORTH FORK NOOKSACK
GLACIER CREEK & FOSTERS
HUMPY UNIT #2, WARNICK BRG.
★ OBSERVATION SITE

Figure 14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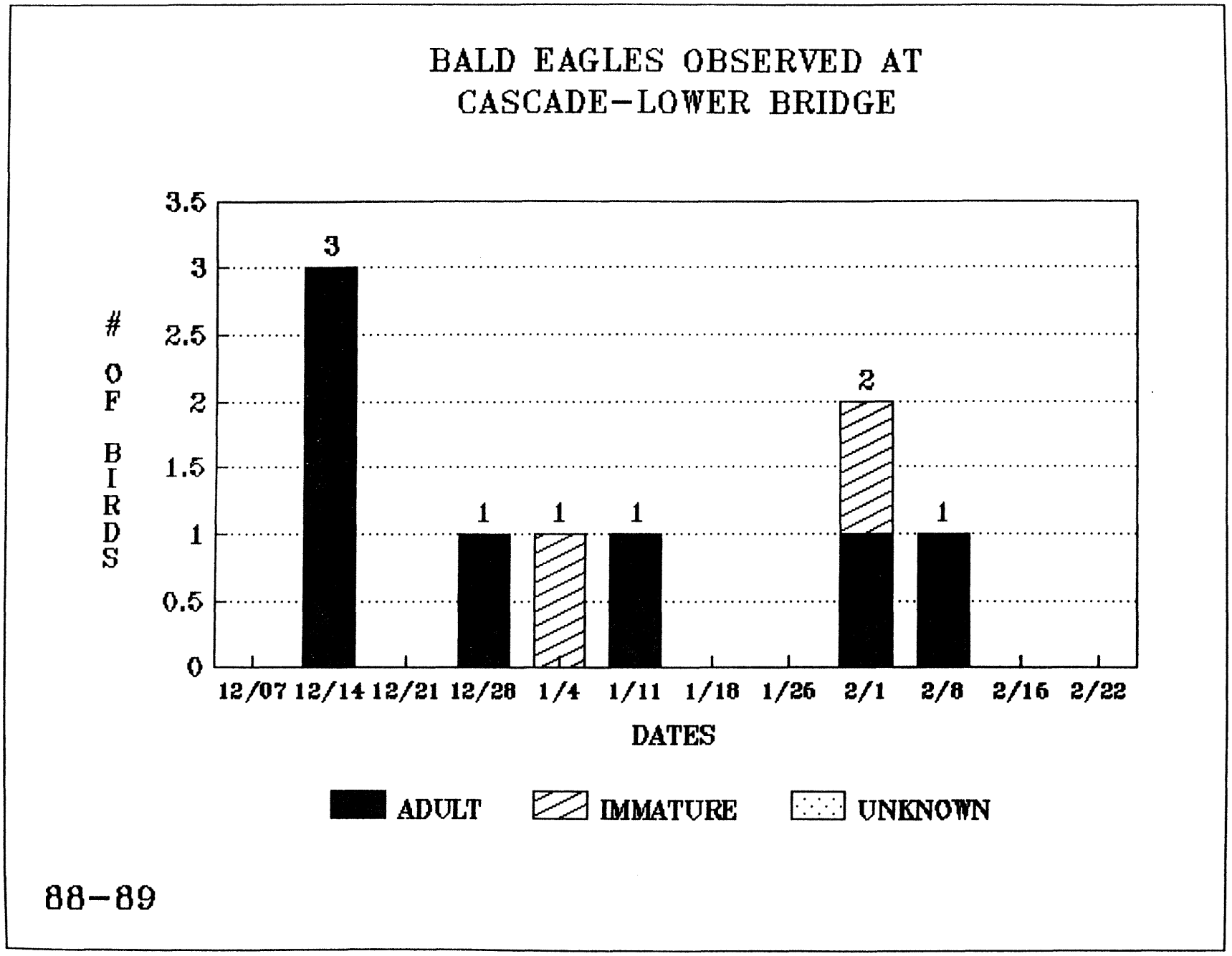
DATES
ADULT
88-89

Figure 15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CASCADE-LOWER BRIDGE
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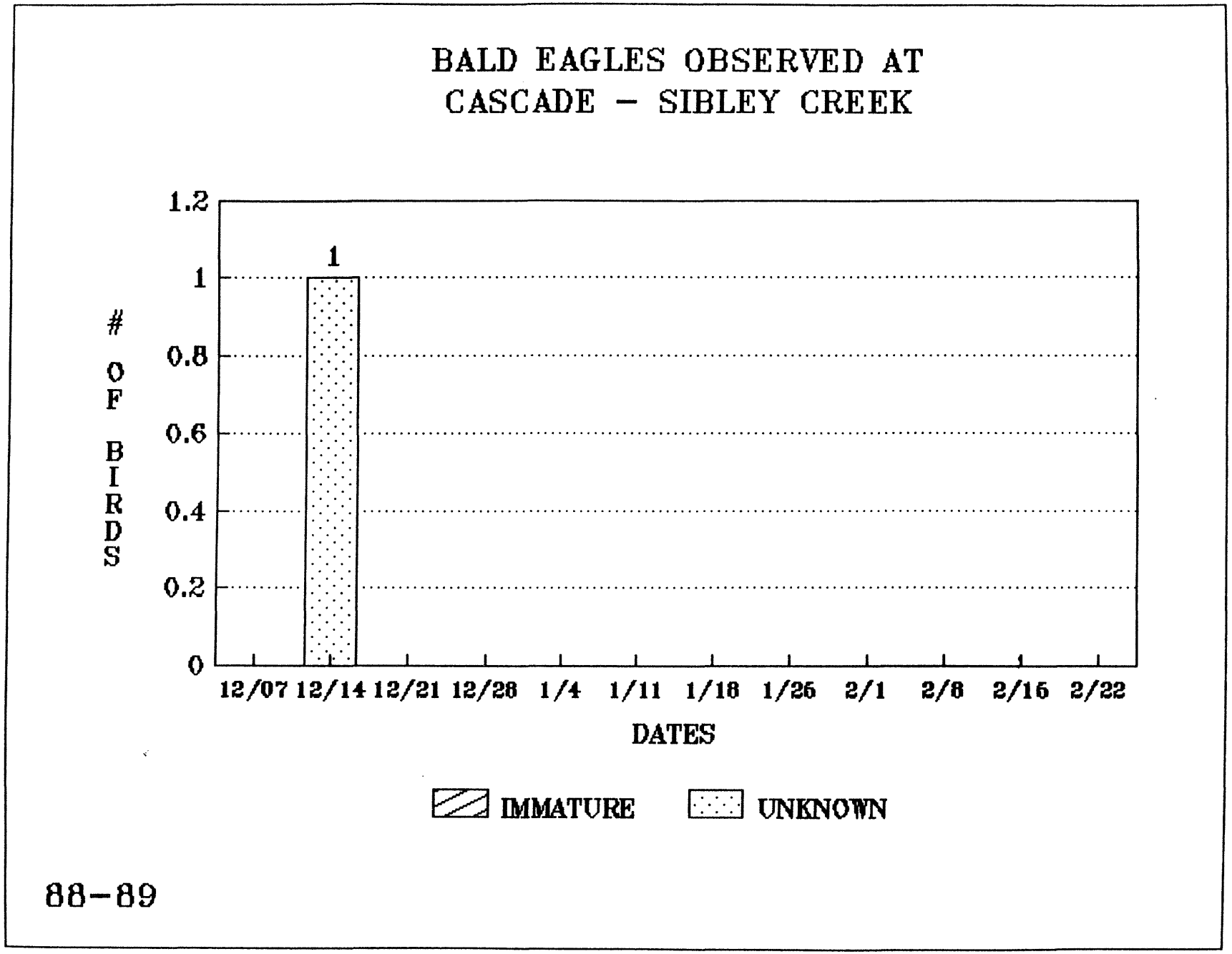
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 16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CASCADE - SIBLEY CREEK
OF BIRDS
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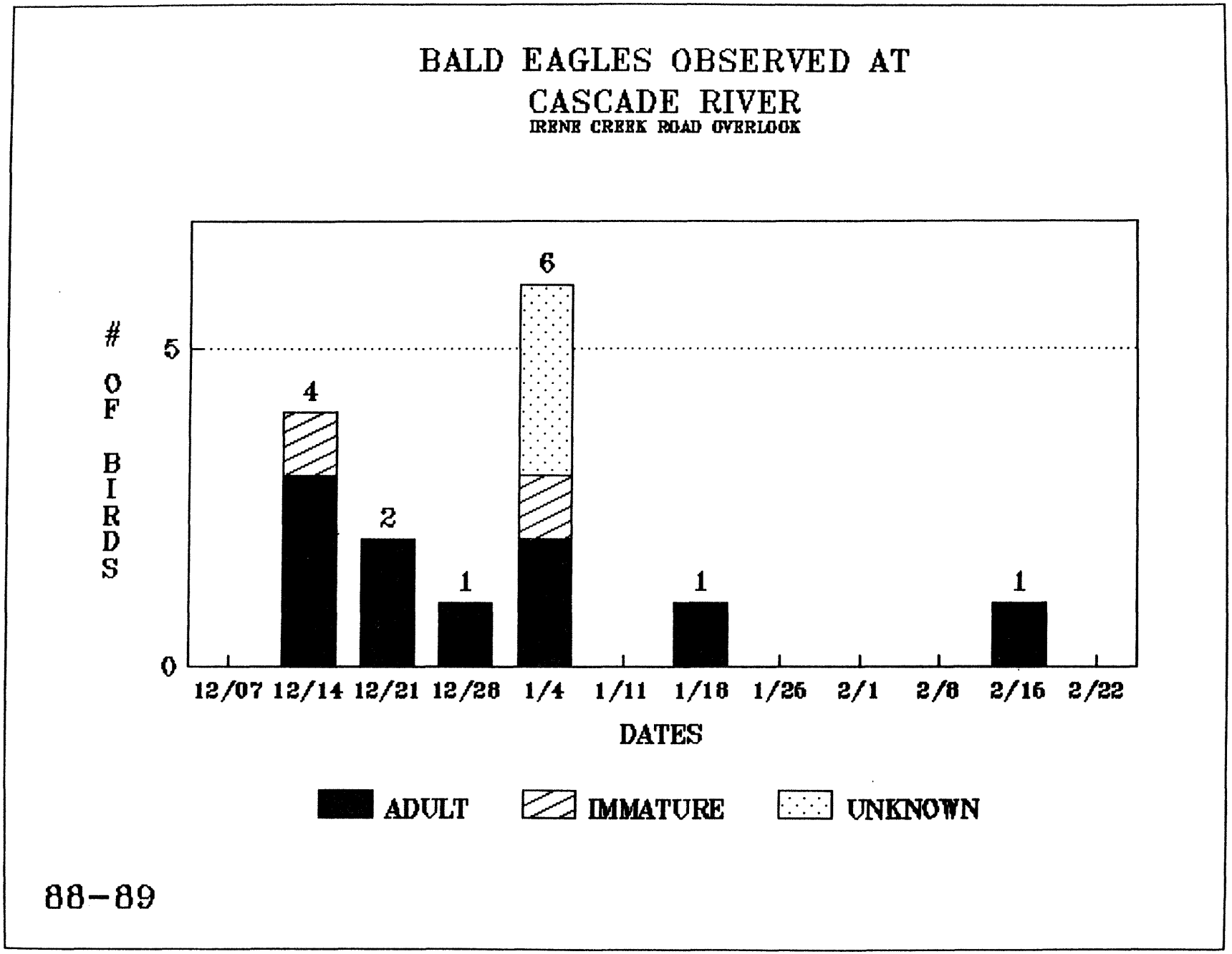
BALD EAGLES OBSERVED AT
CASCADE RIVER
IRENE CREEK ROAD OVERLOOK
OF BIRDS
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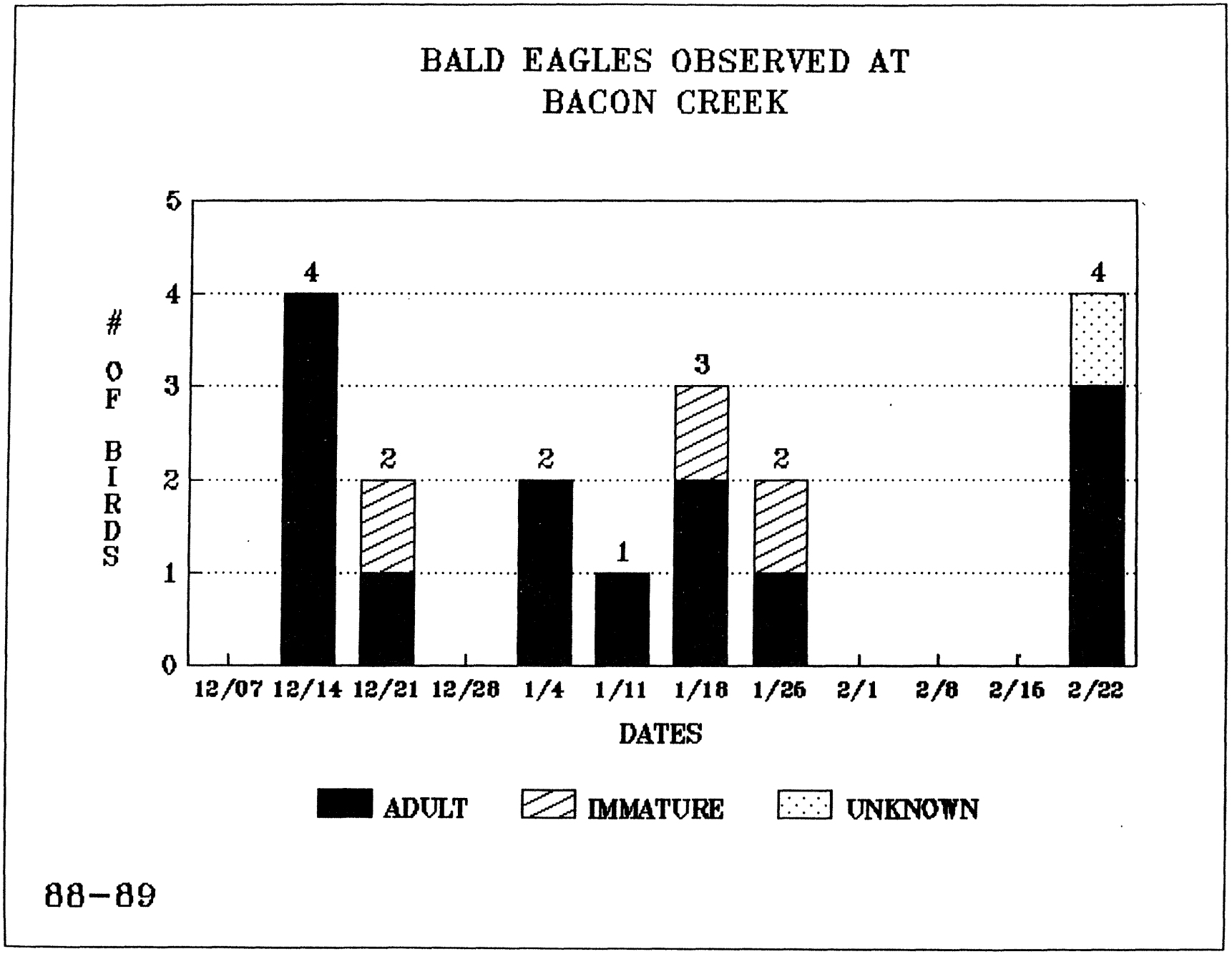
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 18


BALD EAGLES OBSERVED AT
BACON CREEK
OF BIRDS
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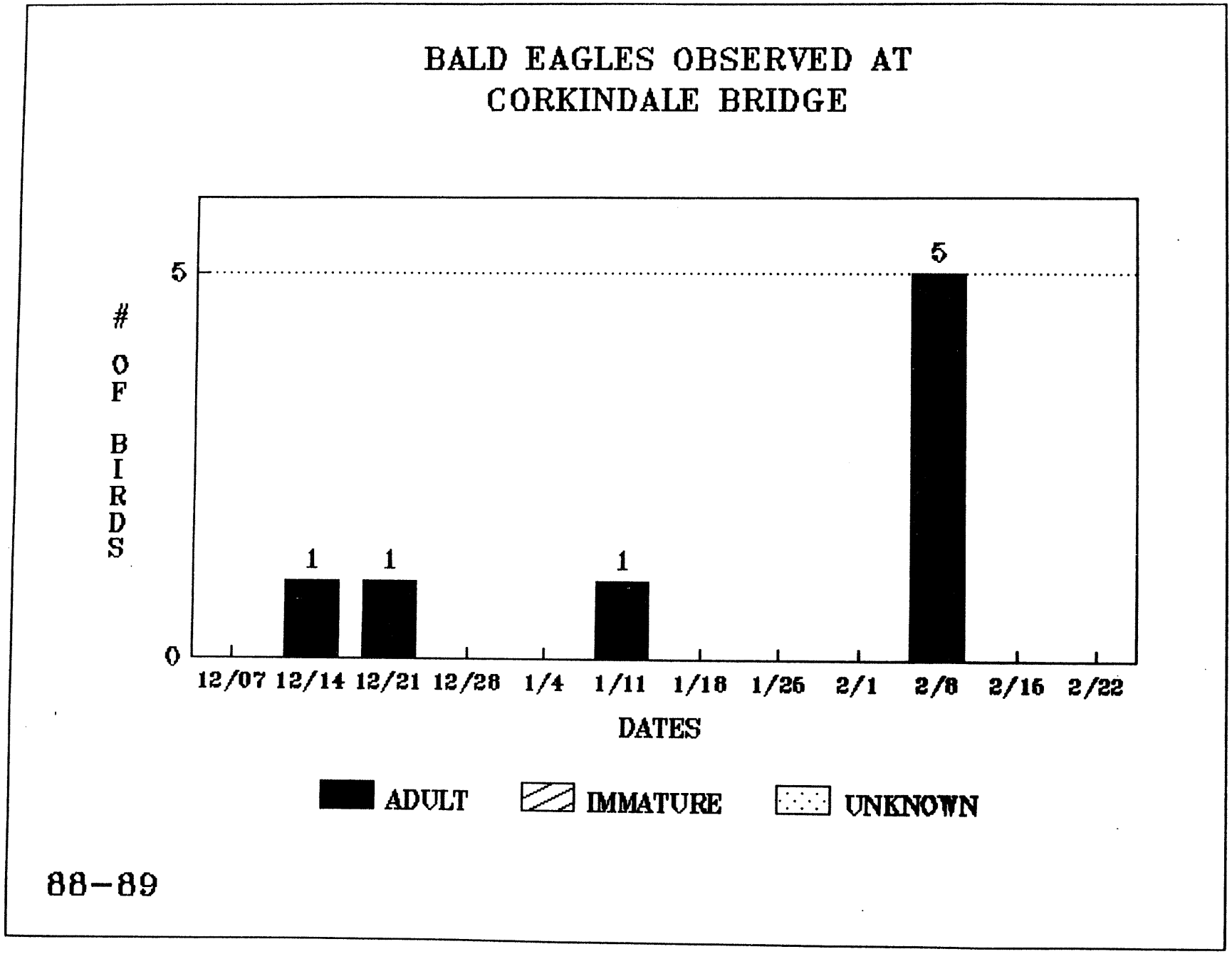
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 19


BALD EAGLES OBSERVED AT
CORKINDALE BRIDGE
OF BIRDS
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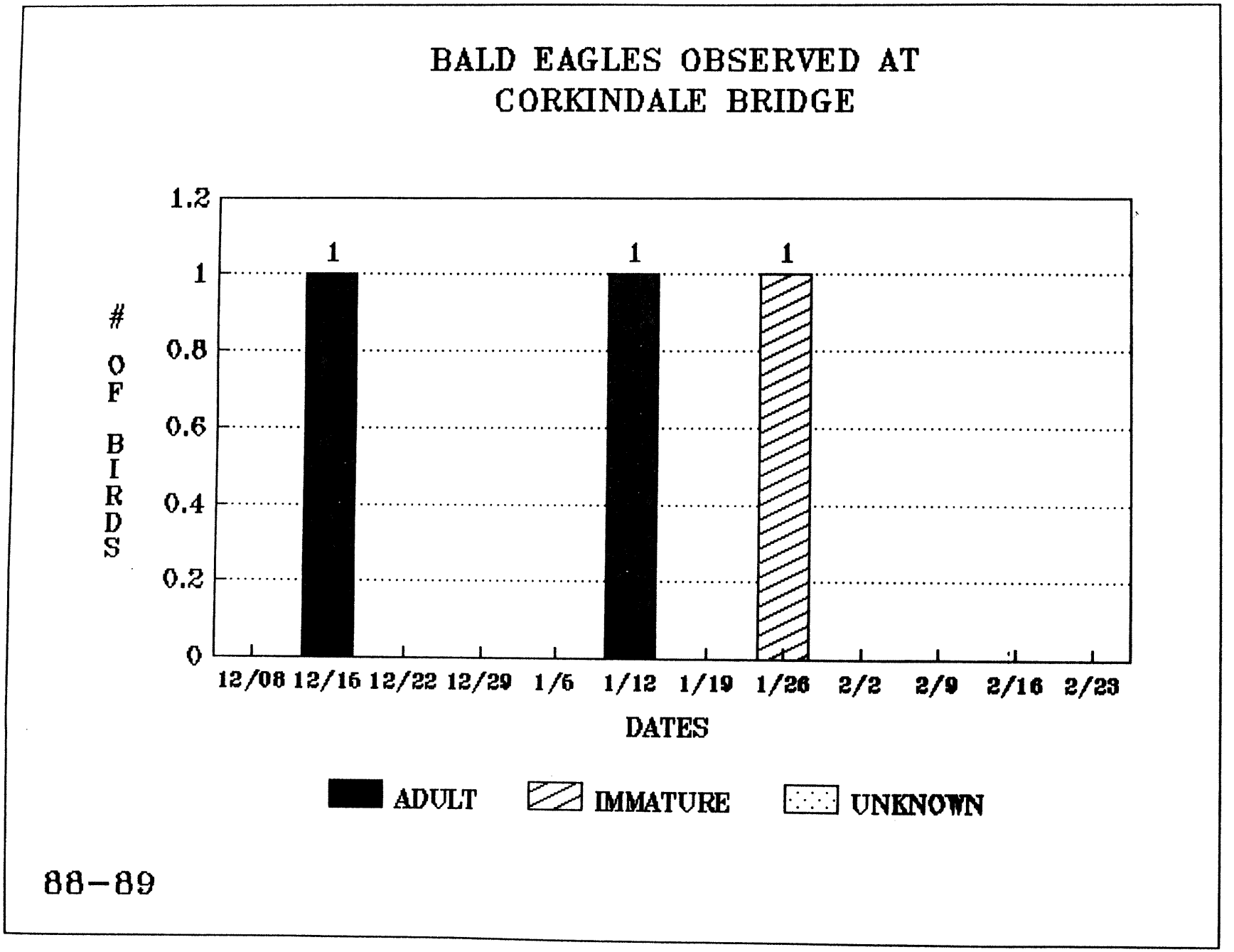
DATES
ADULT
IMMATURE
UNKNOWN
88-89


BALD EAGLES OBSERVED AT
CORKINDALE BRIDGE
OF BIRDS
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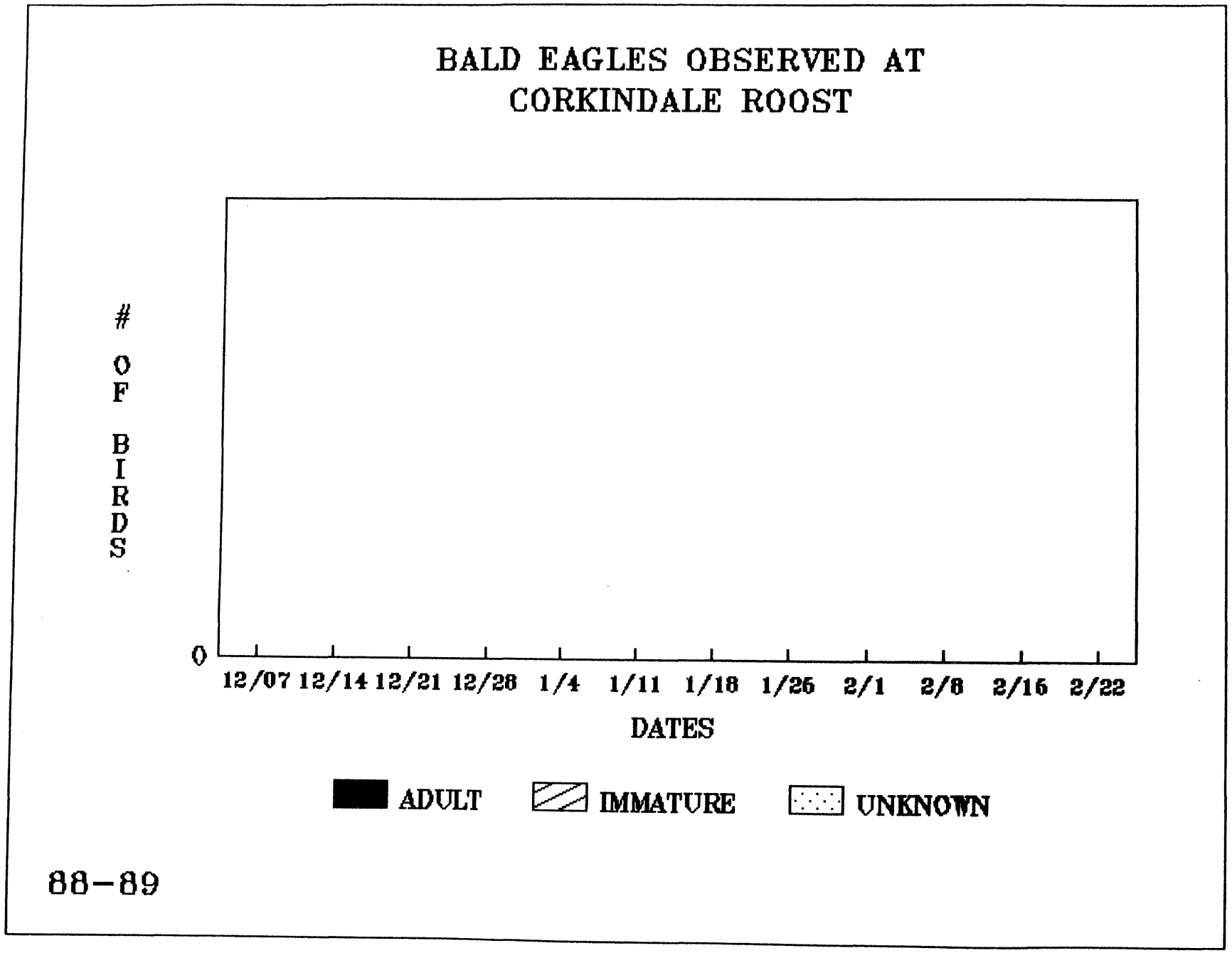
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 21


BALD EAGLES OBSERVED AT
CORKINDALE ROOST
OF BIRDS
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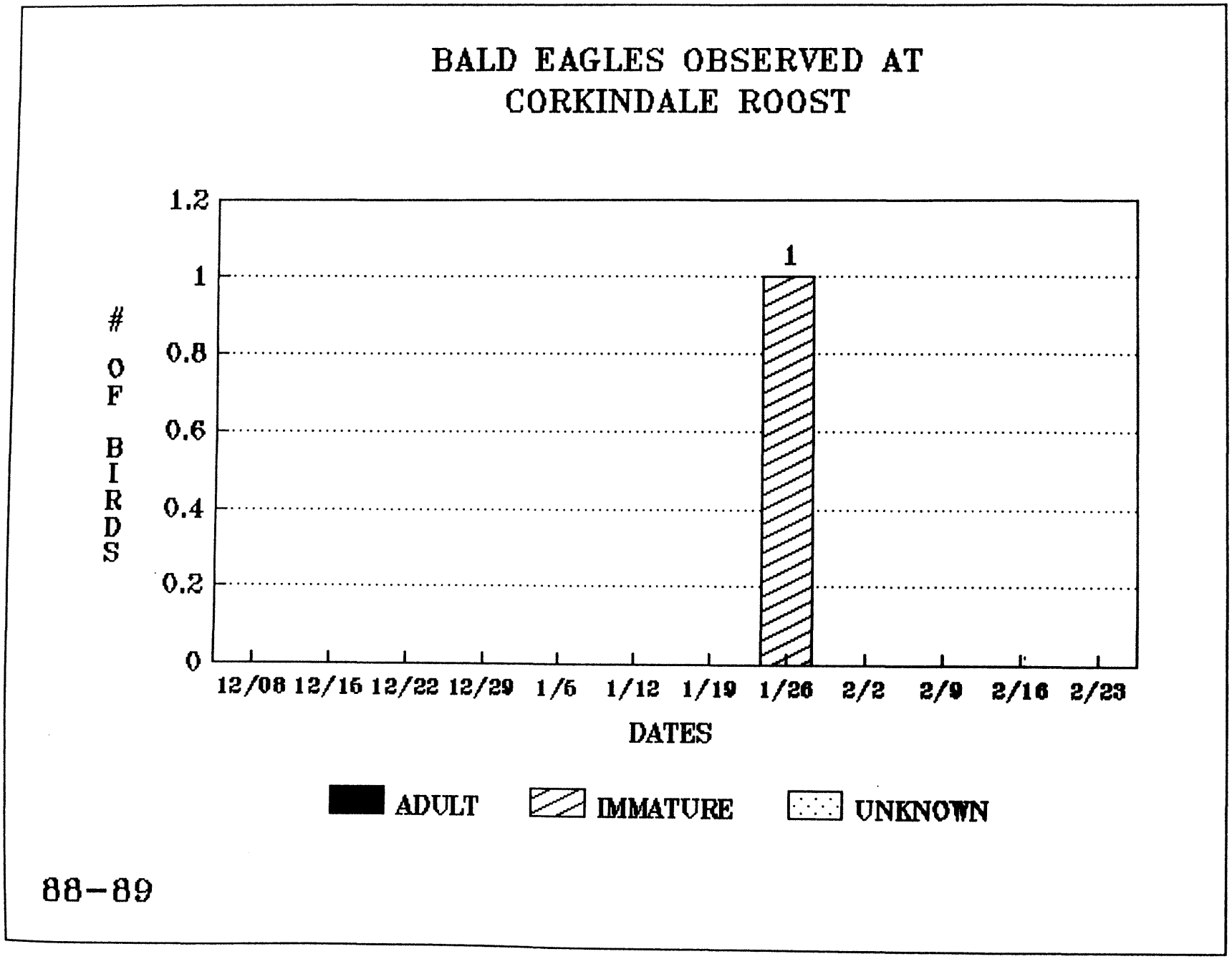
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 2c


BALD EAGLES OBSERVED AT
CORKINDALE ROOST
OF BIRDS
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12/08 12/15 12/22 12/29 1/5 1/12 1/19 1/26 2/2 2/9 2/16 2/23
DATES
ADULT
IMMATURE
UNKNOWN
88-89

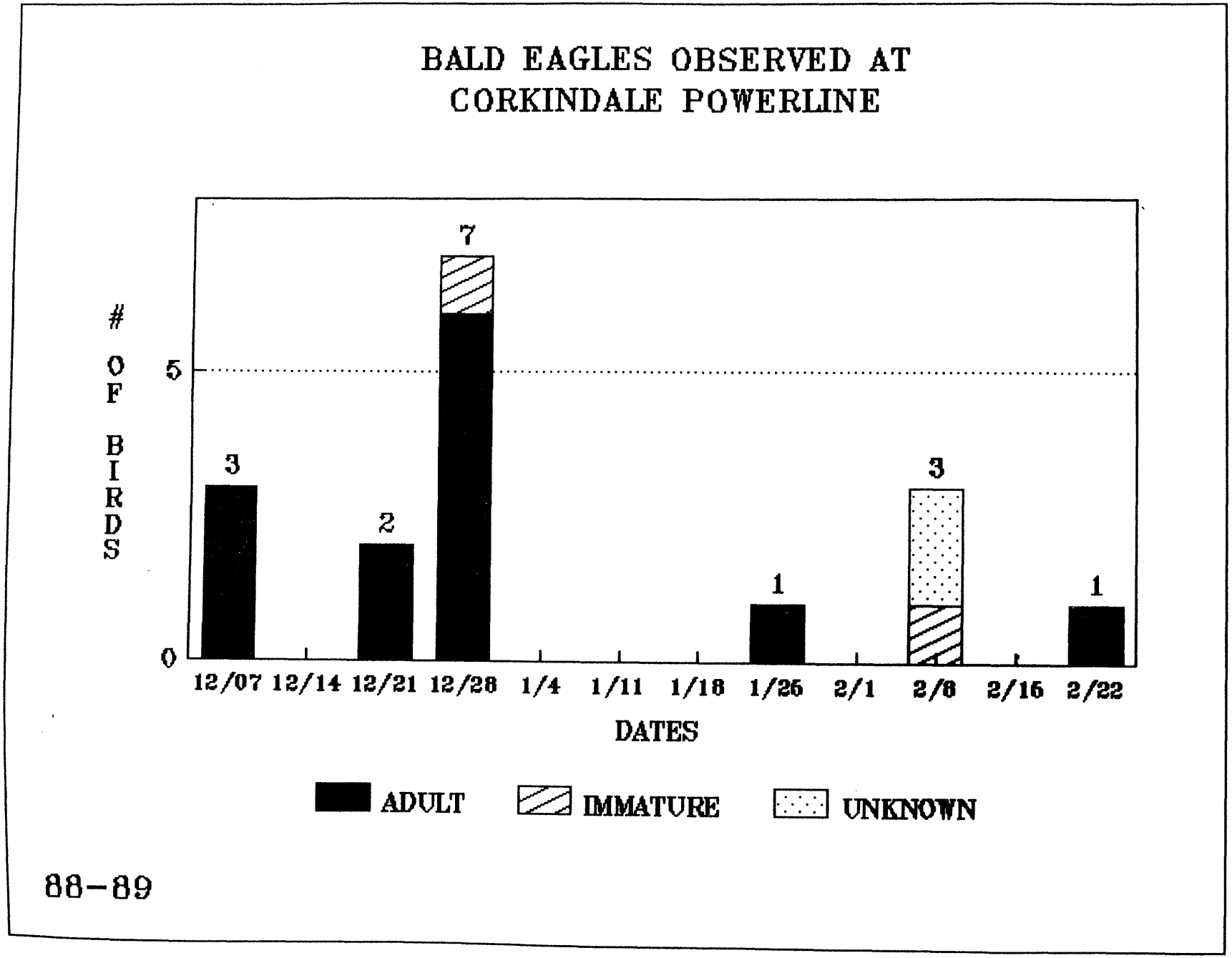
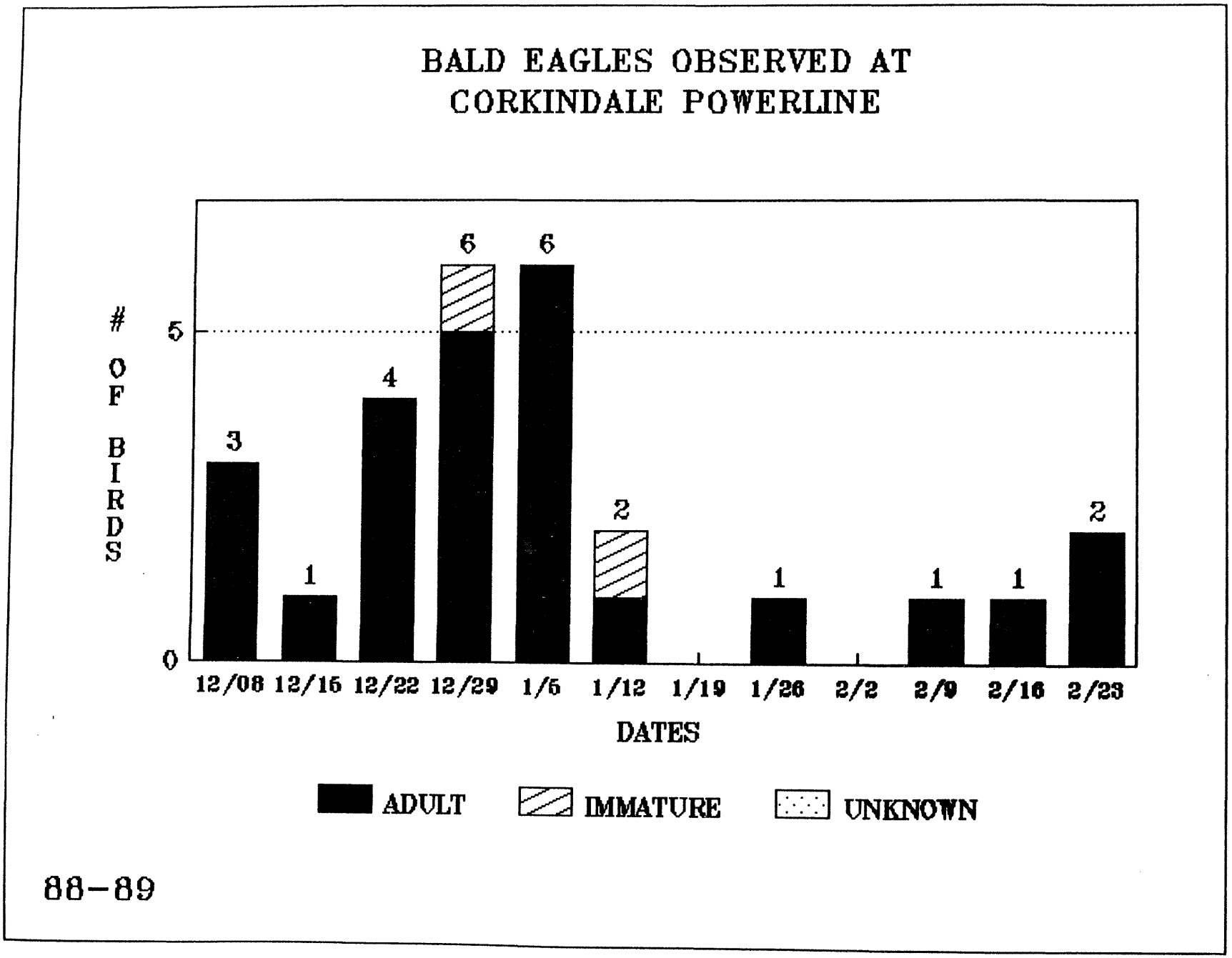

BALD EAGLES OBSERVED AT
CORKINDALE POWERLINE
OF BIRDS
0
5
3
2
7
1
3
1
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 24


BALD EAGLES OBSERVED AT
CORKINDALE POWERLINE
OF BIRDS
0
5
3
1
4
6
6
2
1
1
1
2
12/08
12/15
12/22
12/29
1/5
1/12
1/19
1/26
2/2
2/9
2/16
2/23
DATES
ADULT
IMMATURE
UNKNOWN
88-89

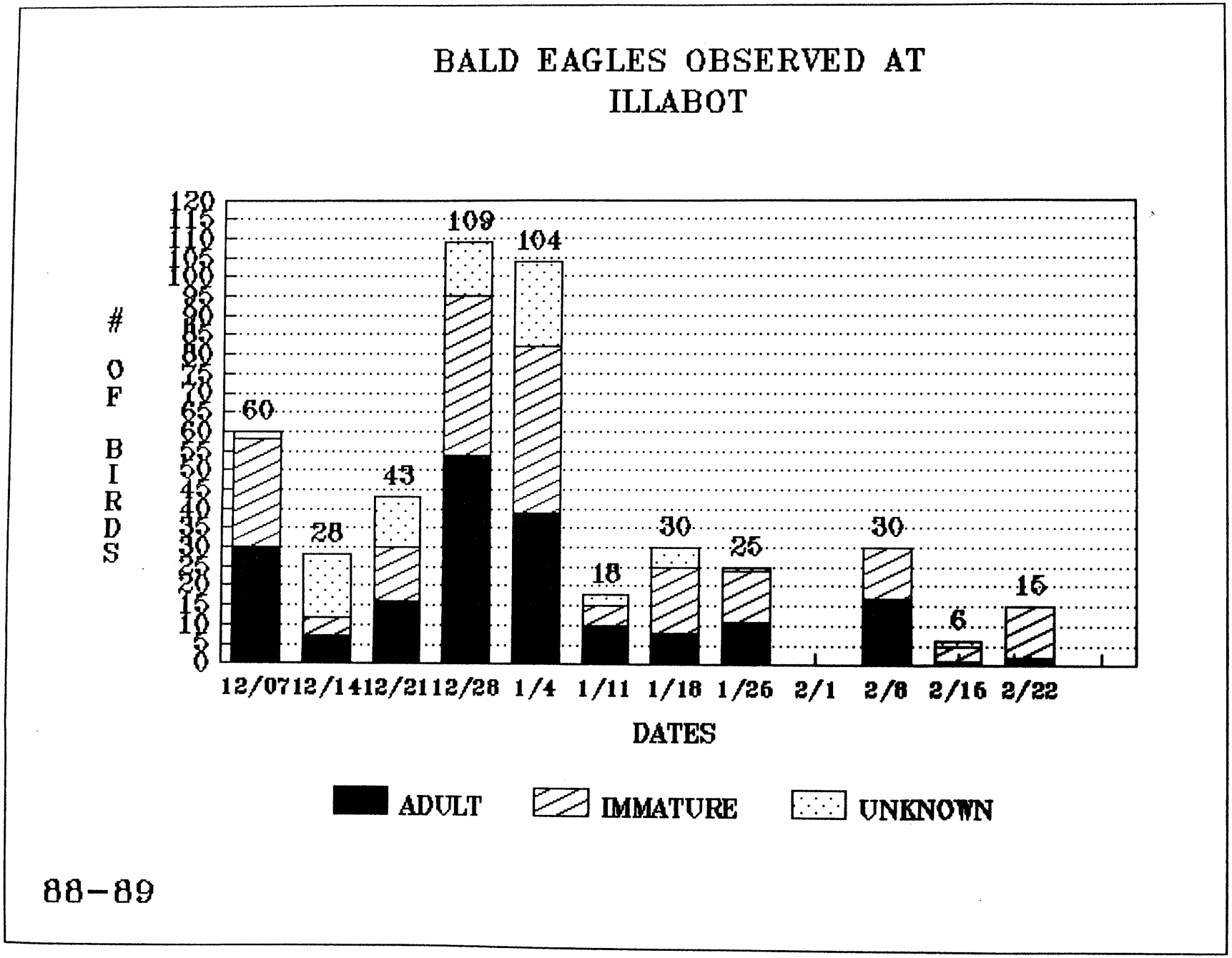

BALD EAGLES OBSERVED AT
ILLABOT
OF BIRDS
60
28
43
109
104
18
30
25
30
6
15
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 26

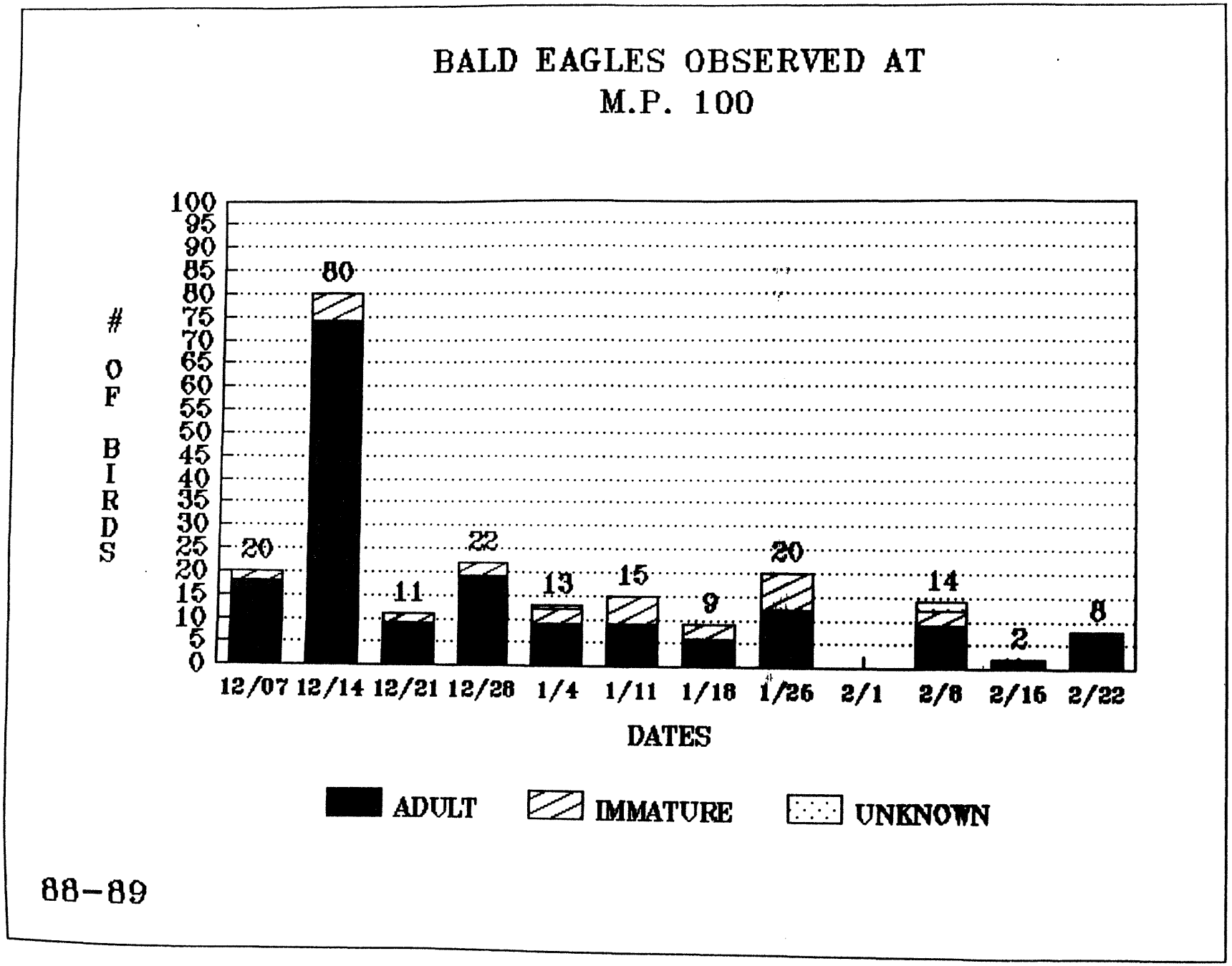

BALD EAGLES OBSERVED AT
M.P. 100
OF BIRDS
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
20
80
11
22
13
15
9
20
14
2
8
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 2/

