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the Nebraska Department of Roads,
the Nebraska Natural Resources Commission,
the Lower Platte South Natural Resources District, and
the Papio-Missouri River Natural Resources District

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12/28/99

Trends in Channel Gradation in Nebraska Streams, 1913-95

Water-Resources Investigations Report 99-4103

U.S. Department of the Interior
U.S. Geological Survey

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Water Resources Division
Federal Building, Room 406
100 Centennial Mall North
Lincoln, NE 68508
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December 21, 1999

Dear Interested Persons:

I am pleased to enclose a copy of the recently published report "Trends in Channel Gradation in Nebraska Streams, 1913-1995," by A.H. Chen, D.L. Rus, and C.P. Stanton. This report was released as Water-Resources Investigations Report 99-4103.

Please share this report with others who may be interested in the work. Additional copies or related information are available through the address and telephone number above or from Kathy Wilson, our Technical Editor, at 402-437-5663 or by email at kewilson@usgs.gov.

Sincerely,

Michael E. Slifer
District Chief

Enclosure (2)

U.S. Department of the Interior
U.S. Geological Survey

Trends in Channel Gradation in Nebraska Streams, 1913-95

By Abraham H. Chen, David L. Rus, *and* C.P. Stanton

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U.S. Department of the Interior
Bruce Babbitt, Secretary

U.S. Geological Survey
Charles G. Groat, Director

Lincoln, Nebraska: 1999

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
meter (m)	3.281	foot
meter per kilometer (m/km)	5.27983	foot per mile
meter per decade (m/decade)	3.281	foot per decade
cubic meter per second (m^3/s)	35.31	cubic foot per second
cubic hectometer (hm^3)	810.7	acre-foot
kilometer (km)	0.6214	mile
square kilometer (km^2)	0.3861	square mile

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

Water year: In U.S. Geological Survey reports dealing with surface-water supply is the 12-month period October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1997, is called the "1997 water year."

Trends in Channel Gradation in Nebraska Streams, 1913-95

By Abraham H. Chen, David L. Rus, *and* C.P. Stanton

ABSTRACT

Many stream channels in the loess area of eastern Nebraska were dredged and straightened during the early 1900s to alleviate cropland flooding by increasing the flow capacity of stream channels. The increased gradient of shortened channels also increased the erosive power of the streams. As a result, many of the modified channels and their upstream tributaries have experienced headward-progressing degradation. Aggradation can occur downstream of degrading channels when increased sediment load exceeds the transport capacity of the stream. Furthermore, many stream channels in Nebraska have been affected by land-use changes, storage reservoirs, and power developments, all of which have affected sediment loads in streams.

Kendall's tau test was used to identify trends in the median surface-water elevations at 145 gaging stations. The trend slope was determined through regression analysis.

Of 145 gaging stations examined, 56 showed a degradation trend (39 percent); 22 showed an aggradation trend (15 percent); and 67 showed no trend (46 percent) at the 99-percent confidence level. The rates of change ranged from -0.752 to 0.941 meters per decade. Degradation was indicated at 62 percent of gaging stations (28 of 45 gaging stations) in the eastern 23-county area, including the Big Nemaha River and the Muddy Creek tributary; the Big Blue River; the Little Nemaha River; Weeping Water Creek; the Platte River; Salt Creek and the Little Salt, Wahoo, Rock, and Stevens Creek tributaries; the Elkhorn River and the Logan Creek tributary; Omaha Creek; Big Papillion Creek, and the Little Papillion and West Papillion Creek tributaries. Degradation was identified at 28 percent of gaging stations in the western 70-county area, including the Niobrara River Basin (7 of 15 gaging stations); the Platte River Basin (13 of 47 gaging stations); and the Republican River Basin (8 of 27 gaging stations). The results are only indicative of trends during the periods of record used for the individual gaging stations.

Streambed degradation downstream from dams is a well-known phenomenon on alluvial streams. The rates of degradation at six sites below the dams ranged from 0.013 to 0.752 meters per decade. Also, increased sediment loads and channel deposition downstream in the Medicine Creek drainage basin were observed and could be the result of agricultural land-use changes.

INTRODUCTION

Stream channels respond to imposed disturbances by altering aspects of their morphology, sediment load, and hydraulic characteristics. Responses or adjustments can involve short time scales (days) and limited spatial extents, or longer periods of time (scores to hundreds of years) and entire fluvial systems, depending on the magnitude, extent, and type of disturbance (Simon, 1994). Information about gradation processes for streams is useful for managers and engineers responsible for the planning and protection of river-crossing structures and land adjacent to streams. Degradation, or lowering of a channel bed, can result in channel widening as banks become too high to remain stable. These processes can affect adversely the foundations of bridge structures spanning a channel and can cause the loss of agricultural lands. Aggradation, or raising of a channel bed through sediment accumulation, reduces the streamflow capacity of bridge openings and can increase the frequency and areal extent of flooding by increasing the stages of given discharges. Streambed aggradation and degradation can affect long stream reaches, entire stream lengths, or entire stream systems.

Many stream channels in the loess area of eastern Nebraska were dredged and straightened during the early 1900s to increase their capacity and to reduce cropland flooding. This engineering practice generally reduces stream lengths, increases channel gradient and stream power, and increases the ability of the flow to erode streambeds. As a result, many of these modified channels and their upstream tributaries have experienced headward-progressing degradation, which has heightened and steepened channel banks, causing channel widening by bank failures. Such channel degradation has resulted in damage to highway structures, pipelines, communication lines, and land adjacent to the stream channels. In western Iowa, accelerated stream-channel degradation was estimated by Baumel (1994) to have caused $1.1 billion in damages to infrastructure and the loss of agricultural lands since 1900.

Rather than the channelization that has disturbed streams in loess areas of eastern Nebraska, many stream channels in western Nebraska have been affected by land-use changes, construction of storage reservoirs and hydroelectric power facilities, ground-water withdrawals, surface-water diversion for irrigation, and return flow from irrigated areas. For instance, the channels of the Platte River and its major tributaries, the South Platte River in Colorado and the North Platte River in Wyoming, have undergone major changes in hydrologic regime and morphology since 1860. These changes were attributed to agricultural, municipal, and industrial water use (Eschner and others, 1983).

Previous investigations have documented degradation in southwestern Nebraska (Brice, 1966) and in southeastern Nebraska (Wahl and Weiss, 1995). Studies of channel adjustment in the loess area of the midwestern United States have been conducted by the U.S. Geological Survey (USGS) and have provided detailed, quantitative information on rates of bed-level change, channel widening, and estimates of stable-channel geometries (Simon and Hupp, 1992; Simon, 1994; Simon, 1995).

In 1996, the USGS, in cooperation with the Nebraska Department of Roads, the Nebraska Natural Resources Commission, the Lower Platte South Natural Resources District, and the Papio-Missouri River Natural Resources District, began an interagency study to evaluate and quantify channel instabilities on selected streams in a 23-county area of eastern Nebraska. One objective of this study was to test for gradation trends at about 30 sites with streamflow stage and discharge records. In 1997, in cooperation with the Nebraska Department of Roads, this objective was expanded to test for gradation trends at additional sites in the remaining 70 counties of Nebraska. This report presents all of the results.

Purpose and Scope

The purpose of this report is to present the results of the testing for gradation trends at 145 gaging stations in Nebraska. The report describes the methods used for site selection, data compilation, and statistical trend analysis. The over-all period of record used for the analysis was from 1913 through 1995. This report also contains plots of surface-water elevation changes over time, tables of stage-discharge relation data, and trend statistics.

Acknowledgment

This study was supported in part by an appointment to the U.S. Geological Survey Earth Sciences Internship Program administered by Oak Ridge Associated Universities.

DESCRIPTION OF STUDY AREA

Topography and Drainage

Nebraska is entirely within the Missouri River Basin, and the Missouri River forms the eastern boundary of the state (fig. 1). The state is physiographically diverse and the characteristics of its streams are strongly influenced by the physiographic areas through which they pass. The eastern one-fourth of the state lies in the dissected till plains in the Central Lowland physiographic province (Fenneman, 1946) (fig. 1). This part of Nebraska is a glaciated region that is characterized by rolling hills, and is covered with loess soils that are easily eroded. The eastern 23-county area lies within the region. Most of the remainder of the state is in the Great Plains province, the majority of which is composed of dissected plains, high plains, and sand hills. The Sand Hills Area (fig. 1), which consists of sand dunes stabilized by native grasses, is a major physiographic feature of Nebraska that covers about one-fifth of the state and contains little surface drainage.

Surface drainage generally follows the regional topography in an eastward or southeastward direction. Land-surface elevations generally decrease from west to east. The greatest topographic relief is observed along the upper reaches of stream valleys.

General Description of Streams and Rivers

The Niobrara, Platte, Loup, Elkhorn, Republican, Big Blue, and Missouri Rivers are the major streams in Nebraska (fig. 1). The Niobrara, Platte, and Republican Rivers flow eastward across much of the state. The Loup, Elkhorn, and Big Blue Rivers originate within Nebraska. The streams vary from braided to mature and meandering, with dominant sediment sources ranging from clay to medium sand.

The Missouri River is a mature, meandering tributary of the Mississippi River and drains a large part of the central Great Plains. Its main stem is regulated by a series of reservoirs to control floods, generate power, store irrigation water, and regulate the flow downstream for navigation. The tributary streams of the Missouri River throughout the eastern part of the state, such as Bow Creek, Omaha Creek, Tekamah Creek, New York Creek, Papillion Creek, Weeping Water Creek, Little Nemaha River, and Big Nemaha River (fig. 1), lie within the Central Lowland physiographic province. The tributaries flow across highly erodible loess soils that are moderately to poorly permeable. The majority of the topography is rolling hills and streamflow consists mainly of overland runoff. Many stream channels were dredged and straightened during the early 1900s.

On the basis of grain-size distribution for composited streambed-sediment samples in the Missouri River main stem near Rulo (fig. 1), Druliner and others (1997) reported that the Missouri River streambed sediment is composed mostly of sand (96.4 percent), some silt (2.6 percent), and clay (1 percent). The streambed sediment near the mouth in three tributaries (Weeping Water Creek, Little Nemaha River, and Big Nemaha River), however, is composed mostly of silt, with lesser amounts of clay and sand.

Streams and rivers throughout the remaining 70-county area, such as the White River, Ponca Creek, Bazile Creek, Niobrara, Elkhorn, Loup, Platte, Republican, and Little and Big Blue Rivers, lie within the High Plains, Plains Border, and Missouri Plateau sections of the Great Plains Province (fig. 1). The generally flat topography of the High Plains provides gentle stream gradients and produces little overland runoff that contributes to limited stream incision and rather broad valleys. Streamflow throughout most of the Sand Hills in this region is derived mainly from ground water. On the other hand, the Plains Border and Missouri Plateau physiographic sections are more dissected than the High Plains and have greater local relief. Stream channels are characteristically narrow, well established, and bounded by a perceptible series of terraces. Streamflow mainly consists of overland runoff. The following is a general description of major rivers in the area.

The Niobrara River lies mostly along the northern border of Nebraska and extends from the Wyoming border about 600 river km (kilometer) (Moody and others, 1986) east to its confluence with the Missouri River (fig. 1). Sand-bed channels of the river commonly are apparent. Streamflow throughout most of its length is derived mainly from ground-water inflow, although in the lower reaches, overland runoff provides a significant percentage of the flow in some years.

The Platte River, which is formed by the confluence of the North Platte and the South Platte Rivers near the city of North Platte, flows 500 river km eastward across central Nebraska into the Missouri River. Its drainage area within the state is about 106,000 km^2 (square kilometers); and represents about 53 percent of the area of the state (Moody and others, 1986). The U.S. Bureau of Reclamation and the Central Nebraska Public Power and Irrigation District store and divert water for

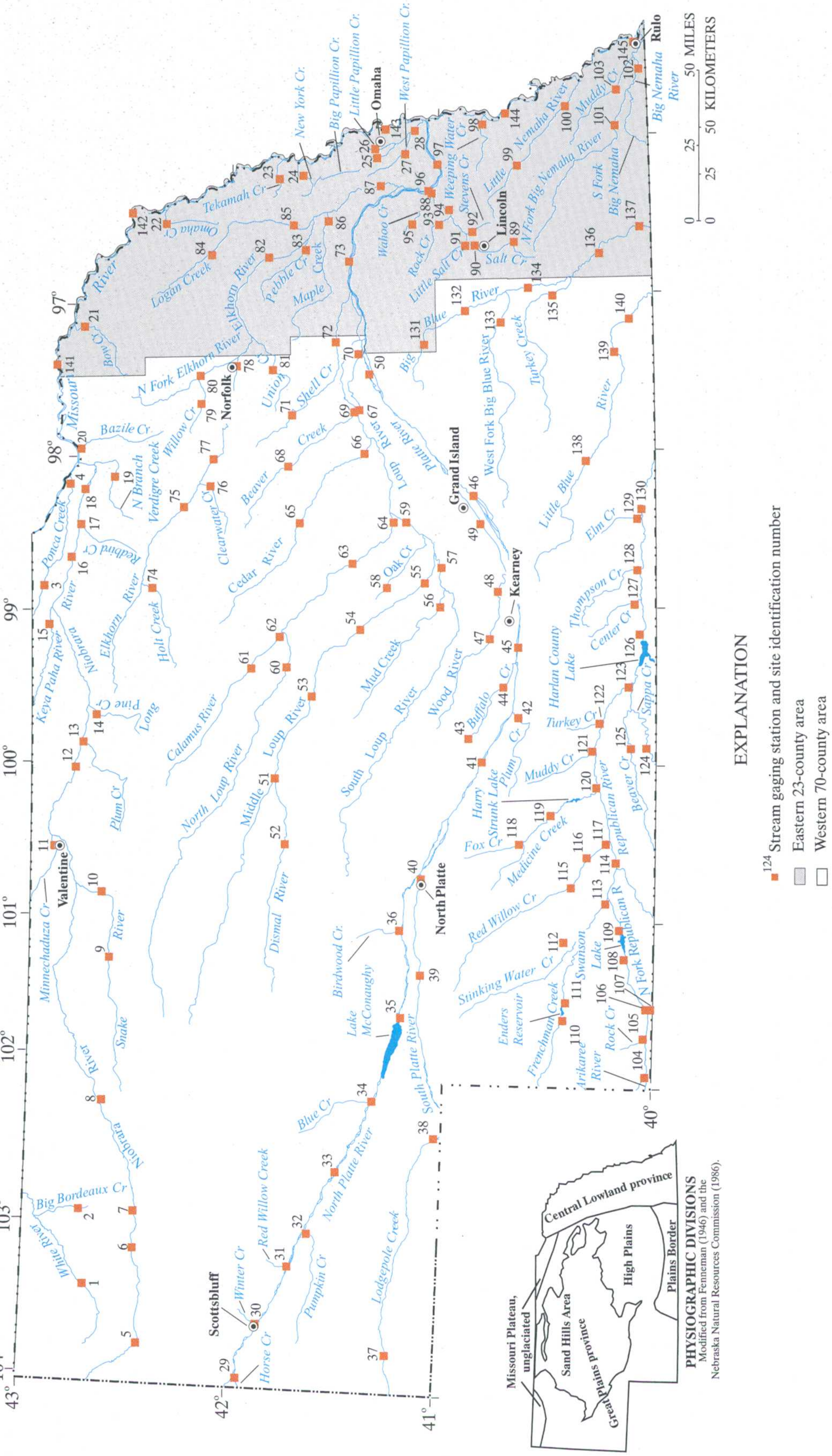

Figure 1. Principal rivers, physiography, and selected gaging stations in Nebraska.

power production, irrigation, and recreation. For example, Lake McConaughy (fig. 1) on the North Platte River, the largest impoundment in Nebraska (about 64 percent of the total storage capacity for the state), affords opportunities for power production, irrigation, and water-based recreation. The Platte River is diverse in channel form; in general, it is wide and shallow. The sand-and-gravel bed has bed forms of various scales. Channel patterns vary from meandering to island-braided to straight. The streambed sediment near Grand Island and near the mouth of the Platte River is composed mostly of sand, some silt, and clay (Druliner and others, 1997).

The Loup River in central Nebraska drains 39,400 km^2 or nearly one-fifth the area of the state. The upper part of the basin drains the eastern Sand Hills Area, which yields mostly ground water and little overland runoff to the river. The lower part of the basin drains loess hills, which contribute overland runoff to streamflow (Moody and others, 1986). The U.S. Bureau of Reclamation and the Loup River Public Power District divert water from the river. The streambed sediment near the mouth is composed mostly of sand, some silt, and clay (Druliner and others, 1997).

The Elkhorn River drains the northeastern part of the Sand Hills Area and the area of northeastern Nebraska that is characterized by rolling hills of glacial drift overlain by loess. Flows in the upper part of the Elkhorn River Basin are uniform because of the constant rate of ground-water discharge from the Sand Hills Area. Flows in the lower basin are more variable owing to less permeable loess soil and greater overland runoff. The streambed sediment near the mouth is composed mostly of sand, some silt, and clay (Druliner and others, 1997).

The Republican River and the Little and Big Blue Rivers are part of the Kansas River Basin. The Republican River flows through southern Nebraska into Kansas. The Republican River in Nebraska is largely incised into bedrock. Five major reservoirs for flood control and irrigation were constructed between 1949 and 1961 on the main stem and on tributaries. The streambed sediment near Superior (near the Nebraska-Kansas state line) is composed mostly of sand, some silt, and clay (Druliner and others, 1997).

The Little and Big Blue Rivers begin in the southeastern part of the state and drain relatively flat lands characterized by loess-covered sand-and-gravel deposits. Streamflow in the basin mainly is the result of direct overland runoff. The streambed sediment in the Little Blue River near the Nebraska-Kansas state line is composed mostly of sand, some silt, and clay. Similarly, the streambed sediment in the Big Blue River near the Nebraska-Kansas state line is composed mostly of sand, silt, and some clay (Druliner and others, 1997).

METHODS

Data from a total of 145 stream-gaging stations across Nebraska (fig. 1 and table 1) were tested for gradation trends. Channel gradation data for each station were extracted from stage-discharge relations (commonly called rating curves) to determine the stage associated with the median discharge at different points in time. If the median discharge was unavailable, then the mean discharge (a common streamflow statistic) was used. These points are called median/mean surface-water elevations (MSWE). Median discharges are preferred to mean discharges because they typically are less than the mean discharges. A low-flow reference discharge is more sensitive to changes in bed level, and therefore, more representative of the streambed elevation (Andrew Simon, National Sedimentation Laboratory, written commun., 1996). The median discharge for each station was computed from daily values collected over the period of record through water year 1995.

The Kendall's tau test (Kendall, 1975) was used to test for temporal trends on the MSWE data at the 145 selected sites. If channel gradation trends were found statistically significant, the simple linear regression was used to estimate the rates of change for channel gradation trends at gaging stations.

Site Selection

Of the 377 current and discontinued USGS streamflow-gaging stations across Nebraska (Boohar and Provaznik, 1996), 141 were selected for testing, along with 4 U.S. Army Corps of Engineers (USACE) streamflow-gaging stations on the Papillion Creek Basin (sites 25-28, table 1). Of those, 45 sites were from the eastern 23-county area. The remaining sites were in the western 70-county area.

Sites were selected primarily to include at least one site for every major stream system in Nebraska. Gradation processes generally migrate away from the area of maximum disturbance (AMD) with degradation moving upstream and causing greater sediment loads, and aggradation occurring downstream as the sediment loads are deposited. Along a stream network, the AMD generally is at the upstream boundary of channel modifications (Simon, 1994). The magnitude of these processes diminishes as they progress farther away from the AMD. Therefore, an unstable channel at a point downstream suggests the potential for points upstream also to become unstable, although to a lesser degree, in the future. Because they are potential indicators of future stream channel conditions, many of the sites selected were in lower reaches of stream systems. Sites also were selected if they had continuous streamflow recording capability and their periods of record were 10 or more years, sufficient to provide statistical evidence of a trend in channel gradation.

Data Compilation

At any given time, a relation exists between stream discharge and water-surface elevation, or stage. These relations, quantified as rating curves, are updated as necessary to accommodate changes in stream geometry and other factors that can affect the relation. By calculating the stage that relates to a reference discharge for each rating curve developed during the period of record of a gaging station, trends in the elevation of the streambed can be inferred by plotting the time-series data that resulted. If the streambed elevation has a downward trend, the

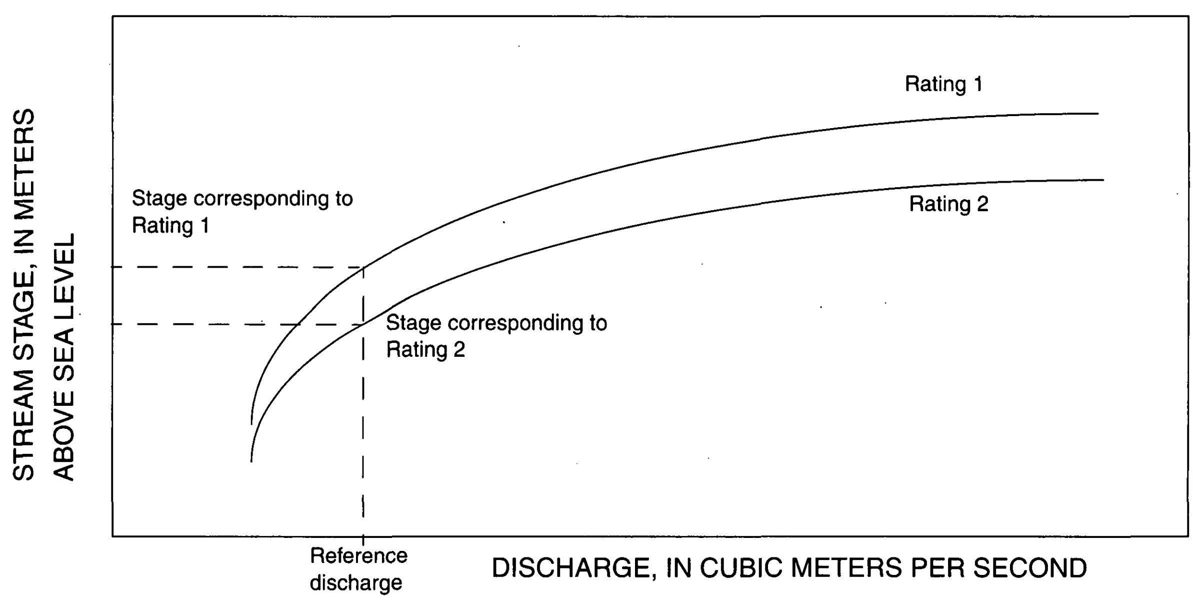

Figure 2. Example of data collection using ratings.

Table 1. Selected streamgaging stations in Nebraska for which channel gradation trends were analyzed

[Station ID, U.S. Geological Survey station identification number; Bridge ID, bridge identification number obtained from the Nebraska Department of Roads; *, gaging station in the eastern 23-county area]

Basin	Site number on map	Station ID	Bridge ID	Location
White River Basin	1	06444000	C023 P4405	White River at Crawford
	2	06445590	C023 05905P	Big Bordeaux Creek near Chadron
Ponca Creek Basin	3	06453500	S011 18443	Ponca Creek at Anoka
	4	06453600	S012 15184	Ponca Creek at Verdel
Niobrara River Basin	5	06454100	S029 04647	Niobrara River at Agate
	6	06454500	C023 17810P	Niobrara River above Box Butte Reservoir
	7	06455900	C023 05905	Niobrara River near Dunlap
	8	06457500	S027 21050	Niobrara River near Gordon
	9	06459175	C016 38305P	Snake River at Doughboy
	10	06459500		Snake River near Burge
	11	06461000	C016 E05905	Minnechaduza Creek at Valentine
	12	06462000	C009 01705P	Niobrara River near Norden
	13	06462500	C009 13505P	Plum Creek at Meadville
	14	06463500	C009 05305P	Long Pine Creek near Riverview
	15	06464900	C008 01705	Keya Paha River near Naper
	16	06465000	S281 20802	Niobrara River near Spencer
	17	06465440	C045 31810P	Redbird Creek at Redbird
	18	06465500	C054 10920	Niobrara River near Verdel
	19	06465680	C054 04005	North Branch Verdigre Creek near Verdigre
Bazile Creek Basin	20	06466500	S012 16603	Bazile Creek near Niobrara
Bow Creek Basin	21	06478518	S012 20744	Bow Creek near St. James*
Omaha Creek Basin	22	06601000	C022 23015	Omaha Creek at Homer*
Tekamah Creek Basin	23	06608000	S032 10147	Tekamah Creek at Tekamah*
New York Creek Basin	24	06609000	S075 12479	New York Creek at Herman*
Papillion Creek Basin	25	6610732	SL28K 01578	Big Papillion Creek at 125th & Fort Street*
	26	6610750	C028 21420	Little Papillion Creek at Irvington*
	27	6610792	C077 20435	West Papillion Creek near Papillion*
	28	6610795	C077 01205P	Big Papillion Creek near Fort Crook*
Platte River Basin	29	06677500	C079 10920	Horse Creek near Lyman
	30	06681000	S026 02559	Winter Creek near Scottsbluff
	31	06684000	C062 14005	Red Willow Creek near Bayard
	32	06685000	S385 06909	Pumpkin Creek near Bridgeport
	33	06686000	C035 00105P	North Platte River at Lisco

Table 1. Selected streamgaging stations in Nebraska for which channel gradation trends were analyzed--Continued

Basin	Site number on map	Station ID	Bridge ID	Location
Platte River Basin--Continued	34	06687000	C035 19405	Blue Creek near Lewellen
	35	06690500	C051 24910	North Platte River near Keystone
	36	06692000	C056 02205	Birdwood Creek near Hershey
	37	06762500	SL53C 00261	Lodgepole Creek at Bushnell
	38	06763500	C025 02105	Lodgepole Creek at Ralton
	39	06765000	SL51C 00053	South Platte River at Paxton
	40	06765500	S083 08198	South Platte River at North Platte
	41	06766500	S021 01167	Platte River near Cozad
	42	06767500	C037 34320	Plum Creek near Smithfield
	43	06768500	C024 14310	Buffalo Creek near Darr
	44	06769000	C024 07705	Buffalo Creek near Overton
	45	06770000	C010 01905	Platte River near Odessa
	46	06770500	S034 23671	Platte River near Grand Island
	47	06771000	S040 07935	Wood Rivernear Riverdale
	48	06771500	C010 16710	Wood River near Gibbon
	49	06772000	SL40C 00496	Wood River near Alda
	50	06774000	C071 03705	Platte River at Duncan*
	51	06775500	S002 23764	Middle Loup River at Dunning
	52	06775900	S083 13350	Dismal River near Thedford
	53	06777500	C021 21405	Middle Loup River at Walworth
	54	06779000	S070 10197	Middle Loup River at Arcadia
	55	06780000	S068 01076	Middle Loup River at Rockville
	56	06783500	S002 32283	Mud Creek near Sweetwater
	57	06784000	C010 17355	South Loup River at St. Michael
	58	06784300	C082 11615	Oak Creek near Loup City
	59	06785000	S281 09239	Middle Loup River at St. Paul
	60	06786000	S183 12438	North Loup River at Taylar
	61	06787000	S183 13617	Calamus River near Harrop
	62	06787500	C036 00505	Calamus River near Burwell
	63	06789000	S022 01454	North Loup River at Scotia
	64	06790500	S281 09667	North Loup River near St. Paul
	65	06791500	C039 00605	Cedar River near Spalding
	66	06792000	C063 22020	Cedar River near Fullerton
	67	06793000	S039 01830	Loup River near Genoa
	68	06793500	C006 02205P	Beaver Creek at Loretto
	69	06794000	S022 07274	Beaver Creek at Genoa
	70	06794500	S030 37773	Loup River at Columbus
	71	06795000	C071 10215	Shell Creek at Newman Grove
	72	06795500	C071 05705P	Shell Creek near Columbus*
	73	06796000	S079 04229	Platte River at North Bend*
	74	06796978	C045 26610	Holt Creek near Emmet
	75	06797500	SL45B 00449	Elkhorn River at Ewing
	76	06798300	C002 31105	Clearwater Creek near Clearwater
	77	06798500	S014 15517	Elkhorn River at Neligh
	78	06799000	S081 15491	Elkhorn River at Norfolk*

Table 1. Selected streamgaging stations in Nebraska for which channel gradation trends were analyzed--Continued

Basin	Site number on map	Station ID	Bridge ID	Location
Platte River Basin--Continued	79	06799080	C070 13805	Willow Creek near Foster
	80	06799100	C070 13710	North Fork Elkhorn River near Pierce*
	81	06799230	S081 14288	Union Creek at Madison*
	82	06799350	S032 07316	Elkhorn River at West Point*
	83	06799385	C027 02305P	Pebble Creek at Scribner*
	84	06799450	S094 00025	Logan Creek at Pender*
	85	06799500	C027 30645	Logan Creek near Uehling*
	86	06800000	S077 12173	Maple Creek near Nickerson*
	87	06800500	S064 06033	Elkhorn River at Waterloo*
	88	06801000	S006 34077	Platte River near Ashland*
	89	06803000	SS55F 00229	Salt Creek at Roca*
	90	06803500	C055 22535	Salt Creek at Lincoln*
	91	06803510	C055 02205P	Little Salt Creek near Lincoln*
	92	06803520	C055 32815	Stevens Creek near Lincoln*
	93	06803530	C055 00650	Rock Creek near Ceresco*
	94	06803555	C013 01405P	Salt Creek near Greenwood*
	95	06804000	S063 03460	Wahoo Creek at Ithaca*
	96	06805000	S006 33987	Salt Creek near Ashland*
	97	06805500	S050 07712	Platte River at Louisville*
Weeping Water Creek Basin	98	06806500	S075 05774	Weeping Water Creek at Union*
Little Nemaha River Basin	99	06810500	S050 05049	Little Nemaha River near Syrucuse*
	100	06811500	S136 23131	Little Nemaha River at Auburn*
Big Nemaha River Basin	101	06814500	S105 00703	North Fork Big Nemaha River at Humboldt*
	102	06815000	S073 00248	Big Nemaha River at Falls City*
	103	06815500	S073 01612	Muddy Creek at Verdon*
Kansas River Basin	104	06821500	S034 00513	Arikaree River at Haigler
	105	06824000	C029 03505P	Rock Creek at Parks
	106	06824500	S034 02922	Republican River at Benkelman
	107	06827500	S061 00053	South Fork Republican River near Benkelman
	108	06828500	C044 01105	Republican River at Stratton
	109	06829500	S025 01354	Republican River at Trenton
	110	06831500	C015 04505	Frenchman Creek near Imperial
	111	06832500	C015 15705	Frenchman Creek near Enders
	112	06835000	C043 02510P	Stinking Water Creek near Palisade
	113	06835500	S006 07255	Frenchman Creek at Culbertson
	114	06837000	S083 01364	Republican River at McCook
	115	06837300	C043 06105	Red Willow Creek above Hugh Butler Lake
	116	06837500	S083 02604	Red Willow Creek near McCook
	117	06838000	S006 09369	Red Willow Creek near Red Willow
	118	06840000	S023 09289	Fox Creek at Curtis

Table 1. Selected streamgaging stations in Nebraska for which channel gradation trends were analyzed--Continued

Basin	Site number on map	Station ID	Bridge ID	Location
Kansas River Basin--Continued	119	06841000	C032 13005P	Medicine Creek above Harry Strunk Lake
	120	06843500	S047 01247	Republican River at Cambridge
	121	06844000	S006 12568	Muddy Creek at Arapahoe
	122	06844210	S136 00453	Turkey Creek at Edison
	123	06844500	S089 05962	Republican River near Orleans
	124	06845200	S283 00305	Sappa Creek near Beaver City
	125	06847000	S283 00816	Beaver Creek near Beaver City
	126	06849500	C031 00505	Republican River below Harlan County Dam
	127	06851000	S136 05029	Center Creek at Franklin
	128	06851500	S136 06247	Thompson Creek at Riverton
	129	06852000	S136 07981	Elm Creek at Amboy
	130	06853020	S078 00423	Republican River at Guide Rock
	131	06879900	C012 00705	Big Blue River at Surprise
	132	06880500	S034 29918	Big Blue River at Seward
	133	06880800	C080 02110	West Fork Big Blue River near Dorchester
	134	06881000	C076 14315P	Big Blue River near Crete*
	135	06881200	S041 05764	Turkey Creek near Wilber*
	136	06881500	S077 02160	Big Blue River at Beatrice*
	137	06882000	S008 08619	Big Blue River at Barneston*
	138	06883000	S014 02410	Little Blue River near Deweese
	139	06883570	S053 00412	Little Blue River near Alexandria
	140	06884000	S008 05189	Little Blue River near Fairbury
Missouri River Basin	141	06467500	S081 21508	Missouri River at Yankton*
	142	06486000	S077 18870	Missouri River at Sioux City*
	143	06610000	S480 00413	Missouri River at Omaha*
	144	06807000	S002 50816	Missouri River at Nebraska City*
	145	06813500	S159 01389	Missouri River at Rulo*

stream has degraded; an upward trend, it has aggraded; or no trend, it has been stable. With the exception of the four USACE stations along Papillion Creek, the sites were analyzed as follows: Consider two rating curves that were in effect during different time periods for a site (fig. 2). The reference discharge corresponds to a higher stage in Rating 1 (in effect during the earlier time period) than in Rating 2, which suggests a decrease in the streambed elevation between the times the respective ratings were in effect.

Rating tables, which are numerical representations of rating curves, were used in the analysis because the rating tables allowed more consistency in determining the stage for the median discharge. The MSWE was interpolated from the rating tables if the discharges in the tables did not match the median discharge.

All MSWEs were adjusted to mean sea level to correct for altered gage datums. To avoid affecting the trend test results for a given station, ratings were not used if the actual gaging location had been moved more than 300 meters during the period of record. Each rating curve yields one data point for the MSWE-time trend analysis at a gaging station. The beginning date of each rating curve was assigned as the date associated with the data point.

The USACE stations in the Papillion Creek Basin were analyzed somewhat differently because only the current (since 1993) rating tables were available for those stations. The stages and discharges for the sites were published annually from 1969 to 1985 by the USACE (Corps of Engineers, 1969 through 1977). Because the published discharges were based on rating tables that were in use at the time, it was possible to estimate the stage for any published discharge during periods of steady flow. First, the mean discharge was calculated from the available data. Then an estimate of the median was made, based on the median-mean relation of other stations with similar drainage area, and in the vicinity of the gaging station. This estimate of the median discharge was used as the reference discharge. For each year, consecutive days in which the discharges were equal to the estimated median discharge were identified, and the corresponding stages were used to estimate the stage for the median discharge. The beginning date for the range of the consecutive days was assigned as the date associated with the MSWE in the analysis. The current rating tables were used according to the method described previously.

Statistical Analyses

Statistical analyses were performed on the MSWE data from the 145 gaging stations to identify the existence of channel gradation trends and to determine channel gradation rates where trends were determined to exist. Statistical procedures applied to morphologic as well as hydrologic variables for trend analyses have been previously described in detail (Wahl and Weiss, 1995; Simon, 1994).

Kendall's tau (Kendall, 1975) was used to test for the presence of trends. The trend is defined as monotonic change over time, occurring as either an abrupt or a gradual change in time-series data. Because the test is nonparametric, the test variables need not be normally distributed, and outliers or missing values present no computational or theoretical problem in application of the test. If the data values are all increasing with time, all differences are positive and tau equals +1; if the data values are all decreasing with time, all the differences are negative and tau equals -1. If the number of positive differences is equal to the number of negative differences, tau equals 0. Tau is, therefore, a measure of the correlation between the direction of change in the data values and time, and the sign of tau indicates whether the data are increasing (+) or decreasing (-) with time. A 99-percent confidence level (level of significance equals 0.01) was used to identify the trends as being either statistically significant or not significant. For each test, the probability (p-value) representing the attained significance level also is presented for each site. A trend was considered to be in evidence when tau differed from zero at the 99-percent confidence level (p is equal to or less than 0.01). A p-value is the probability of getting an observed value of tau for the data equal or more extreme than a critical value from the theoretical distribution for tau. The smaller the p-value, the greater is the confidence in that trend. Thus, p-values of 0.01 or less suggest that the trends of the data being considered are significant.

In unstable channels, changes in bed elevation with time are best described by nonlinear functions, where bed elevation changes rapidly at first and then slows and becomes asymptotic as the bed achieves a new equilibrium with respect to the changed conditions. In this study, a simple linear regression was used to estimate the average rates of changes for channel gradation trends at gaging stations. The regression equation uses a straight line with a slope and an intercept to represent the relation between the MSWE value and time. If a significant relation exists between these two variables, then the estimated slope measures the average rate of change of channel gradation (trend slope). Trend slope, in meters per decade (m/decade) obtained by regression are constant rates over the period of time; negative for degradation and positive for aggradation. The LOWESS smoothing scatter plot (Cleveland, 1979) also was used to generate a smooth curve through the data points. The smoothing procedure is robust in nature, uses a locally-weighted algorithm, and is not limited to showing trends as monotonic.

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GRADATION TRENDS

Results of trend analyses for channel gradation at 145 selected gaging stations in Nebraska streams from 1913 through 1995 are presented in table 2 and plate 1 (in pocket). Summaries of trends in channel gradation by principal river basin and by county areas in Nebraska are in tables 3 and 4, respectively. The MSWE data, graphs, and trend statistics are given in the appendixes.

Of 145 gaging stations examined, 56 showed a degradation trend (39 percent); 22 showed an aggradation trend (15 percent); and 67 showed no trend (46 percent) at the 99-percent confidence level (tables 2 and 3). The absolute values of tau ranged from 0.36 to 1.00, and the actual values ranged from -1.00 to 0.87. The absolute values of the trend slope ranged from 0.012 to 0.941 m/decade, and the actual values ranged from -0.752 to 0.941 m/decade (table 2). Degradation rates greater than 0.5 m/decade were found at the following gaging stations: site 13, Plum Creek at Meadville (-0.604 m/decade); site 28, Big Papillion Creek near Fort Crook (-0.526 m/decade); and site 141, Missouri River at Yankton (-0.752 m/decade). Aggradation rates that were greater than 0.5 m/decade were found at three gaging stations: site 20, Bazile Creek near Niobrara (0.591 m/decade); site 121, Muddy Creek at Arapahoe (0.941 m/decade); and site 130, Republican River at Guide Rock (0.575 m/decade).

In the eastern 23-county area, streambed channels at 28 of 45 gaging stations (62 percent) showed a degradation trend; 3 of 45 gaging stations (7 percent) showed an aggradation trend; and 14 of 45 gaging stations (31 percent) showed no trend (table 4). Gaging stations showing channel degradation in the 23-county area are on the Big Nemaha River and the Muddy Creek tributary; the Big Blue River; the Little Nemaha River; Weeping Water Creek; the Platte River; Salt Creek and the Little Salt, Wahoo, Rock, and Stevens Creek tributaries; the Elkhorn River and the Logan Creek tributary; Omaha Creek; Big Papillion Creek, and the Little Papillion and West Papillion Creek tributaries (plate 1).

Of 100 gaging stations examined in the western 70-county area, 28 showed a degradation trend (28 percent); 19 showed an aggradation trend (19 percent); and 53 showed no trend (53 percent) (tables 3 and 4). Gaging stations showing degradation included those in the Niobrara River Basin (7 of 15 gaging stations); the Platte River Basin (13 of 47 gaging stations); and the Republican River Basin (8 of 27 gaging stations) (table 2). The results, however, are only indicative of trends during the periods of record used for the individual gaging stations.

Channel gradation changes can be the result of both natural and human-induced changes in the watershed. The most common human-related activities that result in gradation problems are channel alterations such as channelization, streambed mining, dam and reservoir construction, and land-use changes.

