NEAFWA ABSTRACT ARCHIVES: 2015 Fisheries Sessions

Inland Fisheries #1	
Monday, April 20, 2015 1:00 p.m. - 5:00 p.m.	
1:00 p.m.	**Northeast Lake and Pond Classification System** *Arlene Olivero Sheldon, Alexandra Jospe, Mark G. Anderson —The Nature Conservancy, Eastern Conservation Science, Eastern Regional Office, Boston, MA* We developed a mapped classification of lakes and ponds based on variables that structure lacustrine natural communities and that could be mapped consistently across Northeastern US. The classification was built upon four key attributes: water temperature, trophic state, alkalinity, and depth. Water temperature was classified into three classes (very cold, cold-cool, warm). Trophic state, representing the productivity of a lake, were mapped into four classes (oligotrophic, mesotrophic, eutrophic, and hyptereutrophic). Alkalinity was grouped into three classes (high, medium, low). Depth was divided into two classes (lake, pond) based on a light penetration zone. A steering committee of state and regional experts contributed sampled data with measured values of these and other variables for waterbodies in their states. Additionally, we received lake survey information from the National Lake Assessment and the New England Lake and Pond Survey. The classification was mapped to every waterbody in the region (n = 32,651) using the National Hydrography Dataset Plus, and for each waterbody we generated over 100 landscape variables including: surface area, elevation, latitude, longitude, geology, and land cover in the buffer zone. We used Random Forest software to develop a predictive model for each variable class. All waterbodies were assigned to one of 68 classification types based on the combination of the four variables, for example "warm, eutrophic, medium alkalinity lake." The classification may be simplified using combinations of only two variables, such as temperature and trophic level, which yields between 9-12 types.
1:20 p.m.	**Natural Dams in Free-Flowing Rivers** *Denise Burchsted, Lindsay St Pierre, Joshua Dallesander, Olivia Thorndike, Charles Stoll — Keene State College* In the absence of active human management, the free-flowing nature of rivers is regularly interrupted by natural dams. These dams - which include beaver dams, log jams, and landslide dams, among many others - create conditions distinctly different from common river management targets such as low temperatures, limited obstructions to movement of organisms, low nutrients, and high oxygen. Despite the contrast between these impoundments and management targets, free-flowing rivers that are punctuated by these temporary impoundments promote desired conditions such as increased biodiversity and higher populations of cold-water salmonids. This talk presents oxygen, temperature, pH, and nutrient data that demonstrate the heterogeneous nature of rivers that are rewilding. Our twelve study rivers are located in protected areas of New Hampshire with very limited modern human impact, including unmaged areas within the White Mountain National Forest, Pisgah State Park, and the Hubbard Brook site for Long Term Ecological Research. We emphasize that a defining feature of these rivers is the heterogeneity generated by natural dams, which are presumably also a part of the conditions under which our river ecosystems developed, under which our desired species evolved, and which, therefore, are worth considering in the context of our modern river management.
1:40 p.m.	**Characterization of the Migratory Phenotype in Lake Sturgeon** *Justine Whitaker, West Virginia University; Amy Welsh, West Virginia University; Darryl Hondorp, US Geological Service; James Boase, U.S. Fish and Wildlife; Stuart Welsh, West*

	Virginia University; George Merovich, West Virginia University In Lake St. Clair of the Great Lakes system, lake sturgeon (Acipenser fulvescens) are partial migrants, with some individuals out-migrating to lakes and others residing in the river year-round. To characterize the migratory phenotype, we analyzed morphometrics, epigenetics, and genetic differentiation using neutral markers. We used photographs to obtain 17 morphometric characters for 60 telemetered fish (35 residents, and 25 out-migrators). Morphometric data, analyzed with Principal component analysis (PCA), did not support morphologic differences between migratory phenotypes. For the epigenetic analysis, differential methylation was measured using the methylation sensitive (MS)-AFLP protocol on 14 individuals (7 migrants and 7 residents). An AMOVA performed for individual loci detected two restriction sites that were nearly statistically different (ϕ=0.05, P=0.063). Locus 118 and 153 were methylated in four of seven individuals of the migrant phenotype, but were unmethylated in all resident individuals. Two additional years of data will be added to increase the power of this analysis. It appears epigenetic changes were the only differences between the two phenotypes and may be the most useful tool for evaluating rapid adaptation in the presence of substantial gene flow.
2:00 p.m.	**Tracing juvenile lake sturgeon (Acipenser fulvescens) from Lake Superior back to their most likely point of spawning origin** *Christi Raines, Amy Welsh — West Virginia University; Henry Quinlan, U.S. Fish and Wildlife Service* Lake sturgeon (Acipenser fulvescens) are a primitive species of North American fishes that reside in fresh water habitats during all parts of their life cycle, living throughout the Great Lakes basin. They remain vital ecological indicators within their ecosystems and are currently threatened or endangered in most of their natural habitats. For our study, juvenile lake sturgeon were sampled and released, using gill netting, at a number of locations throughout Lake Superior. Twelve microsatellite loci were used in order to genotype more than 750 individuals. We have used the data compared against a previously established baseline in order to assign individuals back to their most likely point of spawning origin, using assignment testing methods. Upon preliminary analysis, we have found that Goulais Bay individuals mostly assign back to the Goulais area (79.6%), but small numbers of migrants have been found from other locations in Lake Superior, including Bad/White River (1.7%), Sturgeon River (10.1%) and the stocked Wolf River (8.6%). We have also been able to assess the amount of mixing between populations, allowing us to make inferences about population structure as well as to identify potential "hot spots" that are drawing lake sturgeon from other areas of Lake Superior, potentially suggesting a higher availability of resources at those locations.
2:20 p.m.	**Bioconcentration of Phthalates in Lake Trout Resulting from Ingestion of Soft Plastic Lures** *Dana DeGraaf, ME Dept. Inland Fisheries and Wildlife; Colby Wells, D.V.M., ME Dept. Inland Fisheries and Wildlife; Lawrence LeBlanc, PhD., University of Maine, School of Marine Science; Barry Mower, PhD., ME Dept. Environmental Protection* Soft plastic lures (SPLs) are popular tackle among many sport fisheries in North America. In Maine, SPLs are used frequently in the bass fishery and are often lost to the aquatic environment during active fishing. Discarded SPLs have been documented extensively in many Maine lakes and the ingestion of these SPLs by salmonids is a growing concern by anglers and fisheries managers. Plasticizers, such as phthalates, are a low-molecular weight polymers. Phthalates are frequently used in soft plastics and are used to render SPLs flexible. The negative effects of phthalates on both terrestrial and aquatic organisms have been well documented. Based on the chemical constituency of SPLs, the ubiquity of SPLs as discarded fishing tackle in Maine lakes and ponds, and the well-documented environmental and human health impacts from phthalate

	esters, we developed a study to determine: 1) the chemical constituency of SPLs, including identification of phthalate esters; and 2) the bioconcentration of phthalates in fish tissue commonly consumed by humans. Hatchery lake trout (togue) broodstock were separated and maintained at the Governor Hill Hatchery in Augusta, ME. Two treatment groups and one control group were established. One treatment group was force fed SPLs advertised as not containing phthalates. The other treatment group was force fed SPLs with no distinction regarding phthalates. The control group was not fed any SPLs. Post-SPL feeding, all treatment and control groups were fed a maintenance diet during the duration of the 4-month study. The same brands of SPLs that were used in each of the two treatment groups were provided to the University of Maine Orono for chemical analyses to determine the presence of phthalates via gas chromatography/mass spectrometry. Four months post- SPL feeding, all study fish were provided to the lab and edible fish tissue (i.e. fillets), blood, and livers were analyzed for the presence and concentration of phthalates. The study is currently ongoing. Determining the chemical constituency of SPLs and whether key ingredients (i.e. phthalates) bioconcentrate in edible fish tissue will enhance our understanding of the possible effects of ingested SPLs by salmonids in Maine's lakes and ponds.
BREAK 2:40 p.m.	
3:20 p.m.	**Characterizing survival of Smallmouth Bass, Micropterus dolomieu, from Age 0 to Age 1 in Pennsylvania river sections using electrofishing survey gear catch rates and regression model residuals** *R. Lorantas, Pennsylvania Fish and Boat Commission; T. Wagner, U. S. Geological Survey and the Pennsylvania State University Cooperative Fish and Wildlife Unit; D. Arnold, J. Detar, M. Kaufmann, K. Kuhn, R. Lorson, R. Wnuk, A. Woomer — Pennsylvania Fish and Boat Commission* Riverine backpack electrofishing catch rate of Age 0 Smallmouth Bass and flat-bottom boat electrofishing catch rate of Age 1 and older Smallmouth Bass has been measured on Pennsylvania rivers since 1987. A mixed effects regression model was fit to Age 1 catch rate versus the preceding years' Age 0 catch rate at fixed sites on river sections across Pennsylvania. River section specific regression lines describe, on average, the relation of Age 0 catch rate to the subsequent years Age 1 catch rate. For each river section specific catch rate regression relation, a regression residual was examined for the 1991, 2005 and 2007 year classes. These year classes could be characterized as above average statewide. Of 29 river section residuals used to characterize survival of the 1991 year class, two were negative suggesting below average survival to age 1. Both river sections were contained in the Delaware River Basin. Of 21 river section residuals used to characterize survival of the 2005 year class, six were negative, suggesting below average survival. Five sections were contained within the Susquehanna River Basin and one section in the Delaware Basin. Of 24 river sections where residuals were used to characterize survival of the 2007 year class, 15 were negative. Most, eight, were contained within the Susquehanna River Basin, however, five were contained within the Delaware Basin and two within the Ohio Basin. Coincident with assessment sampling in 2005 and 2007, an unusual mortality of Age 0 Smallmouth Bass was observed, most notably within the Susquehanna River Basin. Survey catch rates provide coarse perspective about survival of early life stages of Smallmouth Bass on Pennsylvania rivers.
3:40 p.m.	**Summer Thermal Thresholds of Fish Community Transitions in Connecticut Streams** *Mike Beauchene, CT DEEP Inland Fisheries Division; Mary Becker, Chris Bellucci — CT DEEP Bureau of Water Protection and Land Reuse; Neal Hagstrom, CT DEEP Inland Fisheries Division; Yoichiro Kanno, Clemson University* Thermal tolerances have been studied for individual fish species but few have investigated how

