Galveston Beach Nourishment Project: Post-monitoring

Beach and Nearshore Surveys

Prepared for the Park Board of Trustees of the City of Galveston

by

Jose H. Vazquez

MASE Department

Texas A&M University - Galveston

200 Seawolf Pkwy

Galveston TX, 77553-1675

August 1996

TABLE OF CONTENTS

Executive Summary

This report summarizes the results from the post-fill surveys at Galveston Beach and is written in partial fulfillment of the surface lease between the City of Galveston and the Texas General Land Office, SL940015. The main purpose of the report is to quantitatively asses the accretion/loss of sand on the newly nourished section of beach between 10th and 61st Street, and the adjacent areas east and west of the site.

The report begins by discussing the different methods available for the nearshore surveys. After careful review of the available methods, the "surveying sled" approach was selected for its accuracy and its independence from tidal effects.

The post-monitoring project established that two surveys be taken each year for three years after nourishment. The first survey took place in November 1995, and consisted only of beach profiles (i.e. profiles extending to the wading depth). The second survey, which included a nearshore survey, was to take place in April 1996. Several factors including unfavorable weather and damage to the surveying equipment caused the second survey to be delayed two months.

In this report, profiles are presented at four different stages of the project: (i) before nourishment (Winter 1994), (ii) immediately after fill (Summer 1995), (iii) Fall 1995, and (iv) Spring 1996. After comparing the beach profiles at the different phases of the project, the following assessments can be made:

1. As expected, larger sand losses are seen on those profiles which had the most fill.
2. Several profiles have almost returned to pre-nourishment levels.
3. For the most part, about 50-60% of the sand in the vicinity of the waterline still remains in place.
4. Profile changes between Winter 1995 and Spring 1996 are relatively small.
5. Although there has been a gain of material west of the nourished area, more significant gains are seen on the east side.

Due to the changes observed during the first year of the project, a revised monitoring schedule will be adopted for the next year. This revised schedule will facilitate the identification of patterns in the sediment transport which are needed to decide future course of action. It should be noted that loss of fill is most pronounced immediately after fill because the beach profile is significantly different from its equilibrium state. Profile changes, and the speed at which these changes occur are decreased as the beach moves towards its equilibrium state.

Introduction

"If beaches are considered in terms of their economic value, spending public funds to maintain them begins to look as sensible as maintaining highways, harbors, and airports."

Jim McGrath
Member of the Board of the California Shore and Beach Preservation Association

With tourism being the largest employer in the country, it is only natural to want to preserve recreational beaches to maintain tourism. This, of course, must be done in a manner which least affects the surrounding environment. In the recent past, several beach nourishment projects such as the one in Miami Beach have proven to be successful. A conclusion of a newly published report by the National Science Foundation committee states that given a choice between coastal fortification and beach nourishment, the current consensus among coastal experts is that nourishment is preferable, if done carefully and selectively and repeated as necessary.

In 1991, the Program for the Study of Developed Shorelines published a summary of beach replenishment projects along the Gulf Coast. In this summary, they identified over 100 projects. Duration data was only obtained for 22 of them. The criteria used for establishing project duration was the time in years it took to lose 50% of the fill material from the project area. Of the 22 projects with know duration, five lasted more than five years, nine lasted between two and five years, and eight lasted less than two years. The nourishment projects identified in the summary cover 33 beaches located mostly in Florida. Of the 33 beaches identified, only 12 of them did not have repeated nourishment.

Galveston Beach Nourishment Project

The City of Galveston, Texas, voted to restore some of its recreational beach through nourishment in front of the seawall extending from 10th Street to 61st Street. Keeping in mind that coastal activity is a very dynamic process, one must be aware that alterations in any of its components may produce a series of unexpected and sometimes undesirable effects. For this reason, the Texas General Land Office established a set of guidelines upon granting the lease needed for the project. These guidelines were established to better quantify the processes involved in beach nourishment and to provide a base-line for evaluating the success of the project. Among the parameters established by the Texas General Land Office were studies of the borrow sites, pre-nourishment beach surveys and post-project surveys.

Prior to the beach nourishment, the Blucher Institute for Surveying and Science, Texas A&M University-Corpus Christi, was given the task of conducting a study of wave refraction and shoreline change in order to make borrow site recommendations with the least adverse impact on the shoreline. The Bureau of Economic Geology, University of Texas-Austin, was responsible for the pre-project surveys of beach and nearshore conditions. The post-monitoring of the nourishment project was granted to Texas A&M University-Galveston. The purpose of the post-monitoring is to establish the effectiveness of the project through a quantitative assessment of the accretion/loss of beach sand, and if required, to provide the bases for a new course of action to preserve the beach. The quantitative assessment is obtained through a comparison of the beach profiles at different phases of the project.

Nearshore Surveying Methods

A typical beach survey consists of a series of profiles extending seaward to the closure depth along a prescribed direction from an established point on land. The depth of closure is defined as the depth at which sediment transport due to the action of waves is essentially zero (i.e., the depth at which the surface waves are no longer felt at the bottom).

A profile is described by a series of points with known distance and elevation. Generally, each profile consists of two parts: a beach (or inshore) profile and a nearshore profile. The former is carried out utilizing standard surveying methods and extends to the wading depth (i.e., as far as a person can maintain the measuring rod steady). A total station is typically used to obtain high accuracy surveys. The set up consists of a device that emits a beam of infrared light which is reflected off a prism mounted on a rod. The instrument then displays and records the precise location of the prism. The beach profile is obtained by setting the rod at close intervals along the desired direction.

In order to continue the profile from the wading depth to the closure depth, a nearshore survey is needed. There are several methods to obtain a nearshore survey. Each of these methods has its advantages and disadvantages. A description of the most common methods is given below.

Fathometer surveys: This is the fastest of the available nearshore surveying methods. A boat equipped with an echo sounder travels along a preset line and obtains depth readings. The echo sounder transmits a beam of acoustic energy which is measured as it returns and in turn related to the water depth. The accuracy of the measurements is dependent on the following parameters: the frequency of the acoustic wave, the density of the soil making up the sea bottom, and most importantly, tide level information and vessel motions. It should be noted that the position of the boat relative to the benchmark is typically obtained through Global Positioning Systems (GPS).

Surveying Sled: A surveying sled is a device consisting of a pair of runners and a mast that is pulled either by boat, truck, or winch and is dragged along the sea bottom. The mast is maintained rigidly in place with guy cables attached to the runners. The sled is a rigid body which sits at the sea bottom when the readings are taken from an onshore benchmark. Therefore, the data so obtained is not dependent on tide information, nor the presence of waves. The profile definition obtained with the sea sled is directly related to the length of its runners. Water depth and distance from the shoreline may be the limiting factors for the use of this device. One of the major disadvantages of the Surveying Sled is that relatively calm sea conditions are required to be able to pull the sled along the desired path. Also, beach access may be a problem.

CRAB: The Coastal Research Amphibious Buggy is a self-propelled offshore vehicle designed and built by the U.S. Army Engineer District, Wilmington. The CRAB is used in the same manner as the surveying sled with the additional advantage that it has its own propulsion. Similar accuracy is obtained from these two methods. As expected, the CRAB is more expensive than the surveying sled.

Galveston Beach Surveys

In order to more accurately evaluate the accretion/loss of beach sand in the region of interest, selected representative locations were surveyed at different phases of the nourishment project. As discussed above, the pre-project surveys were conducted by the Bureau of Economic Geology. Seventeen (17) profiles within 10th and 61st Street together with three (3) profiles east and two (2) profiles west of the nourished region were obtained. A sketch of the profile lines, with their corresponding names is presented in Figure 1. The locations were selected to provide an adequate representation of the beach profile. They are located approximately 1000 ft apart along the seawall. In order to facilitate comparisons, the post-nourishment surveys conducted by Texas A&M University-Galveston were also obtained at the same locations.

The surveys obtained immediately after placement of the sand were obtained by the contractor, T. L. James. A total of 125 profiles were obtained resulting in a more accurate representation of the beach contours. Unfortunately, these profiles were obtained at different locations than those in the pre-project and post-project surveys, thereby requiring numerical interpolation for any comparisons. It should be noted that interpolation was used on the more closely spaced profiles obtained by the contractor to obtain 16 profiles for comparison.

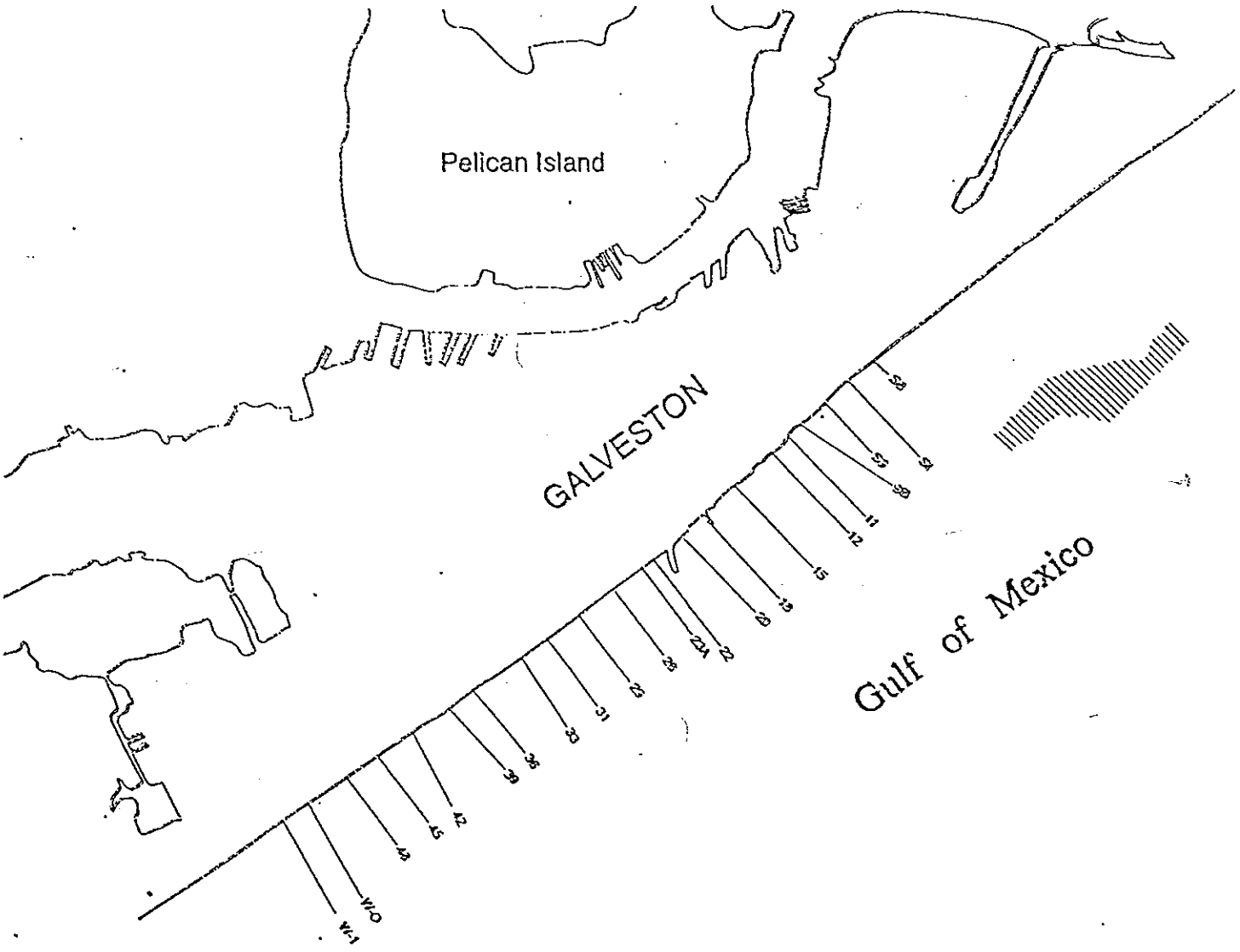


Figure 1. Profile names and locations.

Post- Nourishment Surveys

In accordance with the guidelines established by the Texas General Land Office, the points used to define the beach profiles have a maximum spacing of fifty (50) ft. The twenty-two (22) profiles used for the pre-nourishment survey were used again to describe the nourished portion of the beach between 10th Street and 61st Street, as well as the areas immediately east and west of this area. As agreed in the post-monitoring contract, two surveys per year were performed: one during the Fall, when the beach tends to be at its fullest, and one in the Spring, after the winter storms. As suggested in the pre-nourishment report, performing the surveys in days with good weather resulting in better accuracy is more important than strict adherence to the time schedule. For this reason, the first post-nourishment survey was taken during the first days of November 1995, while the second survey took place in May and June 1996.

Beach Profiles

The first post-nourishment survey consists only of beach profiles. Since obtaining accurate data is the most important factor of the surveys, they were obtained in days of good weather. They took place in November 1995.

The second post-nourishment survey has both beach and nearshore profiles. The beach profiles were obtained in the standard form, while the nearshore profiles were obtained utilizing the "surveying sled" approach. This method was deemed the most accurate of the available methods for the task at hand. Again, due to persistent strong winds during the month of April, the beach surveys were carried out in May 1996, while the nearshore surveys were conducted in May and June 1996.

Nearshore Profiles

As per the post-nourishment monitoring contract, the nearshore profiles extend to a mean water depth of at least 18 ft. For most of the profiles this depth was achieved at a distance of 3500 feet from the waterline. In obtaining the points for the profiles, the Surveying Sled designed and built by the Conrad Blucher Institute of Texas A&M University-Corpus Christi was used.

The results obtained from the sled survey are presented in Appendix B. Upon completion of the beach and nearshore surveys, the results were merged together to provide a single profile.

Discussion of Results

In order to better appreciate the changes that have taken place within the nourished area, a graph presenting expected results for a typical profile is shown in Figure 2. This graph was supplied by the contractor at the time of nourishment. As mentioned above, beaches tend to be (or move towards) a state of equilibrium. This equilibrium state is affected by many factors such as currents, wave action, sediment particle size, etc. After nourishment takes place, the beach is significantly different from its equilibrium state, and therefore it undergoes noticeable changes until a new equilibrium state is reached. Provided that environmental conditions remain the same, the new beach profiles will tend to be similar in shape (slope in particular) as those prior to nourishment. Furthermore, it is seen from Figure 2 that for the typical profile shown, 50% to 60% of the beach gained by the fill disappears within the first year of the project as the beach returns to an equilibrium state.

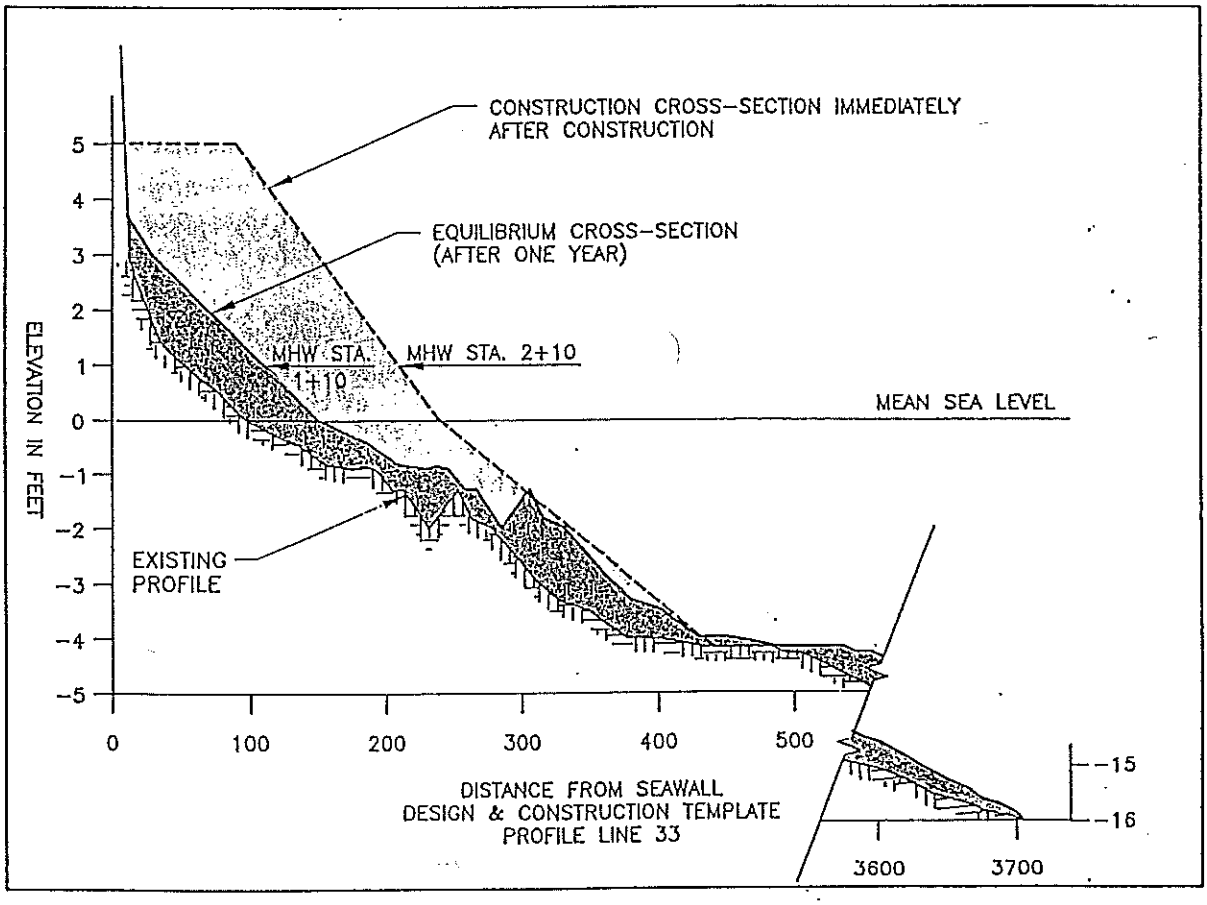


Figure 2. Typical Cross-section of Galveston Beach Nourishment Project.

Two sets of graphs are presented in Appendices A and B. Appendix A contains twenty-two (22) graphs with the beach profiles up to a distance of 1000 ft. from the benchmark. Appendix B contains the nearshore profiles up to a distance of 4000 ft. from the benchmark. In both cases, each graph corresponds to one of the selected profiles. With the exception of the graphs for profiles S8, SI, S9, 9B, W-0, and W-1, each beach profile contains four lines corresponding to (i) Winter 1994, (ii) Summer 1995, (iii) Fall 1995, and (iv) Spring 1996. Summer 1995 data is not available for the four easternmost locations (S8, SI, S9 and 9B) nor the two westernmost profiles (W-0 and W-1.) Although the Fall 1995 survey did not include the nearshore, the beach profiles are included in the graphs of Appendix B for completeness. The graphs are arranged from east to west. Finally, it should be noted that although there is no Summer 1995 data for profile 9B, this profile falls within the nourished area.

The first three graphs (S8, SI, and S9), which are immediately east of the nourished area, indicate a net gain in sand. Profile S9, which is closest to the nourished area has the most significant beach gain. The profile immediately west of the nourished area, W-0, has also experienced gains, though not as large as the ones experienced on the east side. Although profile W-1 (westernmost profile) has changed since the Winter 1994, no significant sign of gain or loss can be seen.

In reviewing the profiles within the nourished area, the following observations can be made. Profiles 11, 12, and 39, which had the most fill, have lost the most sand. Most of the remaining profiles within the nourished area have maintained about 50-60% of the sand in the vicinity of the waterline. Profile 48, which marks the western boundary of the nourished area, has some unique features. One of the most striking observations at profile 48 is that seaward of 320 ft. from the benchmark, the profiles for both Summer 1995 (immediately after fill) and Spring 1996, are lower than the pre-nourishment profile. This, combined with the fact that the adjacent area to the west was not filled, accounts for the rapid changes in the beach profile at this location. Profile 20 also shows a peculiar behavior. At this location, the profile has maintained most of its fill within the first 400 ft. Two key factors account for this performance: the similarity of slopes between the nourished profile and the pre-project profile, and the fact that profile 20 is located immediately east of a rock groin.

Finally, it is worth mentioning that for the most part, the profile changes between the Fall 1995 and the Spring 1996 are much smaller than those experienced between the Summer 1995 and the Fall 1995. This is in accordance with the concept of equilibrium beach profiles. Furthermore, this behavior indicates that smaller changes are to be expected for the next year.

In order to relate the survey data to that which can be seen by people at the beach, the location of the waterline from the benchmark was determined at each profile. The results are shown in Table 1. This waterline corresponds to seaward-most point having zero elevation. The results on this table corroborate the findings described above.

