

and careers and college in general. The aim was for these students to consider college as an option and specifically a STEM discipline as a major. The modules were presented by enthusiastic faculty using demonstrations, laboratory exercises, and hands-on activities to stimulate the students. Participants were administered a questionnaire to assess this program. Students indicated that due to this class they are more likely to attend college and have a more favorable attitude towards pursuing a major in a STEM field. While the students, and high school student mentors are more satisfied with the Phase II remote delivery of this course, NSU faculty indicates it is still a problem. Both high school and NSU faculty indicate that getting the students to turn in assigned work is a problem. These perceptions have not changed significantly from Phase I. Changes to address these concerns are being planned.

Environmental Science

MICROBES IN COMPOST. Katherine B. Mireles & Carolyn Thomas, Ferrum College, Ferrum, VA. The purpose of this project was to determine the effects of composts age on the microbial composition of compost. Four compost samples were collected from the composting bins at Ferrum College in October 2013 and January 2014. The samples encompassed the various stages of the composting process (mesophilic, thermophilic, and curing). The actual temperature of the samples ranged from 0-39°C. The temperature of the compost was believed to have a large impact on the microbial composition. Fungi genera (*Aspergillus*, *Penicillium* and *Mucor*) were similar in both samples collected in October 2013. Similarly the bacteria genera, (*Staphylococcus* and *Bacillus*) were similar in the two October samples. When comparing the samples from the two collection dates, there were more differences in the variety of species of both bacteria and fungi. In January there were no cocci shaped bacteria present in any of the samples collected. *Bacillus* was the most commonly found genus of bacteria found with three out of 15 bacterial colonies isolated being *Bacillus*. *Staphylococcus* was the second most common genera found in the samples collected in October with three out 15 isolated bacterial colonies being identified as *Staphylococcus*.

STATUS OF A CONSTRUCTED WETLAND MITIGATION SITE IN SPOTSYLVANIA COUNTY, VIRGINIA. Michael L. Bass, Robert Ericson, Zack DelGrosso, & Rebecca Conway, Dept. of Earth & Environmental Sciences, University of Mary Washington. The purpose of this project was to analyze the health of two streams that run through Spotsylvania County, Virginia, Massaponax Creek and the Ni River. While Massaponax Creek is an urban tributary and flows through highly developed residential, business, and commercial areas, the Ni is an example of a more rural territory. Together, the streams illustrate the effects of urban development. Massaponax Creek has four sampling locations, while the Ni River has three. For each site, pollution levels were implied through a combination of macrobenthic sampling and water chemistry analyses such as phosphate and nitrate concentrations, total suspended solids and total dissolved solids, and fecal coliform levels. The results were compared to previous research to best identify how stream health changes over seasons. According to the macrobenthic results in the fall, nearly all sites saw an increase in

%EPT, except for Massaponax 208 and Ni Route 1, which fell from 80% to 54% and 88% to 78%, respectively. This improvement in the majority of Massaponax Creek %EPT may be a result of an increased proportion of *Trichoptera*, a more resilient macrobenthic invertebrate, while the Ni River experienced an overall increase in *Ephemeroptera*, which are less tolerant of pollutants. Although both Massaponax Creek and the Ni River are under legal limits for phosphate and nitrate concentrations, the phosphate levels are usually higher in summer on the Massaponax and winter for the Ni, while nitrates peak during the winter and spring for both streams. TDS rose during the summer and then declined, as precipitation rates fell. Massaponax Creek has higher TDS than the Ni, but that is reversed for TSS. Fecal coliform levels greatly decreased from summer into winter and fall, with both streams remaining under legal limits. The overall health of both streams has greatly improved, as suggested from the increased %EPT. This speaks to the recovery of the streams, resulting from repaired leaking sewer lines and decreased erosion risks from buffer zone stability in surrounding areas specifically near Massaponax Creek.

