Kiawah Island
2006 East End Beach Restoration Project
Survey Report No. 19

2025
MONITORING REPORT

Prepared for

Town of Kiawah Island
Kiawah Island, South Carolina

COASTAL SCIENCE & ENGINEERING

CSE

BEACH MONITORING PROGRAM
SURVEY REPORT NO 19

Kiawah Island – South Carolina

Prepared for:

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[CSE 2597–YR2]
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COVER PHOTO: Oblique aerial image of the Ocean Course and east end marshes in December 2025. The ongoing shoal bypass event has affected much of the area between the 2015 project site and the Ocean Course clubhouse. A pond created during the 2015 project is now filled with sediment, and a pair of drainage channels has opened between that pond and the incoming shoal.

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SYNOPSIS

This report is the 19th in a series of annual monitoring reports initiated following the 2006 East End beach restoration project. It contains survey results from the oceanfront beach along Kiawah Island (SC), with a particular focus on the eastern third of the island around the Ocean Course and Stono Inlet. There, shoals and channels of Stono Inlet can create episodic erosional issues and deserve special attention. Special attention is also given to areas that have traditionally had narrower setbacks and saw significant storm-induced erosion in recent years.

The Town of Kiawah Island has completed two projects at the island's East End to address localized erosion and facilitate the flushing of a developing lagoon adjacent to the Ocean Course. The 2006 project moved about 550,000 cubic yards (cy) of sand and restored a wide, dry-sand beach in front of the Ocean Course while relocating a channel. By 2014, the flushing channel was again migrating toward the Ocean Course. Another channel relocation event was completed in the spring of 2015, involving the movement of a total of 100,000 cy. Each project occurred in designated critical habitat for the piping plover and incorporated methods to reduce impacts and promote suitable habitat formation for protected species.

CSE tracks conditions along sections of the island ('reaches' numbered 1 to 6) by measuring sand volumes in the dunes, the visible beach, and the underwater zone. Between December 2024 and December 2025, changes observed along a significant portion of the island were driven by sand spreading related to a shoal bypass event at the East End. The erosion observed along the Lagoon Reach (#5) and accretion observed along the Ocean Course Reach (#4) represent approximately two-thirds of the total volume changes observed between December 2024 and December 2025.

Along the entire shoreline from Captain Sams Inlet to Stono Inlet, the island gained ~178,101 cy (3.1 cy/ft) of sand from December 2024 to December 2025 (Table A). The East End Lagoon Reach accounts for most of the losses (~116,740 cy or –14.6 cy/ft). West Beach was the only other reach losing sand, with erosion of ~26,250 cy (–2.2 cy/ft). The Turtle Point and Ocean Course reaches gained a total of ~310,150 cy (32.1 cy/ft) between December 2024 and December 2025. The inlet reaches were relatively stable, with the Stono Inlet Reach gaining 1.1 cy/ft (6,600 cy) and the Kiawah Spit Reach gaining 0.5 cy/ft (4,400 cy).

Long-term trends in volume changes for each reach are provided in Table A. Shoal bypass events triggered volume increases along the Lagoon Reach between 2007 and 2010, and from 2019 through 2023. Those two events delivered nearly 2.5 million cy of sand to the East End, the majority of which has migrated south and west to offset erosional losses experienced along central and western portions of the island.

These data support the long-held observation that Kiawah Island has a positive sand budget, unlike many other beach communities. Periodic shoal bypasses have delivered millions of yards of beach sand to the East End every ten years or so since studies began in the 1970s (see Section 2.2). In between these shoal bypass events, sand spreads downcoast toward Captain Sams Inlet and augments existing beach volumes along the way.

That said, the island is still susceptible to periodic erosional episodes, often affected by accretion and erosion cycles at Stono Inlet. Figure A shows the change in dune position by monitoring station (Line Number) since August 2007. Positive values indicate a more seaward position of the dune crest due to accretion, whereas negative values indicate a more landward position due to erosion. The transition from strong oscillations between erosion and accretion of the dune in the east (toward the Beach Club) to lower-magnitude changes in the west (toward Eugenia Ave and Beachwalker Park) is a characteristic feature of long-term beach volume changes on barrier islands like Kiawah Island.

Figure B shows the average unit sand volumes (to –10 ft NAVD) by reach from 1999 or 2006 to 2025. The increases and decreases in volume measured along the Lagoon Reach reflect periodic shoal bypass events, while each reach moving west from that area has experienced accretion at progressively lower rates. This signature mirrors that shown in Figure A, wherein volumetric changes are the greatest along the eastern portion of the island affected by Stono Inlet and its shoals. The absolute value of beach volume changes tends to decrease moving west, and is at a minimum along West Beach and Kiawah Spit.

Despite a series of storm impacts from ~2016 through 2020, around half of the island has exhibited stable or slightly accreting beach conditions since 2012, when CSE expanded its survey network from ~36 profiles to more than 60 profiles. Erosional hotspots include the outer beach barrier along the East End, approximately 1 mile of beach centered on the Beach Club, and the southern-most ~2 miles of the island west of Eugenia Avenue. Fortunately, building line offsets in the vicinity of the East End and Beach Club offer a protective buffer seaward of developed parcels. At Eugenia, this buffer is much narrower, and the Town as well as private property owners may consider evaluating alternatives for proactive management of this area, including short and long-term planning and post-storm response.

TABLE A. Beach volumes, along with respective changes for applicable time periods, for each reach and the entire island between 2007 and 2025. Volumes are to −10 ft NAVD. Reach boundaries are described in the report. Red indicates erosion since the prior survey. Average unit volumes for all reaches are weighted by their respective reach lengths. Annualized unit volumes (shown in red/blue coloration) are a normalized measure of change across all reaches. The color scheme is based on the observed percentile change, with a deep red cell indicating the 98th percentile of losses and a deep blue cell indicating the 98th percentile of gains. White cells experienced near-zero change.

Reach Total Volume (cy)

Reach	Name	Length	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1	Kiawah Spit	8,820	1,461,886		1,915,981	1,914,648	1,968,764	2,038,285	2,011,136	2,006,570	2,011,764	2,005,216	1,958,474	1,877,619	1,858,245	1,812,100	1,855,365	1,878,947	1,842,313	1,821,206	1,813,315	1,786,300	1,790,650
2	West Beach	11,798	2,925,119		3,018,972	2,973,269	3,002,842	3,016,726	3,023,391	3,143,512	3,200,438	3,247,900	3,246,474	3,109,992	3,123,811	3,186,466	3,153,949	3,204,546	3,190,781	3,207,656	3,221,570	3,158,775	3,132,521
3	Turtle Point	13,614	3,119,193		3,768,036	3,711,347	3,791,886	3,780,710	3,783,778	3,973,563	4,103,395	4,242,815	4,328,658	4,133,108	4,083,240	4,087,595	4,041,965	4,019,325	4,035,192	4,068,888	4,149,913	4,059,050	4,120,532
4	Ocean Course	9,000		2,612,857	2,726,994	2,659,256	2,755,159	2,769,550	2,874,610	3,171,256	3,273,101	3,405,482	3,467,750	3,431,867	3,447,024	3,560,686	3,577,507	3,486,623	3,457,580	3,458,683	3,586,080	3,733,656	3,982,325
5	Lagoon	8,000		6,559,380	6,462,016	6,840,138	7,055,611	7,419,125	7,222,197	7,071,272	6,946,031	6,993,814	6,787,731	6,325,250	6,139,954	5,939,621	5,936,206	6,198,619	6,605,054	7,336,571	7,435,847	6,901,983	6,785,241
6	Stono Inlet	6,000		1,464,695	1,460,076	1,447,219	1,406,546	1,422,719	1,427,296	1,448,756	1,408,636	1,328,992	1,248,369	1,052,076	966,215	845,351	707,753	715,353	706,907	680,859	638,772	598,701	605,298
1-6	**All**	**57,232**			**19,352,074**	**19,545,877**	**19,980,808**	**20,447,115**	**20,342,409**	**20,814,928**	**20,943,365**	**21,224,219**	**21,037,455**	**19,929,912**	**19,618,488**	**19,431,820**	**19,272,747**	**19,503,413**	**19,837,826**	**20,573,863**	**20,845,497**	**20,238,466**	**20,416,567**

Reach Unit Volume (cy/ft)

Reach	Name	Length	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1	Kiawah Spit	8,820	165.7		217.2	217.1	223.2	231.1	228.0	227.5	228.1	227.3	222.0	212.9	210.7	205.5	210.4	213.0	208.9	206.5	205.6	202.5	203.0
2	West Beach	11,798	247.9		255.9	252.0	254.5	255.7	256.3	266.4	271.3	275.3	275.2	263.6	264.8	270.1	267.3	271.6	270.5	271.9	273.1	267.7	265.5
3	Turtle Point	13,614	229.1		276.8	272.6	278.5	277.7	277.9	291.9	301.4	311.7	318.0	303.6	299.9	300.2	296.9	295.2	296.4	298.9	304.8	298.2	302.7
4	Ocean Course	9,000		290.3	303.0	295.5	306.1	307.7	319.4	352.4	363.7	378.4	385.3	381.3	383.0	395.6	397.5	387.4	384.2	384.3	398.5	414.9	442.5
5	Lagoon	8,000		819.9	807.8	855.0	882.0	927.4	902.8	883.9	868.3	874.2	848.5	790.7	767.5	742.5	742.0	774.8	825.6	917.1	929.5	862.7	848.2
6	Stono Inlet	6,000		244.1	243.3	241.2	234.4	237.1	237.9	241.5	234.8	221.5	208.1	175.3	161.0	140.9	118.0	119.2	117.8	113.5	106.5	99.8	100.9
1-6	**All**	**57,232**			**338.1**	**341.5**	**349.1**	**357.3**	**355.4**	**363.7**	**365.9**	**370.8**	**367.6**	**348.2**	**342.8**	**339.5**	**336.7**	**340.8**	**346.6**	**359.5**	**364.2**	**353.6**	**356.7**

Reach Volume Change Since Previous (cy)

Reach	Name	Length	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1	Kiawah Spit	8,820				-1,333	54,116	69,521	27,149	-4,566	5,195	-6,549	-46,742	-80,856	-19,374	-46,145	43,265	23,581	-36,634	-21,107	-7,890	-27,016	4,350
2	West Beach	11,798				-45,703	**29,573**	**13,884**	**6,665**	**120,120**	**56,926**	**47,462**	**-1,426**	-136,481	13,818	62,656	-32,517	50,598	-13,766	**16,875**	**13,914**	-62,795	-26,254
3	Turtle Point	13,614				-56,689	**80,539**	**-11,176**	**3,068**	**189,784**	**129,833**	**139,419**	**85,843**	-195,550	-49,869	4,356	-45,630	-22,641	15,867	**33,697**	**81,024**	-90,862	**61,482**
4	Ocean Course	9,000			114,136	-67,738	**95,903**	**14,390**	**105,061**	**296,646**	**101,845**	**132,381**	**62,268**	-35,883	15,157	113,662	16,822	-90,884	-29,044	**1,103**	**127,398**	**147,576**	**248,669**
5	Lagoon	8,000			-97,364	**378,122**	**215,473**	**363,514**	-196,928	-150,924	-125,241	47,784	-206,084	-462,481	-185,296	-200,333	-3,415	**262,413**	**406,434**	**731,518**	**99,276**	-533,864	-116,742
6	Stono Inlet	6,000			-4,620	-12,857	-40,673	16,174	4,577	21,459	-40,119	-79,644	-80,624	-196,292	-85,861	-120,864	-137,598	7,600	-8,446	-26,048	-42,088	-40,071	6,597
1-6	**All**	**57,232**				**193,803**	**434,931**	**466,306**	**-104,706**	**472,519**	**128,437**	**280,854**	**-186,764**	**-1,107,543**	**-311,424**	**-186,668**	**-159,073**	**230,666**	**334,412**	**736,037**	**271,634**	**-607,031**	**178,101**

Reach Unit Volume Change Since Previous (cy/ft)

Reach	Name	Length	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1	Kiawah Spit	8,820				-0.2	6.1	7.9	-3.1	-0.5	0.6	-0.7	-5.3	-9.2	-2.2	-5.2	4.9	2.7	-4.2	-2.4	-0.9	-3.1	0.5
2	West Beach	11,798				-3.9	2.5	1.2	0.6	10.2	4.8	4.0	-0.1	-11.6	1.2	5.3	-2.8	4.3	-1.2	1.4	1.2	-5.3	-2.2
3	Turtle Point	13,614				-4.2	5.9	-0.8	0.2	13.9	9.5	10.2	6.3	-14.4	-3.7	0.3	-3.4	-1.7	1.2	2.5	6.0	-6.7	4.5
4	Ocean Course	9,000			12.7	-7.5	10.7	1.6	11.7	33.0	11.3	14.7	6.9	-4.0	1.7	12.6	1.9	-10.1	-3.2	0.1	14.2	16.4	27.6
5	Lagoon	8,000			-12.2	47.3	26.9	45.4	-24.6	-18.9	-15.7	6.0	-25.8	-57.8	-23.2	-25.0	-0.4	32.8	50.8	91.4	12.4	-66.7	-14.6
6	Stono Inlet	6,000			-0.8	-2.1	-6.8	2.7	0.8	3.6	-6.7	-13.3	-13.4	-32.7	-14.3	-20.1	-22.9	1.3	-1.4	-4.3	-7.0	-6.7	1.1
1-6	**All**	**57,232**				**3.4**	**7.6**	**8.1**	**-1.8**	**8.3**	**2.2**	**4.9**	**-3.3**	**-19.4**	**-5.4**	**-3.3**	**-2.8**	**4.0**	**5.8**	**12.9**	**4.7**	**-10.6**	**3.1**

Annualized Reach Unit Volume Change Since Previous (cy/ft/yr)

Reach	Name	Length	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1	Kiawah Spit	8,820				-0.1	7.4	6.8	-3.1	-0.5	0.6	-0.7	-4.9	-7.8	-2.6	-4.6	5.7	2.6	-3.7	-2.7	-0.9	-2.7	0.5
2	West Beach	11,798				-3.3	3.0	1.0	0.6	10.2	4.8	4.0	-0.1	9.9	1.4	4.7	-3.2	4.2	-1.0	1.6	1.2	-4.7	-2.3
3	Turtle Point	13,614				-3.6	7.1	-0.7	0.2	13.9	9.5	10.3	5.8	-12.3	-4.4	0.3	-3.9	-1.6	1.0	2.8	6.3	-5.9	4.6
4	Ocean Course	9,000			13.9	-6.4	12.8	1.4	11.7	32.9	11.3	14.8	6.4	-3.4	2.0	11.2	2.2	-9.9	-2.9	0.1	14.9	14.6	28.3
5	Lagoon	8,000			-13.3	40.4	32.3	38.9	-24.6	-18.8	-15.6	6.0	[illegible]	[illegible]	[illegible]	[illegible]	-0.5	32.2	45.7	103.0	13.1	[illegible]	-15.0
6	Stono Inlet	6,000			-0.8	-1.8	-8.1	2.3	0.8	3.6	-6.7	-13.3	-12.4	[illegible]	-17.2	-17.8	[illegible]	1.2	-1.3	-4.9	-7.4	-5.9	1.1
1-6	**All**	**57,232**				**11.1**	**14.1**	**14.7**	**-3.8**	**7.2**	**-2.8**	**4.4**	**-9.0**	[illegible]	**-13.4**	**-8.0**	**-6.3**	**7.6**	**14.4**	**34.6**	**8.4**	**-16.5**	**6.2**

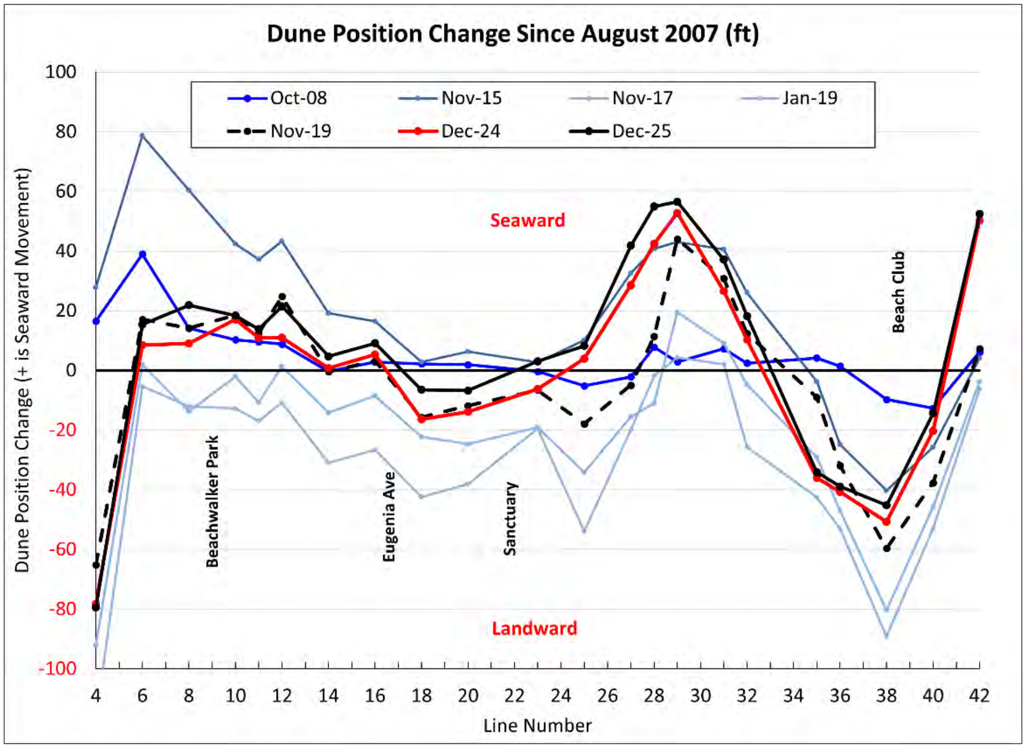

FIGURE A. Yearly dune position changes since August 2007 (negative values indicate erosion of the dune since that survey). Hurricanes *Joaquin* (2015), *Matthew* (2016), *Irma* (2017), *Florence* (2018), *Michael* (2018), and *Dorian* (2019) all resulted in foredune erosion along Kiawah Island. Conditions since 2019 have stabilized compared to the relatively rough period (compare the dashed black line—November 2019—with the solid black line—December 2025).

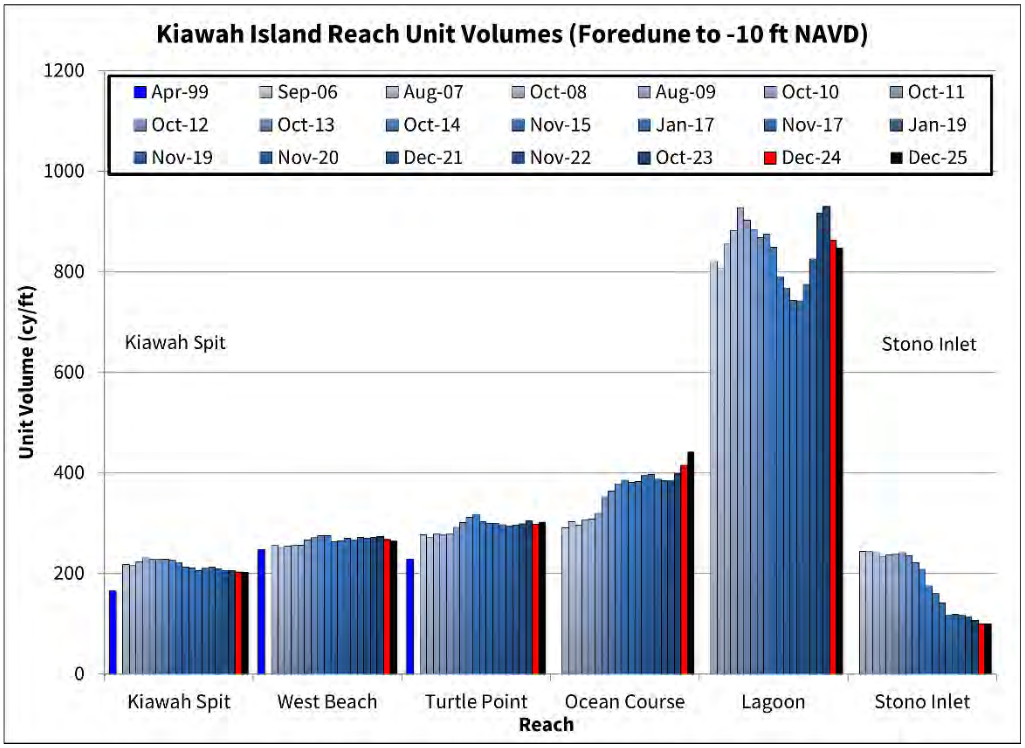

FIGURE B. Unit volumes as measured by reach since April 1999 (September 2006 along the Ocean Course and East End). As of December 2025, much of the island had more sand on the beach above –10 ft NAVD than in September 2006 (April 1999 for the three westernmost reaches—Turtle Point, West Beach, and Kiawah Spit). The decrease in volumes measured along Reach 5 (Lagoon) during the December 2024 to December 2025 surveys reflect sand spreading alongshore from the attached shoal, which is expected to continue delivering sand to adjacent reaches for the next couple years.

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1.0 INTRODUCTION

This report is part of a series of annual beach monitoring reports initiated following the 2006 East End restoration project (see CSE 2005, 2007). The Town of Kiawah Island (SC) sponsors annual surveys of the beach to determine rates and directions of sand movement within the project area and the remainder of the island. This nineteenth report of the series follows over a dozen shoreline erosion reports prepared by Research Planning Institute (RPI) and Coastal Science & Engineering (CSE) for Kiawah Island since the 1980s (eg – Kana et al 1983, CSE 1999). Annual post-project surveys have been conducted in the fall of every year between 2007 and 2025, in addition to periodic post-storm surveys in January 2017 (post-*Matthew*) and January 2019 (post–*Florence* and *Michael*). The present survey was completed in December 2025 to provide a beach condition assessment since the previous monitoring survey conducted in December 2024.

The purpose of annual beach monitoring reports is to compare current conditions in beach volumes along Kiawah Island to past conditions. To do so, survey data are collected along the entire island from Stono River Inlet to Captain Sams Inlet to document volume changes. Profile lines run from the landward side of the seaward-most dune to at least 2,500 feet (ft) offshore. Volume calculations are made within boundaries established using depths and range from 1,000 ft to 2,500 ft offshore. Most volume calculations represent the changes in sand volume above ~–10 ft NAVD* elevation. A positive change indicates accretion, while a negative change indicates erosion. Over years, volumetric changes can be used to infer sediment transport patterns along the shoreline. This information is used to identify erosion hot spots and predict future areas of concern before hazardous situations arise.

The scope of work for the annual monitoring effort includes the following:

- Ground surveys of the dunes, beach, and inshore zone
- Oblique aerial photography
- Data analysis and production of a technical report describing beach volume changes

The next section of this report briefly describes Kiawah Island and its historical shoreline changes. A summary of the methods used during surveying and data analysis follows in Section 3. Section 4 presents the survey results, while Section 5 provides a meteorological and sea level summary to associate beach volume changes with specific weather events or water level increases. Section 6 discusses CSE's findings and recommendations for this year.

**NAVD – North American Vertical Datum of 1988, which is approximately 0.25 ft above present mean sea level (MSL)(https://tidesandcurrents.noaa.gov/stationhome.html?id=8666467). The datum provides a fixed reference plane for setting grades and 1st-floor elevations in the coastal zone regardless of tide range.*

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2.0 SETTING AND HISTORY

Kiawah Island is a ~10-mile-long barrier island situated ~10–15 miles southeast of Charleston, SC (Fig 2.1). The adjacent Stono Inlet has historically provided enough sand so that beach erosion occurs in minor, localized hotspots as sand migrates down the beach from Stono Inlet toward the west. Due to the long-term healthy sand supply, the island contains diverse habitats including marshes, maritime forests, and dunes. The diversity of native habitats and an adaptive beachfront management strategy make Kiawah one of the healthiest barrier islands in South Carolina.

Large quantities of sediment migrate onto the island's eastern end from Stono Inlet, providing sand that sustains dunes and beaches along the entire shorefront (Fig 2.2). This sand supply and the foresight of the island's developers in understanding the island's processes and landforms (see Hayes et al 1975, Hayes 1977) make Kiawah an excellent example of beachfront development and an aesthetically unique community along the South Carolina coast. The role of Stono Inlet in shaping the beach along Kiawah Island is explored in greater detail in Section 2.2.

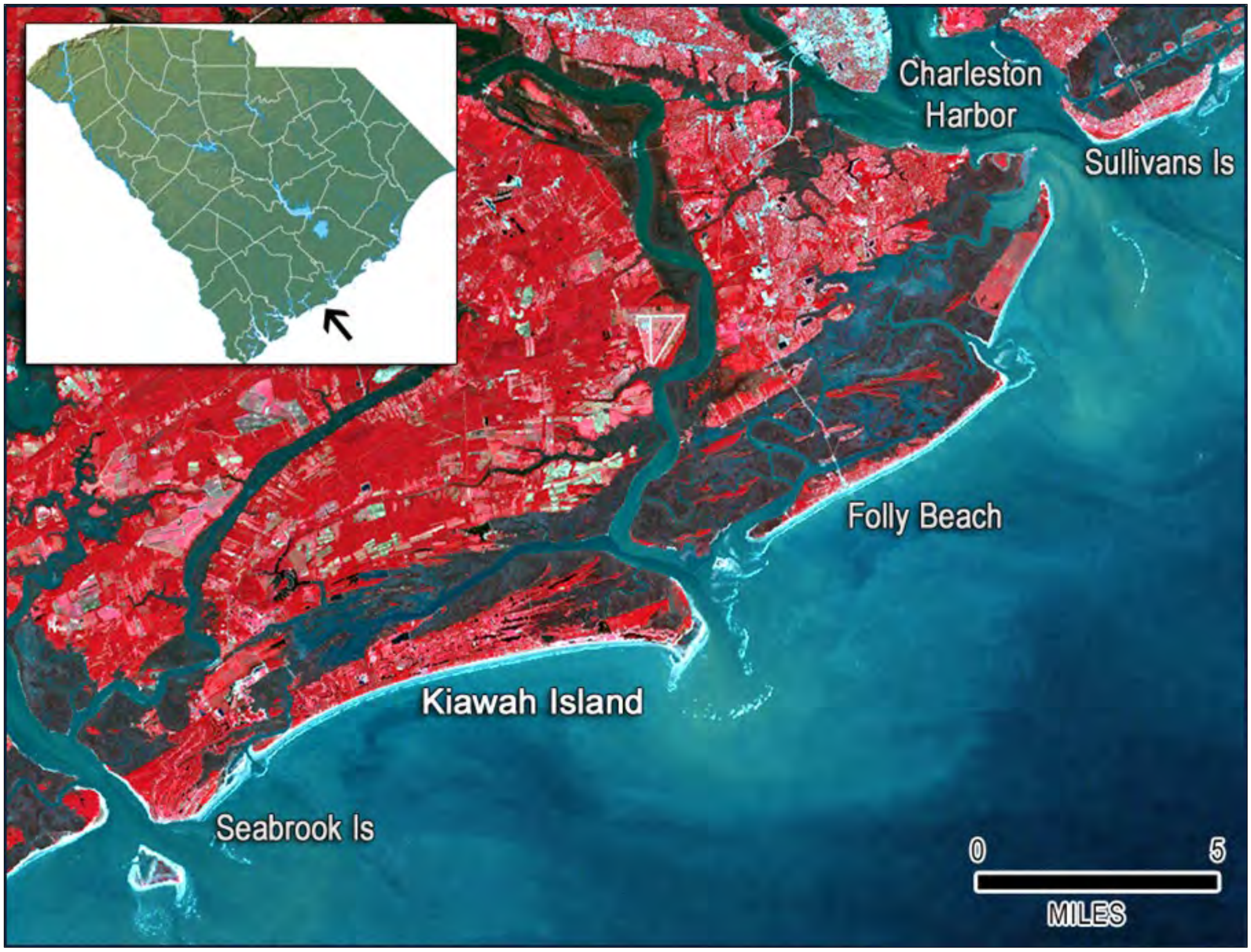


FIGURE 2.1. South Carolina coastline from Seabrook Island to Charleston Harbor. [Circa 1999 image courtesy Research Planning Inc and SCDNR].

FIGURE 2.2. The East End of Kiawah Island in December 2025. A large shoal has delivered ~1.5 million cy of sand to the East End since ~2019. Measured volume increases as far west as the Beach Club reflect the downcoast spreading of this sand over the last several years.

2.1 Geologic History of Kiawah Island

Kiawah Island was first studied in detail when Professor Miles O. Hayes and colleagues at the University of South Carolina initiated field investigations of the island's geologic history in the 1970s. Hayes described the geologic evolution of 'drumstick' barrier islands along South Carolina as well as other 'mixed-energy' coasts like the Gulf of Alaska and the Netherlands using Kiawah as a prototype (see Hayes 1977, Hayes 1994, Hayes and Michel 2008, Hayes and FitzGerald 2013, FitzGerald et al 2018).

The island is bound by Stono Inlet on the east and Captain Sams Inlet on the west (see Fig 2.1). The eastern end episodically gains sand through shoal bypassing events (Williams & Kana 1986, Gaudiano 1998), and the sand eventually spreads to downcoast portions of the island toward Kiawah Spit. From there, smaller bypassing events transport the sand across Captain Sams Inlet toward Seabrook Island. The processes controlling sand movement along the island are discussed in greater detail in CSE (1999).

The oldest part of the island, adjacent to the Kiawah River, is at least ~4,000 years old (Moslow 1980). The most dynamic portion of the island is the northeastern end, where shoal bypassing and channel migration of the Stono River Inlet have caused the island to advance seaward by thousands of feet since the mid-19th century. Such significant changes in shoreline position can have a cascading effect on nearshore wave patterns and may have influenced persistent erosion around Eugenia Avenue in the 1980s and 1990s (see CSE 1999).

2.2 Previous Shoreline Studies

The first shoreline assessment of Kiawah Island was performed by Hayes and his students in the 1970s (Hayes et al 1975). Based on the island's geomorphology, Hayes identified five zones along the beach and recommended two middle zones (West Beach and Turtle Point) as suitable for development landward of the second dune ridge (Figs 2.3 and 2.4). Early development on the island was based on the findings of these studies, and it became one of the first localities in the state to implement rigorous setback lines.

From 1981 to 1987, regular monitoring efforts were conducted by RPI and CSE (cf – Sexton et al 1981, Williams & Kana 1987). In July 1988, the Beach Management Act (BMA) of South Carolina was passed, and by 1989, the State took over management of beach monitoring programs. In 1994, CSE was again contracted by the Town of Kiawah Island and conducted monitoring through 1999. From 1981 to 1999, Kiawah Island either gained sand or remained stable. Isolated erosion did occur, but was generally small in magnitude.

The West Beach area (encompassing Windswept Villas, Mariners Watch Villas, Eugenia Avenue, West Beach Village, and Kiawah Inn) remained stable, losing only 0.21 cubic yards per foot per year (cy/ft/yr*) from 1983 until 1999 (with episodic accretion and erosion events). All other areas showed gains in sand volume between 1983 and 1999. Details of volume change from 1983 to 1999 are provided in CSE (1999).

* *CSE's beach monitoring surveys emphasize volumetric changes rather than linear movement of the shoreline, because quantities of interest are the amounts of sand gained or lost across the entire beach zone. By breaking the measurements down on a per-foot, per-year basis, changes from one place to another are easy to compare and track over time. Along Kiawah Island, loss of ~1.0 cy/ft/yr is equivalent to ~1.5 ft of beach/dune recession.*

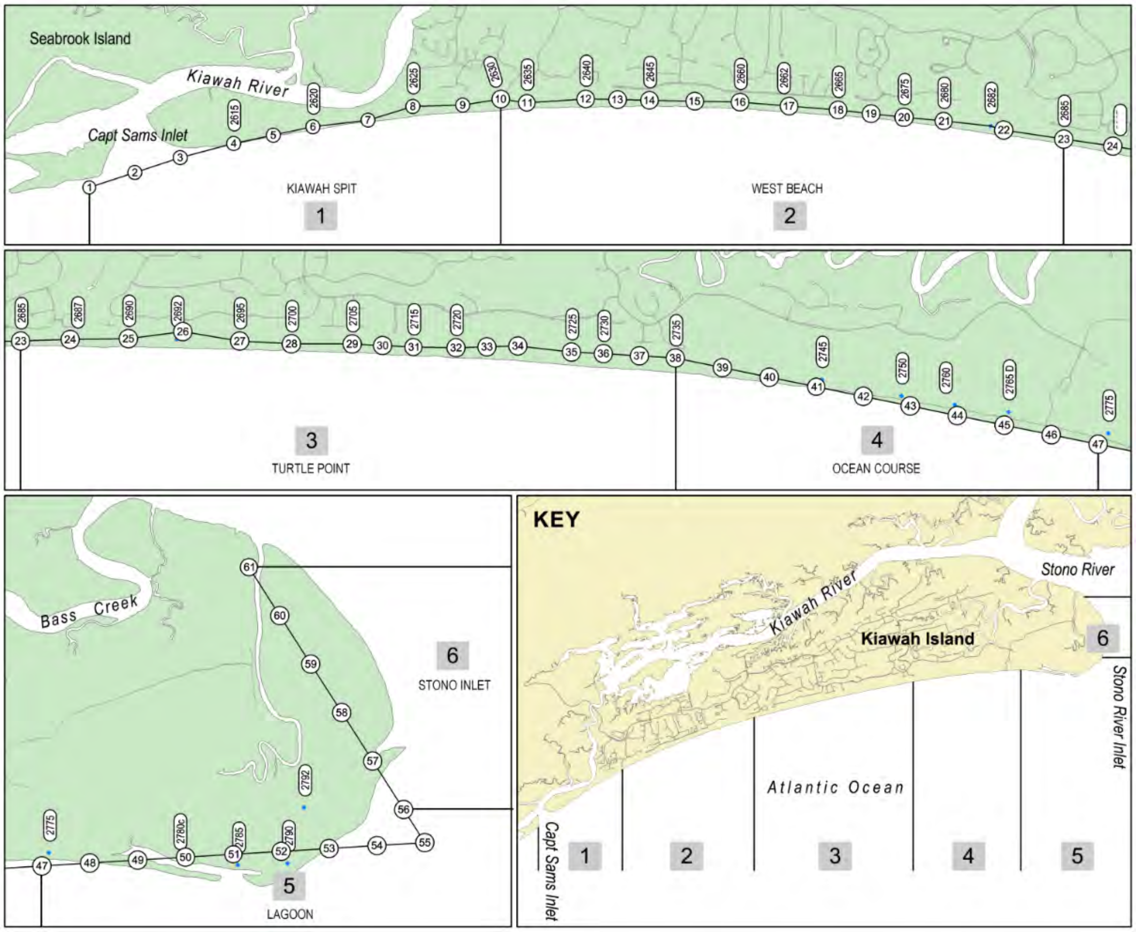


FIGURE 2.3. General location of beach stations and reaches monitored for the present report. Line numbers are shown in circles. State surveys (c/o SCDES-BCM) are the 2700s profile markers.

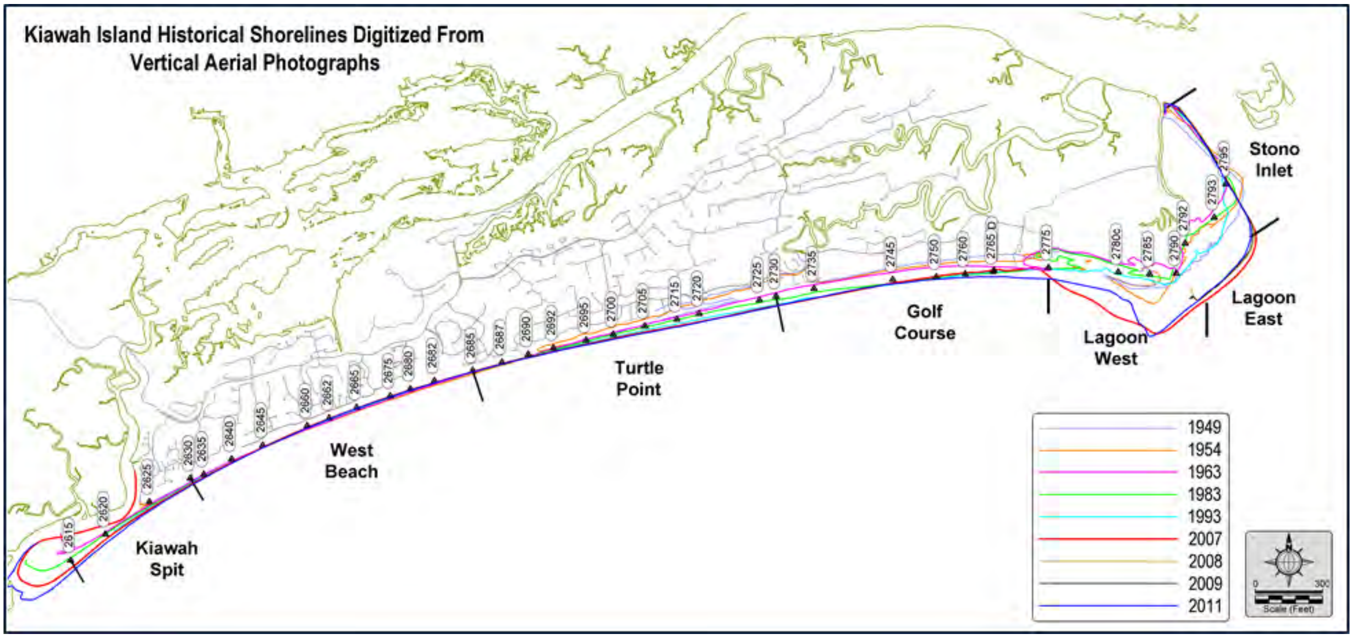


FIGURE 2.4. Historical shorelines (seaward vegetation lines). West Beach has been slightly erosional whereas all other reaches have been accretional since 1949. [Updated from CSE 1995]

2.2.1 Stono Inlet – Kiawah Island's Sand Source

Sand from Stono Inlet is the primary source of beach sand for Kiawah Island (Kana et al 1981). Inlet ebb-tidal deltas often contain as much or more sand than the adjacent barrier islands along the South Carolina coast south of the Santee River mouth (Sexton & Hayes 1996). In this mixed-energy environment (Hayes 1994), waves and tidal currents significantly impact morphology and processes. Powerful tidal currents with a dominant flow at ebb tide move sand seaward out of the inlet channel into the ebb delta (Fig 2.5). Waves then reshape the sands into shoals and bars, some breaking free from the delta and migrating onto the beach. This produces several characteristic features found along the South Carolina coast, including large delta complexes extending miles offshore, marginal flood channels (small channels near the beach flanking the main channel that are dominated by flood currents), and migrating shoals (cf – Fig 2.1 and Fig 2.2).

Periodically, sand stored in the ebb-tidal delta of Stono Inlet is released when the channel shifts position. Shoals on the downcoast (west) side of the channel are freed from the delta and pushed shoreward by wave action. During this process, the beach in the lee of the shoal builds due to decreased wave energy ('Stage 1, Fig 2.6). Adjacent to the accreting beach, erosional arcs are formed by refracting wave crests bending shoreward around the offshore shoal ('Stage 2', Fig 2.6). This process continues until the shoal is fully attached, and sand moves laterally in both directions along the shoreline. The final stage of shoal bypassing ('Stage 3', Fig 2.6) occurs as waves continue to push the shoal landward and upward while sand spreads laterally along the beach. Shoal spreading provides natural nourishment with sand moving downcoast via longshore currents.

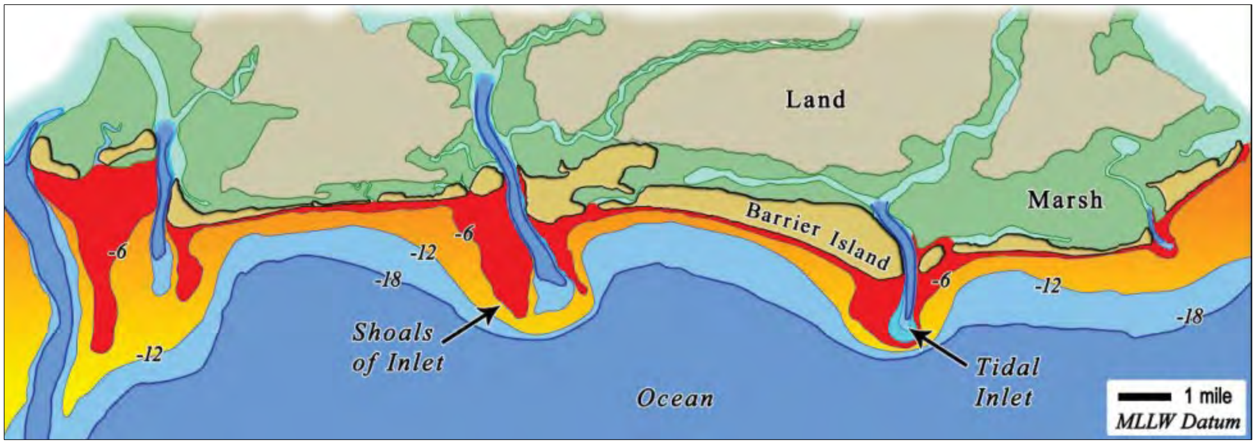


FIGURE 2.5. Nearshore bathymetry for a typical section of the central and southern South Carolina coast. Ebb-tidal deltas contain large amounts of sand, which alter the local bathymetry. This in turn directs wave energy and sediment transport patterns along the adjacent beaches. [From *Coastal Erosion and Solutions — A Primer* (Kana 2011) — CSE]

The time between episodic releases of sand by the inlet and subsequent attachment and spreading depends on the size of the inlet and its ebb-tidal delta. Large inlets such as Stono Inlet tend to initiate shoal-bypassing events every 7 to 8 years, with individual shoal volumes often exceeding 0.5 million cubic yards (Gaudiano & Kana 2001).

Kiawah Island has experienced two impressively large shoal bypassing events over the past ~25 years. The first shoal formed offshore in 1994 and was completely attached by 1997. The second shoal began attaching in 1998 and continued until ~2004 (Fig 2.7). These two events were the largest ever documented in South Carolina (CSE 2005) and collectively contained such a large quantity of sand that wave action could not completely weld the shoal to the beach. As a result, a new beach-dune system developed up to ~2,000 ft seaward of the shoreline as measured in 1984. This created a lagoon between the 'new' and 'old' shorelines, along with a ~2-mile-long barrier beach (Fig 2.7). CSE (2005) estimates that the two shoals added ~5 million cubic yards to Kiawah Island. With sheltering by the new outer beach, marsh grasses propagated naturally around the margins of the lagoon, where elevations were close to mean high water. What had been open ocean area just a few years before became protected tidal wetlands (Kana 2002).

By 2004, the shoals had completely attached at their eastern edge but remained detached at the western end. Shoal sands were migrating westward and were reaching near the (old) Ocean Course Clubhouse (Fig 2.7), but tidal flushing maintained a natural channel between the main shoal complex and that point. Due to the overwhelming quantity of sand gained at the eastern end, the shoreline near the Ocean Course jumped seaward and changed orientation. This effectively paused the shoal-bypassing cycle somewhere between Stage 2 and Stage 3, altered the direction of approaching waves along the island's northeastern end, and caused focused erosion along the Ocean Course.

As longshore transport moved the shoal westward, the flushing channel migrated likewise and encroached on the 16th and 18th holes of the famed Kiawah Ocean Course. The beach at the original Ocean Course Clubhouse (near SCDES-BCM monument 2775) retreated over 500 ft between the years 2000 and 2005. The magnitude of the bypassing event was enough to generate severe erosion for several years before the cycle could be completed (Gaudiano & Kana 2001). The Ocean Course remained vulnerable to erosion as the shoal and flushing channel migrated westward. This led to the plan for beach restoration proposed by CSE (2005).

THE THREE STAGES OF SHOAL BYPASSING

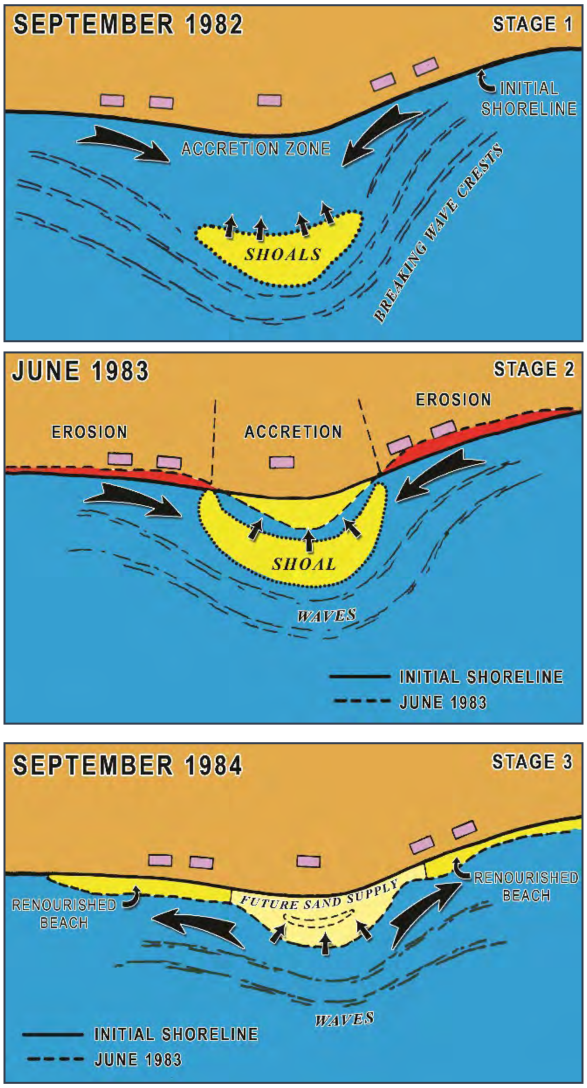


FIGURE 2.6.

[LEFT]
Schematic of the shoal-bypass cycle originally modeled from a bypass event at Isle of Palms (SC). During Stages 1 and 2 of the cycle, accretion in the lee of the shoal is accompanied by erosion on either side of the attachment site. (After Kana et al 1985)

[RIGHT]
Shoal bypassing at the eastern end of Kiawah Island.

Stage 1 in 1977 **[UPPER]**. Stage 2 in January 1979 **[UPPER MIDDLE]** (courtesy of Research Planning Institute Inc). Stage 3 in 1983 **[LOWER MIDDLE]**. Stage 1 in 1986 **[LOWER]**. Note the similarity between the 1977 shoal and the 1986 shoal, but the additional sand accumulated on Kiawah in 1986. [After Kana et al 1999]

FIGURE 2.7. The eastern end of Kiawah Island in December 1998 **[UPPER]** and February 2005 **[LOWER]**. Note the 1989 shoreline situated well inland from the outer beach. Shoals 1 and 2 added upward of 5 million cubic yards to Kiawah in the 1990s. As waves pushed the new sand shoreward, an incipient barrier island/lagoon/marsh formed. The new lagoon was flushed via a channel at the western end of the accreted beach. [From CSE 2007]

2.3 2006 and 2015 East End Projects

Both the 2006 and 2015 East End projects were designed to manage highly unstable beach changes associated with shoal bypassing events. Realignment or relocation of ephemeral channels mimics natural processes while maintaining tidal flows into newly formed wetland areas. The channel closures triggered onshore migration of sand bars and accelerated downcoast sand spreading. Channel openings shifted the inlet upcoast and allowed a new cycle of inlet growth and migration to begin. In each case, wave action did much of the work of restoration, reducing the vulnerability of Kiawah resort facilities to storms.

2.3.1 2006 East End Beach Restoration Project

In June and July of 2006, the East End beach restoration project (SCDES–BCM permit No P/N 2005–1W–310–P, USACE permit No 2005–1W–310) was completed by L. Dean Weaver Company Inc. The enclosure dike spanned ~2,000 ft toward the southeast from the Ocean Course driving range. The excavation area was along ~6,000 ft of shoreline between the dike and the new channel area (Fig 2.8). This project sought to artificially create Stage 3 of the shoal-bypassing cycle and avoid further erosion of the Ocean Course. The project details are in the final report, '2006 East End Erosion and Beach Restoration Project: Kiawah Island' (CSE 2007). The objectives of the project were to:

- Accelerate the shoal-bypassing cycle to restore westerly sand transport along Kiawah Island
- Eliminate rapid erosion along the Ocean Course (particularly around the 16th, 17th, and 18th fairways and the driving range)
- Maintain viable piping plover beach habitat along the newly accreted barrier spit east of the Ocean Course, including areas of frequent washovers and the adjacent incipient dune habitat
- Preserve the environmental, cultural, and aquatic resources of the Town
- Protect oceanfront recreational facilities and community infrastructure as a source of tax revenue and income
- Maintain the economic viability of tourism, the Town's largest industry
- Make a new source of sand from the accreting shoal more readily available for natural nourishment along downcoast areas

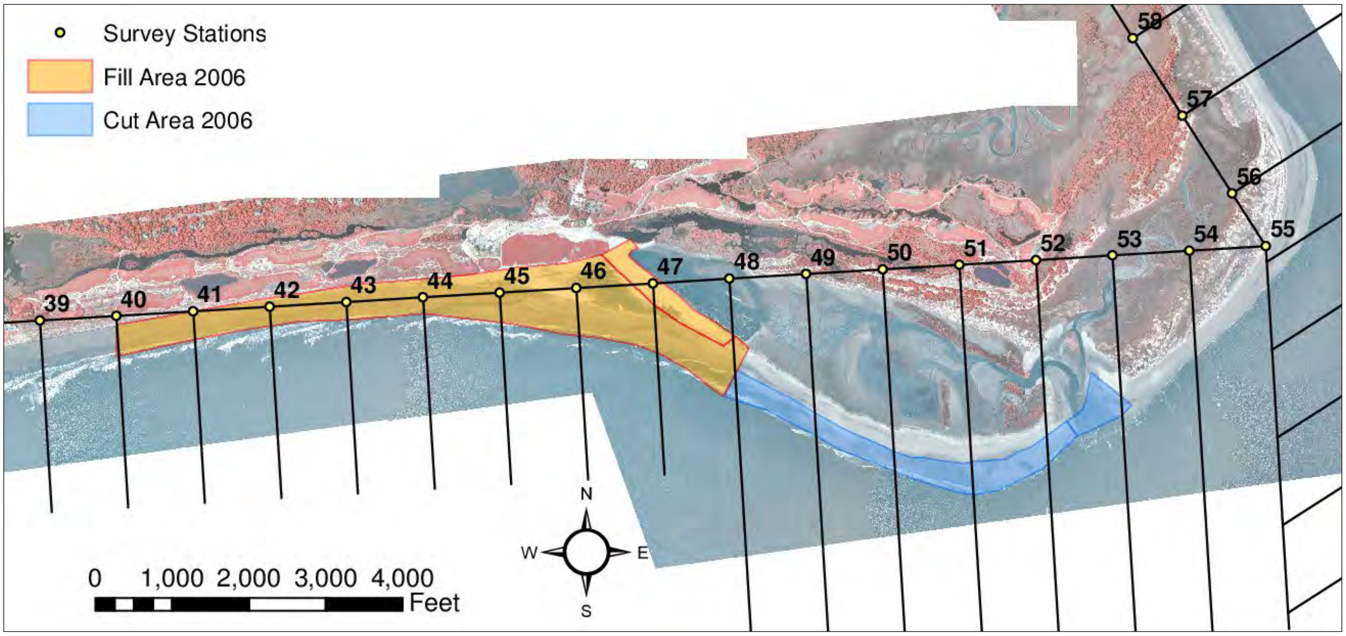


FIGURE 2.8. Excavation and fill areas used in the 2006 project. Approximately 550,000 cy of sand was transferred from the excavation area to the fill. The background image was collected in September 2006 using an infrared camera, so vegetation appears red instead of green.

FIGURE 2.9. Before (February 2006) and after (July 2006) aerial photos of the 2006 East End beach restoration project. [After CSE 2007]

The project consisted of closing the existing flushing channel, creating a new channel to maintain the lagoon's tidal environment, and excavating and transferring nourishment sand from the new inlet and accreted shoal areas to eroded downcoast areas. These actions were designed to provide a smoother transition between Kiawah's main beach and the accreted shoal. The contracted volume for the project was 550,000 cubic yards (cy), the majority of which was placed between the new clubhouse and just west of the old flushing channel. The new flushing channel was positioned at the apex of the attached shoal (Fig 2.9).

2.4 2015 East End Channel Realignment Project

The 2006 beach restoration project effectively restored the dry-sand beach along the Ocean Course. The new flushing channel relocated naturally in 2007 to a point in the middle of the open lagoon area. Between 2007 and 2013, the channel meandered across the intertidal beach; however, the throat of the channel remained east of the 2006 closure dike. In early 2014, the channel began to encroach on the closure dike, and the Town started to plan for another channel relocation in the event that the channel continued to migrate west.

The plan called for periodic relocation of the flushing channel, using the minimal amount of sand necessary, if the channel migrated west beyond its position in February 2014. A permit application was submitted with the intended construction window of September/October; however, by the fall of 2014, the migration of the channel had quickened and eroded much of the dunes protecting the Ocean Course driving range. The Town applied for a one-time modification to the construction window to allow for construction during the spring-summer season, which regulatory agencies granted.

The 2015 project was constructed between May and June 2015 by Lake Moultrie Construction Company Inc, DBA Lake Moultrie Water Company, and Ashridge Inc, A Joint Venture (St Stephen, SC) at a cost of $538,000. A total of 100,000 cy of sand was transferred, and the new inlet was opened ~3,000 ft to the east. A closure dike was built across the original channel, connecting to the remaining portion of the 2006 closure dike (Fig 2.10). Excess sand was placed along the seaward edge of the driving range to facilitate the recovery of the eroded areas and protect the range. The completed project achieved the goal of eliminating the cause of erosion along the Ocean Course while minimizing the construction impacts and manipulation of the beach. More recent aerial photographs and survey results from the current survey period are included in Section 4.1.1.

FIGURE 2.10. [UPPER] Excavation and fill areas used in the 2015 project. Approximately 100,000 cy of sand was transferred from the excavation area to the fill. **[LOWER]** Project area on 7 July 2015, after project completion, showing closure dike in the center of the image and a new flushing channel at the upper right. Encroachment by the 'erosional channel' destroyed hundreds of feet of dunes, leaving no protection in front of the driving range.

3.0 METHODOLOGY

This section describes the methodologies of the topographic survey and habitat mapping used by CSE to monitor changes at Kiawah Island.

3.1 Survey

The present survey was conducted by RTK-GPS* (Trimble^{TM} R12 GNSS system) in December 2025. Profiles along Kiawah are surveyed perpendicular to the local shoreline (CSE baseline) azimuth from the control points to at least –10 ft NAVD (equivalent to the seaward limit of sand exchange with the beach in this setting) or at least 2,500 ft from the primary dune ridge. Surveys were conducted by combining land-based surveys and bathymetric surveys (Fig 3.1). Land surveys were accomplished using an RTK-GPS between the foredune and low-tide wading depth (~–6 ft NAVD), whereas hydrographic surveys were collected by combining the RTK-GPS with a precision echo-sounder mounted on CSE's shallow-draft survey vessel, the *RV Southern Echo*.

[**Real-time kinematic global positioning system*]

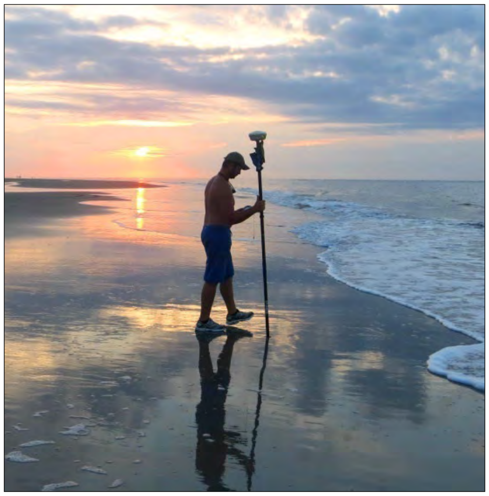


FIGURE 3.1.

CSE's monitoring methods include land-based data collection via RTK-GPS **[UPPER LEFT]** and hydrographic data collection via RTK-GPS linked to a precision echo-sounder. CSE's shallow-draft vessel, the *R/V Southern Echo,* is shown in the lower image.

Working around the tidal cycle, data collected on land extended into shallow depths at low tide. Data were collected from the boat at high tide to ensure overlap of the two surveys close to shore (Fig 3.2). Appendix A includes profiles for the most recent survey compared to earlier surveys. CSE has updated profile sheets to include profile volumes and aerial images showing profile locations.

Surveys conducted from 2007 to 2011 involved 23 stations west of the East End project area (using existing SCDES-BCM monuments spaced ~1,000 to 2,500 ft apart) and 64 stations in the project area spaced 400 ft apart. The present baseline reduces the maximum spacing in the downcoast profiles to ~1,000 ft. CSE also reduced the number of lines in the project area from 64 to 24 by increasing the spacing from 400 ft to between 1,000 and 1,200 ft. The baseline was also modified at the East End to reduce the number of azimuth changes to simplify volume calculations.

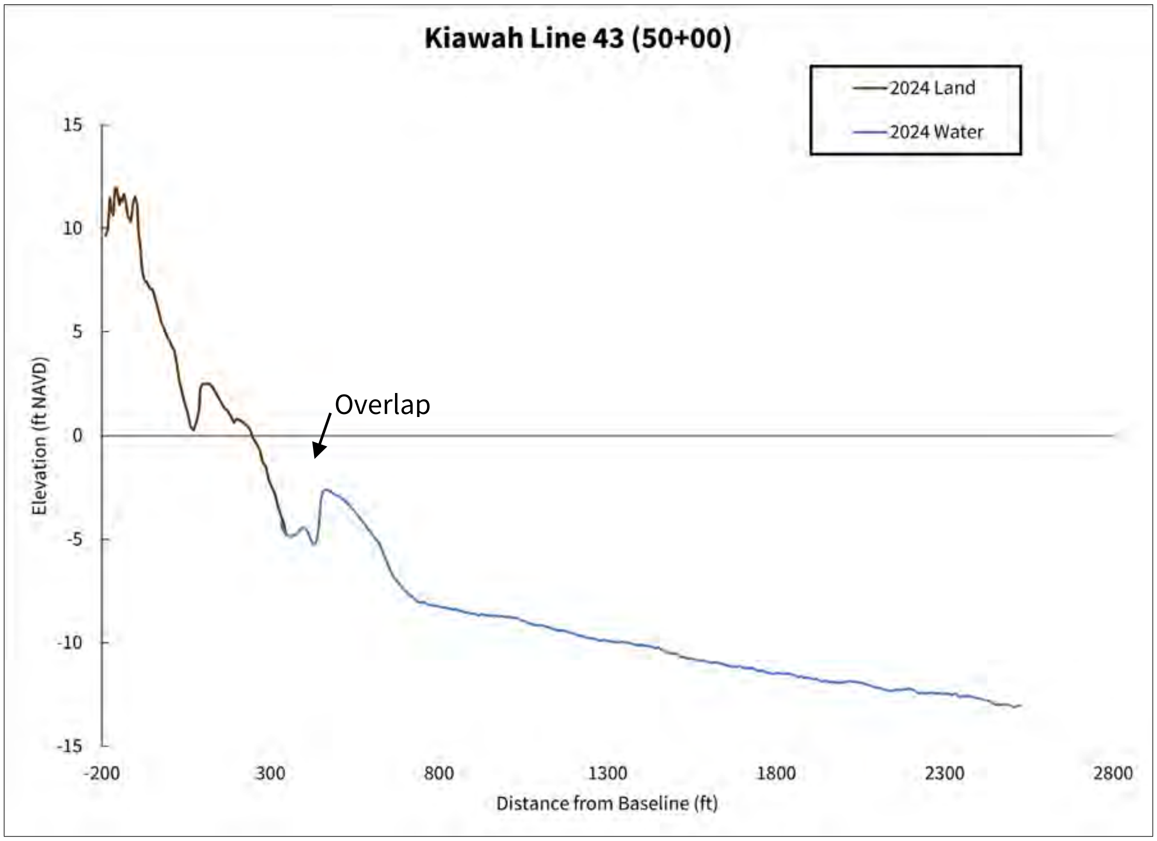


FIGURE 3.2. CSE combines land-based and hydrographic data collection to produce continuous profiles of the beach. Land-based work is accomplished at low tide, while hydrographic work is performed at high tide. This allows for overlap of the two data collection methods and ensures quality data and a complete profile.

The present baseline anchors 61 profiles, with Lines 1–37 representing the shoreline west of the 2006 project and Lines 38–61 representing the project area and eastern end of the island (Table 3.1). The baseline is shown in Figure 2.3. Line numbering increases from west to east – Line 1 is near Captain Sams Inlet, ~1.2 miles southwest of the Beachwalker Park vehicle access. Line 61 is at the tip of the sand spit at the junction of the Stono River and Pennys Creek. SCDES-BCM monument names and CSE project stationing are indicated where the new profile lines coincide with previous stations (ie – Line 35 is SCDES-BCM Station 2725). The current reaches (see Fig 2.3) are defined in Table 3.2.