Profile	Winter 1994	Summer 1995	Fall 1995	Spring 1996
S8	656	n/a	675	705
SI	448	n/a	472	508
S9	315	n/a	349	496
9B	301	n/a	423	431
11	45	254	93	81
12	44	274	119	96
15	130	291	202	184
18	104	255	208	189
20	176	275	279	263
22	128	310	196	155
23A	184	265	254	243
26	87	313	226	211
29	83	323	191	207
31	120	291	237	209
33	104	315	229	222
36	81	346	228	214
39	107	373	254	212
42	180	318	244	241
45	67	267	181	194
48	160	263	234	168
W-0	20	n/a	43	135
W-1	27	n/a	41	40

Table 1. Distance in feet from Benchmark to Water line.
(seaward-most point with zero elevation)

Summary

This report summarizes the results from the post-fill surveys at Galveston Beach and is written in partial fulfillment of the surface lease between the City of Galveston and the Texas General Land Office, SL940015. Two surveys were carried out: a beach survey in the Fall of 1995, and a beach/nearshore survey in the Spring of 1996. A surveying sled was used for the nearshore portion of the Spring 1996 survey.

After comparing the beach profiles at the different phases of the project, the following assessments were made:

1. As expected, larger sand losses are seen on those profiles which had the most fill. In particular, profiles 11, 12 and 39 have lost most of the fill.
2. Several profiles have almost returned to pre-nourishment levels. This is especially true at profile 48, which has actually changed to levels below those before nourishment.
3. For the most part, about 50-60% of the sand in the vicinity of the waterline still remains in place. This is not to say, however, that the percentage of sand that remains within the entire project area is 50-60%.
4. Profile changes between Winter 1995 and Spring 1996 are relatively small. This indicates that an equilibrium state is near.
5. Although there has been a gain of material west of the nourished area, more significant gains are seen on the east side. These gains coincide with larger losses at the profiles near the boundary of the nourished area.

Continuous monitoring of the area is needed to decide on possible courses of action for this portion of Galveston Beach. For this purpose, a revised survey schedule will be implemented.

Acknowledgments

The help facilitated by the following people is hereby gratefully acknowledged.

Ms. Kimberly K. Mckenna	-Texas General Land Office
Mr. Bill Worsham	-Texas General Land Office
Ms. Wendy Denhert	-Park Board of Trustees of the City of Galveston
Ms. Rene Adame	-Park Board of Trustees of the City of Galveston
Dr. Nicholas C. Kraus	-Conrad Blucher Institute for Surveying and Science
Mr. James Rizzo	-Conrad Blucher Institute for Surveying and Science
Mr. Dan Heilsman	-Conrad Blucher Institute for Surveying and Science
Dr. James C. Gibeaut	-Bureau of Economic Geology, University of Texas at Austin
Mr. Larry Grimes	-Larry Grimes Interests
Mr. Taki Kypreos	-Island Majic Beach Service
Dr. Y.H. Wang	-Texas A&M University-Galveston
Mr. Kevin Regini	-Texas A&M University-Galveston
Capt. Ron Ormond	-Texas A&M University-Galveston
Ms. Wanda Wilhem	-Texas A&M University-Galveston
Ms. Victoria L. Jones	-Texas A&M University-Galveston
Mr. Kevin Colston	-Texas A&M University-Galveston

References

Brown, C.A. and Kraus, N.C. Reconnaissance Study of Wave Refraction and Shoreline Change for the Galveston, Texas, Beach Nourishment Borrow Sites. Report prepared for the City of Galveston by the Conrad Blucher Institute for Surveying and Science, Texas A&M University-Corpus Christi, TAMU-CC-CBI-9403. 1994.

Brown, J., Colling A., Park, D., Phillips, J., Rothery, D., and Wright, J. Waves, Tides and Shallow-Water Processes. Pergamon Press. 1989.

Dixon, K.L. and Pilkey Jr., O.H. Summary of Beach Replenishment on the U.S. Gulf of Mexico Shoreline. Journal of Coastal Research. Vol. 7, No. 1. Winter 1991. pp 249-56

Grosskopf, W.G. and Kraus, N.C. Guidelines for Surveying Beach Nourishment Projects. Shore and Beach. . April 1994. pp. 9-16.

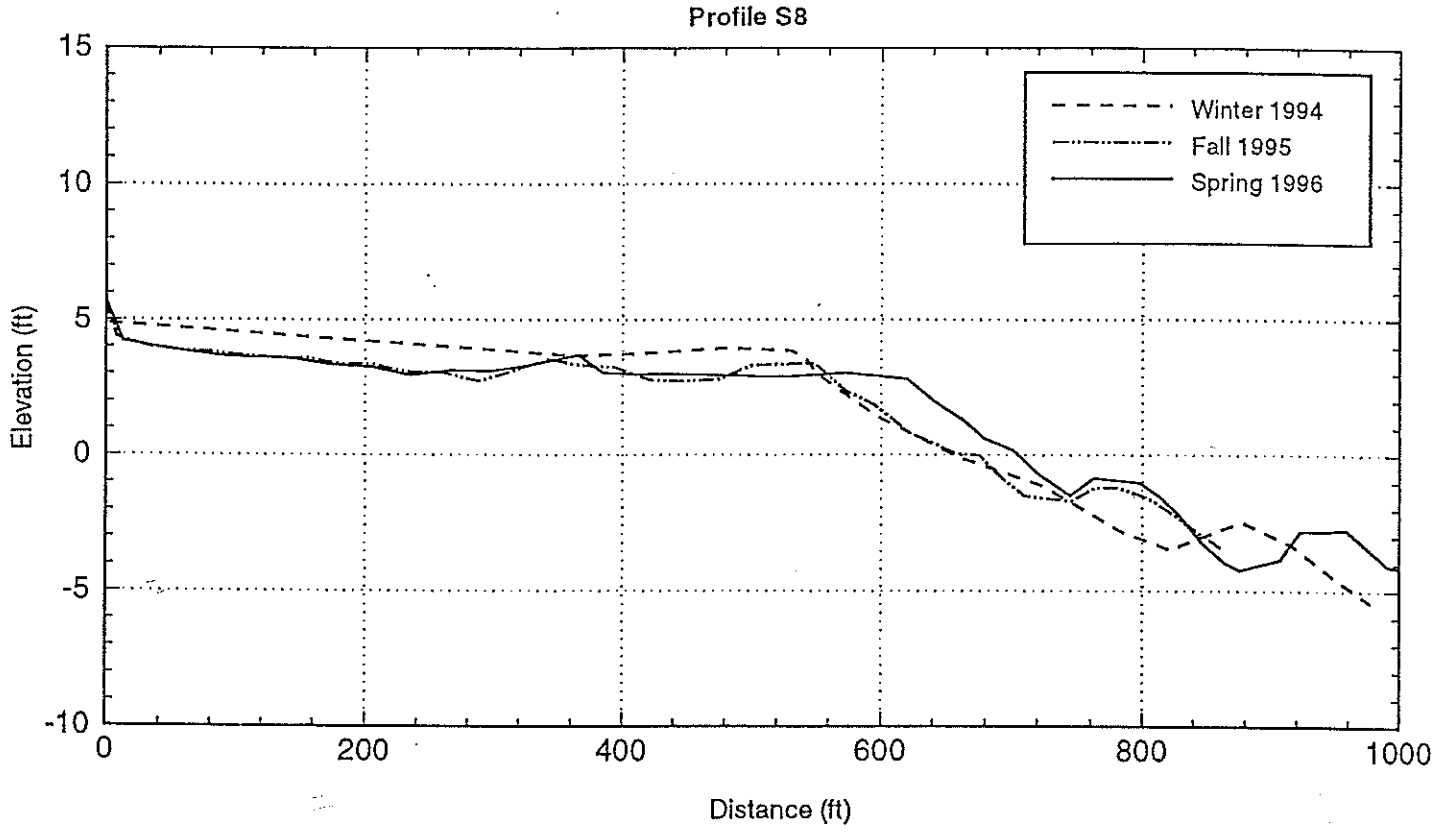
Gustaitis, R. Trying to Balance the Sand Budget. California Coast & Beaches. Vol. 12, No. 1. Spring 1996. pp. 3-10.

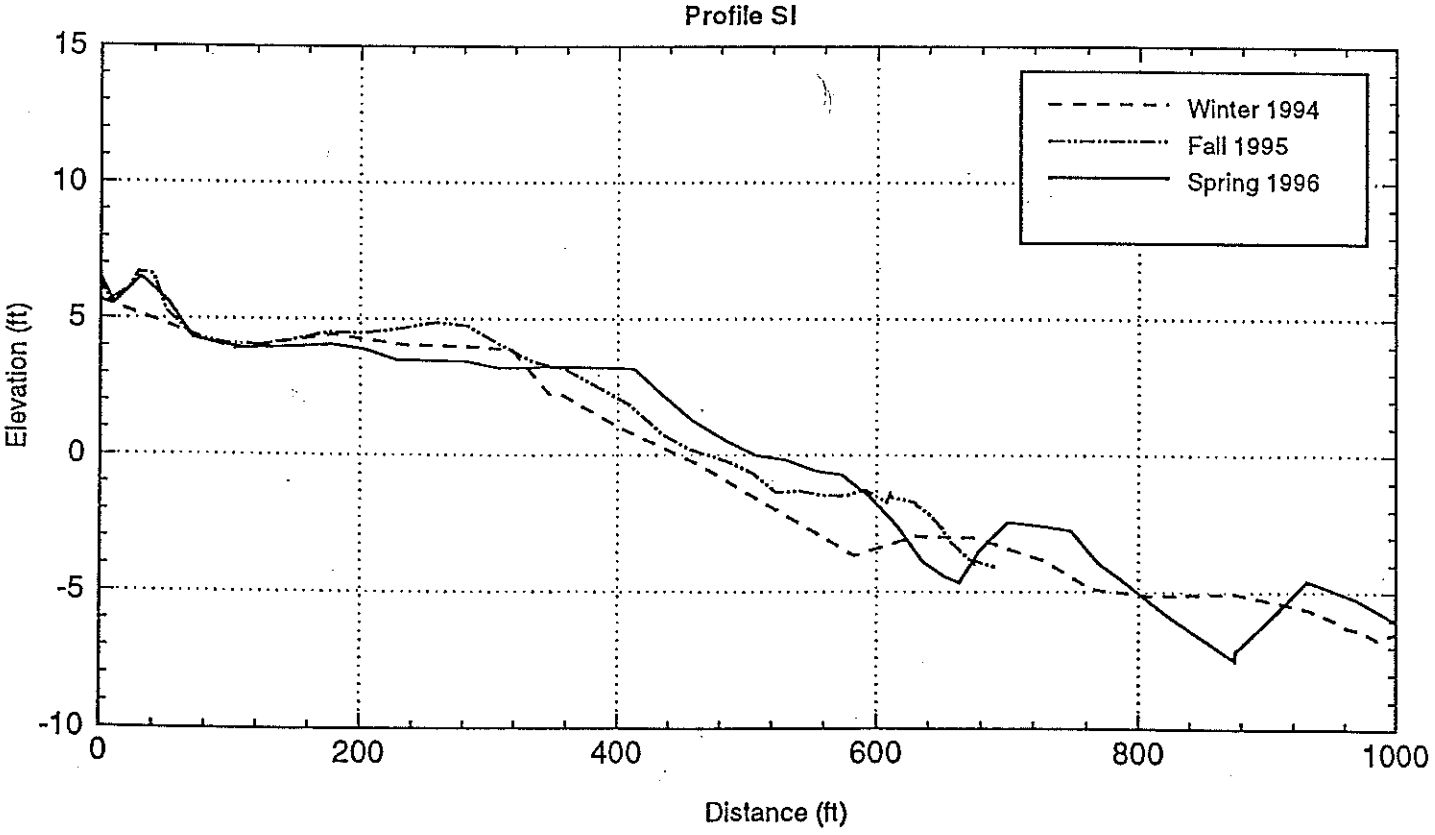
McGrath J. Why it Makes Sense to Take Sand to the Beaches. California Coast & Beaches. Vol. 12, No. 1. Spring 1996. pp. 11-17.

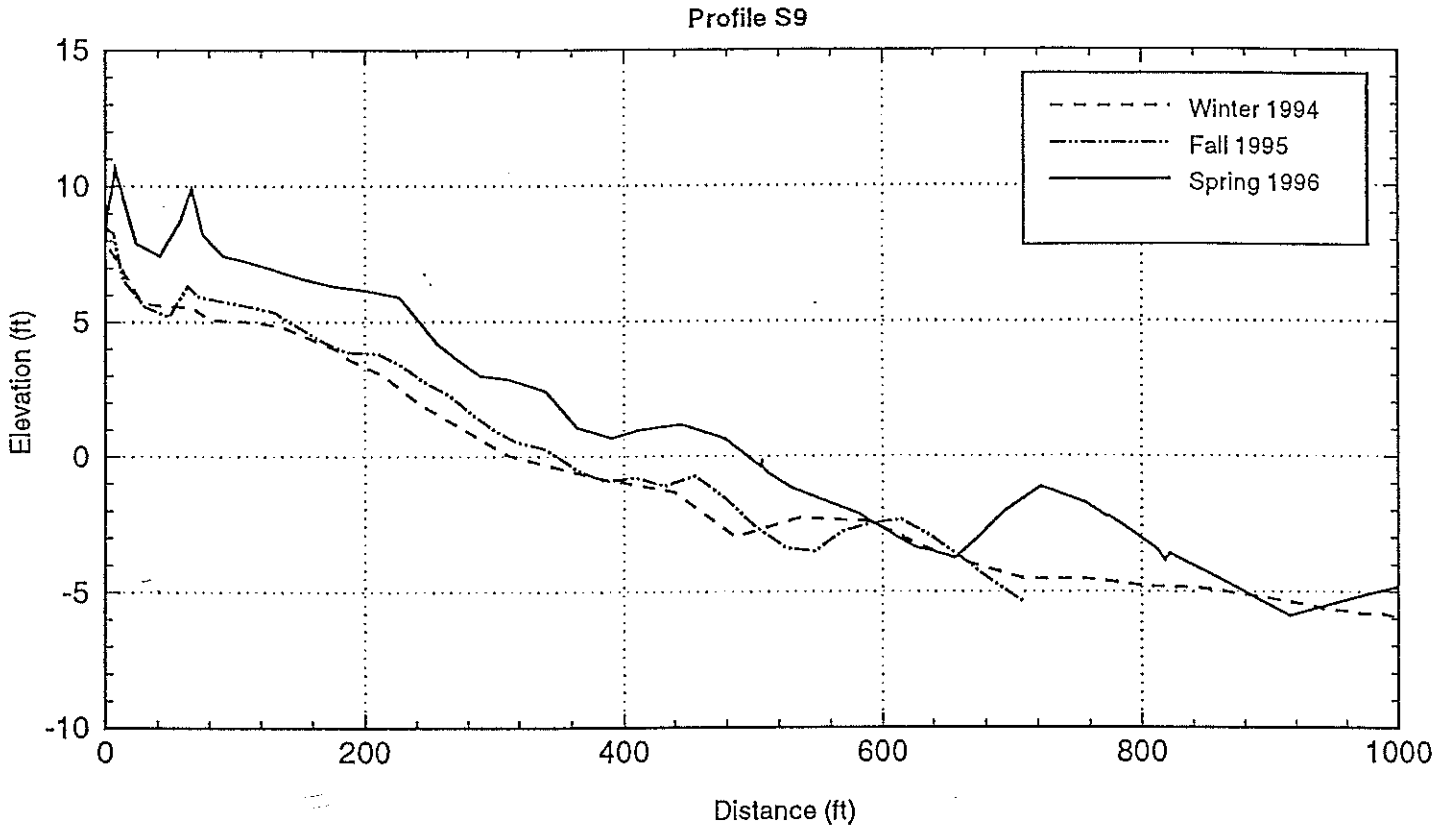
Morton, R.A., Gibeaut, J.C., and Gutierrez, R. Pre-Project Surveys of Beach and Nearshore Conditions Galveston Beach Nourishment Project. Report prepared for the City of Galveston by the Bureau of Economic Geology at the University of Texas at Austin. 1995.

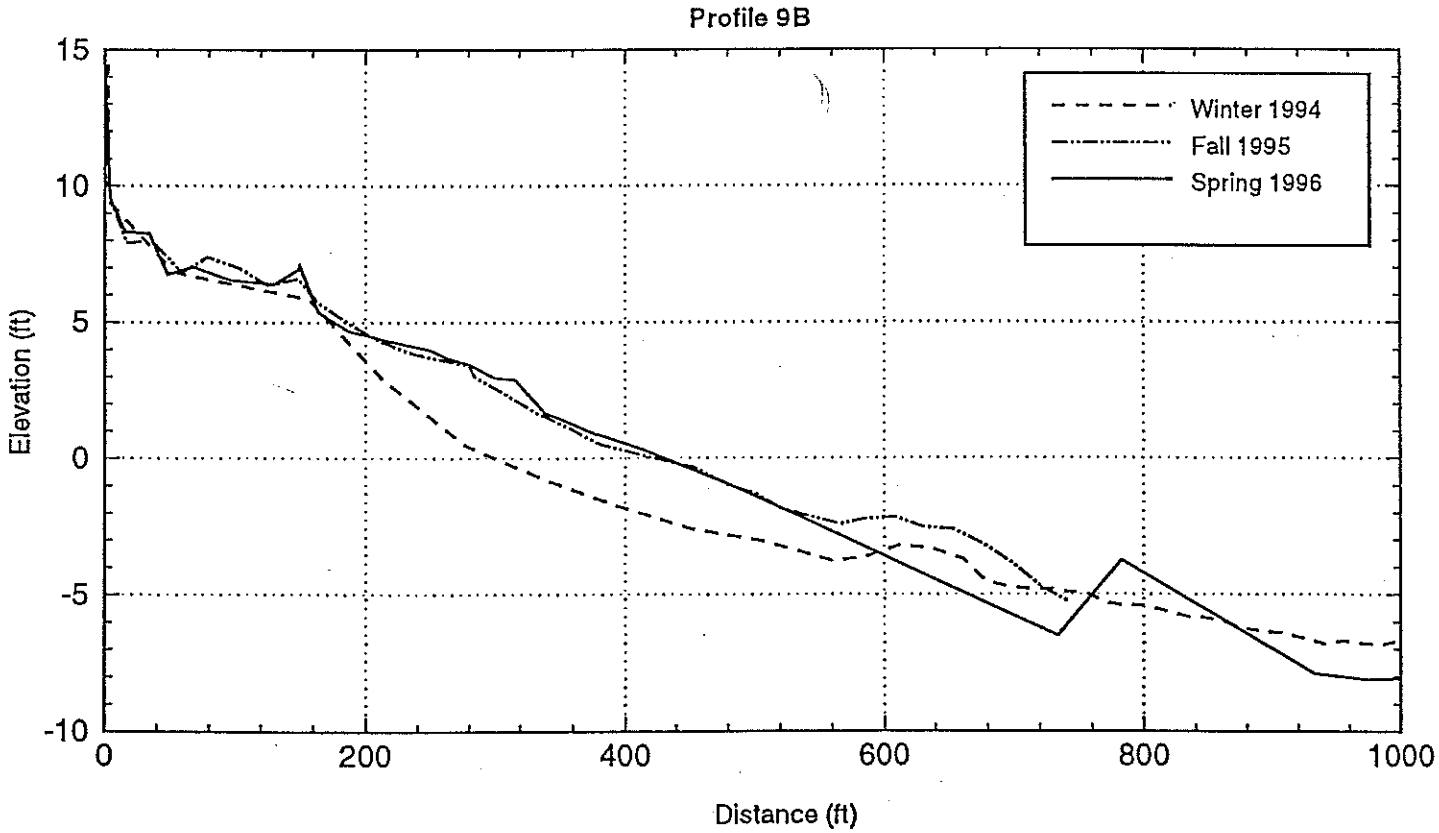
Review of Geologic Data Sources for Coastal Sediment Budgets. U.S. Army Engineer Waterways Experiment Station. Report Number ADA 262 158. Feb. 1993.