OYSTER RESTORATION ON THE HALF SHELL. Todd V. Janeski, Center for Environmental Studies and Rice Center, VCU, Richmond, VA. The VCU Rice Rivers Center confirmed the proof of concept (POC) to collect business generated oyster shells for the purpose of enhancing the Eastern Oyster (*Crassostrea virginica*) at sanctuary sites in the Virginia portion of the Chesapeake Bay. This successful pilot lead by the VCU Rice Rivers Center brought together private businesses, state and local government and nongovernmental organizations to collect nearly 12,000 lbs. of shell in four months. The POC was essentially a zero-budget approach to demonstrating a coordinated effort developing a single vision, to collect and return used oyster shell to the Virginia portion of the Chesapeake Bay for the purpose of wild oyster restoration. Through the demonstrated POC, the VCU Rice Rivers Center advanced the pilot into a Program where more than two dozen public, private and NGO partners are working to enhance restoration efforts. Non-traditional partnerships and outreach activities are effective strategies to engage a broad range of partners and the general public to become involved in Chesapeake Bay restoration programs.

SPATIAL MULTILEVEL MODELING WITH FUNCTIONAL COEFFICIENTS: APPLICATION TO CONOPY VEGETATION PERCENTAGE OF PLOUR RANGELAND, IRAN. Hossein Moradi Rekabdarkolaei, Dept. of Statistical Sciences and Operations Research, VCU, Richmond, VA. 23284. In spatial data analysis, data sometimes are nested in different groups. Hence, beside the spatial correlation, intra-class correlation is another type of correlation in the data. Considering this correlation in the structure of modeling brings us to a multilevel model. Such models provide an appropriate framework for the dependent data which are collected at different levels. In spatial multilevel models the coefficients can be functions of the other variables which lead us to functional model. In this paper we propose a spatial multilevel model with functional coefficients and in order to present the statistical inference, the Bayesian approach is utilized to analyze the model and illustrate its application in zoning of Plour's rangeland canopy vegetation percentage. Examining the proposed model, it is found to provide satisfactory results in compare with the classical

multilevel model, traditional spatial model, and multilevel model with spatially varying coefficients.

THE EFFECT OF WATER LEVELS ON CARBON DIOXIDE EMISSIONS FROM SOIL MICROCOSMS IN THE GREAT DISMAL SWAMP. Justin L. Weiser, Dept. of Organismal and Environmental Biology, CNU, Newport News, VA. Peatlands contain large amounts of stored carbon and form where soils are saturated for long periods. Anthropogenic disturbances can lower water tables and reverse dissimilation and sequestration functions. This study modeled the effect of restored and unrestored hydrology on carbon respiration at two soil depths. Sites are located in northeastern North Carolina within the Dismal Swamp State Park. Carbon dioxide (CO₂) efflux was measured in 24 cores at approximately 30-cm and 60-cm increments below the surface. Microcosm simulations were conducted for 61 days beginning with unrestored (31 days) and then restored hydrology (30 days). Efflux of CO₂ in unrestored microcosms ($1.76 \pm 0.07 \mu\text{mol CO}_2 \cdot \text{m}^{-2} \cdot \text{s}^{-1}$) was greater than in restored microcosms ($0.62 \pm 0.3 \mu\text{mol CO}_2 \cdot \text{m}^{-2} \cdot \text{s}^{-1}$). As a result, modeled annual emissions of CO₂ were significantly greater in unrestored ($13.37 \text{ t C} \cdot \text{ha}^{-1} \cdot \text{yr}^{-1}$) than restored ($3.7 \text{ t C} \cdot \text{ha}^{-1} \cdot \text{yr}^{-1}$) simulated conditions, suggesting that carbon sequestration benefits may be derived from raising water levels in the Dismal Swamp. Supported by: Sigma Xi Grant-in-Aid of Research.