Volume calculations for the lagoon were obtained via digital terrain models (DTMs) produced from CSE survey data. This eliminates the need for volume adjustments due to differing baseline and beach configurations. However, profiles are still used for inferring changes to the beach shape, position of shoals and channels, and berm elevations in this area.

3.2 Volume Calculations

To estimate changes in the sand volume along Kiawah Island, survey data (collected in x-y-z format) were entered into CSE's in-house custom software, Beach Profile Analysis System (BPAS), which calculates volumes based on 2D data (converted to x-z format along profiles) and distances between survey lines. The resulting volumes provide a quantitative method of determining beach condition, including the ideal minimum beach profile and how sand quantities at a site (volume per unit length of shoreline) compare with some desired condition (Kana 1993). Volume results calculated this way integrate all the small-scale perturbations across the beach and yield a simple measure of its condition. This measure is less susceptible to seasonal fluctuations in the profile, which is a common problem with shoreline change studies derived from a single contour or interpreted from aerial photos (such as a wet-dry line or mean high water).

For the present survey, sand volumes were calculated between the primary dune and –10 ft NAVD. The –6 ft NAVD contour has been included in some reports to maintain consistency with earlier studies and data collection limitations prior to 2007. While most sand movement on Kiawah occurs above –6 ft NAVD, some profile changes do occur between –6 ft and –10 ft NAVD. Significant changes can occur within this lens when underwater bars form or change, and as shoals move onshore and alter morphology. Especially along the dynamic northeastern end of the Island, volume calculations are cut off at a set distance due to data coverage or morphological considerations (ie – the profile flattens over the ebb-tidal delta before reaching –10 ft NAVD). Profiles and calculation limits are shown in Appendix A.

TABLE 3.1. Kiawah Island beach monitoring stations referenced in the present report. Order is generally west to east. Offset and cutoff refer to distances in feet from the benchmark/baseline for the start and end of beach volume calculations.

Reach	Line	Name	Offset	Cutoff	Distance to Next	Easting	Northing
1	**1**	1	-200	2,500	1,000	2262721.7	271034.2
	2	2	0	2,500	997	2263451.4	271718.0
	3	3	250	2,500	1,153	2264178.6	272399.3
	4	03 (OCRM 2615)	140	1,500	844	2265064.0	273138.6
	5	5	93	2,500	845	2265739.8	273644.8
	6	06 (OCRM 2620)	86	1,500	1,157	2266414.9	274152.4
	7	7	95	2,500	978	2267397.7	274763.4
	8	08 (OCRM 2625)	189	1,500	1,040	2268125.0	275417.0
	9	9	100	1,500	806	2269055.6	275882.0
2	**10**	10 (OCRM 2630)	152	1,500	547	2269723.8	276332.8
	11	11 (OCRM 2635)	41	1,500	1,232	2270247.2	276490.7
	12	12 (OCRM 2640)	94	1,500	665	2271326.8	277083.3
	13	13	67	1,400	665	2271935.3	277351.5
	14	14 (OCRM 2645)	47	1,200	945	2272543.9	277619.7
	15	15	27	1,400	946	2273408.4	278001.2
	16	16 (OCRM 2660)	28	1,100	1,025	2274273.9	278383.2
	17	17	15	1,400	1,026	2275234.5	278740.9
	18	18 (OCRM 2665)	5	1,000	691	2276196.1	279099.0
	19	19	0	1,400	692	2276850.6	279320.6
	20	20 (OCRM 2675)	0	1,100	831	2277505.6	279542.3
	21	21 (OCRM 21)	46	1,300	1,266	2278288.1	279822.4
	22	22	0	1,400	1,267	2279502.6	280179.9
3	**23**	23 (OCRM 2685)	10	1,200	1,033	2280718.1	280537.6
	24	24 (OCRM 2687)	40	1,500	1,215	2281707.1	280837.2
	25	25 (OCRM 2690)	80	1,300	1,145	2282876.3	281167.0
	26	26 (OCRM 2692)	279	1,500	1,205	2283935.3	281602.5
	27	27 (OCRM 2695)	119	1,400	1,080	2285131.1	281719.2
	28	28 (OCRM 2700)	100	1,400	1,269	2286187.8	281943.8
	29	29 (OCRM 2705)	130	1,500	635	2287413.8	282268.9
	30	30	143	1,500	643	2288034.7	282401.8
	31	31 (OCRM 2715)	145	1,500	889	2288663.4	282536.4
	32	32 (OCRM 2720)	208	1,500	645	2289526.0	282752.7
	33	33	309	1,700	646	2290143.9	282937.6
	34	34 (OCRM 2722)	436	1,600	1,125	2290763.1	283122.9
	35	35 (OCRM 2725)	322	1,600	666	2291875.6	283288.9
	36	36 (OCRM 2730)	316	1,600	666	2292526.8	283430.6
	37	37	319	1,700	752	2293263.8	283580.0
4	**38**	38 (0+00)	300	1,600	1,000	2294001.1	283729.5
	39	39 (10+00)	165	1,700	1,000	2294999.2	283790.2
	40	40 (20+00)	30	1,500	1,000	2295997.4	283850.9
	41	41 (30+00)	-55	1,500	1,000	2296995.5	283911.6
	42	42 (40+00)	-140	1,500	1,000	2297993.6	283972.3
	43	43 (50+00)	-219	1,500	1,000	2298991.7	284033.0
	44	44 (60+00)	-90	1,500	1,000	2299989.8	284093.8
	45	45 (70+00)	-370	1,500	1,000	2300988.0	284154.5
	46	46 (80+00)	-300	1,500	1,000	2301986.1	284215.2
5	**47**	47 (90+00)	-374	1,800	1,000	2302984.2	284275.9
	48	48 (100+00)	0	2,000	1,000	2303982.3	284336.6
	49	49 (110+00)	0	2,500	1,000	2304980.4	284397.3
	50	50 (120+00)	350	3,200	1,000	2305978.6	284458.0
	51	51 (130+00)	780	3,500	1,000	2306976.7	284518.8
	52	52 (140+00)	1100	3,500	1,000	2307974.8	284579.5
	53	53 (150+00)	500	2,800	1,000	2308972.9	284640.2
	54	54 (160+00)	65	1,500	1,000	2309971.0	284700.9
	55	55 (170+00)	-775	1,000	0	2310969.2	284761.6
6	**56**	56 (Inlet 0+00)	300	1,300	1,200	2310528.3	285452.3
	57	57 (Inlet 12+00)	700	1,420	1,200	2309882.6	286463.7
	58	58 (Inlet 24+00)	900	1,420	1,200	2309237.0	287475.2
	59	59 (Inlet 36+00)	920	1,420	1,200	2308591.3	288486.6
	60	60 (Inlet 48+00)	912	1,720	1,200	2307945.7	289498.1
	61	61 (Inlet 60+00)	640	1,520	0	2307300.1	290509.5

TABLE 3.2. Kiawah Island reaches referenced in the present report.

Reach	Approximate Geographic Boundaries	Line Numbers	Reach Length (ft)
Kiawah Spit	West end of Kiawah Island to Beachwalker Park	1–10	8,820
West Beach	Beachwalker Park to Turtle Point	10–23	11,798
Turtle Point	Turtle Point Area	23–38	13,614
Ocean Course	Ocean Course Area	38–47	9,000
Lagoon	Lagoon Area	47–55	8,000
Stono Inlet	Stono Inlet Shoreline	56–61	6,000

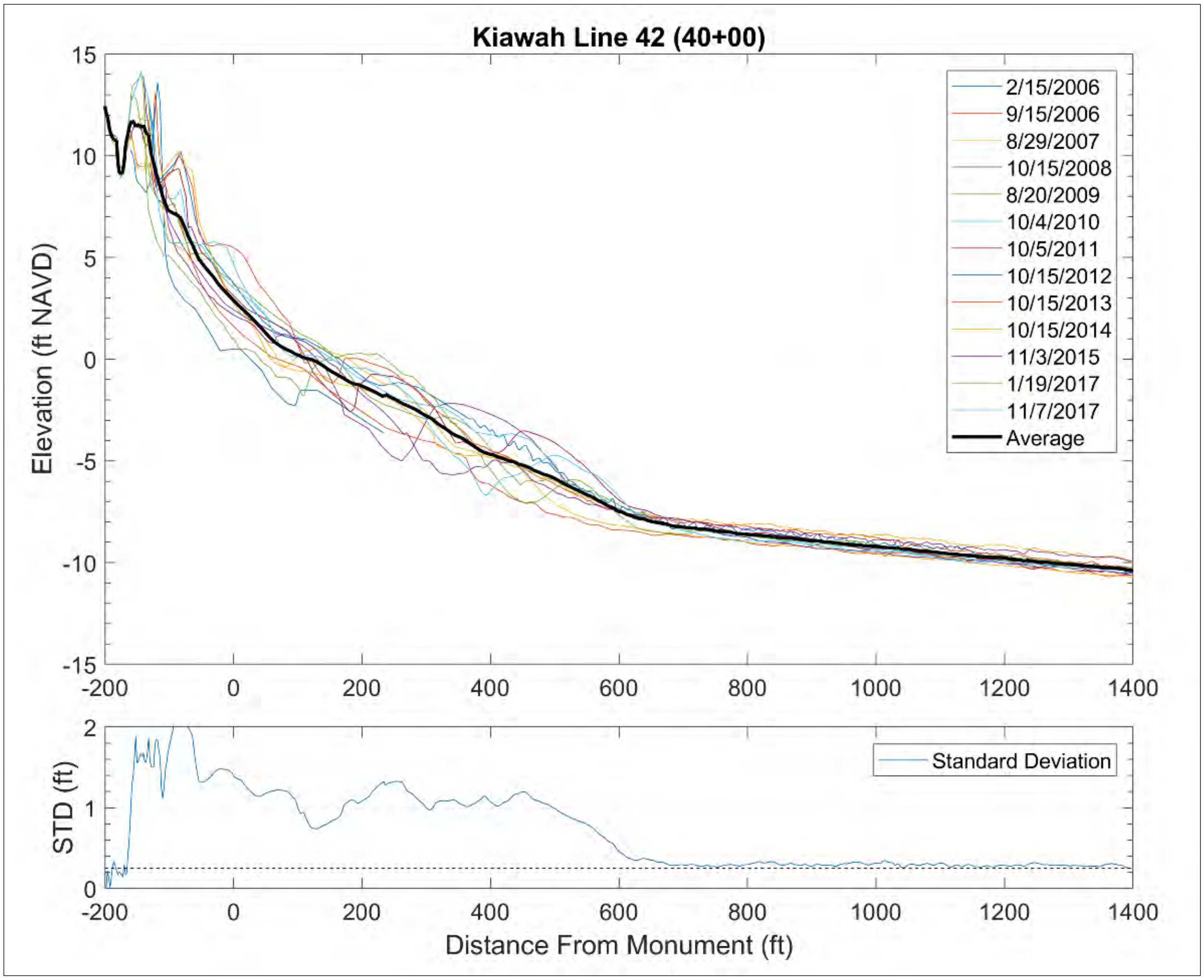


FIGURE 3.3. Comparison of repetitive profiles at a monitoring station along Kiawah Island and computation of standard deviation. Where the profiles converge, the standard deviation is low and is an indicator of little sediment exchange (approximate closure depth).

Figure 3.3 shows a representative profile from Kiawah Island over an approximate 12-year period. The lower portion of the graph tracks the standard deviation in elevation based on the mean profile elevation of the set of profiles at the station. A standard deviation of <0.25 ft over several hundred feet at the outer end of a profile is evidence of little change in bottom elevation over the data collection period. This statistically confirms nearly all measurable volume changes along Kiawah occur above –10 ft NAVD, and a realistic value for depth of closure (DOC) at decadal-or-longer time scales is ~–10 ft NAVD (see Barrineau et al., 2019 for a more detailed discussion).

DOC is the depth at which little sand movement occurs to or from the beach. At longer time scales (eg – 10 yrs), or under storm conditions with rough waves, DOC may become deeper. However, our surveys account for the vast majority of sand movement under 'normal' conditions. Unit-volume calculations allow us to distinguish the quantity of sediment at different lens depths, for instance, in the dunes, on the dry beach, in the intertidal zone, and beyond wading depth. Reference boundaries are site-specific but ideally encompass the entire zone over which sand moves in a given year. This means the survey data incorporate all changes from the dune to the DOC, which constitutes the 'active beach system' under normal conditions.

Unit volumes for each survey date and unit volume changes between selected dates were used to calculate the net volume between stations (called the 'profile volume'). Profile volumes are generated using the average-end-area method. In this method, the average of the area under two profiles at either end of a length of shoreline is multiplied by the length of the cell to determine the total volume between the two stations. When these profile volumes are added for discrete portions of the shoreline, they represent sub-reach and reach volumes and, finally, the net volume for the entire project area.

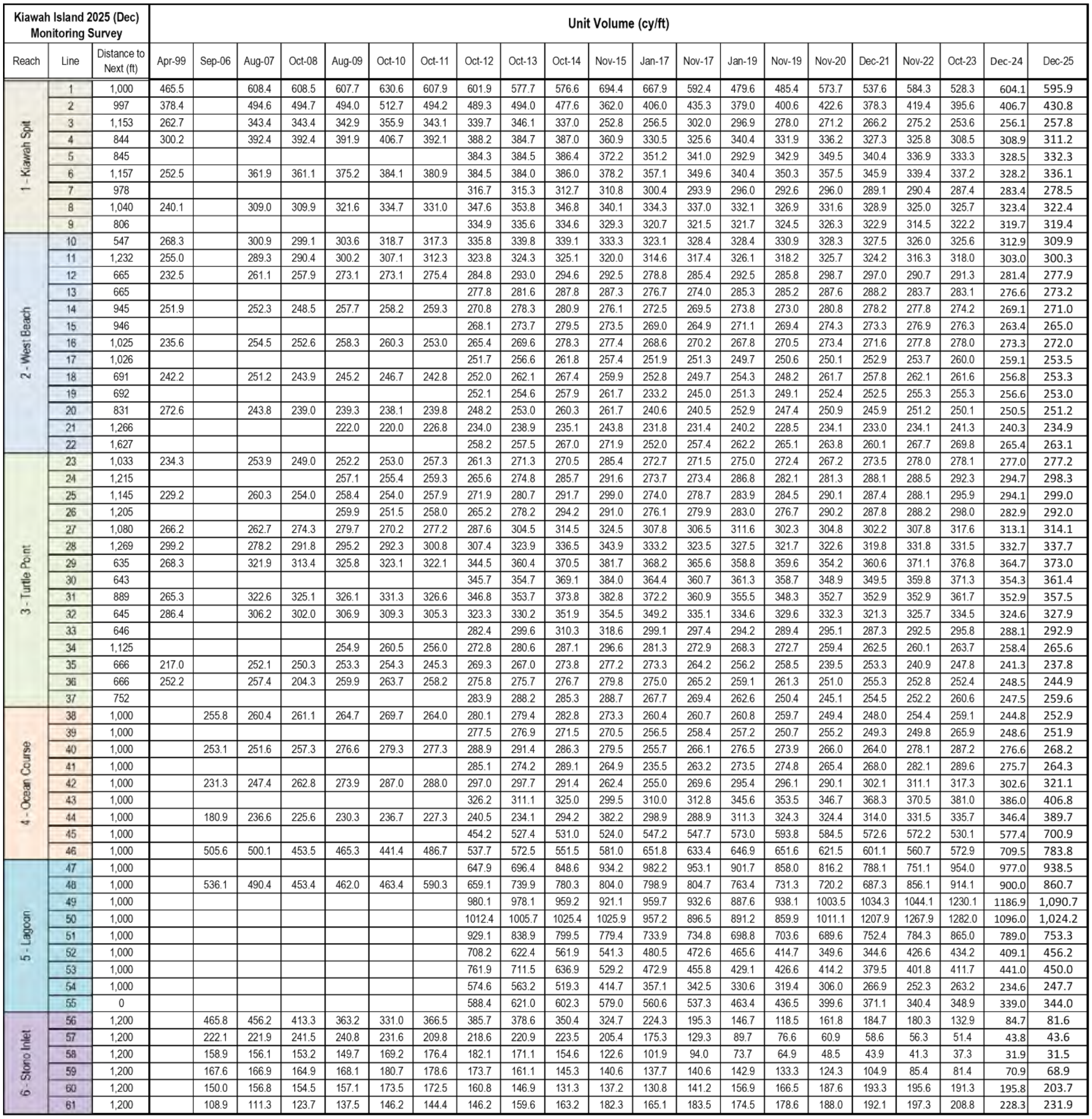
These net volumes by reach can be subdivided by applicable reach lengths to yield weighted average unit volumes. The weighting considers the variations in applicable shoreline distances between individual stations. If they are not evenly spaced, the station-to-station net volumes will be proportional to the distance between stations, and some accuracy in reach- or project-wide profile volumes will be lost. Changes in unit volume can be determined by comparing individual surveyed profiles and computing differences in cross-sectional areas. The change in cross-section can be extrapolated (1) over a 1-ft length of shoreline to yield unit volume changes (in cy/ft) and (2) over a much longer section of beach to yield net volume changes in that particular section of shoreline.

4.0 RESULTS

4.1 Beach Volume Changes (December 2024 – December 2025)

Reach volume changes are reported from the island's eastern end (Reach 6 – Stono Inlet) to the western end (Reach 1 – Captain Sams Spit). Unit volumes for each station are provided in Table 4.1, and volumes for each reach are provided in Table 4.2. Between December 2024 and December 2025, portions of Kiawah Island along the East End gained sand as part of the shoal bypass mentioned in Section 2.1. Most reaches gained sand over the past year, with the exception of West Beach—although in that reach, volume gains above mean low water resulted in slightly wider dry beach widths than last year.

TABLE 4.1. Unit volumes* for monitoring profiles at Kiawah Island (measured to –10 ft NAVD).



Kiawah Island 2025 (Dec) Monitoring Survey			Unit Volume (cy/ft)																			
Reach	Line	Distance to Next (ft)	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1 - Kiawah Spit	1	1,000	465.5		608.4	608.5	607.7	630.6	607.9	601.9	577.7	576.6	694.4	667.9	592.4	479.6	485.4	573.7	537.6	584.3	528.3	604.1	595.9
	2	997	378.4		494.6	494.7	494.0	512.7	494.2	489.3	494.0	477.6	362.0	406.0	435.3	379.0	400.6	422.6	378.3	419.4	395.6	406.7	430.8
	3	1,153	262.7		343.4	343.4	342.9	355.9	343.1	339.7	346.1	337.0	252.8	256.5	302.0	296.9	278.0	271.2	266.2	275.2	253.6	256.1	257.8
	4	844	300.2		392.4	392.4	391.9	406.7	392.1	388.2	384.7	387.0	360.9	330.5	325.6	340.4	331.9	336.2	327.3	325.8	308.5	308.9	311.2
	5	845								384.3	384.5	386.4	372.2	351.2	341.0	292.9	342.9	349.5	340.4	336.9	333.3	328.5	332.3
	6	1,157	252.5		361.9	361.1	375.2	384.1	380.9	384.5	384.0	386.0	378.2	357.1	349.6	340.4	350.3	357.5	345.9	339.4	337.2	328.2	336.1
	7	978								316.7	315.3	312.7	310.8	300.4	293.9	296.0	292.6	296.0	289.1	290.4	287.4	283.4	278.5
	8	1,040	240.1		309.0	309.9	321.6	334.7	331.0	347.6	353.8	346.8	340.1	334.3	337.0	332.1	326.9	331.6	328.9	325.0	325.7	323.4	322.4
	9	806								334.9	335.6	334.6	329.3	320.7	321.5	321.7	324.5	326.3	322.9	314.5	322.2	319.7	319.4
2 - West Beach	10	547	268.3		300.9	299.1	303.6	318.7	317.3	335.8	339.8	339.1	333.3	323.1	328.4	328.4	330.9	328.3	327.5	326.0	325.6	312.9	309.9
	11	1,232	255.0		289.3	290.4	300.2	307.1	312.3	323.8	324.3	325.1	320.0	314.6	317.4	326.1	318.2	325.7	324.2	316.3	318.0	303.0	300.3
	12	665	232.5		261.1	257.9	273.1	273.1	275.4	284.8	293.0	294.6	292.5	278.8	285.4	292.5	285.8	298.7	297.0	290.7	291.3	281.4	277.9
	13	665								277.8	281.6	287.8	287.3	276.7	274.0	285.3	285.2	287.6	288.2	283.7	283.1	276.6	273.2
	14	945	251.9		252.3	248.5	257.7	258.2	259.3	270.8	278.3	280.9	276.1	272.5	269.5	273.8	273.0	280.8	278.2	277.8	274.2	269.1	271.0
	15	946								268.1	273.7	279.5	273.5	269.0	264.9	271.1	269.4	274.3	273.3	276.9	276.3	263.4	265.0
	16	1,025	235.6		254.5	252.6	258.3	260.3	253.0	265.4	269.6	278.3	277.4	268.6	270.2	267.8	270.5	273.4	271.6	277.8	278.0	273.3	272.0
	17	1,026								251.7	256.6	261.8	257.4	251.9	251.3	249.7	250.6	250.1	252.9	253.7	260.0	259.1	253.5
	18	691	242.2		251.2	243.9	245.2	246.7	242.8	252.0	262.1	267.4	259.9	252.8	249.7	254.3	248.2	261.7	257.8	262.1	261.6	256.8	253.3
	19	692								252.1	254.6	257.9	261.7	233.2	245.0	251.3	249.1	252.4	252.5	255.3	255.3	256.6	253.0
	20	831	272.6		243.8	239.0	239.3	238.1	239.8	248.2	253.0	260.3	261.7	240.6	240.5	252.9	247.4	250.9	245.9	251.2	250.1	250.5	251.2
	21	1,266					222.0	220.0	226.8	234.0	238.9	235.1	243.8	231.8	231.4	240.2	228.5	234.1	233.0	234.1	241.3	240.3	234.9
	22	1,627								258.2	257.5	267.0	271.9	252.0	257.4	262.2	265.1	263.8	260.1	267.7	269.8	265.4	263.1
3 - Turtle Point	23	1,033	234.3		253.9	249.0	252.2	253.0	257.3	261.3	271.3	270.5	285.4	272.7	271.5	275.0	272.4	267.2	273.5	278.0	278.1	277.0	277.2
	24	1,215					257.1	255.4	259.3	265.6	274.8	285.7	291.6	273.7	273.4	286.8	282.1	281.3	288.1	288.5	292.3	294.7	298.3
	25	1,145	229.2		260.3	254.0	258.4	254.0	257.9	271.9	280.7	291.7	299.0	274.0	278.7	283.9	284.5	290.1	287.4	288.1	295.9	294.1	299.0
	26	1,205					259.9	251.5	258.0	265.2	278.2	294.2	291.0	276.1	279.9	283.0	276.7	290.2	287.8	288.2	298.0	282.9	292.0
	27	1,080	266.2		262.7	274.3	279.7	270.2	277.2	287.6	304.5	314.5	324.5	307.8	306.5	311.6	302.3	304.8	302.2	307.8	317.6	313.1	314.1
	28	1,269	299.2		278.2	291.8	295.2	292.3	300.8	307.4	323.9	336.5	343.9	333.2	323.5	327.5	321.7	322.6	319.8	331.8	331.5	332.7	337.7
	29	635	268.3		321.9	313.4	325.8	323.1	322.1	344.5	360.4	370.5	381.7	368.2	365.6	358.8	359.6	354.2	360.6	371.1	376.8	364.7	373.0
	30	643								345.7	354.7	369.1	384.0	364.4	360.7	361.3	358.7	348.9	349.5	359.8	371.3	354.3	361.4
	31	889	265.3		322.6	325.1	326.1	331.3	326.6	346.8	353.7	373.8	382.8	372.2	360.9	355.5	348.3	352.7	352.9	352.9	361.7	352.9	357.5
	32	645	286.4		306.2	302.0	306.9	309.3	305.3	323.3	330.2	351.9	354.5	349.2	335.1	334.6	329.6	332.3	321.3	325.7	334.5	324.6	327.9
	33	646								282.4	299.6	310.3	318.6	299.1	297.4	294.2	289.4	295.1	287.3	292.5	295.8	288.1	292.9
	34	1,125					254.9	260.5	256.0	272.8	280.6	287.1	296.6	281.3	272.9	268.3	272.7	259.4	262.5	260.1	263.7	258.4	265.6
	35	666	217.0		252.1	250.3	253.3	254.3	245.3	269.3	267.0	273.8	277.2	273.3	264.2	256.2	258.5	239.5	253.3	240.9	247.8	241.3	237.8
	36	666	252.2		257.4	204.3	259.9	263.7	258.2	275.8	275.7	276.7	279.8	275.0	265.2	259.1	261.3	251.0	255.3	252.8	252.4	248.5	244.9
	37	752								283.9	288.2	285.3	288.7	267.7	269.4	262.6	250.4	245.1	254.5	252.2	260.6	247.5	259.6
4 - Ocean Course	38	1,000		255.8	260.4	261.1	264.7	269.7	264.0	280.1	279.4	282.8	273.3	260.4	260.7	260.8	259.7	249.4	248.0	254.4	259.1	244.8	252.9
	39	1,000								277.5	276.9	271.5	270.5	256.5	258.4	257.2	250.7	255.2	249.3	249.8	265.9	248.6	251.9
	40	1,000		253.1	251.6	257.3	276.6	279.3	277.3	288.9	291.4	286.3	279.5	255.7	266.1	276.5	273.9	266.0	264.0	278.1	287.2	276.6	268.2
	41	1,000								285.1	274.2	289.1	264.9	235.5	263.2	273.5	274.8	265.4	268.0	282.1	289.6	275.7	264.3
	42	1,000		231.3	247.4	262.8	273.9	287.0	288.0	297.0	297.7	291.4	262.4	255.0	269.6	295.4	296.1	290.1	302.1	311.1	317.3	302.6	321.1
	43	1,000								326.2	311.1	325.0	299.5	310.0	312.8	345.6	353.5	346.7	368.3	370.5	381.0	386.0	406.8
	44	1,000		180.9	236.6	225.6	230.3	236.7	227.3	240.5	234.1	294.2	382.2	298.9	288.9	311.3	324.3	324.4	314.0	331.5	335.7	346.4	389.7
	45	1,000								454.2	527.4	531.0	524.0	547.2	547.7	573.0	593.8	584.5	572.6	572.2	530.1	577.4	700.9
	46	1,000		505.6	500.1	453.5	465.3	441.4	486.7	537.7	572.5	551.5	581.0	651.8	633.4	646.9	651.6	621.5	601.1	560.7	572.9	709.5	783.8
5 - Lagoon	47	1,000								647.9	696.4	848.6	934.2	982.2	953.1	901.7	858.0	816.2	788.1	751.1	954.0	977.0	938.5
	48	1,000		536.1	490.4	453.4	462.0	463.4	590.3	659.1	739.9	780.3	804.0	798.9	804.7	763.4	731.3	720.2	687.3	856.1	914.1	900.0	860.7
	49	1,000								980.1	978.1	959.2	921.1	959.7	932.6	887.6	938.1	1003.5	1034.3	1044.1	1230.1	1186.9	1,090.7
	50	1,000								1012.4	1005.7	1025.4	1025.9	957.2	896.5	891.2	859.9	1011.1	1207.9	1267.9	1282.0	1096.0	1,024.2
	51	1,000								929.1	838.9	799.5	779.4	733.9	734.8	698.8	703.6	689.6	752.4	784.3	865.0	789.0	753.3
	52	1,000								708.2	622.4	561.9	541.3	480.5	472.6	465.6	414.7	349.6	344.6	426.6	434.2	409.1	456.2
	53	1,000								761.9	711.5	636.9	529.2	472.9	455.8	429.1	426.6	414.2	379.5	401.8	411.7	441.0	450.0
	54	1,000								574.6	563.2	519.3	414.7	357.1	342.5	330.6	319.4	306.0	266.9	252.3	263.2	234.6	247.7
	55	0								588.4	621.0	602.3	579.0	560.6	537.3	463.4	436.5	399.6	371.1	340.4	348.9	339.0	344.0
6 - Stono Inlet	56	1,200		465.8	456.2	413.3	363.2	331.0	366.5	385.7	378.6	350.4	324.7	224.3	195.3	146.7	118.5	161.8	184.7	180.3	132.9	84.7	81.6
	57	1,200		222.1	221.9	241.5	240.8	231.6	209.8	218.6	220.9	223.5	205.4	175.3	129.3	89.7	76.6	60.9	58.6	56.3	51.4	43.8	43.6
	58	1,200		158.9	156.1	153.2	149.7	169.2	176.4	182.1	171.1	154.6	122.6	101.9	94.0	73.7	64.9	48.5	43.9	41.3	37.3	31.9	31.5
	59	1,200		167.6	166.9	164.9	168.1	180.7	178.6	173.7	161.1	145.3	140.6	137.7	140.6	142.9	133.3	124.3	104.9	85.4	81.4	70.9	68.9
	60	1,200		150.0	156.8	154.5	157.1	173.5	172.5	160.8	146.9	131.3	137.2	130.8	141.2	156.9	166.5	187.6	193.3	195.6	191.3	195.8	203.7
	61	1,200		108.9	111.3	123.7	137.5	146.2	144.4	146.2	159.6	163.2	182.3	165.1	183.5	174.5	178.6	188.0	192.1	197.3	208.8	228.3	231.9

TABLE 4.2. Total reach volumes, weighted unit volume, by volume by reach, net reach volume changes and weighted average unit volume changes since the previous survey.

Reach Total Volume (cy)

Reach	Name	Length	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1	Kiawah Spit	8,820	1,461,886		1,915,981	1,914,648	1,968,764	2,038,285	2,011,136	2,006,570	2,011,764	2,005,216	1,958,474	1,877,619	1,858,245	1,812,100	1,855,365	1,878,947	1,842,313	1,821,206	1,813,315	1,786,300	1,790,650
2	West Beach	11,798	2,925,119		3,018,972	2,973,269	3,002,842	3,016,726	3,023,391	3,143,512	3,200,438	3,247,900	3,246,474	3,109,992	3,123,811	3,186,466	3,153,949	3,204,546	3,190,781	3,207,656	3,221,570	3,158,775	3,132,521
3	Turtle Point	13,614	3,119,193		3,768,036	3,711,347	3,791,886	3,780,710	3,783,778	3,973,563	4,103,395	4,242,815	4,328,658	4,133,108	4,083,240	4,087,595	4,041,965	4,019,325	4,035,192	4,068,888	4,149,913	4,059,050	4,120,532
4	Ocean Course	9,000		2,612,857	2,726,994	2,659,256	2,755,159	2,769,550	2,874,610	3,171,256	3,273,101	3,405,482	3,467,750	3,431,867	3,447,024	3,560,686	3,577,507	3,486,623	3,457,580	3,458,683	3,586,080	3,733,656	3,982,325
5	Lagoon	8,000		6,559,380	6,462,016	6,840,138	7,055,611	7,419,125	7,222,197	7,071,272	6,946,031	6,993,814	6,787,731	6,325,250	6,139,954	5,939,621	5,936,206	6,198,619	6,605,054	7,336,571	7,435,847	6,901,983	6,785,241
6	Stono Inlet	6,000		1,464,695	1,460,076	1,447,219	1,406,546	1,422,719	1,427,296	1,448,756	1,408,636	1,328,992	1,248,369	1,052,076	966,215	845,351	707,753	715,353	706,907	680,859	638,772	598,701	605,298
1-6	All	57,232			19,352,074	19,545,877	19,980,808	20,447,115	20,342,409	20,814,928	20,943,365	21,224,219	21,037,455	19,929,912	19,618,488	19,431,820	19,272,747	19,503,413	19,837,826	20,573,863	20,845,497	20,238,466	20,416,567

Reach Unit Volume (cy/ft)

Reach	Name	Length	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1	Kiawah Spit	8,820	165.7		217.2	217.1	223.2	231.1	228.0	227.5	228.1	227.3	222.0	212.9	210.7	205.5	210.4	213.0	208.9	206.5	205.6	202.5	203.0
2	West Beach	11,798	247.9		255.9	252.0	254.5	255.7	256.3	266.4	271.3	275.3	275.2	263.6	264.8	270.1	267.3	271.6	270.5	271.9	273.1	267.7	265.5
3	Turtle Point	13,614	229.1		276.8	272.6	278.5	277.7	277.9	291.9	301.4	311.7	318.0	303.6	299.9	300.2	296.9	295.2	296.4	298.9	304.8	298.2	302.7
4	Ocean Course	9,000		290.3	303.0	295.5	306.1	307.7	319.4	352.4	363.7	378.4	385.3	381.3	383.0	395.6	397.5	387.4	384.2	384.3	398.5	414.9	442.5
5	Lagoon	8,000		819.9	807.8	855.0	882.0	927.4	902.8	883.9	868.3	874.2	848.5	790.7	767.5	742.5	742.0	774.8	825.6	917.1	929.5	862.7	848.2
6	Stono Inlet	6,000		244.1	243.3	241.2	234.4	237.1	237.9	241.5	234.8	221.5	208.1	175.3	161.0	140.9	118.0	119.2	117.8	113.5	106.5	99.8	100.9
1-6	All	57,232			338.1	341.5	349.1	357.3	355.4	363.7	365.9	370.8	367.6	348.2	342.8	339.5	336.7	340.8	346.6	359.5	364.2	353.6	356.7

Reach Volume Change Since Previous (cy)

Reach	Name	Length	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1	Kiawah Spit	8,820				-1,333	54,116	69,521	-27,149	-4,566	5,195	-6,549	-46,742	-80,856	-19,374	-46,145	43,265	23,581	-36,634	-21,107	-7,890	-27,016	4,350
2	West Beach	11,798				-45,703	29,573	13,884	6,665	120,120	56,926	47,462	-1,426	-136,481	13,818	62,656	-32,517	50,598	-13,766	16,875	13,914	-62,795	-26,254
3	Turtle Point	13,614				-56,689	80,539	-11,176	3,068	189,784	129,833	139,419	85,843	-195,550	-49,869	4,356	-45,630	-22,641	15,867	33,697	81,024	-90,862	61,482
4	Ocean Course	9,000			114,136	-67,738	95,903	14,390	105,061	296,646	101,845	132,381	62,268	-35,883	15,157	113,662	16,822	-90,884	-29,044	1,103	127,398	147,576	248,669
5	Lagoon	8,000			-97,364	378,122	215,473	363,514	-196,928	-150,924	-125,241	47,784	-206,084	-462,481	-185,296	-200,333	-3,415	262,413	406,434	731,518	99,276	-533,864	-116,742
6	Stono Inlet	6,000			-4,620	-12,857	-40,673	16,174	4,577	21,459	-40,119	-79,644	-80,624	-196,292	-85,861	-120,864	-137,598	7,600	-8,446	-26,048	-42,088	-40,071	6,597
1-6	All	57,232				193,803	434,931	466,306	-104,706	472,519	128,437	280,854	-186,764	-1,107,543	-311,424	-186,668	-159,073	230,666	334,412	736,037	271,634	-607,031	178,101

Reach Unit Volume Change Since Previous (cy/ft)

Reach	Name	Length	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1	Kiawah Spit	8,820				-0.2	6.1	7.9	-3.1	-0.5	0.6	-0.7	-5.3	-9.2	-2.2	-5.2	4.9	2.7	-4.2	-2.4	-0.9	-3.1	0.5
2	West Beach	11,798				-3.9	2.5	1.2	0.6	10.2	4.8	4.0	-0.1	-11.6	1.2	5.3	-2.8	4.3	-1.2	1.4	1.2	-5.3	-2.2
3	Turtle Point	13,614				-4.2	5.9	-0.8	0.2	13.9	9.5	10.2	6.3	-14.4	-3.7	0.3	-3.4	-1.7	1.2	2.5	6.0	-6.7	4.5
4	Ocean Course	9,000			12.7	-7.5	10.7	1.6	11.7	33.0	11.3	14.7	6.9	-4.0	1.7	12.6	1.9	-10.1	-3.2	0.1	14.2	16.4	27.6
5	Lagoon	8,000			-12.2	47.3	26.9	45.4	-24.6	-18.9	-15.7	6.0	-25.8	-57.8	-23.2	-25.0	-0.4	32.8	50.8	91.4	12.4	-66.7	-14.6
6	Stono Inlet	6,000			-0.8	-2.1	-6.8	2.7	0.8	3.6	-6.7	-13.3	-13.4	-32.7	-14.3	-20.1	-22.9	1.3	-1.4	-4.3	-7.0	-6.7	1.1
1-6	All	57,232				3.4	7.6	8.1	-1.8	8.3	2.2	4.9	-3.3	-19.4	-5.4	-3.3	-2.8	4.0	5.8	12.9	4.7	-10.6	3.1

Annualized Reach Unit Volume Change Since Previous (cy/ft/yr)

Reach	Name	Length	Apr-99	Sep-06	Aug-07	Oct-08	Aug-09	Oct-10	Oct-11	Oct-12	Oct-13	Oct-14	Nov-15	Jan-17	Nov-17	Jan-19	Nov-19	Nov-20	Dec-21	Nov-22	Oct-23	Dec-24	Dec-25
1	Kiawah Spit	8,820				-0.1	7.4	6.8	-3.1	-0.5	0.6	-0.7	-4.9	-7.8	-2.6	-4.6	5.7	2.6	-3.7	-2.7	-0.9	-2.7	0.5
2	West Beach	11,798				-3.3	3.0	1.0	0.6	10.2	4.8	4.0	-0.1	-9.9	1.4	4.7	-3.2	4.2	-1.0	1.6	1.2	-4.7	-2.3
3	Turtle Point	13,614				-3.6	7.1	-0.7	0.2	13.9	9.5	10.3	5.8	-12.3	-4.4	0.3	-3.9	-1.6	1.0	2.8	6.3	-5.9	4.6
4	Ocean Course	9,000			13.9	-6.4	12.8	1.4	11.7	32.9	11.3	14.8	6.4	-3.4	2.0	11.2	2.2	-9.9	-2.9	0.1	14.9	14.6	28.3
5	Lagoon	8,000			-13.3	40.4	32.3	38.9	-24.6	-18.8	-15.6	6.0	-23.7	-49.4	-27.8	-22.2	-0.5	32.2	45.7	103.0	13.1	-55.4	-15.0
6	Stono Inlet	6,000			-0.8	-1.8	-8.1	2.3	0.8	3.6	-6.7	-13.3	-12.4	-28.0	-17.2	-17.8	-27.6	1.2	-1.3	-4.9	-7.4	-5.9	1.1
1-6	All	57,232				11.1	14.1	14.7	-3.8	7.2	-2.8	4.4	-9.0	-25.8	-13.4	-8.0	-6.3	7.6	14.4	34.6	8.4	-16.5	6.2

4.1.1 *Reach 6 – Stono Inlet*

Stono Inlet (Reach 6) spans ~6,000 ft from Line 56 to Line 61 (see Fig 2.3). Beach profiles in this reach are steeper than the oceanfront reaches due to the presence of Stono Inlet and sheltering from large waves—beach steepness is inversely proportional to wave energy and directly proportional to sediment grain size (Komar 1998). Unit volumes from Stono Inlet are shown in Figure 4.1. Between December 2024 and December 2025, the Stono Inlet Reach gained ~6,600 cy (1.1 cy/ft) of volume (Table 4.2).

Erosion along Stono Inlet generally decreases and transitions to accretion moving from the 'corner' of the island inland (~northwest) up Stono River as exposure to larger northeasterly waves decreases. This is shown in the transition from erosion at Lines 56 to 59 to accretion at Lines 60 and 61 from December 2024 to December 2025. Since 2007, Line 56 has experienced the most erosion of any profile on Kiawah Island (–374.6 cy/ft or –20.4 cy/ft/yr) while Line 61 is one of the most accretional profiles on the island (+120.6 cy/ft or +6.6 cy/ft/yr).

Persistent erosion at Line 56 is related to exposure of the northeastern 'corner' of Kiawah Island. The present shoreline is well seaward of its ~1990 position as a result of particularly large shoals attaching later in that decade. As a result, Line 56 will tend to erode until the shoreline position reaches a more stable landward position. Material eroded from this prominence in the shoreline makes its way north and west toward Line 61 inside the inlet due to the shoreline azimuth along Stono Inlet – both predominant northeasterly and prevailing southeasterly waves push sand from Line 56 to Line 61. Periodically, as shoals attach to the Lagoon Reach, they bring new sand into the Stono Inlet Reach and temporarily slow this erosional trend. Volume increases from 2009 to 2012 and from 2019 to 2020 reflect this process.

Cycles of erosion and accretion in successive survey years are related to the movement of shoals around Stono Inlet. The magnitude of changes associated with shoal attachments is proportional to the size of the shoal and the proximity to the area where the shoal attaches to the beach. This is why changes observed in Reach 6 tend to be smaller than those in Reach 5 and Reach 4 (discussed below). The largest shoals tend to attach along those reaches rather than along Reach 6.

Overwash has shifted the dry beach landward over the last few years. As beach sand is transported into the marsh and out of the active beach-dune system, the shoreline recedes. Since ~2019, some overwash deposits have begun encroaching upon uplands located along the 1989 shoreline ('A,' Fig 4.2). As the deposits have 'run out of room,' they have been redistributed alongshore, and some minor dune scarping has been observed. At the same time, some of these overwash deposits continue to move landward over lower-elevation marsh ('B,' Fig 4.2). This phenomenon can result in uneven rates of shoreline retreat and offsets in the position of mean high water.

While in the past years the predominant shoreline trend along the Stono Inlet Reach has been erosion out to the –10 ft contour, the deepest portions of the main channel of the inlet have not encroached further into Kiawah Island. Figure 4.3 shows cross-inlet profiles for Lines 57 and 60 for the period of

November 2015 to December 2025. Like many drowned coastal plain rivers along the South Carolina coast, Stono Inlet is anticipated to remain "positionally stable" as it is deeply incised into the consolidated sediments underlying the Charleston area. At Line 60, the margins of the channel continue to shift toward Folly Island, though the cross-sectional area and maximum depth have generally remained constant.

However, at Line 57, the deepest portions of the Kiawah-side (eg – southern) bank have moved toward Folly Island while the highest portions (eg – above –10 ft NAVD) have moved toward Kiawah Island since 2015. Along the Folly-side (eg – northern) bank, the whole slope has moved toward Folly Island but has also flattened since 2015. From 2008 to 2015, the 0-ft contour on the Kiawah side at Line 57 moved ~6 ft per year toward Kiawah Island—from 2015 to 2025, that same contour moved ~60 ft per year toward Kiawah Island.

The increased rate of tropical cyclone impacts from 2015 through 2019, and the overwash observed along portions of Stono Inlet (see Fig 4.2), point to a temporary increase in wave energy triggering the relatively rapid erosion in this area over the last ten years. As mentioned above, there is an inverse proportional relationship between wave energy and beach steepness. It is possible that the temporary increase in wave energy at the mouth of Stono Inlet has triggered a flattening of slopes on either side of the main channel. It is likely this trend will not continue indefinitely. It is also possible that the long-term rise in relative sea level and cycling of sediments around Stono Inlet have triggered the observed changes in slope and width. Continued monitoring of the MHW contour along Stono Inlet is recommended, even though in this part of the island, primary impacts would be largely ecological.

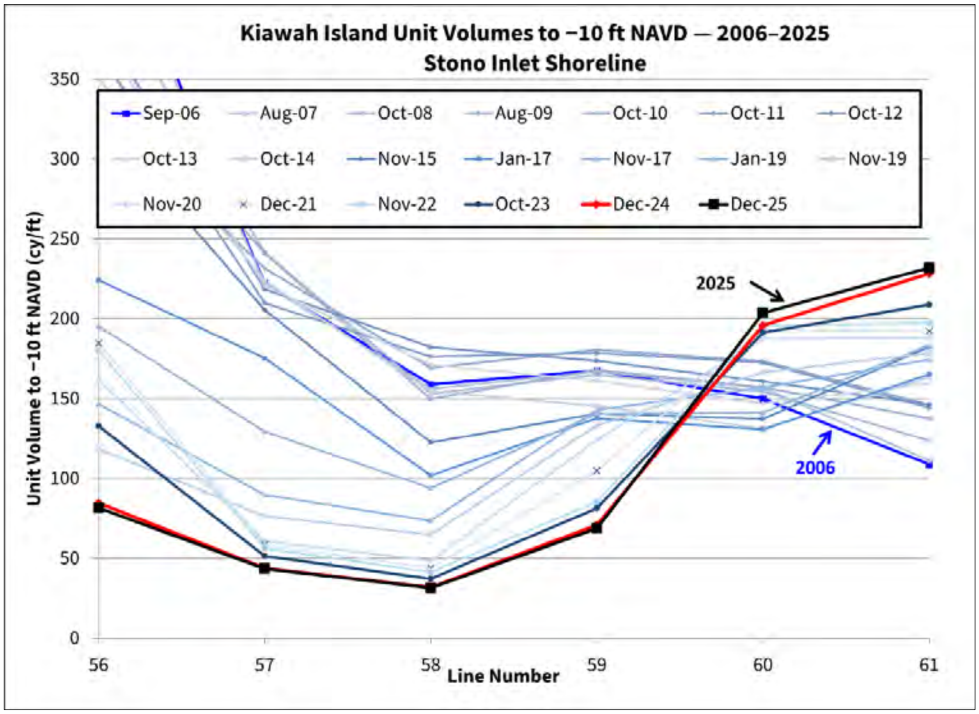


FIGURE 4.1. Unit volumes for stations along the Stono Inlet Reach. Line numbers run east to west, into the inlet along this reach.

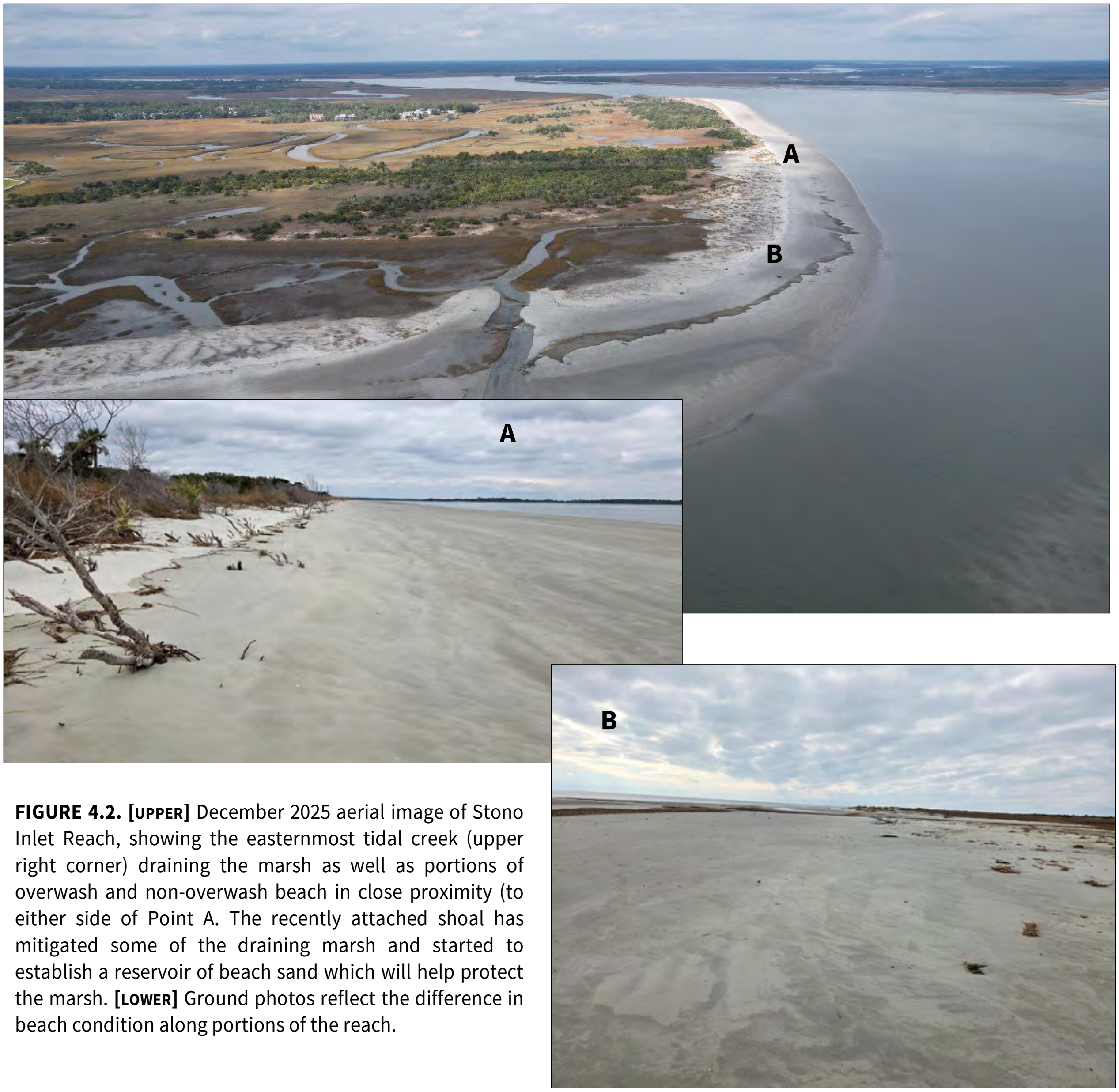
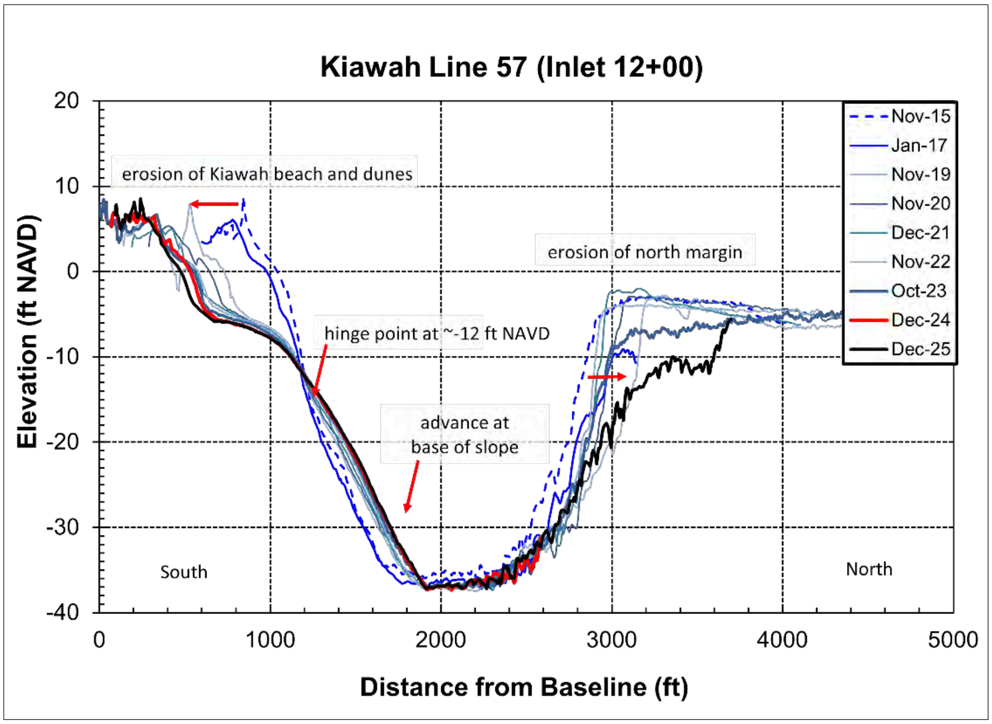


FIGURE 4.2. **[UPPER]** December 2025 aerial image of Stono Inlet Reach, showing the easternmost tidal creek (upper right corner) draining the marsh as well as portions of overwash and non-overwash beach in close proximity (to either side of Point A. The recently attached shoal has mitigated some of the draining marsh and started to establish a reservoir of beach sand which will help protect the marsh. **[LOWER]** Ground photos reflect the difference in beach condition along portions of the reach.



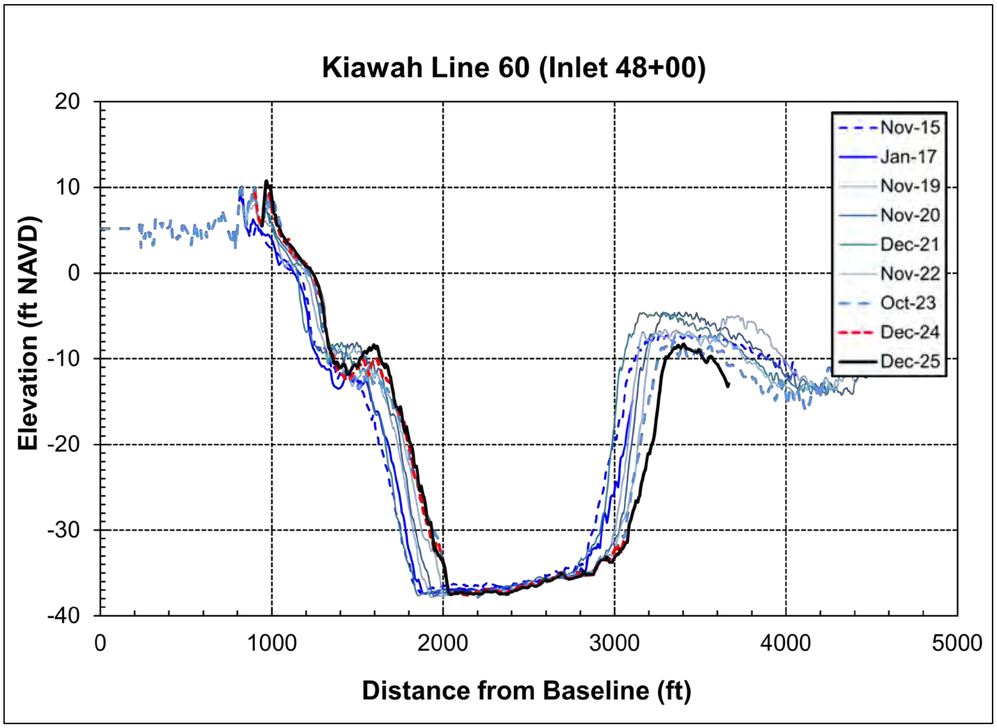


FIGURE 4.3. Profiles from Line 57 [UPPER] and Line 60 [LOWER] along the Stono Inlet shoreline. Hurricane *Matthew* eroded all of the remaining dunes in 2016. The berm shifted over 100 ft landward in 2017 (due largely to impacts of Hurricane *Irma*).

4.1.2 Lagoon Reach

The Lagoon Reach spans 8,000 ft from Line 47 to Line 55 at the easternmost point on the island (Fig 4.4). Monitoring reports for the 2007–2011 surveys subdivided this reach into the eastern and western lagoons. The 2012 report combined these reaches and adjusted the baseline to simplify data collection and reporting, and the present report continues this method. This reach encompasses the area of the island most influenced by shoal bypass events (see Section 1 and Fig 4.5). The Lagoon Reach lost ~116,750 cy (–14.6 cy/ft) above –10 ft NAVD between December 2024 and December 2025.

Due to technical and logistical limitations in this reach, CSE computes beach volumes using digital terrain models (DTMs) created from survey data. These volumes represent the volume of sand within the established boundaries to a set depth. The analogy of a sandbox is often used to describe this method, whereby the volume of sand is measured within the same sandbox each year. DTMs are also used to create contours at specified elevations for each survey, which can then be compared to provide a visual representation of horizontal shoreline change.

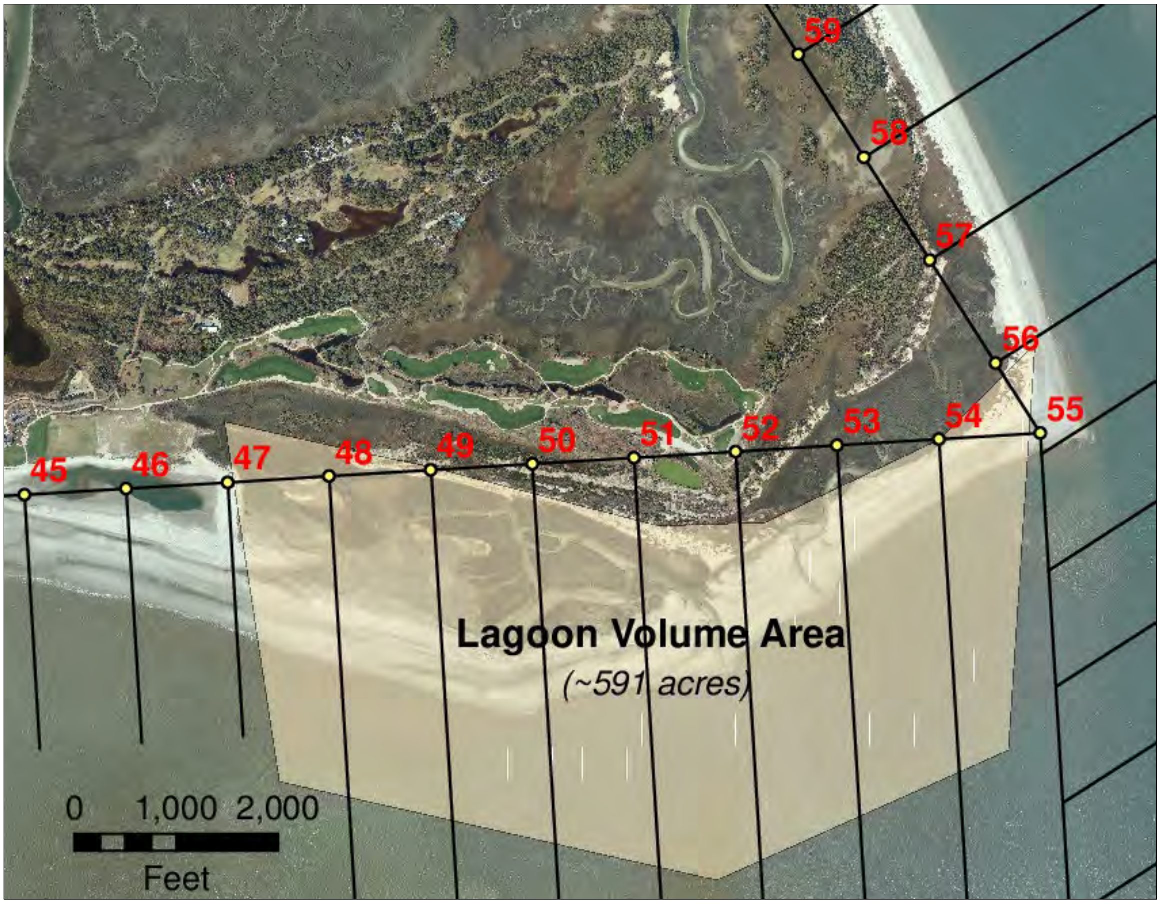


FIGURE 4.4. The Lagoon Reach extends from Line 47 to Line 55. Due to the dynamic nature of the area, the total volume for this reach is calculated from DTMs within the boundaries shown here (image: March 2018).

FIGURE 4.5. December 2025 aerial images of the Lagoon Reach. The 2015 dike is visible in the foreground of the upper image, while showing the small channel that still exists in the Lagoon Reach.

The reach gained a net total of ~323,225 cy (~40.4 cy/ft) between August 2007 and December 2025, but has oscillated between erosion and accretion through three cycles of shoal bypass events over that period. Bypass events along the Lagoon Reach occurred between 2007 and 2010, and 2020 and 2023. The event culminating in 2010 delivered ~957,100 cy (~119.6 cy/ft) of sand, while the most recent event delivered ~1,499,600 cy (~187.5 cy/ft) to the Lagoon Reach.

It is possible to track shoal bypass events in real time using CSE's survey data and generally predict the distribution of erosion and accretion around the shoal itself as sand migrates onshore. In the two bypass events mentioned above, shoals formed around one mile offshore and migrated ~1,000 ft/yr toward the main beach. The sand delivered to the main beach through these events is redistributed to the rest of Kiawah Island via longshore transport, generally toward the south and west.

As of December 2025, the recently attached shoal was spreading away from Reach 5. Downcoast reaches, specifically Ocean Course and Turtle Point, have seen volume increases as a result. Stono Inlet has even become accretional this year, though to a lesser degree than points farther west, likely due to sand moving in from the Lagoon Reach. The eastern flank of the shoal attached to the main beach ~1,500 ft from the 5th hole green in the vicinity of Lines 51 and 52, and continues actively feeding sand toward the northeast. The western flank of the shoal has attached to the main beach ~1,500 ft east of the containment dike constructed during the 2015 East End realignment project. A small flushing channel existed last year between the East End marsh and the ocean, but has since been mostly closed (Figures 4.6 and 4.7).

