Bois Brule River Fall Steelhead Index Report 2024, Douglas County, WI

by

Sam Peterson

Fisheries Biologist

Wisconsin Department of Natural Resources

March 2025

Introduction

The Wisconsin Department of Natural Resources (DNR) performed an adult migrating rainbow trout (Oncorhynchus mykiss; herein called steelhead) spawning survey on the Bois Brule River in the fall of 2024. The sampling location ranged from the first pool south of the walking bridge off HWY 2 and ended 4.6 miles downstream above the fish refuge area known as "Box Car Hole" (**Figure 1**). This targeted survey began in 1984 following the installation of a sea lamprey barrier/fishway by the Great Lakes Fishery Commission and continues annually. DNR and the U.S. Fish and Wildlife Service Sea Lamprey Control Program share responsibility of operation and maintenance of the structure. Steelhead fishing is the main fall and spring-seasonal attraction on the Bois Brule River and is managed primarily for catch-and-release opportunities to accommodate a high level of fishing pressure on the river, relying solely on natural reproduction. The goal of this survey is to collect population demographic information for annual steelhead runs (e.g., size, growth, mortality, maturity etc.). The results are applied to the annual survey data reported in our spring and fall 'Fishway Reports' for a comprehensive picture of population dynamics and to aid in future management decisions.

FISHING REGULATIONS

This survey focuses on the lower river (downstream from U.S. HWY 2 to Lake Superior). The fishing season begins on the last Saturday in March and continues through November 15. Fishing is prohibited from one-half hour after sunset to one-half hour before sunrise. **Special Note**: fishing may not begin before 5 a.m. on the first Saturday in May. The daily bag limit is five (5) trout or salmon in total. Steelhead have a minimum length of 26 inches and only one may be kept. Brown trout have a minimum length of 10 inches and only two may be larger than 15 inches. Brook trout have a minimum length of 8 inches and salmon species have a 12-inch minimum length limit.

Fishing regulations are different elsewhere on the river. Find a copy of the entire Guide to Wisconsin Trout Fishing Regulations here: https://dnr.wisconsin.gov/topic/fishing/regulations. Fishing for trout and salmon on the Bois Brule River and its tributaries requires an inland trout stamp. Brule River State Forest angler parking lots are for day use only; overnight camping is limited to designated campgrounds.

Methods

FIELD COLLECTION

All data collection methods followed state and local field protocols. Adult migrating steelhead were captured via daytime boat-electrofishing by DNR staff on 11/18/2024. All Steelhead were measured to the nearest 0.1-inch, weighed to the nearest 0.01-pounds and sexed. Additionally, scales were collected from a subsample of steelhead (five scales per male and female, separated by 0.5" length bins) and aged. Later, age-length keys were used within each year to assign estimated ages to unaged fish collected during the survey. All fish were released to the river immediately following data collection.

DATA ANALYSIS

Both male and female growth parameters were estimated by a fitted von Bertalanffy growth model (1938):

$$l_t = L_\infty (1 - e^{-K(t-t_0)})$$

where L_∞ is the asymptotic average length, K relates to how quickly the function approaches L_∞, t is time (years) and t_0 is the x-intercept. Due to a model fitting issue and low sample size, a male growth model was not constructed.

This survey was compliant with statewide DNR trout survey protocols. All collected data followed local data workflows and best data management practices. Data were input, analyzed, quality checked and reviewed prior to statistical analyses. All statistics were computed and visualized in Program R (R Core Team 2024, version: 4.3.3).

