

# Compartment Modeling of Cesium Movement through Terrestrial-Aquatic Ecosystems in a Forested Headwater in Fukushima



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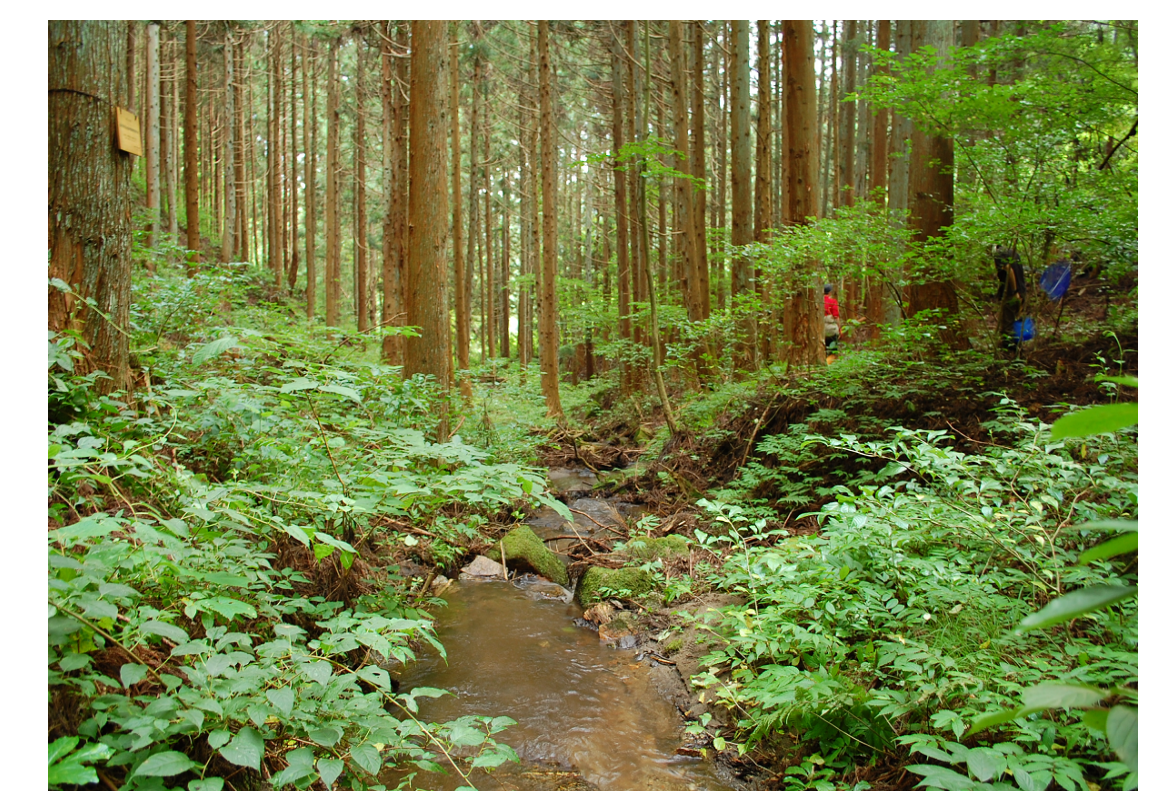
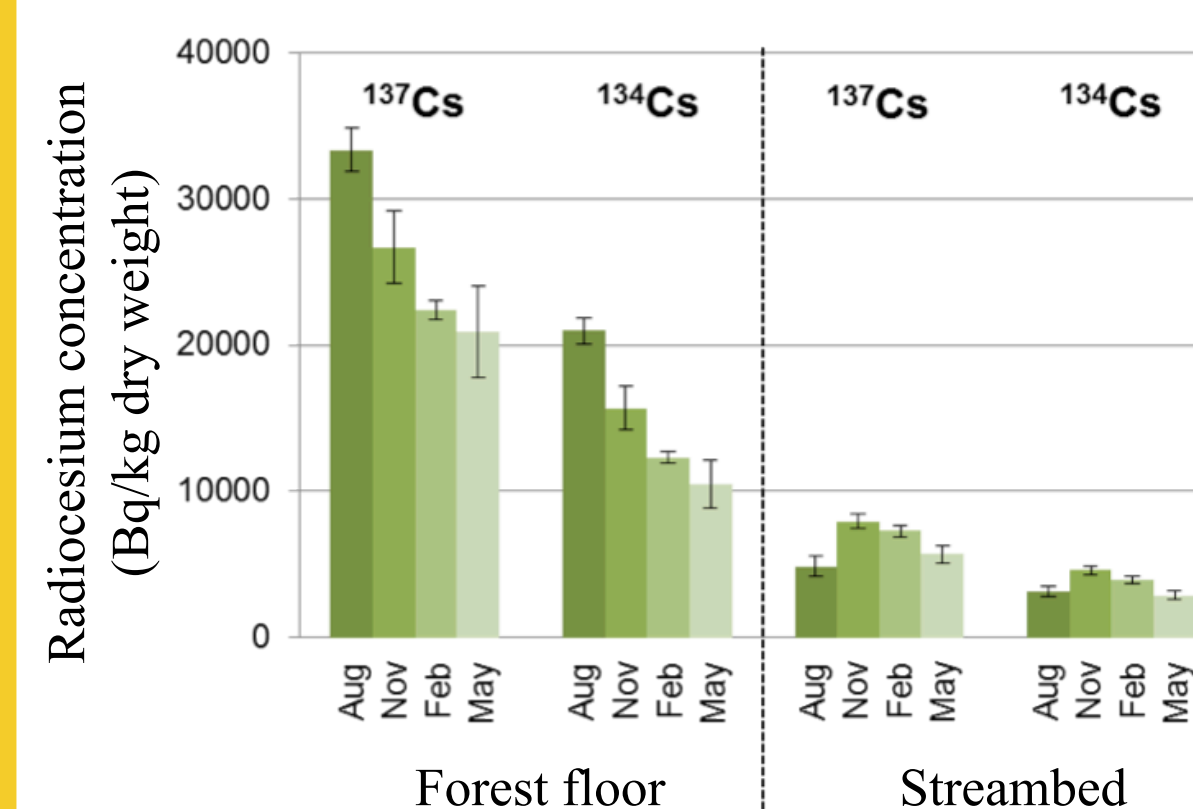
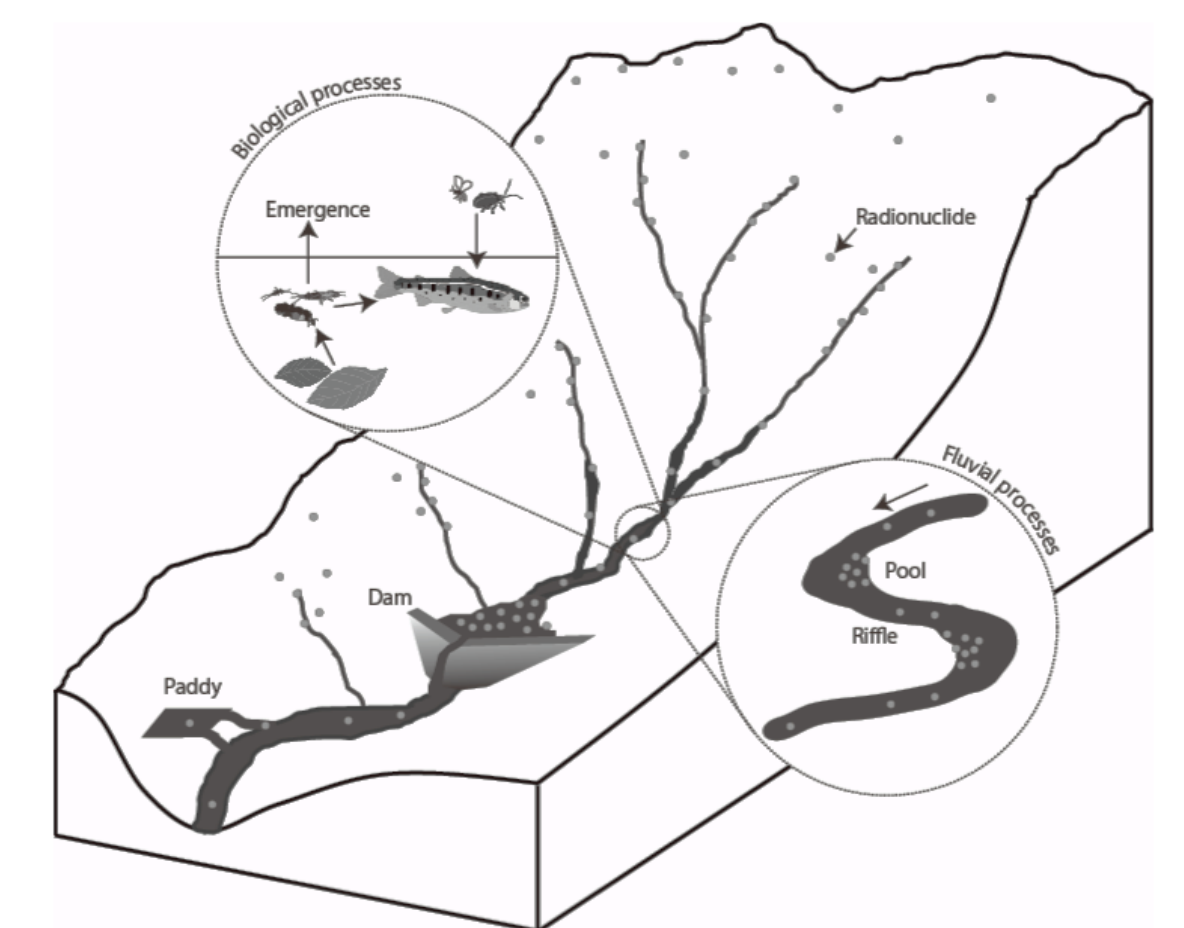
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## Abstract