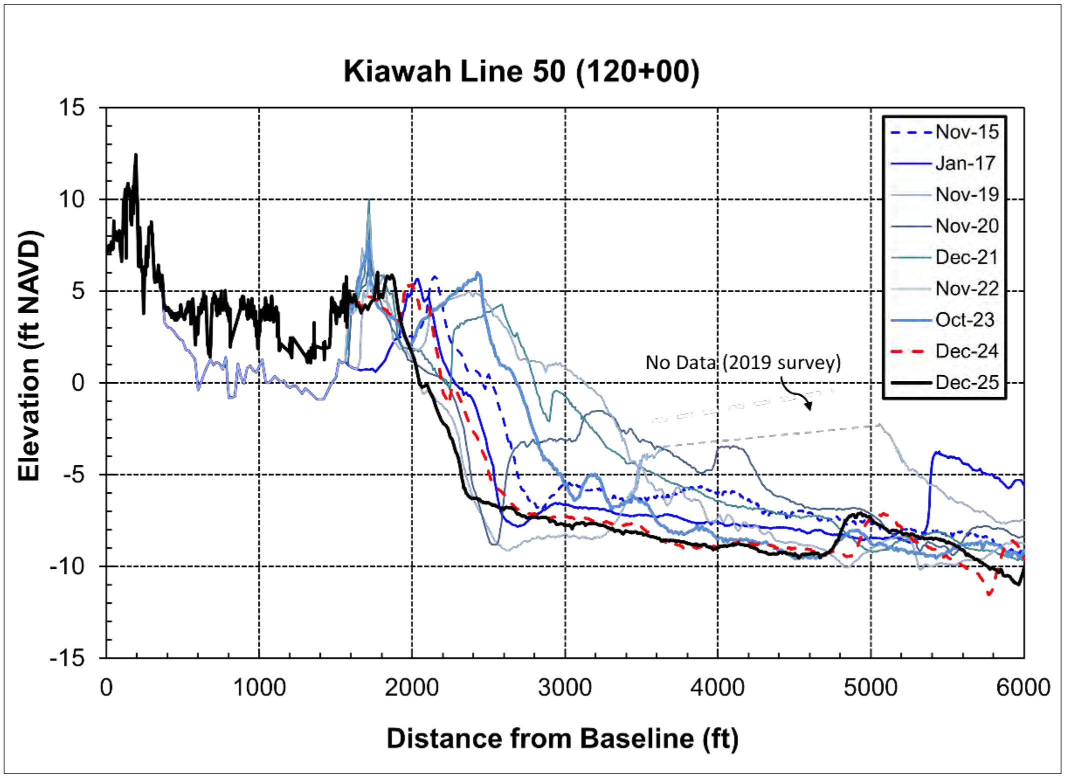


FIGURE 4.6. Profiles from Line 50 showing ~350 ft of dune recession over the past five to six years. Peak elevations of 4–5 ft are insufficient to prevent overwash during storms and spring tides, thus inhibiting dune growth. On a positive note, overwash helps maintain unvegetated beach habitat favored by the piping plover, a threatened species that utilizes the area. This profile line also marks the emergence of the next bypassing shoal approximately 5,000 ft from the baseline. As of December 2025, the "2020" shoal is fully attached to the beach.

FIGURE 4.7. [UPPER] December 2024 aerial photo over the East End marshes showing the shoal is attaching and feeding sand to the beach between the East End and Stono Inlet (center background). **[LOWER]** December 2025 aerial photo showing the shoal attached and growing the dry sand portion of the beach.

FIGURE 4.8. **[UPPER]** December 2024 and **[LOWER]** December 2025 aerial images of the Lagoon Reach. The blue dashed line is the approximate 1989 shoreline. As of December 2025, the east-end channel has shifted westward and mostly closed compared to December 2024 (red line).

4.1.3 Reach 4 – Ocean Course

The Ocean Course Reach is the transition zone between the developed shoreline with a typical strand beach to the west and a dynamic lagoon–beach ridge area to the east (Fig 4.9). It spans ~9,000 ft between Line 38 (Kiawah Beach Club) and Line 47 (east end of driving range). The Ocean Course Reach gained ~248,700 cy (27.6 cy/ft) of sand between December 2024 and December 2025. The reach has generally gained sand since August 2007, with a total volume increase of ~1,255,300 cy (139.5 cy/ft) over that period (Fig 4.10).

However, due to the proximity of the Stono Inlet system and Lagoon Reach—where shoals often attach to Kiawah Island and influence adjacent beaches—the Ocean Course Reach is subject to wide oscillations in beach volumes. The reach tends to gain and lose volumes with the accretion and erosion cycles associated with shoal bypass events, but its shoreline trends tend to lag behind those of the Lagoon Reach by one or two years. As shoals attach to a barrier island, areas immediately 'behind' the shoal (see Fig 2.6) will accrete as the sand migrates onto the submerged beach. During this period of the bypassing process, adjacent beaches will erode due to the refraction of wave crests around the seaward edge of the shoal.

From 2019 to 2022, the reach eroded as a large shoal approached the Lagoon Reach, ~5,000 ft southeast of the Ocean Course driving range. Annualized sand losses over that period averaged around 10 cy/ft/yr. Volumes started to increase in 2021 as sand from the Lagoon Reach began spreading toward the Ocean Course. From December 2024 to December 2025, almost every station, with the exception of two, gained volume. Some of which gained significant volume, specifically toward the east end of the reach, where the shoal attached to the beach. The east end of the reach gained a total of ~200,000 cy from Line 44 to 47. The only stations that lost volume were Lines 40 and 41, likely due to the wave refraction around the accretional bulge associated with the recently attached shoal. Last year, there was a flushing channel just to the north of these lines, which has since closed; however, there is a runnel and ridge system that has shifted to Lines 40 and 41 that could be the cause of some of the erosion. Like last year, Line 46 continues to experience the greatest volume increases along an individual profile from December 2024 to December 2025 (Fig. 4 .11). A December 2025 aerial image is compared to the post-project condition in Figure 4.12.

FIGURE 4.9. The Ocean Course Reach lies along the transition zone from the 'strand' beach to the east end of the driving range. In January 2019, the lagoon and flushing channel fronting the Ocean Course Club House was nearly cut off from the ocean. However, between January 2019 and November 2020, a new flushing channel opened naturally (red circle). As of December 2025, the flushing channel has mostly closed.

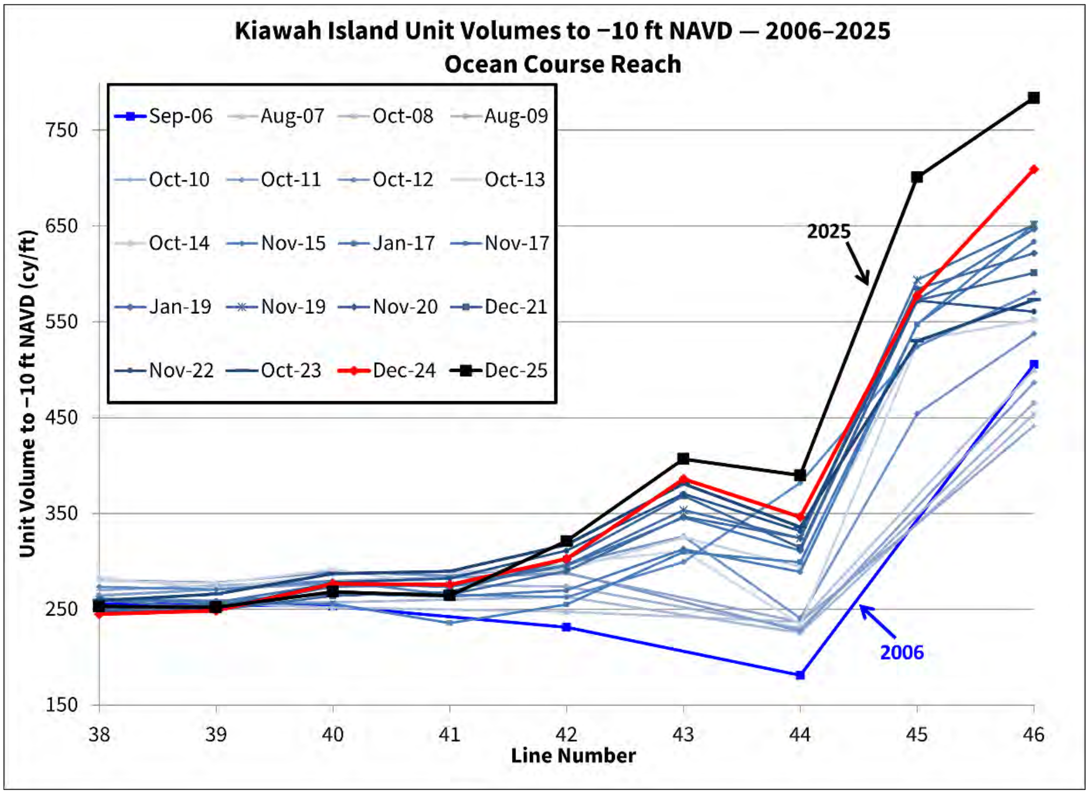
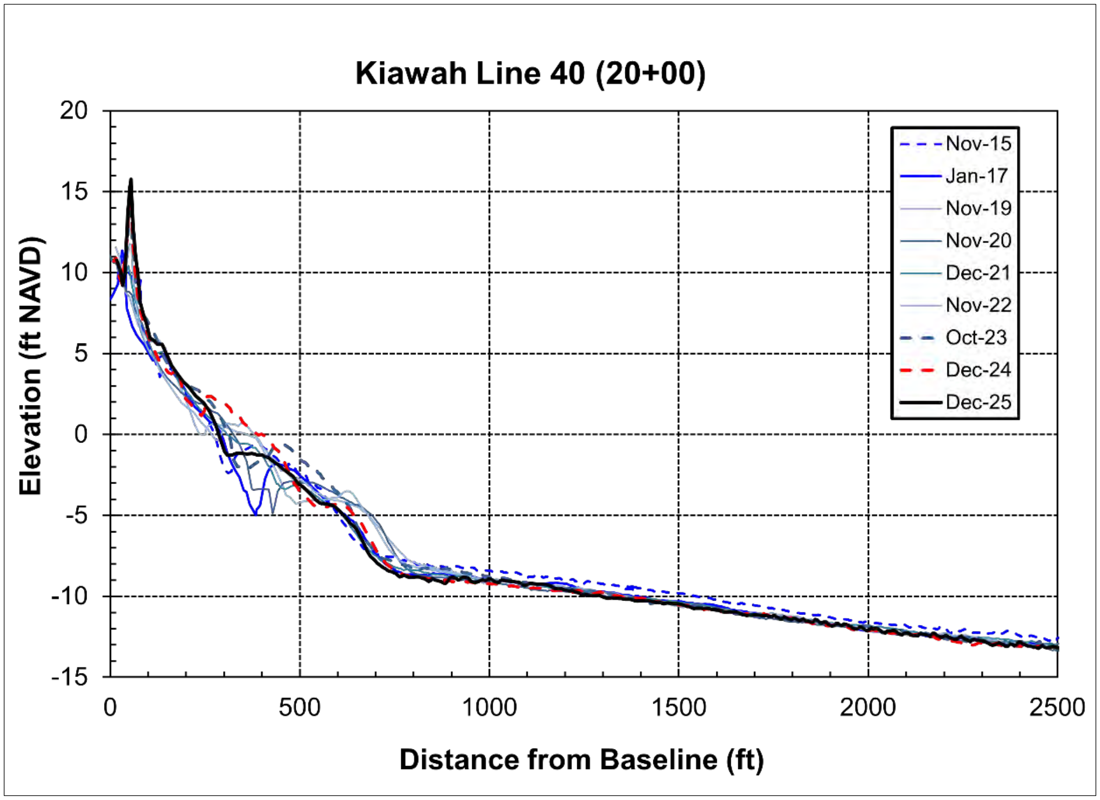


FIGURE 4.10. Unit volumes for the profiles of the Ocean Course Reach illustrating the transition between the 'strand beach' of Kiawah away from inlets (volumes ~250–300 cy/ft to the –10 ft NAVD contour) and the inlet-influenced zone where extensive intertidal bars add to volumes.



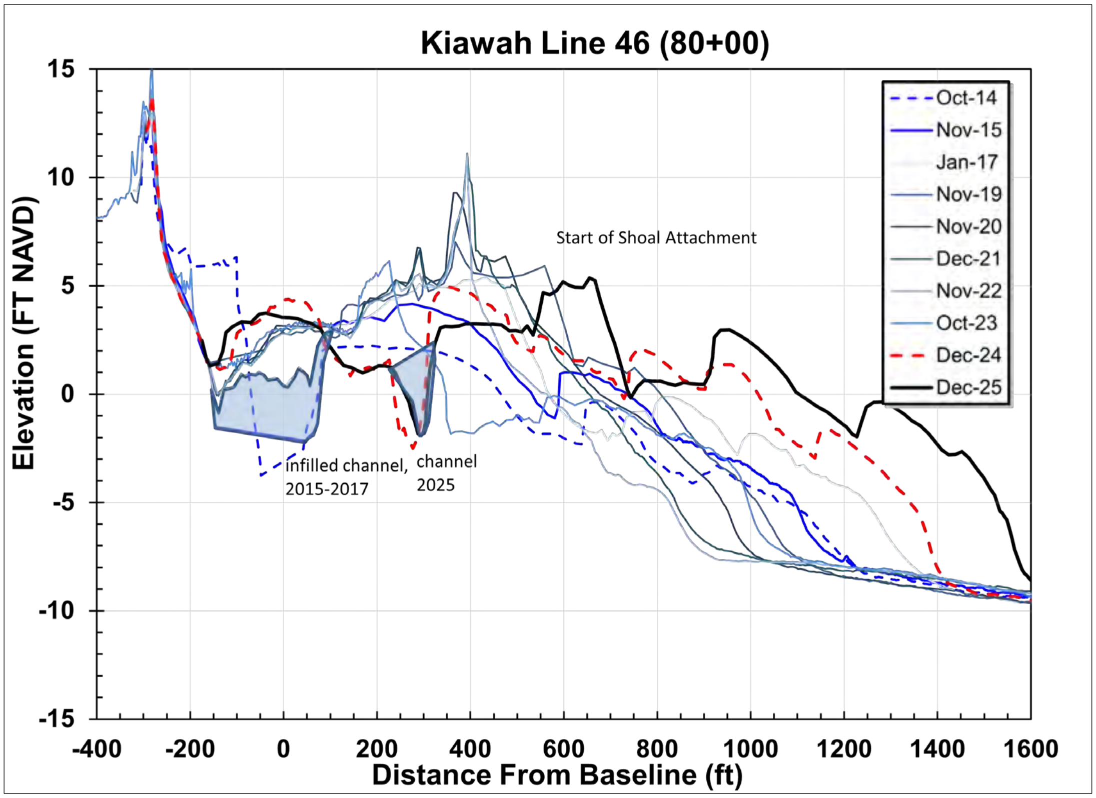


FIGURE 4.11. Profiles from Lines 40 **[UPPER]** and 46 **[LOWER]**. At Line 40, the dunes have remained relatively stable with only a slight decrease in elevation since 2017. At Line 46, the shoal attachment seen last year has progressed with the buildup of a berm around 5 feet NAVD.

FIGURE 4.12. October 2017 aerial image **[UPPER]** compared to December 2025 aerial image **[LOWER]** of the Ocean Course Reach (eastern half). The ponded area is the relict channel basin from the 2015 project, formed before the closure dike was constructed. By December 2025, the flushing channel has closed from the incoming shoal attachment. However, this is a relatively low-elevation beach and lagoon system that can change rapidly. As such, there is an existing application out for review to manipulate shoals and channels along this portion of the island and re-align the system to reduce the flood threat to portions of the Ocean Course.

4.2 Downcoast Reaches

The December 2025 monitoring data for reaches downcoast (west) of the East End project area are compared to 1999 and 2006–2021 data. Profiles in these areas use SCDES-BCM monuments and newly created profiles (2012) so that profile spacing does not exceed 1,267 ft. CSE added these new lines to better monitor local beach changes along the 'populated' beach. CSE has collected data at certain downcoast stations since the early 1980s. Profiles are given in Appendix A.

Figure 4.13 (upper) shows unit volumes for each station in the downcoast reaches. While the typical trend along this area is accretion, yearly volume changes can vary in magnitude, and periods of erosion in some areas are common. From December 2024 to December 2025, the downcoast reaches gained ~39,600 cy (1.2 cy/ft) but ranged from –5.6 cy/ft to +12.1 cy/ft for individual stations compared to last year. This is a significant difference compared to last year's loss of 180,700 (5.3 cy/ft.). This difference is mainly due to the variance seen in Kiawah Spit and the changes in Captain Sams Spit.

Due to the mixture of accretion and erosion, some areas of beach and dunes have receded landward while others have grown seaward. Since 1999, the West Beach Reach (see Fig 2.3) in front of Eugenia Avenue has been a persistent hot spot of erosion compared to areas to the east and west that have generally gained volume (Fig 4.13 upper). This trend is nothing new; historical shorelines published by the USGS document the portion of Kiawah Island between the Sanctuary and Beachwalker Park (centered at Eugenia Avenue) as the only area where the 2025 shoreline lies landward of the 19th-century shoreline. Fortunately, the rates of erosion are relatively low (eg – <10 cy/ft/yr long-term), so should the Town or private property owners choose to pursue remedial work in that area, the costs will accordingly be relatively low as well. Despite this persistent erosion at Eugenia Avenue, the three Downcoast reaches collectively contain more volume than in 1999. Compared to the 2007 survey, only Kiawah Spit has lost sand, and this is due to the adjacent Captain Sams Inlet that naturally draws sand away from Kiawah Island toward Seabrook Island.

An important dynamic to monitor in the coming years is the width of the narrowest portion of Kiawah Spit. Between the 1970s and 2010s, the width of the dry upland (that is, between the MHW contours along Kiawah River and the Atlantic Ocean) along this portion of the spit grew from ~250 ft to nearly 400 ft. As of 2015, this portion of the spit maintained approximately 380 ft of dry upland. From 2015 through 2025, that width narrowed to approximately 250 ft of dry upland. This is equivalent to an average rate of 10 to 12 feet of narrowing per year. At this rate, the MHW contours on either side of the spit will meet in the next 20 to 25 years. However, given the uncertainty surrounding intensity and timing of storm impacts as well as the precise rate of relative sea level rise over a ~20-year horizon, it is possible that a breach could naturally form sooner than ~2045. Based on the site conditions in the 1940s, when such a breach last occurred naturally, a breach would threaten public access to much of Beachwalker Park as well as the developed properties just east of the public access point at Beachwalker Park (Fig 4.14).

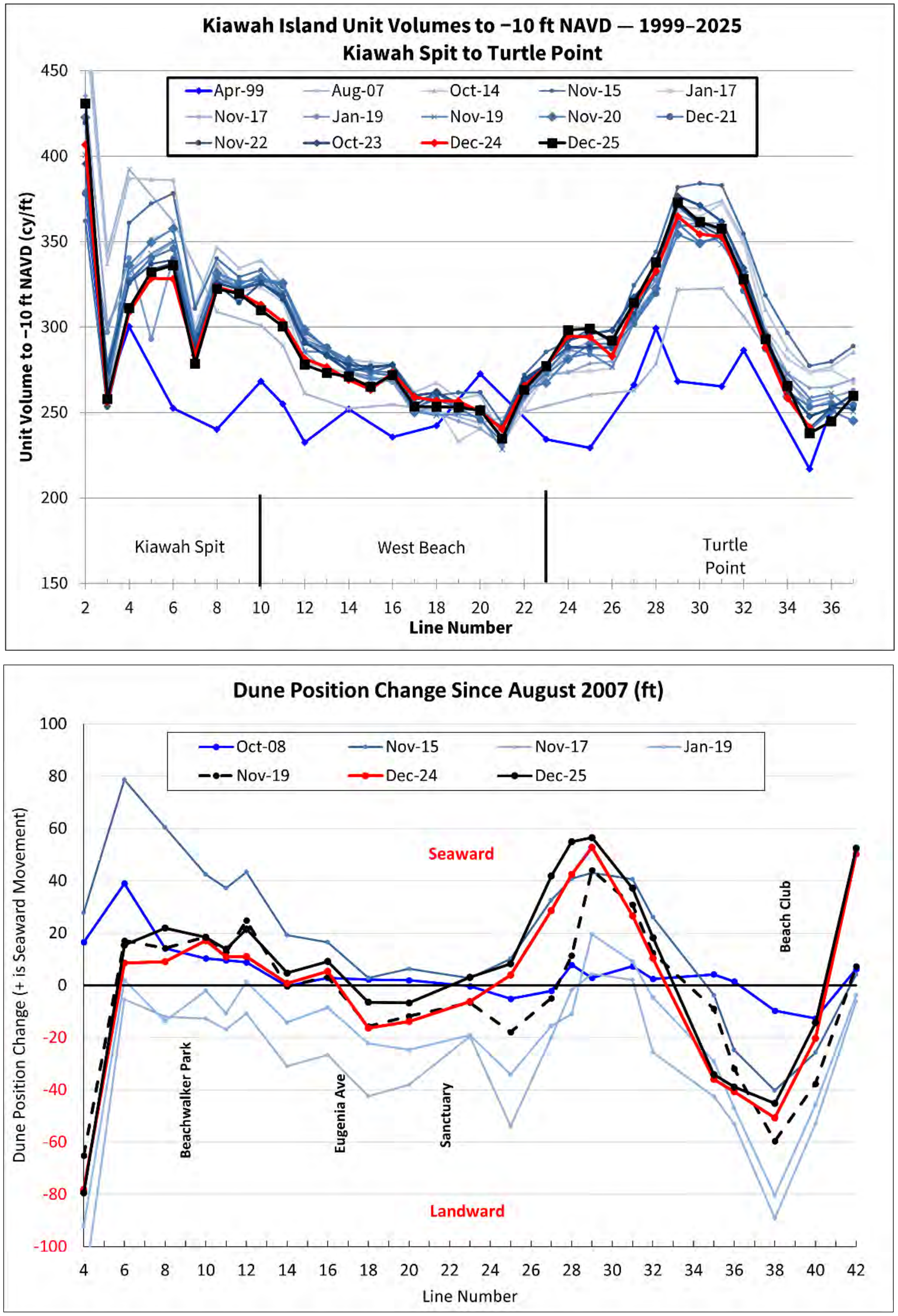


FIGURE 4.13. **[UPPER]** Unit volumes in the downcoast reaches between 1999 and 2025 and **[LOWER]** dune-line linear change (measured at the +7 ft NAVD contour).

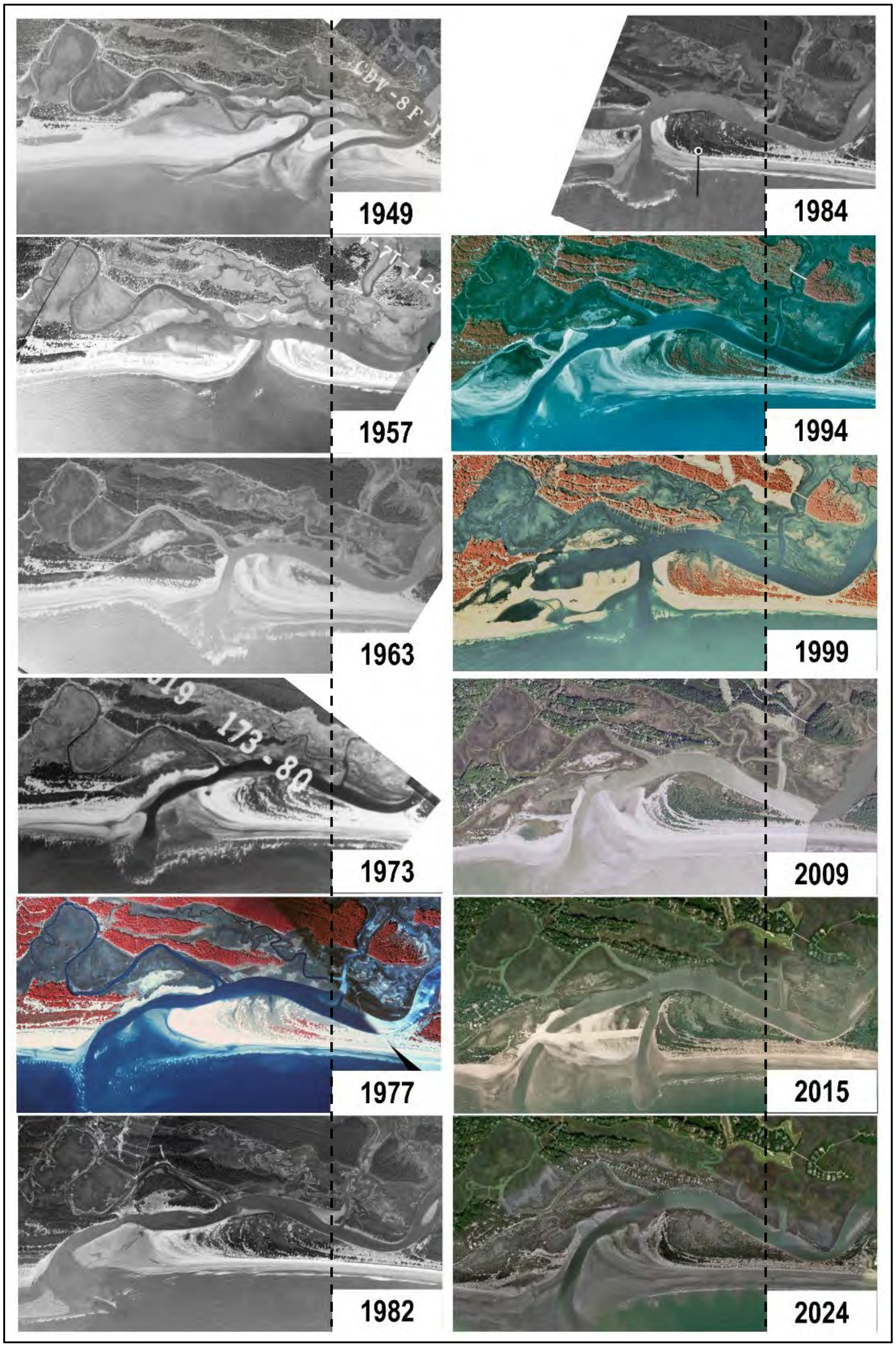


FIGURE 4.14. Existing rectified historical imagery depicting the changing position of Captain Sams Inlet and the changing condition of Kiawah Spit since 1949. The 1963 inlet location was selected as the site of the original inlet relocation cut at the recommendation of Research Planning Institute (RPI) in consultation with SIPOA and the Kiawah Island Company. Both entities agreed that a periodic forced relocation of the inlet within a defined management corridor was a preferable alternative to allowing natural breaches to occur across an unmanaged corridor. This delivers a two-fold benefit of allowing an undeveloped zone immediately surrounding the most dynamic shorelines adjacent to the inlet, while improving shoreline stability on either side of the inlet, thus reducing vulnerability of developed properties.

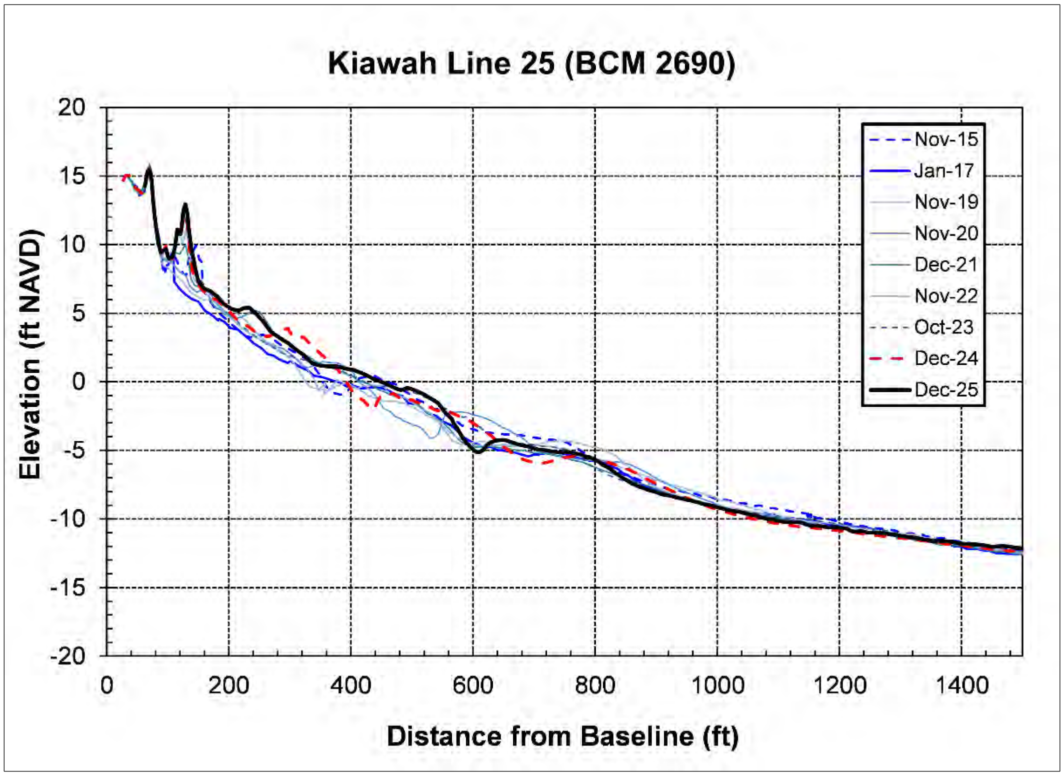
4.2.1 Turtle Point Reach

Turtle Point Reach extends 13,614 ft from Line 23 (16th hole of Turtle Point Golf Course) to Line 38 (Kiawah Beach Club). Between December 2024 and December 2025, the reach gained ~61,500 cy (4.5 cy/ft) of sand. Like the Ocean Course Reach, Turtle Point is the recipient of bypassed sand once shoals fully attach to the main beach.

The relationship between shoal bypass events and volume changes along Turtle Point is evident in measured volume changes since 2007 (see Fig B). A shoal attached to the Lagoon Reach between 2007 and 2010, and volumes increased along Turtle Point from 2011 to 2015. From 2015 to 2020, as sand from that bypass eventually made its way toward Capt Sams Inlet and the island was impacted by multiple named storms, Turtle Point tended to lose sand. Last year, this reach lost volume; incoming swells naturally refract around the wider beach to the east, concentrating breaking wave energy and triggering erosion before the next accreting wave of sand arrives. As of the December 2025 survey, the sediment supply was restored from upcoast areas and the reach accreted.

Unit volume changes within the reach ranged from –3.6 cy/ft to +12.1 cy/ft between December 2024 and December 2025. The beach has generally recovered from damage experienced in 2016 and 2017 from hurricanes (Fig 4.15) and post-storm dune restoration. Ground photos (Fig 4.16) reflect the healthy condition of the beach along Turtle Point.

The significant building setbacks and historical accretion trend around Turtle Point suggest that the reach can recover without any additional action by the Town. There have been varying periods of accretion and erosion since the 2020 survey. The accretion this year tends to reflect the historical stability of the reach with a net accumulation of sand of ~352,000 cy (25.9 cy/ft) compared to the August 2007 condition. The stable beach state in Turtle Point is partly due to its location on the island. Being that it is in the center of the island, Turtle Point does not suffer from being near highly dynamic inlets that tend to cause increased erosion along barrier islands. It is also further west of the normal shoal attachment points, so the temporary erosion caused by these features is milder. With the documented accretion observed in recent years along the upcoast reaches, CSE expects the Turtle Point Reach to continue to have a healthy beach condition in the foreseeable future.



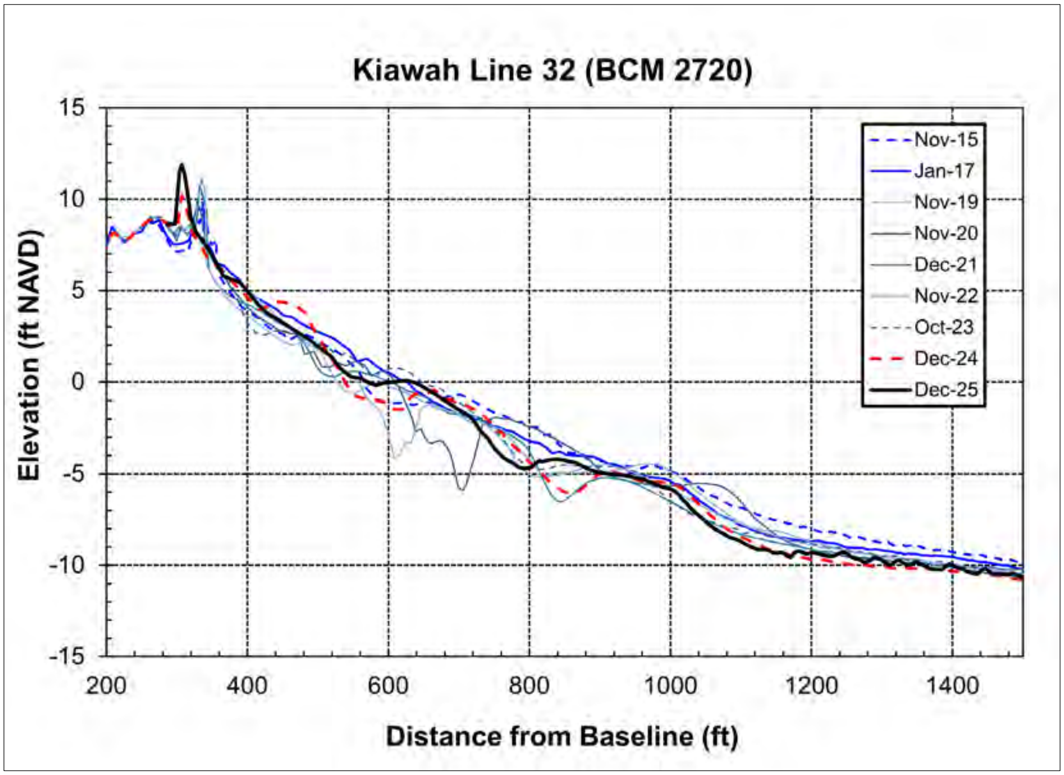


FIGURE 4.15. Profiles from the Turtle Point Reach. In the past couple of years most of the profiles have gained sand near the berm but lost it further down the profile. Note the difference between blue (November 2015 – January 2017) and red/black (December 2024 – December 2025) profiles; the dune ridge was washed away, but a new bar is forming around low tide wading depth. These profile changes are typical of winter or storm beaches.

FIGURE 4.16. Ground photos near Line 28 post-*Irma* September 2017 **[UPPER]**, November 2019 [MIDDLE], and December 2025 **[LOWER]**. The ramp (red circle) exposed by *Irma* is now hidden behind tall stands of sea oats and partially buried by wind-blown sand.

4.2.2 West Beach Reach

West Beach Reach encompasses 8,820 ft of beach between Lines 10 and 23 (Sand Alley to the 16th tee of Turtle Point Golf Course). Historically, this reach, like Turtle Point, has been relatively stable compared to the other reaches (though it tends to experience more erosion than Turtle Point). Between December 2024 and December 2025, West Beach lost ~26,300 cy (–2.2 cy/ft). Although West Beach has experienced volume loss for a second year in a row, many properties within the reach are sufficiently set back to allow for a substantial vegetated buffer between the ocean and the structures. That said, a number of properties located along Eugenia Avenue in particular contain minimal or sparsely vegetated dune buffers. In this area, a single storm (or series of smaller storms in quick succession) could easily overtop the dune leading to property damage and/or flooding.

The reach lost 3.9 cy/ft of sand from 2007 to 2008 but accreted during every monitoring interval between 2008 and 2014. From 2014 to 2015, the reach was stable overall, although within the reach, the western half eroded and the eastern half accreted. The reach was highly erosional from November 2015 to January 2017 (Hurricane *Matthew*), losing ~136,500 cy (–11.6 cy/ft).

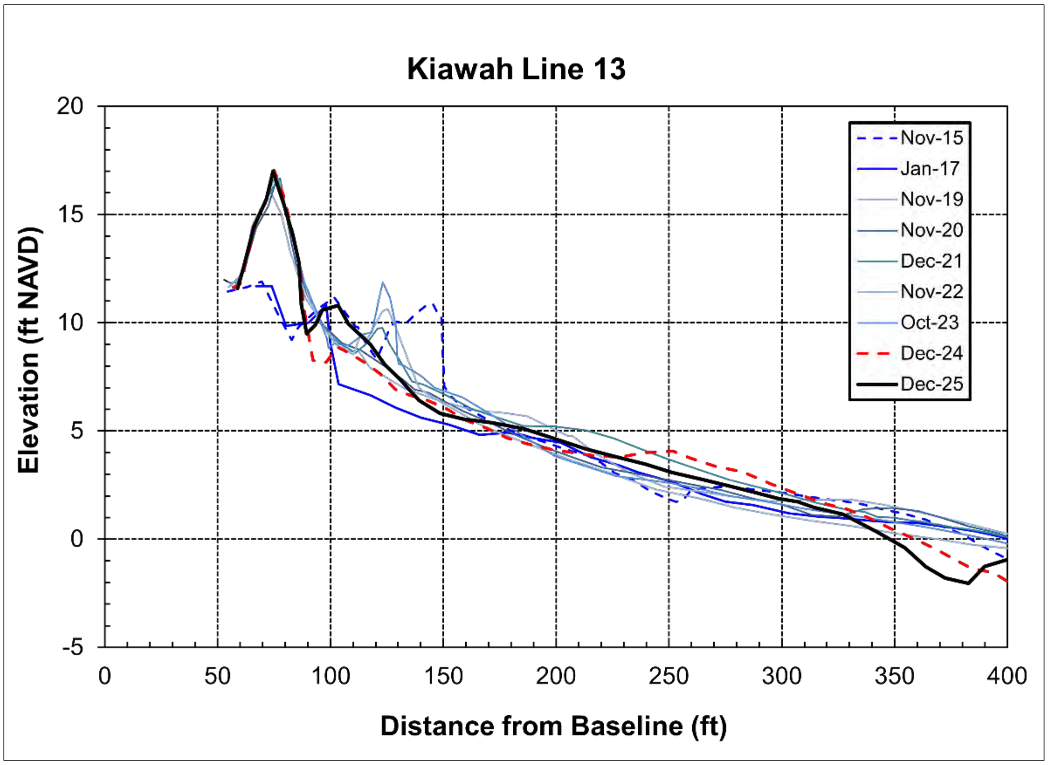
Since January 2017, reach-wide volume changes have oscillated between erosion and accretion, ranging from –5.3 cy/ft (October 2023 to December 2024) to +5.3 cy/ft (November 2017 to January 2019). Individual profiles oscillate between accretion and erosion at moderate rates, ranging from –11.6 cy/ft at Line 21 between January 2019 and November 2019 to +13.4 cy/ft at Line 18 between November 2019 and November 2020. There was a significant loss of sand following Hurricane *Irma* (September 2019), such that between January 2019 and November 2019, the reach lost ~32,500 cy (–2.8 cy/ft). As previously mentioned, sand from the dune shifted lower in the beach profile during the storm but has since migrated back to the upper beach during calmer weather conditions. Between December 2024 and December 2025, most of the lines in the reach lost sand. However, the reach contained ~113,500 cy (9.6 cy/ft) more sand as of December 2025 than in August 2007. The magnitude of loss this year is around 40% of what it was last year.

It is important to note that erosion also occurred at Turtle Point last year, the reach immediately northeast of West Beach. Along the South Carolina coast, sediment transport generally occurs from north to south. As a result, erosion at Turtle Point likely limited the sediment supply to West Beach, contributing to erosion observed last year and again this year. If accretion resumes at Turtle Point, it is likely that sand will subsequently be transported downdrift to West Beach.

Recent profiles from the reach (Fig 4.17) show an improvement in the dry sand portion of the beach above +5 feet NAVD, especially in the foredune. Previous years showed a consistent pattern of erosion of the foredune from 2015 through 2020–2021, leaving a pronounced escarpment on the seaward side of the foredune. As shown in Figure 4.18, the dune receded ~20 ft along the reach. With the combined effects of hurricanes *Joaquin*, *Matthew*, and *Irma*, and the pre-existing narrower setbacks of structures in the reach, several properties were left vulnerable to erosion. The Town obtained a permit for beach scraping to rebuild the dunes along Eugenia Avenue and seaward of The Sanctuary. This effort restored the storm protection offered by the foredune and improved recreational access to the beach via walkovers. Additionally, these efforts provided a healthier habitat for nesting turtles.

While the dune and overall beach health in West Beach remain in good condition, future monitoring in this area should focus on the width of the vegetated dune immediately in front of Eugenia Avenue. Erosion rates have decreased since last year, and the buildup in the sand supply in Turtle Point should trigger accretion in the near future along West Beach. All the same, a single storm impact can severely damage a dune and expose oceanfront properties (as during Hurricane *Irma* – see Fig 4.18). Based on the elevations measured along profiles in front of Eugenia Avenue (Fig 4.17), the seaward dune toe is located at ~7 ft NAVD. This elevation is approximately 5 ft above the average high-tide elevation at Kiawah Island. So, if a storm were to impact the island at high tide with wave heights of 5 ft the dune along Eugenia Avenue would be severely threatened and extensive erosion would be likely.

To mitigate this risk, the Town and private property owners may consider a proactive dune restoration project along Eugenia Avenue. Such an effort would be possible under a relatively quick general permitting process and would provide necessary protection from high water and storm events.



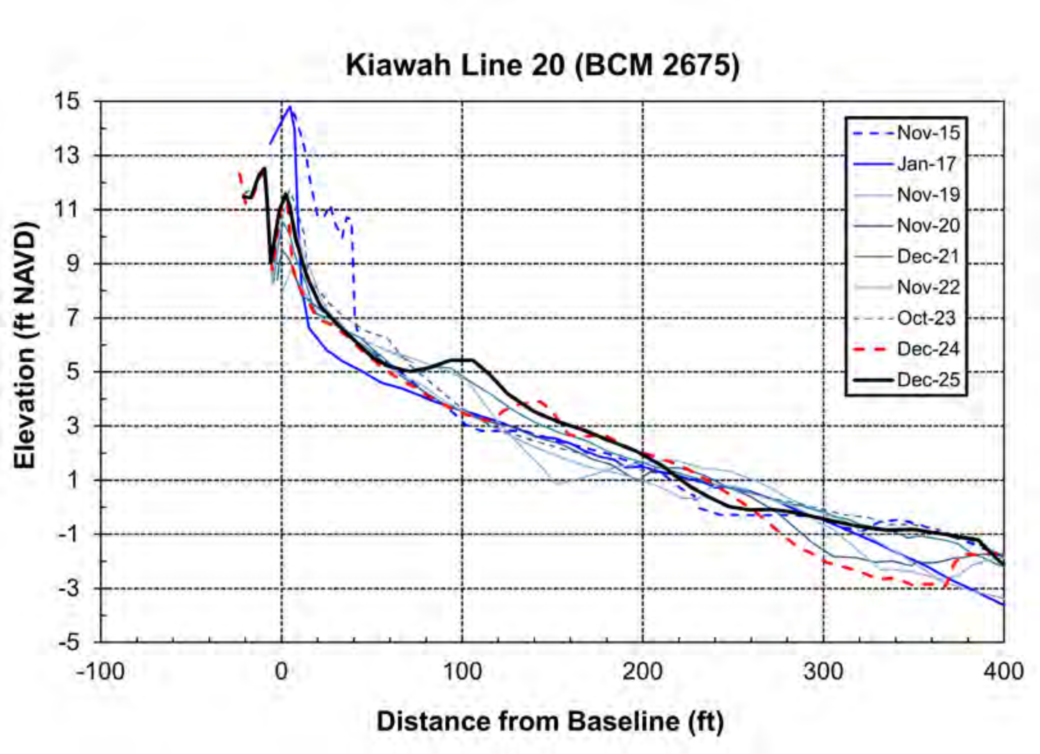


FIGURE 4.17. Representative profiles from West Beach Reach. Much of the reach has experienced erosion of the dune ridge in recent years, which has continued this year. Many of the profiles, including Lines 13 and 20 shown above, are showing the berm is building up despite the erosion.

experienced dune erosion from relatively busy hurricane seasons and nor'easters between 2015 and 2017. Hurricane *Irma* left a particularly noticeable scarp in the dune **(see left-hand portion of the top panel above, November 2017)**. The Town of Kiawah Island elected to scrape the beach to rebuild a protective foredune, and the project has performed well. In December 2024 **(bottom-left panel), the dune face was slightly scarped** by the wind. As of December 2025 **(bottom right panel)**, there is no escarpment in this area, indicating the dune recovered.

4.2.3 Kiawah Spit Reach

Kiawah Spit Reach encompasses the downdrift end of the island. It acts as a sink for sand transported by longshore currents from upcoast areas and a source for sand exported away toward Seabrook Island. As wave action transports sand to the west, it feeds the spit, causing growth into Captain Sams Inlet and forcing the inlet to migrate toward Seabrook Island (Fig 4.19). Between December 2024 and December 2025, Kiawah Spit gained ~4,400 cy (0.5 cy/ft). Despite this short-term volume increase, the reach has lost ~125,300 cy (–14.2 cy/ft or –0.8 cy/ft/yr) since 2007. More than half of that loss was measured in the January 2017 survey, just three months following the impacts from Hurricane *Matthew* (November 2015 to January 2017 ~–80,900 cy or –7.8 cy/ft/yr). Since January 2017, the reach has lost just ~87,000 cy (–9.9 cy/ft or –1.0 cy/ft/yr).

Many of the changes in this region result from changes in Captain Sams Inlet. Shallow inlets tend to be highly dynamic and can drastically impact adjacent beach volumes. Historically, Captain Sams Inlet would breach Kiawah Spit somewhere along the current Beachwalker Park every ~40 years in a cycle of inlet migration, spit breaching, and channel relocation. The historical corridor of inlet migration spanned from the modern-day Beachwalker Park public access point to the Seabrook Island Beach Club, ~3 miles south and west. Between 1949 and 1983, the inlet migrated approximately 10,000 ft (~300 ft/yr) along this corridor (see Fig 4.14). Studies and negotiations between the developers of Kiawah and Seabrook Islands in the 1970s and 1980s led to a programmatic approach to inlet management wherein the spit breaching and inlet migration process would be managed for the benefit of both communities. By taking control of the breaching and migration process, the program was designed to reduce the hazard of a breach at Beachwalker Park and provide a more regulated, steady supply of sand bypassing the inlet.

As mentioned in Section 4.1.2, Captain Sams Inlet was last relocated in June 2015. This placed the eastern margin of the inlet ~450 ft west of Line 3. The shoreline response of Kiawah Spit following these projects generally follows the same pattern—initially, there is some sand loss along Kiawah Spit as the new inlet equilibrates to wave action and tidal currents. Because the inlet is ebb-dominant, within a few months, bars and shoals accumulate on the seaward side of the channel and serve to feed sand to the adjacent beaches. On Kiawah Spit, this typically results in a seaward deflection of the MHW contour moving from east to west. This seaward deflection is an artifact of higher beach volumes in this area, due to the presence of ebb shoals associated with the relocated inlet. This is the mechanism by which the inlet relocations help reduce the chances of an unmanaged breach along Kiawah Spit.

5.0 COASTAL RESILIENCY UPDATE

5.1 Weather and Climate Conditions, January 2025 to December 2025

Weather and climate data are gathered from outside sources (all NOAA-supported) to compare observed changes to the beach and environmental conditions. Data reported in this document covers the period from January 2025 to December 2025 (the same as the survey data presented herein). Wind data are compared to historical data covering the period from 1945 to 2025.

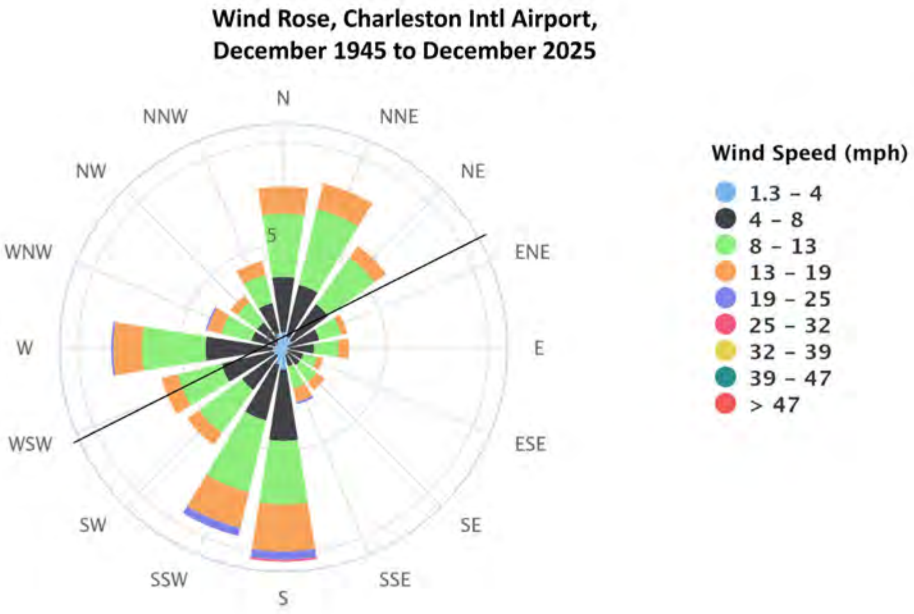
Real-time and historical hourly wind data from across the United States are aggregated by the Midwestern Regional Climate Center (MRCC), a cooperative program between offices of the National Oceanic and Atmospheric Administration (NOAA) and Purdue University (http://mrcc.isws.purdue.edu/). The closest operational station to Kiawah Island is Charleston International Airport (FAA identifier – CHS) in North Charleston.

Winds along Kiawah are bimodal (typical for the southeastern coast), with predominant winds from the north-northeast and prevailing winds from the south-southwest. After averaging the wind data for this year, it yields easterly winds from ~176°. Relative to the shoreline azimuth (see Fig 5.1), these drive more wave energy from easterly components, leading to net westerly transport along the beach. Nor'easters, which generate the highest frequency of strong winds, are partially sheltered by the shoals of Stono Inlet, lessening wave exposure along the oceanfront. In a given year, it is entirely plausible that most of the sand transport occurring around Kiawah Island is driven by non-tropical nor'easter-type storms. The peak observed wind speed was on 11 January 2025 with a gust of 43.0 mph. The maximum wind speed from 2010 to 2025 was 99.3 mph, observed during Hurricane *Dorrian* in September 2019.

According to the data from MRCC-NOAA, between January 2025 and December 2025, there was a weaker northerly component of the winds than typically occurs in the Lowcountry. The typical proportion of winds from that half of the compass represents ~43 percent of the total observed from 1945 to 2025, while from January 2025 to December 2025, these winds represent about ~41.5 percent of the observations. Compared to long-term observations, this suggests there may have been slightly weaker storm winds between January 2025 and December 2025. NOAA buoy data also show a weak northerly component during the same period.

Meteorological and oceanographic data are recorded by the National Data Buoy Center (NDBC) Station 41004 ('Edisto'), ~50 miles due east of Kiawah Island. This is the closest station recording continuous wave data for the entire period.

*The normal convention for wave direction is the direction of propagation, whereas winds are recorded by the direction of origin. Thus, waves at ~132° are moving to the southeast, whereas winds from 132° are blowing toward the northwest.



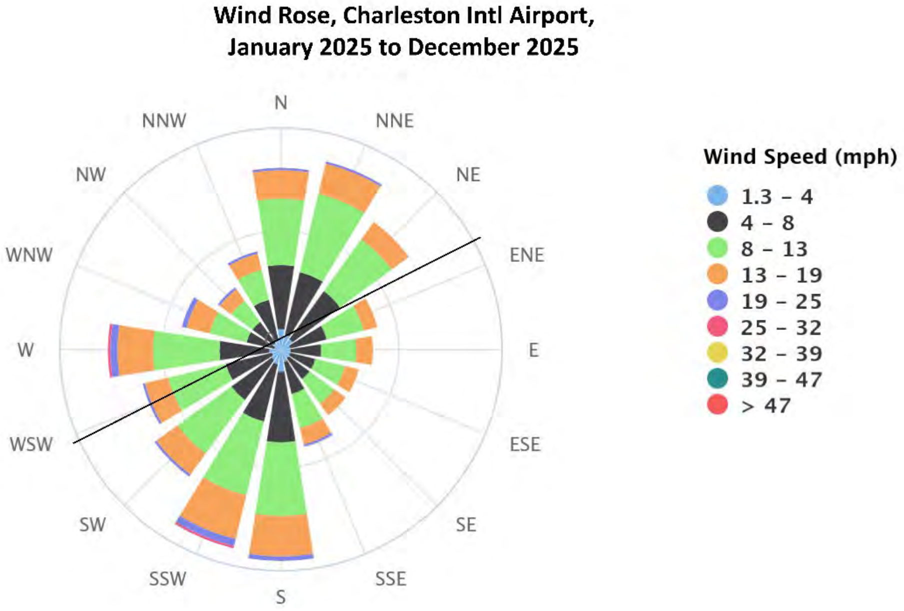


FIGURE 5.1. Wind roses showing direction and magnitude of winds observed at Charleston International Airport from December 1945 to December 2025 **[UPPER]** and from January 2025 to December 2025 **[LOWER]**. The line across the wind rose indicates the average shoreline orientation along Kiawah Island (~75° N). Winds observed over the course of 2025 have featured a smaller proportion of northerly winds than reported in the long-term record.

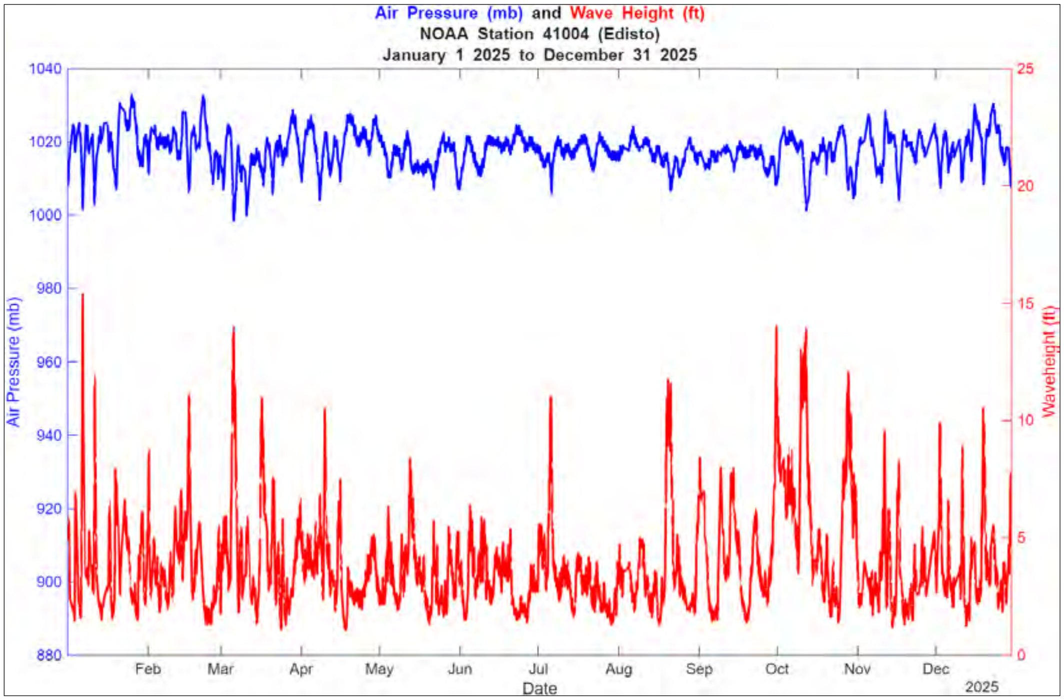


FIGURE 5.2. Atmospheric pressure and wave height at NDBC 41004 from January 2025 to December 2025. Atmospheric pressure only dipped below 1000 mb a few times, displaying the subdued storm season in 2025. Wave height above 10 feet also dropped in 2025 compared to historical trends. There were 197 times in 2025 where waves were greater than 10n ft versus the historical average of 211 times a year from 2010 to 2025.

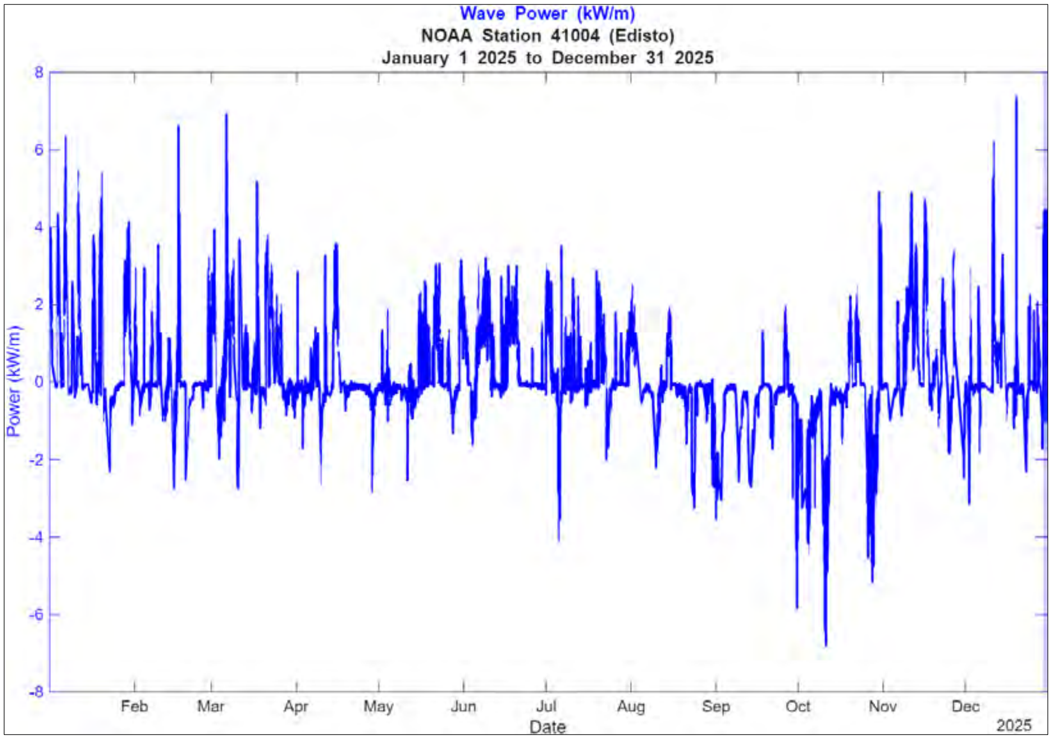


FIGURE 5.3. Wave power (in kW/m) and wave height (in m) for NDBC 41004 from January 2025 to December 2025. Wave power is a useful parameter for determining the relative magnitude and direction of wave energy in a longshore direction along a beach. Positive values indicate waves move from south to north (easterly transport), while negative values indicate predominance of north-to-south (westerly) transport.

The average wave height from January 2025 to December 2025 at Station 41004 was ~3.7 ft, with an average wave period of ~7.6 seconds. The maximum observed wave height was ~15.4 ft during a nor'easter on January 6th, 2025. The average wave direction was ~142°.

Following the relatively energetic hurricane seasons of 2015 (*Joaquin*) through 2019 (*Dorian*), the Lowcountry was spared from significant impacts due to tropical cyclones between 2020 and 2025. This period of relative quiet allowed beach-dune systems to replenish, a development reflected in some of the ground condition photos discussed in Section 4.2.2. With the addition of a shoal bypass event along the East End of Kiawah Island currently in its final stage (see Section 4), continued maturation of beach-dune vegetation, and improved dry beach widths are expected until the next major storm event.

Atmospheric pressure dropped below 1000 millibars (mb) ~88 times per year from 2010 to 2025, and only fell below 1000 mb about ~15 times from January 2025 to December 2025 (Fig 5.2). Pressure did not dip below 990 mb at all during this period.

Most Category 1 hurricanes typically exhibit central pressures around 980–990 mb, while many nor'easter-type storms have central pressures below 1000 mb. While there were no significant storms that made landfall in South Carolina this past year, there were several tropical systems and other storms that affected the area. This includes Hurricane *Erin* that passed offshore South Carolina around August 20th. Also, during the past year, South Carolina had an unusual amount of persistent higher tides that affected much of the coast, especially during storms.

Like atmospheric pressure, wave height is an easy parameter for distinguishing the relative intensity of storm events. However, atmospheric pressure and wave height are imperfect measures because these are simply proxies for the physical processes that produce beach erosion (eg – a more energetic surf zone with longshore transport in a particular direction, occurring in phase with a high tide).