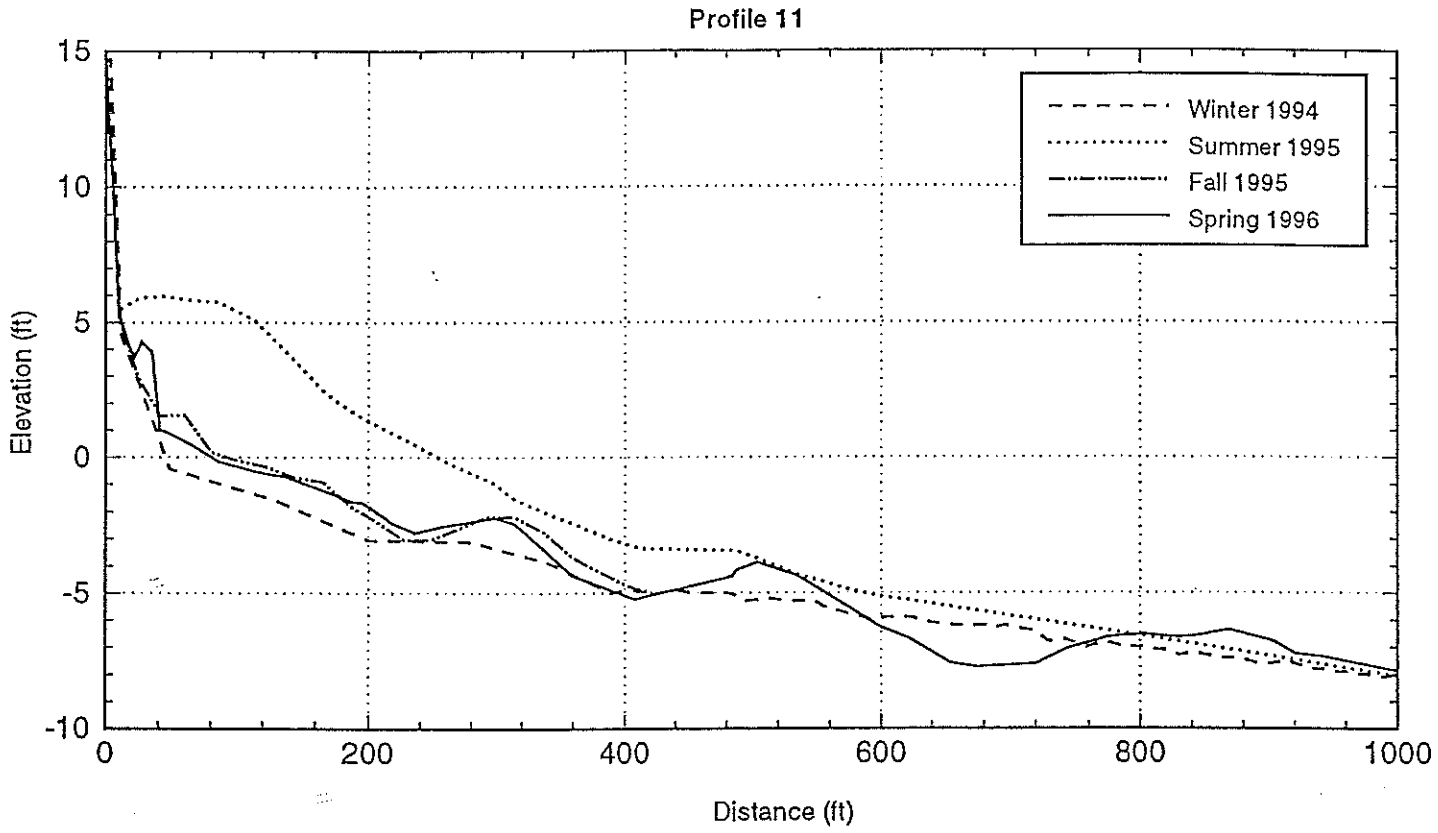
Appendix A

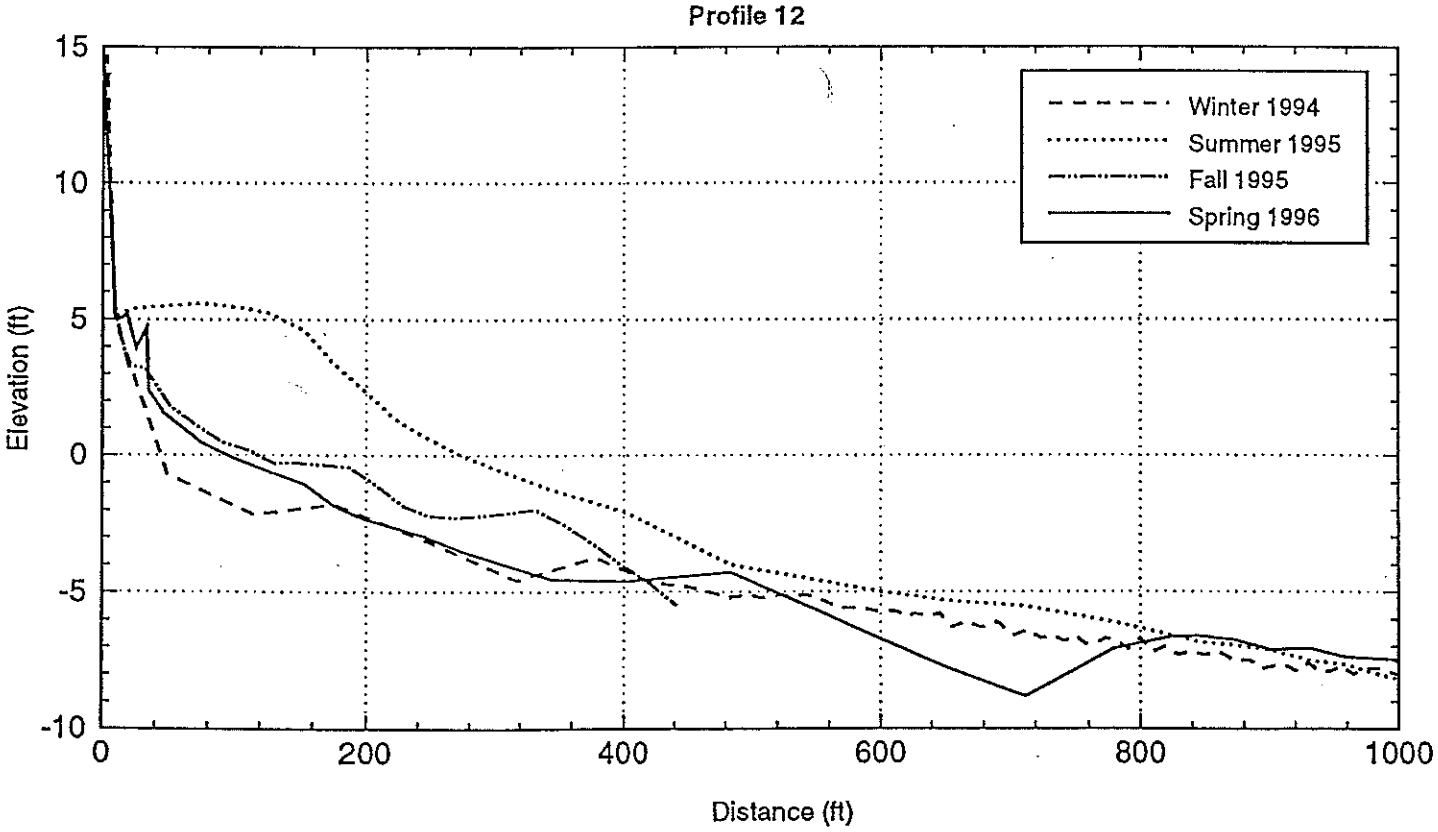

Profile S8
Winter 1994
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

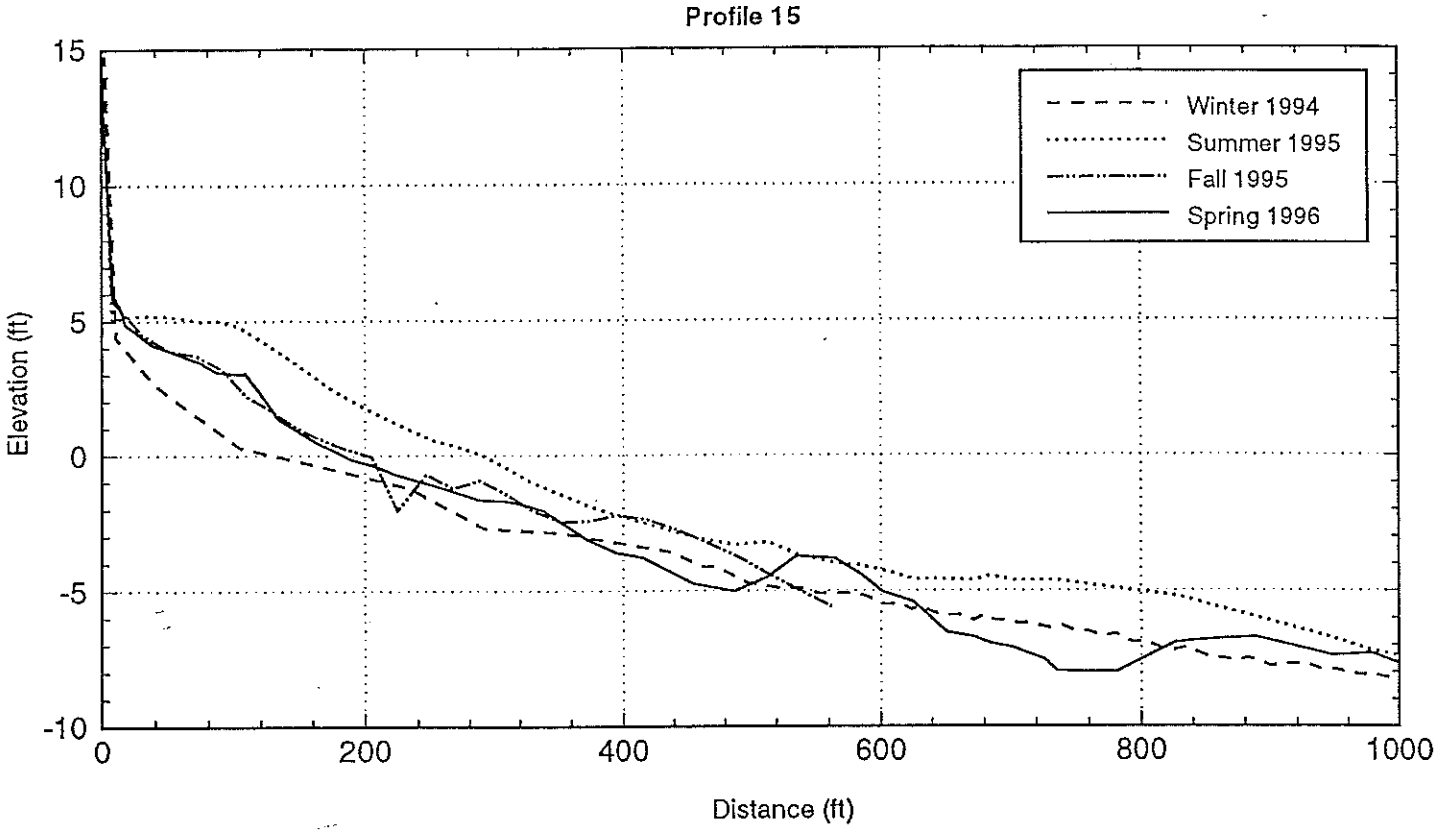

Profile SI
Winter 1994
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

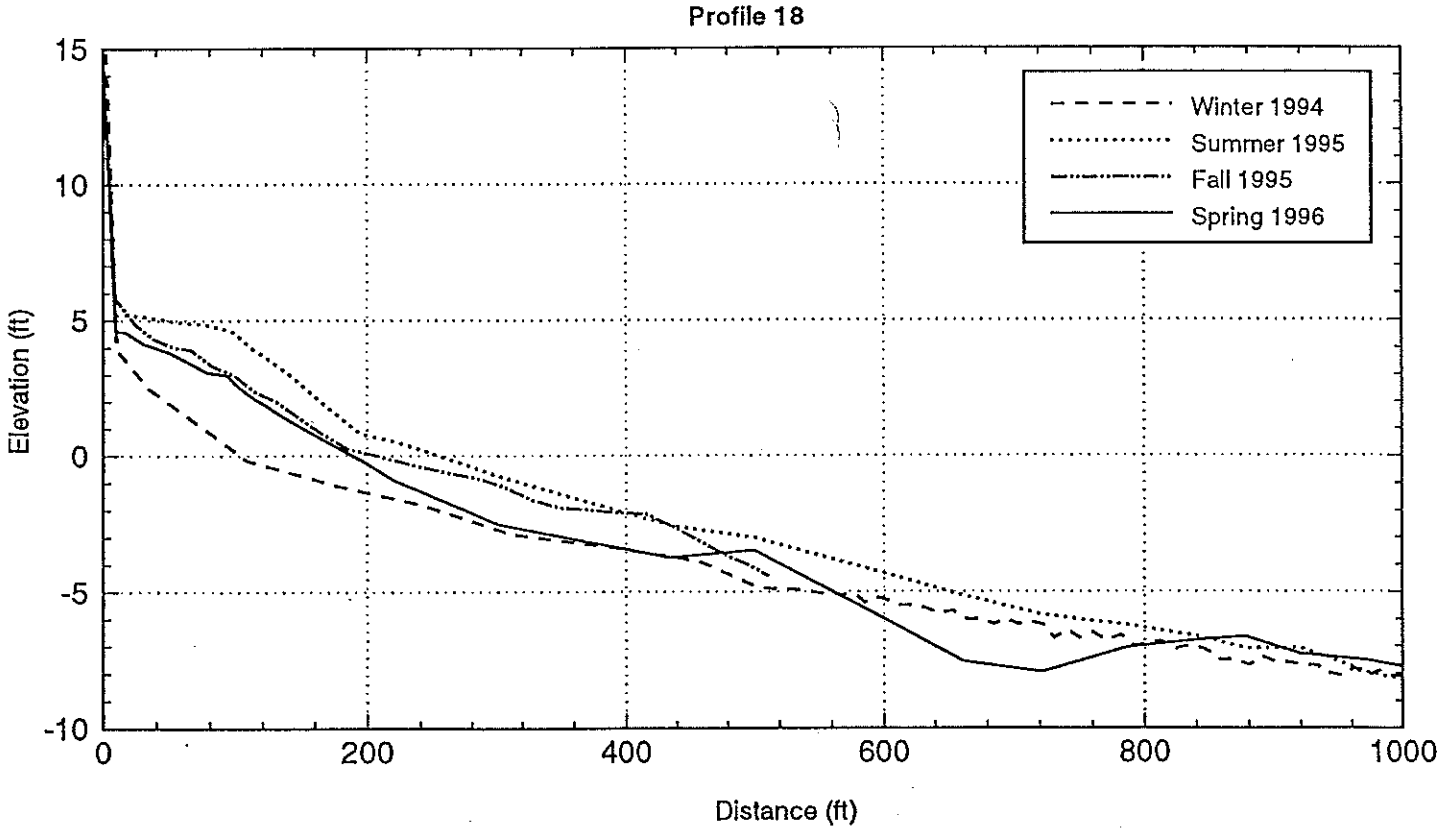

Profile S9
Winter 1994
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

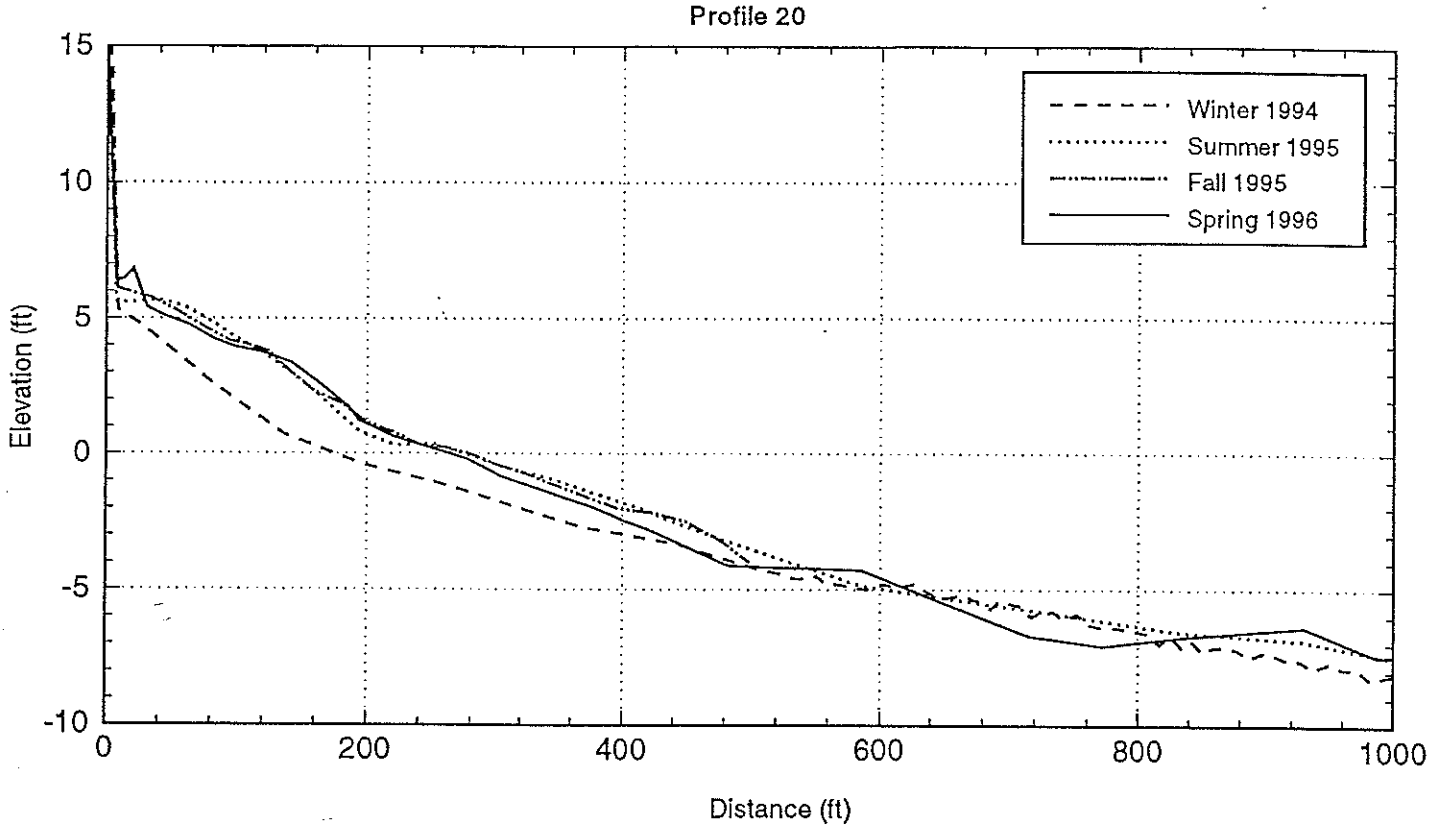

Profile 9B
Winter 1994
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

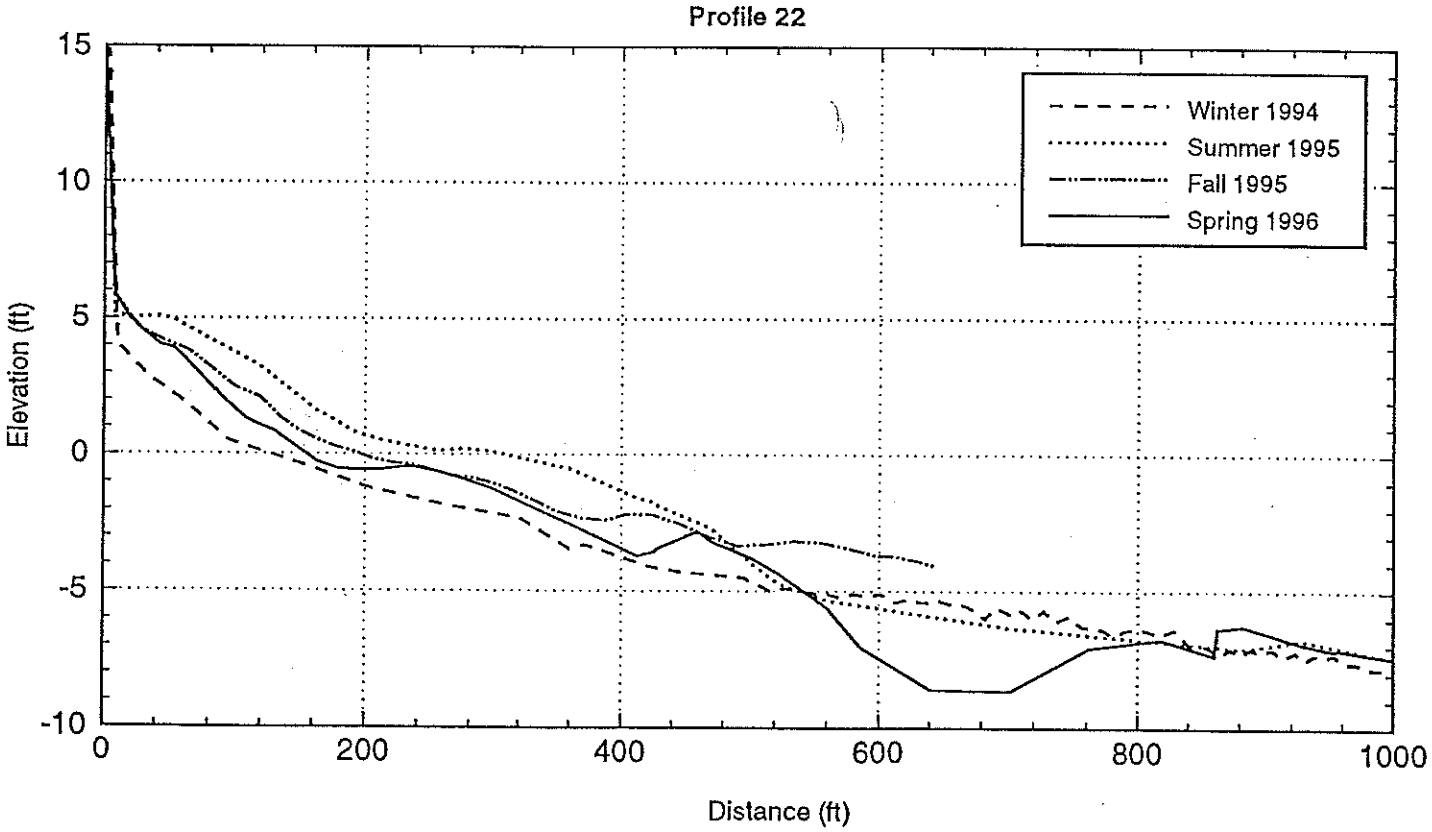

Profile 11
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

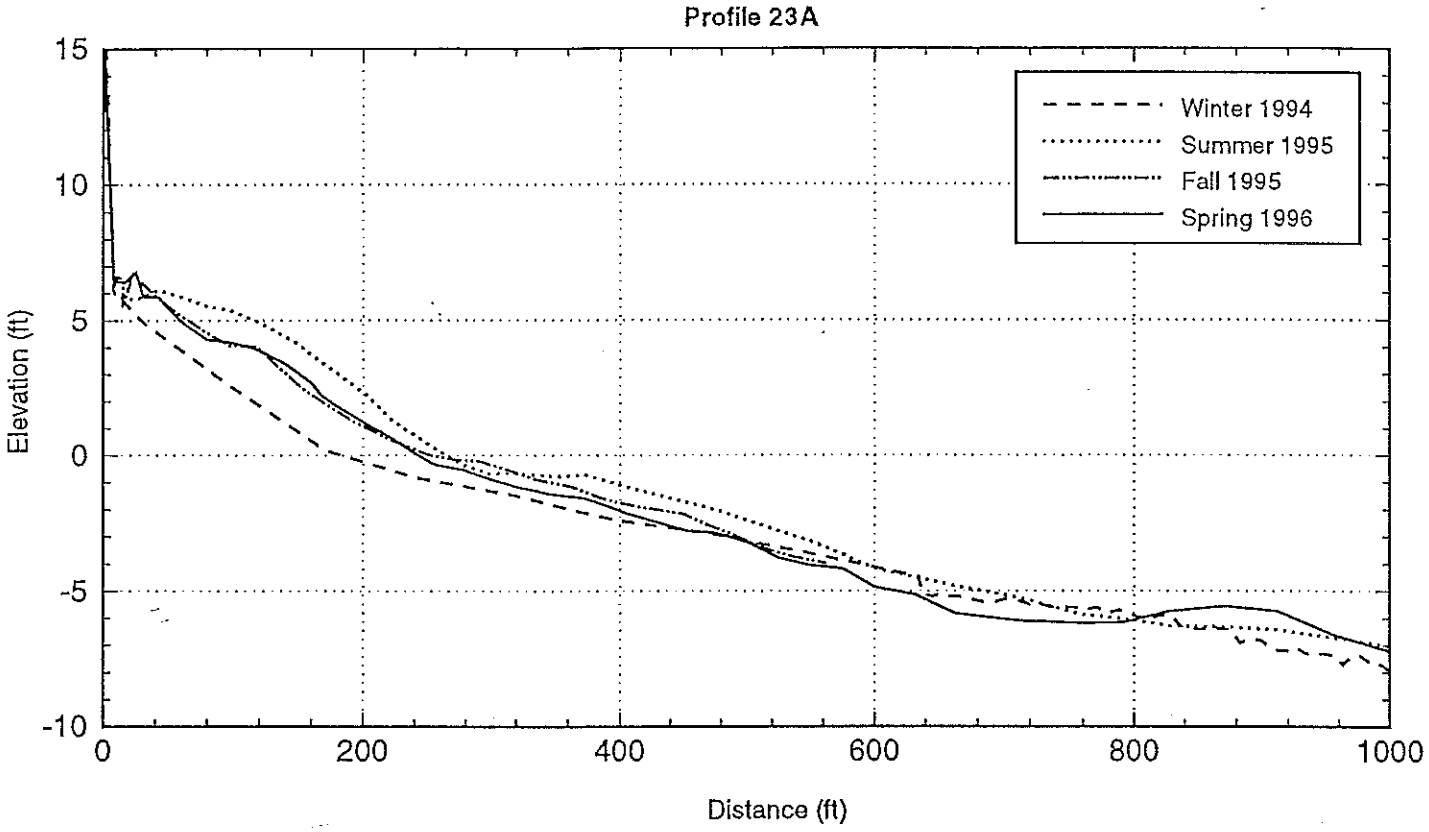

Profile 12