The large percentage (69 percent) of gaging stations in the eastern 23-county area that were determined to be degrading or aggrading is likely related to the abundant loess deposits that mantle the area and to channel dredging and straightening activities in the area during the early 1900s. Loess

Table 2. Results of channel gradation trend analysis for Nebraska streams

[tau, Kendall's tau (significant at the 99-percent confidence level); m^3/s, cubic meter per second; m/decade, meter per decade; NS, not significant; --, not applicable; *, gaging station in the eastern 23-county area]

Location	Site number	Sample size	Period of record	Discharge[1] (m^3/s) Median	Discharge[1] (m^3/s) Mean	Tau	Trend slope (m/decade)	p-value
White River Basin								
White River at Crawford	1	11	1947-87	--	0.58	0.82	0.034	0.000
Big Bordeaux Creek near Chadron	2	8	1968-76	--	.02	NS	--	.100
Ponca Creek Basin								
Ponca Creek at Anoka	3	25	1949-88	0.18	--	NS	--	.690
Ponca Creek at Verdel	4	21	1957-94	--	.45	.58	.141	.000
Niobrara River Basin								
Niobrara River at Agate	5	7	1957-86	--	.82	.96	.106	.001
Niobrara River above Box Butte Reservoir	6	18	1946-84	.74	--	.56	.067	.001
Niobrara River near Dunlap	7	11	1931-40	--	1.16	NS	--	.073
Niobrara River near Gordon	8	15	1945-90	--	3.23	-.79	-.180	.000
Snake River at Doughboy	9	6	1981-92	4.53	--	NS	--	.091
Snake River near Burge	10	16	1947-93	5.52	--	-.62	-.013	.001
Minnechaduza Creek at Valentine	11	18	1947-84	.82	--	-.49	-.021	.005
Niobrara River near Norden	12	17	1952-85	24.4	--	-.69	-.247	.000
Plum Creek at Meadville	13	23	1962-92	2.92	--	-.73	-.604	.000
Long Pine Creek near Riverview	14	35	1948-93	3.97	--	NS	--	.898
Keya Paha River near Naper	15	20	1957-90	2.10	--	.73	.077	.000
Niobrara River near Spencer	16	14	1944-64	36.3	--	-.60	-.432	.003
Redbird Creek at Redbird	17	8	1980-89	.96	--	NS	--	.442
Niobrara River near Verdel	18	4	1938-88	41.1	--	NS	--	.279
North Branch Verdigre Creek near Verdigre	19	6	1979-90	.65	--	-1.00	-.268	.005
Bazile Creek Basin								
Bazile Creek near Niobrara	20	33	1932-93	--	1.42	.79	.591	.000
Bow Creek Basin								
Bow Creek near St. James*	21	7	1979-92	1.36	--	NS	--	.176
Omaha Creek Basin								
Omaha Creek at Homer*	22	20	1952-92	.45	--	-.71	-.053	.000
Tekamah Creek Basin								
Tekamah Creek at Tekamah*	23	17	1949-77	.18	--	.68	.124	.000
New York Creek Basin								
New York Creek at Herman*	24	9	1946-63	--	.19	.78	.195	.004
Papillion Creek Basin								
Big Papillion Creek at 125th & Fort Street*	25	9	1969-75	.50	--	NS	--	.037
Little Papillion Creek at Irvington*	26	26	1950-93	.17	--	-.75	-.189	.000
West Papillion Creek near Papillion*	27	11	1966-76	.55	--	-.93	-.371	.000
Big Papillion Creek near Ft Crook*	28	18	1958-93	3.49	--	-.84	-.526	.000
Platte River Basin								
Horse Creek near Lyman	29	32	1938-92	1.16	--	NS	--	.372
Winter Creek near Scottsbluff	30	13	1938-75	1.50	--	NS	--	.017
Red Willow Creek near Bayard	31	19	1931-77	2.51	--	-.81	-.136	.000
Pumpkin Creek near Bridgeport	32	20	1931-85	.76	--	NS	--	.381

Table 2. Results of channel gradation trend analysis for Nebraska streams--Continued

Location	Site number	Sample size	Period of record	Discharge[1] (m³/s) Median	Mean	Tau	Trend slope (m/decade)	p-value
				Platte River Basin--Continued				
North Platte River at Lisco	33	26	1931-92	32.3	--	-0.52	-0.050	0.000
Blue Creek near Lewellen	34	31	1931-86	1.95	--	NS	--	.332
North Platte River near Keystone	35	29	1945-87	1.59	--	NS	--	.626
Birdwood Creek near Hershey	36	26	1931-86	4.28	--	-.52	-.091	.000
Lodgepole Creek at Bushnell	37	22	1931-80	.29	--	.68	.074	.000
Lodgepole Creek at Ralton	38	11	1951-73	.24	--	NS	--	.205
South Platte River at Paxton	39	22	1939-70	--	4.02	-.49	-.143	.001
South Platte River at North Platte	40	35	1947-93	4.81	--	NS	--	.029
Platte River near Cozad	41	40	1940-87	9.06	--	-.42	-.125	.000
Plum Creek near Smithfield	42	8	1946-75	.08	--	NS	--	.533
Buffalo Creek near Darr	43	15	1946-65	.10	--	NS	--	.067
Buffalo Creek near Overton	44	6	1949-57	--	.40	NS	--	.227
Platte River near Odessa	45	24	1938-88	33.1	--	-.80	-.071	.000
Platte River near Grand Island	46	33	1933-95	31.2	--	-.64	-.044	.000
Wood River near Riverdale	47	27	1946-67	.20	--	NS	--	.116
Wood River near Gibbon	48	14	1949-93	.24	--	NS	--	.125
Wood River near Alda	49	14	1953-92	.23	--	NS	--	.185
Platte River at Duncan*	50	37	1928-90	33.7	--	NS	--	.017
Middle Loup River at Dunning	51	5	1962-90	11.6	--	-1.00	-.012	.000
Dismal River near Thedford	52	5	1966-87	5.58	--	NS	--	.014
Middle Loup River at Walworth	53	6	1940-58	22.6	--	NS	--	.126
Middle Loup River at Arcadia	54	37	1937-92	21.2	--	NS	--	.202
Middle Loup River at Rockville	55	16	1955-72	--	21.3	.64	.144	.001
Mud Creek near Sweetwater	56	18	1946-74	.65	--	NS	--	.758
South Loup River at St. Michael	57	27	1943-95	5.38	--	NS	--	.128
Oak Creek near Loup City	58	7	1952-63	--	.05	NS	--	.098
Middle Loup River at St. Paul	59	60	1928-94	30.0	--	-.57	-.079	.000
North Loup River at Taylor	60	19	1936-95	13.3	--	NS	--	.049
Calamus River near Harrop	61	11	1978-95	6.80	--	NS	--	.019
Calamus River near Burwell	62	22	1940-93	8.16	--	.72	.119	.000
North Loup River at Scotia	63	13	1936-69	24.5	--	-.66	-.048	.002
North Loup River near St. Paul	64	38	1929-95	25.1	--	-.36	-.033	.002
Cedar River near Spalding	65	18	1961-92	4.22	--	NS	--	.063
Cedar River near Fullerton	66	31	1931-93	6.00	--	-.73	-.144	.000
Loup River near Genoa	67	30	1943-96	3.09	--	NS	--	.486
Beaver Creek at Loretto	68	10	1944-85	2.27	--	NS	--	.245
Beaver Creek at Genoa	69	19	1955-94	2.49	--	NS	--	.233
Loup River at Columbus	70	10	1967-74	--	21.0	.68	.465	.009
Shell Creek at Newman Grove	71	10	1949-66	.28	--	NS	--	.209
Shell Creek near Columbus*	72	23	1947-94	.42	--	NS	--	.771
Platte River at North Bend*	73	22	1949-88	102	--	NS	--	.214
Holt Creek near Emmet	74	6	1980-87	--	.99	NS	--	.40
Elkhorn River at Ewing	75	21	1947-95	2.12	--	NS	--	.027
Clearwater Creek near Clearwater	76	6	1961-86	1.18	--	-1.00	-.140	.005

Table 2. Results of channel gradation trend analysis for Nebraska streams--Continued

Location	Site number	Sample size	Period of record	Discharge[1] (m^3/s) Median	Discharge[1] (m^3/s) Mean	Tau	Trend slope (m/decade)	p-value
Platte River Basin--Continued								
Elkhorn River at Neligh	77	31	1931-87	4.81	--	NS	--	0.350
Elkhorn River at Norfolk*	78	20	1945-95	8.50	--	-0.63	-0.229	.000
Willow Creek near Foster	79	9	1975-93	.24	--	NS	--	.463
North Fork Elkhorn River near Pierce*	80	19	1960-94	1.22	--	NS	--	.599
Union Creek at Madison*	81	9	1978-91	.57	--	NS	--	.297
Elkhorn River at West Point*	82	15	1967-92	15.3	--	NS	--	.052
Pebble Creek at Scribner*	83	8	1978-93	.65	--	-.76	-.210	.009
Logan Creek at Pender*	84	7	1978-93	2.01	--	NS	--	.011
Logan Creek near Uehling*	85	24	1941-93	2.52	--	-.84	.207	.000
Maple Creek near Nickerson*	86	22	1951-90	.48	--	.65	.342	.000
Elkhorn River at Waterloo*	87	42	1928-95	19.0	--	-.82	-.253	.000
Platte River near Ashland*	88	21	1928-47	147	--	NS	--	.319
Salt Creek at Roca*	89	23	1951-93	.28	--	-.63	-.190	.000
Salt Creek at Lincoln*	90	19	1949-93	2.58	--	-.85	-.190	.000
Little Salt Creek near Lincoln*	91	15	1968-87	.15	--	-.86	-.448	.003
Stevens Creek near Lincoln*	92	10	1968-93	.10	--	-.90	-.086	.000
Rock Creek near Ceresco*	93	11	1980-92	.34	--	-.99	-.498	.000
Salt Creek near Greenwood*	94	19	1965-95	3.82	--	-.94	-.227	.000
Wahoo Creek at Ithaca*	95	27	1950-87	.96	--	-.77	-.232	.000
Salt Creek near Ashland*	96	12	1947-66	--	13.7	-.82	-.283	.000
Platte River at Louisville*	97	20	1953-93	138	--	-.60	-.109	.000
Weeping Water Creek Basin								
Weeping Water Creek at Union*	98	43	1951-93	1.05	--	-.81	-.394	.000
Little Nemaha River Basin								
Little Nemaha River near Syracuse*	99	16	1951-67	1.84	--	-.89	-.492	.000
Little Nemaha River at Auburn*	100	19	1949-93	2.78	--	-.81	-.181	.000
Big Nemaha River Basin								
North Fork Big Nemaha River at Humboldt*	101	26	1952-95	1.47	--	-.85	-.350	.000
Big Nemaha River at Falls City*	102	31	1944-93	4.53	--	-.79	-.194	.000
Muddy Creek at Verdon*	103	9	1952-68	--	1.88	-.87	-.163	.001
Kansas River Basin								
Arikaree River at Haigler	104	20	1962-90	2.69	--	NS	--	.098
Rock Creek at Parks	105	19	1940-90	.37	--	.56	.034	.001
Republican River at Benkelman	106	25	1946-91	2.18	--	NS	--	.742
South Fork Republican River near Benkelman	107	25	1951-95	.57	--	-.66	-.135	.000
Republican River at Stratton	108	9	1967-86	2.55	--	.78	.111	.004
Republican River at Trenton	109	25	1954-90	.04	--	-.87	-.429	.000
Frenchman Creek near Imperial	110	7	1958-86	1.59	--	NS	--	.229
Frenchman Creek near Enders	111	19	1950-92	.25	--	-.96	-.130	.000
Stinking Water Creek near Palisade	112	23	1949-91	.94	--	.58	.064	.000
Frenchman Creek at Culbertson	113	21	1950-95	2.12	--	-.54	-.029	.001
Republican River at McCook	114	19	1954-93	3.17	--	NS	--	.013

Table 2. Results of channel gradation trend analysis for Nebraska streams--Continued

Location	Site number	Sample size	Period of record	Discharge[1] (m^3/s) Median	Mean	Tau	Trend slope (m/decade)	p-value
				Kansas River Basin--Continued				
Red Willow Creek above Hugh Butler Lake	115	11	1960-89	0.62	--	-0.84	-0.095	0.000
Red Willow Creek near McCook	116	12	1960-91	.12	--	NS	--	.091
Red Willow Creek near Red Willow	117	20	1949-92	.27	--	NS	--	.052
Fox Creek at Curtis	118	12	1951-85	--	0.18	.61	.057	.006
Medicine Creek above Harry Strunk Lake	119	20	1949-92	1.50	--	.87	.144	.000
Republican River at Cambridge	120	22	1945-95	4.87	--	NS	--	.713
Muddy Creek at Arapahoe	121	24	1951-93	.20	--	.57	.941	.000
Turkey Creek at Edison	122	9	1977-90	.18	--	NS	--	.673
Republican River near Orleans	123	27	1947-93	4.73	--	-.84	-.132	.000
Sappa Creek near Beaver City	124	29	1937-72	1.08	--	NS	--	.072
Beaver Creek near Beaver City	125	15	1958-88	.03	--	.7	.133	.000
Republican River below Harlan County Dam	126	22	1952-92	.40	--	-.82	-.085	.000
Center Creek at Franklin	127	13	1952-91	.18	--	-.64	-.119	.000
Thompson Creek at Riverton	128	21	1948-93	.62	--	NS	--	.011
Elm Creek at Amboy	129	9	1946-87	.42	--	NS	--	.173
Republican River at Guide Rock	130	39	1950-81	3.34	--	.71	.575	.000
Big Blue River at Surprise	131	7	1964-85	.05	--	NS	--	.121
Big Blue River at Seward	132	19	1954-87	.91	--	-.92	-.126	.000
West Fork Big Blue River near Dorchester	133	21	1958-94	2.27	--	NS	--	.487
Big Blue River near Crete*	134	15	1952-85	4.08	--	.81	.149	.000
Turkey Creek near Wilber*	135	14	1970-93	.45	--	NS	--	.551
Big Blue River at Beatrice*	136	13	1913-87	7.48	--	NS	--	.028
Big Blue River at Barneston*	137	28	1941-79	7.39	--	-.43	-.056	.002
Little Blue River near Deweese	138	12	1953-93	1.98	--	NS	--	.487
Little Blue River near Alexandria	139	8	1974-91	2.89	--	NS	--	.034
Little Blue River near Fairbury	140	29	1957-92	4.53	--	NS	--	.016
				Missouri River Basin				
Missouri River at Yankton, S.D.*	141	20	1955-90	787	--	-.98	-.752	.000
Missouri River at Sioux City, Iowa*	142	37	1928-79	847	--	-.61	-.397	.000
Missouri River at Omaha*	143	45	1930-89	918	--	-.68	-.288	.000
Missouri River at Nebraska City*	144	34	1929-62	1,060	--	NS	--	.019
Missouri River at Rulo*	145	10	1949-89	1,110	--	NS	--	.587

[1]If the median discharge was unavailable, then the mean discharge (a common streamflow statistic) was used.

Table 3. Summary of channel gradation in Nebraska river basins

[No., number of selected stream-gaging stations; %, percent]

River basin	Total stations	Degradation		Aggradation		No Trend	
		No.	%	No.	%	No.	%
White River Basin	2	0	0	1	50	1	50
Ponca Creek Basin	2	0	0	1	50	1	50
Niobrara River Basin	15	7	47	3	20	5	33
Missouri River tributaries	9	4	45	3	33	2	22
Platte River Basin							
North Platte River Basin	8	3	37	0	0	5	63
South Platte River Basin	4	1	25	1	25	2	50
Platte River main stem and tributaries	15	3	20	0	0	12	80
Loup River Basin	20	6	30	3	15	11	55
Elkhorn River Basin	14	5	36	1	7	8	57
Salt Creek Basin	8	8	100	0	0	0	0
All stations in Platte River Basin	69	26	38	5	7	38	55
Weeping Water, Little and Big Nemaha	6	6	100	0	0	0	0
Kansas River Basin							
Republican River Basin	27	8	30	8	30	11	40
Big and Little Blue River Basin	10	2	20	1	10	7	70
All stations in Kansas River Basin	37	10	27	9	24	18	49
Missouri River main stem	5	3	60	0	0	2	40
All stations	145	56	39	22	15	67	46

Table 4. Summary of channel gradation by county area in Nebraska

[No., number of selected streamflow-gaging stations; %, percent]

Area	Total stations	Degradation		Aggradation		No trend	
		No.	%	No.	%	No.	%
The eastern 23-county area	45	28	62	3	7	14	31
The western 70-county area	100	28	28	19	19	53	53
All stations	145	56	39	22	15	67	46

soils are highly erodible. Channel straightening reduced stream lengths and caused channel slopes to steepen. The shortened streams and steep channels in turn increased stream power, which increased bed and bank erosion. Furthermore, increases in erosion rates upstream can lead to substantial aggradation and loss of channel capacity downstream, where the increased sediment loads exceed the transport capacity of streams.

Wahl and Weiss (1995) found that channelization in the lower reaches of the Big Nemaha River, for instance, decreased the channel to about one-fourth of its original length. The modifications to the Little Nemaha River in Nemaha County reduced the channel length to about 37 km, about one-fourth the original channel length, and increased stream grade from about 0.2 m/km (meters per kilometer) to about 0.8 m/km. These disturbances increased flow velocity and channel capacity, as well as the ability of the rivers to transport sediment. Examination of stream channels in southeastern Nebraska in 1994 (Wahl and Weiss, 1995) indicated that the alluvial channels were incised and were continuing to undergo systematic downcutting. This resulted in destabilization of channel banks and aggradation downstream. Channels were as much as 12 m deep in both straight and sinuous reaches. Maximum amounts of channel widening occurred on the outside of meander bends as evidenced by a complete lack of woody vegetative cover in these reaches. Wahl and Weiss (1995) also applied a statistical trend test on stage-of-mean-annual-discharge and average-stage-of-streambed data over a time period of 50 years (1944-93) for six gaging stations in the area. Their results indicated that channels were degrading significantly. In the current study, the Kendall's tau test was applied on the MSWE data at the same six gaging stations over a period of 52 years (1944-95). The trend analyses confirmed that channels were degrading in the area, and rates of degradation for the six gaging stations determined for both studies were comparable.

In a study of downstream effects of dams on alluvial rivers in the semiarid western United States, Williams and Wolman (1984) described changes in mean channel-bed elevation, channel width, bed-material sizes, vegetation, water discharges, and sediment loads downstream from 21 dams constructed on alluvial rivers. They noted that river dams that trap incoming sediment and change the flow regimen can affect channel stability on the downstream reach adversely. Downstream erosive power is increased because the outflow from the dam is no longer using energy to transport sediment trapped in the reservoir. The erosive power of the river can be decreased if the channel slope is flattened and scoured, sediment becomes suspended in the river, or other bed material is reached that can resist the erosion (very coarse material or bedrock).

Results of the investigation for six dams in Nebraska—Gavins Point Dam (Missouri River), Milburn Dam (Middle Loup River), Harlan County Dam (Republican River), Trenton Dam (Republican River), Medicine Creek Dam (Medicine Creek), and Enders Dam (Frenchman Creek)—were reported by Williams and Wolman (1984). The report showed that at a given cross section within the degraded reach, the maximum observed depth of bed erosion below the Gavins Point, Milburn, Medicine Creek, and Enders Dams were 2.5, 2.4, 0.6, and 0.49 m, respectively. However, on the Republican River downstream from Harlan County Dam, the maximum possible degradation probably was restricted by contacting bedrock in place. Williams and Wolman (1984) and others stated that such streambed degradation downstream from dams is a well-known phenomenon on alluvial streams.

According to the data in the present study, the MSWE of the gaging station on Missouri River at Yankton (site 141), which is below Gavins Point Dam, decreased 2.53 meters from 354.55 m in 1955 to 352.02 m in 1990 (appendix O). The site had a trend slope of 0.752 m/decade degradation. Similarly, many stream channels in the western 70-county area likely have been affected by dams and storage reservoirs. For instance, the declines of MSWEs of the gaging stations on five rivers below the dams ranged from 0.05 to 1.94 m. Degradation processes occurred significantly at site 10 (Snake River near Burge, below Merritt Dam) (appendix C), site 16 (Niobrara River near Spencer, below Spencer Dam) (appendix C), site 109 (Republican River at Trenton, below Trenton Dam) (appendix N), site 111 (Frenchman Creek near Enders, below Enders Dam) (appendix N), and site 126 (Republican River below Harlan County Dam) (appendix N) with rates of

0.013, 0.432, 0.429, 0.130, and 0.085 m/decade, respectively. The principal reservoirs with maximum storage capacity greater than 1.85 cubic hectometers in Nebraska river basins are summarized in table 5.

Stream gradation produced by agricultural land-use changes usually is disseminated broadly over the stream system, rather than occurring at a specific location. Many types of land-use changes at the drainage-basin scale create new sources of sediment with the potential for downstream aggradation. The aggradation process occurs when the available stream power at the location is not sufficient to transport the sediment load delivered from upstream. For example, aggradation was identified through trend analysis to have occurred in Fox Creek at Curtis (site 118) and in the downstream reach of Medicine Creek, a tributary to the Republican River, above Harry Strunk Lake (site 119). Aggradation processes occurred at a rate of 0.057 m/decade (p-value equals 0.006) at site 118 since 1951, and 0.144 m/decade (p-value equals 0.000) at site 119 since 1949 (table 2). In a study of erosion and deposition in the loess-mantled Medicine Creek drainage basin, Brice (1966) concluded that numerous active valley-head, valley-side, and valley-bottom gullies in the area were attributed to agricultural land use since settlement rather than to climate change. Likely, such active and rapid gully erosion on the loess-mantled upland resulted in increased sediment loads and channel deposition downstream, and thus probably caused aggradation to occur at sites 118 and 119.

Table 5. Number and maximum storage capacity of principal reservoirs in Nebraska

[Maximum storage capacity greater than 1.85 cubic hectometers or 1,500 acre-feet]

River basin	Number of reservoirs	Maximum storage capacity (cubic hectometers)	Maximum storage capacity (acre-feet)
White River Basin	3	21.2	17,000
Niobrara River Basin	10	200	162,000
Missouri River tributaries	7	91.8	74,000
Tekamah Creek	2	12.6	10,000
Papillion Creek	5	79.2	64,000
Platte River Basin	55	4,320	3,505,000
North Platte River Basin	8	2,830	2,297,000
South Platte River Basin	4	263	214,000
Platte River main stem and tributaries	18	337	273,000
Loup River Basin	4	499	405,000
Elkhorn River Basin	4	59.2	48,000
Salt Creek Basin	17	331	268,000
Weeping Water, Little and Big Nemaha River Basins	17	44.9	36,000
Kansas River Basin	58	2,250	1,823,000
Republican River Basin	16	2,100	1,699,000
Big and Little Blue River Basins	42	153	124,000
Total	150	6,930	5,619,000

Stream channels at several gaging stations with long periods of record showed no net gradation trends that were of statistical significance. Gaging stations at the following sites (table 2) showed no significant gradation trends for more than 50 years of records: Horse Creek near Lyman (site 29), Pumpkin Creek near Bridgeport (site 32), Middle Loup River at Arcadia (site 54), North Loup River at Taylor (site 60), and Elkhorn River at Neligh (site 77).

SUMMARY

Many stream channels in the loess area of eastern Nebraska were dredged and straightened during the early 1900s to alleviate cropland flooding by increasing the flow capacity of stream channels. The increased gradient of shortened channels also increased the erosive power of the streams. As a result, many of the modified channels and their upstream tributaries have experienced headward-progressing degradation. Aggradation can occur downstream of degrading channels when increased sediment load exceeds the transport capacity of the stream. Furthermore, many stream channels in Nebraska have been affected by land-use changes, storage reservoirs, and power developments, all of which have affected sediment loads in streams.

The U.S. Geological Survey, in cooperation with Nebraska Department of Roads, Nebraska Natural Resources Commission, Lower Platte South Natural Resources District, and Papio-Missouri River Natural Resources District, began a study in 1996 to evaluate and quantify channel instabilities on selected streams in the state. Kendall's tau test was used to identify trends in MSWE at 141 selected USGS streamflow-gaging stations and 4 USACE stream-gaging stations. The trend slope of each site was determined through regression analysis.

Of 145 gaging stations examined, 56 showed a degradation trend (39 percent); 22 showed an aggradation trend (15 percent); and 67 showed no trend (46 percent) at the 99-percent confidence level. The tau values, which indicate the correlation between the data values and time, ranged from -1.00 to 0.87. The rates of change (or trend slope) in channel gradation ranged from -0.752 to 0.941 meters per decade. Degradation rates greater than 0.5 m/decade were found at the following gaging stations: site 13, Plum Creek at Meadville (-0.604 m/decade); site 28, Big Papillion Creek near Fort Crook (-0.526 m/decade); and site 141, Missouri River at Yankton (-0.752 m/decade). Aggradation rates that were greater than 0.5 m/decade were found at three gaging stations: site 20, Bazile Creek near Niobrara (0.591 m/decade); site 121, Muddy Creek at Arapahoe (0.941 m/decade); and site 130, Republican River at Guide Rock (0.575 m/decade).

In the eastern 23-county area, streambed channels at 28 of 45 gaging stations (62 percent) showed a degradation trend; 3 of 45 gaging stations (7 percent) showed an aggradation trend; and 14 of 45 gaging stations (31 percent) showed no trend at the 99-percent confidence level. Gaging stations showing channel degradation in the 23-county area included the Big Nemaha River and the Muddy Creek tributary; the Big Blue River; the Little Nemaha River; Weeping Water Creek; the Platte River; Salt Creek and the Little Salt, Wahoo, Rock, and Stevens Creek tributaries; the Elkhorn River and the Logan Creek tributary; Omaha Creek; Big Papillion Creek, and the Little Papillion and West Papillion Creek tributaries.

Of 100 gaging stations examined in the western 70-county area, 28 showed degradation (28 percent); 19 showed aggradation (19 percent); and 53 showed no trend (53 percent). Those sites showing degradation include sites in the Niobrara River Basin (7 of 15 gaging stations); the Platte River Basin (13 of 47 gaging stations); and the Republican River Basin (8 of 27 gaging stations). The results, however, are only indicative of trends during the periods of record used for the individual gaging stations.

River dams affect channel stability on the downstream reach; streambed degradation downstream from dams is a well-known phenomenon on alluvial streams. The rates of degradation at the six gaging stations downstream from dams—sites 10,16,109, 111, 126, and 141—ranged from 0.013 to 0.752 m/decade.

Land-use changes at the drainage-basin scale can create new sources of sediment with the potential

for downstream aggradation. Agricultural land-use changes in Medicine Creek drainage basin had increased sediment loads and channel deposition downstream, and thus probably caused aggradation to occur at sites 118 and 119, with rates of 0.057 to 0.144 m/decade, respectively.

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APPENDIXES

Data, Trend Analyses, Trend Slopes, and Graphs for 145 Selected Gaging Stations

EXPLANATION

The data are presented in appendixes by drainage basin. For each site, a figure and two tables are presented. The title gives the site number, the stream name and nearby town, and the USGS station identification number. The figure shows the surface-water elevation of the mean or median discharge over time. The data points, the LOWESS trend line, and the regression line are all shown on the figure. Below that, a table containing the data points (surface-water elevation and corresponding date) is given. Finally, the statistical trend parameters for the site are in the second table.

Abbreviations

SW	surface water
elev.	elevation
m	meter
m^3/s	cubic meters per second
m/decade	meters per decade
NS	not significant
NA	not applicable
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

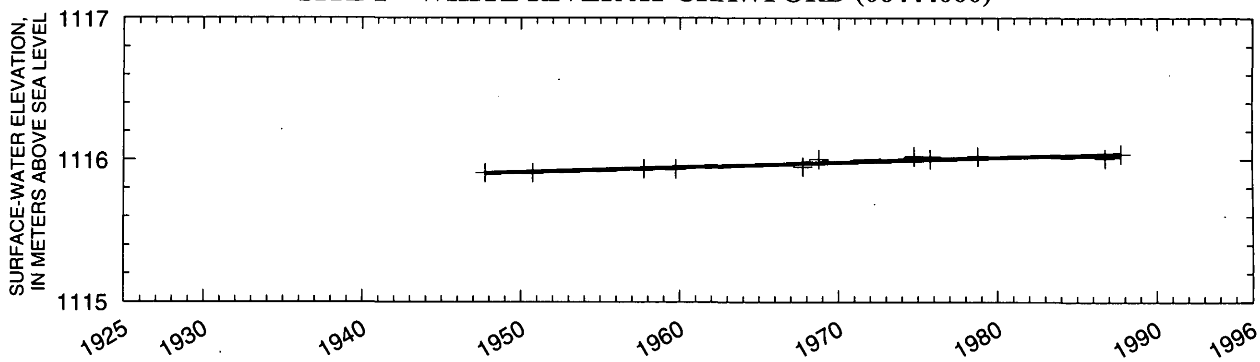
Graph lines and symbol

———	regression line
– – – –	LOWESS trend line
+	individual data (rating) point

APPENDIX A—WHITE RIVER BASIN

(Explanation of abbreviations and graph lines and symbols are given at front of appendixes.)

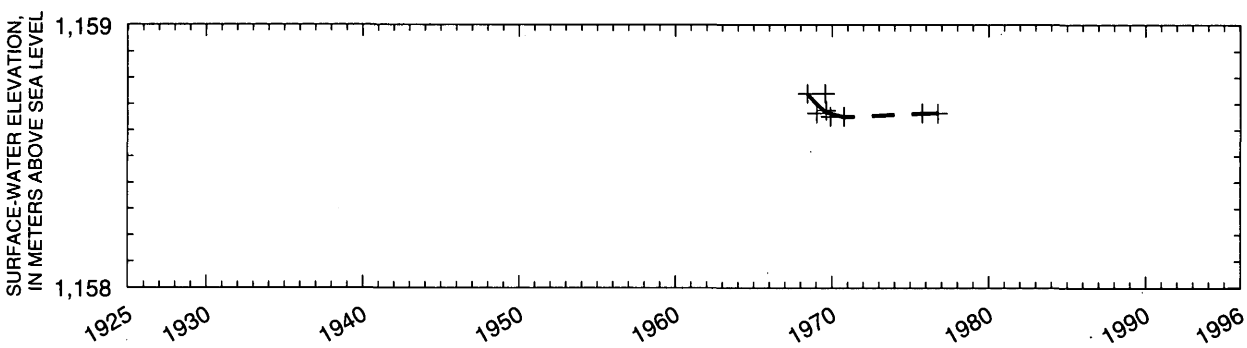
SITE 1—WHITE RIVER AT CRAWFORD (06444000)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-47	1115.91	10-01-75	1116.00
10-01-50	1115.91	10-01-78	1116.02
10-01-57	1115.94	10-01-86	1116.01
10-01-59	1115.94	10-01-87	1116.04
10-01-67	1115.95		
10-01-68	1116.00		
10-01-74	1116.02		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.58	11	0.82	0.000	0.034

SITE 2—BIG BORDEAUX CREEK NEAR CHADRON (06445590)



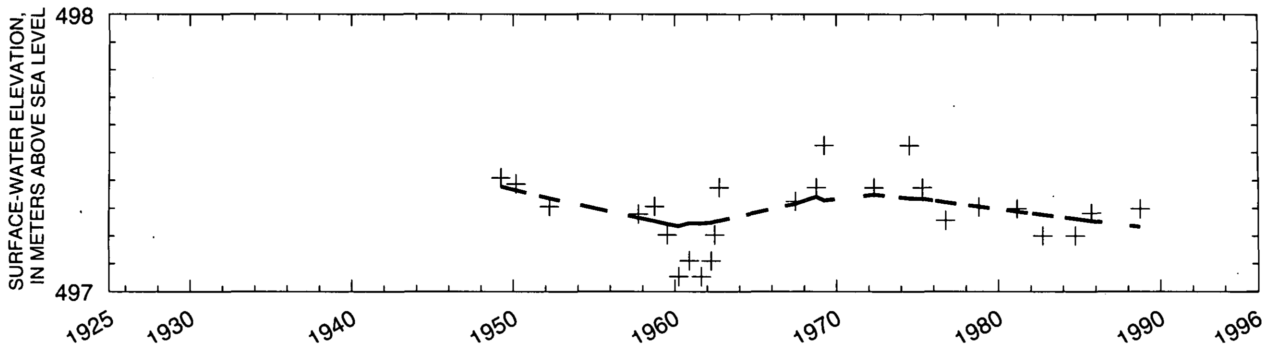
Date	SW stage (m)	Date	SW stage (m)
6-04-68	1158.74	10-01-76	1158.66
1-05-69	1158.66		
7-20-69	1158.74		
8-15-69	1158.67		
11-22-69	1158.65		
10-01-70	1158.65		
10-01-75	1158.66		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.02	8	NS	0.100	NA

APPENDIX B—PONCA CREEK BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

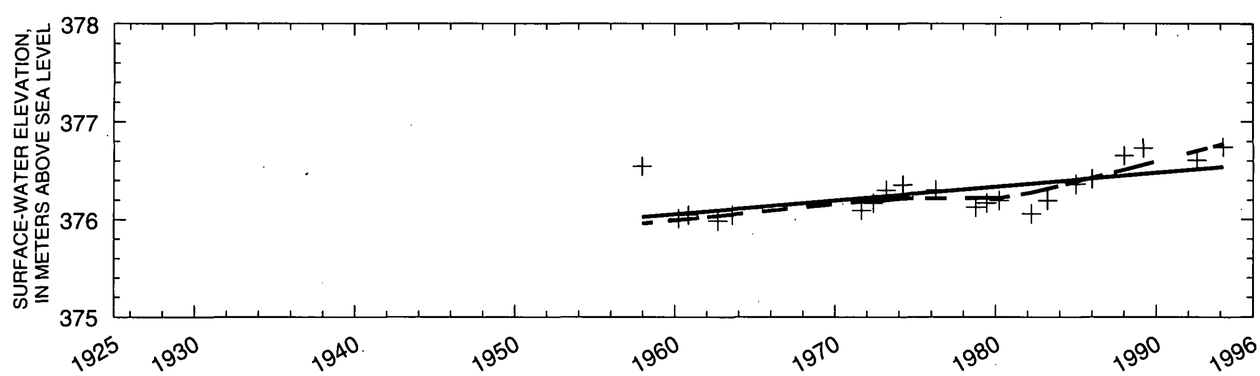
SITE 3—PONCA CREEK AT ANOKA (06453500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
3-29-49	497.41	11-15-60	497.11	3-24-69	497.53	10-01-82	497.20
3-04-50	497.39	8-19-61	497.05	4-25-72	497.37	10-01-84	497.20
3-30-52	497.31	3-26-62	497.11	7-03-74	497.53	10-01-85	497.28
10-01-57	497.28	6-23-62	497.20	4-22-75	497.37	10-01-88	497.30
10-01-58	497.31	10-01-62	497.37	10-01-76	497.26		
7-17-59	497.20	6-20-67	497.32	10-19-78	497.30		
3-26-60	497.05	10-01-68	497.37	2-26-81	497.30		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.18	25	NS	0.690	NA

SITE 4—PONCA CREEK AT VERDEL (06453600)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
12-11-57	376.54	3-07-73	376.30	3-23-83	376.19
3-27-60	376.01	3-20-74	376.35	1-01-85	376.36
11-02-60	376.04	4-07-76	376.30	1-01-86	376.41
9-05-62	375.98	10-05-78	376.12	1-01-88	376.65
8-01-63	376.04	6-12-79	376.17	3-11-89	376.73
8-24-71	376.09	3-20-80	376.19	7-12-92	376.60
5-19-72	376.17	3-24-82	376.06	3-01-94	376.74

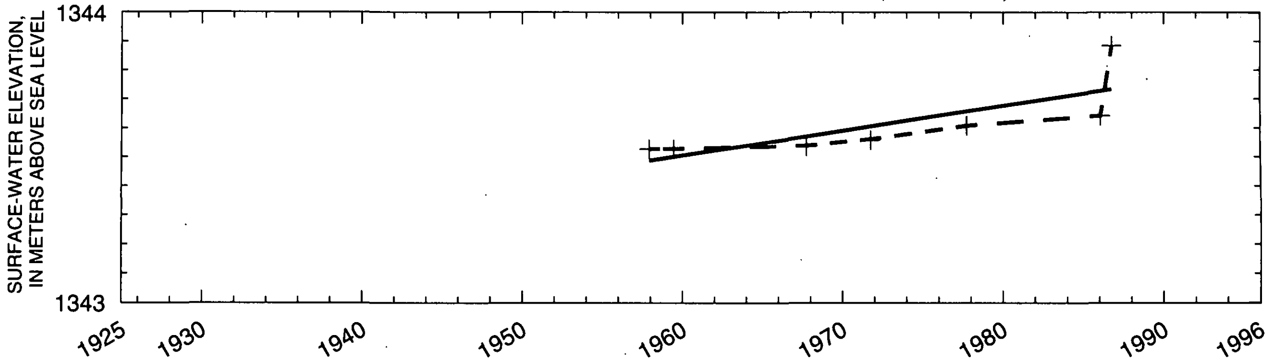
Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.45	21	0.58	0.000	0.141

APPENDIX C—NIOBRARA RIVER BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

Table 1.

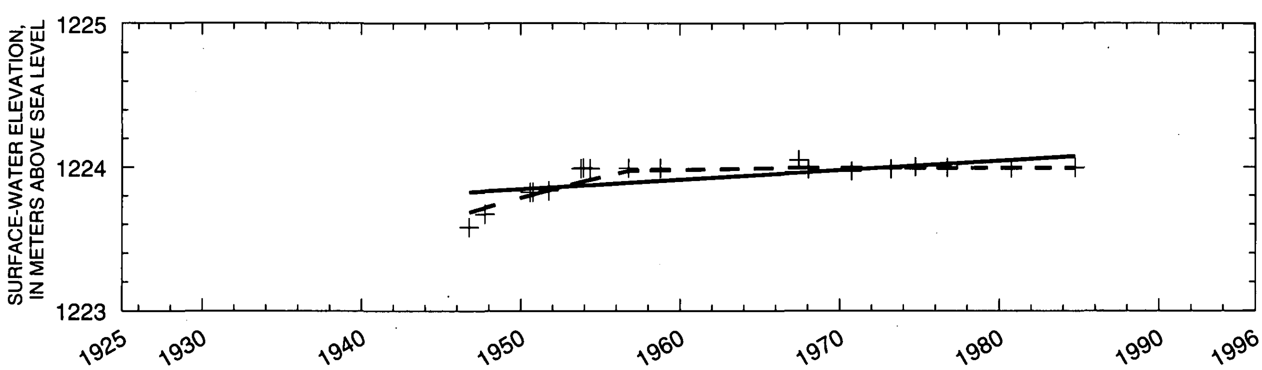
SITE 5—NIOBRARA RIVER AT AGATE (06454100)



Date	SW elev. (m)
12-12-57	1343.53
6-22-59	1343.53
10-01-67	1343.54
10-01-71	1343.56
10-01-77	1343.61
1-28-86	1343.64
10-01-86	1343.88

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.82	7	0.96	0.001	0.106

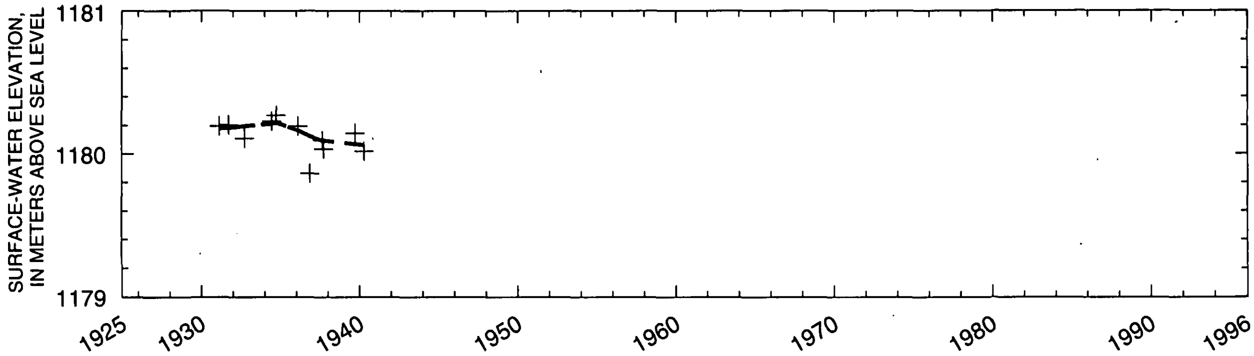
SITE 6—NIOBRARA RIVER ABOVE BOX BUTTE RESERVOIR (06454500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-46	1223.58	5-04-54	1223.99	10-01-74	1224.00
10-01-47	1223.67	10-01-56	1223.99	10-01-76	1224.00
8-01-50	1223.82	10-01-58	1223.99	10-01-80	1223.99
10-01-50	1223.82	6-06-67	1224.05	10-01-84	1224.00
10-01-51	1223.83	1-16-68	1223.99		
10-12-53	1223.99	10-01-70	1223.97		
12-03-53	1223.99	3-22-73	1223.99		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.74	18	0.56	0.001	0.067

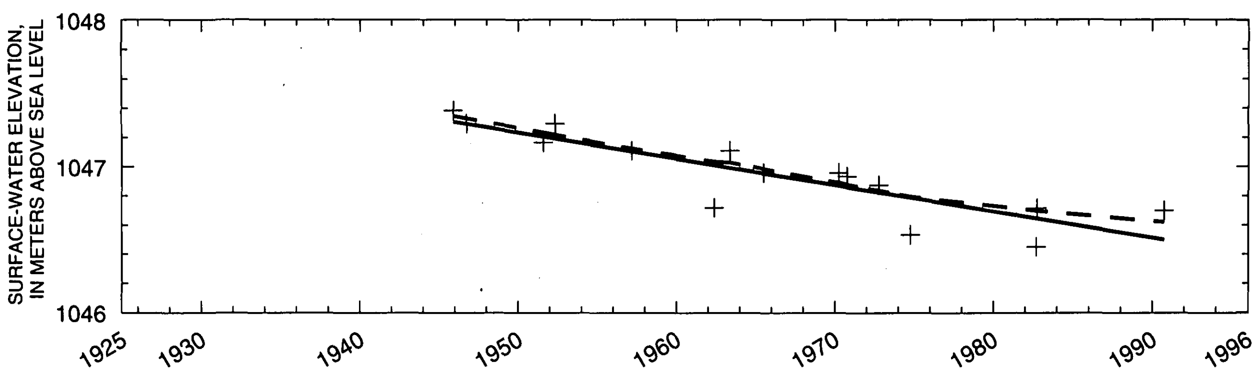
SITE 7—NIOBRARA RIVER NEAR DUNLAP (06455900)



Date	SW elev. (m)	Date	SW elev. (m)
2-25-31	1180.19	9-05-37	1180.09
10-01-31	1180.20	10-01-37	1180.03
10-01-32	1180.11	10-01-39	1180.15
6-22-34	1180.23	4-21-40	1180.02
10-01-34	1180.27		
2-22-36	1180.19		
11-17-36	1179.86		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.16	11	NS	0.073	NA

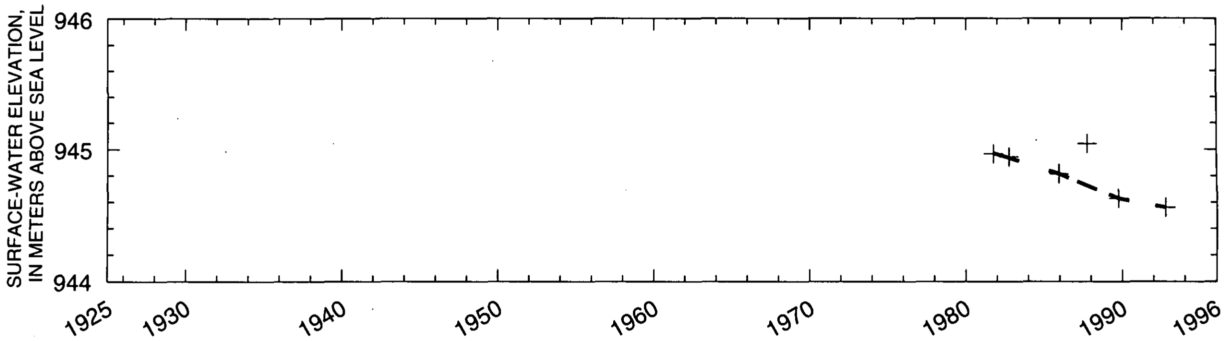
SITE 8—NIOBRARA RIVER NEAR GORDON (06457500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
12-01-45	1047.38	6-26-65	1046.96	10-01-90	1046.70
10-01-46	1047.29	3-25-70	1046.96		
7-28-51	1047.16	10-01-70	1046.93		
5-05-52	1047.29	10-01-72	1046.87		
3-01-57	1047.11	10-01-74	1046.53		
5-21-62	1046.72	9-08-82	1046.45		
5-15-63	1047.11	10-01-82	1046.71		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	3.23	15	-0.79	0.000	-0.180

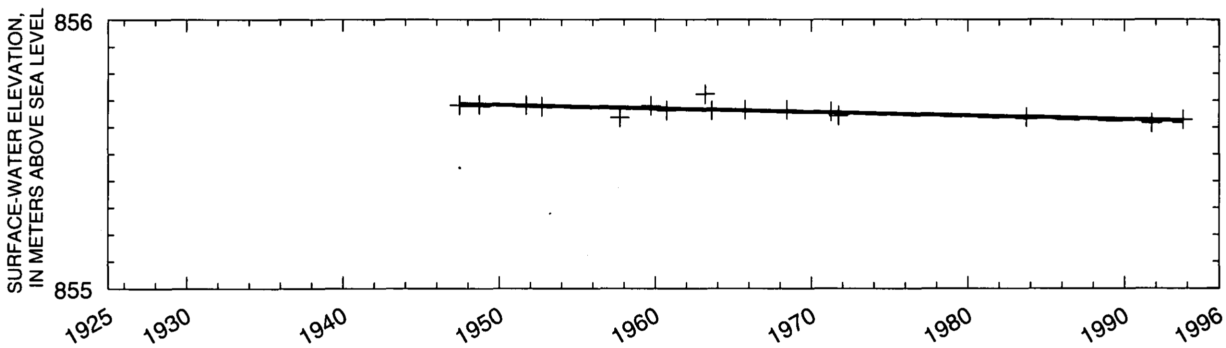
SITE 9—SNAKE RIVER AT DOUGHBOY (06459175)



Date	SW elev. (m)
10-01-81	944.97
10-01-82	944.94
12-10-85	944.81
10-01-87	945.04
10-01-89	944.63
10-01-92	944.56

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.53	6	NS	0.091	NA

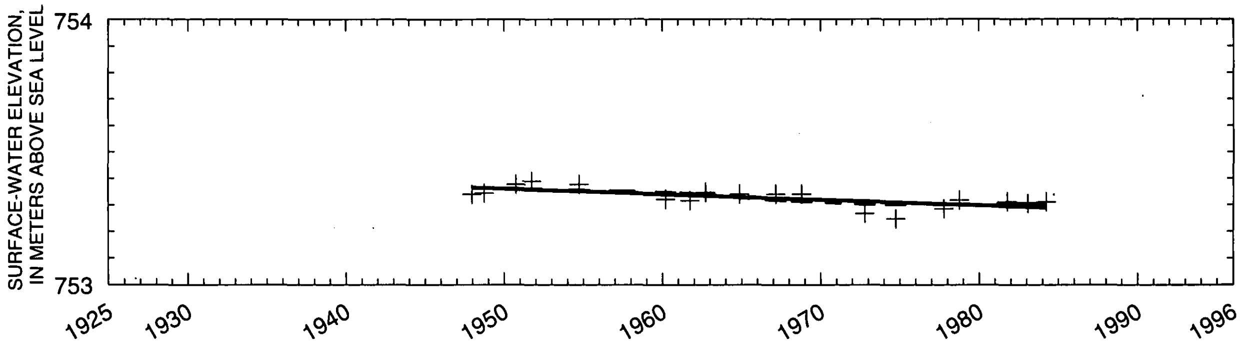
SITE 10—SNAKE RIVER NEAR BURGE (06459500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
6-27-47	855.68	3-17-63	855.72	10-01-91	855.62
10-01-48	855.68	8-21-63	855.66	10-01-93	855.63
10-01-51	855.68	10-07-65	855.67		
10-01-52	855.68	6-13-68	855.67		
10-01-57	855.64	4-07-71	855.66		
10-01-59	855.68	10-01-71	855.64		
10-01-60	855.66	10-01-83	855.64		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	5.52	16	-0.62	0.001	-0.013

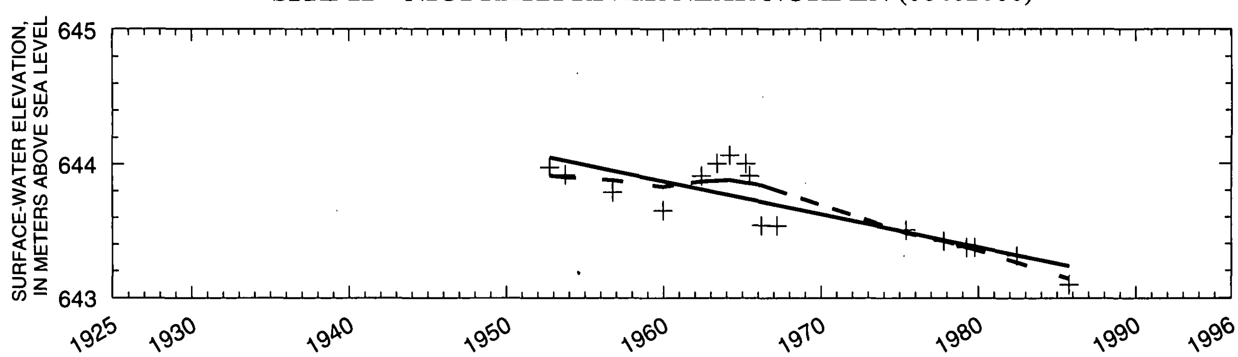
SITE 11—MINNECHADUZA CREEK AT VALENTINE (06461000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
12-19-47	753.34	10-03-62	753.35	10-12-78	753.32
10-01-48	753.34	11-25-64	753.34	10-22-81	753.31
10-01-50	753.38	3-08-67	753.34	2-08-83	753.30
10-01-51	753.39	10-24-68	753.34	4-05-84	753.31
10-01-54	753.38	10-19-72	753.27		
3-21-60	753.32	10-01-74	753.25		
10-01-61	753.32	10-18-77	753.29		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.82	18	-0.49	0.005	-0.021