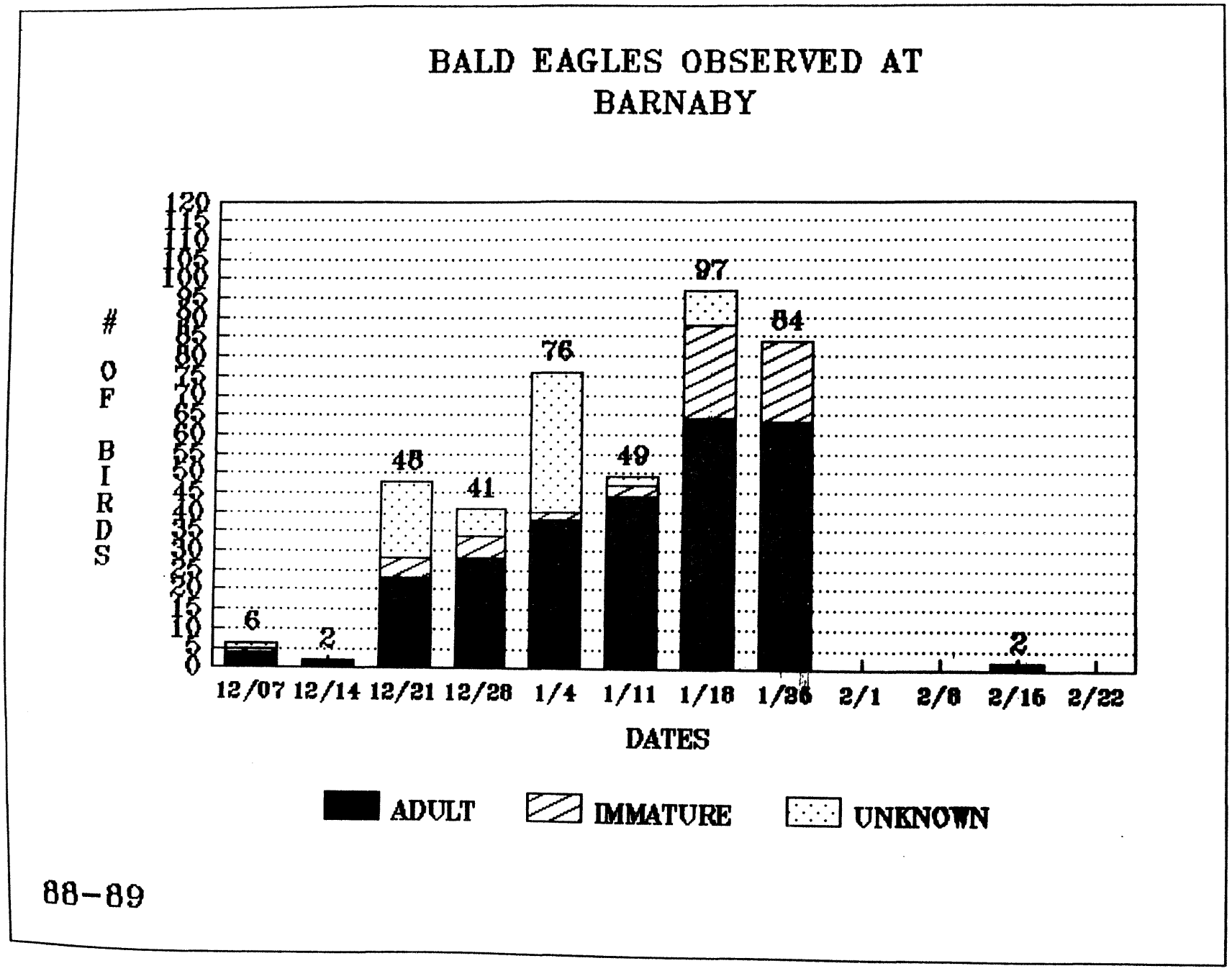
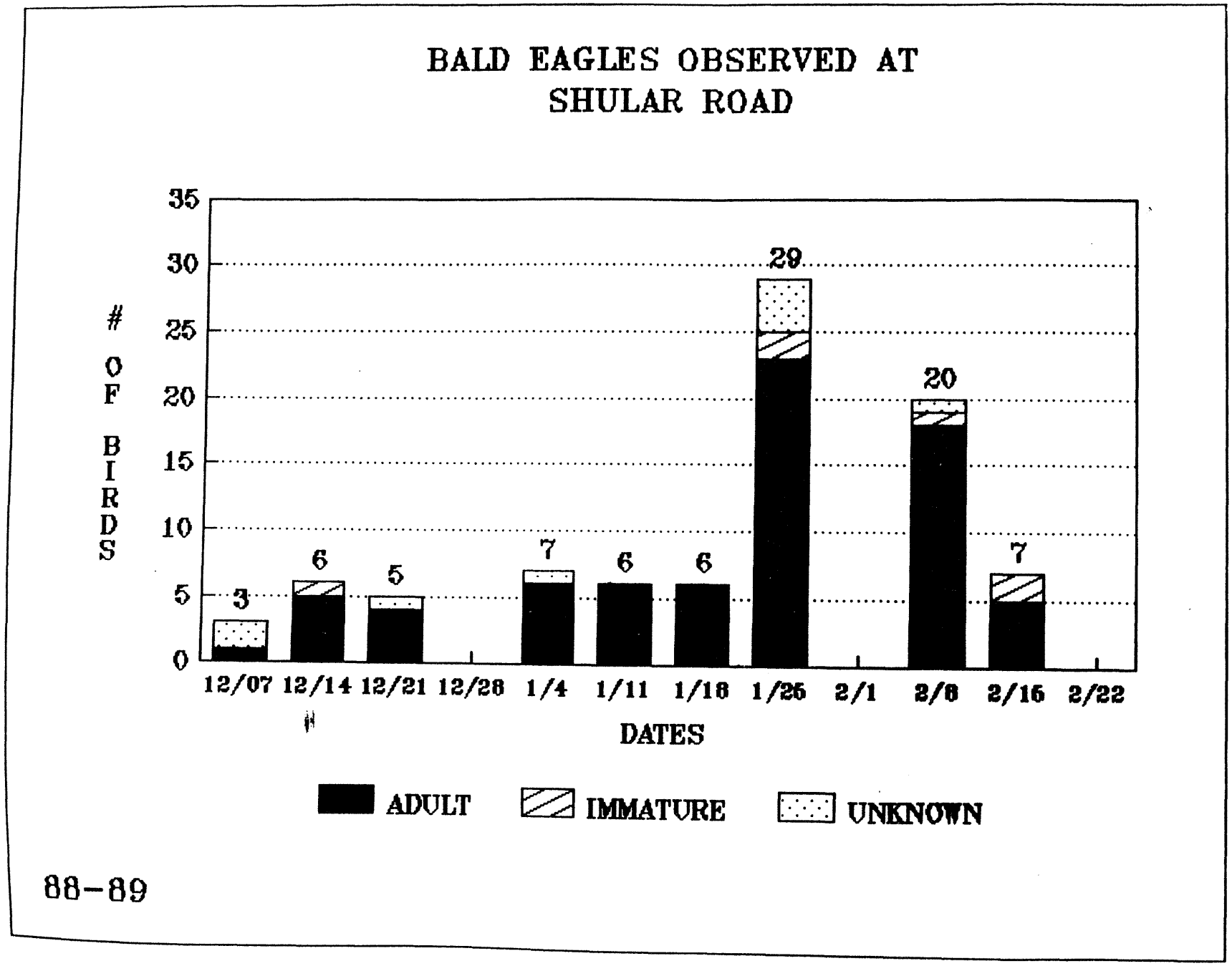

BALD EAGLES OBSERVED AT
BARNABY
OF BIRDS
6
2
48
41
76
49
97
84
2
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/26 2/1 2/8 2/15 2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 28


BALD EAGLES OBSERVED AT
SHULAR ROAD
OF BIRDS
35
30
25
20
15
10
5
0
3
6
5
7
6
6
29
20
7
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

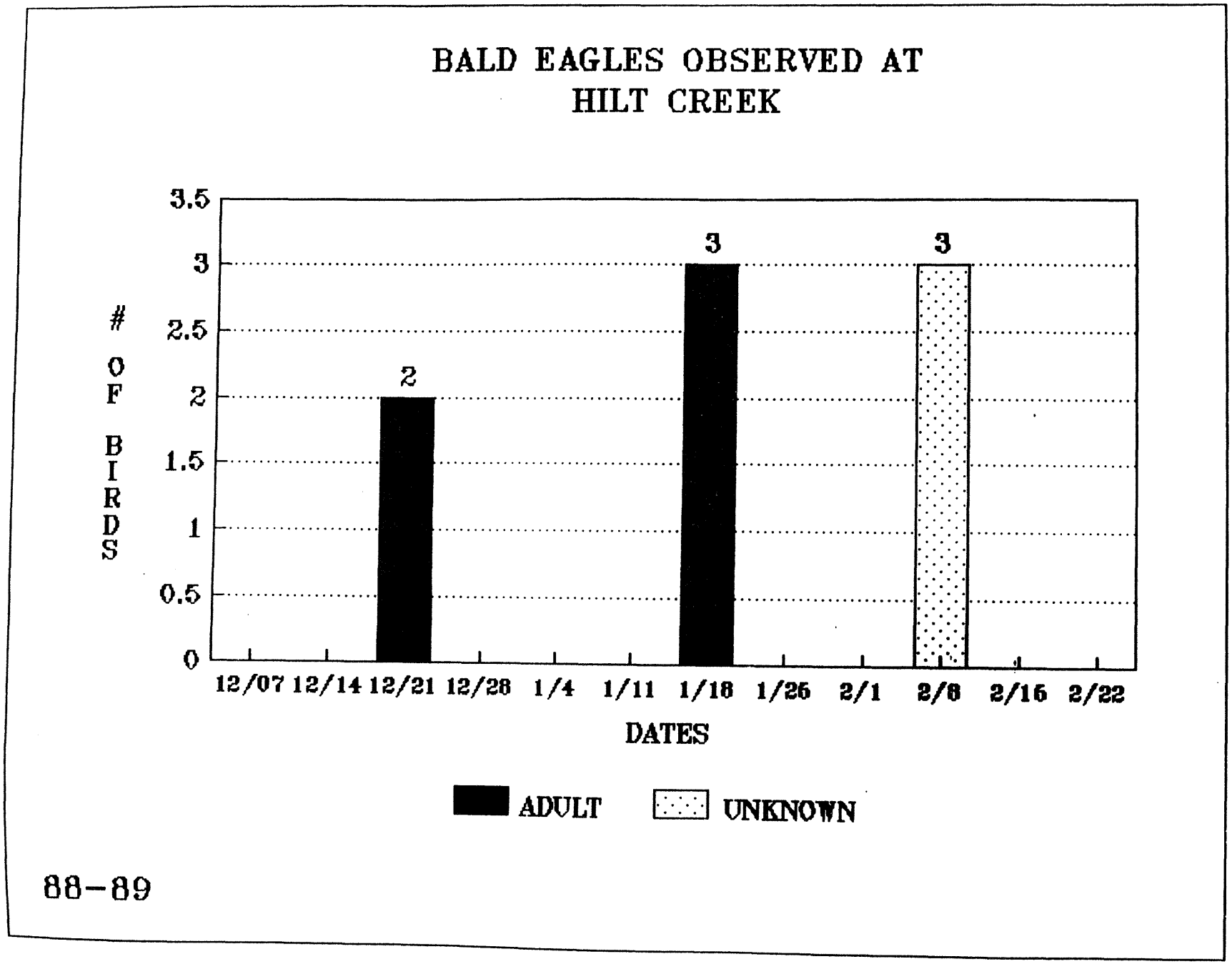
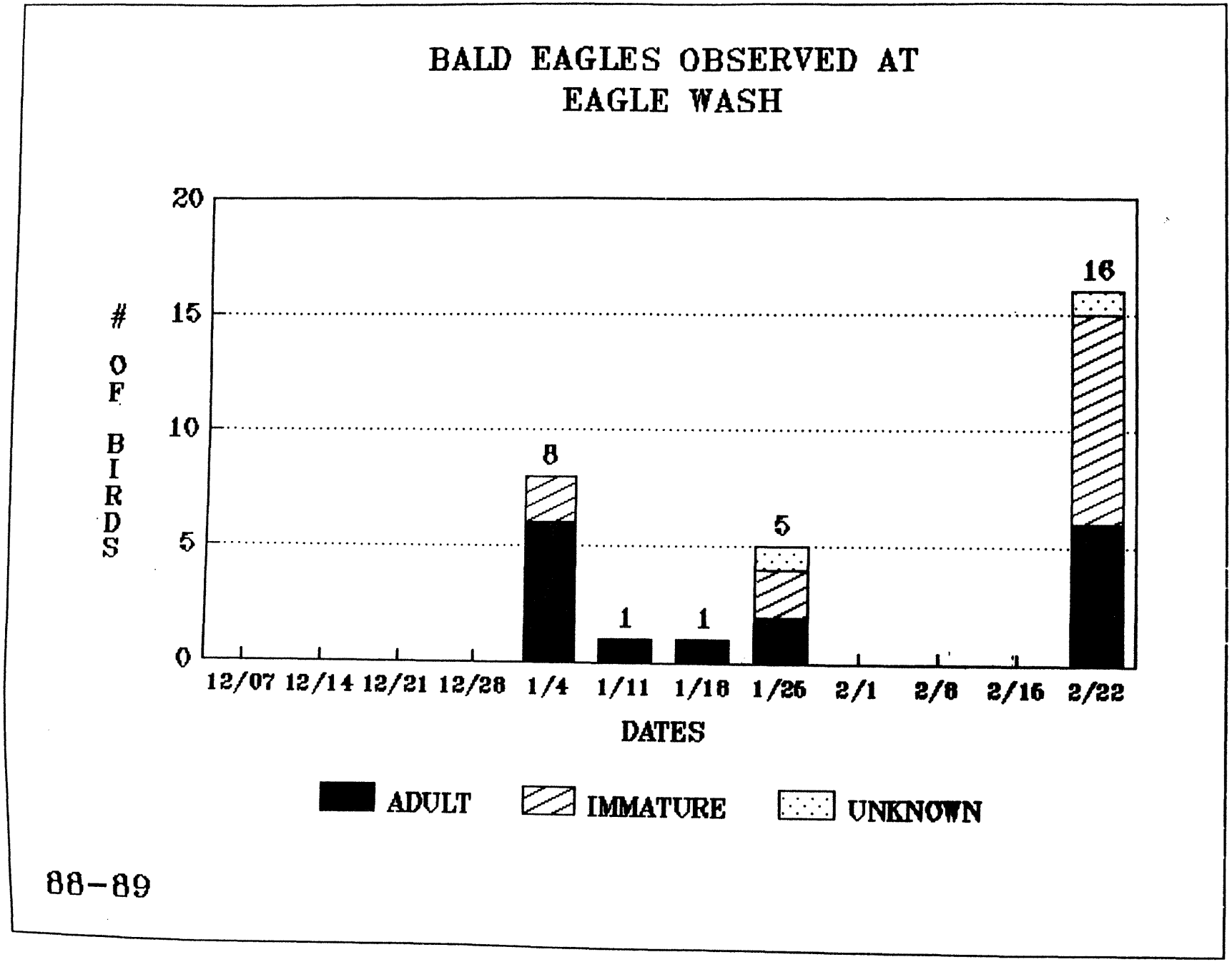
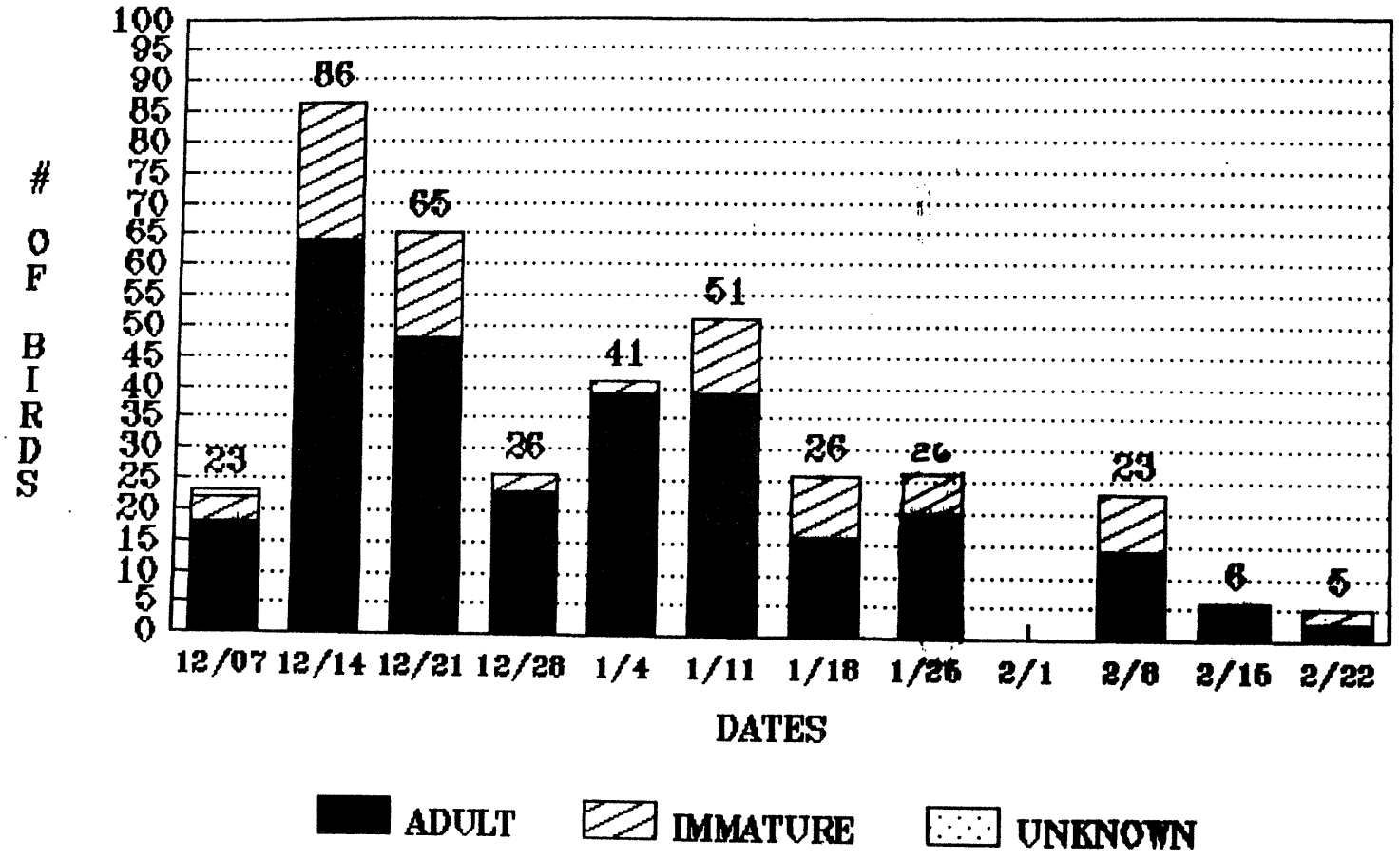

BALD EAGLES OBSERVED AT
HILT CREEK
OF BIRDS
3.5
3
2.5
2
1.5
1
0.5
0
2
3
3
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
ADULT
UNKNOWN
88-89

Figure 30


BALD EAGLES OBSERVED AT
EAGLE WASH
OF BIRDS
20
15
10
5
0
8
1
1
5
16
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

BALD EAGLES OBSERVED AT ROCKPORT STATE PARK



88-89

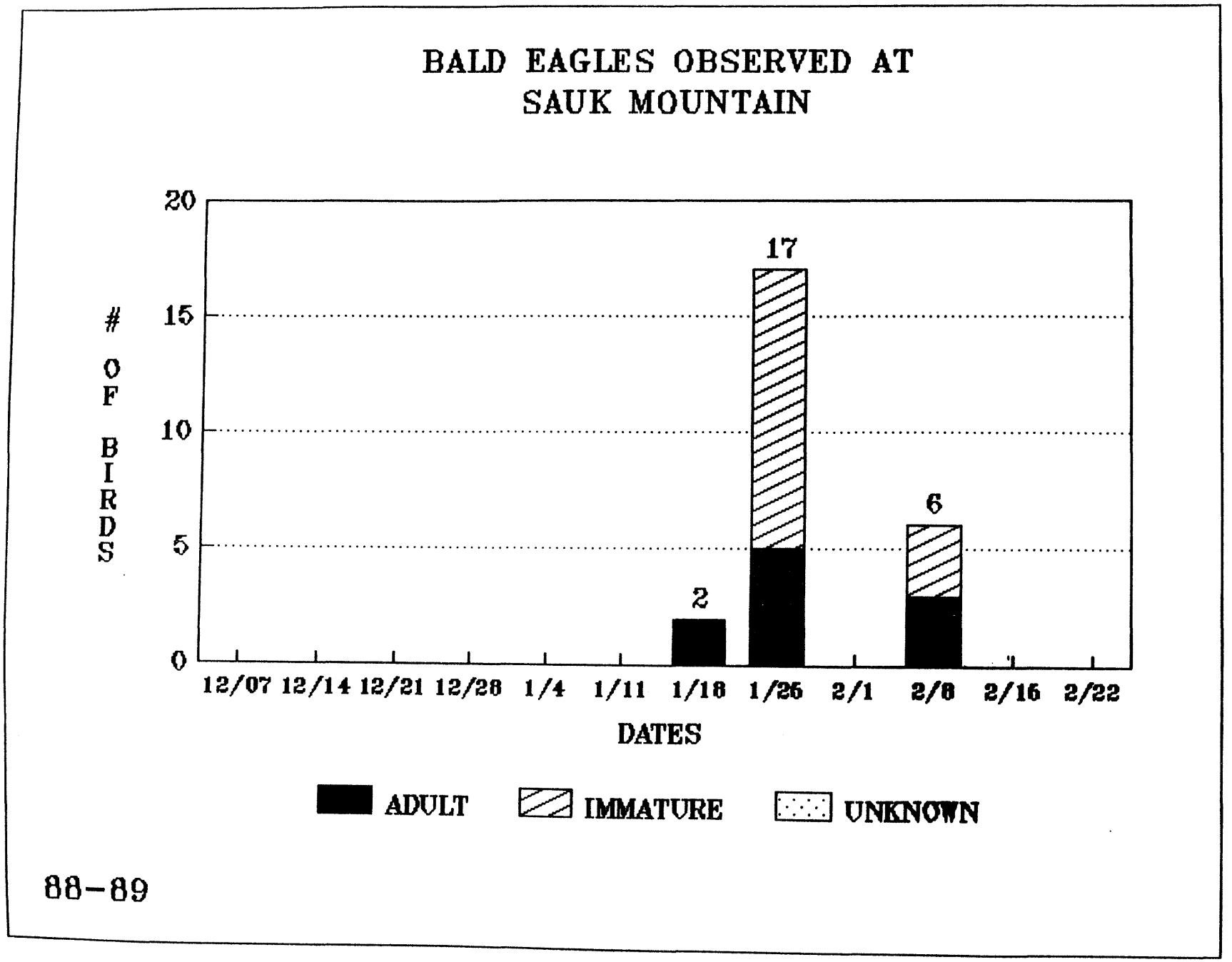

BALD EAGLES OBSERVED AT
SAUK MOUNTAIN
OF BIRDS
20
15
10
5
0
17
6
2
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 33

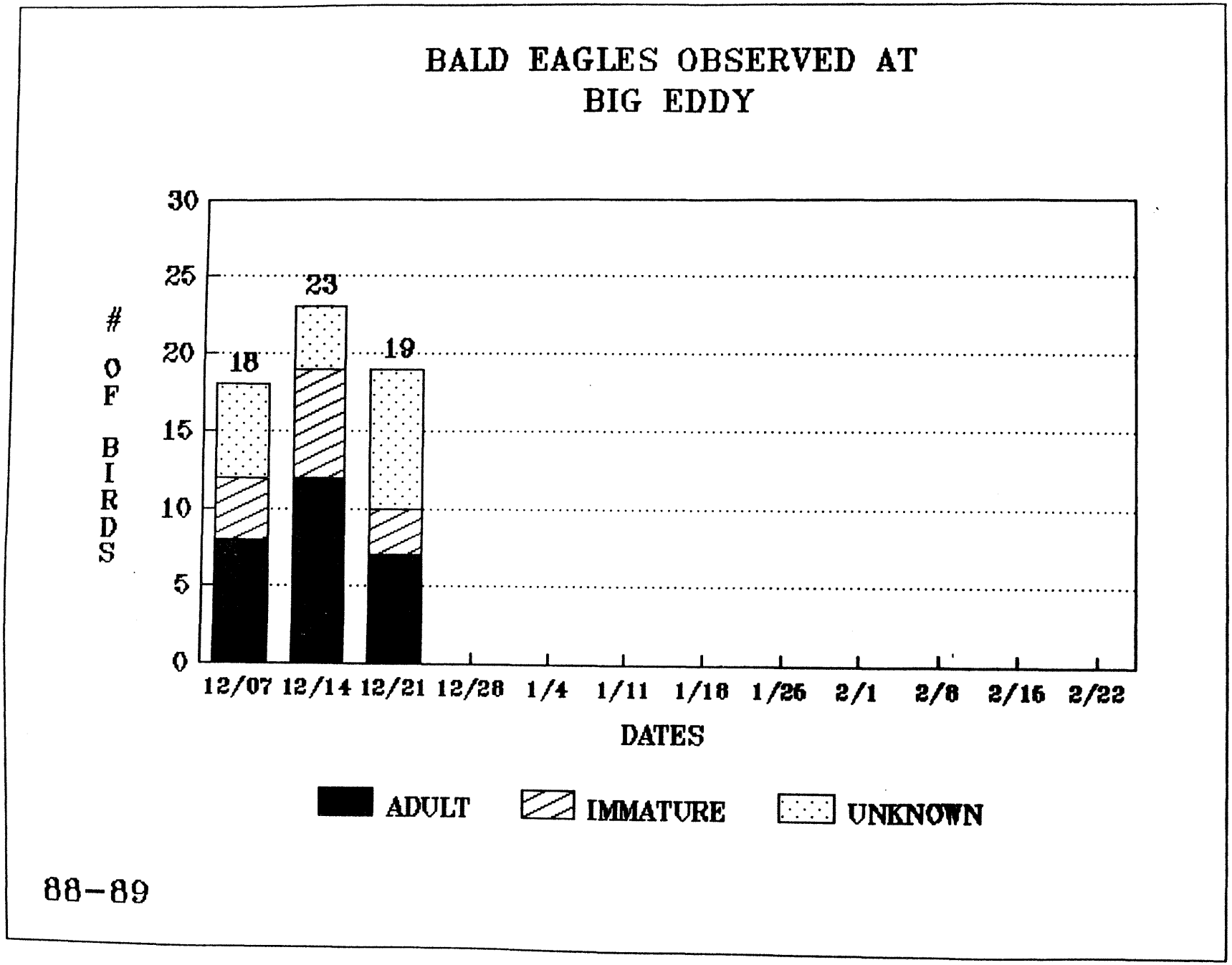

BALD EAGLES OBSERVED AT
BIG EDDY
OF BIRDS
30
25
20
15
10
5
0
18
23
19
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 34

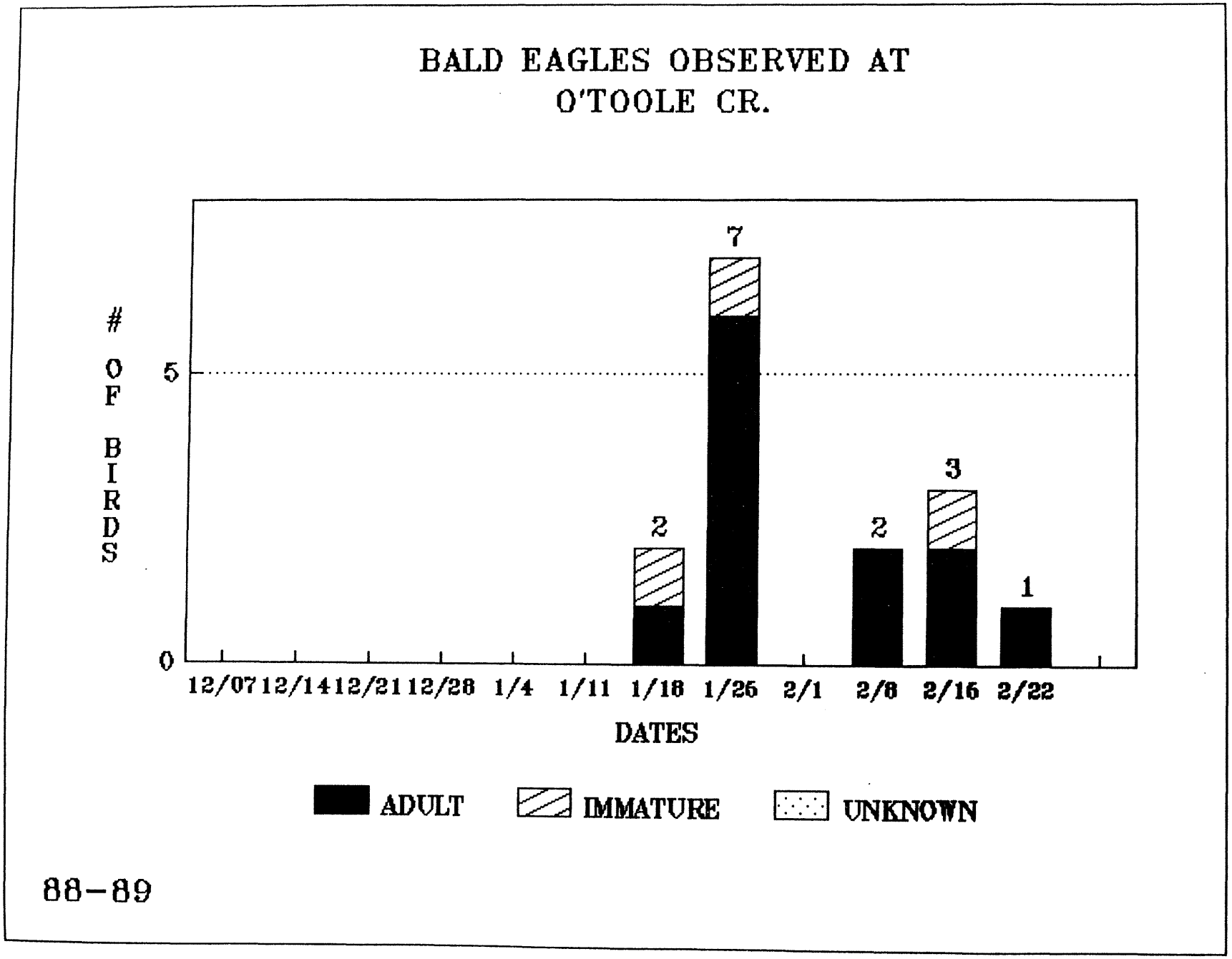

BALD EAGLES OBSERVED AT
O'TOOLE CR.
OF BIRDS
0
5
7
2
2
3
1
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 35

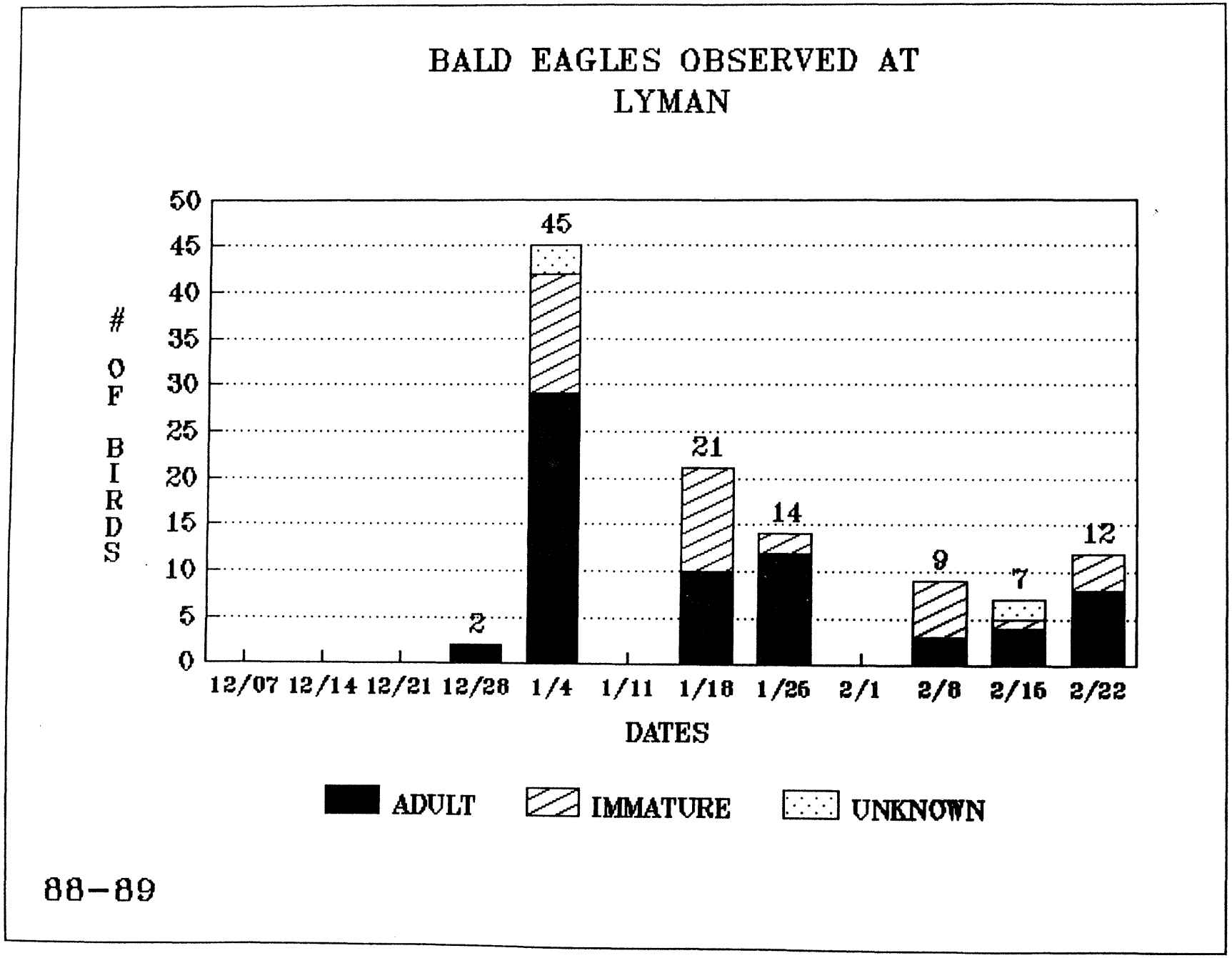
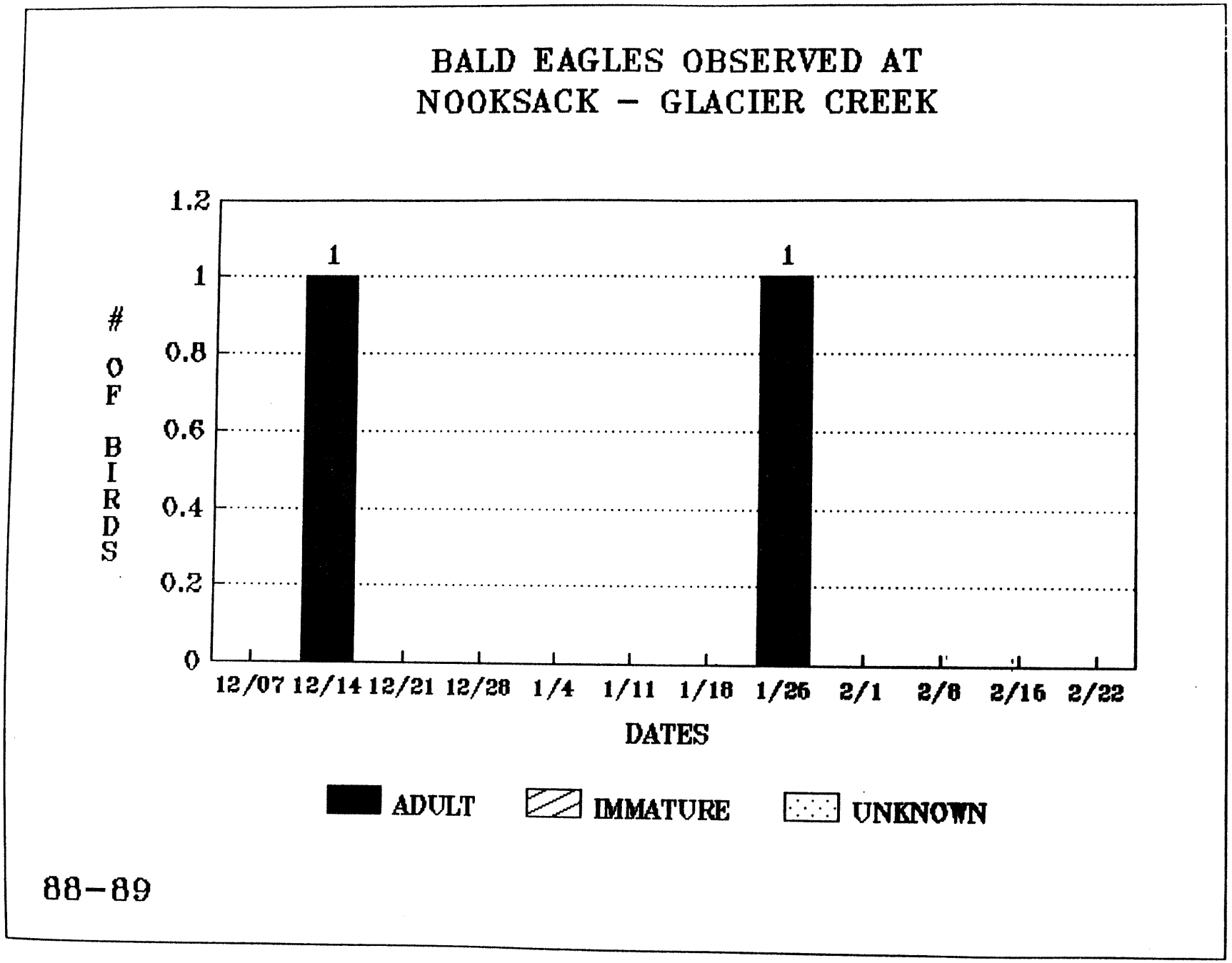

BALD EAGLES OBSERVED AT
LYMAN
OF BIRDS
50
45
40
35
30
25
20
15
10
5
0
45
21
14
12
9
7
2
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 36


BALD EAGLES OBSERVED AT
NOOKSACK – GLACIER CREEK
OF BIRDS
1.2
1
0.8
0.6
0.4
0.2
0
1
1
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

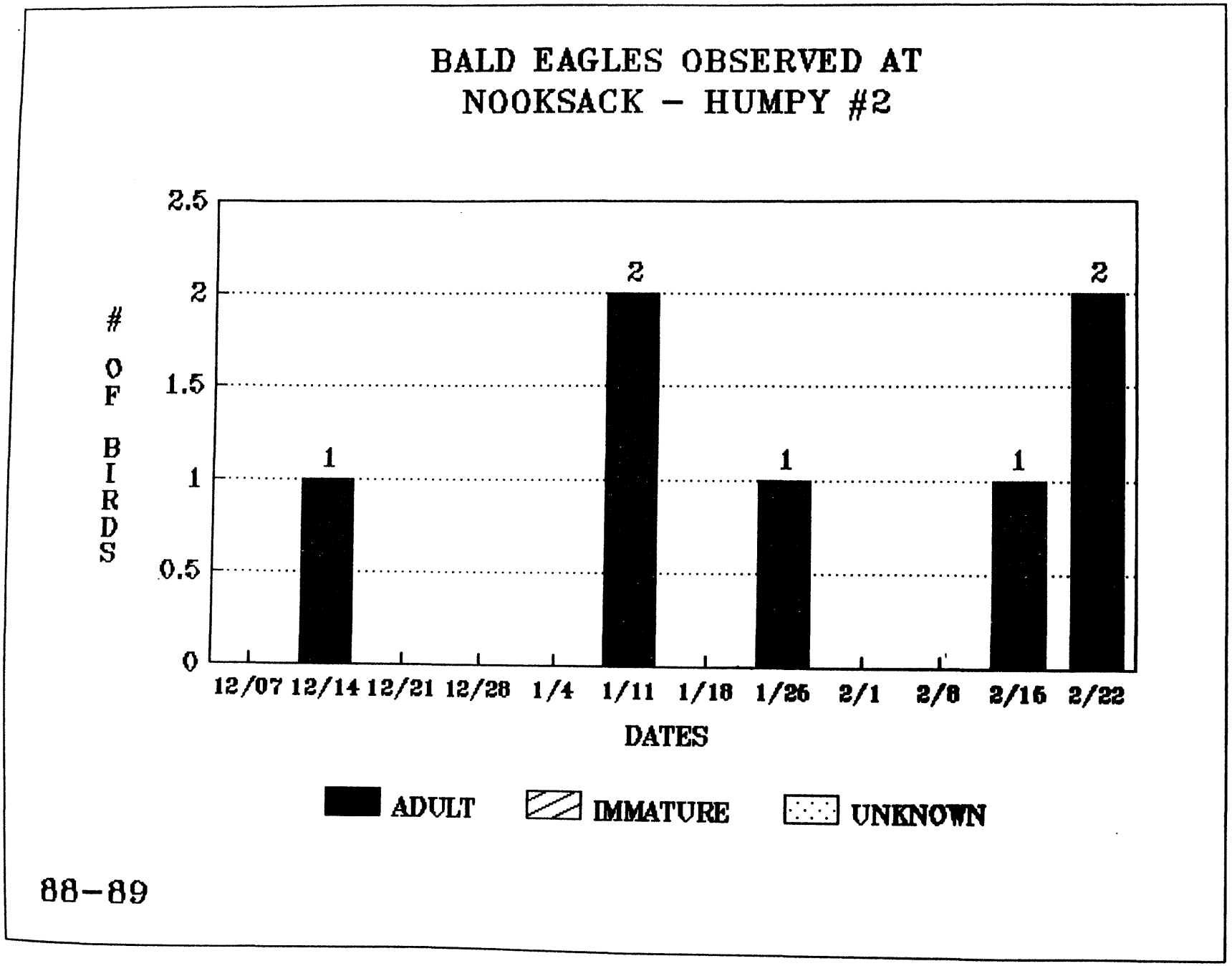

BALD EAGLES OBSERVED AT
NOOKSACK - HUMPY #2
OF BIRDS
2.5
2
1.5
1
0.5
0
1
2
1
1
2
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 38

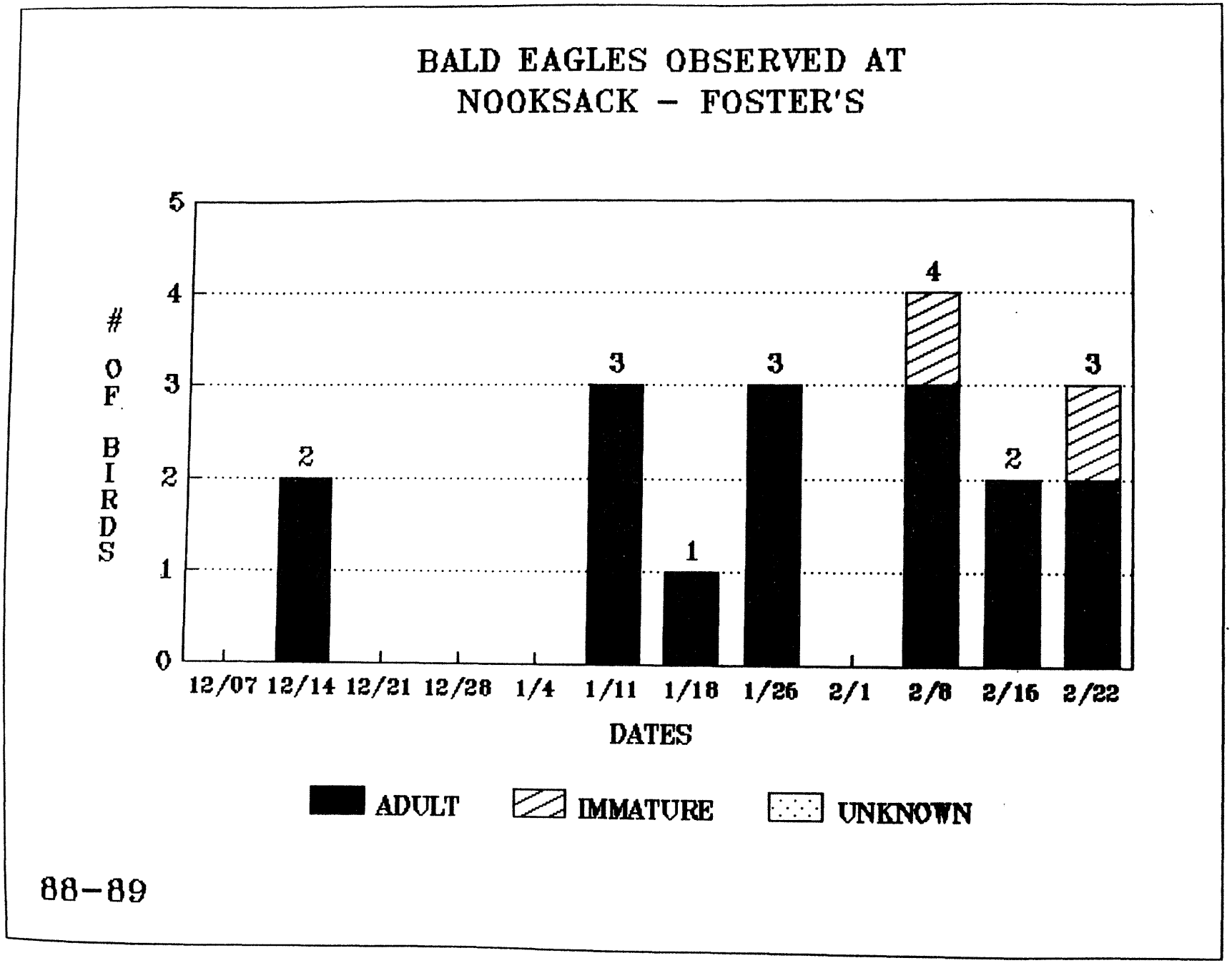
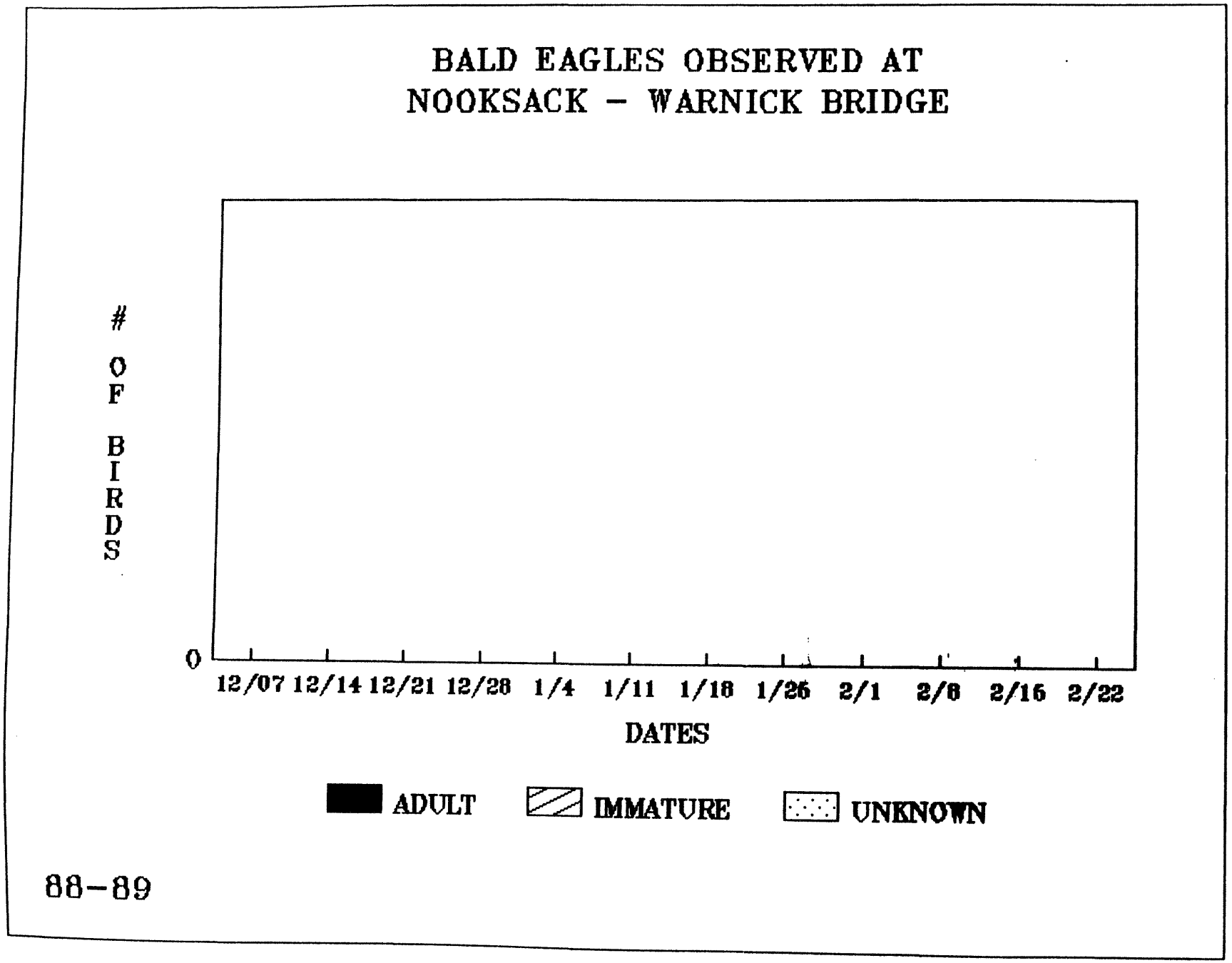

BALD EAGLES OBSERVED AT
NOOKSACK - FOSTER'S
OF BIRDS
0
1
2
3
4
5
2
3
1
3
4
2
3
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

Figure 39


BALD EAGLES OBSERVED AT
NOOKSACK - WARNICK BRIDGE
OF BIRDS
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
ADULT
IMMATURE
UNKNOWN
88-89

11/4/88

SAMPLE

COMMUNAL NIGHT ROOST OBSERVATION FORM
Mt. Baker Ranger District

DATE 12 / 10

LOCATION	SAUK MTN.						PAGE 1 OF 2	
OBSERVERS	A. PERSON							
ON SITE START TIME	3:00 P.M.			ON SITE LEAVE TIME	6:00 P.M	# OF VEHICLE	040 3205	TOTAL MILES
TIME	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30
TEMP(F)	50°	45°	40°	39°	38°	36°	28°	
WIND SPEED(MPH)	0-5 →	→	→	→	5-7 →	→	CALM	
DIRECTION WIND FROM	N →	→	→	NW →	→	→	→	
CLOUD COVER	51-75 →	→	→	→	76-100 →	→	→	
PRECIP.	SC	F, D →	→	→	DF, R →	→	→	
VISIBILITY	G	F →	→	→	P →	→	N	

TIME	ADULT	IMM.	UNK.	COMMENTS(direction, location, activity
3:00	5 (1-5A)	3 (1-3I)		ALL BIRDS FEEDING ON GRAVEL BAR
3:12	+ 1 (6A)			1 ADULT CROSSES RIVER E→W, DISSAPEARS BEHIND HILL.
4:00			1 (1U)	UNKNOWN BIRD PASSES N→S TOO FOGGY TO CONFIRM
4:30				(A) 1-4 AND (I) 1-3 LEAVE BAR, CIRCLE APPROX. 5 MIN. THEN LEAVE FOLLOWING (A) 6

VISIBILITY: G=GOOD, F=FAIR, P=POOR, N=NONE. PRECIPITATION: SC=SUNNY & CLEAR, F=FOG, DF=DENSE FOG, D=DRIZZLE
Y RAIN, S=SNOW. NOTE: multiple codes may be necessary CLOUD COVER: 0-25%, 26-50%, 51-75%, 76-100%.

