

Salamander News

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www.yearofthesalamander.org

Iconic Forest Salamanders

by Deanna H. Olson, US Forest Service



Salamander Flat is in the Uinta-Wasatch-Cache National Forest in the Wasatch Mountains of Utah, USA. Photograph by Su Alexander, US Forest Service.

Almost 70% of world amphibians have associations with forests and woodlands. In particular, salamanders are iconic symbols of forest biodiversity, including the giant salamanders of Asia and America—*attaining sizes measured in meters*; the fire salamanders of Europe—*emerging from ancient people’s fires due to their associations with down wood*; the newts—*which proudly swagger along the forest floor in broad daylight because their toxic skin renders them immune to predators*; the pond-breeding mole salamanders—*for their persistence, inter-pond connectivity is of paramount importance*; and the woodland salamanders—*nocturnal and fossorial, lending mystery to their existence*.

Their notoriety in world lore is now being trumped by our increasing understanding of the myriad forest ecosystem services they provide, and the multiple threats they face. This issue of the *Salamander News* celebrates emerging knowledge of forest salamander ecology, threats, and conservation actions.

US State Wildlife Grant Provides Great News for Forest Salamanders

By Kevin Hamed, Virginia Highlands Community College, Abingdon, VA, USA, and J.D. Kleopfer, Virginia Department of Game and Inland Fisheries, Charles City, VA, USA

Salamanders in montane forests are thought to be at risk for declines or extirpations as many are at their elevational range limits. The US Southern Appalachian Mountains have one of the greatest diversity of plethodontid salamanders, with many having limited distributions on montane peaks. Climate change, competition from other salamanders, and habitat loss/alteration could decrease and even eliminate all suitable habitats on mountain peaks.



Figure 1. Red Spruce dominates the high elevations of Whitetop Mountain. Photo by Kevin Hamed.

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To determine if range shifts have occurred, areas with historical salamander records warrant reassessment, however few long-term

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Get Your November Photo Contest Calendar - Free!

Little-known, but believed to be declining due to loss of habitat, winning photographer **Todd Pierson** captured a rare portrait of *Nyctanolis pernix*, native to Guatemala and Chiapas, Mexico. To get a better look, and see our more common, but no less important runner-up, go to <http://www.parcplace.org/images/stories/YOSal/YoSalCalendarNovember.pdf>.



Another rare salamander, *Oedipina tomasi* is known from only one locality in Parque Nacional El Cusuco in the Sierra del Omoa of Honduras. It was found in primary tropical cloud forest at around 1800 meters above sea level. Photo by Brooke Lee Talley, Year of the Salamander Photo Contest.



Get your Year of the Salamander 2014 Gear!

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Ready to gear up for Year of the Salamander? We've got you covered!

At the Café Press PARCStore, you can find just about any style of t-shirt, sweatshirt, or hoodie, for men, women, or children. But don't stop there - you'll find a messenger bag, field bag, aluminum water bottle, even a beach towel (in case you want to join the salamanders crawling out of that primeval sea).



And take a look at the beautiful **Year of the Salamander Wall Calendar**, full of fantastic salamander photos for every month of your year!

Proceeds from sales go to the Year of the Salamander Conservation grant, managed by Amphibian and Reptile Conservancy, a not-for-profit organization that helps support PARC activities, such as public education, publications, and research.

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Year of the Salamander Collaborating Partners

The Year of the Salamander Planning Team is pleased to welcome the following organizations to our growing list of collaborating partners:

Association for the Conservation, Management and Sustainable Use of Wild Fauna and Flora BC

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Association for the Conservation, Management and Sustainable Use of Wild Fauna and Flora BC is a civil association formed by a multidisciplinary group of enthusiastic entrepreneurs and professionals with the goal of fostering care, outreach, conservation, research, training, management, and sustainable use of flora and fauna both in captivity and in the wild. COMAFFAS B.C. has produced and directed several projects around disclosure and awareness of Amphibians in Chiapas and Veracruz, providing workshops, courses and talks on amphibians and their importance to schools, forums and events focused on environmental issues.



Barro Jaguar, Photography and Conservation B.C.

www.barrojaguar.org



Barro Jaguar, Photography and Conservation B.C. is a civil association whose main objective is to provide biodiversity education through photography, and thereby promote conservation. It is for this reason that Jaguar acts in favor of the conservation of amphibians, giving talks to school children about the great importance of amphibians in the

environment, and why they need to conserve. Similarly, photographic exhibitions are mounted with various species of frogs in Oaxaca and Mexico, available to the general public to keep them motivated. Finally, Jaguar joins forces with other associations and groups to spread the importance of these organisms and promote their conservation, because if you do not act quickly, they will gradually be extinguished and disappear.

COATZIN

www.inaturalist.org/projects/anfibios-de-mexico

COATZIN is a multidisciplinary team of biologists, veterinarians, nature photographers, and environmental educators, concerned about the conservation of natural resources in Mexico. We have developed workshops focused environmental education knowledge of amphibians, as well as documentation of species that are cataloged in a conservation status by national and international standards, in addition to guides visual in collaboration with other agencies, exhibitions for dissemination and collective knowledge, and the development of projects to study wild populations, and manage a project Amphibian Mexico located on the platform of science literacy.



Davidson College Herpetology Lab

www.bio.davidson.edu/dorcas



The Davidson College Herpetology Laboratory is actively involved in salamander conservation through our outreach programs and research focusing on anthropogenic impacts on salamander populations. Our research on wetland-dependent species provides information important for habitat management. Our studies of urbanization effects and potential mitigation strategies for stream salamanders provides clear evidence of human's impact on stream ecosystems. The Davidson College Herpetology Outreach Program reaches thousands of people each year and helps the public to understand, appreciate, and conserve our natural resources, including salamanders.

Saratoga PLAN

www.saratogaplan.org

Saratoga PLAN is a not-for-profit land trust that works to preserve the rural character, natural habitats and scenic beauty of Saratoga County so that these irreplaceable assets are accessible to all and survive for future generations. We help landowners conserve their farmland, woodlands and natural habitats, and work to connect people to nature through an extensive trail network and 10 public nature preserves, for hiking, biking, cross country skiing, snowshoeing, and kayaking.



facebook

Follow all of the Year of the Salamander news and happenings on Facebook (<https://www.facebook.com/YearOfTheSalamander2014>) and Twitter (@YOSal2014).