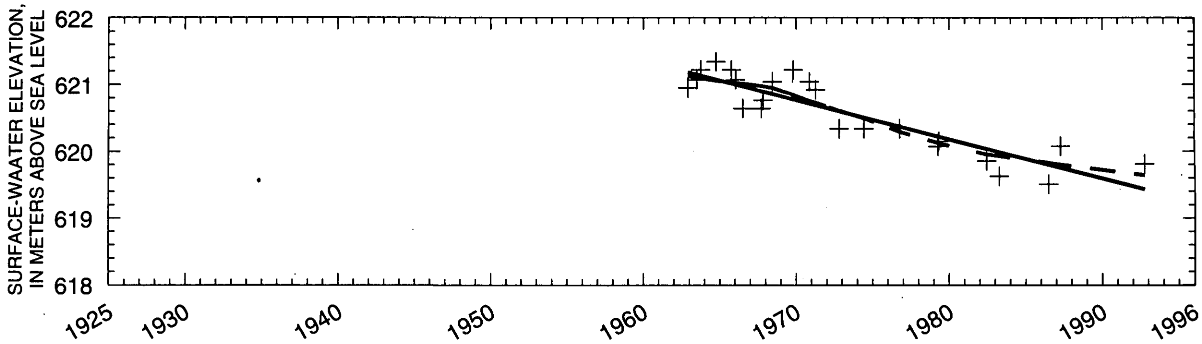
SITE 12—NIOBRARA RIVER NEAR NORDEN (06462000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-52	643.97	3-26-65	644.00	10-05-79	643.37
10-01-53	643.92	6-18-65	643.91	6-05-82	643.31
10-01-56	643.79	3-11-66	643.54	10-01-85	643.09
12-16-59	643.65	3-09-67	643.53		
5-28-62	643.91	5-20-75	643.50		
5-29-63	644.00	10-18-77	643.42		
3-18-64	644.06	3-27-79	643.37		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	24.4	17	-0.69	0.000	-0.247

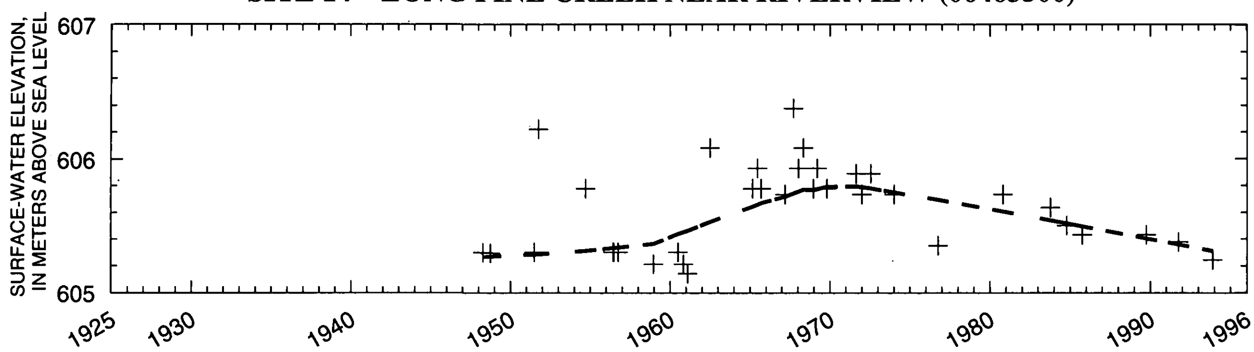
SITE 13—PLUM CREEK AT MEADVILLE (06462500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
11-25-62	620.95	9-17-67	620.64	5-29-74	620.34	4-03-87	620.08
6-26-63	621.07	10-27-67	620.76	10-01-76	620.34	10-01-92	619.81
10-01-63	621.22	6-12-68	621.04	3-29-79	620.07		
10-01-64	621.34	10-23-69	621.22	4-21-79	620.15		
10-01-65	621.22	11-11-70	621.04	6-04-82	619.85		
1-13-66	621.07	4-08-71	620.92	4-07-83	619.62		
6-29-66	620.64	10-20-72	620.34	6-26-86	619.50		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.92	23	-0.73	0.000	-0.604

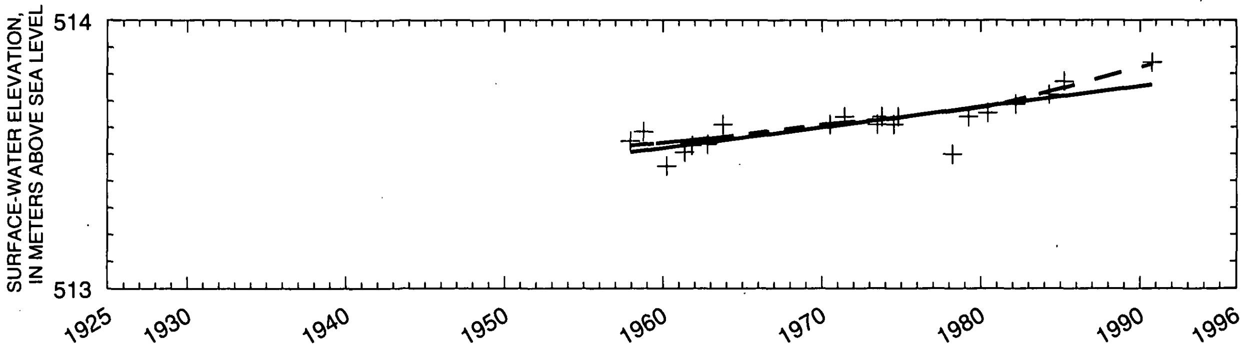
SITE 14—LONG PINE CREEK NEAR RIVERVIEW (06463500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
4-11-48	605.30	10- 1-56	605.30	6-16-65	605.93	3-14-69	605.93	10-23-80	605.73
10- 1-48	605.29	12-17-58	605.21	9-10-65	605.78	10-24-69	605.78	10- 7-83	605.64
6-25-51	605.30	6-28-60	605.30	3- 9-67	605.73	8-19-71	605.89	10-11-84	605.50
10- 1-51	606.22	10-31-60	605.21	9-18-67	606.37	12-31-71	605.73	10- 1-85	605.43
9-13-54	605.78	2- 6-61	605.14	1-12-68	605.93	7-20-72	605.89	10- 1-89	605.43
6- 6-56	605.30	7- 1-62	606.08	5- 1-68	606.08	1- 5-74	605.73	10- 1-91	605.38
6-18-56	605.30	2-27-65	605.78	12-20-68	605.78	10- 6-76	605.35	11-25-93	605.24

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	3.97	35	NS	0.898	NA

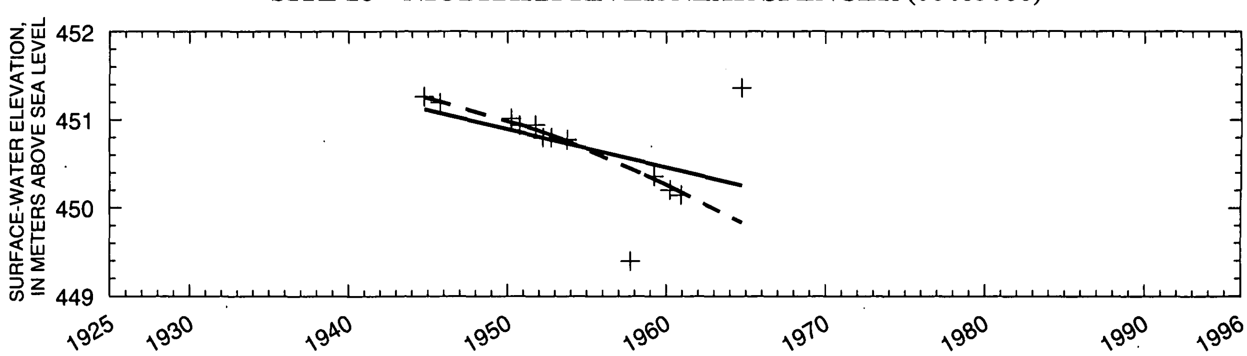
SITE 15—KEYA PAHA RIVER NEAR NAPER (06464900)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
12-11-57	513.55	7-01-70	513.61	3-19-79	513.64
10-01-58	513.58	6-02-71	513.64	6-05-80	513.65
3-24-60	513.45	6-20-73	513.61	3-06-82	513.69
5-09-61	513.51	10-03-73	513.64	4-18-84	513.72
10-26-61	513.53	7-03-74	513.61	4-01-85	513.77
10-19-62	513.54	10-15-74	513.64	10-01-90	513.84
10-01-63	513.61	3-22-78	513.50		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.10	20	0.73	0.000	0.077

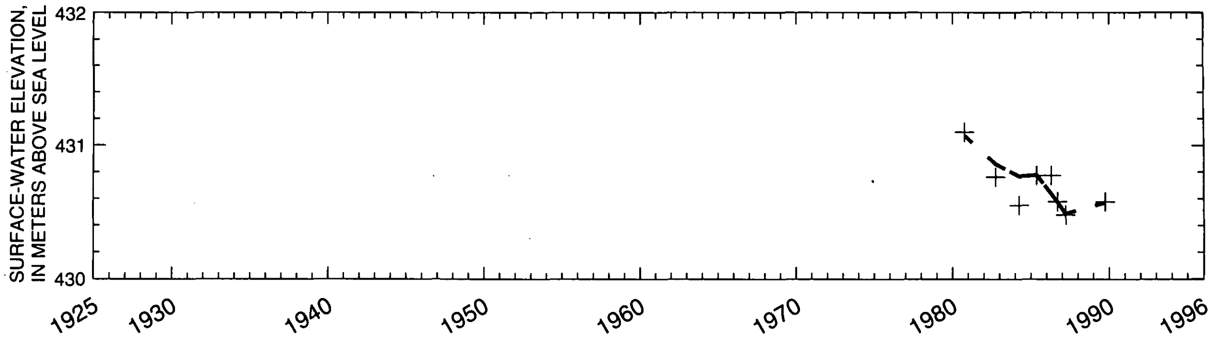
SITE 16—NIOBRARA RIVER NEAR SPENCER (06465000)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-44	451.26	10-01-53	450.78
10-01-45	451.19	10-01-53	450.77
3-26-50	451.01	10-01-57	449.39
10-01-50	450.94	3-20-59	450.36
10-01-51	450.94	3-27-60	450.20
3-25-52	450.80	12-06-60	450.14
10-01-52	450.80	10-01-64	451.36

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	36.3	14	-0.60	0.003	-0.432

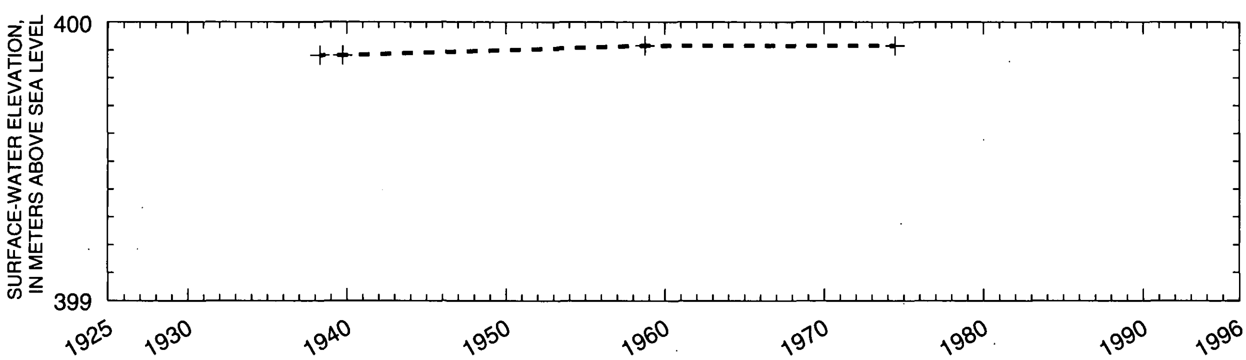
SITE 17—REDBIRD CREEK AT REDBIRD (06465440)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-80	431.10	10-01-89	430.58
10-01-82	430.76		
4-03-84	430.55		
5-11-85	430.77		
4-17-86	430.77		
9-16-86	430.58		
3-18-87	430.48		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.96	8	NS	0.442	NA

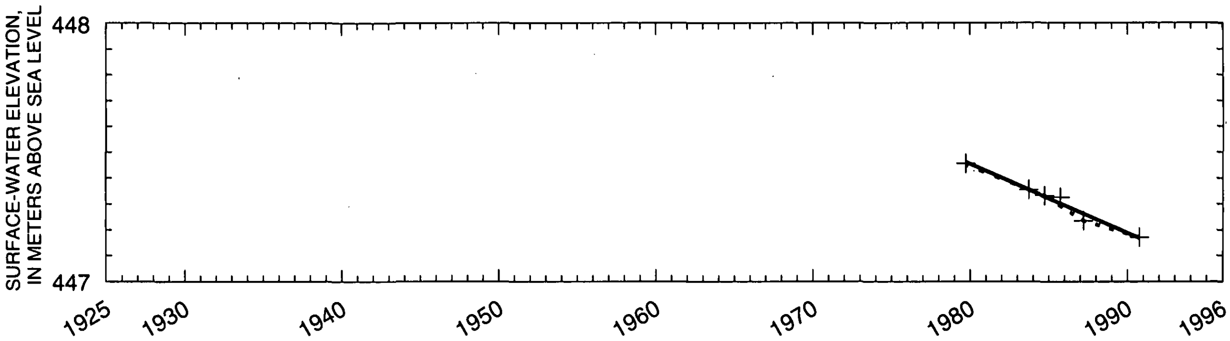
SITE 18—NIOBRARA RIVER NEAR VERDEL (06465500)



Date	SW elev. (m)
4-26-38	399.88
10-01-39	399.88
10-01-58	399.92
6-14-74	399.92

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	41.1	4	NS	0.279	NA

SITE 19—NORTH BRANCH VERDIGRE CREEK NEAR VERDIGRE (06465680)



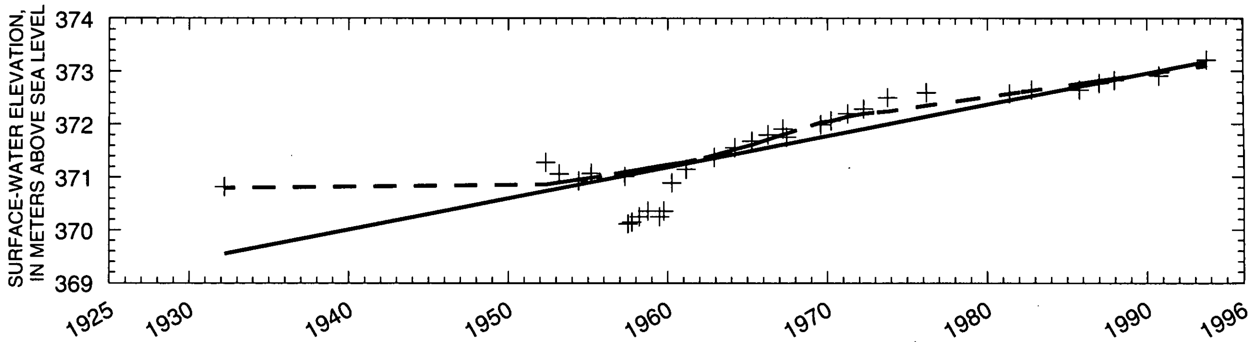
Date	SW elev. (m)
10-01-79	447.46
10-01-83	447.35
10-01-84	447.33
10-01-85	447.33
3-17-87	447.23
10-01-90	447.17

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.65	6	-1.00	0.005	-0.268

APPENDIX D—BAZILE CREEK BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

SITE 20—BAZILE CREEK NEAR NIOBRARA (06466500)



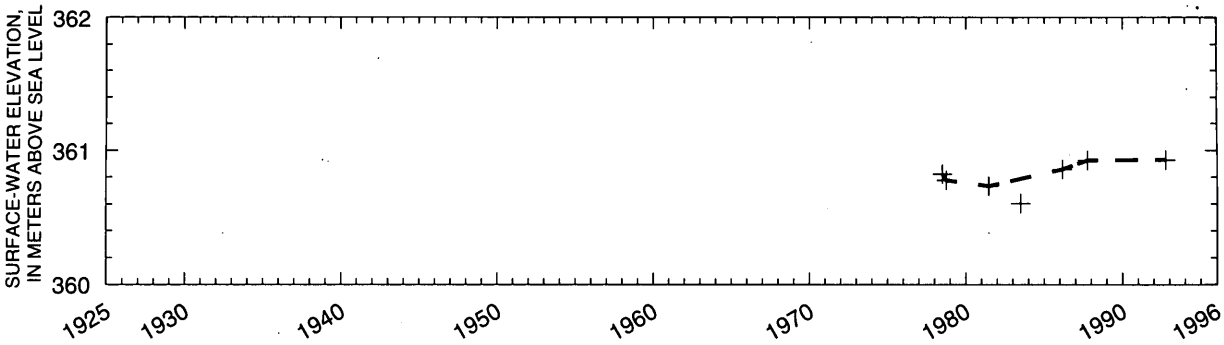
Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
3-21-32	370.82	10-01-57	370.15	11-28-62	371.37	3-18-70	372.06	10-01-85	372.65
5-07-52	371.28	3-16-58	370.25	3-14-64	371.56	3-31-71	372.20	1-01-87	372.77
3-11-53	371.06	10-01-58	370.36	4-06-65	371.68	4-04-72	372.29	12-14-87	372.82
5-31-54	370.92	6-28-59	370.25	4-06-66	371.80	10-03-73	372.50	10-01-90	372.91
3-11-55	371.07	10-01-59	370.36	3-15-67	371.91	3-02-76	372.60	10-01-93	373.21
4-20-57	371.01	3-29-60	370.89	6-08-67	371.76	5-19-81	372.57		
7-01-57	370.12	2-23-61	371.15	7-24-69	371.99	10-01-82	372.65		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.42	33	0.79	0.000	0.591

APPENDIX E—BOW CREEK BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

SITE 21—BOW CREEK NEAR ST JAMES (06478518)



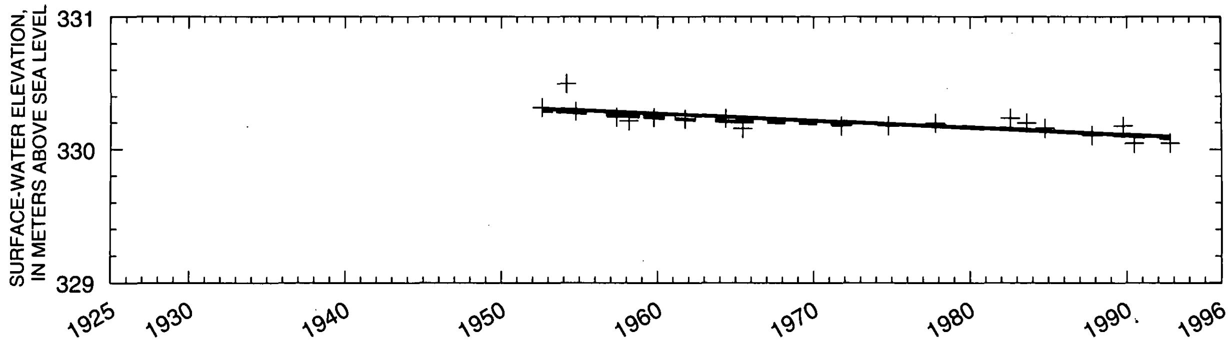
Date	SW elev. (m)
6-26-78	360.82
10-01-78	360.78
6-14-81	360.73
6-27-83	360.60
2-26-86	360.86
10-01-87	360.93
10-01-92	360.93

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.36	7	NS	0.176	NA

APPENDIX F—OMAHA CREEK BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

SITE 22—OMAHA CREEK AT HOMER (06601000)



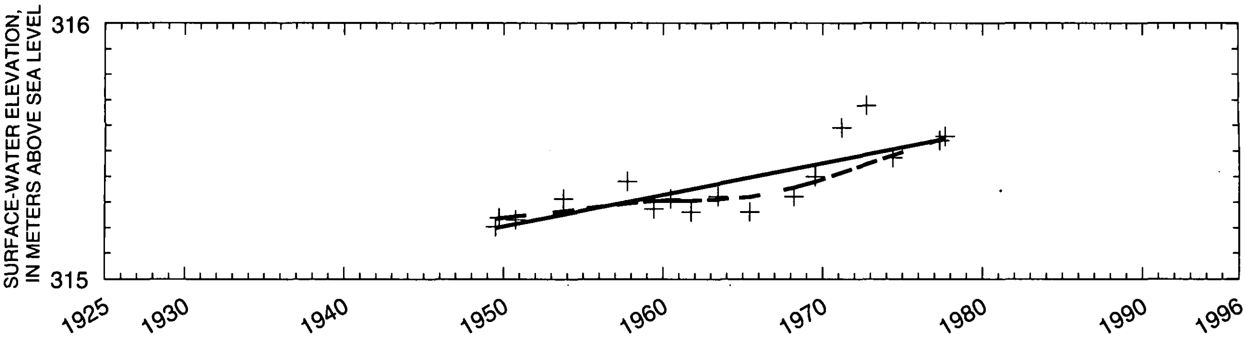
Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
8-04-52	330.32	5-07-64	330.23	7-27-83	330.20
3-02-54	330.49	6-10-65	330.16	10-01-84	330.16
10-01-54	330.29	10-01-71	330.18	10-01-87	330.10
5-12-57	330.24	10-01-74	330.18	10-01-89	330.17
2-27-58	330.21	10-01-74	330.18	6-16-90	330.05
10-01-59	330.24	10-05-77	330.20	10-01-92	330.05
10-01-61	330.23	7-15-82	330.24		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.45	20	-0.71	0.000	-0.053

APPENDIX G—TEKAMAH CREEK BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

SITE 23—TEKAMAH CREEK AT TEKAMAH (06608000)



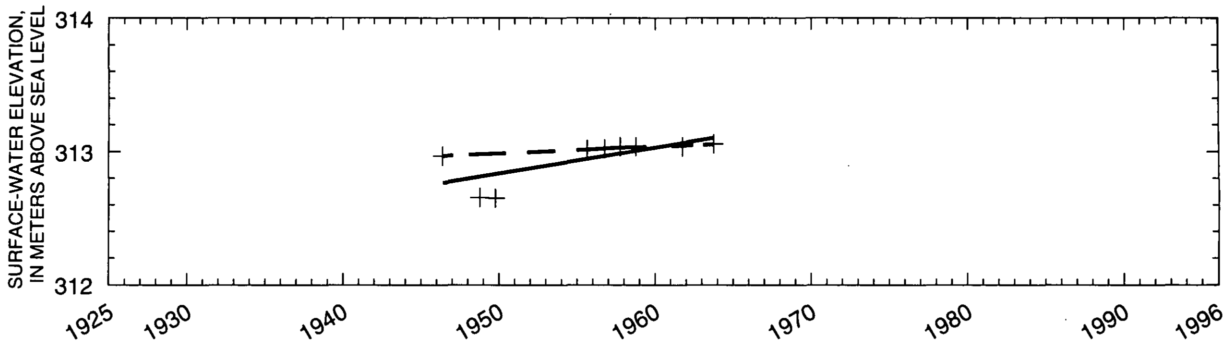
Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
6-30-49	315.20	10-01-61	315.26	5-18-74	315.47
9-15-49	315.24	6-06-63	315.32	4-18-77	315.54
10-01-50	315.23	6-05-65	315.26	8-21-77	315.56
10-01-53	315.31	3-08-68	315.32		
10-01-57	315.38	7-09-69	315.40		
5-29-59	315.27	3-06-71	315.59		
6-20-60	315.31	10-01-72	315.68		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.18	17	0.68	0.000	0.124

APPENDIX H—NEW YORK CREEK BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

SITE 24—NEW YORK CREEK AT HERMAN (06609000)



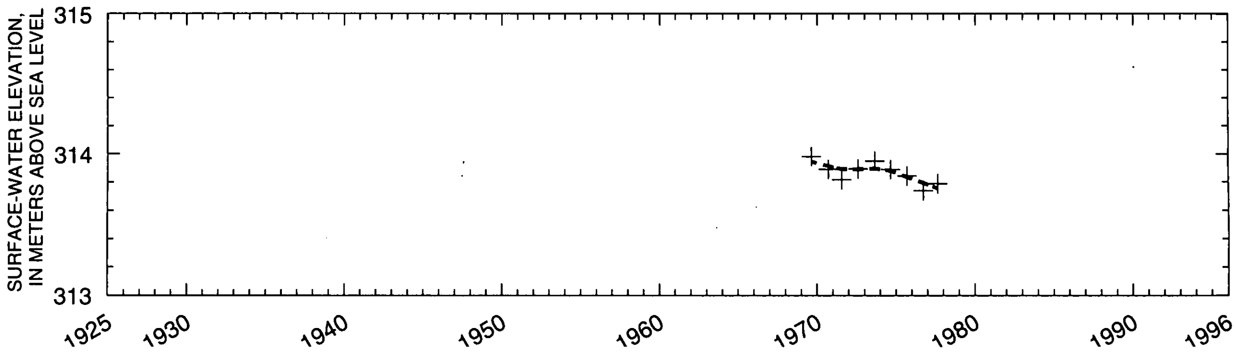
Date	SW elev. (m)	Date	SW elev. (m)
5-18-46	312.97	10-01-61	313.04
10-01-48	312.66	10-01-63	313.06
10-01-49	312.65		
8-25-55	313.02		
10-01-56	313.02		
10-01-57	313.04		
10-01-58	313.04		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.19	9	0.78	0.004	0.195

APPENDIX I—PAPILLION CREEK BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

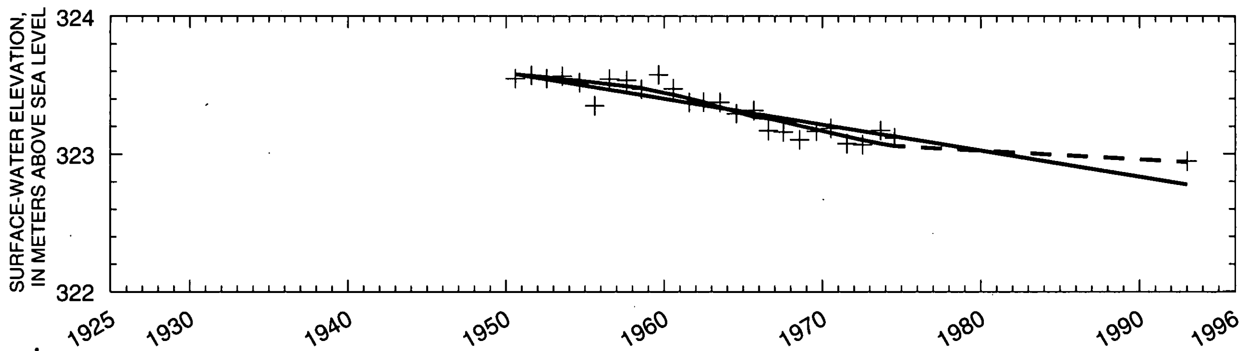
SITE 25—BIG PAPILLION CREEK AT 125TH AND FORT STREET (06610732) (USACE GAGE)



Date	SW elev. (m)	Date	SW elev. (m)
8-18-69	313.98	9-19-76	313.74
9-14-70	313.89	8-18-77	313.79
7-16-71	313.82		
7-31-72	313.89		
8-22-73	313.95		
8-24-74	313.89		
9-04-75	313.84		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.50	9	NS	0.037	NA

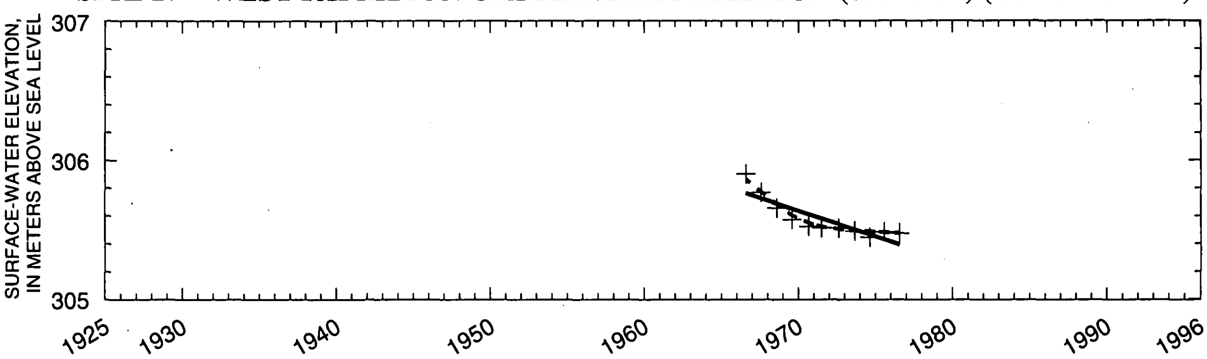
SITE 26—LITTLE PAPILLION CREEK AT IRVINGTON (06610750) (USACE GAGE)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
7-31-50	323.55	8-14-57	323.53	7-23-64	323.29	7-19-71	323.07
8-05-51	323.57	7-24-58	323.47	8-29-65	323.31	7-17-72	323.07
7-25-52	323.55	8-25-59	323.57	7-29-66	323.17	9-04-73	323.17
7-18-53	323.56	7-26-60	323.47	7-11-67	323.16	7-21-74	323.11
8-20-54	323.52	8-03-61	323.37	7-21-68	323.10	1-01-93	322.95
8-08-55	323.35	6-29-62	323.38	8-14-69	323.16		
7-14-56	323.54	7-11-63	323.37	7-11-70	323.19		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.17	26	-0.75	0.000	-0.189

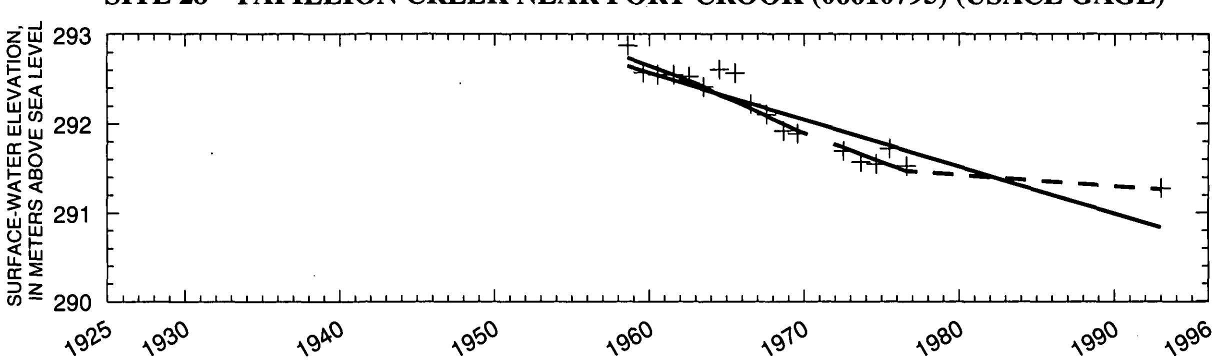
SITE 27—WEST PAPILLION CREEK NEAR PAPILLION (06610792) (USACE GAGE)



Date	SW elev. (m)	Date	SW elev. (m)
8-06-66	305.90	8-26-73	305.49
8-05-67	305.77	8-22-74	305.44
8-10-68	305.66	7-26-75	305.48
8-07-69	305.57	7-27-76	305.48
9-01-70	305.52		
7-02-71	305.51		
8-14-72	305.51		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.55	11	-0.93	0.000	-0.371

SITE 28—PAPILLION CREEK NEAR FORT CROOK (06610795) (USACE GAGE)



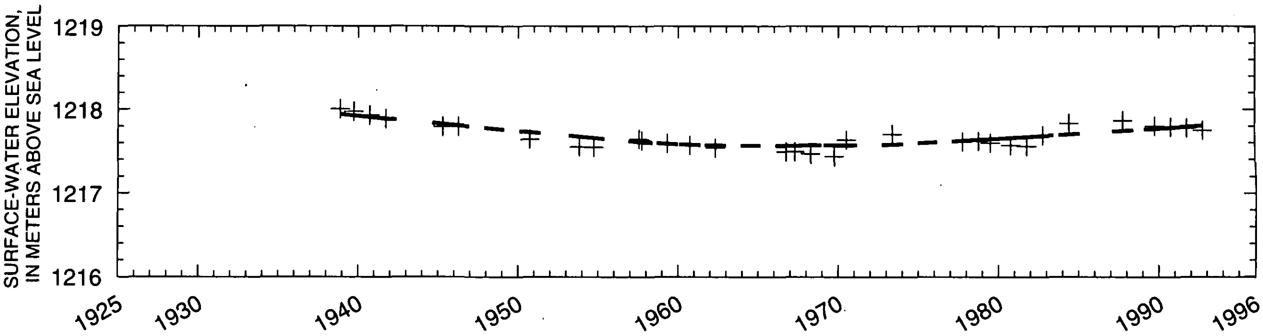
Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
8-08-58	292.87	7-20-65	292.57	8-27-74	291.55
8-12-59	292.57	7-16-66	292.22	7-03-75	291.72
7-20-60	292.55	7-25-67	292.10	8-13-76	291.53
8-02-61	292.55	8-25-68	291.92	1-01-93	291.28
8-01-62	292.53	7-23-69	291.89		
7-04-63	292.41	7-14-72	291.69		
7-14-64	292.61	9-01-73	291.57		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	3.49	18	-0.84	0.000	-0.526

APPENDIX J—PLATTE RIVER BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

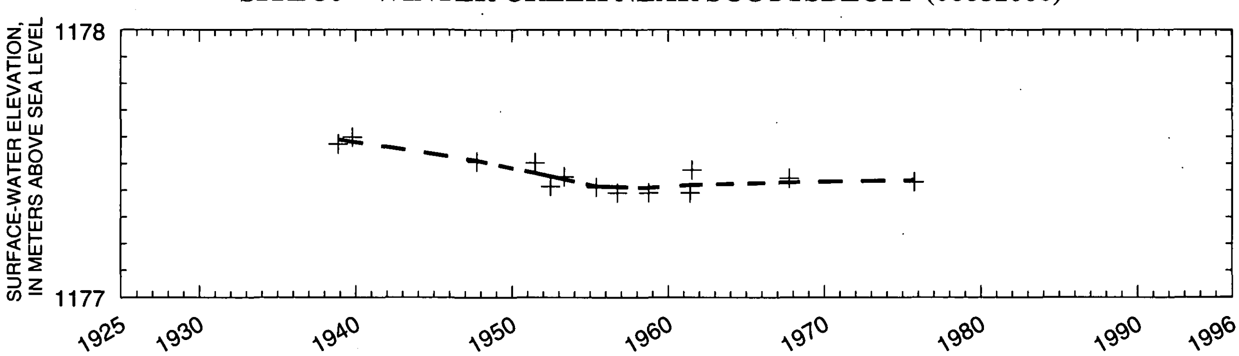
SITE 29—HORSE CREEK NEAR LYMAN (06677500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
11-23-38	1218.00	11-06-53	1217.55	10-01-66	1217.49	10-01-78	1217.62	10-01-89	1217.80
10-01-39	1217.97	10-01-54	1217.55	4-17-67	1217.49	6-26-79	1217.60	10-01-90	1217.79
10-01-40	1217.93	7-29-57	1217.64	4-15-68	1217.47	10-01-80	1217.57	10-01-91	1217.78
10-01-41	1217.89	10-01-57	1217.63	10-01-69	1217.44	10-01-81	1217.56	10-01-92	1217.75
4-25-45	1217.80	5-01-59	1217.59	7-08-70	1217.63	10-01-82	1217.69		
4-13-46	1217.80	10-01-60	1217.57	5-19-73	1217.71	5-21-84	1217.83		
10-01-50	1217.64	5-01-62	1217.54	10-01-77	1217.61	10-01-87	1217.87		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.16	32	NS	0.372	NA

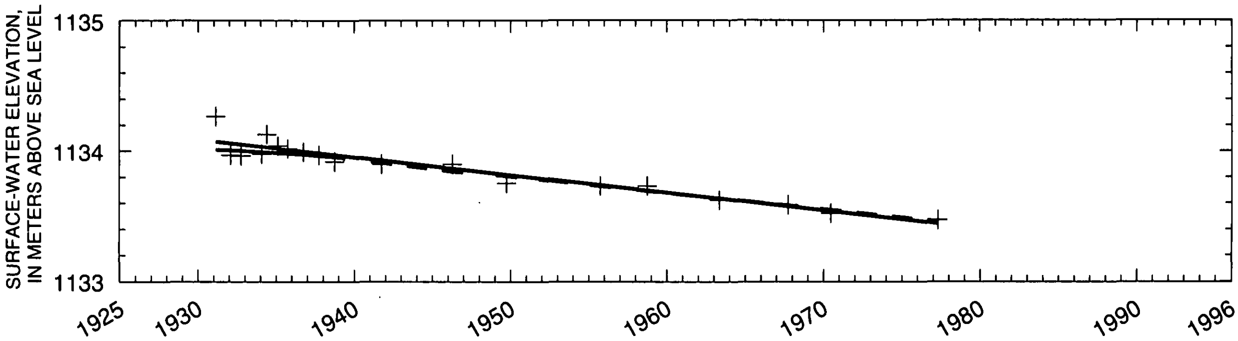
SITE 30—WINTER CREEK NEAR SCOTTSBLUFF (06681000)



Date	SW elev. (m)	Date	SW elev. (m)
11-19-38	1177.57	10-01-56	1177.39
10-10-39	1177.60	10-01-58	1177.39
10-01-47	1177.51	6-01-61	1177.39
6-25-51	1177.50	7-07-61	1177.48
6-22-52	1177.42	10-01-67	1177.45
5-08-53	1177.45	10-01-75	1177.43
5-26-55	1177.41		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.50	13	NS	0.017	NA

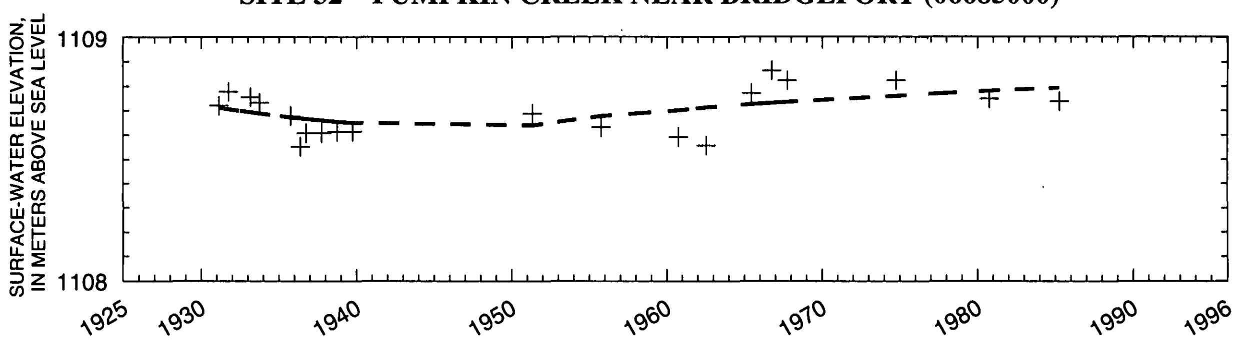
SITE 31—RED WILLOW CREEK NEAR BAYARD (06684000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
2-20-31	1134.27	10-01-36	1133.99	10-01-58	1133.73
2-02-32	1133.97	10-01-37	1133.97	5-11-63	1133.62
10-01-32	1133.96	10-01-38	1133.92	10-01-67	1133.59
2-01-34	1133.98	10-01-41	1133.90	6-23-70	1133.52
5-28-34	1134.13	4-16-46	1133.90	5-02-77	1133.47
2-15-35	1134.04	10-01-49	1133.75		
10-01-35	1134.02	10-01-55	1133.73		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.51	19	-0.81	0.000	-0.136

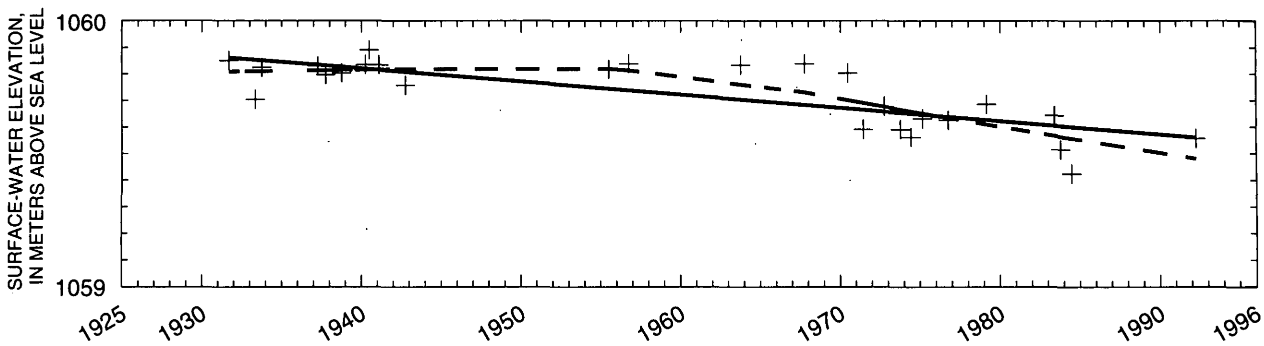
SITE 32—PUMPKIN CREEK NEAR BRIDGEPORT (06685000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
2-19-31	1108.72	10-01-37	1108.61	6-10-65	1108.77
10-01-31	1108.78	10-01-38	1108.61	10-01-66	1108.86
3-01-33	1108.76	10-01-39	1108.61	10-01-67	1108.82
10-01-33	1108.73	5-01-51	1108.69	10-01-74	1108.82
10-01-35	1108.68	10-01-55	1108.63	10-01-80	1108.75
5-19-36	1108.55	10-01-60	1108.59	4-01-85	1108.74
10-01-36	1108.61	7-14-62	1108.56		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.76	20	NS	0.381	NA

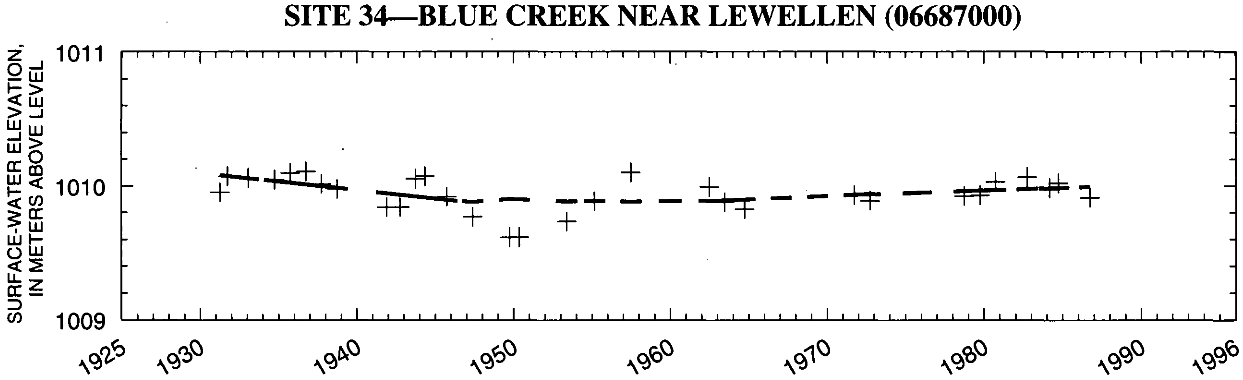
SITE 33—NORTH PLATTE RIVER AT LISCO (06686000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
9-08-31	1059.85	6-23-40	1059.89	6-19-70	1059.80	2-23-79	1059.69
5-01-33	1059.70	2-04-41	1059.83	6-03-71	1059.59	5-18-83	1059.64
10-01-33	1059.83	10-01-42	1059.76	10-01-72	1059.68	10-01-83	1059.51
4-01-37	1059.83	6-28-55	1059.82	10-01-73	1059.59	6-10-84	1059.42
10-01-37	1059.80	10-01-56	1059.84	5-29-74	1059.56	4-02-92	1059.56
10-01-38	1059.80	10-01-63	1059.83	2-20-75	1059.63		
4-01-40	1059.83	10-01-67	1059.84	10-01-76	1059.63		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	32.3	26	-0.52	0.000	-0.050