INSTRUCTIONS TO FILL OUT FORM
1986-87

OBSERVATION LOCATION: Describe your observation point location and show this location on your aerial photo copy.

TIME: Fill out the time you arrive and the time you complete your observations. Please use **NON-MILITARY** TIME, eg. 4:30.

TEMPERATURE: Take the temperature in **Fahrenheit** degrees when you first arrive and then every 1/2 hour after that. Take the temperature again at dusk.

WIND SPEED: Estimate in increments of 5 mph.

WIND DIRECTION: Circle the direction the wind is coming **from.**

CLOUD COVER: Circle the percent cloud cover overhead in 25% increments.

VISIBILITY: Circle the appropriate visibility.

PRECIPITATION: Circle the appropriate condition.

COMMENTS: Note any changes in weather conditions or visibility. Note the flight behavior of the eagles, flight height and interactions with other eagles. Note other birds flying in similar directions, especially crows, ravens, or other special wildlife species. Note staging areas and human disturbances to flying or perched eagles.

EXAMPLE:

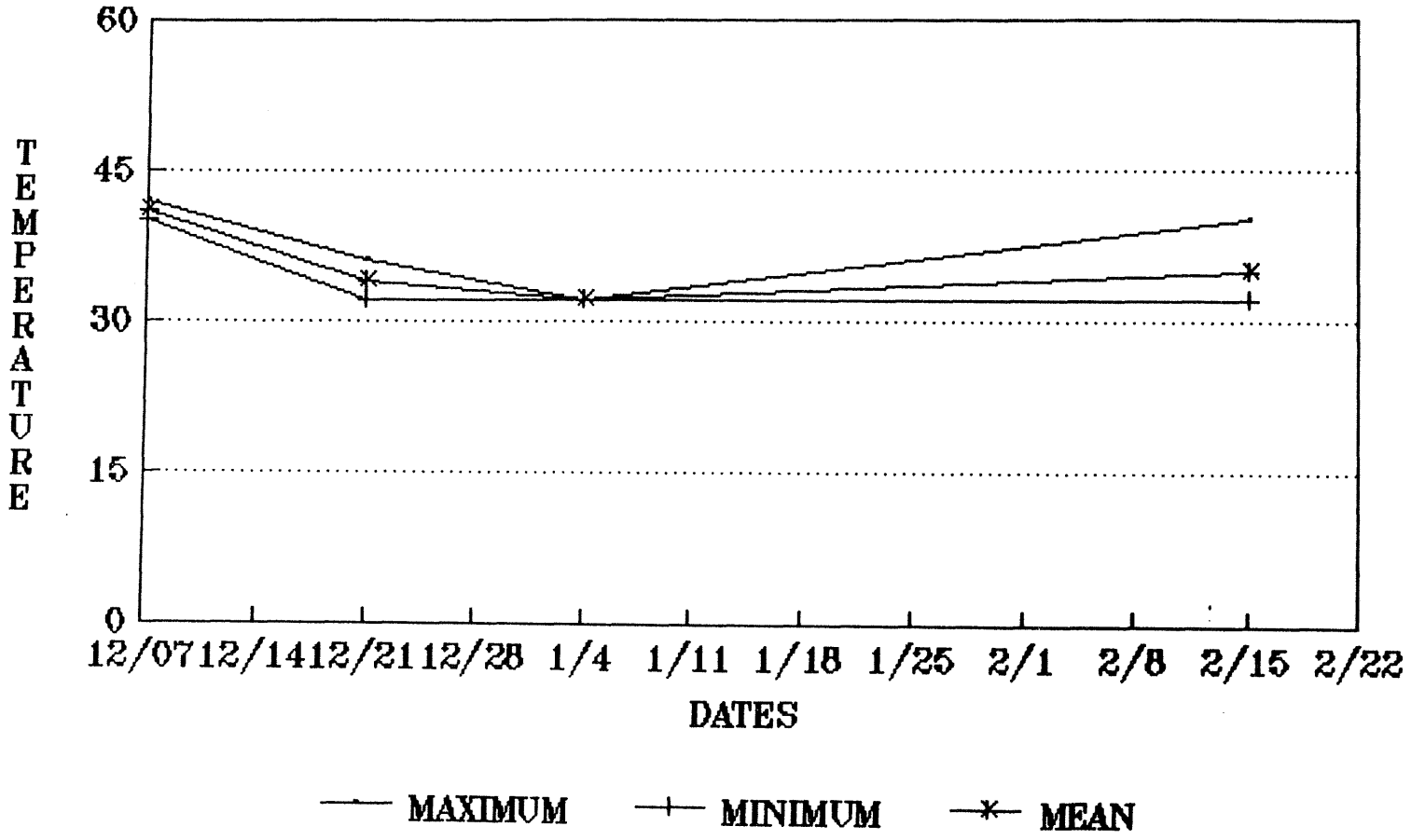
2 A, 3:40 = Two adults at 3:40 p.m.

1I, 4:10 = One immature at 4:10 p.m.

On your aerial photo (copy) map, please draw in:

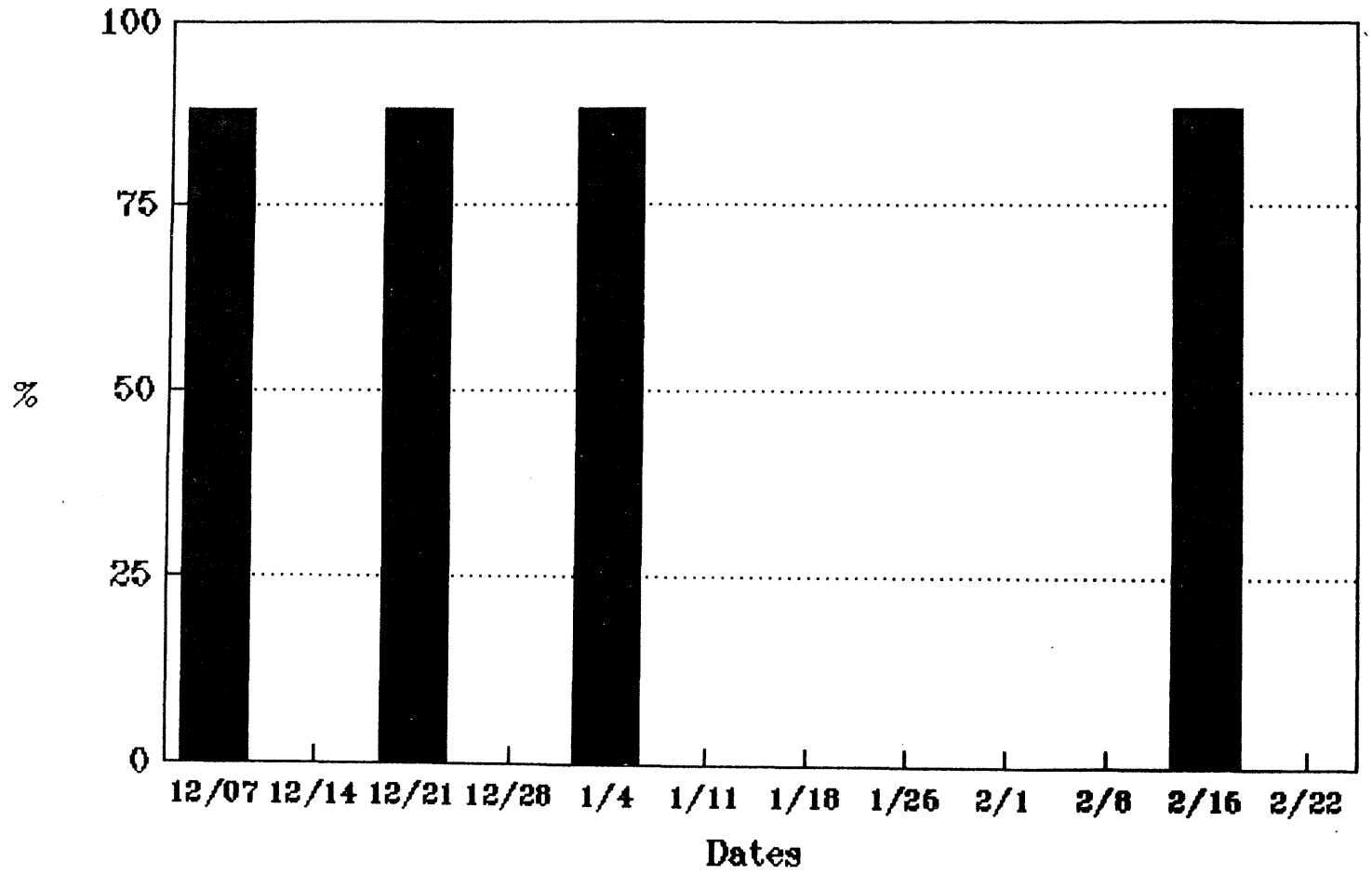
1. Your observation point, eg. o
2. Flight pattern of all eagles, eg. ⟶
3. The number, age, and time of each flight pattern eg. **2A, 3:40.**

MAX, MIN & MEAN NIGHT ROOST TEMP
CASCADE-SPUR RD.



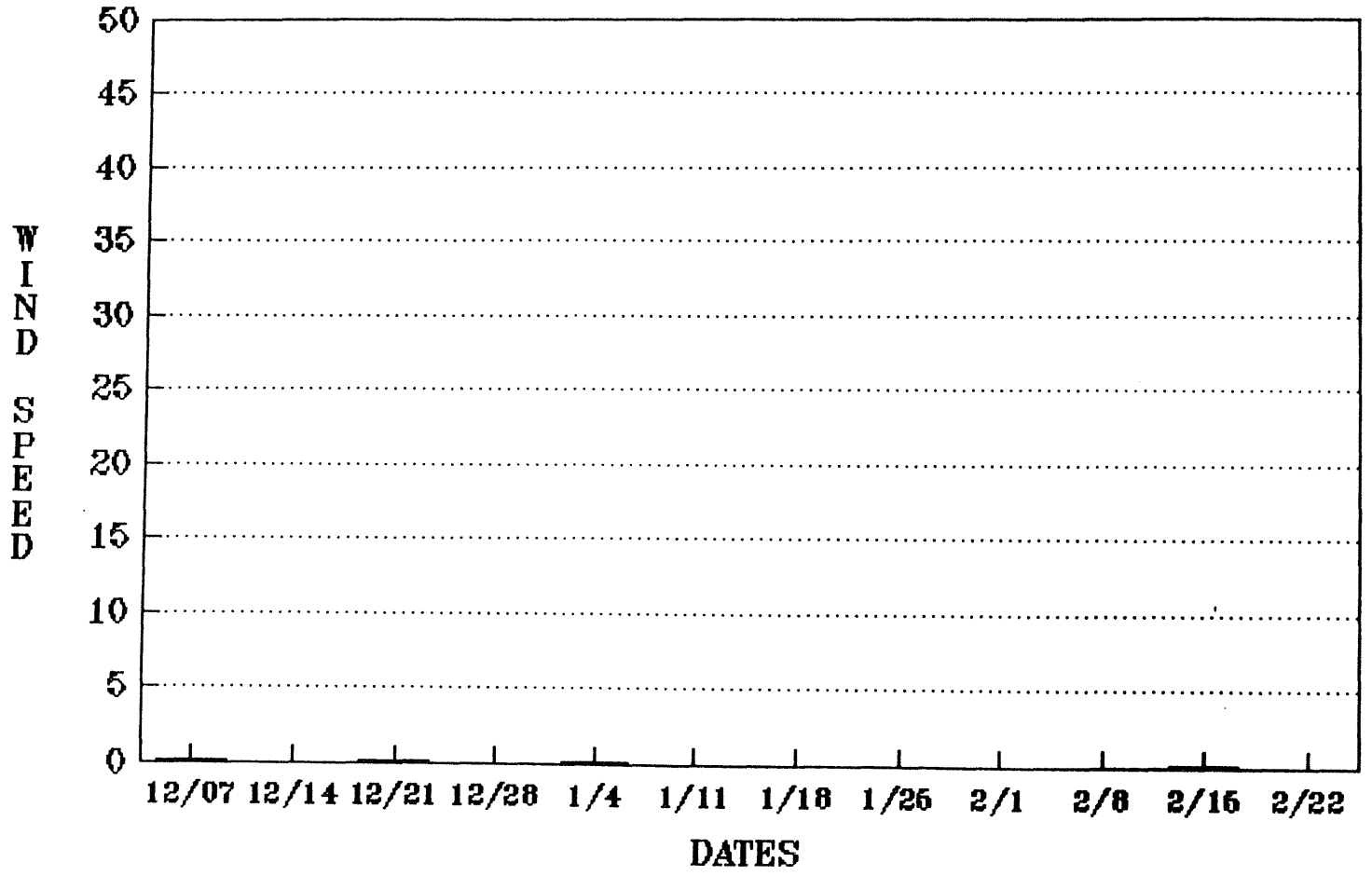
88-89

MAXIMUM CLOUD COVER (%)
CASCADE-SPUR RD.



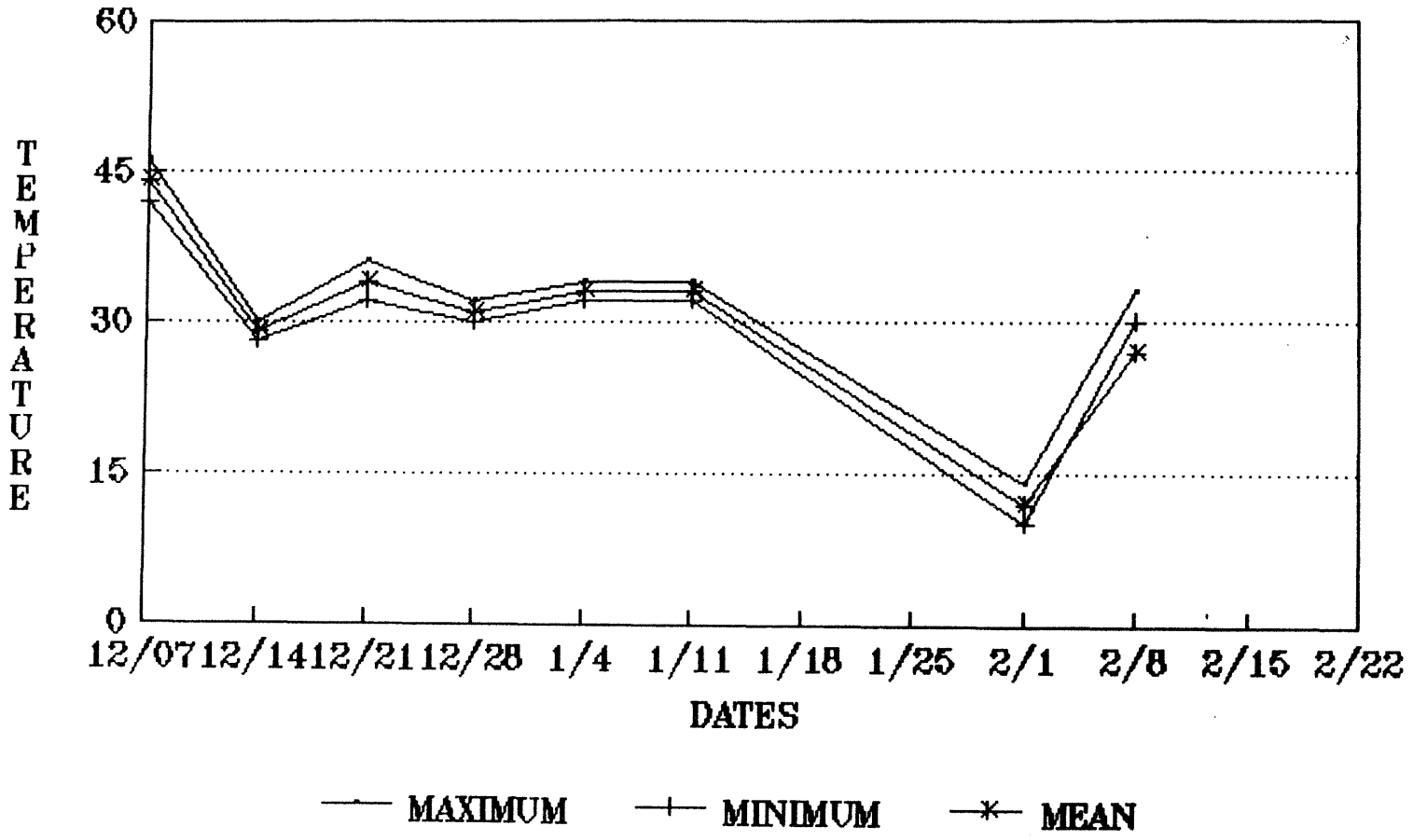
88-89

MAXIMUM WIND SPEED
CASCADE-SPUR RD.

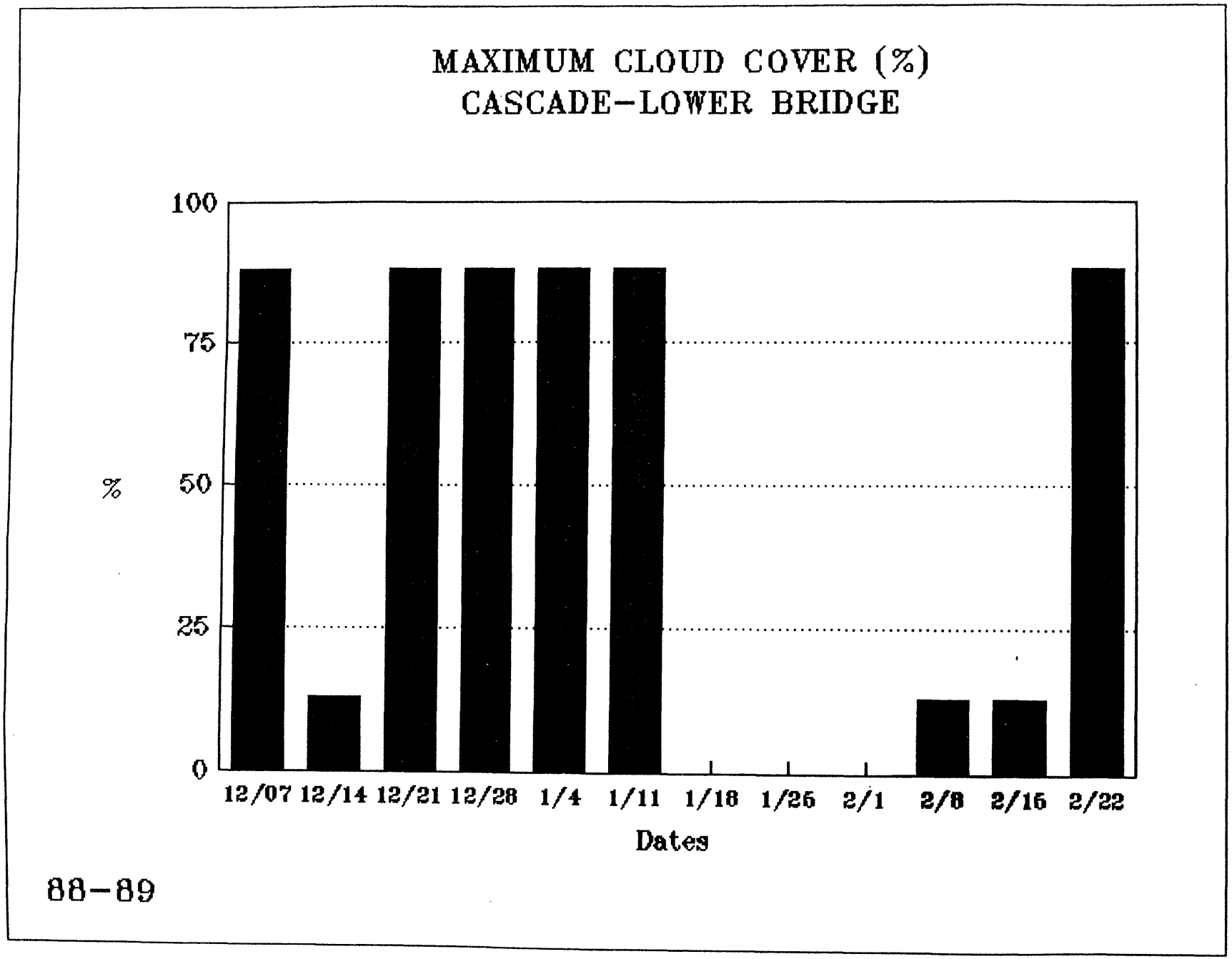


88-89

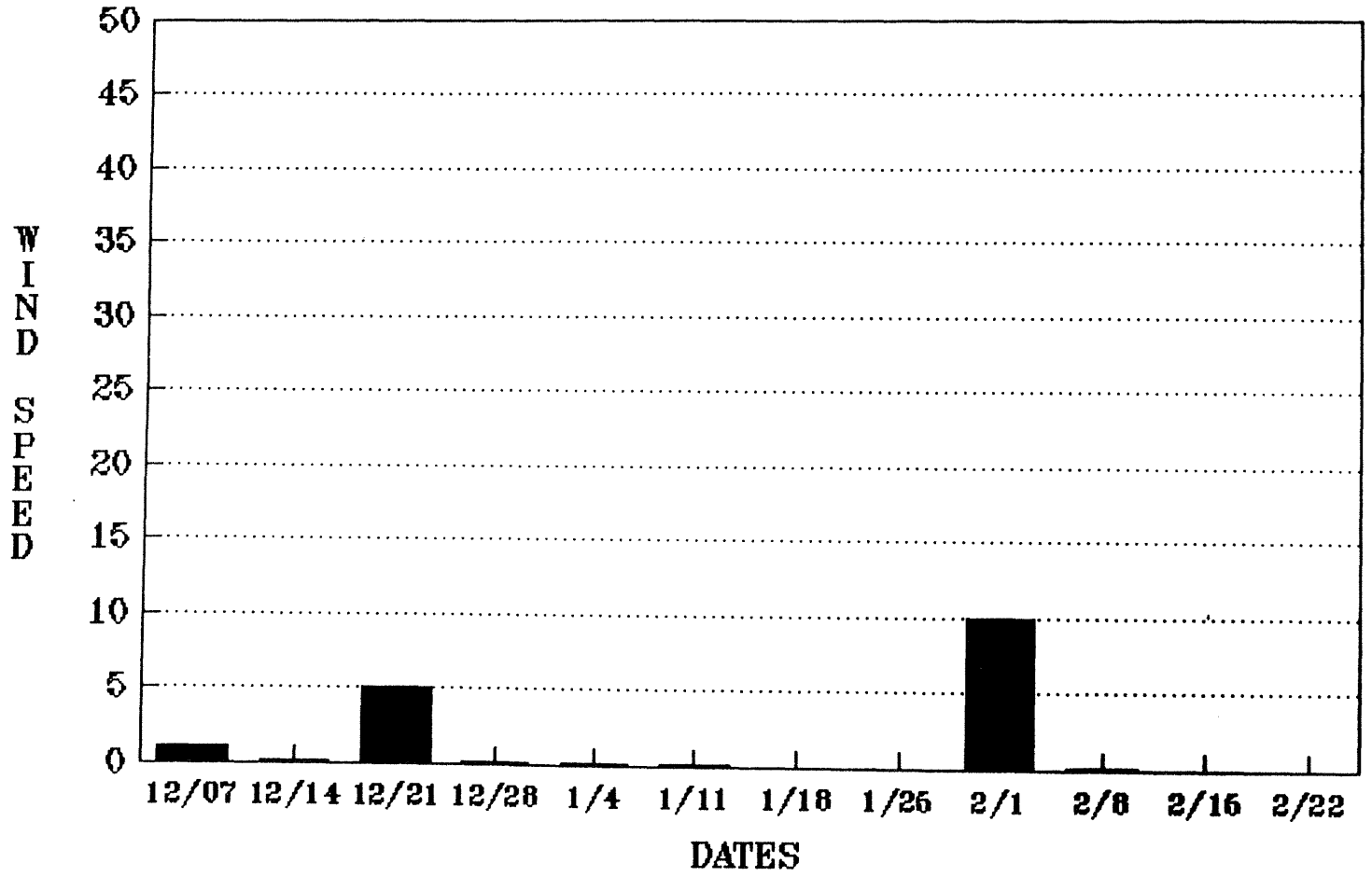
MAX, MIN & MEAN NIGHT ROOST TEMP
CASCADE–LOWER BRIDGE



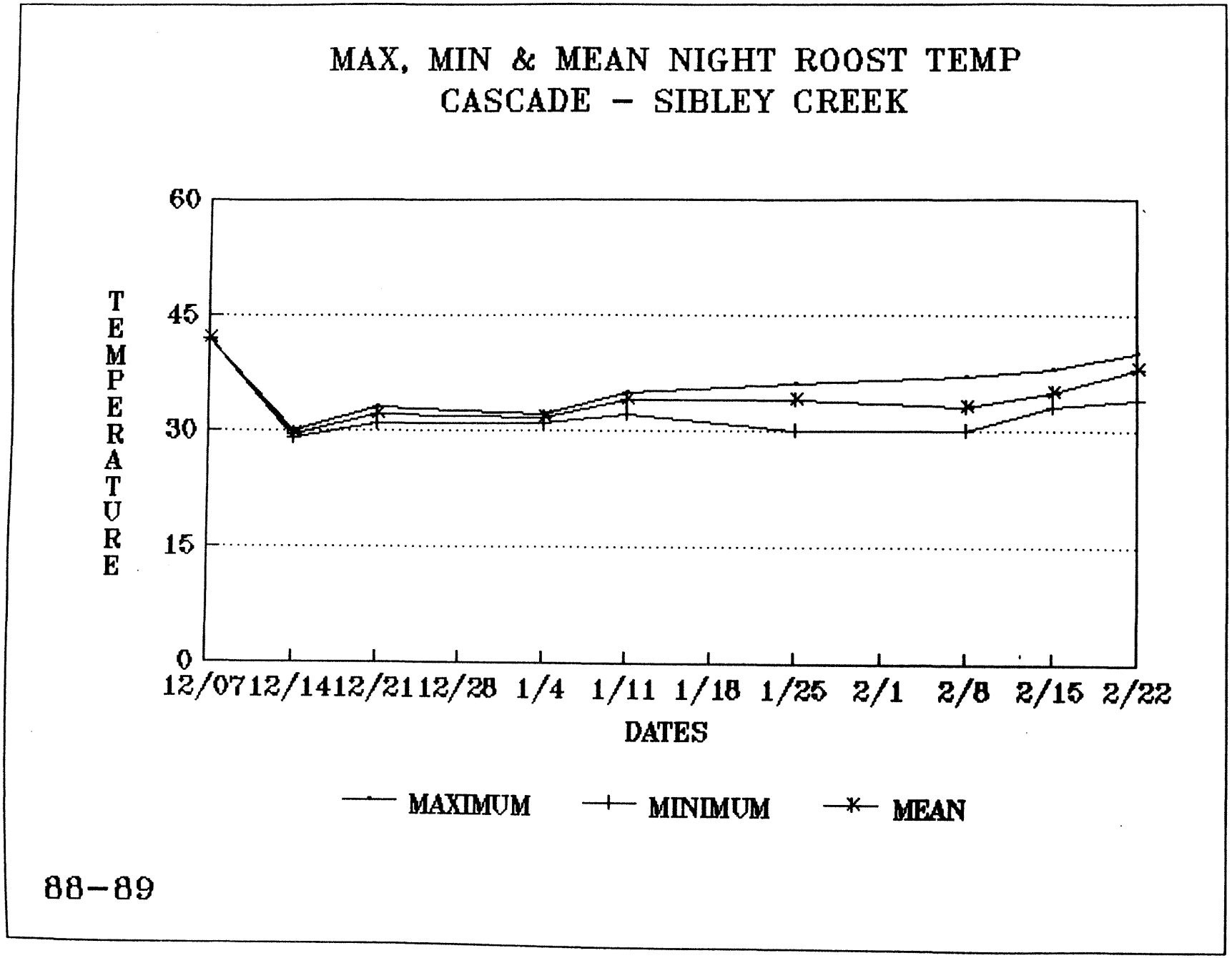
88–89

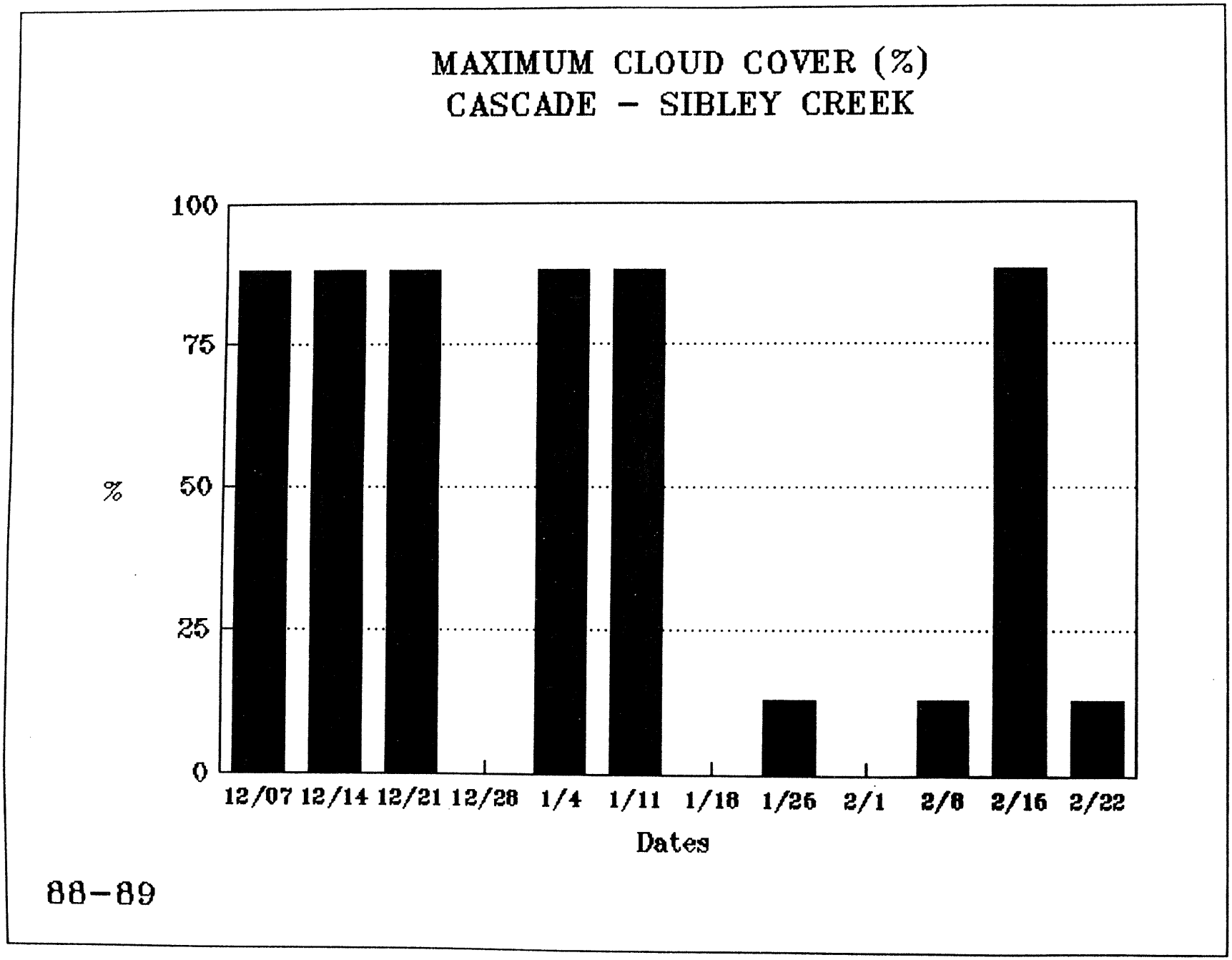

MAXIMUM CLOUD COVER (%)
CASCADE-LOWER BRIDGE
100
75
50
25
0
%
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
Dates
88-89

MAXIMUM WIND SPEED
CASCADE-LOWER BRIDGE

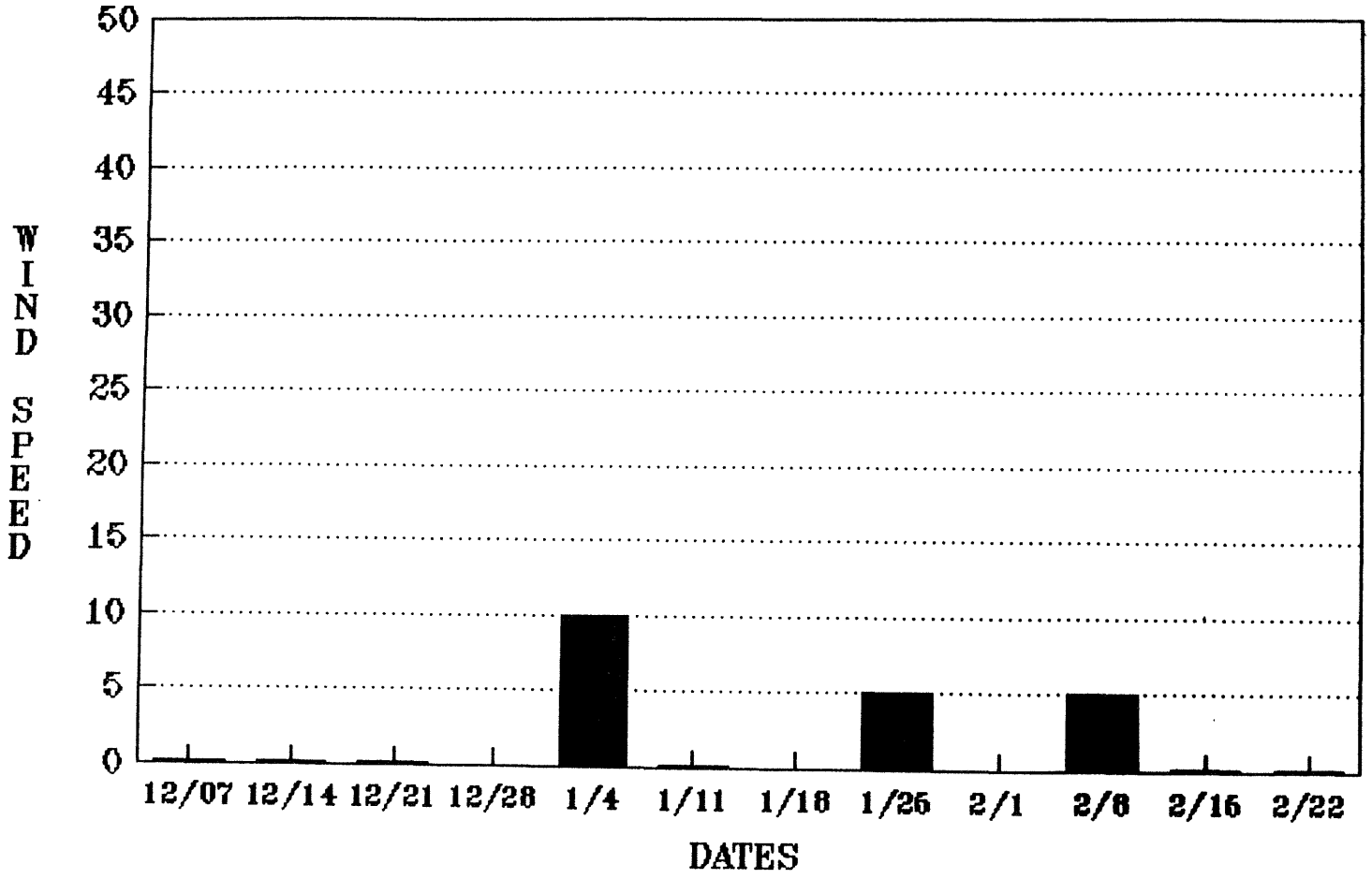


88-89


MAX, MIN & MEAN NIGHT ROOST TEMP
CASCADE – SIBLEY CREEK
TEMPERATURE
60
45
30
15
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
MAXIMUM
MINIMUM
MEAN
88-89

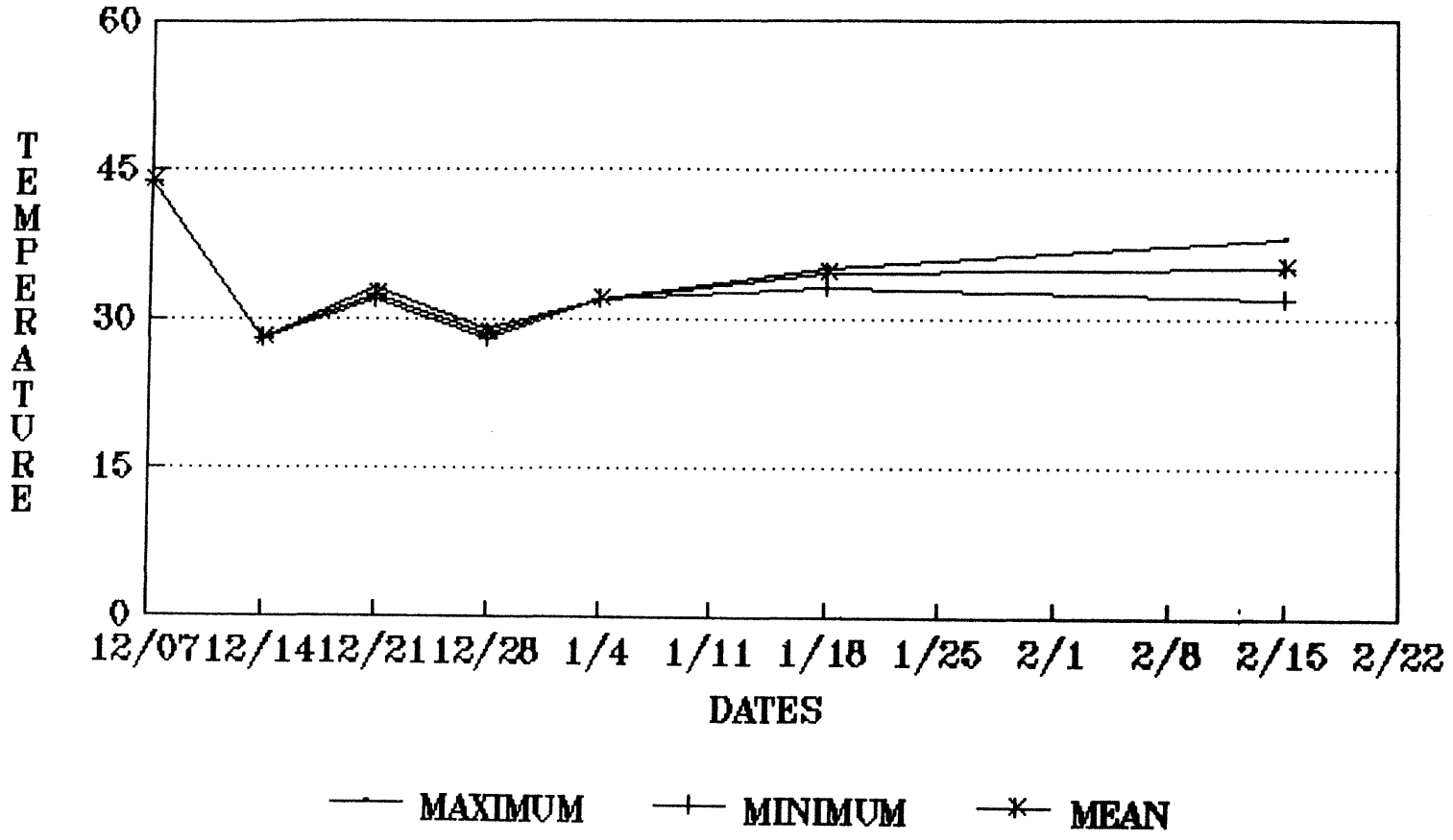

MAXIMUM CLOUD COVER (%)
CASCADE - SIBLEY CREEK
100
75
50
25
0
%
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
Dates
88-89

MAXIMUM WIND SPEED
CASCADE – SIBLEY CREEK

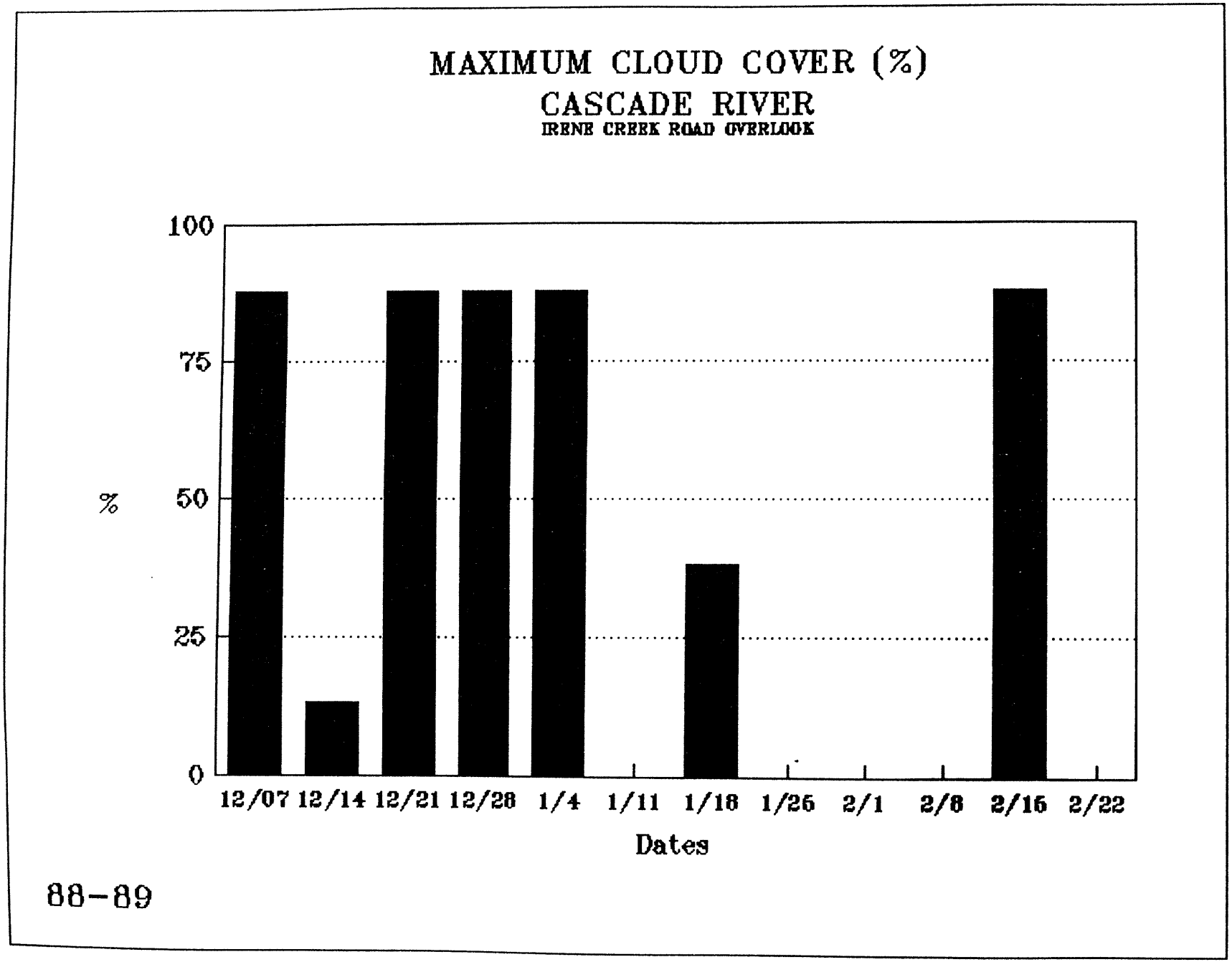


88-89

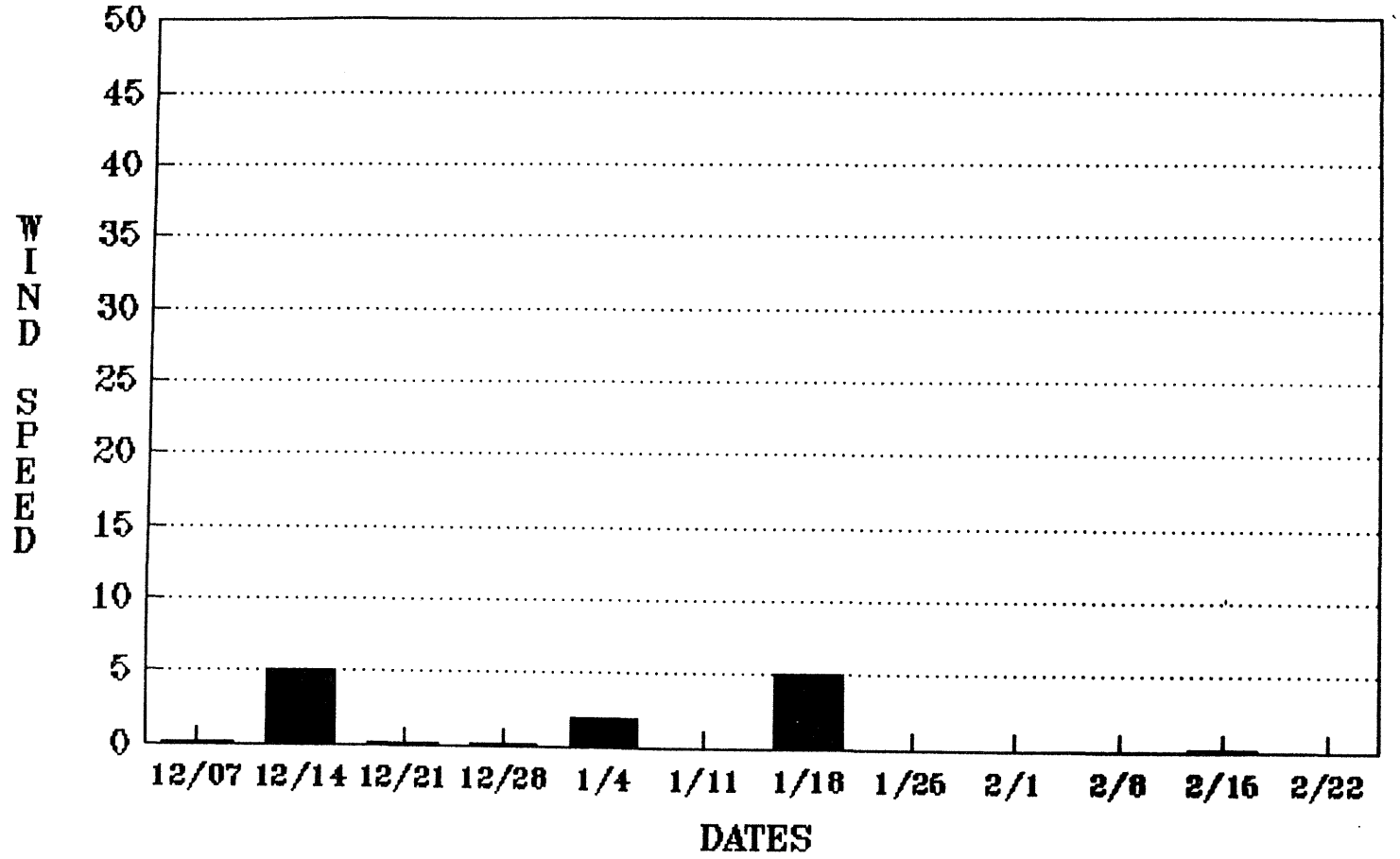
MAX, MIN & MEAN NIGHT ROOST TEMP
CASCADE RIVER
IRENE CREEK ROAD OVERLOOK



88-89

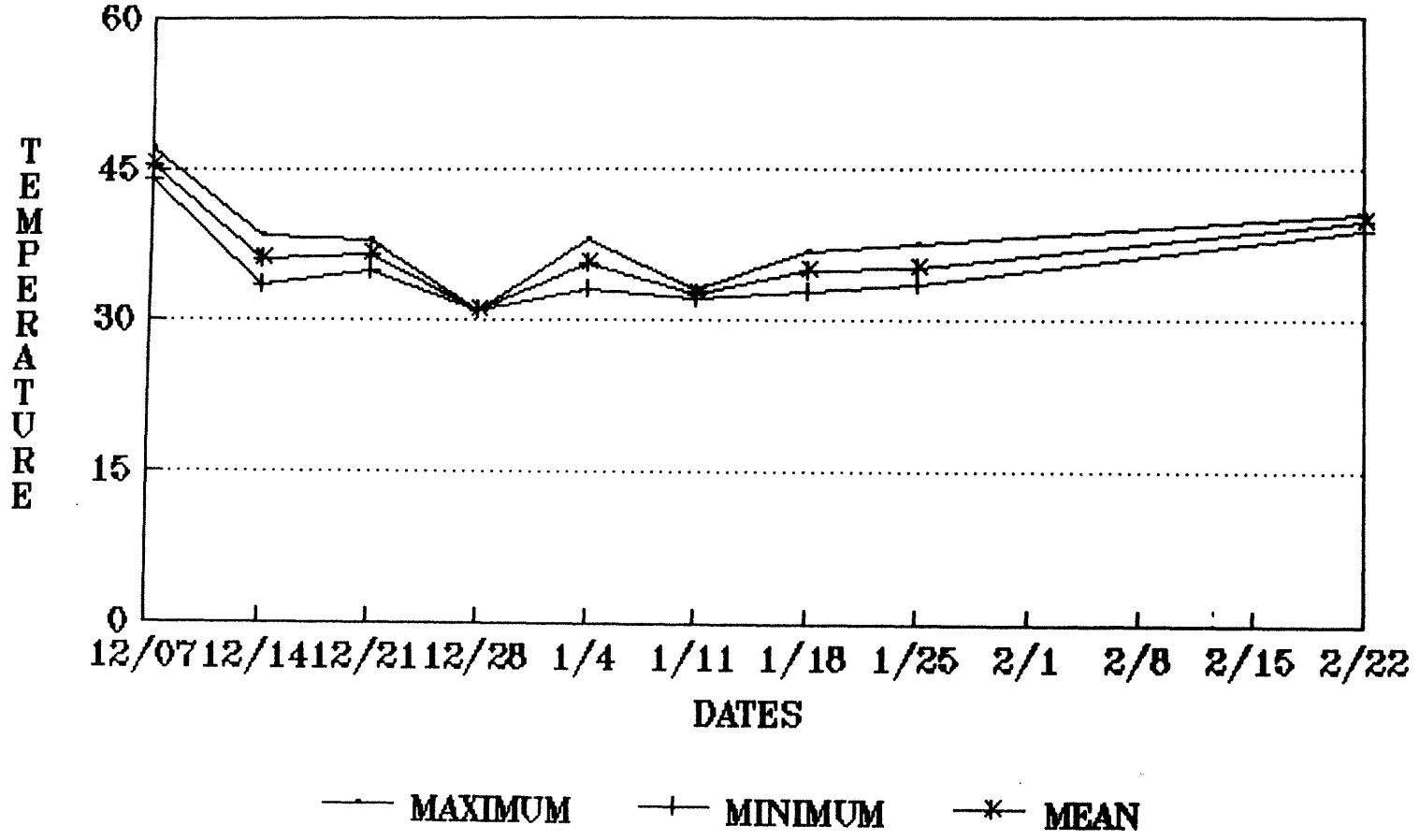

MAXIMUM CLOUD COVER (%)
CASCADE RIVER
IRENE CREEK ROAD OVERLOOK
100
75
50
25
0
%
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
Dates
88-89

