HIGH ABUNDANCE AND LOW DIVERSITY OF FOSSIL TETRAPOD VERTEBRATES IN THE SOLITE QUARRY (VIRGINIA-NORTH CAROLINA, UPPER TRIASSIC, 225 MILLION YEARS AGO). Alexander K. Hastings & Christina J. Byrd, Virginia Museum of Natural History, 21 Starling Avenue, Martinsville, VA 24112. The Solite Quarry, which spans the Virginia-North Carolina border, contains a Late Triassic (ca. 225 million-year-old) shale deposit with thousands of fossil plants, insects, and vertebrates. Among the plant fossils preserved, cycad fronds and stems of conifers are common. Numerous fossil insects and other arthropods have been collected from a three cm thick unit, including over 2,400 individual specimens, with many more to be catalogued. The dominance of aquatic insects suggests a shallow lake basin, but the phenomenal preservation and black sediments suggest a deeper, anaerobic setting. In either case, the site represents a relatively low-energy freshwater lake environment. 484 vertebrate fossils have been collected thus far. The rarest vertebrate species is the gliding reptile Mecistotrachelos apeoros, which was likely non-aquatic. Fish account for at least 140 of the vertebrates, including coelacanths, semionotiforms, and palaenisciforms. The remaining 340 vertebrate specimens belong to the aquatic reptile Tanytrachelos ahynis. Based on this sample, over 70% of the vertebrates and over 98% of the tetrapods belonged to a single species. The high abundance of insects and low abundance of predatory competition may explain why the Tanytrachelos are so common at Solite. Despite a high level of sampling, there appears to be very low levels of tetrapod alpha diversity during the Triassic of this region.

TESTING THE CEPHALIC ADHESIVE ORGAN HYPOTHESIS IN CYPRINID PROTOLARVAE. George E. Maurakis, College of Science, Virginia Tech, Blacksburg VA 24061. The objective of this research is to test the hypothesis that protolarvae of the phytophilous species, Hybognathus hankinsoni, Notemigonus crysoleucas, Carassius auratus, and Cyprinus carpio (Cyprinidae), contain cephalic adhesive glands. The hypothesis is if newly hatched larvae of phytophilous species attach to aquatic vegetation, then they have adhesive glands. SEM examination of 11 areas around the head (including dorsal, lateral, and ventral) of each specimen indicated there were no adhesive organs on the control species (S. corporalis), or test species (H. hankinsoni, N. crysoleucas, C. auratus, and C. carpio). The hypothesis that if newly hatched protolarvae of the phytophilous species attach to aquatic vegetation, then they have adhesive
organs, is rejected. Both SEM and light microscopy indicated the absence of adhesive organs on all areas of heads of all control and test protolarvae. The control species (*S. corporalis*) only had epithelial pores with no epidermal mucus. Although test species did not have adhesive organs, all of them had both epithelial pores and epidermal mucus. This mucus is probably responsible for the adhesion of protolarvae to aquatic vegetation, a hypothesis that could be tested in the future. Light microscopy indicated that the control species (*S. thoreauianus*) had a two cell-thick epidermis, whereas the epidermis of *N. crysoleucas* was about three to four cell layers thick. The three to four cell layer thick epidermis of *N. crysoleucas* is significant as some cells were goblet cells opening outside of the epidermis. Goblet cells have been reported to contain mucus (mucopolysaccharides), which can serve as an adhesive substance.

**Evolving Isolation Mechanisms Among Host-Foodplant Sources of a Parasitic Wasp Species.** Justin P. Bredlau & Karen M. Kester, Integrative Life Sciences & Department of Biology, Virginia Commonwealth University, Richmond VA 23284.

Parasitic wasps are highly diverse and play a major role in suppression of herbivorous pest populations. Recent research has demonstrated that previously identified species of some parasitic wasps are actually complexes of cryptic species resulting from adaptations to specific hosts or host foodplants. *Cotesia congregata* (Braconidae) is reported to attack at least 15 species of sphingid caterpillars, most of which are plant family specialists. We expanded on our earlier finding that wasps from *Manduca sexta* on tobacco (“MsT”) and *Ceratomia catalpae* (“CcC”) represent distinct genetic lineages with both pre- and post-zygotic barriers to reproduction by testing for post-zygotic barriers to reproduction among wasps from additional host-foodplant complexes. Wasps were collected from five host sources in two subfamilies of Sphingidae: MsT, CcC, and *Sphinx kalmiae* on privet (“SkP”) (Sphinginae), and *Darapsa myron* and *Eumorpha pandorus* from wild grape and Virginia creeper (“DmV” and “EpV”) (Macroglossinae). Reciprocal hybrid crosses were established between MsT and CcC wasps with each of these additional sources to test for the production of viable fertile hybrids. All reciprocal crosses produced hybrid females. Most hybrid females from CcC♂xMsT♀, CcC♂xEpV♀, SkP♂xMsT♀, and DmV♂xMsT♀ failed to produce F₂ offspring, whereas the reciprocal crosses produced viable offspring. Dissections of hybrid females revealed that sterile wasps lacked mature ovaries. The pattern of asymmetric hybrid dysgenesis indicates that *C. congregata* is diverged into at least two reproductively isolated groups.
COMPARATIVE THERMAL PERFORMANCE IN A CATERPILLAR-PARASITOID-HYPERPARASITOID TRI-TROPHIC SYSTEM. Kanchan Anand Joshi, Salvatore J. Agosta & Karen M. Kester, 1Department of Biology and 2Center for Environmental Studies, Virginia Commonwealth University, Richmond VA, 23284. Among the predicted impacts associated with global climate change, the effects of warming on organismal performance are of special interest because the rates of all physiological processes are temperature-dependent. Ectotherms such as insects, which are the most abundant and speciose animal taxon, are likely to be most affected due to their limited ability to control body temperature. Further, responses are likely to vary among species, which may have significant consequences for the dynamics of species interactions, such as those between hosts and parasites. In this study, we measured tolerance to extreme high temperatures, i.e., critical thermal maximum (CTmax) to test differences among component species in a tri-trophic system including a caterpillar, *Manduca sexta*, a parasitoid wasp, *Cotesia congregata*, and a hyperparasitoid in the genus *Spilochalcis*. Critical thermal tolerance (CTmax) varied significantly among the component species. The parasitoid wasp had the lowest CTmax and the hyperparasitoid had the highest CTmax. Both unparasitized and parasitized caterpillars had CTmax values that were intermediate between the parasitoid and hyperparasitoid. Our results demonstrate that species involved in multi-trophic interactions can vary in their tolerances to high temperatures and suggest that climate change may result in disruption of these interactions.