The fundamental driver of beach erosion is variation in sediment transport. An increase in erosion indicates more sand is being transported away from a location than toward it. Over time, this reduces beach volumes. Sand transport increases exponentially with shear stresses generated by currents and wave action, such that a doubling of current velocity or wave height will increase sediment transport rates several times over. This helps explain why even minor storms can produce significant erosional losses along the coast. Engineers and scientists use measurements of wave properties like height, length, and speed to estimate the magnitude of energy exerted by a single wave crest. The estimate is expressed as 'wave power' in kilowatts per meter of crest length (kW/m). Because sand can migrate either way along a beach, wave power must be adjusted so that waves generating southerly transport (north to south) and northerly transport (south to north) can be differentiated.[1]

To accomplish this, wave power can be calculated so that northerly (south-to-north) transport is measured above zero (positive) while southerly transport (north-to-south) is measured below zero (negative). The estimated wave power at Kiawah from January 2025 to December 2025 is shown in Figure 5.3. The larger-magnitude and positive wave power values in the winter months represent the passage of low-pressure tropical cyclones and nor'easters. In contrast, lower-magnitude and negative values during the summer, spring, and winter months indicate calmer seas.

From January 2025 to December 2025, the average wave power was .26 KW/m, indicating northernly transport. This trend is the opposite of last year, where southernly transport dominated the survey period. As expected, the average northernly transport was 1.41 Kw/m, five times the magnitude of the southernly transport of –.27 KW/m. A strong seasonal signal persists such that northerly-directed wave power dominates the spring and summer, while southerly-directed wave power dominates the fall. Given that the storm season for South Carolina was relatively tame compared to years prior, it makes sense that there is not a significant southernly transport because the fall was subdued.

Typically, offshore at the Station 41004 buoy, northerly waves tend to dominate the spectrum over the long-term, but the strongest waves are southerly-directed. However, this year the strongest magnitude wave energy indicated northern-directed with a value of 7.37 KW/m. This is compared to the strongest southernly-directed of –5.84 KW/m. Not only does the strongest wave trend this year go against the historical trend of the buoy, but also against the historical trend of the South Atlantic Bight. In many locations along the South Atlantic Bight, this observation matches beach volume changes wherein seasonality in wind and wave directions can trigger alongshore shifts in beach volumes; however, long-term averages show longshore transport from north to south in most locations. It continues to demonstrate that the fall this past year was calmer compared to historical trends.

The difference between offshore and nearshore measurements is a crucial point to consider in interpreting these data. Sediment transport is primarily influenced by wave height, which is modified by the refraction of wave energy around ebb-tidal deltas and tidal currents near inlets. Moreover, wave height varies alongshore within a single reach due to these factors, as well as others—and Station 41004 is located ~40 miles from Kiawah. All this is to say, offshore buoy data are an imperfect representation, but remain valuable for comparing long-term records.

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[1] Notwithstanding this common convention for wave analyses, the mean shoreline azimuth along Kiawah Island is ENE to WSW. Therefore, "north to south" wave energy actually moves sand from Stono Inlet to Captain Sams Inlet in a WSW direction.

5.2 Sea Level Conditions and Trends

Sea level rise (SLR) is a concern in coastal communities due to the potential for increased flooding and beach erosion. While global trends of sea level show widespread increases in water levels over the past few decades, regional- and local-scale observations indicate a significant amount of variability. For instance, yearly sea level rise rates vary by ~0.1 in/yr between the VA/NC Outer Banks and the SC/GA Lowcountry (NOAA 2020). This quantity represents ~2/3 of the average SLR rate measured at Charleston since 1947 (~0.17 in/yr; NOAA 2024).

The closest SLR observation station to Kiawah Island is a tide gauge located at the Cooper River entrance channel in Charleston, ~10 miles northeast of Stono Inlet. This station (NOAA 8665530) is part of a nationwide network of observation stations. Water level data have been collected almost continuously at Charleston since 1921. De-trending the SLR data allows us to observe fluctuations in the rate of SLR around that average long-term rate. Some years will experience a more rapid increase in water levels, while others will experience a slower increase or even a decrease. Polynomial trend lines plotted over de-trended mean sea level observations from 1921 to 2025 suggest there is a ~20- to 30-year cycle where water levels are ~1 to 2 inches higher or lower than the long-term mean (Fig 5.4). This pattern has been observed at other locations along the US East Coast as well (see CSE 2020) and seems to agree with modeled estimates of SLR variability at regional and sub-regional scales (see Piecuch et al, 2018).

Calculating SLR rates based on running averages of mean sea level (MSL) helps smooth the long-term curves and reveals a shorter-term, ~5 to 10-year cycle wherein SLR rates vary by as much as ~2–3 inches between given years (‘moving average,’ Fig 5.4; ‘Change from 2-year Average MSL’, Fig 5.5). Because these cycles are shorter relative to the overall data observation period, they are more easily verified against the long-term record than the 20-year sea-level cycle. As of December 2025, the long-term polynomial trend line and 2-year running averages suggest year-to-year SLR rates around Charleston will likely continue to increase (see green curve, Fig 5.5). However, because Kiawah is adjacent to a large tidal inlet (Stono Inlet), background change in SLR will have a subdued effect on beach erosion compared to a ‘strand-type’ shoreline with no inlets or shoals.

Sea level rise by itself does not cause erosion, but it results in beach narrowing as the mean tide level moves up the shoreface slope. Sea level controls the elevation at which waves move sand, which is of primary concern when looking into the future. If sand volume is neither gained nor lost at a particular locality along Kiawah Island, 4 inches of SLR (the approximate increase since 1980) will produce an apparent shoreline recession of 8–10 ft. As this happens, the dry-sand beach elevation will also gain height due to storms overtopping the berm and washing sand toward the toe of the dune. So, even with no volume lost, the narrower beach provides less protection to oceanfront development.

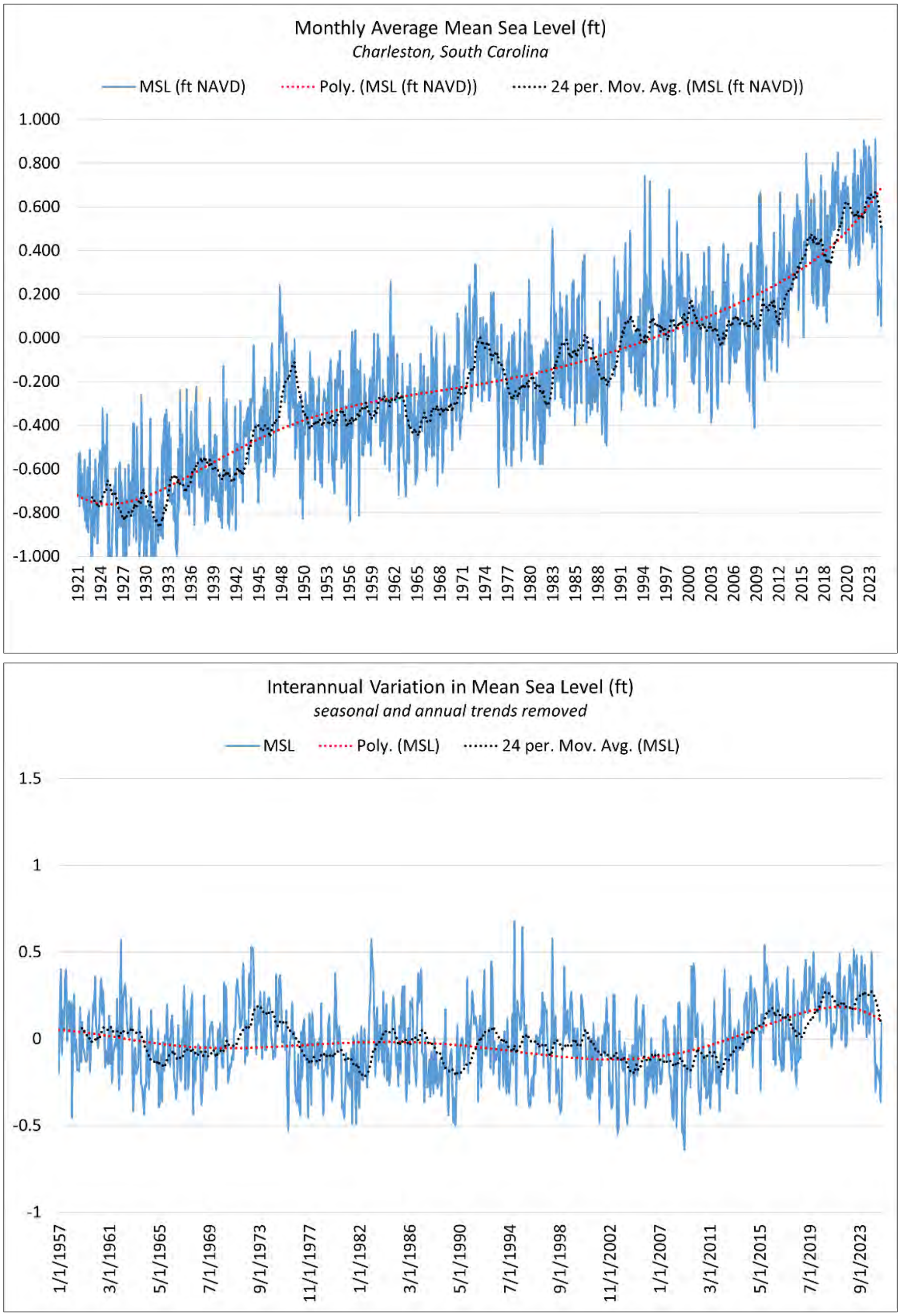


FIGURE 5.4. **[UPPER]** Interannual variations in MSL, with long-term linear and seasonal trends **not** removed. **[LOWER]** Changes in MSL with the linear trend removed from the data. This curve shows us how SLR rates vary around the long-term mean. A polynomial trend line (sixth order) plotted over the curve helps to visualize oscillations in MSL observed since 1957 at Charleston. The maximum difference between observed and average MSL over these 20-year periods is on the order of ~3–4 inches. Shorter-term (~5–10-year periods) oscillations move about that longer-term trend, as well.

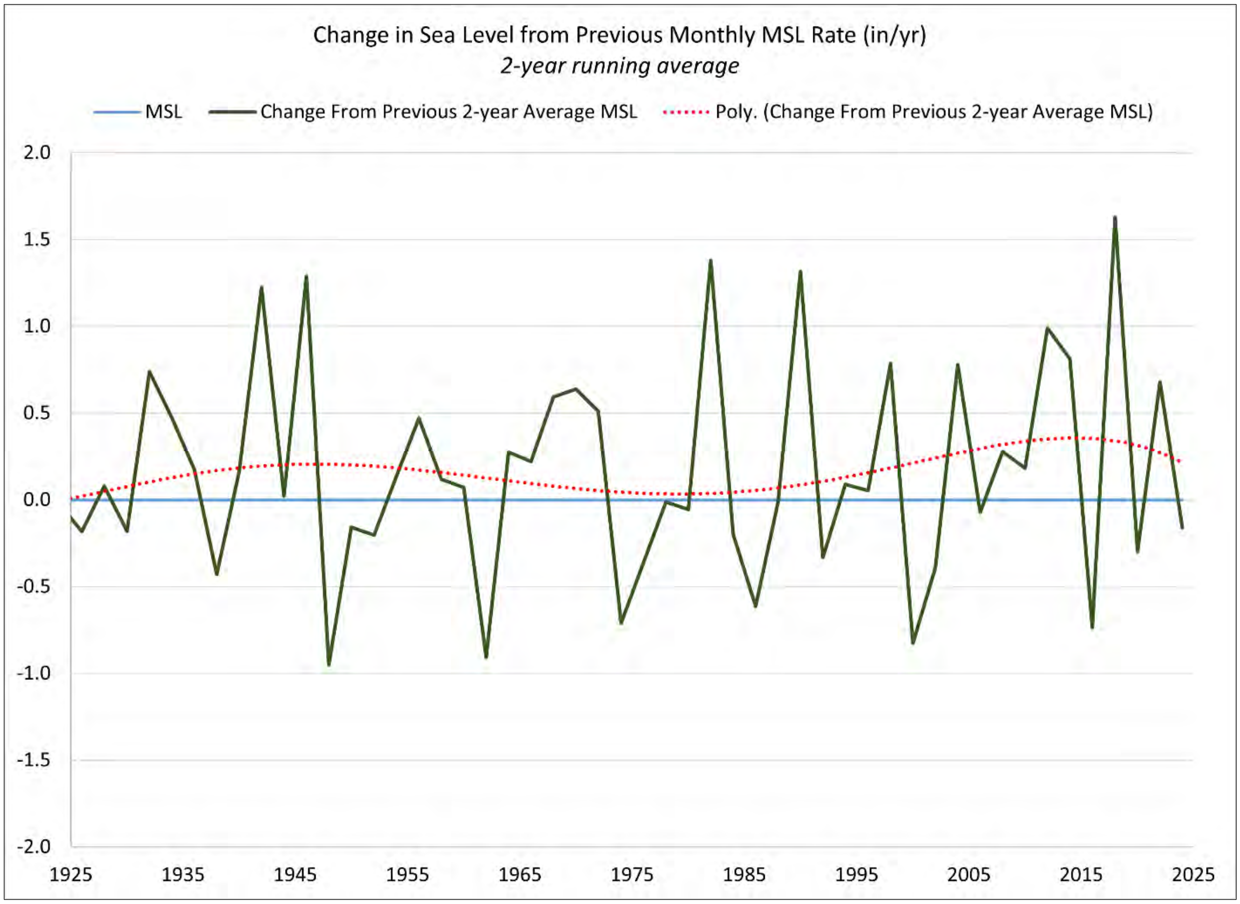


FIGURE 5.5. Differences in MSL calculated at Charleston Harbor for 2-year periods. The green line represents the difference in 2-year moving averages of water levels. The red dotted polynomial trend line represents a moving average of the green curve. This de-trended moving average curve helps identify oscillations in SLR rates around the long-term mean SLR rate.

5.3 Flood Vulnerability

While analyzing past sea level trends helps predict changes in the short-term (eg – years to decades), longer-term future sea level trend projections are more useful for strategic planning within coastal communities. To that end, NOAA and several national and international organizations regularly update future sea level projections. Recent observations in global SLR trends and research into the effects of various physical phenomena on sea levels enable more confident projections of future sea levels. The latest regional projections of average SLR by 2100 within the Southeast US range from ~1.5 ft to ~7 ft (Sweet et al 2022). These projections are based on modeled values of future emissions, shifts in ocean circulation, vertical movements in the Earth's crust, and changes to Earth's gravitational field and rotation. For reference, the highest astronomical tide (aka 'King Tide') brings water levels ~3 ft above MSL at Kiawah Island. So, the water levels observed during those King Tide events represent the higher range of projected MSL by ~2060 and the lower to intermediate projected MSL by ~2100 (Fig 5.6).

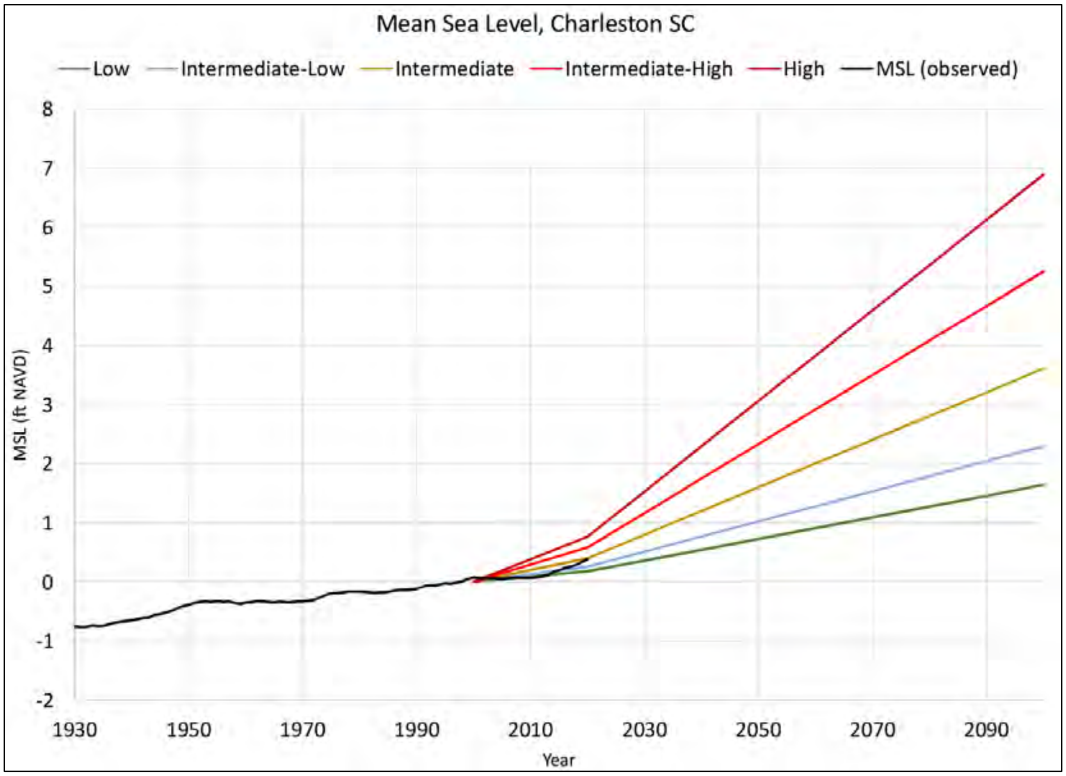


FIGURE 5.6. Projected MSL values at Charleston average ~2 ft by 2060, and ~4 ft by 2100 according to Sweet et al 2022. Although lower and higher values are possible, these averages are statistically more likely based on the latest future SLR model projections. The IPCC (2021) advised that SLR will continue through the end of this century regardless of any extra mitigation measures to reduce global warming. They concluded that a rise of at least 2 ft by 2100 has a high probability. Variations between that global estimate and regional estimates provided by NOAA are due to fluctuations in MSL related to vertical movement in the Earth's crust and shifts in ocean circulation.

Coastal communities are becoming more aware of the subtle differences in these impacts as they begin to feel pressure from sunny-day 'nuisance' floods (see Sweet et al 2018, Sweet et al 2020, Sweet et al 2022). Such floods will tend to impact low-lying sheltered shorelines, including causeways over the marsh or backyards fronting sheltered estuaries. Just a small super-elevation of the tide can quickly overtop a road that is barely above normal spring tide levels. On the other hand, locations on the open ocean generally don't experience nuisance floods the same way. This is because dry beach elevations are typically driven by the uprush limit of waves at high tide. This creates the beach width that allows wind-blown sand to build dunes vertically just landward of that elevation. Thus, higher wave action along the oceanfront leads to relatively high elevations compared to the lagoon side of barrier islands, where there is less wave energy to build elevation above marsh and creek habitats.

Figure 5.7 shows a series of satellite images of Kiawah Island with potentially flooded areas under a range of SLR scenarios between 1 ft and 4 ft. It becomes apparent with increasing SLR that flooding will propagate inland from estuarine habitats and be more impactful along the mainland-facing shorelines of Kiawah Island than the ocean-facing beaches. NOAA provides an easy-to-use 'Sea Level Rise Viewer'

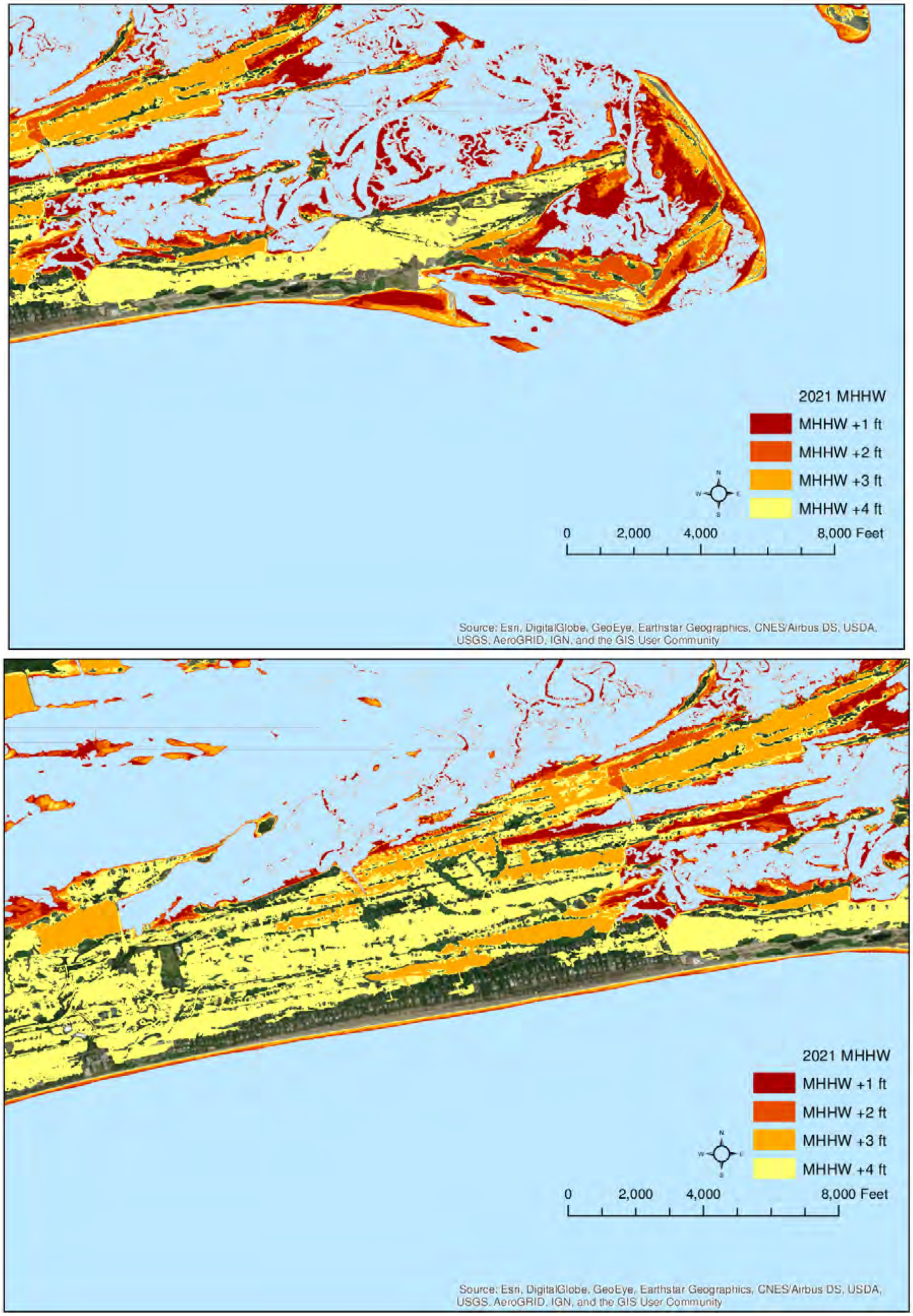
(SLRV; see https://coast.noaa.gov/digitalcoast/tools/slr.html) to help people identify local variations in flood impacts under different SLR scenarios. This tool allows users to specify water levels and then generate inundation maps showing MSL as well as depth in previously dry areas. Shapefiles are available for download through this user interface; these shapefiles were used by CSE to generate Figure 5.7, which shows future MHHW elevations plus 1 ft, 2 ft, 3 ft, and 4 ft for Kiawah Island. These types of data-viewing applications are useful for determining when certain SLR scenarios start to impact a particular property.

At present, all properties on Kiawah Island remain above MHHW, except for a few stormwater ponds and the East End marsh. Thoughtful site planning around the island by the original developers, and a continuation of that ethos into the present day, has resulted in Kiawah Island not exhibiting the same degree of vulnerability to SLR as seen in some other communities around South Carolina. As a result, SLR of 1 to 2 ft is not likely to threaten many properties along the central and western portions of the island. Low-lying properties on peninsulas extending into the marsh along the island's eastern third may experience more significant flooding. At least 1 ft of SLR is all but guaranteed by 2050 (Sweet et al, 2022).

When MHHW increases from 2 ft to >3 ft above present, particularly along the eastern third of the island, low-lying properties and infrastructure bordering Bass Creek or much of Governors Drive would see an increase in nuisance flooding and greater storm tide elevations. The most significant impacts will be felt when MHHW increases to 4 ft above present, at which point much of the island will be threatened with inundation at each high tide.

On the oceanfront, SLR of 3 ft and 4 ft could trigger a mixture of impacts. The first 2 to 3 rows of beachfront homes would likely remain high and dry, despite a 4-ft rise in MSL. However, infrastructure connecting those homes to the mainland may be compromised if MHHW reaches elevations greater than 4 ft above its present level. The most significant expansion in flooding on the island will occur under these scenarios, so monitoring the measured rate of SLR in the coming decades will be critical for adequate advance notice for planning and mitigation purposes. A 3-ft increase in MSL is possible under the 'Intermediate' scenario by ~2090 (see Fig 5.6), whereas a 4-ft SLR under the same scenario is not expected until after 2100.

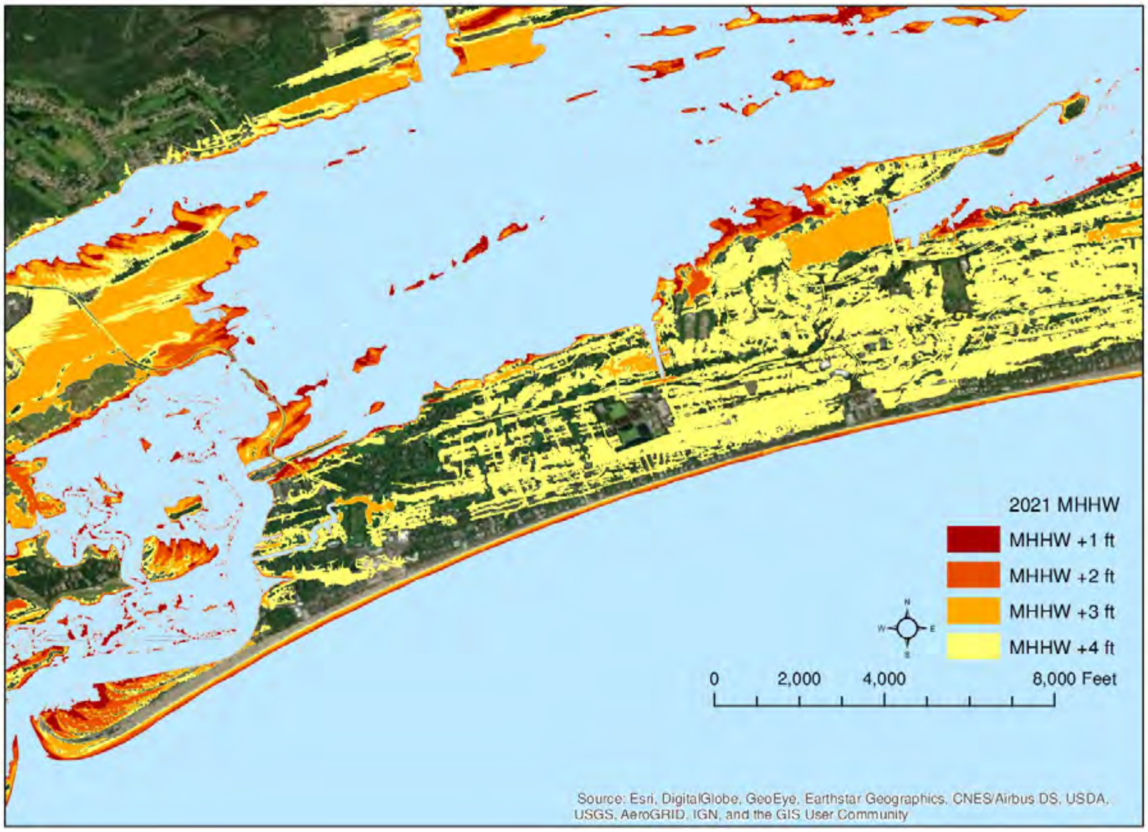
It is important to remember that with a significant rise in MSL, the various flood elevations will also increase. If present V-zone flood levels along Kiawah's oceanfront are around 15 ft NAVD, they are expected to increase to at least 17 ft NAVD by 2100. Alternatively, today's 100-year flood elevation will become a 10- or 25-year flood elevation some decades from now. The impact will be much more frequent damaging storm surges.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FIGURE 5.7. Inundated areas under MHHW +1, 2, 3, and 4 ft around western (UPPER) and central (LOWER) Kiawah Island. Dark green areas are the highest ground.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FIGURE 5.7(cont). Inundated areas under MHHW +1, 2, 3, and 4 ft around eastern Kiawah Island. Dark green areas are the highest ground.

6.0 FINDINGS AND RECOMMENDATIONS

Kiawah Island gained a total of ~178,100 cy (3.1 cy/ft/yr) of sand between December 2024 and December 2025, a welcome change compared to last year's net erosion (~–607,000 or –10.6 cy/ft). This continues the trend in island-wide recovery of volume lost between 2014 and 2019. Over that five-year period, the island lost ~1.9 million cy (–34.1 cy/ft or –6.8 cy/ft/yr) of sand. Since 2019, relatively quiet conditions and a shoal bypassing event have triggered the accretion of ~1.1 million cy (+20.0 cy/ft or 3.3 cy/ft/yr).

Over the next year, it is likely that erosion will persist along the East End and the new packet of sediment migrates towards the Ocean Course, Turtle Point, West Beach, and (to a lesser degree) Stono Inlet reaches. Although these changes are expected to be generally positive—in keeping with the long-term positive sediment budget for the Kiawah Island beachfront—there are four locations to monitor for potential vulnerabilities. These vulnerabilities represent opportunities for proactively recognizing or mitigating hazards, but as of December 2025, they are not yet fully emergency situations:

- 2015 East End project area: Natural flushing channels are mostly closed near the Ocean Course clubhouse, but can rapidly reappear. CSE has prepared a permit application for manipulating flushing channels to reduce the risk of damage to the Ocean Course. This project will be the third East End channel relocation project.

- Stono Inlet: Marsh basins located between the Ocean Course and the eroding shoreline described in Fig 4.3 will allow rapid landward advance of the MHW contour toward the eastern end of the Ocean Course (holes 4 and 5). While there is still a significant buffer present, future erosion is likely and may warrant proactive mitigation.

- Eugenia Avenue: A long-term erosional hotspot persists in this location, where storms have repeatedly triggered relatively severe dune erosion (particularly by Kiawah Island standards). The Town and/or private property owners should evaluate options for proactive and/or reactive beach management of this area. Alternatives could include importing upland sand, small-scale nourishment, or post-storm dune restoration.

- Kiawah Spit: Erosional trends over the past 10 years have resulted in narrowing of the neck of Kiawah Spit. If this trend continues, it is possible that an unmanaged breach may occur in the next 20 to 25 years, with no severe storm impacts, or with a shorter time limit in the event of severe storm impacts. A breach of this area would bring significant impacts to Beachwalker Park and developed properties north of the spit.

CSE recommends the Town consider sponsoring an detailed risk assessment of its ocean-facing shorelines. Such an assessment would be communicated in a report, which could be used as a guidance document by the Town for project planning and/or prioritization for many years following publication.

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7.0 ACKNOWLEDGEMENTS

Sponsored by the Town of Kiawah Island, this report is the 19th in a series of annual beach monitoring reports following the 2006 East End beach restoration project.

We thank Mayor Bradley Belt and Jim Jordan (town wildlife biologist) for coordinating CSE's work and providing access to the project site and related information on natural changes at the eastern end.

Drew Giles and Jake Rotureau directed CSE's field surveys. Data reduction and analysis were accomplished by Drew Giles and Scott Finnis with assistance from Patrick Barrineau and Jyothirmayi Palaparthi. Scott Finnis and Patrick Barrineau wrote the report with production assistance from Carrie Marks and Trey Hair.

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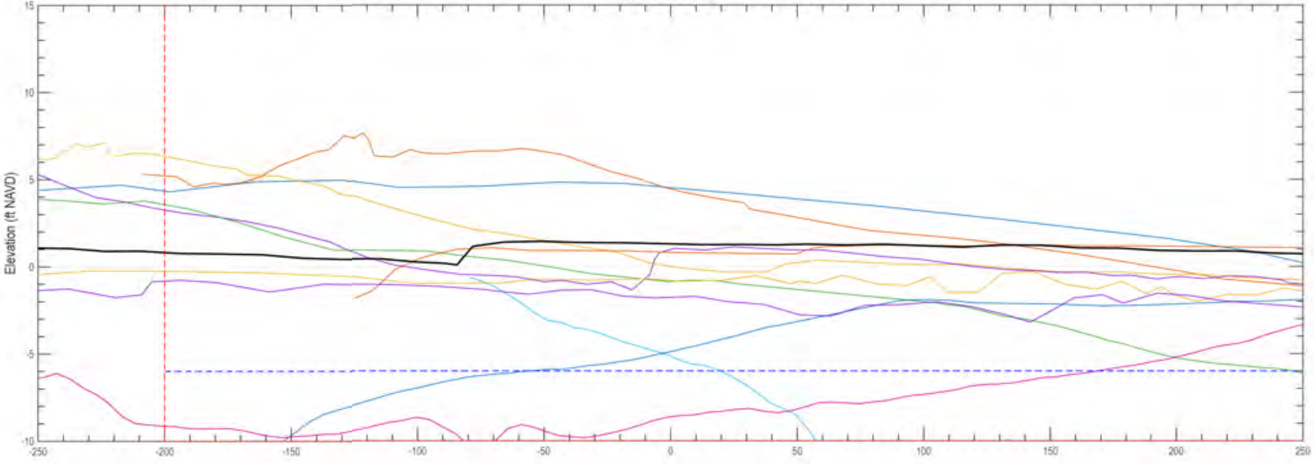
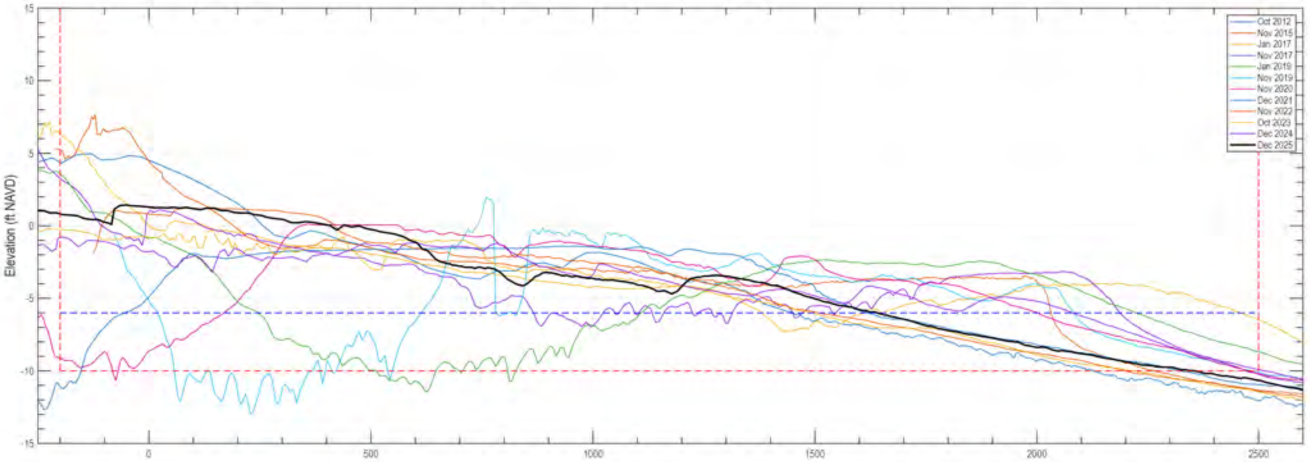
APPENDIX A

CSE Profiles

Kiawah Line 01





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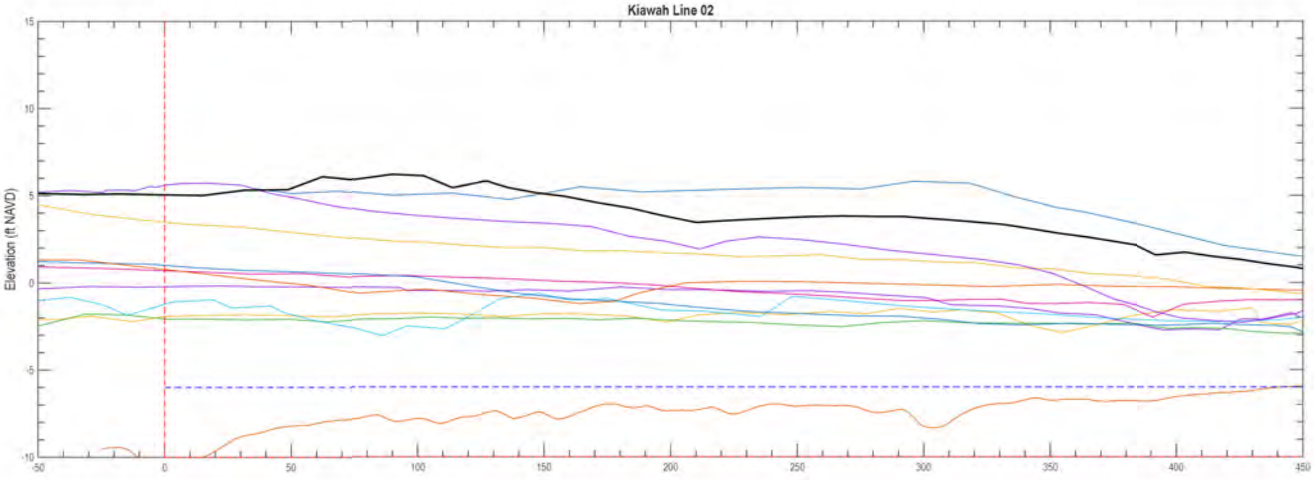
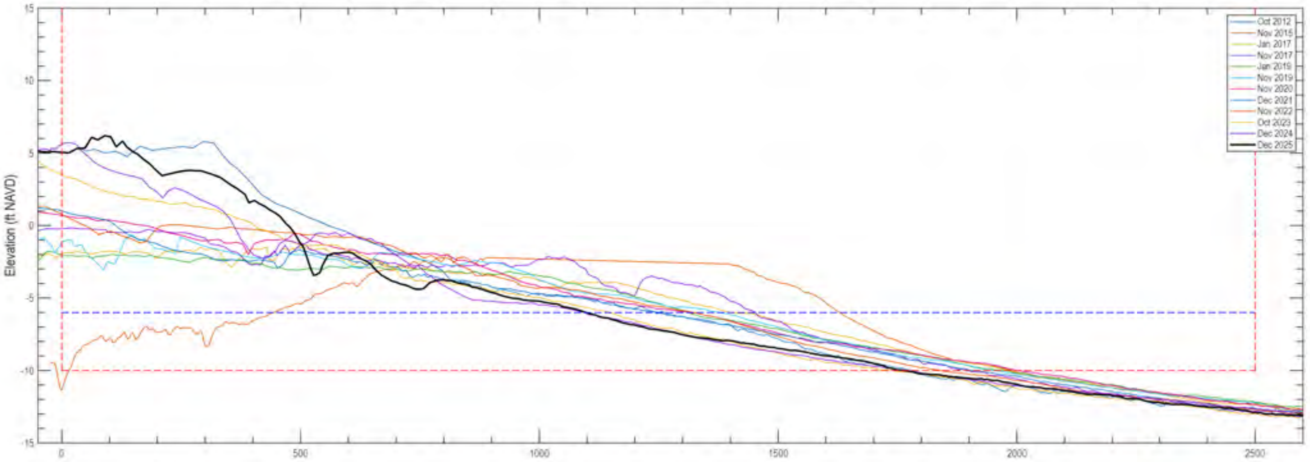
Nov 2015	353.0	341.4	694.4
Jan 2017	274.7	393.2	667.9
Nov 2017	225.3	367.1	592.4
Jan 2019	181.6	298.0	479.6
Nov 2019	196.5	288.9	485.4
Nov 2020	247.6	326.0	573.7
Dec 2021	228.2	309.4	537.6
Nov 2022	278.5	305.8	584.3
Oct 2023	223.1	305.2	528.3
Dec 2024	237.1	367.0	604.1
Dec 2025	276.3	319.6	595.9





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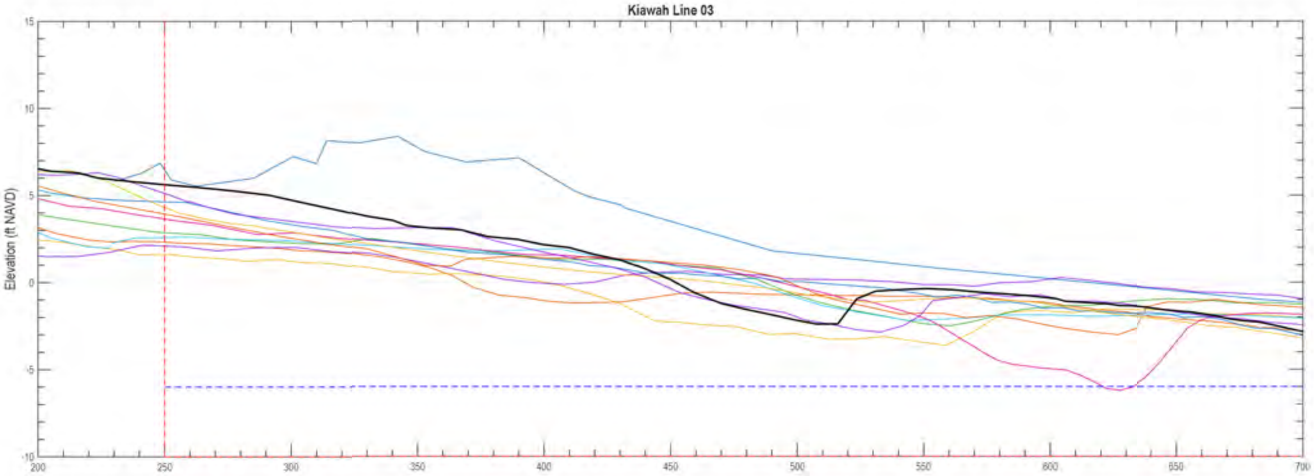
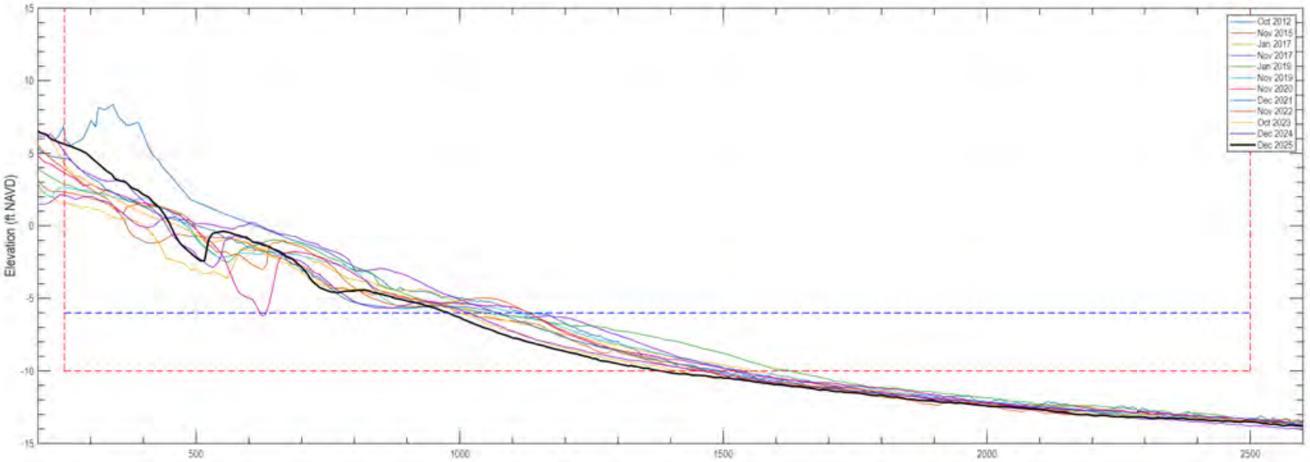
Oct 2012	265.2	224.1	489.3
Nov 2015	123.9	238.2	362.0
Jan 2017	155.7	250.3	406.0
Nov 2017	192.4	242.9	435.3
Jan 2019	137.1	241.9	379.0
Nov 2019	157.9	242.8	400.6
Nov 2020	181.2	241.4	422.6
Dec 2021	144.2	234.1	378.3
Nov 2022	188.7	230.7	419.4
Oct 2023	187.9	207.6	395.6
Dec 2024	200.4	206.3	406.7
Dec 2025	221.4	209.4	430.8





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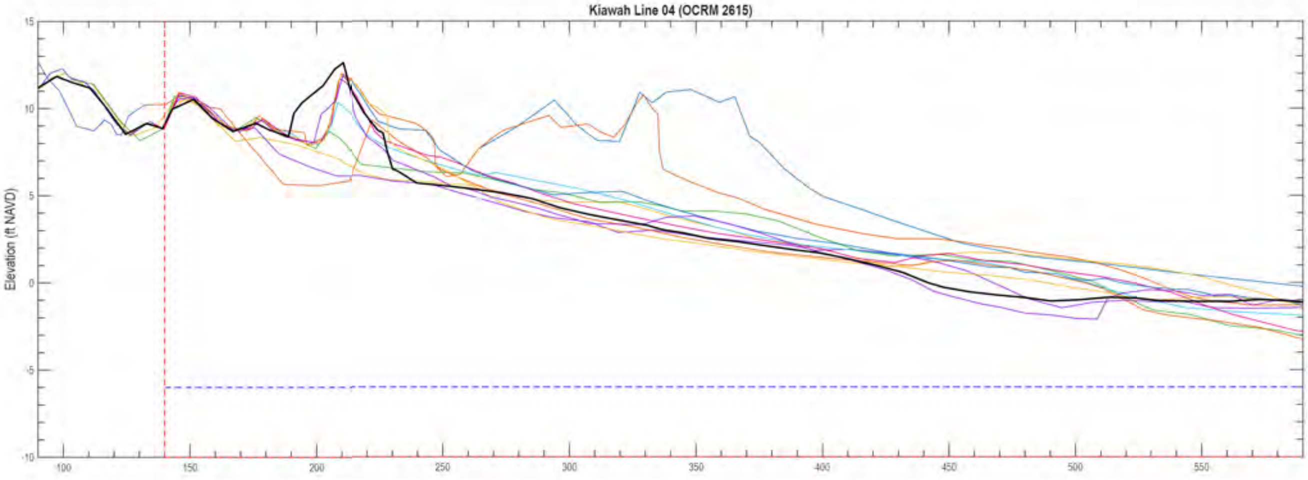
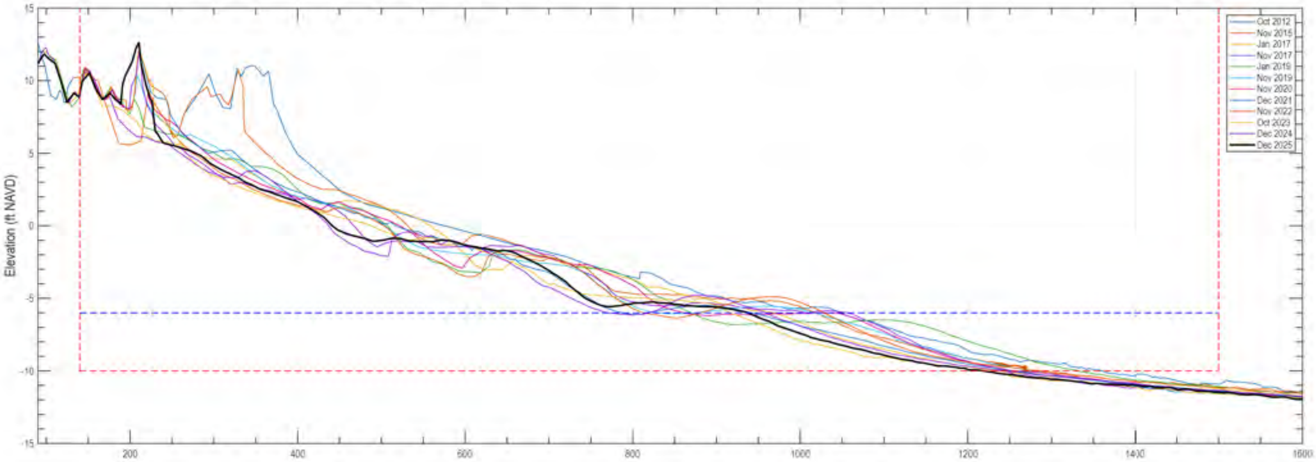
Oct 2012	184.6	155.1	339.7
Nov 2015	107.4	145.4	252.8
Jan 2017	104.5	152.1	256.6
Nov 2017	141.6	160.4	302.0
Jan 2019	129.2	167.7	296.9
Nov 2019	122.6	155.4	278.0
Nov 2020	118.9	152.3	271.2
Dec 2021	118.6	147.7	266.2
Nov 2022	124.0	151.1	275.2
Oct 2023	116.6	137.0	253.6
Dec 2024	116.9	139.3	256.1
Dec 2025	125.0	132.7	257.7





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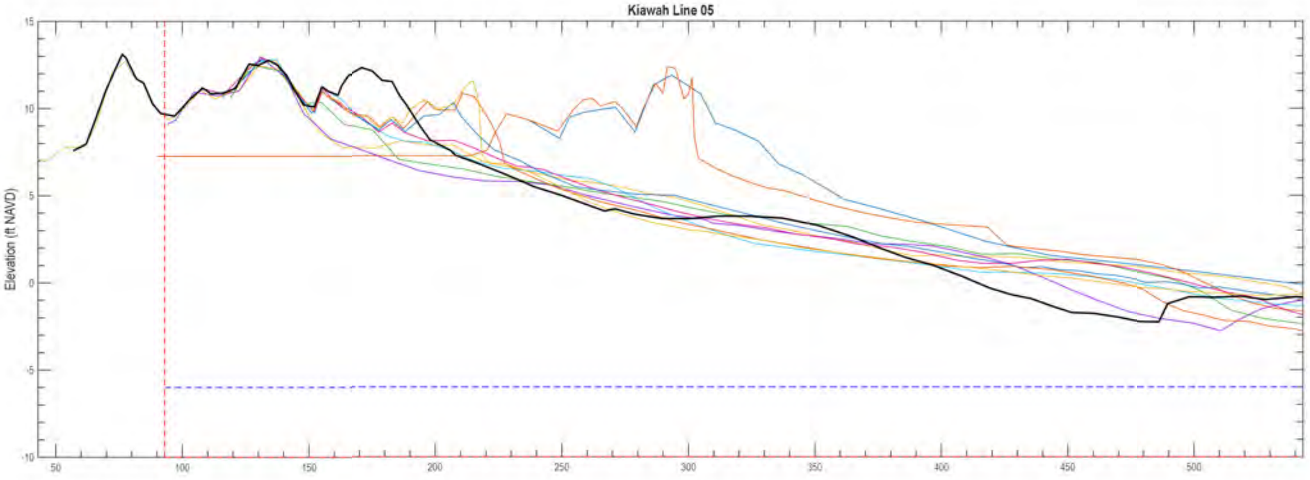
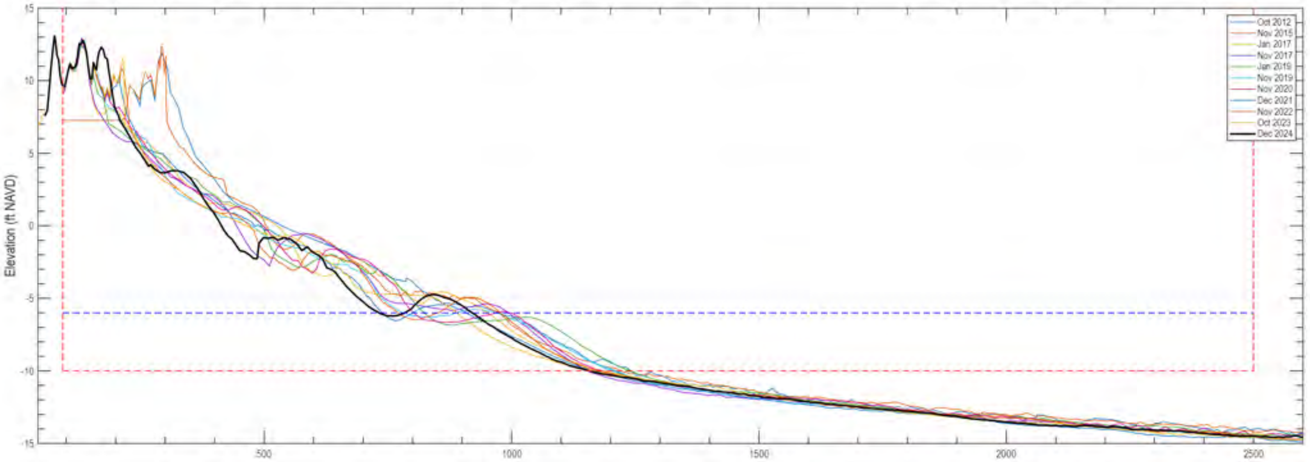
Nov 2015	214.7	146.2	360.9
Jan 2017	191.6	138.8	330.5
Nov 2017	177.4	148.2	325.6
Jan 2019	187.9	152.5	340.4
Nov 2019	184.7	147.3	331.9
Nov 2020	189.5	146.8	336.2
Dec 2021	187.5	139.8	327.3
Nov 2022	181.3	144.5	325.8
Oct 2023	176.7	131.8	308.5
Dec 2024	171.4	137.5	308.9
Dec 2025	176.8	134.4	311.2





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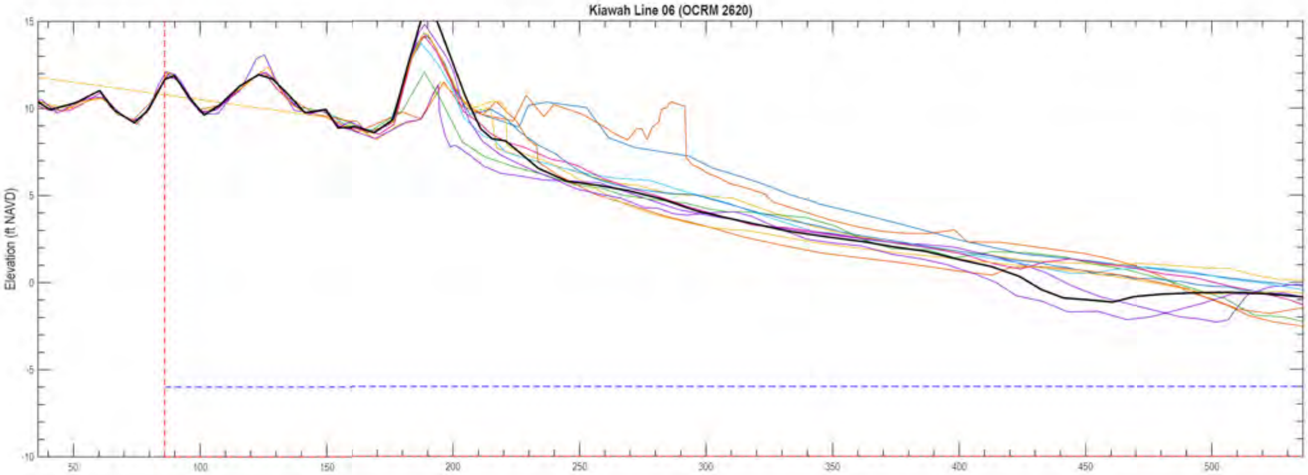
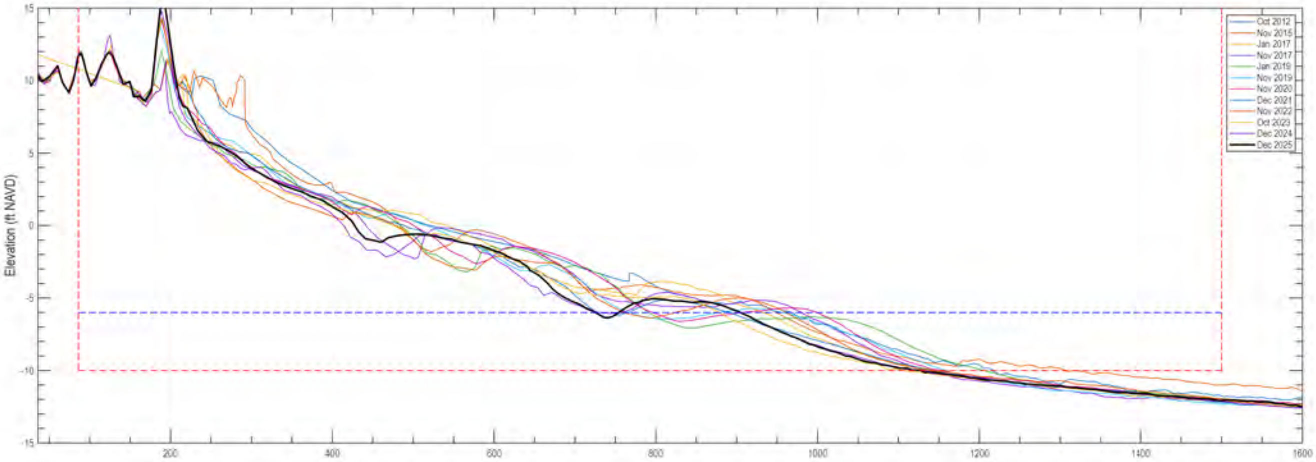
Nov 2015	227.3	145.0	372.2
Jan 2017	209.7	141.4	351.2
Nov 2017	196.4	144.6	341.0
Jan 2019	203.4	149.5	352.9
Nov 2019	196.2	146.7	342.9
Nov 2020	205.8	143.7	349.5
Dec 2021	202.7	137.7	340.4
Nov 2022	194.8	142.1	336.9
Oct 2023	199.8	133.5	333.3
Dec 2024	191.4	137.1	328.5

Kiawah Line 06 (OCRM 2620)





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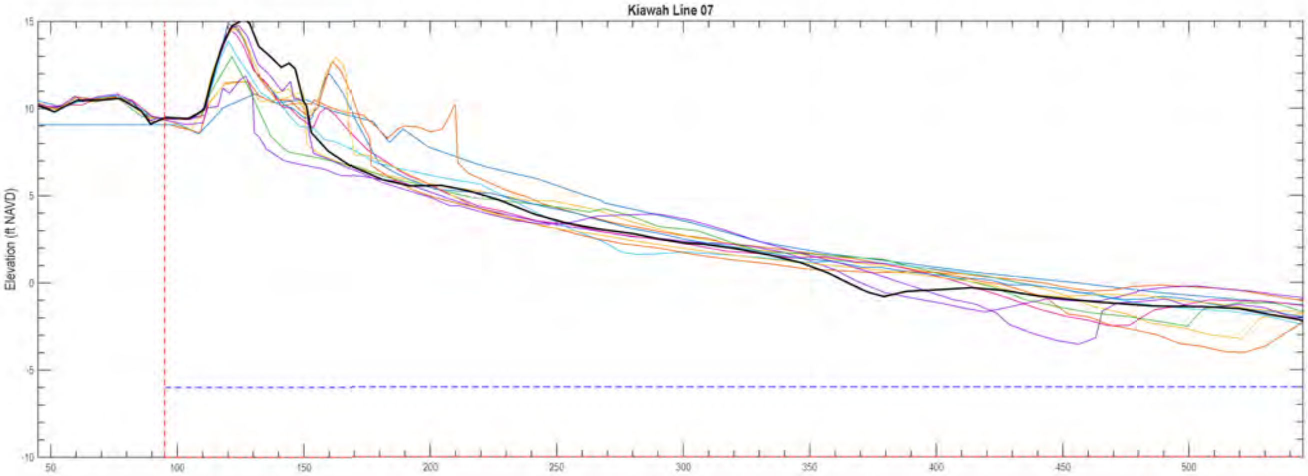
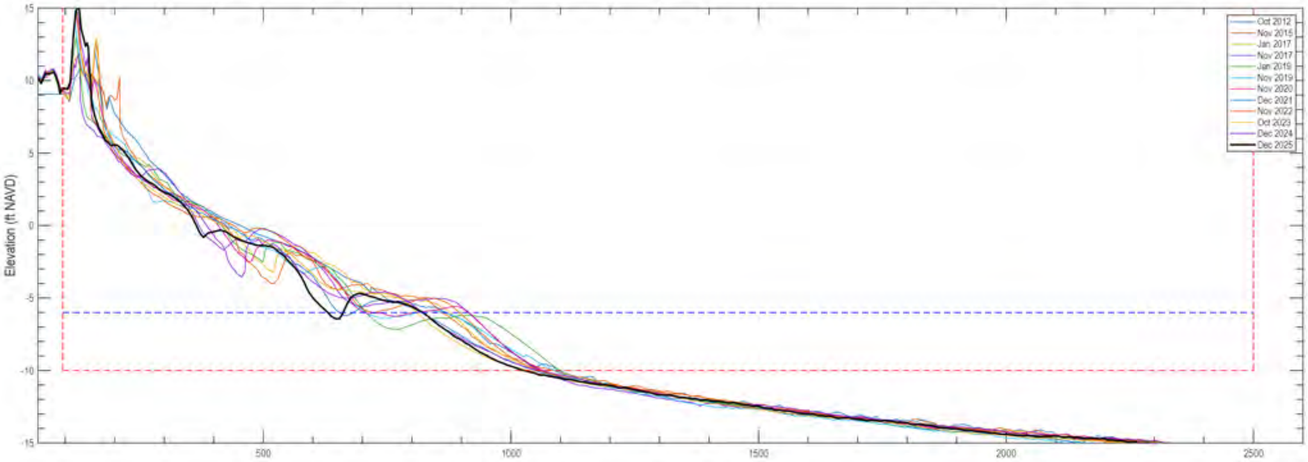
Nov 2015	234.1	144.1	378.2
Jan 2017	218.8	138.3	357.1
Nov 2017	206.8	142.8	349.6
Jan 2019	204.7	146.0	350.8
Nov 2019	206.9	143.4	350.3
Nov 2020	213.7	143.8	357.5
Dec 2021	209.7	136.2	345.9
Nov 2022	199.8	139.6	339.4
Oct 2023	206.4	130.8	337.2
Dec 2024	193.6	134.6	328.2
Dec 2025	202.1	134.0	336.1