MAXIMUM WIND SPEED
CASCADE RIVER
IRENE CREEK ROAD OVERLOOK

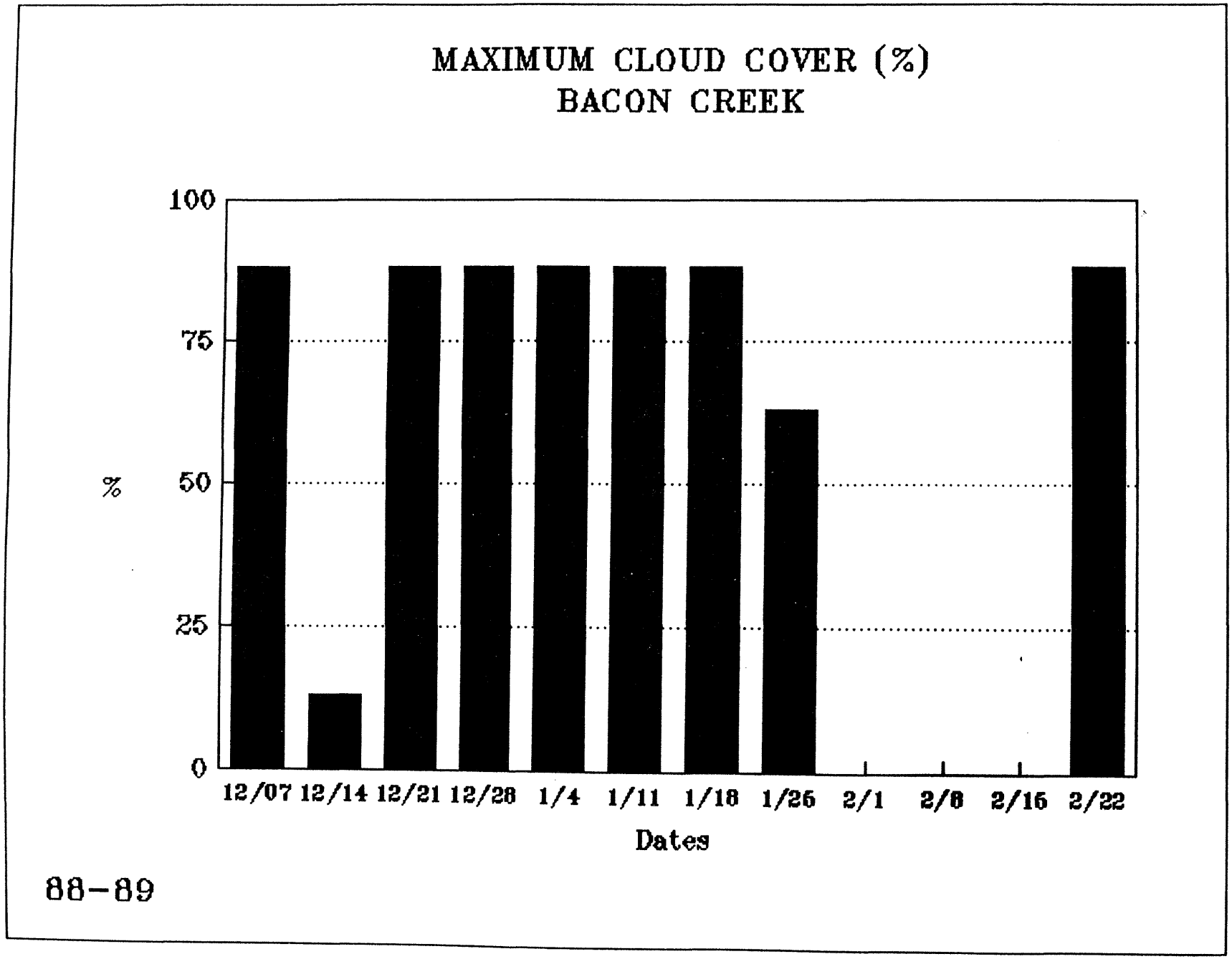


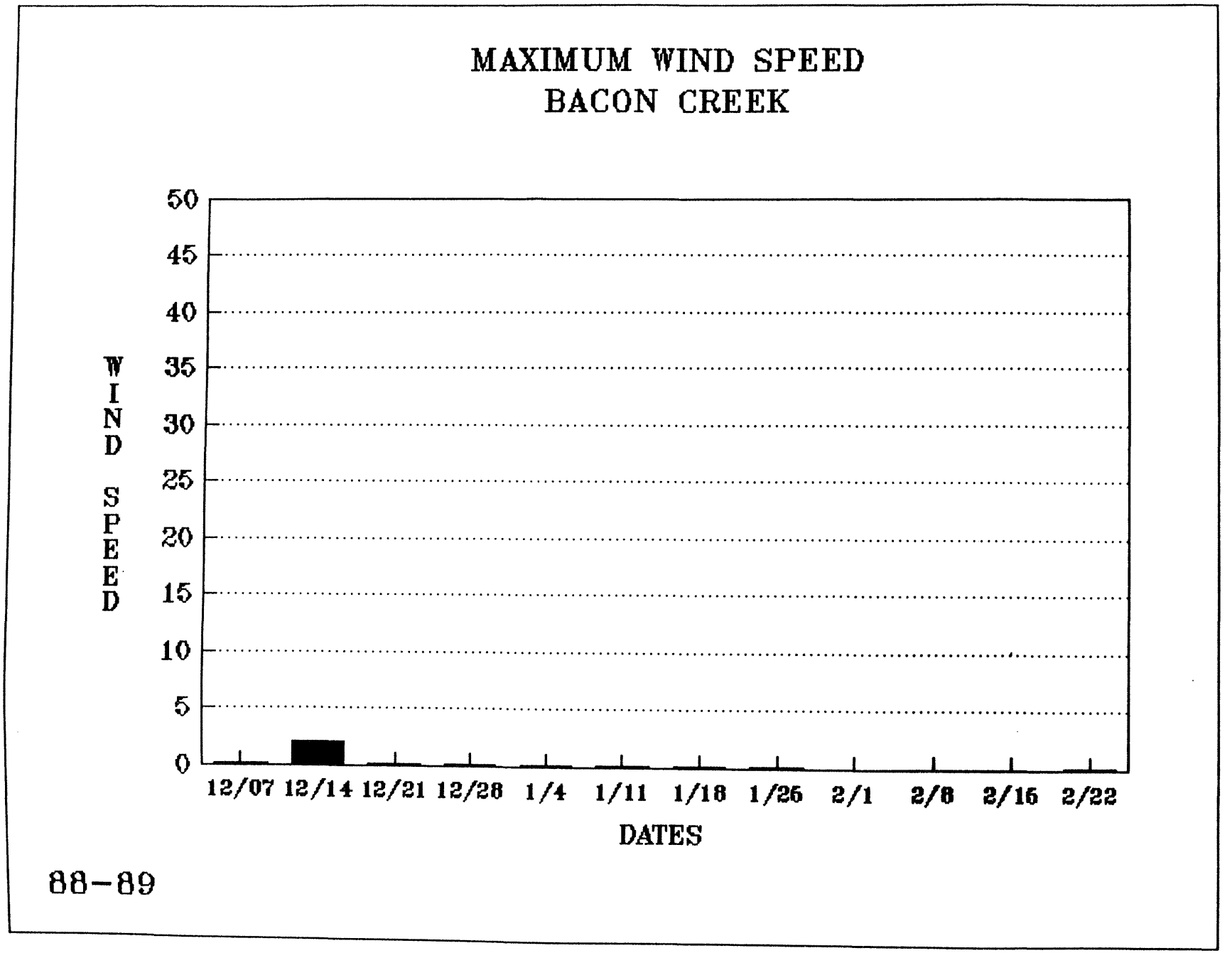
88-89

MAX, MIN & MEAN NIGHT ROOST TEMP
BACON CREEK

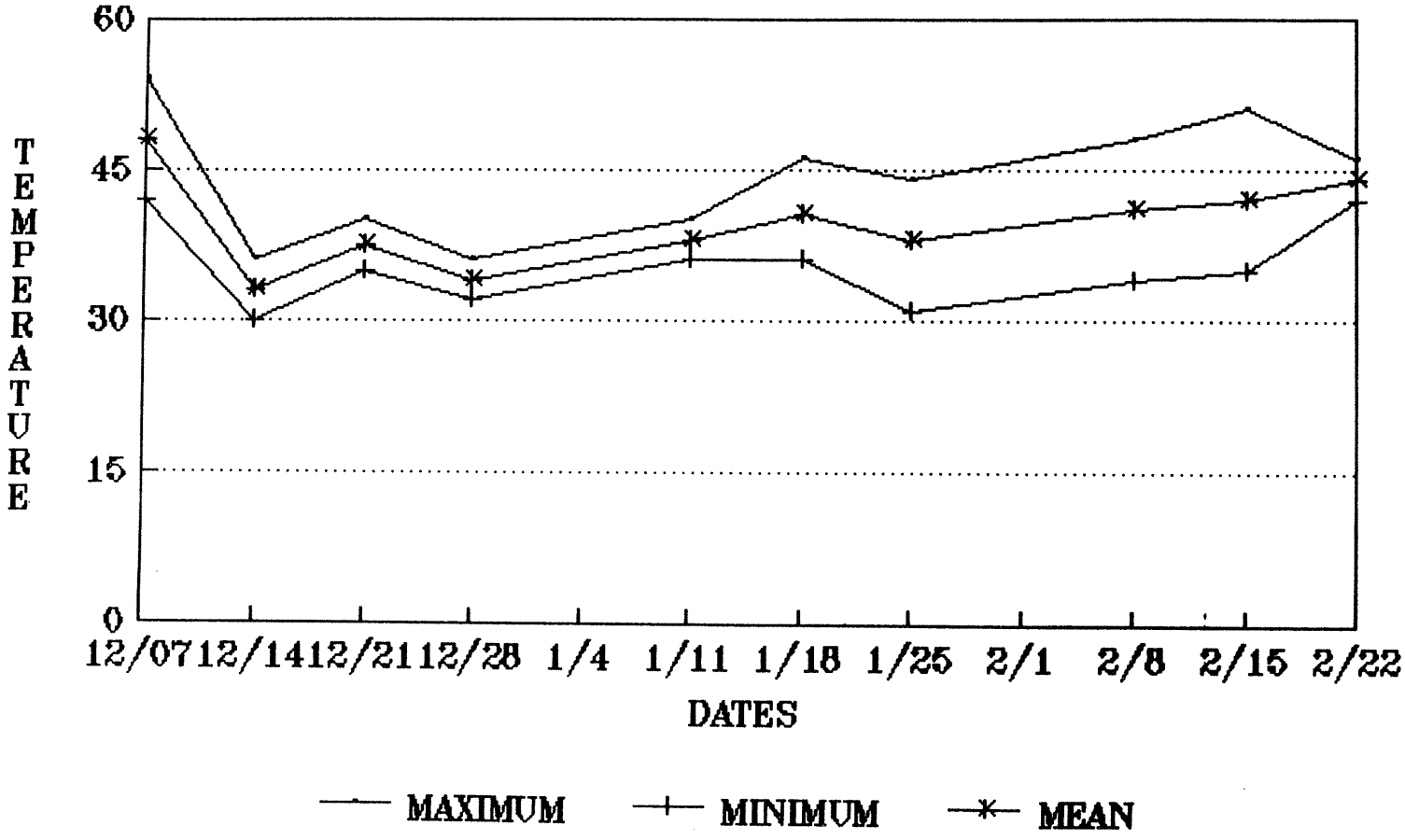


88-89

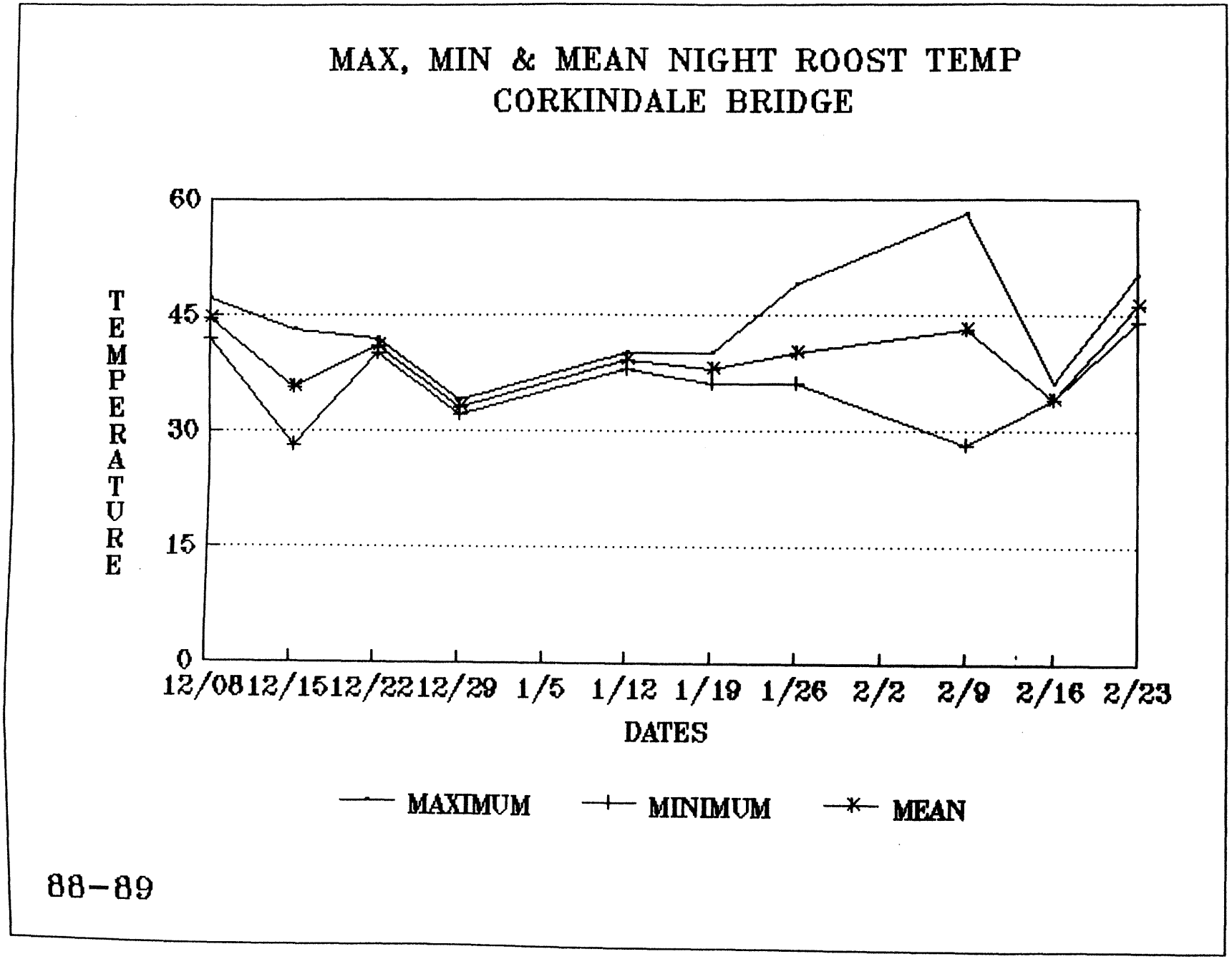

MAXIMUM CLOUD COVER (%)
BACON CREEK
100
75
50
25
0
%
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
Dates
88-89

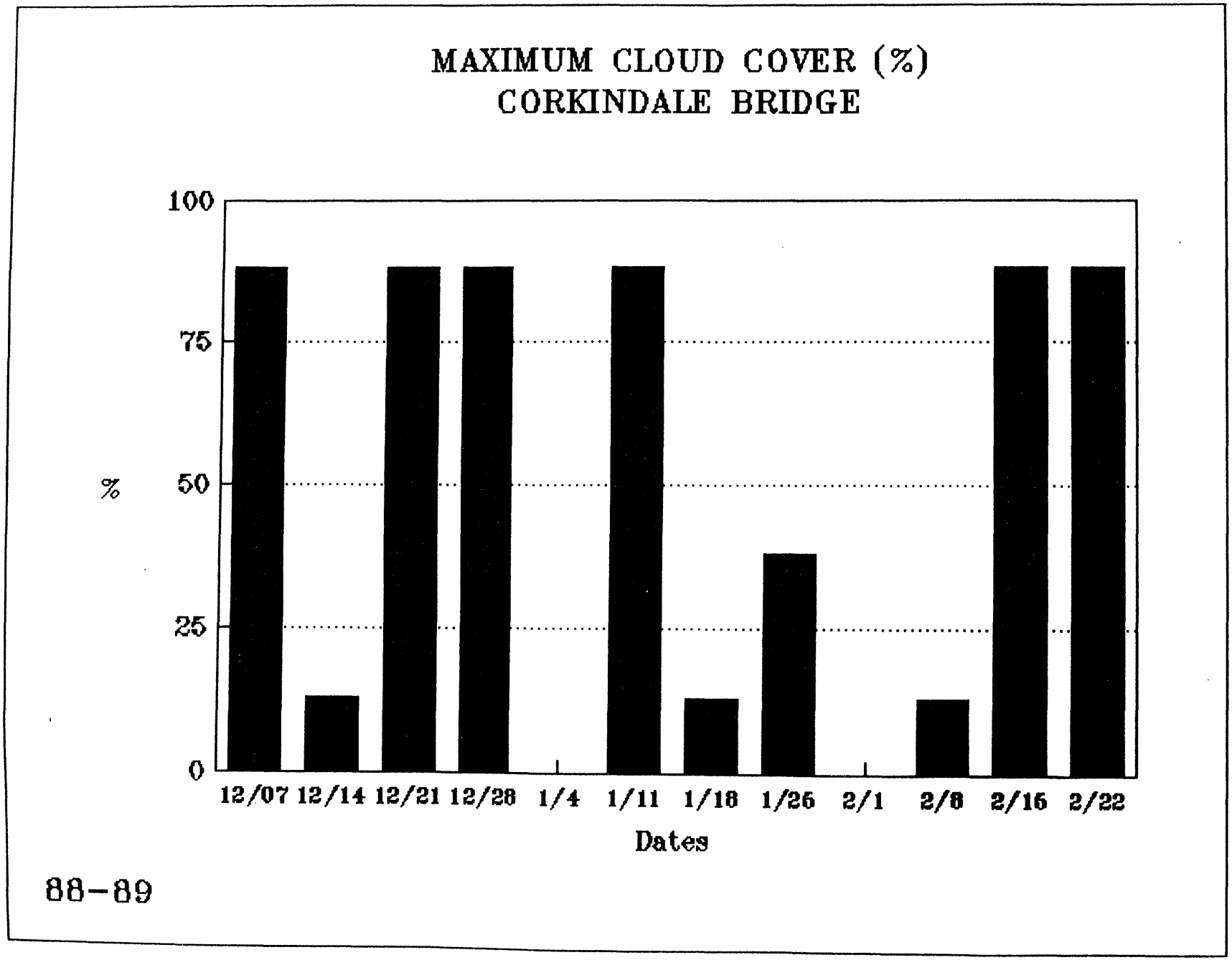

MAXIMUM WIND SPEED
BACON CREEK
WIND SPEED
50
45
40
35
30
25
20
15
10
5
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
88-89

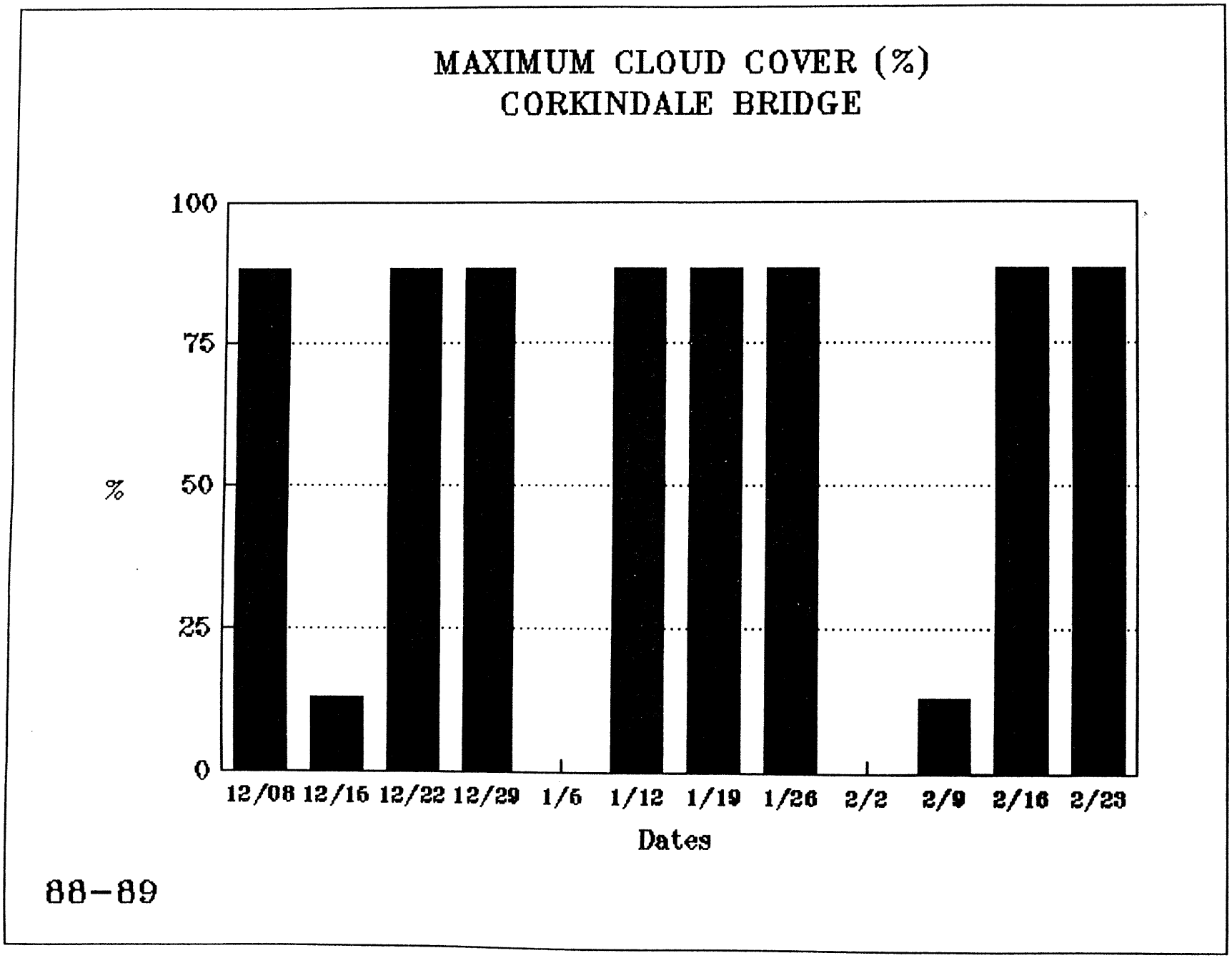
MAX, MIN & MEAN NIGHT ROOST TEMP
CORKINDALE BRIDGE

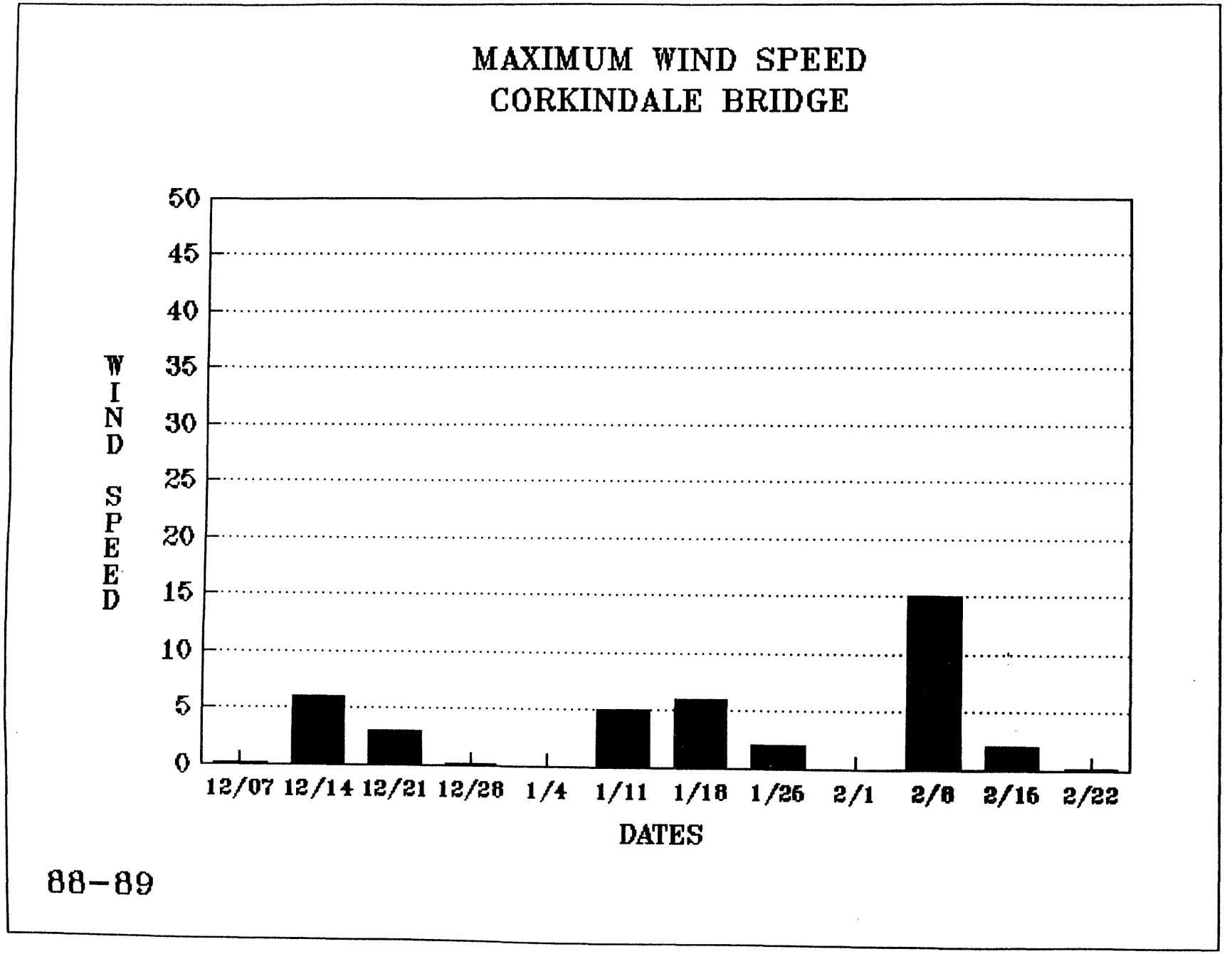


88-89

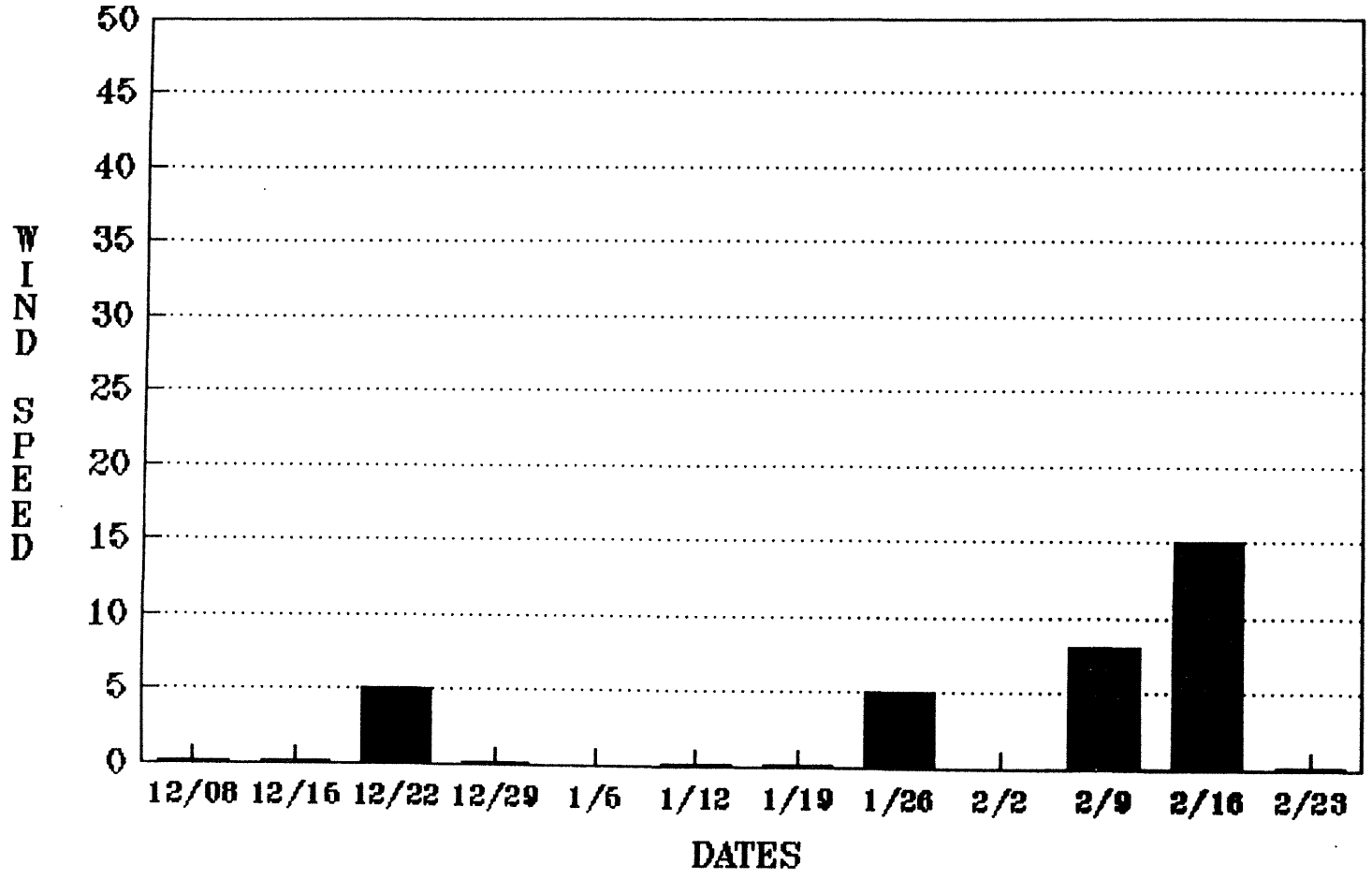

MAX, MIN & MEAN NIGHT ROOST TEMP
CORKINDALE BRIDGE
TEMPERATURE
60
45
30
15
0
12/08 12/15 12/22 12/29 1/5 1/12 1/19 1/26 2/2 2/9 2/16 2/23
DATES
MAXIMUM
MINIMUM
MEAN
88-89


MAXIMUM CLOUD COVER (%)
CORKINDALE BRIDGE
100
75
50
25
0
%
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
Dates
88-89


MAXIMUM CLOUD COVER (%)
CORKINDALE BRIDGE
100
75
50
25
0
%
12/08 12/15 12/22 12/29 1/5 1/12 1/19 1/26 2/2 2/9 2/16 2/23
Dates
88-89


MAXIMUM WIND SPEED
CORKINDALE BRIDGE
WIND SPEED
50
45
40
35
30
25
20
15
10
5
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
88-89

MAXIMUM WIND SPEED
CORKINDALE BRIDGE



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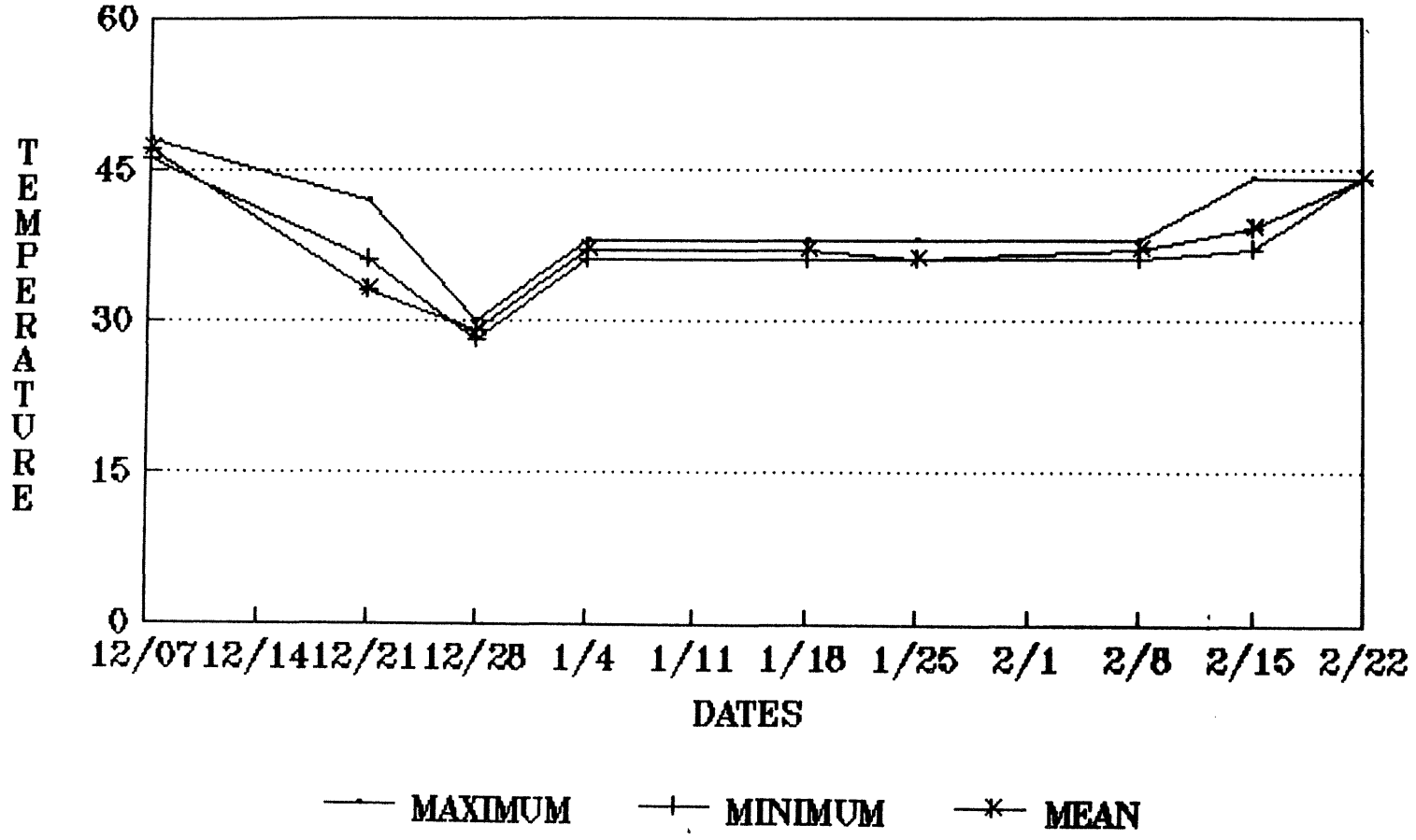
MAX, MIN & MEAN NIGHT ROOST TEMP
CORKINDALE ROOST



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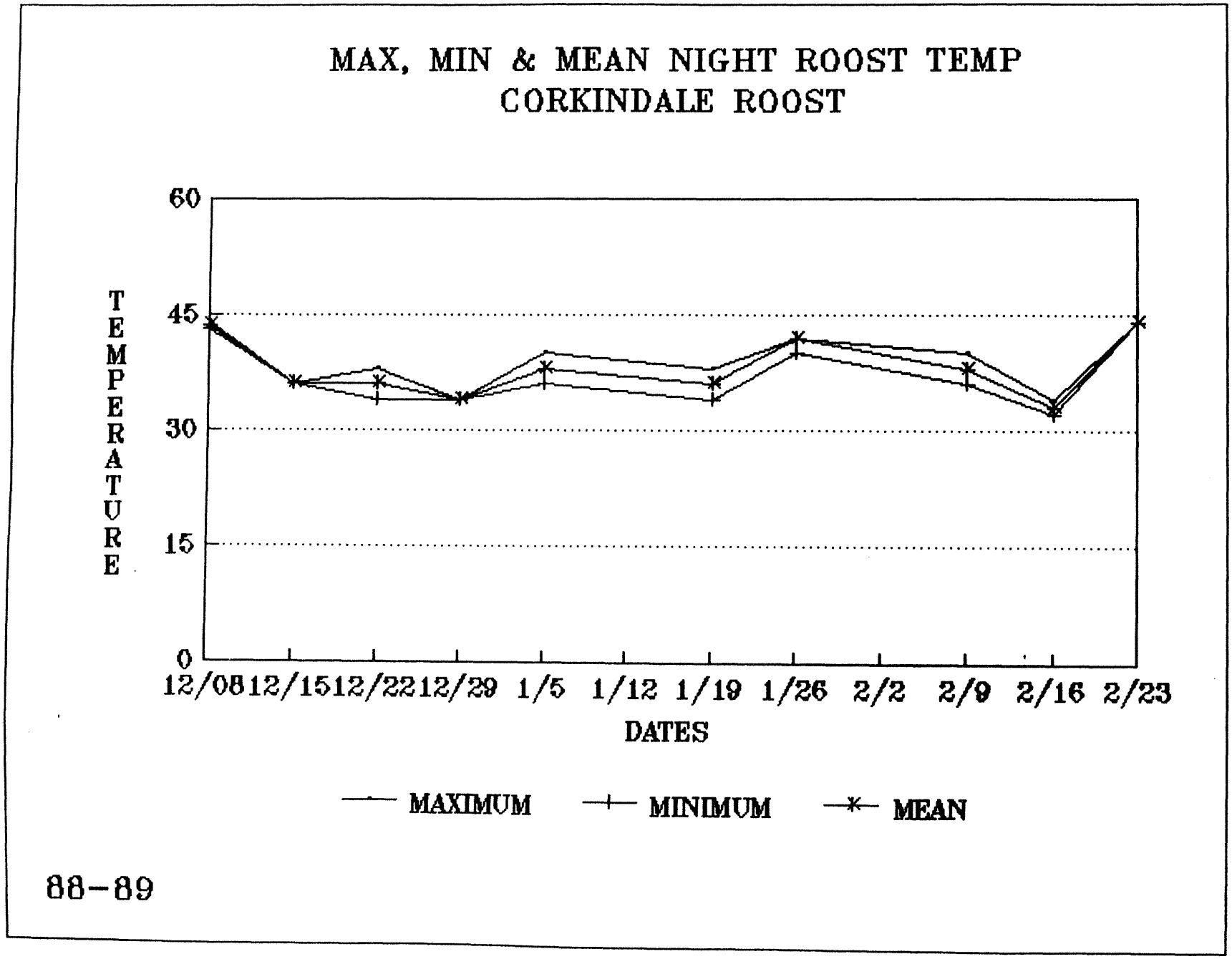
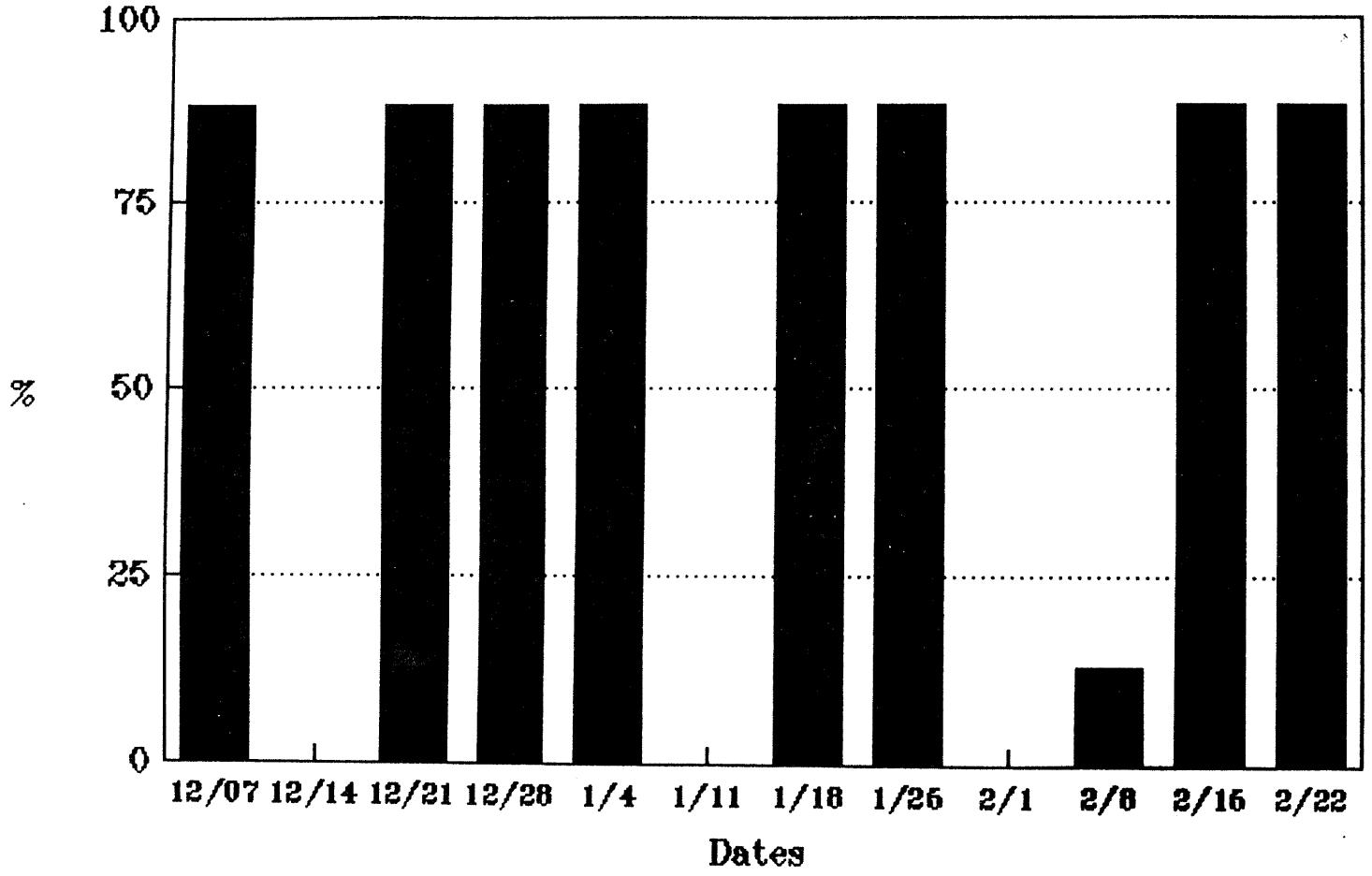
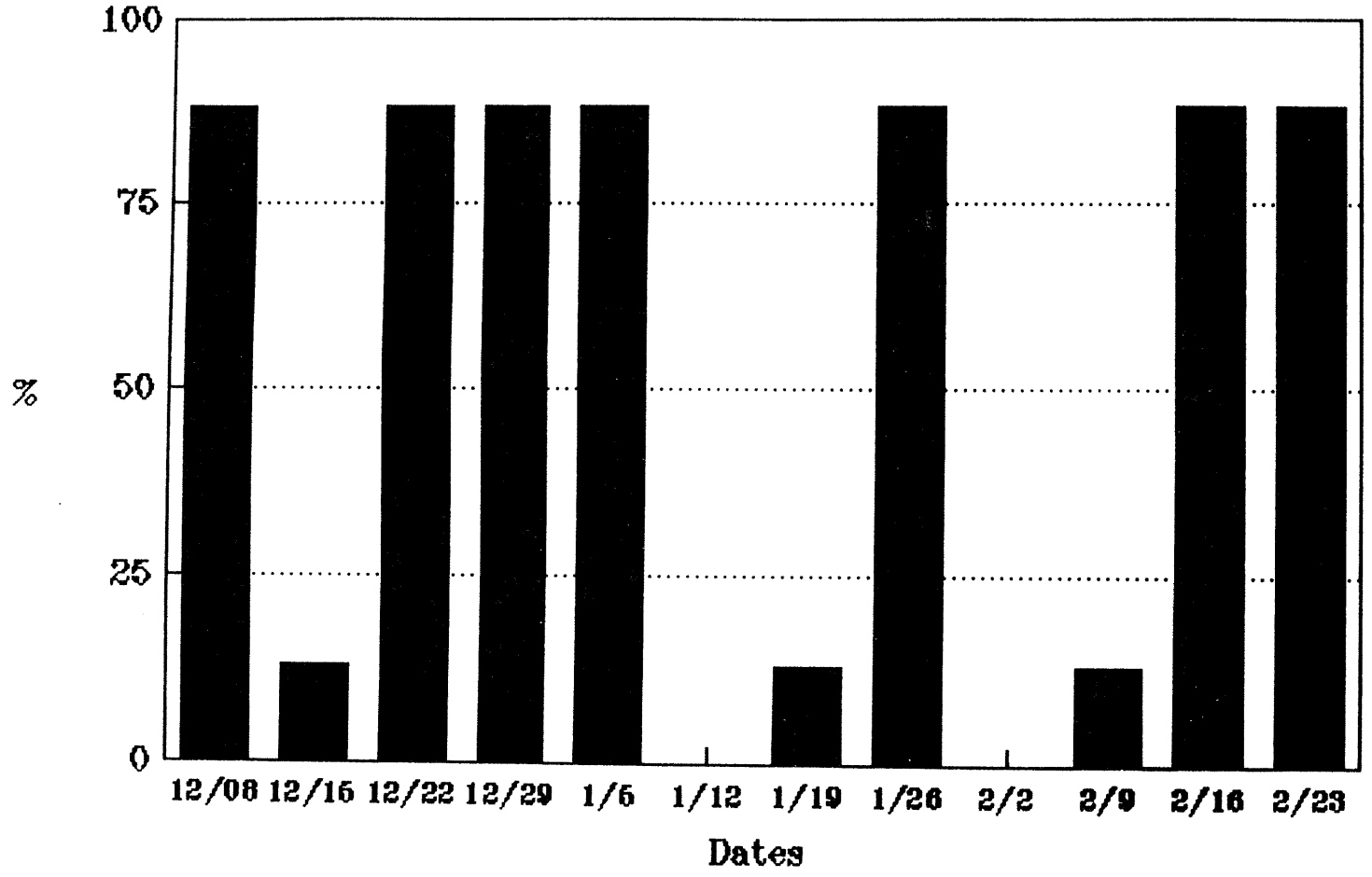

MAX, MIN & MEAN NIGHT ROOST TEMP
CORKINDALE ROOST
TEMPERATURE
60
45
30
15
0
12/08 12/15 12/22 12/29 1/5 1/12 1/19 1/26 2/2 2/9 2/16 2/23
DATES
MAXIMUM
MINIMUM
MEAN
88-89

