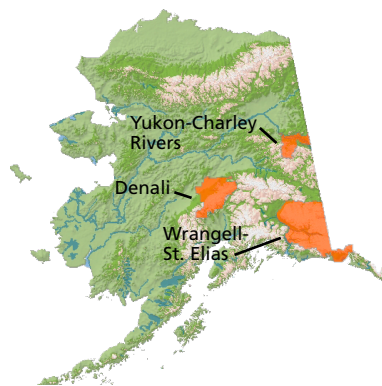




Wood Frog Resource Brief

The Status of Wood Frogs in The Central Alaska Network



Map: Wood Frogs are being monitored in all 3 Central Alaska Network parks: Yukon-Charley Rivers National Preserve, Denali National Park & Preserve and Wrangell-St. Elias National Park & Preserve.

For the past twelve years the Central Alaska Network (CAKN) has deployed and maintained passive acoustic recorders at seven wetland ecosystems in Denali National Park and Preserve (DENA), Yukon-Charley Rivers National Preserve (YUCH) and Wrangell-St. Elias National Park and Preserve (WRST) to monitor the timing and duration of the wood frog (*Lithobates sylvaticus*) breeding season. The network monitors wood frogs because of their special overwintering strategy and particularly early breeding season. Nearly 65% of their body freezes during winter, and they breed in the spring as soon as they are able to thaw out and begin calling. This makes them an excellent indicator of spring phenology.

Acoustic monitoring in remote regions of Alaska is challenging because the sound

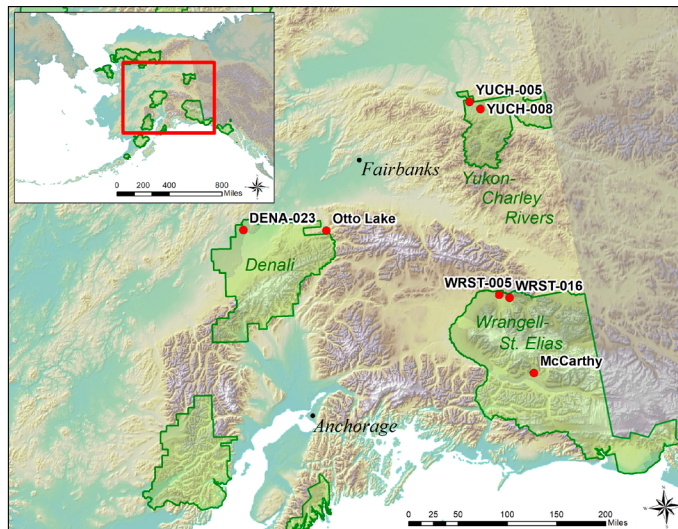
recorders can only be accessed and serviced a few times throughout the year and are susceptible to being damaged by weather and wildlife. Despite these difficulties, the network has six sites with five or more years of acoustic data.

Wood frog calls have unique acoustic characteristics that make automated detection from the raw acoustic data possible. The network collaborated with the Natural Sounds and Night Skies Division to develop a semi-automated process for analyzing the acoustic data to identify calling frogs. Because the resulting frog detections contain an unknown number of false positives due to other sources of sound in the environment like wind and birds, staff must manually review the data to remove false positive detections.

Image (top): Adult wood frog (*Lithobates sylvaticus*).
NPS/Jared Hughey

Map (left): Locations of the 7 monitoring sites where acoustic devices have been deployed throughout the 3 Central Alaska Network (CAKN) parks.

Image (right): An acoustic recording station. NPS/Danielle Knapp



Patterns in Wood Frog Calling

Wood frog calling varies in timing and duration in the CAKN parks, typically beginning in late-April to early-May and continuing for two to three weeks. In some years there is a second period of low intensity calling that occurs in August and September as ambient temperatures become cooler. Wood frogs do not breed in the fall, although the cooler temperatures may simulate spring breeding conditions and trigger calling.

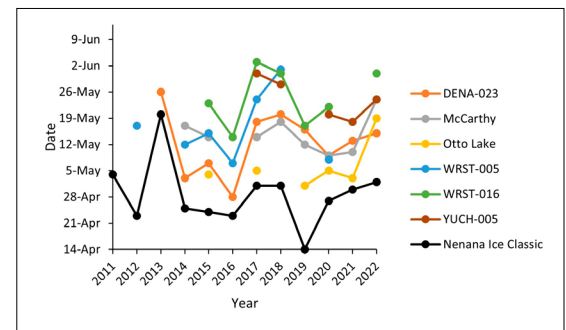
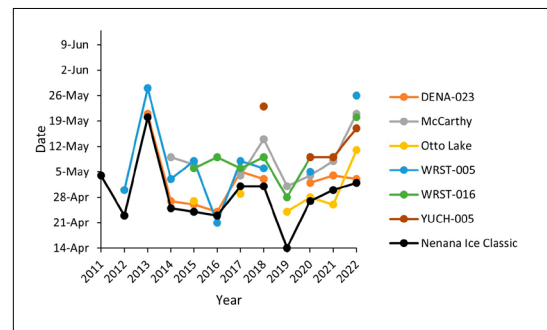
The earliest initiation date we have documented occurred April 21, 2016, the second earliest spring on record (Sousanes and Hill) (Figure 1). The earliest spring on record is 2019, but unfortunately we were unable

to establish first call dates due to equipment failure at several sites including DENA-023 and WRST-005, our two sites with the longest period of record. The latest initiation date occurred May 28, 2013 during an unusually late spring.

Peak activity, or the day with highest number of calls per hour, occurs in mid- to late-May at most sites, depending on the year (Figure 2). The period of peak calling, defined as continuous days with over 25 detections per hour, is highly variable among sites and years, but typically occurs 2-3 weeks after calling begins.

Figure 1 (left): Call initiation dates from the 6 acoustic recording stations with 5 or more years of data and the date of river ice break up on the Tanana River (Nenana Ice Classic) from 2012-2022.

Figure 2 (right): Peak activity dates from the 6 acoustic recording stations with 5 or more years of data and the date of river ice break up on the Tanana River (Nenana Ice Classic) from 2012-2022.



Environmental Drivers to Breeding Calls

Wood frogs don't begin calling until they have thawed and can get out of the frozen ground. Time of day, date, temperature, and snow depth are important predictors of wood frog calling (Larsen et al., 2021). The slight variations we observe in calling activity are likely due to site-specific characteristics such as elevation, slope, and aspect that influence ground temperature and timing of snowmelt.

Call initiation tracks well with other indicators of spring (Figures 1 and 2), including the Nenana Ice Classic (NIC), a contest that

records the exact date and time of river ice breakup on the Tanana River. Data from the NIC indicate that spring breakup has advanced 5.5 days 1917-2001 (Saragin and Micheli, 2001). Based on our results, wood frogs will begin calling shortly after the ice goes out on the Tanana River. Two of the warmest springs on record have occurred recently, 2016 (Sousanes and Hill) and 2019 (Alaska Climate Research Center). The network is closely tracking how these shifts in spring phenology are impacting wood frog breeding phenology.

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