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

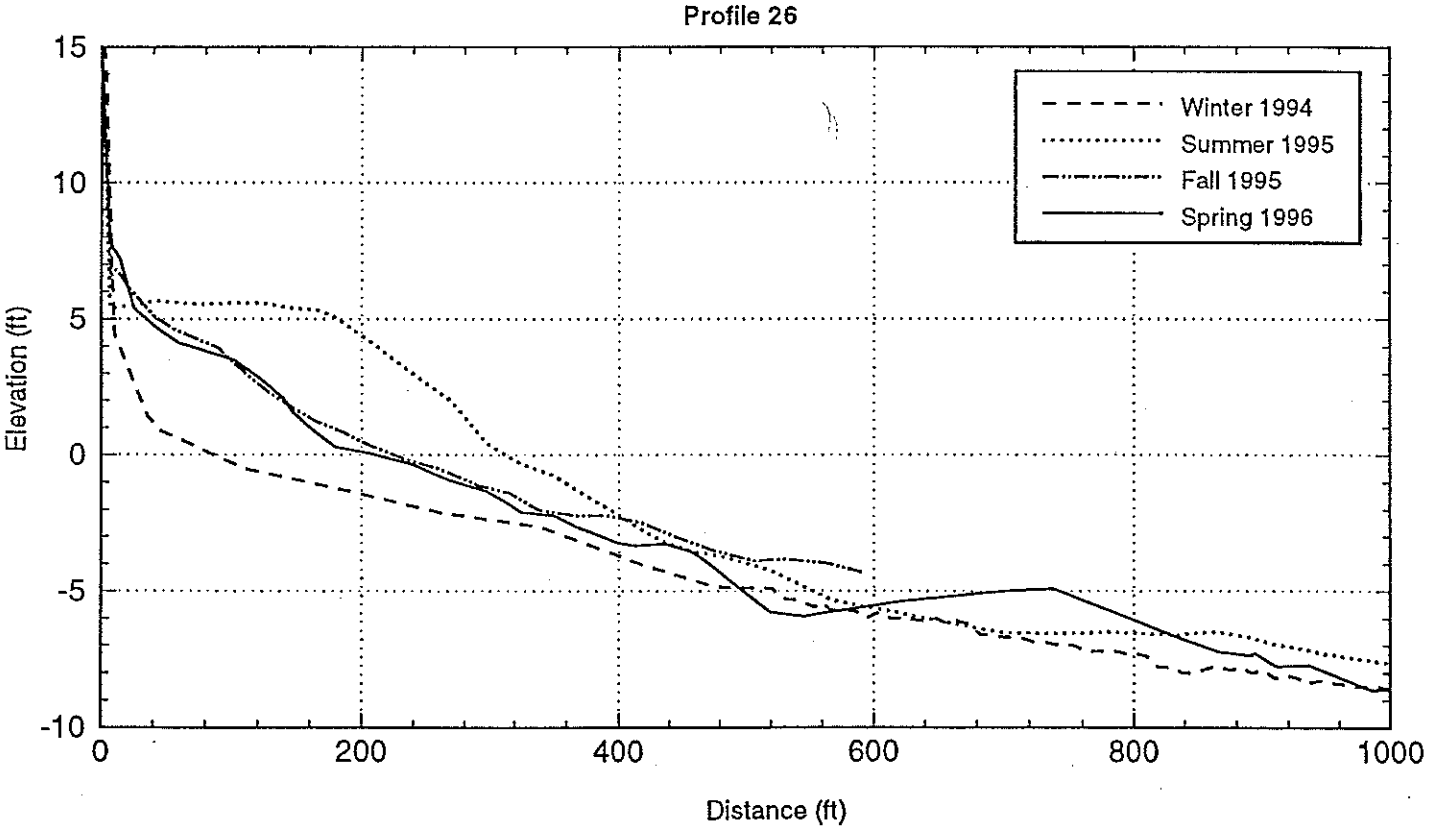

Profile 15
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

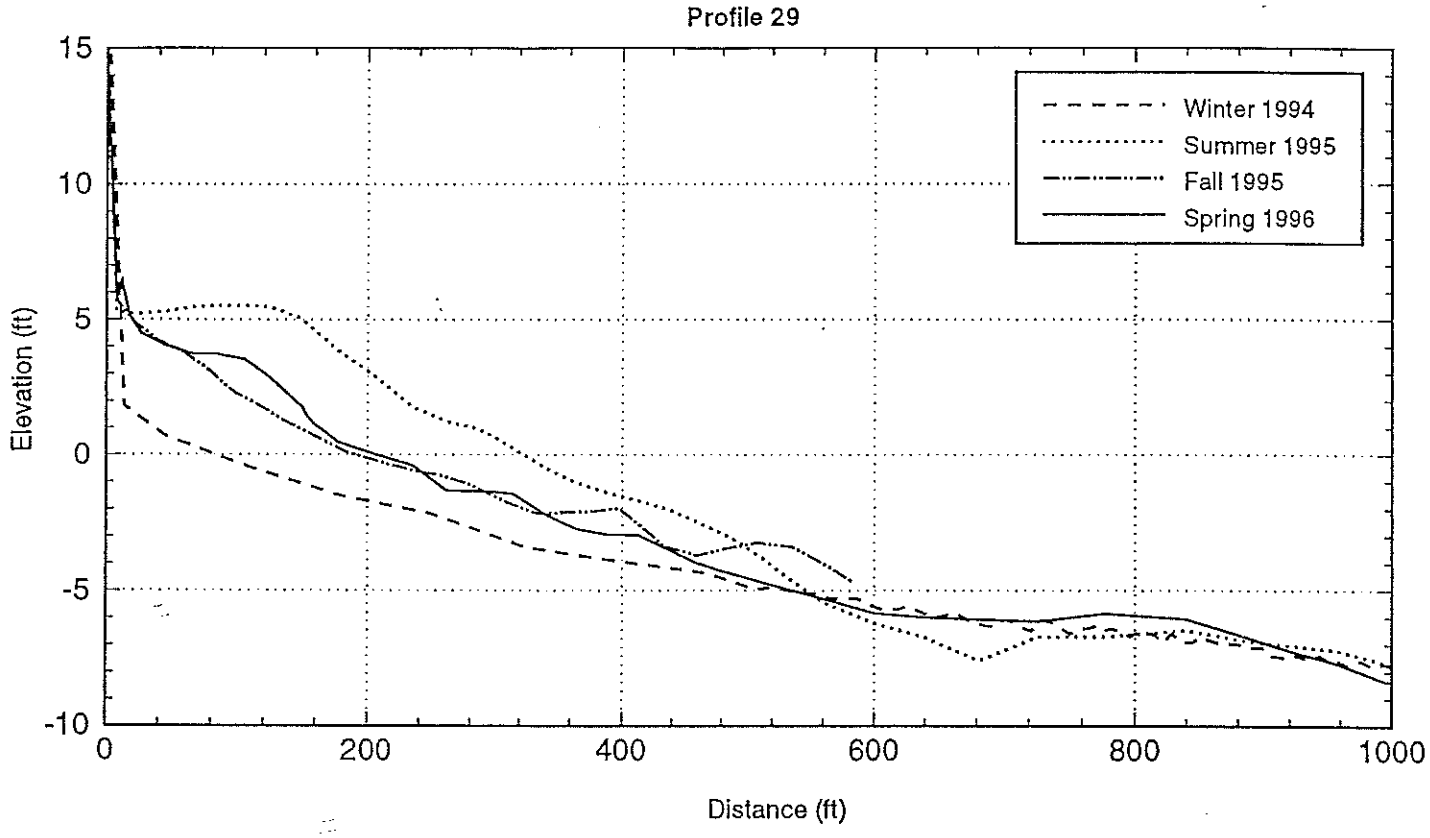

Profile 18
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

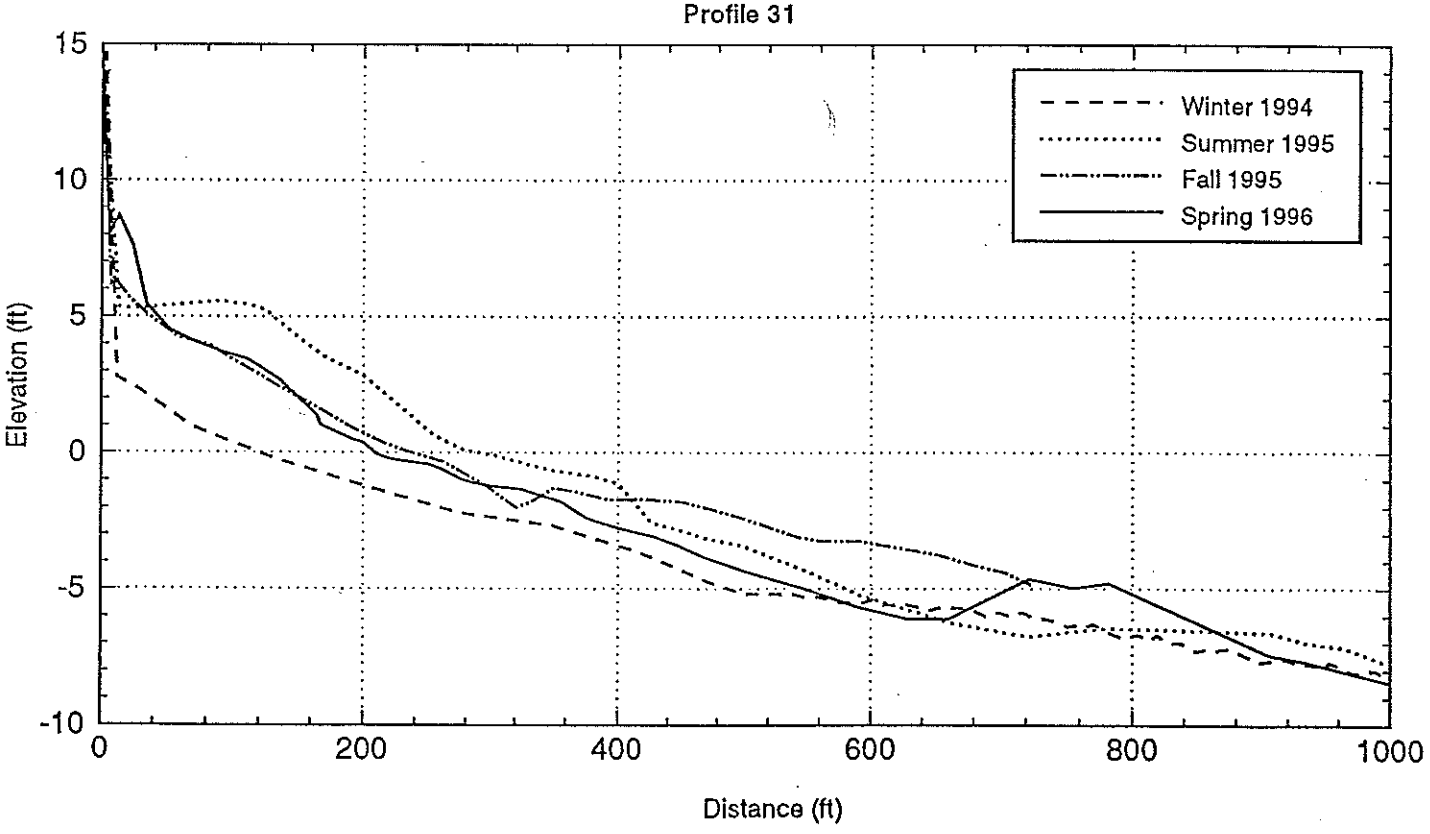

Profile 20
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

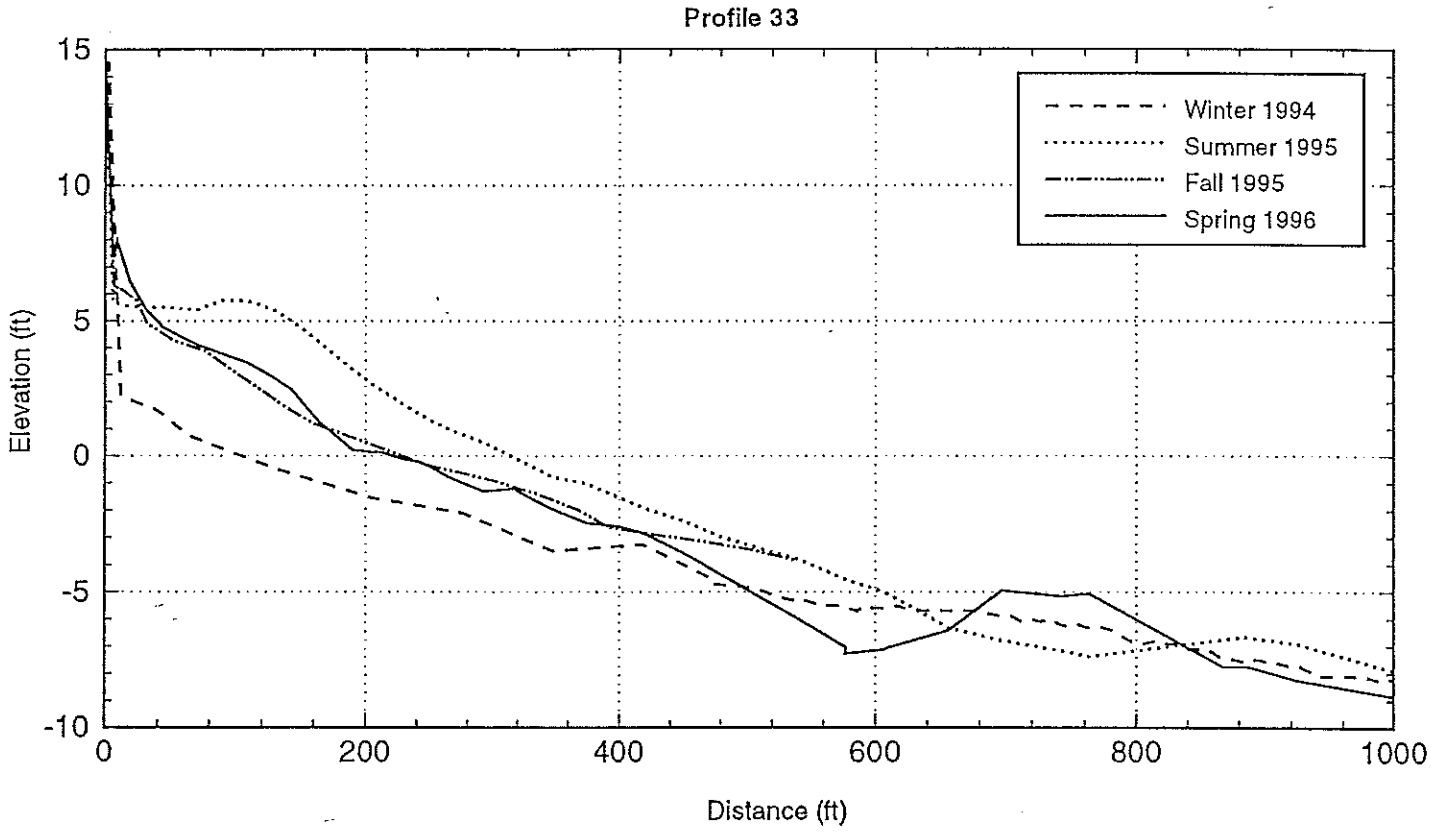

Profile 22
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

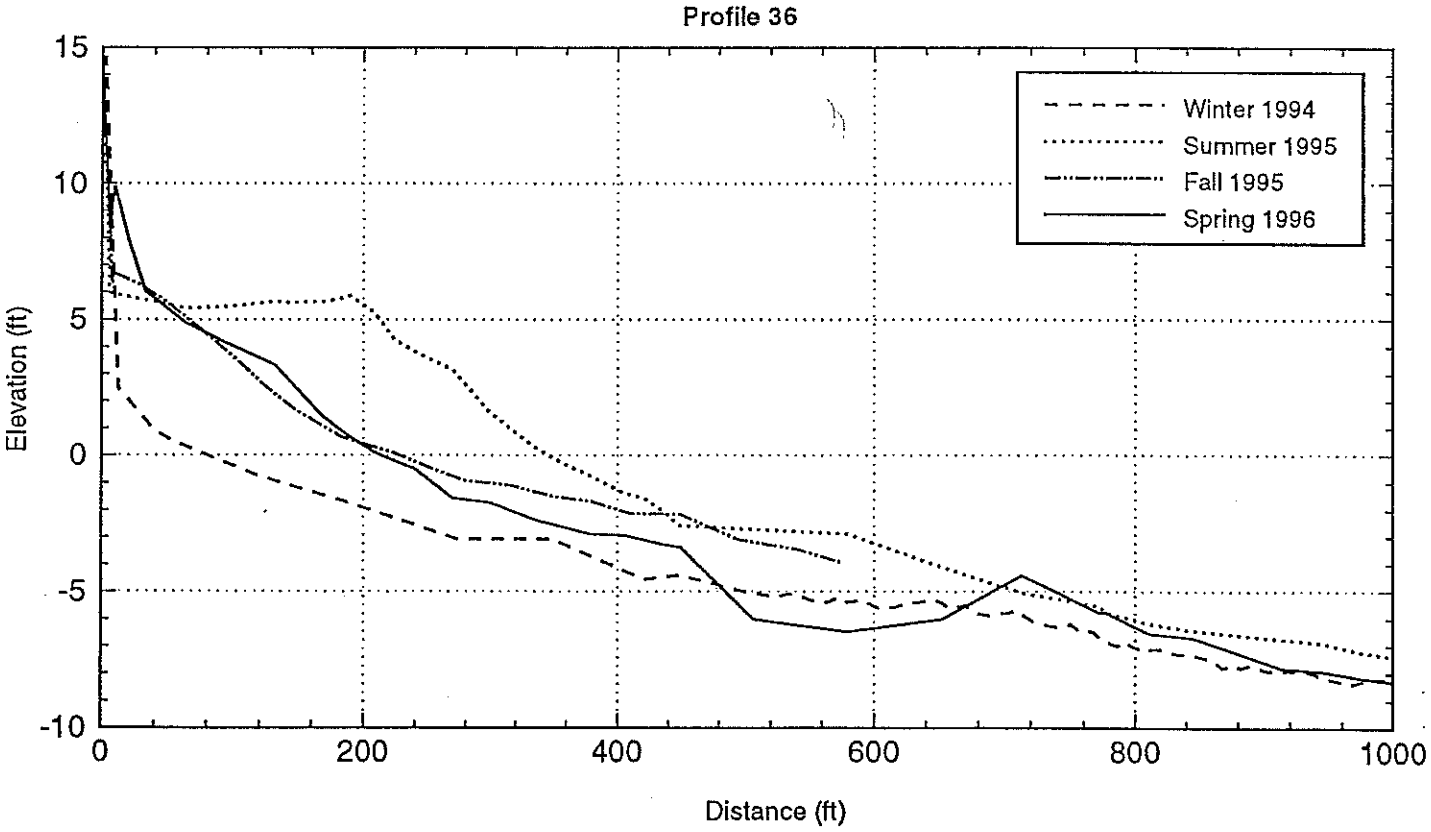

Profile 23A
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

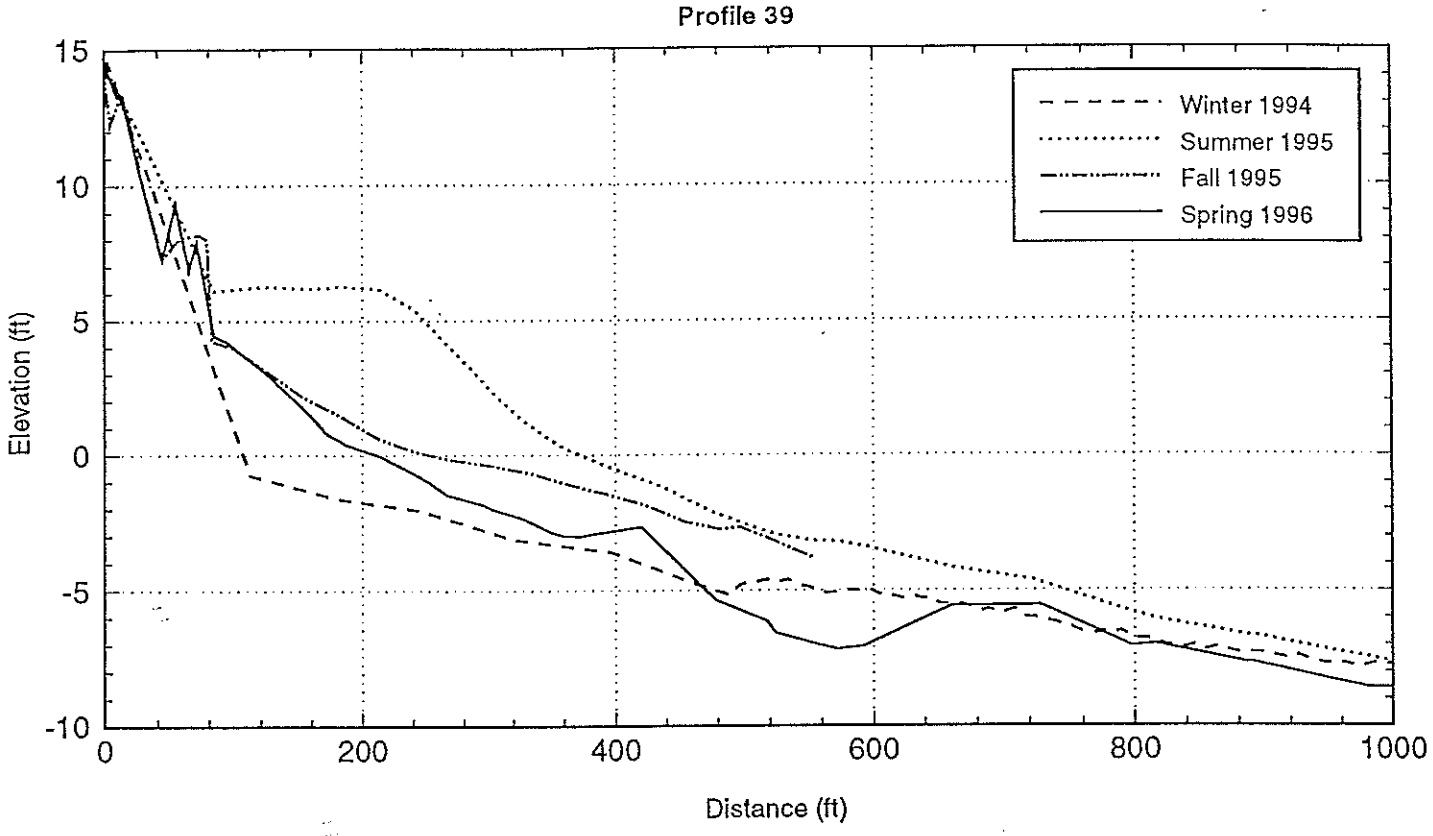

Profile 26
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