MAXIMUM CLOUD COVER (%)
CORKINDALE ROOST



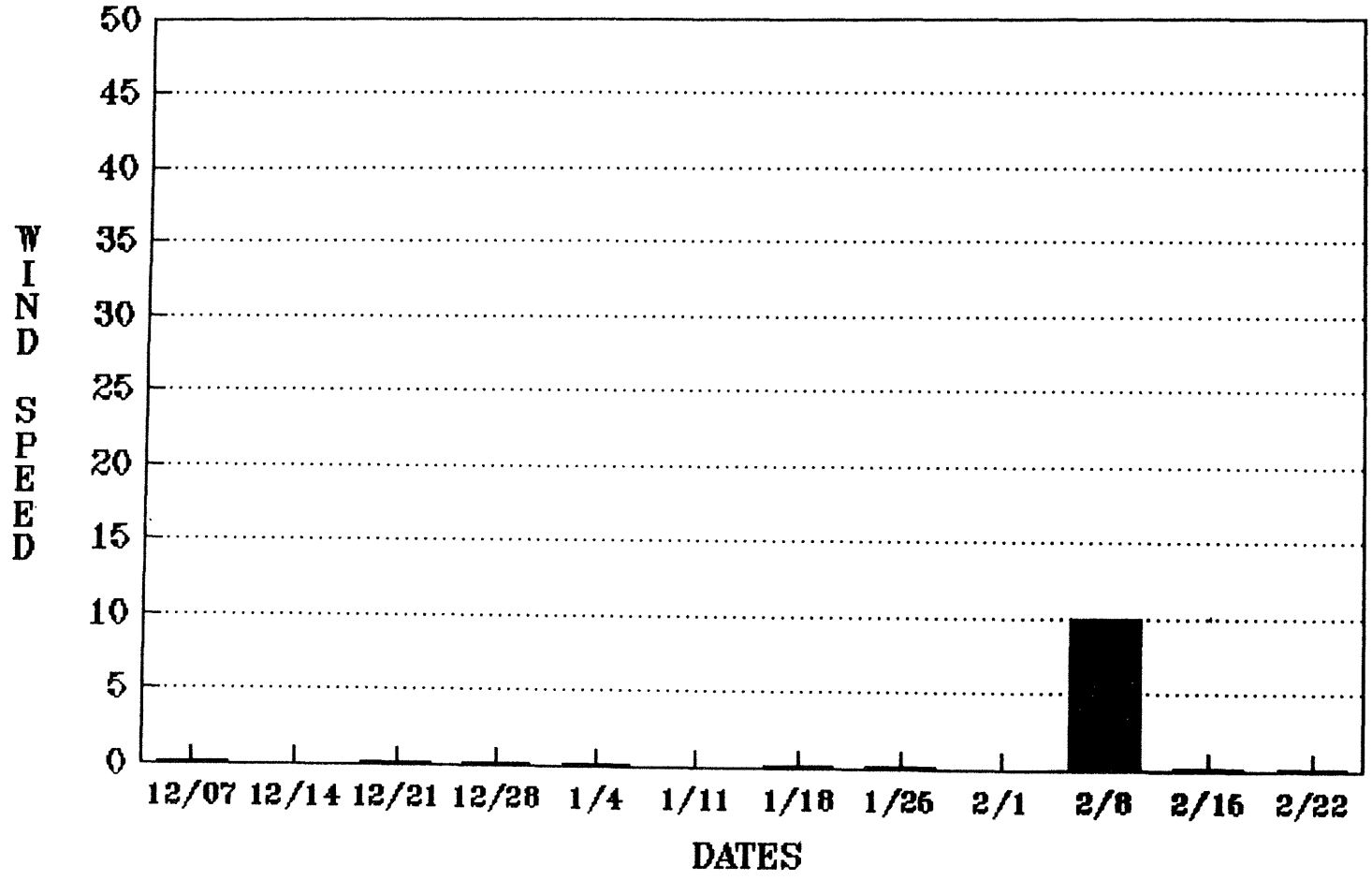
88-89

MAXIMUM CLOUD COVER (%)
CORKINDALE ROOST



88-89

MAXIMUM WIND SPEED
CORKINDALE ROOST



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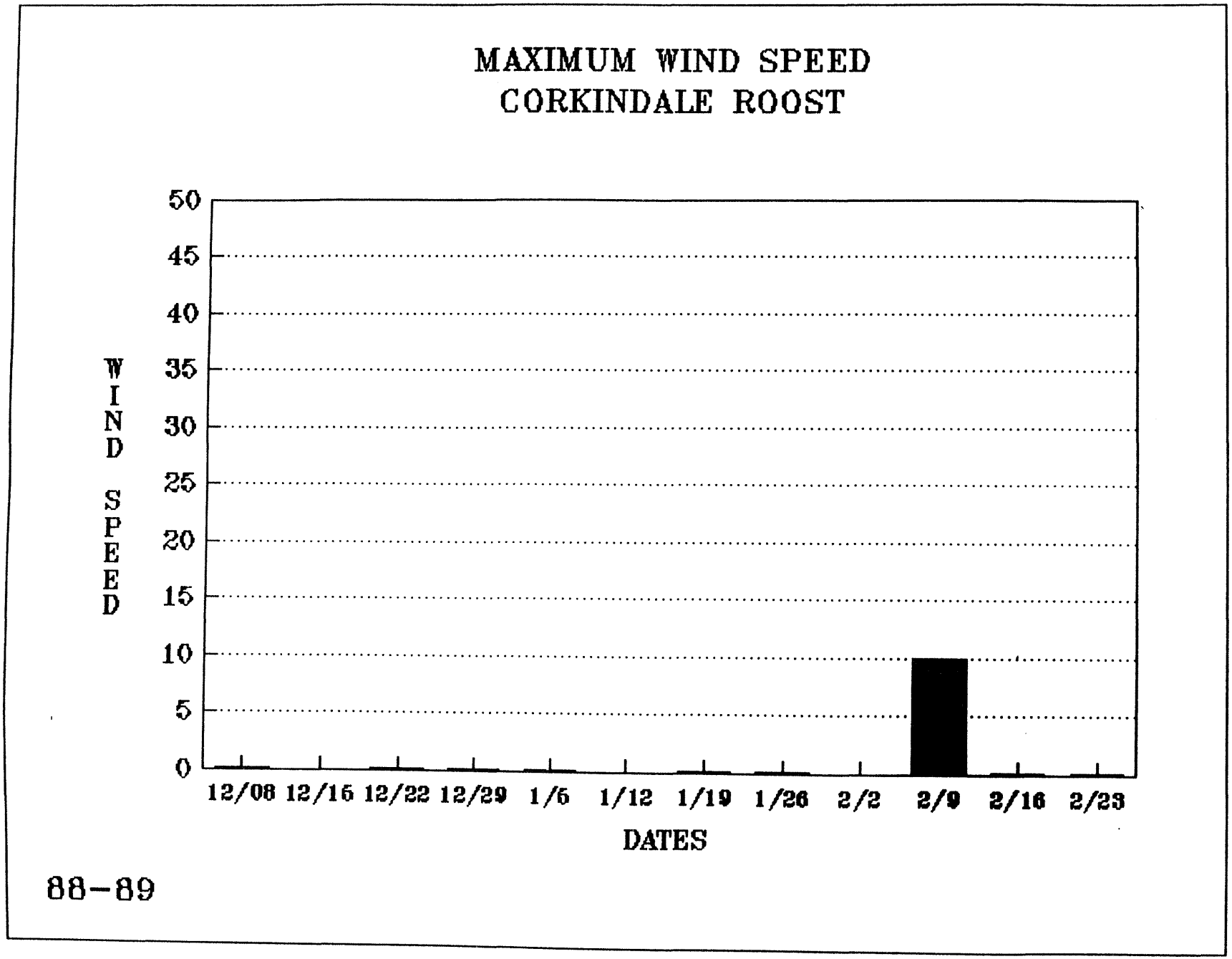
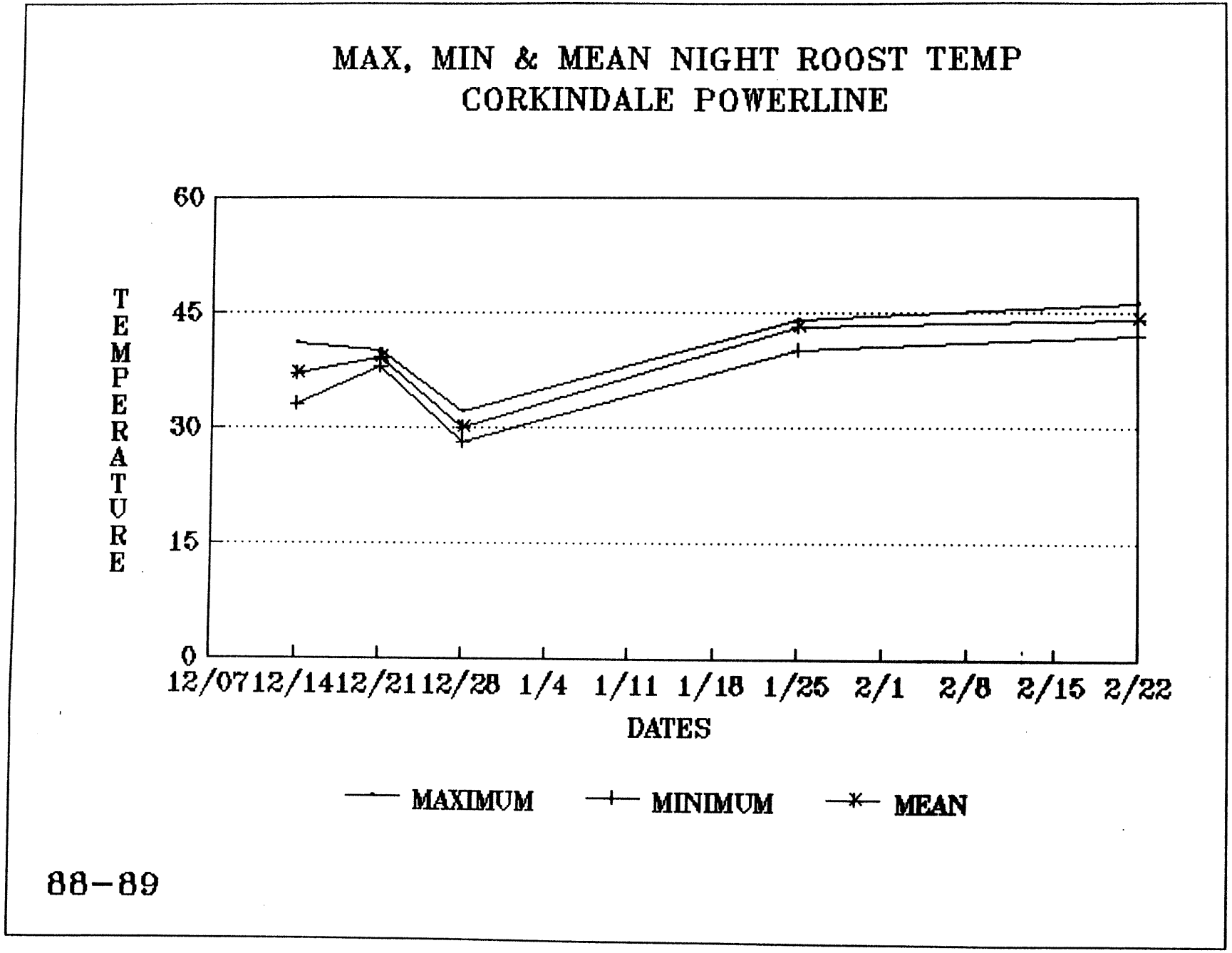
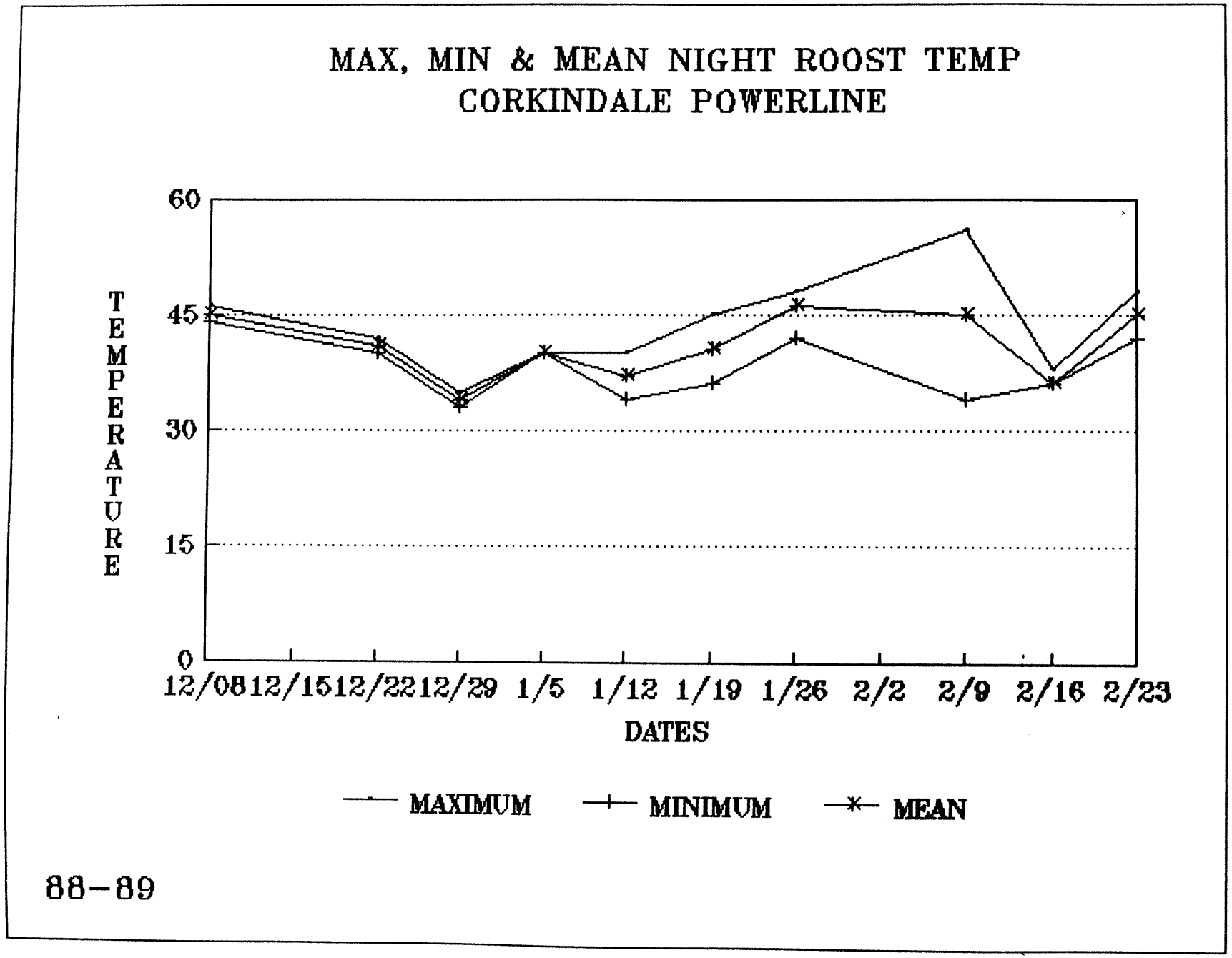
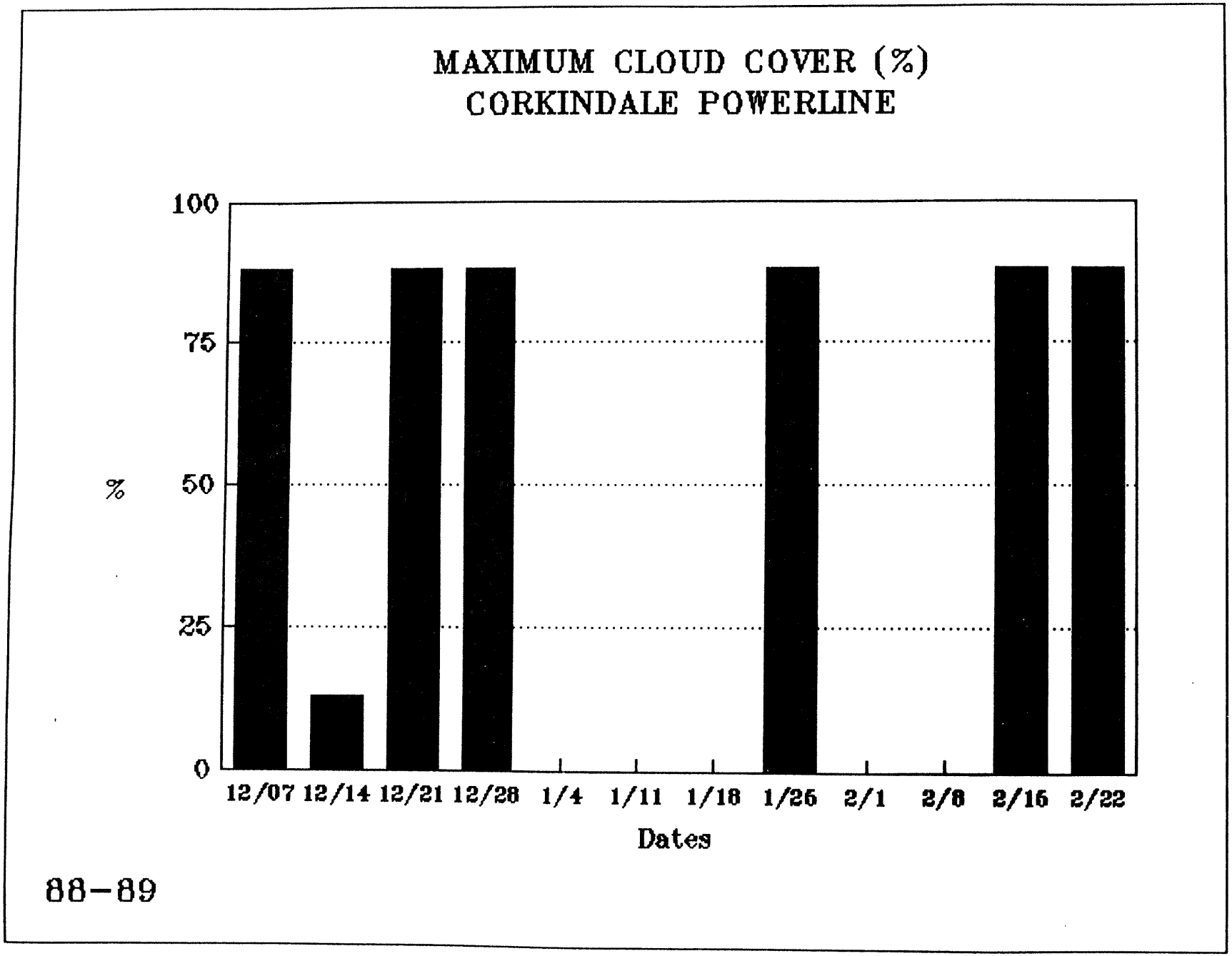
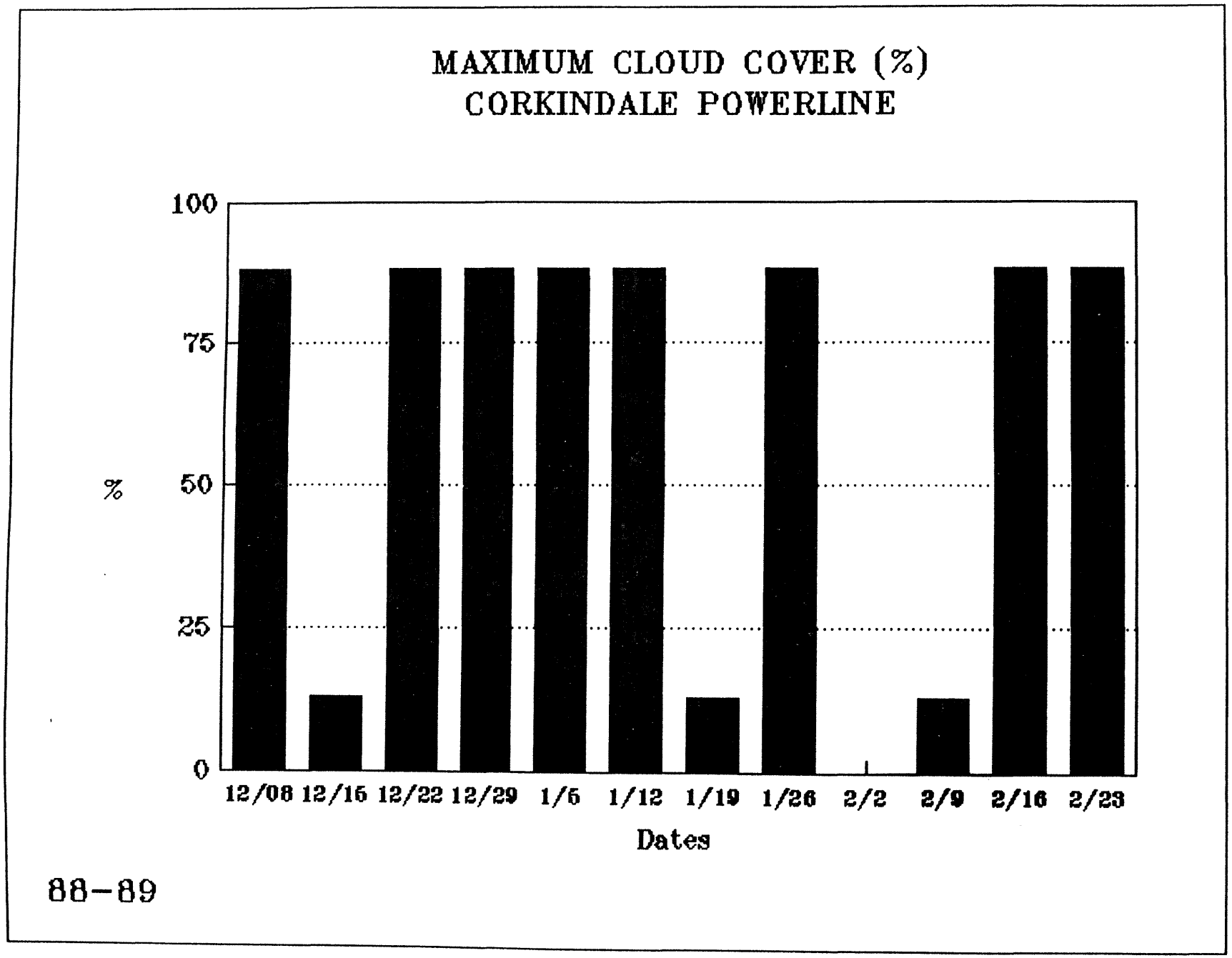
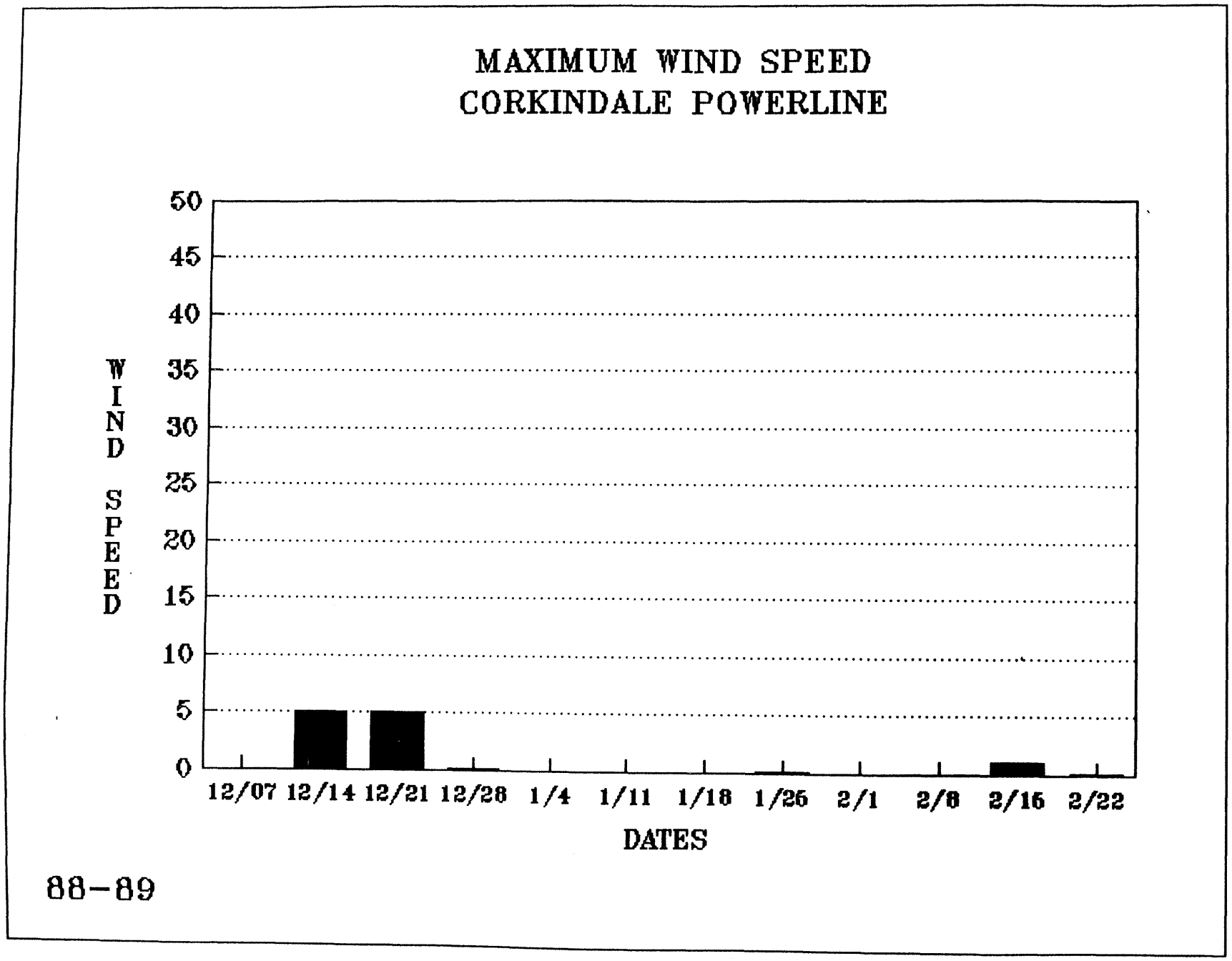

MAXIMUM WIND SPEED
CORKINDALE ROOST
WIND SPEED
50
45
40
35
30
25
20
15
10
5
0
12/08 12/15 12/22 12/29 1/5 1/12 1/19 1/26 2/2 2/9 2/16 2/23
DATES
88-89


MAX, MIN & MEAN NIGHT ROOST TEMP
CORKINDALE POWERLINE
TEMPERATURE
60
45
30
15
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
MAXIMUM
MINIMUM
MEAN
88-89

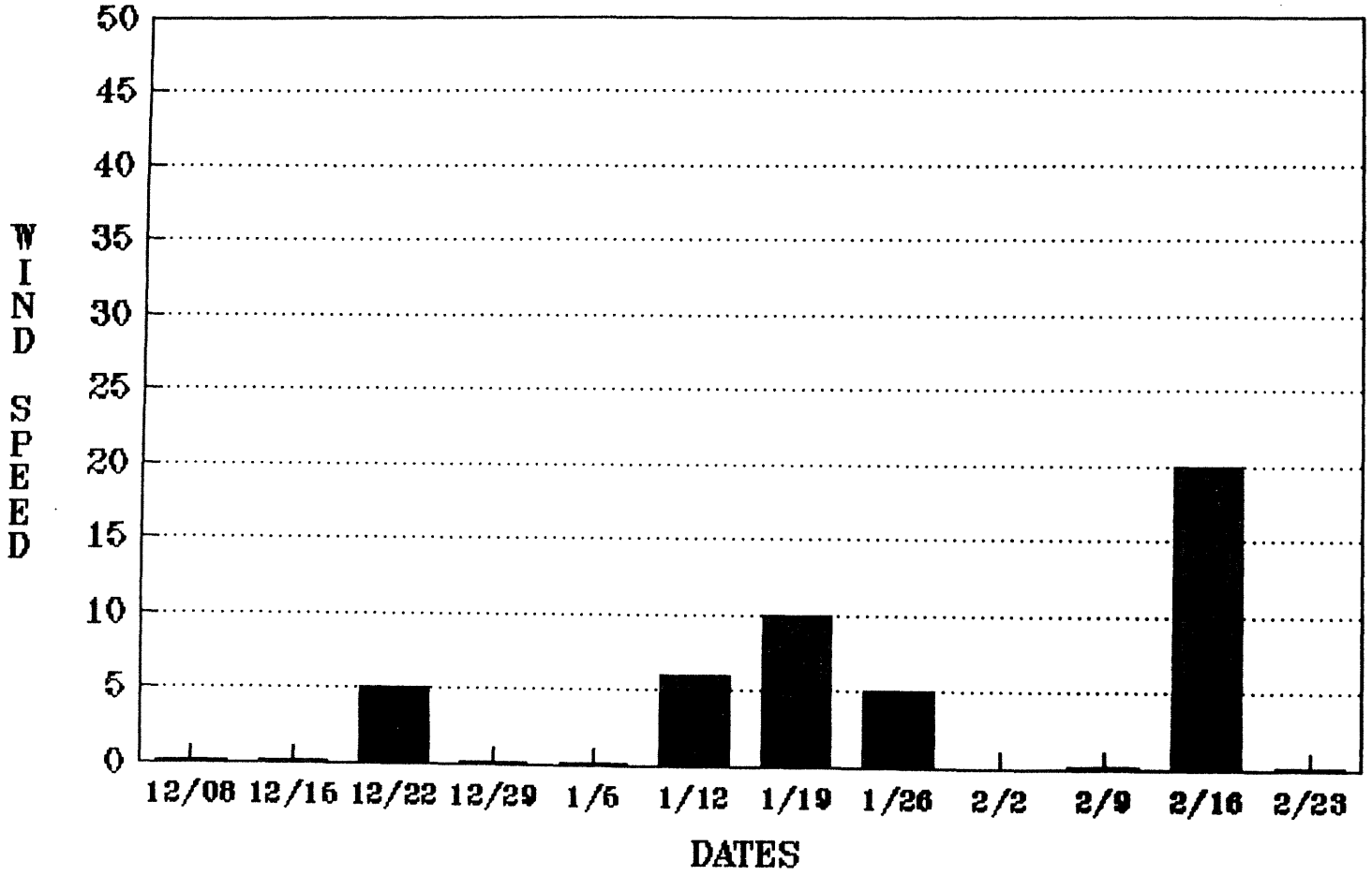

MAX, MIN & MEAN NIGHT ROOST TEMP
CORKINDALE POWERLINE
TEMPERATURE
60
45
30
15
0
12/08 12/15 12/22 12/29 1/5 1/12 1/19 1/26 2/2 2/9 2/16 2/23
DATES
MAXIMUM
MINIMUM
MEAN
88-89


MAXIMUM CLOUD COVER (%)
CORKINDALE POWERLINE
100
75
50
25
0
%
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
Dates
88-89


MAXIMUM CLOUD COVER (%)
CORKINDALE POWERLINE
100
75
50
25
0
%
12/08 12/15 12/22 12/29 1/5 1/12 1/19 1/26 2/2 2/9 2/16 2/23
Dates
88-89


MAXIMUM WIND SPEED
CORKINDALE POWERLINE
WIND SPEED
50
45
40
35
30
25
20
15
10
5
0
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
DATES
88-89

MAXIMUM WIND SPEED
CORKINDALE POWERLINE



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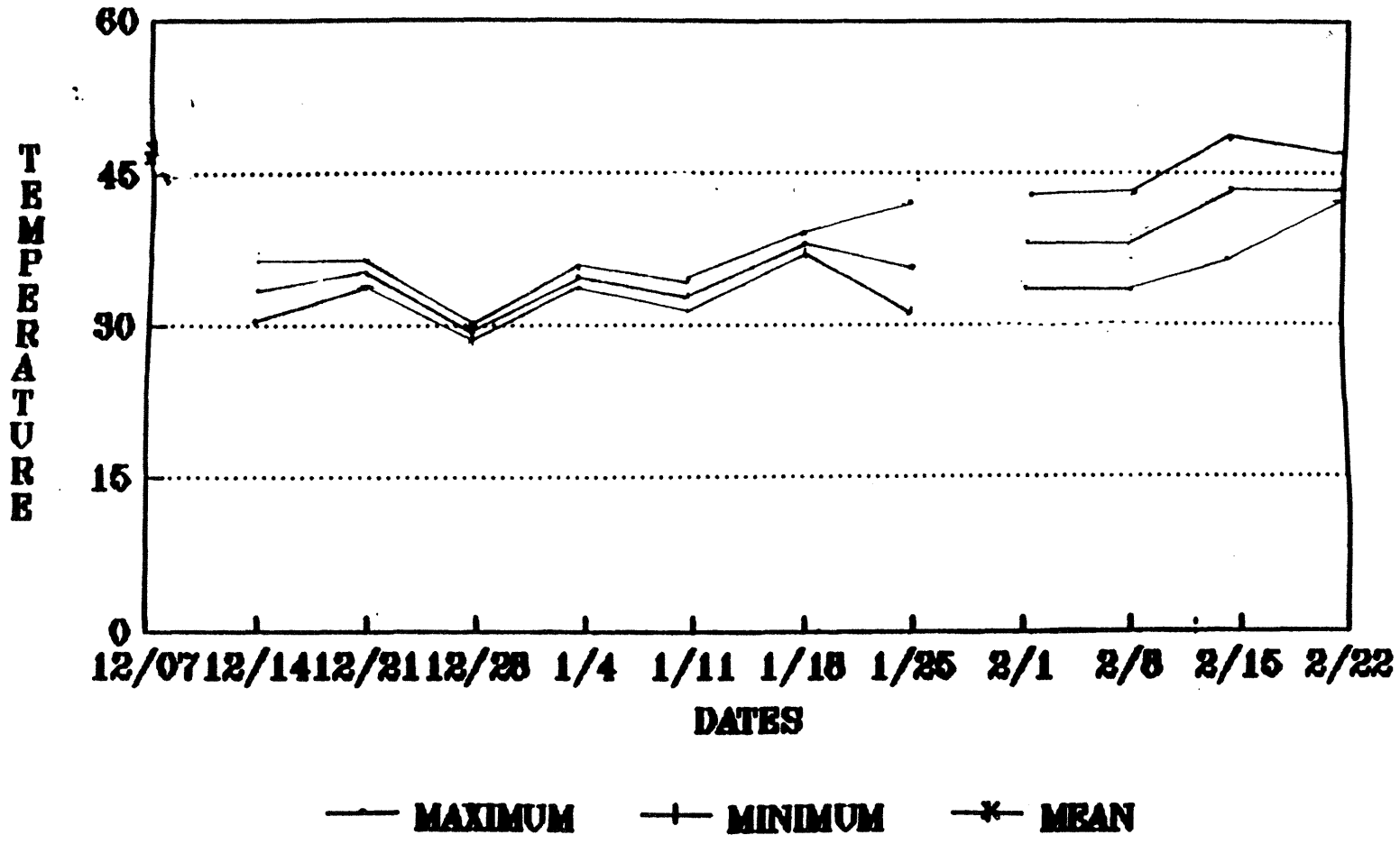
MAX, MIN & MEAN NIGHT ROOST TEMP

ILLABOT CREEK



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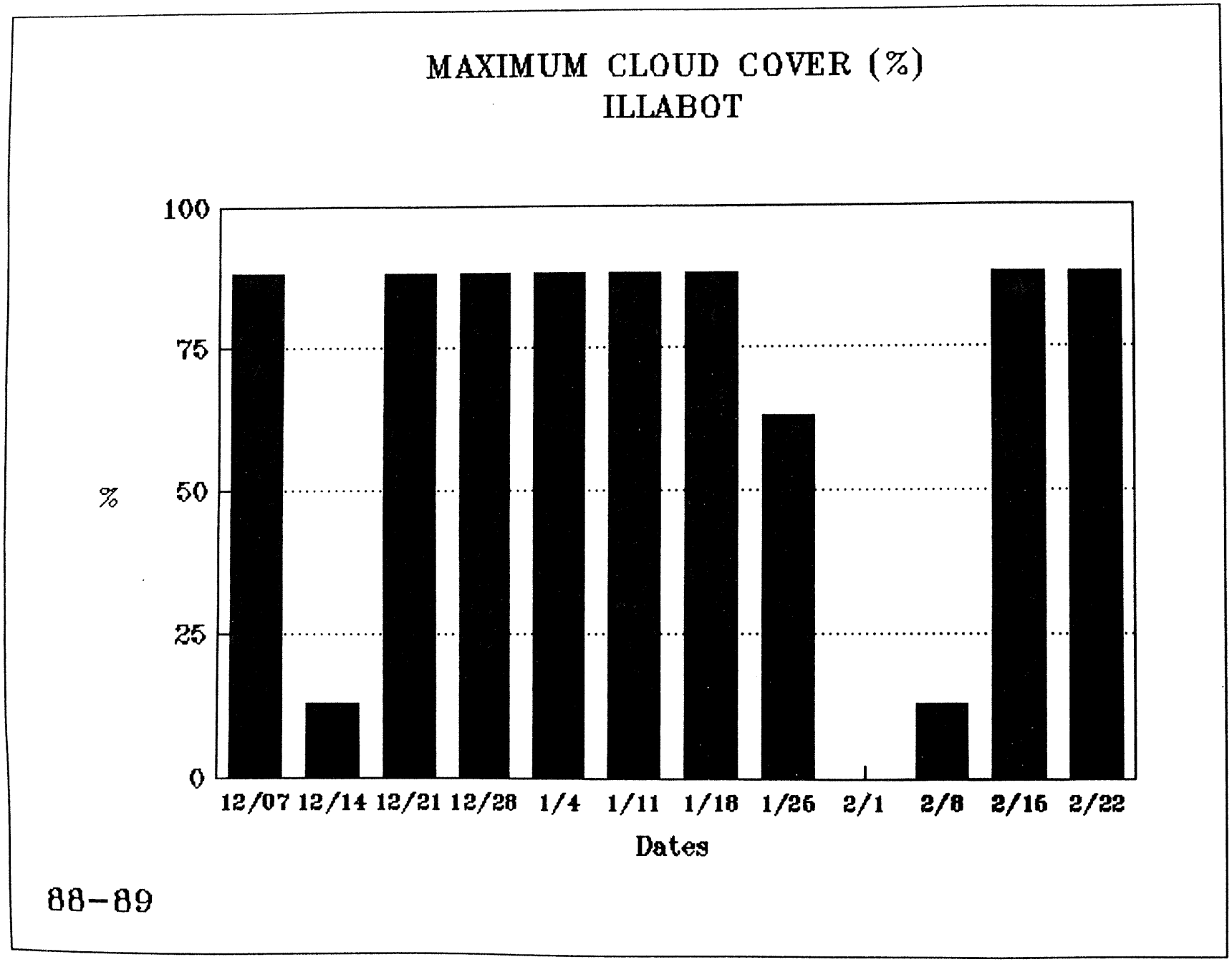
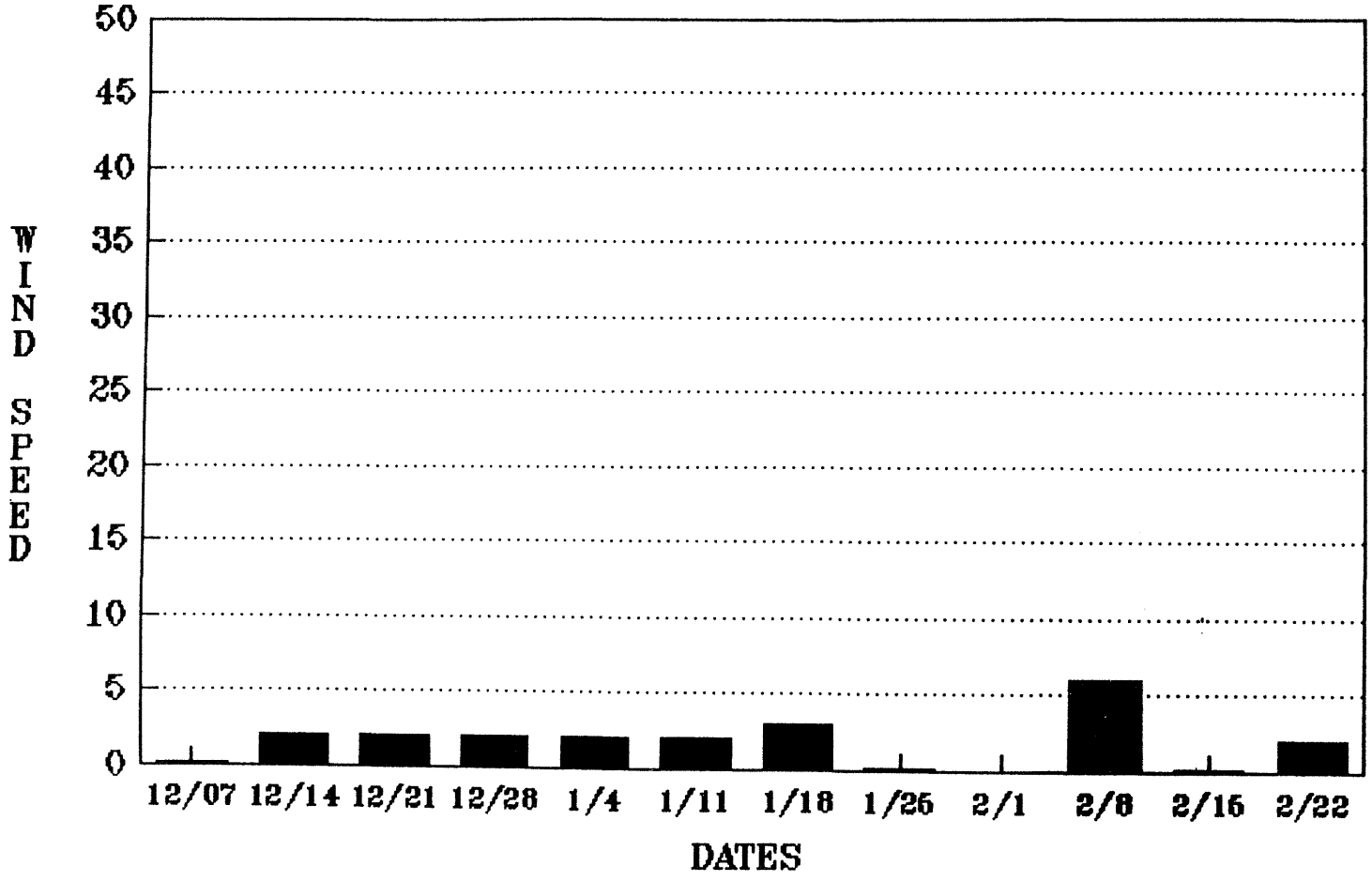
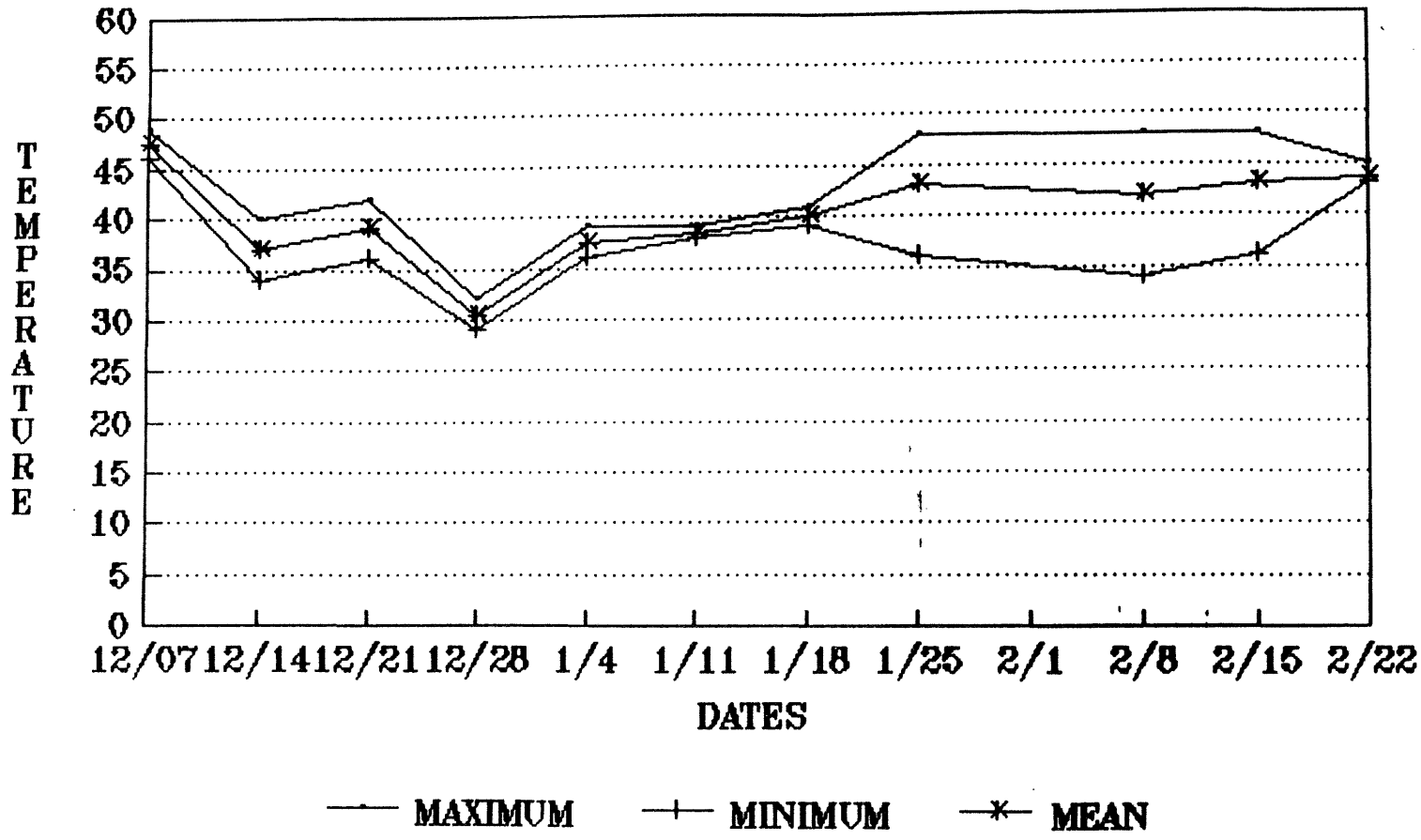

MAXIMUM CLOUD COVER (%)
ILLABOT
100
75
50
25
0
%
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
Dates
88-89

