8th ANNUAL NEW ENGLAND ENVIRONMENTAL RESEARCH SYMPOSIUM

BRIDGEWATER STATE COLLEGE
JOHN JOSEPH MOAKLEY CENTER

Saturday, November 14, 2009
9:00 AM - 3:00 PM

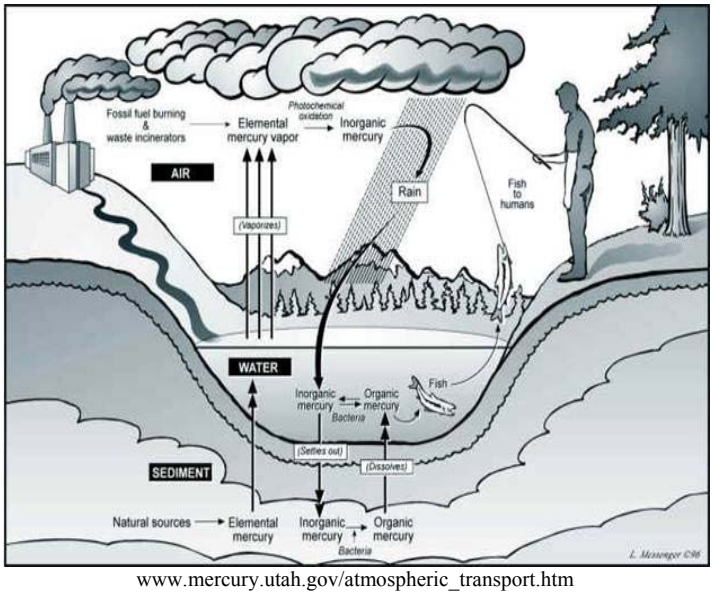
COMPLETE PROGRAM AND POSTER ABSTRACTS

8th ANNUAL NEW ENGLAND ENVIRONMENTAL RESEARCH SYMPOSIUM

Saturday, November 14, 2009
Bridgewater State College Moakley Center

Symposium Theme: "Environmental Analysis"

The 8th Annual New England Environmental Research Symposium will focus on undergraduate research posters (including completed, in progress, and proposed research in all environmental disciplines from colleges and universities in the Northeastern U.S. Since its inception in November 2001, the Symposium has averaged 100 attendees and over 40 student poster presentations. This Symposium provides an annual forum for discussion of issues related to environmental research and education particular to the New England region, and has opened doors to collaborations in research and education among the participants.



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- **Northeastern Section of the American Chemical Society**

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http://www.bridgew.edu/sustainability/

The Center for Sustainability at Bridgewater State College fosters the study and application of sustainable practices both on campus and throughout the region. The Center views a sustainable society as economically vibrant, environmentally sound, and socially just, now and into the future. The Center's goal is to use the knowledge and abilities of the BSC community to make sustainable practices an integral part of our campus, and to share these efforts with regional and global stakeholders.

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8th ANNUAL NEW ENGLAND ENVIRONMENTAL RESEARCH SYMPOSIUM

Saturday, November 14, 2009
Bridgewater State College Moakley Center

PROGRAM

8:00 – 10:00 AM Registration and light breakfast in Moakley Atrium

9:00 AM Welcoming Remarks in Moakley Auditorium: Dr. Howard London, Provost and Vice President for Academic Affairs

9:15 – 10:30 AM Guest Speaker:

Dr. Carl Lamborg
Department of Marine Chemistry and Geochemistry
Woods Hole Oceanographic Institution

"Research into the Biogeochemistry of Mercury in the Ocean and its Impact on Public Policy"

10:30 – 12:00 PM – Poster Session I: Boards 1-29, Moakley Atrium

12:00 – 1:00 PM – Lunch; take down posters from Session I, put up Session II posters

1:00 – 2:30 PM – Poster Session II: Boards 30-58, Moakley Atrium (Informal poster discussions may continue through lunch)

Poster Session I Titles: Boards 1-29
Moakley Atrium (10:30 AM to 12:00 PM)

Board #1: "Morphological and physiological response to cadmium exposure in zebrafish, *Danio rerio*," Ana Malone Oliver and Dr. Kerri S. Warren, Department of Chemistry and Biology, Roger Williams University, Bristol, RI 02809

Board #2: "Estuarine invertebrates and forge finfish as bio-indicators of environmental mercury levels in the Narragansett Bay (Rhode Island, USA)," Jennifer Linehan and Dr. David Taylor, Department of Marine Biology, Roger Williams University, Bristol, RI 02809

Board #3: "Maternal transfer of mercury to gonad tissue and its effect on the fecundity of the Atlantic Silverside, *Menidia menidia*," Elizabeth Futoma and Dr. David Taylor, Departement of Marine Biology, Roger Williams University, Bristol, RI 02809

Board #4: "Mercury accumulation in the brain and muscle tissue of bluefish (*Pomatomus saltatrix*) and tautog (*Tautoga onitis*)," Nichole Ares and Dr. David Taylor, Department of Marine Biology, Roger Williams University, Bristol, RI 02809

Board #5: "Total Mercury in the Feathers of Passerines in Connecticut," Amy Duggan, Casey Jung, and Dr. Joan Morrison, Environmental Science, Trinity College, Hartford, CT 06106

Board #6: "Use of Portable XRF to Compare Arsenic Levels at the Surface of Various Wooden Play Structures," Jonathan Vitrano, Christopher Cepero, Jason MacLean, and Dr. Cielito King, Chemistry Department, Bridgewater State College, Bridgewater, MA 02324

Board #7: "An Investigation of Metal Sequestration by Phragmites in Boston's Emerald Necklace using X-ray Fluorescence," Mei Tan, Juliana Barrios, Beatriz Datangel, Melissa Lever, Melissa Trieu, and Dr. Michael Berger, Department of Chemistry, Simmons College, 300 The Fenway, Boston, MA 02115

Board #8: "Chemometric Classification of Shrimp through Multidimensional Fluorescence Spectroscopy," John Eaton, Acacia Alcivar-Warren, and Dr. Jonathan Kenny, Tufts University, Department of Chemistry, 62 Talbot Avenue, Medford, MA 02155

Board #9: "Generation of diverse protein variants for use in a pollution biosensor," Henry Rogalin, David Weisman, and Dr. Adán Colón-Carmona, Department of Biology, UMass Boston, 100 Morrissey Blvd., Boston, MA 02125-3393

Board #10: "A Five Year Study of the Effectiveness of Replication of Spotted Turtle (*Clemmys guttata*) Nesting Habitat in Southeastern Massachusetts," Daniel J. Schepis, Jeffrey Carboni, and Dr. John C. Jahoda, Department of Biology, Bridgewater State College, Bridgewater, MA 02325

Board #11: "Factors associated with the abundance of the mussel *Elliptio complanata* in three freshwater ponds near a major highway in central New Hampshire," Adam LaBonte, Ashley Pinkham, Christopher Freeman, Mariana Graves, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Board #12: "Influence of macrophyte presence on the distribution of invertebrates within a freshwater pond," Philip Thompson, Elizabeth Zack, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Board #13: "Habitat preference of crayfish (*Orconectes virilis*) among three different macrophytes," Ben Crawford, Rebecca Mailhot, Kris Wojtusik, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Board #14: "The preference of freshwater fish for two types of live versus artificial baits," Trevor Dickerman, Josh Foster, Emily Berube, Ian Blakeney, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Board #15: "Chemical and Spectroscopic Analysis of the Effects of High Earthworm Density and Soil Composition On Biogeochemical Cycling," Taryn Mancarella, James A. Rice, Gabriela Chilom, Loren Byrne, and Dr. Stephen K. O'Shea, Department of Biology and Chemistry, Roger Williams University, Bristol, RI 02809

Board #16: "Effects of land cover patterns on arthropods in lawns," Joseph Koproski and Dr. Loren Byrne, Roger Williams University, Biology Department, Bristol, RI 02809

Board #17: "Effect of buckwheat (*Fagopyrum esculentum*) treatments on available soil phosphorus and oxalate^{2-} concentrations in a field experiment," Angela Possinger and Dr. Loren Byrne, Department of Biology, Roger Williams University, Bristol, RI 02809

Board #18: "Development of a non-invasive determination of carotenoid concentration in *Amphiprion ocellaris* eggs," Michelle Gladding, Andrew Foley, Nancy Breen, and Dr. Stephen O'Shea, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Board #19: "Abundance, Growth, and Diet of Juvenile Summer Flounder (*Paralichthys dentatus*) and Winter Flounder (*Pseudopleuronectes americanus*) in the Seekonk River, RI and the Taunton River, MA," Carissa Gervasi and Dr. David Taylor, Roger Williams University, Department of Marine Biology, Bristol, RI 02809

Board #20: "Fatty Acid Profiles of the Invasive Lionfish (*Pterois volitans/ Pterois miles*): A Delicious and Nutritious Method of Controlling the Invasion," Amber Thomas, Andrew Rhyne, and Dr. Nancy Breen, Departments of Marine Biology and Chemistry, Roger Williams University, Bristol, RI 02809

Board #21: "Restored oyster reefs and their impact on the presence of local fauna," Todd Massari, Dale Leavitt, Marty Chintala, Suzanne Ayvazian, and Dr. David Taylor, Roger Williams University, Department of Biology and Marine Biology, Bristol, RI 02809

Board #22: "Potential factors leading to the juvenile mortality of the Northern quahog, *Mercenaria mercenaria*, farmed in Wellfleet, Massachusetts: food availability, QPX disease, and disseminated sarcoma," Rachel Mielcarek and Dr. Dale Leavitt, Marine and Natural Sciences, Roger Williams University, One Old Ferry Rd, Bristol, RI 02809

Board #23: "The Effects of Shade and Dissolved Oxygen on Spotted Salamander Egg Mass Counts," Rebekah Zimmerer and Dr. Dorothy Boorse, Biology Department, Gordon College, 255 Grapevine Rd., Wenham, MA 01984

Board #24: "Ice Storm Damage Assessment on Interior Forests," Jordan Gibbons and Dr. Laura Marx, Environmental Science Department, Westfield State College, Westfield, MA 01086