Results and Discussion

A total of 162 steelhead were collected. Steelhead consisted of 32% male (N=51), 53% female (N=86) and 15% (N=25) undetermined. This proportion of steelhead by sex is comparable to previous surveys (**Figure 2**). Median female and male steelhead total lengths were 22.7 and 20.6 inches, respectively, which is lower compared to past surveys, but remain within a normal range of variation across surveys (**Figure 3**). Total weight ranged from 0.62 to 9.90 pounds. Median total weights consisted of 3.90 and 3.15 pounds for female and male steelhead, respectively. A total of 139 steelhead were aged, ranging from three to nine years old. Age-4 male and female steelhead were present at relatively high frequencies (**Figure 4**), and older age classes were dominated by females (**Figure 5**). In this sample, female steelhead reached the 26-

inch minimum length limit for harvest at six years old (**Figure 6**), which provided most adult fish the opportunity for multiple spawning runs to contribute to the naturally reproducing population (**Figure 7**). Most females in the sample had spawned three times or less thus far in their lifetime, with one fish having spawned up to six times (<0.01%), which is consistent with previous surveys (**Figure 7**).

References

R Core Team (2024). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Von Bertalanffy, L. 1938. A quantitative theory of organic growth (inquiries on growth laws. II). Human biology 10:181-213.

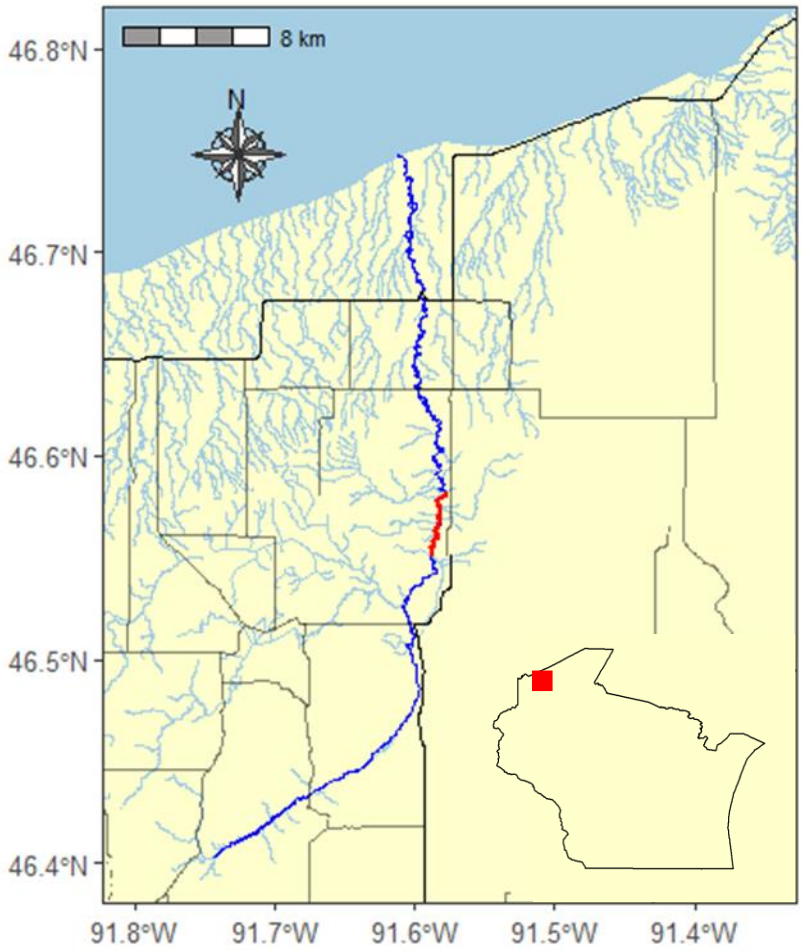

Figure 1. Map denoting survey sampling location (red) on the Bois Brule River (blue).