	stream fish assemblages respond along a temperature gradient and which thermal ranges act as a threshold, triggering discernible community change. The purpose of this study was to define summer temperature thresholds of fish community transitions in Connecticut streams. The program Threshold Indicator Taxa Analysis suggested that the coldwater class had a June–August mean water temperature < 18.29◦C, the coolwater class 18.29–21.70◦C, and a warmwater class > 21.70◦C. Significant indicator species of coldwater streams were Slimy Sculpin Cottus cognatus and Brook Trout Salvelinus fontinalis. Significant indicator species of warmwater streams were Cutlip Minnow Exoglossum maxillingua, Smallmouth Bass Micropterus dolomieu, Rock Bass Ambloplites rupestris, Brown Bullhead Ameiurus nebulosus, Redbreast Sunfish Lepomis auritus and Yellow Bullhead A. natalis. The narrow 3.41◦C temperature range between the coldwater and warmwater thresholds was designated as a coolwater transition zone, with potential for the presence of both coldwater and warmwater species and lack of species uniquely associated with this thermal range. Our approach based on a robust set of water temperature and fish community data should be applicable to other temperate regions and will be useful for informing development of thermal criteria, application of multimetric indices, and planning for anticipated effects of climate change.
4:00 p.m.	**Empirical evaluation of the temporal stability of microsatellite DNA genotypes in spawning populations of Atlantic sturgeon: Implications for mixed stock analysis** *Isaac Wirgin, Lorraine Maceda — Department of Environmental Medicine, NYU School of Medicine; Doug Peterson, Adam Fox — Warnell School of the Environment, University of Georgia* DNA analyses have served as a foundation for the listing and management of Atlantic sturgeon under the U.S. Endangered Species Act. The five Distinct Population Segments (DPS) under which the species is listed were largely defined by the genetic similarity among spawning populations. DNA profiles of individuals or aggregations of Atlantic sturgeon are now used to identify the DPS or population origin of specimens that are bycaught in coastal fisheries, implanted with acoustic tags, or found dead from anthropogenic or unknown causes. Ancestries of individuals or aggregations of unknown origin are identified by comparing their DNA profiles to reference collections of juvenile or adult specimens obtained from individual spawning rivers. Thus, it is imperative that reference river collections accurately represent the genetic signatures of those populations. To date, reference samples are often represented by adult or juvenile samples collected from only a single year within a spawning river. In this study, we compared the inter-annual temporal stability of microsatellite DNA genotypes in juvenile (<50 cm TL) or adult (>130 cm TL) Atlantic sturgeon collections from 8 spawning rivers coastwide. We found significant genetic inter-annual differentiation between collection years of juveniles from some presumably smaller populations and an absence of significant genetic differentiation among collection years of adults or juveniles from larger populations. Our results suggest that the most informative use of genetic mixed stock analysis of Atlantic sturgeon requires that reference collections be made over several years, particularly for small populations where only juvenile samples are available. Given the intermittent spawning patterns of Atlantic sturgeon, particularly females, we suggest that it may take up to 5 collection years to accurately represent the genotypic signatures of small populations.
4:20 p.m.	**The North Atlantic Aquatic Connectivity Collaborative: Unifying Stream Crossing Assessment Protocols** *Scott Jackson, Melissa Ocana — University of Massachusetts Amherst* The fragmentation of aquatic habitats by roads and road-stream crossings, such as culverts, is a primary threat to aquatic species. These barriers limit the ability of fish, amphibians, and other wildlife to move freely throughout their habitats or adjust their distribution in response to climatic changes. Road-stream crossings also limit the ability of water to flow freely during

	extreme storm events. This often results in culvert failures and road washouts, as happened on a large scale during Hurricanes Irene and Sandy. Strategic replacement or upgrade of road-stream crossings can both increase habitat connectivity and enhance resiliency of road infrastructure to storm damage. Thanks to support from the North Atlantic Landscape Conservation Cooperative and DOI Hurricane Sandy Mitigation funds, the University of Massachusetts-Amherst, The Nature Conservancy, and expert partners throughout thirteen states have formed the North Atlantic Aquatic Connectivity Collaborative (NAACC). The NAACC is a participatory network of practitioners united in their efforts to enhance aquatic connectivity. Our presentation will provide an overview of the NAACC's work, including: 1) developing unified protocols for road-stream crossing assessments for use in identifying bridges and culverts for upgrade or replacement, 2) launching an online assessment training program, 3) creating an online database to be a common repository for crossing assessment data, and 4) supporting efforts to conduct assessments in target areas throughout the region. The project will support planning and decision-making by providing tools and information on where restoration projects are likely to have the most benefit on aquatic connectivity and build community resiliency.
4:40 p.m.	**Fly Fishing the Beautiful Waters of Rhode Island: Freshwater and Marine** *Edward Lombardo, Sr., Volunteer, RIDEM Division of Fish and Wildlife, ARE Program* Being the Ocean State, Rhode Island has a multitude of saltwater, estuarine and freshwater resources for fly fishing anglers young and old to enjoy. The presentation will include common local species, unique and accessible fishing areas in RI, and the best flies to use. Mr. Lombardo will also give a brief synopsis of the many collaborative fly fishing programs facilitated by RIDEM Division of Fish and Wildlife's Aquatic Resource Education program and its many fly fishing volunteers.
Symposium: Challenges to Fisheries Management in the Era of Catch-and-Release Fishing	
Monday, April 20, 2015 1:00 p.m. - 4:00 p.m.	
1:20 p.m.	**Estimating and mitigating post-release mortality of Atlantic cod in the Gulf of Maine's recreational rod-and-reel fishery** *Connor W. Capizzano, University of New England; John W. Mandelman, New England Aquarium; William S. Hoffman, Micah J. Dean — Massachusetts Division of Marine Fisheries; Douglas R. Zemeckis, University of Massachusetts Dartmouth - School for Marine Science and Technology; Hugues P. Benoît, Fisheries and Oceans Canada; Marc J. Stettner, Jeff Kneebone, Nicholas C. Buchan — Massachusetts Division of Marine Fisheries; Joseph A. Langan, James A. Sulikowski — University of New England* Over the past decade, the recreational contribution to total catch of Atlantic cod, Gadus morhua, in the Gulf of Maine (GOM) has increased with recreational discards outnumbering landings by 2:1 in this region due to increasingly strict size, possession, and seasonal regulations. However, the post-release mortality (PRM) of these discarded cod remains poorly understood, creating uncertainty in recent GOM cod stock assessments. Thus, the current project examined the capture-related factors most detrimental to cod PRM in the recreational rod-and-reel fishery. Both sublegal and just legal cod (n = 640; 26-72cm) were angled using Norwegian-style jigs (48%) or baited J-hooks (52%) at depths ranging from 44.5-83.0m on southern Jeffreys Ledge from July-October 2013. All cod were visually inspected for injuries from capture and ranked based on a condition index. A subset (n = 136) was also tagged with ultrasonic transmitters before being released into an acoustic receiver array deployed to monitor survival for a 94d period. The fate of these tagged fish was assessed through a user-defined algorithm that evaluated depth variance between tagged specimens and negative controls. A mixed-effects logistic regression model identified condition and total length to be the covariates that best

	explained the variation observed in cod PRM. Using coefficients from a Weibull-type survival function, an injury-dependent Monte Carlo simulation calculated the mean PRM rate to be 0.153 (95% CI: 0.101, 0.231). Results can assist with future management decisions and enhance survival through "best practice guides" that will be disseminated to stakeholders. *Intended for "Challenges to Fisheries Management in the Era of Catch-and-Release Fishing" symposium.
1:40 p.m.	**Evaluating the Management Implications of Discard Mortality in the Gulf of Maine Recreational Atlantic cod (Gadus morhua) Fishery** *Joseph A. Langan, James E. Quinlan, Michael J. Arciero — University of New England; John W. Mandelman, New England Aquarium; Micah J. Dean, William S. Hoffman — Massachusetts Division of Marine Fisheries; Douglas R. Zemeckis, University of Massachusetts-Dartmouth; Connor W. Capizzano, Marc Stettner, James A. Sulikowski — University of New England* This paper is intended for the Challenges with Catch and Release Symposium. Increased fishing-induced mortality during the late 20th century has led to the severe decline of Atlantic cod (Gadus morhua) populations throughout the Gulf of Maine (GOM). Despite the common supposition that commercial fishing is the foremost factor influencing cod stocks, recent reductions in annual commercial harvests have not allowed the fishery to recover as expected. This trend suggests that other factors, such as the growing GOM recreational fishery, may be significant drivers of cod populations. In addition to the mortality attributed to harvest, Atlantic cod are known to experience increased mortality after being discarded by recreational fishermen. However, the mortality of cod in response to such recreational fishing activity is not clearly understood. This study aims to evaluate the impacts of this discard mortality on GOM cod stocks and its implications for fishery management. As part of a larger investigation, 130 specimens were captured using standard recreational fishing practices during the summer of 2013. After release, these cod were tracked using acoustic telemetry in order to assess their movements for evidence of mortality. Total length and environmental parameters were recorded for each individual to determine and quantify the influence of these factors on recreational discard mortality. These data are currently being utilized in a Leslie-form matrix model to investigate the effects of varying fishing regulations. Ultimately, this model will serve as a tool for fishery managers to simulate the potential implications and comparative efficacy of policy options for the GOM recreational cod fishery.
2:00 p.m.	**Incongruities between catch rate oriented trout stocking and the contemporary recreational fishery pose new challenges for trout stream management in New York State** *Fred Henson, Philip Hulbert — NYSDEC Bureau of Fisheries; Patrick Sullivan, Alex Alexiades, Ben Marcy-Quay, Clifford Kraft — Cornell University* The NYSDEC Bureau of Fisheries and the NY Cooperative Fish and Wildlife Research Unit at Cornell University recently completed a statewide study to reevaluate and update the methods currently used to determine trout stocking rates for streams in New York State. The Catch Rate Oriented Trout Stocking (CROTS) model aims to provide anglers with a high quality trout fishery and is based on several parameters derived from fieldwork conducted during the late 1970s; these include natural mortality rate, angler effort, and catch and harvest rates. Based on recurring creel surveys and three-pass electrofishing population estimates completed from 2011-2013 on nine stocked trout streams, the new study found comparatively lower levels of angling effort and lower harvest rates. However, substantially higher rates of non-angling related (natural) losses were documented. Release rates ranged from 38% to 99% of trout caught. The mean release rate for the study streams was 76% with the result that, for much of the reported catch, creel agents were unable to examine fin clips to distinguish the different stocked increments from each other or from wild trout. The ratio of trout harvested to trout stocked averaged 0.02 in this study yet, in most cases, the principal CROTS objective of supporting a mean catch rate of 0.5 trout/hour was met or exceeded. The prevalence of catch and release

