developments and contribute to the development of spaceflight as well. Continued advances in aerospace research required well trained researchers. To this end, NASA-Langley participates in mentorship programs to encourage high school students to become researchers. The first author of this paper has been a mentor for this program and the second author of this paper has been a student.

FEDERAL FUNDING OF AERODYNAMIC RESEARCH IN THE UNITED STATES. M. Leroy Spearman, NASA-Langley Research Center, Hampton, VA 23681. In 1898 the Assistant Secretary of the Navy, Theodore Roosevelt reported to the Secretary of the Navy of the potential of aviation for use in war. A joint board was appointed (Army & Navy) to consider the role of aircraft in warfare. In April 1898 the Board's report favored the value of aviation for military purposes. In 1910 Capt Washington I. Chambers was designated officer in charge of Navy aviation matters. The Navy constructed an Experimental Model Basin . In 1912, at the urging of Capt. Chambers, President Taft appointed a board to consider a national aerodynamic laboratory. Legislation to create the laboratory was introduced in Congress in 1913 but was defeated. When war broke out in Europe in 1914 it was apparent that European countries had adapted the airplane and that development in the U.S. was lagging. Charles D. Walcott of the Smithsonian Institute undertook the effort to get approval for a federally funded aerodynamics laboratory. In January 1915, Assistant Secretary of the Navy, Franklin D. Roosevelt endorsed a resolution introduced in Congress for the creation of an advisory committee for aeronautics and suggested that it be attached to the Navel Appropriations Bill. The bill was approved on March 3, 1915. President Woodrow Wilson signed a bill that established the National Advisory Committee for Aeronautics (NACA), now the National Aeronautics and Space Administration (NASA), that provides federally funded research for aeronautics and astronautics.

## Agriculture, Forestry and Aquaculture Science

EFFECTS OF DIFFERENT ORGANIC APPLICANTS ON SOIL CONDITIONS FOR BLUEBERRY PRODUCTION. Jeremiah D. Vallotton & Roman J. Miller, Dept. of Biology, E. Mennonite University, Harrisonburg VA, 22802. Blueberries are a potentially profitable crop that have yet to be tested under organic agricultural practices in the Shenandoah Valley of Virginia. Blueberries require a low pH between 4.8 to 5.5 and high levels of organic matter for optimal growth. In this experiment, four treatments of organic matter (horse manure, sheep manure, pine needles, and compost) were used to grow blueberries, along with a control plot where chemical herbicides and pesticides will be used. Elemental sulfur was used on all plots to lower the pH of the soil over time. Soils were sampled and analyzed to measure soil pH, soil organic matter, and nutrients. Tests suggest that the organic treatments had a highly positive effect on the soil organic matter levels, while decreasing the pH yielded higher levels of available Mn and Fe, but Cu remained low. Soil pH mostly decreased to desirable ranges, but in some of the plots application of sulfur resulted in less change. The most recent tests indicate that the pH continued to decrease, from an average of 6.1 to 5.5,

though the manure treatments were still somewhat high. Organic matter increased by 19%. Organic amendments provide excellent conditions for successful organic production of blueberries. (Research supported in part by USDA Specialty Crop Grant # 2008-427, Commonwealth of Virginia, Department of Agriculture and Consumer Services.)

ACTH 22-39 INDUCES HYPERPHAGIA AND ANXIO-LIKE BEHAVIORS IN COBB-500 CHICKS. Caitlin A. Reid, Evin L. Guilliams, and Marissa L. Smith. Dept. of Biol., Radford University, Radford, VA 24141. The melanocortin system plays a key role in the regulation of appetite in both mammals and birds. A member of this system, ACTH 22-39, is cleaved from proopiomelanocortin and is a well known insulin secretagogue. However, it also increases food intake in mammals. To our knowledge its effects are unreported in avians. When centrally administered, ACTH 22-39 (0, 2, 4, 8 nmol) increased food intake in fed 4-day post hatch Cobb-500 chicks but did not affect whole blood glucose concentrations. That ACTH 22-39 is an insulin secretagogue and food intake increases glucose may explain this lack of a net effect on glucose concentrations. To determine if food intake was competitive with other behaviors a 60 min behavioral analysis was conducted which revealed that ACTH 22-39 also increases the number of jumps and escape attempts. Other behaviors were not affected. These data may lead to novel treatments for anorexia in other species, including humans.

COMPARATIVE GENOMICS ANALYSIS OF GENETIC FACTORS INFLUENCING RESISTANCE TO GASTROINTESTINAL PARASITES. Damarius Fleming & Glenn C. Harris, Dept. of Biology, Virginia State University, Petersburg, VA 23806. Gastrointestinal (GI) parasite infections are a primary limitation to livestock production. As nematode resistance to anthelmintics continues to spread worldwide the search for factors that confer genetic resistance gains new importance. We use a mouse model as a framework for comparative genomic mapping with cow, rat, chicken and human to identify the genetic factors associated with phenotypes that are resistant to GI infections. A total of 10 regions in mice were matched with syntenic regions in the other species and an accumulated list of candidate genes was assembled and prioritized. Most candidate genes identified have a function involving cytokine function or intestinal immune regulation. These results confirm that GI nematode response is multifactorial, potentially including the interaction of many genes, and provide a list of prioritized gene candidates that represent prime targets for individualized functional analysis in future studies.

