After the Mexican War Captain Highsmith was stationed in San Antonio as commander of one of the two companies of rangers garrisoning the town and on December 15, 1848, was chosen to command the escort that guarded the commissioners sent by the state of Texas to open a road from San Antonio to El Paso. Under Hays's command, he and thirty-five men of his company marched from San Antonio for the Rio Grande. "We encountered an exceedingly rugged and dry country," he reported to Colonel Bell, "which caused great inconvenience to my men and great injury to their horses." By October 18, when the rangers reached Fort Leaton near Presidio del Norte, Highsmith and his men were near starvation, "our only food consisting of mustangs and our pack mules," he reported. The party started for home on November 25 and arrived in San Antonio after an arduous journey. Highsmith reported that "a first rate road can be established on or very near the same route which we traversed . . . with the necessary requisites of wood, water, and grass, over a fine and level country, unobstructed by mountains or any natural opposing obstacles."

With the completion of this mission Highsmith submitted his resignation from the ranger service, intending to return to private life. The trip had greatly weakened him, however, and he died of influenza on January 10, 1849.