Great News for Forest Salamanders, cont. from p. 1

data sets exist for Southern Appalachian plethodontid salamanders. James Organ (The City College of New York) conducted elevational transects in the Mount Rogers National Recreation Area, Virginia from 1957-1959 during his dissertation research. Later in his academic career, Dr. Organ resurveyed his original transects and examined new transects from 1990-1991. A State Wildlife Grant administered through the Virginia Department of Game and Inland Fisheries provided funding allowing a follow-up 50-year comparison of Dr. Organ's sites from 2008-2011.

In collaboration with Matthew Gray (University of Tennessee) and Bill Sutton (Tennessee State University), we focused on Whitetop Mountain, Virginia which is inhabited by 15 species of plethodontid salamanders (Figure 1).

However, only 12 species were encountered frequently enough during both historic and recent sampling to make comparisons. We sampled Dr. Organ's original transects using methods which allowed us to model detection. The historic data set did not account for detection, but we were able to apply recent detection probabilities to historic data. Accounting for imperfect detection is critical for historical comparisons as extinctions can often be overestimated if only direct comparisons are made. We also constructed



Figure 2. *Plethodon welleri*, a high elevation endemic, has expanded its range downslope. Photo by Kevin Hamed.



Figure 3. *Plethodon yonahlossee* has expanded its range both up and down slope. In addition to reassessing distributions, we were also able to document the tail-straddle walk of courtship. Photo by Kevin Hamed.

occupancy models with covariates that would have been similar during all sampling periods (e.g., elevation, aspect).

Comparisons were inconsistent as some species shifted upslope while others expanded downslope. However, we found no detectable range changes in more than half (7/12) of all species examined. Weller's Salamanders (*Plethodon welleri*), a high elevation endemic, decreased its lower range limit over the past 50 years (Figure 2). We also documented a Weller's Salamander nest 91 m lower than had previously been documented, which also supported downslope range expansions. The Virginia State Wildlife Action Plan lists Weller's Salamanders as a Tier 2 species with a very high conservation need. However, our results indicated that Weller's Salamanders in the National Recreation Area have increased their range and potentially could be downgraded in conservation and protection status. Yonahlossee Salamanders (*P. yonahlossee*), a Tier 4 species and thought to be

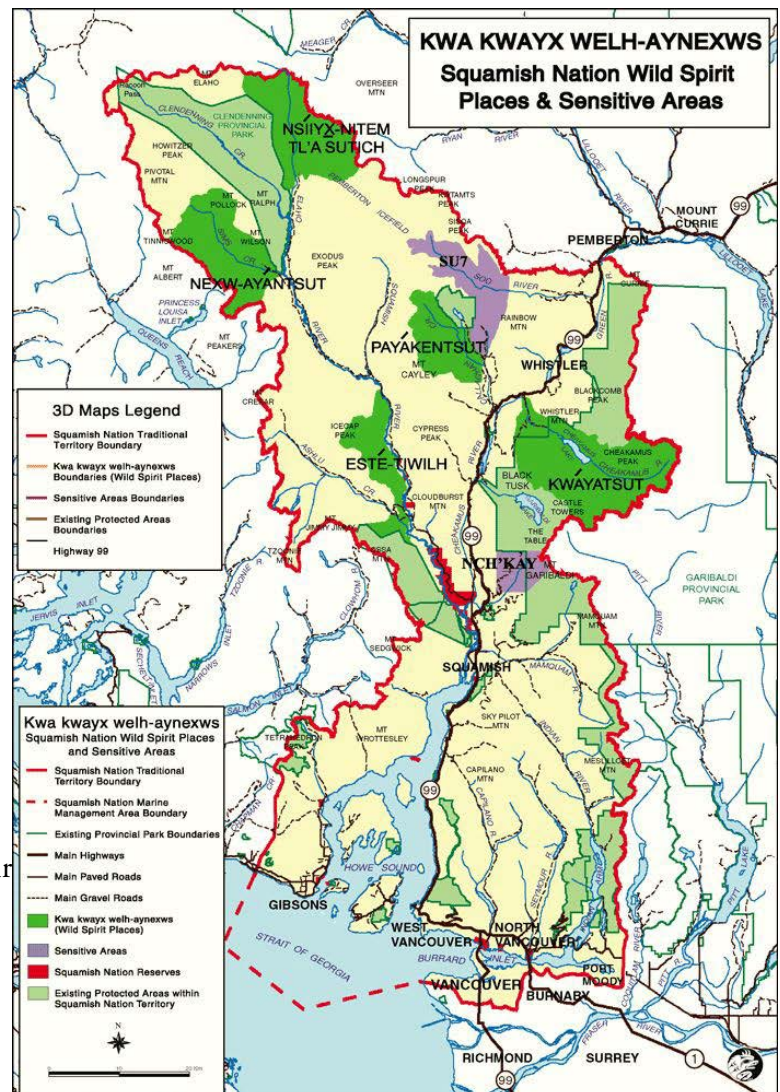
declining, have expanded their range limits both down and upslope since historic samples (Figure 3). Our results were encouraging for the future of these rare species as declines were not detected. However, Slimy Salamanders (*P. cylindraceus*), a common species in historic samples, fared the worst of all Plethodontids as they experienced range contractions. Lower range limits moved upslope and upper range limits shifted downslope. Red-backed salamanders (*P. cinereus*) shifted both their upper and lower range limits upslope. Most salamanders from the genus *Desmognathus* experienced no range changes over 50 years with the exception of the Seal Salamander (*D. monticola*), which had a slight increase in median midpoints, thus expanding upslope.

Without the funding of a State Wildlife Grant, the current status of Mount Rogers National Recreation Area salamanders would be unknown. Results from this project are encouraging and suggests that at least in this National Recreation Area, rare salamanders are thriving and less protection may be warranted. Future impacts such as climate change or diseases and pathogens could create new threats and salamander populations might require reassessment. However, most of the range of these rare salamanders in Virginia is entirely on public land which should provide an even greater level of protection.