DEVELOPMENT OF DNA PROBES FOR DETERMINATION OF SPECIES IN MIXED POPULATIONS. Tiffany Toledo and Brian L. Sayre, Dept. of Biol., Virginia State Univ., Petersburg, VA 23806. A quick reliable test to determine the species of organisms found in environmental samples has far reaching potential. An example may be to determine the source of contamination in a ground water location during a disease outbreak. We are developing a technique to use DNA for determination of individual species in a mixed species environment. The objective of this experiment was to

develop a DNA probe for use in this technique. The DNA of mixed plant samples was amplified using PCR with primers developed for the NADH dehydrogenase subunit 5 gene of the mitochondrial DNA. The PCR product was attached to an Au nanoparticle and DNA binding determined with spectrophotometric anlayses. Ultimately, these nanoparticle-DNA probes will be used to create a detection system that will have increase sensitivity and capability to detect DNA from multiple organisms in an environmental population.

HOW TEMPERATURE AND LIGHT AFFECT TOMATO YIELD IN WINTER-SPRING GREENHOUSE PRODUCTION. Mark E. Kraemer and Françoise Favi, Agricultural Research Station, Virginia State University, Petersburg, Virginia 23806. Rising energy costs have been a significant factor in winter-grown greenhouse tomato production. Propane prices generally track the cost of oil. It was proposed that reducing temperatures in the greenhouse during periods of cloudy weather could reduce costs with little to no loss in tomato production. Previous research indicated that under low light conditions (PAR<100μE) the photosynthetic rate of variety Trust leaves, the most commonly grown greenhouse tomato used in the mid-Atlantic region, was not significantly different at 64°F than at 74°F. In this research, two sections of a glass greenhouse were used to compare tomato yield under different temperatures. Daytime temperatures in the west section were set to 74°F whereas east section was set to 64°F, before fans would come on. Night temperatures were the same in both sections (60°F). The overall difference in temperature between the two sections was 2.3°F. After 8 weeks, the warm section yielded 27% more ripe fruit than the cool room. However, the total weight of tomato fruit (harvested and green on the vine) was the same in the two sections. It appears that warmer temperatures do not increase tomato fruit biomass but promote fruit ripening. Because fruit biomass is not lost with cooler temperatures under low light conditions it may be possible to use temperature to time fruit production to market needs, or to save energy during periods of unusually cold weather.

INFLUENCE OF SHADOW COSTS OF FRESHWATER SHRIMP PROUCTION IN VIRGINIA. Brian Nerrie, Virginia Cooperative Extension, Virginia State Univ., Petersburg VA 23806. Consumers in the United States eat more shrimp than any other seafood. A great majority of shrimp are imported or harvested by domestic fishers in areas such as the Gulf of Mexico. Freshwater prawn (Macrobrachium rosenbergii) farming is presently expanding in Virginia. The prawn not only has established its own market, but has been shown to be an excellent substitute for marine shrimp. During 2009 prawn selling prices ranged from $15.40 – 22.00/kg. Production averaged between 500 – 1000 kg/ha and net returns ranged from $7700 – 22,000/ha. A producer association was subsidizing some input costs. Shadow costs, the maximum price a farmer is willing to pay for an extra unit of input, were examined for two major production inputs: sinking feed and juvenile shrimp. Feed cost ($0.66/kg) would have to increase by more than 100% to impact on the decision to produce. Juvenile shrimp costs would have to increase from $0.06/shrimp to more than $0.17/shrimp to discourage production.

USE OF WETLANDS TO REDUCE TROUT PRODUCTION EFFLUENT NUTRIENTS. Bryan Taliaferro & Brian Nerrie, Dept. of Agriculture, Virginia State Univ., Petersburg VA 23806. Wetlands are among the most productive ecosystems in the world that can filter nutrients, sediment, and pollutants from surface and ground water, absorb excess floodwater and rainwater, and provide habitats to numerous plants and animals. Constructed wetlands are engineered marshes that duplicate natural processes to cleanse water, process livestock effluent, human waste, and drainage water. With the worldwide demand for aquaculture products increasing, production of trout requires substantially high amounts of quality inflow water. This causes an increase in effluents that are discharged to the environment with enhanced nutrient and solid concentrations. Effluents contain significant amounts of organic and inorganic nutrients such as nitrogen and phosphate. Forms of nitrogen found are nitrogen – $N_2$, nitrate – $NO_3$, ammonium nitrogen – $NH_4$. Wetlands can be used as a cost-saving alternative treatment method that can combine both mechanical and biological effluent treatment. Wetland plants can be used for their ability to absorb nutrients through surface or sub-surface flow of water through the wetland. Certain plants can be found commonly around wetlands and make a greater contribution to the percent nutrient removal under low-load conditions than high-load. For wetlands that treat trout effluent with high loads of nitrogen (3.2 to 15.6g N $m^{-2}d^{-1}$) to wetlands with lower loads (0.4 to 2.0g N $m^{-2}d^{-1}$), plants assimilated on 1 to 4% of the nitrogen in the higher loads, as opposed to 18 to 30% of nitrogen in the lower loaded systems. This is significant in that with in a low load trout production, a constructed wetland of a particular size with the incorporated plants can reduce the amount of nitrogen released into the environment. In conclusion, wetlands can be a less expensive and more environmentally efficient method of removing nutrients from trout effluent as well as other sources if necessary.

