

Science You Can Use *Tool*

Hatch Me if You Can: New hatchR tool helps predict and protect fish development

Hidden like fish eggs in the streambed, the answer was buried in the mathematical models of Morgan Sparks's graduate work. Biologists and land managers know early fish life is sensitive, and nature is difficult to predict. In the streambed, eggs and young fish can be at risk from unintentional habitat disruptions from activities such as grazing, prescribed fire, and road work. The question was how to know when wild fish are hatching and emerging to avoid those sensitive windows. A new tool, [hatchR](#), is here to lend biologists a helping hand—or fin.

While models existed before, they had limits. Some relied on consistent temperatures—unlike the wide temperature ranges found in nature—or most focused on a single fish family (*cough*, salmonids).

“It’s been bothering me for a long time,” said Sparks, a research fish biologist at Rocky Mountain Research Station (RMRS). “We know there are models out there for other fish species, but there was no formal framework for people to leverage them.” Outside of research settings and computer coding circles, there simply wasn’t a user-friendly tool.

Sparks teamed up with Bryan Maitland, also a research fish biologist with Rocky Mountain Research Station, to create hatchR, a more precise tool that can predict when a specific population of wild fish is hatching and emerging. The models in hatchR account for the way fish growth adjusts in response to a stream’s daily temperature fluctuations. The software is presented in two ways, as a point-and-click online app and an R package to run advanced and customizable computer models. Those with and without scripting experience can use it for free. hatchR can help users find



A bull trout is captured near its headwater spawning grounds on the Boise National Forest. hatchR can provide advice for more specific work-window restrictions that are easier for the contractors to work around. Forest Service photo by Morgan Sparks.

quick answers via the app or research complex ecological questions via the R package.

The app needs only three data types—spawning date, water temperature, and a developmental model. For the models, users can input custom data for any fish species, or they can apply pre-set species models, which include most native salmon and trout. “I really hope people take away from hatchR that with pretty simple hatchery data you can make a parameterization [aka custom model] specific to the exact population that you care about,” said Sparks.

Sparks and Maitland provide a scenario in a recent study to showcase hatchR’s ability. In the scenario, a hypothetical fisheries biologist in Idaho might need to know the hatch and emergence windows of a population of bull trout (an Endangered Species Act threatened species) that could be affected by a road work project. The biologist wondered if sediment from the work due to start in June might cover up sensitive redds? The case study scenario found that all fish should emerge from the stream bed around April 21st, safely outside the work schedule.

“As a district biologist, I must consider bull trout recovery. Any instream work (be they minor culvert replacements or major restoration projects) must adhere to a rather broad, generic work window restriction meant to protect spawning adults and emerging fry,” said Mariel Leslie, fisheries biologist on the Bitterroot National Forest in Montana. “The introduction of hatchR will allow me to provide advice for more specific work window restrictions that are easier for the contractors to work around while also providing me with more confidence that necessary work is not adversely affecting our Endangered Species Act-listed species. It’s a win for everyone.”

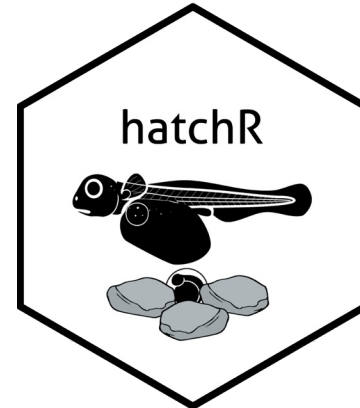
Featured Scientists

[Morgan Sparks](#) and [Bryan Maitland](#) are Research Fish Biologists with the Rocky Mountain Research Station.

[Annabelle Moore](#) is the author of this Science You Can Use Tool.

Management Considerations

- hatchR is a tool to help land managers predict when wild fish populations will be in their most sensitive life cycles of hatching and emerging.
- hatchR is a living tool. Researchers welcome input from users and shared case studies of how it is applied in the field.
- The R package can be used in a research capacity to increase understanding of fish early life history across diverse species as stream temperatures and flows change over time.
- hatchR can be accessed via an online app found at: https://elifelts.shinyapps.io/hatchR_demo/ or as an R package downloaded from CRAN. The project website, which contains numerous tutorials of how to use the tools, can be found at: <https://bmait101.github.io/hatchR/>



Graphic for hatchR R package. Forest Service image by Laura Koller.

Further Reading

Sparks, M.; Maitland, B.; Felts, E.; Swartz, A.; Frater, P. 2026. [hatchR: A toolset to predict when fish hatch and emerge](#). Fisheries. 51(2): 49–59.

Sparks, Morgan. [hatchR: A toolset to predict fish development](#). United States Department of Agriculture, US Forest Service Rocky Mountain Research Station. Page last modified: December 4, 2025. Washington, DC: U.S. Department of Agriculture.



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