Date	Vol to -6	Vol -6 to -10	Vol to -10
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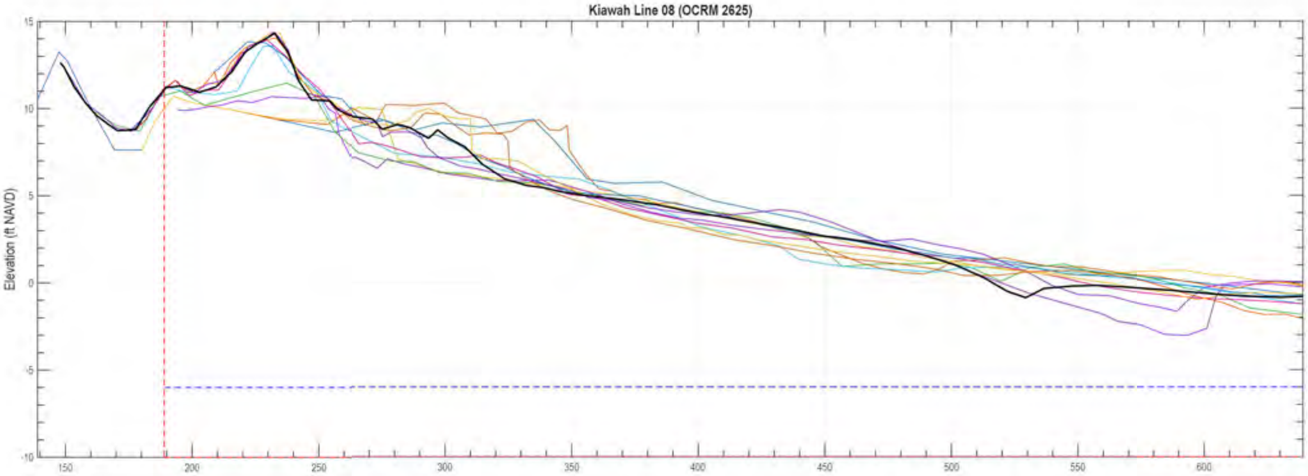
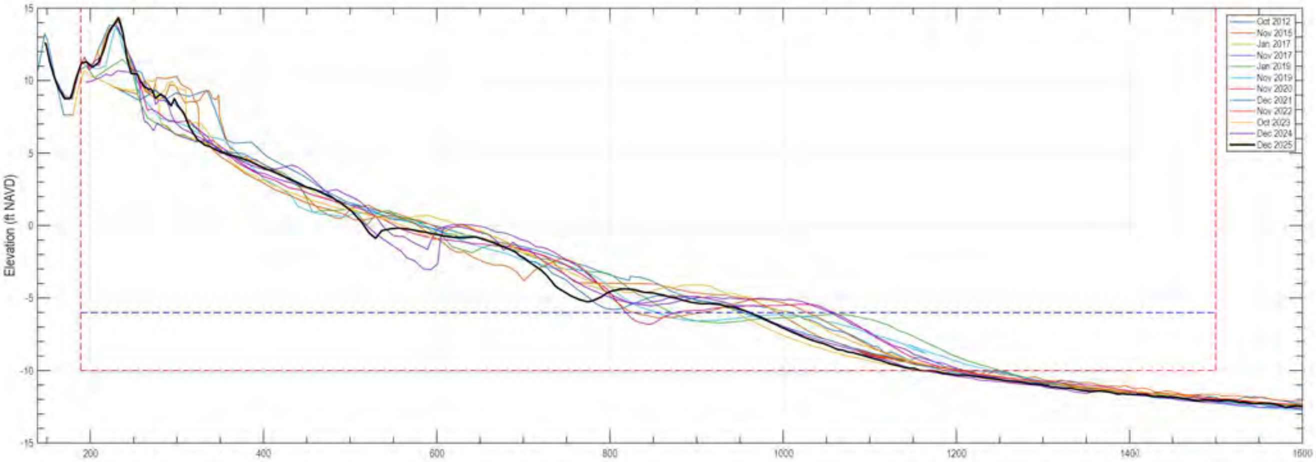
Nov 2015	184.3	126.6	310.8
Jan 2017	173.8	126.6	300.4
Nov 2017	162.7	131.2	293.9
Jan 2019	163.9	132.0	296.0
Nov 2019	162.6	129.9	292.6
Nov 2020	165.2	130.8	296.0
Dec 2021	166.5	122.6	289.1
Nov 2022	161.6	128.8	290.4
Oct 2023	168.4	119.0	287.4
Dec 2024	161.2	122.2	283.4
Dec 2025	158.3	120.2	278.5



Kiawah Line 08 (OCRM 2625)



Date	Vol to -6	Vol -6 to -10	Vol to -10
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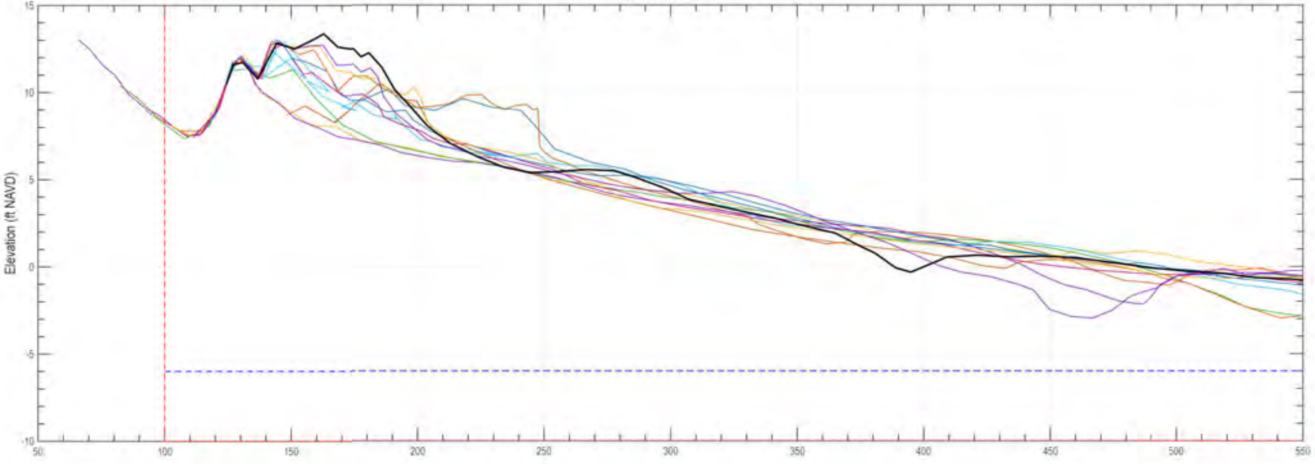
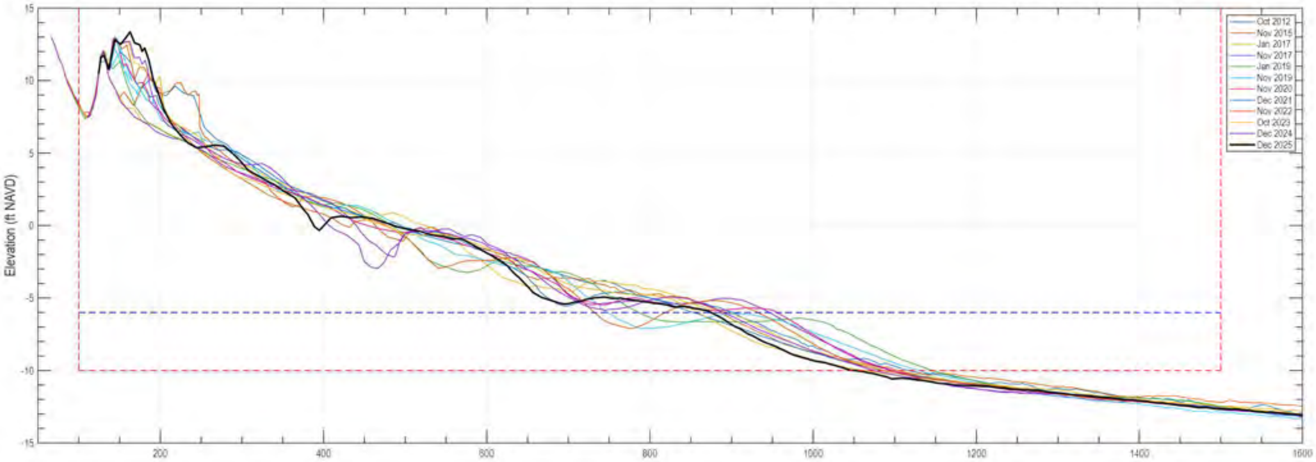
Nov 2015	209.6	130.5	340.1
Jan 2017	201.1	133.2	334.3
Nov 2017	198.6	138.4	337.0
Jan 2019	191.0	141.1	332.1
Nov 2019	189.9	137.0	326.9
Nov 2020	194.9	136.6	331.6
Dec 2021	199.7	129.2	328.9
Nov 2022	191.2	133.8	325.0
Oct 2023	201.1	124.6	325.7
Dec 2024	195.4	128.0	323.4
Dec 2025	195.4	127.0	322.4

Kiawah Line 09





Date	Vol to -6	Vol -6 to -10	Vol to -10
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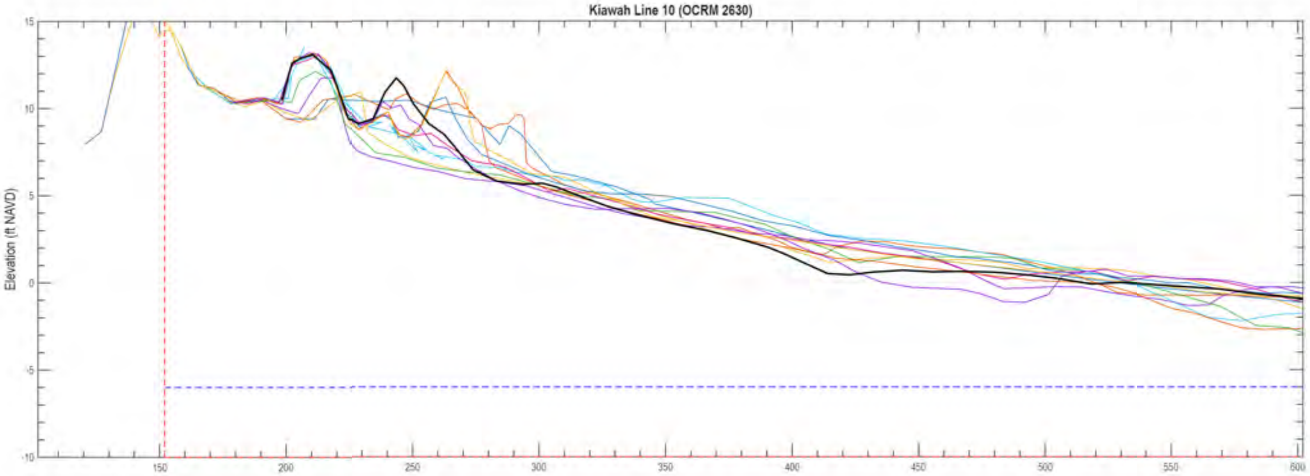
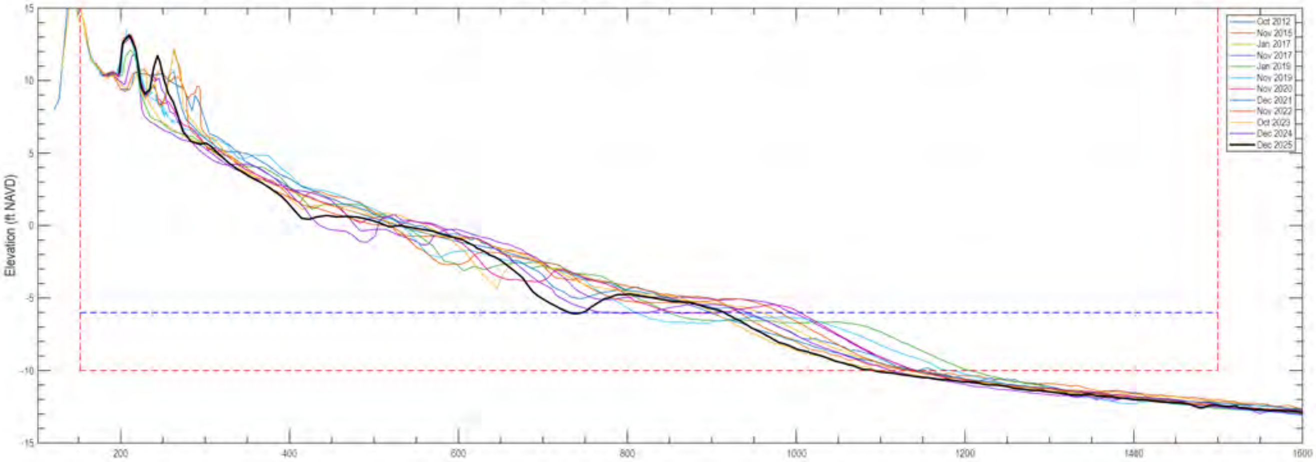
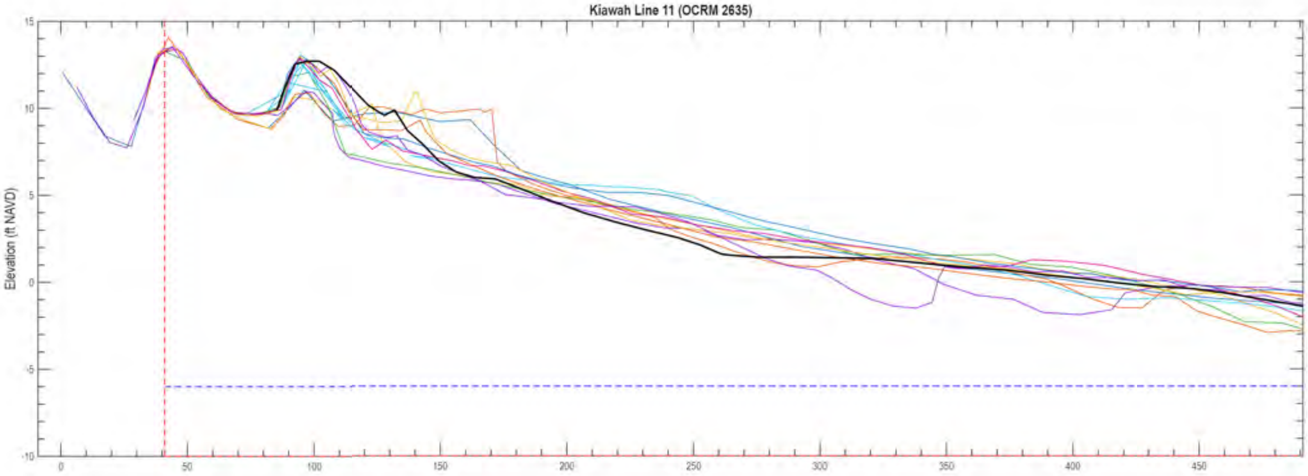
Nov 2015	200.0	129.3	329.3
Jan 2017	190.3	130.4	320.7
Nov 2017	185.9	135.6	321.5
Jan 2019	183.3	138.4	321.7
Nov 2019	190.7	133.8	324.5
Nov 2020	190.4	135.9	326.3
Dec 2021	195.3	127.6	322.9
Nov 2022	183.5	130.9	314.5
Oct 2023	197.8	124.4	322.2
Dec 2024	190.2	129.5	319.7
Dec 2025	194.0	125.4	319.4

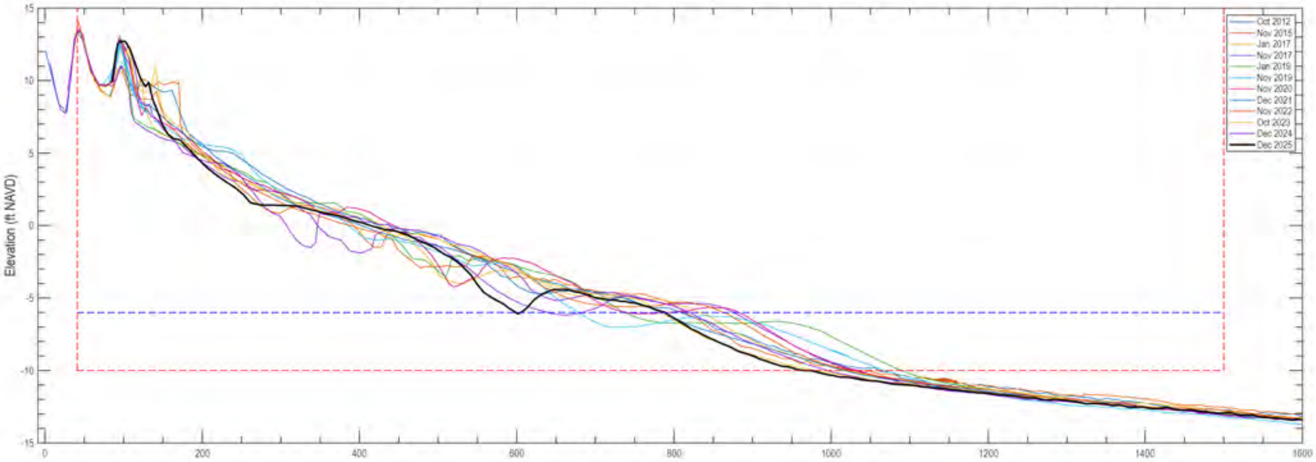


Kiawah Line 10 (OCRM 2630)

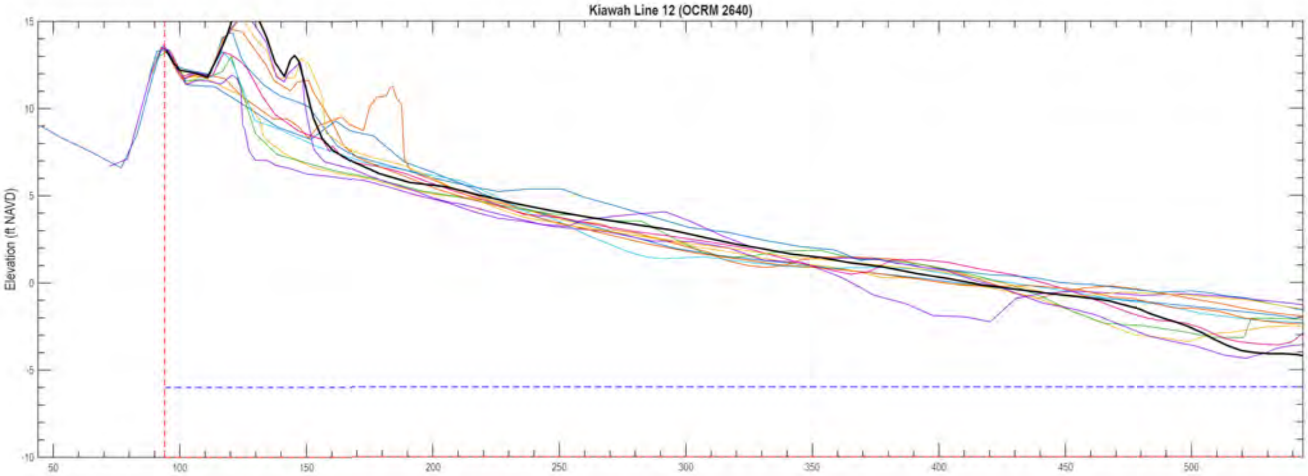


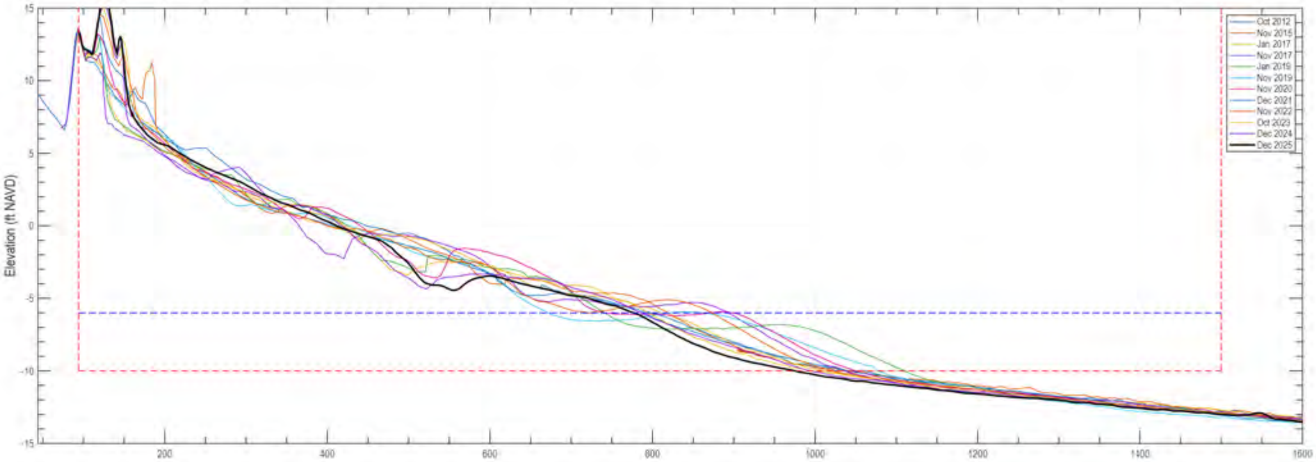
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	205.0	130.8	335.8
Nov 2015	206.5	126.9	333.3
Jan 2017	192.4	130.7	323.1
Nov 2017	193.3	135.2	328.4
Jan 2019	189.6	139.6	329.1
Nov 2019	197.1	135.4	332.5
Nov 2020	193.8	135.5	329.3
Dec 2021	202.6	126.5	329.1
Nov 2022	193.5	132.5	326.0
Oct 2023	202.8	122.8	325.6
Dec 2024	184.2	128.6	312.9
Dec 2025	186.1	123.8	309.9



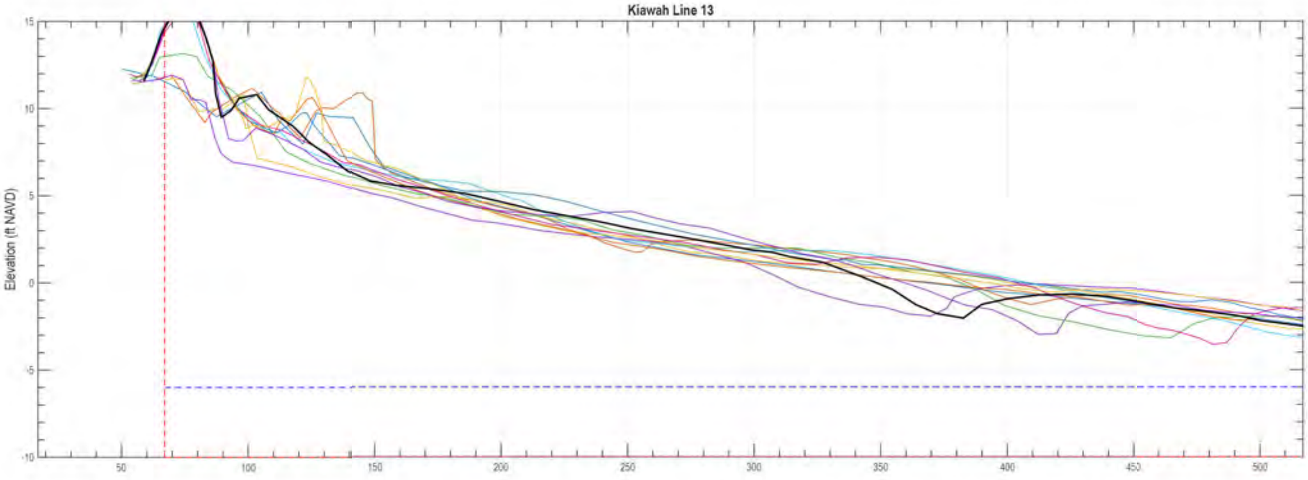


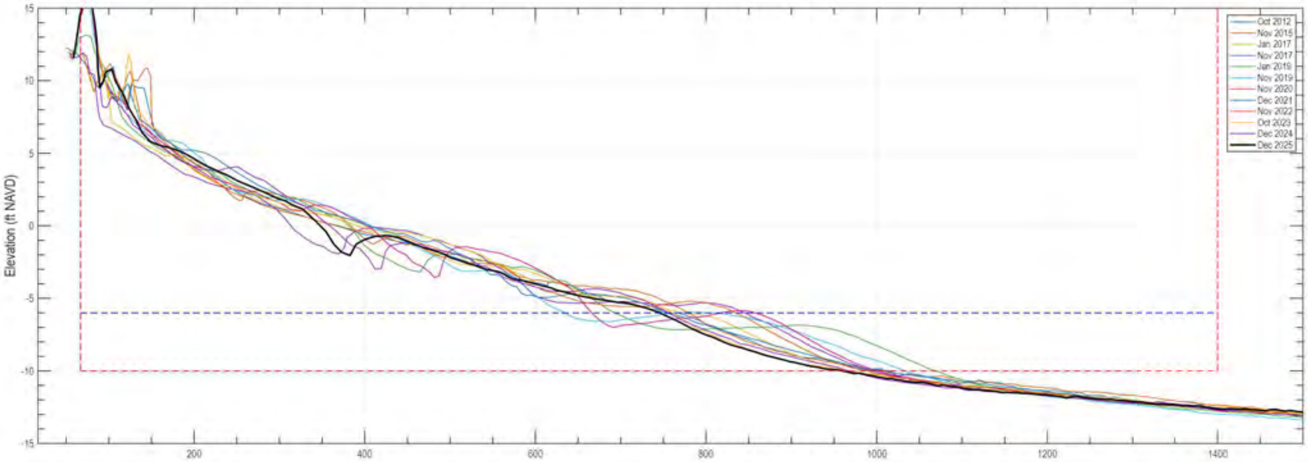
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	194.5	129.3	323.8
Nov 2015	194.0	126.1	320.0
Jan 2017	185.6	129.0	314.6
Nov 2017	183.3	134.1	317.4
Jan 2019	187.4	138.8	326.1
Nov 2019	184.9	133.3	318.2
Nov 2020	191.5	134.2	325.7
Dec 2021	198.1	126.1	324.2
Nov 2022	184.3	132.0	316.3
Oct 2023	196.3	121.7	318.0
Dec 2024	176.0	126.9	303.0
Dec 2025	178.8	121.5	300.3



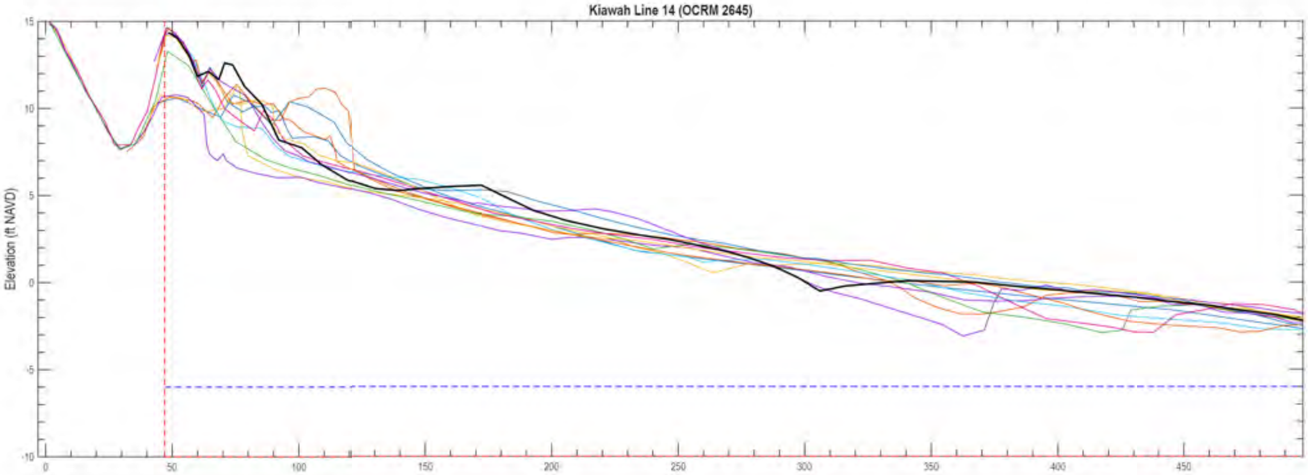


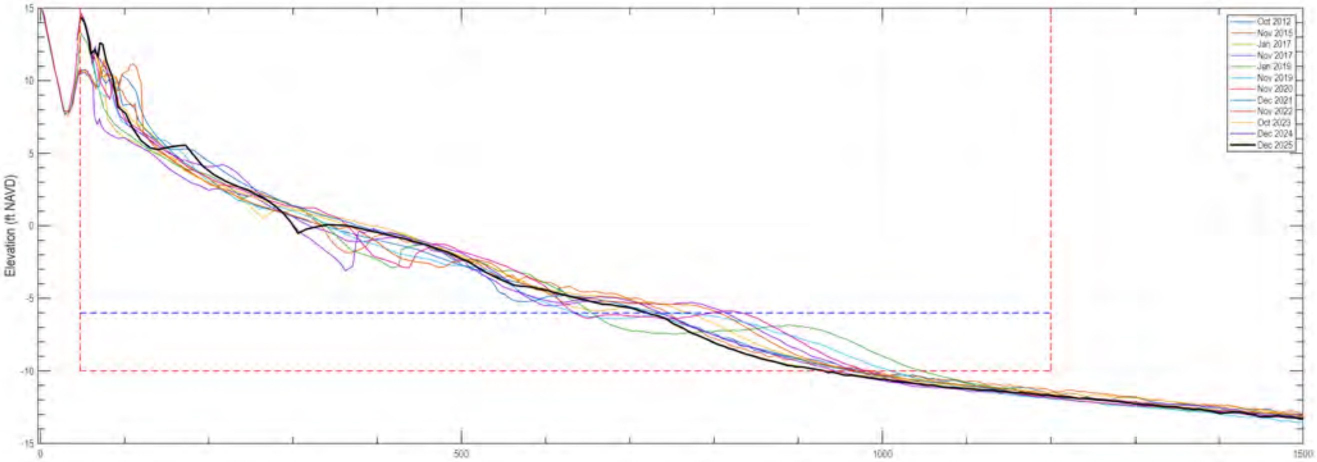
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	165.1	119.8	284.8
Nov 2015	173.4	119.1	292.5
Jan 2017	159.0	119.8	278.8
Nov 2017	157.4	128.0	285.4
Jan 2019	161.5	130.9	292.5
Nov 2019	156.5	129.3	285.8
Nov 2020	169.1	129.6	298.7
Dec 2021	177.9	119.1	297.0
Nov 2022	165.6	125.0	290.7
Oct 2023	175.5	115.8	291.3
Dec 2024	164.5	116.9	281.4
Dec 2025	165.0	112.9	277.9





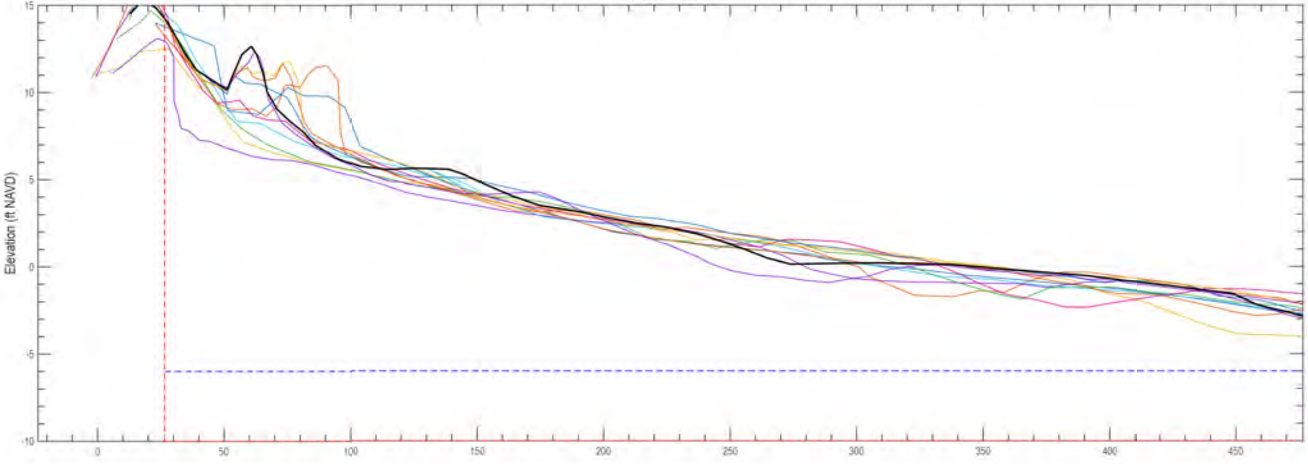
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	159.5	118.2	277.8
Nov 2015	169.3	118.0	287.3
Jan 2017	157.3	119.4	276.7
Nov 2017	148.3	125.7	274.0
Jan 2019	156.9	128.3	285.3
Nov 2019	158.2	127.0	285.2
Nov 2020	163.1	124.5	287.6
Dec 2021	169.3	118.9	288.2
Nov 2022	160.1	123.6	283.7
Oct 2023	169.0	114.1	283.1
Dec 2024	161.1	115.5	276.6
Dec 2025	160.1	113.1	273.2

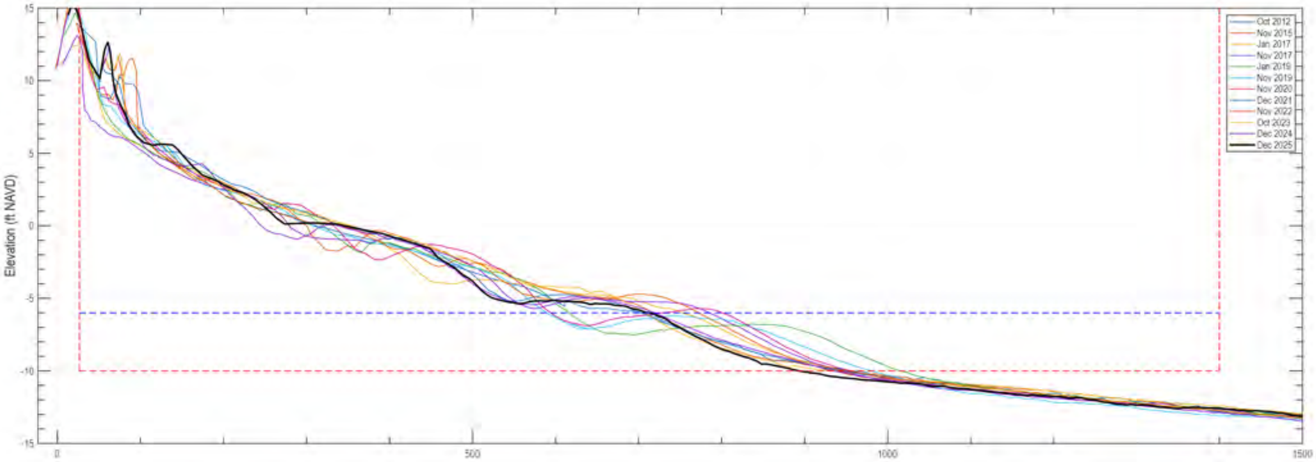




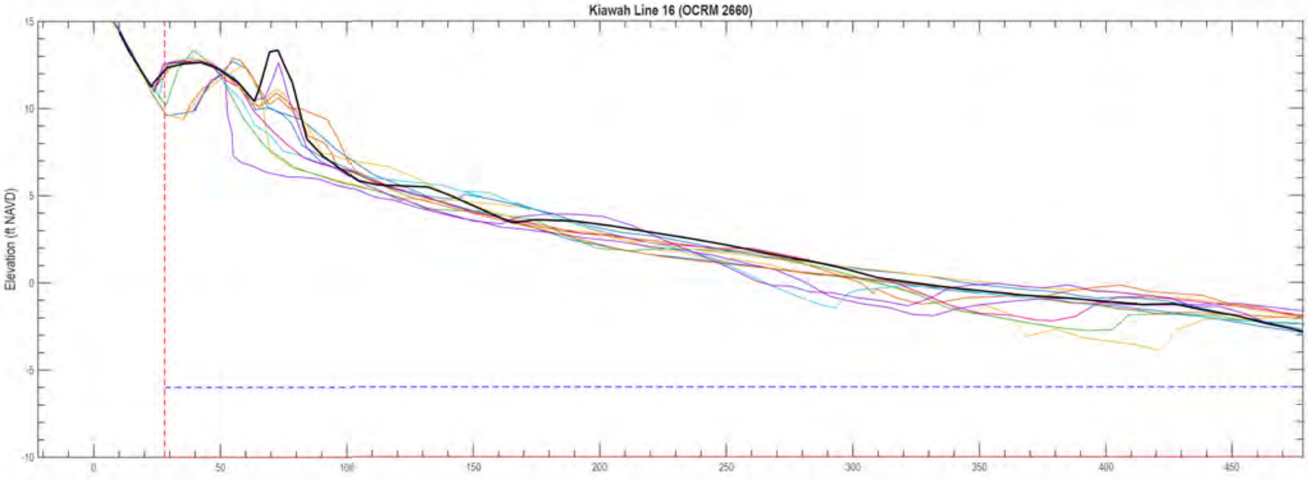
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	153.8	117.0	270.8
Nov 2015	160.4	115.7	276.1
Jan 2017	153.1	119.4	272.5
Nov 2017	145.4	124.1	269.5
Jan 2019	148.6	125.3	273.8
Nov 2019	146.7	126.4	273.0
Nov 2020	155.2	125.6	280.8
Dec 2021	162.0	116.3	278.2
Nov 2022	155.4	122.3	277.8
Oct 2023	161.4	112.8	274.2
Dec 2024	153.2	115.9	269.1
Dec 2025	158.4	112.6	271.0

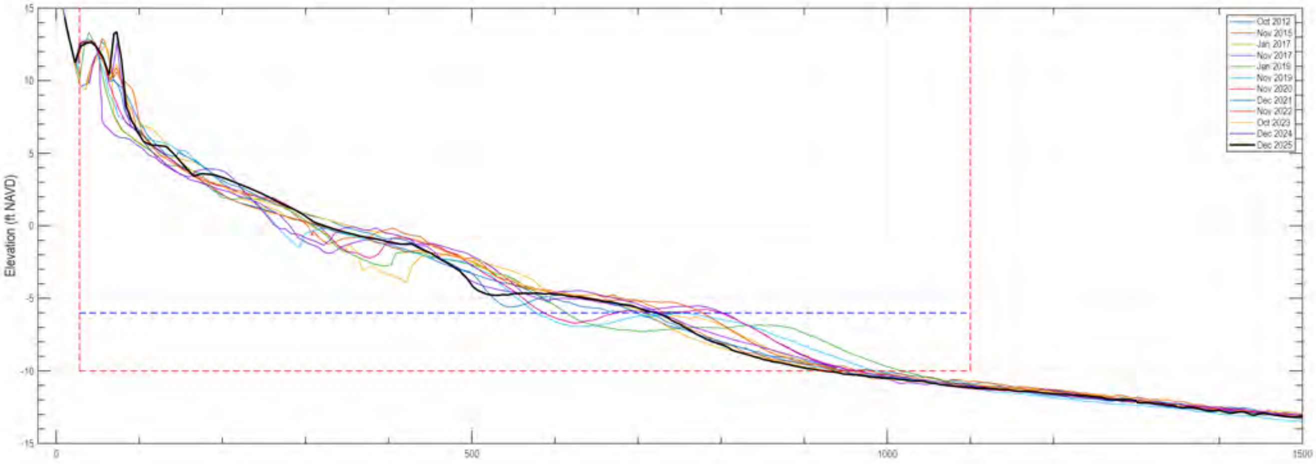
Kiawah Line 15





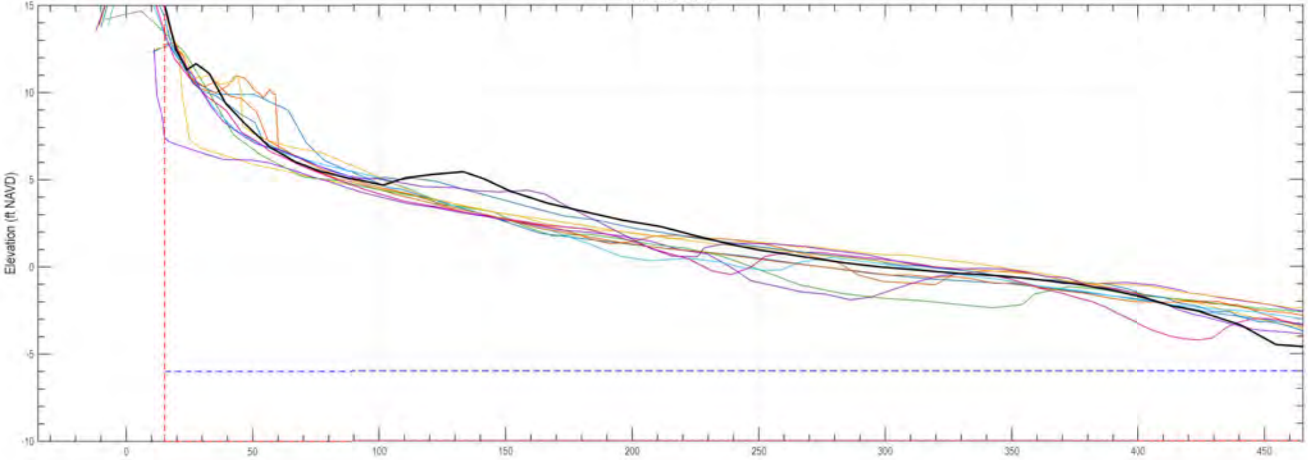
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	152.7	115.4	268.1
Nov 2015	158.4	115.0	273.5
Jan 2017	149.0	120.0	269.0
Nov 2017	141.8	123.1	264.9
Jan 2019	146.6	124.4	271.1
Nov 2019	146.7	122.7	269.4
Nov 2020	151.5	122.8	274.3
Dec 2021	157.8	115.5	273.3
Nov 2022	155.6	121.3	276.9
Oct 2023	163.3	113.0	276.3
Dec 2024	146.5	116.8	263.4
Dec 2025	152.0	113.0	265.0

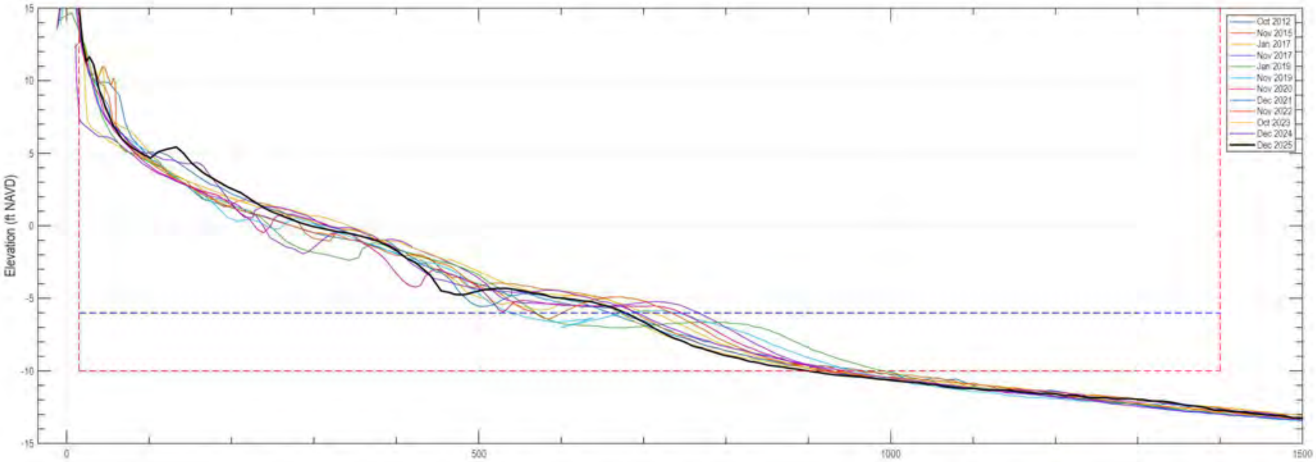




Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	149.3	116.1	265.4
Nov 2015	161.1	116.4	277.4
Jan 2017	148.0	120.6	268.6
Nov 2017	145.5	124.7	270.2
Jan 2019	143.7	124.1	267.8
Nov 2019	146.7	123.8	270.5
Nov 2020	149.8	123.6	273.4
Dec 2021	156.4	115.2	271.6
Nov 2022	156.9	120.8	277.8
Oct 2023	164.7	113.3	278.0
Dec 2024	154.4	118.9	273.3
Dec 2025	157.5	114.5	272.0

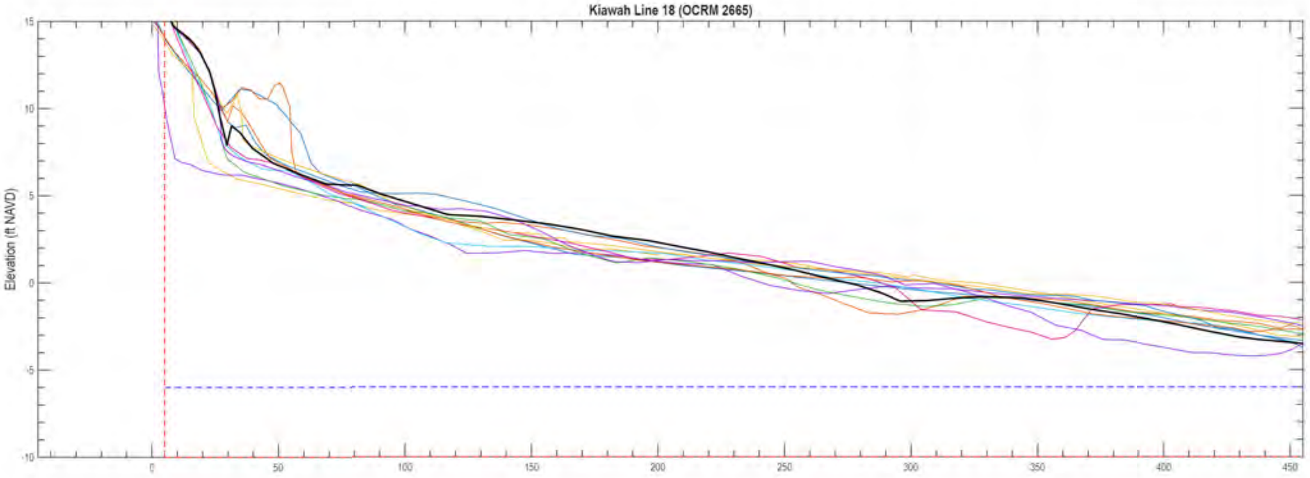
Kiawah Line 17

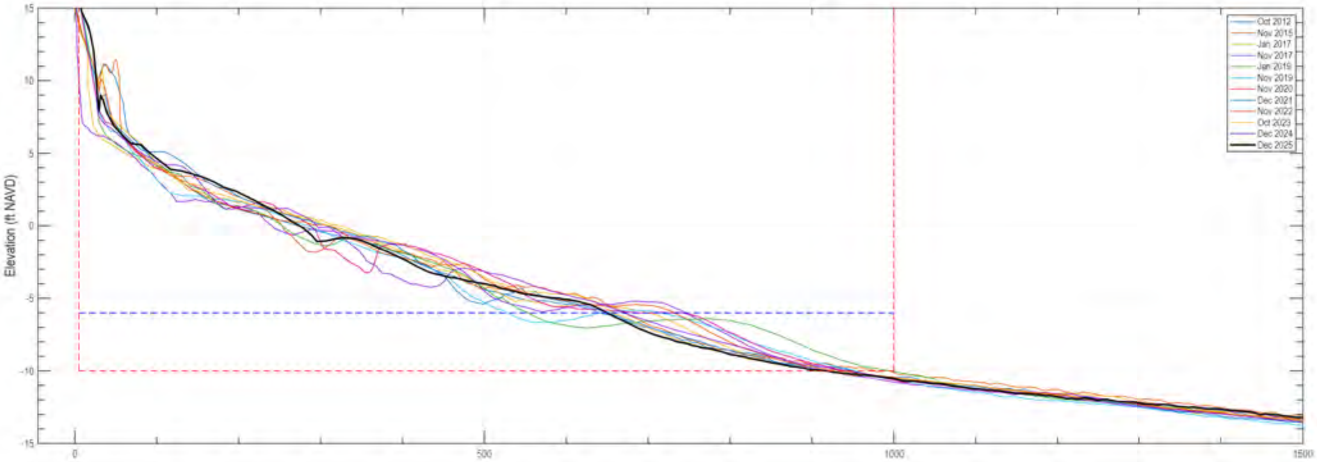




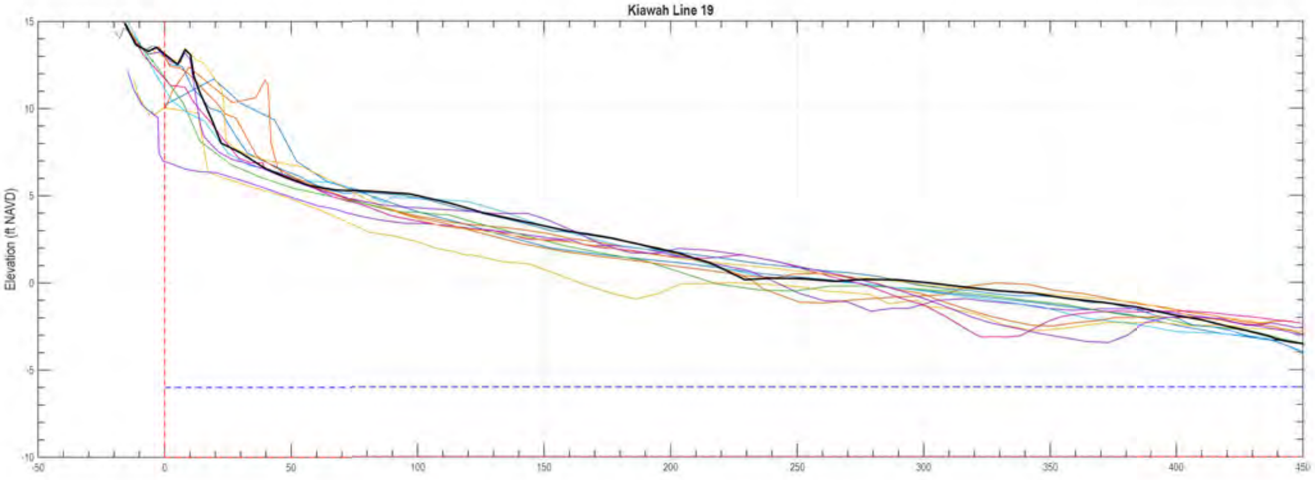
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	137.0	114.7	251.7
Nov 2015	143.8	113.6	257.4
Jan 2017	136.1	115.9	252.0
Nov 2017	129.7	121.6	251.3
Jan 2019	127.7	122.1	249.8
Nov 2019	129.3	121.3	250.6
Nov 2020	130.7	119.4	250.1
Dec 2021	141.0	111.9	252.9
Nov 2022	136.5	117.2	253.7
Oct 2023	149.1	110.9	260.0
Dec 2024	143.8	115.3	259.1
Dec 2025	143.0	110.5	253.5

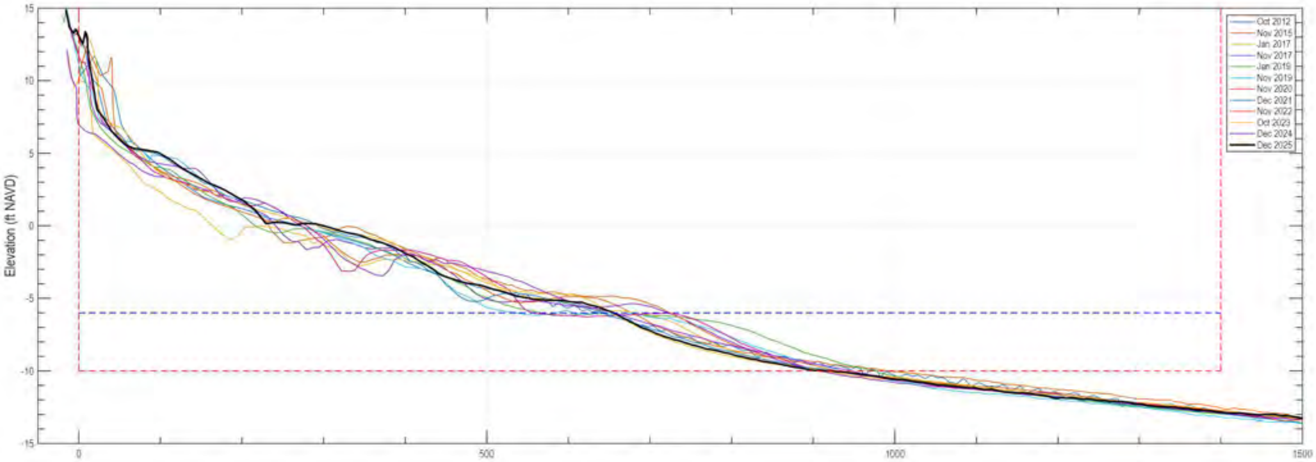
Kiawah Line 18 (OCRM 2665)



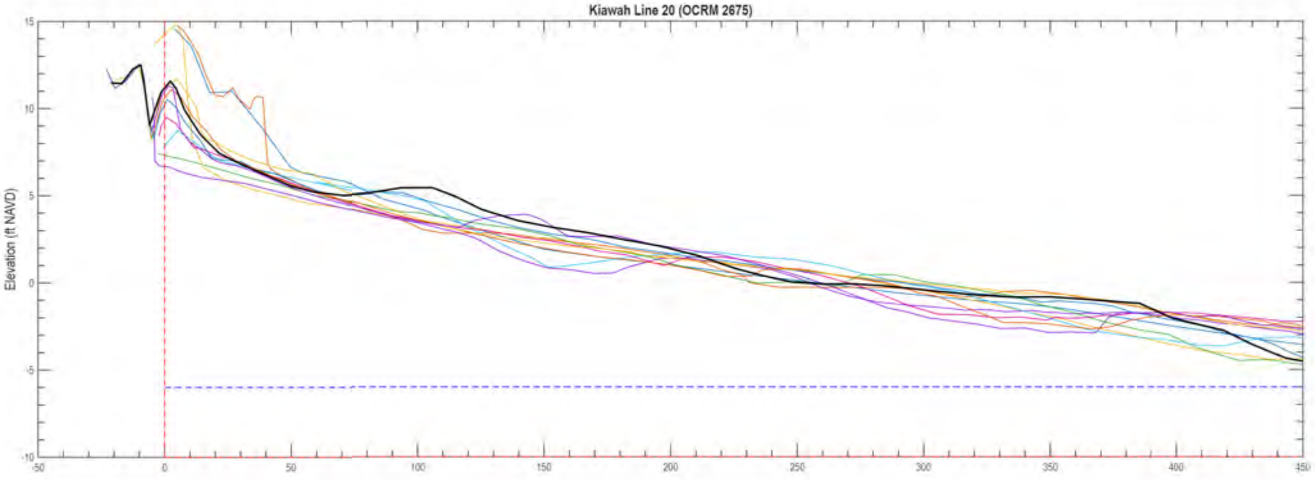


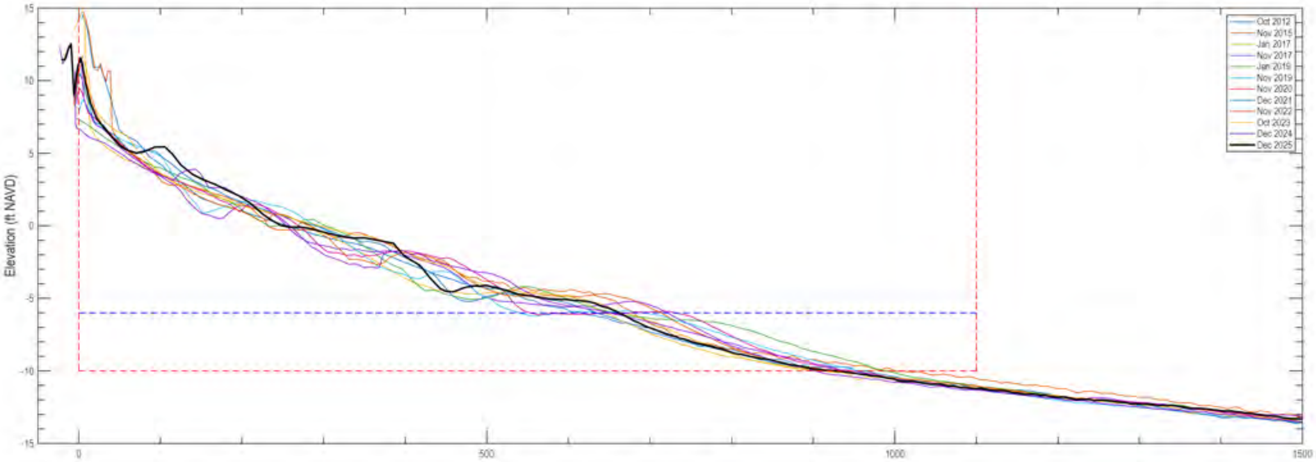
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	139.1	112.9	252.0
Nov 2015	144.8	115.1	259.9
Jan 2017	136.8	116.0	252.8
Nov 2017	129.2	120.5	249.7
Jan 2019	130.5	123.8	254.3
Nov 2019	127.7	120.5	248.2
Nov 2020	139.3	122.4	261.7
Dec 2021	144.7	113.0	257.8
Nov 2022	143.0	119.1	262.1
Oct 2023	150.1	111.5	261.6
Dec 2024	140.3	116.5	256.8
Dec 2025	142.5	110.8	253.3



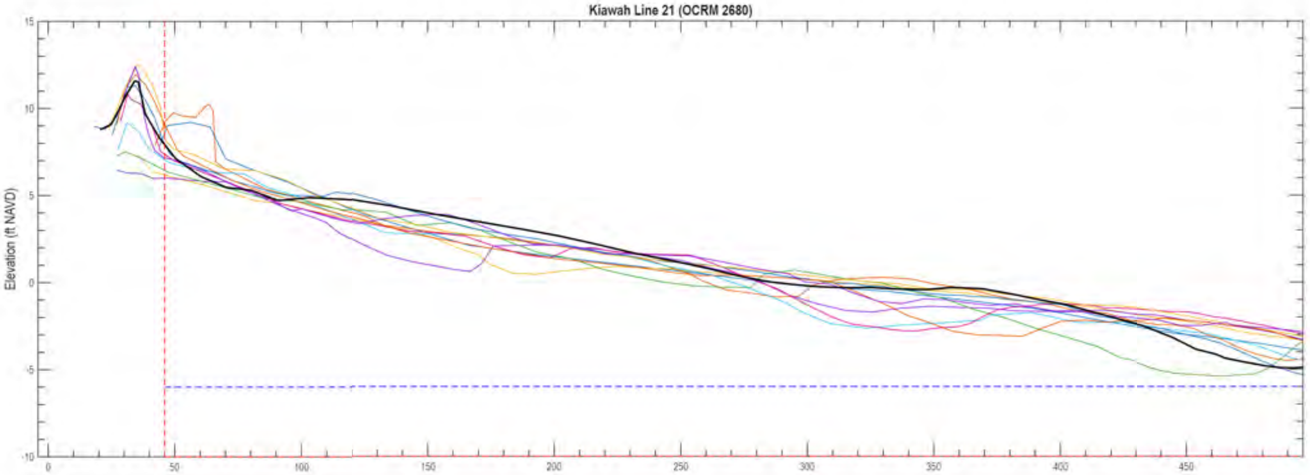


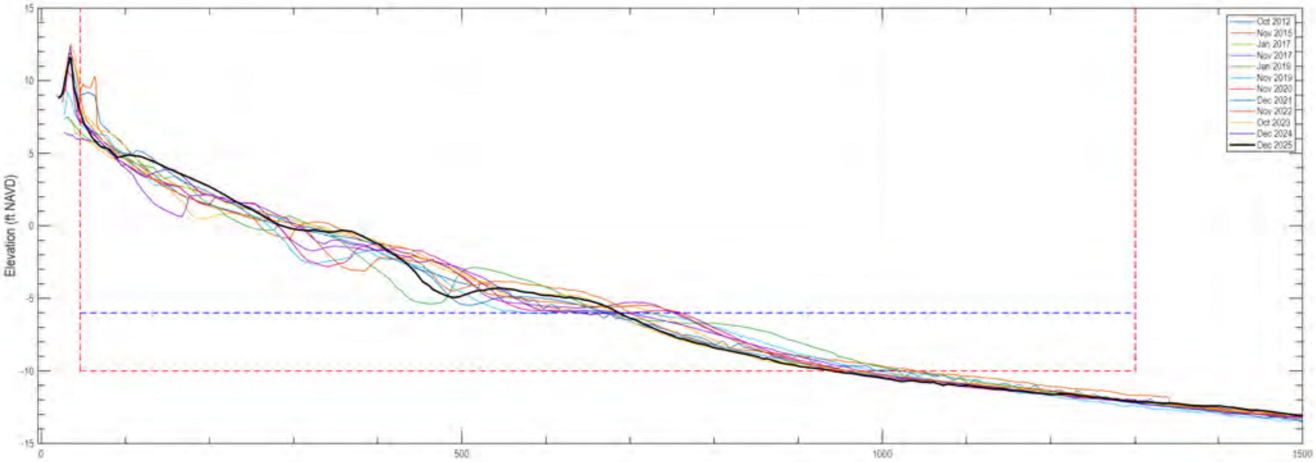
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	136.4	115.6	252.1
Nov 2015	145.1	116.6	261.7
Jan 2017	117.2	116.0	233.2
Nov 2017	125.9	119.1	245.0
Jan 2019	125.7	125.7	251.3
Nov 2019	128.9	120.2	249.1
Nov 2020	132.7	119.7	252.4
Dec 2021	139.7	112.9	252.5
Nov 2022	135.9	119.4	255.3
Oct 2023	144.5	110.8	255.3
Dec 2024	139.9	116.7	256.6
Dec 2025	141.3	111.7	253.0