Posters

NUTRIENT EXCRETION BY FRESHWATER SNAILS: EFFECT OF FEEDING AND BODY MASS. David McGuire & Maynard Schaus, Dept. of Biology, VWC, Norfolk, VA 23505. Consumer-mediated nutrient cycling can have an impact on the chemical composition of the environment. Nitrogen and Phosphorus are potentially limiting resources in freshwater habitats. As such, the rates of excretion of N and P by animals may be important to aquatic primary producers. In order to determine the factors that influence the rate of nutrient cycling, the levels of phosphate and ammonia excreted by pond snails were examined based on the sizes of snails and whether or not they had recently been fed. No significant effect was found for the differences in size between snails and the rate of excretion, but this study did conclude that undernourished snails excreted almost no phosphates, and only a small amount of ammonia. Therefore, the snail's contribution to the environmental levels of these compounds is reliant on the amount of food they eat.

MERCURY CONCENTRATIONS IN DOLPHINS STRANDED ALONG THE COAST OF VIRGINIA. E. Smith, E. Malcolm, R. Ellick², K. M. Phillips³, & M. Lynott³, Dept. of Earth and Environmental Sciences, VWC, ²Institute for Integrative Bird Behavior Studies, WM, ³Virginia Aquarium Stranding Response Program. This study was conducted to assess the mercury levels in bottlenose dolphins (*Tursiops truncatus*) from North Atlantic communities. This is the first study to assess the mercury levels in bottlenose dolphins off the coast of Virginia. Mercury, released from both anthropogenic and natural processes, is a highly toxic metal that bioaccumulates in the tissues of top marine predators, including dolphins. As a result, tissue concentrations of dolphins from Atlantic communities can be used as an indicator of relative mercury concentrations throughout their corresponding food webs. Tissues

were subsampled from 19 North Atlantic bottlenose dolphins collected by the Stranding Response Team of the Virginia Aquarium. This included a total of 18 liver samples, 13 kidney samples, two skin samples, and two muscle samples. The samples were freeze dried and then analyzed for total mercury using a DMA-80 at the College of William and Mary. Liver samples were found to contain the highest levels of mercury, followed by the kidney samples. The lowest concentrations were found in skin and muscle samples. There were no significant differences in concentration between sexes, though there was a positive correlation between length and mercury concentrations in the liver and kidney. The concentrations in these dolphins are most likely related to their age and their diet.

CITIZEN SCIENCE! A NOVEL APPROACH TO ASSESS THE IMPACTS OF URBANIZATION ON VIRGINIA BIRDS. Emily Crawford, Brady P. Donovan, Sujana M. Henkanaththegedara & Mark L. Fink, Department of Biological & Environmental Sciences, LWU, Farmville VA 23909. It has been shown that bird diversity has changed in response to urbanization. However, most previous studies have been narrowly focused and limited to localized study sites. We studied the statewide impact of urbanization on Virginia birds using a citizen science data base, eBird supported by the Cornell Lab of Ornithology and National Audubon Society. We assessed the impacts of urbanization on Virginia birds by comparing, 1) species richness, and 2) feeding guild composition between urban areas (cities/towns) and natural areas (state parks). Natural areas (N = 34, average richness = 115.18) had a significantly higher ($t = 5.659$, $P < 0.001$) species richness compared to urban areas (N = 34, average richness = 52.12). However, we failed to detect any significant differences of feeding guild composition between natural and urban areas for 6 feeding guilds of birds (N = 10; d.f. = 1; $F = 0.959$; $p = 0.226$). Our work shows the feasibility of utilizing citizen science data bases to assess the impacts of urbanization on wildlife populations covering large geographic areas. Future research involves expanding the analysis to the southeast United States to understand continental scale patterns.