	behavior documented in this research has broad implications for the CROTS model and for stream trout management in New York.
2:20 p.m.	**The Landlocked Salmon Angler's Pledge - An Outreach Effort to Address Adverse Effects of Catch-and-Release on New Hampshire's Landlocked Salmon Fisheries** *Scott Decker, Donald Miller, John Viar* — New Hampshire Fish and Game Department* New Hampshire's lake Atlantic salmon (Salmo salar), commonly known as "landlocked salmon", provide a unique and limited fishery and increasing fishing pressure combined with the use of advanced fishing technology is having a profound negative impact on their populations. Biologists have noted increased frequency of "hook-wounding" in fall trap net catches resulting in poorer quality fish condition factors. The paper will describe an outreach effort that was undertaken to address salmon angler ethics and catch-and-release techniques designed to improve post-release survival of angler-caught salmon.
BREAK 2:40 p.m.	
3:20 p.m.	**The History of Bass Management in Connecticut – Is Catch and Release Fishing Making Traditional Management Tools Irrelevant?** *Eileen O'Donnell, Robert Jacobs, Justin Davis — Connecticut Department of Energy and Environmental Protection, Inland Fisheries Division* Symposium: Challenges to Fisheries Management in the Era of Catch-and-Release Fishing Abstract: Black bass have been managed in Connecticut with a statewide 30-cm minimum length limit and a six fish creel limit since the 1950s. However, a survey in the early 1980s revealed significant heterogeneity in Connecticut bass populations, suggesting benefits to a more individualized management approach. Alternative, more conservative length limits were initiated in 1989 at three Bass Management Lakes (BMLs), following which bass densities and size structure improved. Following this success, 26 new BMLs were created in 2002. This time results were mixed; changes in bass densities and size structure were inconsistent among the new BMLs five years post-implementation. Available data suggest that angler catch rates and bass size structure have generally improved statewide over the past 25 years. Concurrently, angler surveys conducted over the last two decades reveal that angler harvest rates for all fish species have declined, and the overwhelming majority of bass anglers now practice catch-and-release fishing. Despite these improvements, size and age structure of bass in many public lakes are still sub-optimal. Traditional management tools such as slot length limits that rely on modulating harvest mortality will be ineffective in addressing these challenges given that harvest mortality for these populations is becoming negligible. The future of bass management in Connecticut therefore depends on developing alternative strategies to optimize fishing quality for bass and other warmwater fishes.
3:40 p.m.	**Can high rates of catch-and-release angling affect Largemouth Bass population size structure?** *Jan-Michael Hessenauer, Jason Vokoun — Wildlife and Fisheries Conservation Center, Department of Natural Resources and the Environment, University of Connecticut; Justin Davis, Robert Jacobs, Eileen O'Donnell — Inland Fisheries Division, Connecticut Department of Energy and Environmental Protection* Largemouth Bass Micropterus salmoides recreational fisheries are increasingly dominated by catch-and-release (CR) practices. Low levels of intentional harvest suggest that when fishing pressure is high, CR-related mortality may comprise a large or majority portion of overall fishing-related mortality. CR-related mortality is a challenge to managers because it is unlikely to be altered by traditional management actions such as altering length or bag limits. We conducted population surveys over two years in two popular Connecticut bass fisheries. Surveys included

	population estimates, creel surveys, and tournament monitoring with the objective of characterizing the relative contributions of CR-related mortality and harvest to overall annual mortality. Using a population modeling simulation approach we evaluated whether or not CR-related mortality significantly affected population size structure at given levels of fishing pressure. Analyses of tournament monitoring and creel survey data indicates that the total number of catch events was 3 to 4 times higher than estimated population size in both lakes across both years, indicating that most individuals are captured more than once. Simulations reveal that at the observed levels of fishing pressure, even when modeled with low rates of CR-related mortality, population size structure is significantly altered. The results of our simulations suggest that management actions seeking to reduce or redirect harvest are unlikely to effectively improve population size structure in these systems. Rather, management of highly utilized, but little harvested, populations will require creative solutions that can reduce the amount of CR-related mortality.
4:00 p.m.	**The Rise of the Catch-and-Release Era in Connecticut** *Justin Davis, Robert Jacobs, Eileen O'Donnell — CT DEEP Inland Fisheries Division* Much of traditional fisheries management has focused on managing harvest mortality to achieve a desired outcome. As catch-and-release fishing becomes more prevalent and harvest becomes increasingly insignificant, many traditional management measures may be rendered ineffective. In Connecticut, angler surveys conducted by the D.E.E.P Inland Fisheries Division (IFD) over the last three decades demonstrate a substantial shift in freshwater angler practices and attitudes related to harvest. Harvest rates for most freshwater fish species have declined substantially since the 1980s, and for some species now approach zero. Responses to opinion questions in recent surveys indicate many anglers have low motivation to harvest fish, and commonly self-identify as "catch-and-release only" anglers. This phenomenon reflects changes in angler demographics (e.g. reductions in generalist and/or subsistence fishing), a trend towards specialization (e.g. increase in tournament fishing), and a pervasive perception amongst anglers that a strict catch-and-release ethic represents a "one size fits all" best practice. The advent of the catch-and-release era poses new challenges when dealing with situations such as stockpiled panfish and gamefish, in which increased harvest mortality is desirable but perhaps unachievable. In addition, increased angler effort on some water bodies coupled with high release rates may mean that hooking mortality is becoming a more important structuring force than harvest for some sportfish populations.
Diadromous Fisheries	
Tuesday, April 21, 2015 8:00 a.m. - 2:20 p.m.	
8:00 a.m.	**Restoring Migratory Fish to Rhode Island Rivers and Streams** *Phil Edwards, RIDEM/Fish & Wildlife* During the industrial revolution many dams were built to harness energy but these dams also prevented anadromous fish from reaching valuable spawning and nursery habitat. In many cases fish runs diminished or disappeared entirely. Since the passage of the Anadromous Fish Conservation Act of 1965, the Rhode Island Division of Fish and Wildlife has worked towards restoring anadromous fish to selected river systems. These efforts include monitoring anadromous fish populations, partnering with various organizations on habitat restoration projects, and conducting anadromous fish stocking programs throughout the state. The primary goal of these efforts is to create self-sustaining runs of anadromous fish and to restore access to valuable spawning and nursery habitat to selected river systems. A secondary goal is to create river connectivity, by providing continuous unobstructed passage for aquatic organisms and resident fish species. This presentation will summarize recent trends in Rhode Island's

	anadromous fish populations, and provide an overview of RI Fish and Wildlife's monitoring, stocking, and habitat restoration efforts to restore river herring and American shad to Rhode Island rivers and streams.
8:20 a.m.	**Diadromous Fish Passage with a Nature-like Fishway, Pawcatuck River, Rhode Island** *James Turek, Restoration Ecologist, NOAA Restoration Center* NOAA in collaboration with multiple governmental agencies, non-governmental organizations, and private industry partners completed the last of three fish passage projects on the Upper Pawcatuck River through a 2009 ARRA-NOAA grant award and NOAA-RAE and NOAA-TNC partnership funding awards. While water supply concerns prevented a preferred removal of the 5-foot high Kenyon Mill dam, the public-private partnership facilitated the design and construction of a nature-like fishway with 5 stone weirs and pools on this 4th-order river. The 180-foot long fishway has been designed to efficiently pass river herring (Alosa aestivlis and A. pseudoharengus) and American shad (A. sapidissima) with operational flows of 88-461 cfs for these target species, as well as American eel (Anguilla rostrata) and resident species (e.g., Semotilis corporalis, Catostomus commersonii). Information will be discussed on the primary, in-line and secondary weir notch dimensions and flow velocities, pool and weir notch dimensions, and other critical fishway features. The installation of a temporary by-pass channel along river-left bank not only afforded the construction of the fishway "in the dry", but provided the opportunity to run fish passage test flows before project construction ceased in late 2013. Key design components of the fishway included a geofabric liner to minimize interstitial loss during low-flow periods, a new concrete grade-control structure with weir slot for headpond control assurance, and a downstream sheet-pile cutoff wall as added protection to address potential sediment scour, particularly during high flows. A summary of project costs of the nature-like fishway will also be presented.
8:40 a.m.	**Coast-wide River Herring Conservation Planning** *Diane Borggaard, National Marine Fisheries Service, Greater Atlantic Regional Fisheries Office; Kim Damon-Randall, National Marine Fisheries Service, Greater Atlantic Regional Fisheries Office; Marin Hawk, Atlantic States Marine Fisheries Commission, Arlington, Virginia; Dan Kircheis, National Marine Fisheries Service, Greater Atlantic Regional Fisheries Office, Orono, ME; Tara Trinko Lake, National Marine Fisheries Service, Greater Atlantic Regional Fisheries Office, Orono, ME* In August 2013, the National Marine Fisheries Service (NMFS) found that listing river herring under the Endangered Species Act was not warranted but also committed to some immediate next steps. This included working to fill some of the research gaps, address uncertainty in the data, and if necessary, revisit the status of both species within the next few years. NMFS also announced the agency would collaborate with the Atlantic States Marine Fisheries Commission in order to work with our partners to implement a coordinated coastwide effort to proactively conserve river herring and address the data gaps. The primary objective of this collaboration is to develop and implement a dynamic conservation plan to help restore river herring. The Plan will identify important conservation efforts that can be implemented to help restore river herring throughout their entire range from Canada to Florida, track the implementation of these efforts, identify research needed to fill in critical data gaps, and monitor the progress of restoring these important species. Given the many threats that river herring face, conservation of river herring must be holistic. Additionally, coordination is essential given the many previous and ongoing efforts to further river herring conservation. The plan is intended to increase public awareness about river herring, stimulate cooperative research efforts, and better inform focused efforts to conserve the species.