Board #25: "Effects of the Mountaintop Removal on Surrounding Ecosystems: An Analysis of Mountaintop Removal in Amherst, MA," Sam Wiater, Matthew Smith, Sean Brady, and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

Board #26: "Effects of Mountaintop Removal on aquatic and terrestrial ecosystems of Appalachia," Rachel Rosensweig and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

Board #27: "Bluegill Predator Avoidance Response to Largemouth Bass," Craig Stevenson, Kayla Cialdea, Hannah Freeman, and Dr. David R Christensen, Westfield State College, Biology Department, 577 Western Ave., Westfield, MA 01086

Board #28: "Utilization of Two Indices to Measure Macroinvertebrate Diversity and Abundance," Deidre Armstrong, Aileen Zurita, Adriana Avellino, and Dr. David R Christensen, Westfield State College, Biology Department, Westfield, MA 01086

Board #29: "The genetic architecture of Sequoia sempervirens, a range wide study," Alanna Kassarjian and Dr. Vladimir Douhovnikoff, Department of Biology, Simmons College, 300 The Fenway, Boston, MA 02115

Poster Session II Titles: Boards 30-58
Moakley Atrium (1:00 AM to 2:30 PM)

Board #30: "Quantification of the amount of diesel exhaust from the bio-fuel delivery trucks to the proposed Russell Biomass plant in Russell, Massachusetts, and determination of the impact on human and environmental health," Cory Andros, Steven Case, and Dr. Michael Vorwerk, Environmental Science, Westfield State College, Westfield, MA 01050

Board #31: "Analysis of Hydrogen Power," Sean Walsh and Dr. Michael Vorwerk, Environmental Science, Westfield State College, Westfield MA, 01086

Board #32: "The Reality of Corn's Efficiency as a Source of Food and Ethanol," Leah Visconti, Brian Kopinto, Aaron Rittlinger, and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

Board #33: "Fuel or Foul: Quantifying the Viability of French Fry Oil as an Alternative to Fossil Fuels," Angela Reid and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

Board #34: "Purification of Biodiesel Using a Bubble Column," Kristin Jackson, Michael Goretti, Eric Dombrowski, Hao Trieu, and Dr. Cheryl Schnitzer, Stonehill College, Department of Chemistry, North Easton, MA 02357

Board #35: "Formation of Coumarin Base Polymer," Hawa Fall and Dr. Margaret Kerr, Department of Chemistry, Worcester State College, Worcester, MA 01602

Board #36: "The Greening of Coumarin Synthesis," Wyatt Merrill, Stephen Glynn, and Dr. Margaret Kerr, Department of Chemistry, Worcester State College, Worcester, MA 01602

Board #37: "Greener Separation of Dyes using Aqueous Biphasic Systems," Keith Dusoe and Dr. Meghna Dilip, Department of Chemistry, Worcester State College, Worcester, MA 01602

Board #38: "Microwave Assisted Silane Depositions for Application in Solar Cell Materials," Robert W. Cotta Jr., Charles Hall, and Dr. Clifford Murphy, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Board #39: "Coupling reactions on functionalized quartz and ITO substrates using microwave irradiation," Charles Hall and Dr. Clifford B. Murphy, Roger Williams University, Department of Chemistry, One Old Ferry RD, Bristol, RI 02809

Board #40: "Trends in overall water quality at four sites along the Pemigewasset River, New Hampshire from 1990 to 2009," Laura Pinkham, Nathan Furey, Ashley Wasilew, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Board #41: "Response of experimental freshwater communities to increasing dissolved road salt concentrations," Dylan Jackson, Basil O'Leary, Donal Magrane, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Board #42: "Road salt versus Ice Ban®: the effect of deicing agents on the survival of dragonfly larvae," Katherine Holder, Devin Arn, Will Colt, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Board #43: "Developing a GIS Pilot Project to Assess and Predict the Probable Return of a Green Rooftop Conversion in the Study Area Abutting Boston Harbor, MA," Matthew T. Iannelli and Dr. Helenmary Hotz, Environmental Earth and Ocean Sciences Department, UMASS Boston, Boston, MA, 02125

Board #44: "Theoretical docking between papain and X-phenyl hippurates," Katie Link and Dr. Nancy Breen, Chemistry Department, Roger Williams University, Bristol, RI 02809

Board #45: "QSAR investigation of the Fungal Zinc Protease (IX) Hydroxide Hydrolysis of the Para-Substituted Phenyl-Hippurates Under Varying Temperature and pH Conditions," Jonathan R. Dorian and Dr. Stephen O'Shea, Department of Chemistry, Roger Williams University, 1 Old Ferry Rd., Bristol, RI 02809

Board #46: "QSAR model of para -substituted phenyl hippurates enzymatic hydrolysis by Trypsin XIX under varying temperature and pH conditions," Jesse A. Dixon and Dr. Stephen K. O'Shea, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Board #47: "Protein-ligand binding studies of alcohol dehydrogenase with four pyrazoline-based ligands using AutoDock," Elizabeth LeMasters and Dr. Nancy Breen, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Board #48: "**Synergistic approach to find alternative drug against amebiasis: 3-phenyl-1-(phenyl carbamoyl and thiocarbamoyl)-2-pyrazolines,"** Monichan Phay, Barbara Mann and Dr. Avelina Espinosa, Department of Biology and Chemistry, Roger Williams University, Bristol, RI 02809

Board #49: "Synergistic approach to find alternative drugs against amebiasis: 3,5-diphenyl-1-(Phenyl carboxamide)-2-pyrazoline series," Keith B. Austin, Laura-Ashley Przondo, Barbara Mann, Monichan Phay, Robert Yaeger, Erica Ryke and Dr. Lauren Rossi, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Board #50: "Synthesis and characterization of a pyrazine-bridged ruthenium acetylide complex," Daniel J. Van Buren and Dr. Cliff J. Timpson, Department of Chemistry and Physics, Roger Williams University, Bristol, RI 02809

Board #51: "Synthesis and characterization of a series of dicyano bridged ruthenium complexes," Brian N. DiMarco and Dr. Cliff J. Timpson, Department of Chemistry, Roger Williams University, Bristol RI, 02809

Board #52: "Pure Water for Cambodia: Testing an Alternative *E.coli* Bacteria Filtration Protocol for the Siem Reap Water Laboratory," Heather M. Pereira and Dr. Kevin Curry, Department of Biological Sciences, Bridgewater State College, Bridgewater, MA 02325

Board #53: "Creating a Bicycle Culture: A Bicycle Plan for Westfield State College," Jacquelyn Vincent, Thomas Pease, Matthew Waldrip, Ethan Michaud, Jacquelyn Vincent and Dr. Marijoan Bull," Department of Geography and Regional Planning, Westfield State College, Westfield, MA 01086

Board #54: "Measuring Impacts of Tray Removal in College Dining Programs: An Eco-Friendly Alternative at Westfield State College," Rowan Cignoni, Meghan Scholl, Aviva Berezin, Wayne Wagner and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

Board #55: "The Environmental and Human Health Impacts of the Bottled Water Industry," Amy Clark, Alicia Hummel and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

Board #56: "Habitat Limitations and Resource Partitioning during Summer Stratification in Productive Lakes," Kyle Jones, Tim Fontana, Bethany St. Laurent and Dr. David R Christensen, Westfield State College, Biology Department, 577 Western Ave., Westfield, MA 01086

Board #57: "Westfield State College Microclimate Analysis," Jonathan Peters and Dr. Michael Vorwerk, Department of Geography and Regional Planning, 577 Western Avenue, Westfield State College, Westfield, MA 01086

Board #58: "A Quantitative Accuracy Assessment of Inexpensive GPS Receivers," Clark Freeman and Dr. Carsten Braun, Westfield State College, Geography and Regional Planning, Westfield, MA 01085

Poster Session I Titles and Abstracts: Boards 1-29
Moakley Atrium (10:30 AM to 12:00 PM)

Board #1: "Morphological and physiological response to cadmium exposure in zebrafish, *Danio rerio*," Ana Malone Oliver and Dr. Kerri S. Warren, Department of Chemistry and Biology, Roger Williams University, Bristol, RI 02809

To determine the role of metallothionein (MT) protein in zebrafish, *Danio rerio*, cadmium-treated embryos are analyzed to determine physiological response, cadmium accumulation and MT-Cd complex formation. Zebrafish embryos are exposed to cadmium chloride ($CdCl_2$) early in their development to induce the expression of metallothionein protein. Embryos exposed to $CdCl_2$ produce consistent physiological responses - swim bladder defects, cardiac conduction block, and upward axis curvature. Zebrafish responses to free Cd^{2+} ion are compared to those of complexed Cd with acetate and EDTA ligands. ICP-MS is used to determine the cadmium bioaccumulation after four days of exposure and to identify the correlation between higher doses of cadmium, relative apparent toxicity and increased levels of bioaccumulation. Work is underway to investigate MT through native-PAGE gel protein isolation, RP-HPLC separation, and MT classification by NMR. Support for this study is supported by the Merck/AAAS Undergraduate Science Research Program.

Board #2: "Estuarine invertebrates and forge finfish as bio-indicators of environmental mercury levels in the Narragansett Bay (Rhode Island, USA)," Jennifer Linehan and Dr. David Taylor, Department of Marine Biology, Roger Williams University, Bristol, RI 02809

Environmental mercury (Hg) contamination is of particular concern because Hg bioaccumulates in aquatic food webs and exposure has deleterious effects on biota, including humans. The potential health risks associated with Hg exposure justifies the development of monitoring programs that link environmental and biological Hg contamination. In a preliminary study, we assessed the utility of estuarine invertebrates and forage finfish as bio-indicators of environmental Hg pollution. A significant positive correlation between sediment Hg levels and the Hg content of bivalves and zooplankton . Conversely, polychaete, macrocrustacean, and finfish Hg body burdens were not significantly related to environmental Hg levels. Preliminary results therefore indicate that the effectiveness of estuarine biota as bio-indicators of environmental Hg contamination is taxon-specific, and is likely influenced by feeding ecology, longevity, and site fidelity.