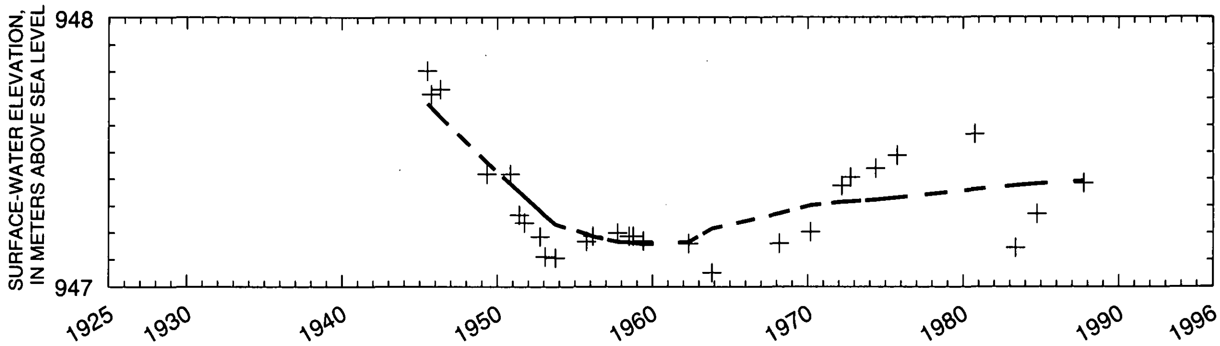
SITE 34—BLUE CREEK NEAR LEWELLEN (06687000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
4- 8-31	1009.95	10- 1-38	1009.98	10- 1-49	1009.61	10- 1-64	1009.83	3- 9-84	1009.98
10- 1-31	1010.07	11-24-41	1009.84	5-11-50	1009.61	10- 1-71	1009.93	10- 1-84	1010.02
2- 2-33	1010.06	10- 1-42	1009.84	5-25-53	1009.73	10- 1-72	1009.89	10- 1-86	1009.91
10- 1-34	1010.05	10- 1-43	1010.05	3- 4-55	1009.89	10- 1-78	1009.92		
10- 1-35	1010.09	5-10-44	1010.07	7- 1-57	1010.10	10- 1-79	1009.93		
10- 1-36	1010.11	10- 1-45	1009.92	7- 1-62	1009.99	10- 1-80	1010.03		
10- 1-37	1010.01	5-22-47	1009.77	6-20-63	1009.88	10- 1-82	1010.06		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.95	31	NS	0.332	NA

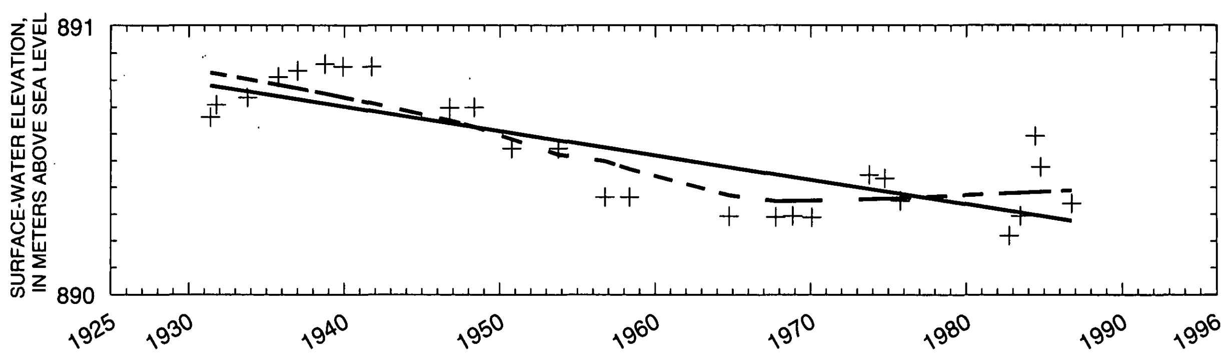
SITE 35—NORTH PLATTE RIVER NEAR KEYSTONE (06690500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
7-01-45	947.80	10-01-52	947.18	7-01-58	947.19	3-08-72	947.37	10-01-87	947.38
10-01-45	947.72	2-05-53	947.11	10-01-58	947.19	10-01-72	947.41		
5-01-46	947.73	4-04-53	946.96	6-01-59	947.17	5-10-74	947.44		
4-30-49	947.42	10-01-53	947.11	5-01-62	947.16	10-01-75	947.49		
11-04-50	947.42	10-01-55	947.17	11-01-63	947.05	10-01-80	947.57		
6-01-51	947.27	2-29-56	947.19	3-02-68	947.16	5-11-83	947.14		
10-01-51	947.24	10-01-57	947.20	3-04-70	947.20	10-01-84	947.27		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.59	29	NS	0.626	NA

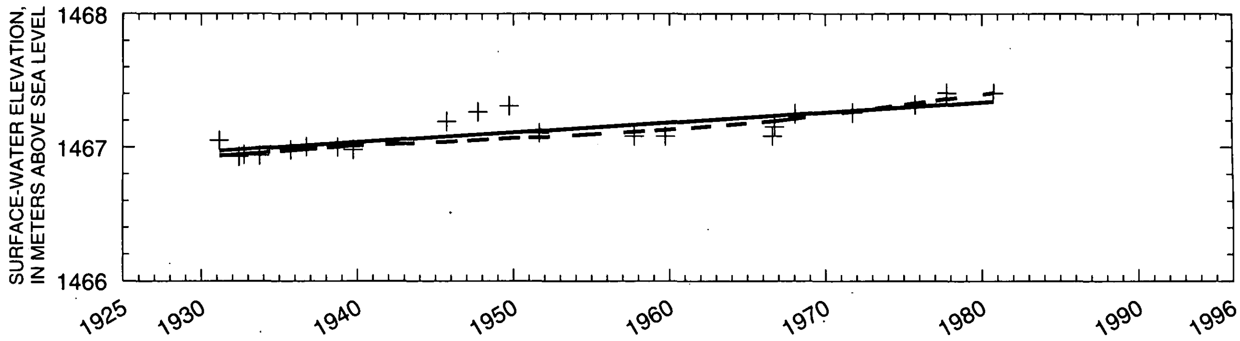
SITE 36—BIRDWOOD CREEK NEAR HERSHEY (06692000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
5-14-31	890.66	10-01-41	890.85	10-01-64	890.29	10-01-82	890.22
10-01-31	890.71	10-01-46	890.70	10-01-67	890.29	6-17-83	890.29
10-01-33	890.74	5-01-48	890.70	10-29-68	890.29	5-23-84	890.59
10-01-35	890.81	10-01-50	890.55	1-24-70	890.29	10-01-84	890.48
1-01-37	890.83	10-01-53	890.55	10-01-73	890.45	10-01-86	890.34
10-01-38	890.86	10-01-56	890.36	10-01-74	890.43		
12-02-39	890.85	5-01-58	890.36	10-01-75	890.35		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.28	26	-0.52	0.000	-0.091

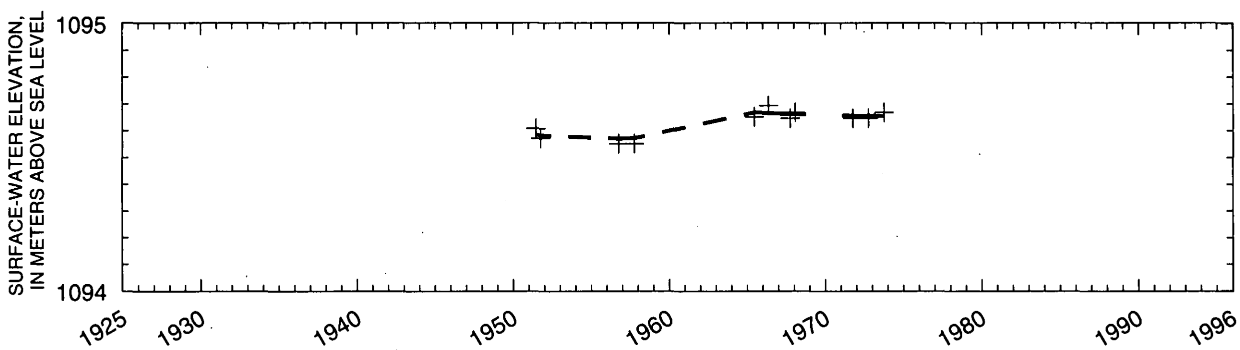
SITE 37—LODGEPOLE CREEK AT BUSHNELL (06762500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
3-03-31	1467.05	10-01-39	1466.98	8-09-66	1467.08	10-01-80	1467.40
6-08-32	1466.93	10-01-45	1467.19	10-01-66	1467.15		
10-01-32	1466.94	10-01-47	1467.26	1-26-68	1467.25		
10-01-33	1466.94	10-01-49	1467.31	10-01-71	1467.26		
10-01-35	1466.98	9-07-51	1467.11	10-01-71	1467.26		
10-01-36	1467.00	10-01-57	1467.08	10-01-75	1467.32		
10-01-38	1467.00	10-01-59	1467.08	10-01-77	1467.40		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.29	22	0.68	0.000	0.074

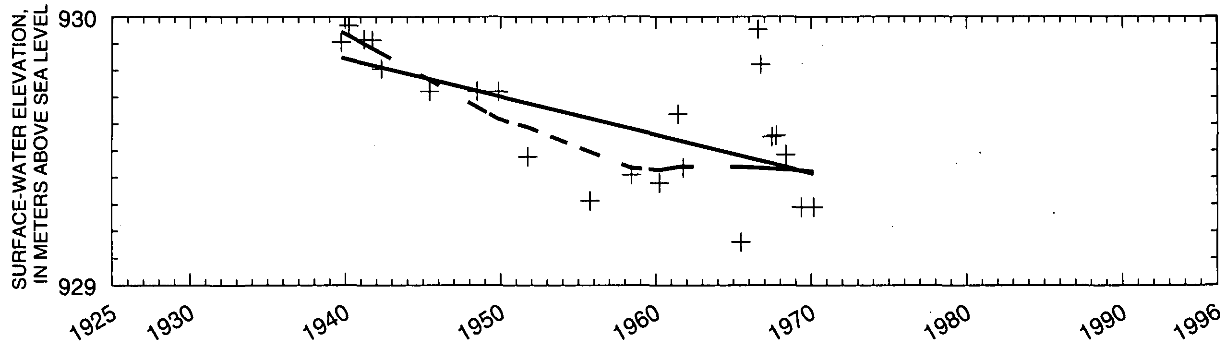
SITE 38—LODGEPOLE CREEK AT RALTON (06763500)



Date	SW elev. (m)	Date	SW elev. (m)
6-15-51	1094.61	1-26-68	1094.67
10-01-51	1094.57	10-01-71	1094.65
10-01-56	1094.55	10-01-72	1094.65
10-01-57	1094.55	10-01-73	1094.67
6-13-65	1094.65		
5-08-66	1094.69		
10-01-67	1094.65		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.24	11	NS	0.205	NA

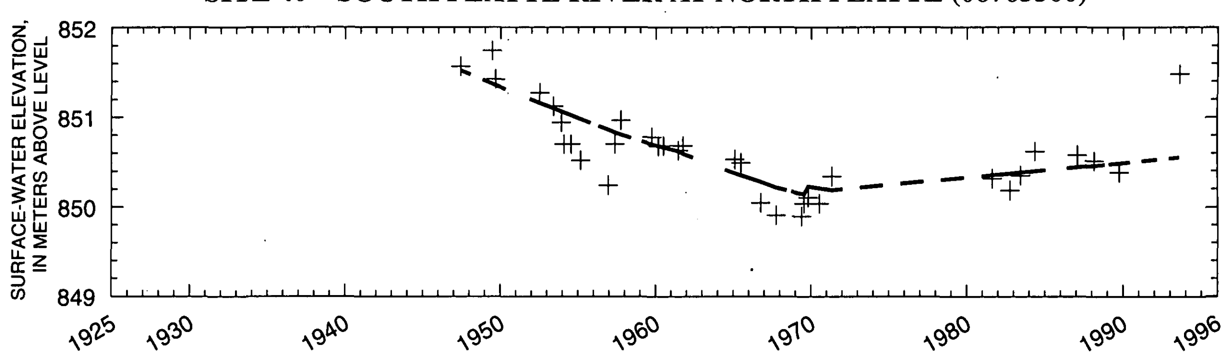
SITE 39—SOUTH PLATTE RIVER AT PAXTON (06765000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-39	929.91	11-07-49	929.72	6-21-65	929.16	2-27-70	929.29
4-02-40	929.97	10-01-51	929.48	7-28-66	929.95		
3-19-41	929.92	10-01-55	929.31	10-01-66	929.82		
10-01-41	929.91	6-10-58	929.41	6-24-67	929.55		
4-30-42	929.81	3-28-60	929.38	10-01-67	929.56		
6-01-45	929.72	6-01-61	929.64	5-20-68	929.48		
6-25-48	929.72	10-07-61	929.44	5-13-69	929.29		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.02	22	-0.49	0.001	-0.143

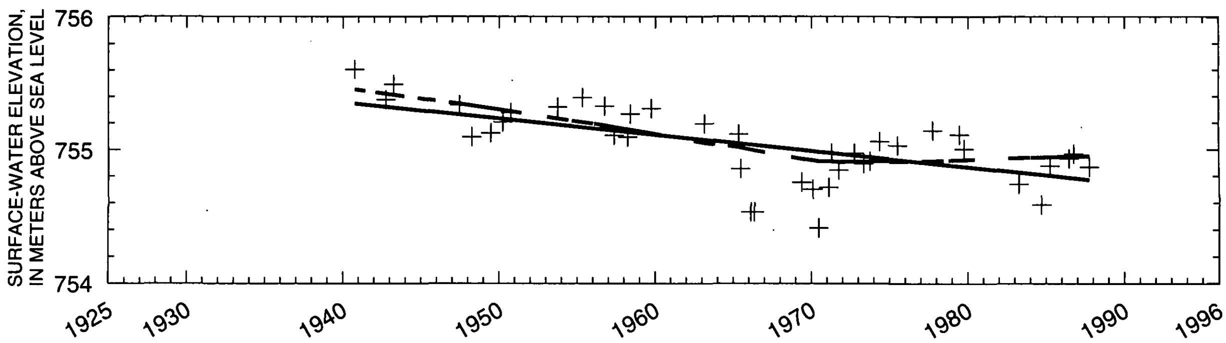
SITE 40—SOUTH PLATTE RIVER AT NORTH PLATTE (06765500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
6-01-47	851.57	7-19-54	850.70	3-01-60	850.68	10-01-67	849.91	10-01-82	850.19
6-16-49	851.75	3-01-55	850.52	7-01-60	850.68	5-14-69	849.89	6-07-83	850.35
9-01-49	851.43	12-11-56	850.24	6-14-61	850.63	7-08-69	850.04	5-08-84	850.62
7-10-52	851.27	5-17-57	850.70	10-01-61	850.68	10-17-69	850.11	1-27-87	850.58
6-01-53	851.12	10-01-57	850.97	2-01-65	850.53	7-07-70	850.04	2-21-88	850.51
12-07-53	850.94	10-01-57	850.97	6-22-65	850.49	4-28-71	850.34	10-01-89	850.38
2-03-54	850.70	10-01-59	850.78	10-01-66	850.04	8-13-81	850.31	8-09-93	851.48

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.81	35	NS	0.029	NA

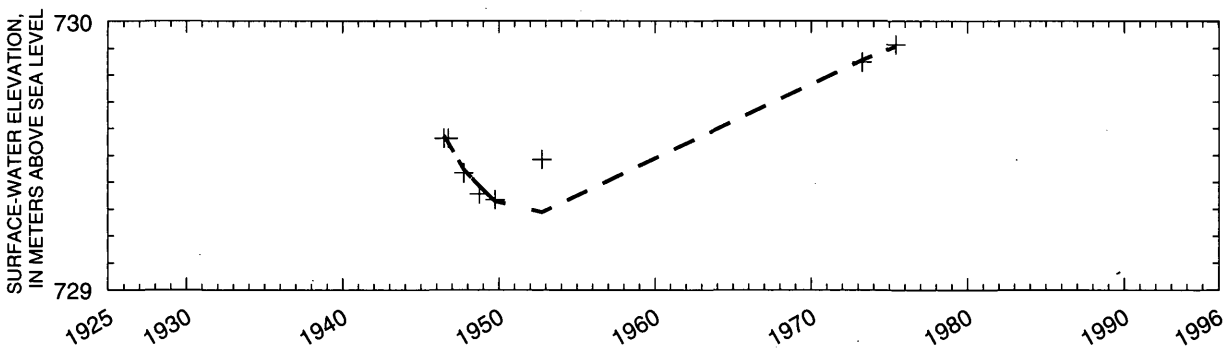
SITE 41—PLATTE RIVER NEAR COZAD (06766500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-40	755.60	5-02-55	755.39	2-13-66	754.53	5-02-73	754.89	3-28-85	754.87
10-01-42	755.38	10-01-56	755.33	5-09-66	754.53	10-01-73	754.91	6-13-86	754.93
4-01-43	755.49	5-15-57	755.11	5-17-69	754.75	5-06-74	755.06	10-01-86	754.97
6-22-47	755.33	3-25-58	755.09	2-04-70	754.70	7-03-75	755.03	10-01-87	754.87
4-07-48	755.10	5-26-58	755.27	6-23-70	754.41	10-01-77	755.14		
6-24-49	755.12	10-01-59	755.31	2-12-71	754.72	6-14-79	755.11		
4-01-50	755.21	2-26-63	755.19	4-13-71	754.97	10-01-79	755.00		
10-01-50	755.28	5-04-65	755.12	10-01-71	754.84	4-01-83	754.74		
10-01-53	755.32	6-23-65	754.86	10-01-72	754.97	9-07-84	754.59		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	9.06	40	-0.42	0.000	-0.125

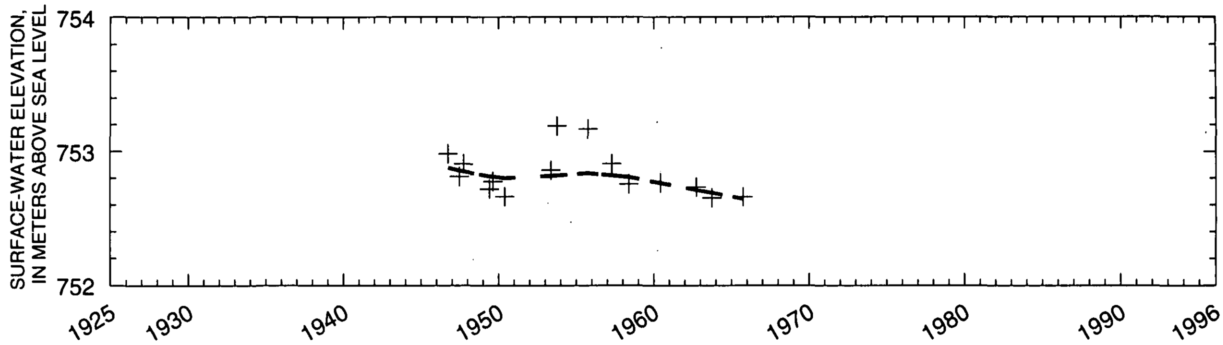
SITE 42—PLUM CREEK NEAR SMITHFIELD (06767500)



Date	SW elev. (m)	Date	SW elev. (m)
6-25-46	729.56	5-29-75	729.91
10-01-46	729.56		
10-01-47	729.43		
10-01-48	729.36		
10-01-49	729.33		
10-01-52	729.48		
4-04-73	729.85		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.08	8	NS	0.533	NA

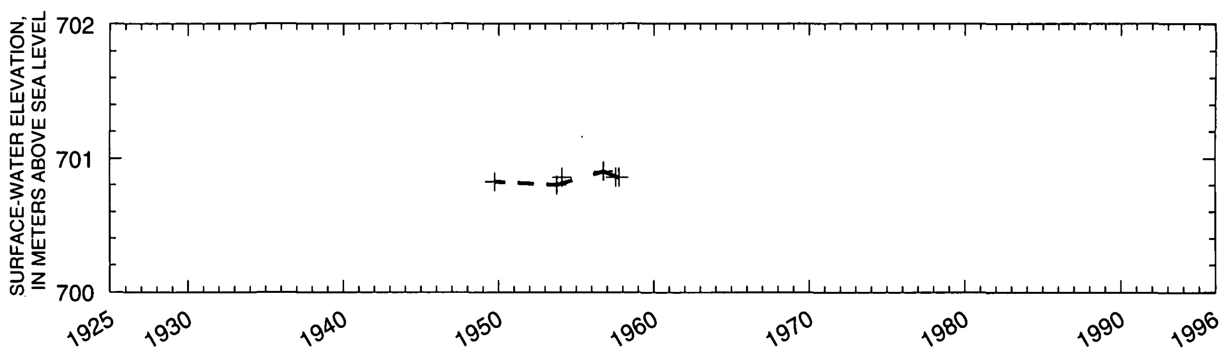
SITE 43—BUFFALO CREEK NEAR DARR (06768500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-04-46	752.98	10-01-53	753.19	10-01-65	752.66
6-23-47	752.81	10-01-55	753.17		
10-01-47	752.91	4-22-57	752.91		
6-01-49	752.72	5-26-58	752.76		
8-21-49	752.78	6-10-60	752.76		
5-27-50	752.66	10-01-62	752.73		
5-22-53	752.86	10-01-63	752.65		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.10	15	NS	0.067	NA

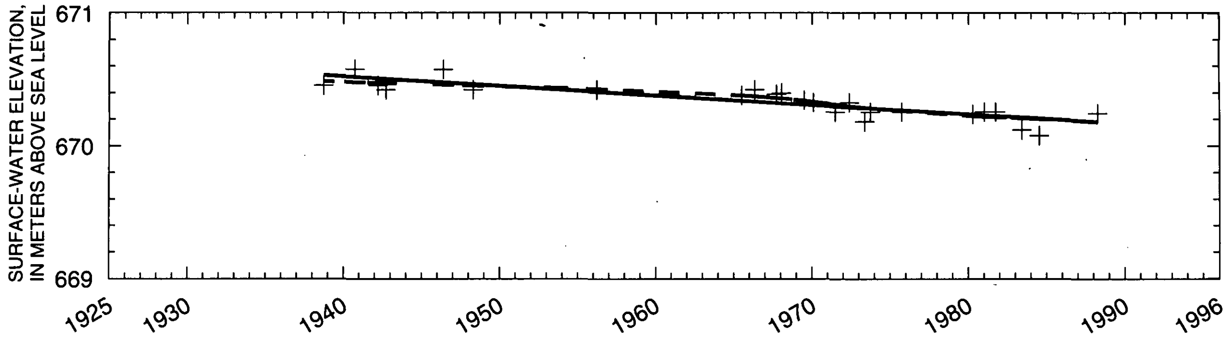
SITE 44—BUFFALO CREEK NEAR OVERTON (06769000)



Date	SW elev. (m)
10-01-49	700.82
10-01-53	700.80
2-04-54	700.86
10-01-56	700.90
7-16-57	700.86
10-01-57	700.86

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.40	6	NS	0.227	NA

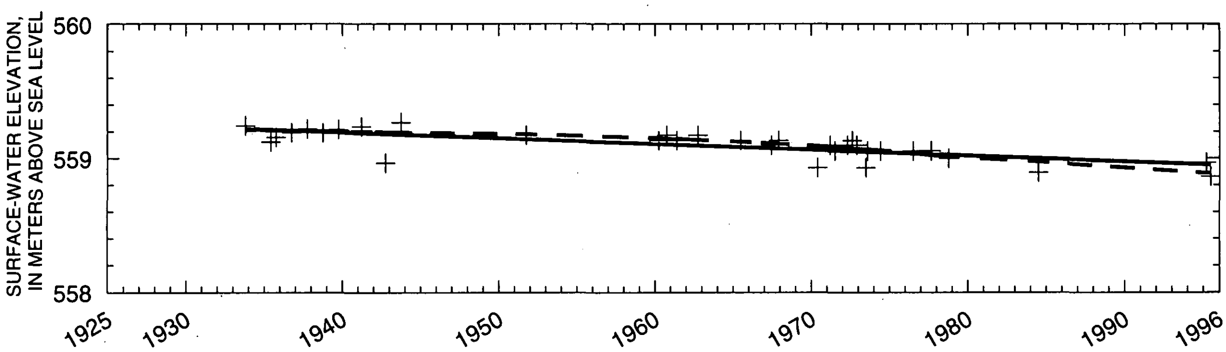
SITE 45—PLATTE RIVER NEAR ODESSA (06770000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-38	670.45	7-03-65	670.38	5-27-72	670.33	6-04-83	670.12
10-01-40	670.58	5-08-66	670.42	5-22-73	670.18	7-14-84	670.08
3-24-42	670.45	10-01-67	670.39	10-01-73	670.26	4-06-88	670.24
10-01-42	670.42	1-27-68	670.40	10-01-75	670.26		
6-01-46	670.58	7-09-69	670.34	4-16-80	670.24		
5-01-48	670.42	2-08-70	670.33	1-14-81	670.26		
4-01-56	670.42	7-02-71	670.26	10-01-81	670.26		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	33.1	24	-0.80	0.000	-0.071

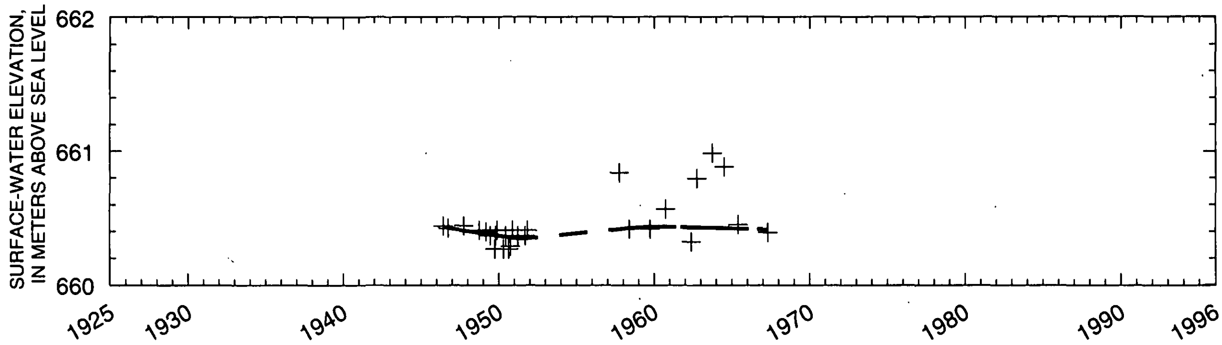
SITE 46—PLATTE RIVER NEAR GRAND ISLAND (06770500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-21-33	559.24	3-20-41	559.24	10-01-62	559.17	4-18-72	559.10	8-23-77	559.05
6-01-35	559.12	10-01-42	558.96	6-23-65	559.13	8-10-72	559.13	10-04-78	559.00
10-01-35	559.16	10-01-43	559.27	6-07-67	559.10	11-22-72	559.10	6-28-84	558.89
10-01-36	559.19	10-01-51	559.17	11-29-67	559.13	6-22-73	558.93	3-10-95	558.97
10-01-37	559.22	3-29-60	559.13	5-23-70	558.93	7-27-73	559.05	6-20-95	558.86
10-01-38	559.19	10-01-60	559.17	3-12-71	559.10	5-29-74	559.05		
10-01-39	559.22	5-22-61	559.13	7-01-71	559.05	7-01-76	559.05		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	31.2	33	-0.64	0.000	-0.044

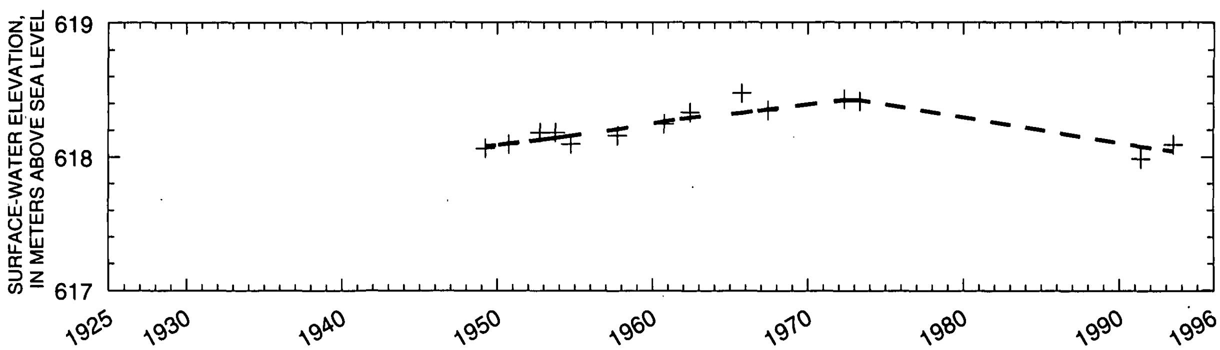
SITE 47—WOOD RIVER NEAR RIVERDALE (06771000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
6-07-46	660.44	10-21-49	660.37	3-27-51	660.37	5-20-62	660.32
10-01-46	660.42	11-25-49	660.41	9-15-51	660.37	10-01-62	660.80
10-01-47	660.44	4-23-50	660.27	11-09-51	660.41	10-01-63	660.99
10-01-48	660.41	6-10-50	660.37	10-01-57	660.84	7-01-64	660.88
3-09-49	660.40	8-25-50	660.27	5-28-58	660.42	5-26-65	660.45
6-18-49	660.37	10-04-50	660.29	10-01-59	660.42	4-26-67	660.39
10-03-49	660.27	11-22-50	660.41	10-01-60	660.57		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.20	27	NS	0.116	NA

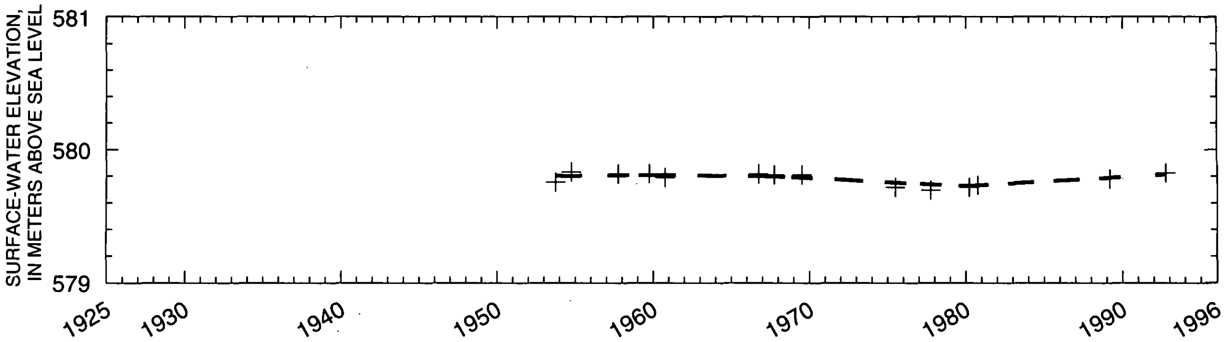
SITE 48—WOOD RIVER NEAR GIBBON (06771500)



Date	SW elev. (m)	Date	SW elev. (m)
4-01-49	618.06	5-29-62	618.33
10-01-50	618.09	10-01-65	618.48
10-01-52	618.18	6-05-67	618.35
10-01-53	618.18	5-02-72	618.43
10-01-54	618.10	5-02-73	618.41
10-01-57	618.16	5-22-91	617.99
10-01-60	618.25	6-24-93	618.09

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.24	14	NS	0.125	NA

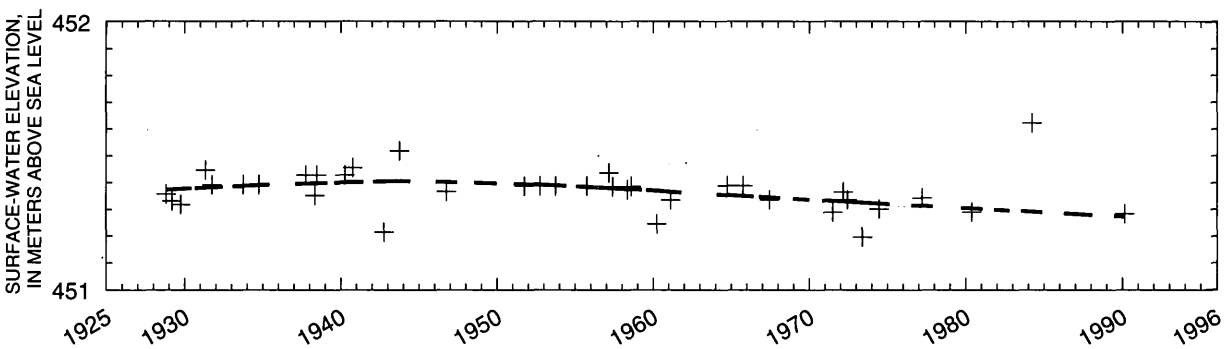
SITE 49—WOOD RIVER NEAR ALDA (06772000)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-53	579.76	7-03-69	579.81
10-01-54	579.83	6-25-75	579.72
10-01-57	579.82	10-01-77	579.70
10-01-59	579.82	3-15-80	579.72
10-05-60	579.79	10-01-80	579.73
10-01-66	579.82	3-05-89	579.78
10-01-67	579.81	9-30-92	579.83

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.23	14	NS	0.185	NA

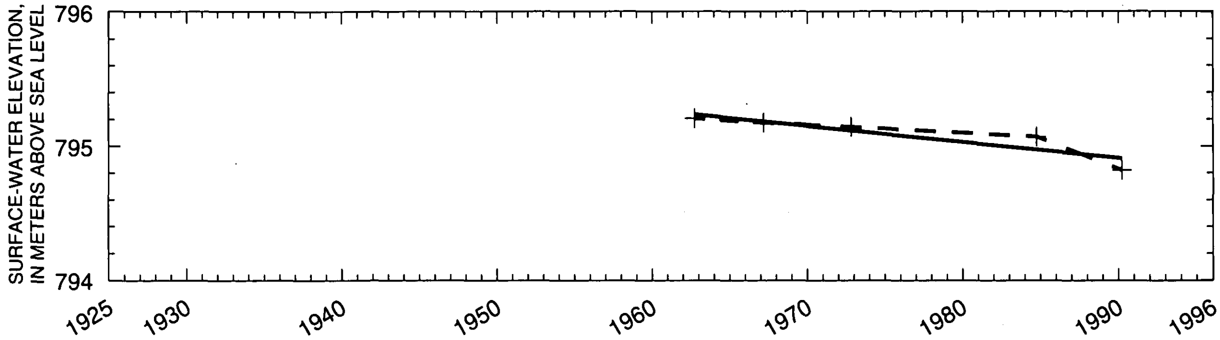
SITE 50—PLATTE RIVER AT DUNCAN (06774000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-25-28	451.36	5-05-38	451.35	10-01-52	451.39	2-17-61	451.34	6-16-74	451.30
3-13-29	451.33	6-16-38	451.43	10-01-53	451.39	10-01-64	451.39	3-15-77	451.34
10-01-29	451.32	4-04-40	451.43	10-01-55	451.39	10-01-65	451.39	5-20-80	451.29
5-01-31	451.45	10-01-40	451.46	2-28-57	451.44	6-14-67	451.34	3-21-84	451.62
10-01-31	451.39	10-01-42	451.21	5-30-57	451.38	7-02-71	451.29	2-23-90	451.28
10-01-33	451.39	10-01-43	451.52	5-06-58	451.37	2-29-72	451.36		
10-01-34	451.39	10-01-46	451.37	8-07-58	451.38	6-09-72	451.34		
10-01-37	451.43	10-01-51	451.39	3-28-60	451.24	5-19-73	451.20		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	33.7	37	NS	0.017	NA

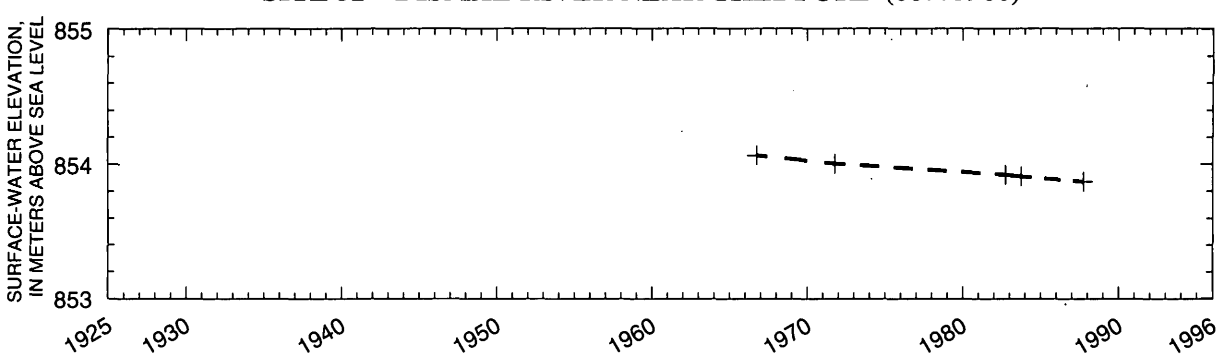
SITE 51—MIDDLE LOUP RIVER AT DUNNING (06775500)



Date	SW elev. (m)
10-01-62	795.21
3-07-67	795.17
10-25-72	795.14
10-01-84	795.07
3-20-90	794.82

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	11.6	5	-1.00	0.000	-0.012

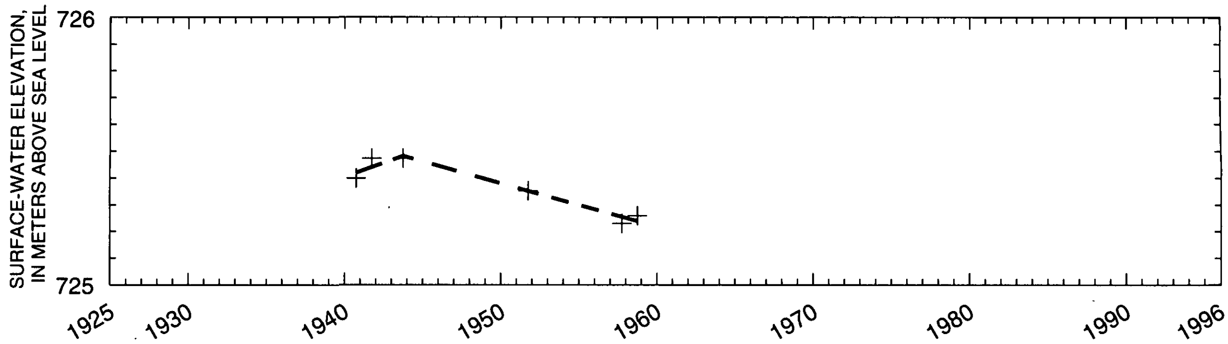
SITE 52—DISMAL RIVER NEAR THEDFORD (06775900)



Date	SW elev. (m)
10-05-66	854.06
10-15-71	854.00
10-01-82	853.92
10-01-83	853.91
10-01-87	853.87

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	5.58	5	NS	0.014	NA

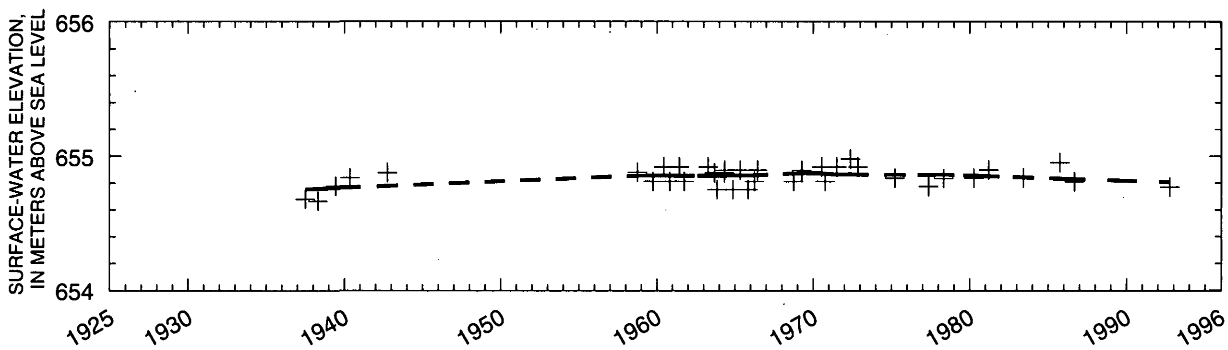
SITE 53—MIDDLE LOUP RIVER AT WALWORTH (06777500)



Date	SW elev. (m)
10-01-40	725.40
10-01-41	725.47
10-01-43	725.47
10-01-51	725.35
10-01-57	725.23
10-01-58	725.26

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	22.6	6	NS	0.126	NA

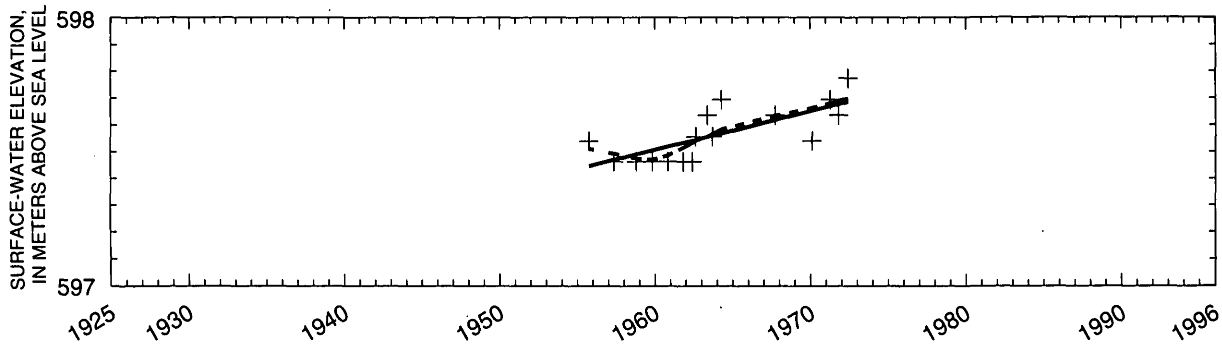
SITE 54—MIDDLE LOUP RIVER AT ARCADIA (06779000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
7-01-37	654.68	10-24-60	654.81	11-10-64	654.75	10-06-70	654.81	3-13-81	654.90
4-23-38	654.66	6-09-61	654.92	4-29-65	654.90	6-30-71	654.92	5-31-83	654.84
6-13-39	654.78	10-01-61	654.81	11-02-65	654.75	5-17-72	654.98	10-01-85	654.95
5-08-40	654.84	4-11-63	654.92	3-29-66	654.81	11-10-72	654.92	9-03-86	654.81
10-01-42	654.88	9-06-63	654.88	6-08-66	654.90	3-18-75	654.84	10-01-92	654.77
10-01-58	654.88	11-05-63	654.75	10-01-68	654.81	5-13-77	654.77		
10-01-59	654.81	4-22-64	654.88	4-04-69	654.90	4-28-78	654.83		
6-08-60	654.92	5-01-64	654.90	7-15-70	654.92	4-08-80	654.84		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	21.2	37	NS	0.202	NA

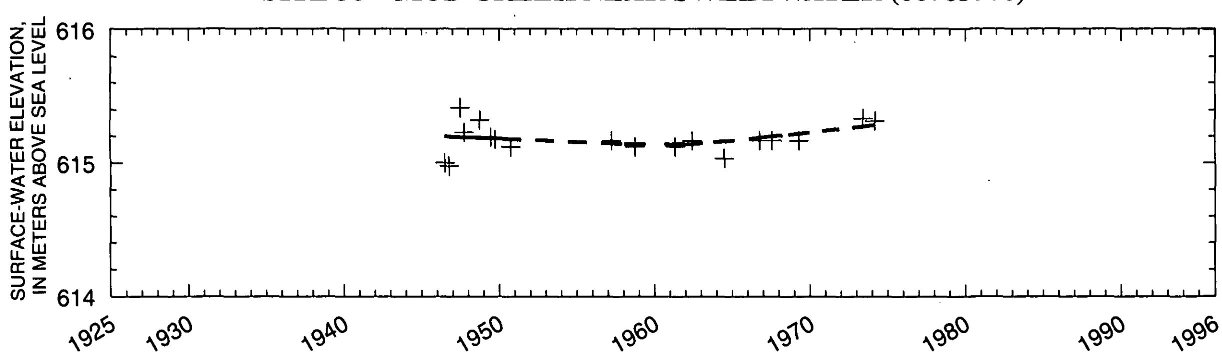
SITE 55—MIDDLE LOUP RIVER AT ROCKVILLE (06780000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-55	597.54	8-17-62	597.56	10-28-71	597.64
5-09-57	597.46	5-17-63	597.64	6-08-72	597.77
10-21-58	597.46	9-17-63	597.56		
11-04-59	597.46	4-16-64	597.69		
11-04-60	597.46	10-01-67	597.64		
10-31-61	597.46	2-18-70	597.54		
5-30-62	597.46	4-15-71	597.69		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	21.3	16	0.64	0.001	0.144