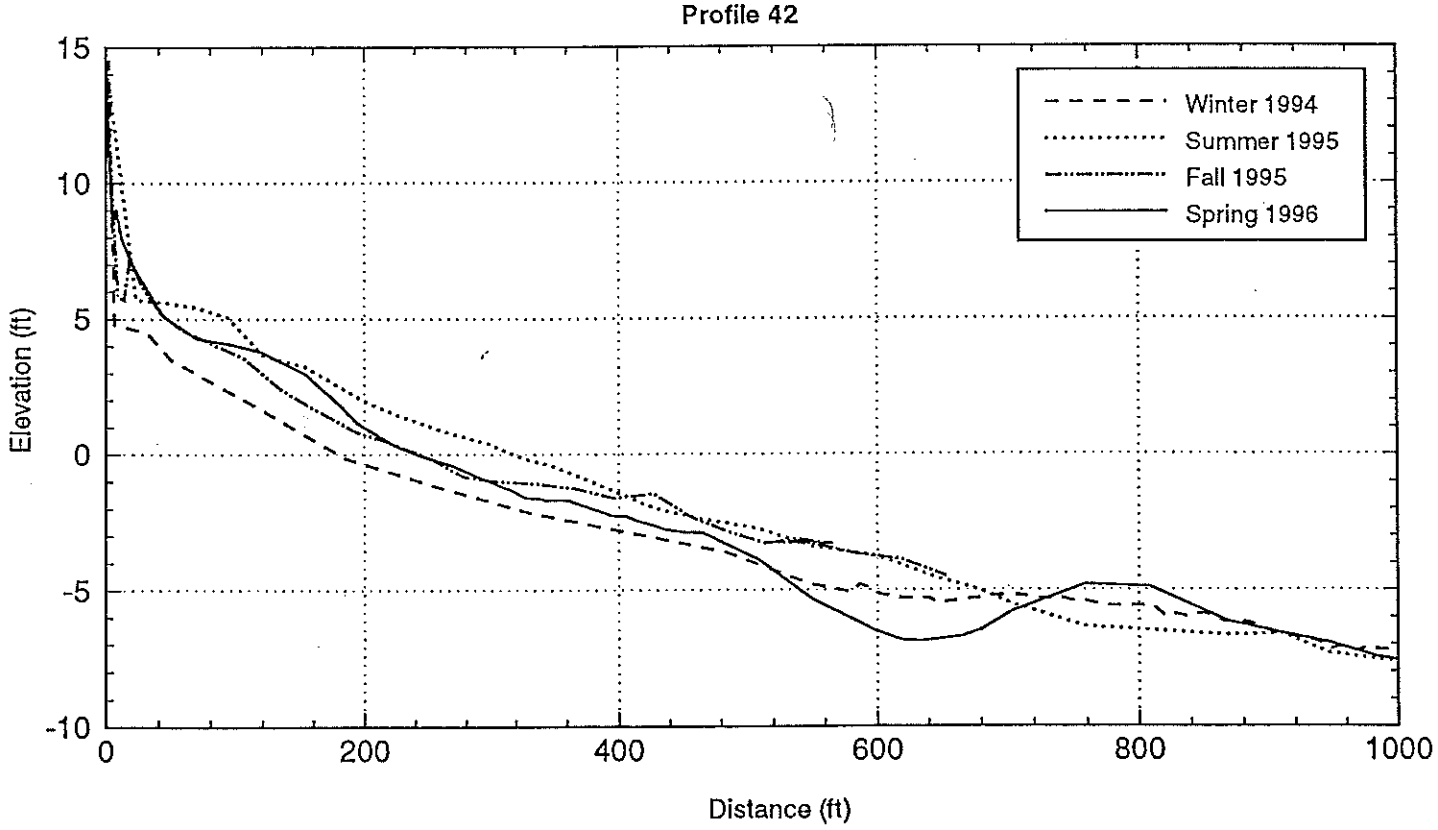

Profile 29
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

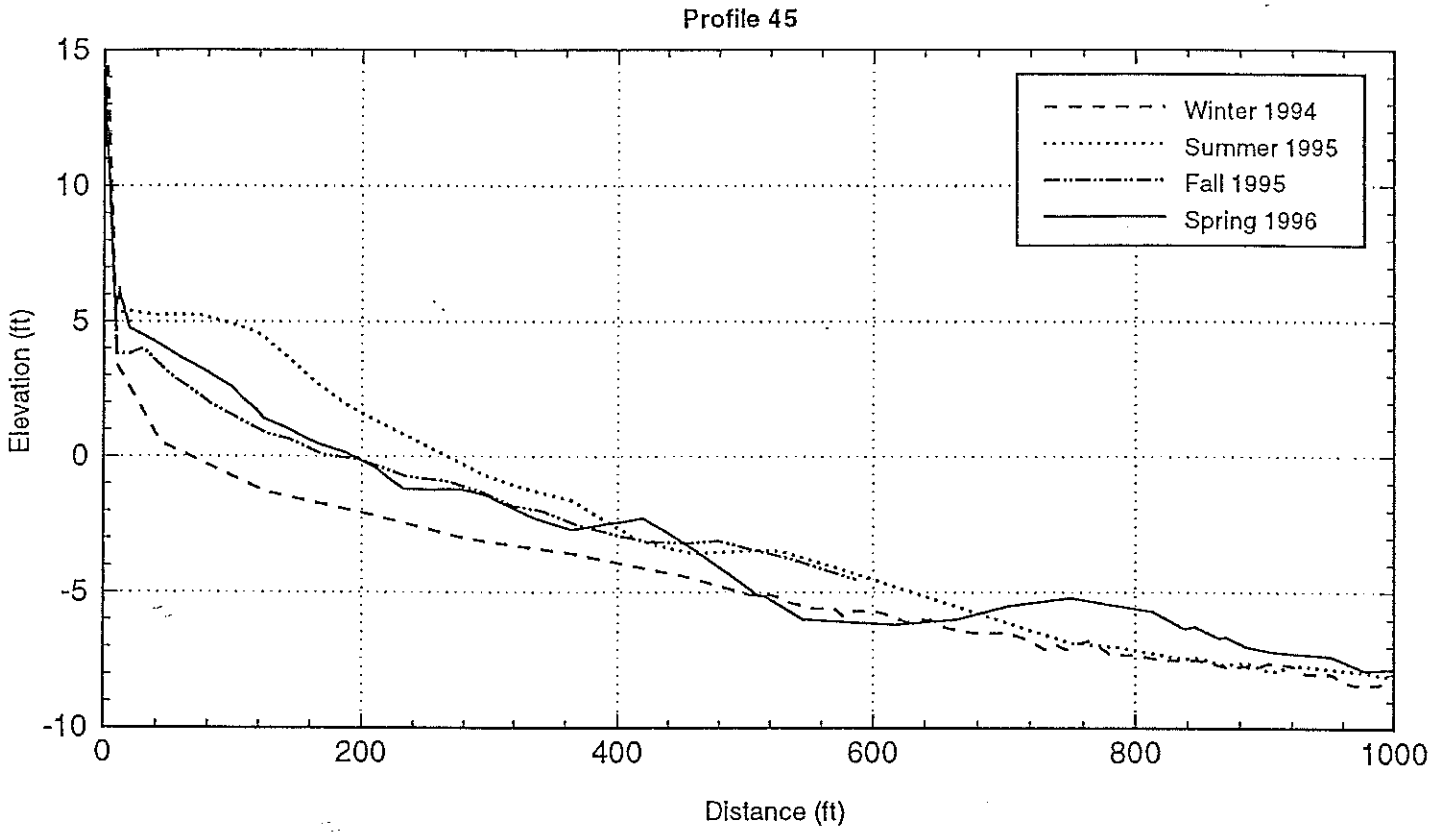

Profile 31
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

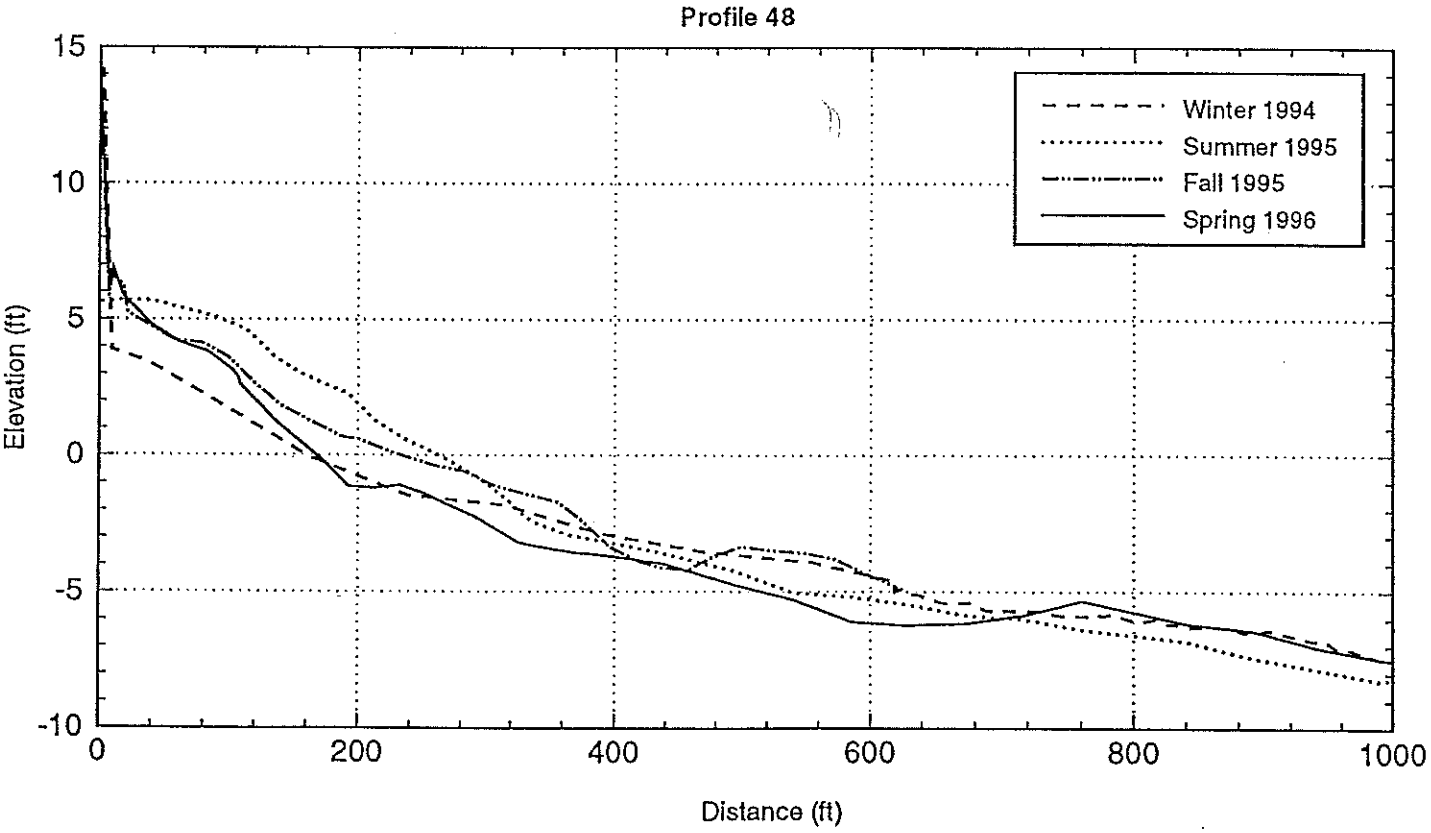

Profile 33
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

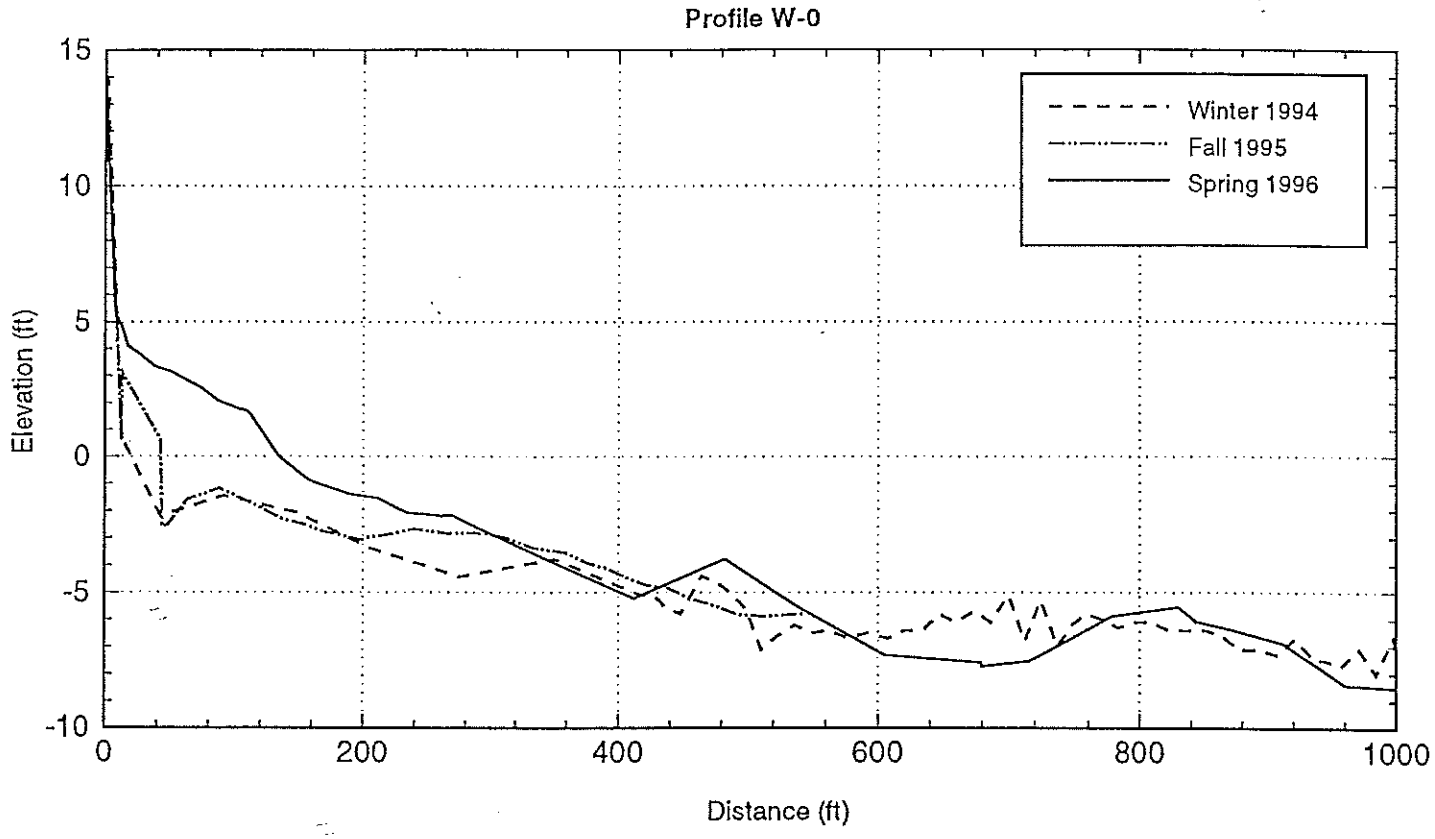

Profile 36
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

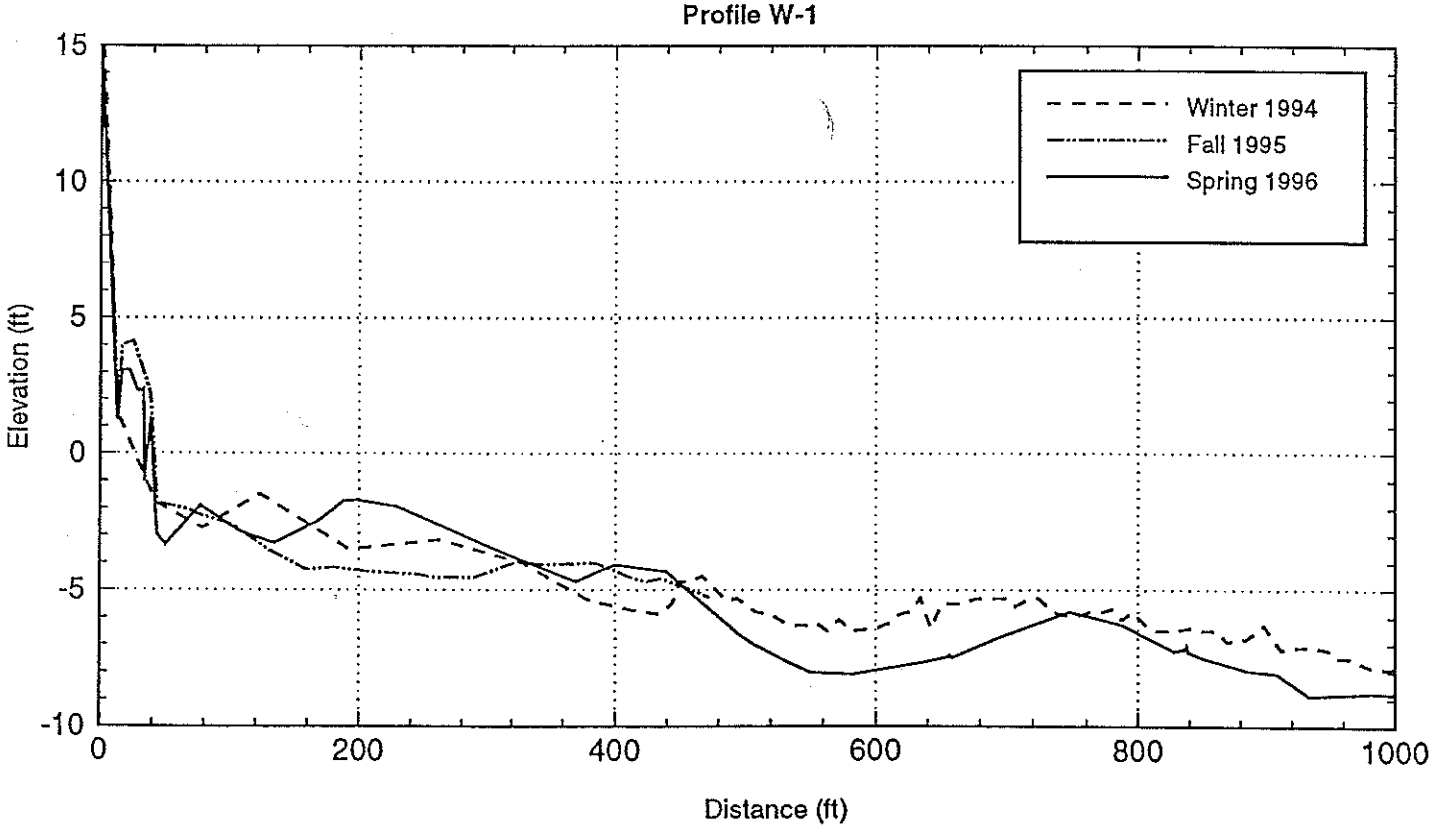

Profile 39
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000


Profile 42
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

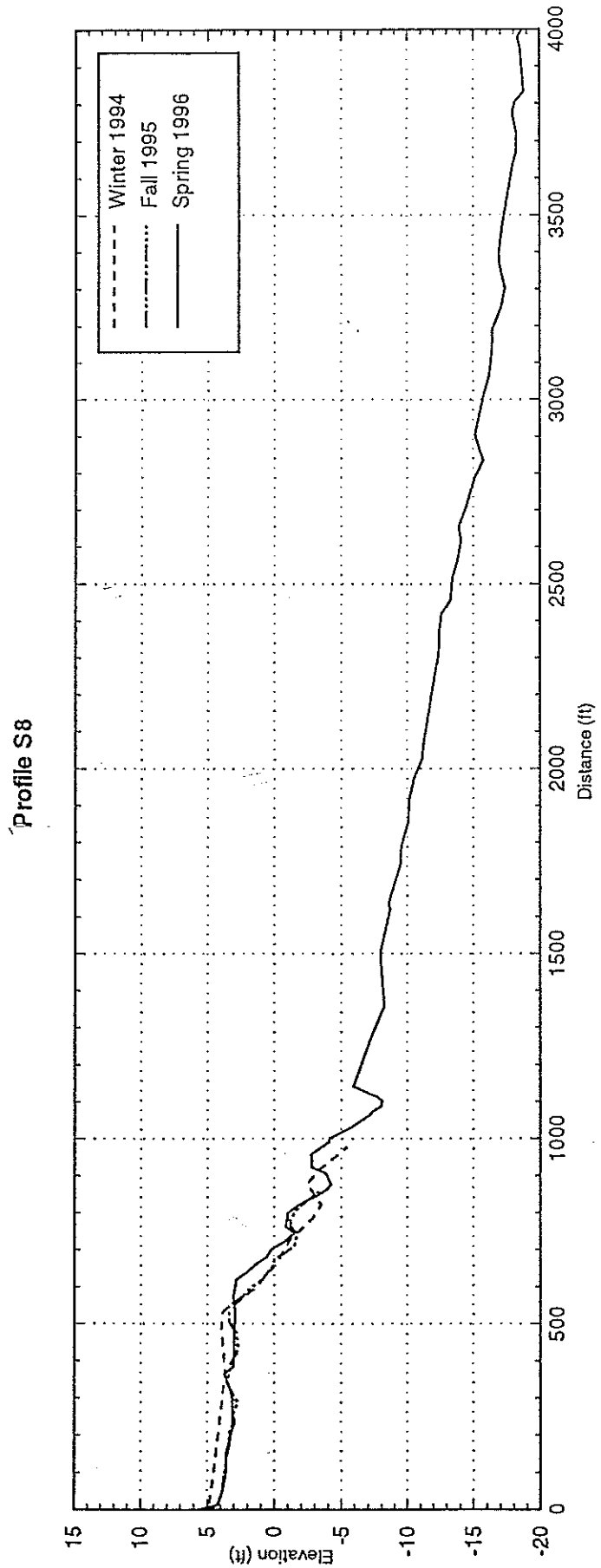

Profile 45
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