EFFECT OF SEX ON NUTRIENT EXCRETION IN SEXUALLY DIMORPHIC FISH. Lisa Murray & Maynard Schaus, Dept. of Biology, VWC, Norfolk, VA 23505. Previous research on nutrient cycling by fishes has examined factors such as mass, temperature, and diet, which can have important effects on nutrient excretion. However, no previous study has examined the effect of sex on nutrient excretion, even though sex can have large impacts on fish size and reproductive investment. This study was undertaken to determine whether the sex of a fish impacts the excretion of nitrogen and phosphorus in *Betta splendens* and *Poecilia reticulata*. It was hypothesized that nutrient excretion would be significantly impacted by both mass and sex. We conducted direct nutrient excretion measures by examining changes in N and P concentrations over a 4 hour period. We detected no significant differences in excretion rates of males and females for *B. splendens* or *P. reticulata*. Ammonia nitrogen excretion was significantly higher in the fed fish treatment of *B. splendens*, compared to the unfed treatment. In both species, we detected no significant effect of mass, likely because we restricted our measures to adult fish of similar size. Our results indicate that sex is not likely important to nutrient cycling rates. Feeding history can have important impacts on excretion rates, especially for nitrogen.

EFFECTS OF BODY MASS AND TIDAL SUBMERGENCE ON NITROGEN EXCRETION IN THE RIBBED MUSSEL, *Geukensia demissa*. Jeff Illinik¹, Raluca Illinik² and Maynard Schaus¹, ¹Dept. of Biology, VWC, Norfolk, VA 23505 and ²Dept. of Molecular Biology & Chemistry, CNU, Newport News, VA 23606. *Geukensia demissa* is an abundant filter feeder that may have important effects on nutrient cycling within East Coast salt marshes. This species is thought to interact mutualistically with salt marsh cordgrass (*S. alterniflora*), as nutrient cycling by mussels fertilizes the cordgrass, which provides attachment sites for mussels. We investigated the effects of mussel mass and tidal immersion on nitrogen excretion by *G. demissa* in the Lafayette River, Norfolk, VA. Mussels were collected, cleaned, and placed in bags containing filtered estuarine water, which was later analyzed for total dissolved N using 2 point UV spectroscopy following persulfate digestion. We observed a significant negative correlation between mussel mass and mass-specific N excretion. N excretion remained consistently high through the tidal cycle, unlike P, which was previously shown to decrease dramatically after 1.5-3 hours of tidal immersion. This consistent release of N has important implications for cordgrass productivity, especially in the outer marsh zone where *G. demissa* is abundant.

EFFECT OF URBANIZATION ON SALT MARSH BIRD DIVERSITY AND COMMUNITY COMPOSITION. Maynard Schaus & Mark Petersen, Dept. of Biology, VWC, Norfolk, VA 23505. The impact of urbanization on salt marsh bird communities was investigated in the Lynnhaven River estuary, Virginia Beach, VA during summer 2012-2013. Bird diversity, abundance, and community composition was compared across 18 sites grouped into 4 urbanization categories (low, medium, high, and very high). The intermediate disturbance hypothesis predicted the highest diversity and abundance in areas of moderate disturbance, in this case the medium to high urbanization categories. However, diversity and abundance did not differ significantly with urbanization. Bird community structure differed significantly with urbanization, as Great Blue Heron and Purple Martin were more abundant in areas with low urbanization, and generalist species (e.g., Laughing Gull, Common Grackle, Herring Gull) dominated in areas with very high urbanization. This shift in bird community structure is similar to the type of shift observed in forest bird communities across a gradient of urbanization. However, unlike forest bird communities, the intermediate disturbance hypothesis was not supported.