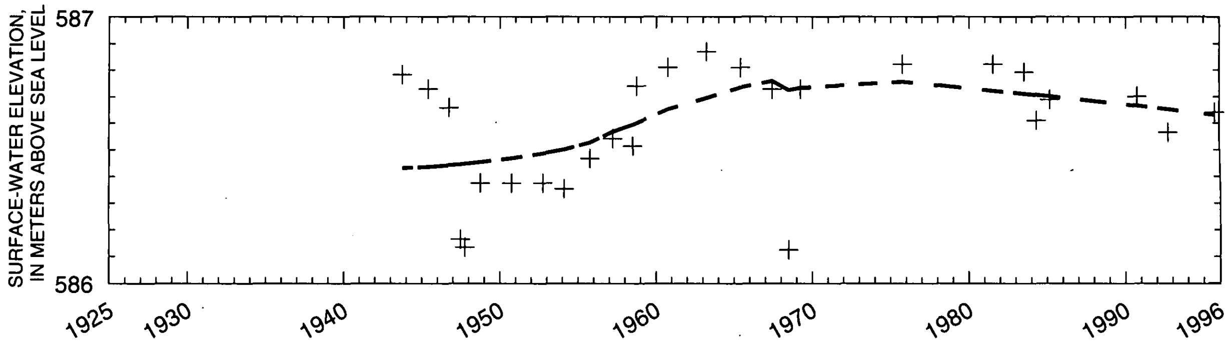
SITE 56—MUD CREEK NEAR SWEETWATER (06783500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
7-01-46	615.00	10-01-50	615.12	7-28-67	615.16
10-01-46	614.98	4-01-57	615.16	4-24-69	615.16
6-23-47	615.42	10-01-58	615.12	6-06-73	615.33
10-01-47	615.23	5-05-61	615.12	3-13-74	615.32
10-01-48	615.32	6-12-62	615.16		
6-20-49	615.19	6-30-64	615.03		
10-01-49	615.17	10-14-66	615.16		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.65	18	NS	0.758	NA

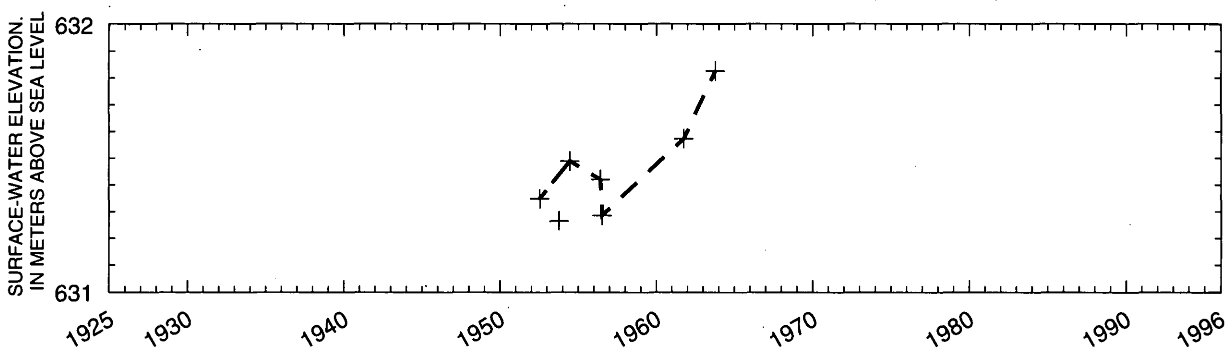
SITE 57—SOUTH LOUP RIVER AT ST. MICHAEL (06784000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-43	586.78	10-01-52	586.37	3-20-63	586.87	7-08-83	586.79
6-01-45	586.73	2-10-54	586.35	5-25-65	586.81	4-21-84	586.61
10-01-46	586.66	10-01-55	586.47	6-05-67	586.73	2-28-85	586.69
6-22-47	586.16	3-26-57	586.54	6-24-68	586.12	10-01-90	586.70
10-01-47	586.13	7-04-58	586.51	3-21-69	586.73	10-01-92	586.56
10-01-48	586.37	10-01-58	586.74	10-01-75	586.82	10-01-95	586.64
10-01-50	586.37	10-01-60	586.81	7-10-81	586.82		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	5.38	27	NS	0.128	NA

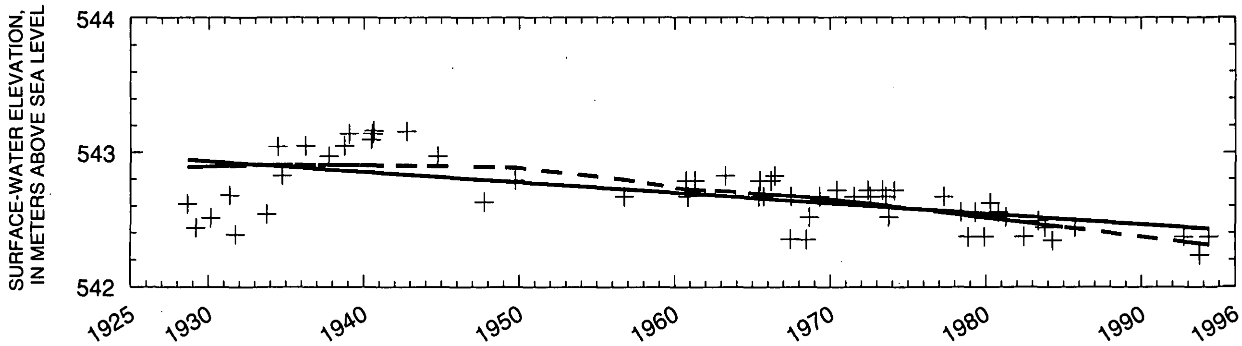
SITE 58—OAK CREEK NEAR LOUP CITY (06784300)



Date	SW elev. (m)
7-14-52	631.35
10-01-53	631.26
6-17-54	631.49
6-05-56	631.42
7-05-56	631.29
10-01-61	631.57
10-10-63	631.83

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.05	7	NS	0.098	NA

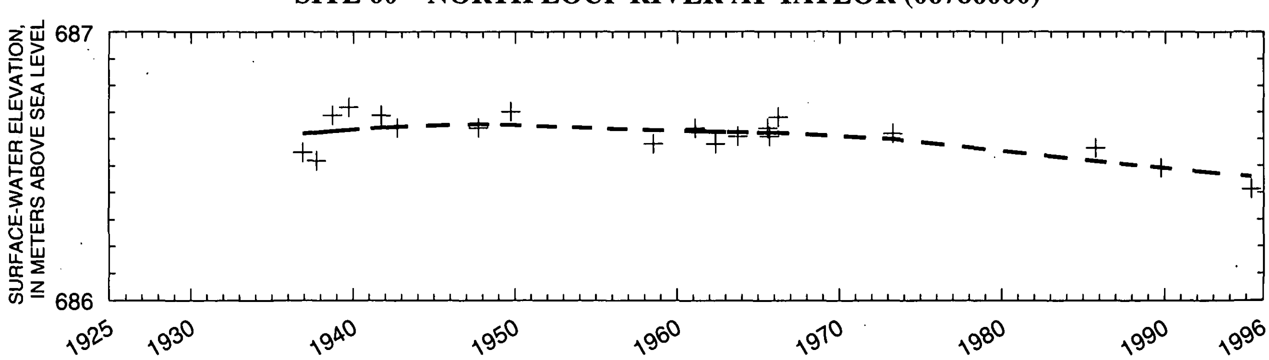
SITE 59—MIDDLE LOUP RIVER AT ST. PAUL (06785000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
8-16-28	542.62	6-23-40	543.10	4-24-61	542.79	6-10-70	542.72	11-27-79	542.37
3-11-29	542.44	7-17-40	543.14	4-09-63	542.82	7-14-71	542.67	4-15-80	542.62
2-19-30	542.51	7-26-40	543.14	5-28-65	542.67	6-09-72	542.72	10-16-80	542.55
5-11-31	542.68	8-10-40	543.14	6-30-65	542.79	7-27-72	542.67	4-15-81	542.52
10-01-31	542.39	8-23-40	543.16	9-21-65	542.67	5-11-73	542.72	6-16-82	542.37
10-01-33	542.54	10-01-42	543.15	3-17-66	542.79	7-26-73	542.67	5-18-83	542.49
6-15-34	543.04	10-01-44	542.97	6-14-66	542.82	10-05-73	542.52	10-24-83	542.44
10-01-34	542.83	10-01-47	542.63	6-14-67	542.35	2-20-74	542.72	4-16-84	542.34
4-01-36	543.05	10-01-49	542.79	6-27-67	542.67	4-19-77	542.67	10-01-85	542.44
10-01-37	542.97	10-01-56	542.67	6-24-68	542.35	5-23-78	542.55	10-01-92	542.37
10-01-38	543.05	10-01-60	542.79	8-27-68	542.52	11-16-78	542.37	10-01-93	542.23
1-24-39	543.14	11-08-60	542.67	4-30-69	542.67	4-24-79	542.55	5-09-94	542.37

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	30.0	60	-0.57	0.000	-0.079

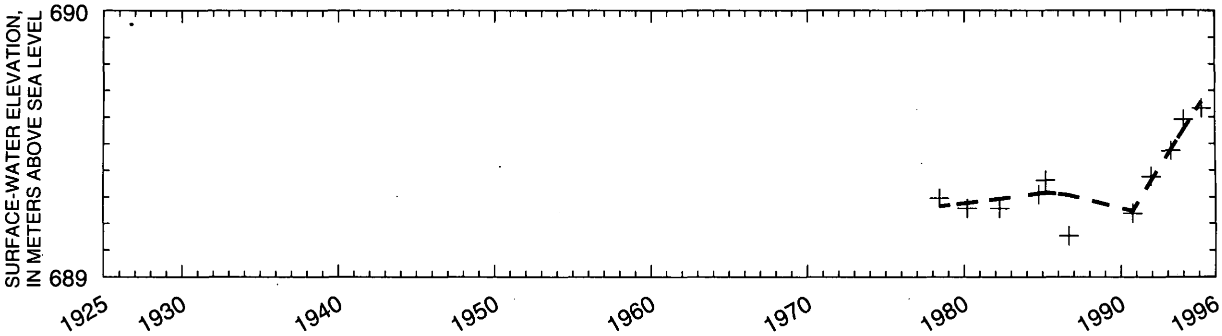
SITE 60—NORTH LOUP RIVER AT TAYLOR (06786000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
11-26-36	686.55	10-01-41	686.69	7-17-58	686.58	8-06-65	686.64	10-01-85	686.57
10-01-37	686.52	10-01-42	686.64	2-14-61	686.64	9-14-65	686.61	10-01-89	686.49
10-01-38	686.69	10-01-47	686.64	5-19-62	686.58	3-29-66	686.68	4-12-95	686.41
10-01-39	686.72	10-01-49	686.70	10-01-63	686.61	4-18-73	686.62		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	13.3	19	NS	0.049	NA

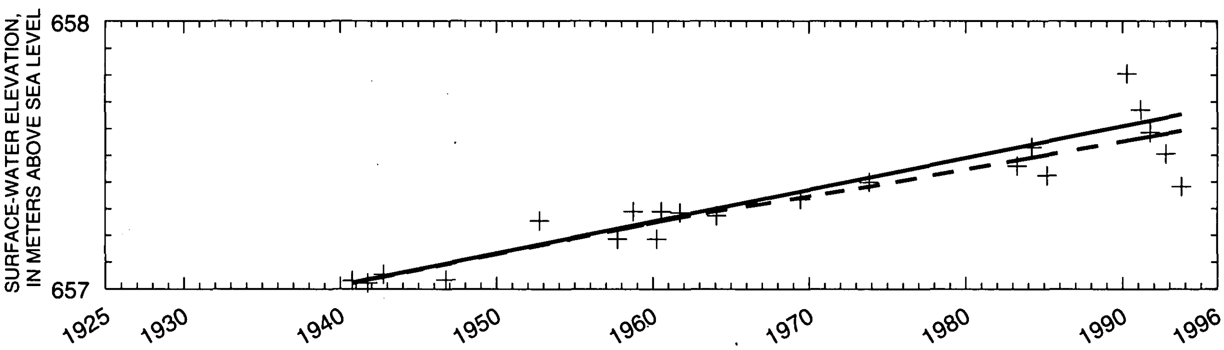
SITE 61—CALAMUS RIVER NEAR HARROP (06787000)



Date	SW elev. (m)	Date	SW elev. (m)
6-05-78	689.29	12-03-91	689.38
3-14-80	689.26	3-09-93	689.47
4-07-82	689.26	1-07-94	689.59
10-01-84	689.31	3-08-95	689.63
3-04-85	689.36		
9-01-86	689.15		
10-01-90	689.24		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	6.80	11	NS	0.019	NA

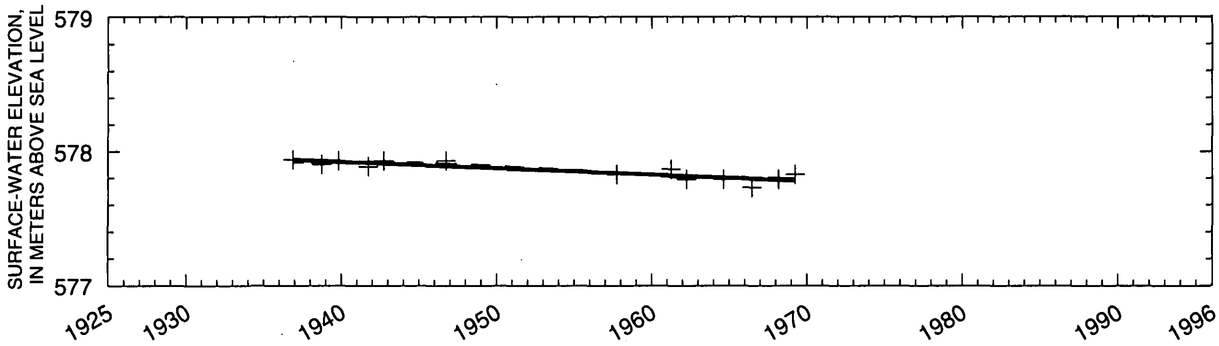
SITE 62—CALAMUS RIVER NEAR BURWELL (06787500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-40	657.03	4-04-60	657.19	3-17-84	657.53	10-01-93	657.38
10-01-41	657.02	7-19-60	657.29	3-06-85	657.42		
10-01-42	657.05	10-01-61	657.28	10-01-87	658.06		
10-01-46	657.03	1-29-64	657.27	4-11-90	657.81		
10-01-52	657.25	6-13-69	657.33	2-28-91	657.67		
10-01-57	657.19	11-01-73	657.40	10-01-91	657.59		
10-01-58	657.29	4-05-83	657.46	10-01-92	657.51		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	8.16	22	0.72	0.000	0.119

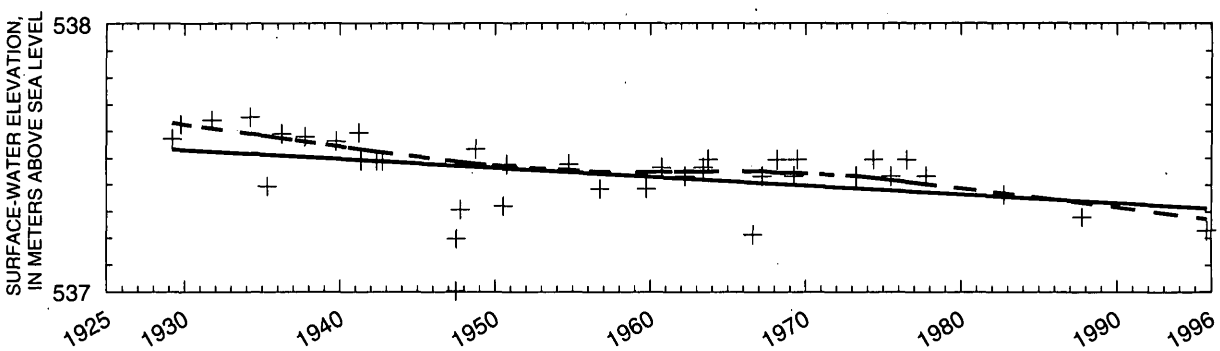
SITE 63—NORTH LOUP RIVER AT SCOTIA (06789000)



Date	SW elev. (m)	Date	SW elev. (m)
11-25-36	577.94	4-04-61	577.87
10-01-38	577.90	3-30-62	577.79
11-01-39	577.93	8-21-64	577.79
10-01-41	577.89	6-16-66	577.73
10-01-42	577.93	3-06-68	577.79
10-01-46	577.93	4-03-69	577.83
10-01-57	577.83		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	24.5	13	-0.66	0.002	-0.048

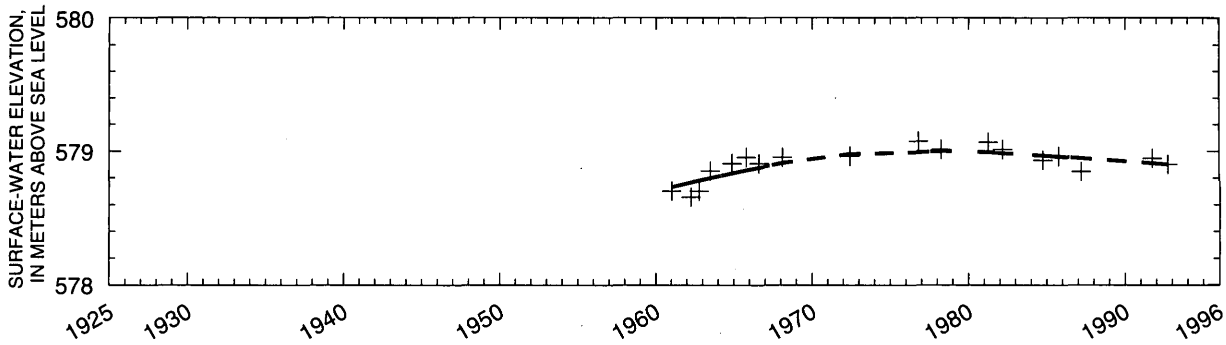
SITE 64—NORTH LOUP RIVER NEAR ST. PAUL (06790500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
3-11-29	537.57	3-16-41	537.59	7-09-50	537.32	10-01-63	537.49	6-26-75	537.43
10-01-29	537.63	5-13-41	537.49	10-01-50	537.48	8-12-66	537.21	7-07-76	537.49
10-01-31	537.64	5-13-42	537.49	10-01-54	537.48	3-16-67	537.43	10-04-77	537.43
3-20-34	537.65	10-01-42	537.49	10-01-56	537.38	3-05-68	537.49	10-01-82	537.36
4-25-35	537.39	6-20-47	537.00	10-01-59	537.38	4-02-69	537.43	10-01-87	537.28
4-01-36	537.59	7-03-47	537.20	10-01-60	537.46	6-24-69	537.49	10-01-95	537.23
10-01-37	537.58	10-01-47	537.31	3-27-62	537.43	4-04-73	537.43		
10-01-39	537.56	10-01-48	537.53	5-28-63	537.46	5-16-74	537.49		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	25.1	38	-0.36	0.002	-0.033

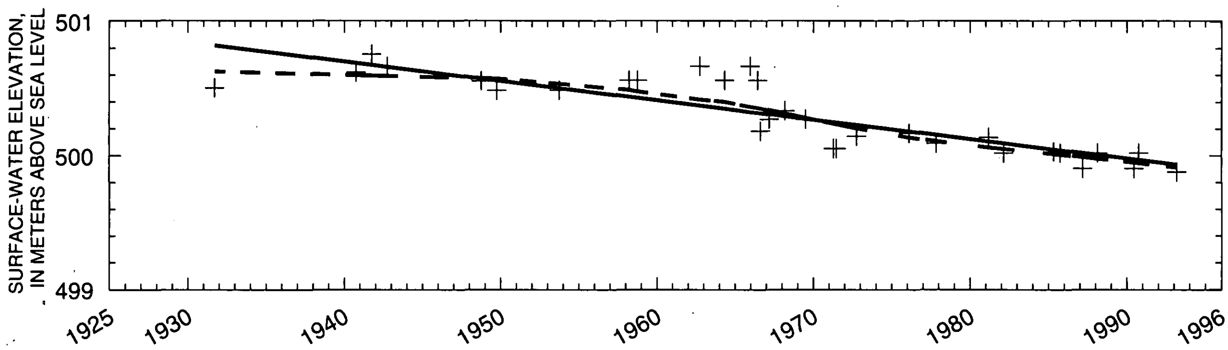
SITE 65—CEDAR RIVER NEAR SPALDING (06791500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
1-04-61	578.70	2-07-68	578.95	10-01-85	578.96
3-27-62	578.66	6-02-72	578.96	3-09-87	578.85
10-02-62	578.70	10-19-76	579.07	10-01-91	578.95
7-02-63	578.85	3-28-78	579.01	10-01-92	578.90
11-17-64	578.91	4-02-81	579.07		
10-16-65	578.95	3-02-82	579.01		
8-10-66	578.91	10-01-84	578.93		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.22	18	NS	0.063	NA

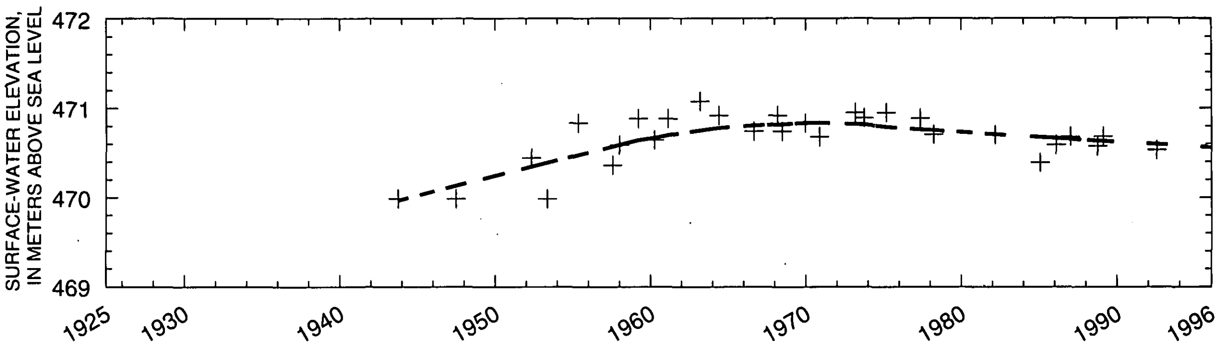
SITE 66—CEDAR RIVER NEAR FULLERTON (06792000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
9-14-31	500.50	3-20-58	500.56	3-07-67	500.27	11-02-77	500.09	6-13-90	499.90
10-04-40	500.62	10-01-58	500.56	3-06-68	500.33	3-05-81	500.14	10-01-90	500.02
10-01-41	500.76	10-01-62	500.67	6-26-69	500.27	2-23-82	500.02	3-08-93	499.88
10-01-42	500.66	4-27-64	500.56	4-16-71	500.05	4-29-85	500.03		
10-01-48	500.56	12-16-65	500.67	6-16-71	500.05	10-01-85	500.02		
10-01-49	500.49	6-09-66	500.56	10-05-72	500.14	3-05-87	499.90		
10-01-53	500.49	8-13-66	500.18	2-09-76	500.17	2-20-88	500.02		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	6.00	31	-0.73	0.000	-0.144

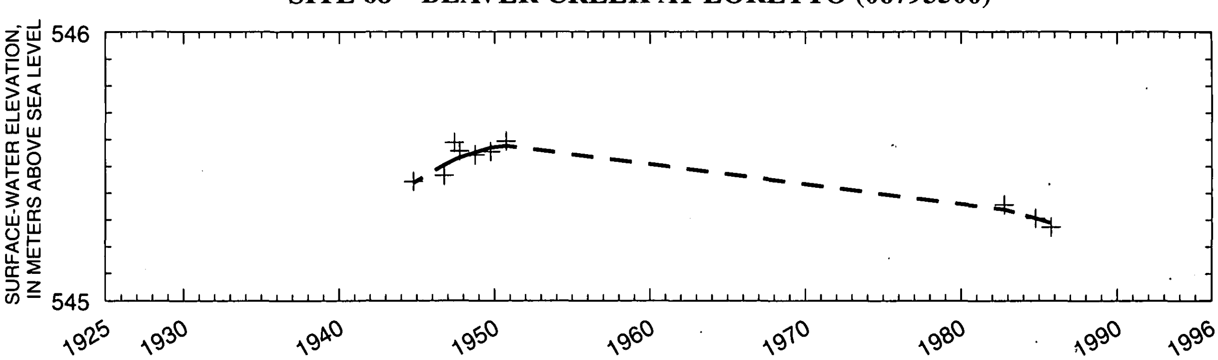
SITE 67—LOUP RIVER NEAR GENOA (06793000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-43	469.99	3-16-59	470.88	6-18-68	470.74	3-18-78	470.71	7-15-92	470.53
6-26-47	469.99	3-28-60	470.64	12-17-69	470.83	3-01-82	470.70	9-04-96	470.73
5-07-52	470.44	2-17-61	470.88	11-15-70	470.68	1-30-85	470.39		
5-11-53	469.99	3-09-63	471.08	3-04-73	470.95	2-05-86	470.59		
5-06-55	470.83	5-26-64	470.92	10-01-73	470.89	1-05-87	470.68		
8-01-57	470.36	8-26-66	470.74	3-01-75	470.95	10-01-88	470.58		
1-01-58	470.59	3-06-68	470.92	5-10-77	470.89	2-09-89	470.68		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	3.09	30	NS	0.486	NA

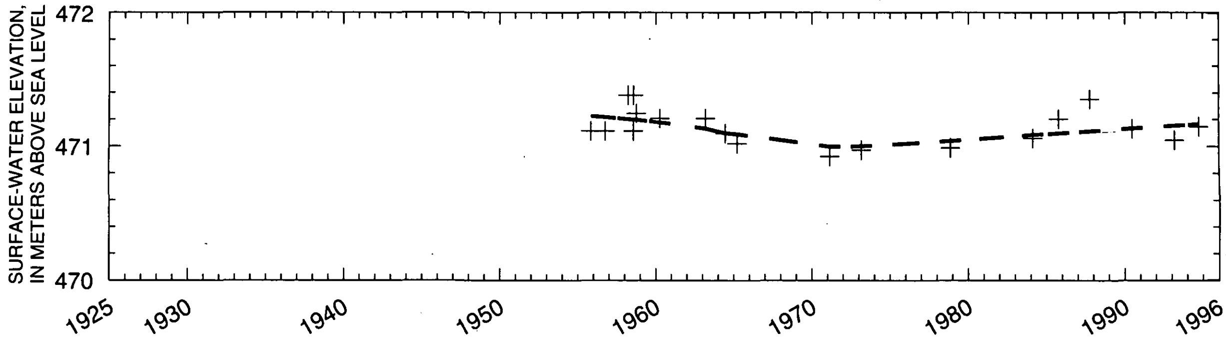
SITE 68—BEAVER CREEK AT LORETTO (06793500)



Date	SW elev. (m)	Date	SW elev. (m)
10-13-44	545.44	10-01-82	545.36
10-01-46	545.47	10-01-84	545.31
6-01-47	545.59	10-01-85	545.27
10-01-47	545.56		
10-01-48	545.54		
10-01-49	545.55		
10-01-50	545.59		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.27	10	NS	0.245	NA

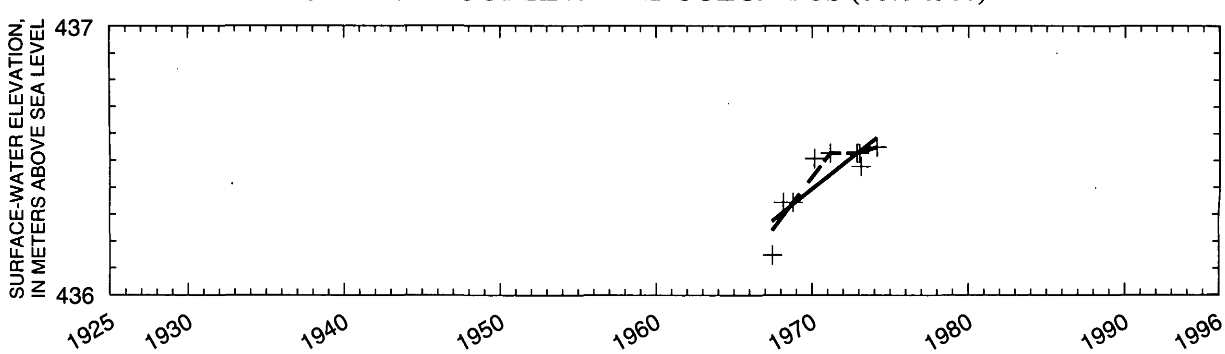
SITE 69—BEAVER CREEK AT GENOA (06794000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
11-02-55	471.11	3-03-63	471.21	10-01-85	471.20
10-01-56	471.11	6-11-64	471.09	10-01-87	471.35
3-23-58	471.38	3-17-65	471.02	6-17-90	471.13
7-24-58	471.11	2-20-71	470.93	3-08-93	471.05
7-26-58	471.38	2-26-73	470.97	10-01-94	471.15
10-01-58	471.25	11-07-78	470.99		
3-30-60	471.21	2-09-84	471.06		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.49	19	NS	0.233	NA

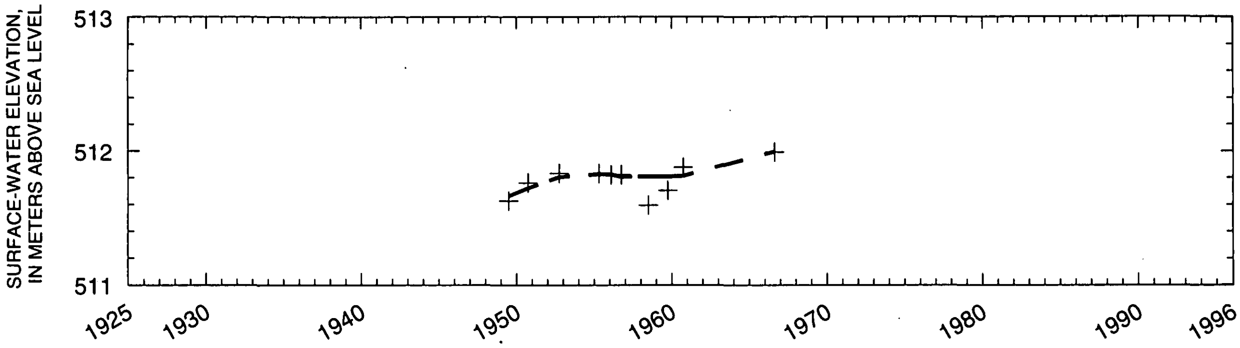
SITE 70—LOUP RIVER AT COLUMBUS (06794500)



Date	SW elev. (m)	Date	SW elev. (m)
6-15-67	436.15	1-11-73	436.53
3-01-68	436.34	2-22-73	436.48
10-17-68	436.34	2-26-74	436.55
2-28-70	436.51		
3-02-71	436.53		
11-14-72	436.53		
11-28-72	436.53		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	21.0	10	0.68	0.009	0.465

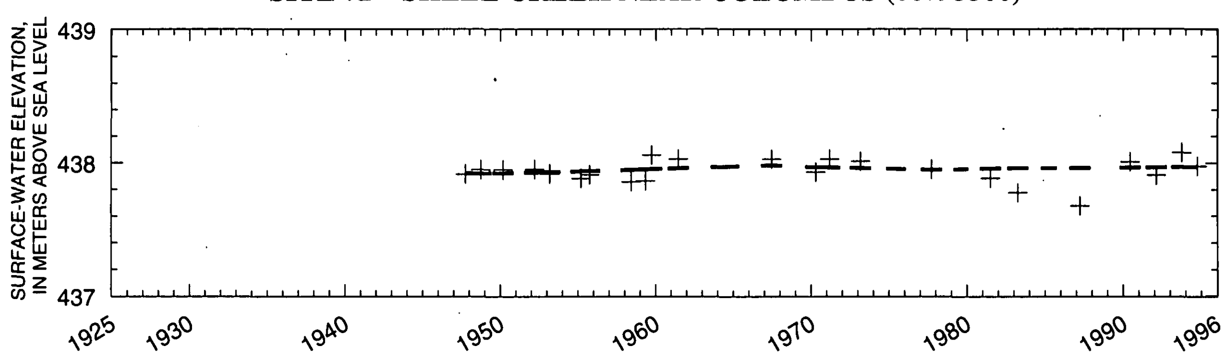
SITE 71—SHELL CREEK AT NEWMAN GROVE (06795000)



Date	SW elev. (m)	Date	SW elev. (m)
7-05-49	511.63	10-01-59	511.71
10-01-50	511.76	10-01-60	511.88
10-01-52	511.83	8-13-66	511.99
4-26-55	511.83		
2-09-56	511.82		
10-01-56	511.82		
7-02-58	511.60		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.28	10	NS	0.209	NA

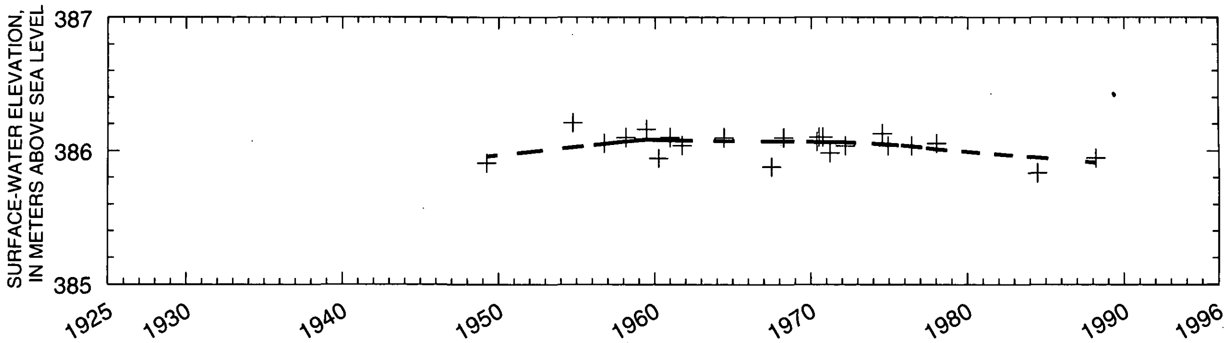
SITE 72—SHELL CREEK NEAR COLUMBUS (06795500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-47	437.92	6-02-58	437.86	3-03-73	438.01	10-01-93	438.08
10-01-48	437.95	5-06-59	437.87	9-21-77	437.95	9-30-94	437.97
3-07-50	437.95	10-01-59	438.06	6-30-81	437.89		
3-16-52	437.95	6-17-61	438.03	4-01-83	437.78		
3-10-53	437.92	6-16-67	438.03	3-23-87	437.68		
3-15-55	437.88	4-22-70	437.93	6-12-90	438.01		
10-01-55	437.91	3-11-71	438.03	2-16-92	437.91		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.42	23	NS	0.771	NA

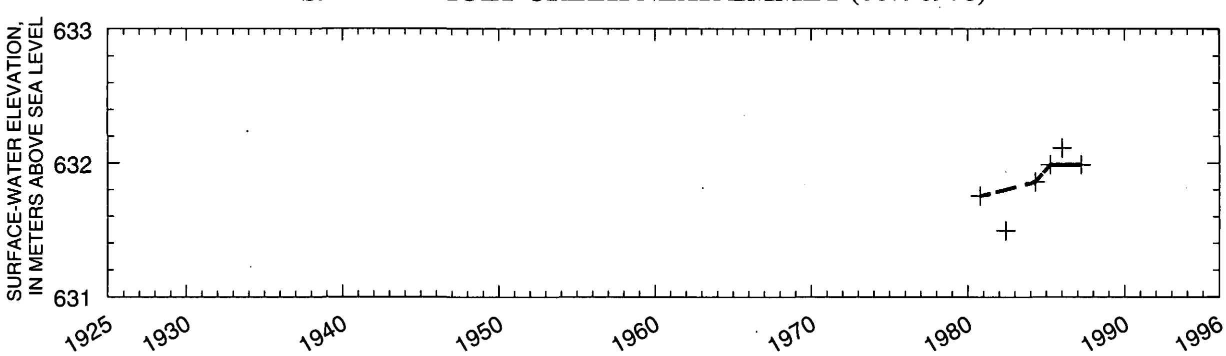
SITE 73—PLATTE RIVER AT NORTH BEND (06796000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
4-01-49	385.91	10-01-61	386.04	3-13-71	385.98	3-03-88	385.94
10-01-54	386.21	6-03-64	386.10	3-10-72	386.04		
10-01-56	386.06	6-22-67	385.88	7-20-74	386.13		
2-26-58	386.10	3-29-68	386.10	11-26-74	386.04		
6-16-59	386.16	5-12-70	386.07	6-01-76	386.04		
3-30-60	385.94	6-30-70	386.10	1-05-78	386.06		
12-21-60	386.10	10-01-70	386.10	6-13-84	385.83		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	102	22	NS	0.214	NA

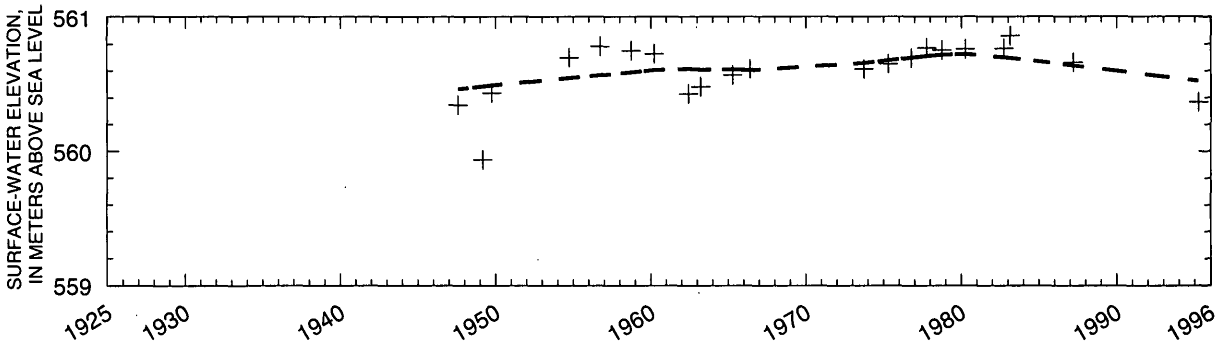
SITE 74—HOLT CREEK NEAR EMMET (06796978)



Date	SW elev. (m)
10-10-80	631.75
5-29-82	631.49
4-18-84	631.86
4-01-85	631.99
1-01-86	632.11
3-18-87	631.99

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.99	6	NS	0.040	NA

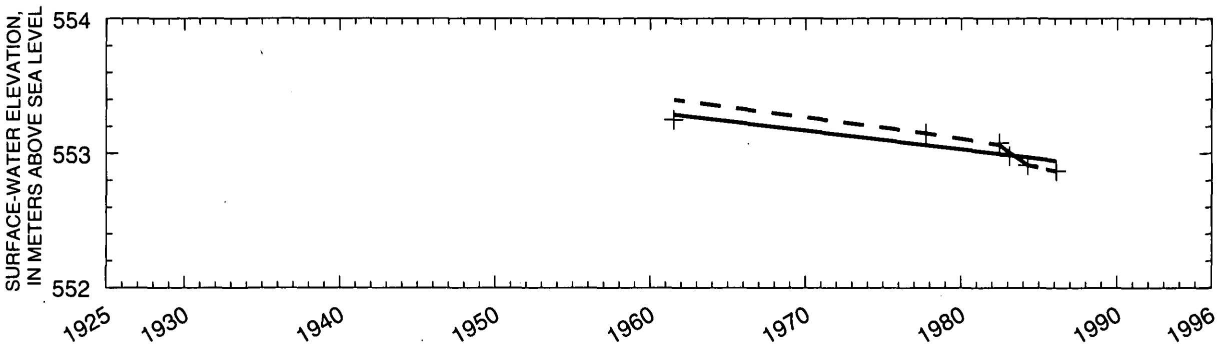
SITE 75—ELKHORN RIVER AT EWING (06797500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
7-31-47	560.35	6-09-62	560.43	10-15-77	560.77
3-07-49	559.94	3-25-63	560.48	10-06-78	560.75
10-01-49	560.44	4-15-65	560.57	4-06-80	560.76
10-01-54	560.70	6-01-66	560.61	10-01-82	560.77
10-01-56	560.78	10-01-73	560.61	2-22-83	560.86
10-01-58	560.75	4-23-75	560.65	3-20-87	560.66
3-29-60	560.73	10-19-76	560.69	4-01-95	560.37

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.12	21	NS	0.027	NA

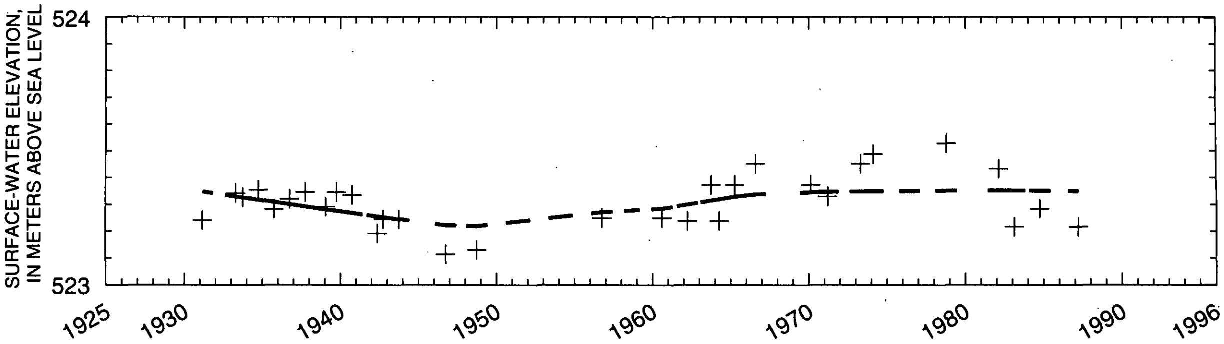
SITE 76—CLEARWATER CREEK NEAR CLEARWATER (06798300)



Date	SW elev. (m)
7-12-61	553.25
10-01-77	553.15
6-17-82	553.08
2-09-83	552.98
4-05-84	552.91
2-06-86	552.87

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.18	6	-1.00	0.005	-0.140

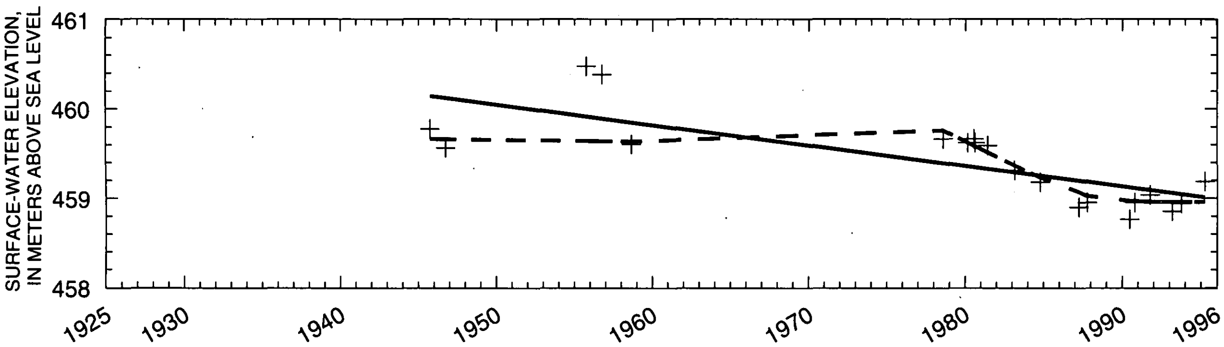
SITE 77—ELKHORN RIVER AT NELIGH (06798500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
3-05-31	523.24	1-24-39	523.29	10-01-48	523.13	7-28-66	523.45	2-20-83	523.22
4-16-33	523.34	10-01-39	523.35	10-01-56	523.25	2-11-70	523.37	10-01-84	523.28
10-01-33	523.33	10-01-40	523.34	8-08-60	523.25	3-14-71	523.33	3-18-87	523.22
10-01-34	523.35	5-19-42	523.19	3-27-62	523.24	4-17-73	523.45		
10-01-35	523.28	10-01-42	523.24	10-01-63	523.37	2-02-74	523.49		
10-01-36	523.32	10-01-43	523.24	4-09-64	523.24	10-03-78	523.53		
10-01-37	523.35	10-01-46	523.11	3-31-65	523.37	2-10-82	523.43		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.81	31	NS	0.350	NA