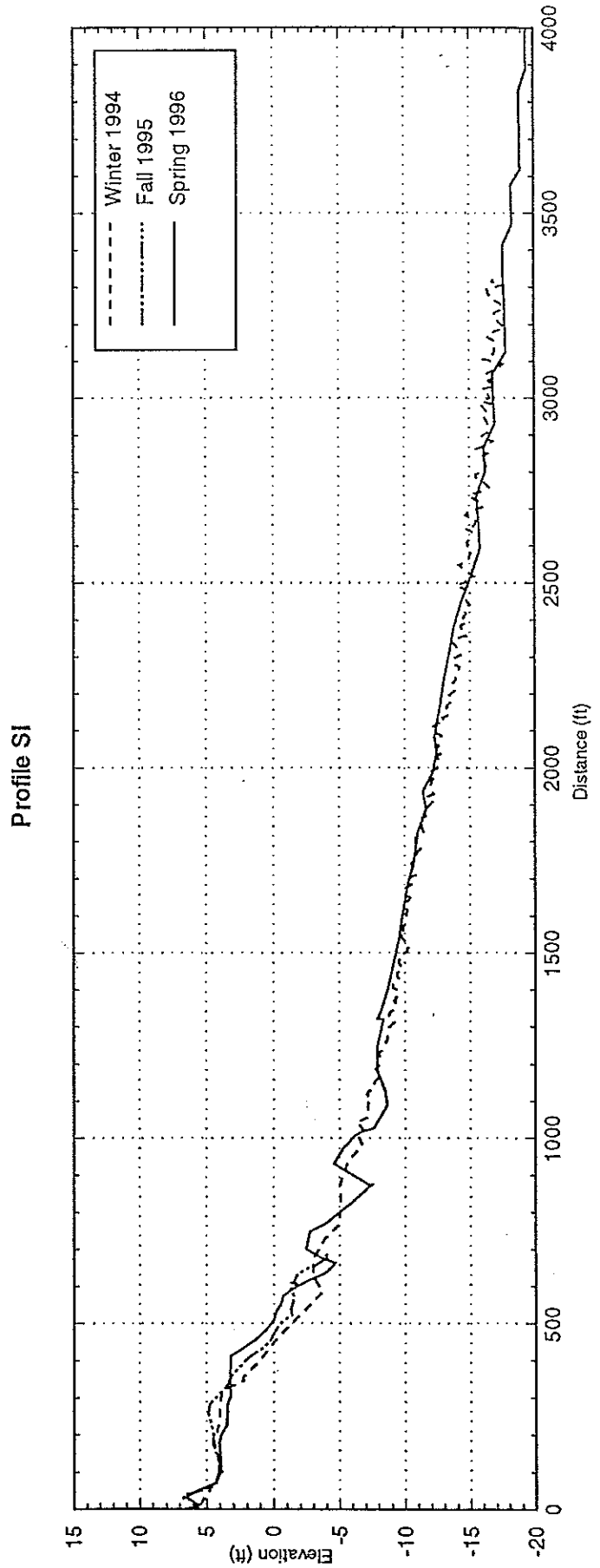

Profile 48
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000


Profile W-0
Winter 1994
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

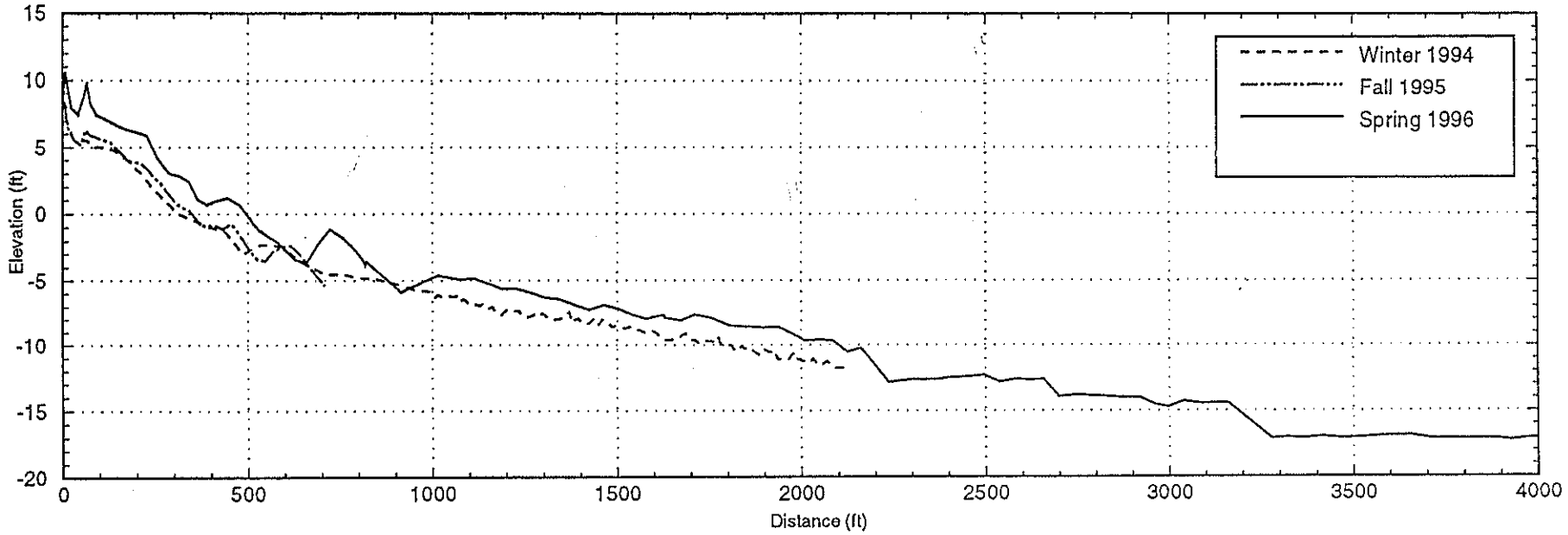

Profile W-1
Winter 1994
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
0
200
400
600
800
1000

Appendix B

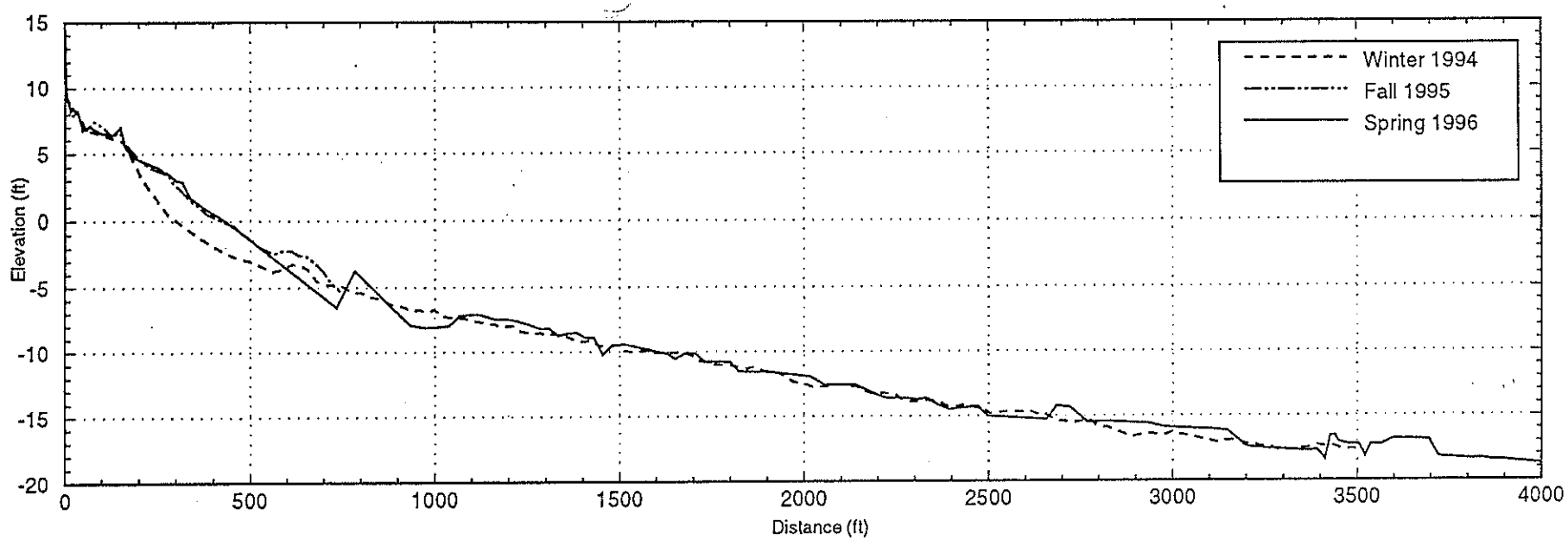

Profile S8
Winter 1994
Fall 1995
Spring 1996
Elevation (ft)
15
10
5
0
-5
-10
-15
-20
0
500
1000
1500
2000
2500
3000
3500
4000
Distance (ft)


Profile SI
Winter 1994
Fall 1995
Spring 1996
Elevation (ft)
15
10
5
0
-5
-10
-15
-20
0
500
1000
1500
2000
2500
3000
3500
4000
Distance (ft)

