

# All the Salamanders

Maplewood Richmond Heights, MO

GREAT SMOKY MOUNTAINS INSTITUTE AT TREMONT

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With 31 species, the Great Smoky Mountains are world famous for salamander diversity. Variation over time in climate, geography, migration patterns, natural resources, and other organisms led to the adaptation and speciation of salamanders in these mountains. Today, this biodiversity is being threatened by an invasive species: the hemlock woolly adelgid. The tree canopy is reduced when adelgids kill hemlocks. More sunlight reaches the ground or water and increases the temperature, making it harder for salamanders to survive. Conservation efforts to control the woolly adelgid, and indirectly protect salamander stream habitat, demonstrate the interconnected nature of ecosystems. Students who live near the Smokies can help maintain salamander biodiversity by interacting with the animals appropriately and educating others to do the same.

## LIFE SCIENCE

4.LS2.4	Develop and use models to determine the effects of introducing a species to, or removing a species from, an ecosystem and how either one can damage the balance of an ecosystem.	6.LS4.1	Explain how changes in biodiversity would impact ecosystem stability and natural resources.
4.LS2.5	Analyze and interpret data about changes (land characteristics, water distribution, temperature, food, and other organisms) in the environment and describe what mechanisms organisms can use to affect their ability to survive and reproduce	6.LS4.2	Design a possible solution for maintaining biodiversity of ecosystems while still providing necessary human resources without disrupting environmental equilibrium.
5.LS3.2	Provide evidence and analyze data that plants and animals have traits inherited from parents and that variations of these traits exist in a group of similar organisms.	7.LS1.6	Develop an argument based on empirical evidence and scientific reasoning to explain how behavioral and structural adaptations in animals and plants affect the probability of survival and reproductive success.
5.LS4.2	Use evidence to construct an explanation for how variations in characteristics among individuals within the same species may provide advantages to these individuals in their survival and reproduction.	8.LS4.2	Construct an explanation addressing similarities and differences of the anatomical structures and genetic information between extinct and extant organisms using evidence of common ancestry and patterns between taxa.
6.LS2.1	Evaluate and communicate the impact of environmental variables on population size.	8.LS4.3	Analyze evidence from geology, paleontology, and comparative anatomy to support that specific phenotypes within a population can increase the probability of survival of that species and lead to adaptation.
6.LS2.5	Analyze existing evidence about the effect of a specific invasive species on native populations in Tennessee and design a solution to mitigate its impact.	8.LS4.4	Develop a scientific explanation of how natural selection plays a role in determining the survival of a species in a changing environment.
6.LS2.6	Research the ways in which an ecosystem has changed over time in response to changes in physical conditions, population balances, human interactions, and natural catastrophes.	<b>ENGINEERING, TECHNOLOGY &amp; APPLICATIONS OF SCIENCE</b>	
		6.ETS1.1	Evaluate design constraints on solutions for maintaining ecosystems and biodiversity.

## EARTH & SPACE SCIENCE

4.ESS2.3	Provide examples to support the claim that organisms affect the physical characteristics of their regions.	6.ESS2.4	Apply scientific principles to design a method to analyze and interpret the impact of humans and other organisms on the hydrologic cycle.
4.ESS3.2	Create an argument, using evidence from research, that human activity (farming, mining, building) can affect the land and ocean in positive and/or negative ways.	6.ESS3.3	Assess the impacts of human activities on the biosphere including conservation, habitat management, species endangerment, and extinction.
6.ESS2.3	Construct an explanation for how atmospheric flow, geographic features, and ocean currents affect the climate of a region through heat transfer.	8.ESS2	Analyze and interpret data to support the assertion that rapid or gradual geographic changes lead to drastic population changes and extinction events.

CHORUS  
Glaciate  
Migrate  
Elevate  
Separate  
Habitate  
Diversify traits  
Speciate  
Appreciate!

So salamanders were too cool, they had to flee  
It got too cold up in Canada, they needed to get some heat  
Then the ice age ended, so the salamanders elevated  
No going back down so those groups were getting separated

All up in those mountain ranges, making changes  
Evolving in those Appalachians  
All these new species from evolution and migration  
Changing over eons makes biodiversity  
Salamander capital, so when somebody's asking me:

Why are the Smokies such a diverse spot?  
There are a lot of salamanders in this plot  
Smoky Mountain forests full of critters  
And they're thriving  
Habitats full of critters  
And they're thriving

This mountainous country has got so many good spaces  
It's dark and damp in a lot of places  
Smoky Mountain forests full of critters  
And they're thriving  
Habitats full of critters  
And they're thriving

CHORUS  
All the salamanders  
Now put your tails up

Went to sleep, woke up in a creek  
Now fingers are touching me  
I'm so sad in a plastic bag  
I can barely breathe  
Places that are slimy  
That's where you'll find me  
These rocks have different dimensions  
So don't touch me again  
But I breathe through my skin  
So put that rock back on me

If you like me then you should have put a rock on me  
Don't be mad if you see that a hawk wants me  
If you like me then you should have put a rock on me  
Crawl, Crawl, Crawl

I'm sorry I didn't understand  
That you breathe through your slimy skin  
I thought you liked my plastic bag  
I see you need your habitat  
But how can we protect it, though?  
So many threats it makes me mad

Like invasive species eating trees  
Not so shady in this creek  
It's getting too hot for me  
But it doesn't have to be  
Habitats for you and me

Just give me a clean stream  
No pollution in the water  
If that hawk comes down and chews up my tail  
Then it will start to grow again  
With all of these cars, invasive species  
And these threats looming large  
Here in the Smoky Mountains  
We can protect all life again

Appreciate!