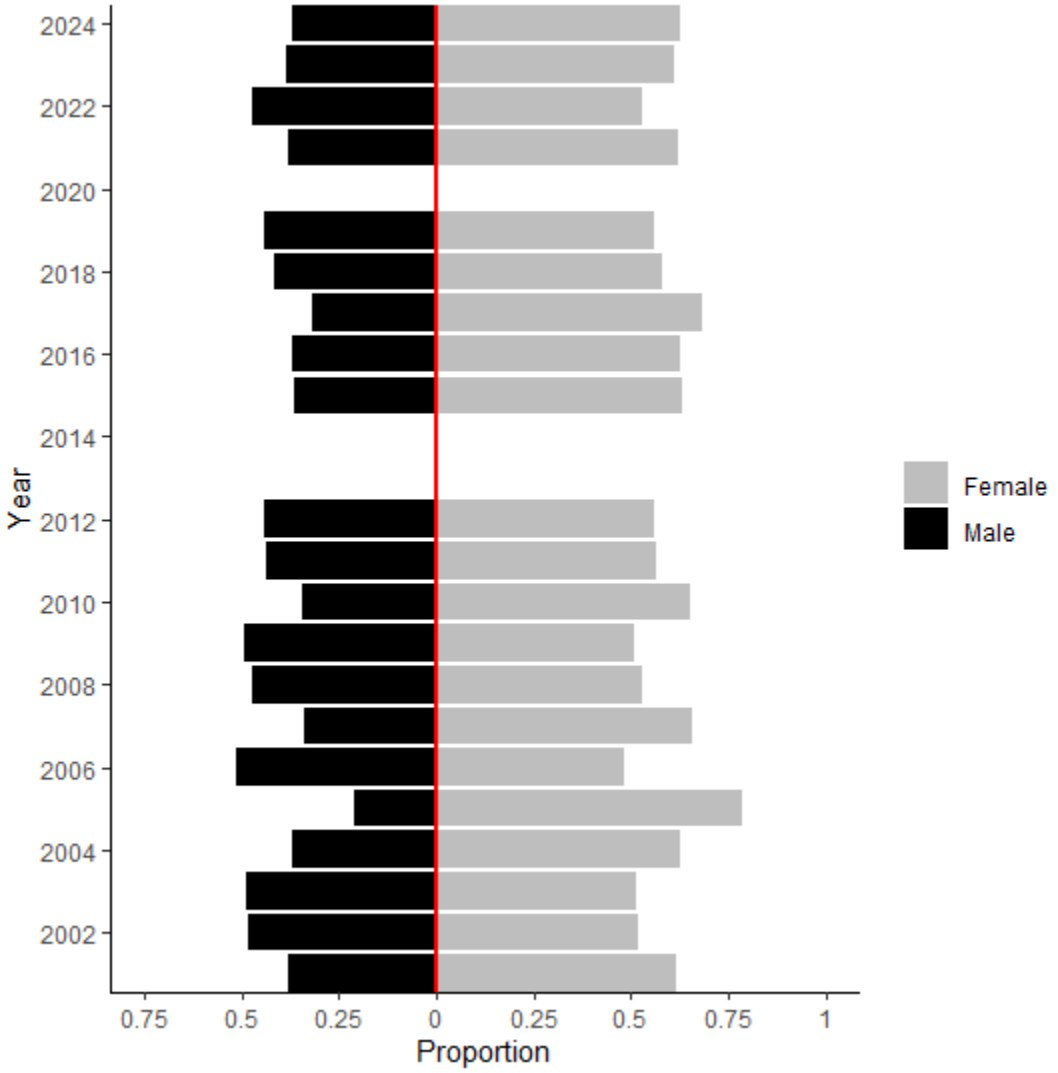

Figure 2. A time series denoting proportions of male (black) and female (gray) Steelhead sampled each year.