COMPARATIVE STUDY OF WATER QUALITY PARAMETERS IN NI RIVER AND MASSAPONAX CREEK IN SPOTSYLVANIA COUNTY, VIRGINIA. Robert K. Ericson, Zack DelGrosso, Rebecca Conway, & Michael L. Bass, Dept. of Earth & Environmental Sciences, University of Mary Washington. The goal of this research was to determine the health of two Spotsylvania County streams, the Ni River and Massaponax Creek, in Virginia. The streams illustrate the effects of urbanization, since the Ni River is a rural tributary and Massaponax Creek travels through a more developed area. At four sites on Massaponax Creek and three on the Ni, macrobenthic samples were taken as bio-indicators of pollution. Water chemistry testing then supported this analysis, such as calculating phosphate and nitrate concentrations, total suspended solids and total dissolved solids, and fecal coliform levels. Comparisons between the two streams across different seasons illustrate how the overall health of

each stream ecosystem may be impacted by land use and intensified human expansion. According to the fall macrobenthic results, nearly all sites saw an increase in %EPT, except for Massaponax 208 and Ni Route 1. Even though both Massaponax Creek and the Ni River are under EPA legal limits for phosphate and nitrate concentrations, the phosphate levels usually rose in summer on the Massaponax and winter for the Ni, while nitrates peak during the winter and spring for both streams. TDS increased during the summer and then declined, as precipitation rates fell. Massaponax Creek has higher TDS than the Ni, but that is reversed for TSS. Fecal coliform levels greatly decreased from summer into winter and fall, with both streams remaining under legal limits. This speaks to the recovery of the streams, resulting from repaired sewer lines and decreased erosion risks in surrounding areas specifically near Massaponax Creek. Due to the majority increase in %EPT, decreased concentration of nitrates and phosphates, and reduced fecal coliform levels, the Ni River and Massaponax Creek have generally seen an improvement in overall health.

Medical Sciences

THE ACTIVATION STATUS OF RHEB IN PEMETREXED TREATED HUMAN CANCER CELLS. C. M. Bell, S. Agarwal & R. G. Moran, Dept. of Pharmacology & Toxicology, Virginia Comm. Univ., Richmond, VA 23298. Rheb (Ras homolog enriched in brain) is a small GTPase essential for activating mTORC1 (mammalian target of rapamycin complex 1) when loaded with GTP. mTORC1 activation increases cell growth by promoting protein synthesis and lipogenesis. Tuberous sclerosis protein 2 (TSC2) negatively regulates mTORC1 by stimulating the GTPase activity of Rheb. Pemetrexed (PTX) is a multi-targeted antifolate drug that suppresses tumor growth by obstructing folate metabolism and indirectly activating AMP activated kinase (AMPK). AMPK-activators inhibit cell growth by activation of TSC2 and deactivation of the mTORC1-partner protein, Raptor. We have shown that PTX treatment does not increase the activating phosphorylation of TSC2, but that mTORC1 activity is still significantly decreased. Further, we have also shown that in cells null for p53, more Rheb is associated with Raptor and mTORC1 activity is increased. Thus, two methods have been developed to measure the levels of Rheb-bound nucleotide. Coupled enzymatic assays using nucleoside diphosphate kinase were employed to convert GTP to ATP, and the ATP quantified in a luciferase assay. Corresponding GDP was converted to $\gamma^{32}\text{P}$ -GTP and quantified by reverse phase-HPLC and liquid scintillation counting. Alternatively, cells were metabolically labeled with ^{32}P orthophosphate and the Rheb-bound nucleotides resolved by TLC. These two methods show the levels of Rheb-GTP to be increased in p53 null cells and surprisingly slightly increased in AICAR or PTX treated cells. Further studies aim to elucidate these data, specifically by assaying subcellular compartments of the cell for Rheb activation.

TOWARDS UNDERSTANDING MOLECULAR INTERACTIONS OF ETHYLENEDIOXY COUNTERPARTS OF MDMA AND METHYLONE AT hDAT. F. T. Sakloth¹, F. Del Bello¹, R. Kolanos¹, J. Partilla², P. D. Mosier¹, M. H. Baumann² & R. A. Glennon¹, ¹Department of Medicinal Chemistry, VCU, Richmond, VA 23298 and ²National Institutes of Health, NIDA, Baltimore, MD 21224. MDMA ("Ecstasy")