Salamanders Have Spiritual Value for the Squamish Nation in British Columbia, Canada

By Dede Olson, US Forest Service

Chief Bill Williams of the Squamish Nation gave an inspiring welcome to the Society for Northwestern Vertebrate Biology who had convened their annual meeting in the town of Squamish, British Columbia in April 2013. Many messages conveyed by Chief Williams perked my interest, especially his reverence for salamanders. “Salamanders are very powerful to us,” he said, “they have the power to heal.” The Squamish Nation reveres salamanders both spiritually and as part of the forest ecosystems on their lands which are distributed north of Vancouver, B.C., along the recently re-vamped Sea-to-Sky Highway. “The Squamish connection to land is real and long term” said Chief Williams. They have designated ‘high spiritual value areas’ to look after their forests and the animals within them. One such stream area is designated for salamanders and it is closed to all but the spiritually prescribed Squamish people. Such areas are protected as important set-asides for their children’s-children’s children. In fact, they consider their land management decisions to reflect seven generations into the future. Chief Williams cited the Red Cedar trees that can be 1,500 years of age on their lands; “a 500-year plan is not enough”. The Squamish have been in B.C. for 10,000 years, and their legacy of the past is now reflected into a forward vision. For salamanders and the larger web of life in the B.C. forests, a future is being planned carefully by these careful ecological stewards. I admire the tenets of Chief Williams and the Squamish Nation. We can all learn from their wisdom.



Neurergus Newts in the Middle East, status and current distribution

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The geographical distribution and current conservation status of the three species of mountain dwelling newts of the genus *Neurergus* found in the Zagros Mountains in the Middle East are still not fully discovered. The critically endangered Kurdistan Newt *Neurergus microspilotus* (Nesterov 1916), the critically endangered Loristan (Kaiser's) Newt *N. kaiseri* (Schmidt, 1952), and the vulnerable Lake Urmia or Azerbaijan Newt *N. crocatus* (Cope 1862) are confined to the springs and streams of mountain woodlands of north and northeastern Iraq, northwestern Islamic republic of Iran, and southeastern Turkey.

Neurergus microspilotus is restricted to the Avroman Mountains on the Iraq-Iran-Turkey borders. In Iraq, recent surveys in Kurdistan region (2007 to 2014) resulted in the discovery of *N. microspilotus* at several new localities distributed along the northeastern mountains along the Iraq-Iran border. The newly discovered sites represent a major extension of the known range of the species in Iraq (Al-Sheikhly et al. 2013) (Fig.1). The Iranian distribution of *N. microspilotus* is limited to the forest streams of Kurdistan and Kermanshah provinces in the western Iranian plateau along the northwestern border with Iraq (Rastegar-Pouyani et al. 2013). During 2014, intensive field sampling in the mountains of Iraqi Kurdistan was performed. The surveys aimed to discover additional new localities for *N. microspilotus*, delineate the species geographical range, and estimate the population size in Iraq. In addition, collaborations between Iraqi and Iranian herpetologists have been conducted to advance conservation of the shared populations.



Figure 1: The critically endangered *Neurergus microspilotus* in the streams of northern Iraqi mountains. Photo: Omar F. Al-Sheikhly 2014.



Figure 2: The Iranian endemic The critically endangered *Neurergus kaiseri*. Photo: Robert K. Browne.

One of the flagship *Neurergus* species in the Middle East is *N. kaiseri*, which is endemic to Iran, with limited range in the southern Zagros Mountains. It is confined to the mountain streams and ponds of Khuzestan and Lorestan provinces. *Neurergus kaiseri* has received considerable public attention as an icon for amphibian conservation (ZSL 2013) and has also been listed as one of the top priority amphibian species for conservation by representatives of the IUCN Species Survival Commission Specialist Groups (Baillie and Butcher 2012). Recently, Mobaraki et al. (2014) intensively surveyed for *N. kaiseri* to delineate the known distribution and reassessed the *N. kaiseri* status in Iran. They estimated the total population to exceed 9,000 adults, which is considerably greater than the previously estimated population size of less than 1000 in the IUCN 2006 Red List assessment (Sharifi et al. 2009; 2013). Furthermore, Mobaraki et al. emphasized the need for a reassessment of the IUCN Red List conservation status of *N. kaiseri* (Fig.2).

Neurergus crocatus is restricted to the woodland streams and springs of south-east Anatolia, Turkey, and the mountains of northern Iraq, while its current distribution in Iran needs further surveys. Both *N. crocatus* and *N.*

microspilotus are allopatric species and have been shown to have a restricted range in Iraq and Iran. Al-Sheikhly et al. (2013) reported four new localities of *N. crocatus* from Iraqi Kurdistan, while it was recently rediscovered in northwestern Iran by Najafi-Majd and Kaya (2013). During 2014, intensive surveys of potential habitats in northern Iraq were conducted, supported by the University of Baghdad, and aimed to shed more light on the species geographical range and potential habitats. These efforts have resulted in the discovery of new localities of *N. crocatus* in northern Iraq (Fig.3).

The mountain dwelling *Neurergus* newts are living in sensitive aquatic environments that make them particularly vulnerable to environmental changes and have faced dramatic declines in their populations. Severe drought, habitat destruction, and harvesting for the pet trade are considered the major threats on *Neurergus* newts' survival in the Middle East.

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Figure 3: The vulnerable *N. crocatus* couple in the mountains of northern Iraq. Photo: Omar F. Al-Sheikhly 2014.



Wehrle's Salamander (*Plethodon wehrlei*) can be abundant in suitable habitats at mid to higher elevations in the northern Appalachians. Photo by Madelyn Messner, Year of the Salamander Photo Contest.

Forests & Hellbenders

By Max A. Nickerson, University of Florida, Gainesville, FL
USA

In 1968 we discovered a substantial population of Ozark Hellbender salamanders *Cryptobranchus alleganiensis* in the North Fork of the White River, Ozark County, Missouri, USA and our group has been studying these giant cryptobranchid amphibians for 46 years. The North Fork habitat and population studies enable us to present a case study examining the federally endangered Ozark Hellbender *C. a. bishopi* in the North Fork habitat. The early population estimate in a 2.67-km section was 428 adult and immature individuals/km and a portion of one riffle with 269 individuals. Resurveys in 2004-2006 have documented dramatic losses. Critical temperature studies showed that Hellbenders could survive temperatures exceeding 30°C, even though they preferred 20 -25°C. As likely contributing factors to declines, we have documented habitat loss and degradation, pollution, and support for exploitation for the pet trade. Also, there is evidence of numerous microbial pathogens affecting these animals. Conversely, there is currently little support for problems from introduced or native fishes (Rainbow and Brown Trout [*Oncorhynchus mykiss* and *Salmo trutta*], sculpins [Cottidae]), although the reintroduced Otter (*Lontra canadensis*) is suspected to prey on these salamanders. These various factors appear to be interwoven.