MAXIMUM WIND SPEED
ILLABOT

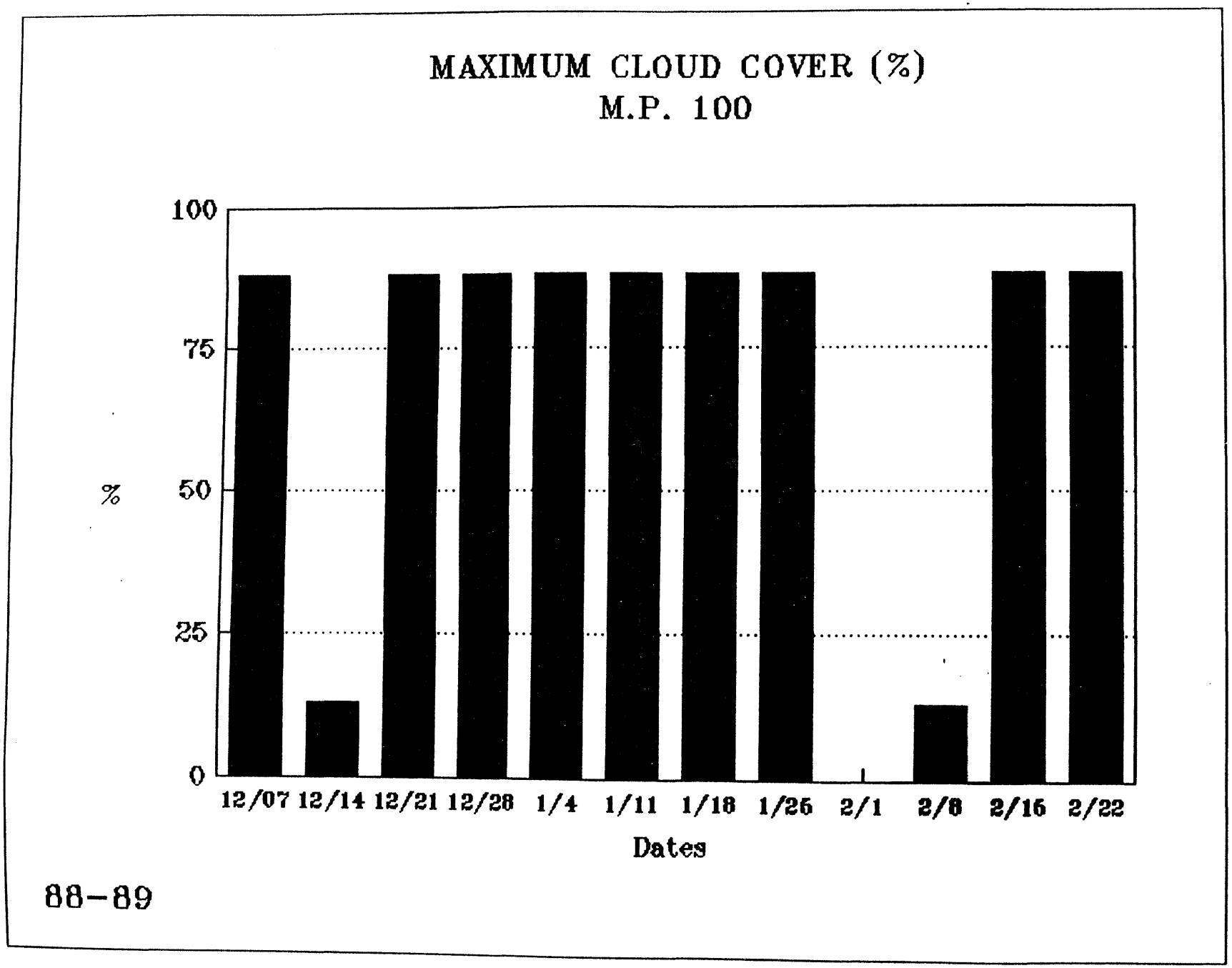


88-89

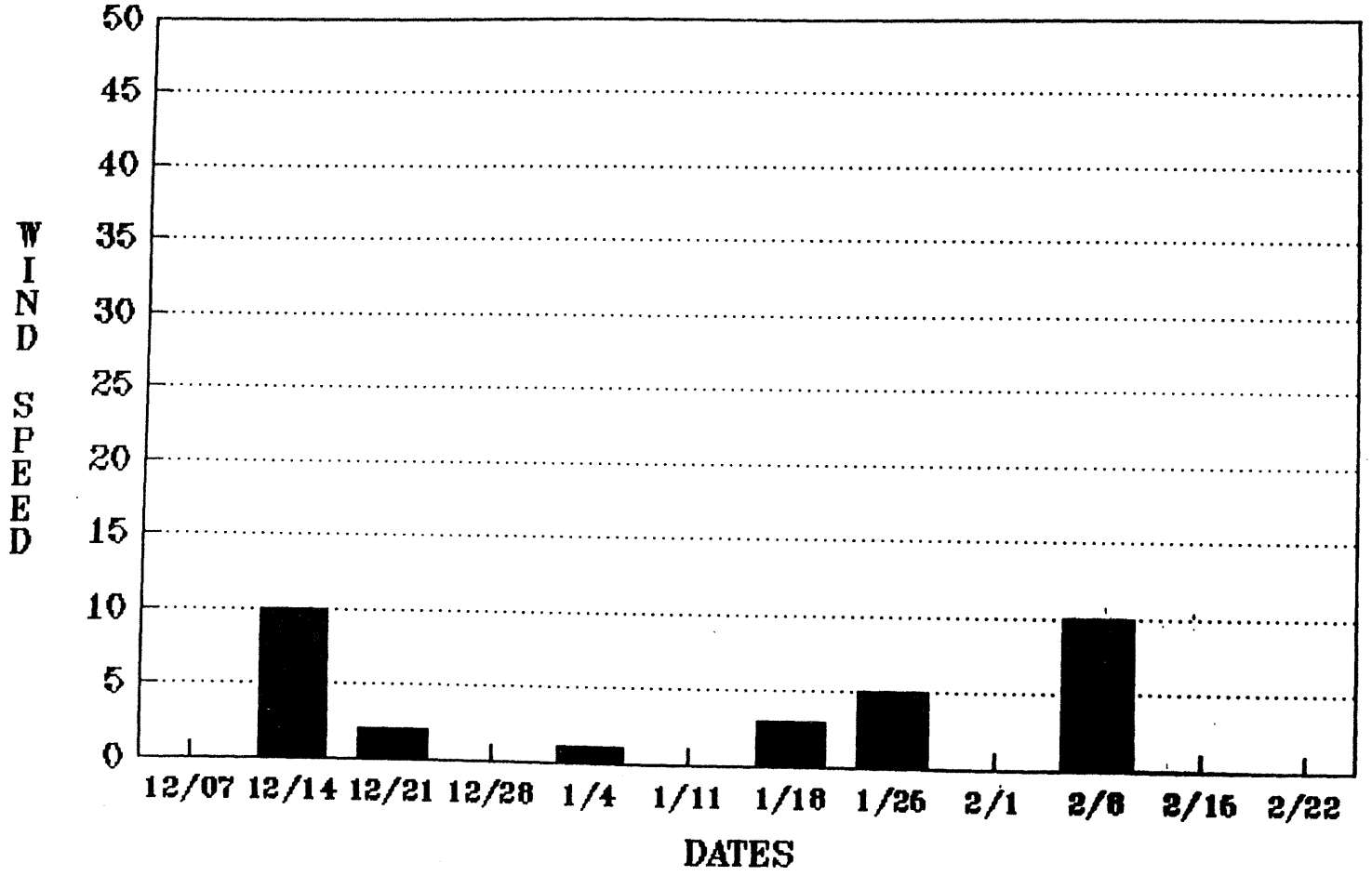
MAX, MIN & MEAN NIGHT ROOST TEMP
M.P. 100



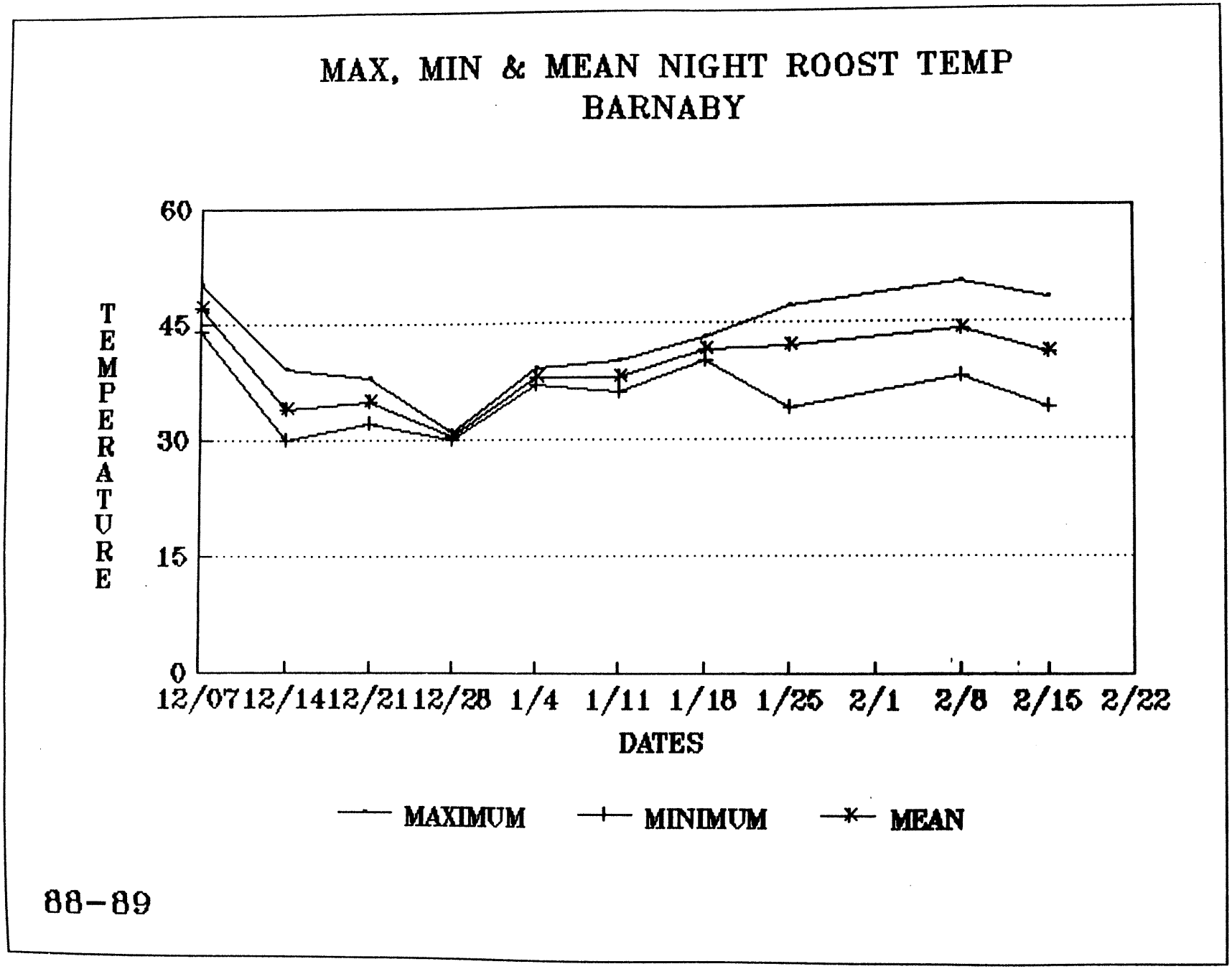
88-89

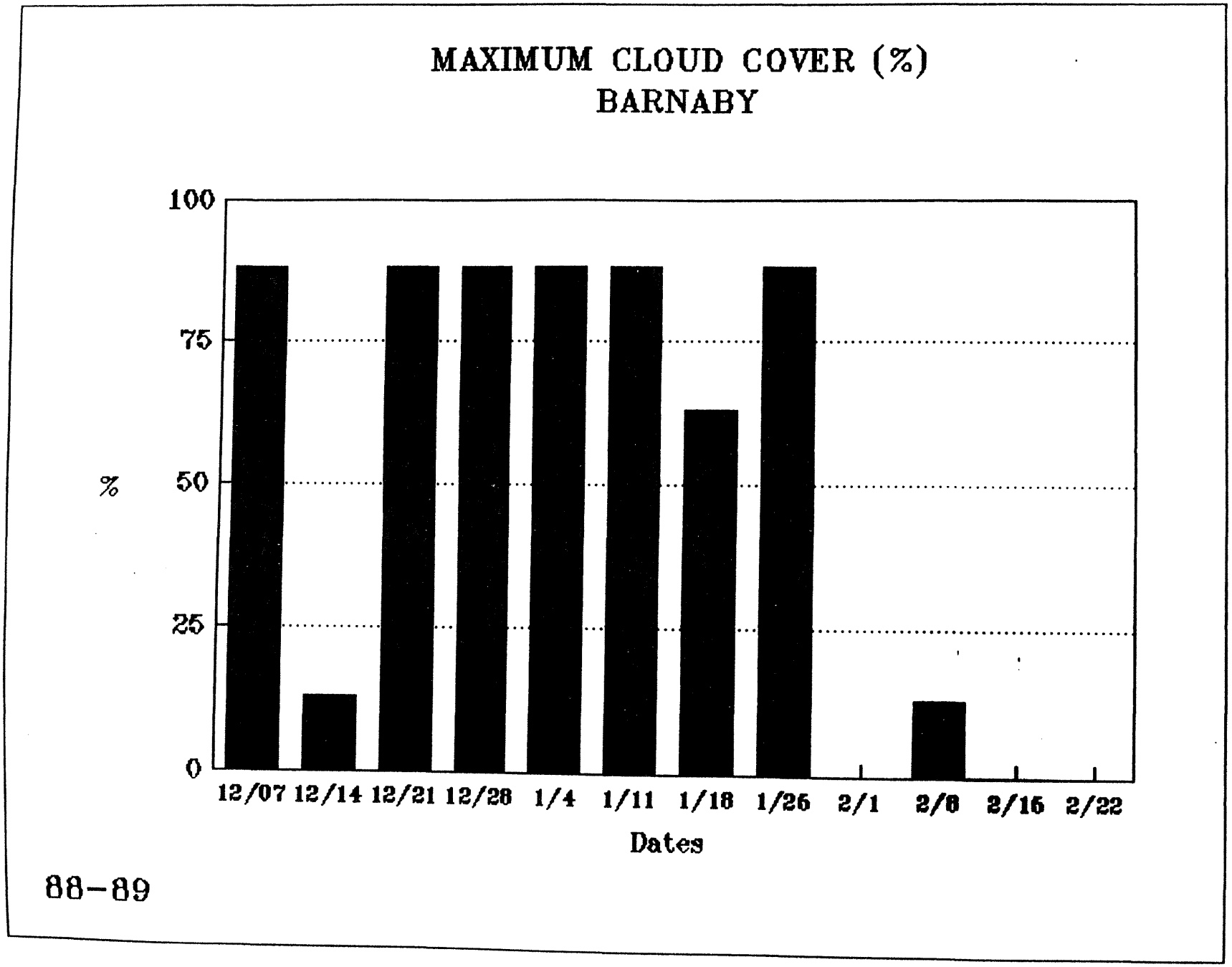

MAXIMUM CLOUD COVER (%)
M.P. 100
100
75
50
25
0
%
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
Dates
88-89

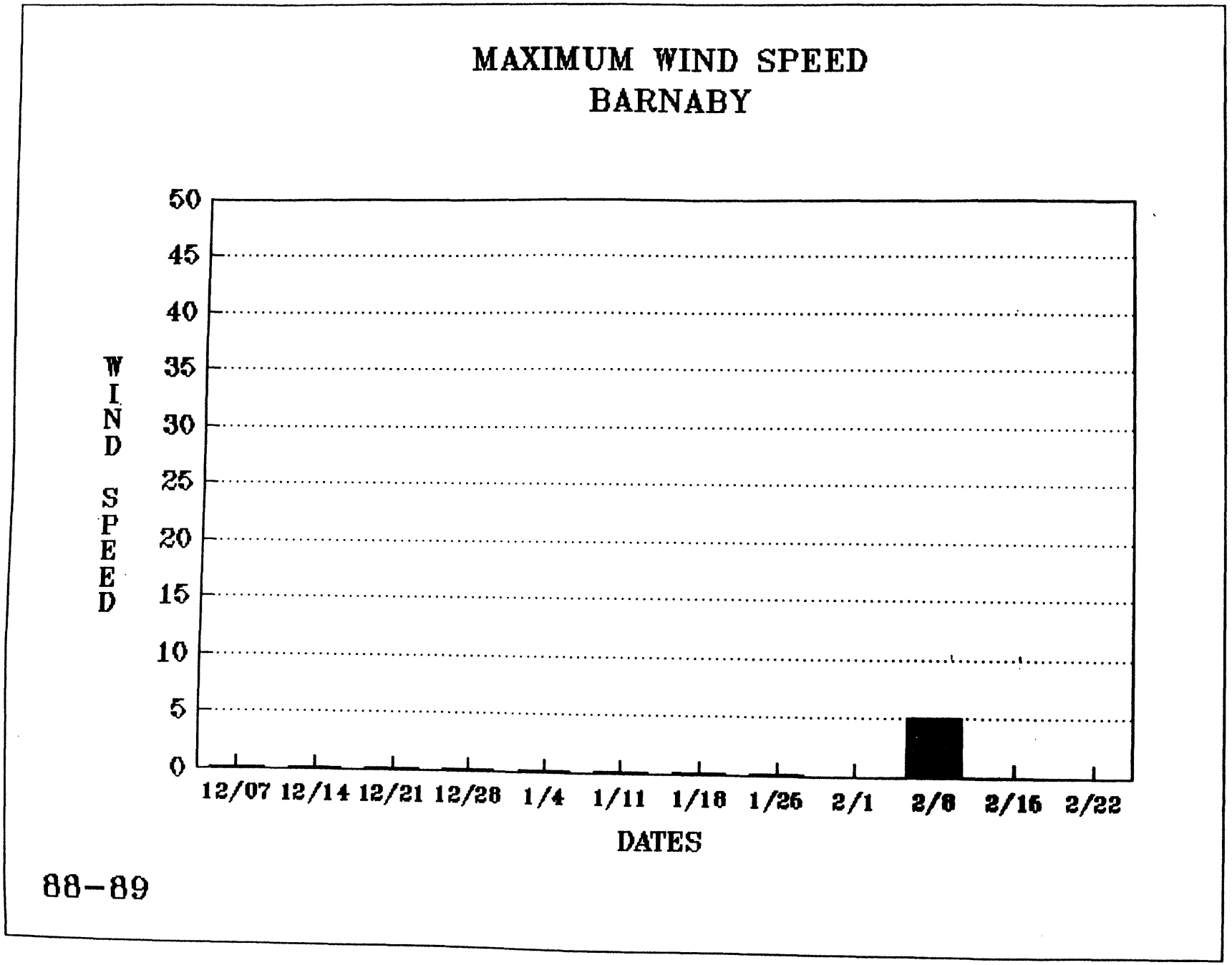
MAXIMUM WIND SPEED
M.P. 100

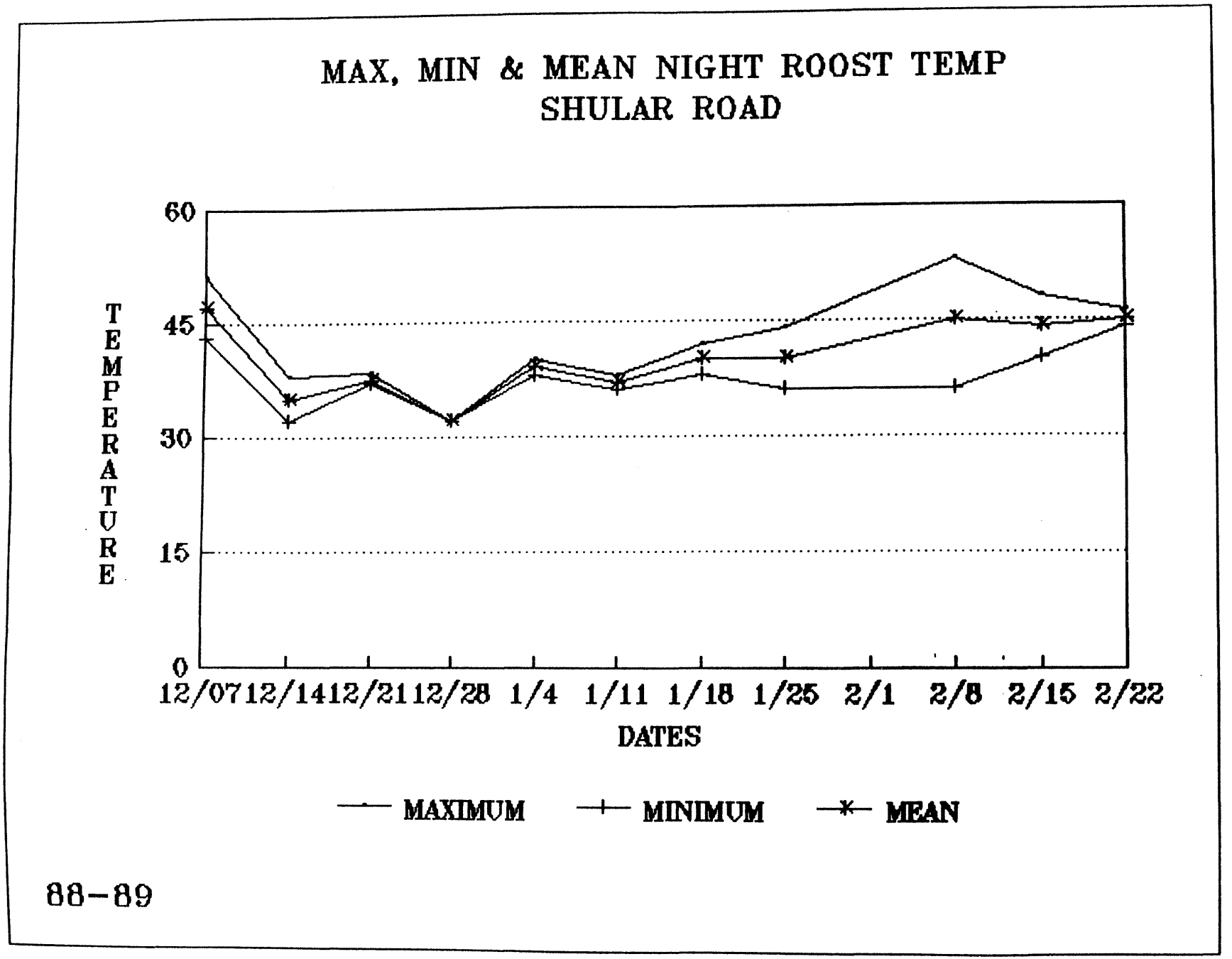


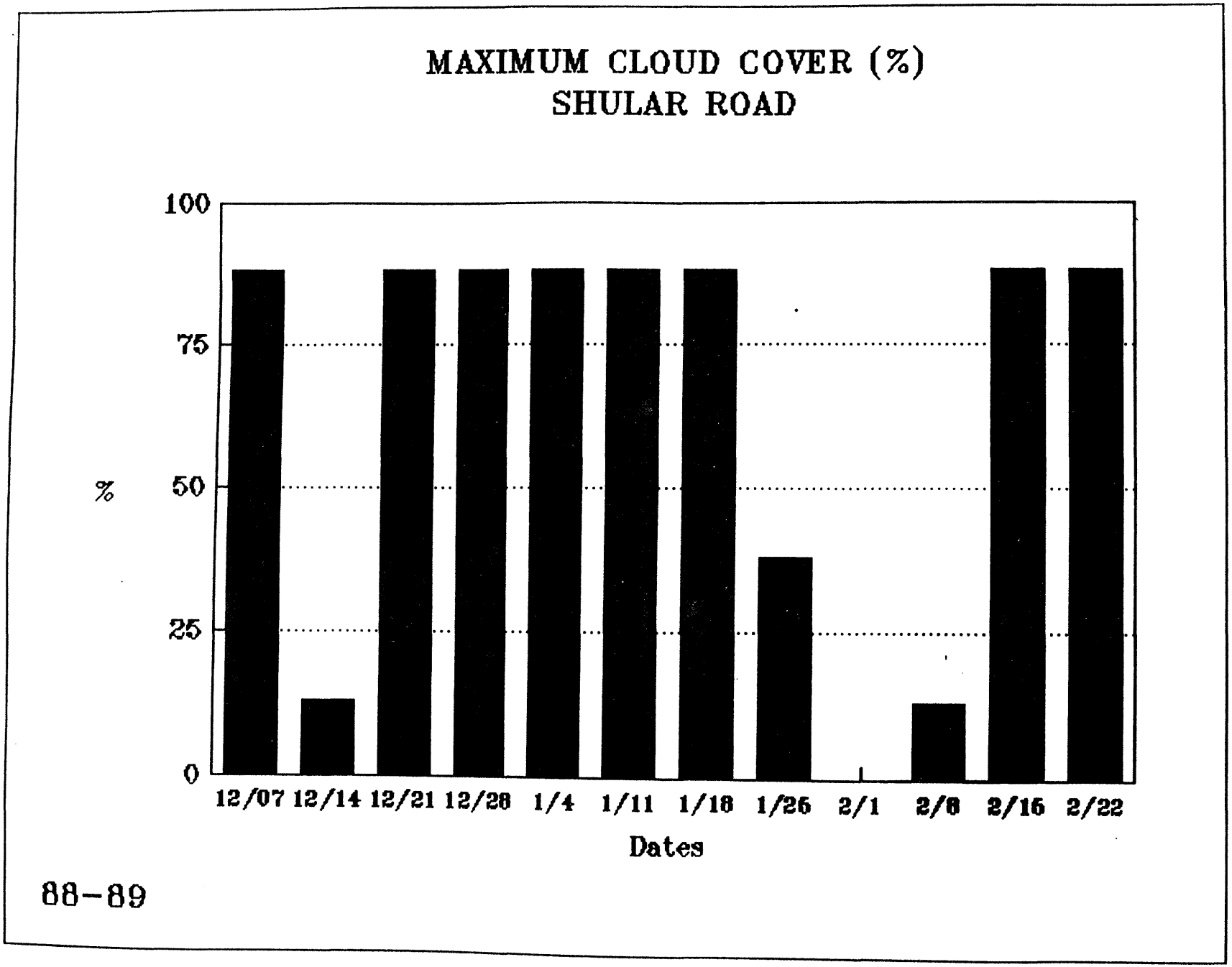
88-89


MAX, MIN & MEAN NIGHT ROOST TEMP
BARNABY
TEMPERATURE
60
45
30
15
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
MAXIMUM
MINIMUM
MEAN
88-89

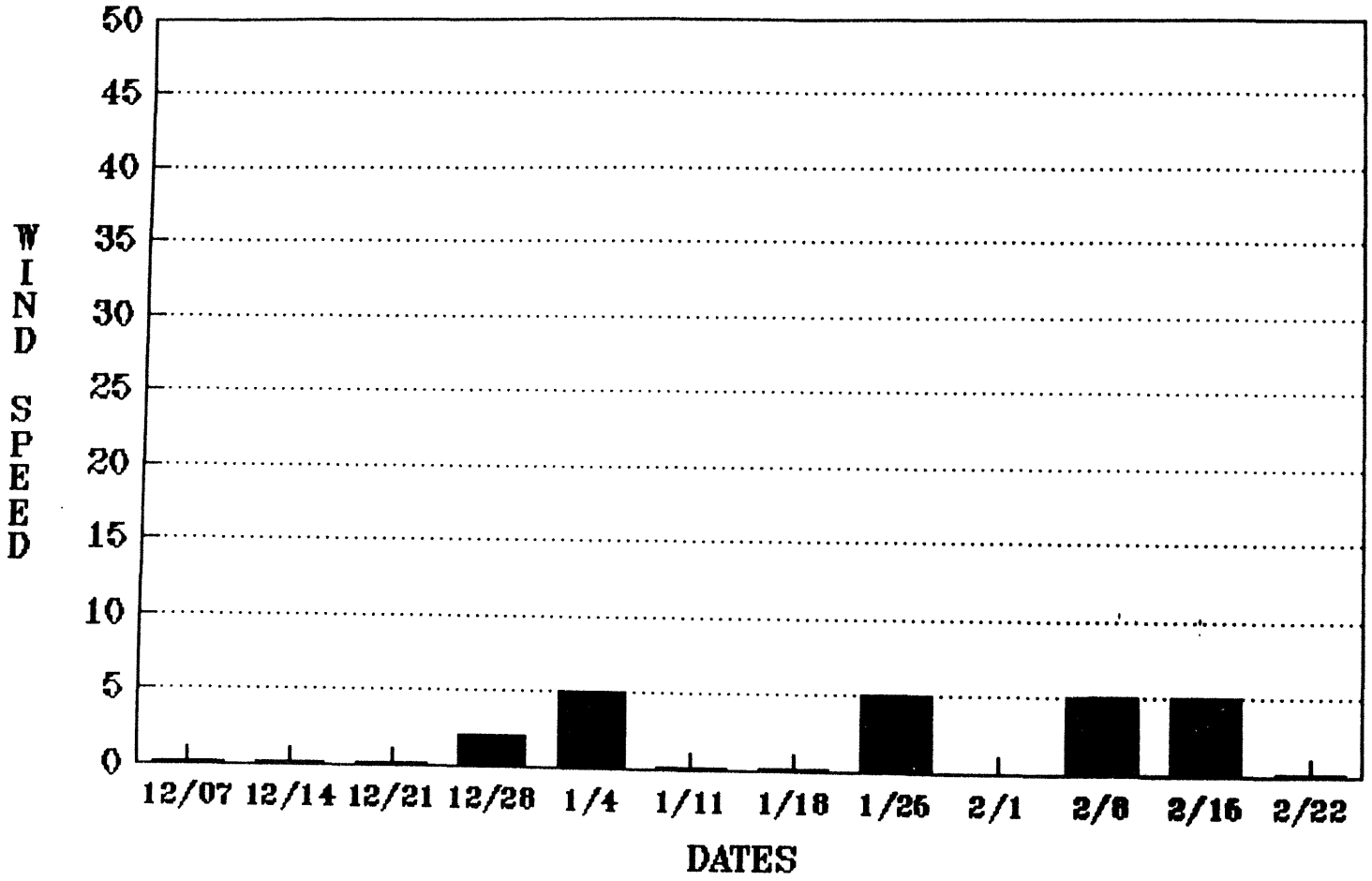

MAXIMUM CLOUD COVER (%)
BARNABY
100
75
50
25
0
%
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
Dates
88-89


MAXIMUM WIND SPEED
BARNABY
WIND SPEED
50
45
40
35
30
25
20
15
10
5
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
88-89


MAX, MIN & MEAN NIGHT ROOST TEMP
SHULAR ROAD
TEMPERATURE
60
45
30
15
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
MAXIMUM
MINIMUM
MEAN
88-89


MAXIMUM CLOUD COVER (%)
SHULAR ROAD
100
75
50
25
0
%
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
Dates
88-89

MAXIMUM WIND SPEED
SHULAR ROAD



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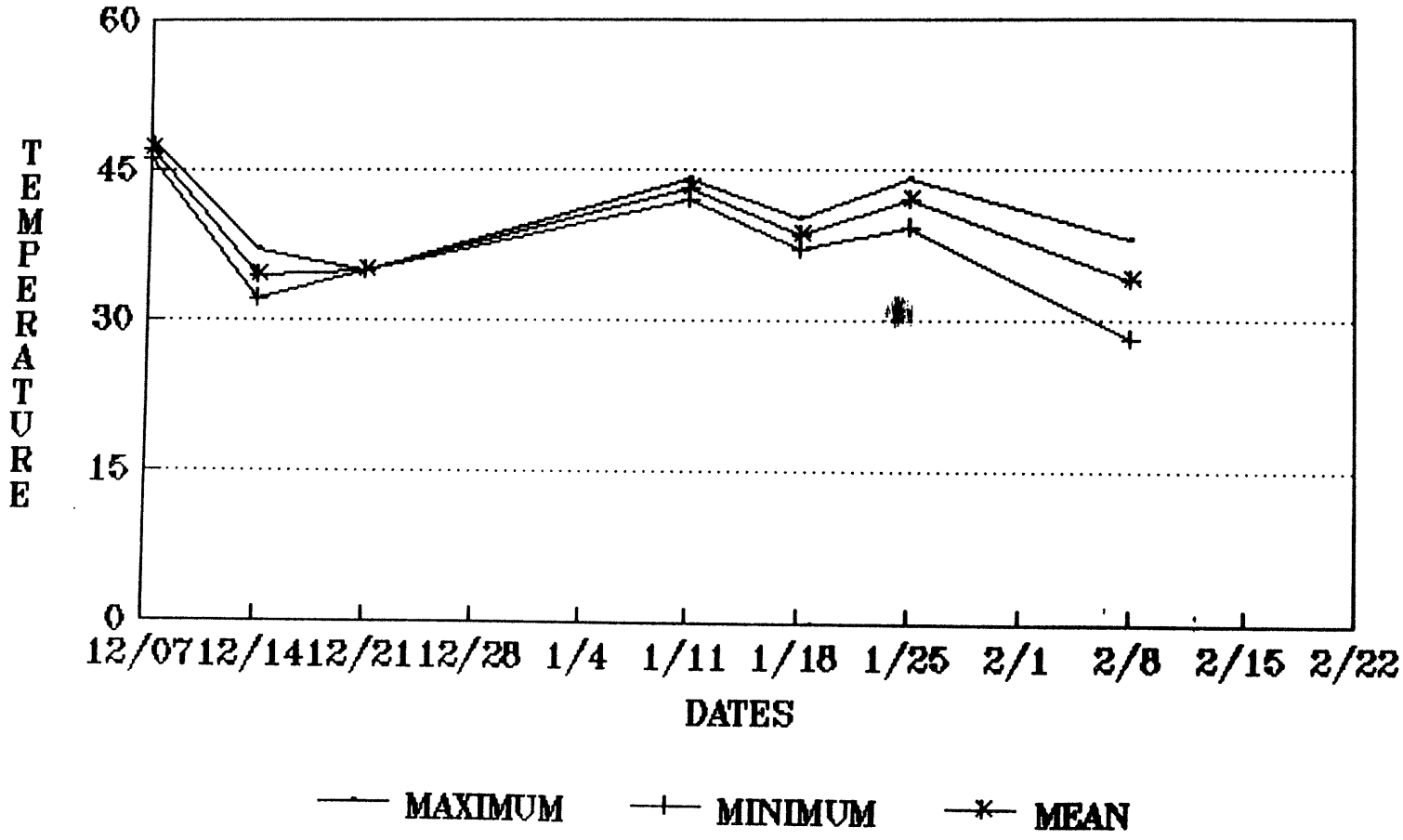
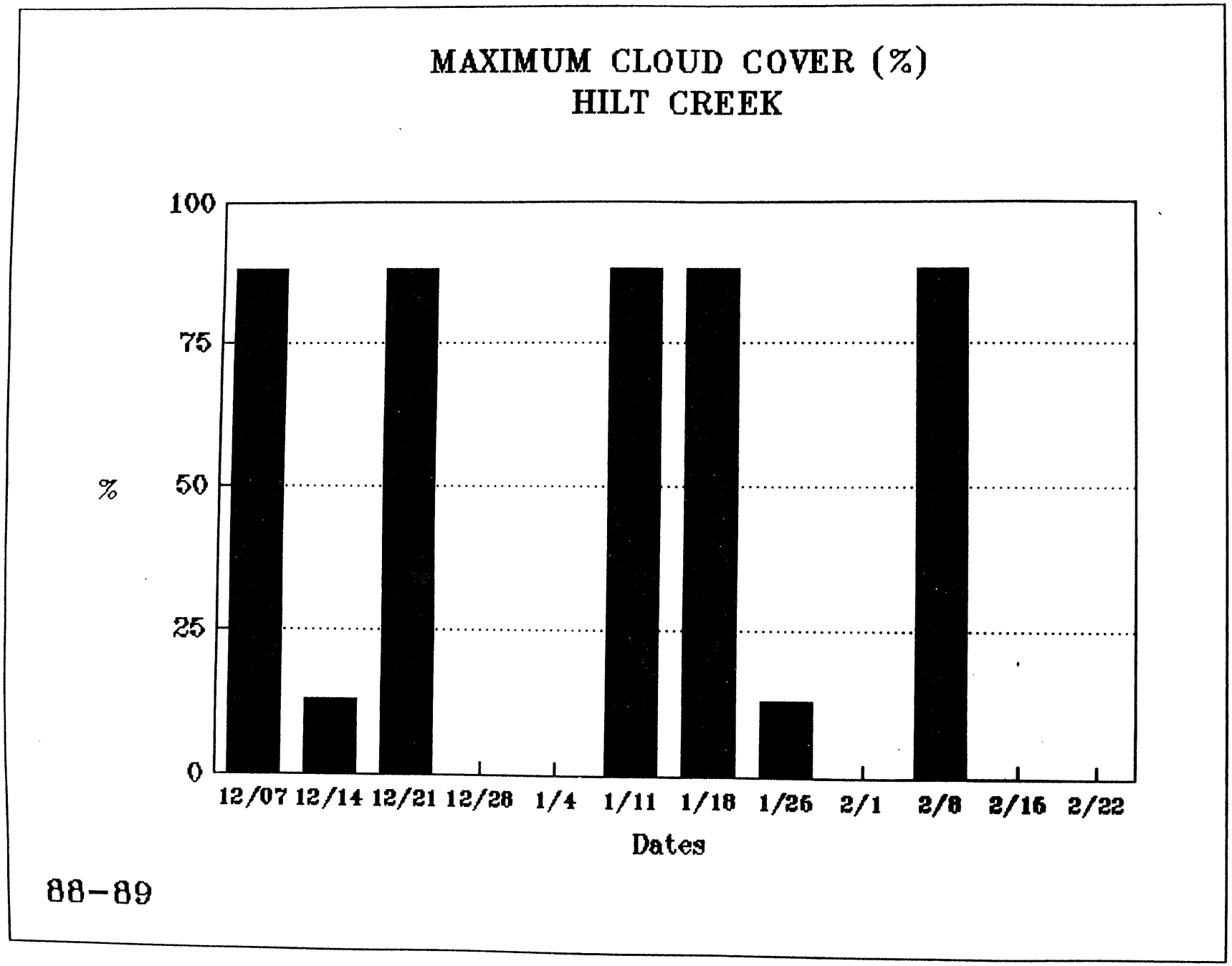
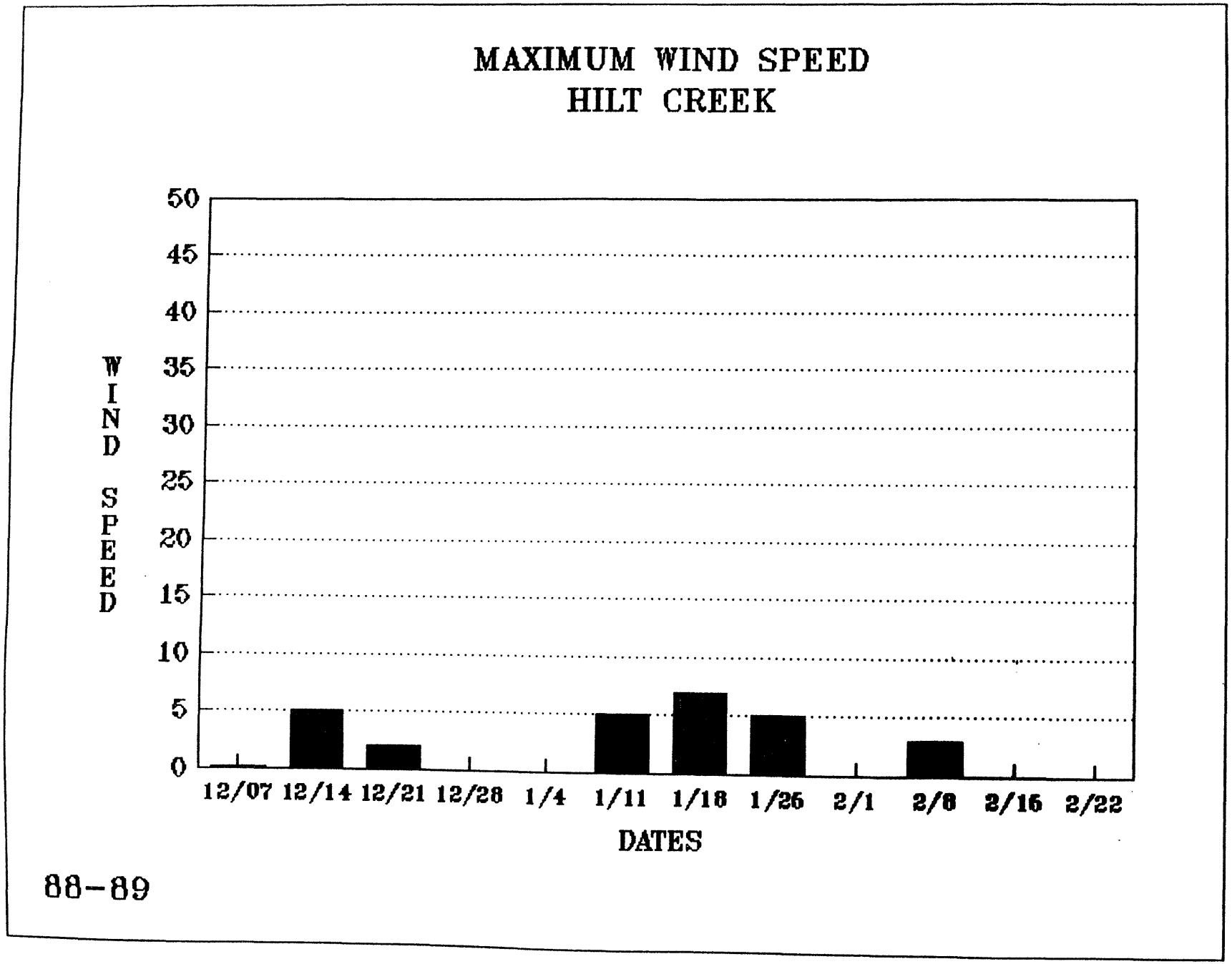
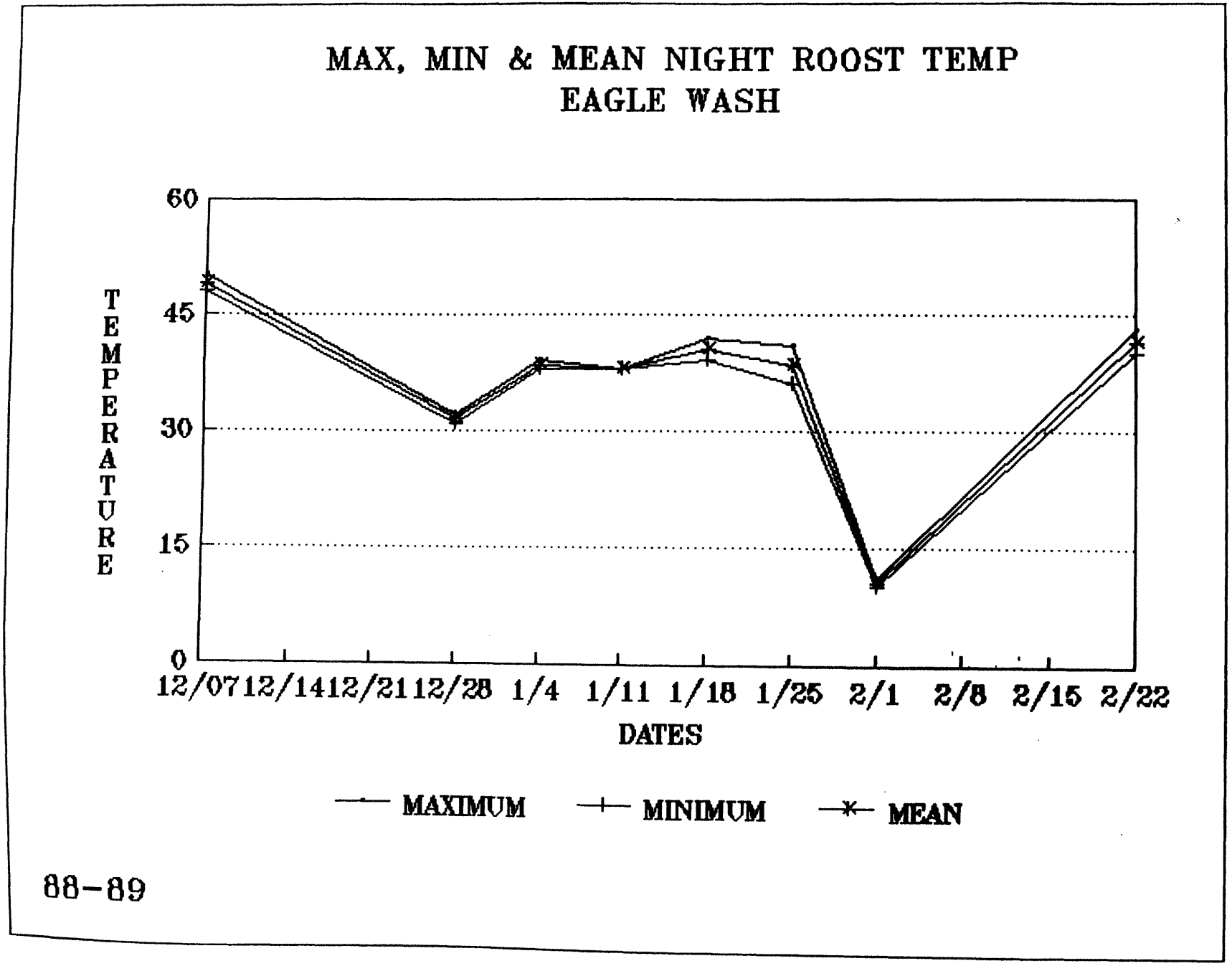
MAX, MIN & MEAN NIGHT ROOST TEMP
HILT CREEK



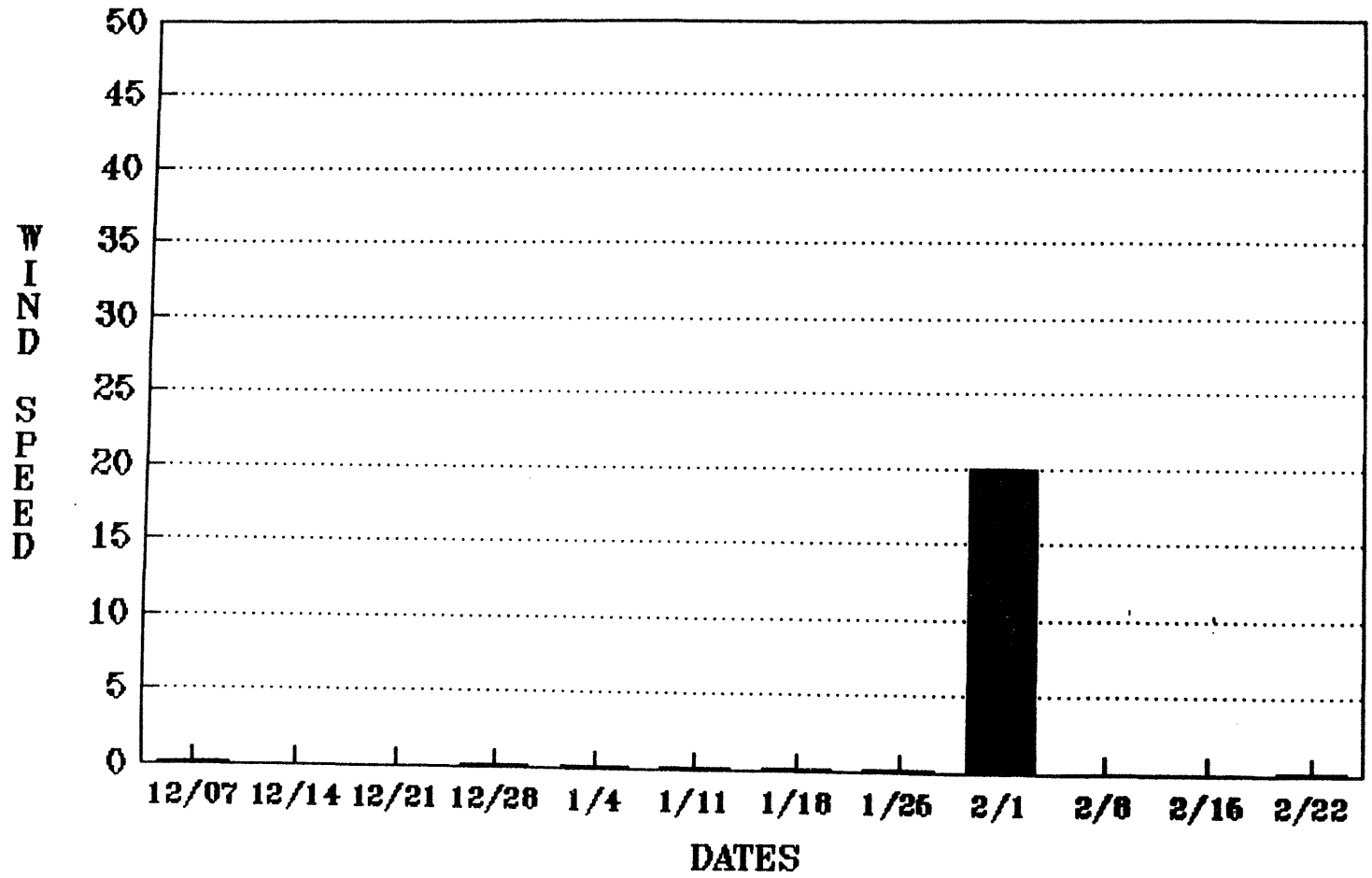
88-89


MAXIMUM CLOUD COVER (%)
HILT CREEK
100
75
50
25
0
%
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
Dates
88-89

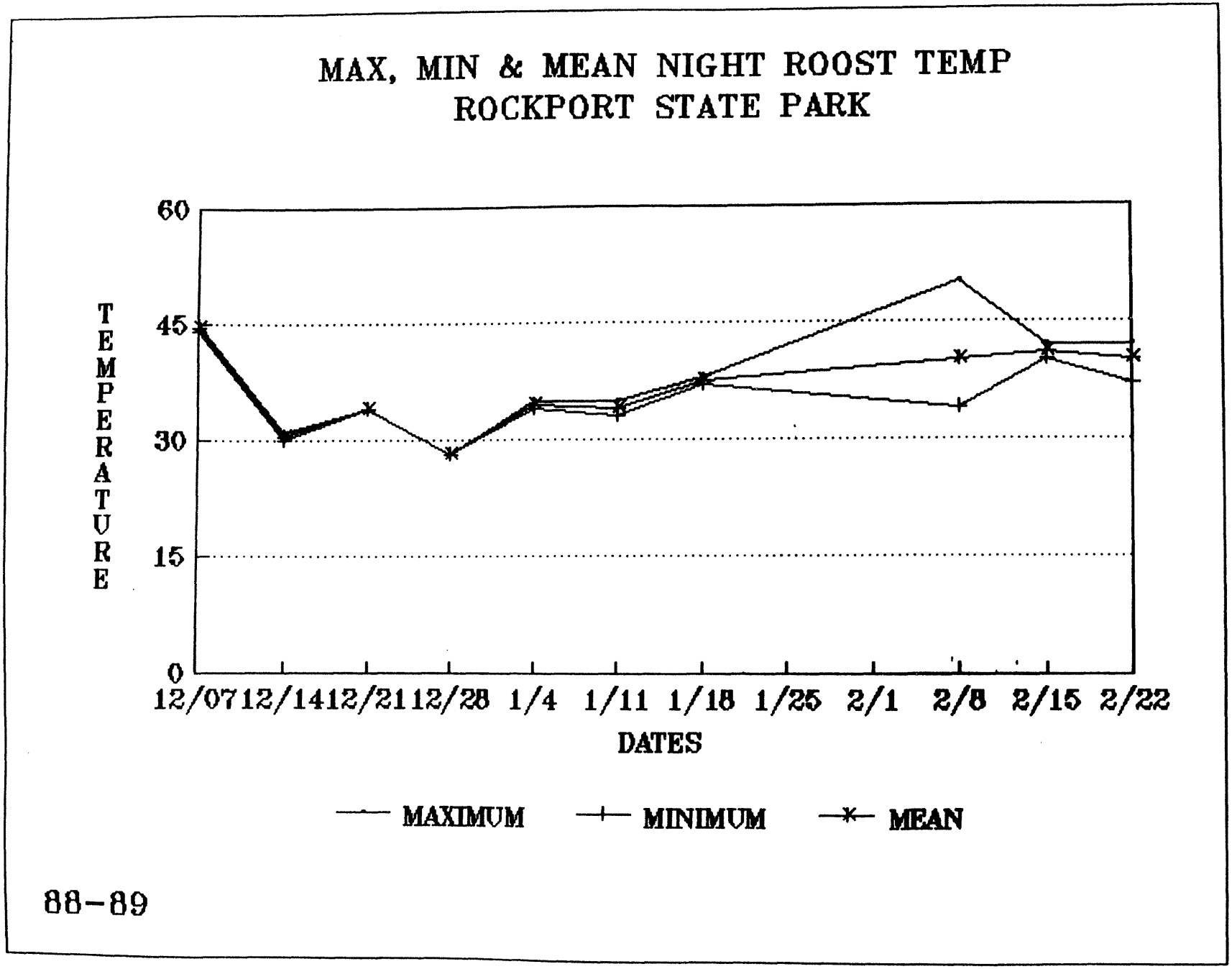

MAXIMUM WIND SPEED
HILT CREEK
WIND SPEED
50
45
40
35
30
25
20
15
10
5
0
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
DATES
88-89