9:00 a.m.	**Using habitat preferences models, ocean forecasts, and cooperative research to avoid river herring bycatch** *Sara M. Turner, Jonathan A. Hare, John Hoey — NOAA Northeast Fisheries Science Center, Narragansett, RI; John P. Manderson, NOAA Northeast Fisheries Science Center, Highlands, NJ ; David E. Richardson, NOAA Northeast Fisheries Science Center, Narragansett, RI* Recent attention on declines in river herring (alewife, Alosa pseudoharengus, and blueback herring, A. aestivalis) populations has brought attention to their incidental harvest in the Atlantic herring (Clupea harengus) fishery. While catch caps were recently added to the Atlantic herring Fishery Management Plan, strategic methods to reduce by-catch are also needed (e.g., http://www.umassd.edu/smast/bycatch/). We developed generalized additive models (GAMs) to describe observed habitat preferences for river herring and Atlantic herring using data from the NOAA Northeast Fisheries Science Center bottom trawl winter and spring surveys. Observations for all three species (modeled as presence or absence) were related to bottom temperature, bottom salinity, depth, solar azimuth and elevation (proxies for season and time of day), and region. We plan to test the real-time accuracy of these models by coupling the habitat preference models with an ocean forecast model (FV COM), and then sampling the predicted distributions using cooperative research vessels that are participants in the Atlantic herring fishery.
9:20 a.m.	**The New England Large River Fish Assemblage Assessment: Applications to the Management of Riverine Resources** *Chris O. Yoder, Midwest Biodiversity Institute & Center for Applied Bioassessment and Biocriteria, Columbus, OH* The results obtained from a fish assemblage assessment of rivers in New England in 2008-9 and the Lower Kennebec R. in 2002-14 illustrate applications of the sampling and assessment methods to the management of riverine resources throughout New England. A standardized raft and boat mounted electrofishing method that was developed and tested in Maine during 2002-7 was used to sample riverine fish assemblages at more than 500 sites throughout New England. The baseline design was an intensified probabilistic draw of sites from the 2008-9 National Rivers and Streams Assessment (NRSA) to provide the basis for an overall assessment of the condition of fish assemblages and habitat for New England rivers. Additional sites from intensive surveys of selected mainstem rivers were also included and provided the opportunity to compare the usefulness of these different sampling designs to support various management issues. The intensive pollution survey design captured the highest quality sites as measured by the Maine Rivers IBI that were not revealed by the REMAP probabilistic design. Specifically we illustrate the application of the sampling and assessment methodology to contemporary management issues concerning the management of flows and efforts to restore diadromous fish populations in Maine and the Connecticut River. This approach represents a tractable methodology that illustrates the actual and potential impacts of current management efforts to the whole fish assemblage in addition to key species of management interest.
BREAK 9:40 a.m.	
10:20 a.m.	**Estimating natural reproduction by Atlantic salmon in Maine through sibship analysis** *Meredith L. Bartron, Shannon Julian, Jeff Kalie — U.S. Fish and Wildlife Service* Atlantic salmon in the Gulf of Maine Distinct Population Segment are currently listed as endangered, and the population is maintained through hatchery supplementation. Natural reproduction by Atlantic salmon in Maine rivers is limited, but evaluation of the number of Atlantic salmon reproducing in the wild is critical to assess progress towards recovery. The number of reproducing adults is estimated through redd counts, which may not accurately reflect the number of individuals spawning due to reproduction by precocious parr or the contribution of

	adults to multiple redds. To obtain broodstock from six of the seven captively spawned populations, parr are collected from the wild. For each of the six populations, the majority of each parr collection generally represents juvenile salmon stocked as fry (44-80% hatchery origin, for the 2008-2011 parr collection years based on genetic analysis of parentage). However, it is assumed that natural reproduction contributes to the remainder of the parr collected. To estimate the number of parents contributing to the parr not assigned to hatchery parents, sibship analyses were used. Estimates of the number of parents were compared to linkage-disequilibrium based effective population size estimates to obtain Ne/N ratios and to redd counts to assess accuracy.
10:40 a.m.	**Who needs FLIR? A Low Cost but Highly Sensitive Thermal Profile Method to Identify Cool Water Refugia in Downeast Maine Salmon Rivers** *Scott Craig, U.S. Fish and Wildlife Service* A water temperature profile method developed by Vaccaro and Maloy (USGS Report 2006-5136) was used to efficiently locate summer time cool water refugia for two stenothermic salmonids (Atlantic salmon and Brook Trout) that experience thermal limiting factors each summer. This low cost methodology helped identify both cooling and warming trends from 2 second interval sampling evens to help prioritize future habitat restoration projects. The data collection and equipment is relatively inexpensive because only 1-2 people are needed and sampling equipment consists of a handheld GPS Unit (Garmin Etrex <$100) and 3 highly sensitive (records to thousandths of a °C) temperature loggers (Solinst Inc.) 1) stream profile drag, 2) air (Baralogger unit) and 3) a stationary base water temperature location. In 2012, we purchased 5 @ Solinst Inc. units for just under $3,000 and they have adequate battery life for 10+ years of intermittent use. Surveys were completed between the hours of 10AM and 4 PM to coincide with optimal thermal conditions. Overall spatial coverage per day is somewhat dependent on stream gradient and habitat complexity. In the Upper Narraguagus River study area (Catchment=53-192 km2 (21-74 mi2), 0.1% gradient and poor canoeing conditions due to low water) we surveyed at a speed of 2.4km/hr (1.5 mi/hr) covering between 7-11 km (4.2-6.8 mi) over 3-4.5 hours. This equates to 5,400 – 8,100 data records per trip. When output into GIS, heating and cooling is readily apparent from the raw data output (scatter plot). To further assess temperature fluctuations, each 2 second record was binned into 3 nominal criteria relating to a rate of change: 1) <0.001 °C= Decreasing, 2) -0.001 – 0.001 °C Stable and 3) >0.001 °C= Increasing.
11:00 a.m.	**Evaluation of seasonal night-time turbine shutdowns to protect silver American Eels (Anguilla rostrata) at five hydroelectric dams on the Shenandoah River** *Sheila M. Eyler, U. S. Fish and Wildlife Service – Mid-Atlantic Fishery Resources Office; Stuart A. Welsh, U. S. Geological Survey, West Virginia Cooperative Fish and Wildlife Research Unit; David R. Smith, U. S. Geological Survey, Leetown Science Center; Mary M. Rockey, National Ecological Observatory Network* Hydroelectric dams can cause turbine mortality in downstream migrating of silver American Eels (Anguilla rostrata). A radio-telemetry study on American Eels was conducted to determine impacts of five hydroelectric dams located over a 195 km stretch of the Shenandoah River in Virginia and West Virginia from fall 2007 through summer 2010. A total of 96 radio-tagged individuals migrated downstream during the study. Two-thirds of the dam passage events occurred via spill and the remaining passage events were through turbines. During periods of high river discharge (greater than 5x median), American Eels were more likely to spill over the dam (79%) compared to times during low river discharge (less than 2x median, 15 h median delay, 26% passage via spill). Twenty-eight American Eels experienced turbine mortality, which occurred at all five dams. Mortality rates for eels passing through turbines ranged from 16% to 41% at individual dams. Overall project mortality rates ranged from 3% to 14% during the study. Night-time turbine shutdowns implemented 15 September–15 December, 18:00–06:00 hours

	encompassed 50% of the total downstream passage events in the study. Implementation of the seasonal turbine shutdown period reduced cumulative mortality for American Eels passing all five dams from 63% to 37%. Modifying the turbine shutdown period to encompass more dates in the spring and potentially have them linked to environmental variable triggers could provide more protection to downstream migrating American Eels.
11:20 a.m.	**The Claim by the International Union for the Conservation of Nature that American Eels are an Endangered Species Does Not Hold Up to an Examination of the Available Data** *Desmond M. Kahn, unaffiliated* The IUCN in 2014 put American Eel on its Red List, indicating the species is endangered, i.e. threatened with extinction. This claim has garnered headlines, in Scientific American, for example. Such a claim should be treated by the scientific community as a hypotheses and examined critically. For a species to be endangered, its abundance must be very low. Yet American eel, for much of its range, is the object of a directed commercial fishery. For a directed commercial fishery to be economically viable, the species targeted must have at least a moderate level of abundance. I will examine the extent and magnitude of the American eel fishery on the Atlantic coast. Second, a number of fishery-independent indices of relative abundance of American eel are available on the Atlantic coast. If the IUCN claim is correct, such indices would presumably show significant decline in recent years. I will examine the trend of several indices in light of the claim that American eel is endangered. The combination of fishery-dependent and fishery-independent data show that the IUCN claim is not in accord with the reality of eel abundance levels.
11:40 a.m.	**Coastal spawning migrations of shortnose sturgeon in the Gulf of Maine** *Micah Kieffer, US Geological Survey; Gail Wippelhauser, Maine Department of Marine Resources; James Sulikowski, University of New England; Gayle Zydlewski, University of Maine; Michael Kinnison, University of Maine* Nineteen stage-IV shortnose sturgeon females acoustically-tagged in the Merrimack River were observed departing the river in early spring, moving 130 km to the northeast, then entering the Kennebec River System and eventually occupying three known spawning sites. During four consecutive springs beginning in 2010, migrants departed Merrimack River wintering sites between 15 March–12 April and exited the river mouth between 22 March–20 April. River temperatures during departures ranged between 4.1–11.5°C (mean; 8.1°C), and discharged ranged between 121–1,495 m3/s (mean; 593 m3/s). Migrants entered the Kennebec River between 30 March–4 May, resulting in migration durations of 6.8–22.1 d (mean; 12.1 d). Coastal ocean temperature and salinity levels during pre-spawning movements ranged between 4.6–7.2°C and 28.6–32.2 ppt. After participating in upstream spawning runs within the Kennebec System, 15 migrants returned to the Merrimack River in spring, entering the river mouth between 3–31 May. Two migrants, however, returned later (July and November), and two remained within the Kennebec System. During both pre- and post-spawning migration segments, several fish spent brief periods in the Piscataqua River (four) and the Saco River (six), two smaller non-spawning drainages positioned between the Merrimack and Kennebec rivers.
BREAK 12:00 p.m.	
1:00 p.m.	**Observations on diet and prey availability of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) in the Saco River, Maine** *Ashleigh J. Novak, University of New England; Amy E. Carlson, University of New England; Gail Wippelhauser, Maine Department of Marine Resources; Gayle Zydlewski, University of Maine Orono; Michael Kinnison, University of Maine Orono; James A. Sulikowski, University of New England*

	Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) are a highly migratory anadromous fish species, ranging from Labrador, Canada to Florida. Populations of this large and late maturing species decreased significantly along the coast in the early 20th century due to overharvest, development of dams, and pollution. As a result, this species of sturgeon was extirpated from many river systems, including the Saco River, Maine, by the 1950s. However, recent field work within this river system indicates that this species has returned to the Saco River watershed after a 60 year absence. To investigate the reasons behind the reappearance of this species, a comprehensive study was initiated in 2008 to broadly investigate movement, diet, and reproduction within the river system. The acoustic telemetry results suggest that Atlantic sturgeon have a core usage area where the movement patterns are concentrated within the natural mouth, extending ¼ of the way up the Saco River. In addition, the diet data from 2013 and 2014 indicates that American sand lance (Ammodytes americanus), was the dominant prey item from sampled sturgeon (% Index of Relative Importance: 93.5, 85.4, respectively). Finally, the results of benthic grabs, beam and otter trawls, and beach seines indicate that the distribution of sand lance was correlated with the core usage data, suggesting that the lower estuary of the Saco River provides critical habitat for this threatened species within the Gulf of Maine population.
1:20 p.m.	**Determining Sex Ratios and Sexual Maturity of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) in the Saco River, Maine** *Carolyn R. Wheeler, University of New England; Gail Wippelhauser, Maine Department of Resources; Gayle Zydlewski, University of Maine Orono; Michael Kinnison, University of Maine Orono; James A. Sulikowski, University of New England* The Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) is a long-lived, anadromous fish species ranging from Labrador, CA to Florida, USA. In the Saco River, located in the Gulf of Maine, Atlantic sturgeon were common in the 1920's, but were extirpated by the 1950's due to overfishing. However, after a 60 year absence, Atlantic sturgeon reappeared in the Saco River in 2007. Although the reason for the return of this species to this river system remains unknown, research on basic life history information is necessary to facilitate the conservation of this federally protected species. Understanding reproductive parameters such as sex ratios and sexual maturity are vital to effective management of any species. Unfortunately in sturgeon, this information is typically obtained by lethal gross dissection, or stress inflicting endoscopy. Thus, in order to better understand these important life history parameters, three non-invasive techniques (sex steroid hormone analysis, ultrasonography, and examination of one external morphological feature) were used to non-lethally determine sex ratios and sexual maturity for sturgeon captured within the Saco River watershed. Although the results indicated the overall sex ratio (male: female) was 1:1, seasonal differences were observed such that there was a 4:1 ratio in the spring, 0.7:1 in the summer and 1.5:1 in the fall. Hormone concentrations were variable across seasons, but overall mean concentrations were elevated in mature adults compared to juveniles. Overall, these combined techniques were shown to be a valuable tool for assessing reproductive biology in sturgeon.
1:40 p.m.	**Diadromous Fish Assemblage Assessment and Food Web Characterization in the Saco River Estuary, ME** *Kayla M. Smith, Carrie J. Byron, James A. Sulikowski — Department of Marine Sciences, University of New England, Biddeford, ME* Significant population declines of diadromous fishes have impaired the productivity and trophic efficiency of near shore ecosystems. In combination with biological factors, physical perturbations additionally influence the frequency and use of estuaries by sea-run fish, emphasizing the need for comprehensive research on these assemblages within small coastal rivers such as the Saco River estuary (SRE). From 2012 to 2014, gillnet surveys were conducted at three sites during summer months to record fish species presence and various environmental

	conditions (bottom temperature, salinity and dissolved oxygen). Out of 240 gillnet sets, 14 fish species were observed with diadromous fishes representing 91% of the total catch. The Atlantic sturgeon, shortnose sturgeon, and striped bass were the most abundant species by biomass. Fish diversity and abundance was lowest in areas of the estuary with significant salinity mixing. This empirical data along with diet compositions and vital rates were used to construct a static food web model. Using model outputs, sensitivity analyses will aid in determining the trophic position and interspecific interactions of diadromous fishes within the SRE food web. Twenty-eight functional groups were chosen to represent trophic levels in this network including 17 fish groups in addition to four bird, three invertebrate, and two plankton compartments with a detritus pool. Model creation revealed low phytoplankton biomass, suggesting an important function of marsh grasses in detrital pathways that support diverse bird and fish communities. Investigating trophic dynamics in coastal watersheds can provide a greater understanding of complicated multispecies interactions on economically valuable and threatened species.
2:00 p.m.	**Striped Bass Predation is an Important Factor in River Herring Dynamics** *Desmond M. Kahn (unaffiliated)* Striped bass (Morone saxatilis) are large anadromous serranids that ascend rivers in the spring on spawning and feeding migrations, simultaneously with spawning migrations of anadromous Alosa species, including river herring. Several diet studies found that the preferred prey of striped bass are members of the Clupeidae, including the genus Alosa. Consequently, because the science of ecology has found that primary predators can affect the survival and abundance of important prey, striped bass can potentially affect or control the abundance of Alosa species. This hypothesis has been tested for the Connecticut River population of blueback herring and the Delaware River spawning stock of American shad and was not rejected. Because striped bass attained historically unprecedented abundance from 1995 through the late 2000s, the large reduction in abundance of Alosa species is consistent with the hypothesis of predatory control of Alosa abundance. Following the decline in total abundance of striped bass in recent years, from about 2008 through 2012, due to the absence of production of a dominant year class in the Chesapeake Bay from 2003 until 2011, was followed by some increase in abundance of American shad and river herring on the Atlantic coast, consistent with the hypothesis of a dominant effect of striped bass predation. The Atlantic States Marine Fisheries Commission, has failed to investigate impacts of striped bass predation on associated species.
Symposium: Challenges and Opportunities in Managing Non-native Fishes in the Northeast	
Tuesday, April 21, 2015 8:00 a.m. - 12:00 p.m.	
8:00 a.m.	**Northern Pike in Vermont's Northeast Kingdom: Lemons or Lemonade?** *Jud Kratzer, Vermont Department of Fish and Wildlife* Northern Pike are native to Vermont's Lake Champlain valley, but they have been introduced, mostly illegally, throughout the state. While the effects of Northern Pike introductions on existing fisheries have not been well documented in Vermont, the state's fisheries managers and many anglers are rightfully concerned about the continued spread of this large predator to new waters. However, Northern Pike are popular with many of Vermont's anglers, being the second most popular target for Vermont's resident ice anglers and the favorite target of Vermont's non-resident ice anglers. This tension between pike as a prized sport fish and a despised non-native species is especially apparent in Vermont's Northeast Kingdom, where anglers have traditionally favored trout and salmon. The two most popular pike fisheries in the Northeast Kingdom are Norton Pond, where pike were introduced in the late 1970's, and South Bay of Lake Memphremagog, where pike were introduced in the 1990's. In the winter of 2012, the Vermont Fish and Wildlife Department (VTFW) conducted a creel survey on these two waters. Angler

	effort on these two waters was as high, or higher, than the effort estimated at any of the Northeast Kingdom's more traditional trout and salmon lakes. Northern Pike catch rates were higher than those observed on Vermont's most traditional pike water, Lake Champlain. Approximately 50% of pike anglers on both waters said their main motivation for targeting pike was to catch a trophy fish. While many anglers have embraced the opportunity to target a trophy-sized pike in these waters, others lament the effects, real or perceived, that these invaders have had on the salmonid fisheries of these waters. Due to the controversy surrounding the Northeast Kingdom's pike fisheries, VTFW has purposefully elected to take almost no management actions in these waters. In this presentation, I will provide an overview of these fisheries and the management actions that we have and have not taken. I will also discuss my theory about how hybridization between Northern Pike and Chain Pickerel may be helping to prevent the further spread of pike to some waters with robust pickerel populations.
8:20 a.m.	**A Challenging Success Story: The Development, Maintenance and Management of Northern Pike in Connecticut** *Christopher McDowell, Connecticut Department of Energy and Environmental Protection, Eastern District Headquarters, Inland Fisheries Division; Edward Machowski, Connecticut Department of Energy and Environmental Protection, Inland Fisheries Division, Western District Headquarters; Justin Davis, Connecticut Department of Energy and Environmental Protection, Eastern District Headquarters, Inland Fisheries Division* Though not native to Connecticut, Northern Pike have been present in the Connecticut River since at least the mid-1800s. The first known introduction of Northern Pike into a Connecticut lake occurred at Bantam Lake in 1971. Soon thereafter, Connecticut developed its first managed spawning marshes to enhance the pike population of Bantam Lake by augmenting natural reproduction. With the success of this fledgling experiment, marsh management was expanded and currently the Inland Fisheries Division manages five to seven marshes for fingerling pike production. Annual spring stocking of fingerlings from these marshes has been used to maintain five "Pike Management Lakes" (PMLs) in Connecticut. This Northern Pike Management Program has been successful in increasing the quality and diversity of fishing opportunities for Connecticut anglers. Popular year-round fisheries have been created, which yield trophy-size fish. Introduction of pike has resulted in improved growth and size structure of stunted white perch in two instances; and thus far no negative impacts on other fish populations or fisheries have been detected. However, production from the managed marshes has been inconsistent due to uncontrollable issues including such things as flooding, beaver damage and natural aggradation of the marsh systems. This has resulted in some years with very low production, which has forced management staff to begin researching new means of producing and/or procuring northern pike to stock in Connecticut's PMLs to maintain consistent year classes.
8:40 a.m.	**Northern Snakehead biology and ecology in the Potomac River system, Virginia. Part 1.** *John Odenkirk, Virginia Department of Game and Inland Fisheries* A Northern Snakehead Channa argus population was documented in the Potomac River system in 2004. Since then, the population expanded its range considerably; however, density (relative abundance) potentially stabilized. The population was evaluated with annual electrofishing of numerous tributaries in addition to tagging and telemetry studies. The fish were excellent migrants, tolerant of wide ranges of salinity and expanded their range though natural dispersal utilizing freshets and human assistance. Infestation now includes the entire Potomac River below Great Falls, the Rappahannock River and several regional reservoirs. Upstream spring dispersal prior to the first spawn was dramatic, but more sedentary behavior was the rule. Electrofishing catch rates in 2014 dropped to 9 fish/hour after a decade of increases. A Schnabel multiple-census mark recapture population estimate in Little Hunting Creek in 2014 (20 fish/ha) was slightly less than in 2013. Northern snakehead appeared to be opportunistic feeders consuming