A NEW PROPOSED STANDARD WEIGHT EQUATION DERIVED FROM HISTORICAL WEIGHT-LENGTH DATA TO CALCULATE RELATIVE WEIGHT OF CHANNEL CATFISH FINGERLINGS. Edward N. Sismour, Agricultural Research Station, Virginia State University, P.O. Box 9061, Petersburg, VA 23806. A standard weight ($W_s$) equation for calculation of relative weight ($W_r$ = observed weight / $W_s$ x 100) of channel catfish, *Ictalurus punctatus*, grown in aquaculture is proposed. The function, log $W_s$ = -5.163 + 3.042 · log[total length ($L_T$, mm)], was derived using the RLP technique from nine weight-length relationships originally published as producer guidelines. It was compared to an equation published by Brown, Jaramillo, Gatlin, and Murphy (1995) for feral channel catfish and to Fulton's K using published mean weights-at-length of pond-raised catfish that received supplemental ration, observed weights-at-length of catfish grown in cages, and observed weights-at-length of feral catfish from the James and Rappahannock rivers, Virginia. $W_{s\,\text{<proposed>}}$ was ~50 percent higher at 7 cm and ~12 percent lower at 58 cm compared to $W_{s\,\text{<established>}}$. $W_{r\,\text{<proposed>}}$ increased linearly and $W_{r\,\text{<established>}}$ decreased nonlinearly with $L_T$ for catfish receiving supplemental ration. Among cage-grown catfish, $W_{r\,\text{<proposed>}}$ and K showed no length-bias after three weeks. Among feral catfish, $W_{r\,\text{<proposed>}}$ showed no length-bias from 7 cm to 40 cm whereas $W_{r\,\text{<established>}}$ decreased and K increased with $L_T$. $W_s$ predicted by the proposed equation for channel catfish from 7 cm to 40 cm and

$W_s$ predicted by the equation of Brown et al. for channel catfish greater than 40 cm are suggested as a single reference guideline for channel catfish producers in lieu of the variable guidelines that are currently available.

TROUT GROWTH UNDER ALTERNATIVE FEEDING LEVELS. Terrone Jaspers & Brian Nerrie, Dept. of Agriculture, Virginia State Univ., Petersburg VA 23806. Rainbow trout (Oncorhynchus mykiss) is the primary cold water aquaculture species in Virginia. Four 7000-liter outdoor tanks were stocked with equal size (80 g) and number of trout (50) on 10 March. Water in the tanks was provided with diffused air from a centralized air pump. Each trout population was fed a 36% crude-protein floating pellet at a rate of 50, 100, 150 and 200 g/day. The study was terminated after 30 days. Water quality parameters were monitored in each tank. Alkalinity was 30 ppm with the pH ranging from 7.5-8.5. Ammonia levels were not detectable. Dissolve oxygen concentrations were consistently greater than 5 ppm. High temperatures (>22°C during the fourth week of the study resulted in the termination. Feed conversion ranged from 1.5 to 1.9. Average sizes of trout at harvest were: 98g (fed 50g); 111g (fed 100g); 128g (fed 150g); 160g (fed 200g.)

IDENTIFICATION OF CANDIDATES GENES FROM SHEEP QTL REGIONS USING A SYSTEMS BIOLOGY APPROACH. Brian L. Sayre, Dept. of Biol., Virginia State Univ., Petersburg, VA 23806. Variability in the genomic regions defined by QTL studies for parasite resistance has hindered the identification of candidate genes for selection. A pathway analysis combined with a haplotype analysis across species can narrow the potential candidate gene list down significantly. Data from QTL regions were collected from published projects in sheep, cattle, mice, rats, and human. The complete gene list was compared to the KEGG pathway database. Identified genes from the pathways were compared to determine haplotype differences between the CBA and SWR strains of inbred mice, a known model for parasite resistance. The pathways identified were Fc epsilon R1 signaling pathway, focal adhesion, regulation of actin cytoskeleton, ubiquitin mediated proteolysis, MAPK signaling pathway, and pathways in cancer. Of 172 pathway genes belonging to at least one QTL data set, over half were also found in a QTL region in another species, and 10% were found in QTL regions from four of the five species. Comparisons of the CBA to SWR HapMap indicated that of the 40 possible SNPs, 20 SNPs were differentially identified in 15 genes between the model strains. This methodology has promise as a mechanism to improve the process of candidate gene identification from QTL regions. Improvement of the candidate gene identification process in turn will lead to increased identification of relationships among genes and economically important phenotypes.