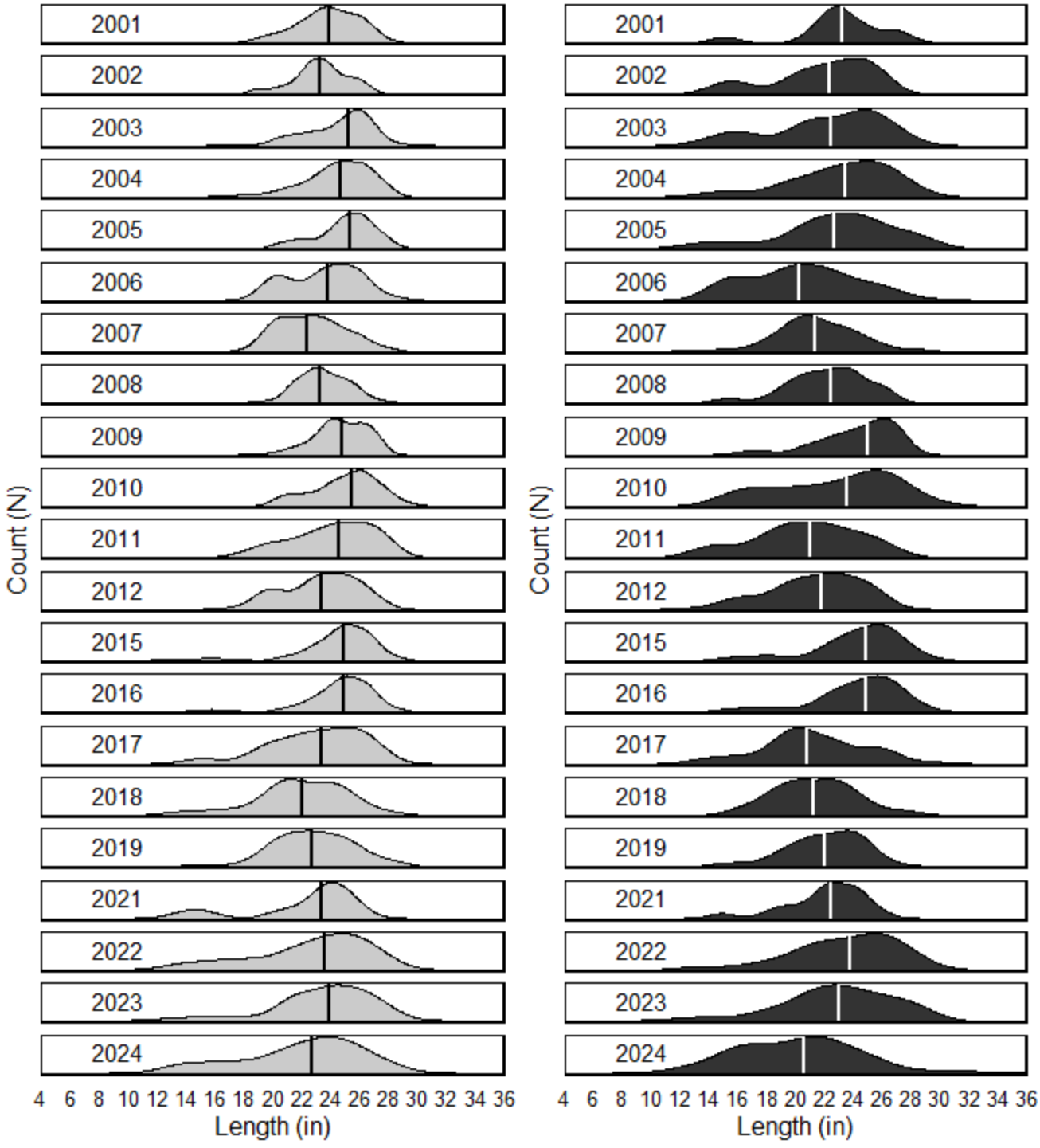

Figure 3. Time series of male (black) and female (gray) migrating steelhead length frequencies on the Bois Brule River. Vertical lines represent the median total length sampled each year.