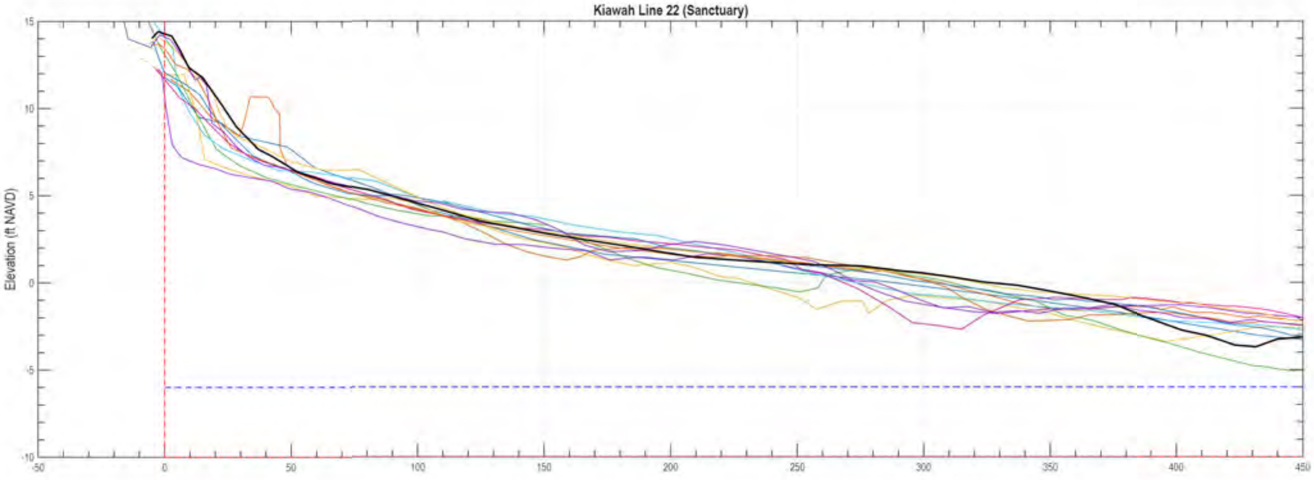


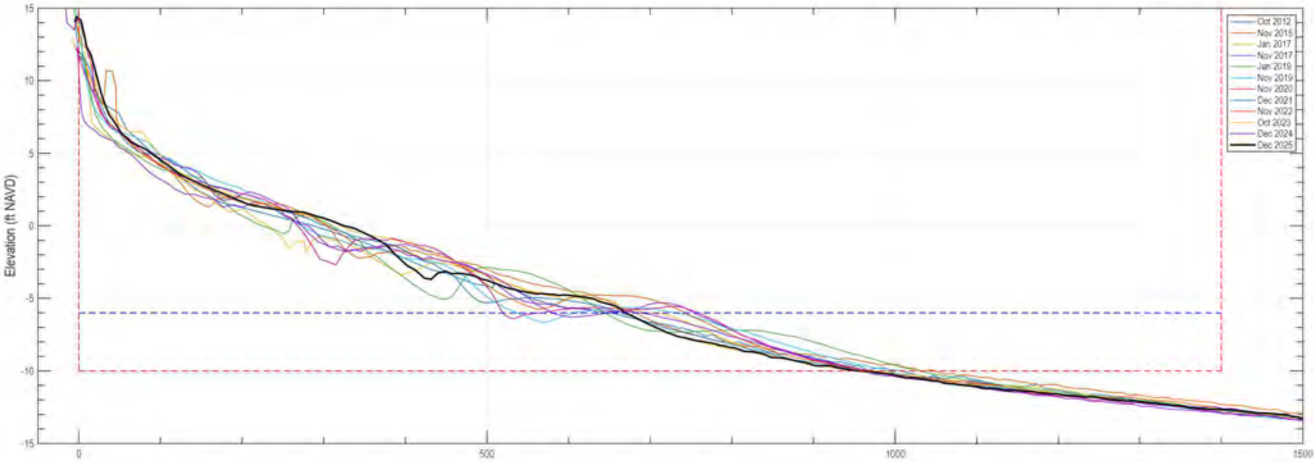
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	134.9	113.3	248.2
Nov 2015	144.6	117.2	261.7
Jan 2017	127.0	113.6	240.6
Nov 2017	122.4	118.0	240.5
Jan 2019	126.2	126.6	252.9
Nov 2019	125.8	121.6	247.4
Nov 2020	129.5	121.5	250.9
Dec 2021	133.9	111.9	245.9
Nov 2022	133.7	117.4	251.2
Oct 2023	139.7	110.4	250.1
Dec 2024	132.8	117.7	250.5
Dec 2025	137.9	113.3	251.2



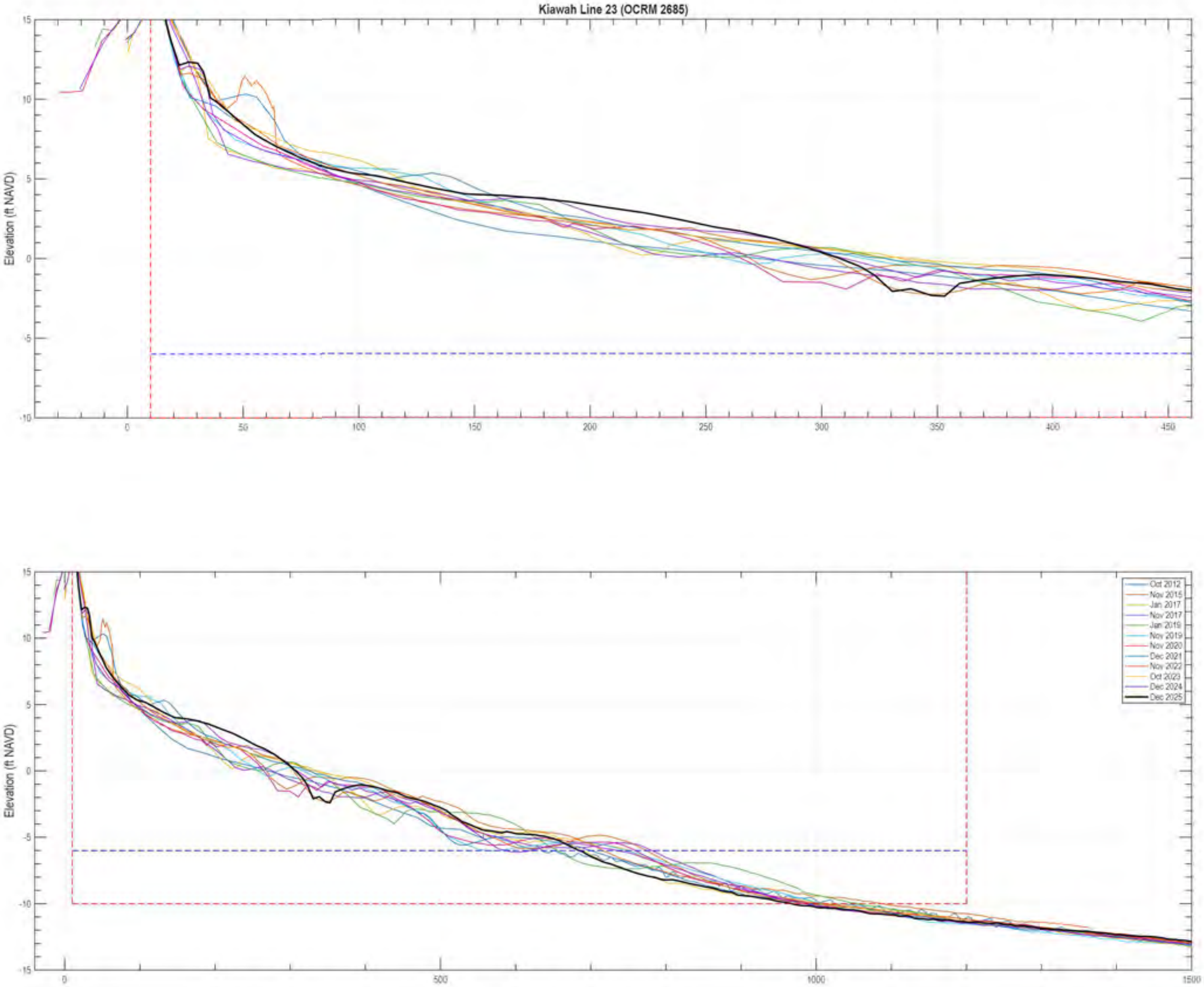


Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	120.5	113.6	234.0
Nov 2015	128.7	115.1	243.8
Jan 2017	118.5	113.3	231.8
Nov 2017	114.6	116.8	231.4
Jan 2019	116.6	123.6	240.2
Nov 2019	108.4	120.1	228.5
Nov 2020	115.9	118.2	234.1
Dec 2021	122.1	111.0	233.0
Nov 2022	117.0	117.2	234.1
Oct 2023	131.6	109.7	241.3
Dec 2024	123.3	117.0	240.3
Dec 2025	124.8	110.0	234.8

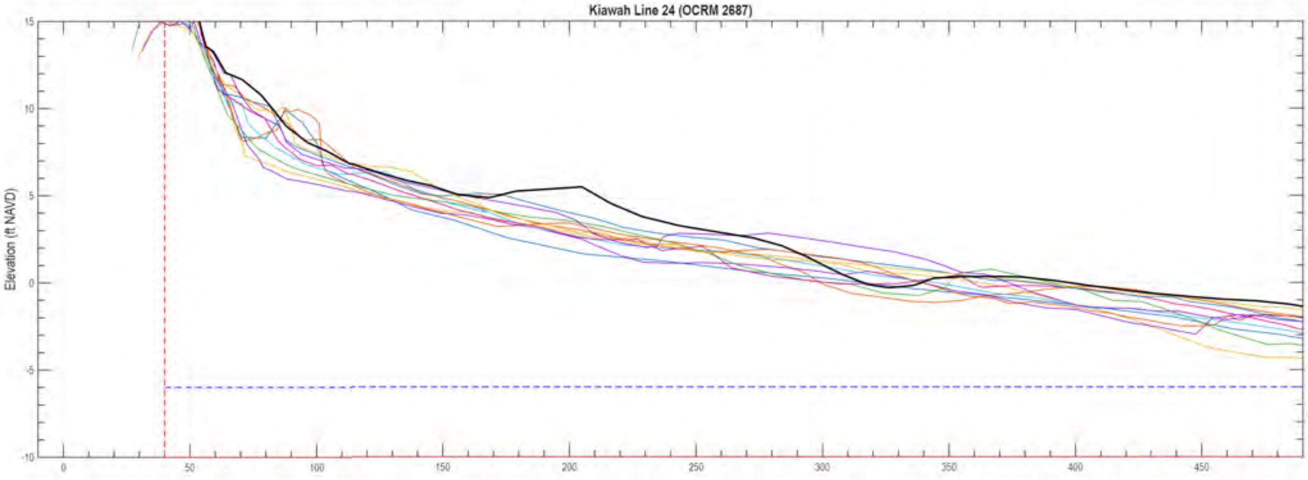


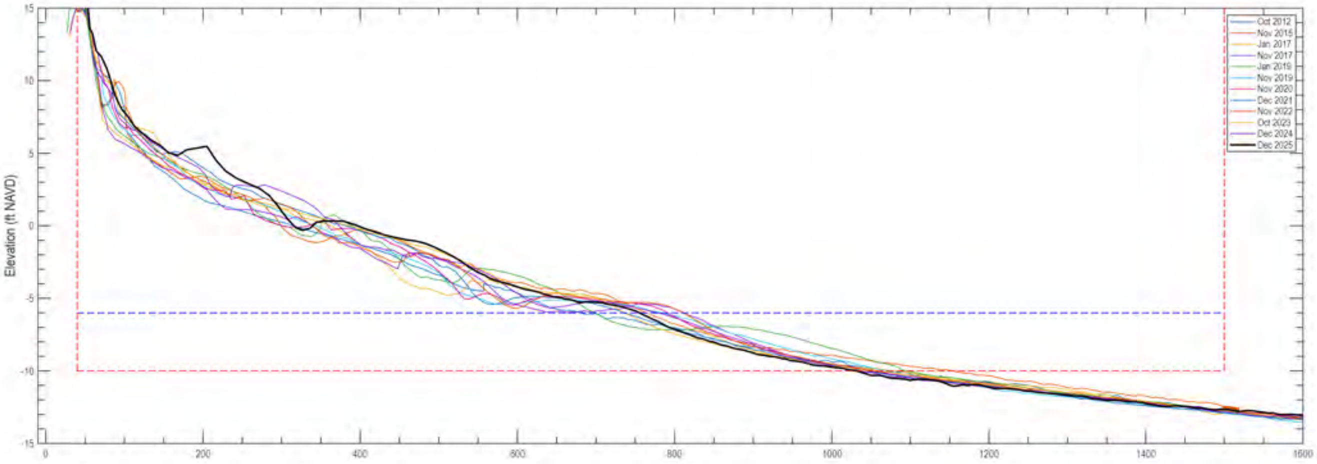


Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	138.3	120.0	258.2
Nov 2015	150.2	121.6	271.9
Jan 2017	131.8	120.2	252.0
Nov 2017	132.7	124.6	257.4
Jan 2019	135.8	126.3	262.2
Nov 2019	138.9	126.2	265.1
Nov 2020	139.2	124.6	263.8
Dec 2021	142.6	117.5	260.1
Nov 2022	144.6	123.1	267.7
Oct 2023	154.6	115.3	269.8
Dec 2024	143.4	122.0	265.4
Dec 2025	147.4	115.8	263.1



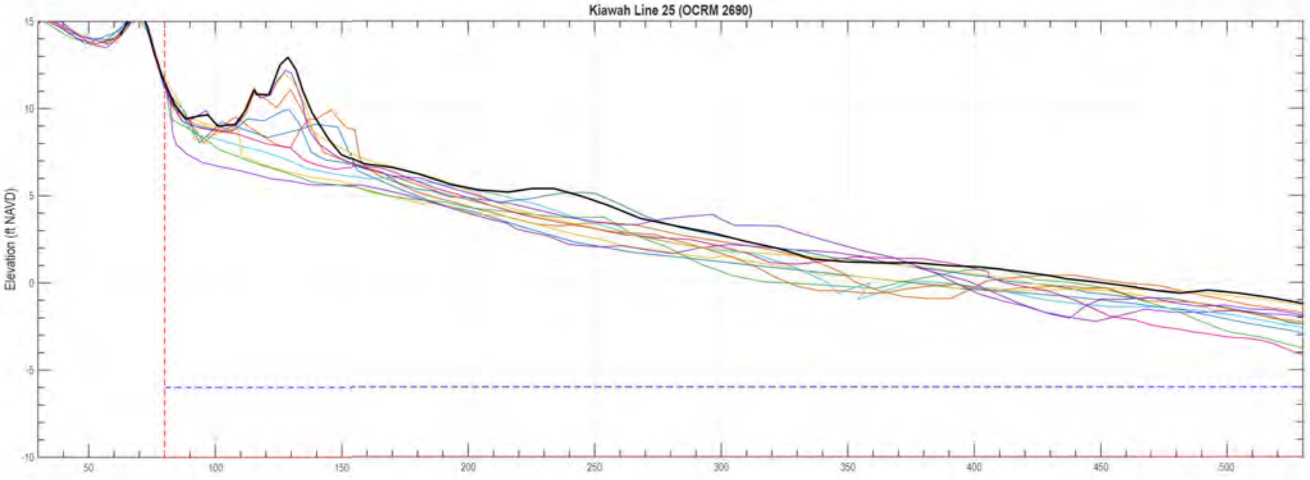
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	139.2	122.1	261.3
Nov 2015	160.0	125.5	285.4
Jan 2017	148.1	124.5	272.7
Nov 2017	144.0	127.5	271.5
Jan 2019	146.1	128.9	275.0
Nov 2019	144.8	127.6	272.4
Nov 2020	142.7	124.5	267.2
Dec 2021	153.0	120.5	273.5
Nov 2022	152.6	125.4	278.0
Oct 2023	161.1	117.0	278.1
Dec 2024	152.1	124.9	277.0
Dec 2025	160.0	117.2	277.2

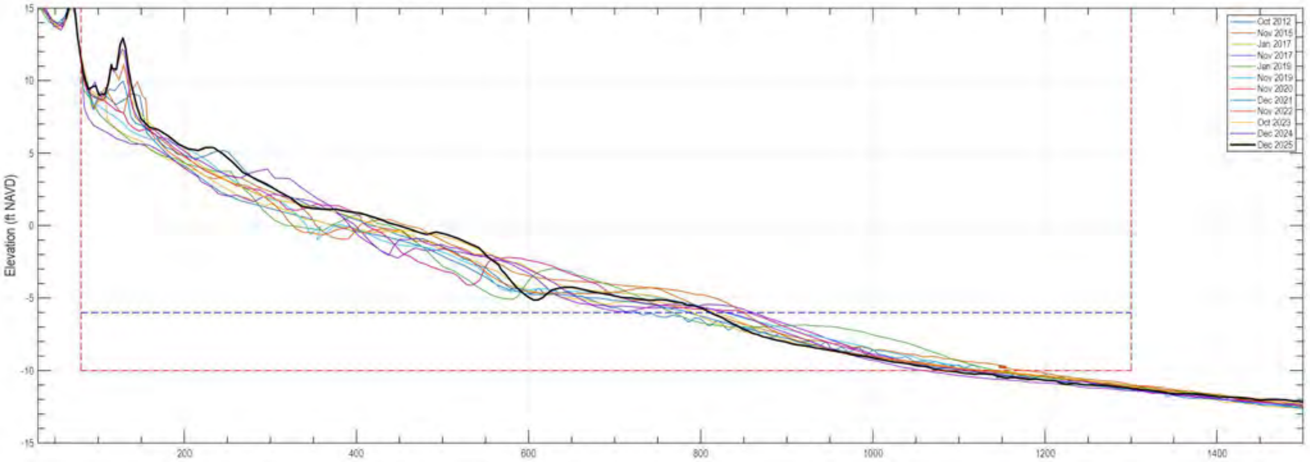




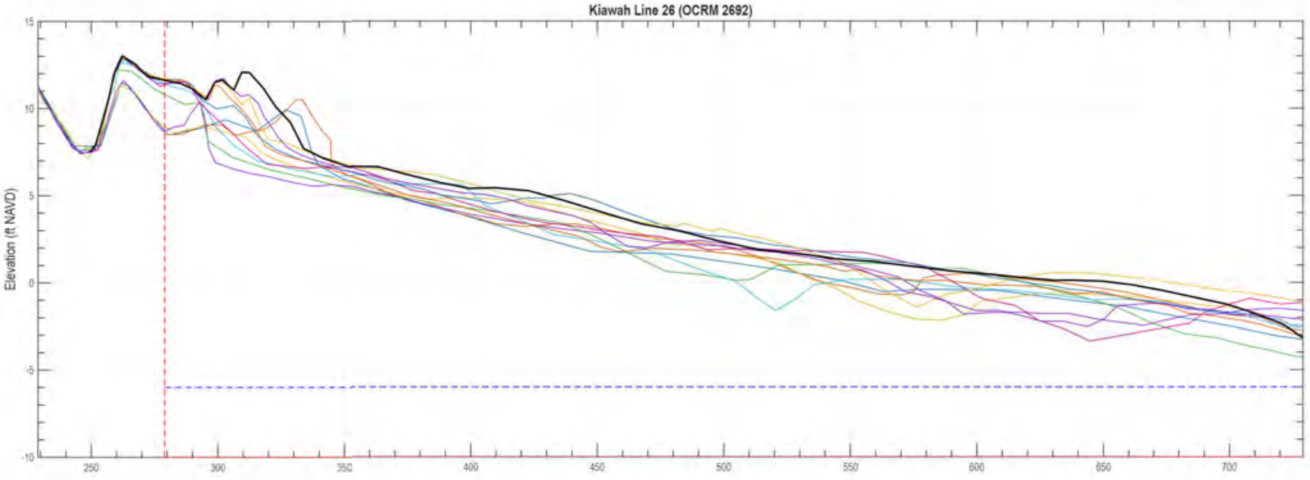
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	142.2	123.4	265.6
Nov 2015	162.4	129.2	291.6
Jan 2017	148.2	125.4	273.7
Nov 2017	144.9	128.5	273.4
Jan 2019	155.2	131.6	286.8
Nov 2019	151.9	130.2	282.1
Nov 2020	154.9	126.4	281.3
Dec 2021	165.1	123.0	288.1
Nov 2022	161.1	127.4	288.5
Oct 2023	171.2	121.1	292.3
Dec 2024	168.4	126.3	294.7
Dec 2025	176.5	121.8	298.3

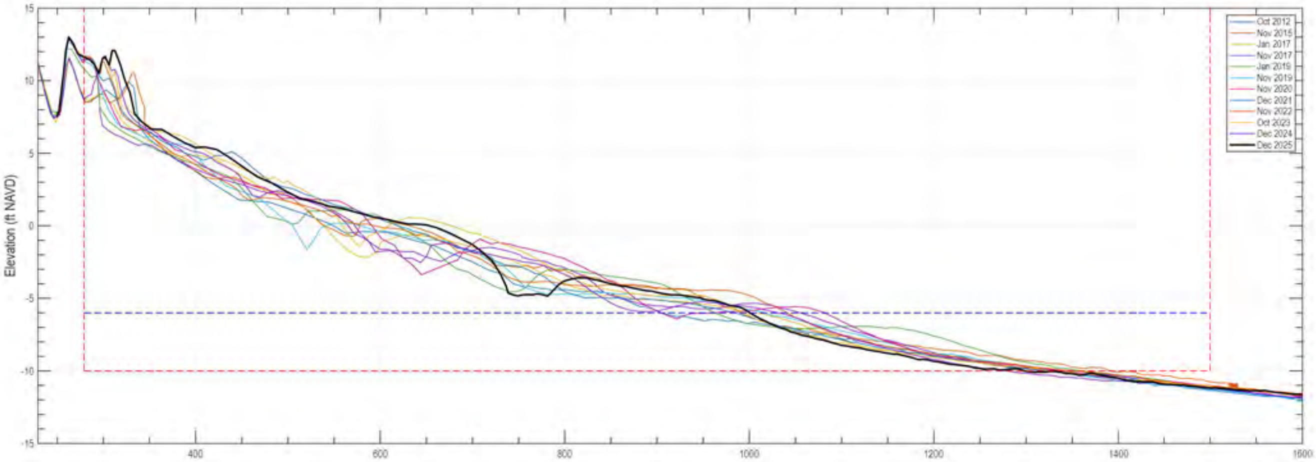
Kiawah Line 25 (OCRM 2690)



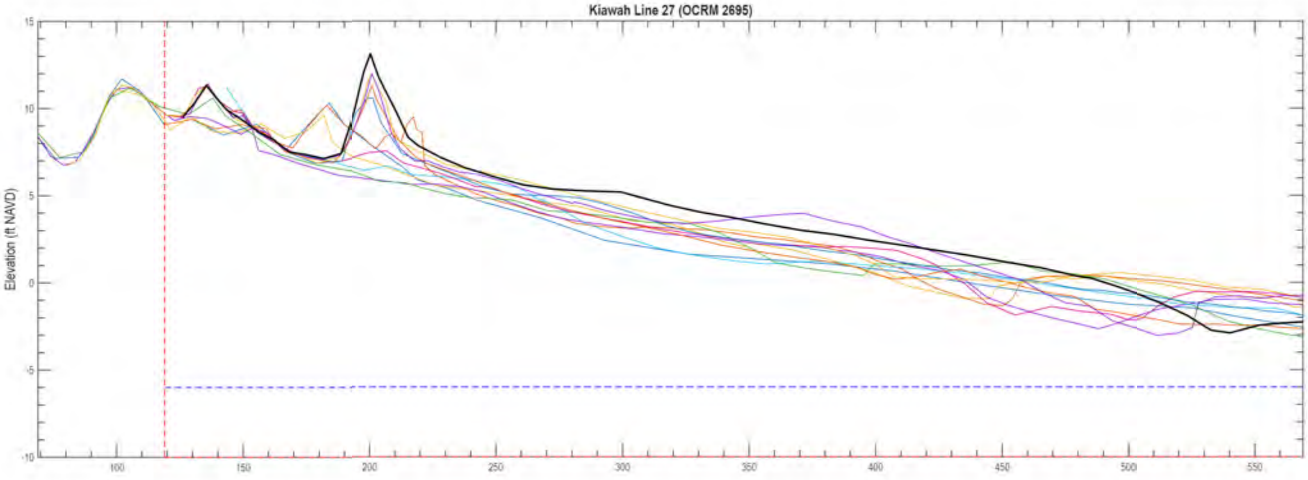


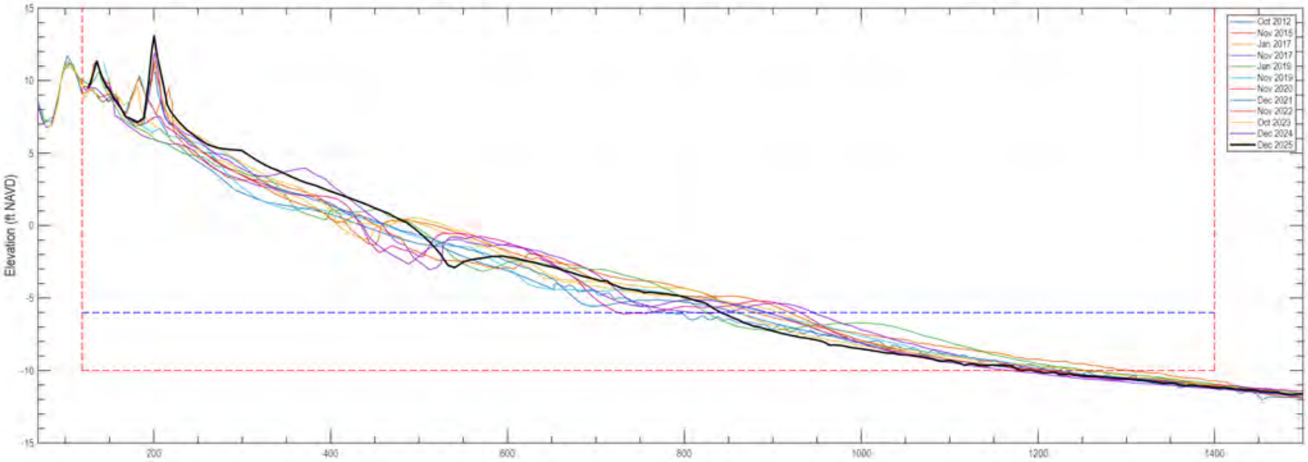
Date	**Vol to -6**	**Vol -6 to -10**	**Vol to -10**
Oct 2012	146.2	125.7	271.9
Nov 2015	168.1	130.9	299.0
Jan 2017	148.2	125.9	274.0
Nov 2017	147.8	130.8	278.7
Jan 2019	148.9	135.0	283.9
Nov 2019	153.2	131.3	284.5
Nov 2020	160.3	129.9	290.1
Dec 2021	162.5	124.9	287.4
Nov 2022	160.4	127.7	288.1
Oct 2023	172.2	123.7	295.9
Dec 2024	167.8	126.3	294.1
Dec 2025	174.9	124.1	299.0


Kiawah Line 26 (OCRM 2692)

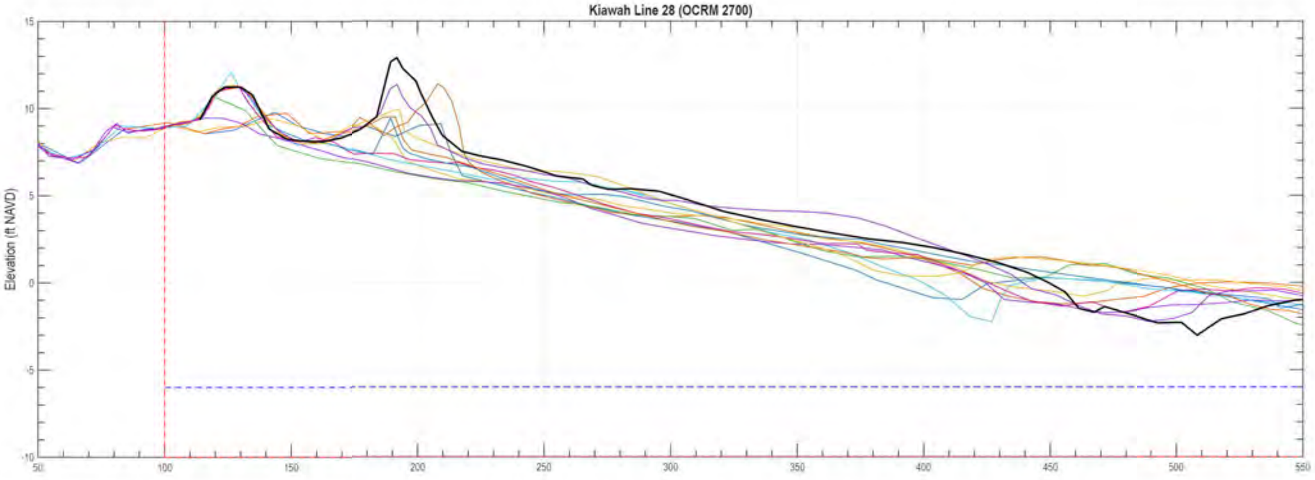


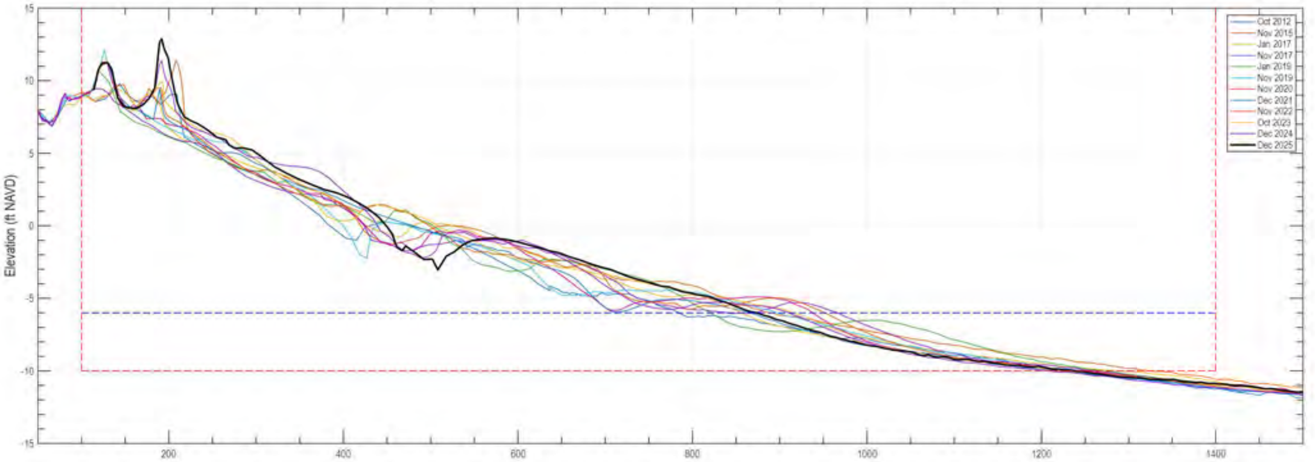
Date	**Vol to -6**	**Vol -6 to -10**	**Vol to -10**
Oct 2012	140.7	124.5	265.2
Nov 2015	160.4	130.6	291.0
Jan 2017	149.7	126.4	276.1
Nov 2017	148.8	131.2	279.9
Jan 2019	148.9	134.1	283.0
Nov 2019	146.6	130.1	276.7
Nov 2020	158.6	131.6	290.2
Dec 2021	162.5	125.3	287.8
Nov 2022	159.0	129.2	288.2
Oct 2023	173.7	124.3	298.0
Dec 2024	156.2	126.7	282.9
Dec 2025	169.7	122.4	292.0





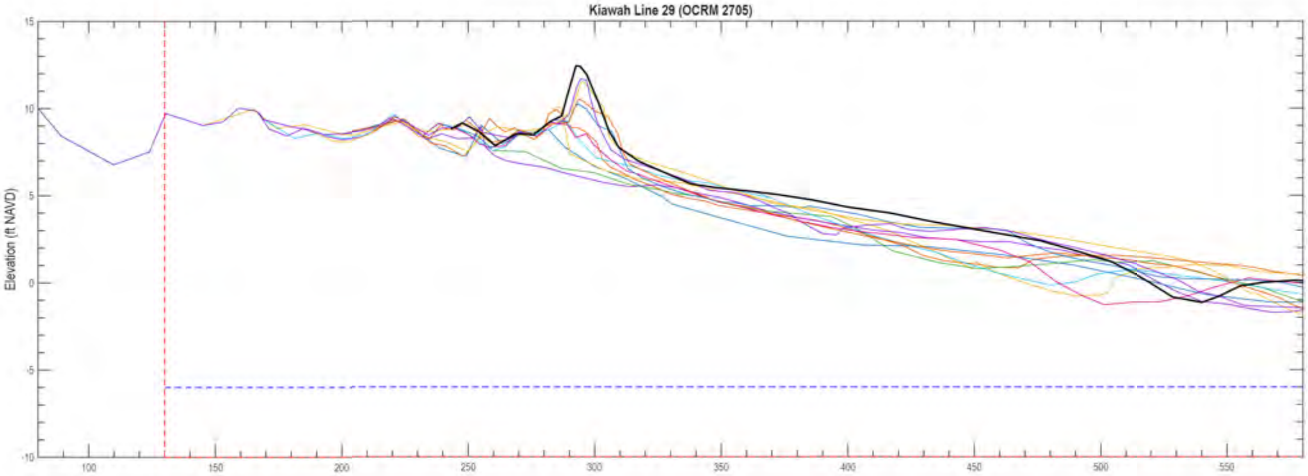
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	156.3	131.3	287.6
Nov 2015	183.9	140.5	324.5
Jan 2017	173.2	134.6	307.8
Nov 2017	167.6	138.9	306.5
Jan 2019	172.0	139.6	311.6
Nov 2019	166.1	136.2	302.3
Nov 2020	171.6	133.1	304.8
Dec 2021	171.3	130.9	302.2
Nov 2022	173.9	133.9	307.8
Oct 2023	186.6	131.0	317.6
Dec 2024	182.0	131.1	313.1
Dec 2025	187.3	126.9	314.1

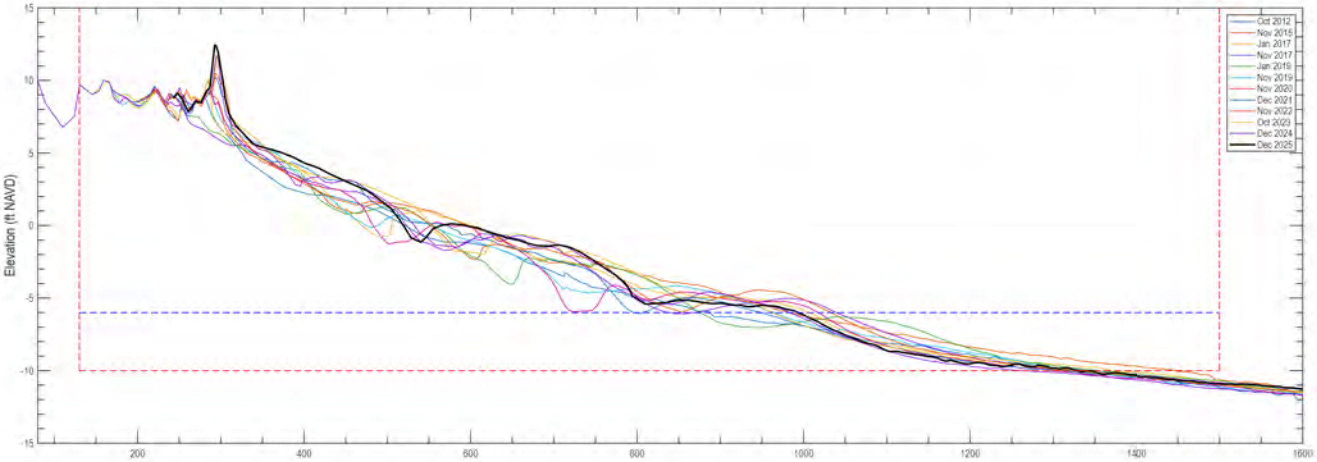




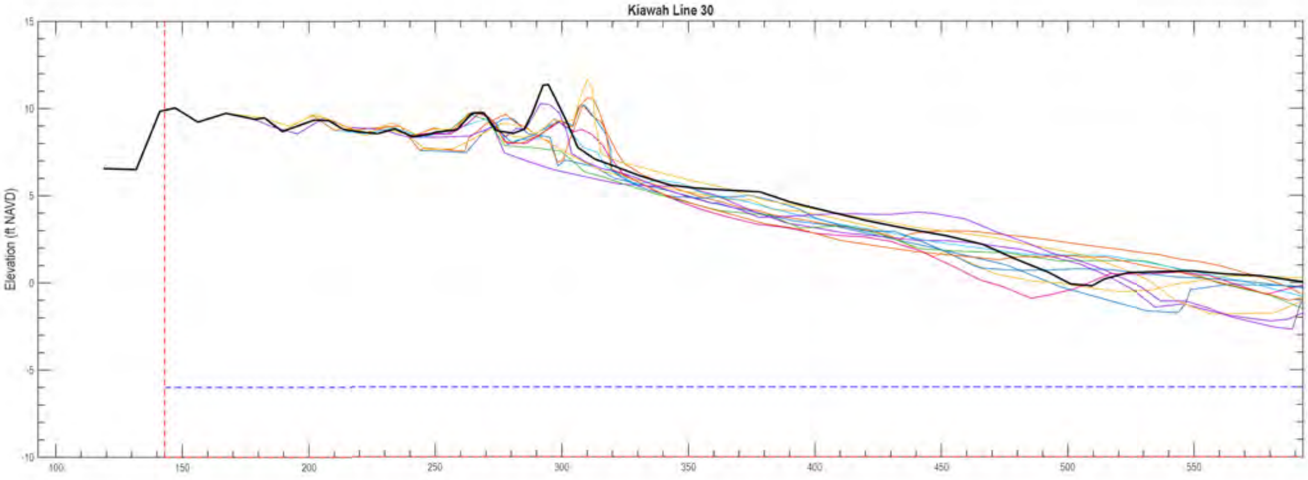
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	172.1	135.4	307.4
Nov 2015	197.5	146.4	343.9
Jan 2017	192.6	140.6	333.2
Nov 2017	180.0	143.5	323.5
Jan 2019	183.3	144.2	327.5
Nov 2019	182.2	139.5	321.7
Nov 2020	184.1	138.5	322.6
Dec 2021	185.9	133.9	319.8
Nov 2022	191.3	140.5	331.8
Oct 2023	197.9	133.6	331.5
Dec 2024	197.2	135.6	332.7
Dec 2025	203.0	134.7	337.7

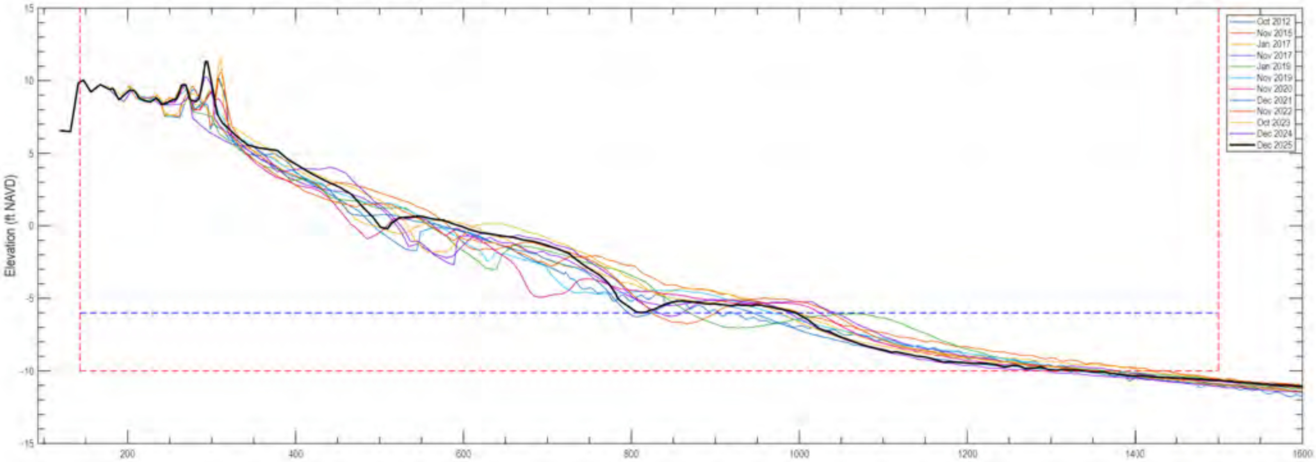
Kiawah Line 29 (OCRM 2705)



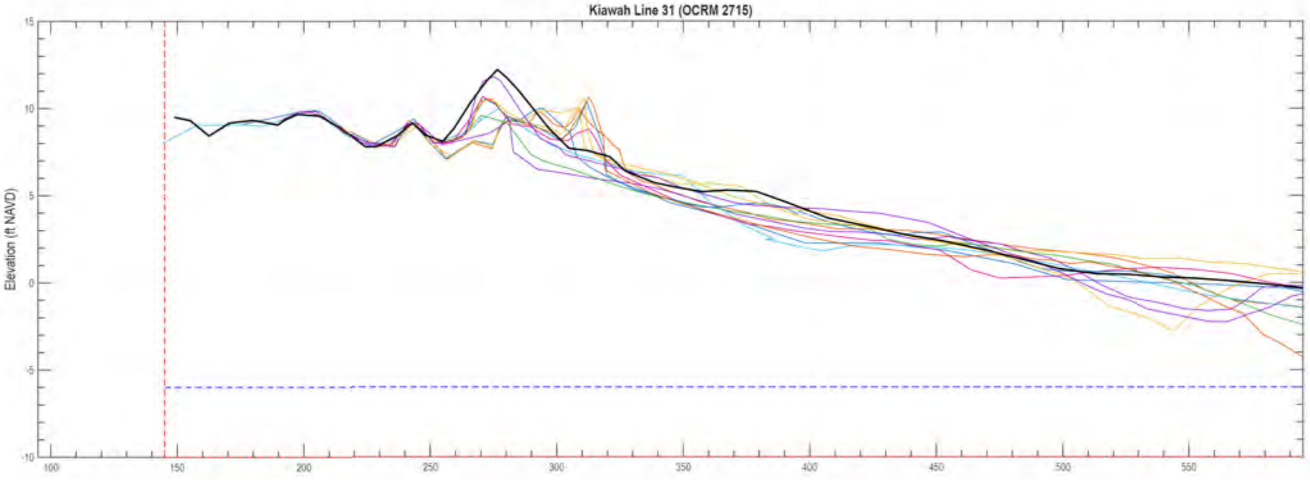


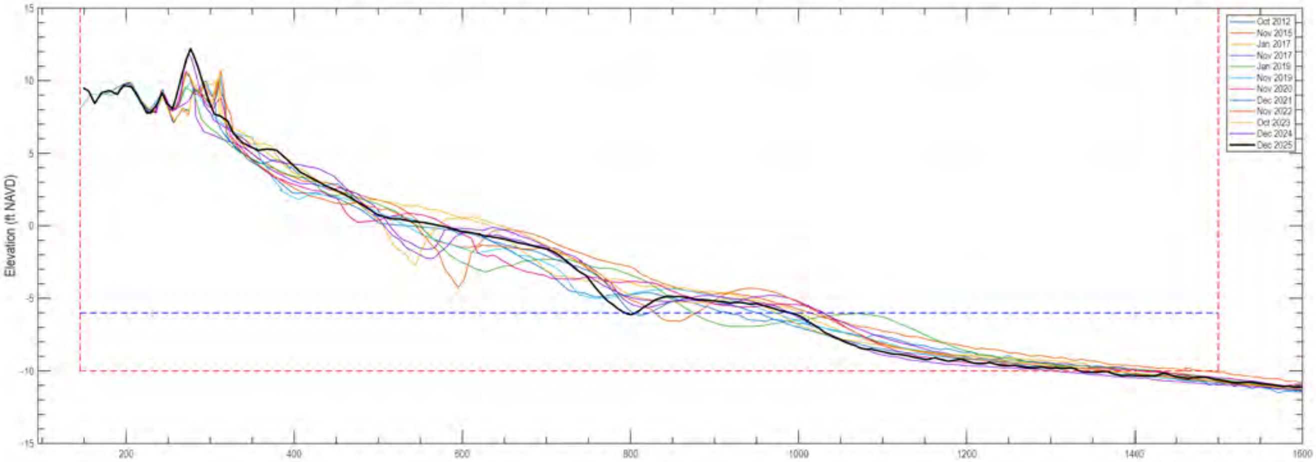
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	200.7	143.8	344.5
Nov 2015	225.9	155.8	381.7
Jan 2017	220.5	147.7	368.2
Nov 2017	215.5	150.1	365.6
Jan 2019	207.6	151.2	358.8
Nov 2019	211.9	147.7	359.6
Nov 2020	209.2	145.1	354.2
Dec 2021	218.8	141.8	360.6
Nov 2022	222.4	148.6	371.1
Oct 2023	234.0	142.8	376.8
Dec 2024	224.0	140.7	364.7
Dec 2025	229.7	143.3	373.0



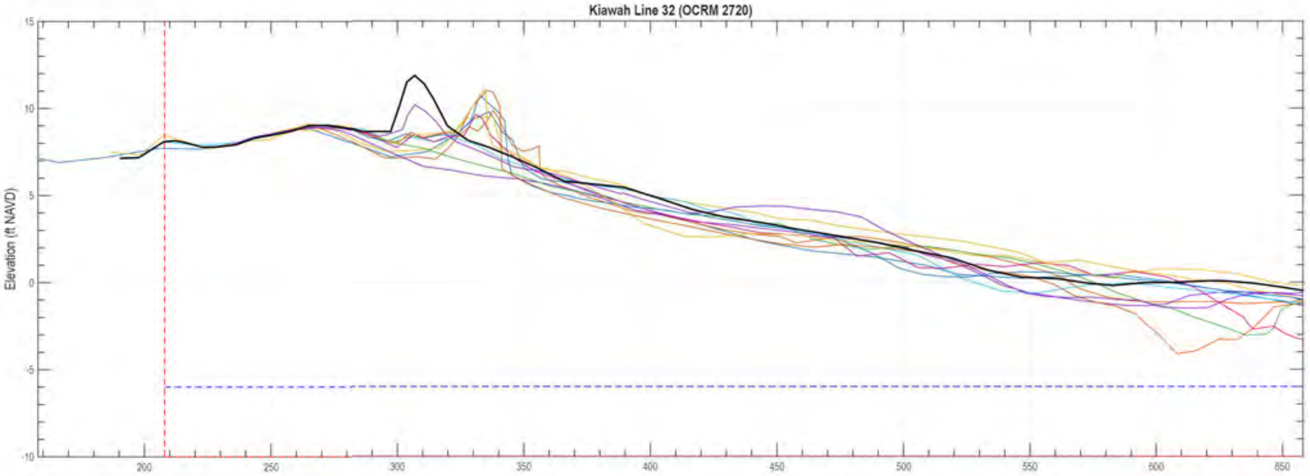


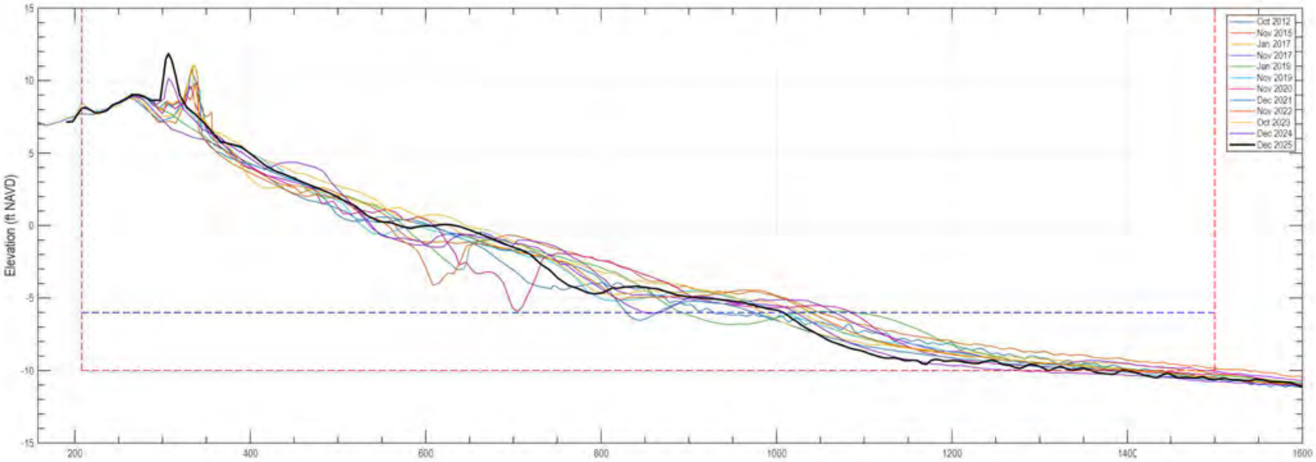
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	201.8	143.9	345.7
Nov 2015	230.7	153.3	384.0
Jan 2017	217.0	147.5	364.4
Nov 2017	211.9	148.8	360.7
Jan 2019	210.8	150.5	361.3
Nov 2019	212.4	146.3	358.7
Nov 2020	203.9	145.1	348.9
Dec 2021	211.6	138.0	349.5
Nov 2022	213.9	146.0	359.8
Oct 2023	229.0	142.3	371.3
Dec 2024	215.3	139.0	354.3
Dec 2025	220.7	140.8	361.4



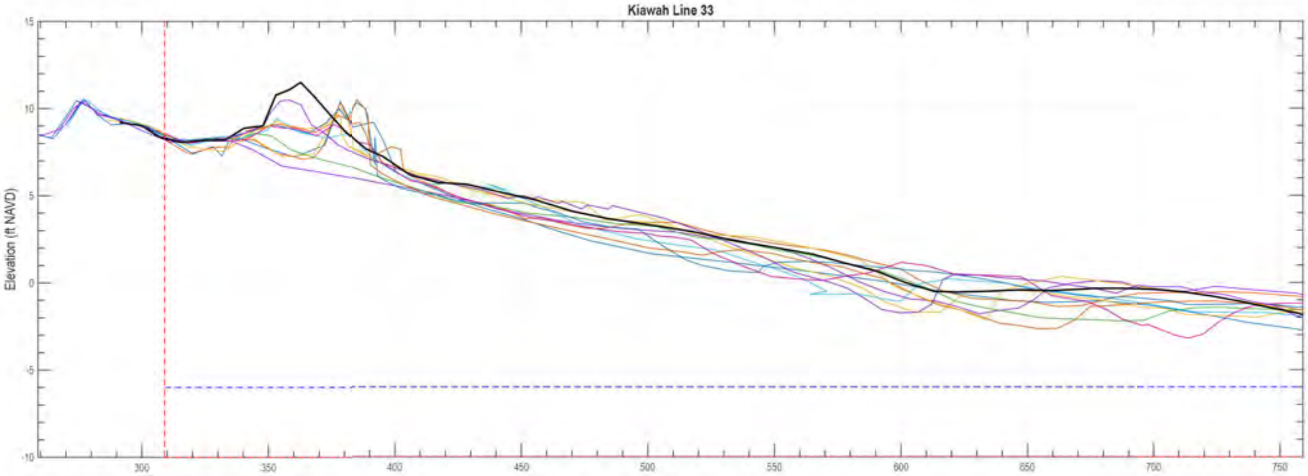


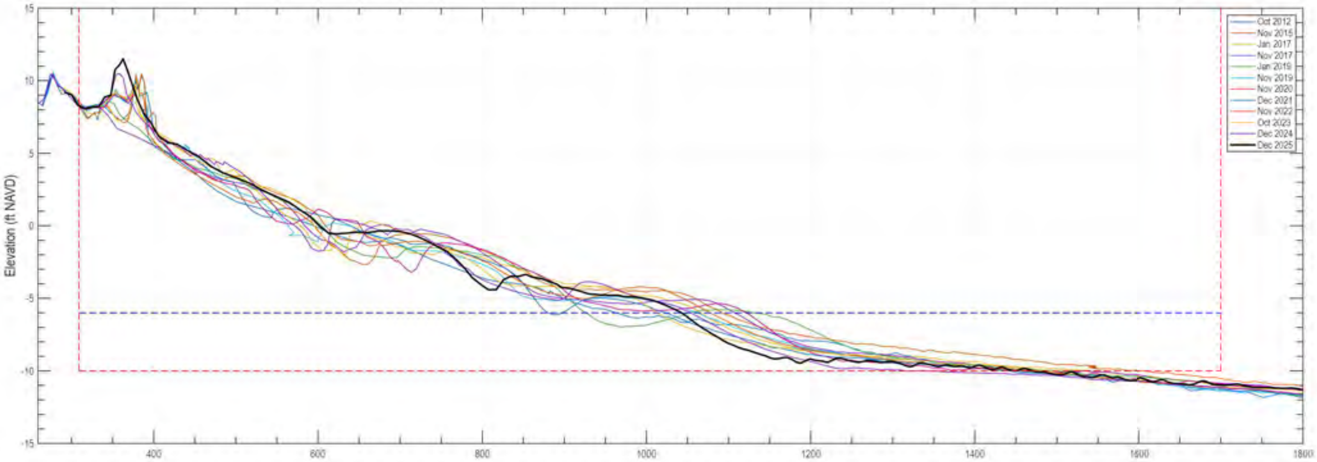
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	200.9	146.0	346.8
Nov 2015	227.6	155.2	382.8
Jan 2017	225.3	146.9	372.2
Nov 2017	212.0	148.8	360.9
Jan 2019	204.4	151.0	355.5
Nov 2019	204.3	144.0	348.3
Nov 2020	208.5	144.2	352.7
Dec 2021	212.5	140.4	352.9
Nov 2022	208.1	144.9	352.9
Oct 2023	218.7	143.0	361.7
Dec 2024	214.7	138.2	352.9
Dec 2025	217.4	140.1	357.5


Kiawah Line 32 (OCRM 2720)

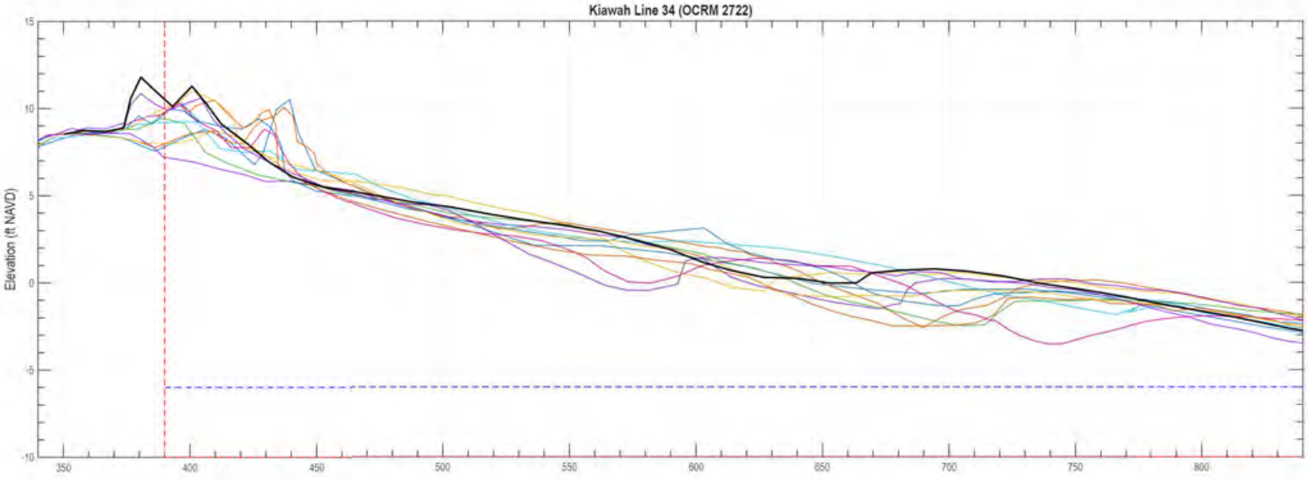


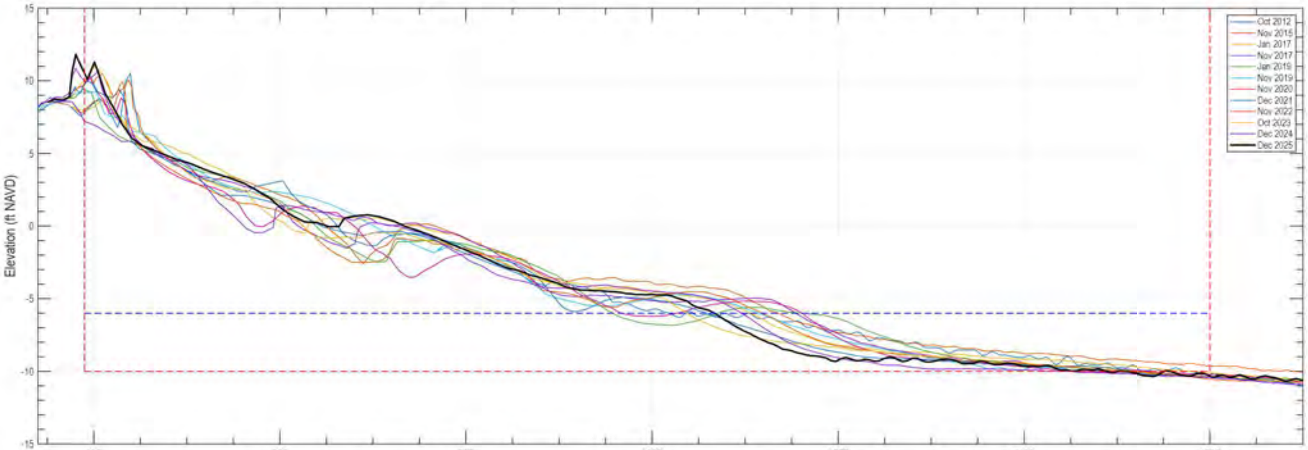
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	180.3	143.0	323.3
Nov 2015	202.7	151.8	354.5
Jan 2017	207.0	142.2	349.2
Nov 2017	190.4	144.7	335.1
Jan 2019	188.7	145.9	334.6
Nov 2019	190.0	139.5	329.6
Nov 2020	191.2	141.0	332.3
Dec 2021	188.2	133.1	321.3
Nov 2022	185.4	140.2	325.7
Oct 2023	198.0	136.5	334.5
Dec 2024	192.9	131.7	324.6
Dec 2025	196.2	131.6	327.8