Conducting field surveys for Ozark Hellbenders (*Cryptobranchus alleganiensis bishopi*) in 1970: Left to right, Charles Mays (crouching) Rebecca Cooper (standing) and Max Nickerson (standing).



Ozark Hellbender (*Cryptobranchus alleganiensis bishopi*) from the North Fork of the White River, Ozark County, Missouri, USA. Photographs by Jeff Briggler (Missouri State Herpetologist).

and other facilities results in massive amounts of particulates washed into the river, covering all of our known Ozark Hellbender nests, and also filling the interstitial spaces in stream substrates that are used as refugia by juvenile Hellbenders and the macroinvertebrates that are their food. This sedimentation should greatly affect the carrying capacity of this population. The huge increase of visitors and river users causes increases in pollution, nutrients, and coliform bacteria, including *E. coli* levels at times too high for full-body contact. The reintroduction of 60 Otter into the river basin in 1992 correlates with

Jeff Humphries (North Carolina Wildlife Resources Division, Chapel Hill, NC, USA) called our attention to the relationship of contemporary populations of Hellbenders in protected forests. From his observations, coupled with our studies and colleagues' research, a paradigm emerges for the North Fork White River and its inhabitants. The removal of forests, especially from the riparian area, begins a cascade of disturbances to stream habitats. The exposed thin Ozark soil is sparsely vegetated and composed of sandstone, limestone, and dolomite layers which breakdown into sand and small calcareous particles. The increased amount of rainfall and flooding during the 1990s and 2000s, coupled with clearing for bridges, road building, canoe ranches, airstrip, cottages,



Herpetologist Max A. Nickerson has worked with Ozark Hellbenders in Missouri, USA since 1969.

a great increase in Ozark Hellbender injuries. Injuries from Otter predation attempts and the currently elevated microbiota of the river are suspected to interact, resulting in the lack or retardation of regeneration of Ozark Hellbenders' tissues. Although it appears to be a complex series of factors affecting today's Hellbenders, key points in the cascade of events track back to human uses of forests without consideration of secondary consequences for aquatic biodiversity.

The Last Dragons: Protecting Appalachia's Hellbenders

Freshwaters Illustrated has just released a short film, **The Last Dragons - Protecting Appalachia's Hellbenders**, about North America's largest salamander and its conservation need. Produced in Partnership with the US Forest Service, this film aims to raise awareness and appreciation for these rare and little-known stream-dwellers, and to help viewers understand how sensitive their streambed habitats can be in the biologically diverse rivers of Appalachia.



Watch **The Last Dragons** now on Vimeo!
<http://vimeo.com/wemayfly/thelastdragons>

The film features fantastic underwater footage of Hellbenders in their increasingly rare habitat: clean, cool streams with rocky bottoms.

Salamanders at the World Forestry Conference

by Deanna H. Olson, US Forest Service

Over 3,500 scientists from all over the world convened in October at the 2014 World Congress of the International Union of Forest Research Organizations (IUFRO) in Salt Lake City, Utah, USA. One current IUFRO focal area is 'Biodiversity and Ecosystem Services', and that thread was visible in numerous conference sessions.

I looked for that thread as I fine-tuned my schedule, to jump among concurrent sessions and maximize my exposure to a variety of topics. During an unscheduled block of time, I happened upon a vendor booth with the book *The Forest Unseen* by David George Haskell (University of the South, Tennessee, USA). Flipping through the pages, I alit on page 41 – the chapter entitled "Salamander"! He spent one year at a one-square-meter area of Tennessee forest, and had written about his insights. Plethodon salamanders were a significant part of his 1-meter forest world, and in a later chapter he spoke about the red eft he observed, a juvenile Eastern Newt. In my own way, stumbling upon these chapters in his book, I had discovered salamanders occupying a small part of the entire forestry congress as well.

I co-lead the IUFRO sub-division of Aquatic Biodiversity in Forests and convened one of the 170 technical sessions on Salamanders: World Icons of Aquatic Biodiversity in Forests. The seven speakers of the session were amazing, representing a broad array of taxa, and highlighting the forest ecosystem services tied to salamanders, forest salamander habitat requirements, and the complex array of stressors affecting these animals. In brief:

- A novel ecosystem service of woodland salamander presented by Hartwell H. Welsh, Jr. (US Forest Service, California) was their functional role in mediating carbon retention in the forest-floor leaf litter via predator-prey interactions. Please see his interview in this Newsletter!
- Forest habitat relationships were presented by:
 - o Kirsten Hecht (Univ. Florida) in her assessment of streams in protected and unprotected forests as habitat for Hellbender salamanders;
 - o Jessica Homyack (Weyerhaeuser Company, North Carolina, USA) who focused on the use of down wood

- microhabitats by terrestrial species;
- o Wesley Staats (Univ. Kentucky, USA) who used LiDAR to understand forest macrohabitat suitability;
- o Valorie Titus (Green Mountain College, Vermont, USA) who focused on the ramifications of pond habitat fragmentation for mole salamanders in Long Island, New York.
- Key threats were addressed by:
 - o Deanna Olson (US Forest Service, Oregon), who found reduced densities of stream-associated salamanders in areas managed by narrow stream-riparian buffers with upland forest thinning;
 - o Max Nickerson (Univ. Florida), who provided a comprehensive long-term study of composite threats of recreation, degraded water quality, siltation and embedded substrates, and novel predators to Ozark Hellbender populations in Missouri, USA. Please see his accompanying article about hellbenders in this newsletter.



Speakers in the forest salamander session of the 2014 World Congress of the International Union of Forest Research Organizations, from left to right: Jessica Homyack, Dede Olson, Hart Welsh, Max Nickerson, Kirsten Hecht, Wesley Staats, Valorie Titus.