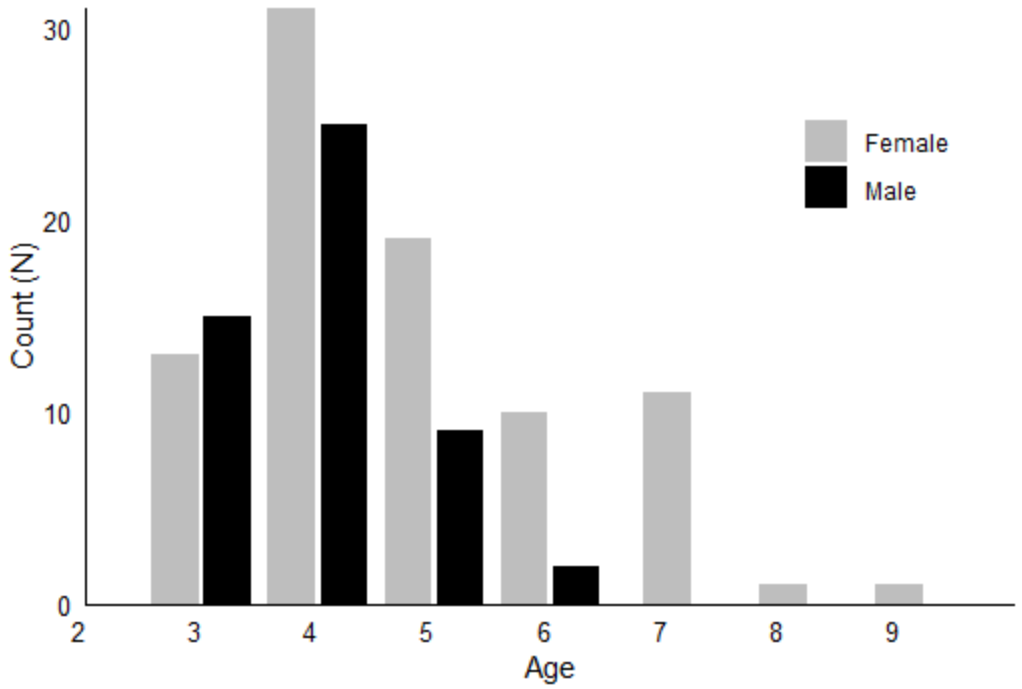

Figure 4. Age frequencies of male (black) and female (gray) steelhead collected during the 2024 survey. Ages were based on 139 scale samples.