The 2011 nuclear accident at the Fukushima-Daiichi nuclear reactor in Japan caused large areas to be contaminated with reactor fission products—the most dominant of these being Cesium-137. Widespread contamination gave rise to questions concerning the public safety of Japanese citizens. Cesium movement in headwaters of forested ecosystems, which comprise over 70% of the contaminated region, is one of the key factors for long-term risk assessment in downstream agricultural and residential areas. Scientists from Tokyo Univ. of Agri. and Tech. have collected field data on the cesium concentrations in various species of plants and wild life since 2012. In collaboration with Colorado State University, the data has been fit to in-house compartment modeling software that details transfer coefficients between various species. Using this compartment model, we have been able to study the transfer of cesium through this environment including where the majority of cesium is deposited and how concentrations vary over time. This compartment model can also be easily adjusted to include any further changes to the environment, such as additional depositions, or the addition (or elimination) of a species.

## Methods

Scientists at Tokyo University of Agriculture and Technology have gathered environmental samples from a forested headwater near Nihonmatsu city, Fukushima which is about 45 km away from FDNPP. Scientists gathered soil samples, litter from the forest floor, insects, spiders, frogs, mice, crustaceans, and fish in an attempt to recreate the forest as accurately as possible during simulation. A model will be developed which incorporates all these samples and considers their various pathways in the ecosystem as well as their effective half-lives. The program was developed by a scientist from Los Alamos National Laboratory and can illustrate transfer coefficients. The model will be further analyzed to assess the fit and sensitivities of each compartment. The program can also be manipulated to adjust for the addition or subtraction of a compartment, which could aid in developing clean up efforts.



## Results

This project is still in very early stages, but, so far, cesium concentrations have been recorded and a model is nearing completion. Once the model is complete, it will be a matter of analyzing the output from the Environmental Compartment Modeling program and making necessary adjustments to represent the actual ecosystem as accurately as possible.

## References

[1] Gomi, Takashi. "Food web structure and radiocesium transfer in stream-riparian ecosystems in Fukushima" Lecture. Tokyo University of Agriculture and Technology, Tokyo, Fall 2014.