The difference between the fundamental niche (all boreal habitat extending west into Alaska) and the realized niche (breeding ranges extending only into eastern Yukon Territory) of many North American wood-warblers may be the result of a tradeoff between the long migrations required to access less used suitable western habitat and the maintenance of southern winter ranges. Because many eastern parulids overwinter far south, migrating to western boreal breeding grounds may be too costly. Some species such as the Northern Waterthrush and Blockpoll Warbler can undergo extreme migrations from South America to access less used western habitat, but most species do not. Here we propose an alternative solution and demonstrate using isotopic data how an eastern wood-warbler may have established a novel migratory route allowing access to previously unused breeding habitat. The Myrtle subspecies of the Yellow-rumped Warbler complex is primarily found east of the continental divide. However, western overwintering records are common and individuals are recorded all along the pacific coast each spring. In the spring of 2014 we captured Myrtle and Audubon’s warblers near Vancouver, British Columbia. We took measurements and collected two greater coverts, one basic grown on the individual’s breeding grounds and one alternate grown on the wintering grounds. We analyzed the feathers for stable hydrogen isotopes and compared these values to those of feathers from known geographic origin to determine the summer and winter ranges. Our estimates show that these pacific Myrtle Warblers breed far into northwestern Alaska. The timing, association with Audubon’s warblers, and wing chords characteristic of western Alaska breeding birds corroborate isotope data to indicate pacific wintering grounds for these birds. In addition to describing previously unknown migratory connectivity, these results may apply broadly to other eastern parulids exhibiting western ranges that may have arisen due to the adoption of novel migratory routes.