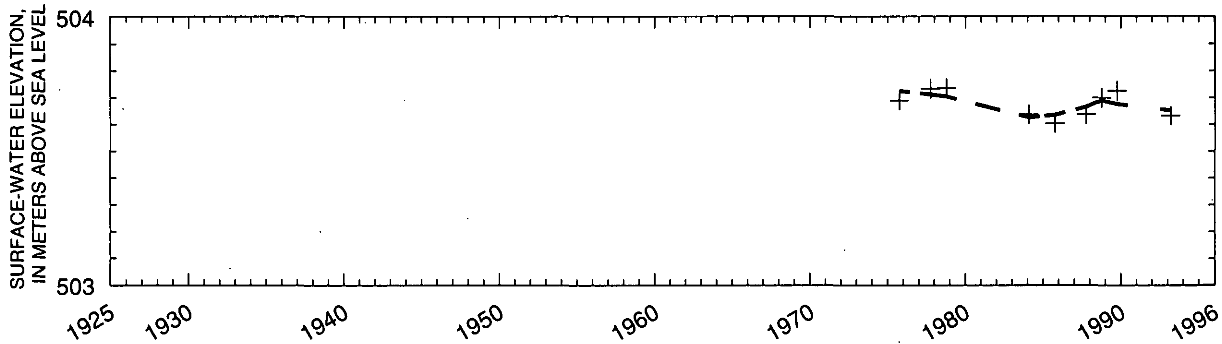
SITE 78—ELKHORN RIVER AT NORFOLK (06799000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-45	459.78	7-17-80	459.66	6-16-90	458.76
10-01-46	459.56	8-13-80	459.62	10-09-90	458.95
10-01-55	460.48	6-02-81	459.59	10-01-91	459.03
10-01-56	460.38	2-15-83	459.31	3-01-93	458.85
8-29-58	459.60	10-01-84	459.18	10-01-93	458.94
7-28-78	459.66	3-19-87	458.90	4-01-95	459.19
2-23-80	459.62	9-30-87	458.95		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	8.50	20	-0.63	0.000	-0.229

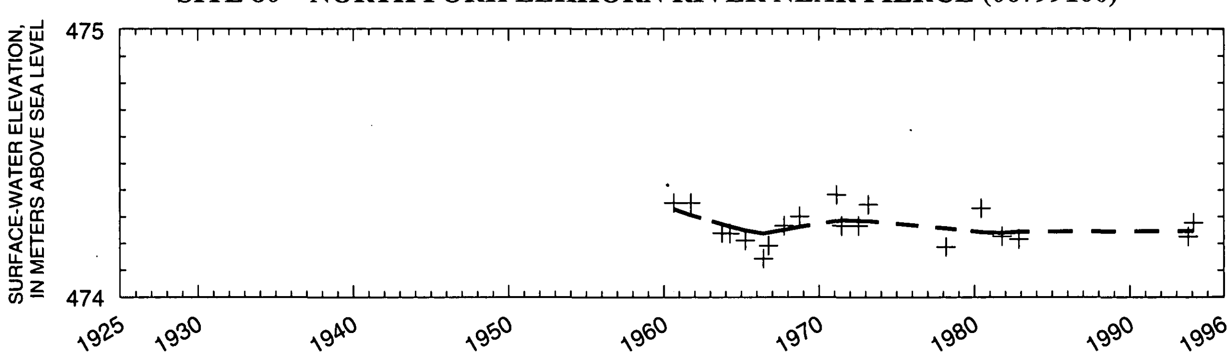
SITE 79—WILLOW CREEK NEAR FOSTER (06799080)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-75	503.69	10-01-89	503.73
10-01-77	503.73	3-09-93	503.63
10-11-78	503.73		
2-02-84	503.64		
10-01-85	503.60		
9-30-87	503.64		
10-01-88	503.70		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.24	9	NS	0.463	NA

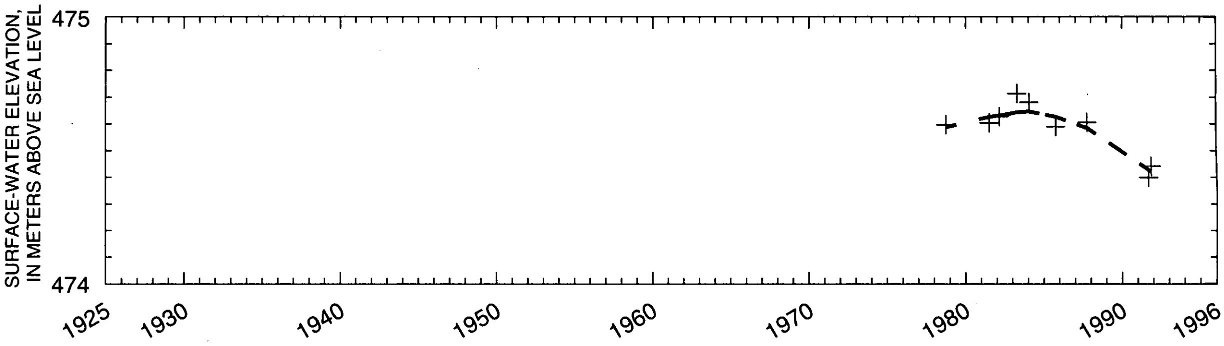
SITE 80—NORTH FORK ELKHORN RIVER NEAR PIERCE (06799100)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
8-19-60	474.35	10-01-67	474.27	6-03-80	474.33
10-01-61	474.35	10-01-68	474.30	10-08-81	474.23
10-01-63	474.24	2-19-71	474.38	11-11-82	474.22
3-31-64	474.24	6-11-71	474.27	10-01-93	474.23
4-02-65	474.21	7-13-72	474.27	2-03-94	474.28
6-01-66	474.14	3-01-73	474.35		
10-01-66	474.19	3-02-78	474.19		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.22	19	NS	0.599	NA

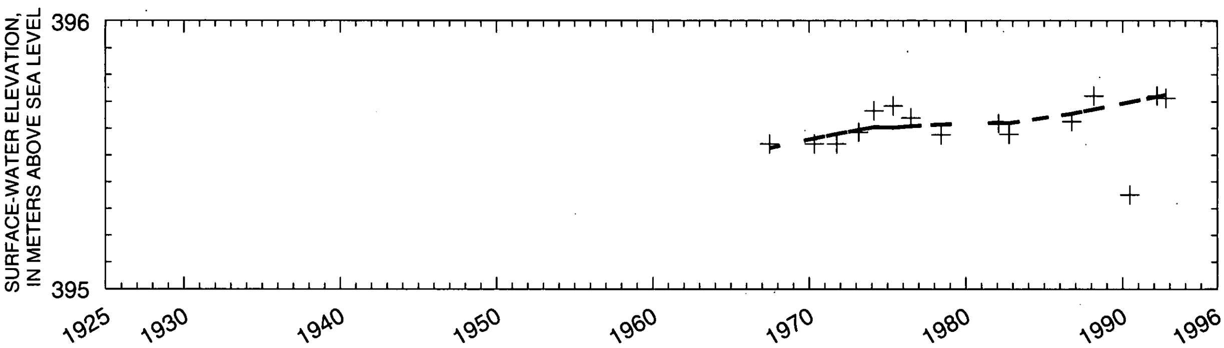
SITE 81—UNION CREEK AT MADISON (06799230)



Date	SW elev. (m)	Date	SW elev. (m)
9-19-78	474.60	8-29-91	474.40
6-29-81	474.60	11-01-91	474.44
2-20-82	474.63		
4-06-83	474.71		
1-11-84	474.68		
10-01-85	474.59		
10-01-87	474.60		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.57	9	NS	0.297	NA

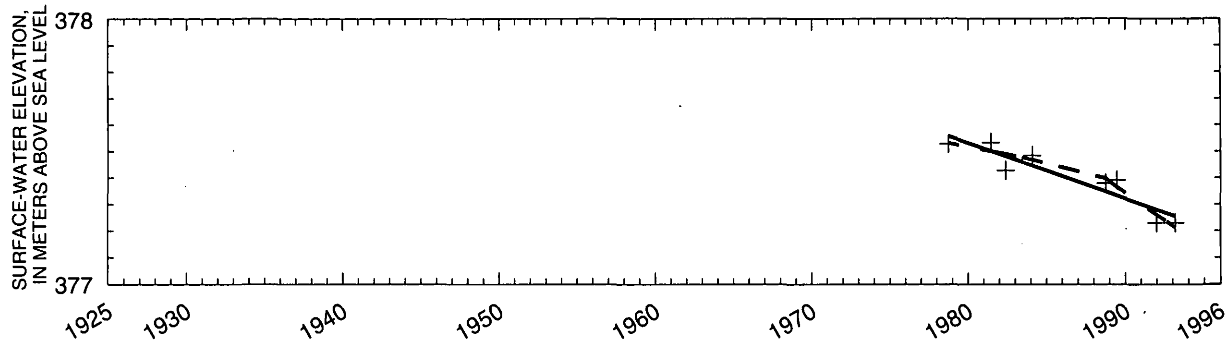
SITE 82—ELKHORN RIVER AT WEST POINT (06799350)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
6-18-67	395.54	5-29-78	395.58	10-01-92	395.71
4-27-70	395.54	2-01-82	395.62		
10-01-71	395.54	10-01-82	395.58		
2-27-73	395.59	10-01-86	395.63		
2-20-74	395.67	2-28-88	395.72		
5-08-75	395.68	6-16-90	395.35		
6-25-76	395.64	3-05-92	395.72		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	15.3	15	NS	0.052	NA

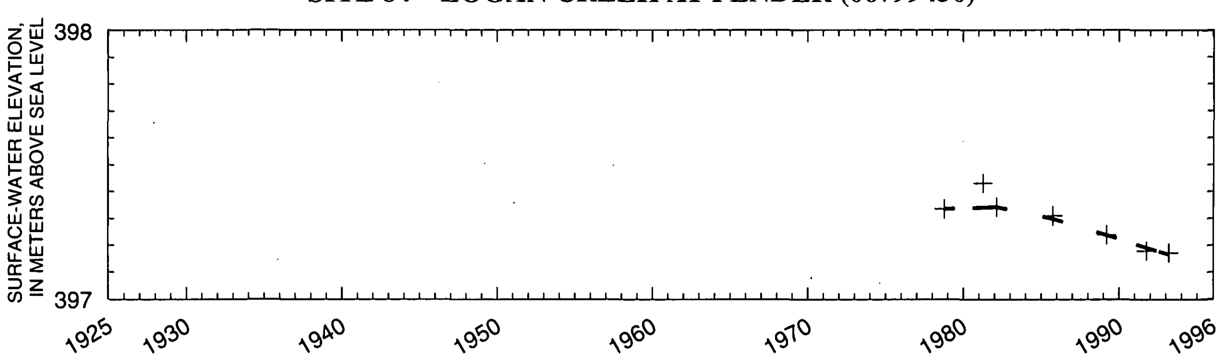
SITE 83—PEBBLE CREEK AT SCRIBNER (06799385)



Date	SW elev. (m)	Date	SW elev. (m)
9-20-78	377.53	3-05-93	377.23
6-08-81	377.53		
5-18-82	377.43		
1-31-84	377.48		
10-01-88	377.38		
6-14-89	377.39		
12-31-91	377.23		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.65	8	-0.76	0.009	-0.210

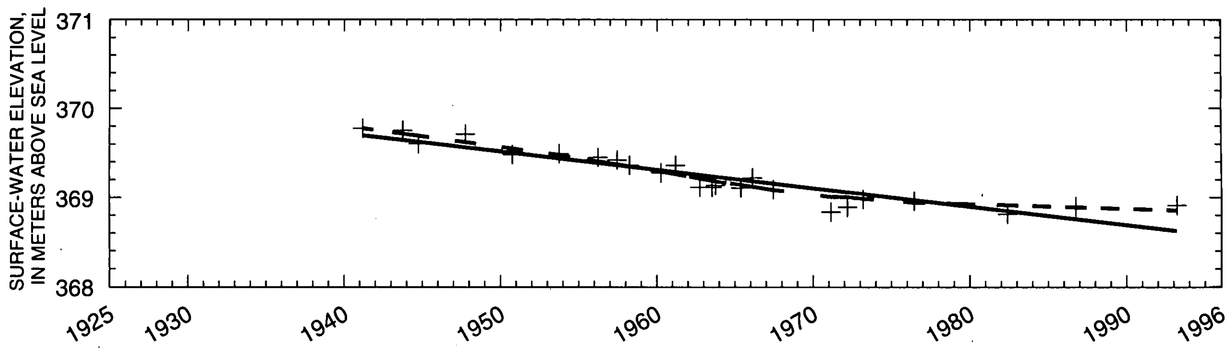
SITE 84—LOGAN CREEK AT PENDER (06799450)



Date	SW elev. (m)
10-10-78	397.33
4-08-81	397.43
2-22-82	397.34
10-01-85	397.31
3-10-89	397.24
10-01-91	397.18
3-09-93	397.17

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.01	7	NS	0.011	NA

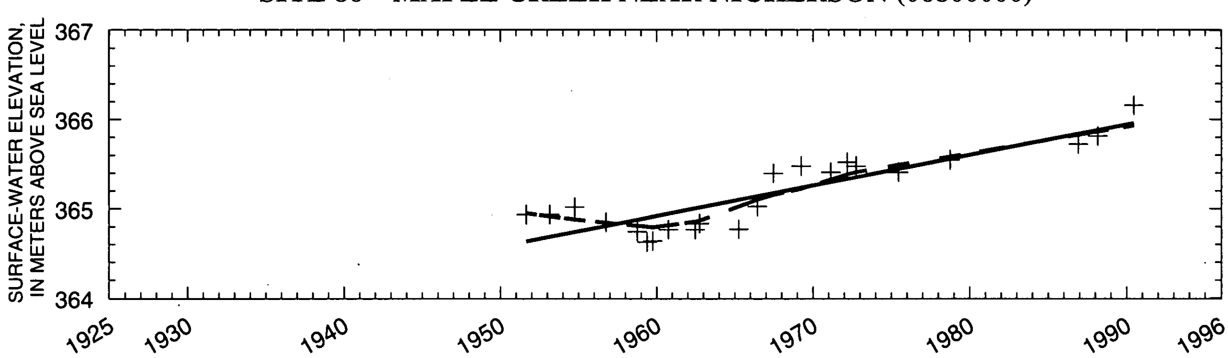
SITE 85—LOGAN CREEK NEAR UEHLING (06799500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
3-10-41	369.78	6-14-57	369.42	5-10-65	369.11	5-21-82	368.81
10-01-43	369.75	3-26-58	369.36	2-10-66	369.22	10-01-86	368.90
10-01-44	369.60	3-31-60	369.28	6-07-67	369.09	3-09-93	368.91
10-01-47	369.71	3-09-61	369.36	2-19-71	368.84		
10-01-50	369.48	10-01-62	369.12	3-07-72	368.89		
10-01-53	369.49	7-10-63	369.12	3-06-73	368.98		
3-24-56	369.45	10-01-63	369.14	6-11-76	368.96		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.52	24	-0.84	0.000	-0.207

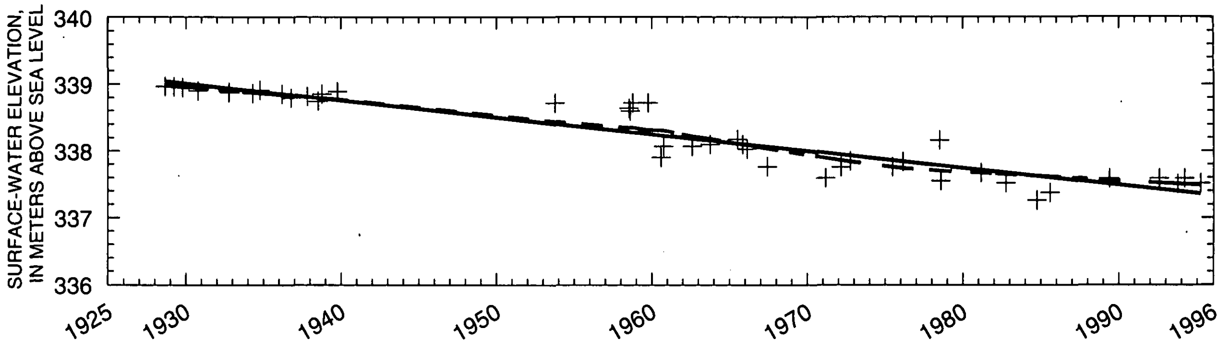
SITE 86—MAPLE CREEK NEAR NICKERSON (06800000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
8-27-51	364.93	10-01-60	364.77	2-19-71	365.41	6-13-90	366.16
3-01-53	364.94	6-19-62	364.77	3-07-72	365.52		
10-01-54	365.02	10-01-62	364.83	10-01-72	365.48		
10-01-56	364.85	4-02-65	364.77	6-13-75	365.41		
10-01-58	364.75	6-10-66	365.02	10-01-78	365.55		
5-21-59	364.62	6-16-67	365.40	12-03-86	365.72		
10-01-59	364.64	3-27-69	365.48	2-27-88	365.81		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.48	22	0.65	0.000	0.342

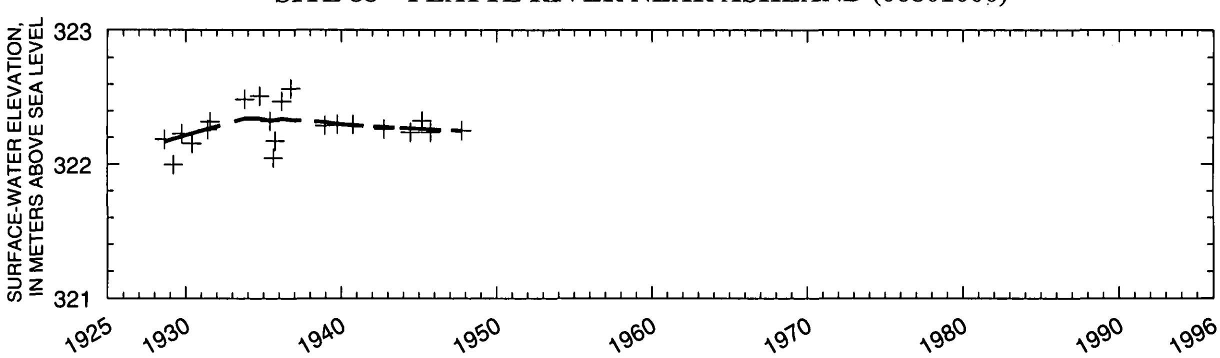
SITE 87—ELKHORN RIVER AT WATERLOO (06800500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
8-18-28	338.96	10-21-37	338.82	8-01-60	337.90	2-27-72	337.76	7-31-85	337.37
3-13-29	338.96	7-04-38	338.74	10-01-60	338.07	10-01-72	337.84	5-22-89	337.58
10-01-29	338.95	10-01-38	338.85	8-01-62	338.07	6-19-75	337.76	7-27-92	337.58
10-01-30	338.90	10-01-39	338.89	10-01-63	338.09	2-17-76	337.83	10-01-93	337.50
10-01-32	338.87	10-01-53	338.72	6-30-65	338.17	6-28-78	338.16	3-05-94	337.58
4-13-34	338.86	7-04-58	338.63	11-01-65	338.09	7-28-78	337.55	3-17-95	337.51
10-01-34	338.91	8-06-58	338.60	2-11-66	338.02	2-26-81	337.67		
3-02-36	338.85	10-01-58	338.72	6-06-67	337.76	10-01-82	337.52		
10-01-36	338.79	10-01-59	338.72	3-01-71	337.59	10-01-84	337.26		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	19.0	42	-0.82	0.000	-0.253

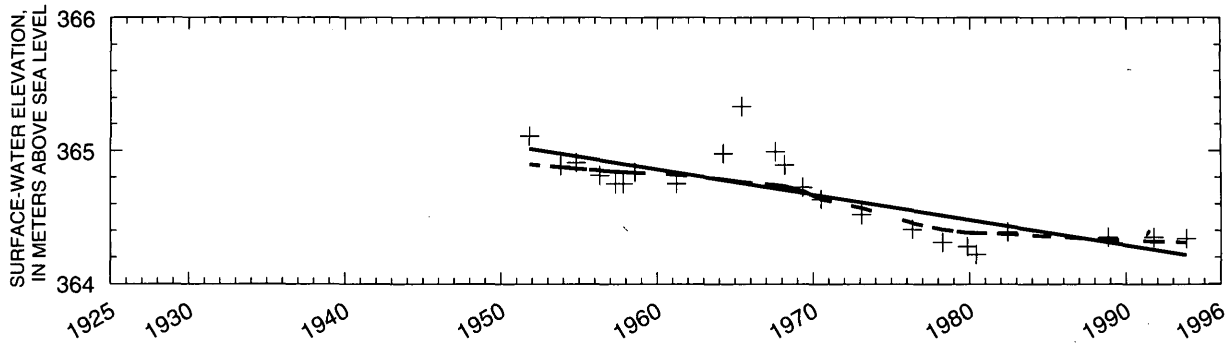
SITE 88—PLATTE RIVER NEAR ASHLAND (06801000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
8-20-28	322.18	10-01-34	322.51	10-01-39	322.30
3-14-29	322.00	6-01-35	322.32	10-01-40	322.30
10-01-29	322.23	8-22-35	322.05	10-01-42	322.26
6-01-30	322.16	10-01-35	322.17	6-18-44	322.24
6-01-31	322.26	3-05-36	322.47	3-11-45	322.32
7-26-31	322.32	10-01-36	322.57	10-01-45	322.24
10-14-33	322.49	12-11-38	322.29	10-01-47	322.25

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	147	21	NS	0.319	NA

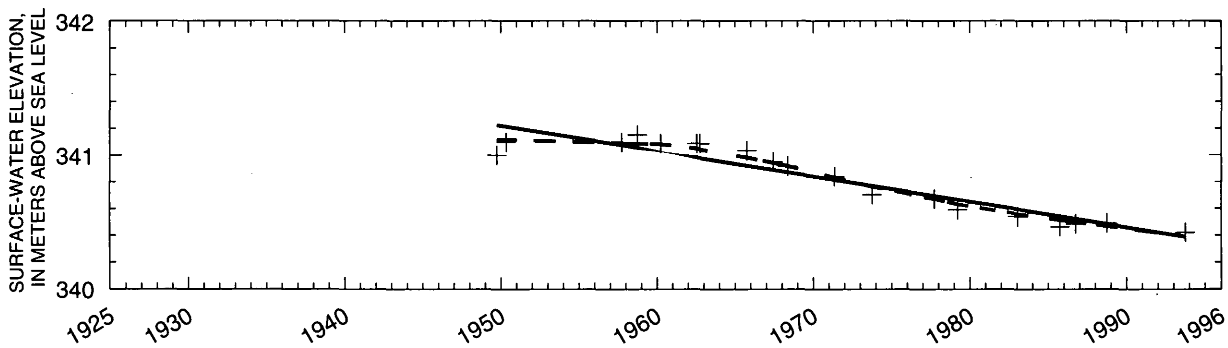
SITE 89—SALT CREEK AT ROCA (06803000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-51	365.11	3-27-61	364.75	1-17-73	364.52	9-30-91	364.35
10-01-53	364.88	3-24-64	364.98	4-15-76	364.41	10-13-93	364.34
10-21-54	364.91	5-09-65	365.33	3-13-78	364.31		
4-17-56	364.81	7-07-67	364.99	10-01-79	364.28		
4-03-57	364.75	2-06-68	364.89	5-14-80	364.22		
10-01-57	364.75	4-04-69	364.72	5-07-82	364.39		
7-12-58	364.84	6-11-70	364.63	10-01-88	364.35		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.28	23	-0.63	0.000	-0.190

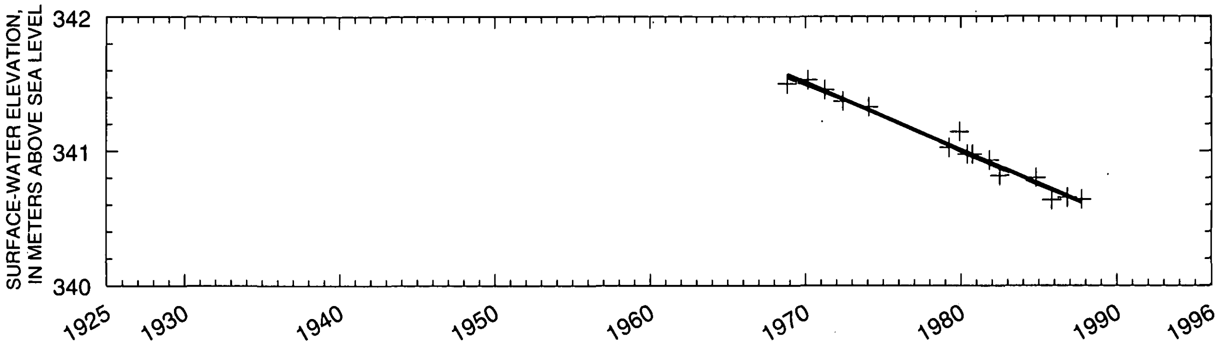
SITE 90—SALT CREEK AT LINCOLN (06803500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-49	341.00	10-01-65	341.03	1-20-83	340.54
5-09-50	341.09	6-05-67	340.95	10-01-85	340.46
10-01-57	341.09	5-08-68	340.91	10-01-86	340.48
10-01-58	341.15	5-12-71	340.84	10-01-88	340.49
3-27-60	341.09	10-10-73	340.70	10-01-93	340.42
10-01-62	341.09	10-01-77	340.67		
7-20-62	341.09	3-26-79	340.59		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.58	19	-0.85	0.000	-0.190

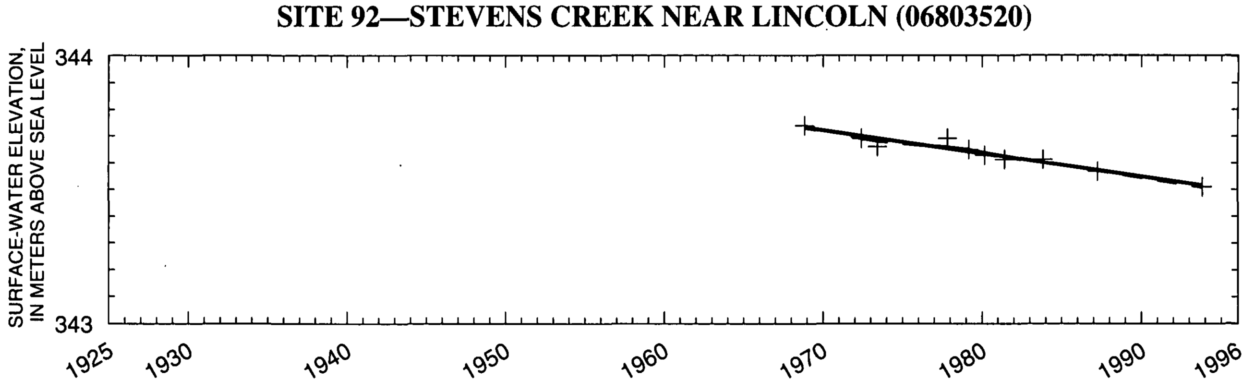
SITE 91—LITTLE SALT CREEK NEAR LINCOLN (06803510)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-68	341.50	5-14-80	340.98	9-30-87	340.64
2-18-70	341.53	9-30-80	340.98		
3-12-71	341.46	10-01-81	340.93		
5-01-72	341.37	6-15-82	340.82		
1-31-74	341.33	10-01-84	340.80		
3-02-79	341.03	10-01-85	340.63		
11-09-79	341.14	10-01-86	340.65		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.15	15	-0.86	0.003	-0.448

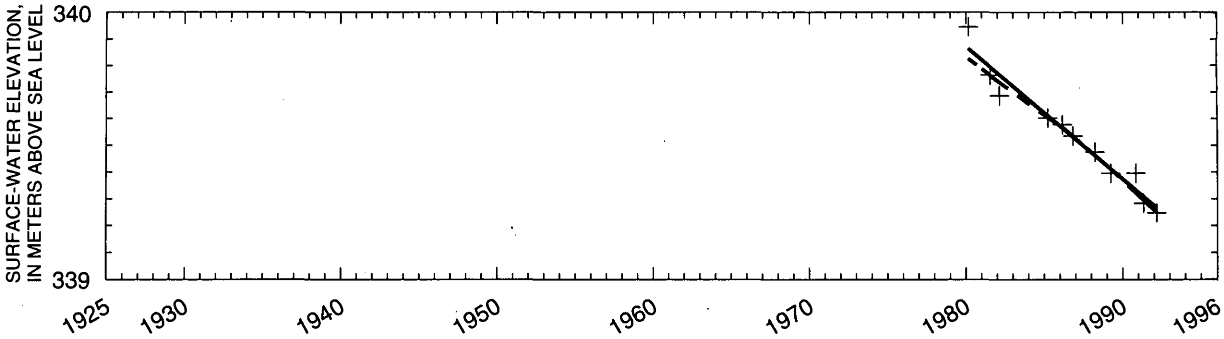
SITE 92—STEVENS CREEK NEAR LINCOLN (06803520)



Date	SW elev. (m)	Date	SW elev. (m)
10-14-68	343.74	10-01-83	343.61
5-01-72	343.69	3-17-87	343.57
5-08-73	343.66	10-12-93	343.51
10-04-77	343.69		
2-21-79	343.65		
2-19-80	343.63		
5-04-81	343.61		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.10	10	-0.90	0.000	-0.086

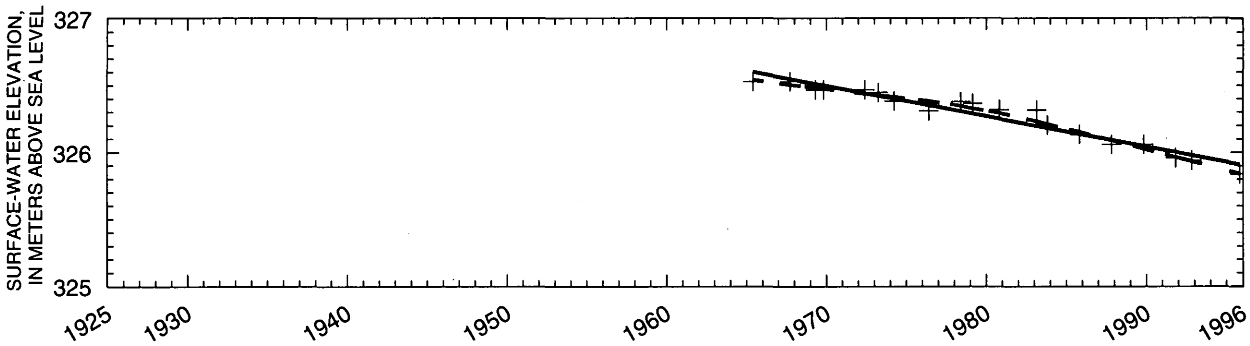
SITE 93—ROCK CREEK NEAR CERESCO (06803530)



Date	SW elev. (m)	Date	SW elev. (m)
2-06-80	339.95	3-09-89	339.40
7-01-81	339.76	10-01-90	339.40
2-18-82	339.69	4-13-91	339.28
3-04-85	339.60	2-13-92	339.25
2-27-86	339.58		
10-01-86	339.54		
3-16-88	339.47		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.34	11	-0.99	0.000	-0.498

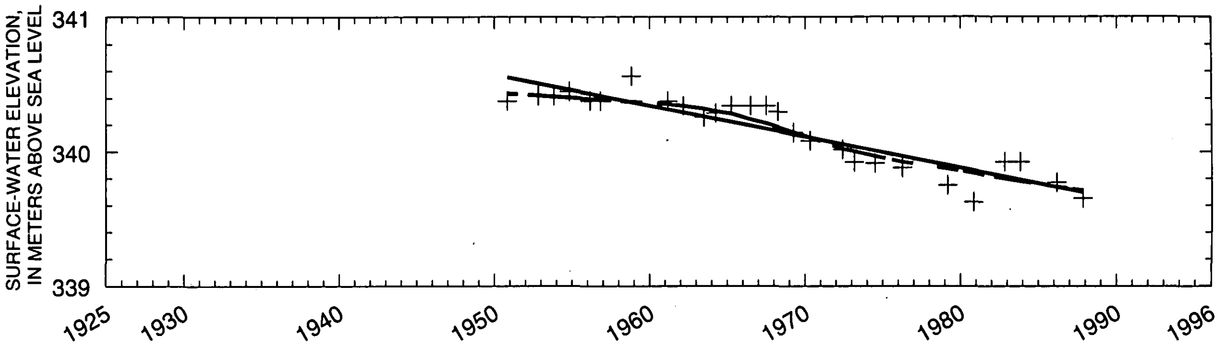
SITE 94—SALT CREEK NEAR GREENWOOD (06803555)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
5-23-65	326.53	5-23-76	326.31	10-01-87	326.06
9-30-67	326.53	5-05-78	326.38	10-01-89	326.06
4-22-69	326.47	2-07-79	326.36	10-01-91	325.96
10-01-69	326.47	10-14-80	326.32	10-01-92	325.94
5-03-72	326.47	2-18-83	326.31	10-01-95	325.84
3-11-73	326.45	10-04-83	326.20		
3-05-74	326.38	10-01-85	326.13		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	3.82	19	-0.94	0.000	-0.227

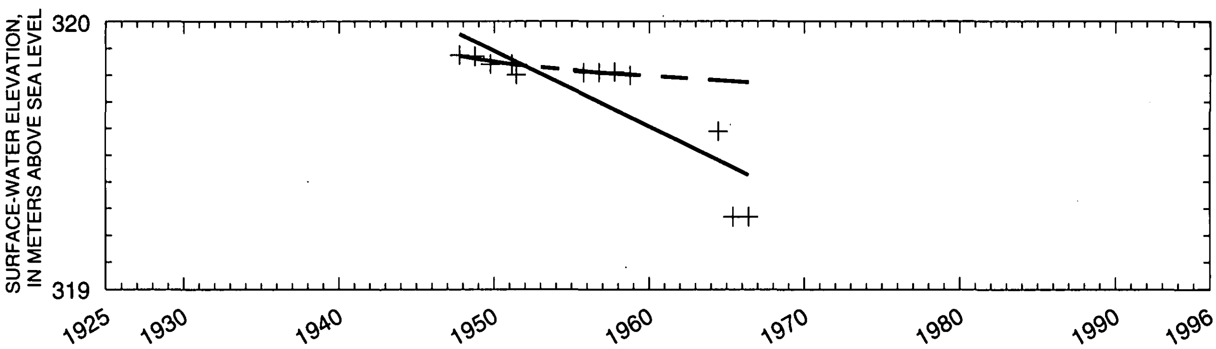
SITE 95—WAHOO CREEK AT ITHACA (06804000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-50	340.38	2-23-61	340.38	3-31-68	340.30	2-20-79	339.75
10-01-52	340.42	2-04-62	340.34	3-19-69	340.14	10-01-80	339.62
10-01-53	340.42	6-24-63	340.26	4-22-70	340.08	10-25-82	339.92
10-01-54	340.45	3-27-64	340.29	5-01-72	340.02	10-01-83	339.92
2-20-56	340.38	3-04-65	340.34	2-21-73	339.92	2-26-86	339.77
10-01-56	340.38	6-08-66	340.34	6-01-74	339.91	10-01-87	339.65
10-01-58	340.56	6-05-67	340.34	3-31-76	339.88		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.96	27	-0.77	0.000	-0.232

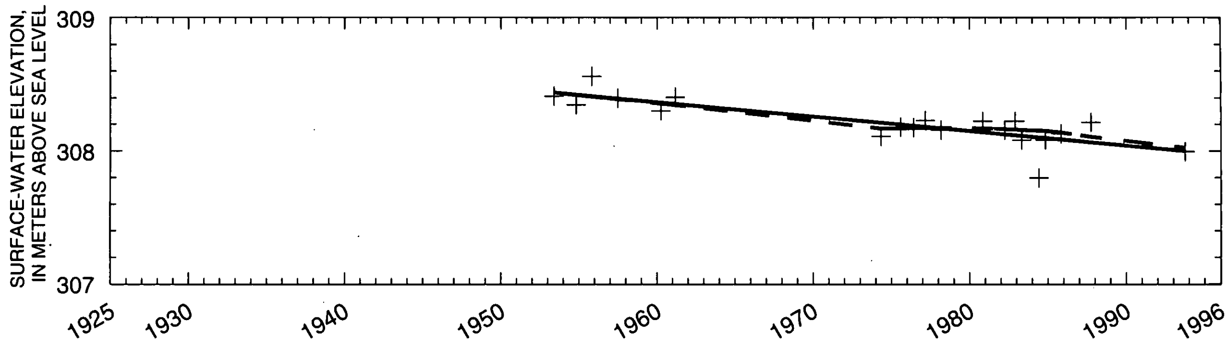
SITE 96—SALT CREEK NEAR ASHLAND (06805000)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-47	319.87	10-01-57	319.81
10-01-48	319.87	10-01-58	319.80
10-01-49	319.84	6-18-64	319.59
2-20-51	319.84	5-25-65	319.27
6-01-51	319.80	6-01-66	319.27
10-01-55	319.81		
10-01-56	319.81		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	13.7	12	-0.82	0.000	-0.283

SITE 97—PLATTE RIVER AT LOUISVILLE (06805500)



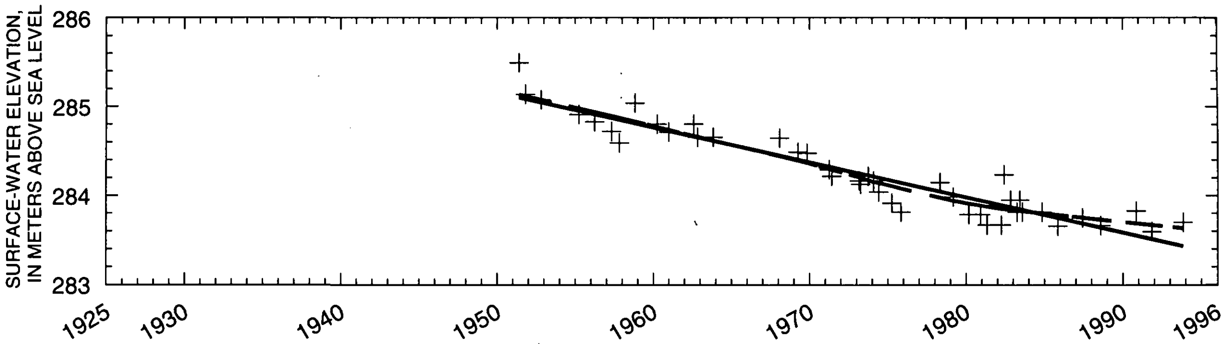
Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
5-12-53	308.41	7-14-75	308.18	4-02-83	308.08
10-01-54	308.35	5-19-76	308.17	5-26-84	307.80
10-01-55	308.56	2-24-77	308.23	10-16-84	308.08
6-16-57	308.40	2-16-78	308.16	10-01-85	308.13
3-29-60	308.30	10-06-80	308.22	9-30-87	308.21
2-28-61	308.40	3-09-82	308.16	9-30-93	307.99
4-29-74	308.11	11-13-82	308.22		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	138	20	-0.60	0.000	-0.109

APPENDIX K—WEEPING WATER CREEK BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

SITE 98—WEEPING WATER CREEK AT UNION (06806500)



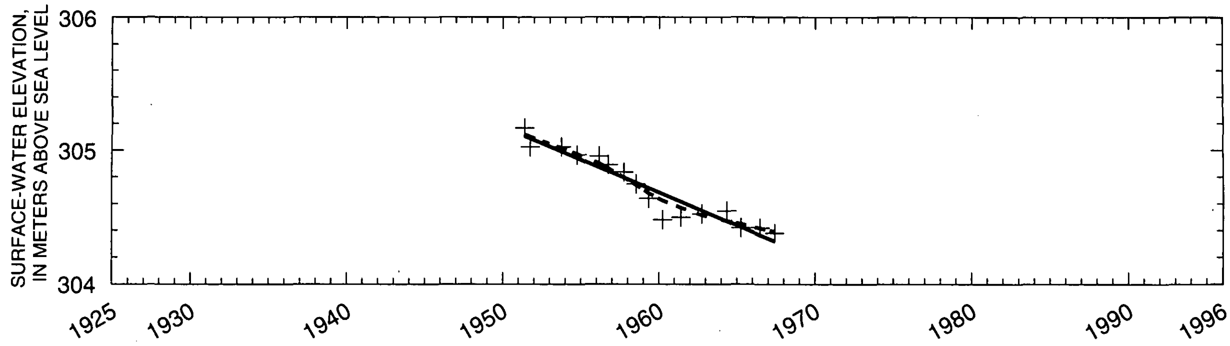
Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
5-14-51	285.49	12-25-60	284.71	2-20-73	284.17	2-24-80	283.78	10-01-84	283.81
10-01-51	285.14	7-23-62	284.80	3-06-73	284.13	11-05-80	283.78	10-01-85	283.65
10-01-52	285.08	10-01-62	284.65	9-26-73	284.21	4-07-81	283.67	5-27-87	283.75
3-28-55	284.91	10-01-63	284.65	1-04-74	284.17	3-02-82	283.67	7-18-88	283.66
3-14-56	284.83	1-25-68	284.65	5-18-74	284.04	5-22-82	284.23	10-01-90	283.82
4-03-57	284.72	3-15-69	284.49	3-20-75	283.91	10-01-82	283.95	10-01-91	283.59
10-01-57	284.59	10-01-69	284.48	10-01-75	283.81	3-03-83	283.81	10-01-93	283.70
10-01-58	285.04	3-05-71	284.29	4-20-78	284.14	5-26-83	283.95		
3-29-60	284.80	5-20-71	284.21	2-22-79	283.98	7-05-83	283.81		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.05	43	-0.81	0.000	-0.394

APPENDIX L—LITTLE NEMAHA RIVER BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

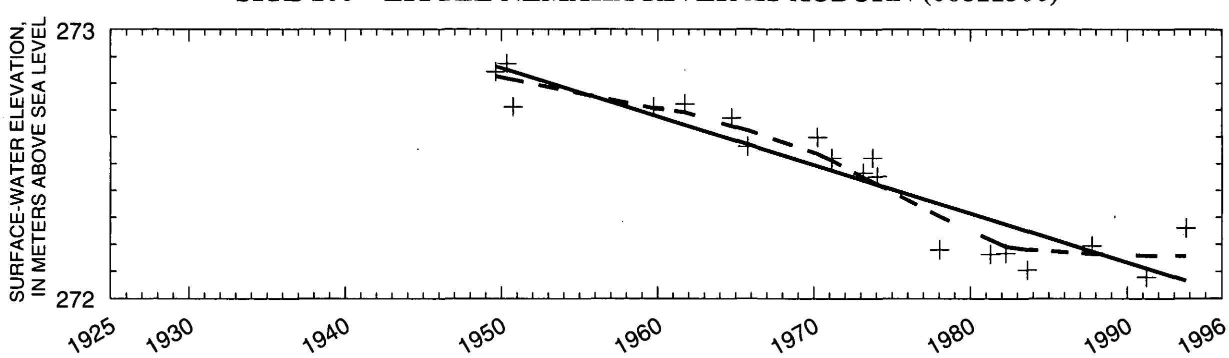
SITE 99—LITTLE NEMAHA RIVER NEAR SYRACUSE (06810500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
5-13-51	305.17	10-01-57	304.83	5-08-64	304.54
10-01-51	305.02	7-12-58	304.74	4-01-65	304.42
10-01-53	305.02	5-03-59	304.64	6-23-66	304.42
10-01-54	304.96	3-28-60	304.48	6-01-67	304.38
2-29-56	304.95	5-31-61	304.50		
10-01-56	304.89	10-01-62	304.52		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.84	16	-0.89	0.000	-0.492

SITE 100—LITTLE NEMAHA RIVER AT AUBURN (06811500)



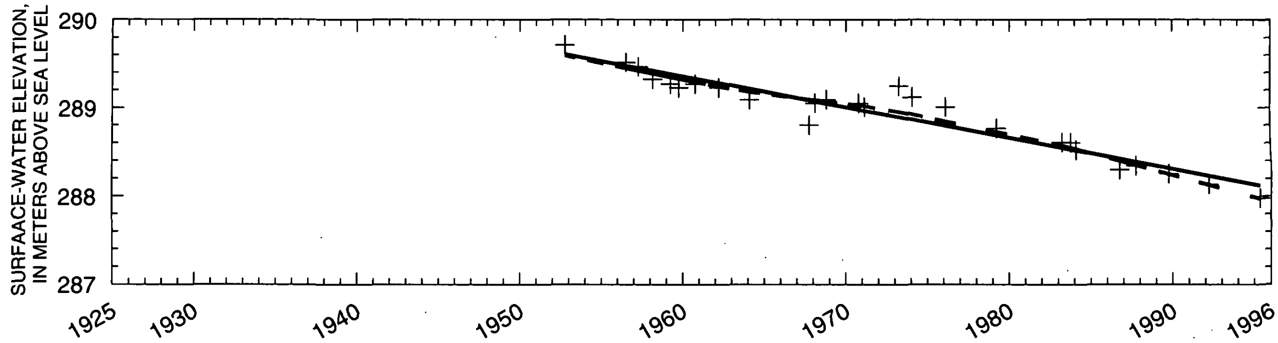
Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
8-20-49	272.84	3-20-70	272.60	4-01-82	272.17
5-05-50	272.87	2-18-71	272.52	8-18-83	272.10
10-01-50	272.71	2-22-73	272.47	10-01-87	272.19
10-01-59	272.71	9-26-73	272.52	3-20-91	272.08
10-01-61	272.72	1-18-74	272.45	10-01-93	272.26
10-01-64	272.67	1-12-78	272.18		
10-01-65	272.56	4-07-81	272.16		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.78	19	-0.81	0.000	-0.181