Board #3: "Maternal transfer of mercury to gonad tissue and its effect on the fecundity of the Atlantic Silverside, *Menidia menidia*," Elizabeth Futoma and Dr. David Taylor, Departement of Marine Biology, Roger Williams University, Bristol, RI 02809

Mercury (Hg) is a toxic contaminant that is prevalent in estuarine environments. Dietary intake is the main route of Hg exposure in estuarine fish, after which it potentially bioaccumulates in their muscle and gonad tissue. This Hg exposure may cause population-level effects if females transfer Hg to their offspring or experience reduced fecundity. The objectives of this study were twofold: (1) examine the maternal transfer of Hg to the gonad tissue of a ubiquitous estuarine fish, the Atlantic silverside, *Menidia menidia*, and (2) evaluate the effect of Hg exposure on silverside egg production. In June-July of 2008 and 2009, silversides were collected from six sites in Narragansett Bay (RI, USA) that differed in environmental Hg contamination (3 pristine and 3 polluted sites). Total lengths (cm) and weights of excised muscle and gonad tissues (g wet wt) were measured for each silverside. All tissue samples were then freeze-dried for 48 hr, homogenized, and analyzed for total Hg content using combustion atomic absorption spectrometry (ppm dry wt). Average gonad and muscle tissue Hg

concentrations were significantly higher in fish from polluted sites (n=21; muscle=0.858 ppm; gonad=0.156 ppm) than those from pristine sites (n=22; muscle=0.527 ppm; gonad=0.089 ppm). Moreover, Hg concentrations in muscle and gonad tissue were positively correlated for fish collected from both areas (R2=0.785 and R2=0.494 for pristine and polluted, respectively). Although a positive correlation also existed between fish length and gonad mass for individuals from pristine and polluted areas, unexpectedly, fish from polluted sites had a higher gonad mass (mean=0.985±0.126 g) than those from pristine sites (mean=0.795±0.071 g). Future work will investigate the rates of gonad growth in pristine and polluted locations and examine the effect of Hg exposure on egg number and size. Research funded by NCRR/NIH Grant # 5 P20 RR016457.

Board #4: "Mercury accumulation in the brain and muscle tissue of bluefish (*Pomatomus saltatrix*) and tautog (*Tautoga onitis*)," Nichole Ares and Dr. David Taylor, Department of Marine Biology, Roger Williams University, Bristol, RI 02809

Human health, and exposure occurs mainly through the consumption of finfish. Consequently, previous research has been dedicated to measuring Hg levels in muscle filets of edible fish, including the bluefish (*Pomatomus saltatrix*) and tautog (*Tautoga onitis*). While Hg contamination in muscle tissue of these species is well documented, there is little information on Hg concentrations in other tissues. The brain is a tissue of particular concern because Hg is a neurotoxin. The objectives of this investigation were to: (1) examine Hg bioaccumulation in brain and muscle tissue of bluefish and tautog, and (2) evaluate the relationship between Hg levels in the two tissue types. From June to August 2007-2009, target fish were collected from Narragansett Bay (RI, USA) using otter trawls and rod & reel. Length (cm) was recorded for each fish, after which total Hg was measured in excised muscle and brain tissue using combustion atomic-absorption spectroscopy (ppm dry wt). For bluefish and tautog, Hg concentrations of muscle and brain tissue were positively correlated with fish length (Blue: R2=0.110, n=7; Taut: R2=0.256, n=17), indicating that the Hg bioaccumulates in both tissues. There was also a positive correlation between muscle and brain tissue Hg concentrations for both target fish (Blue: R2=0.868, n=7; Taut: R2=0.468, n=17). Among these relationships, tautog experienced elevated brain Hg concentrations relative to bluefish. Interspecies differences in Hg contamination are attributed to tautog being older, and thus, having a protracted period in which they accumulate Hg. Future research will include the analysis of target fish livers, as well as the possible role of selenium in mitigating the toxic effects of Hg.

Board #5: "Total Mercury in the Feathers of Passerines in Connecticut," Amy Duggan, Casey Jung, and Dr. Joan Morrison, Environmental Science, Trinity College, Hartford, CT 06106

Mercury is a toxic metal present in the environment which can cause abnormal behavior, impaired reproduction and fatalities in avian species. The purpose of this project is to determine how much total mercury is in the feathers of passerines in Connecticut. Our preliminary focus is to survey the total mercury in a variety of species captured using mist nets at 1 rural and 3 urban locations. Feathers were collected and analyzed using a D-80 Mercury Analyzer. Once a larger sample size is obtained, the concentrations of total mercury in the different species will be compared to see which species have higher levels of mercury. Individuals of the same species from different locations, both rural and urban, also will be compared to see how the different environments may affect mercury concentrations.

Board #6: "Use of Portable XRF to Compare Arsenic Levels at the Surface of Various Wooden Play Structures," Jonathan Vitrano, Christopher Cepero, Jason MacLean, and Dr. Cielito King, Chemistry Department, Bridgewater State College, Bridgewater, MA 02324

The Rainbow's End Playground in Bridgewater, MA has long been a gathering place for parents and children. This exclusively wooden playground is constructed of CCA (chromated copper arsenate) treated wood which contains the extremely toxic arsenic, among other carcinogens. Children and adults pose the risk of arsenic exposure through hand-to-mouth contamination from direct contact with picnic tables, railings, and other wooden playground structures. Using a portable XRF (X-Ray Fluorescence) over 80 scans of the CCA treated wood were collected, all of which exceeded EPA limits of 20 ppm (soil) by over one-hundred fold. Leaching of CCA into surrounding pebble-covered soil does not seem to pose a threat with scans mostly below limit, yet efforts to coat the playground with a sealant have been enacted to ensure future hazards through direct contact are minimized.

Board #7: "An Investigation of Metal Sequestration by Phragmites in Boston's Emerald Necklace using X-ray Fluorescence," Mei Tan, Juliana Barrios, Beatriz Datangel, Melissa Lever, Melissa Trieu, and Dr. Michael Berger, Department of Chemistry, Simmons College, 300 The Fenway, Boston, MA 02115

Over the years, the Muddy River, part of Frances Law Olmsted's Emerald Necklace in Boston Massachusetts, has accumulated large quantities of sediment contaminated with petroleum hydrocarbons and high levels of metals, especially lead and arsenic. In addition, water flow in the River has been choked by invasive species, such as the common reed, or Phragmites. The Phragmites plant has been used in a recent study in Spain for phytoremediation of soils contaminated with toxic heavy metals. The purpose of this investigation is to determine whether heavy metals from the contaminated sediment in the Muddy River sediment have been sequestered by the Phragmites. X-ray fluorescence was used as the analytical technique since this method can simultaneously quantify several elements of interest. Preliminary results indicate that lead and chromium have been concentrated in the roots of the Phragmites, while zinc, iron, and manganese are incorporated to a lesser degree.

Board #8: "Chemometric Classification of Shrimp through Multidimensional Fluorescence Spectroscopy," John Eaton, Acacia Alcivar-Warren, and Dr. Jonathan Kenny, Tufts University, Department of Chemistry, 62 Talbot Avenue, Medford, MA 02155

Shrimp and other shellfish represent a large and growing portion of the seafood industry in the Unites States. To meet demand the global shrimp aquaculture industry has also expanded. Current aquaculture practices raise concerns over local ecosystem health because shrimp farming can result in habitat destruction, chemical pollution, and reduction of the biodiversity of shrimp species. In an effort to monitor shrimp populations to assess these problems, chemometric analysis coupled with genetic monitoring can be used to discriminate between shrimp samples of different locations. In this study, Parallel Factor Analysis with Soft Independent Modeling by Class Analogy (PARAFAC-SIMCA) was used to analyze shrimp fluorescence data to create a classification scheme for samples from four different countries. Twenty-four shrimp (six from each location) were studied; twenty were correctly identified at the 95% confidence level, with one false positive and four outliers. Funding provided by FUCOBI and Tufts Summer Scholars Program.

Board #9: "Generation of diverse protein variants for use in a pollution biosensor," Henry Rogalin, David Weisman, and Dr. Adán Colón-Carmona, Department of Biology, UMass Boston, 100 Morrissey Blvd., Boston, MA 02125-3393

Polycyclic aromatic hydrocarbons (PAHs) are carcinogens in the environment. This project focuses on designing a biosensor that is based on the aryl hydrocarbon receptor (AhR), a protein found in vertebrates that detects PAHs, and subsequently induces transcription of target genes. A core aspect of this biosensor research is to optimize the AhR by creating a large number of gene variants. To create the diverse AhR allele library, the Staggered Extension Process (StEP), a PCR-mediated DNA recombination technique incorporates AhR alleles from many organisms and produces chimeric DNA sequences. These will yield AhR proteins with varying affinities for PAHs, which will be selected for fitness. Additionally, the Allele Finder program, created for this project, reads the parental and chimeric DNA sequences and helps elucidate the recombination points. This information is being used to adjust the StEP protocol parameters to maximize the diversity of the AhR allele library.

Board #10: "A Five Year Study of the Effectiveness of Replication of Spotted Turtle (*Clemmys guttata*) Nesting Habitat in Southeastern Massachusetts," Daniel J. Schepis, Jeffrey Carboni, and Dr. John C. Jahoda, Department of Biology, Bridgewater State College, Bridgewater, MA 02325

Throughout its range the Spotted turtle (*Clemmys guttata*) has declined. Because of the apparent critical state of the spotted turtle in Massachusetts, the species was listed in 1986 as a "Species of Special Concern". In 2004 Waste Management of Massachusetts replicated nesting habitat around a facility in Raynham, MA and agreed to conduct a five year study to determine the effectiveness of this replication. Field work was conducted over a five year period each June through October. All turtles found were sexed, marked, and a complete set of morphometric measurements taken. Thirty-two adults, eight sub-adults and two hatchlings were included in this study. Turtles were observed either nesting or within the nesting area 27 times throughout this study. This population appears to be "relic" as it is composed mostly of old individuals. Projects like this nesting habitat replication are vitally important and will remain a necessary part of the conservation strategy.