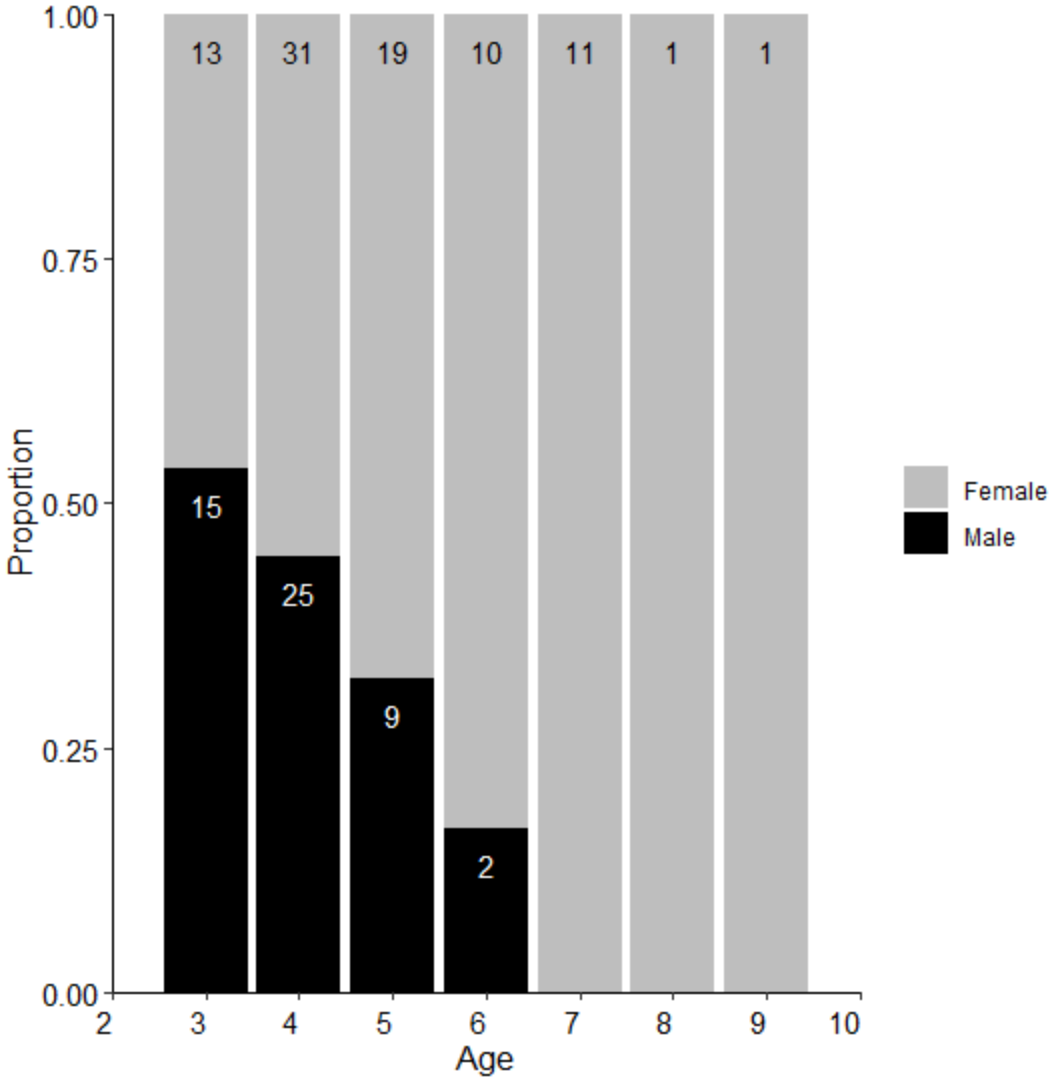

Figure 5. Proportion of aged male (black) and female (gray) Steelhead separated by age. Unique values denote total number of aged male and female steelhead sampled in 2024.