APPENDIX M—BIG NEMAHA RIVER BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

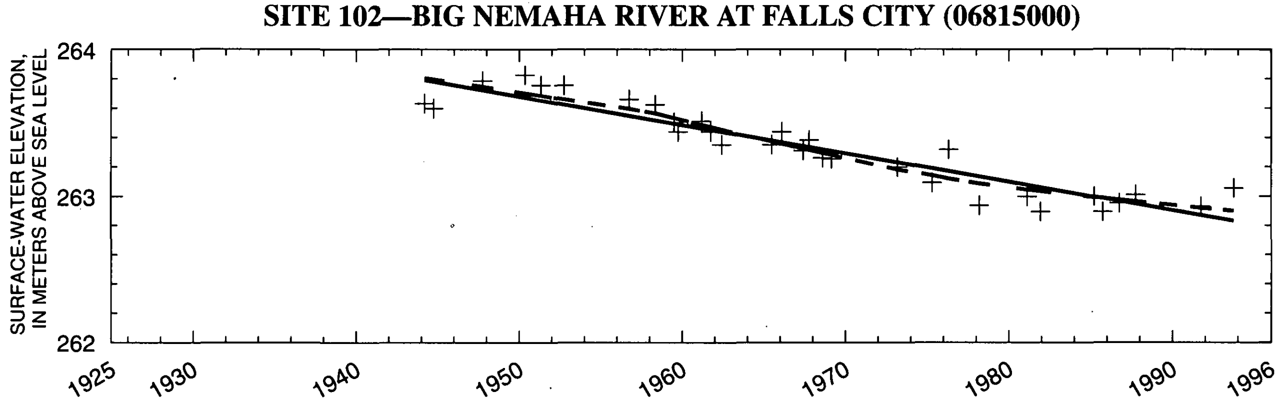
SITE 101—NORTH FORK BIG NEMAHA RIVER AT HUMBOLDT (06814500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-52	289.71	3-13-62	289.23	3-31-73	289.25	10-01-86	288.30
7-02-56	289.51	2-01-64	289.09	1-18-74	289.12	9-30-87	288.34
4-03-57	289.46	10-01-67	288.80	2-01-76	289.01	10-01-89	288.25
2-24-58	289.32	2-05-68	289.05	3-18-79	288.76	3-18-92	288.13
3-26-59	289.27	10-19-68	289.09	3-26-83	288.60	5-07-95	287.98
10-01-59	289.23	10-10-70	289.05	10-01-83	288.60		
10-01-60	289.27	2-17-71	289.01	2-02-84	288.52		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.47	26	-0.85	0.000	-0.350

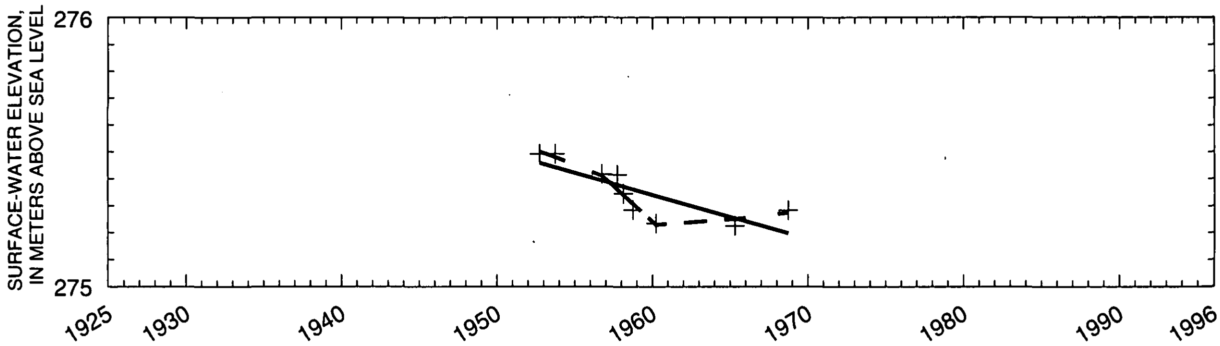
SITE 102—BIG NEMAHA RIVER AT FALLS CITY (06815000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
3-09-44	263.63	5-04-58	263.62	2-10-66	263.44	4-25-76	263.32	9-30-87	263.01
10-01-44	263.60	7-01-59	263.50	6-01-67	263.31	3-14-78	262.94	10-01-91	262.93
10-01-47	263.79	10-01-59	263.44	10-08-67	263.38	2-16-81	263.00	10-01-93	263.05
5-10-50	263.83	3-13-61	263.51	8-09-68	263.26	12-09-81	262.89		
5-01-51	263.76	10-01-61	263.44	2-26-69	263.25	3-20-85	263.00		
10-01-52	263.76	6-05-62	263.35	3-05-73	263.20	10-01-85	262.89		
10-01-56	263.66	6-28-65	263.35	4-25-75	263.09	10-01-86	262.95		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.53	31	-0.79	0.000	-0.194

SITE 103—MUDDY CREEK AT VERDON (06815500)



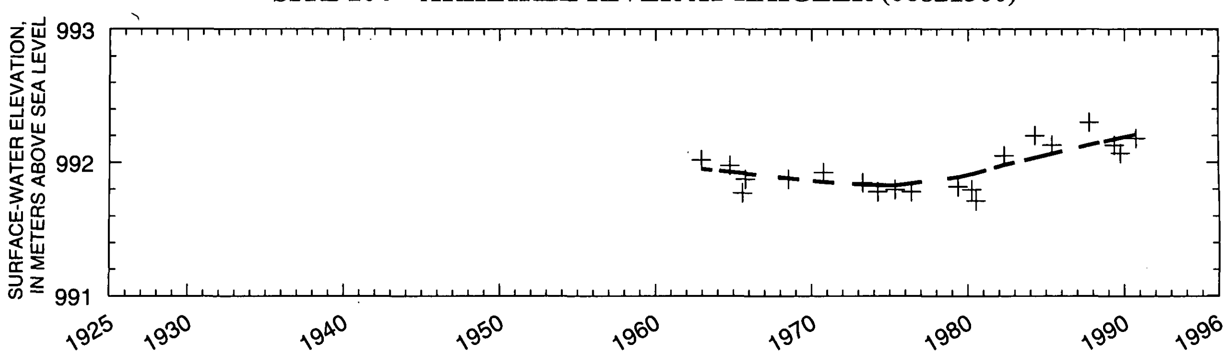
Date	SW elev. (m)	Date	SW elev. (m)
10-01-52	275.49	4-24-65	275.22
10-01-53	275.49	10-01-68	275.28
10-01-56	275.42		
10-01-57	275.42		
2-23-58	275.35		
10-01-58	275.28		
3-28-60	275.23		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.88	9	-0.87	0.001	-0.163

APPENDIX N—KANSAS RIVER BASIN

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

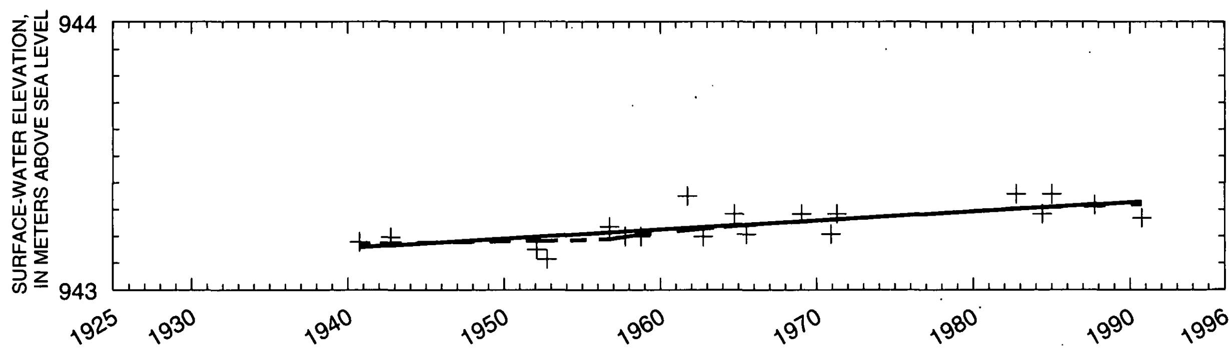
SITE 104—ARIKAREE RIVER AT HAIGLER (06821500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
12-05-62	992.02	3-19-74	991.78	4-10-84	992.20
10-01-64	991.98	4-29-75	991.80	5-13-85	992.13
7-25-65	991.77	5-12-76	991.78	10-01-87	992.30
10-01-65	991.87	5-08-79	991.82	5-09-89	992.13
7-02-68	991.87	3-24-80	991.80	10-01-89	992.07
10-01-70	991.93	7-03-80	991.71	10-01-90	992.18
4-03-73	991.85	4-26-82	992.05		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.69	20	NS	0.098	NA

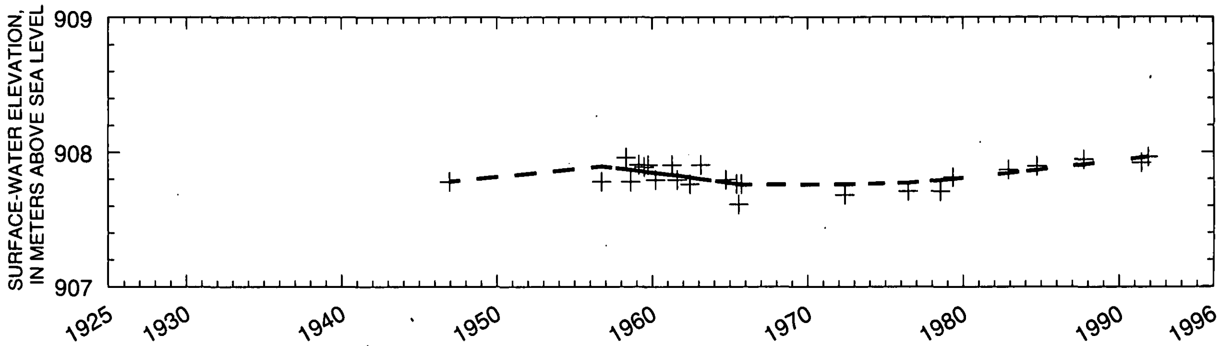
SITE 105—ROCK CREEK AT PARKS (06824000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-40	943.18	10-01-61	943.35	10-01-82	943.36
10-01-42	943.20	10-01-62	943.20	5-31-84	943.28
2-03-52	943.15	10-01-64	943.28	1-09-85	943.36
10-01-52	943.11	7-04-65	943.21	10-01-87	943.32
10-01-56	943.23	1-15-69	943.28	10-01-90	943.27
10-01-57	943.20	12-01-70	943.21		
10-01-58	943.20	4-20-71	943.28		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.37	19	0.56	0.001	0.034

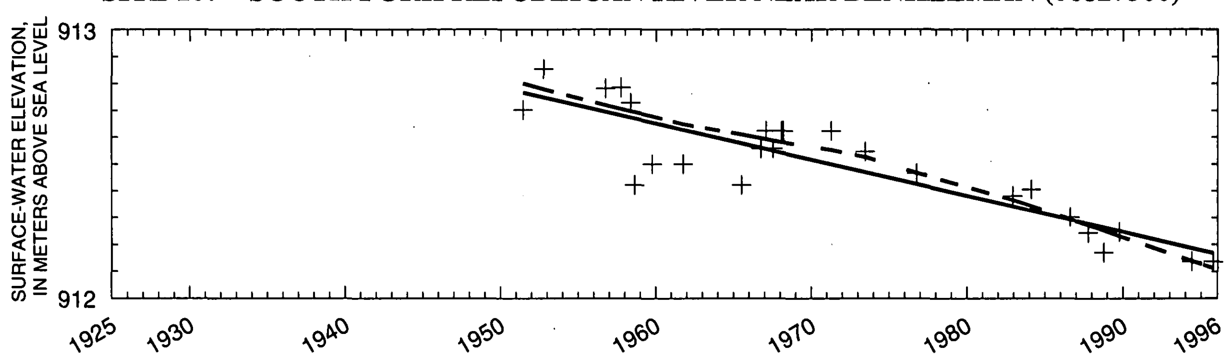
SITE 106—REPUBLICAN RIVER AT BENKELMAN (06824500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
12-17-46	907.78	3-23-60	907.79	7-26-65	907.61	10-01-84	907.89
10-01-56	907.78	4-15-61	907.90	10-01-65	907.76	10-01-87	907.94
5-02-58	907.96	8-13-61	907.79	5-27-72	907.68	6-06-91	907.92
8-16-58	907.78	6-06-62	907.76	6-22-76	907.71	11-12-91	907.96
2-26-59	907.90	2-20-63	907.90	7-18-78	907.71		
7-01-59	907.89	10-01-64	907.79	5-09-79	907.81		
10-01-59	907.90	6-08-65	907.76	12-01-82	907.87		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.18	25	NS	0.742	NA

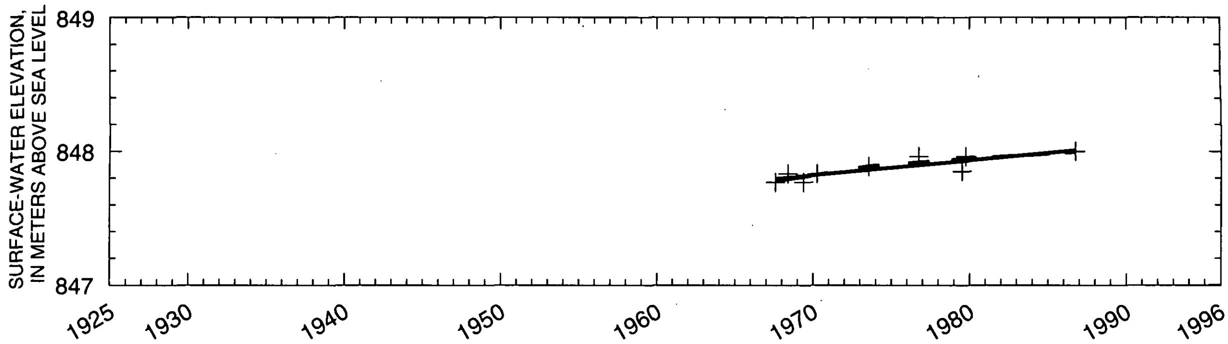
SITE 107—SOUTH FORK REPUBLICAN RIVER NEAR BENKELMAN (06827500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
6-12-51	912.70	10-01-61	912.50	4-07-71	912.62	10-01-88	912.17
10-01-52	912.85	6-30-65	912.42	6-12-73	912.55	10-03-89	912.25
10-01-56	912.78	10-01-66	912.56	10-01-76	912.47	5-20-94	912.14
10-01-57	912.79	1-31-67	912.62	12-01-82	912.38	10-01-95	912.14
5-15-58	912.73	7-08-67	912.56	2-09-84	912.41		
8-16-58	912.42	1-29-68	912.62	8-09-86	912.30		
10-01-59	912.50	3-08-68	912.62	10-01-87	912.24		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.57	25	-0.66	0.000	-0.135

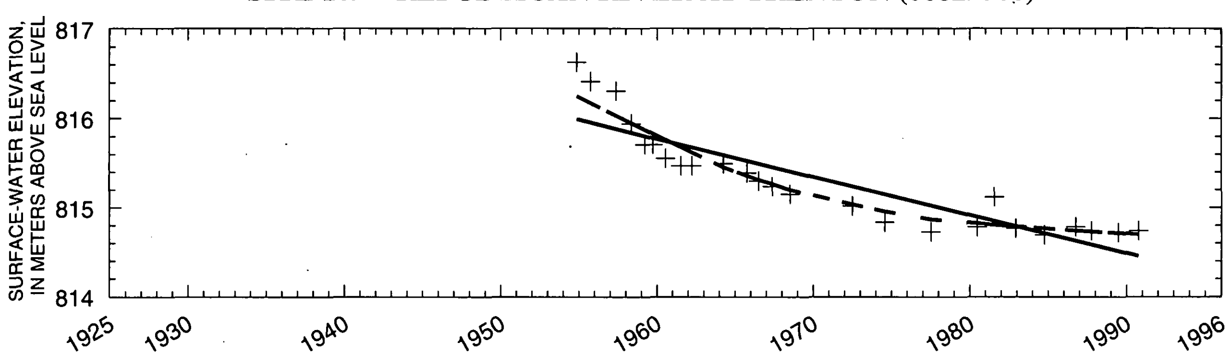
SITE 108—REPUBLICAN RIVER AT STRATTON (06828500)



Date	SW elev. (m)	Date	SW elev. (m)
8-01-67	847.77	10-01-79	847.96
5-21-68	847.83	10-01-86	848.00
5-21-69	847.77		
4-01-70	847.83		
7-20-73	847.89		
10-01-76	847.96		
7-04-79	847.85		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.55	9	0.78	0.004	0.111

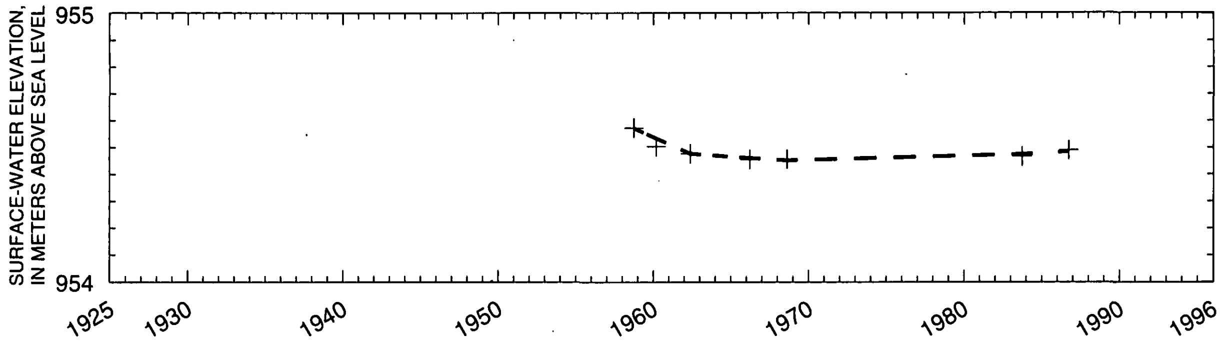
SITE 109—REPUBLICAN RIVER AT TRENTON (06829500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
11-12-54	816.63	7-16-61	815.47	6-28-72	815.02	10-01-86	814.78
10-01-55	816.41	3-31-62	815.47	7-23-74	814.83	10-01-87	814.74
5-20-57	816.31	4-07-64	815.49	7-06-77	814.73	6-19-89	814.72
5-13-58	815.94	10-08-65	815.39	6-17-80	814.78	10-01-90	814.74
3-29-59	815.71	7-09-66	815.30	7-18-81	815.12		
10-01-59	815.71	5-19-67	815.24	12-01-82	814.76		
7-24-60	815.55	7-03-68	815.15	10-01-84	814.69		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.04	25	-0.87	0.000	-0.429

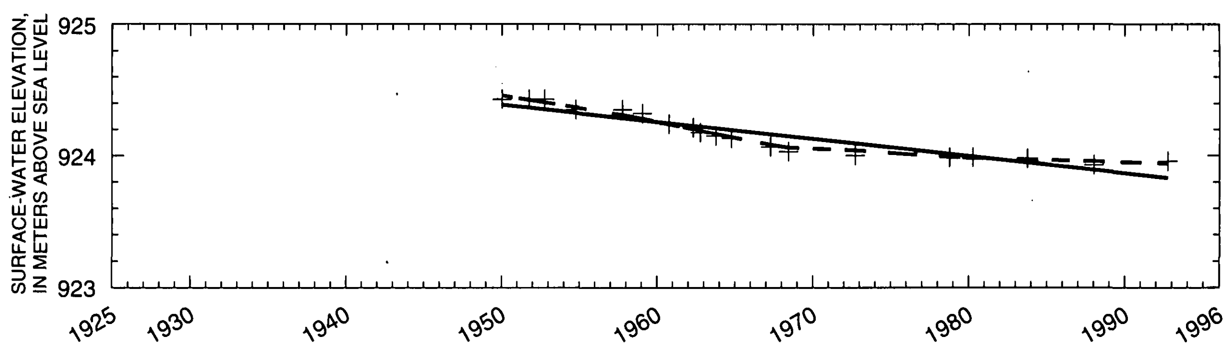
SITE 110—FRENCHMAN CREEK NEAR IMPERIAL (06831500)



Date	SW elev. (m)
10-01-58	954.57
3-12-60	954.50
5-27-62	954.48
3-25-66	954.45
8-13-68	954.45
10-01-83	954.47
10-01-86	954.49

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.59	7	NS	0.229	NA

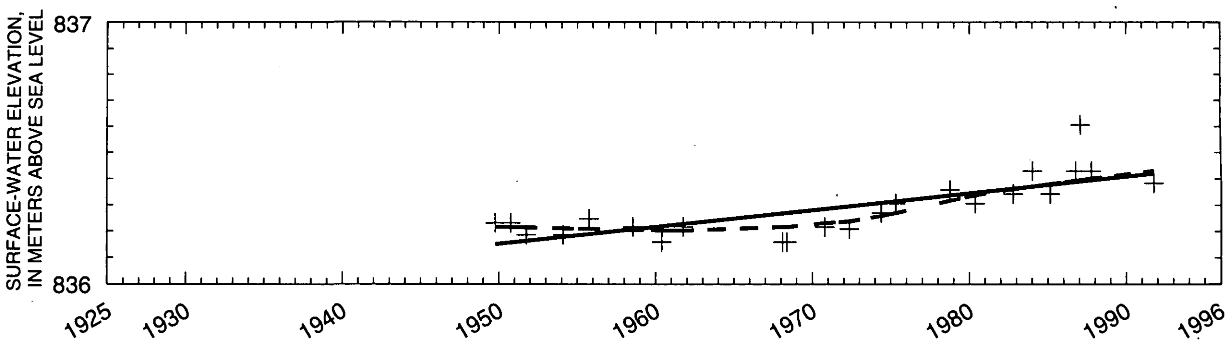
SITE 111—FRENCHMAN CREEK NEAR ENDERS (06832500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
1-05-50	924.43	4-21-62	924.21	10-03-78	923.99
10-01-51	924.43	10-01-62	924.17	3-29-80	923.99
10-01-52	924.43	10-01-63	924.15	10-01-83	923.98
10-01-54	924.35	10-01-64	924.13	1-05-88	923.93
10-01-57	924.35	4-05-67	924.07	9-30-92	923.96
1-12-59	924.32	5-28-68	924.03		
10-01-60	924.24	9-15-72	924.00		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.25	19	-0.96	0.000	-0.130

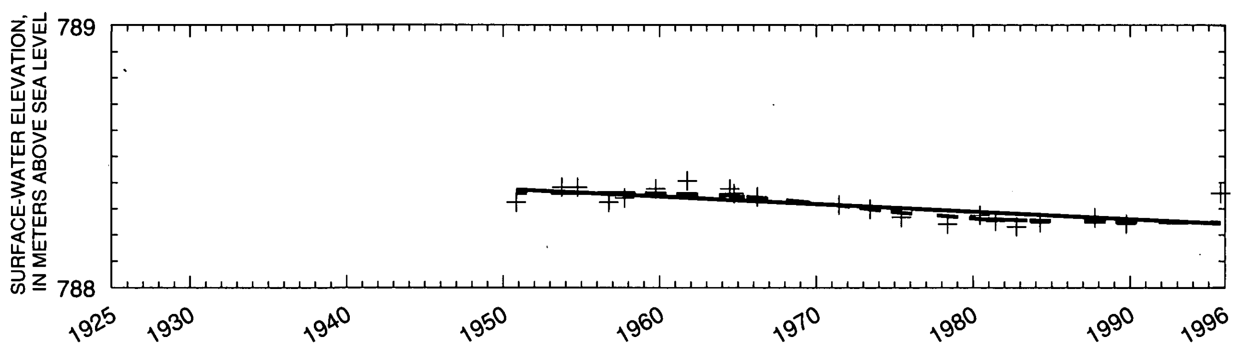
SITE 112—STINKING WATER CREEK NEAR PALISADE (06835000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-04-49	836.23	10-01-61	836.22	10-03-78	836.36	10-01-87	836.43
10-01-50	836.23	2-08-68	836.16	5-13-80	836.31	10-01-91	836.38
10-01-51	836.19	5-15-68	836.16	10-12-82	836.34		
2-05-54	836.19	10-15-70	836.22	1-01-84	836.43		
10-01-55	836.25	5-09-72	836.21	2-20-85	836.34		
7-20-58	836.22	5-21-74	836.27	10-01-86	836.43		
5-19-60	836.16	4-22-75	836.31	1-22-87	836.61		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.94	23	0.58	0.000	0.064

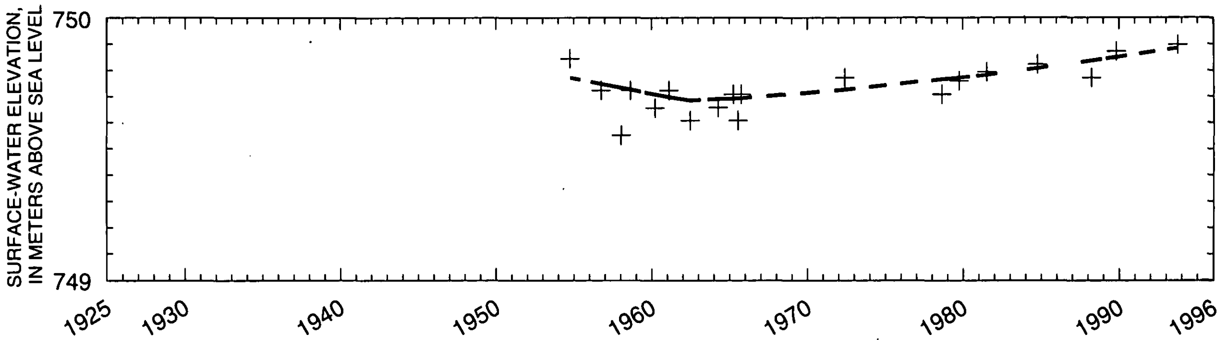
SITE 113—FRENCHMAN CREEK AT CULBERTSON (06835500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
11-02-50	788.32	6-23-64	788.38	6-06-80	788.27
10-01-53	788.38	10-01-64	788.36	6-03-81	788.25
10-01-54	788.38	3-24-66	788.34	10-06-82	788.23
10-01-56	788.32	6-09-71	788.31	4-05-84	788.25
10-01-57	788.34	6-07-73	788.30	10-01-87	788.26
10-01-59	788.38	6-04-75	788.27	10-01-89	788.24
10-01-61	788.41	5-16-78	788.24	10-01-95	788.36

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.12	21	-0.54	0.001	-0.029

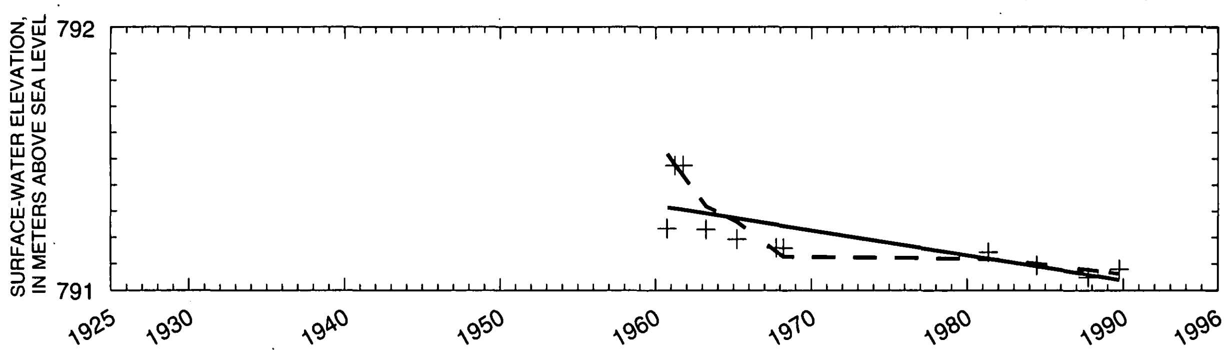
SITE 114—REPUBLICAN RIVER AT McCOOK (06837000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-54	749.84	4-08-64	749.66	7-09-81	749.79
10-01-56	749.72	3-27-65	749.71	10-11-84	749.82
1-17-58	749.55	7-16-65	749.61	3-29-88	749.77
8-17-58	749.72	10-01-65	749.71	10-31-89	749.87
3-19-60	749.66	5-24-72	749.77	10-01-93	749.90
2-13-61	749.72	8-21-78	749.71		
6-17-62	749.61	10-01-79	749.76		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	3.17	19	NS	0.013	NA

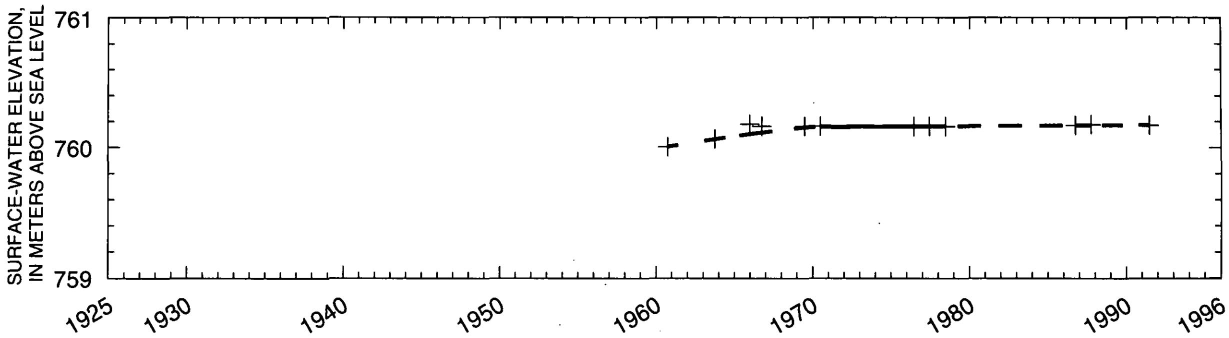
SITE 115—RED WILLOW CREEK ABOVE HUGH BUTLER LAKE (06837300)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-60	791.23	5-15-81	791.14
3-23-61	791.47	6-18-84	791.09
10-01-61	791.47	10-01-87	791.05
4-02-63	791.23	10-02-89	791.08
3-25-65	791.19		
10-01-67	791.16		
3-18-68	791.16		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.62	11	-0.84	0.000	-0.095

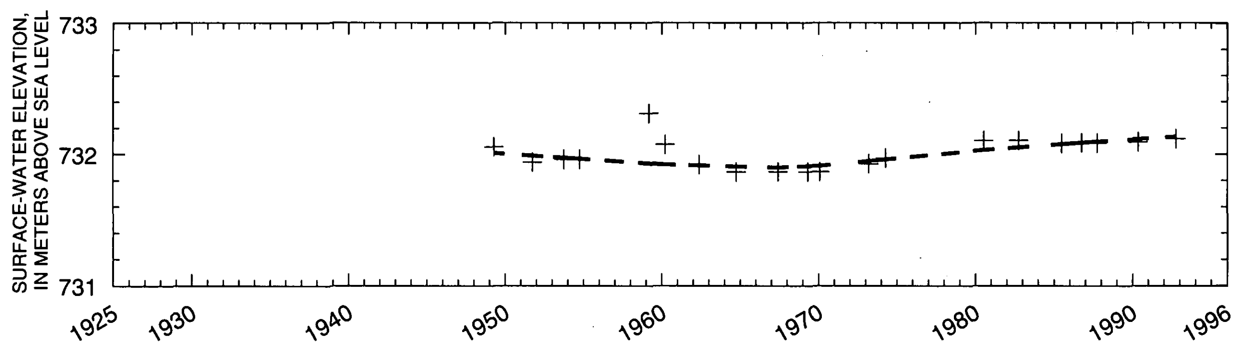
SITE 116—RED WILLOW CREEK NEAR McCOOK (06837500)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-60	760.01	6-25-70	760.16
10-01-63	760.07	6-14-77	760.16
12-24-65	760.18	10-01-87	760.18
10-01-66	760.16	10-01-86	760.17
6-24-69	760.16	6-17-91	760.17
6-15-76	760.16		
6-27-78	760.16		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.12	12	NS	0.091	NA

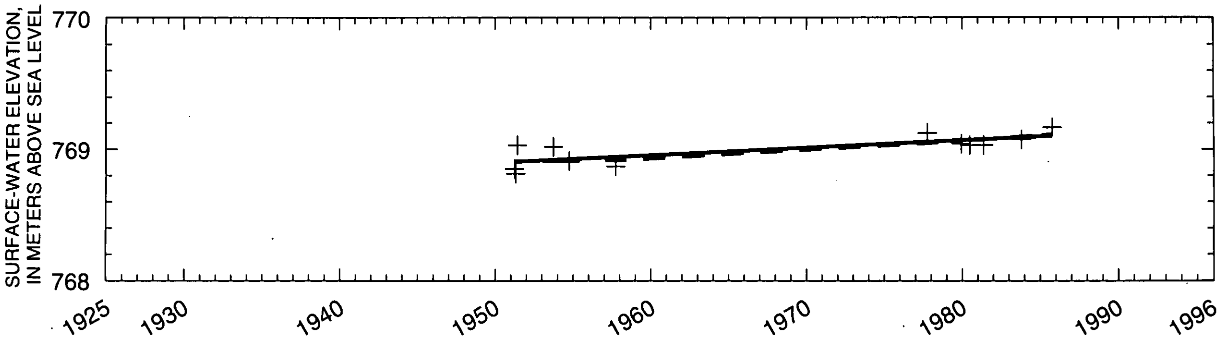
SITE 117—RED WILLOW CREEK NEAR RED WILLOW (06838000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
4-11-49	732.05	10-01-64	731.86	10-01-82	732.10
10-01-51	731.94	6-05-67	731.86	6-25-85	732.08
10-01-53	731.96	4-29-69	731.86	10-01-86	732.09
10-01-54	731.96	2-05-70	731.86	10-01-87	732.08
3-05-59	732.31	3-14-73	731.93	5-08-90	732.09
3-19-60	732.07	4-12-74	731.97	10-01-92	732.12
5-18-62	731.92	7-10-80	732.10		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.27	20	NS	0.052	NA

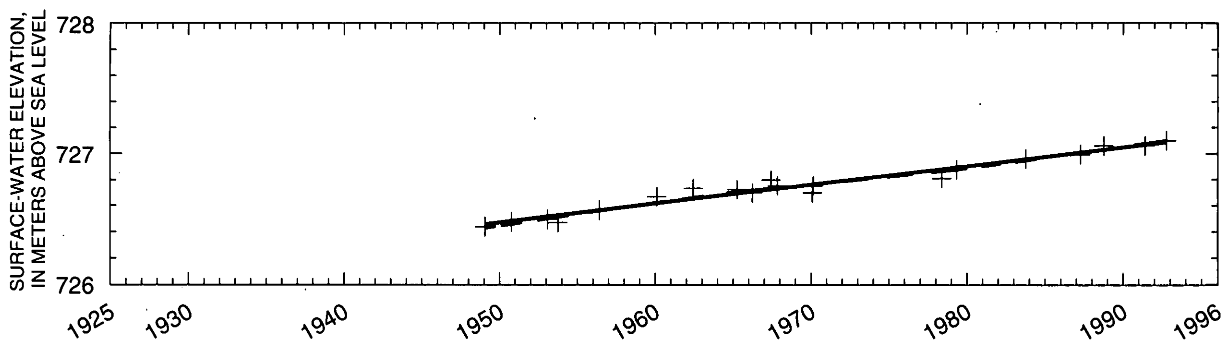
SITE 118—FOX CREEK AT CURTIS (06840000)



Date	SW elev. (m)	Date	SW elev. (m)
3-27-51	768.85	12-10-79	769.04
4-26-51	768.82	6-25-80	769.03
6-05-51	769.03	5-13-81	769.03
10-01-53	769.02	10-17-83	769.07
10-01-54	768.91	10-01-85	769.17
10-01-57	768.87		
10-01-77	769.12		

Gradation trend analysis:	Mean discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.18	12	0.61	0.006	0.057

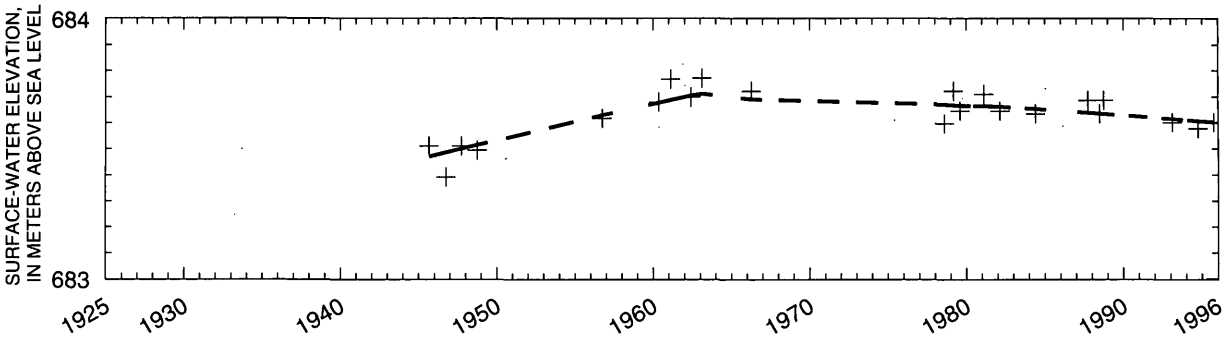
SITE 119—MEDICINE CREEK ABOVE HARRY STRUNK LAKE (06841000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
1-19-49	726.44	3-28-65	726.72	4-25-79	726.88
10-01-50	726.48	3-26-66	726.70	10-01-83	726.96
2-01-53	726.49	6-05-67	726.80	4-03-87	726.99
10-01-53	726.47	11-01-67	726.75	10-03-88	727.06
5-27-56	726.56	1-29-70	726.70	5-23-91	727.06
2-06-60	726.67	2-19-70	726.75	10-01-92	727.10
6-07-62	726.73	5-19-78	726.81		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.50	20	0.87	0.000	0.144

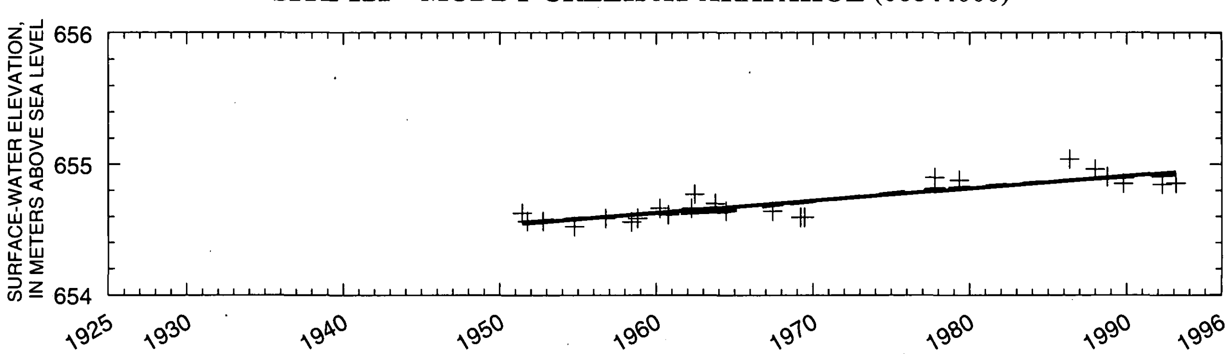
SITE 120—REPUBLICAN RIVER AT CAMBRIDGE (06843500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
9-01-45	683.51	5-30-62	683.70	2-24-82	683.65	9-30-95	683.60
10-01-46	683.39	2-13-63	683.77	5-29-84	683.64		
10-01-47	683.51	4-07-66	683.72	10-01-87	683.69		
10-01-48	683.50	8-09-78	683.60	6-30-88	683.64		
10-01-56	683.62	3-08-79	683.72	10-01-88	683.69		
5-06-60	683.68	8-07-79	683.65	2-10-93	683.60		
2-13-61	683.77	2-19-81	683.71	9-30-94	683.58		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.87	22	NS	0.713	NA

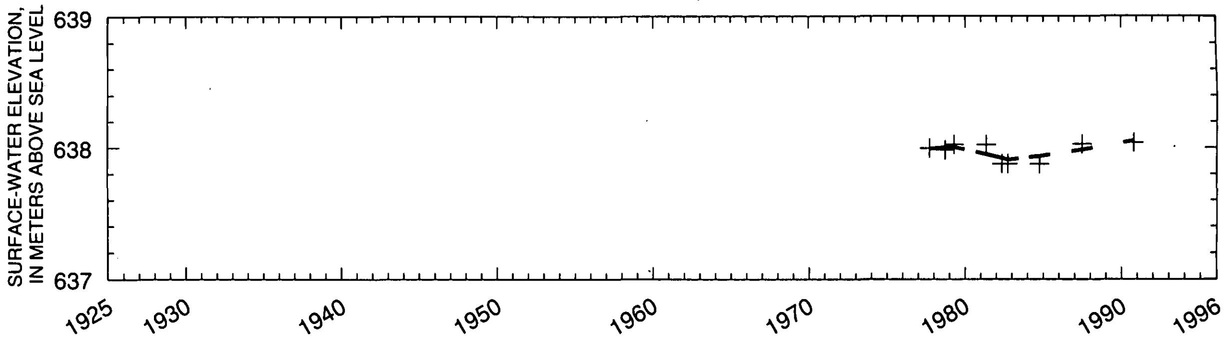
SITE 121—MUDDY CREEK AT ARAPAHOE (06844000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
5-30-51	654.63	3-19-60	654.66	3-13-69	654.59	10-10-89	654.85
10-01-51	654.56	10-01-60	654.61	6-11-69	654.59	4-02-92	654.85
10-01-52	654.56	3-24-62	654.66	10-01-77	654.90	2-17-93	654.86
10-01-54	654.52	6-07-62	654.77	4-25-79	654.88		
10-01-56	654.58	10-01-63	654.70	5-08-86	655.04		
5-27-58	654.56	6-12-64	654.64	12-21-87	654.96		
10-16-58	654.58	6-01-67	654.64	10-01-88	654.90		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.20	24	0.57	0.000	0.941

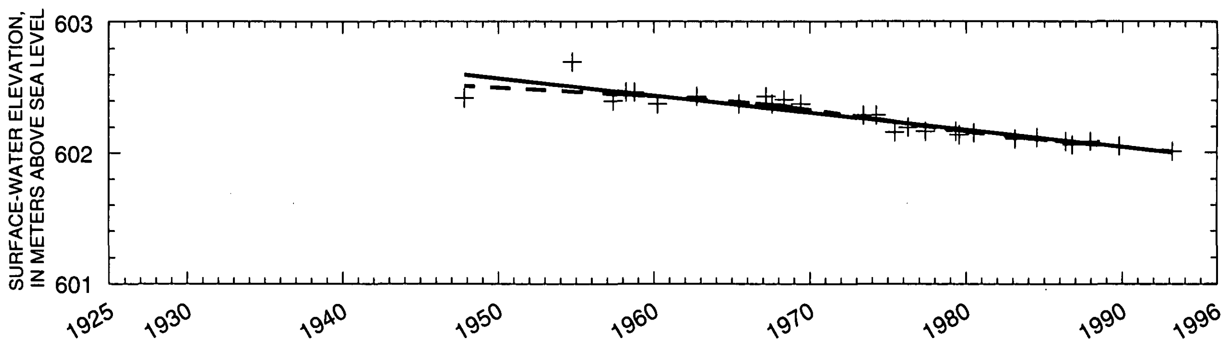
SITE 122—TURKEY CREEK AT EDISON (06844210)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-77	637.99	6-15-87	638.03
10-01-78	637.98	10-02-90	638.04
4-26-79	638.02		
5-14-81	638.02		
5-13-82	637.88		
10-01-82	637.88		
10-01-84	637.87		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.18	9	NS	0.673	NA