Board #11: "Factors associated with the abundance of the mussel *Elliptio complanata* in three freshwater ponds near a major highway in central New Hampshire," Adam LaBonte, Ashley Pinkham, Christopher Freeman, Mariana Graves, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Human development has been shown to negatively affect the biodiversity of aquatic ecosystems in many ways. Our study focused on the potential impact of road salt input from a major highway on a common freshwater mussel species, *Elliptio complanata*, in three ponds in New Hampshire. We quantified the density of *E. complanata* and estimated pH, conductivity, and percent macrophyte cover at a series of sites differing in distance from Interstate 93. No mussels were found in the two ponds closest to the highway. In the third pond, conductivity decreased as distance from the highway increased, and mussel abundance was highest in sampling sites farthest from the highway. There was a strong negative relationship between mussel density and conductivity but no relationship between mussel density and macrophyte cover. Our study suggests that road treatments and local urbanization may affect the quality of nearby aquatic ecosystems and the organisms that inhabit them.

Board #12: "Influence of macrophyte presence on the distribution of invertebrates within a freshwater pond," Philip Thompson, Elizabeth Zack, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Many factors contribute to an organism's overall fitness. Habitat selection is one key contributor because where an individual lives can directly affect many ecological variables such as access to resources, exposure to abiotic factors, and risk of predation. Freshwater ponds include a plethora of different microhabitats. In this study, we surveyed areas in a pond with and without macrophytes to compare patterns in invertebrate abundance, diversity, and community composition. Areas with macrophyte cover had greater richness than areas without macrophytes, although abundance did not differ between microhabitats. Using a principal component analysis, we found that the types of invertebrates that occupy the two microhabitats tended to differ. Overall, these results suggest that microhabitats with macrophyte cover provide niche space for a variety of invertebrate taxa, and that the presence of these microhabitats enriches the diversity of the pond as a whole.

Board #13: "Habitat preference of crayfish (*Orconectes virilis*) among three different macrophytes," Ben Crawford, Rebecca Mailhot, Kris Wojtusik, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Habitat preferences are important because microhabitat selection can have an effect on the fitness of organisms. This study was conducted to determine the habitat preference of the crayfish *Orconectes virilis* in terms of its distribution relative to macrophyte cover. We observed crayfish microhabitat selection in a natural pond by distributing minnow traps among four selected microhabitats: areas lacking significant macrophyte cover versus areas dominated by one of three different plant species. We then observed the active selection of the crayfish for areas with different macrophytes in pairwise trials in the lab. In the pond, most crayfish were captured in sampling areas without macrophytes, and the fewest were captured in areas with watershield (*Brasenia schreberi*). In the lab crayfish once again avoided areas with watershield. We hypothesize that crayfish prefer vegetation that provides the most shelter so that they may hide from predators and ambush their prey.

Board #14: "The preference of freshwater fish for two types of live versus artificial baits," Trevor Dickerman, Josh Foster, Emily Berube, Ian Blakeney, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Predators select their prey based on many different attributes, including size, ease of capture and energy content. Recreational anglers use a variety of bait types to try to attract the attention of predatory fish. We conducted a study to determine the preference of fish for live versus artificial bait of two types (worm and minnow). In a series of 30-minute sampling bouts in September 2009, we tested the effectiveness of live versus artificial baits in a New Hampshire pond. The number of fish caught was higher on live bait than artificial bait when using worms but not minnows. For minnow bait, different species were caught while using live versus artificial bait. The total length of fish captured was greater on artificial than live minnow bait but did not differ between worm baits. Overall, our results indicate that bait choice can affect the number, type and size of fish caught.

Board #15: "Chemical and Spectroscopic Analysis of the Effects of High Earthworm Density and Soil Composition On Biogeochemical Cycling," Taryn Mancarella, James A. Rice, Gabriela Chilom, Loren Byrne, and Dr. Stephen K. O'Shea, Department of Biology and Chemistry, Roger Williams University, Bristol, RI 02809

The presence of earthworms in terrestrial ecosystems contributes to the rates of change in biogeochemical cycles, specifically those of carbon and nitrogen. A preliminary investigation has provided insights about the effects of high earthworm (ew) soil density (20 ew $25cm^{-3}$) chemistry. The carbon to nitrogen ratio for cast samples was 13.33 vs. soil samples 12.93. Nitrate levels for cast samples were 33.5 ppm vs. 15.3 ppm in bulk soil samples. Nitrite levels for cast samples were 19 ppm vs. 15.5 ppm in bulk soil samples. The changes observed in nitrogen cycling are correlated with an increased microbial ammonia enzyme activity in cast samples. The bulk soil was overall more acidic (pH 4.83) than cast samples (pH 5.86). Laboratory mesocosm experiments modeled those biogeochemical observations in the environment. Earthworms were fed differing diets of grass clippings, leaves and wood mulch. The soil and resulting casts were investigated by solid state 13C NMR and gas SPE GC/MS. The results indicate that the type of organic matter, notably grass clippings, affects composition of casts and volatile organics released through soil chemical processes. Characteristic of the volatile organic determined by GC/MS encompassed short straight chain alkanes and alkenes with functional groups of esters, ketones and aldehydes.

Board #16: "Effects of land cover patterns on arthropods in lawns," Joseph Koproski and Dr. Loren Byrne, Roger Williams University, Biology Department, Bristol, RI 02809

Humans manipulate landscapes for many reasons including to create aesthetically-pleasing land covers as in lawns and gardens. The effects of urbanization on arthropod populations are generally unknown even though they provide important ecosystem services (e.g., pest control, decomposition). The question being asked in this experiment is: do urban land-cover treatments (wood mulch, mowed lawn, un-mowed lawn, and leaves) affect the arthropod populations in adjacent lawns? For each of four treatments, four replicate 6 x 6m plots were set up at Mt. Hope Farm in Bristol, RI. Two pitfall traps were used in each plot for monthly arthropod sampling. The variation in results among sampling dates suggests an interaction between seasons and land-cover. This indicates the possibility that different landscapes may affect the arthropod populations in adjacent lawns. Such ecological information may be useful for guiding the sustainable management of arthropods and the ecosystem services they affect in urbanized landscapes.

Board #17: "Effect of buckwheat (*Fagopyrum esculentum*) treatments on available soil phosphorus and oxalate^{2-} concentrations in a field experiment," Angela Possinger and Dr. Loren Byrne, Department of Biology, Roger Williams University, Bristol, RI 02809

Soil phosphorus (P), an essential element for plant growth, is increased in low-input farming through use of cover crops, including buckwheat (*Fagopyrum esculentum*). Some plants exude oxalate^{2-} for P uptake, and buckwheat exudes oxalate^{2-} in response to aluminum toxicity; therefore, oxalate^{2-} exudation may facilitate P uptake in buckwheat and increase available P for subsequent crops. This study seeks to develop greater understanding of the buckwheat - P relationship and improve its use in sustainable agriculture. Field buckwheat plots with added and existing P treatments were used to examine the effect of buckwheat on available P and oxalate^{2-} concentrations in soil and root tissues. Preliminary results indicate no significant difference in root and shoot biomass. Buckwheat growth was not inhibited in existing P conditions (4.54 ± 0.8 ppm), suggesting increased P uptake efficiency. Fall lettuce will be planted in post-buckwheat soil to assess differences in growth.

Board #18: "Development of a non-invasive determination of carotenoid concentration in *Amphiprion ocellaris* eggs," Michelle Gladding, Andrew Foley, Nancy Breen, and Dr. Stephen O'Shea, Department of Chemistry, Roger Williams University, Bristol, RI 02809

This work determines the relationship between the dietary astaxanthin concentration for topical marine ornamental fish, *Amphiprion ocellaris* and carotenoid egg deposition. Four groups of breeding pairs were fed two different diets varying in astaxanthin concentration, spawned 3-4 times before switching diets. Eggs were collected (#20) on day 1, 3 (fertilized and unfertilized), and 9. Whole eggs were examined by visual coloration (Photoshop) and Raman Spectroscopy on carotenoid accumulation during development is used as a successful spawn bioindicator. The carotenoids focused on in this study are lutein, beta-carotene, and astaxanthin. Individual carotenoids were identified by extraction into MtBE and analysis by HPLC/MS, quantified by inline VIS detection @ 450 nm and fluorescence detection Ex290nm: Em330nm. The variety and concentration of the carotenoids varied depending on; day, fertilization, and diet. Diets that are high in carotenoid concentration have been demonstrated to increase deposition and improve successful egg hatch to survival rate.

Board #19: "Abundance, Growth, and Diet of Juvenile Summer Flounder (*Paralichthys dentatus*) and Winter Flounder (*Pseudopleuronectes americanus*) in the Seekonk River, RI and the Taunton River, MA," Carissa Gervasi and Dr. David Taylor, Roger Williams University, Department of Marine Biology, Bristol, RI 02809

Summer flounder and winter flounder utilize estuaries as nursery habitat during their early life history stages. In southern New England estuaries, however, little is known regarding the spatiotemporal overlap and potential biotic interactions between the flounder species. The purpose of this research was to assess the abundance, growth, and dietary habits of juvenile summer and winter flounder to determine if predator-prey and/or competitive relationships exist. From May to September 2009, flounder were sampled biweekly using beach seines. Captured flounder were enumerated, measured for total length (mm), and a sub-sample was preserved for stomach content analysis. Summer flounder abundance decreased significantly over time, but the abundance of winter flounder remained relatively constant during the sampling period. Summer flounder grew significantly faster than winter flounder. Decapods and fish were an important component of the summer flounder diet, while amphipods and nematodes were favored by winter flounder. These data suggest that competition for food resources is minimal between species.