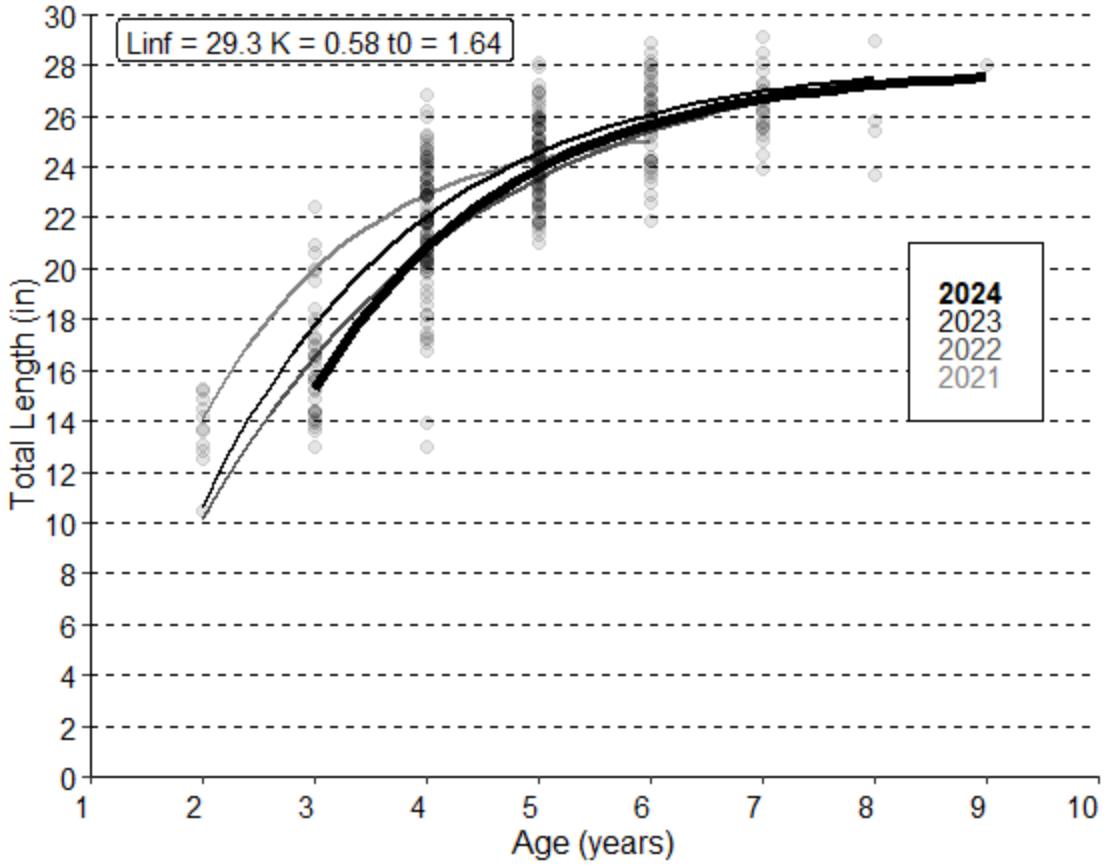

Figure 6. The smoothed lines represent a calculated length at a given age of female steelhead on the Bois Brule River based on raw data points (gray) collected from the 2021 to 2024 fall surveys.

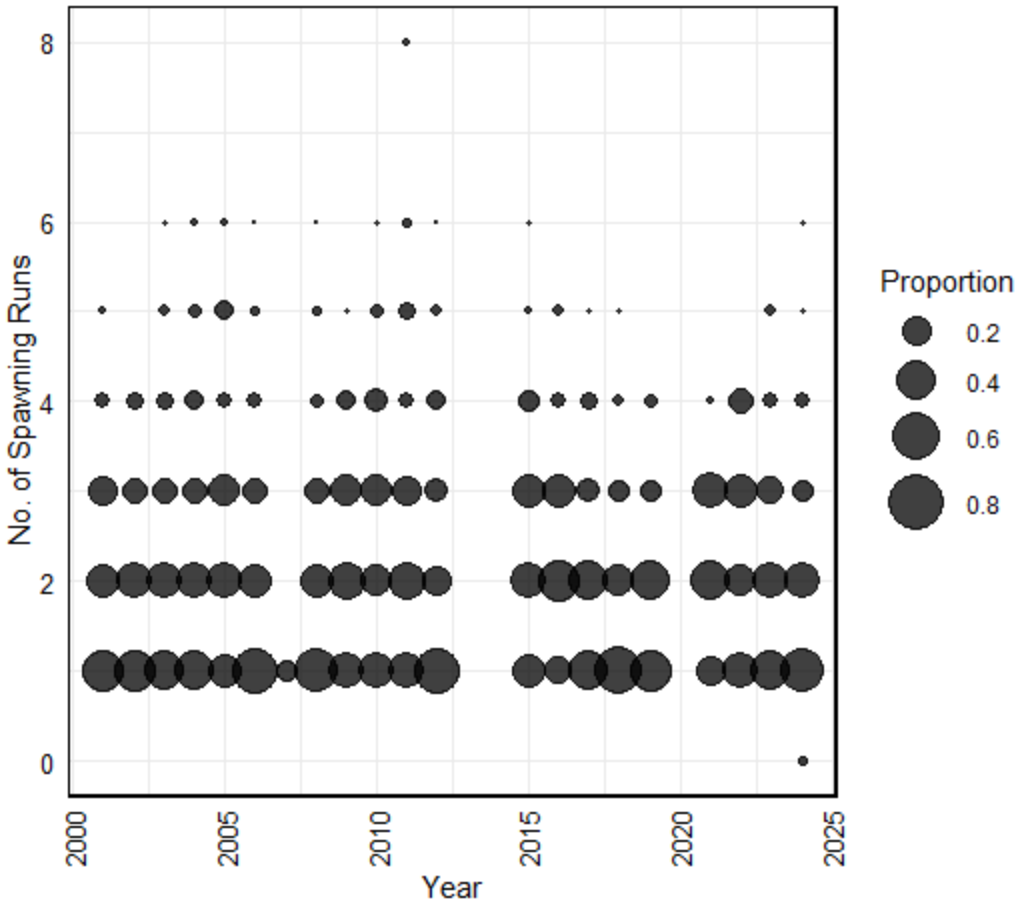

Figure 7. Proportion of steelhead sampled each year by number of lifetime spawning runs. If a steelhead has spawned, a mark will be made on their scale and can be detected during age assignments. Size of bubbles denote proportion of fish that had made *y* number of spawning runs. Gaps in timeline denote years data was not collected.