One of the highlights of the conference for me was the presentation of the Collaborative Partnerships of Forests 2014 Wangari Maathai Award to Martha 'Pati' Ruiz Corzo from Mexico. This award recognizes extraordinary efforts by an individual to improve and sustain forests and the people who depend on them. In her impassioned acceptance speech, she touched us with her heart-felt truths. Here are some excerpts:

- It's now or never
- It's up to us who have the power to decide
- We have to keep that tapestry alive
- Play an orchestra of forest and wildland management
- Use the tools to rescue this society
- Let's plant the world
- Keep the old forest
- Build the sponge of soils and water
- Look for the sustainability symphony
- Local action, Love for the plant
- Improve our legacy for the ones to follow
- Let's make it happen

Photograph by Mónica Barrientos of FUNDAECO, a Guatemalan NGO, in the new Sierra Caral Reserve during a community wide celebration of the reserve's official declaration. The pink salamander piñata was one of several events organized to engage local children (and adults) and give them a sense of why the forests surrounding their community are so important and valued nationally and internationally. Thanks to Don Church, Amphibian Survival Alliance, for facilitating use of this photo in the Salamander News.

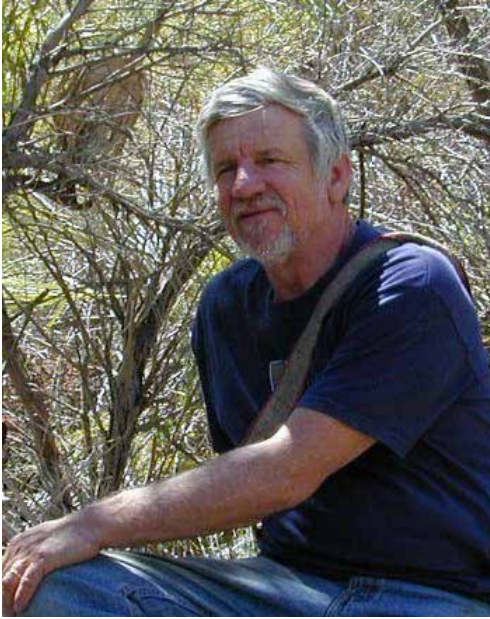


Upcoming Meetings & Events

Duck Lake Wetland Restoration Workshops, Duck Lake, Kaibab National Forest, near Williams, AZ. November 12 and 19, 9:00 am - 4:30 pm. FREE one-day workshops led by Tom Biebighauser. See <http://www.wetlandrestorationandtraining.com/wp-content/uploads/2014/07/Duck-Lake-Wetland-Restoration-one-day-workshops.pdf> for more info.

An Interview with Hartwell Welsh

By Dede Olson, U.S. Forest Service



Hartwell H. Welsh, Jr.

Hart Welsh is a research wildlife ecologist with the U. S. Forest Service, Pacific Southwest Research Station. He is a research scientist in the unit charged with the conservation of biodiversity, and is stationed at the Redwood Sciences Laboratory in Arcata, California. He has a B. S. Degree (Zoology) from the University of California at Berkeley, an M. S. Degree (Wildlife Biology) from Humboldt State University, and a Ph. D. (Wildlife Ecology) from U. C. Berkeley. He has previously worked in the Forestry and Natural Resources Department at U. C. Berkeley and the National Ecology Center (U. S. Fish and Wildlife Service) in Colorado. His primary research interest is herpetology and he has 80+ publications on the herpetofauna of the western United States and Mexico (Baja California). His current research agenda includes: (1) investigating the links between natural and anthropogenic landscape processes and the distributions and abundances of reptile and amphibians; (2) understanding the dynamics of stream networks, their channel characteristics, flow regimes, and riparian attributes as they relate to the distribution and abundance of lotic forest herpetofauna; (3) the use of amphibians as indicators of forest ecosystem health and integrity; and (4) the ecological roles of forest reptiles and amphibians.

How did you become interested in salamanders, and at what age?

I would have to say it goes back to when I was a toddler and saw my first herp in the wild, which was not actually a salamander but rather a horned lizard in the coastal mountains of southern California. I thought, wow, a baby dinosaur, and I was hooked on herps from that point on.

What is your current role in salamander research and conservation?

Salamanders are the most abundant vertebrates in our temperate forests, and as a research wildlife biologist with the Forest Service I am interested in the impacts of forestry on these amphibians, as well as an interest in their ecological roles in forest ecosystems.

Do you have a favorite salamander or group of salamanders?

Not too long ago a fellow researcher and I found evidence of a canopy-dwelling temperate salamander. Prior to that discovery, canopy-dwelling salamanders were known only from the new world tropics. We have since been involved in researching the natural history and ecology of this species, the Wandering Salamander (*Aneides vagrans*), in the canopy of old-growth redwood forest, a very challenging but fascinating research environment.

How would you describe a defining moment or favorite memory of working with salamanders?

Probably the discovery of a wandering salamander egg clutch 60 meters up the trunk of an old-growth redwood tree in a crevice behind a fern clump.

What do you believe is the biggest threat facing salamanders in the 21st century?

The combined human impacts of habitat destruction and global warming.



A Wandering Salamander, *Aneides vagrans*, of Humboldt County, California. Photo by William P. Leonard.

What are some of the ways that the public help in the conservation of salamanders?

It is a basic truth that one won't protect and care for something they know nothing about, so the education of the public about these amphibians and the important roles they have in forest nutrient cycling and particularly the carbon cycle is one of the best ways to bring them the attention and appreciation they need so people will understand their value and protect them.

What guidance would you give to natural resource managers and policy makers regarding salamander conservation?

I would say learn to manage forests so that resource extraction does not compromise the vital ecological processes provided by the native biodiversity of our forest ecosystems. We still have a long way to go to achieve that end, but the outcome of operating under

that paradigm is that we will preserve the most effective natural carbon sequestering mechanisms on the planet along with the high biodiversity that accompanies them and makes them so effective.

What advice would you give to young people (or adults) who love salamanders and want to work with them?

Just like Joseph Campbell says "follow your bliss."

Is there anything else you would like to add? (Are there any questions I should have asked that you're burning to answer?)

E..O. Wilson said it best when he said it is the little things that run the world. We need to understand and appreciate the roles of the little things, because if we take care of them we will be taking care of ourselves.