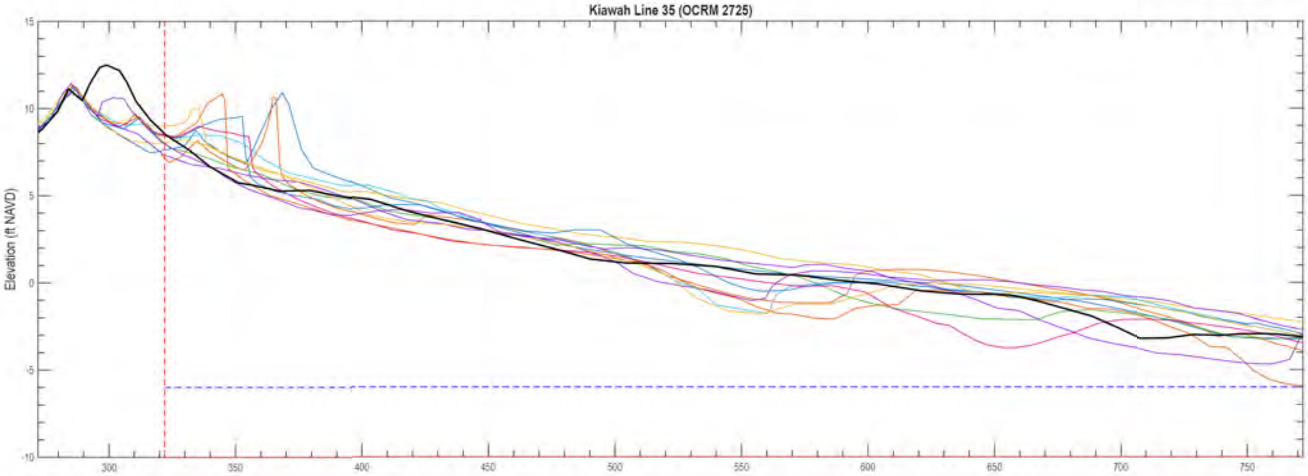
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	148.4	134.0	282.4
Nov 2015	174.2	144.4	318.6
Jan 2017	166.5	132.6	299.1
Nov 2017	162.1	135.2	297.4
Jan 2019	157.0	137.2	294.2
Nov 2019	158.3	131.1	289.4
Nov 2020	163.4	131.7	295.1
Dec 2021	161.1	126.2	287.3
Nov 2022	161.2	131.3	292.5
Oct 2023	168.6	127.2	295.8
Dec 2024	165.7	122.4	288.1
Dec 2025	169.6	123.3	292.9

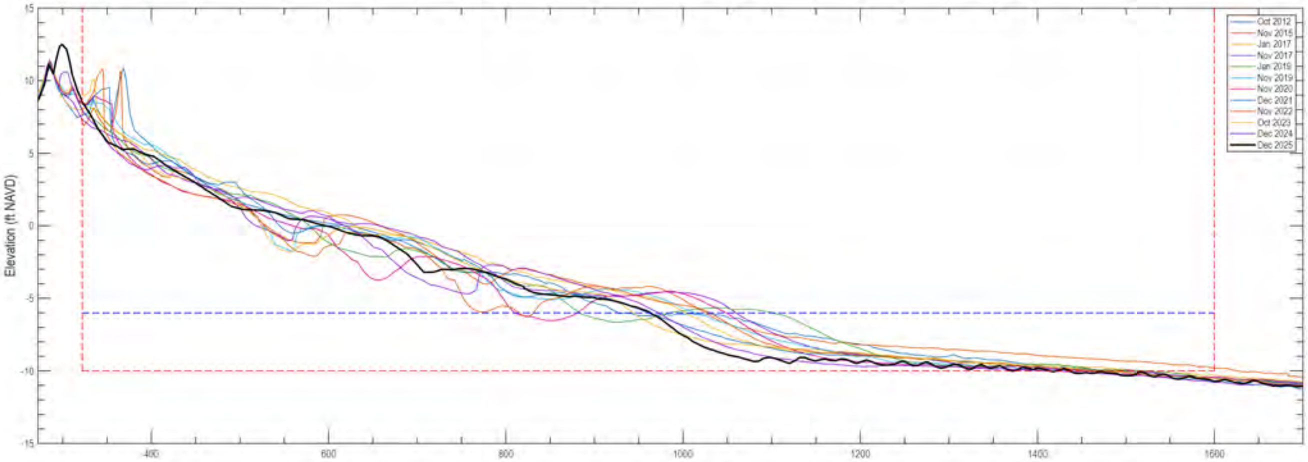




Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	139.8	133.0	272.8
Nov 2015	158.6	138.0	296.6
Jan 2017	153.3	128.0	281.3
Nov 2017	143.6	129.3	272.9
Jan 2019	137.6	130.7	268.3
Nov 2019	147.9	124.8	272.7
Nov 2020	133.8	125.7	259.4
Dec 2021	143.6	118.9	262.5
Nov 2022	135.4	124.7	260.1
Oct 2023	144.4	119.3	263.7
Dec 2024	143.1	115.3	258.4
Dec 2025	149.7	115.9	265.6

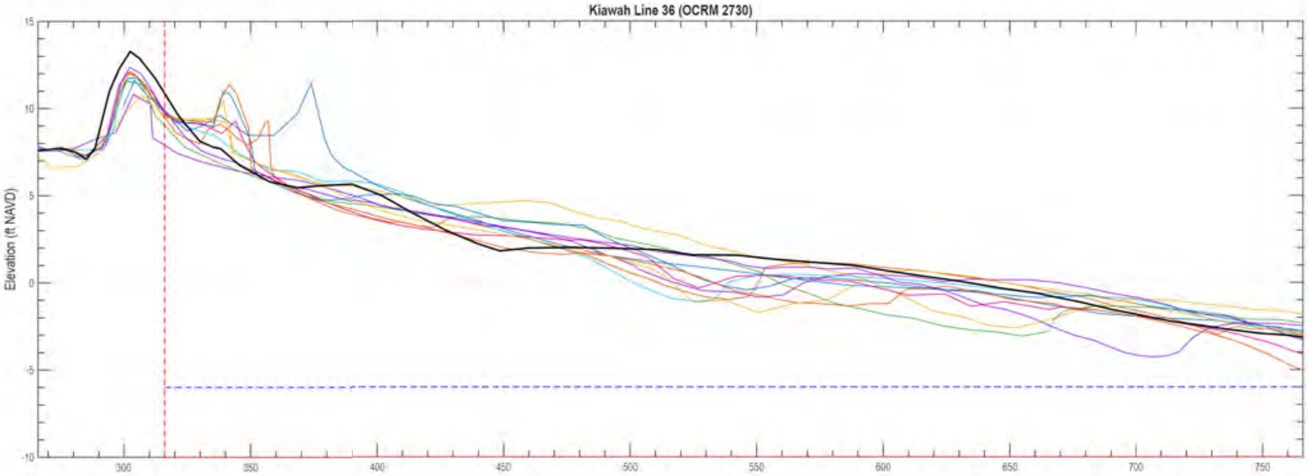
Kiawah Line 35 (OCRM 2725)

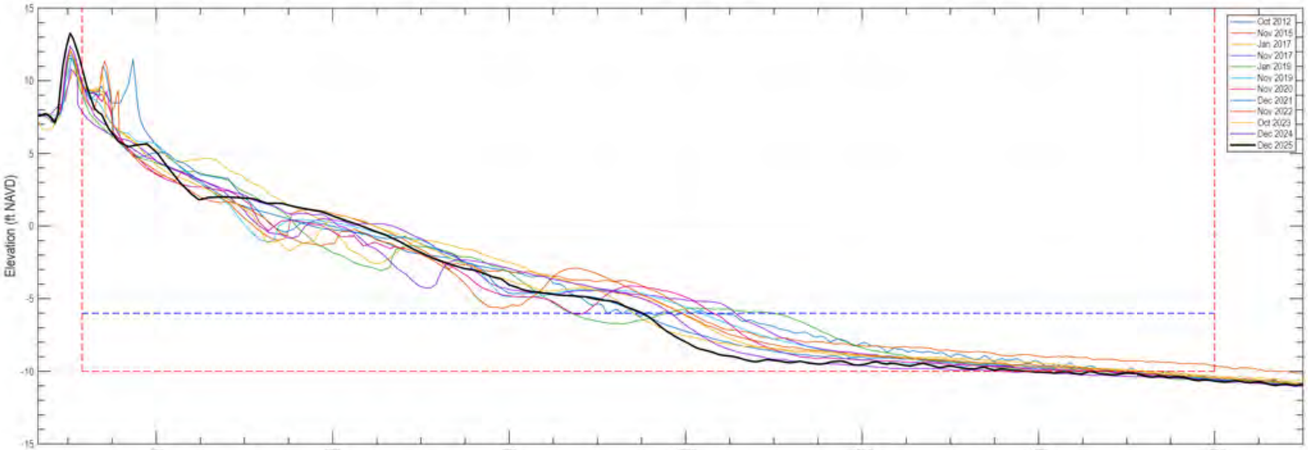




Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	139.1	130.2	269.3
Nov 2015	140.6	136.6	277.2
Jan 2017	151.3	122.0	273.3
Nov 2017	139.2	125.0	264.2
Jan 2019	126.8	129.3	256.2
Nov 2019	136.7	121.8	258.5
Nov 2020	119.8	119.7	239.5
Dec 2021	134.9	118.4	253.3
Nov 2022	118.3	122.6	240.9
Oct 2023	131.0	116.8	247.8
Dec 2024	130.8	110.5	241.3
Dec 2025	128.2	109.6	237.8

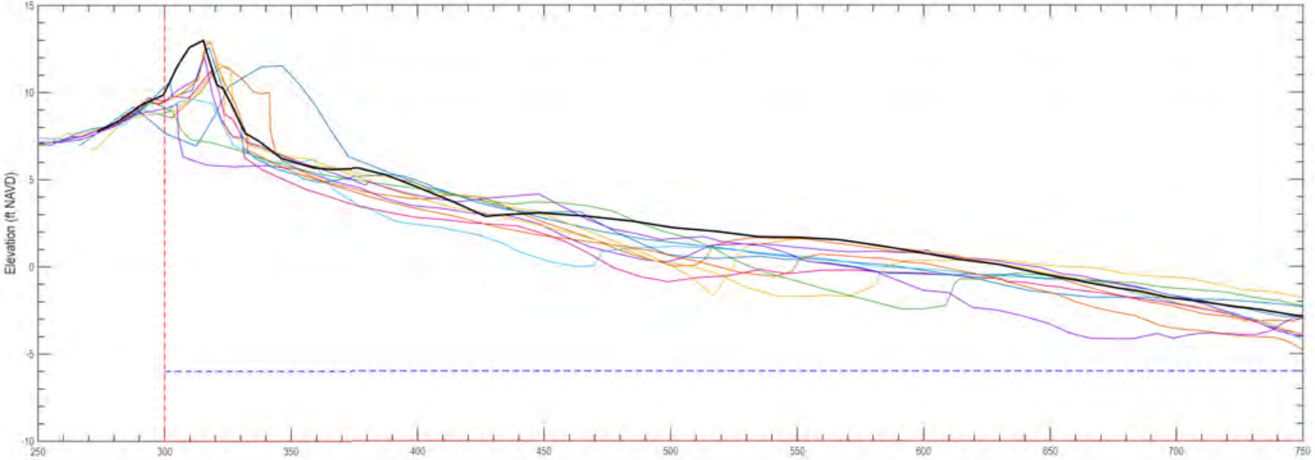
Kiawah Line 36 (OCRM 2730)

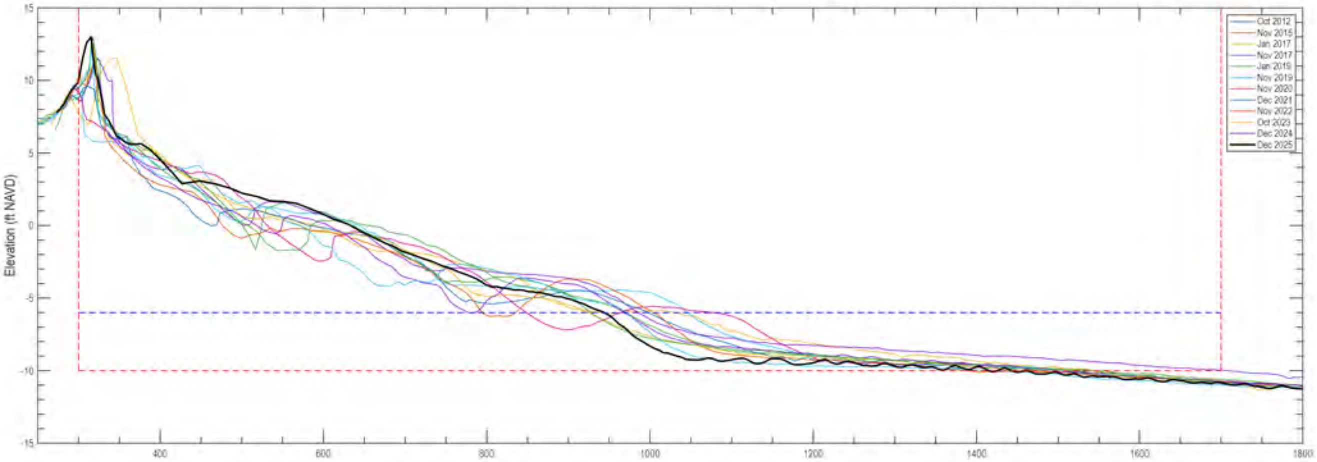




Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	142.4	133.4	275.8
Nov 2015	143.7	136.1	279.8
Jan 2017	152.4	122.6	275.0
Nov 2017	139.1	126.1	265.2
Jan 2019	129.0	130.1	259.1
Nov 2019	138.4	123.0	261.3
Nov 2020	131.0	120.0	251.0
Dec 2021	138.2	117.1	255.3
Nov 2022	130.0	122.8	252.8
Oct 2023	134.9	117.5	252.4
Dec 2024	138.1	110.5	248.5
Dec 2025	136.8	108.1	244.9

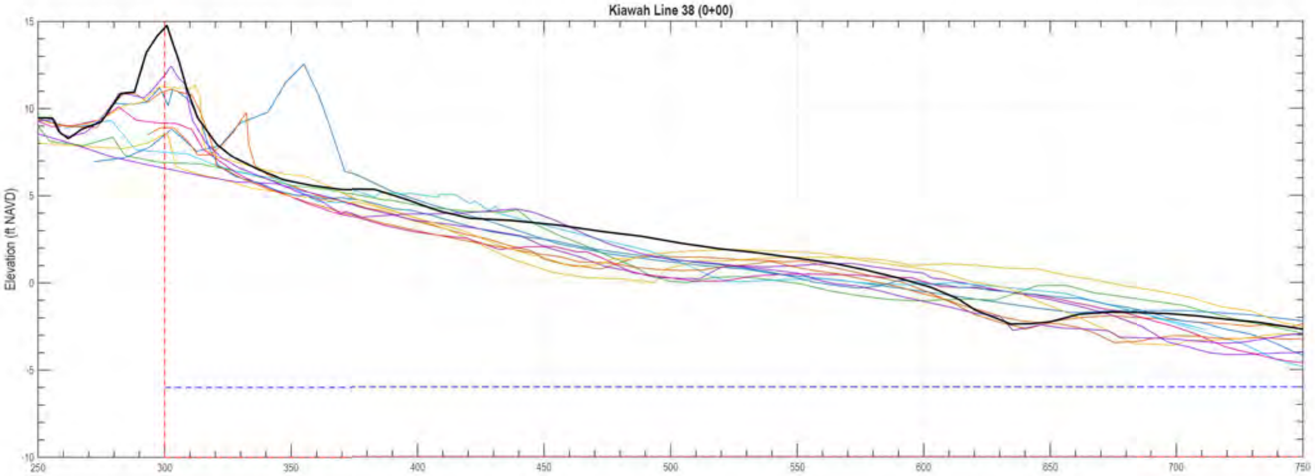
Kiawah Line 37

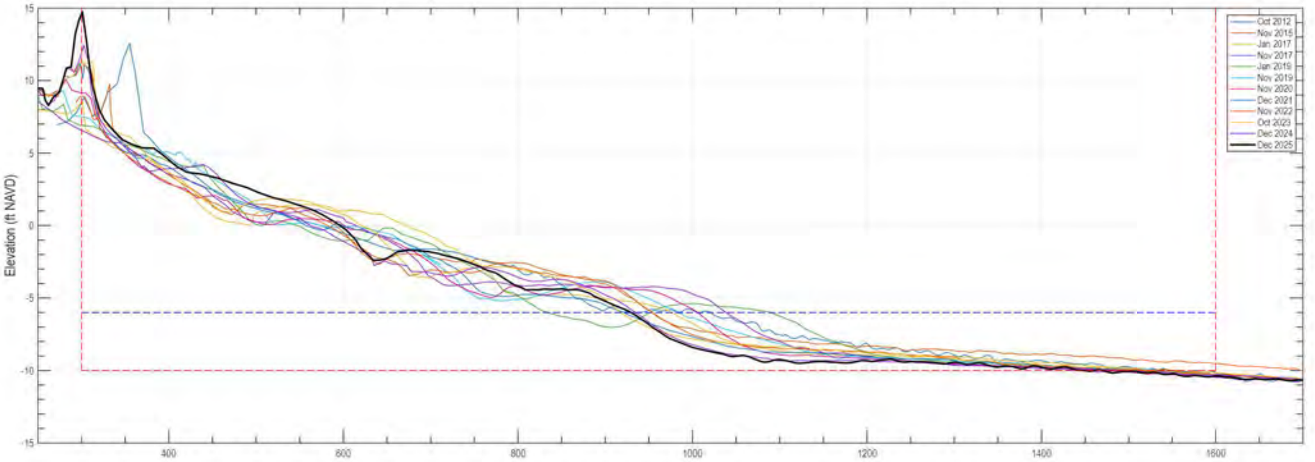




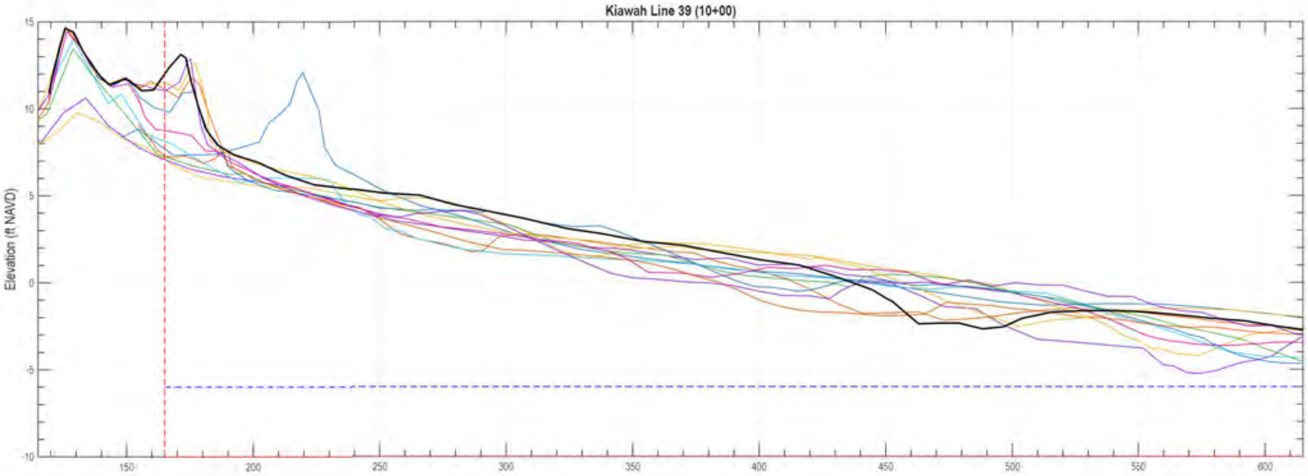
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	148.0	136.0	283.9
Nov 2015	151.3	137.5	288.7
Jan 2017	145.7	121.9	267.7
Nov 2017	141.3	128.1	269.4
Jan 2019	134.5	128.1	262.6
Nov 2019	128.3	122.1	250.4
Nov 2020	126.7	118.4	245.1
Dec 2021	137.5	117.0	254.5
Nov 2022	129.8	122.4	252.2
Oct 2023	142.1	118.5	260.6
Dec 2024	136.4	111.1	247.5
Dec 2025	149.6	110.0	259.6

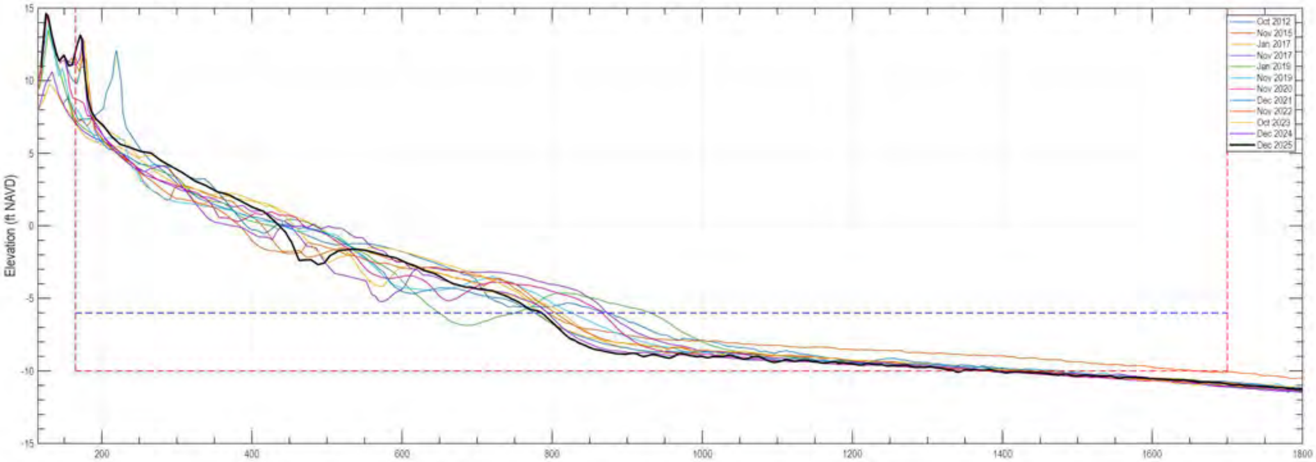
Kiawah Line 38 (0+00)





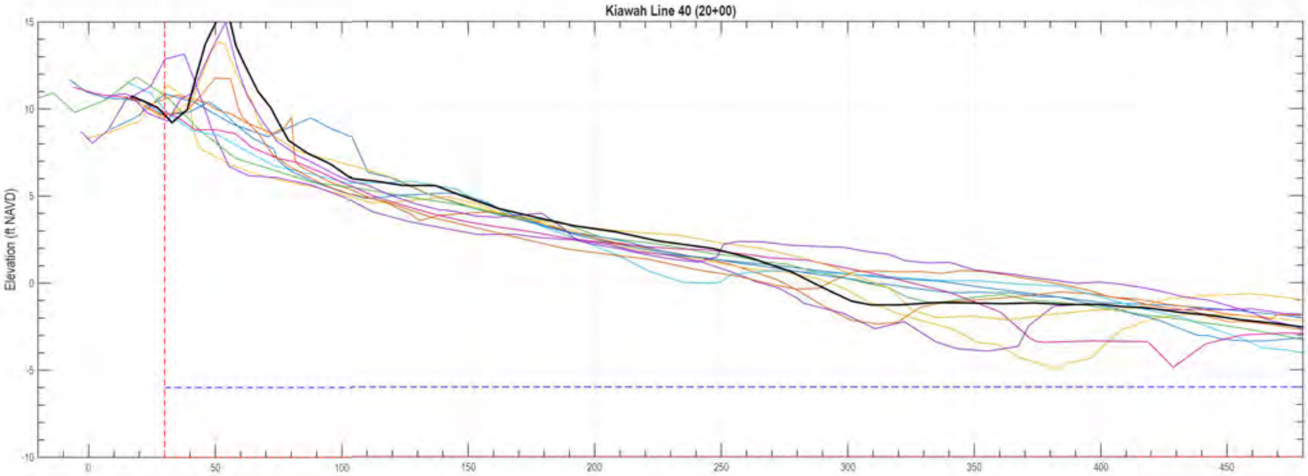
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	146.4	133.7	280.1
Nov 2015	138.9	134.4	273.3
Jan 2017	137.2	123.2	260.4
Nov 2017	135.9	124.8	260.7
Jan 2019	130.4	130.5	260.8
Nov 2019	136.3	123.3	259.7
Nov 2020	129.7	119.7	249.4
Dec 2021	130.7	117.3	248.0
Nov 2022	133.1	121.3	254.4
Oct 2023	139.7	119.4	259.1
Dec 2024	134.0	110.8	244.8
Dec 2025	142.9	110.0	252.8

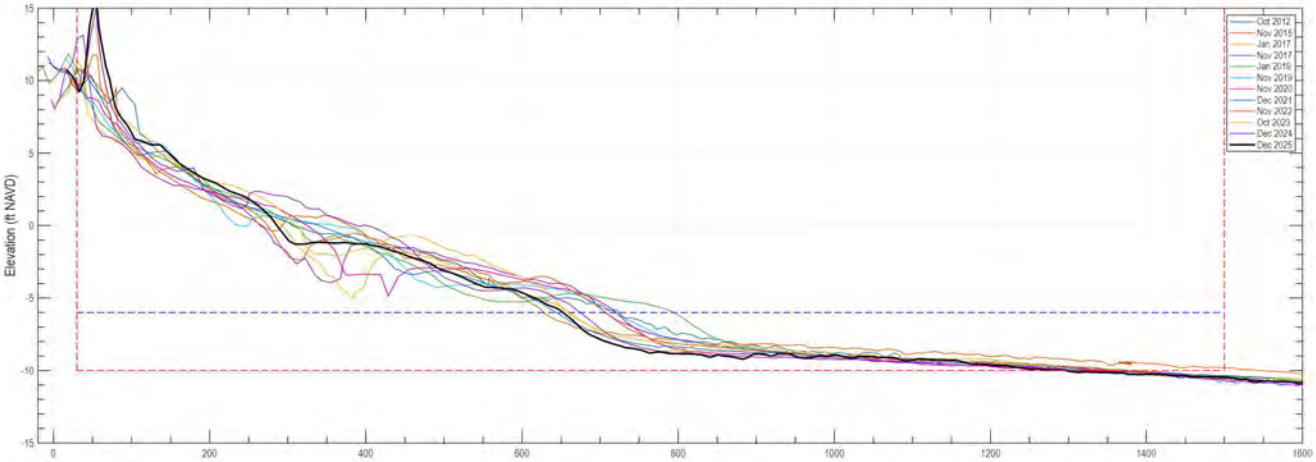




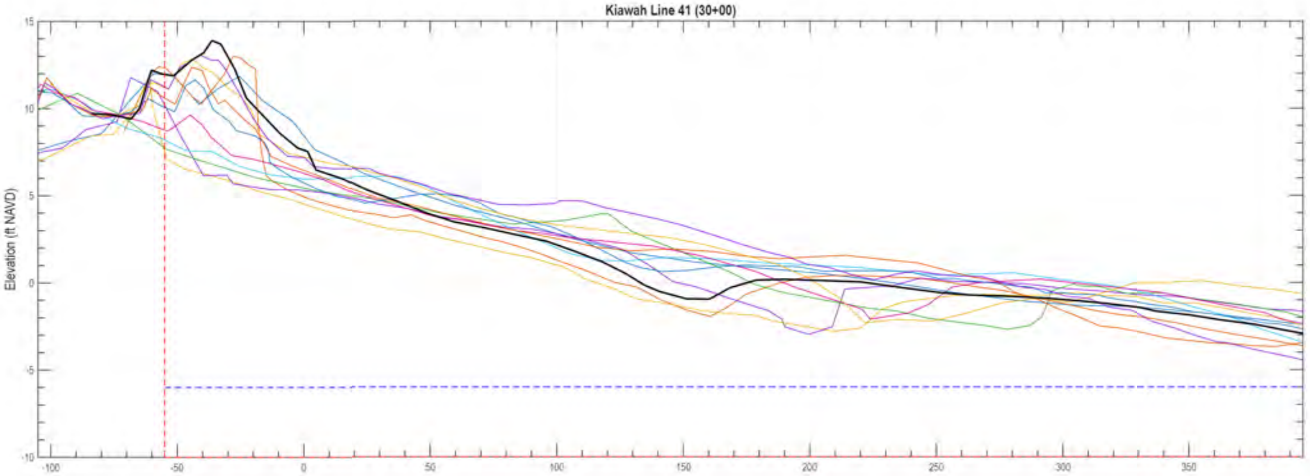
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	145.5	132.1	277.5
Nov 2015	130.1	140.4	270.5
Jan 2017	136.9	119.6	256.5
Nov 2017	133.9	124.6	258.4
Jan 2019	127.9	129.3	257.2
Nov 2019	128.9	121.8	250.7
Nov 2020	134.7	120.5	255.2
Dec 2021	131.5	117.9	249.3
Nov 2022	129.1	120.7	249.8
Oct 2023	146.5	119.4	265.9
Dec 2024	134.9	113.7	248.6
Dec 2025	139.9	112.0	251.9

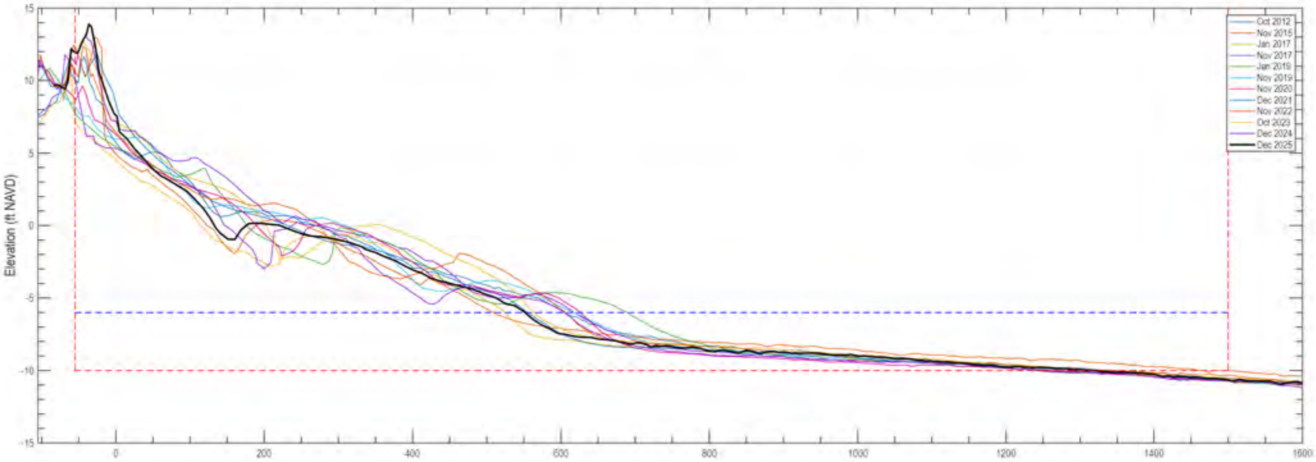
Kiawah Line 40 (20+00)



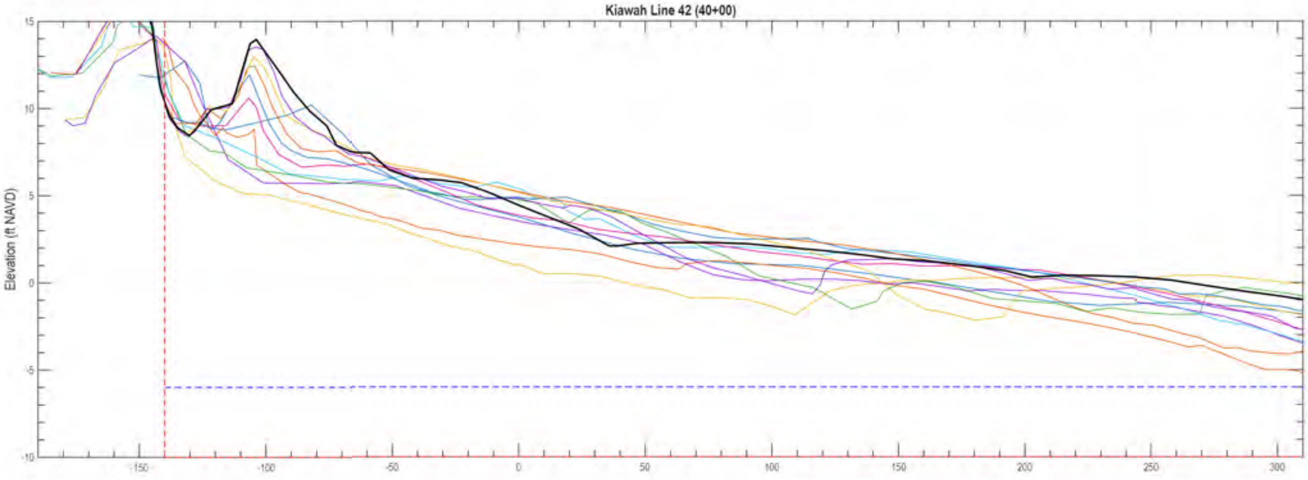


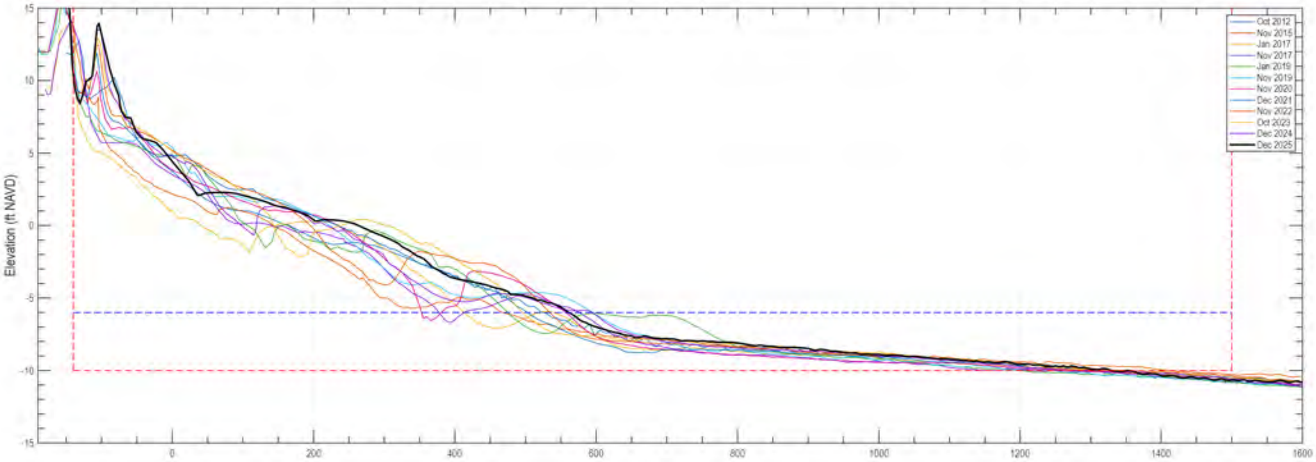
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	156.3	132.7	288.9
Nov 2015	144.3	135.2	279.5
Jan 2017	133.1	122.6	255.7
Nov 2017	140.3	125.8	266.1
Jan 2019	142.8	133.6	276.5
Nov 2019	145.4	128.4	273.9
Nov 2020	143.7	122.4	266.0
Dec 2021	142.9	121.1	264.0
Nov 2022	150.8	127.4	278.1
Oct 2023	161.8	125.4	287.2
Dec 2024	159.0	117.6	276.6
Dec 2025	151.4	116.9	268.2


Kiawah Line 41 (30+00)

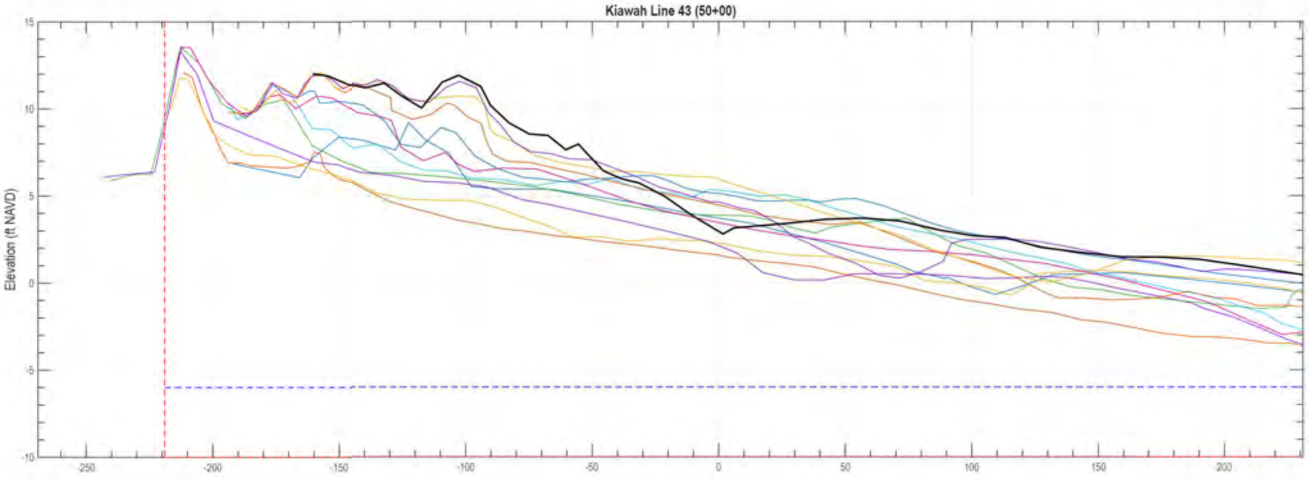


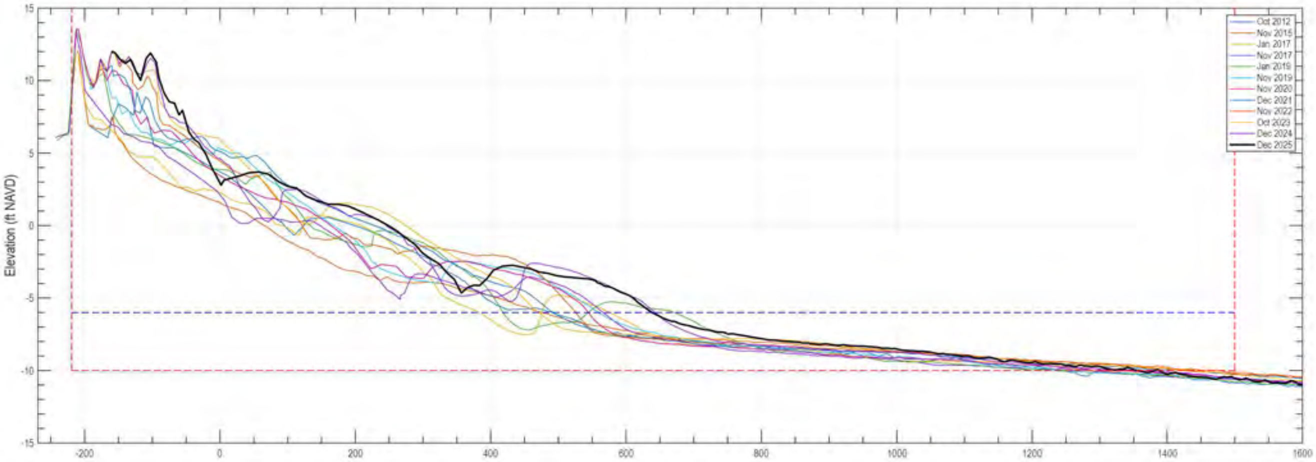
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	153.2	131.9	285.1
Nov 2015	127.5	137.5	264.9
Jan 2017	116.6	118.9	235.5
Nov 2017	138.0	125.1	263.2
Jan 2019	140.1	133.5	273.6
Nov 2019	146.9	127.9	274.8
Nov 2020	144.3	121.0	265.4
Dec 2021	145.9	122.1	268.0
Nov 2022	153.1	129.0	282.1
Oct 2023	161.2	128.4	289.6
Dec 2024	153.5	122.2	275.7
Dec 2025	140.1	124.1	264.3





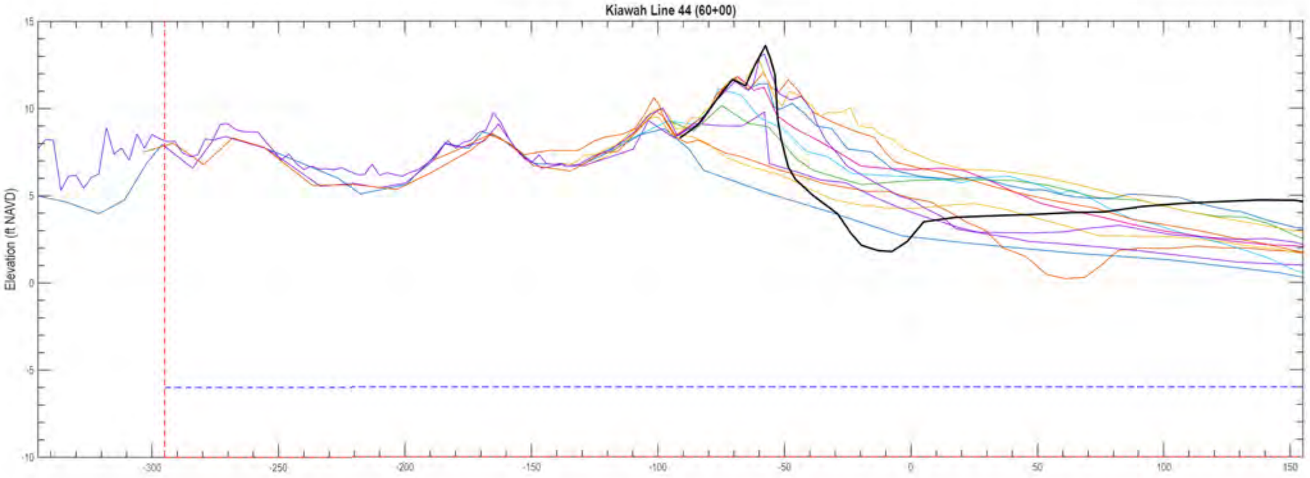
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	159.9	137.1	297.0
Nov 2015	122.2	140.2	262.4
Jan 2017	125.5	129.6	255.0
Nov 2017	139.8	129.8	269.6
Jan 2019	154.0	141.4	295.4
Nov 2019	160.3	135.8	296.1
Nov 2020	161.6	128.6	290.1
Dec 2021	171.7	130.4	302.1
Nov 2022	174.2	136.9	311.1
Oct 2023	178.9	138.4	317.3
Dec 2024	161.5	141.1	302.6
Dec 2025	177.7	143.4	321.1

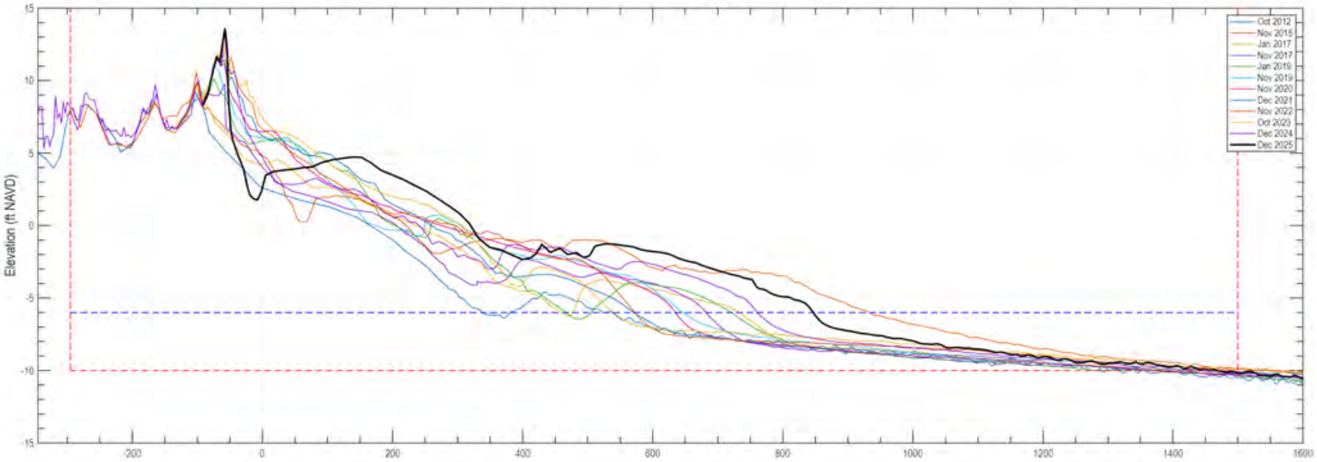

Kiawah Line 43 (50+00)



Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	179.0	147.2	326.2
Nov 2015	141.0	158.5	299.5
Jan 2017	163.4	146.6	310.0
Nov 2017	167.9	144.9	312.8
Jan 2019	193.7	151.9	345.6
Nov 2019	203.7	149.9	353.5
Nov 2020	200.6	146.1	346.7
Dec 2021	217.3	151.0	368.3
Nov 2022	216.0	154.6	370.5
Oct 2023	225.5	155.5	381.0
Dec 2024	226.2	159.8	386.0
Dec 2025	240.0	166.9	406.8

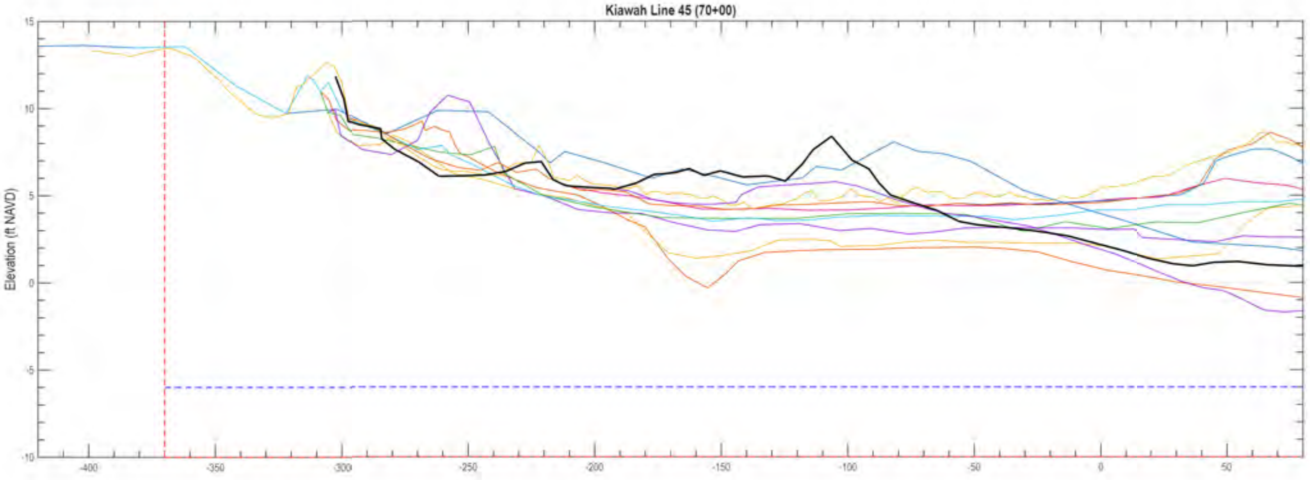
Kiawah Line 44 (60+00)

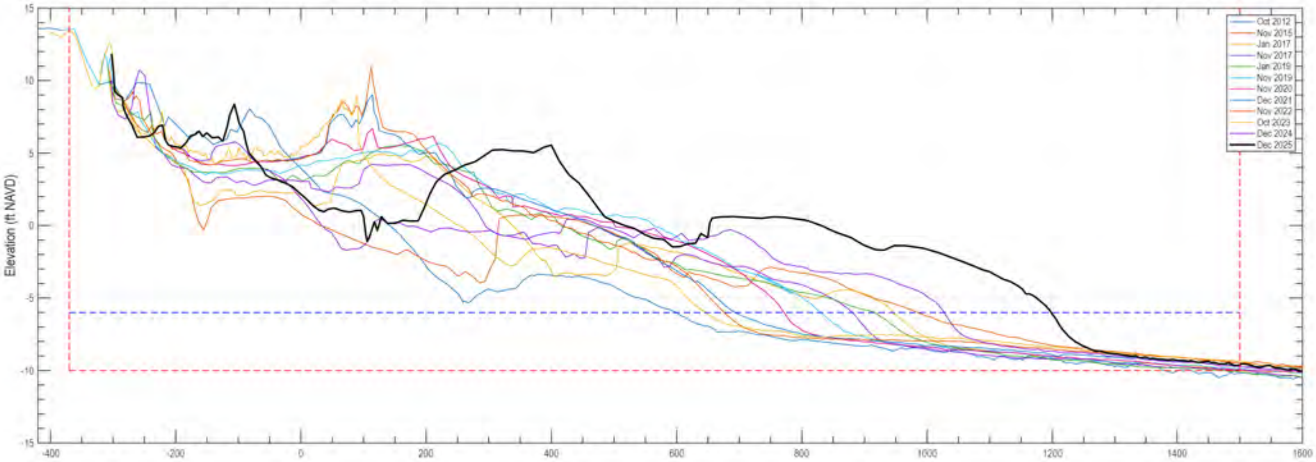




Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	205.0	166.2	371.2
Nov 2015	298.5	215.7	514.2
Jan 2017	249.9	179.6	429.6
Nov 2017	249.1	170.0	419.1
Jan 2019	267.1	173.9	441.0
Nov 2019	278.8	175.1	454.0
Nov 2020	303.3	169.7	473.0
Dec 2021	278.2	169.7	447.9
Nov 2022	284.7	176.6	461.2
Oct 2023	286.7	182.9	469.6
Dec 2024	291.5	188.6	480.1
Dec 2025	332.0	199.2	531.2

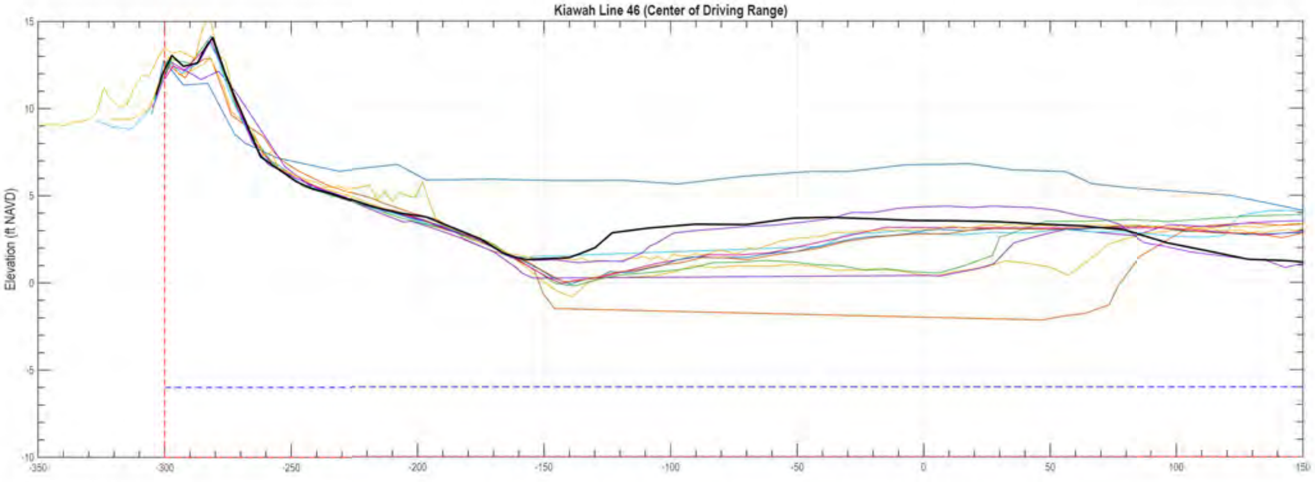
Kiawah Line 45 (70+00)

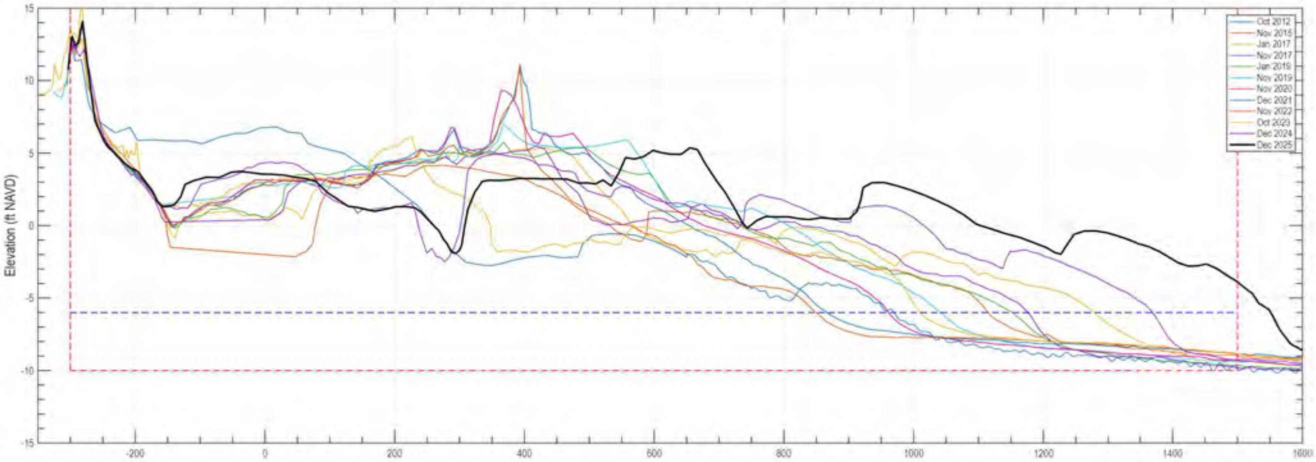




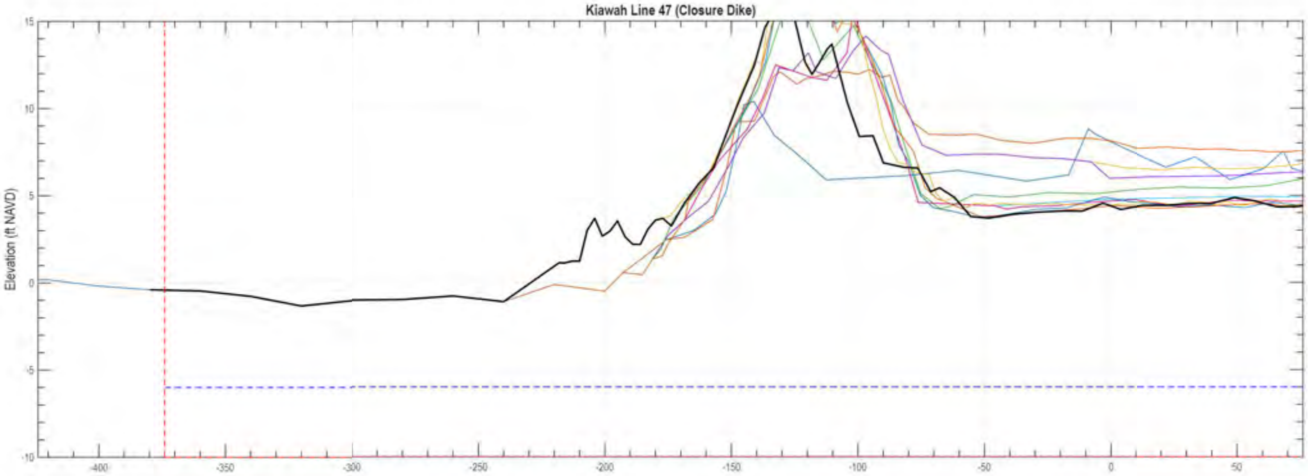
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	267.0	187.2	454.2
Nov 2015	289.1	234.9	524.0
Jan 2017	330.4	216.8	547.2
Nov 2017	340.5	207.3	547.7
Jan 2019	360.7	212.2	573.0
Nov 2019	386.1	207.8	593.8
Nov 2020	381.5	203.0	584.5
Dec 2021	367.4	205.2	572.6
Nov 2022	364.1	208.1	572.2
Oct 2023	317.8	212.3	530.1
Dec 2024	349.0	228.4	577.4
Dec 2025	455.7	245.2	700.9

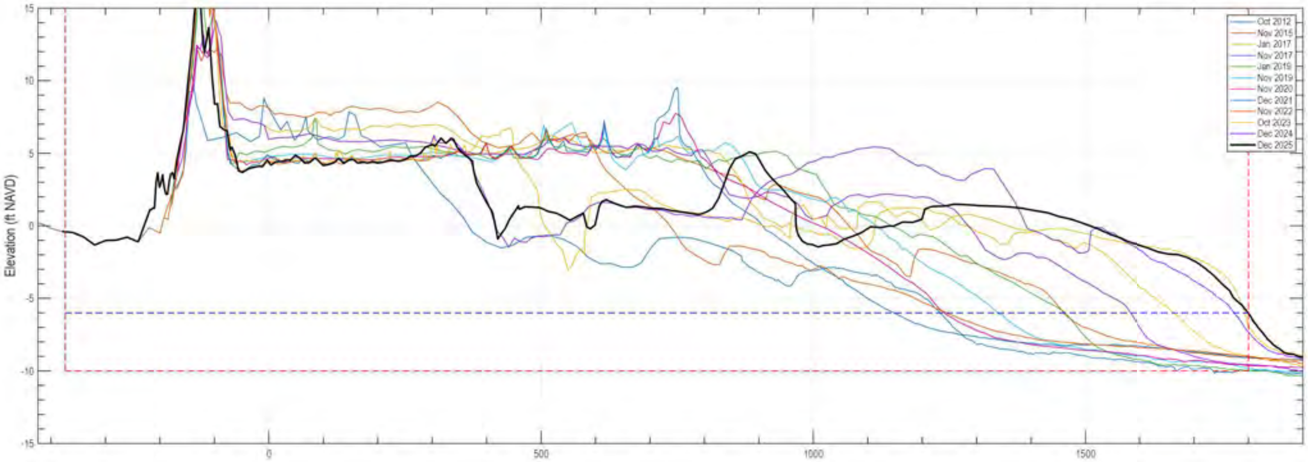
Kiawah Line 46 (Center of Driving Range)



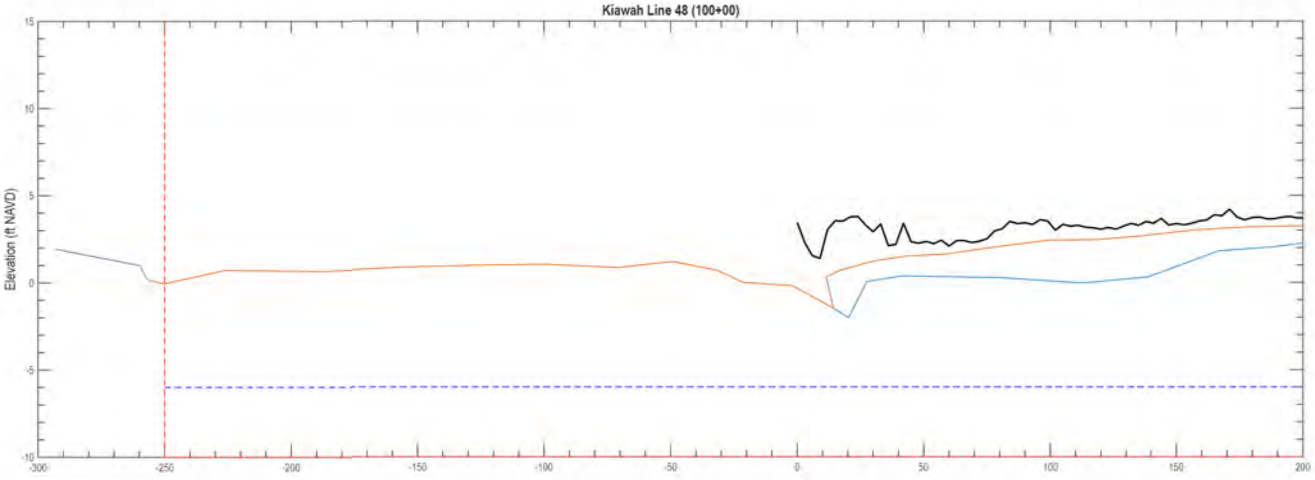


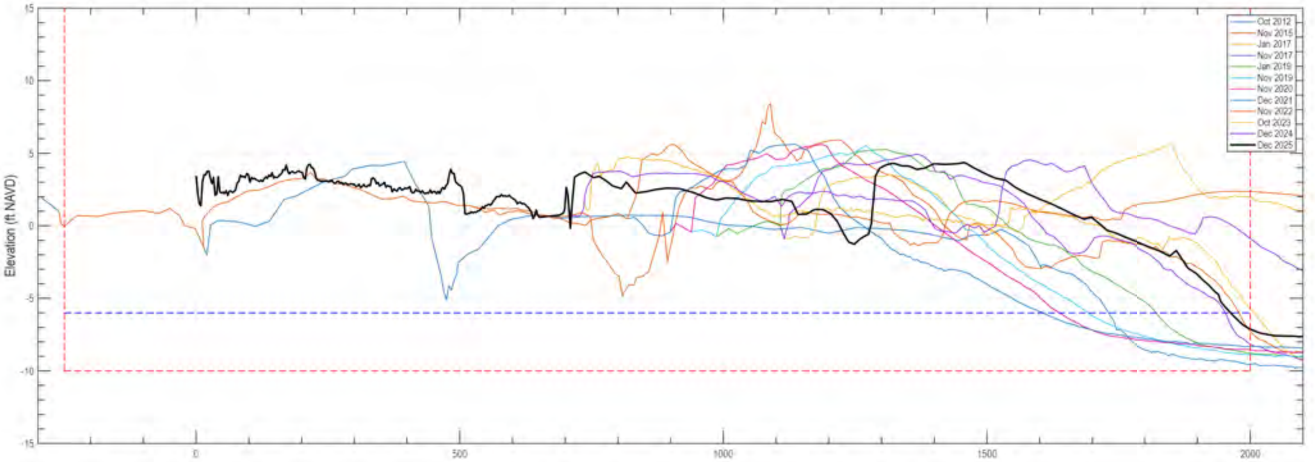
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	324.7	213.0	537.7
Nov 2015	345.2	235.8	581.0
Jan 2017	404.2	247.7	651.8
Nov 2017	401.4	232.0	633.4
Jan 2019	415.6	231.4	646.9
Nov 2019	427.0	224.5	651.6
Nov 2020	402.7	218.8	621.5
Dec 2021	380.3	220.8	601.1
Nov 2022	340.9	219.8	560.7
Oct 2023	342.1	230.8	572.9
Dec 2024	454.7	254.8	709.5
Dec 2025	517.2	266.7	783.8