Board #20: "Fatty Acid Profiles of the Invasive Lionfish (*Pterois volitans/ Pterois miles*): A Delicious and Nutritious Method of Controlling the Invasion," Amber Thomas, Andrew Rhyne, and Dr. Nancy Breen, Departments of Marine Biology and Chemistry, Roger Williams University, Bristol, RI 02809

Red lionfish, *Pterois volitans*, of the family Scorpaenidae are venomous marine fish found in most Indo-Pacific regions of the world. Released through means assumed to be aquarium trade related, lionfish have recently invaded the Western Atlantic Ocean. Previous data suggests that lionfish are both breeding and adapting to Atlantic waters. The population that has settled in the waters surrounding the Bahamas has reached numbers far greater than any other lionfish population worldwide. It has recently been suggested that this invasion be controlled by lionfish consumption by local people. Through this study, it has been determined that the levels of healthy n-3 fatty acids in lionfish qualify them to be considered a category 3 fish. And though the taste has been compared to that of grouper and snapper, other category 3 fish, the lionfish contains a higher percentage of n-3 fatty acids than the others, making them both delicious and nutritious.

Board #21: "Restored oyster reefs and their impact on the presence of local fauna," Todd Massari, Dale Leavitt, Marty Chintala, Suzanne Ayvazian, and Dr. David Taylor, Roger Williams University, Department of Biology and Marine Biology, Bristol, RI 02809

The Eastern Oyster (*Crassotrea virginica*) is an ecologically important species that provides multiple ecosystem services, including the potential to increase complex habitat for resident fauna. To this end, the objective of this study was to determine if the presence of restored oyster reefs in Narragansett Bay (RI, USA) increased the abundance and diversity of local macro-invertebrates and finfish. In June and July 2009, six baited traps were deployed biweekly one hour ± of high tide at three oyster reef (OR) and three non-oyster reef (NOR) sites in the Bay. There was no significant difference in the abundance of fish and macro-invertebrates between the OR and NOR sites. The richness of finfish at OR sites was significantly greater than that of the NOR sites, but there was no difference in the richness of invertebrates. These data suggest that oyster reefs impact the richness of finfish species that occupy a habitat, although they do not necessarily increase the overall abundance of finfish and invertebrates.

Board #22: "Potential factors leading to the juvenile mortality of the Northern quahog, *Mercenaria mercenaria*, farmed in Wellfleet, Massachusetts: food availability, QPX disease, and disseminated sarcoma," Rachel Mielcarek and Dr. Dale Leavitt, Marine and Natural Sciences, Roger Williams University, One Old Ferry Rd, Bristol, RI 02809

The culturing of quahogs, *Mercenaria mercenaria*, has grown to be a multi-million dollar industry in the northeast; as well as, an industry accounting for $50 million annually on the East Coast, throughout its native range. Though considered to be the top shellfish farming town on Cape Cod, hard clams cultured on Egg Island in Wellfleet Harbor have been infected by Quahog Parasite Unknown (QPX), a pathogen recently discovered to infect the soft tissue of *M. mercenaria* (Smolowitz et al. 1998). Disseminated sarcoma, a fatal disease, has also been identified in the cultured clams in the last 2 years. Currently, the infected quahogs farmed on Egg Island display QPX characteristics, such as rising to the sediment surface; but quahogs are showing progressive juvenile mortality, uncharacteristic of QPX or disseminated sarcoma. The objective of this research project is to evaluate the vigor and health of farmed quahogs on Egg Island; as well as, examine the animals for the presence of disease. The ultimate goal is to investigate the possible combination of one or more stress factors leading to the juvenile mortality of the quahogs; presumably low food availability, infection with QPX disease, and/or the displacement of normal blood cells due to disseminated sarcoma. Based on our findings, we will have a better understanding of whether the quahogs are succumbing to lack of nutrition, disease, or both; and whether the location of the quahogs within the flats affects their survival.

Board #23: "The Effects of Shade and Dissolved Oxygen on Spotted Salamander Egg Mass Counts," Rebekah Zimmerer and Dr. Dorothy Boorse, Biology Department, Gordon College, 255 Grapevine Rd., Wenham, MA 01984

Spotted salamanders are obligate species of vernal pools and lay their eggs, as gelatinous masses, there every spring. Different parameters affect their preference of various pools and my study is focusing on the relationship between dissolved oxygen in the pools, canopy cover, and the number of egg masses present in the pools. In order to study this relationship we used egg mass counts at fourteen pools in the area, as well as a water quality tester to measure the amount of dissolved oxygen. A densitometer was used to quantitatively measure the amount of canopy cover. For our results we anticipate that the number of egg masses increased with an increase in shade, which also allows the water to house more dissolved oxygen.

Board #24: "Ice Storm Damage Assessment on Interior Forests," Jordan Gibbons and Dr. Laura Marx, Environmental Science Department, Westfield State College, Westfield, MA 01086

The worst ice storm of the decade hit New England and upper state New York during December of 2008. Over four inches of ice accumulation was recorded in some areas, with over half of an inch accumulating on various tree stands. Ice storms are reoccurring natural disasters that help succession and aid in changing forest dynamics. Forest ecologists are studying the extent of damage to the forest during ice storms along with questions about future management. Does damage from an ice storm increase in interior forests if the forest has harvested areas in or surrounding it? Fieldwork will occur in a variety of transect plots chosen under three different categories: harvested plots, interior forest, and interior forest within 300 feet of harvested forest. A variety of methods will be used to collect tree damage and canopy loss in each plot for a comparative analysis.

Board #25: "Effects of the Mountaintop Removal on Surrounding Ecosystems: An Analysis of Mountaintop Removal in Amherst, MA," Sam Wiater, Matthew Smith, Sean Brady, and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

Mountaintop removal is a major issue in the Appalachia region. These gigantic strip mines have adverse effects on the environment and with the demand for coal and other raw materials increasing, they will continue to grow in size. These operations cause many environmental catastrophes that affect human and environmental health such as well water contamination and the drying up of wells, destruction of wildlife habitat and forests, and the filling in of streams. To determine the impacts of mountaintop removal on the ecosystem, we examined the John S. Lane & Son strip mine off of Rt. 116 in Amherst, Massachusetts. We collected water samples and are analyzing old and current topographic maps to determine the long and short-term impacts of mountaintop removal on a local scale. Our poster will demonstrate our methods and the results of our analysis.

Board #26: "Effects of Mountaintop Removal on aquatic and terrestrial ecosystems of Appalachia," Rachel Rosensweig and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

Mountaintop removal is a form of surface mining that involves mining the summit of a mountaintop. This process consists of removing all of the vegetation from the top of the mountain and using explosives to blast away the overburden rock and soil to access the coal seams beneath. The overburden is then moved to previously mined areas or dumped into a valley, which is known as a valley fill, and often buries streams. As of 2004, more than 1.1 million acres of land in northern and central Appalachia were undergoing mining operations. These mines are having significant impacts on aquatic and terrestrial ecosystems. In this research, I will examine various studies conducted on the environmental impacts of mountaintop removal in Appalachia. Using this research, I will quantify the total amount of mountaintop removal and determine the full range of impacts on terrestrial and aquatic life.

Board #27: "Bluegill Predator Avoidance Response to Largemouth Bass," Craig Stevenson, Kayla Cialdea, Hannah Freeman, and Dr. David R Christensen, Westfield State College, Biology Department, 577 Western Ave., Westfield, MA 01086

The largemouth bass (*Micropterus salmoides*) is often piscivorous and the top-predator in aquatic ecosystems. These fish can often have cascading effects on food webs by regulating the abundance of lower trophic species through predation. Largemouth bass consume other fish such as bluegill (*Lepomis macrochirus*) which is a

secondary heterotroph due to a diet composed mostly of macroinvertebrates and zooplankton. We evaluated predator avoidance behavior of bluegill to the presence of the largemouth bass. In particular, we tested visual and olfactory response and the role macrophytes have on predator avoidance. We concluded sight is a more powerful sense for the bluegill to react to the presence of a predator. However, some minor avoidance responses were observed when a high concentration of bass water (without the bass) was added to bluegill tanks. The smaller the bluegill, the better reaction was observed. Macrophytes were an important refuge for bluegill when threatened by predation. Bluegill avoidance and largemouth bass predation success appear to be linked to size, visual and chemical cues as well as the presence of macrophytes.

Board #28: "Utilization of Two Indices to Measure Macroinvertebrate Diversity and Abundance," Deidre Armstrong, Aileen Zurita, Adriana Avellino, and Dr. David R Christensen, Westfield State College, Biology Department, Westfield, MA 01086

The Westfield River is inhabited by a diverse group of macroinvertebrates that have adapted to their physical environment by dispersing throughout different macrohabitats in the river, specifically riffles and pools. The assemblage of species found in any particular part of the stream is not random, but each species is adapted to live in a specific habitat. The diversity and abundance is determined by multiple factors including stream order, productivity, substrate size, and water velocity. The variety of macroinvertebrates in relationship to the aforementioned factors was key to gauging the health of the Westfield River and Bradley Brook. Invertebrate diversity is often used as a measure of stream health with certain species indicative of healthy or degraded streams. We sampled macroinvertebrate diversity within two stream orders using the Shannon-Weiner diversity index and the EPT (Ephemeroptera, Plecoptera, Trichoptera) richness index. We found diversity and EPT richness to be greater in riffles than pools within a fourth order stream and no difference in a second order stream. There was a low correlation between the diversity and abundance with velocity and substrate size in the two sections we sampled. Results from this study are specific to the Westfield River and may not apply to other ecosystems. We concluded that macroinvertebrate diversity and abundance is greater in riffles than pools. Our research shows that these indices can be used in an effective way to measure the relationship between macroinvertebrates, stream order, substrate size, and velocity but require further research and needs to be calibrated for each river.

Board #29: "The genetic architecture of Sequoia sempervirens, a range wide study," Alanna Kassarjian and Dr. Vladimir Douhovnikoff, Department of Biology, Simmons College, 300 The Fenway, Boston, MA 02115

Sequoia sempervirens, the tallest tree in the world, is of special conservation interest as it fills an important role both ecologically and economically. An important aspect of species conservation is the genetic variation in that species. Loss of genetic variation in a species has many effects ranging from a loss of desirable traits to extinction. Understanding the genetic variation can lead to more effective management strategies by preserving genetic quality. The objective of this study was to quantify and describe the genetic structure of the genets archived in the University of California redwood gene bank that includes over 175 cloned original genotypes from 82 locations from the entire natural range of coast redwood. We found impartial variation in genetic structure between populations delineated by watersheds and separated by the San Francisco Bay.