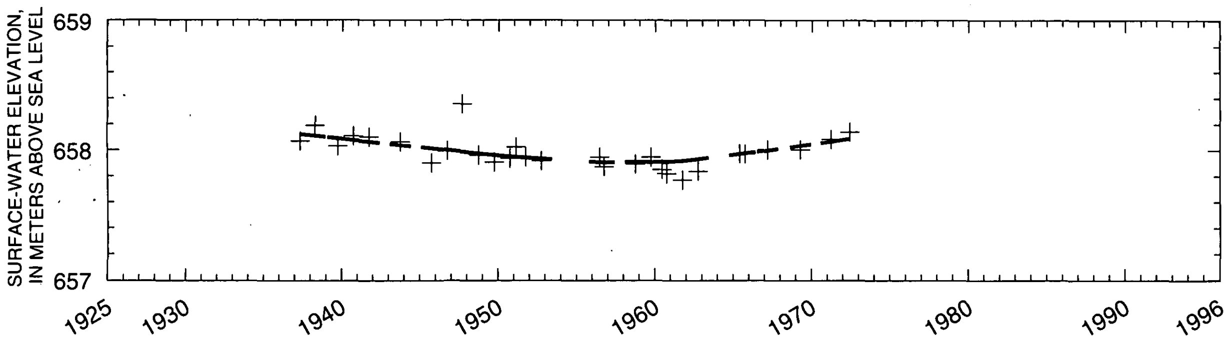
SITE 123—REPUBLICAN RIVER NEAR ORLEANS (06844500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-27-47	602.42	6-15-65	602.37	6-09-75	602.16	7-11-84	602.11
10-01-54	602.69	3-10-67	602.43	4-13-76	602.19	5-10-86	602.08
5-18-57	602.40	8-01-67	602.37	5-24-77	602.16	10-13-86	602.06
3-15-58	602.46	5-08-68	602.40	5-02-79	602.16	12-10-87	602.09
10-01-58	602.46	6-05-69	602.37	7-20-79	602.14	10-12-89	602.05
3-22-60	602.37	6-06-73	602.29	6-27-80	602.15	3-09-93	602.01
10-01-62	602.43	4-01-74	602.29	2-15-83	602.10		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.73	27	-0.84	0.000	-0.132

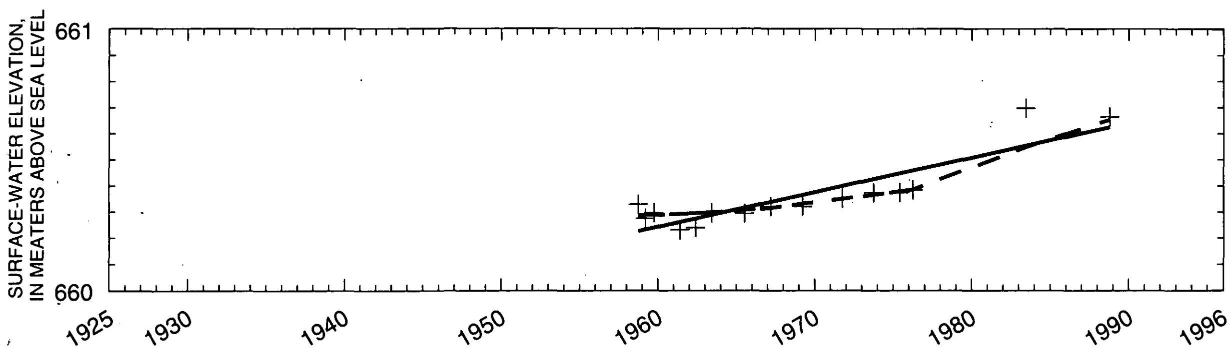
SITE 124—SAPPA CREEK NEAR BEAVER CITY (06845200)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
5-01-37	658.07	10-01-46	657.99	10-01-52	657.92	10-01-61	657.77	6-09-72	658.14
4-15-38	658.19	9-01-47	658.36	6-18-56	657.95	10-01-62	657.84		
10-01-39	658.03	10-01-48	657.96	10-01-56	657.87	5-27-65	657.97		
10-01-40	658.11	10-01-49	657.91	10-01-58	657.89	10-01-65	657.97		
10-01-41	658.10	10-01-50	657.94	10-01-59	657.95	3-10-67	658.01		
10-01-43	658.06	2-22-51	658.02	6-14-60	657.85	4-16-69	658.01		
10-01-45	657.90	10-01-51	657.95	10-01-60	657.82	3-31-71	658.09		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.08	29	NS	0.072	NA

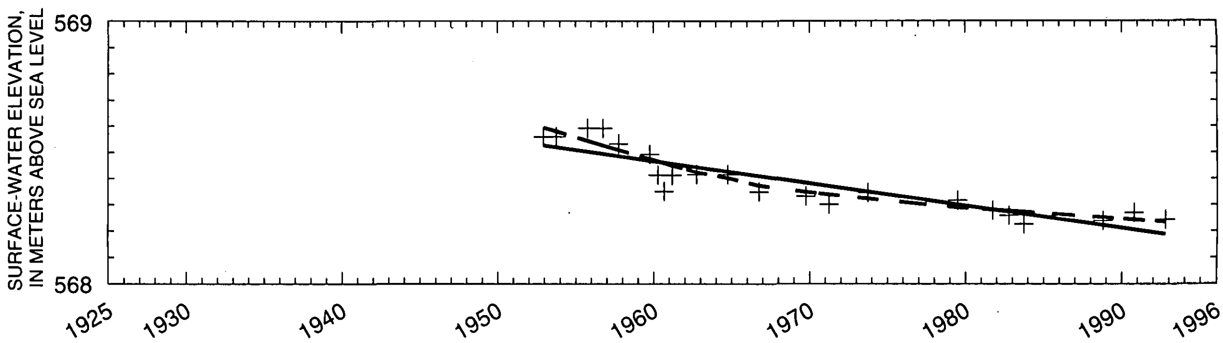
SITE 125—BEAVER CREEK NEAR BEAVER CITY (06847000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
9-23-58	660.33	3-11-67	660.32	10-13-88	660.66
3-06-59	660.27	3-20-69	660.32		
10-01-59	660.30	10-01-71	660.35		
5-19-61	660.23	10-01-73	660.37		
5-19-62	660.24	5-28-75	660.37		
6-04-63	660.30	4-01-76	660.38		
7-07-65	660.29	6-13-83	660.70		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.03	15	0.70	0.000	0.133

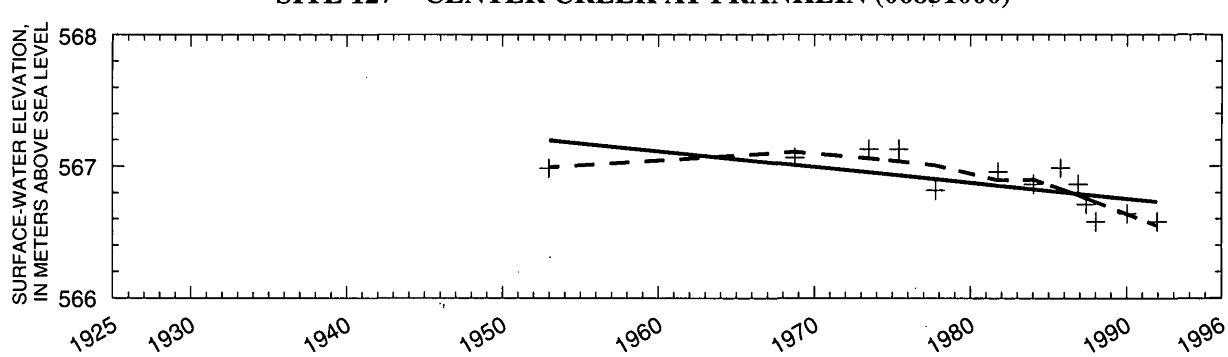
SITE 126—REPUBLICAN RIVER BELOW HARLAN COUNTY DAM (06849500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
12-03-52	568.56	8-31-60	568.35	10-01-73	568.35	10-01-92	568.24
10-01-53	568.56	3-11-61	568.41	7-04-79	568.32		
10-01-55	568.59	10-01-62	568.42	10-01-81	568.28		
10-01-56	568.59	10-01-64	568.42	10-13-82	568.26		
10-01-57	568.53	10-03-66	568.35	10-01-83	568.23		
10-01-59	568.49	10-09-69	568.33	10-13-88	568.24		
4-05-60	568.41	3-31-71	568.30	10-03-90	568.27		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.40	22	-0.82	0.000	-0.085

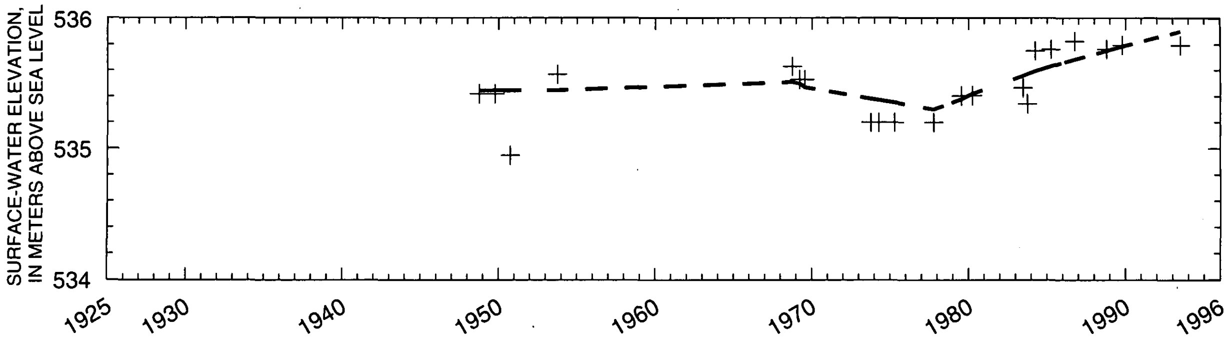
SITE 127—CENTER CREEK AT FRANKLIN (06851000)



Date	SW elev. (m)	Date	SW elev. (m)
12-19-52	566.98	10-01-85	566.99
10-01-68	567.06	11-19-86	566.86
6-26-73	567.13	5-21-87	566.71
5-28-75	567.13	1-06-88	566.58
10-01-77	566.82	1-05-90	566.64
10-06-81	566.96	12-09-91	566.58
1-13-84	566.86		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.18	13	-0.64	0.000	-0.119

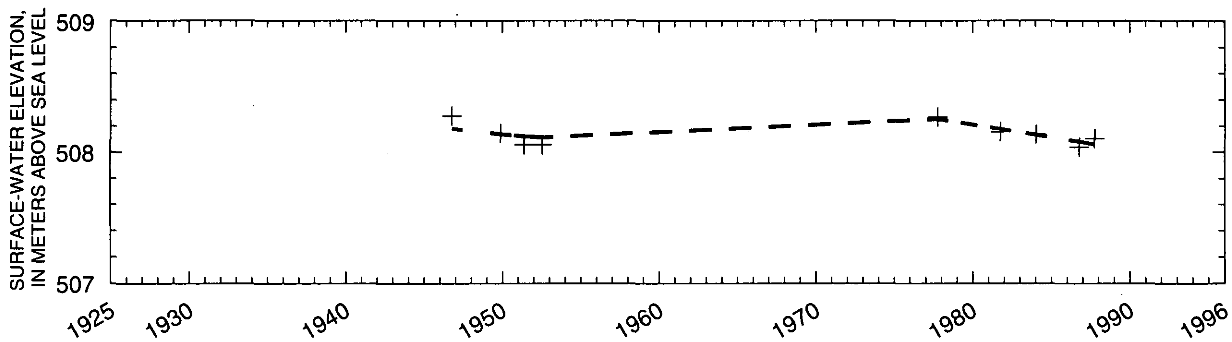
SITE 128—THOMPSON CREEK AT RIVERTON (06851500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-48	535.42	10-02-73	535.20	10-01-83	535.34
10-01-49	535.42	4-02-74	535.20	3-29-84	535.75
10-01-50	534.95	4-02-75	535.20	4-01-85	535.76
10-01-53	535.57	10-01-77	535.20	10-01-86	535.82
10-01-68	535.63	7-17-79	535.40	10-13-88	535.76
3-12-69	535.53	4-01-80	535.40	10-12-89	535.79
7-15-69	535.53	6-20-83	535.46	7-01-93	535.79

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.62	21	NS	0.011	NA

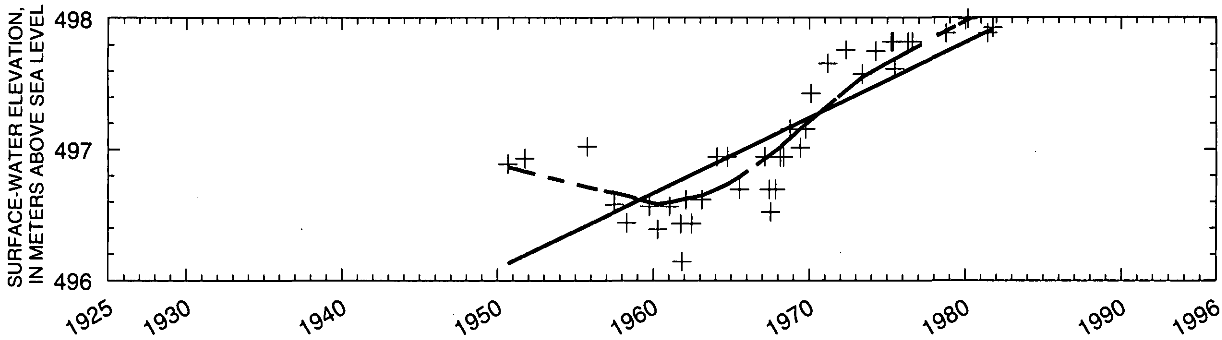
SITE 129—ELM CREEK AT AMBOY (06852000)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-46	508.28	10-11-86	508.04
11-17-49	508.14	10-01-87	508.10
5-23-51	508.05		
7-17-52	508.05		
10-01-77	508.27		
10-01-81	508.15		
1-10-84	508.13		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.42	9	NS	0.173	NA

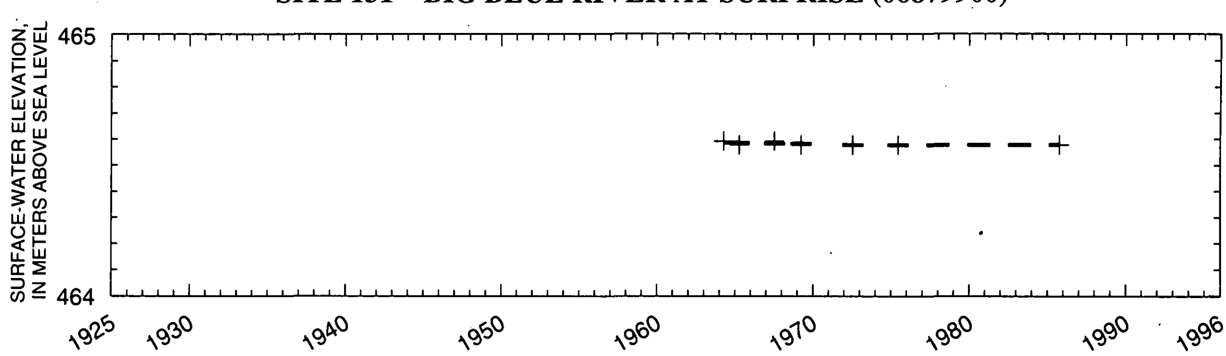
SITE 130—REPUBLICAN RIVER AT GUIDE ROCK (06853020)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
8-24-50	496.89	10- 1-61	496.43	2-27-67	496.94	10- 8-69	497.15	6-23-75	497.61
10- 1-51	496.93	11- 4-61	496.14	6- 7-67	496.69	2- 6-70	497.43	4-27-76	497.82
10- 1-55	497.02	2- 1-62	496.62	7-12-67	496.52	3-10-71	497.65	8- 4-76	497.82
6-28-57	496.58	6-18-62	496.43	11- 6-67	496.69	5- 3-72	497.76	10- 1-78	497.89
4-16-58	496.44	2-11-63	496.62	2-26-68	496.94	5-27-73	497.57	2-26-80	498.00
10- 1-59	496.56	1-31-64	496.94	5- 7-68	496.94	4- 3-74	497.75	6- 4-81	497.89
4-12-60	496.39	10- 1-64	496.94	10- 8-68	497.15	4- 2-75	497.82	10- 5-81	497.93
1-17-61	496.56	7-10-65	496.69	6- 3-69	497.01	5-14-75	497.82		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	3.34	39	0.71	0.000	0.575

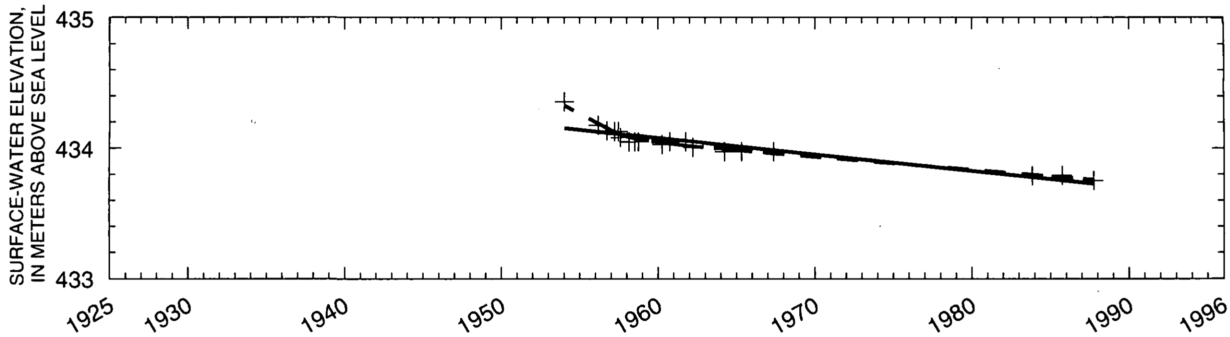
SITE 131—BIG BLUE RIVER AT SURPRISE (06879900)



Date	SW elev. (m)
4-03-64	464.59
4-02-65	464.58
7-07-67	464.59
3-18-69	464.58
7-12-72	464.58
6-08-75	464.58
10-01-85	464.58

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.05	7	NS	0.121	NA

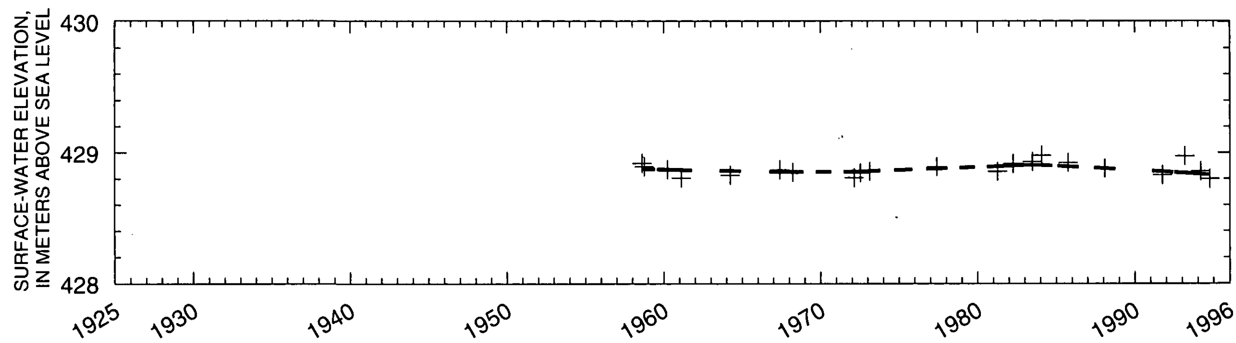
SITE 132—BIG BLUE RIVER AT SEWARD (06880500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
1-12-54	434.36	7-11-58	434.05	4-29-65	433.97
3-06-56	434.18	10-01-58	434.05	5-17-67	433.97
10-01-56	434.13	3-30-60	434.03	11-07-83	433.79
3-26-57	434.13	10-01-60	434.05	10-01-85	433.79
6-21-57	434.13	10-01-61	434.05	9-30-87	433.75
8-06-57	434.08	3-21-62	434.01		
2-28-58	434.05	3-27-64	433.97		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.91	19	-0.92	0.000	-0.126

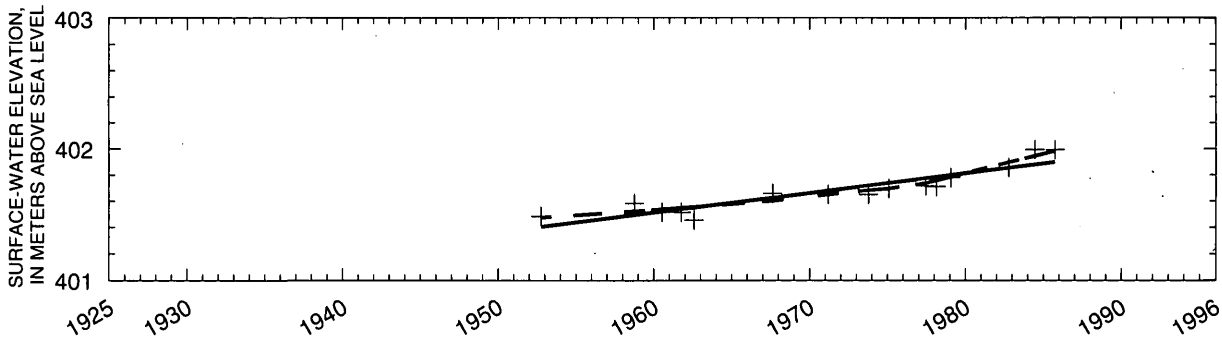
SITE 133—WEST FORK BIG BLUE RIVER NEAR DORCHESTER (06880800)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
8-13-58	428.92	2-20-72	428.81	1-27-84	428.98
10-01-58	428.89	7-12-72	428.84	10-01-85	428.92
3-27-60	428.87	2-19-73	428.85	2-03-88	428.88
2-13-61	428.80	5-25-77	428.89	10-01-91	428.83
3-27-64	428.83	4-07-81	428.85	3-04-93	428.97
5-25-67	428.87	3-31-82	428.92	3-10-94	428.86
3-25-68	428.85	6-21-83	428.93	10-08-94	428.80

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.27	21	NS	0.487	NA

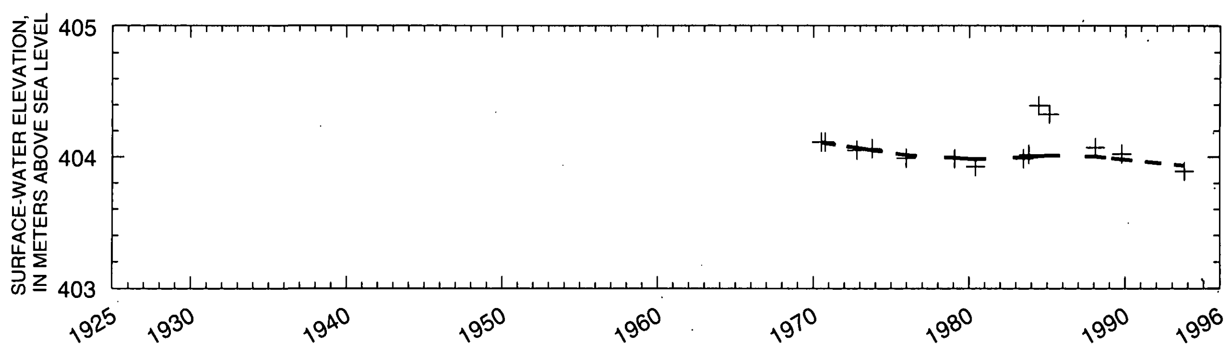
SITE 134—BIG BLUE RIVER NEAR CRETE (06881000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-52	401.49	10-10-73	401.65	10-01-85	401.99
10-01-58	401.58	2-02-75	401.70		
7-11-60	401.52	6-17-77	401.72		
10-01-61	401.52	2-21-78	401.71		
7-26-62	401.46	1-22-79	401.78		
8-16-67	401.66	10-13-82	401.86		
3-10-71	401.65	6-18-84	401.99		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.08	15	0.81	0.000	0.149

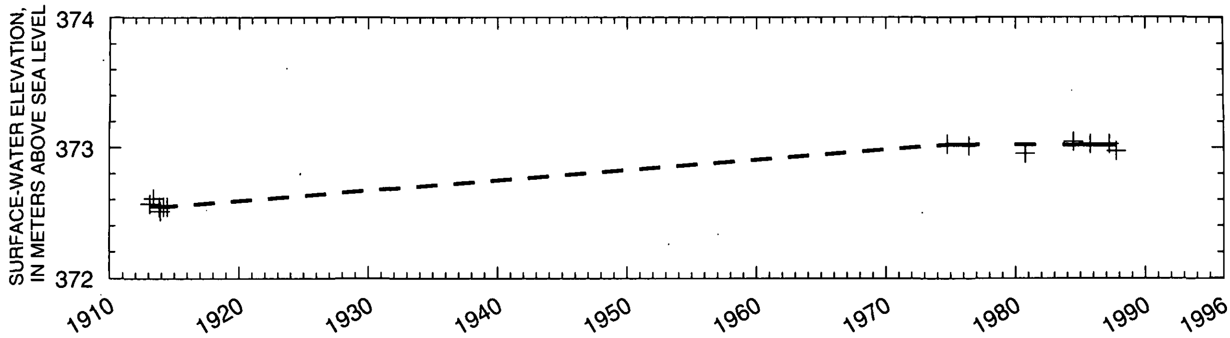
SITE 135—TURKEY CREEK NEAR WILBER (06881200)



Date	SW elev. (m)	Date	SW elev. (m)
7-10-70	404.11	6-20-83	403.99
10-01-70	404.11	10-25-83	404.02
10-18-72	404.05	6-13-84	404.39
10-10-73	404.06	2-20-85	404.33
12-16-75	403.99	2-02-88	404.07
1-23-79	403.99	10-11-89	404.02
5-27-80	403.93	10-13-93	403.89

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	0.45	14	NS	0.551	NA

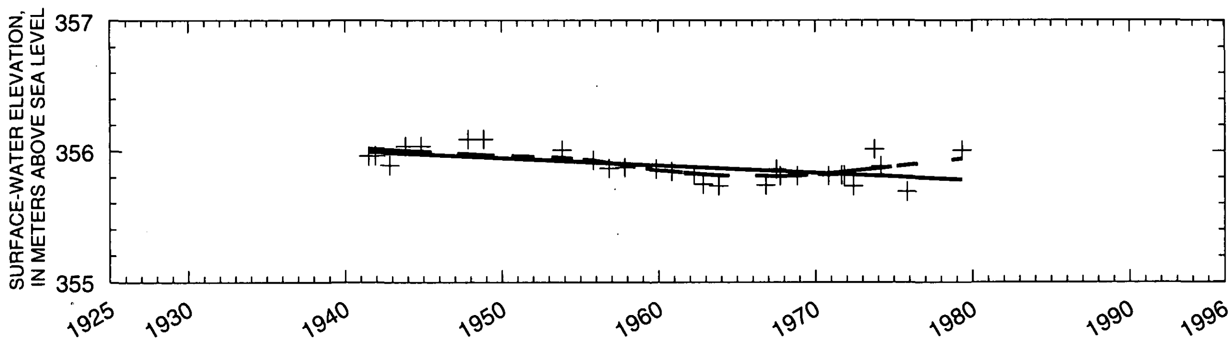
SITE 136—BIG BLUE RIVER AT BEATRICE (06881500)



Date	SW elev. (m)	Date	SW elev. (m)
2- 7-13	372.57	6- 3-76	373.01
5-20-13	372.61	10- 1-80	372.95
11- 5-13	372.54	6-15-84	373.04
12- 6-13	372.51	10- 1-85	373.03
3- 1-14	372.54	3-20-87	373.03
6-16-14	372.54	10- 1-87	372.97
10- 1-74	373.03		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	7.48	13	NS	0.028	NA

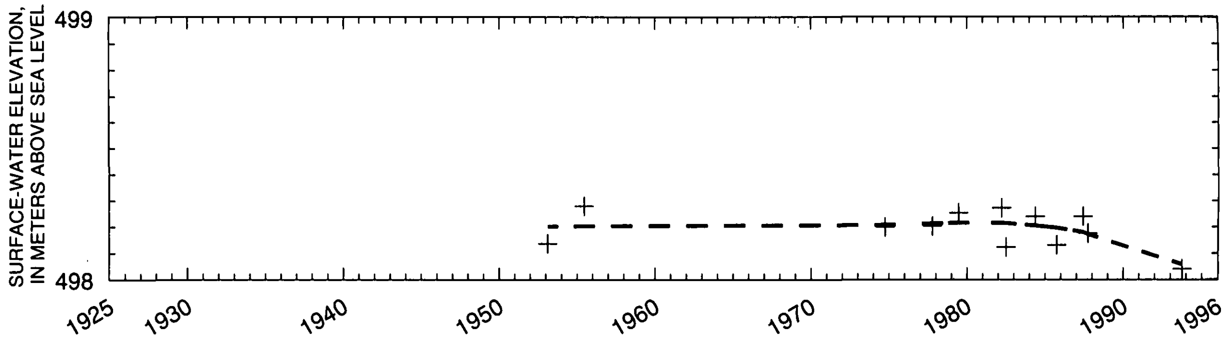
SITE 137—BIG BLUE RIVER AT BARNESTON (06882000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
6-09-41	355.96	10-01-53	356.01	10-01-62	355.75	8-02-71	355.82
11-18-41	355.96	10-01-55	355.93	10-01-63	355.73	10-01-71	355.82
10-01-42	355.89	10-01-56	355.87	10-01-66	355.74	5-03-72	355.73
10-01-43	356.04	10-01-57	355.87	6-12-67	355.86	9-26-73	356.02
10-01-44	356.04	10-01-59	355.86	9-14-67	355.81	2-13-74	355.89
10-01-47	356.09	10-01-60	355.84	10-01-68	355.81	10-01-75	355.69
10-01-48	356.09	3-22-62	355.82	10-29-70	355.81	4-18-79	356.01

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	7.39	28	-0.43	0.002	-0.056

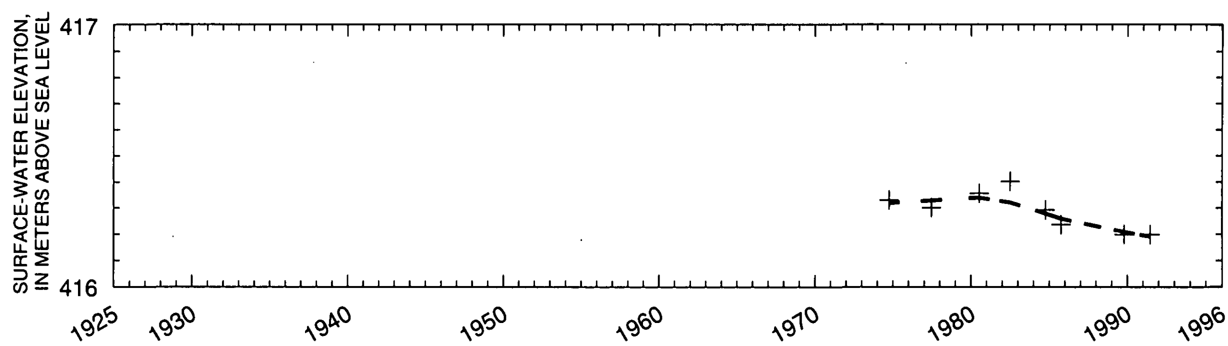
SITE 138—LITTLE BLUE RIVER NEAR DEWEESE (06883000)



Date	SW elev. (m)	Date	SW elev. (m)
2-12-53	498.14	5-18-84	498.24
6-18-55	498.28	10-01-85	498.13
10-01-74	498.20	6-09-87	498.24
10-13-77	498.20	10-01-87	498.18
6-19-79	498.25	10-01-93	498.04
3-24-82	498.27		
7-03-82	498.12		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1.98	12	NS	0.487	NA

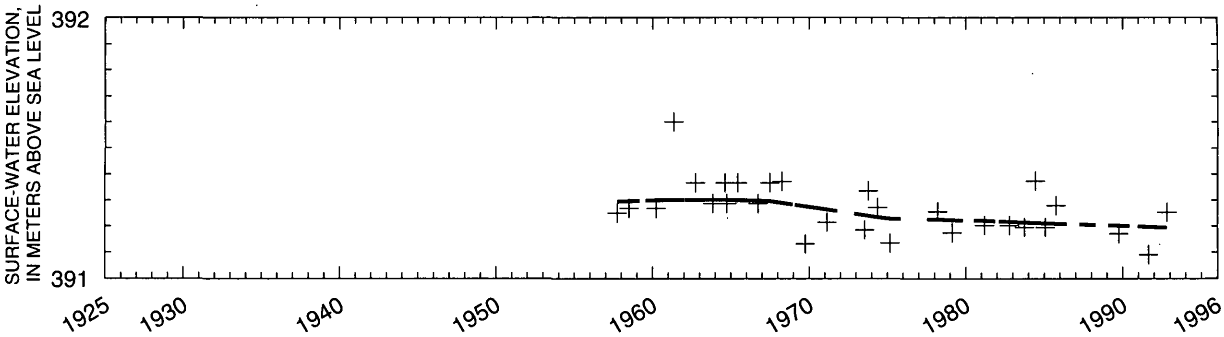
SITE 139—LITTLE BLUE RIVER NEAR ALEXANDRIA (06883570)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-74	416.33	6-18-91	416.20
6-17-77	416.30		
7-08-80	416.36		
6-29-82	416.40		
10-01-84	416.29		
10-01-85	416.24		
10-17-89	416.20		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	2.89	8	NS	0.034	NA

SITE 140—LITTLE BLUE RIVER NEAR FAIRBURY (06884000)



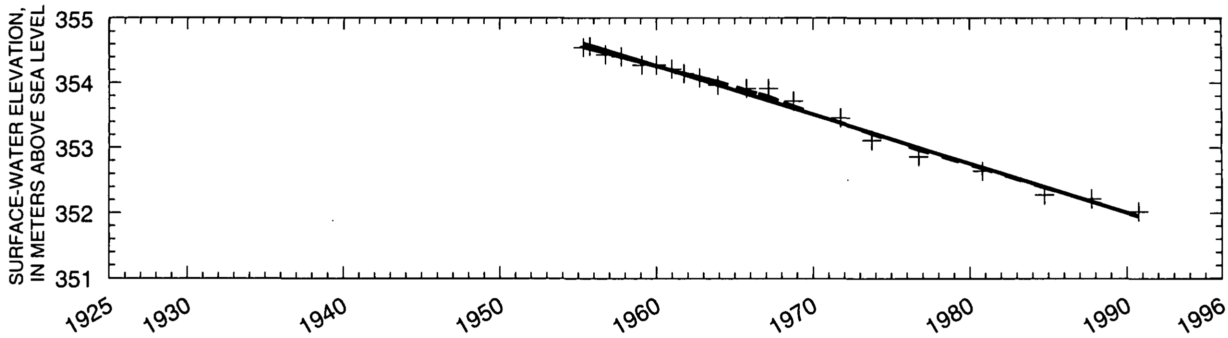
Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-01-57	391.25	10-01-64	391.29	7-20-73	391.18	10-13-82	391.20	10-20-92	391.25
7-03-58	391.27	6-09-65	391.37	10-14-73	391.34	10-01-83	391.20		
3-27-60	391.27	10-01-66	391.29	5-19-74	391.27	6-14-84	391.37		
5-05-61	391.60	6-30-67	391.37	3-02-75	391.13	1-24-85	391.20		
10-01-62	391.37	4-12-68	391.37	3-15-78	391.26	10-01-85	391.28		
11-11-63	391.29	10-01-69	391.13	2-21-79	391.17	10-01-89	391.17		
8-21-64	391.37	2-18-71	391.22	3-10-81	391.20	8-21-91	391.09		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	4.53	29	NS	0.016	NA

APPENDIX O—MISSOURI RIVER SITES

(Explanation of abbreviations and graph lines and symbol are given at front of appendixes.)

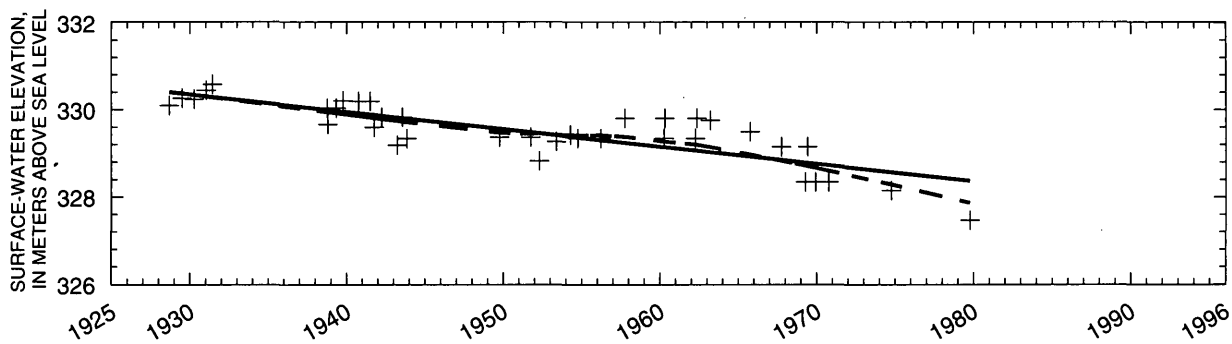
SITE 141—MISSOURI RIVER AT YANKTON, SD (06467500)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
5-01-55	354.55	10-01-61	354.15	10-01-73	353.11
10-01-55	354.57	10-01-62	354.08	10-01-76	352.86
10-01-56	354.44	12-02-63	353.96	10-21-80	352.64
10-01-57	354.40	10-01-65	353.91	10-01-84	352.28
1-27-59	354.28	2-27-67	353.91	10-01-87	352.22
12-31-59	354.28	10-01-68	353.71	10-01-90	352.02
12-24-60	354.21	10-01-71	353.46		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	787	20	-0.98	0.000	-0.752

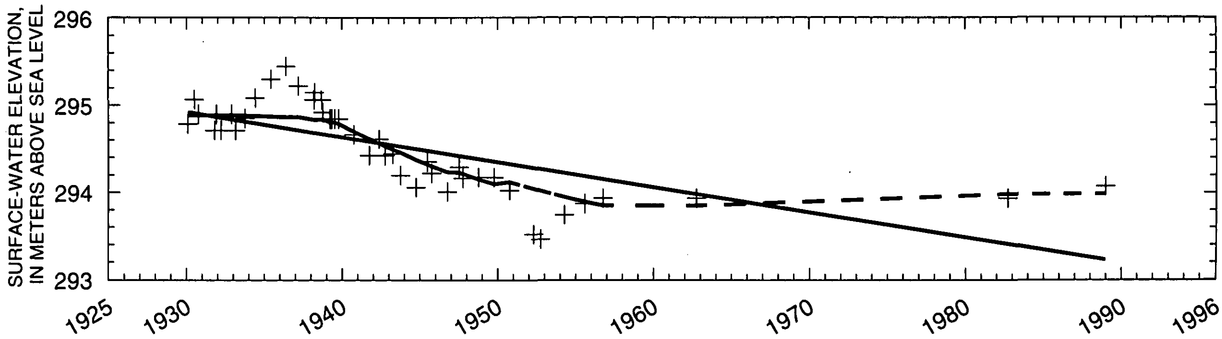
SITE 142—MISSOURI RIVER AT SIOUX CITY, IA (06486000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
9-02-28	330.09	10-09-39	330.20	10-01-49	329.37	3-30-60	329.34	6-01-69	329.15
6-27-29	330.26	10-01-40	330.19	10-01-51	329.37	4-19-60	329.80	12-01-69	328.34
4-01-30	330.24	6-28-41	330.19	4-15-52	328.82	3-29-62	329.34	10-01-70	328.34
1-11-31	330.44	10-01-41	329.59	5-18-53	329.27	5- 5-62	329.80	10-01-74	328.15
6-01-31	330.58	3-25-42	329.83	4-12-54	329.42	3-17-63	329.75	10-01-79	327.46
10-01-38	330.03	3-24-43	329.19	10-01-54	329.34	10-01-65	329.49		
10-17-38	329.66	7-20-43	329.83	3-15-56	329.34	10-01-67	329.15		
4-26-39	330.03	11-01-43	329.34	10-01-57	329.80	4-05-69	328.34		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	847	37	-0.61	0.000	-0.397

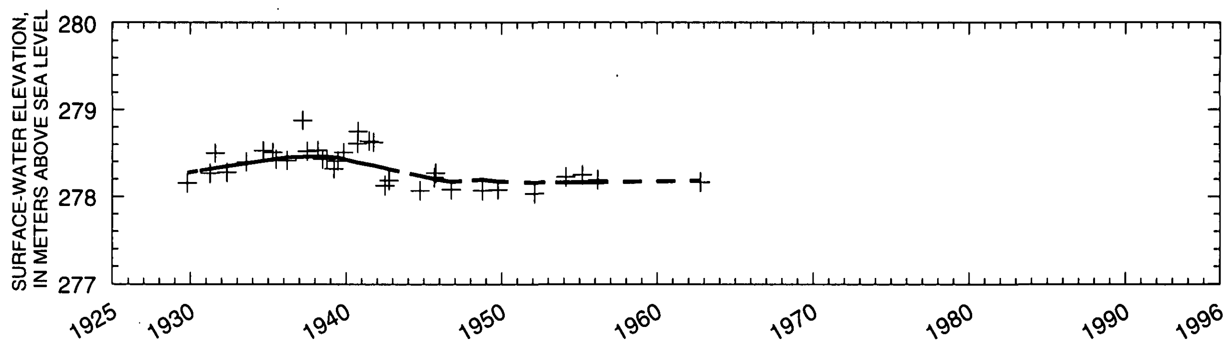
SITE 143—MISSOURI RIVER AT OMAHA (06610000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
2-01-30	294.79	6-01-34	295.08	4-07-39	294.84	10-01-43	294.20	10-01-50	294.02
7-01-30	295.07	6-04-35	295.30	5-02-39	294.84	10-01-44	294.06	4-19-52	293.52
10-01-30	294.90	5-24-36	295.45	7-08-39	294.84	6-17-45	294.35	10-01-52	293.46
10-19-31	294.71	3-13-37	295.22	10-09-39	294.84	10-01-45	294.22	4-08-54	293.74
12-01-31	294.90	3-10-38	295.06	10-01-40	294.66	10-01-46	294.01	7-31-55	293.87
3-24-32	294.71	4-01-38	295.15	10-01-41	294.42	7-03-47	294.29	10-01-56	293.93
11-16-32	294.90	9-06-38	295.06	5-13-42	294.61	10-01-47	294.16	10-01-62	293.93
2-27-33	294.71	10-01-38	294.92	10-01-42	294.42	10-01-48	294.17	10-01-82	293.93
10-01-33	294.85	3-15-39	294.84	4-01-43	294.44	10-01-49	294.17	1-01-89	294.07

Gradation trend analysis:	Median discharge (m³/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	918	45	-0.68	0.000	-0.288

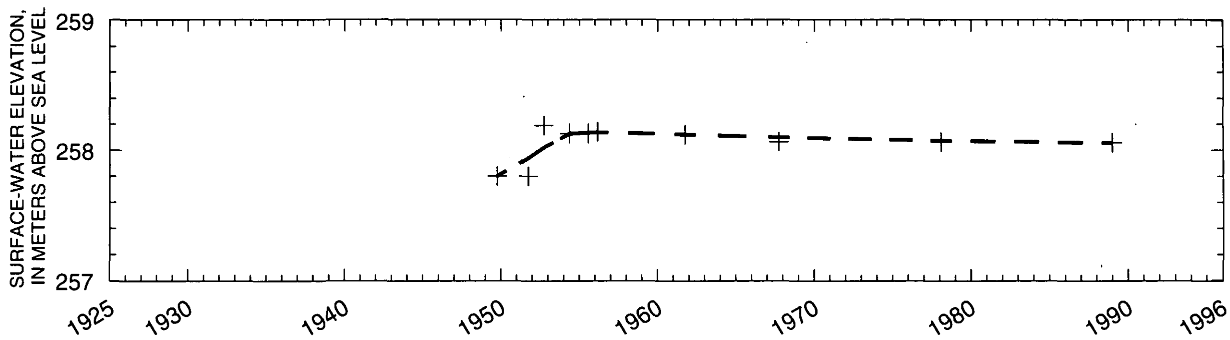
SITE 144—MISSOURI RIVER AT NEBRASKA CITY (06807000)



Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)	Date	SW elev. (m)
10-16-29	278.15	6-26-35	278.43	3-17-39	278.32	6-26-42	278.12	10-01-49	278.08
4-01-31	278.26	3-08-36	278.41	6-15-39	278.41	10-01-42	278.18	2-09-52	278.03
8-01-31	278.50	3-08-37	278.88	11-01-39	278.51	10-01-44	278.07	2-10-54	278.22
5-01-32	278.28	6-25-37	278.52	9-22-40	278.61	8-29-45	278.22	3-04-55	278.25
8-01-33	278.40	3-04-38	278.53	10-01-40	278.75	10-01-45	278.27	2-27-56	278.19
9-01-34	278.53	6-28-38	278.43	6-20-41	278.64	10-01-46	278.08	10-01-62	278.16
4-12-35	278.51	10-01-38	278.43	10-01-41	278.63	10-01-48	278.07		

Gradation trend analysis:	Median discharge (m³/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1060	34	NS	0.019	NA

SITE 145—MISSOURI RIVER AT RULO (06813500)



Date	SW elev. (m)	Date	SW elev. (m)
10-01-49	257.80	10-01-67	258.07
10-01-51	257.80	2-02-78	258.07
10-01-52	258.19	1-01-89	258.06
5-18-54	258.13		
8-01-55	258.13		
3-02-56	258.14		
10-01-61	258.12		

Gradation trend analysis:	Median discharge (m^3/s)	Number of observations	Kendall's tau	p-value	Trend slope (m/decade)
	1110	10	NS	0.587	NA

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