The Salamander Effect

By Mark Thompson, Ecologist, DWB Consulting Services

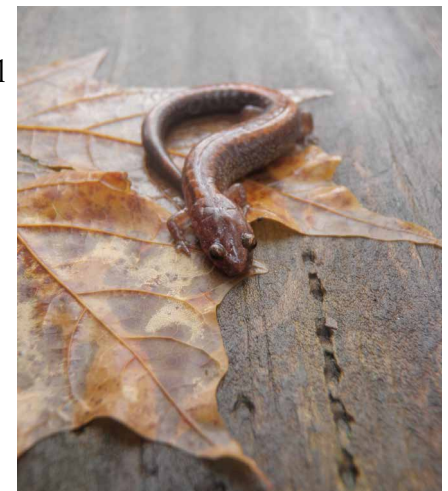
My first encounter with a salamander happened on my grandparents' farm in New Brunswick, Canada. I had never seen a salamander before. It had a beautiful dark-body with bright yellow spots. It squirmed in a muddy puddle and oozed a white milky juice onto my hands. I remember that day very well. The encounter left a lasting impression. The salamander effect had taken hold.

The foundations of our experience with nature translate into emotions that we carry with us through our lives. I am not alone in recounting the salamander effect from a childhood experience. It has hit many of us. Our experience with nature is a topic that conservation psychologists have started to think about as it relates to conservation in practice.

I use the salamander as an example, but it could be a spider, a caterpillar, or even a bird. It is the experience that counts. I refer to the salamander because it leaves a particular kind of imprint in our minds that I find fascinating—plus this is the Year of the Salamander! To some, they are frightening, but most kids express joy, if not awe, when they have one in their hand. Our experience with nature extends far beyond the constellation of emotions that develop in the immediate moment of direct contact. This constellation of emotional attachment to nature, or "biophilia", creates a place where nature continues to live in the human mind, a place psychologists have dubbed the cognitive niche.

The salamander effect is not just in our minds, it is much more than a psychological phenomenon. We are linked to them beyond the stories and the experiences that we live and relive. They expertly hide the heftiness of their biomass and affect us greatly through a diversity of ecological processes. They have threaded a network of lasting ecological impressions across the planet's biomes. Salamanders are nested in both aquatic and terrestrial food webs where they quietly pass resources along the food chain. They have dragged nutrients from water onto land, and vice versa, for over 165 million years!

As a conservation biologist, I wonder about the possibility of engineering the salamander effect into schoolyards and urban parklands. The rapid distancing of urbanized people from nature could be slowed by the intersection of a salamander's path. We must keep the wonder alive, to hold, and to protect salamanders as eternal bastions of the urban wildland to sustain and nurture our sense of biophilia across the generations.



An Eastern Red-backed Salamander, *Plethodon cinereus*, native to the eastern U.S. and southeastern Canada. Photo by Jenna Quinn, Year of the Salamander Photo Contest.

If you build it, they will come: Constructed wetlands attract forest salamanders, and others

by Jann Williams, Aquatic biologist, Eldorado National Forest, California

Tom Biebighauser can create a wetland in many various places: on a ridge top, in a swale, in a floodplain, or in a field, as long as the location is fairly level. Some locations seem like such unlikely spots for aquatic features to exist, but if you build it, they will come. A community of aquatic-associated species such as Sierra Newts (*Taricha sierrae*), Pacific Chorus Frogs (*Pseudacris regilla*), California Red-legged Frogs (*Rana draytonii*), bats, birds, dragonflies, butterflies, Western Pond Turtles (*Actinemys marmorata*), and aquatic insects will find the aquatic feature and make it their home. Tom designs and builds rain-catching wetlands that provide ephemeral habitat for an abundance of species. He is also very experienced at improving degraded in-stream stream habitat.

The Eldorado National Forest, California, decided to expand available aquatic habitat for a known population of California Red-legged Frogs, a threatened species under the US Endangered Species Act. The local frog population resides only in a small lake on private land surrounded by National Forest on the Georgetown Ranger District. They decided to hire Tom Biebighauser, a retired Forest Service wildlife biologist from Kentucky, to come and design potential pond sites within the same watershed of Bear Creek, and within a mile of the existing lake. Eldorado National Forest aquatic biologist, Jann Williams, had attended one of Tom's wetland construction trainings in Weaverville, California, along the Trinity River, and realized Tom's expertise would be perfect for increasing available habitat for the threatened California Red-legged Frog.

In the fall of 2013, Jann invited Tom to come to Eldorado National Forest and to help choose and design project locations. To their amazement, during that week he designed nine sites, many more than were originally anticipated! Four sites were to be ephemeral wetlands where a geotextile liner would be needed to hold water, three sites involved increasing pool habitat in the degraded and down-cut stream channel of Bear Creek, and two sites were existing ponds that needed improvements. In particular, an aim was to provide ephemeral habitat that would dry up during



Sierra Newt (*Taricha sierrae*).



California Red-legged Frog (*Rana draytonii*).



Heavy equipment used – an excavator and a Skidsteer digging an ephemeral wetland.



Class is laying-in what will be 3 layers of geotextile liners for the ephemeral wetland.



Filling trimmed and staked liners with 6 to 8 inches of soil.



A finished wetland ready for rainfall.

late summer because of the non-native, invasive Bullfrogs (*Lithobates catesbeianus*) in the Georgetown area. California Red-legged Frogs only need 3.5 to 7 months to metamorphose, whereas Bullfrogs need a year.

During the winter, spring, and summer of 2014, the Forest Service completed the necessary environmental documents for the agency requirements, and permits from the State of California. In order for the work to begin in early October, 2014, two sites dropped out because they were not able to obtain private landowner permission to use their road in time for the work to begin. That left three ephemeral wetlands with liners, two in-stream restoration sites, and two existing pond improvements.

From October 4th to October 11th, Tom and two volunteers assisted Jann with restoring aquatic habitat. Two volunteers, Robin Annschild from British Columbia and Kathlyn Franco from Save the Frogs, were dedicated assistants during the entire time. Forest Service heavy equipment operators John Rothballer and Jason Downing were amazing in their abilities to create exactly what Tom desired. Tom set aside two of the days for training on constructing two of the ephemeral wetlands with geotextile liners. There were 40 people that attended from many various backgrounds and agencies, including Trout Unlimited, US Fish and Wildlife Service, National Park Service, Bureau of Land Management, CA State Parks and Recreation, and others.

Special thanks go to partners Amphibian and Reptile Conservancy for paying for Tom's time and travel, and to three volunteers from Save the Frogs for their many days of assistance as laborers. Tom's organization is Wetland Restoration and Training LLC (www.wetlandsandstreamrestoration.org).



Tom Biebighauser, wetlands restoration specialist and workshop instructor, showing his book.