Poster Session II Titles and Abstracts: Boards 30-58
Moakley Atrium (1:00 AM to 2:30 PM)

Board #30: "Quantification of the amount of diesel exhaust from the bio-fuel delivery trucks to the proposed Russell Biomass plant in Russell, Massachusetts, and determination of the impact on human and environmental health," Cory Andros, Steven Case, and Dr. Michael Vorwerk, Environmental Science, Westfield State College, Westfield, MA 01050

This research project will show the impacts of bio-fuel delivery vehicles to the proposed biomass site at Russell, Massachusetts. Using the quantified data of diesel emissions from the heavy duty engines used for transportation of the biomass fuel, we calculated the total amount of particulate matter released. The results of these calculations were used to determine the widespread effects of diesel emissions on the site's surrounding environment and inhabitants. As seen with the environmental and health impacts of the Port of Oakland, diesel pollution contributes to adverse health effects such as cancer, asthma, and other respiratory issues and environmental impacts such as greenhouse gas and reduced air quality. With information obtained from research we will show how this aspect of the proposed Russell Biomass Power Plant will impact the region.

Board #31: "Analysis of Hydrogen Power," Sean Walsh and Dr. Michael Vorwerk, Environmental Science, Westfield State College, Westfield MA, 01086

In my project, I analyzed the efficiencies, eco-friendliness, and safety of hydrogen power. My theory is that hydrogen power, although very dangerous, can be altered and contained to better help human society. As of today, we power our society using mainly fossil fuels such as coal, oil, and natural gas. With the need for a reusable and sustainable power source we can look to hydrogen. I will compare the great aspects of Hydrogen, such as: it is an eco-friendly gas that when burned only releases water. To the very dangerous aspects of Hydrogen, such as, the volatility or explosiveness of the stored gas. I hope to bestow the idea that hydrogen power will soon be in our future, helping the world to become a cleaner and more efficient place. Also that hydrogen power can be safe, effective, and most important, an eco-friendly solution to our worlds issues.

Board #32: "The Reality of Corn's Efficiency as a Source of Food and Ethanol," Leah Visconti, Brian Kopinto, Aaron Rittlinger, and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

Agricultural subsidies have pressured US farmers to grow excess amounts of commodity corn for human and animal consumption. This excess of subsidized corn has allowed the ethanol industry to explode in the US. This study examines the efficiency of corn which is our major source of ethanol for fuel. Our study questions whether corn is the most efficient producer of food and ethanol by comparing it to alternative sources of ethanol. We have quantified the efficiency of the production of food and ethanol for corn as well as for switch grass and sugar cane. Our comparative analysis determines each crop's ethanol production, food supply, cost to grow, energy required to produce fuel, environmental impacts, and the ethics surrounding each.

Board #33: "Fuel or Foul: Quantifying the Viability of French Fry Oil as an Alternative to Fossil Fuels," Angela Reid and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

This project reports the results of a study I conducted throughout the semester to determine if biodiesel fuel made from French fry oil is a viable alternative to fossil fuels. By taking the amount of vegetable oil consumed/produced in a single year and the amount of vegetable oil it takes to fuel the average driver's vehicle, I was able to quantify the data to estimate the total French fry fuel available. By comparing the amount of French fry fuel available to the amount of fossil fuels consumed in a given year I was able to determine whether French fry oil is a feasible solution to our fuel dilemma, or if it's simply a foul smelling attempt at one. Along with examining whether this is a solution or a Band-Aid, I researched what happens with the leftover glycerin, and the environmental impacts of those remnants.

Board #34: "Purification of Biodiesel Using a Bubble Column," Kristin Jackson, Michael Goretti, Eric Dombrowski, Hao Trieu, and Dr. Cheryl Schnitzer, Stonehill College, Department of Chemistry, North Easton, MA 02357

Biodiesel is a fatty acid methyl ester that is used as an alternative to or in combination with diesel fuel. Derived from waste vegetable oil, biodiesel is nontoxic, biodegradable, has a closed-carbon cycle, and burns cleaner than diesel and other fossil fuels. It is synthesized through the reaction of either vegetable oil or waste cooking oil with methanol and a KOH catalyst. Crude biodiesel contains contaminants such as glycerol, methanol, and catalyst that must be removed before use in an automobile. Glycerol content was determined using gas chromatography/mass spectrometry. Methanol content was determined using gas chromatography. A bubble column apparatus was successfully used to purify biodiesel with a 1:6 ratio of water to biodiesel. The purified biodiesel met standards set by the American Society for Testing and Materials for glycerol, methanol, and viscosity.

Board #35: "Formation of Coumarin Base Polymer," Hawa Fall and Dr. Margaret Kerr, Department of Chemistry, Worcester State College, Worcester, MA 01602

7-hydroxy-4-methylcoumarin was synthesized with 1, 6-dibromohexane to form a monomer with coumarin base. The purpose of this study is to develop a water-soluble polymer for use of photoresists application. Unlike other commercially polymer, the proposed polymer of this study is believed to be more benign, therefore it would not contribute to air pollution. When 7-hydroxy-4-methylcoumarin reacted with excess 1, 6-dibromocoumarin and potassium carbonate in acetronitrile, yellowish oil with white solid at the bottom was formed. The product of the solution was believed to be to 7-(6-bromohexyloxy)-4-methylchromen-2-one. The solution was separated by adding distilled water and dichloromethane. Each product was then tested with NMR and IR to further conclude their identity.

Board #36: "The Greening of Coumarin Synthesis," Wyatt Merrill, Stephen Glynn, and Dr. Margaret Kerr, Department of Chemistry, Worcester State College, Worcester, MA 01602

In conjunction with an ongoing project which seeks to incorporate substituted coumarin molecules into polymer chains for use as water-soluble photoresists, we report an examination of various coumarin synthesis techniques with an emphasis on environmentally benign methods. In recent years, synthesis techniques for coumarin and its derivatives have evolved considerably. This evolution has largely been driven by the recent push toward

"greener" methods across the field of chemistry. Many new reaction schemes make use of ionic liquids as greener, more efficient solvents. Others employ ionic liquids for catalysis, opting for water as an even greener solvent. Still others have developed techniques for the synthesis of coumarin which forgo solvents altogether. Our work experimentally aims to recreate many of these techniques, and improve upon them with the goal of optimizing the "greenness" of coumarin synthesis.

Board #37: "Greener Separation of Dyes using Aqueous Biphasic Systems," Keith Dusoe and Dr. Meghna Dilip, Department of Chemistry, Worcester State College, Worcester, MA 01602

Aqueous Biphasic Systems (ABSs) are a safer and "greener" alternative to the traditional solvent based extraction methods for environmental remediation since they replace volatile organic solvents that are often times flammable and carcinogenic. Composed largely of water and non-toxic, non-volatile and non-flammable components (Polyethylene glycol or ionic liquids), an aqueous biphasic system (ABS) allows for extraction of hazardous chemicals without use of auxiliary substances. In this work, the effective partitioning of gentian violet, a toxic dye, was demonstrated in both a polymer- salt ABS and a salt-salt ABS. The polymer-salt system studied was composed of polyethylene glycol (average molecular weight 950-1050) and a kosmotropic salt ($(NH_4)_2SO_4$,) while the salt-salt ABS was composed of a chaotropic hydrophilic ionic liquid (n-butyl-3-methylimidazolium chloride, [C4mim]Cl) and kosmotropic salt (K_3PO_4). It was shown that the nature of the kosmotropic salt, ionic liquid/PEG concentrations and pH all played a major role in the partitioning of the dyes. Differences in the nature of partitioning in a salt-salt ABS as opposed to better known polymer-salt ABS will be discussed.

Board #38: "Microwave Assisted Silane Depositions for Application in Solar Cell Materials," Robert W. Cotta Jr., Charles Hall, and Dr. Clifford Murphy, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Solar energy as a source of sustainable energy is an attractive alternative to coal, natural gas, or nuclear energy but is not yet cost compatible. Development of dye-sensitized solar cells (DSCs) and organic polymer solar cells (OSCs) have both incorporated functionalized silane layers to improve electronic communication between metal oxide and photosensitizing layers. Here we investigate the application of microwave heating to accelerate and improve silane depositions on glass, quartz, and ITO substrates and characterize the completeness of reaction by contact angle measurement, surface free energy, and AFM. Silane depositions will occur under conventional heating and room temperature depositions as controls for the varied microwave irradiation time deposition experiments. These surfaces will undergo additional coupling reactions and the surfaces will be re-characterized to provide additional data.

Board #39: "Coupling reactions on functionalized quartz and ITO substrates using microwave irradiation," Charles Hall and Dr. Clifford B. Murphy, Roger Williams University, Department of Chemistry, One Old Ferry RD, Bristol, RI 02809

The field of microwave chemistry has shown a multitude of reactions performed under microwave radiation to be faster, more efficient, and potentially better for the environment. Self-assembling monolayer's (SAMs) and thin films have demonstrated applications in the fields of electronics, optoelectronics, photovoltaic's, and biological sensors. We have performed the Sonogashira coupling reactions on silane-functionalized glass slides in the microwave and shown an 84% time decrease along with an 87% power decrease from conventional heating methods. The next step is to perform the same coupling reaction on a quarts substrate as a control

experiment due to its crystalline flat surface allowing for a more uniform coverage as well as easier to read AFM roughness measurements. Using the quarts substrate as a control we hope to continue on to performing the coupling reaction with ruthinium complexes on Indium tenoxide (ITO) functionalized quarts slides for use in photovoltaics. This will allow us to obtain electrochemical characterization of the prepared surfaces.

Board #40: "Trends in overall water quality at four sites along the Pemigewasset River, New Hampshire from 1990 to 2009," Laura Pinkham, Nathan Furey, Ashley Wasilew, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Water quality is important to human health and to biodiversity, and it can be assessed through different means. With data collected through the Merrimack River Watershed Education Project, we looked at trends in water quality at four sites along the Pemigewasset River in Lincoln, New Hampshire from 1990 to 2009. The variables we compared were dissolved oxygen, pH, temperature, and a macroinvertebrate index. Between the four sites, conditions fluctuated from year to year but we found similar water quality overall. Across all sites, analyses of trends in water quality over time revealed that dissolved oxygen levels have decreased, while pH, temperature, and the macroinvertebrate index all increased. The index we used for the macroinvertebrate collection showed that many taxa were intolerant of pollution, indicating good water quality. These data suggest that overall water quality has improved since 1990.