	crayfish, frogs and turtles, and 19 species of fish. Banded Killifish Fundulus diaphanous was the overwhelming item consumed based on frequency occurrence. Relative abundance of Largemouth Bass Micropterus salmoides increased during the ten-year investigation. Habitat preferences included shallow backwaters and a strong association with aquatic vegetation.
9:00 a.m.	**Angler Perception and Population Viability of the Northern snakehead (Channa argus) in the Potomac River** *Isha Agarwal, Lauren Amrhein, Robert Fitzgerald, Skyler Golt, Zeke Gonzalez, Yasmine Hentati, Brian Kang, Yvette Mann, Gregory Matthews, Trevor Mills, Natalie Watts — Gemstone Program, University of Maryland, College Park; Dr. Thomas Miller, Chesapeake Biological Laboratory, Center for Environmental Science, University of Maryland* Our research addresses the extent to which the Northern snakehead (Channa argus), an invasive fish species, represents a threat to the Potomac River ecosystem. One goal of our research was to determine the perceptions and opinions of recreational anglers on the snakehead population's effect on the Potomac River. To determine angler perceptions, we created and administered surveys which we based off of the MFRO Creel surveys. The results of these surveys were analyzed using SPSS. These survey results showed that there has been a decrease in target species, specifically Largemouth bass, according to recreational angler perceptions. A second goal of our research was to determine the health and potential for expansion of the snakehead population. We genetically analyzed snakehead from the Potomac River. We used microsatellites derived from previous research to compare to DNA samples from harvested snakehead tissue and analyzed our results with MATLAB algorithms. Our genetic analysis supports the hypothesis that there are multiple introductions of Northern snakehead into the Potomac River.
9:20 a.m.	**Northern Snakehead biology and ecology in the Potomac River system, Virginia. Part 2.** *John Odenkirk, Virginia Department of Game and Inland Fisheries* Annuli of Northern Snakehead Channa argus otoliths from fish sacrificed in 2011 and 2012 (n = 192) were compared with growth increments (mm/d) of recaptured T-bar anchor tagged fish (n = 51, mean time at large 310 d [SD = 302]). Otolith transverse perspectives were viewed "cracked' with transmitted light while immersed. Readings from fish aged 1-4 suggested initial growth was much faster than previously reported, but length at age was highly variable. Annual growth increments for fish aged 1 - 4 (mean length at age of 394, 563, 644, and 721 mm TL) were converted to estimated daily growth (mm/d) which were reasonably similar to daily growth of recaptured tagged fish. Von Bertalanffy growth parameters were Linf = 780, K = 0.48, and t_0 = -0.56, where Linf is the asymptotic length, K is a growth coefficient, and t_0 is a time coefficient at which length would theoretically be 0. Implications of rapid growth include the potential for earlier onset of sexual maturity representing enhanced chances for successful colonization. Gravid females were found from March through September, but peaks in GSI and field observations suggested two spawning surges – a primary event in early June and a secondary peak in August. Year class strength appeared highly variable, but recruitment drivers remain largely unknown.
BREAK 9:40 a.m.	
10:20 a.m.	**Here Comes the Bowfin to Connecticut! - Be Ye Scourge or Opportunity?** *Robert Jacobs, Justin Davis, Eileen O'Donnell —Inland Fisheries Division, Connecticut Department of Energy and Environmental Protection* Challenges and Opportunities in Managing Non-Native Fishes in the Northeast Abstract: The Bowfin (Amia calva) is an enigmatic, remnant species of a once widespread order of fishes that dates as far back as the Triassic. They typically frequent backwater, swampy areas of lakes and rivers in large part because they can survive at higher water temperatures and lower dissolved

	oxygen levels than most other fishes. The species has suffered from an image problem throughout much of its range. Although it is regarded as both a food and fighting fish by some, for various reasons (mostly unfair) it is reviled by others. Many anglers and fish biologists once thought that introduced bowfin posed a significant threat to native fish populations; however, evidence for this has not yet materialized. Accordingly, more fisheries managers are now accepting the bowfin as a desirable component of a diverse aquatic ecosystem, as well as being an impressive gamefish. Once rare in Connecticut, a bowfin population has recently exploded in the lower Connecticut River (below Holyoke MA). Although anglers are encountering them with increased frequency, bowfin are presently illegal to possess in the state. The author will recount personal experiences with angling for bowfin (highlighting the Lake Champlain fishery) and outline Connecticut's plans for the Connecticut River population, which because they cannot be eradicated, may as well be promoted.
10:40 a.m.	**Adaptively Managing Stocked Salmonine Waters of the Belgrade Lakes (Maine) in the Presence of Invasive Species** *Wes Ashe, Jason Seiders, Scott Davis — Maine Department of Inland Fisheries & Wildlife* The Belgrade Lakes located in central Maine is a series of seven waters with a combined surface area of over 20,000 acres. Historically, much of "The Belgrades" were managed by the Maine Department of Inland Fisheries and Wildlife (MDIFW) primarily as coldwater fisheries, and recognized nationally for their renowned brook trout and landlocked salmon fisheries. Over the past few decades, several factors including land use practices, water quality degradation, and the illegal introduction of numerous invasive fish species (e.g. northern pike, black crappie, and landlocked alewives) have required biologists to adaptively manage these fisheries. In many cases these management changes affected either the stocking program, the regulations governing the fishery, and/or modifications to the duration or timing of the fishing season. Although many of these changes have been accepted by Maine anglers, there are a few that have met public scrutiny and resistance, due mainly to a sense of nostalgia and the perception that the historic salmonine fisheries can be restored. After years of data collection, MDIFW fisheries biologists are confident that one lake's landlocked salmon fishery has irreparably collapsed. This has prompted MDIFW to begin developing a comprehensive fisheries management plan; attempting to provide a better coldwater fishing opportunity in a lake that has been severely impacted by invasive fishes.
11:00 a.m.	**Common Carp: Trash (fish) Turned to Treasure in Modern Day Recreational Fisheries** *Pete Aarrestad, CT DEEP Inland Fisheries Division; Iain Sorrell, Angling Solutions LLC (DBA Saxon Tackle) and Vice President, Carp Anglers Group North America* Common carp (Cyprinus carpio) is a very large (current world record 101 lb 4oz from Euro Aqua in Hungary.) minnow native to Eurasia. It was imported into the United States in the 1800s and was initially intentionally spread across the continental United States to serve as a cheap food source for a growing nation. Its ability to spread rapidly and survive in even relatively polluted waters soon resulted in the Common Carp becoming viewed by many fish and game agencies as a scourge. It has often been a scapegoat for causing habitat impacts and the demise of recreational and commercial fishes, sometimes instead of greater environmental concerns such as agricultural run off and reduced water flow or quality. This perspective still persists within many fish and game agencies across the country, and the species has generally been viewed as a trash fish in recreational fisheries within the U.S – until recently. Few if any states restrict the size and number of fish that can be harvested. European anglers have held Common Carp in high regard as far back as the sixteenth century and today the species is probably the most sought after freshwater species in Europe. The economic value of European recreational carp fisheries has been estimated at $6-8 billion annually. While recreational fishing for Common Carp in North America is slowly starting to grow, the fish remains a dramatically underutilized resource. We

	believe there is great potential to grow recreational fishing for Common Carp in the U.S., including waters of the Northeast. Favorable factors include the large size these fish attain (often among the largest strictly freshwater fish in many NE states), their widespread abundance across various aquatic habitats, the fact that these fish can be caught with relatively simple and inexpensive equipment, and the fact that most carp angling is done from shore (no fancy or expensive boat required). The presentation will also discuss some recent regulatory changes that have been enacted to enhance carp fishing in the Northeast, and conclude with an overview of some regulation changes being seriously contemplated in Connecticut to better utilize and promote this undervalued and exciting resource.
11:20 a.m.	**Muskies and Bass in the St. John River Watershed: An overview of a decades-long species invasion into brook trout country** *Jeremiah Wood, Dana DeGraaf — Maine Department Inland Fisheries and Wildlife* Northern Maine's St. John River watershed has long supported some of the best fisheries for wild and native brook trout in the United States, but the recent introduction of invasive fish species poses a severe threat to this brook trout stronghold. More than 40 years after the introduction of muskellunge to a headwater lake in Quebec, these competitive and predatory fish have become well established throughout suitable and accessible habitat in the St. John River and several major tributaries. A few key barriers to fish passage have thus far limited further expansion into the Allagash, Fish and Aroostook river drainages, but their long term effectiveness is questionable. Additionally, smallmouth bass have been recently introduced into the St. John River, and their establishment and spread is taking place at a rapid rate. Further complicating these species invasions is a growing appreciation of the species among locals and visiting anglers as desirable sportfish, and accompanying pressure to manage them as such. A better understanding of the current distribution, rate of invasion, and factors affecting the spread of muskellunge and smallmouth bass in the St. John watershed is a critical first step toward long term protection of this valuable brook trout resource.
11:40 a.m.	**Muskellunge Range Expansions in West Virginia - Opportunities and Challenges** *Scott F. Morrison, West Virginia Division of Natural Resources, Parkersburg, WV ; Jeffery L. Hansbarger, West Virginia Division of Natural Resources, Point Pleasant, WV ; Lila H. Warren, West Virginia Division of Natural Resources, Beckley, WV* The native range of Muskellunge in West Virginia is limited to the Ohio River Drainage. The West Virginia Division of Natural Resources (WVDNR) currently does not believe this range included waters above Kanawha Falls, a natural barrier that historically prevented upstream movement by large piscivores such as Walleye and Muskellunge or waters within the Monongahela River system. Since 1958 the WVDNR has stocked Muskellunge into native and non-native waters throughout the state. Waters where Muskellunge have been introduced outside their native range in West Virginia include the Monongahela and Potomac drainages and the Ohio River drainage upstream of Kanawha Falls (upper Kanawha, Gauley, Meadow, New, Greenbrier, and Bluestone rivers). Expanding the range of Muskellunge in the state of West Virginia gave the state opportunities to protect a popular native game fish against habitat degradation by resource extraction, create trophy fisheries, establish new fisheries sustained by natural reproduction, diversify angling opportunities, and develop new sources for Muskellunge broodstock. Challenges of this expansion are Muskellunge egg, fry, and fingerling availability, the potential for impacts on native fish communities, forage availability, opposition from angler groups, unintentional development of new fisheries by dam escapement, and future spawning and nursery habitat loss from resource extraction and development entities.
Marine Fisheries	