MAX, MIN & MEAN NIGHT ROOST TEMP
EAGLE WASH
TEMPERATURE
60
45
30
15
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
MAXIMUM
MINIMUM
MEAN
88-89

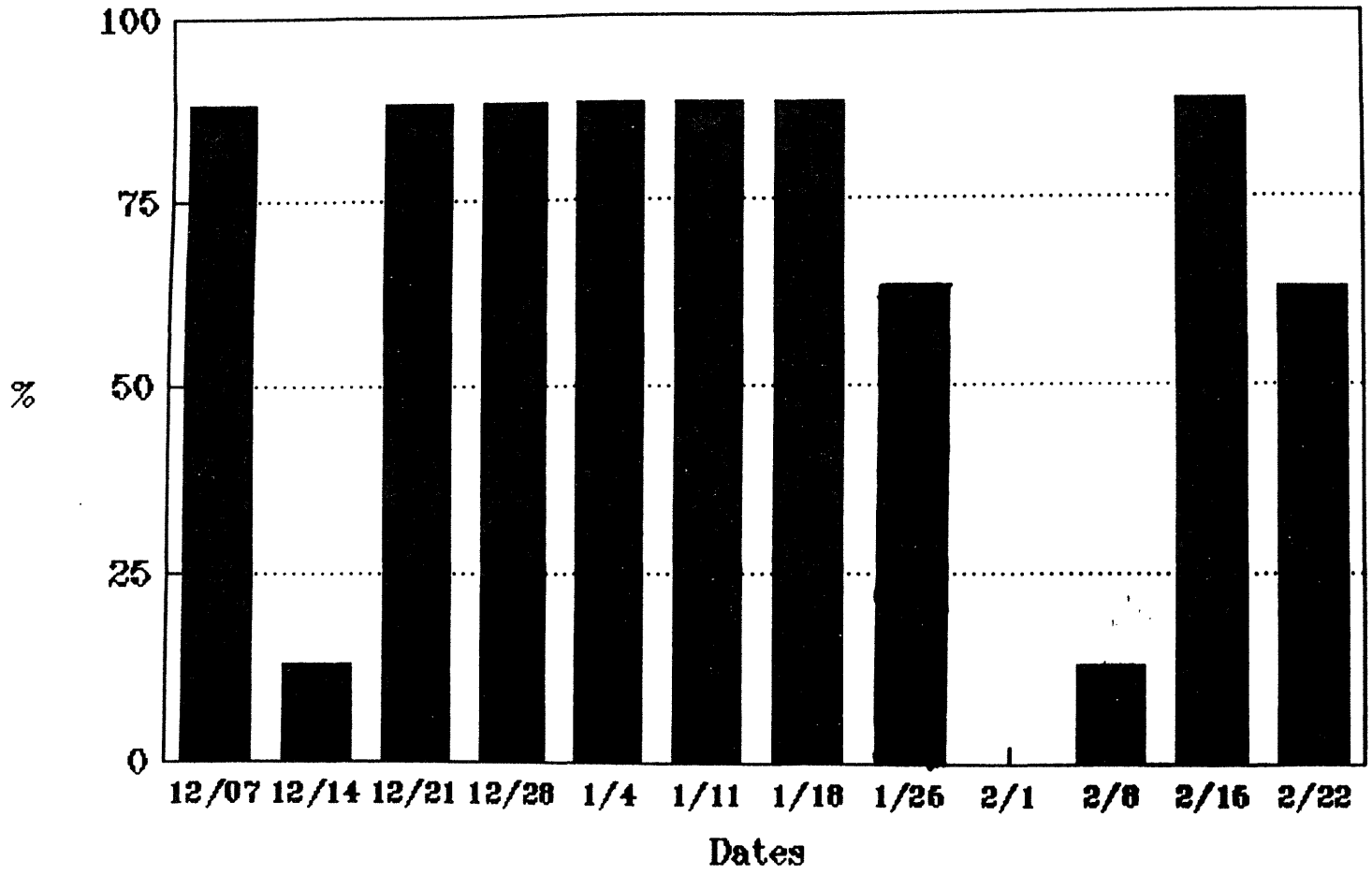
MAXIMUM WIND SPEED
EAGLE WASH



88-89


MAX, MIN & MEAN NIGHT ROOST TEMP
ROCKPORT STATE PARK
TEMPERATURE
60
45
30
15
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
MAXIMUM
MINIMUM
MEAN
88-89

MAXIMUM CLOUD COVER (%)
ROCKPORT STATE PARK



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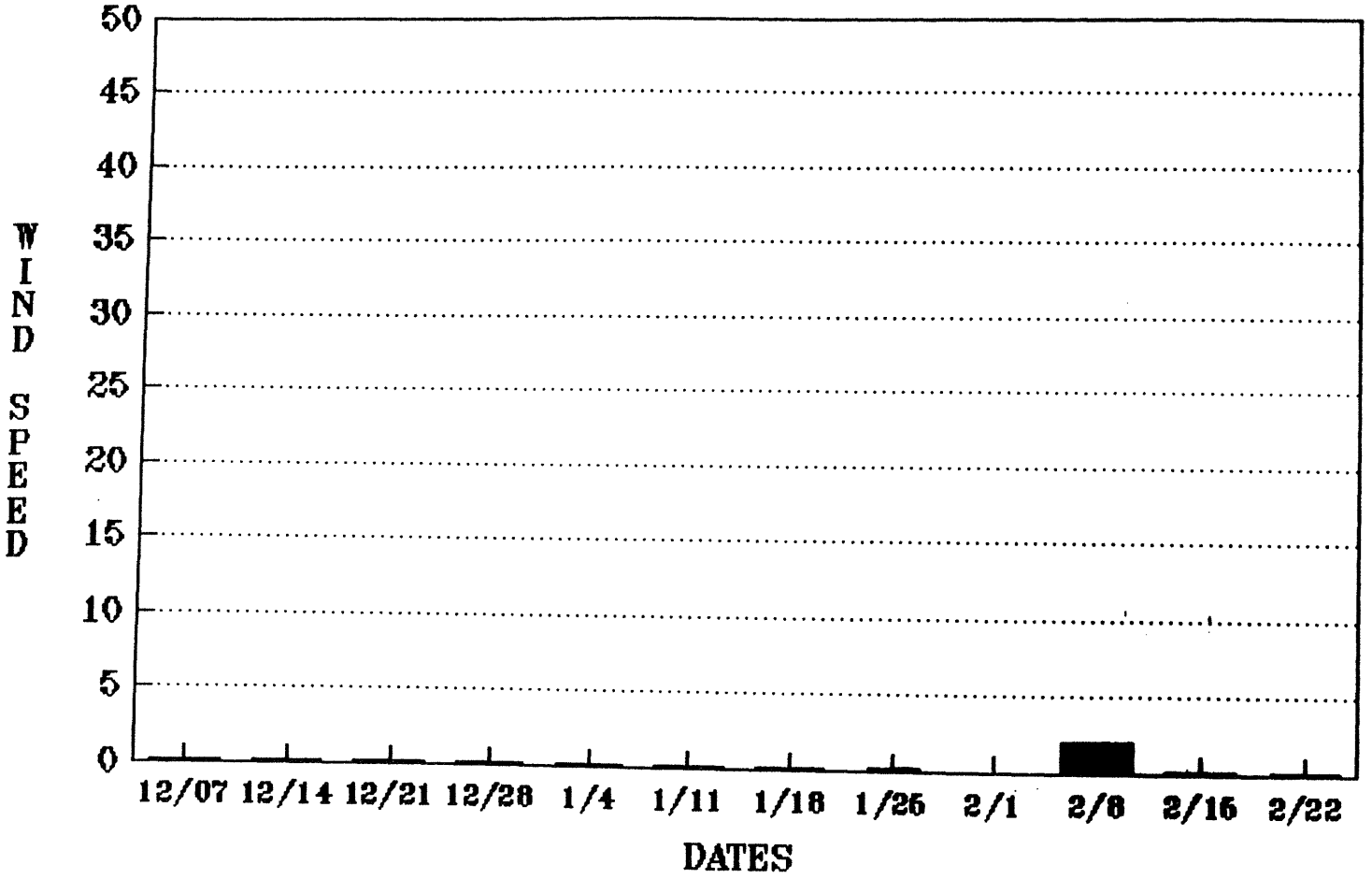
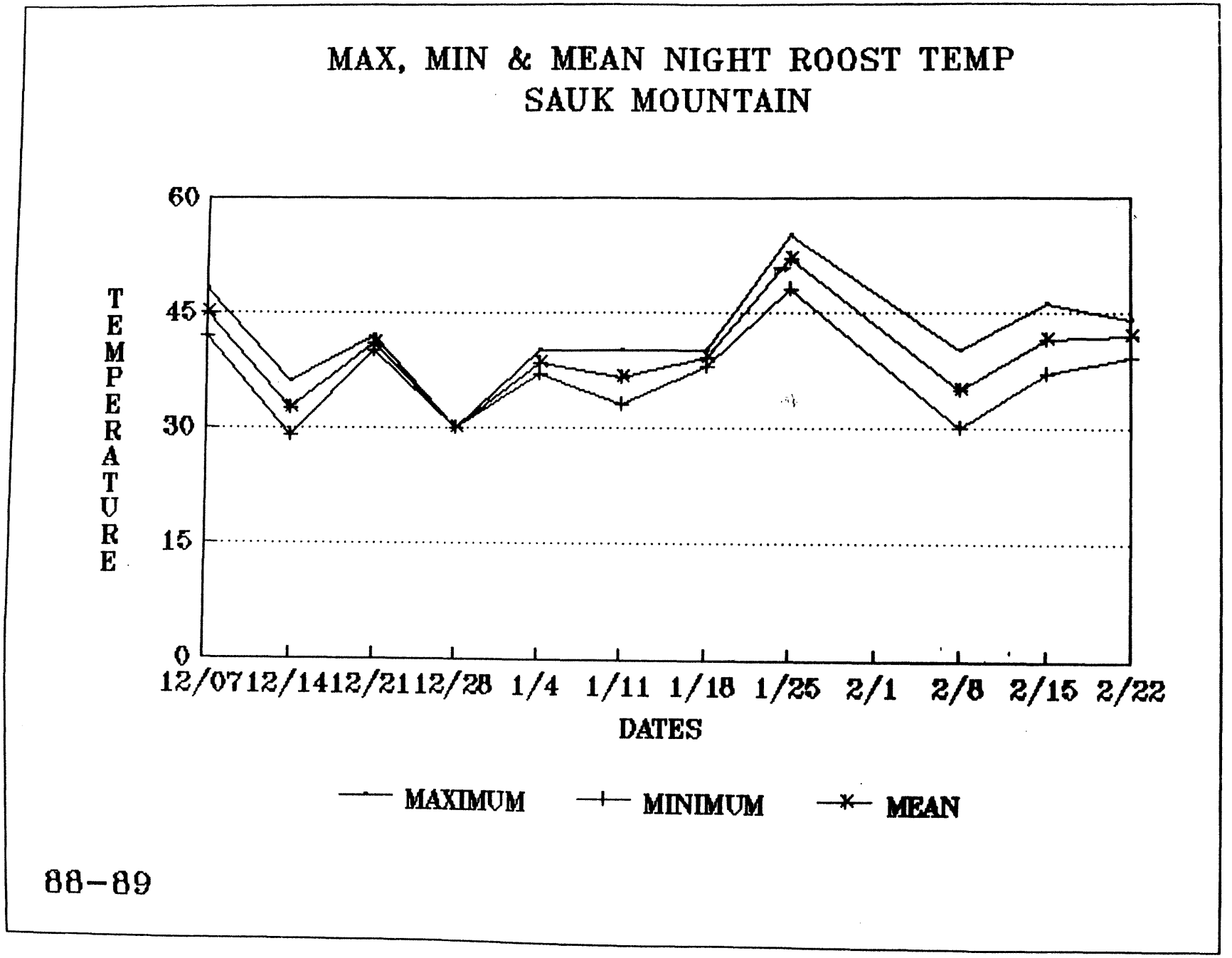
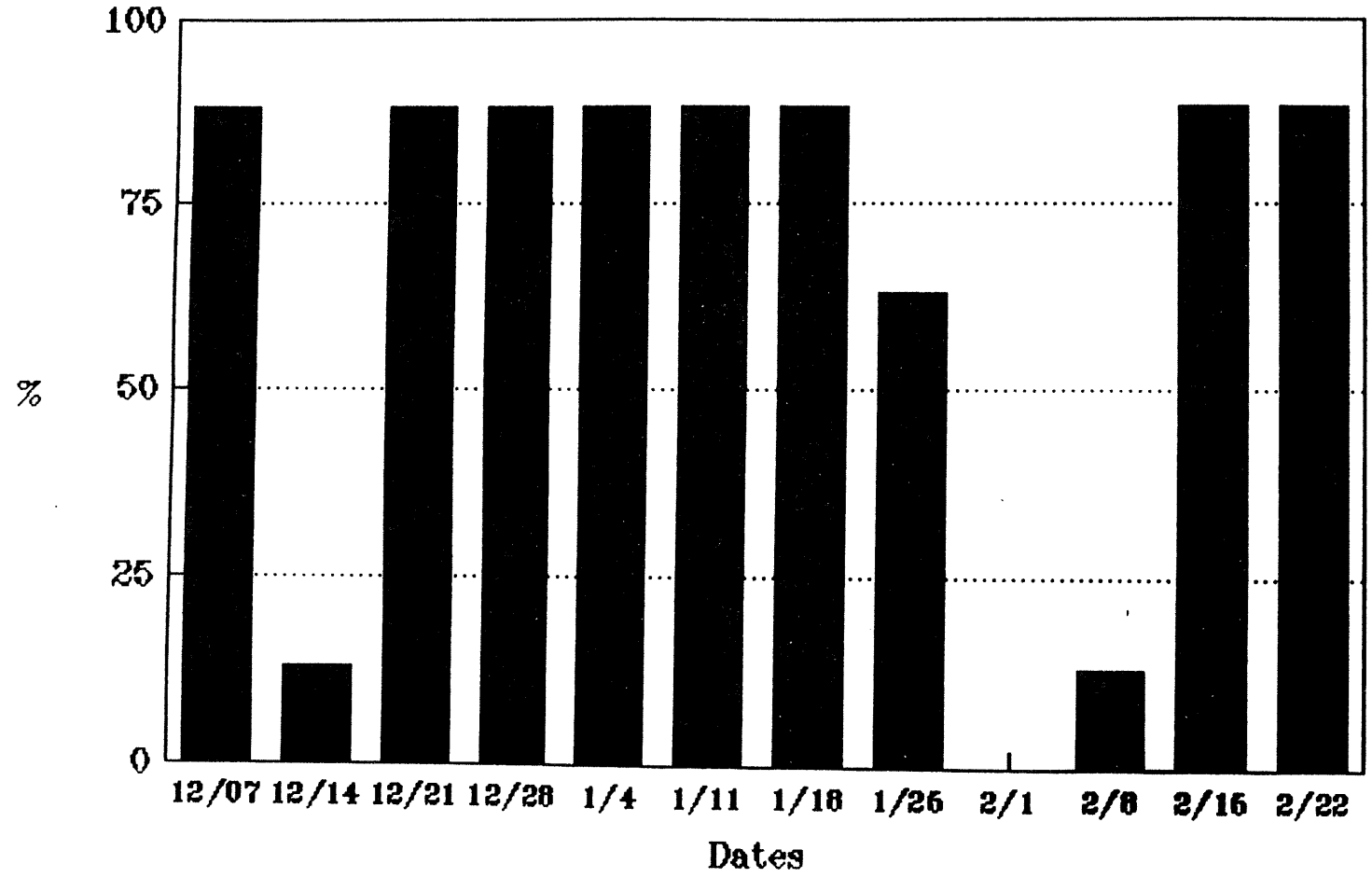
MAXIMUM WIND SPEED
ROCKPORT STATE PARK



88-89


MAX, MIN & MEAN NIGHT ROOST TEMP
SAUK MOUNTAIN
TEMPERATURE
60
45
30
15
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
MAXIMUM
MINIMUM
MEAN
88-89

MAXIMUM CLOUD COVER (%)
SAUK MOUNTAIN



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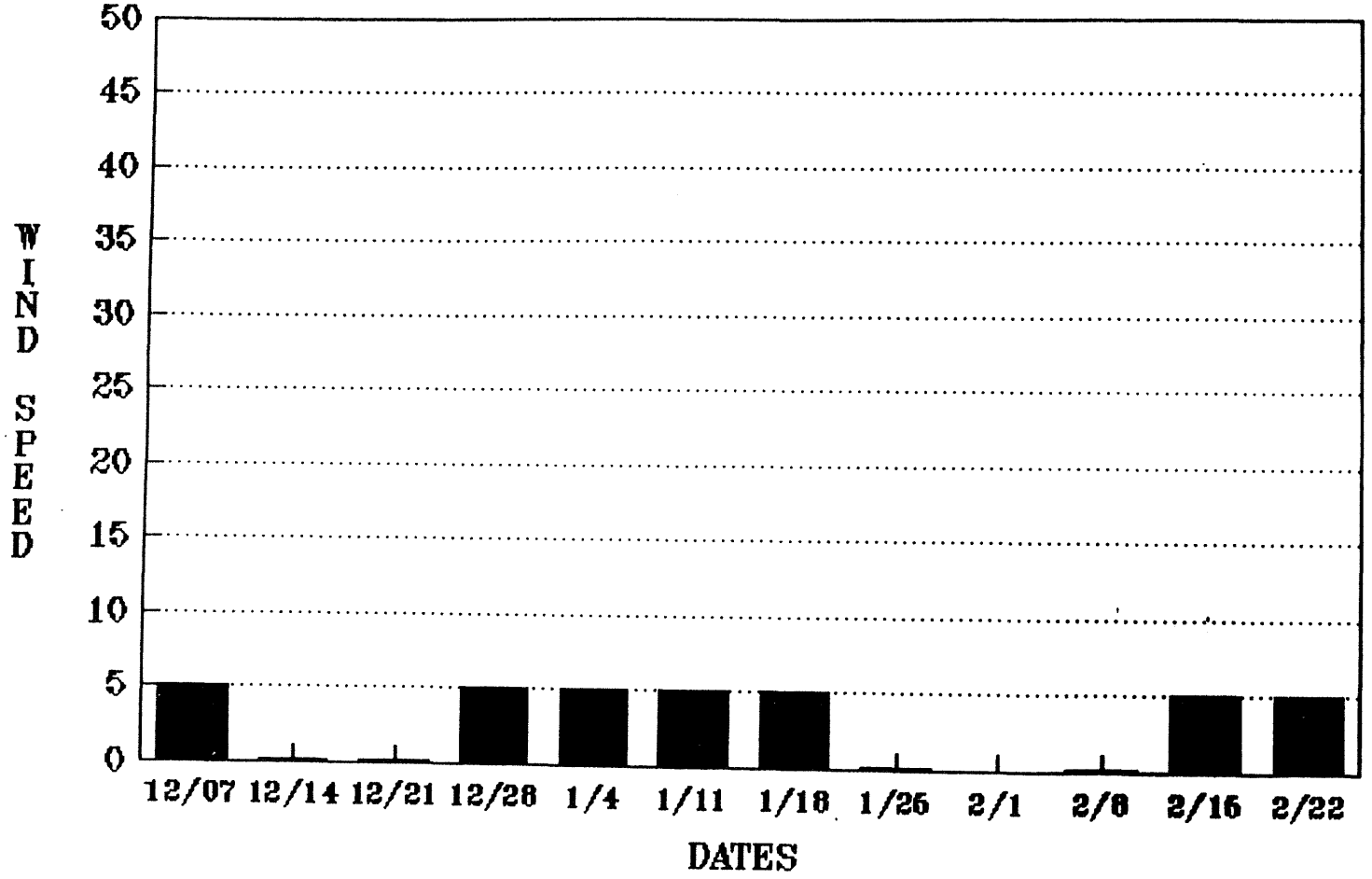
MAXIMUM WIND SPEED
SAUK MOUNTAIN



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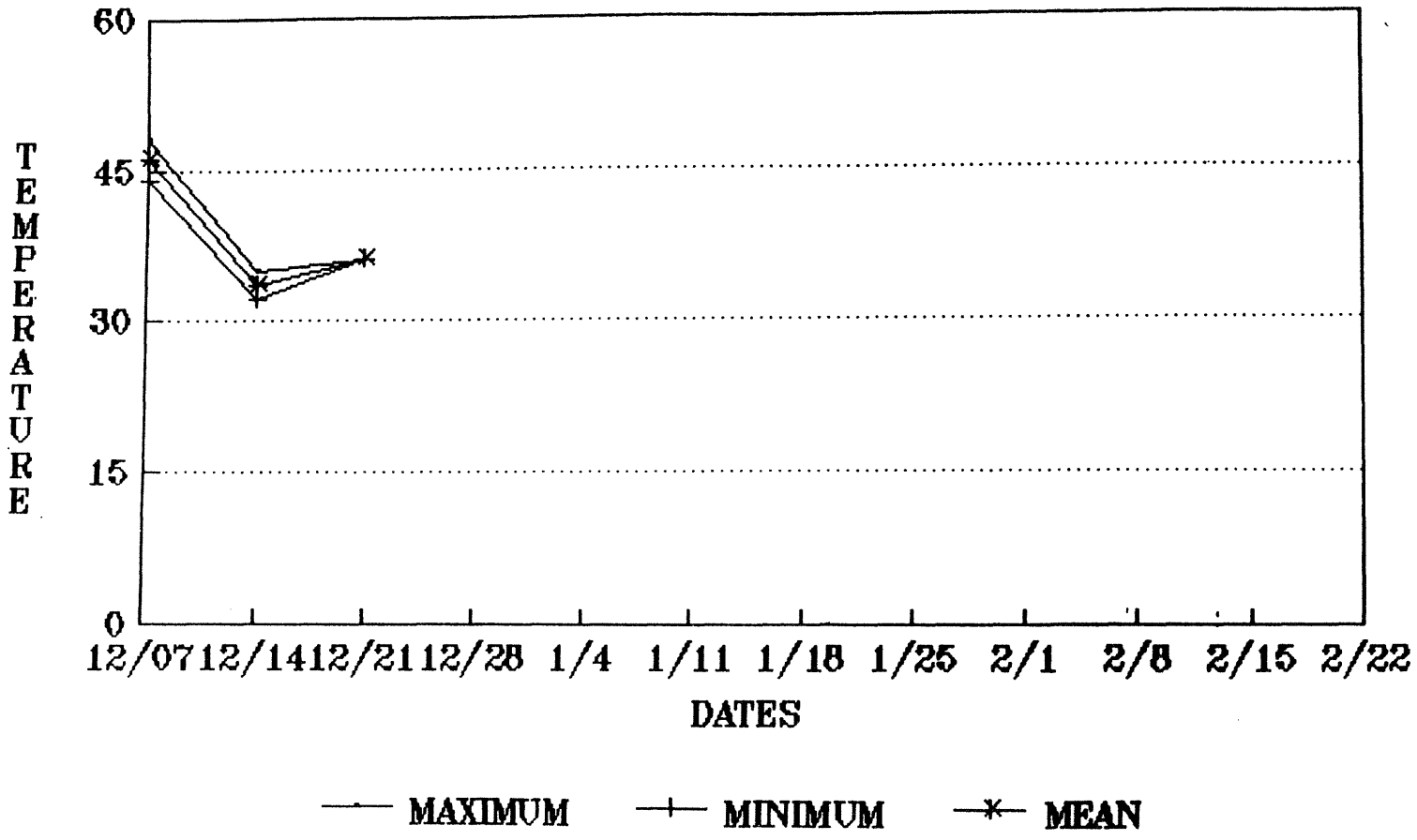
MAX, MIN & MEAN NIGHT ROOST TEMP
BIG EDDY



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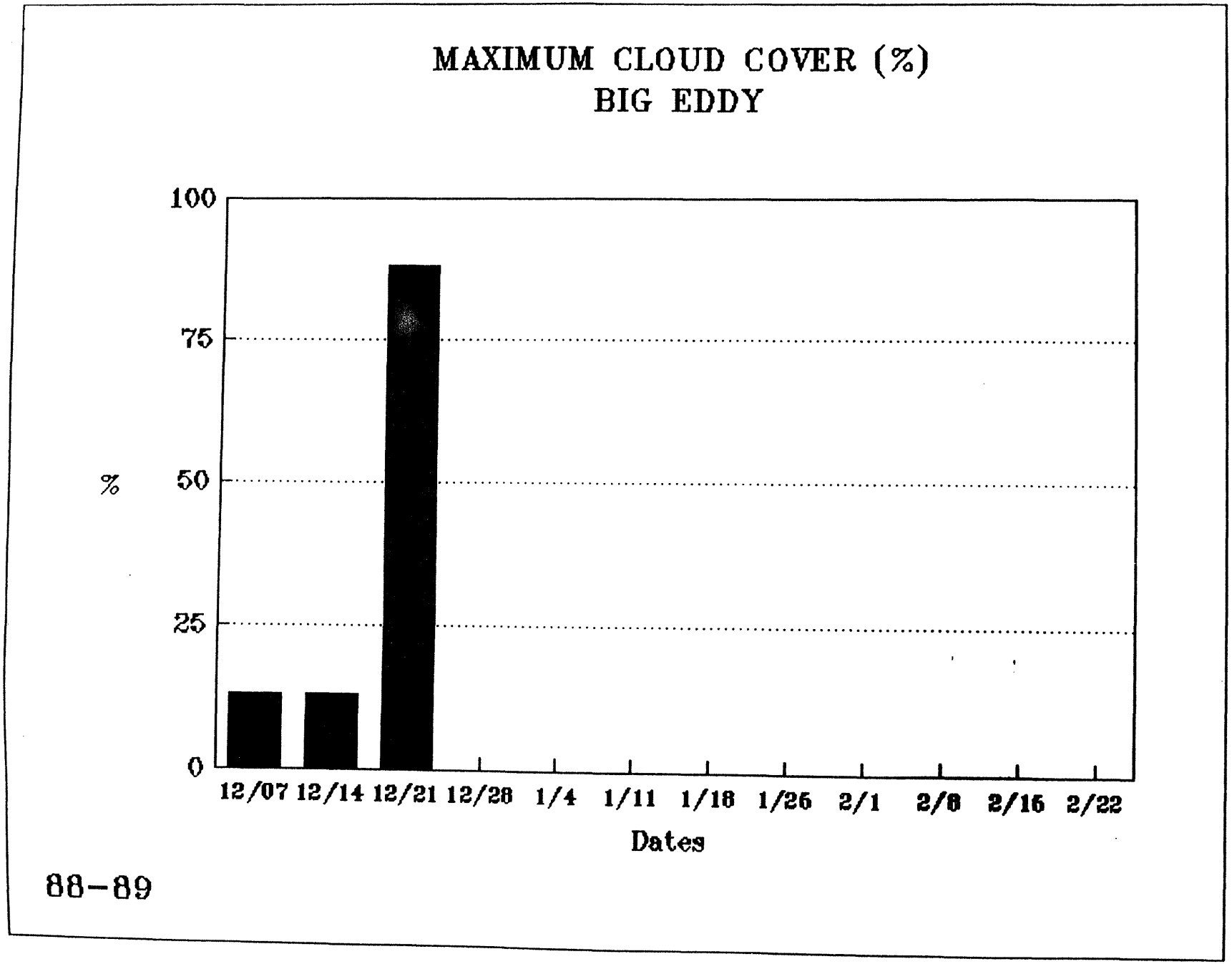
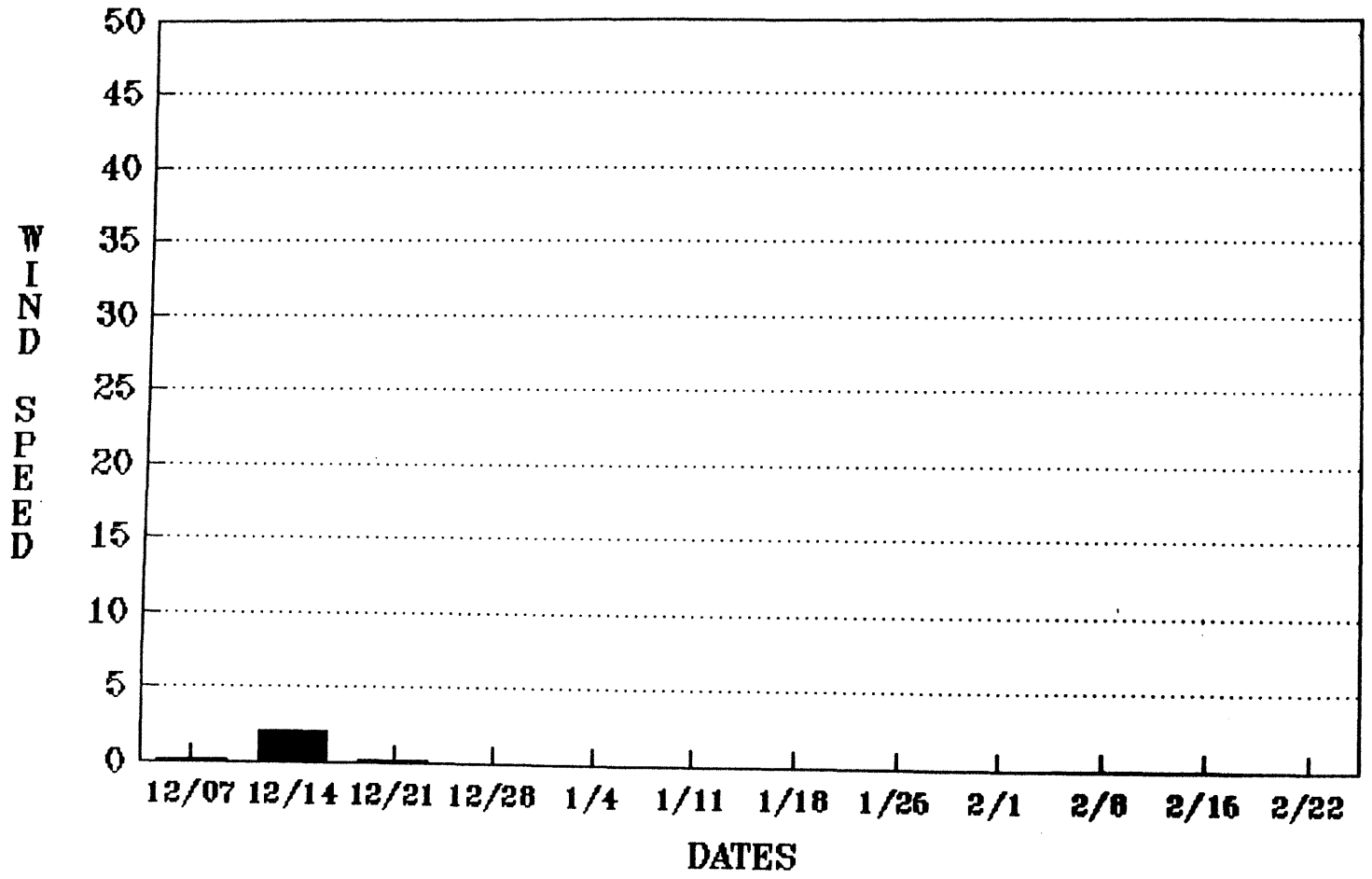
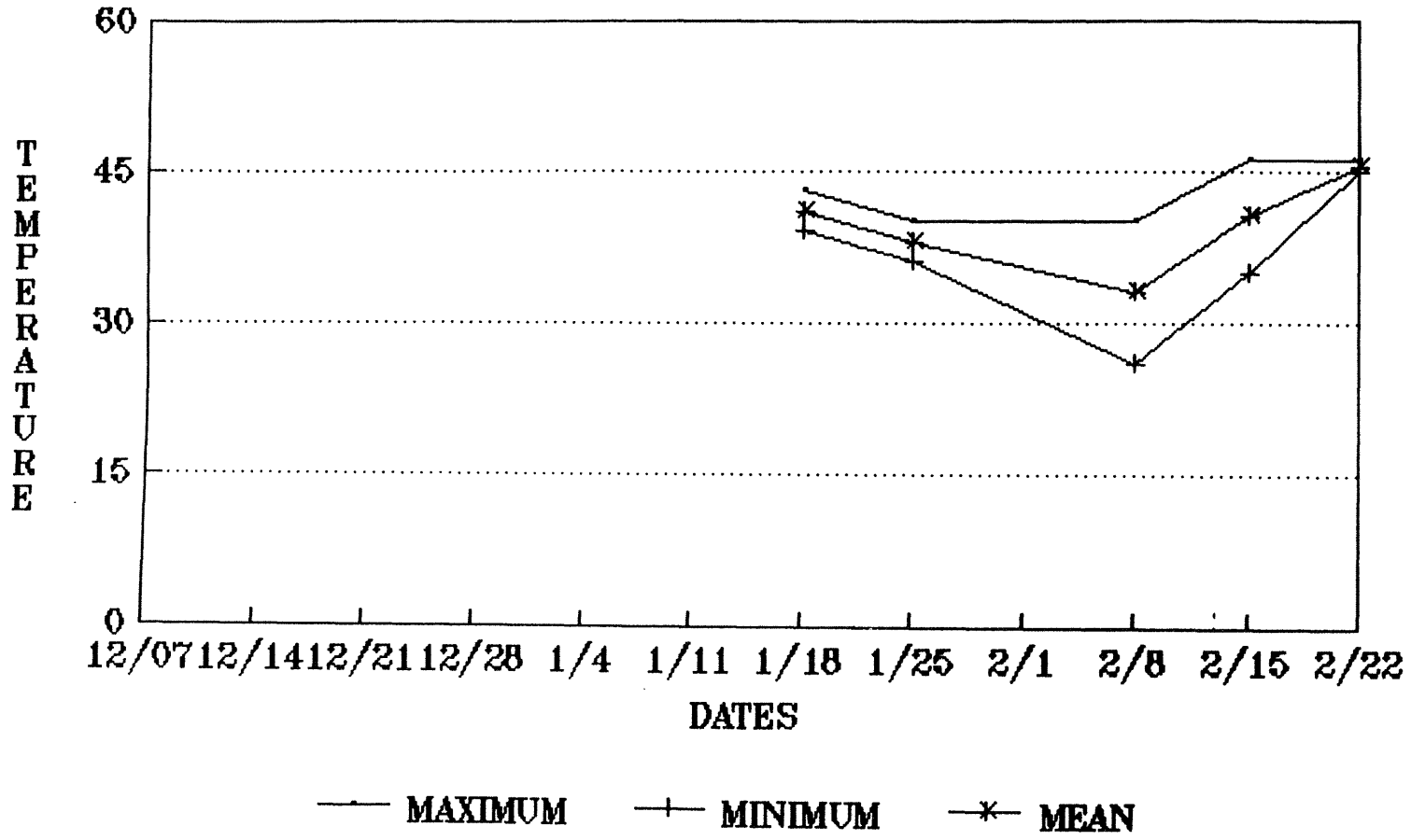

MAXIMUM CLOUD COVER (%)
BIG EDDY
100
75
50
25
0
%
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
Dates
88-89

MAXIMUM WIND SPEED
BIG EDDY



88-89

MAX, MIN & MEAN NIGHT ROOST TEMP
O'TOOLE CR.



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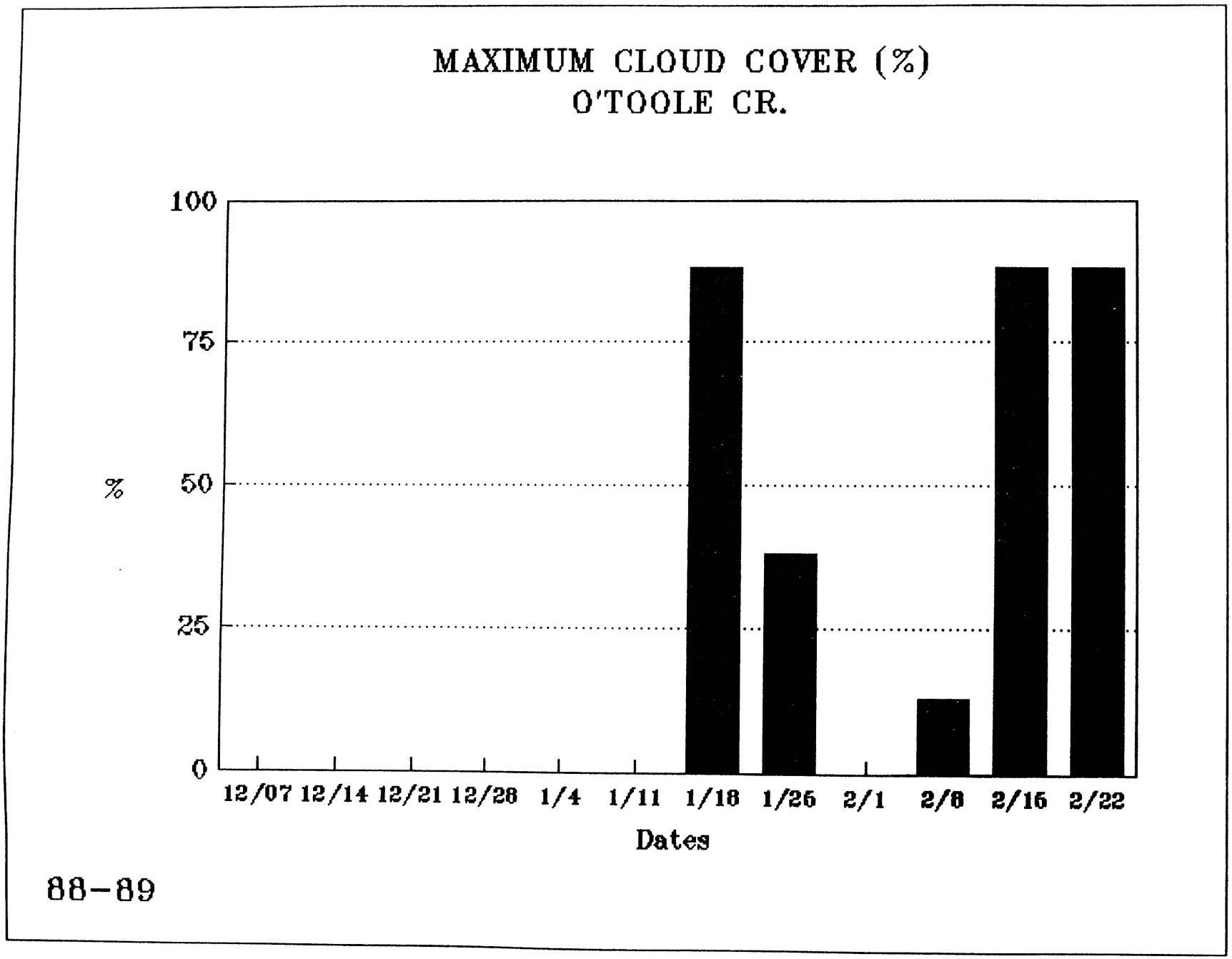
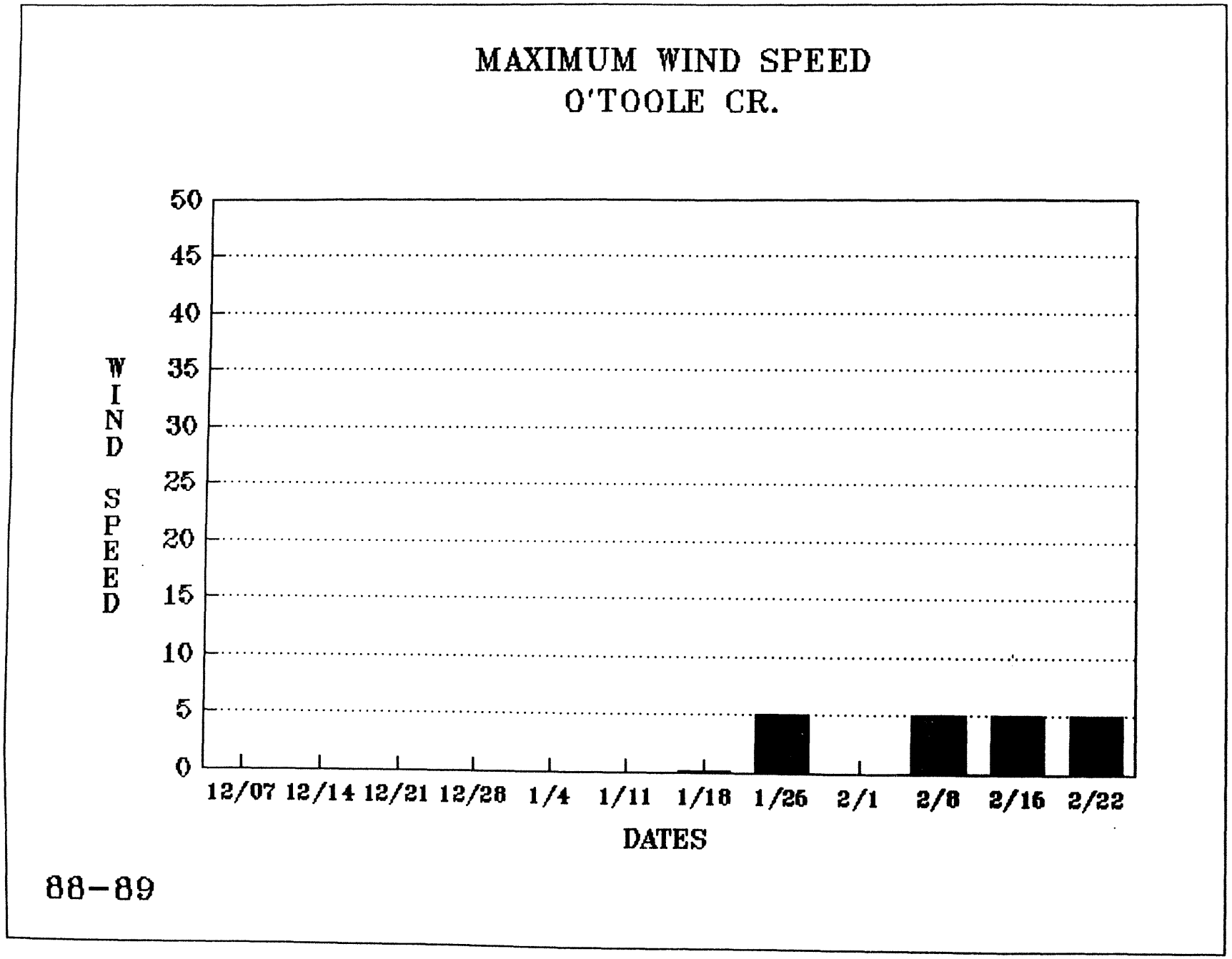
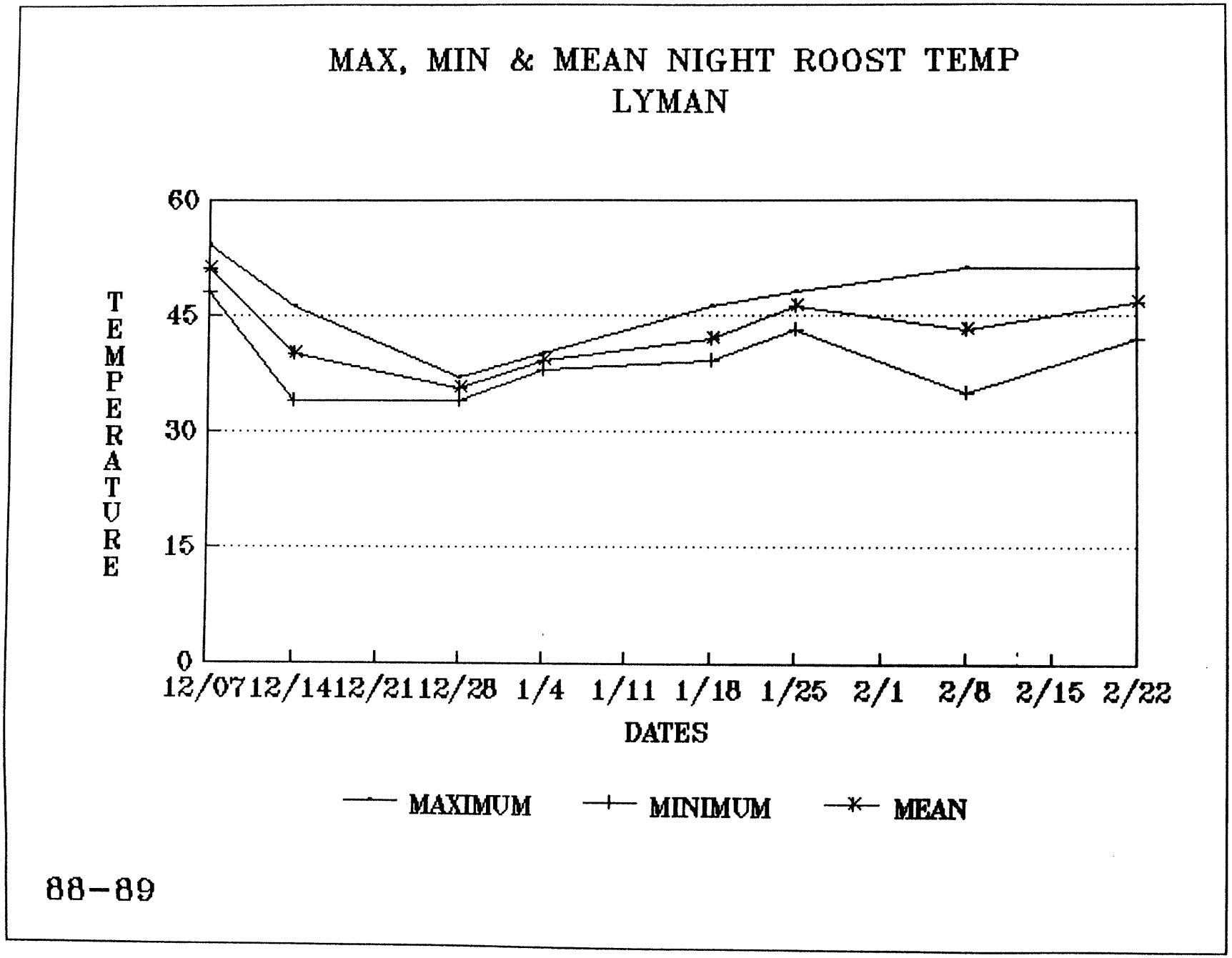
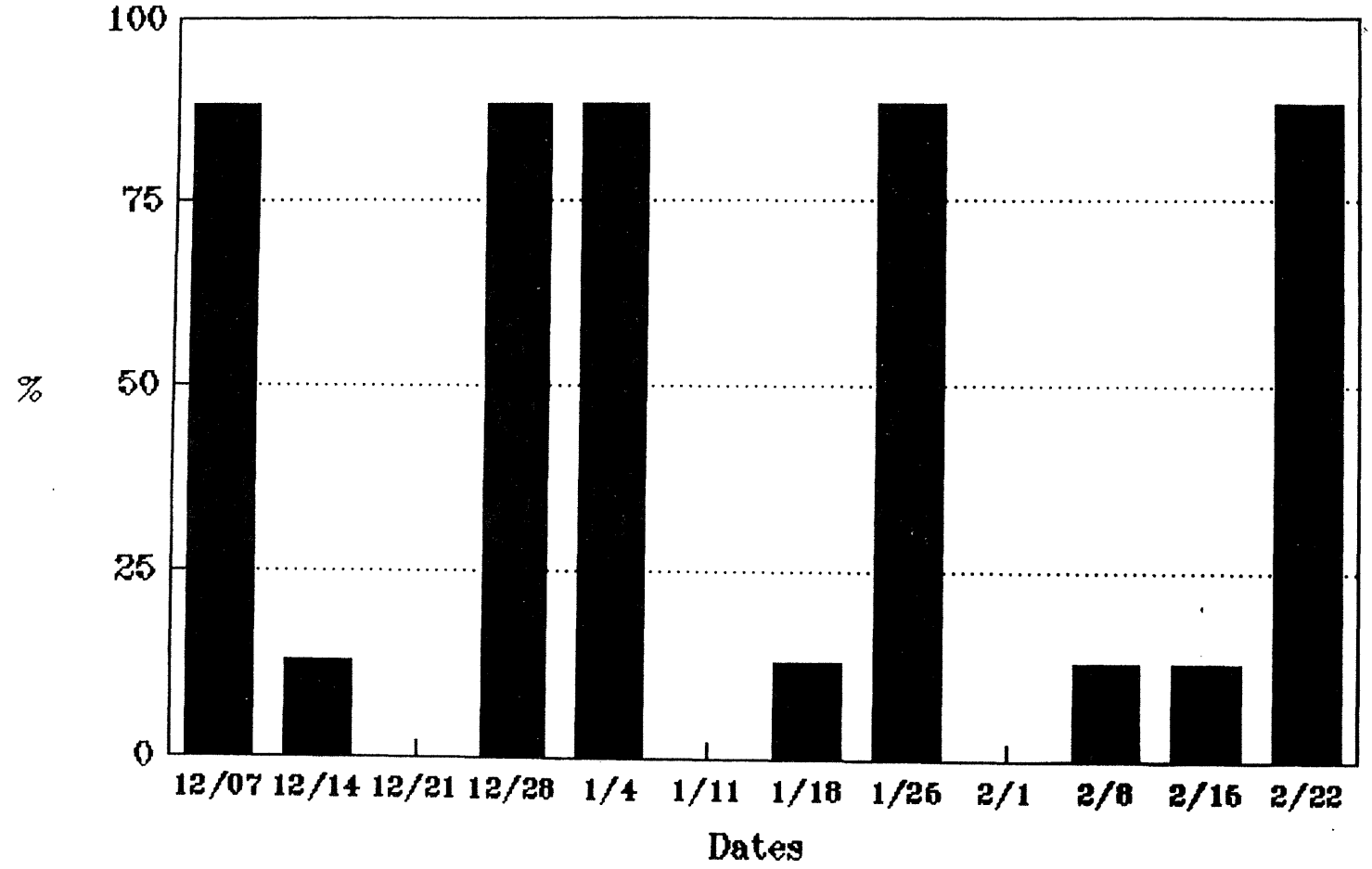