Board #41: "Response of experimental freshwater communities to increasing dissolved road salt concentrations," Dylan Jackson, Basil O'Leary, Donal Magrane, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

The health of freshwater ecosystems can be determined by observing the abundance and distribution of certain species called bioindicators. The decline of some bioindicators can indicate that a habitat has become polluted. Because regions in the northern United States experience long, intense winters, large quantities of salt are used on the roadways to create safer driving conditions. Runoff in the springtime carries salt from the roadways to surrounding freshwater habitats. In our study, experimental communities containing five different types of organisms were exposed to different concentrations of dissolved road salt. Although all species were not affected to the same extent, overall survival decreased as salt concentration increased. Snails in this study were the most susceptible to high salt levels. In conclusion, some species showed they could be useful bioindicators for high salt levels, but in the long run, biodiversity in freshwater ecosystems could be significantly altered by increased salt levels.

Board #42: "Road salt versus Ice Ban®: the effect of deicing agents on the survival of dragonfly larvae," Katherine Holder, Devin Arn, Will Colt, and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

In cold climates, salt is frequently applied to roads to prevent the accumulation of ice and snow, but can negatively impact freshwater organisms when it enters their habitats through runoff. Some alternative deicing agents, however, may be less detrimental to freshwater ecosystems. One alternative, IceBan®, is a byproduct of the domestic brewing industry and is used on campus at Plymouth State University in New Hampshire. We tested the effects of different concentrations of road salt and IceBan® on the survival of dragonfly larvae. At the lowest concentration (5 g/L), neither salt nor IceBan® caused dramatic decreases in survival. However, at higher concentrations, survival in road salt solutions was significantly lower than in IceBan® solutions. These

results suggest that the use of IceBan® may be less harmful to some aquatic life than the use of road salt, although other aspects of its effects on dragonflies and other species need further investigation.

Board #43: "Developing a GIS Pilot Project to Assess and Predict the Probable Return of a Green Rooftop Conversion in the Study Area Abutting Boston Harbor, MA," Matthew T. Iannelli and Dr. Helenmary Hotz, Environmental Earth and Ocean Sciences Department, UMASS Boston, Boston, MA, 02125

Research shows that surface temperature is greatly affected by land use. This supports development of green strategies, such as green rooftops, as a viable solution to addressing climate change in mid-latitude urban settings. Green conversion of urban rooftops can drastically reduce the cost of heating and cooling, and therefore reduce the overall energy cost and the building's carbon footprint. This pilot project will employ a Geographic Information System (GIS) to gain a realistic assessment of percentage of area available for greening within the designated pilot portion of coastal Boston, as well as estimate the probable return gained by this conversion. To address the policy issues involved in these decisions, data on building/parcel ownership will be included in the model to determine if the building is designated as private, state or federal. This will be beneficial in determining the associated cost of the proposed conversion.

Board #44: "Theoretical docking between papain and X-phenyl hippurates," Katie Link and Dr. Nancy Breen, Chemistry Department, Roger Williams University, Bristol, RI 02809

Papain is a cysteine protease that has been frequently used both as a model for structure based drug design and in QSAR studies because of its well-characterized structure. This study uses Autodock 4.0 to investigate papain's ability to hydrolyze eleven mono-substituted X-phenyl hippurates. These ligands were chosen because previous QSAR studies indicate a close relationship between the Hammett constant to rate of the hydrolysis. The docking energies are compared with QSAR data to determine if the two methods can be correlated. These same ligands will then be docked with *Asperigillus phoenicis* to compare the results with ongoing QSAR studies.

Board #45: "QSAR investigation of the Fungal Zinc Protease (IX) Hydroxide Hydrolysis of the Para-Substituted Phenyl-Hippurates Under Varying Temperature and pH Conditions," Jonathan R. Dorian and Dr. Stephen O'Shea, Department of Chemistry, Roger Williams University, 1 Old Ferry Rd., Bristol, RI 02809

This study investigates a series of X-para-substituted phenyl-hippurates as substrates in Quantitative Structure Activity Relationship (QSAR) investigation with fungal Zinc Protease. Zinc Protease enzymes have been structurally well characterized but no comprehensive research have investigated the mode of action. The metallo zinc enzyme is coordinated by three histidine rings there is no evidence of a metal binding site activating water by increasing auto ionization and generating a hydroxide nucleophile. While it shows that a water molecule is dissociated and forming a hydroxide nucleophile there have been no previous observations that water is bound to the enzyme. This can be elucidated by pH and temperature QSAR studies. The substrate compounds synthesized from condensation reaction of phenyl hippuric acid and para substituted X-phenol (X=Cl, Br, F, CH_3, OH, NH_2). The purity determined by using NMR, IR, and UV-Vis. Zinc Protease hydrolytic substrates activity was assayed spectrophotometrically (190-700nm) on the Omegastar plate reader ®. The data collected has been used to develop a QSAR model that explains the enzyme's structure-reactivity relationship towards the substrates under varying pH and temperature conditions.

Board #46: "QSAR model of para -substituted phenyl hippurates enzymatic hydrolysis by Trypsin XIX under varying temperature and pH conditions," Jesse A. Dixon and Dr. Stephen K. O'Shea, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Pharmaceutical drug design begins with target molecules that display interesting biological profiles and ends with optimizing their activity profile. Quantitative Structure Activity Relationship (QSAR) method is used to design these new drug targets. This research investigates a relationship between the kinetics of the hydrolytic enzyme Trypsin and how substituent sigma effects on the substrate regulate the rate of reaction with view to developing a potent substrate. The set of substrates investigated is a series X-para-substituted phenyl-hippurate (X= Cl, Br, F, CH_3, OH, C_2H_5). The substrates are prepared by the condensation reaction of phenyl hippuric acid with an X-para-substituted phenol. The purity of the substrates were determined by NMR and FTIR. Trypsin hydrolytic substrate activity was assayed spectrophotometrically (190-700 nm) on the Omegastar® plate reader. The data collected has been used to develop a QSAR model that explains the enzyme's structure-reactivity relationship with the substrate under varying pH and temperature conditions.

Board #47: "Protein-ligand binding studies of alcohol dehydrogenase with four pyrazoline-based ligands using AutoDock," Elizabeth LeMasters and Dr. Nancy Breen, Department of Chemistry, Roger Williams University, Bristol, RI 02809

AutoDock is a molecular modeling program used to explore many different binding conformations and to best determine optimum protein-ligand binding geometry. AutoDock was applied to predict the binding orientation of four different pyrazoline-based compounds to an iron-containing alcohol dehydrogenase protein. The ligands act as potential drug candidates to inhibit the secondary response observed by the alcohol dehydrogenase protein in *Entamoeba histolytica*. AutoDock computationally screens proposed inhibitors to determine theoretically which compound binds best to the protein. The relative binding energies calculated in AutoDock determine the affinity of the ligand for the protein. Thus, we can suggest the best ligand to synthesize and also identify a better inhibitor for alcohol dehydrogenase.

Board #48: "**Synergistic approach to find alternative drug against amebiasis: 3-phenyl-1-(phenyl carbamoyl and thiocarbamoyl)-2-pyrazolines,"** Monichan Phay, Barbara Mann and Dr. Avelina Espinosa, Department of Biology and Chemistry, Roger Williams University, Bristol, RI 02809

Entamoeba histolytica causes 50 million infections and 100,000 deaths annually. Deficient in mitochondria and cytochrome oxidative system, these parasites use a fermentative pathway for energy metabolism by means of a bi-functional enzyme, *Entamoeba histolytica* alcohol dehydrogenase 2 (EhADH2). Due to the enzymes' crucial role in *E. histolytica's* survival and its dissimilar characteristics to human alcohol and aldehyde dehydrogenases, EhADH2 is an excellent target to treat amebic infection. Series of pyrazoline analogues were synthesized and tested against EhADH2 activity because of their broad use in medicine as anesthetics and antibiotics. All pyrazolines compounds tested showed inhibitory effects on *E. histolytica* trophozoite growth and EhADH2 enzymatic activities. The efficiency of each compound on growth and activities varied depending on the side halogens: chloride affect amebic growth and biochemical activities more than bromide. Furthermore, thiocarbamoyls are better inhibitors than carbamoyls. These compounds are being modified to improve their solubility and efficiency. Cyclic pyrazolines are thought to act as alcohol analogs but more work is needed to elucidate the mechanism of action on EhADH2.

Board #49: "Synergistic approach to find alternative drugs against amebiasis: 3,5-diphenyl-1-(Phenyl carboxamide)-2-pyrazoline series," Keith B. Austin, Laura-Ashley Przondo, Barbara Mann, Monichan Phay, Robert Yaeger, Erica Ryke and Dr. Lauren Rossi, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Entamoeba histolytica is a parasitic protozoan which infects 50 million people worldwide causing 100,000 mortalities annually. The primary treatment of amebiasis utilizes metronidazole which has unwanted side effects. Lacking mitochondria and residing within the anaerobic environment of the intestinal lumen causes the organism to utilize a fermentative pathway for metabolism. The terminal fermentation step is catalyzed by the bifunctional enzyme *E. histolytica* alcohol dehydrogenase 2 (EhADH2) which converts acetyl-CoA to acetaldehyde then to ethanol, regenerating NAD^+ from NADH. It has been found that EhADH2 is required for both growth and survival of the parasite. Nine compounds of the 3, 5-phenyl-1-(Phenylcarboxamide)-2-pyrazoline series have been synthesized and tested for antiamebic activity and inhibition of EhADH2. None of the compounds exhibited antiamebic or EhADH2 inhibitory properties during screening. However, when compared to 3-phenyl-1-(phenylcarboxamide)-2-pyrazolines, which display both antiamebic and EhADH2 inhibition activities, information can be gathered on both successful inhibitor design and enzyme structure.