Two forest salamanders that couldn't be more different—the behemoth Coastal Giant Salamander (*Dicamptodon tenebrosus*), with a tiny Clouded Salamander (*Aneides ferreus*) on its head. The Clouded is safer where it is than it would be in front of the Giant, where it could expect to become lunch! Both species are native to the wet forests of the Pacific Northwest U.S., but Coastal Giants are associated with streams, where their large aquatic larvae are key predators, whereas Clouded Salamanders are most often found in rotting logs or tree stumps. Photo by William P. Leonard.

On the hunt for wild Chinese Giant Salamanders

By Helen Meredith, University of Kent, Zoological Society of London, IUCN Amphibian Specialist Group, UK

The Chinese Giant Salamander (*Andrias davidianus*) is a beast among amphibians. Weighing up to 50 kg, with a maximum length of around 1.8 meters, it dwarfs your average caudate. The only Salamanders to approach this colossal scale are its two closest relatives—the Japanese Giant Salamander (*A. japonicas*) and, to a lesser extent, the Hellbender (*Cryptobranchus alleganiensis*) from the United States.

The Chinese Giant Salamander is highly prized in China due to its delicate taste, and its body parts are used in traditional Chinese medicine. This has led to unsustainable and unregulated harvesting from the wild, despite the species' listing on Appendix I of CITES and as a Class II State Major Protected Wildlife Species in China. A vast Chinese Giant Salamander farming industry has engulfed most of the range, with farms springing up in the midst of wild salamander habitat. These operations present serious hazards to any remaining wild populations, due to illegal harvesting by those seeking to sell to farms and an added risk from disease spread through effluent water. Harmful pathogens such as Ranavirus may flow freely into waterways, with potentially dire consequences for any surviving wild populations. Farmed individuals may also be released back into the wild in the name of conservation with little or no post-release monitoring, which presents further disease risks and can compromise the genetic structure of wild populations.



The first Chinese Giant Salamander (*Andrias davidianus*) found in the wild by the project in Fanjingshan National Nature Reserve, Guizhou Province, China in 2014. Photograph by Benjamin Tapley.



Stream habitat for the Chinese Giant Salamander (*Andrias davidianus*) in the Fanjingshan National Nature Reserve, Guizhou Province, China. Photograph by Benjamin Tapley.

Chinese Giant Salamanders occupy a huge range across forestlands of China, encompassing the mountain tributaries of the Pearl, Yellow, and Yangtze Rivers across 17 provinces of China. However, severe declines have been noted since the 1950s as a result of overexploitation for the food market, habitat loss, and pollution. Found at high altitudes, this species is also potentially vulnerable to climate change. It occupies underwater hollows and cavities in streams with clear, fast-running water that flow through forested landscapes. But despite their bulk and unmistakable appearance, they are proving to be increasingly difficult to find. Some reports suggest that the number of individuals in farms (estimated at several million) now far exceeds the remaining wild population. However, distribution and population data are woefully lacking so the true situation is somewhat cloaked in mystery.

The Zoological Society of London launched a conservation programme in 2012 in collaboration with Guiyang University, Shaanxi Normal University, the Kunming Institute of Zoology, and Chinese Government partners. A sustainable future for the Chinese Giant Salamander is sought (www.ChineseGiantSalamanders.org), which includes building up a much clearer picture of the present-day distribution. The programme is therefore training Chinese conservation scientists to monitor wild giant salamanders, and range-wide surveys are being conducted to find out if this species is hanging on throughout its former haunts. An initial survey, involving capacity building of Chinese project members, was conducted in Guizhou's Fanjingshan National Nature Reserve in 2013. In spite of



Gong Yu-Zhou (Ph.D. student, Chengdu Institute of Biology) and Jay Redbond (Wildfowl & Wetlands Trust) conduct surveys for the Chinese Giant Salamander (*Andrias davidianus*).

good-quality habitat and tireless searching, not one individual was spotted. However, there was a glimmer of hope this year when a Giant Salamander was found during follow-up surveys in the outskirts of the reserve.

The search is now on in earnest. Trained survey teams are being deployed across the range during the April to October field season. A habitat modelling map was produced to aid selection of appropriate survey sites and, together with data on areas with the most historic records, 100 sites have been randomly selected. At each site, a detailed field survey will be carried out along 1-km stretches of river, both during the day and night. In addition to thorough searches of the water (leaving no possible hiding place uninvestigated), each survey will include speaking to local people about historic and current presence of Giant Salamanders in the area. Any proximate Chinese Giant Salamander farms will also be visited to check for the presence of amphibian chytrid fungal pathogens, Ranavirus, and other disease-causing agents.

This represents the most comprehensive attempt at surveying the Chinese Giant Salamander's range ever conducted. It has proved very difficult to find wild animals, so this crucial work will help form the much-needed evidence-base for in situ conservation activities. If you would like to support these efforts, please contact Professor Andrew Cunningham (A.Cunningham @ ioz.ac.uk) for more information. Surveys cost around \$1,500 per site.

Please spread the word and help us to build a brighter future for these amazing amphibians!

A Newt Note

One time, years ago, I was shuffling with my children through the vast wet moist dripping enormous thicketed webbed muddy epic forest on the Oregon coast, which is a forest from a million years ago, the forest that hatched the biggest creatures that ever lived on this bruised blessed earth, all due respect to California and its redwood trees but our cedars and firs made them redwoods look like toothpicks, and my kids and I were in a biggest-creature mood, because we had found slugs waaay longer than bananas, and footprints of elk that must have been gobbling steroids, and a friend had just told us of finding a bear print the size of a dinner plate, and all of us had seen whales in the sea that very morning, and all of us had seen pelicans too which look like flying pup tents, and how *do* they know to all hit cruise control at the same time, does the leader give a hand signal? as my son said, and one of us had seen the two ginormous young eagles who lived somewhere in this forest, so when we found the biggest stump in the history of the world, as my daughter called it, we were not exactly surprised, it was basically totally understandable that suddenly there would be a stump so enormous that it was like someone had dropped a dance floor into the forest, that's the sort of thing that *happens* in this forest, and my kids of course immediately leapt up on it and started shaking their groove thangs, and dancing themselves silly, and I was snorting with laughter until one kid, the goofiest, why we did not name this kid Goofy when we had the chance in those first few dewy minutes of life I will never know, well, this kid of course shimmed over to the edge and fell off head over teakettle, vanishing into a mat of fern nearly