MAXIMUM CLOUD COVER (%)
O'TOOLE CR.
100
75
50
25
0
%
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
Dates
88-89


MAXIMUM WIND SPEED
O'TOOLE CR.
WIND SPEED
50
45
40
35
30
25
20
15
10
5
0
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
DATES
88-89


MAX, MIN & MEAN NIGHT ROOST TEMP
LYMAN
TEMPERATURE
60
45
30
15
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
MAXIMUM
MINIMUM
MEAN
88-89

MAXIMUM CLOUD COVER (%)
LYMAN



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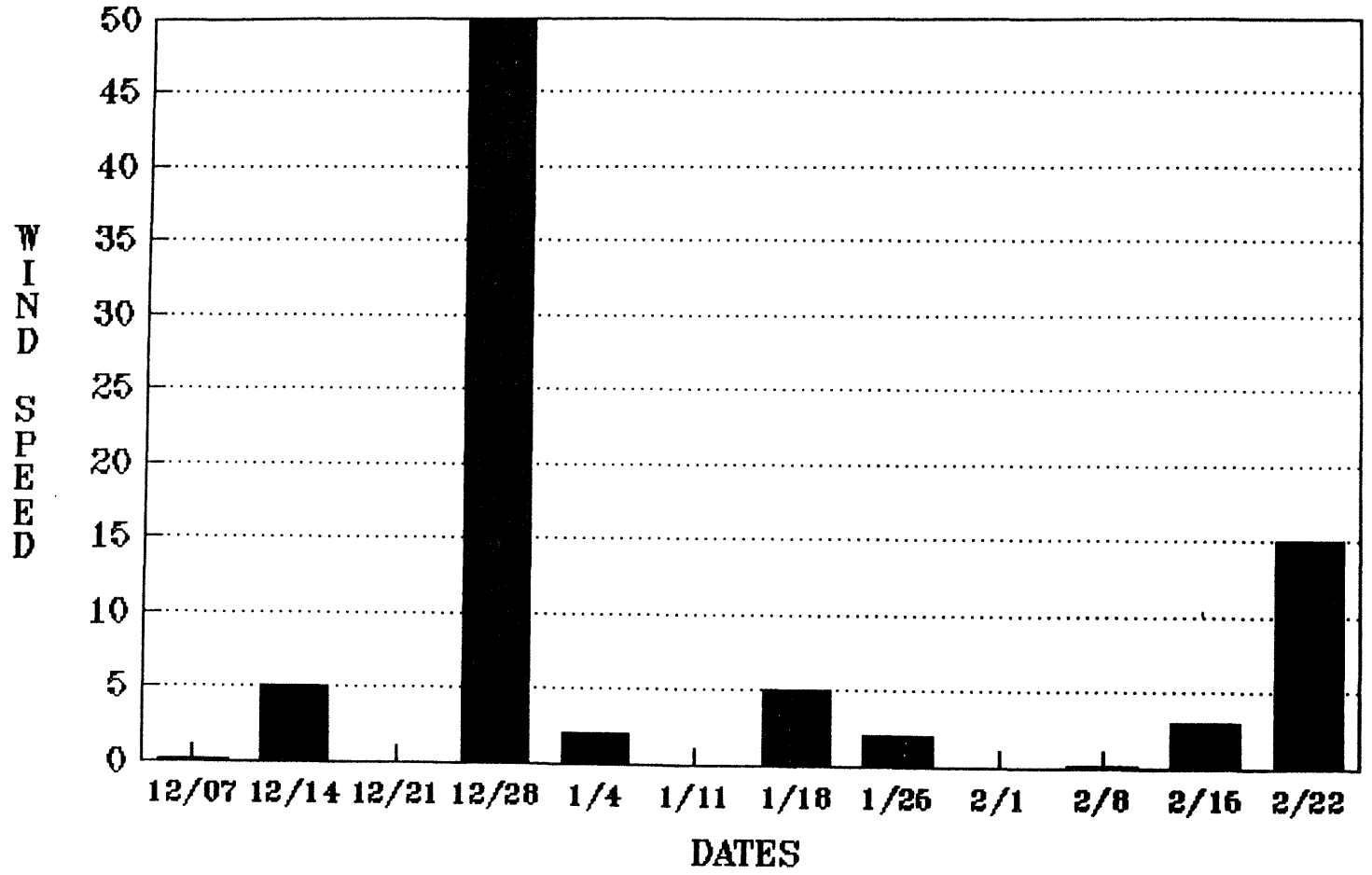
MAXIMUM WIND SPEED
LYMAN



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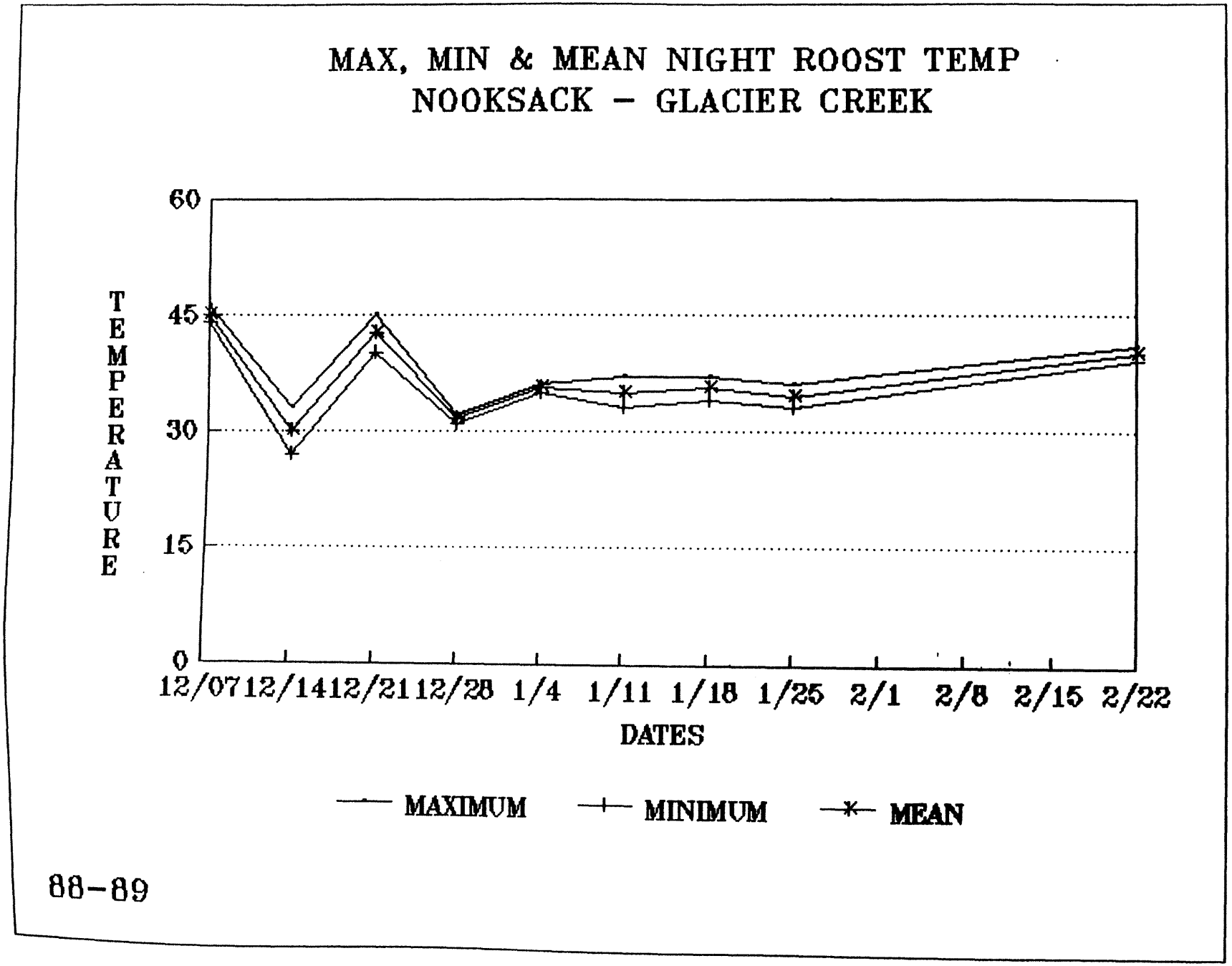
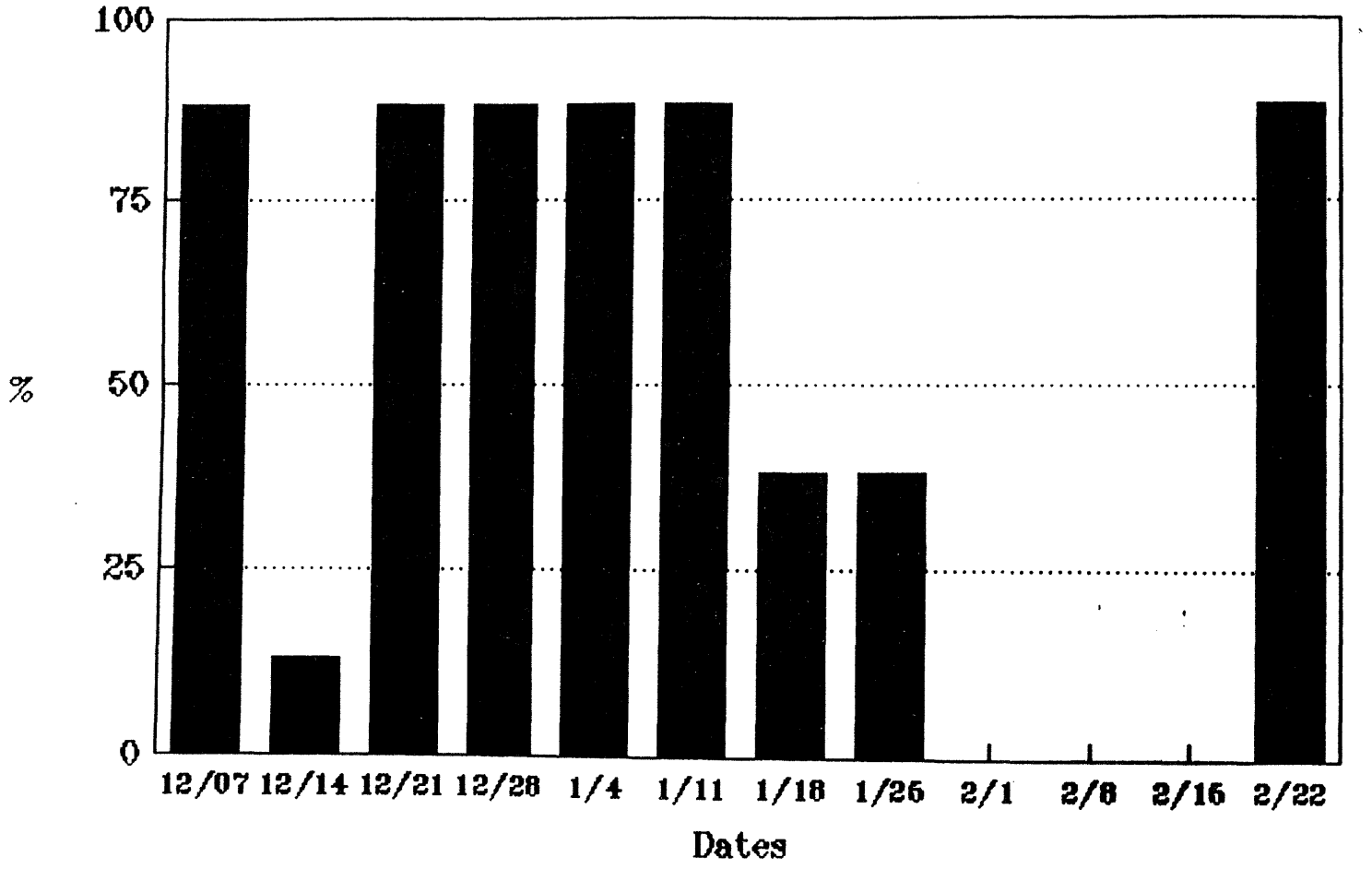

MAX, MIN & MEAN NIGHT ROOST TEMP
NOOKSACK – GLACIER CREEK
TEMPERATURE
60
45
30
15
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
MAXIMUM
MINIMUM
MEAN
88-89

MAXIMUM CLOUD COVER (%)
NOOKSACK - GLACIER CREEK



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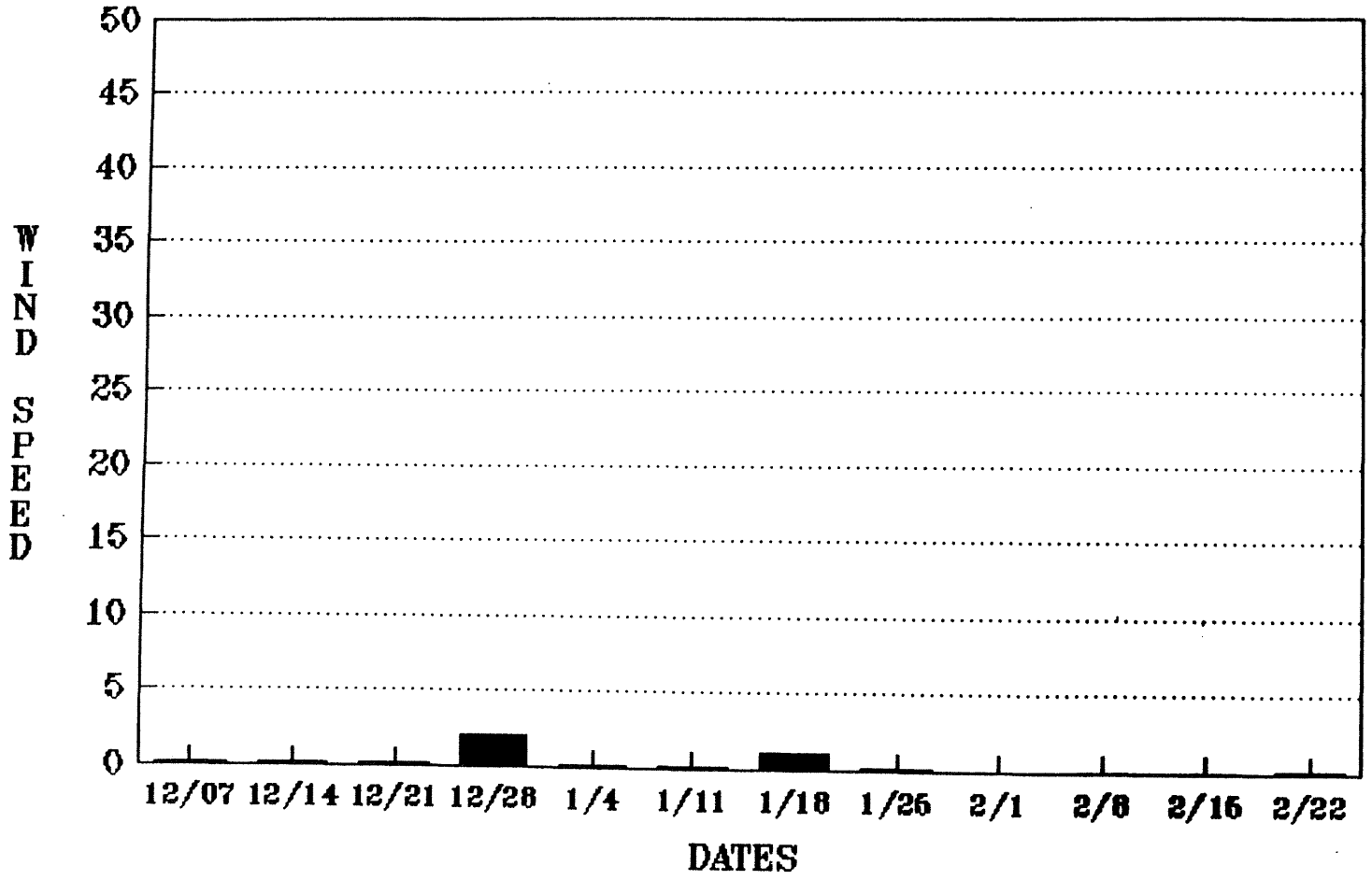
MAXIMUM WIND SPEED
NOOKSACK - GLACIER CREEK



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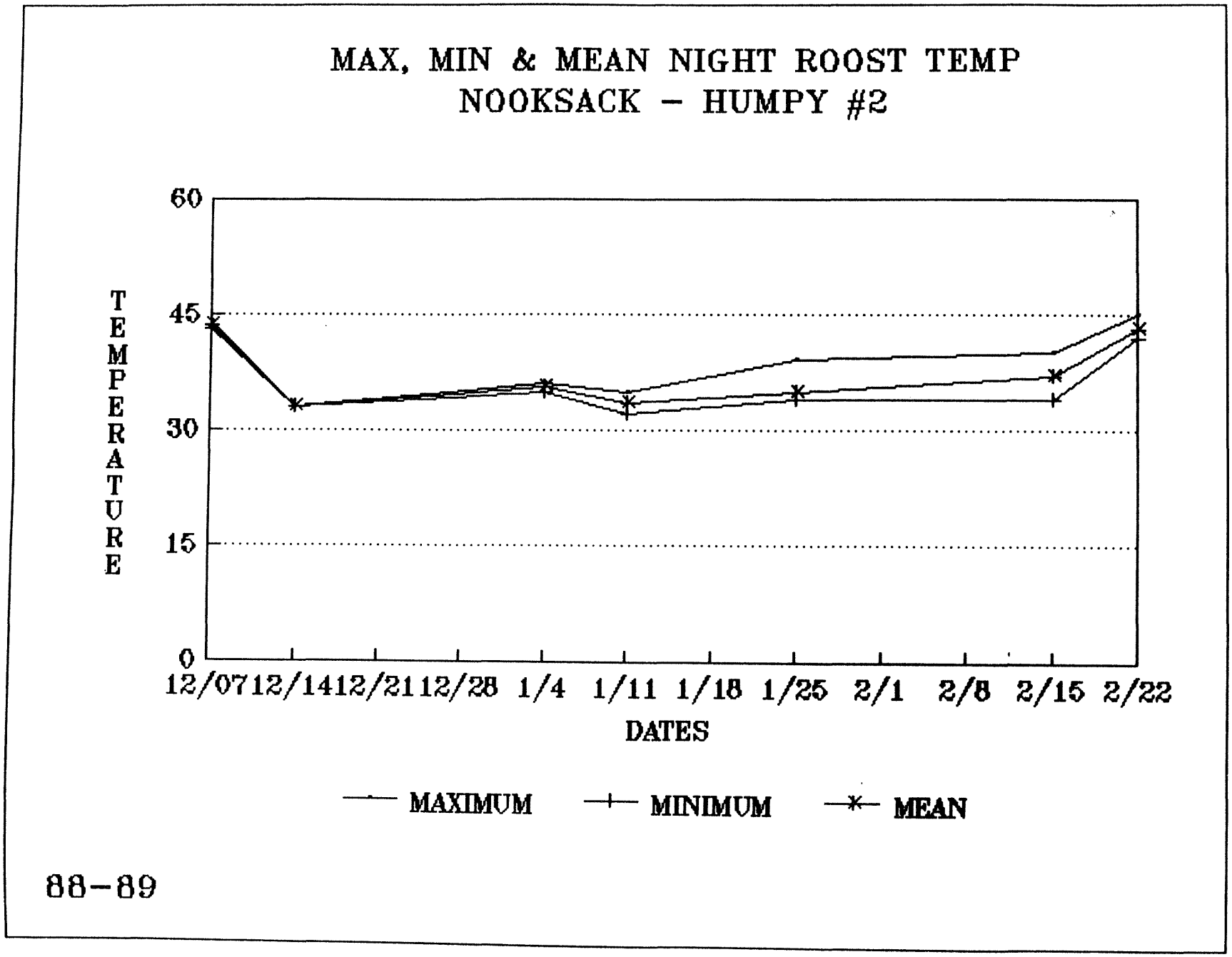
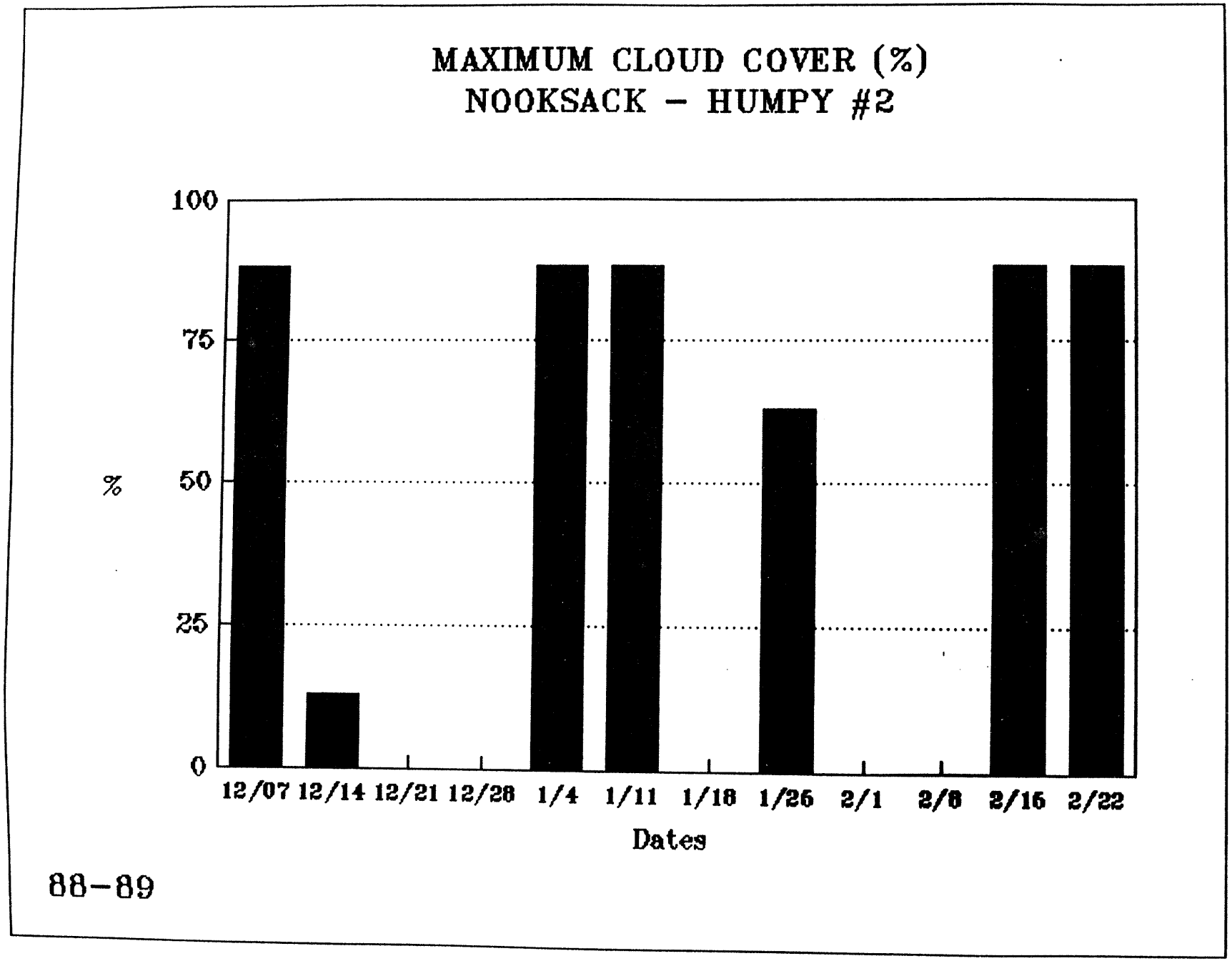
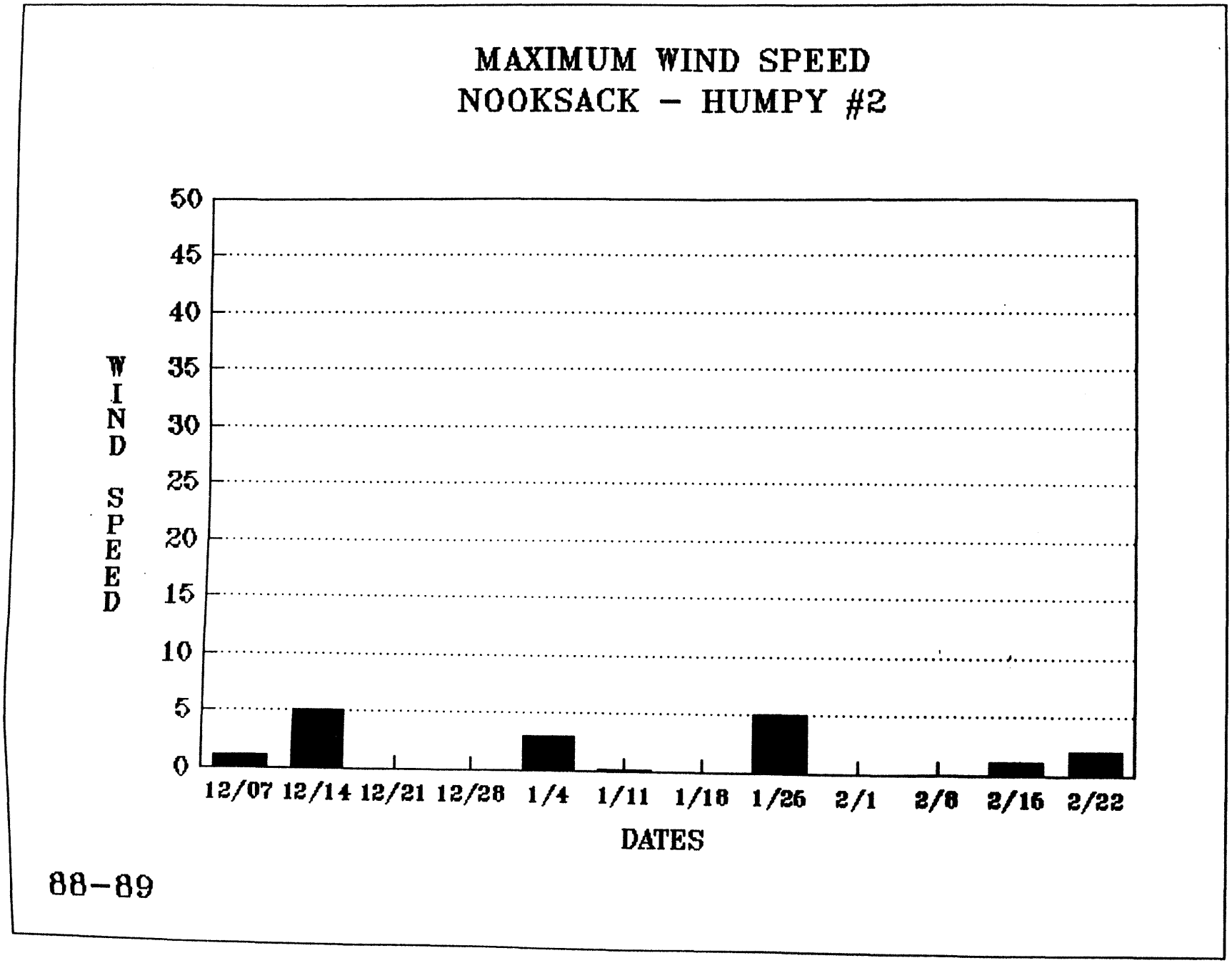
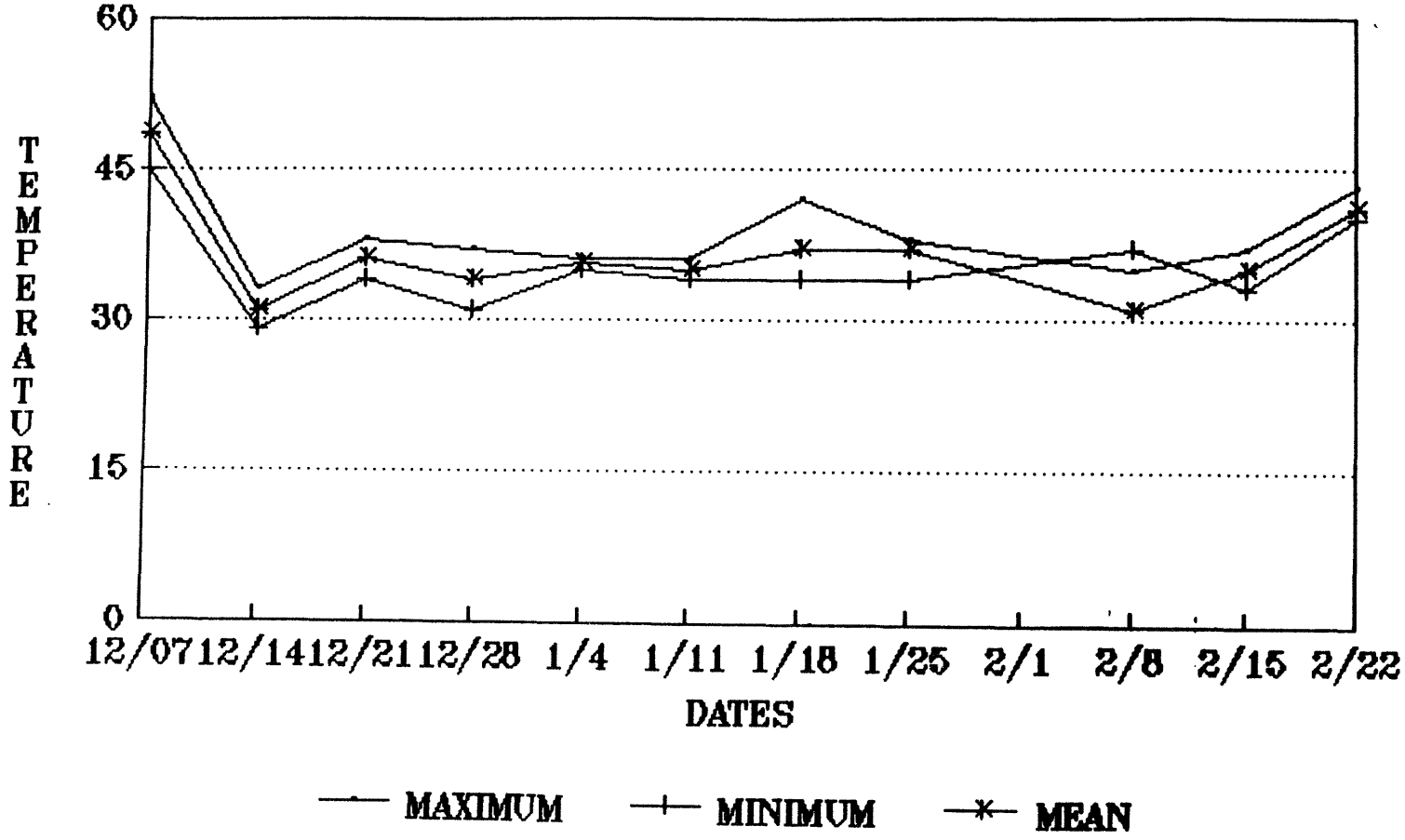

MAX, MIN & MEAN NIGHT ROOST TEMP
NOOKSACK - HUMPY #2
TEMPERATURE
60
45
30
15
0
12/07 12/14 12/21 12/28 1/4 1/11 1/18 1/25 2/1 2/8 2/15 2/22
DATES
MAXIMUM
MINIMUM
MEAN
88-89


MAXIMUM CLOUD COVER (%)
NOOKSACK - HUMPY #2
100
75
50
25
0
%
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
Dates
88-89


MAXIMUM WIND SPEED
NOOKSACK - HUMPY #2
WIND SPEED
50
45
40
35
30
25
20
15
10
5
0
12/07
12/14
12/21
12/28
1/4
1/11
1/18
1/25
2/1
2/8
2/15
2/22
DATES
88-89

MAX, MIN & MEAN NIGHT ROOST TEMP
NOOKSACK – FOSTER'S



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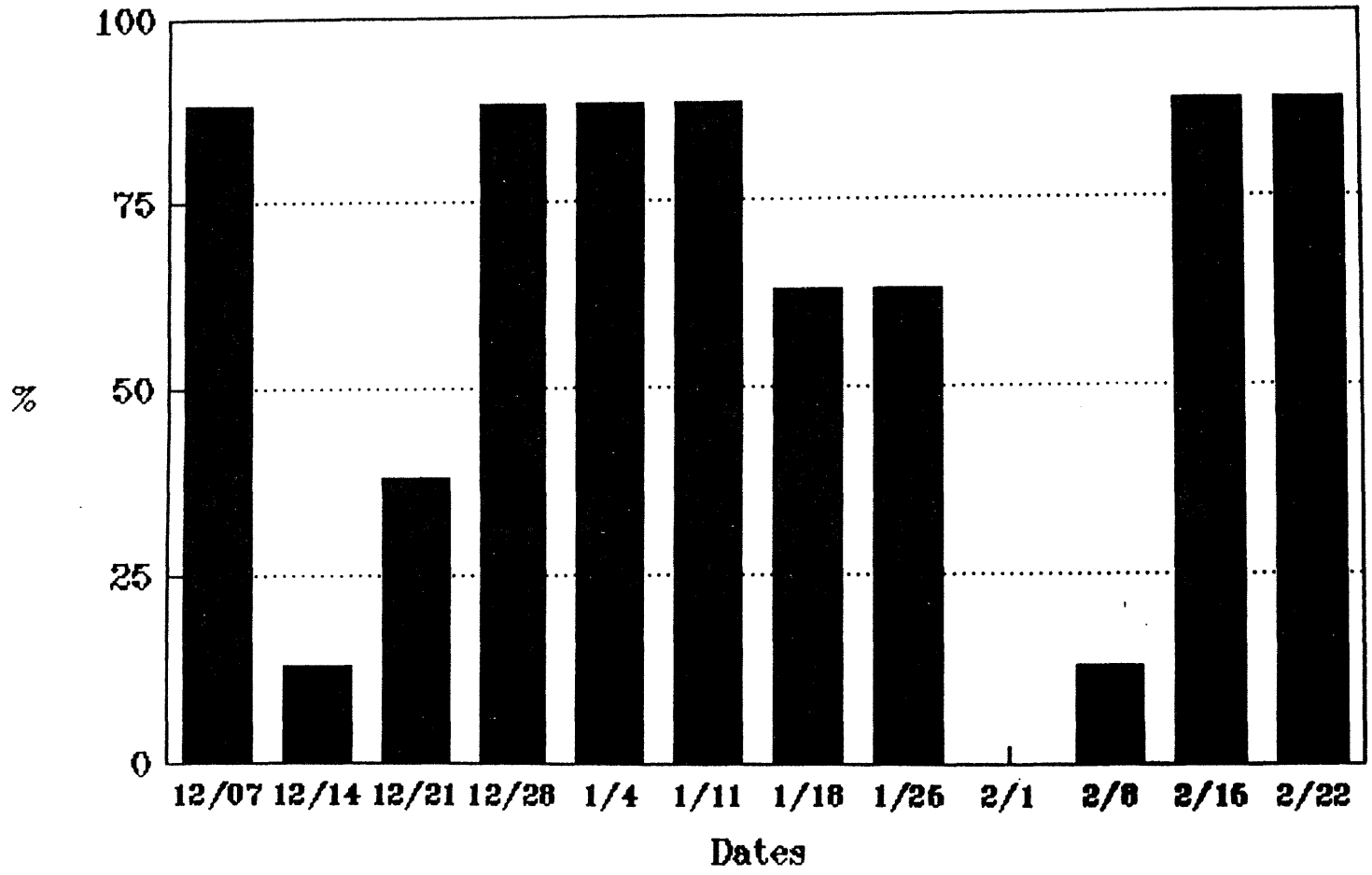
MAXIMUM CLOUD COVER (%)
NOOKSACK - FOSTER'S



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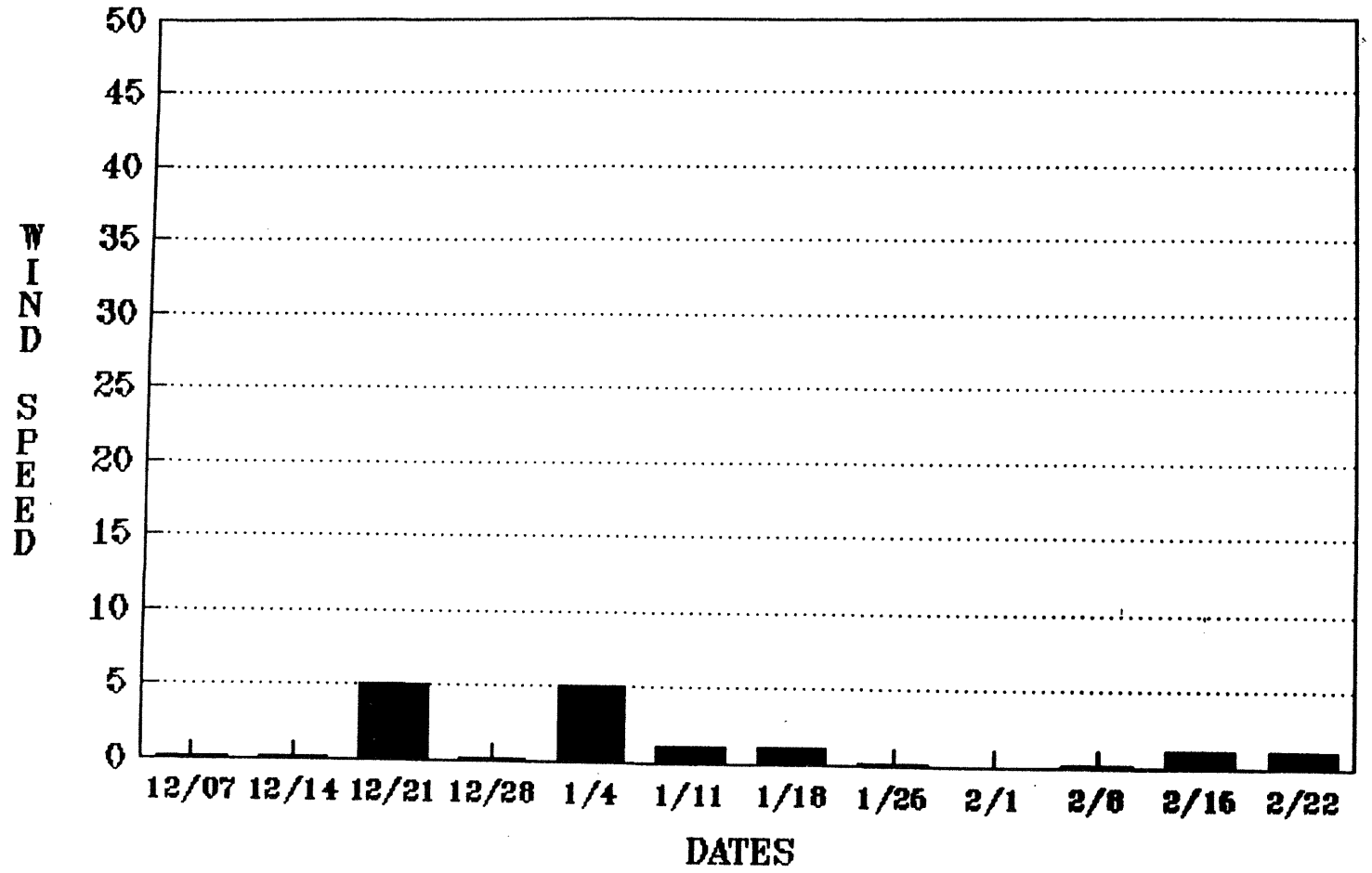
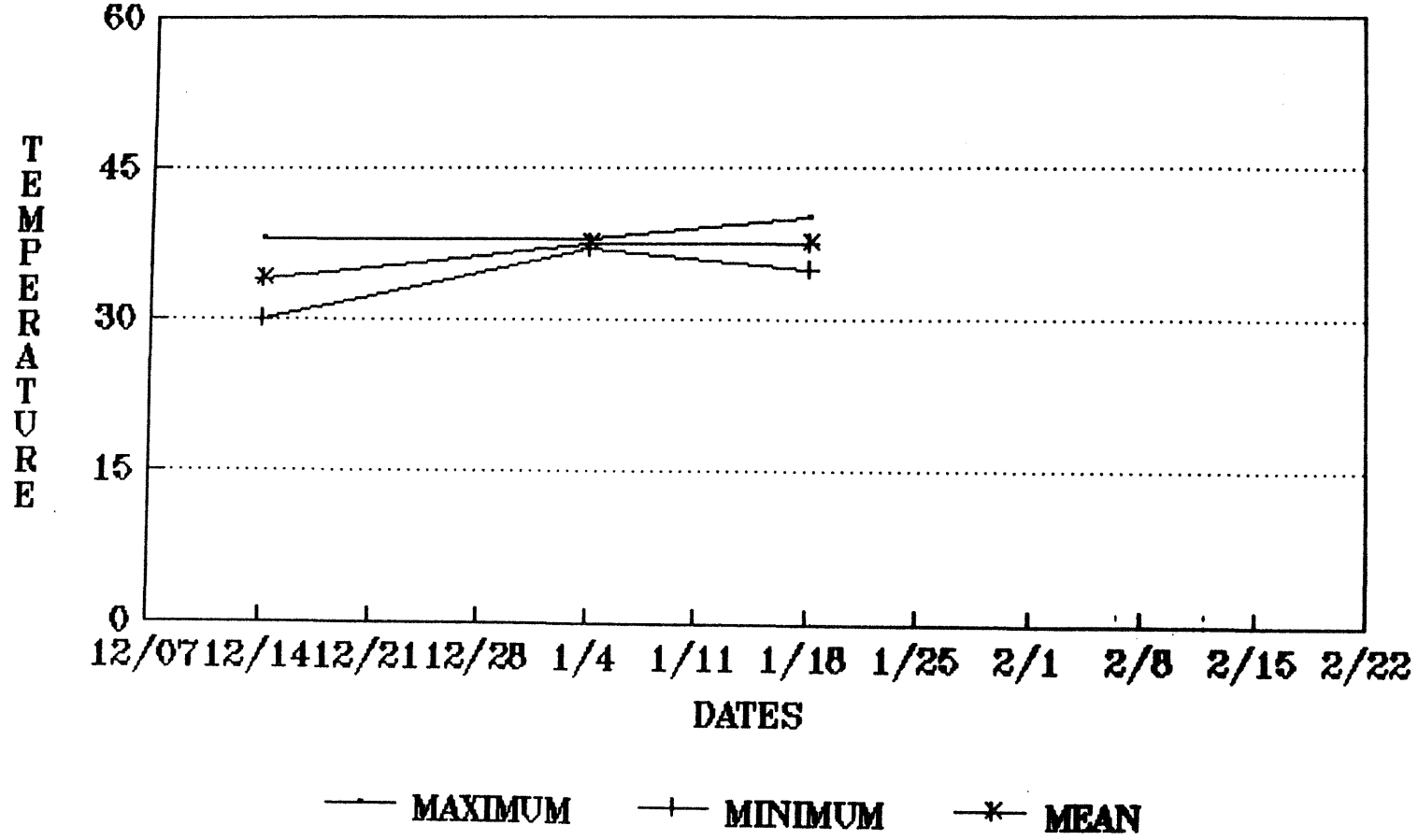
MAXIMUM WIND SPEED
NOOKSACK - FOSTER'S



88-89

MAX, MIN & MEAN NIGHT ROOST TEMP
NOOKSACK – WARNICK BRIDGE



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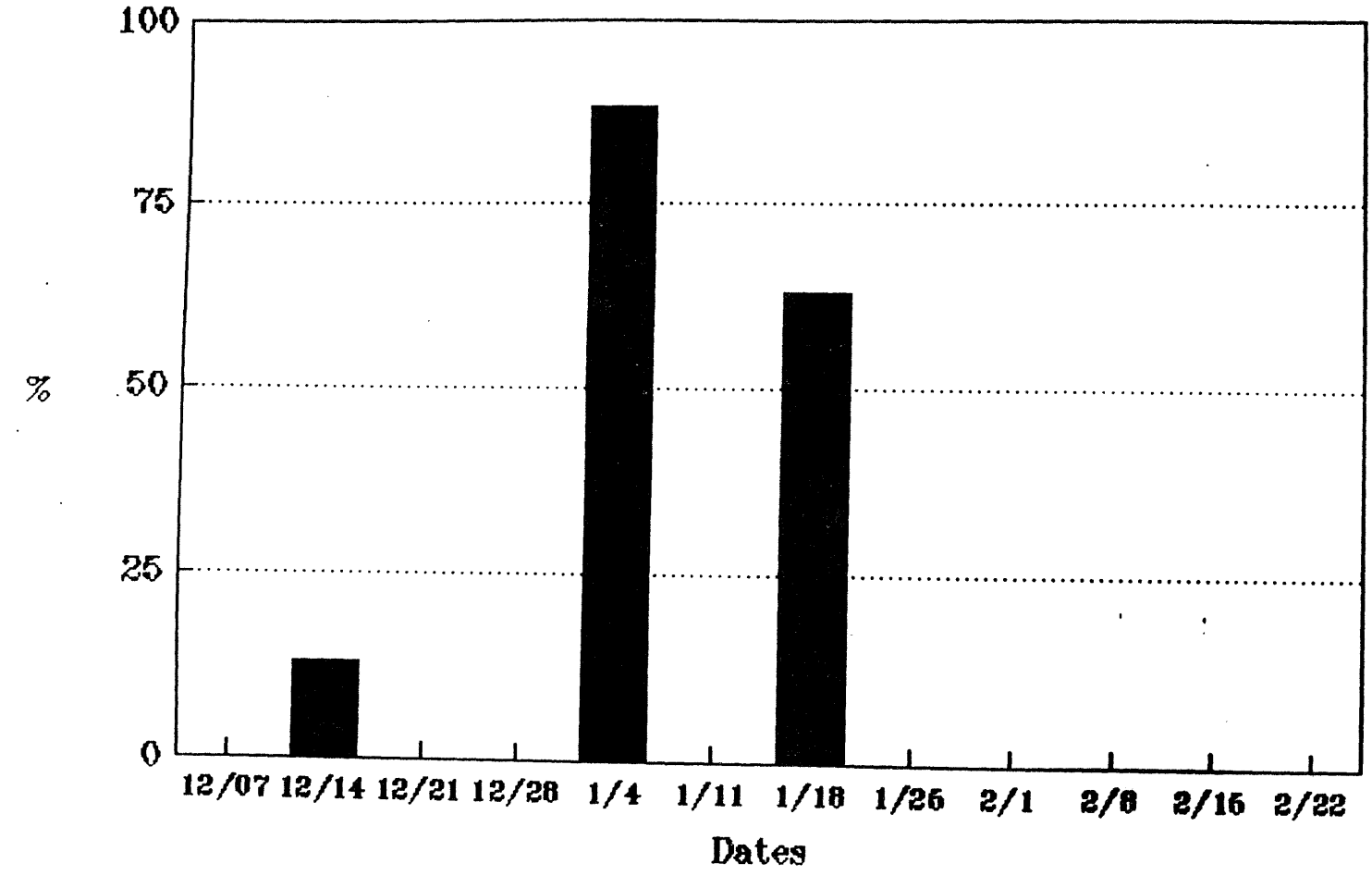
MAXIMUM CLOUD COVER (%)
NOOKSACK - WARNICK BRIDGE



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