Board #50: "Synthesis and characterization of a pyrazine-bridged ruthenium acetylide complex," Daniel J. Van Buren and Dr. Cliff J. Timpson, Department of Chemistry and Physics, Roger Williams University, Bristol, RI 02809

Our group has been interested in ligand-bridged, ruthenium metal complexes for several years. Recently, we have turned our attention to the synthesis of the dimer trans-trans-[PhCC-$(dppm)_2$Ru-pyrazine-Ru$(dppm)_2$-CCPh] where dppm = bis(diphenylphosphino) methane. We are interested in exploring the metal-metal coupling in this complex and the possible existence of any intervalence charge transfer bands that may exist in the partially oxidized, mixed-valent form of the dimer. Our efforts to synthesize and characterize this complex will be presented.

Board #51: "Synthesis and characterization of a series of dicyano bridged ruthenium complexes," Brian N. DiMarco and Dr. Cliff J. Timpson, Department of Chemistry, Roger Williams University, Bristol RI, 02809

Over the past few years our group has been interested in the photochemical and electrochemical properties of complexes based on trans-$[Ru(pyridine)_4Cl(L)]^{n+}$, where L is a pyridyl-type ligand (i.e. pyridine, isonicotinic acid, or pyrazine). Recent work in our group is focused on a series of dinuclear complexes of the form trans-trans-$[Cl(pyridine)_4$Ru-NC-L-CN-Ru$(pyridine)_4Cl]^{n+}$, where NC-L-CN is an alkyl or aromatic dicyano bridging ligand. The syntheses along with our efforts to investigate the properties of the mixed-valent forms of these complexes will be presented.

Board #52: "Pure Water for Cambodia: Testing an Alternative *E.coli* Bacteria Filtration Protocol for the Siem Reap Water Laboratory," Heather M. Pereira and Dr. Kevin Curry, Department of Biological Sciences, Bridgewater State College, Bridgewater, MA 02325

Clean drinking water is not something to take for granted. *Escherichia coli* (*E.coli*) bacterial filtration methods are used all over the world to help aid in a promotion of health for all communities rich and poor. The ability to test *E.coli*, makes tracking the progress made with clean water projects possible. *E.coli* is used as an indicator

of water-born pathogens that can cause gastroenteritis and sever diarrhea. In Cambodia, almost 17% of children under the age of 5 typically die from dehydration due to diarrhea from contaminated water (WHO 2006). The purpose of this project was to compare bacterial filtration methods used at the Siem Reap Water Lab (SRWL) and an alternative filtration method used at the Watershed Access Lab (WAL). The focus was to save the SRWL resources by decreasing the volume of sterile distilled water needed filtration when sample dilution is required. Both methods were tested at the WAL in Fall 2008 and Spring 2009. In March 2009, a trip was taken to Cambodia to test both filtration methods at the SRWL. Siem Reap River samples were gathered, filtered and then observed in the SRWL to evaluate the two methods.

Board #53: "Creating a Bicycle Culture: A Bicycle Plan for Westfield State College," Jacquelyn Vincent, Thomas Pease, Matthew Waldrip, Ethan Michaud, Jacquelyn Vincent and Dr. Marijoan Bull," Department of Geography and Regional Planning, Westfield State College, Westfield, MA 01086

Campus sustainability has been a relatively new goal for Westfield State College, but one that has quickly taken priority. Students in the spring 2009 course, Land Use and Natural Resource Planning at Westfield State College undertook a planning process to create a bicycle plan for the college, with the aim of creating a bicycle culture. The steps followed included: (1) setting goals; (2) gathering data through a variety of methodologies such as: interviews, field work, a survey, research, and case studies; (3) analyzing the data with GIS and the help of some outside experts; (4) developing recommended actions; and (5) implementing and evaluating the plan. The recommendations range from creating bike lanes in areas around the campus, to implementing bike share programs and supporting advocacy groups. Currently the plan has gathered a fair amount of interest from the city of Westfield and has even been adopted by the parks and recreation committee. Efforts will continue this year focusing on getting support from both the college and the city for a variety of actions.

Board #54: "Measuring Impacts of Tray Removal in College Dining Programs: An Eco-Friendly Alternative at Westfield State College," Rowan Cignoni, Meghan Scholl, Aviva Berezin, Wayne Wagner and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

In the fall of 2009, Westfield State College followed through in its efforts to reduce waste produced by the campus dining commons. This act has been referred to as "going trayless in the DC". Following in the footsteps of many other campuses nationwide, Westfield State College has eliminated trays and introduced attractively designed plates and bowls instead, with hopes that this will yield some long-term environmental and financial benefits. Based on information collected from other institutions, going "trayless" promises to decrease solid and chemical waste, increase energy and water savings, and even benefit the well-being of students due to a healthier diet. Our poster presents the results of our research to determine the short-term costs of this project and compare these costs to the long-term benefits. To get a sizable sample of the student population's outlook on the program, we surveyed fifty people during peak hours at the Dining Commons. This survey covered topics such as the general student opinion on the changes and whether or not they have been eating or feeling healthier as a result. Our other task was to measure the impacts this project may have if expanded to a statewide or a full nationwide level. Using the computer program SPSS to conduct a statistical analysis, we found a mean savings by all schools in Massachusetts that were similar in size to Westfield State (2,000 – 5,000 students). This average was based on our research of what other schools similar to Westfield State College had saved after going trayless. We then researched schools all around the nation that adhere to this size and used these combined data to extrapolate an estimation of potential nationwide savings. As of now the studies are incomplete, but we hypothesize that the long-term impacts of the trayless program will easily compensate for the short-term costs if expanded to a national course of action.

Board #55: "The Environmental and Human Health Impacts of the Bottled Water Industry," Amy Clark, Alicia Hummel and Dr. Michael Vorwerk, Environmental Science Department, Westfield State College, Westfield, MA 01086

These days drinking bottled water has become a habit for most people. The plastic water bottle industry is a competitive market with the average world consumption increasing 7% annually (Ferrier, 2001). There are a few reasons why this billion dollar industry is constantly on the rise including the population increase of many areas. Urbanization is steadily rising and with that increase comes people's concerns for the quality of tap water. Many consumers believe bottled water is a safe alternative, but what they don't know is that their consumption is actually doing more harm to both their bodies and the environment then they believe. Industries are obliterating the earth's natural resources and fossil fuels in order to manufacture and transport their products. On average about 86% of manufactured water bottles end up as litter in landfills (Levchuk, 2008). The world's consumption of bottled water is a wasteful luxury with devastating impacts on both the environment and society's health.

Board #56: "Habitat Limitations and Resource Partitioning during Summer Stratification in Productive Lakes," Kyle Jones, Tim Fontana, Bethany St. Laurent and Dr. David R Christensen, Westfield State College, Biology Department, 577 Western Ave., Westfield, MA 01086

Stratification in productive lakes provides a system which segregates different fish species to the epilimnion, metalimnion, and hypolimnion based on temperature and dissolved oxygen concentrations. Elevated phosphorus and nitrogen concentrations can further exacerbate stratification effects through excessive productivity and hypolimnetic oxygen demand. Diverse groups of fish isolated together or segregated in either lake zone could increase the potential for competition or segregation. In particular, coldwater species such as trout may be confined to the metalimnion when temperature and dissolved oxygen is inadequate in the remainder of the lake. Global climate change can exacerbate stratification levels, possibly leading to the accelerated compression and extinction of coldwater fishes. In this study we found high concentrations of phosphorus and nitrogen in Hampton Ponds, Massachusetts suggesting that the lake is mesotrophic. Temperature and dissolved oxygen curves also suggest high productivity and potential segregation and confinement of species based on temperature and dissolved oxygen levels. No trout were sampled during epilimnetic electrofishing excursions during September of 2008 when temperatures exceeded 18°C in the epilimnion; suggesting that trout were suppressed to the metalimnion. In September 2009, however, trout were sampled and were able to utilize the epilimnion due to cooler temperatures. Stratification is a natural process and can be more intense in lowland productive lakes. Cultural eutrofication and global climate change can severely enhance stratification effects on sensitive coldwater species.

Board #57: "Westfield State College Microclimate Analysis," Jonathan Peters and Dr. Michael Vorwerk, Department of Geography and Regional Planning, 577 Western Avenue, Westfield State College, Westfield, MA 01086

A microclimate defines an area in which the climate is different from the surrounding areas due to subtle differences in topography, vegetation, or land use. In this GIS-based research experiment, six temperature loggers were deployed in the vicinity of Westfield State College. Four of the loggers measure air temperature and relative humidity and two were placed in surface water bodies. The experiment answers several questions: 1) Does the cold air drain to lower elevations in the vicinity of the college? 2) Is the school an "urban Heat Island" and what is the impact to the surrounding area? 3) Is there a climate difference based on this data between densely-forested and open-natural areas? The data has been collected over the past year and will be

presented in relationship to a digital elevation model and land use/vegetation cover. The network will be expanded in the coming months to include higher-elevation sites in the Berkshires and additional sites in Westfield.

Board #58: "A Quantitative Accuracy Assessment of Inexpensive GPS Receivers," Clark Freeman and Dr. Carsten Braun, Westfield State College, Geography and Regional Planning, Westfield, MA 01085

Garmin eTrex series 12 channel GPS receivers were used to evaluate horizontal and vertical accuracy of GPS receivers. Tests were conducted in a variety of typical environmental situations (open, thin vegetation, thick vegetation) to evaluate how vegetation affects the accuracy of GPS receivers. Accuracy test were conducted locating two GPS receivers in fixed positions ten meters apart for ten minute intervals, recording their locations every two seconds. ArcGIS and Microsoft Excel were used to create scatter plots to quantify the data for horizontal and vertical accuracy. Preliminary results indicate as vegetation cover increases, accuracy of the GPS receivers decrease as evident by a larger standard deviation in the data collected. In addition, similar tests were conducted over an official NGS benchmark to determine the absolute accuracy of the GPS receivers. As a practical application, we used the GPS receivers to map the hiking trail system in Tekoa Park (Westfield, Massachusetts).