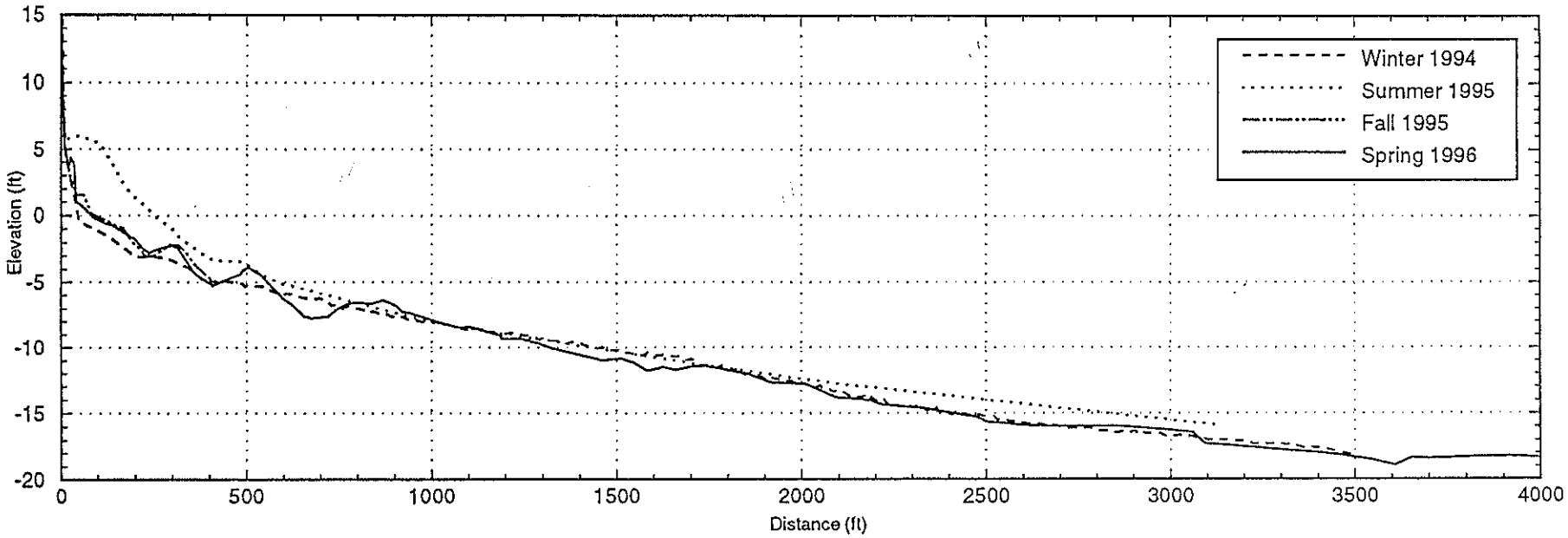
Profile S9



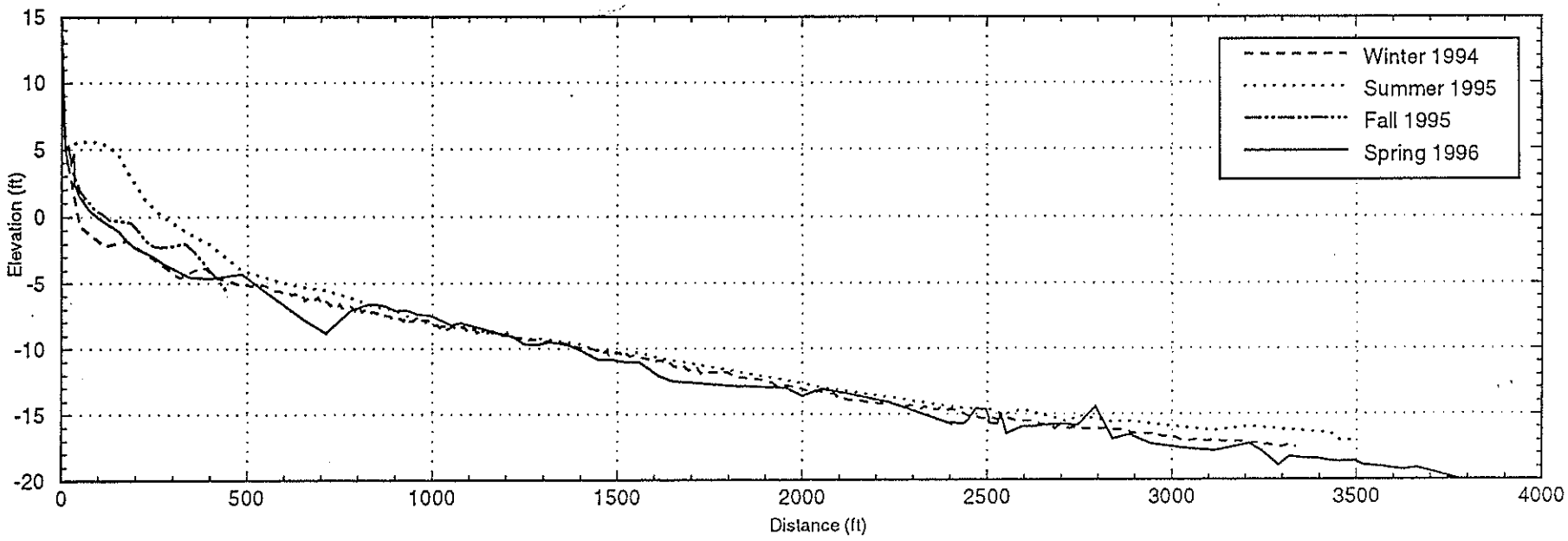
Profile 9B



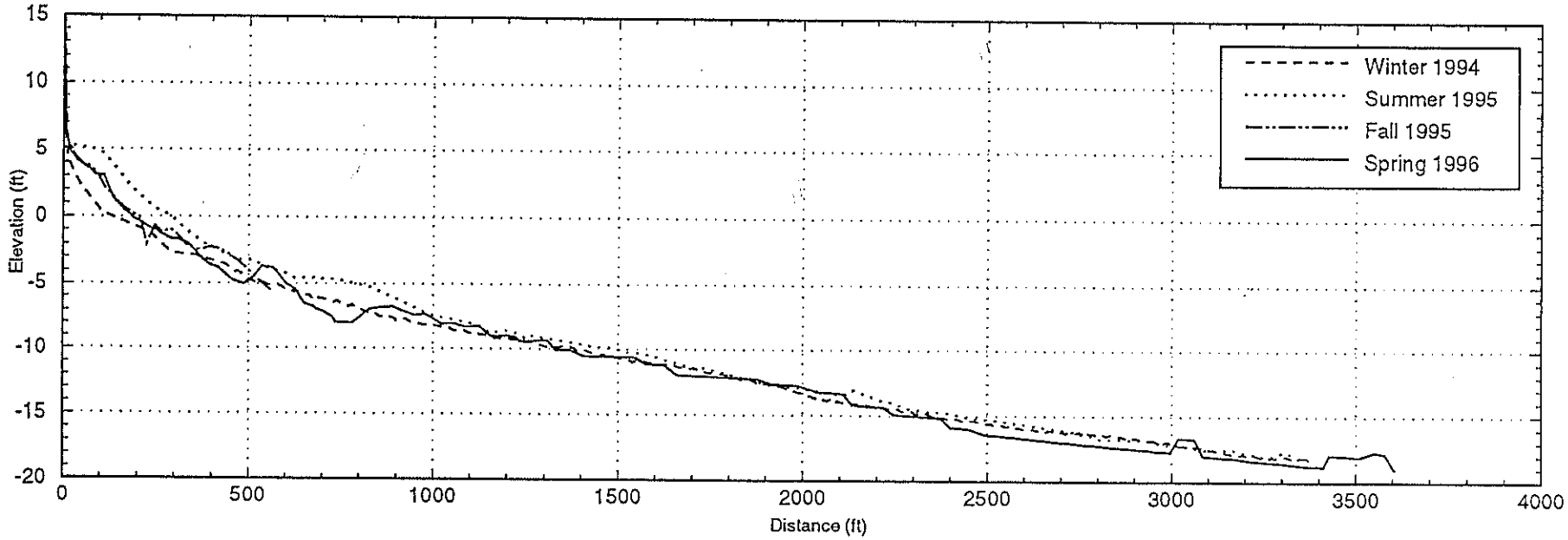
Profile 11



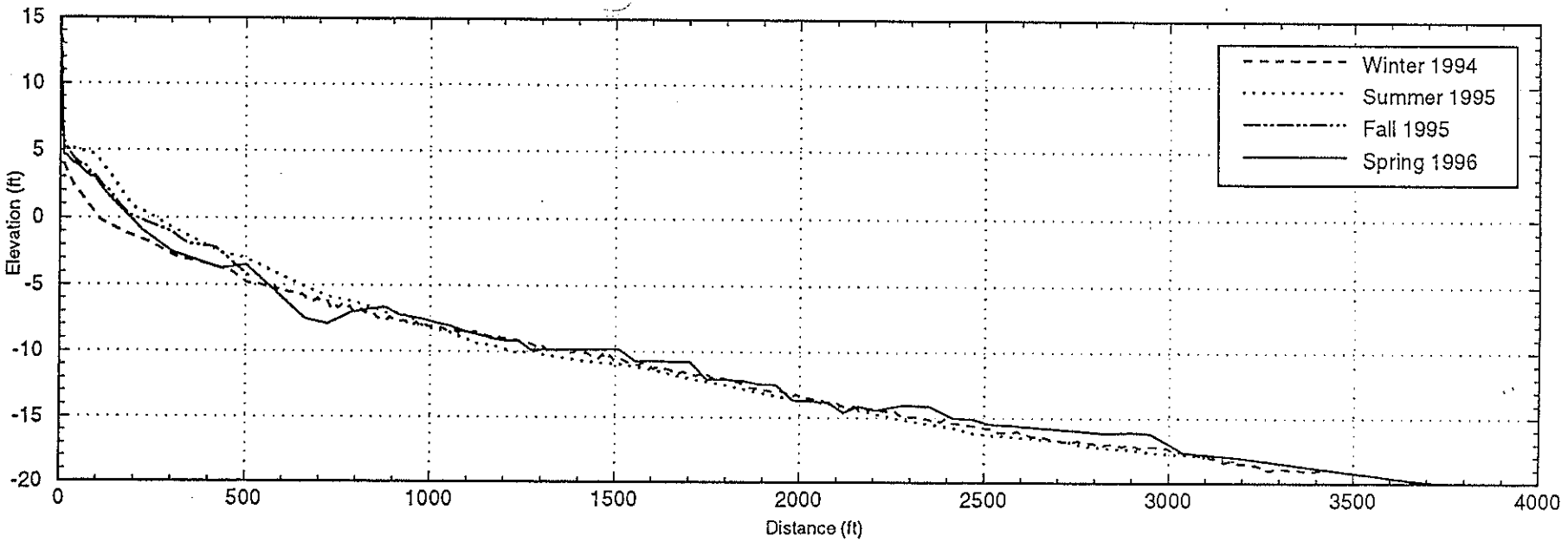
Profile 12

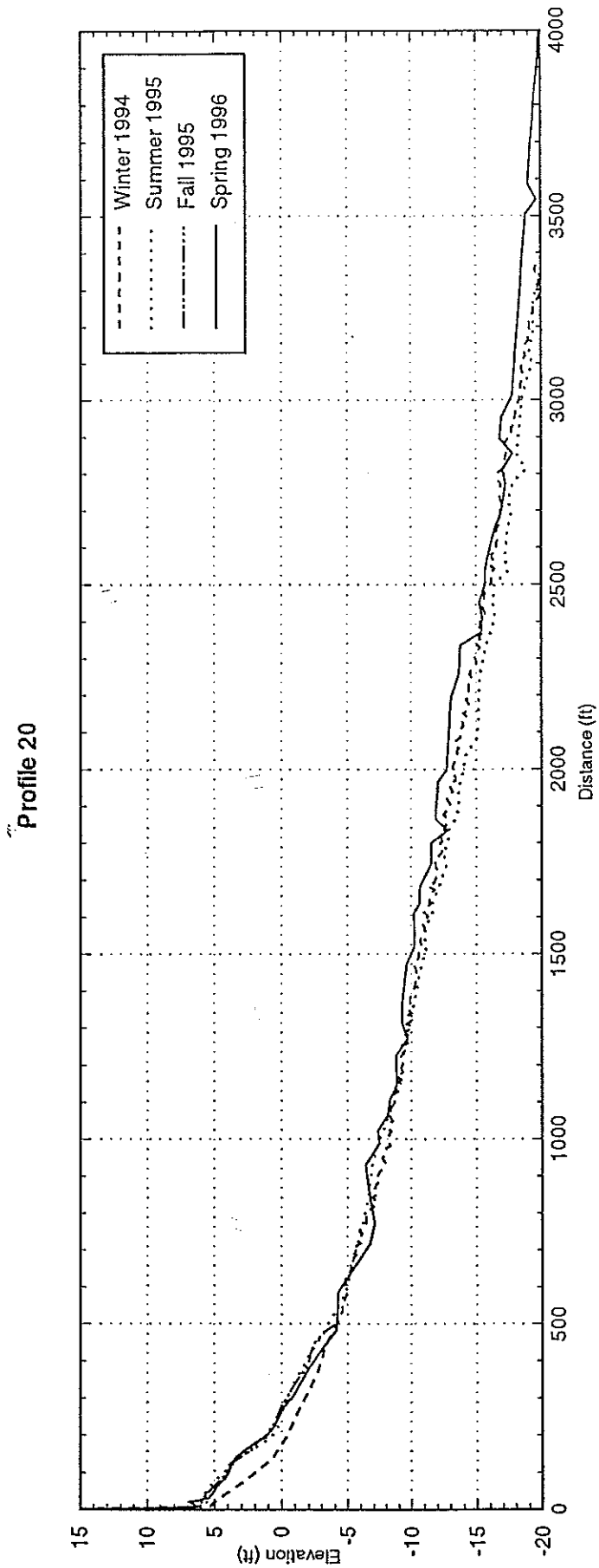


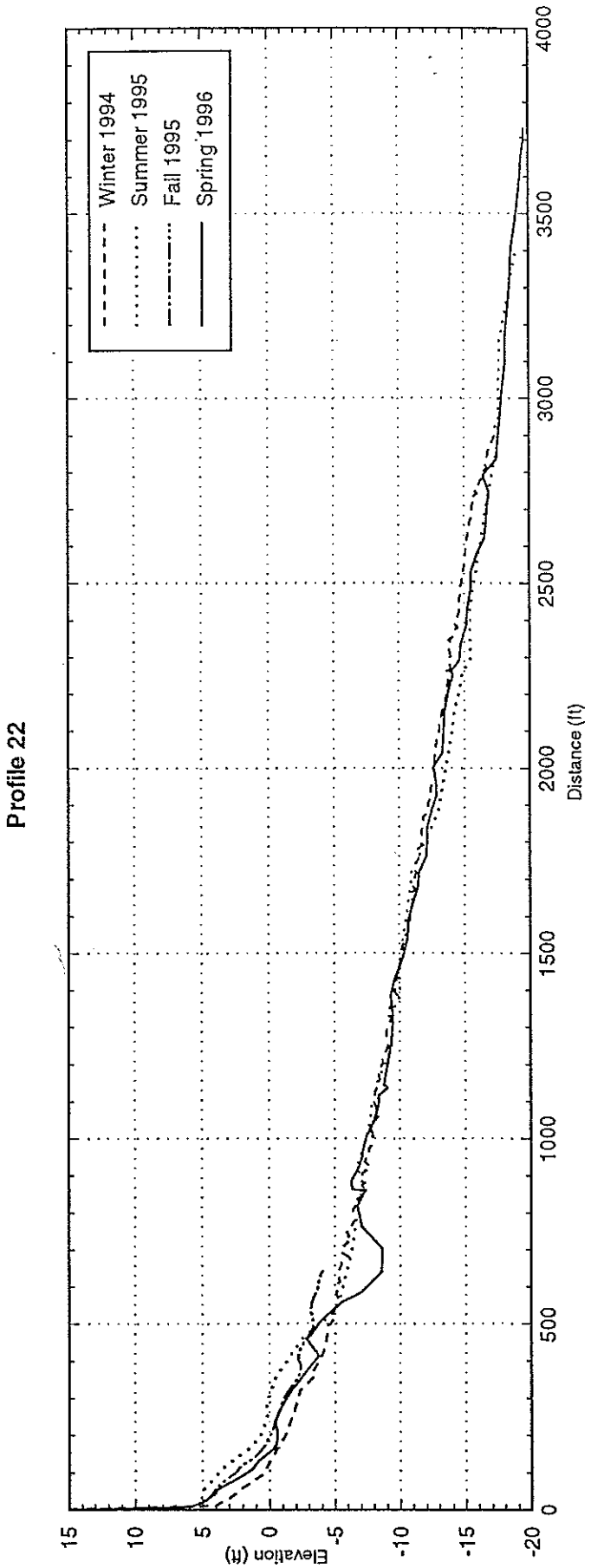
Profile 15



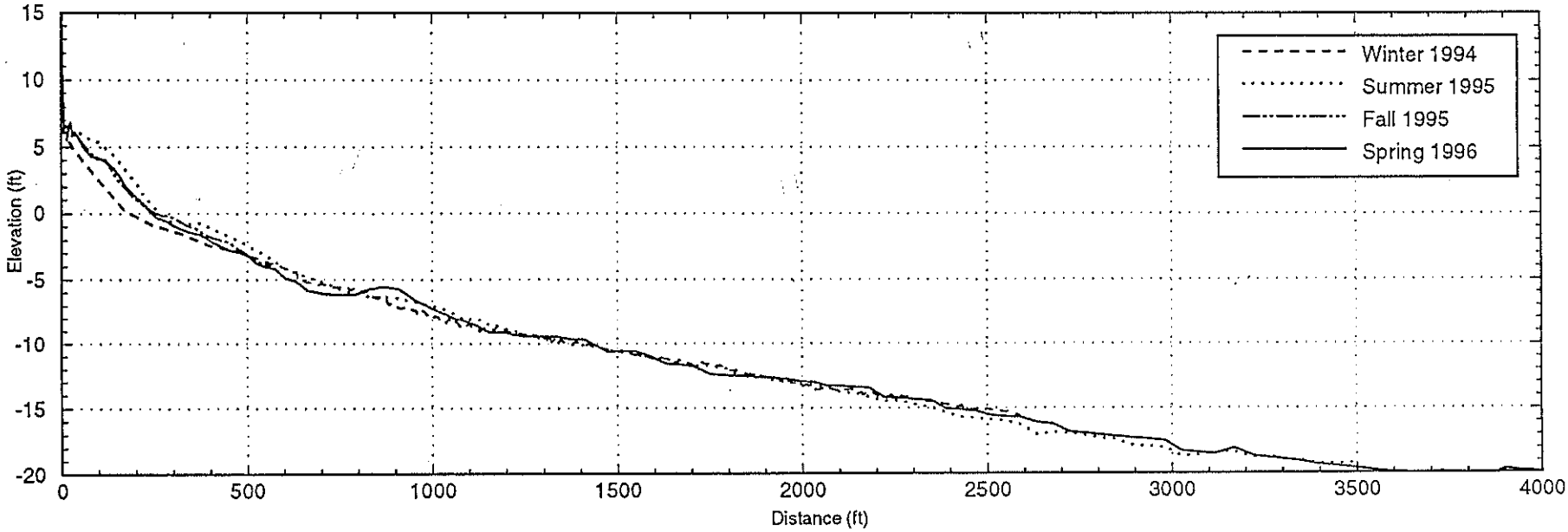
Profile 18



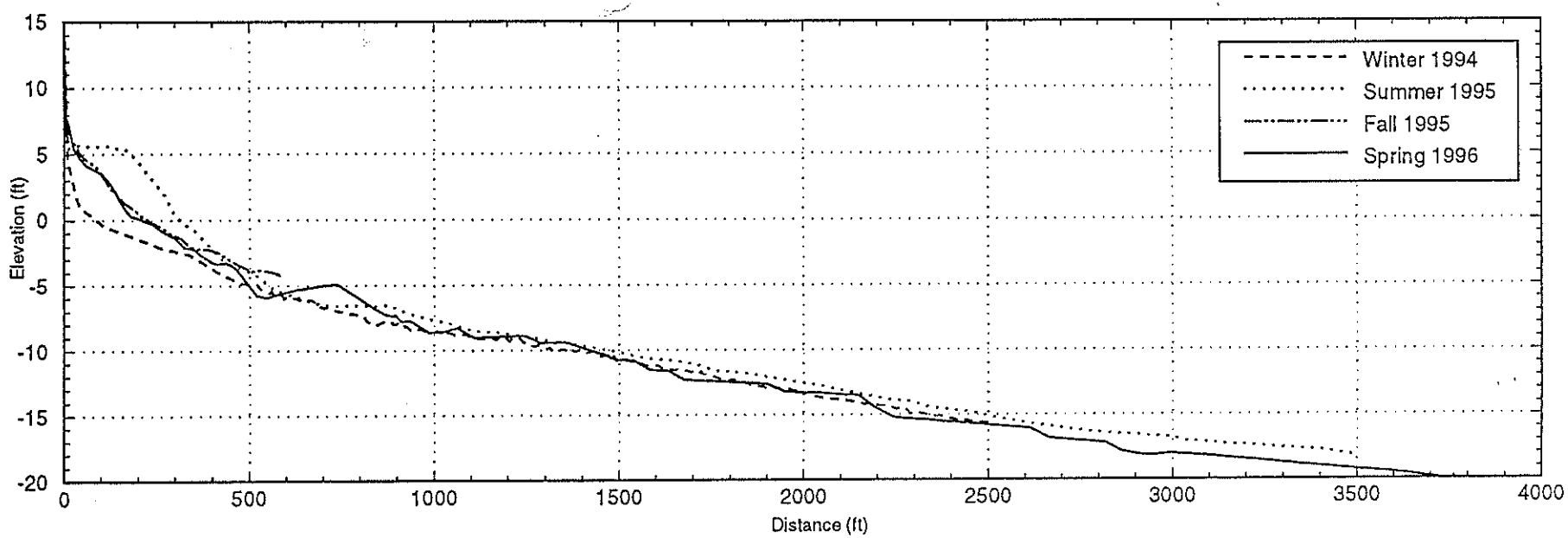

Profile 20
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
-15
-20
0
500
1000
1500
2000
2500
3000
3500
4000


Profile 22
Winter 1994
Summer 1995
Fall 1995
Spring 1996
Elevation (ft)
Distance (ft)
15
10
5
0
-5
-10
-15
-20
0
500
1000
1500
2000
2500
3000
3500
4000