Tuesday, April 21, 2015 8:00 a.m. - 5:00 p.m.	
8:00 a.m.	**Factors of yellowtail flounder bycatch in the sea scallop fishery on Georges Bank** *Brooke L. Wright, Catherine E. O'Keefe, Gregory R. DeCelles, Steve X. Cadrin — School for Marine Science and Technology, University of Massachusetts Dartmouth* Reduced catch limits of Georges Bank yellowtail flounder (Limanda ferruginea) in recent years have become a constraint to New England fisheries, including the Atlantic sea scallop (Placopecten magellanicus) fishery, in which yellowtail flounder are caught as bycatch. As a complement to an existing bycatch avoidance program, we are examining the use of environmental variables as predictive factors for bycatch occurrence through exploratory statistical analysis and generalized model building. Despite an existing body of literature on factors that determine yellowtail flounder abundance, there is limited information available on the relationships between bycatch of yellowtail flounder in the scallop fishery and environmental factors. We analyze catch data from a bycatch survey to develop models of yellowtail flounder bycatch in the scallop fishery in response to depth, temperature, substrate, zenith angle, month, time of day, and location. Models are cross-validated using fisheries observer data and data from the bycatch avoidance program. Results will be useful for predicting the magnitude and location of bycatch prior to fishery openings and in areas of non-reporting and may aid in enhancing the bycatch avoidance efforts of the scallop fleet. Fishery management can be improved by using such information to refine spatial and seasonal regulations for more effective avoidance of yellowtail flounder, resulting in low-cost proactive bycatch mitigation measures.
8:20 a.m.	**Evaluating the Condition and Discard Mortality of Winter Skate, Leucoraja ocellata, Following Capture and Handling in the Sink Gillnet Fishery** *James Sulikowski, Ph.D., Ryan J. Knotek, Connor Capizzano — University of New England, Marine Science Center; David Rudders, Ph.D., Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA ; John Mandelman, Ph.., John H. Prescott Marine Laboratory, New England Aquarium (NEAq), Central Wharf, Boston M; Hugues Benoit, Ph.D. – Gulf Fisheries Centre, Fisheries and Oceans Canada, Moncton, Canada* One of the most significant issues effecting marine fisheries management is the immediate and delayed mortality of fish that are discarded (as bycatch) after capture. Specifically, post release (P-R) mortality rates can be applied to overall discard estimates in a fishery, thus enabling finer scale estimates of mortality and stock biomass, while aiding in the establishment of landings limits for given species/fisheries. Sink gillnets are used to target skates, monkfish, and other demersal species in the northeast (NE). Despite the widespread use of this gear type, information regarding P-R mortality for any species captured by this method is lacking, and for winter skates it is assumed to be 50%. Given the uncertainty in the discard mortality estimates for winter skates in this gear type, one suggested management alternative was a reduction in the winter skate allowable biological catch (ABC). This was put forth as a means to rebuild winter skate stocks and also protect other fisheries (i.e monkfish). Given the gaps in knowledge, the authors were funded by the monkfish research set aside program to quantify the (immediate) at-vessel and short-term delayed (discard) mortality rates from sink gillnet capture for winter skate. Preliminary data obtained from various environmental temperature and soak times suggests that P-R mortality of winter skates in sink gillnet gear is less than 5%. Ongoing research will evaluate factors that will allow the PI's to refine mortality estimates to the conditions in the fishery and to identify potential avenues to improve the chances of successful live release.
8:40 a.m.	**Discard Mortality of Sea Scallops Following Capture and Handling in the Sea Scallop Dredge Fishery** *Ryan Knotek, University of New England; David Rudders, Virginia Institute of Marine Science, College of William and Mary; John Mandelman, John H. Prescott Marine Laboratory, New*

	England Aquarium; James Sulikowski, University of New England; Hugues Benoît, Gulf Fisheries Centre, Fisheries and Oceans Canada; Kenneth Goldman, Alaska Department of Fish and Game The sea scallop, Placopecten magellanicus, commercial dredge fishery is the most valuable single species fishery in the U.S. portion of the Northwest Atlantic Ocean. Despite the importance of this fishery, the post-release mortality of discarded scallops (which accounts for nearly half of the overall bycatch in the fishery), has received little attention. Furthermore, the current stock assessment is associated with a mortality estimate from a single antiquated mark-and-recapture tagging study and studies examining non-Placopecten species under different biotic and abiotic conditions. To gain insight into mortality rates, 322 tows have been conducted across three research trips (2014 fishing season) thus far, with a total of 5417 scallops evaluated and scored on injury (i.e. physical shell damage) and reflex impairment indices. To quantify mortality rates associated with these indices, 889 scallops have been maintained in a novel on-deck refrigerated flow-through seawater system for up to 120 hours. This study also assessed the effect of fishing conditions and practices on post-release mortality. Preliminary data suggests that mortality varies based on injury and reflex impairment. For example, highest mortality was observed for scallops with the greatest degree of shell damage (up to 100%) and reflex impairment (up to 89.2%) while lowest mortality was observed in undamaged (up to 2.5%) or unimpaired (up to 12.6%) scallops. Data also suggests that mortality increases when scallops are subject to increased air exposure or have reduced shell heights. Five more research trips are planned for the upcoming fishing year (2015) and a more extensive analysis of the data will follow. This abstract is intended for the "Catch and Release" symposium.
9:00 a.m.	**Results of an Industry-Based Survey for Black Sea Bass** *Greg DeCelles, University of Massachusetts Dartmouth, School for Marine Science and Technology; Laura Skrobe University of Rhode Island, Charles Borden Cockeast Fisheries Inc.; Steve Cadrin, University of Massachusetts Dartmouth, School for Marine Science and Technology* Black sea bass (Centropristis striata) are a warm-temperate species that occurs along the US Atlantic coast. Throughout their range, black sea bass are often found on structured habitats such as reefs, wrecks, and oyster beds, making it difficult to sample this species using trawl surveys. Beginning in 2012, researchers at the University of Rhode Island and University of Massachusetts collaborated with black sea bass fishermen to initiate an industry-based survey between Virginia and Massachusetts. The survey utilizes ventless fish traps, which are able to sample black sea bass effectively on hard-bottom habitats. To date, nearly 100,000 black sea bass have been captured in the survey, providing information on the abundance, distribution, and biological characteristics of this species that can help inform the stock assessment. Catch rates have differed significantly between the different sampling zones, suggesting that the productivity and abundance of black sea bass varies throughout the range of the stock. Survey results show that the size structure of sea bass differs significantly between the southern (Virginia and New Jersey) and northern (Rhode Island and Massachusetts) survey zones, with larger fish captured more commonly in the northern zones. The ventless trap survey also provides a method to monitor recruitment into the recreational fishery in a spatially specific manner. Length-based mortality estimators and analysis of catch curves suggest that mortality rates are variable across the range of the stock.
9:20 a.m.	**Following the Quahog: Investigating Polluted Closure Areas as Potential Larval Sources for Northern Quahog Populations in Narragansett Bay, Rhode Island** *Jeff Mercer, Rhode Island Department of Environmental Management, Fish and Wildlife*

	The Northern Quahog (Mercenaria mercenaria) is the single most valuable marine species harvested in Narragansett Bay, RI and has a history of being managed in a spatially explicit manner due to the human health hazards associated with the consumption of shellfish from polluted areas. Analysis of fisheries independent data indicate that these non-harvested contaminated areas serve as de facto marine reserves where biomass tends to accumulate. The large reproductive biomass in these polluted areas may serve as source populations for the harvested portions of the bay if there is a high degree of larval export to suitable fished habitat. Both Eulerian and Lagrangian approaches were utilized to assess the potential contribution of the closed areas to the total larval pool. A quahog specific primer of the mitochondrial COI gene and quantitative PCR (qPCR) were used to quantify larvae in plankton samples from stations throughout Narragansett Bay during the early-Summer spawning season. In addition, a bio-physical Larval Transport Model (LTRANS, North et al., 2011) was adapted and used to develop a larval exchange matrix for areas within Narragansett Bay. Field sampling indicates that time integrated larval abundance is many times greater within closed areas and model results show that large proportions of these larvae may be transported to productive fishing grounds. These results may be used to guide management decisions as some of the shellfish closure areas may soon meet environmental health standards with measurable water quality improvements and the accumulated reproductive biomass may be potentially open to harvest.
BREAK 9:40 a.m.	
10:20 a.m.	**Young of the Year Finfish Survey in Rhode Island Coastal Ponds** *John Lake, RI Division of Fish and Wildlife* The Rhode Island Division of Fish and Wildlife has been conducting a young of the year finfish survey in the coastal ponds of southern Rhode Island since 1993. The primary objective of this coastal pond young of the year survey is to collect, analyze, and summarize beach seine survey data from Rhode Island's coastal ponds and estuaries, for the purpose of forecasting recruitment in relation to the spawning stock biomass of winter flounder and other recreational important species. Currently, 24 stations within 8 coastal ponds and estuaries are sampled monthly from May to October. Sampling is accomplished from a 16' skiff using a 130' beach seine. Fish are sorted to species measured and enumerated. Physical parameters including salinity, temperature, and dissolved oxygen, are recorded at each station. Results show intra and inter-annual trends in juvenile finfish populations over the time series.
10:40 a.m.	**Abundance and distribution of ichthyoplankton within and around the Saco River plume in Saco Bay, Maine** *Tracey C. Bauer, James A. Sulikowski — University of New England* It is well established that large river plumes impact ichthyoplankton in many ways, such as providing nutritional benefits and influencing transport in and out of estuaries. However, the effects of smaller, more variable sized river plumes on ichthyoplankton ecology are far less understood. Located in the southern Gulf of Maine, the Saco River represents a unique nearshore ecosystem characterized by a shallow brackish river plume that can rapidly alter abiotic conditions. In order to investigate the effect of this plume on ichthyoplankton distribution, weekly surface and subsurface plankton tows were conducted in plume and nearshore ocean waters from May to November (2013 and 2014). Biotic and abiotic variables included salinity, temperature, chlorophyll a (a measure of primary productivity) and zooplankton (a measure of secondary productivity) densities, which were collected at sites within and outside of the plume. Preliminary results using two-sample t-tests from 2013 indicate that ichthyoplankton density was greater outside the plume compared to within the plume. Outside the plume, ichthyoplankton density was greater at the surface than the subsurface. Within the plume, ichthyoplankton densities did not differ between the surface and subsurface. Currently, the 2014 data is being