THE CENTER FOR BIODIVERSITY AT JOSEPH PINES PRESERVE. Philip M. Sheridan, Meadowview Biological Research Station, 8390 Fredericksburg Tnpk., Woodford, VA 22580. The Center for Biodiversity is a 1.5 acre parcel with a 3000 s.f. building adjacent to Meadowview’s 232 acre Joseph Pines Preserve. The Center supports the conservation, protection, and restoration of the endangered longleaf pine/pitcher plant ecosystem in Virginia. The Center allows Meadowview staff to train students and the general public about the need and value of rare plant and animal conservation, support ongoing scientific research and restoration efforts at the Joseph Pines Preserve, and demonstrate how a sustainable lifestyle can support habitat restoration. The Center property is part of a conservation plan to acquire over 2000 contiguous acres and provide one of the largest and best managed examples of a longleaf pine ecosystem in a multi-state area. This property represents the northern limit of the known range of the longleaf pine ecosystem. Habitat restoration has included mechanical clearing, chemical site treatments, prescribed fire, and controlled reintroductions of 18 indigenous rare plant taxa (including one
federally endangered species). Habitat is also provided for one federally endangered bird species (red-cockaded woodpecker), one state threatened bird species (Bachman’s sparrow), and one endangered fish species (black-banded sunfish).

PRESCRIBED FIRE INCREASES PLANT SPECIES RICHNESS IN RESTORED VIRGINIA LONGLEAF PINE HABITATS. Philip M. Sheridan, Meadowview Biological Research Station, 8390 Fredericksburg Tnpk., Woodford, VA 22580 & Alex Petzke, Department of Environmental and Forest Biology, State University of New York College of Environmental Science and Forestry, Syracuse, NY. Longleaf pine forests are known for high plant species diversity. A number of research studies in the southeastern U.S. support the hypothesis that high plant species diversity in longleaf pine forests is enhanced by disturbance provided by frequent fire. We were interested in determining whether this hypothesis was supported in longleaf pine restoration sites in Virginia, when Virginia longleaf pine habitats might rival plant diversity found in southeastern U.S. longleaf pine habitats, and if herbicide had a negative effect on plant diversity. We collected data on two longleaf pine nature preserves in Sussex and Prince George County, VA (Cherry Orchard Bog Preseve and Joseph Pines Preserve) and found that plant diversity increased over time with prescribed fire. We predict that Virginia longleaf pine forests, managed with regular prescribed fire, could achieve 50 species/m² within 48 years and rival diversity found in their southeastern counterparts. We also found that herbicide did NOT have a negative effect on plant diversity.

RESTORING GROUNDWATER HYDROLOGY IN A VIRGINIA PITCHER PLANT SEEPAGE WETLAND. Marissa Merhout & Philip M. Sheridan. Meadowview Biological Research Station, 8390 Fredericksburg Tnpk., Woodford, VA 22580. Pitcher plant habitats in southeastern Virginia are typically located on 0 order headwater seepage wetlands with marine deposits of sandy to sandy loam soils. Frequent fire is important in keeping pitcher plant habitats open and preventing the encroachment of competing vegetation. We initiated a longleaf pine/pitcher plant ecosystem habitat restoration program at our Joseph Pines Preserve in Sussex County, VA that included an aggressive assault on competing woody plant species. We observed an increase in groundwater in our seepage bogs after treatment of woody plant competitors and conducted graduate and intern research to measure the effects of woody plant control on groundwater hydrology at our preserve.
We found that conversion of a dense mixed oak/pine forest to longleaf pine savanna resulted in a 25% reduction in evapotranspiration, or a retention of almost 4 million gallons of water/year on a 24 acre watershed. We also found that seepage bog pore water was potable and met state certified lab criteria as drinking water with a t.d.s of 9. We found that rainfall enters the ground water column within two days of a rain event. These results indicate that Virginia pitcher plant wetland hydrology is very sensitive to woody plant invasion, that pitcher plant seepage water is very clean, and that surface activities could quickly contaminate the aquifer.