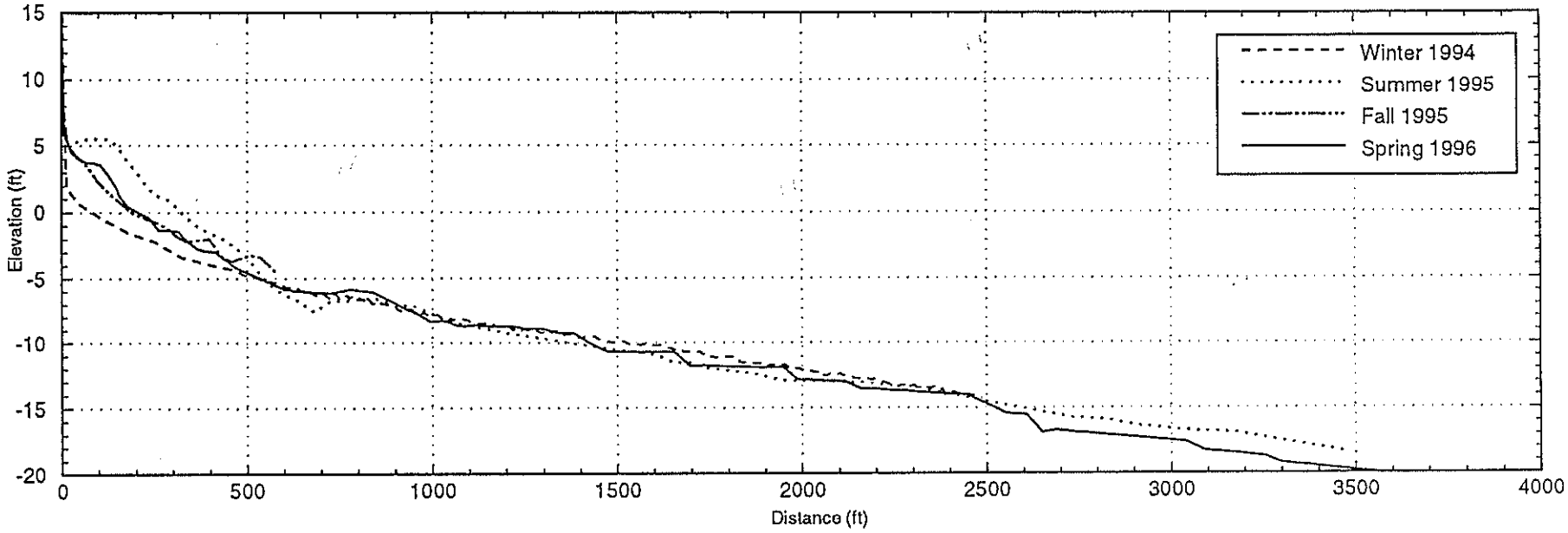
Profile 23A



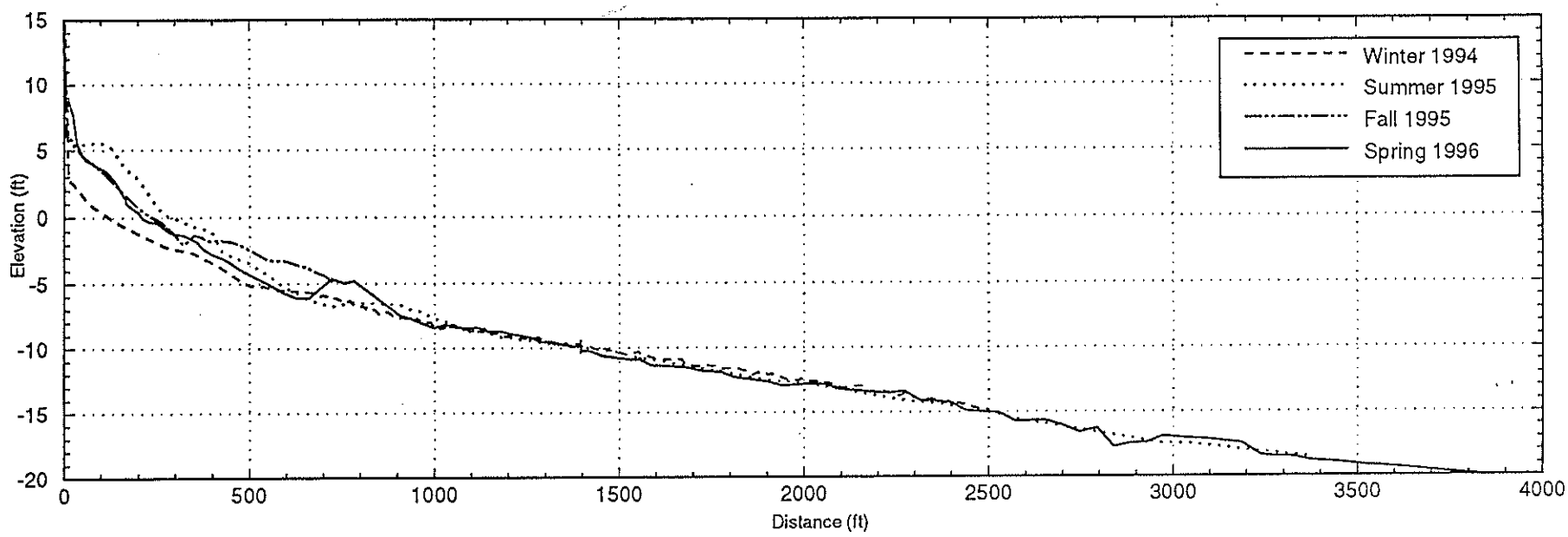
Profile 26



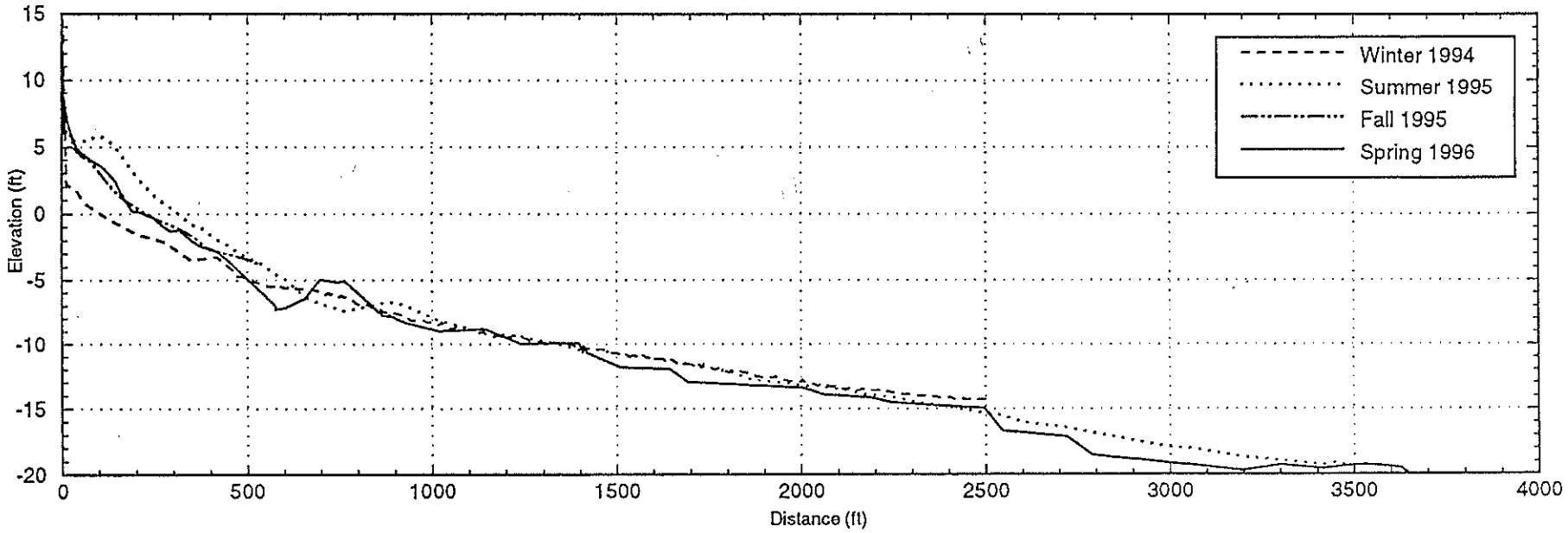
Profile 29



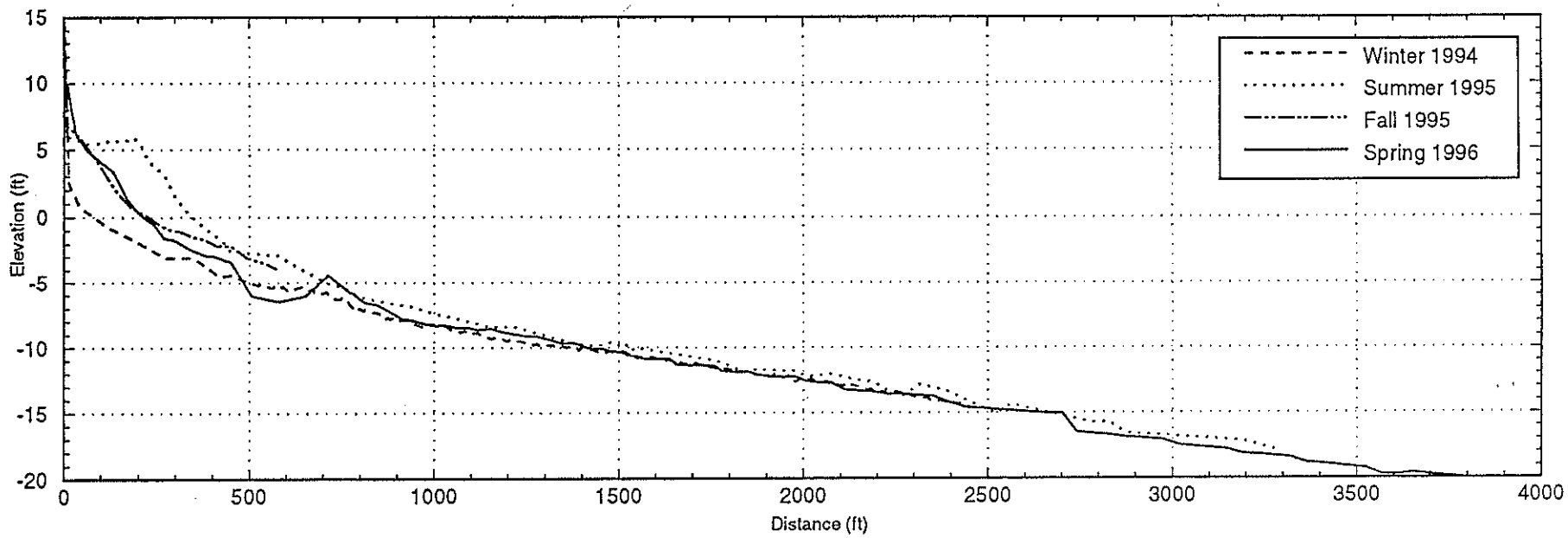
Profile 31



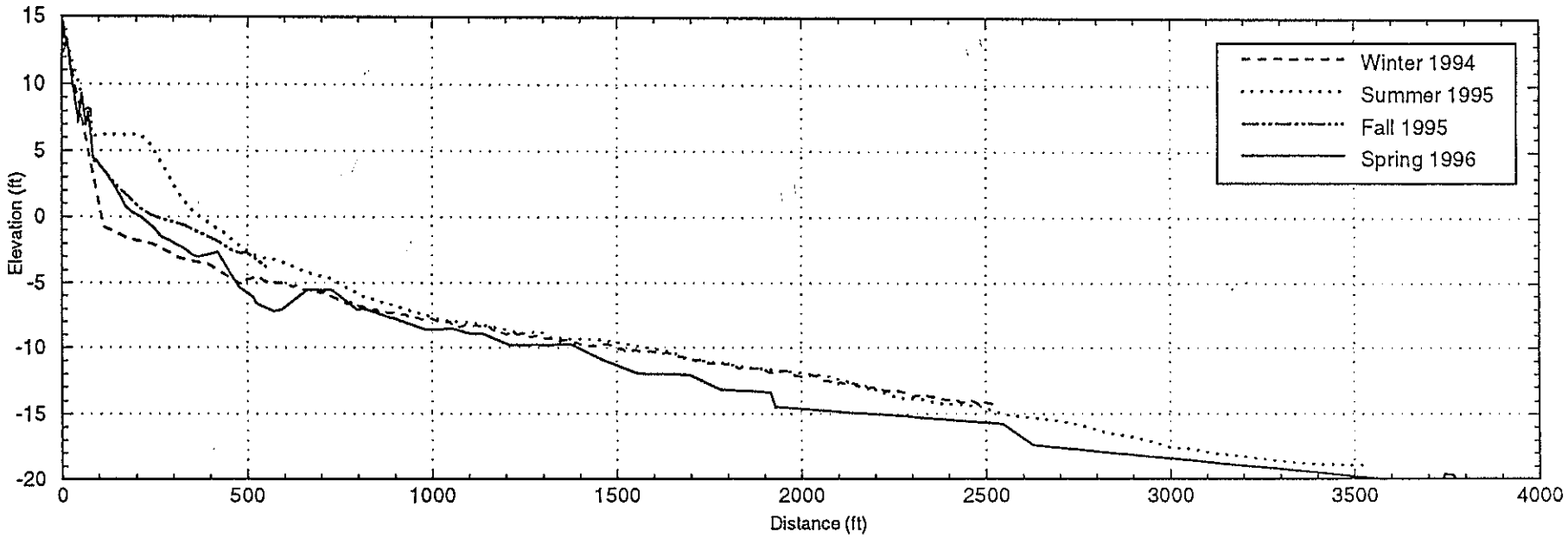
Profile 33



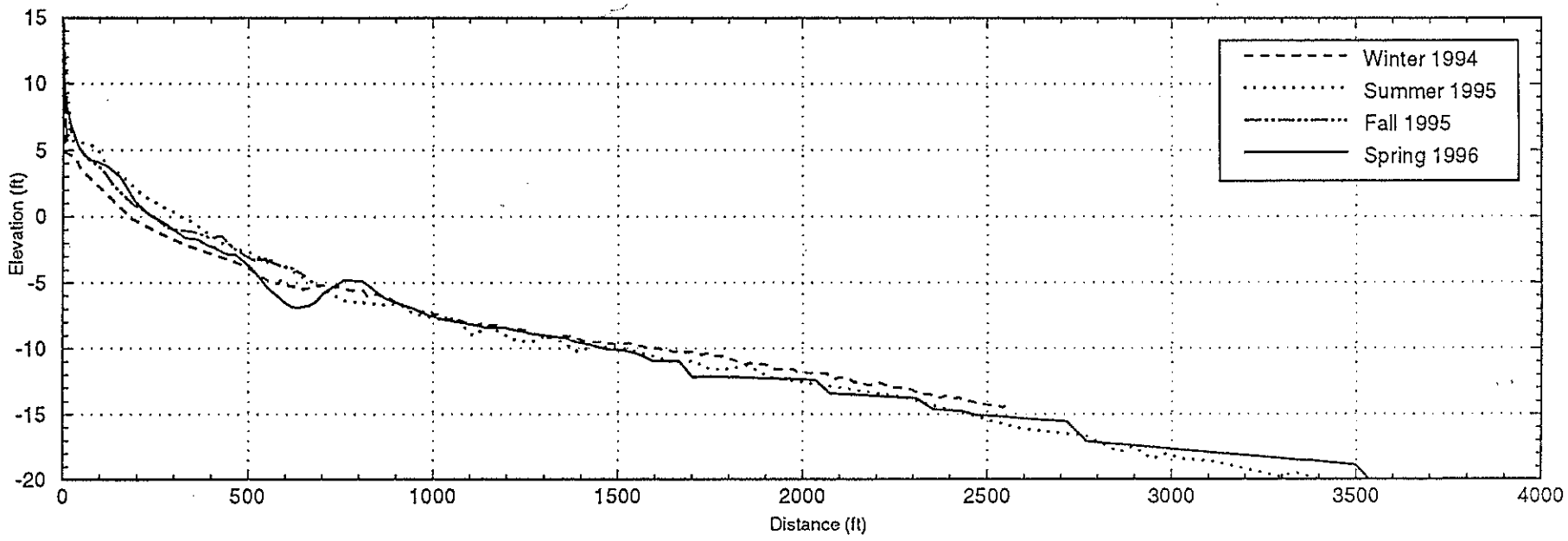
Profile 36



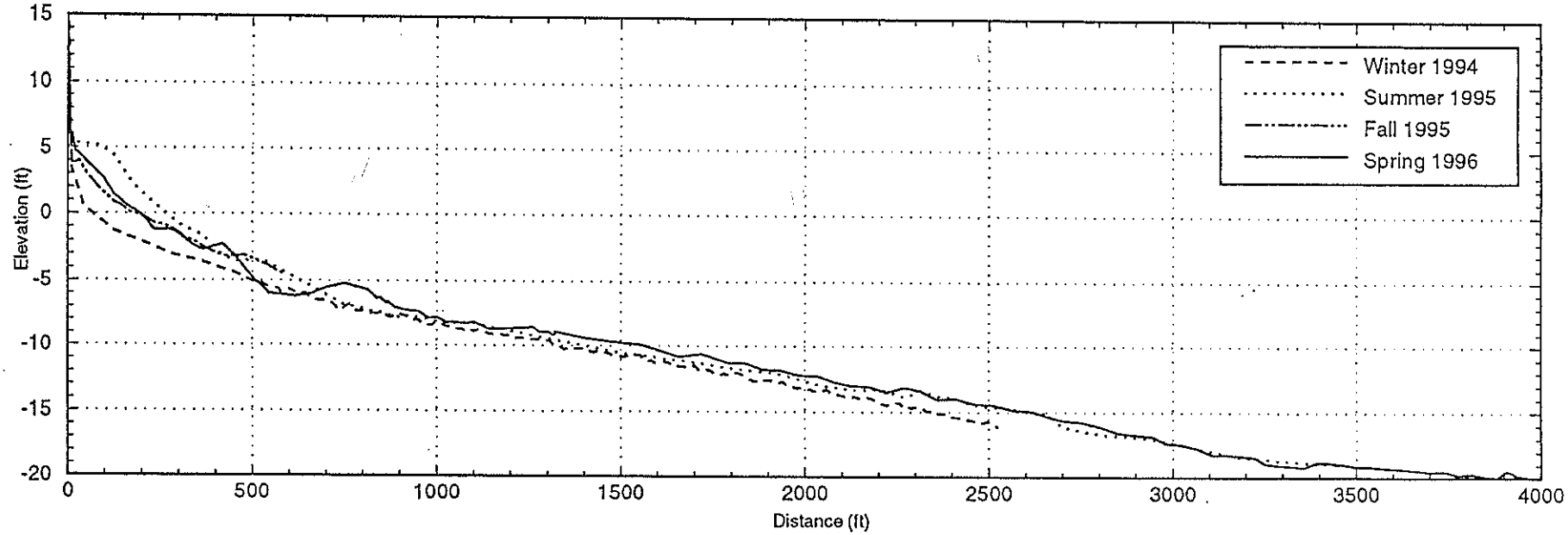
Profile 39



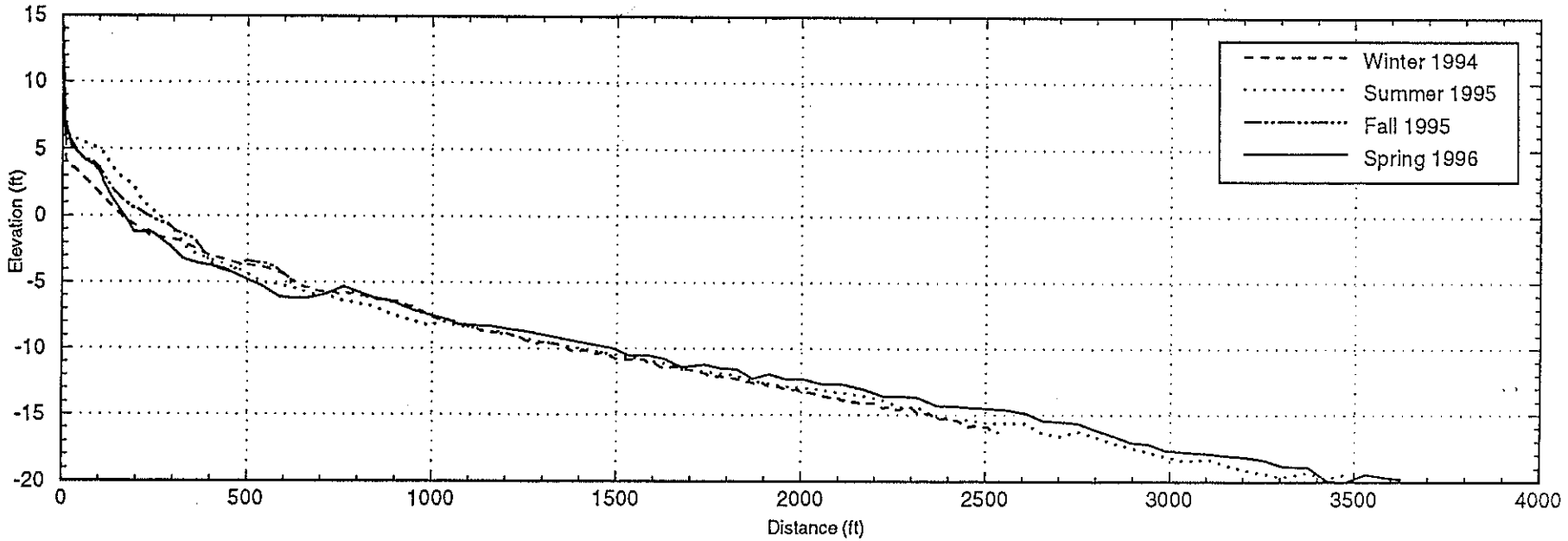
Profile 42



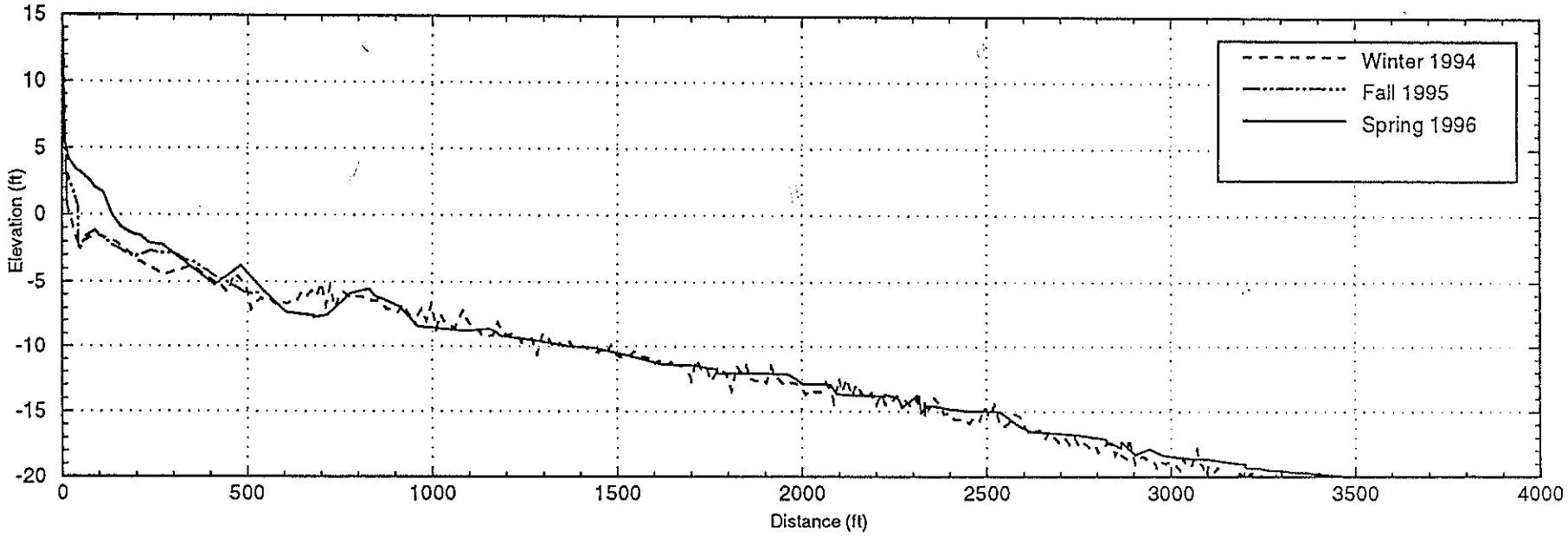
Profile 45



Profile 48



Profile W-0



Profile W-1