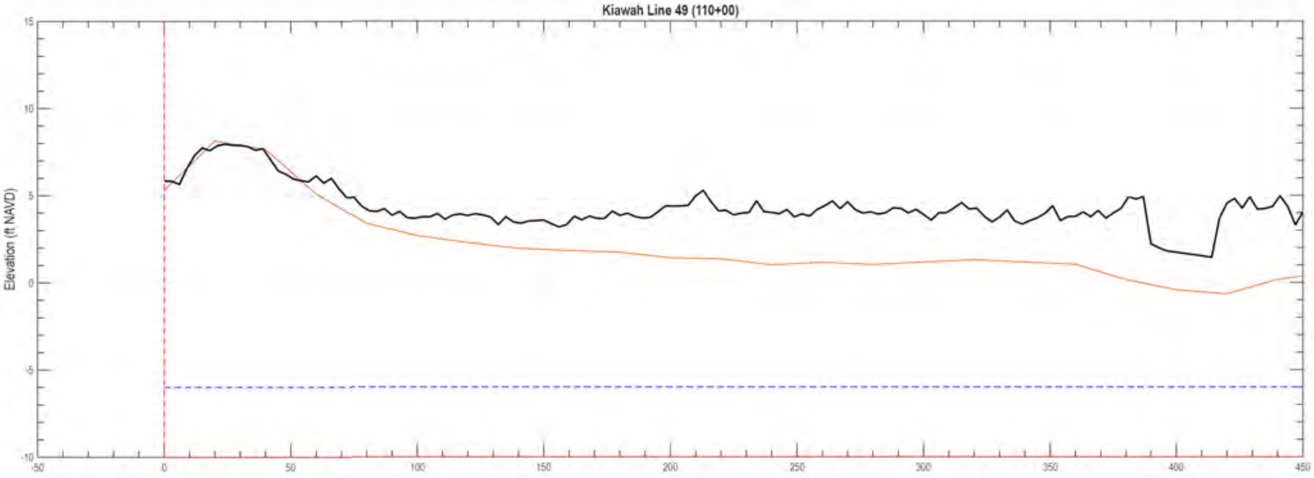


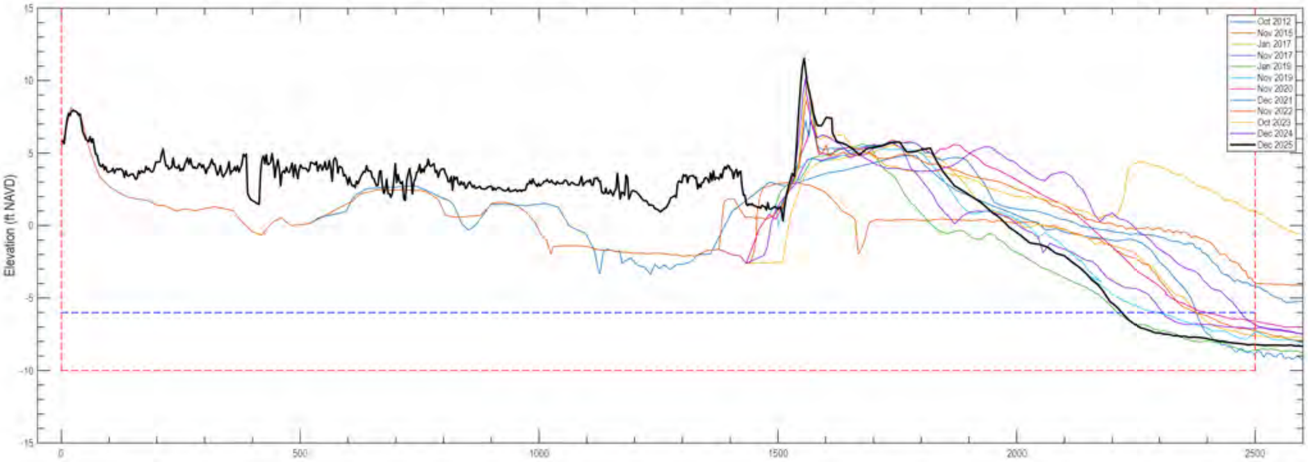
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	388.4	259.5	647.9
Nov 2015	638.9	295.3	934.2
Jan 2017	669.8	312.5	982.2
Nov 2017	652.3	300.8	953.1
Jan 2019	617.9	283.8	901.7
Nov 2019	580.8	277.2	858.0
Nov 2020	545.7	270.6	816.2
Dec 2021	515.1	273.0	788.1
Nov 2022	470.2	280.9	751.1
Oct 2023	632.1	322.0	954.0
Dec 2024	655.6	321.4	977.0
Dec 2025	616.4	322.1	938.5



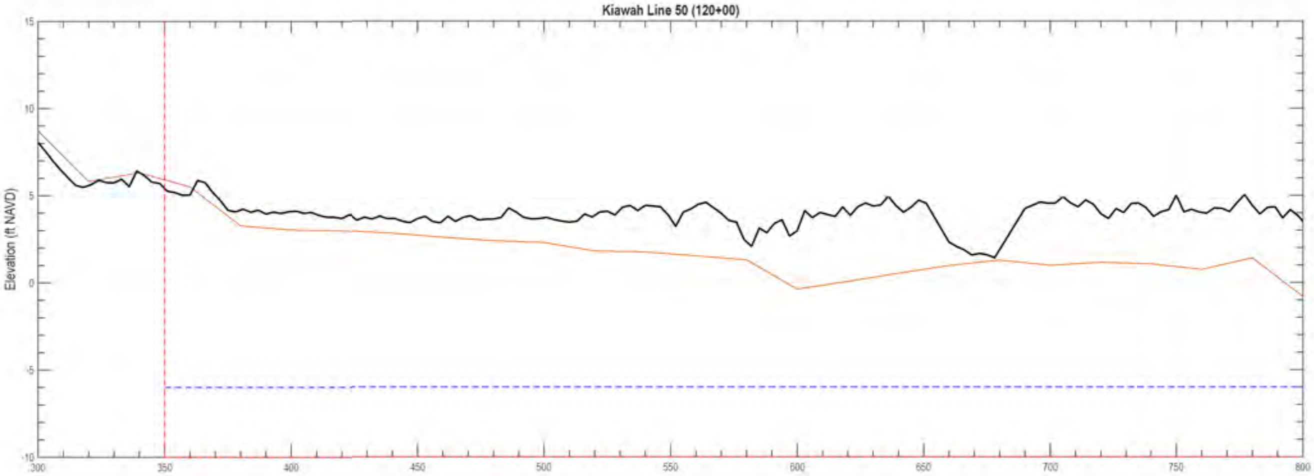


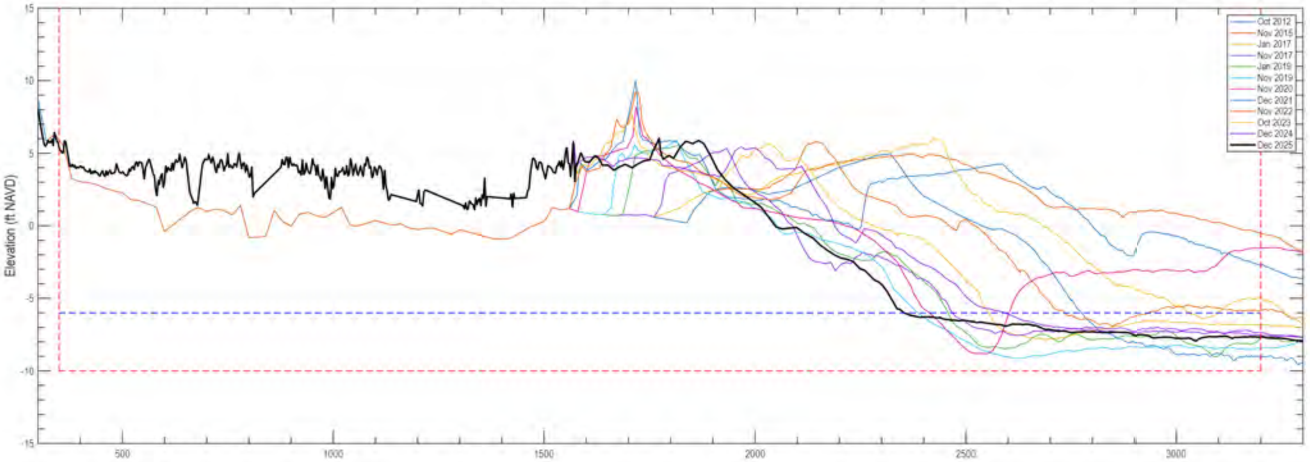
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	452.0	306.4	758.3
Nov 2015	570.8	332.8	903.6
Jan 2017	565.1	333.3	898.4
Nov 2017	573.3	331.0	904.3
Jan 2019	542.4	320.6	862.9
Nov 2019	518.8	312.0	830.8
Nov 2020	510.6	309.2	819.7
Dec 2021	476.9	310.0	786.8
Nov 2022	622.3	333.3	955.6
Oct 2023	1155.8	333.3	1489.2
Dec 2024	1141.8	333.3	1475.1
Dec 2025	1103.3	332.5	1435.8





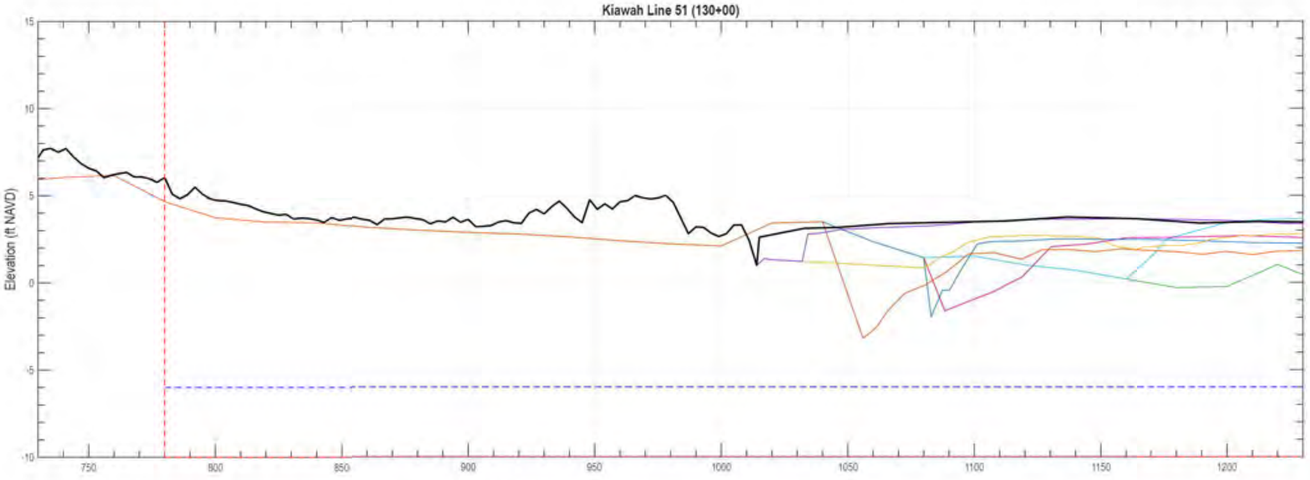
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	619.1	361.0	980.1
Nov 2015	554.0	367.1	921.1
Jan 2017	594.2	365.5	959.7
Nov 2017	568.2	364.4	932.6
Jan 2019	534.6	353.0	887.6
Nov 2019	575.3	362.8	938.1
Nov 2020	634.4	369.1	1003.5
Dec 2021	664.0	370.4	1034.3
Nov 2022	673.8	370.4	1044.1
Oct 2023	859.8	370.4	1230.1
Dec 2024	817.1	369.8	1186.9
Dec 2025	736.7	353.9	1090.7

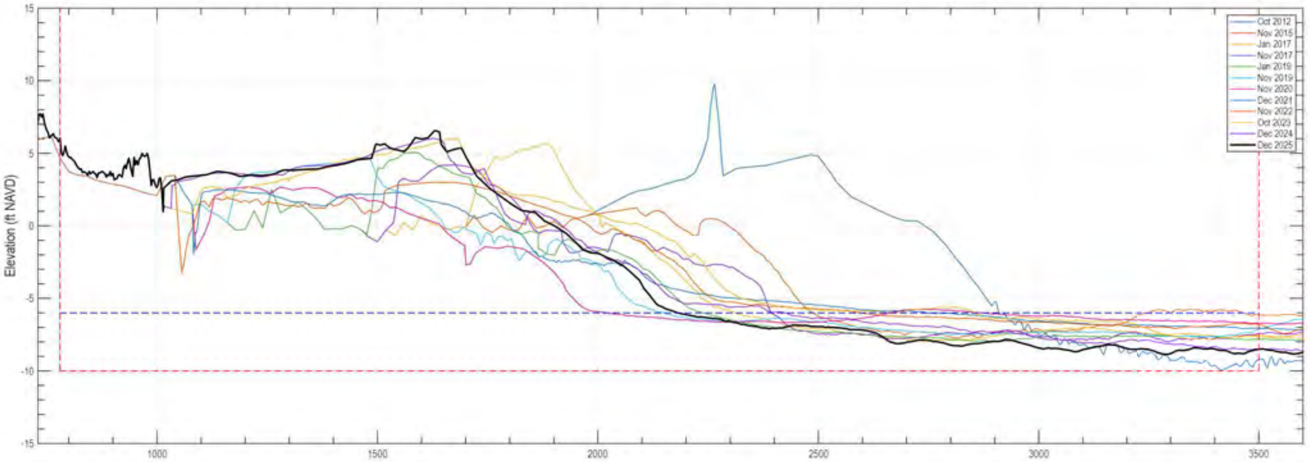




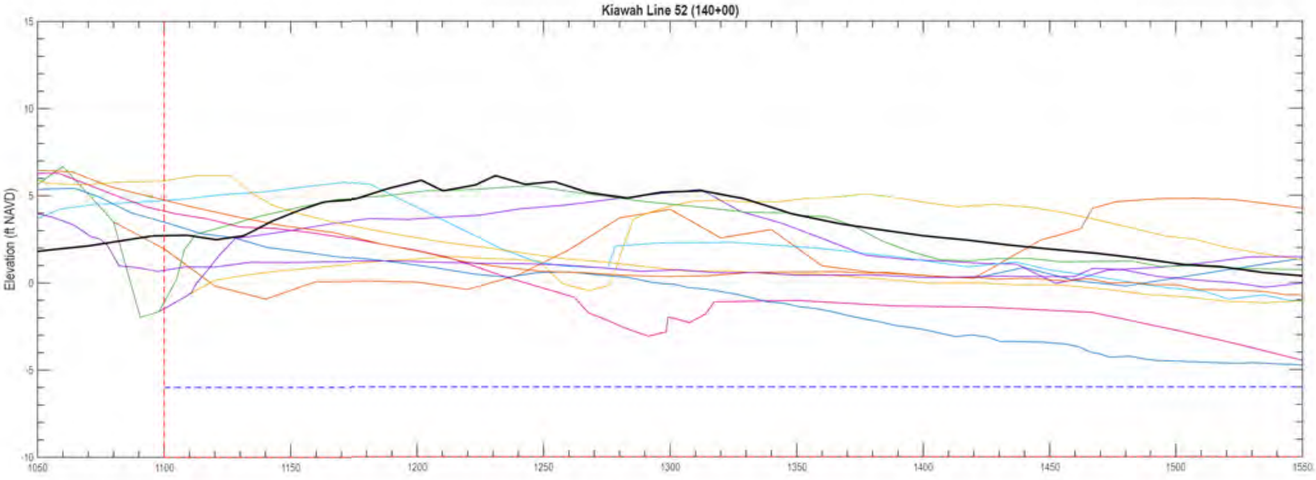
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	626.8	385.6	1012.4
Nov 2015	607.0	418.8	1025.9
Jan 2017	559.7	397.4	957.2
Nov 2017	505.6	390.9	896.5
Jan 2019	520.5	370.7	891.2
Nov 2019	507.9	352.0	859.9
Nov 2020	601.1	410.0	1011.1
Dec 2021	785.7	422.2	1207.9
Nov 2022	845.6	422.2	1267.9
Oct 2023	860.2	421.7	1282.0
Dec 2024	699.8	396.3	1096.0
Dec 2025	638.2	386.0	1024.2

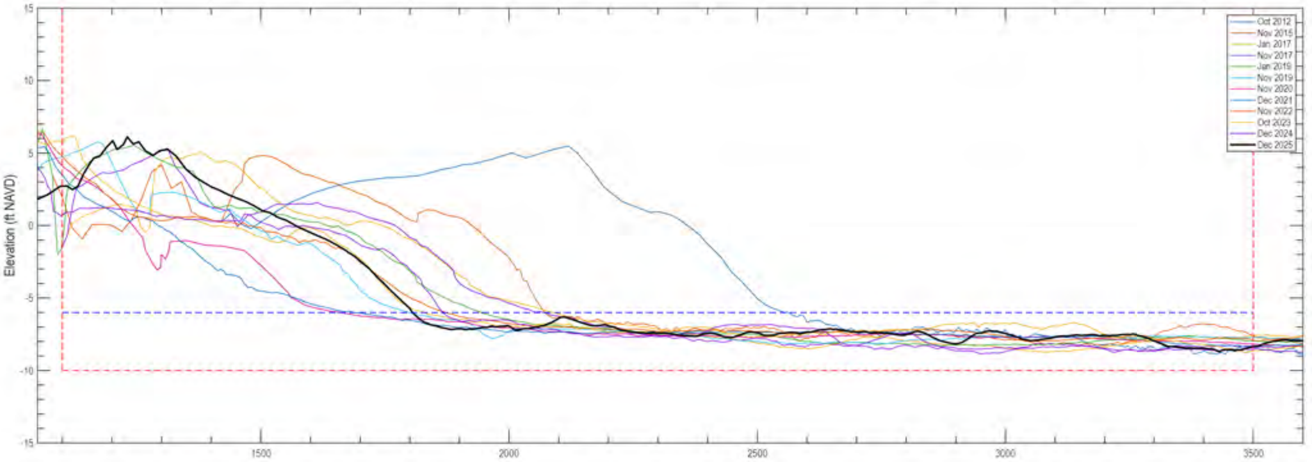
Kiawah Line 51 (130+00)





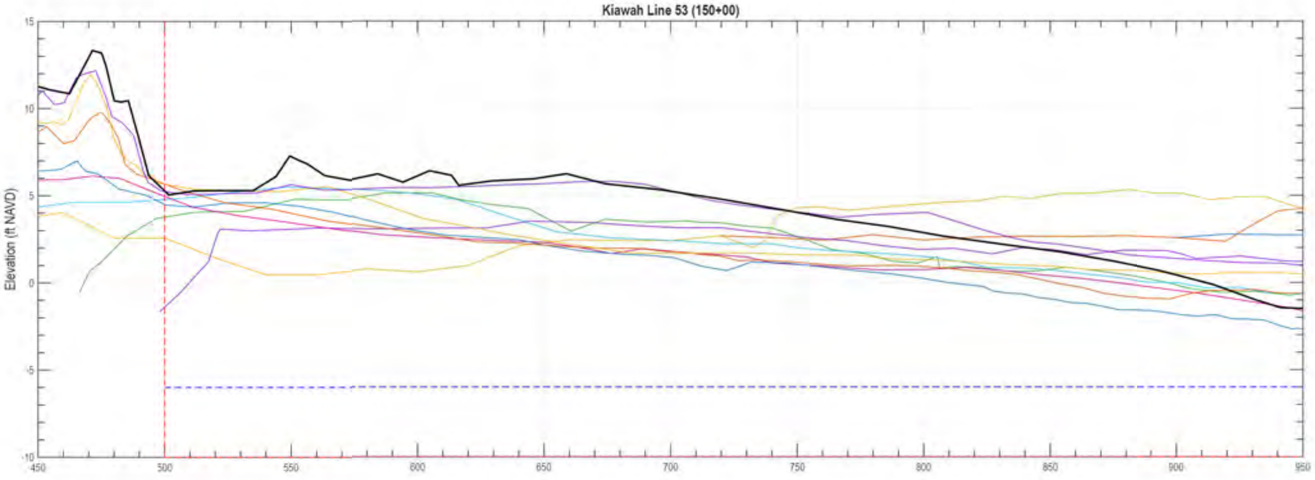
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	580.6	348.5	929.1
Nov 2015	407.7	371.7	779.4
Jan 2017	390.1	343.8	733.9
Nov 2017	395.0	339.8	734.8
Jan 2019	365.2	333.5	698.8
Nov 2019	356.2	347.4	703.6
Nov 2020	307.2	382.4	689.6
Dec 2021	367.5	384.9	752.4
Nov 2022	402.7	381.6	784.3
Oct 2023	484.7	380.3	865.0
Dec 2024	443.3	345.7	789.0
Dec 2025	438.4	314.9	753.3

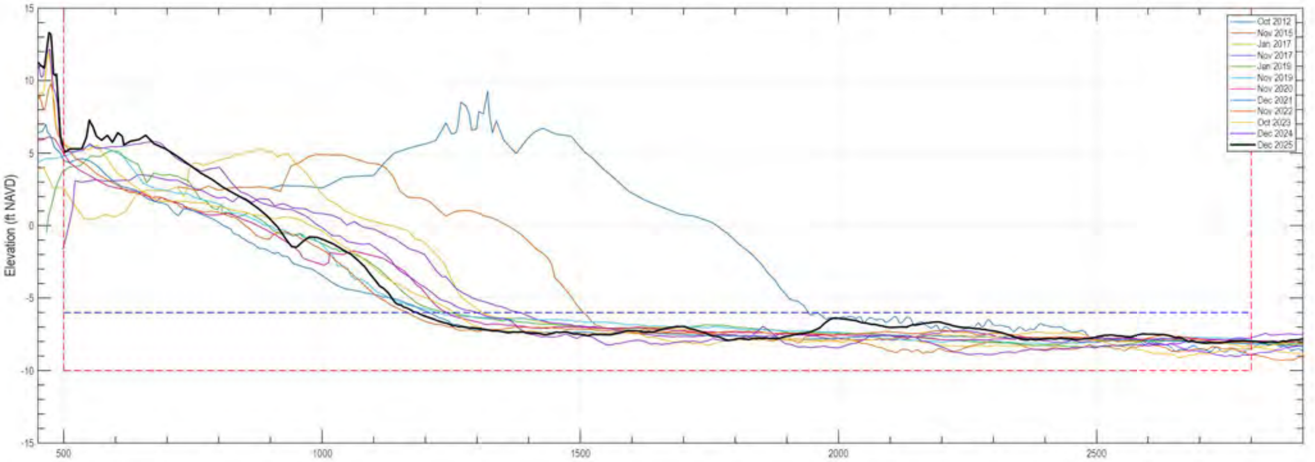




Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	411.2	296.9	708.2
Nov 2015	258.7	282.6	541.3
Jan 2017	222.0	258.5	480.5
Nov 2017	225.2	247.5	472.6
Jan 2019	206.9	258.6	465.6
Nov 2019	158.4	256.2	414.7
Nov 2020	92.9	256.8	349.6
Dec 2021	84.6	260.0	344.6
Nov 2022	151.8	274.8	426.6
Oct 2023	156.5	277.7	434.2
Dec 2024	161.2	248.0	409.1
Dec 2025	193.3	262.9	456.2

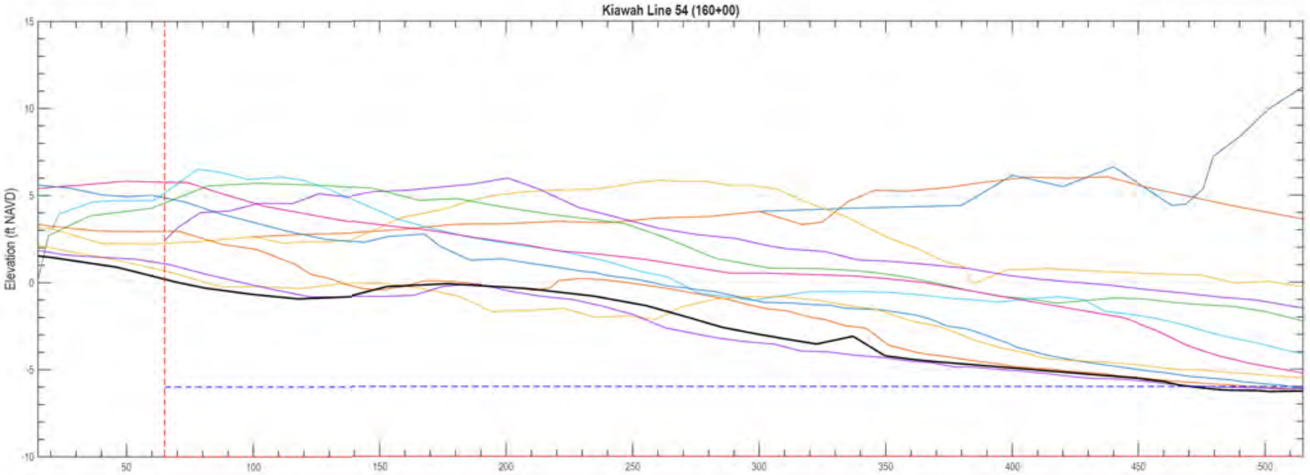
Kiawah Line 53 (150+00)

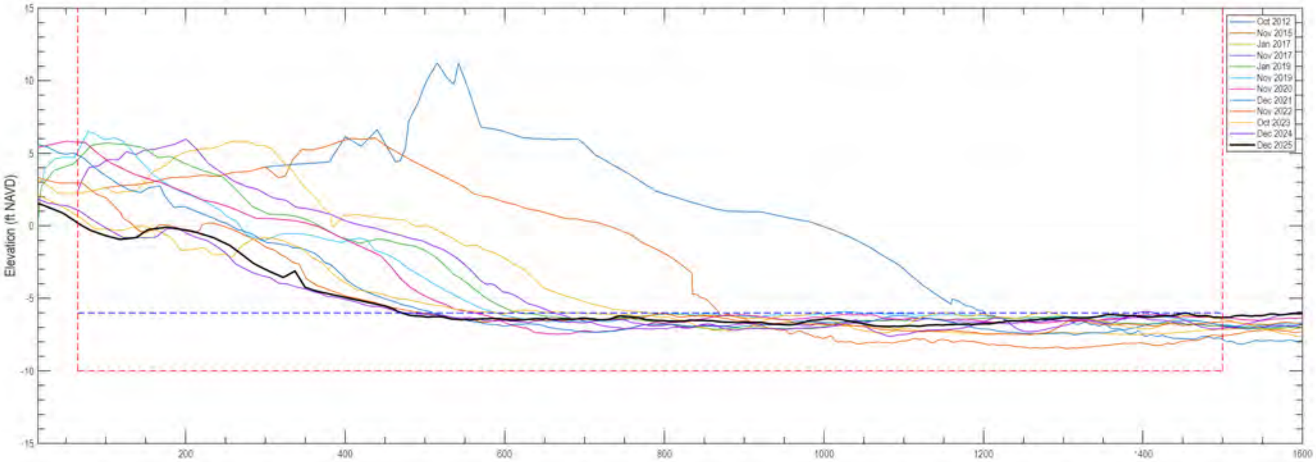




Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	463.5	298.4	761.9
Nov 2015	286.4	242.8	529.2
Jan 2017	224.1	248.8	472.9
Nov 2017	203.8	252.0	455.8
Jan 2019	173.5	255.6	429.1
Nov 2019	164.7	261.9	426.6
Nov 2020	157.8	256.4	414.2
Dec 2021	133.9	245.6	379.5
Nov 2022	147.4	254.4	401.8
Oct 2023	174.2	237.6	411.7
Dec 2024	211.5	229.5	441.0
Dec 2025	190.6	259.4	450.0

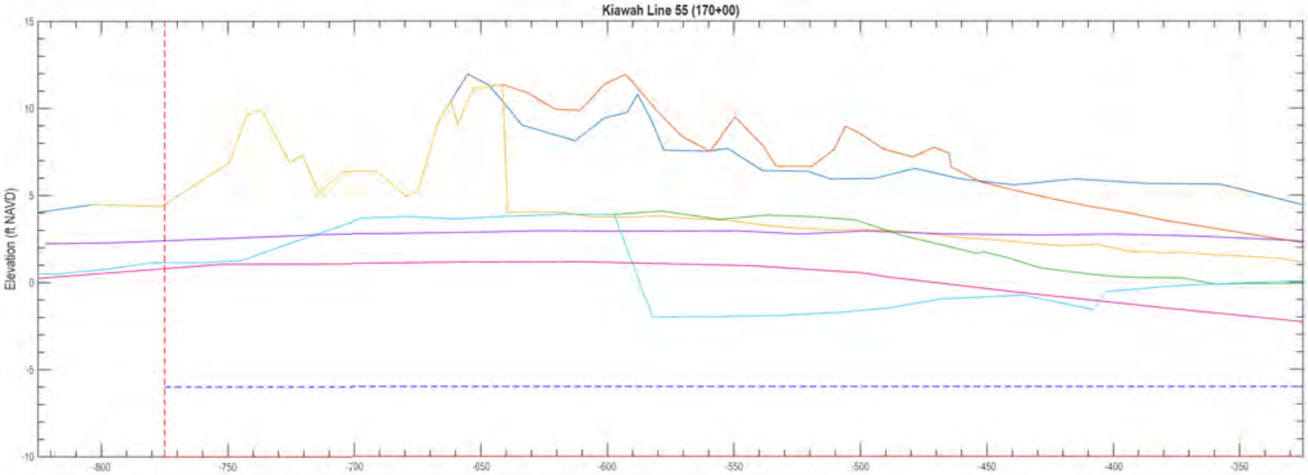
Kiawah Line 54 (160+00)

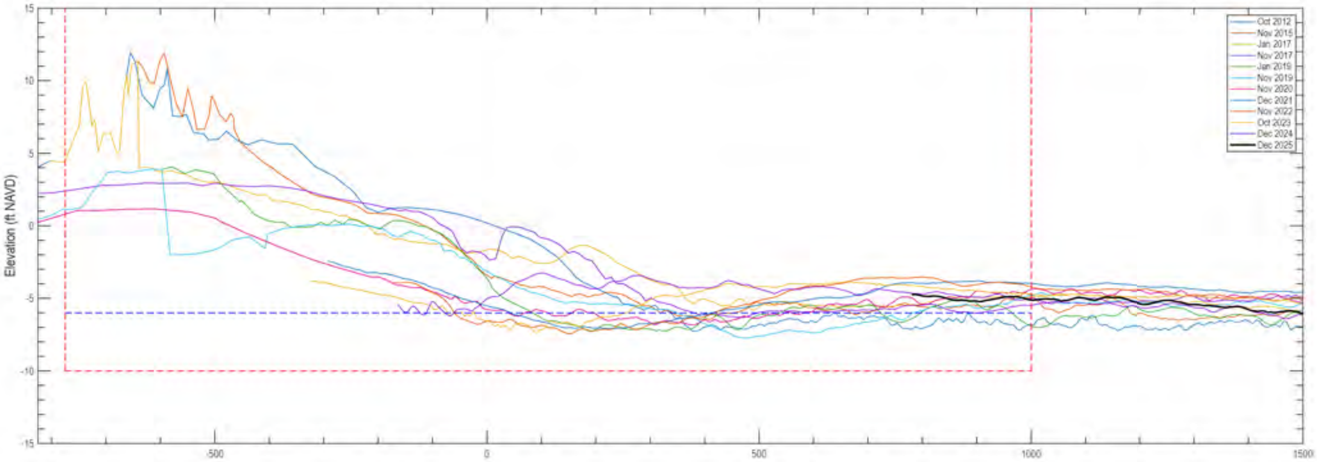




Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	373.4	201.2	574.6
Nov 2015	245.4	169.3	414.7
Jan 2017	170.8	186.3	357.1
Nov 2017	151.3	191.2	342.5
Jan 2019	138.1	192.5	330.6
Nov 2019	115.8	203.6	319.4
Nov 2020	112.2	193.8	306.0
Dec 2021	85.9	181.0	266.9
Nov 2022	67.0	185.3	252.3
Oct 2023	65.4	197.9	263.2
Dec 2024	50.8	183.9	234.6
Dec 2025	53.8	193.9	247.7

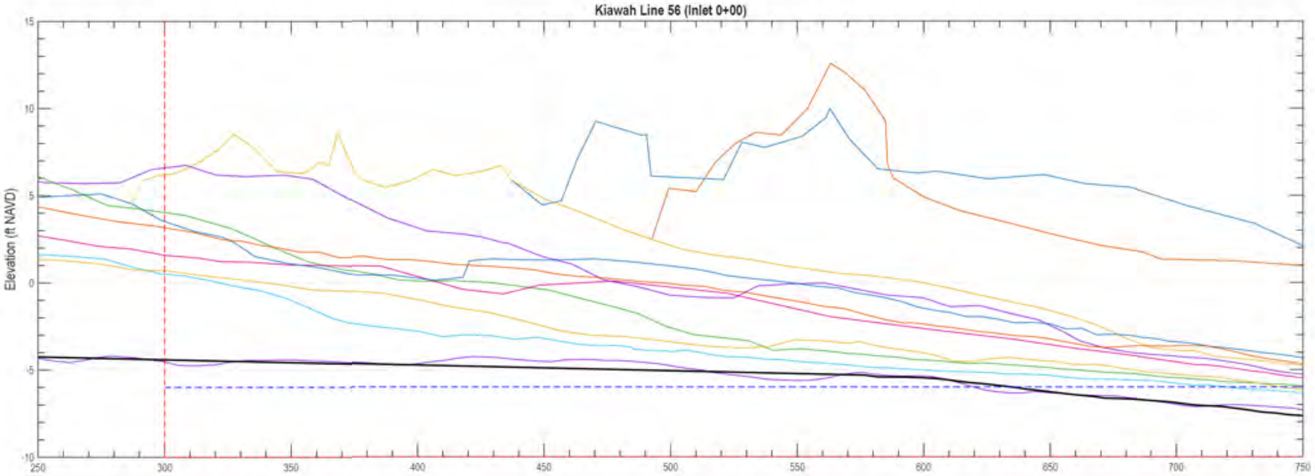
Kiawah Line 55 (170+00)

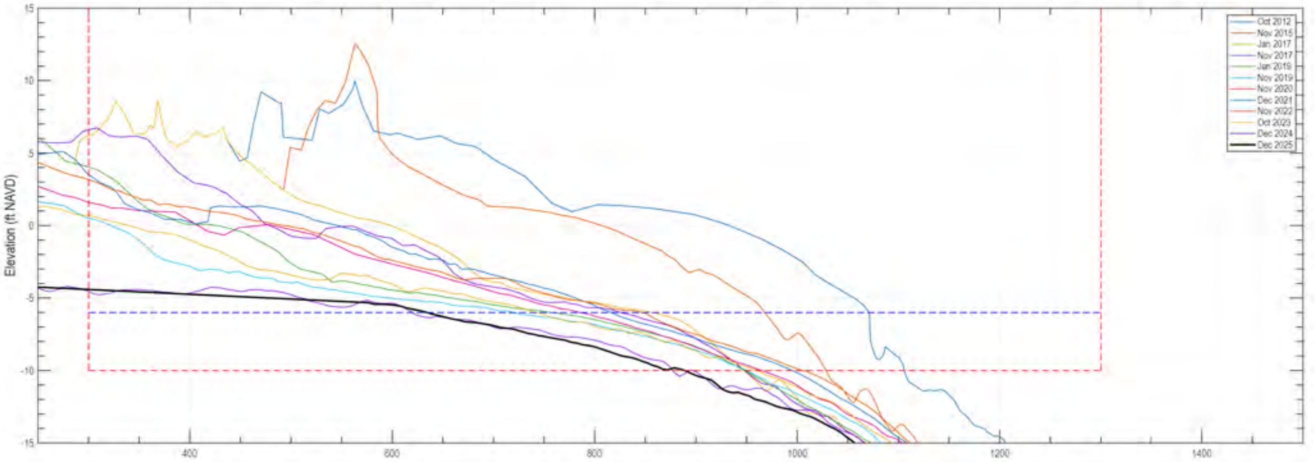




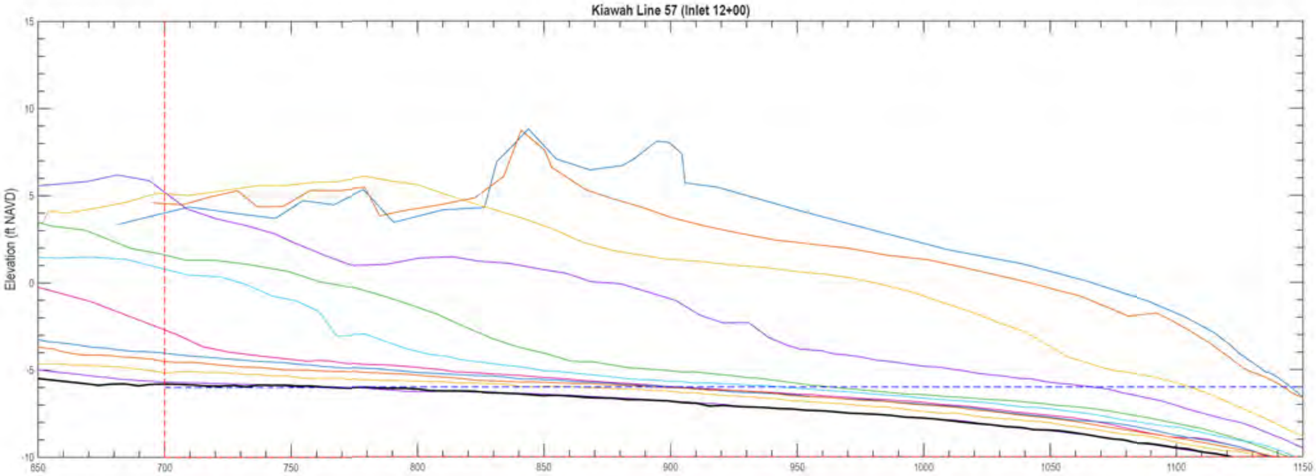
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	341.9	246.6	588.4
Nov 2015	317.0	262.0	579.0
Jan 2017	297.6	263.0	560.6
Nov 2017	275.0	262.2	537.3
Jan 2019	215.3	248.2	463.4
Nov 2019	189.1	247.5	436.5
Nov 2020	143.1	256.5	399.6
Dec 2021	117.3	253.8	371.1
Nov 2022	91.5	248.8	340.4
Oct 2023	92.9	256.0	348.9
Dec 2024	76.2	262.9	339.0
Dec 2025	81.1	263.0	344.0

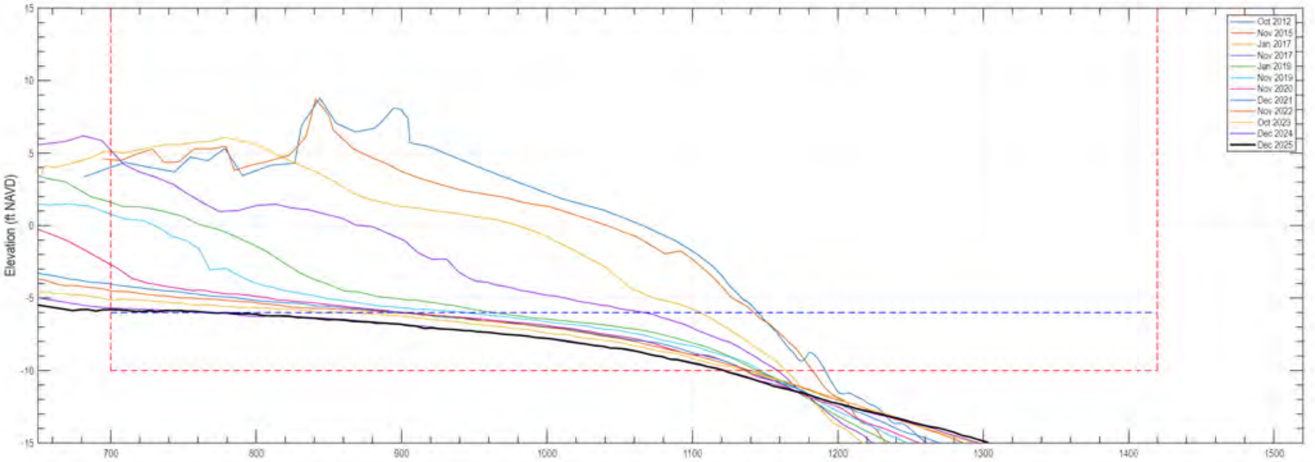
Kiawah Line 56 (Inlet 0+00)





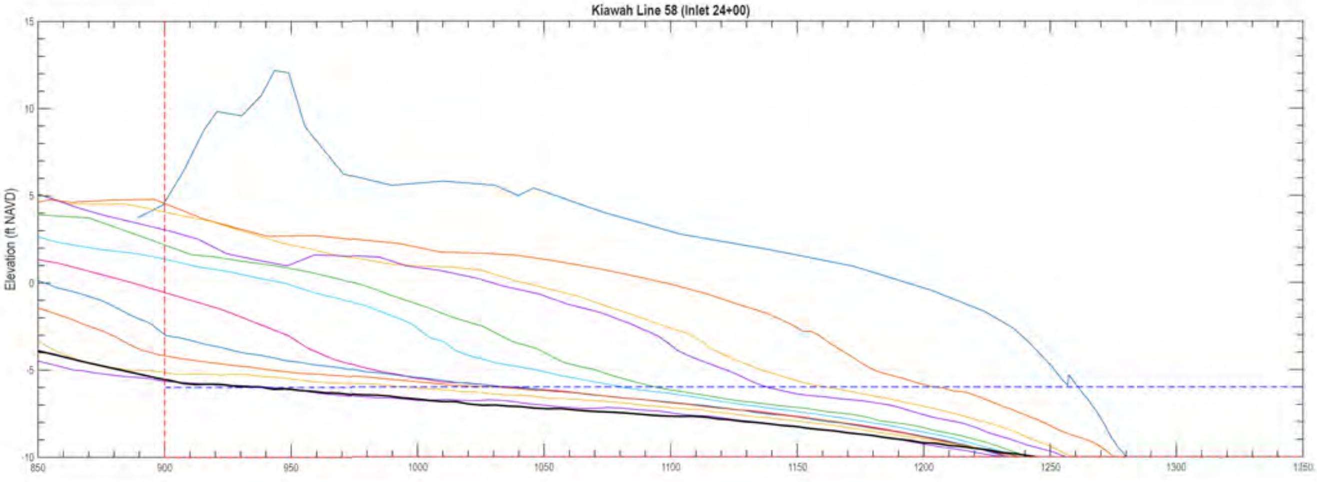
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	269.9	115.7	385.7
Nov 2015	220.9	103.8	324.7
Jan 2017	133.7	90.6	224.3
Nov 2017	106.4	88.9	195.3
Jan 2019	61.7	85.1	146.7
Nov 2019	35.7	82.8	118.5
Nov 2020	75.7	86.1	161.8
Dec 2021	94.6	90.1	184.7
Nov 2022	88.1	92.2	180.3
Oct 2023	49.7	83.3	132.9
Dec 2024	13.7	71.1	84.7
Dec 2025	12.5	69.1	81.6

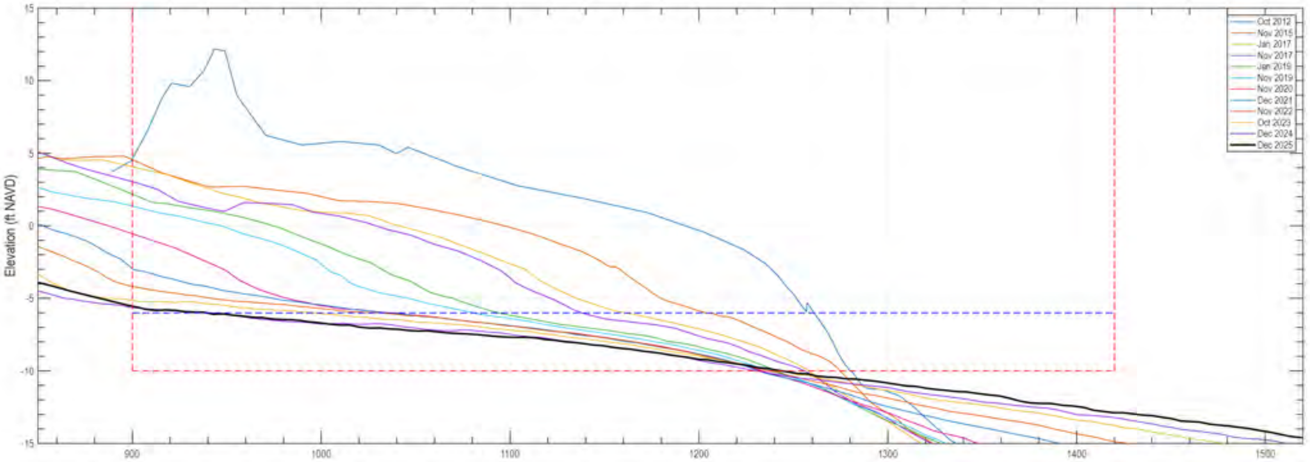




Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	149.6	69.0	218.6
Nov 2015	136.6	68.8	205.4
Jan 2017	110.6	64.8	175.3
Nov 2017	67.1	62.2	129.3
Jan 2019	33.1	56.6	89.7
Nov 2019	21.3	55.2	76.6
Nov 2020	8.6	52.2	60.9
Dec 2021	6.7	51.9	58.6
Nov 2022	5.0	51.3	56.3
Oct 2023	2.7	48.7	51.4
Dec 2024	0.4	43.3	43.8
Dec 2025	0.3	43.3	43.6

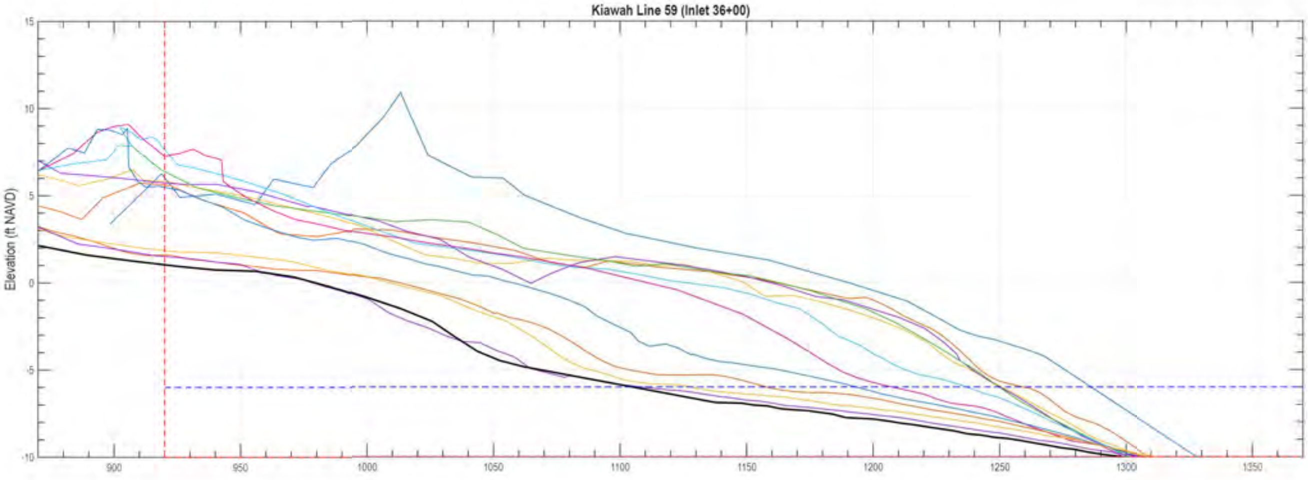
Kiawah Line 58 (Inlet 24+00)

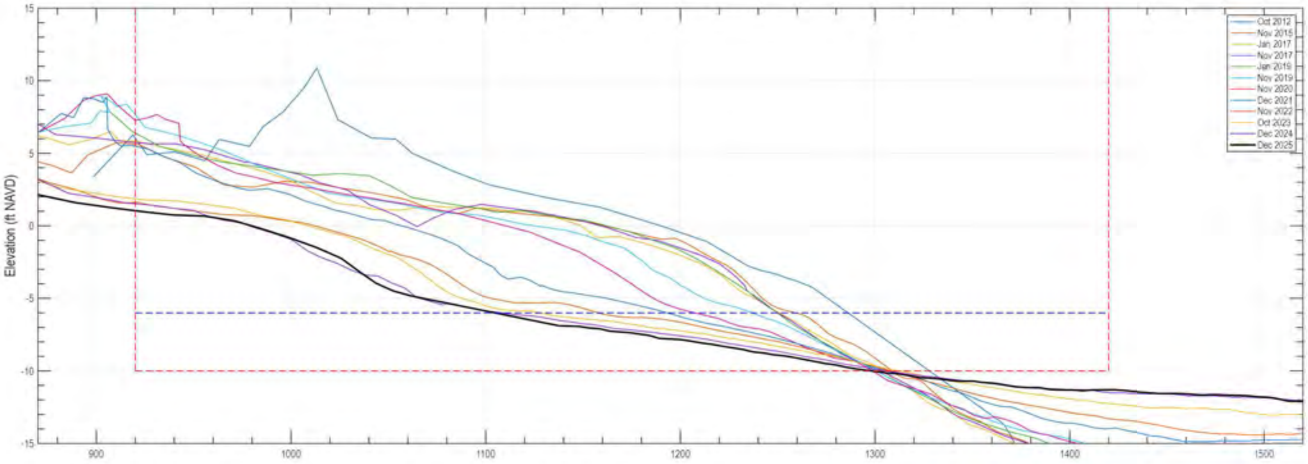




Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	127.2	54.9	182.1
Nov 2015	71.4	51.2	122.6
Jan 2017	54.7	47.2	101.9
Nov 2017	48.6	45.4	94.0
Jan 2019	32.3	41.3	73.7
Nov 2019	24.9	40.0	64.9
Nov 2020	10.8	37.8	48.5
Dec 2021	6.3	37.6	43.9
Nov 2022	3.7	37.6	41.3
Oct 2023	1.7	35.6	37.3
Dec 2024	0.3	31.6	31.9
Dec 2025	0.3	31.2	31.5

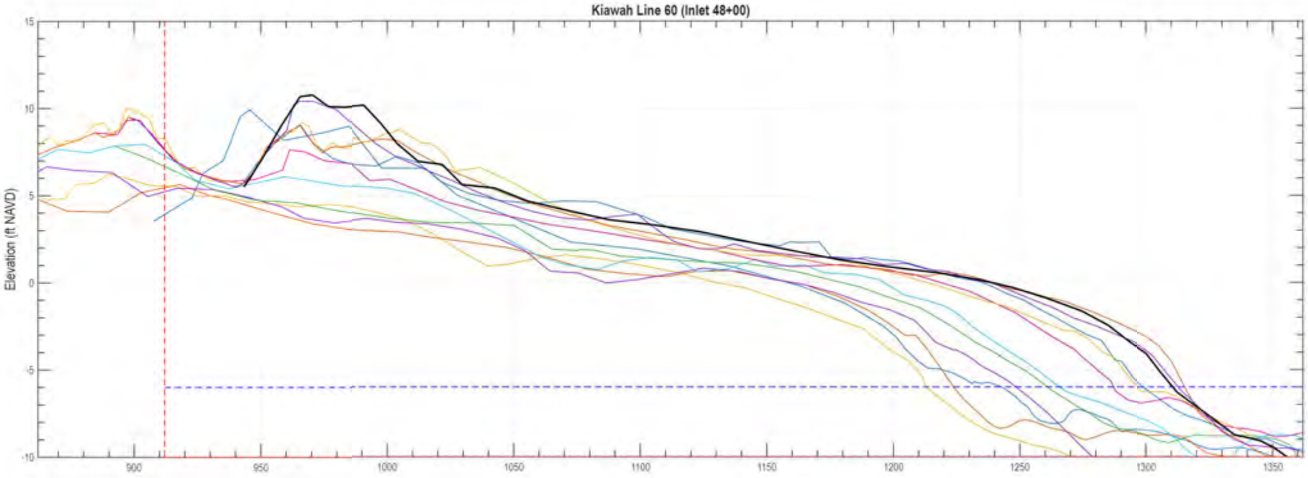
Kiawah Line 59 (Inlet 36+00)

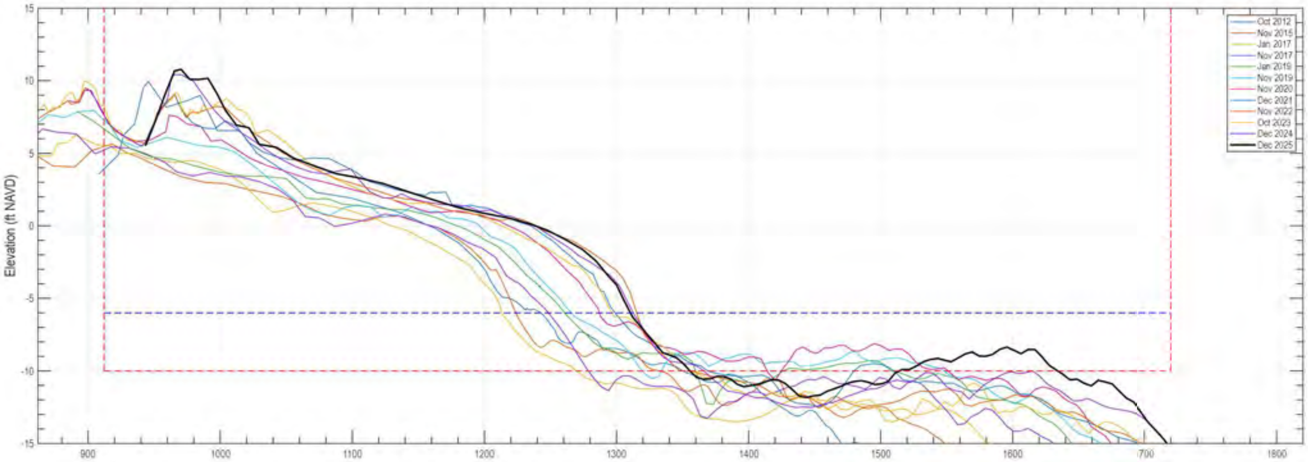




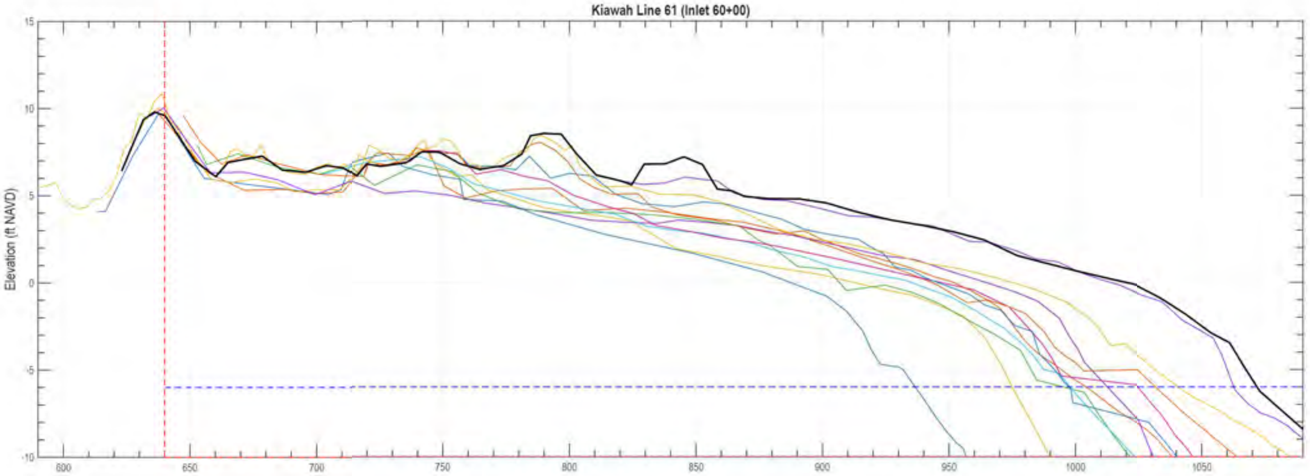
Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	116.4	57.3	173.7
Nov 2015	86.5	54.1	140.6
Jan 2017	84.8	52.8	137.7
Nov 2017	88.1	52.5	140.6
Jan 2019	90.5	52.4	142.9
Nov 2019	81.4	52.0	133.3
Nov 2020	74.4	49.9	124.3
Dec 2021	55.6	49.3	104.9
Nov 2022	37.3	48.1	85.4
Oct 2023	35.4	46.0	81.4
Dec 2024	27.3	43.6	70.9
Dec 2025	27.0	41.8	68.9

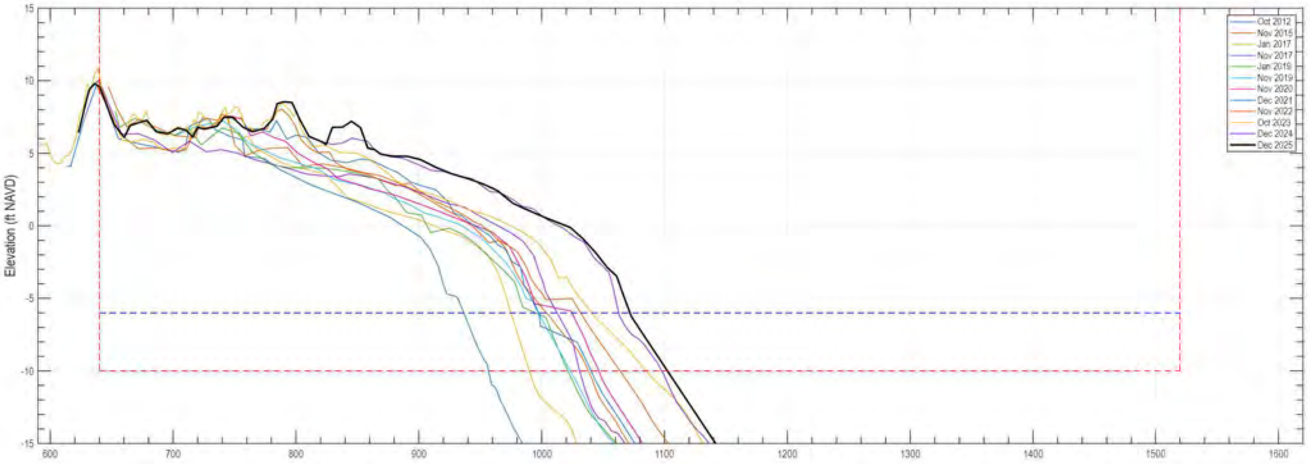
Kiawah Line 60 (Inlet 48+00)





Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	105.5	55.3	160.8
Nov 2015	85.1	52.2	137.2
Jan 2017	82.9	47.9	130.8
Nov 2017	89.0	52.2	141.2
Jan 2019	98.4	58.5	156.9
Nov 2019	103.6	62.9	166.5
Nov 2020	118.4	69.2	187.6
Dec 2021	131.4	61.9	193.3
Nov 2022	134.0	61.6	195.6
Oct 2023	129.5	61.9	191.3
Dec 2024	133.9	61.9	195.8
Dec 2025	137.7	66.1	203.7





Date	Vol to -6	Vol -6 to -10	Vol to -10
Oct 2012	100.8	45.4	146.2
Nov 2015	125.6	56.7	182.3
Jan 2017	114.4	50.7	165.1
Nov 2017	126.7	56.8	183.5
Jan 2019	119.5	55.0	174.5
Nov 2019	123.7	54.9	178.6
Nov 2020	129.3	58.6	188.0
Dec 2021	135.7	56.4	192.1
Nov 2022	136.9	60.4	197.3
Oct 2023	146.0	62.7	208.8
Dec 2024	163.1	65.2	228.3
Dec 2025	165.7	66.2	231.9