Amy Jesswein, U.S. Forest Service, moving a Rough-skinned Newt, *Taricha granulosa*, off the road at the H.J. Andrews Experimental Forest in the Oregon Cascade Range. Photo by Tammy Verhunc, US Forest Service.

as tall as me, but the reason I tell you this story is that while we were all down in the moist velvet dark of the roots of the ferns, trying to be solicitous about Goofy and see if he was busted anywhere serious but also trying not to laugh and whisper the word doofus, one of us found a newt! O my god! dad! check it *out!*

Of course the newt, rattled at the attention, peed on the kid who held it, and of course that led to screeching and hilarity, and of course on the way home we saw damselflies mating, which also led to screeching and hilarity, but the point of this story isn't pee or lust, however excellent a story about pee or lust would be. It's that one day when my kids and I were shuffling through the vast wet moist forest we saw so many wonders and miracles that not one of us ever forgot any of the wonders and miracles we saw, and we saw tiny shreds and shards of the ones that are there, and what kind of greedy criminal thug thieves would we be as a people and a species if we didn't spend every iota of our cash and creativity to protect and preserve a world in which kids wander around gaping in wonder and hoping nothing else rubbery and astonishing will pee on them? You know what I mean?

-- Brian Doyle

From *Moral Ground*, Trinity University Press, 2011

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This essay appeared in the book *Moral Ground: Ethical Action for a Planet in Peril* (\$18.95) published by Trinity University Press. For more information, please visit www.tupress.org. Third party reprinting or re-use of this material is not permitted.

Brian Doyle is the author of *Mink River*, a novel set in coastal Oregon, and the recently released collection of essays *Children and Other Wild Animals*.

Lethal Consequences

By Dede Olson, U.S. Forest Service

This week, An Martel (University of Gent, Belgium) and colleagues report (2014: *Science* 346(6209):631-632) on the effects of the newly described chytrid fungus *Batrachochytrium salamandrivorans* (*Bs*) on 35 amphibian species from around the world. Using laboratory trials, they exposed anurans, caecilians, and urodeles to *Bs*. They found anurans and caecilians did not become infected, but urodeles (salamanders) did, and most test animals from European families Salamandridae and Plethodontidae rapidly died after infection. Furthermore, their work supports an Asian origin of *Bs*, implicating trade as the mechanism for the recent appearance of *Bs* in populations of the Fire Salamander (*Salamandra salamandra*) in Netherlands and Belgium. Then, to see if *Bs* occurs in trade animals, they tested skin samples of captive animals in Europe and Asia for *Bs*: 3 of 2,335 animals tested positive for *Bs*; all were Asian newts; 2 of which were known to have been imported to Europe from Asia in 2010. Several messages are coming from the Martel et al. studies. *Bs* may have lethal effects on a broad set of salamanders, yet some Asian species are resistant and may serve as carriers, and frogs, toads and caecilians do not seem to be susceptible to *Bs* infection. It appears that *Bs* has been imported from Asia to Europe, and was found in a couple of Asian newts that were captive in Europe. The implications are that *Bs* may already be in international collections via past trade,



Rough-skinned Newt, *Taricha granulosa*. Photo by Vikki Jackson, Year of the Salamander Photo Contest.

and current trade may be transporting the fungus. Due to the lethal consequences of *Bs* to many salamanders, this new disease threat has serious potential ramifications, which are different in scope and extent from the other amphibian chytrid fungus (*Bd*: *B. dendrobatidis*), if it were to be released into the wild where naïve animals have no resistance, especially forest salamanders such as some of those in related articles in this newsletter. Martel et al. reported that *Bs* infection was lethal to both the common North American Rough-skinned Newts (*Taricha granulosa*), and Eastern Newts (*Notophtalmus viridescens*), and the rare Middle-eastern Lake Urmia or Azerbaijan Newts (*Neurergus crocatus*). *Bs* disease risk could reset conservation priorities for many forest salamander populations.

Read the full article in *Science* at <http://www.sciencemag.org/content/346/6209/630.full>

Family of the Month: Rhyacotritonidae

The family Rhyacotritonidae has only four species, the torrent salamanders, including the Columbia Torrent Salamander (*Rhyacotriton kezeri*) and Southern Torrent Salamander (*R. variegatus*) shown here. These species occur in the western-most portion of the US Pacific Northwest, from the northern California Coast Range, through the Oregon and Washington Coast Ranges to the Olympic Peninsula of Washington state, and in the Oregon and Washington Cascade Range.



Southern Torrent Salamander, *R. variegatus*. Photo by William P. Leonard.



Columbia Torrent Salamander, *R. kezeri*. Note this adult male's squared vent lobes. Photo by William P. Leonard.

They live in headwater streams in moist forests and temperate rain forests. They are small, and strongly associated with riparian areas, rarely observed far from cold water, and often found in springs or seeps, or in the spray zone at the base of waterfalls.

Family: Rhyacotritonidae

Also known as:	Torrent Salamanders
Number of Species:	4 species in a single genus, <i>Rhyacotriton</i>
Region / Habitat:	<ul style="list-style-type: none"> - found only in the Pacific Northwest U.S.A.: western Washington, western Oregon, and the coastal forests of northern California - occupy low-flow, cool-water aquatic habitats including springs, seeps, small headwater streams, and backwater areas of larger streams in forested areas up to 5,900 ft (1800 m) above sea level
Physical Characteristics:	<ul style="list-style-type: none"> - small (<110 mm TL even for largest species) - very sensitive to desiccation because their reduced lungs and gills cause them to rely largely on respiration through their moist skin - difficult to distinguish among species except by location found: ranges do not overlap - adult males have distinctive, squared-off vent lobes - possess eyelids
Behavior / Development	<ul style="list-style-type: none"> - larvae have gills so diminutive that they can be difficult to see - nests have been found for only two species, <i>R. kezeri</i> and <i>R. variegatus</i> - adults can be found deep below the surface of the stream substrate, which may be why they prefer unconsolidated, rocky stream beds
Fun Fact:	Coastal Giant Salamanders (<i>Dicamptodon tenebrosus</i>) often prey on other smaller salamander species, but Southern Torrent Salamanders apparently taste bad to them: in a laboratory study, the Giants avoided them.