	analyzed and will be compared to the 2013 data to test for interannual variation. The knowledge gained from this study will be applicable to help understand how other small-scale plumes may be affecting the distribution and abundance of ichthyoplankton, as well as allow for better management of the Saco River estuary in the future.
11:00 a.m.	**Rhode Island Marine Fisheries Utilization of the Standard Atlantic Fisheries Information System** *Thomas Rosa, RIDEM Marine Fisheries; Nichole Ares, RIDEM/ACCSP* The mission of Rhode Island's (RI) Fish and Wildlife Division (DFW) is to ensure that the Freshwater, Marine, and Wildlife Resources of the State will be conserved and managed for equitable and sustainable use. RI's Marine Fisheries office guarantees this mission through their partnership with the Atlantic Coastal Cooperative Statistics Program (ACCSP). The ACCSP began in 2004 and RI has been a partner since its inception. The program purpose is to gather and house fisheries data, both from the Commercial Dealers (purchases) and Commercial Fishermen (catch and effort). Multiple sources of data enable this partnership to gather valuable information regarding economics, participation, catch and effort, as well as trends in fisheries patterns. This data is valuable to the DFW, and is used in a variety of ways including quota monitoring, stock assessments, grants/federal funding requests, compliance, and more. This data is also available by request to industry partners, Universities, participants in the fishing community, and the general public. It is useful for these groups to help plan their business models, education courses, tracking personal fishing history, and further the knowledge of the fishing industry of Rhode Island.
BREAK 11:20 a.m.	
1:00 p.m.	**Biotic interactions between age-0 summer flounder and winter flounder in New England tidal rivers** *David L. Taylor, Roger Williams University, Department of Marine Biology, Bristol, RI* Summer flounder (SF), Paralichthys dentatus, and winter flounder (WF), Pseudopleuronectes americanus, utilize southern New England tidal rivers as nursery habitat during the juvenile, post-settlement stage. The biotic interactions between these species, however, have not been examined in this geographic area or habitat-type. In this study, the putative competitive and predator-prey interactions between age-0 SF and WF were elucidated using conventional stomach content analysis. Flounder were collected from the Seekonk and Taunton Rivers (RI/MA) from May to September 2009-2014. In the laboratory, individual flounder were measured for total length (TL), and prey contents were extracted from stomachs and identified to the lowest practical taxon. Direct visual analysis of stomach contents affirmed that SF and WF undergo ontogenetic dietary shifts. The principal prey of SF less than 50 mm TL were mysids and copepods, whereas sand shrimp, amphipods, and fish were the dominant prey of larger conspecifics. Similarly, WF initially fed on copepods, transitioning to amphipods and bivalves (e.g., siphon cropping) with increasing body size. Nematodes and polychaetes were also frequently consumed by WF, irrespective of their body size. Biologically significant competitive interactions, as determined by the Schoener's Index, were observed between small SF and WF (< 50 mm TL). Disparity in species-specific growth rates during the summer season, however, equated to SF preying on smaller WF, albeit to a limited extent. Length estimates of WF extracted from SF stomachs indicated that predation was highly size-dependent and partially constrained by predator-to-prey size ratios.
1:20 p.m.	**Development of a multi-species statistical catch-at-age model for a mid-Atlantic species complex: Atlantic menhaden and striped bass** *Jason McNamee, RIDEM Division of Fish and Wildlife Marine Fisheries; Jeremy Collie, University of Rhode Island Graduate School of Oceanography*

	Predation is an often overlooked or poorly understood source of mortality, and can be the largest source of mortality for a marine fish species. Given this importance, predation is a critically important process to consider when studying the dynamics of marine fish populations. Traditionally, population models have either quantified predation externally or use a general and fixed natural mortality level. To develop a new perspective on the predation component of natural mortality, and extend recent work, a multispecies statistical catch-at-age assessment model (MSSCA) for a mid-Atlantic species complex is being developed. The initial configuration includes striped bass (Morone saxatilis), Atlantic menhaden (Brevoortia tyrannus), bluefish (Pomatomus saltatrix), weakfish (Cynoscion regalis), and scup (Stenotomus chrysops). This presentation puts the project in the context of existing work on this species complex, and presents some of the preliminary output from the multispecies modeling framework.
1:40 p.m.	**Enhancing fish habitat: evaluating whether the creation of oyster and artificial reefs in Rhode Island improve local fish populations** *Eric Schneider, Chris Deacutis, Ph.D. — RI DEM Division of Fish & Wildlife, Marine Fisheries; Kevin Ruddock, The Nature Conservancy* There is general agreement that the amount, distribution, and quality of marine habitat influences the productivity and resiliency of local fish populations. Of particular importance to fishery managers are habitats such as submerged aquatic vegetation, complex hard bottom, and complex shellfish and oyster reefs which are both important to early life stages of finfish and susceptible to habitat alteration and loss. While it is broadly accepted that habitat restoration and enhancement improves coastal ecosystems; it remains unclear if fish habitat enhancement practices conducted here in RI would improve the survival and growth of early life stages of finfish, as shown in the mid-Atlantic. Therefore, RI DEM's Div. of Fish and Wildlife and The Nature Conservancy are cooperating on research to determine if enhancing fish habitat by creating (a) oyster reefs and (b) artificial reefs using Reef Balls improves the growth and survival (i.e. productivity), and abundance of early-life stages of recreationally important fish, including black sea bass (Centropristis striata), tautog (Tautoga onitis), scup (Stenotomus chrysops), summer flounder (Paralichthys dentatus), and winter flounder (Pseudopleuronectes americanus). Since in-water work has yet to begin, we will discuss each project in detail, with particular attention to the experimental designs and site selection process for the artificial reef work.
BREAK 2:00 p.m.	
3:20 p.m.	**Early life compensatory growth and aerobic performance within the threespine stickleback radiation system** *Miguel L. Reyes, John A. Baker, Susan A. Foster — Clark University* Many organisms exhibit compensatory growth (CG), an accelerated growth rate during recovery from a total or partial food deprivation. However, many aspects of compensatory growth, such as its effects on future growth and aerobic performance, remain poorly understood. To explore these effects of early-life compensatory growth, we studied a model organism, the threespine stickleback (Gasterosteus aculeatus) across the first four months of life to assess longer-term physiological effects on growth and swimming performance during the juvenile and sub-adult stages. We hypothesized that fish exposed to a diet deficit during the second month of life, and then returned to an ad-lib diet, would take longer to achieve a normal growth trajectory than would fish exposed to diet deprivation in the third and fourth months of life. Our second prediction was that stickleback exposed to a diet deficit earlier in life would manifest lower swimming stamina levels during the sub-adult stage. Recent stickleback research suggests that the effect of CG on aerobic performance is time dependent and is much higher in stickleback just prior to the breeding season. Contrary to our above-mentioned hypotheses, our results show that

	younger fish that undergo a CG event are better able to regain optimal growth trajectories. The sticklebacks across the three dietary treatments also showed similar swimming stamina levels upon reaching the sub-adult stage.
3:40 p.m.	**The little shark that could: The amazing travels of a young of the year porbeagle shark** *J.A. Sulikowski, Carlson, A.E. —University of New England, Marine Science Center; L.K. B. Jordan, Microwave Telemetry, Inc., Columbia, Maryland* The porbeagle (Lamna nasus) is a predatory, endothermic shark that typically inhabits the upper pelagic zone from the surface to 200 m deep. Conventional and satellite tagging data suggest this species is highly migratory, however; these studies also indicate that this shark predominantly inhabits coastal and shelf-break regions, where they can remain localized for prolonged periods of time. Furthermore, the available information regarding the spatial ecology of this species has focused on adults with little to no information available on young of the year (YOY) or juveniles. The only information to date, suggests mature females tagged off the Canadian coast migrate to give birth in deep water in the Sargasso Sea, where the pups are reported to then follow the Gulf Stream as they return north. In order to test the hypothesis that the returning YOY sharks were using the Gulf of Maine (GOM) as a nursery ground, a satellite tag was attached to a 88 cm TL female on October 8th, 2012. Geolocation data indicated this shark was not using the GOM as a nursery ground, but instead embarked on a 10,000 km round trip that took it up to Nova Scotia Canada, down to South American, past Panama, Cuba, into the Gulf of Mexico and back up the Atlantic coast into the Gulf of Maine where the tagged released 5km from where it was attached 365 days earlier. This incredible little shark also made consistent dives from the surface to 300m with the deepest dives reaching nearly 700m.
4:00 p.m.	**Utilization of steroid hormones extracted from the skeletal muscle tissue to determine sex and reproductive state of Atlantic Bluefin Tuna (Thunnus thynnus)** *Laura Ellis, University of New England; Dr. Walt Golet, University of Maine Gulf of Maine Research Institute; Dr. James Sulikowski, University of New England* The Atlantic bluefin tuna (ABFT; Thunnus thynnus), a highly migratory pelagic species, is among the most sought after commercial fish in the world's oceans. As a consequence, ABFT are believed to be overfished throughout their Atlantic range. The ability to conduct routine biological sampling to determine age, growth, and reproductive status is needed to accurately define stock structure and population abundance which is critical for the proper management of this and other exploited species. Nearly 2000 ABFT have been sampled between 2013-2014 to provide missing life history data. However, determining the sex of sampled tuna is difficult as the majority of the catch is brought into port completely gutted (i.e. lacking reproductive tracts). Thus, unless alternative biomarkers or novels techniques can be developed to determine key biological characteristics, information on sexual identity will be lost for these and other fish collected from commercial and recreational fisheries. Recently, skeletal muscle tissue has been found to be a depot for steroid hormones and their metabolites in many species including ABFT. Using this information and the previous knowledge of a link between skeletal muscle tissue and plasma steroid levels, we intend to use a muscle tissue biopsy to determine the sex of ABFT samples captured off the coast of New England. The objective of our study is to development a valid method for extracting the steroid hormones estradiol (E2), progesterone (P4), testosterone (T), and vitellogenin (VTG) from skeletal muscle tissue of ABFT, and then quantifying the concentrations using radioimmunoassay and ELISA techniques.
4:20 p.m.	**Biological Aspects of the Channeled Whelk (Busycotypus canaliculatus) and Knobbed Whelk (Busycon carica) in Narragansett Bay, Rhode Island: Current Stock Status and Implications for Whelk Fishery Management** *Thomas E. Angell, RI Department of Environmental Management, Division of Fish and Wildlife,*

	Marine Fisheries Section In spite of a relatively long history of exploitation, little is known regarding the life history traits (growth rates, size-at-maturity, age-at-maturity) of these whelk species in the northern extent of their range. A data collection program was initiated in 2012 to collect the basic biological and fishery catch and effort information needed for fishery management purposes. Sea sampling collected whelk population size structure (total n=27,982; channeled n=27,502; knobbed n=480) and fishery catch and effort data (CPUE) by species. Laboratory research collected detailed morphological, anatomical, and physiological data for estimation of biological reference points (growth rates, age- and size-at-maturity) by species and sex (channeled n=540 (female n=270, male n=270); knobbed n=193 (female n=127, male n=66)). Data analyses for estimation of key biological parameters included morphometric (size) correlations, age estimation, growth rate estimates, age-at-maturity, and size-at-maturity. Morphometric correlation analyses showed that minimum size standards were not correctly matched and that the minimum shell length standard needed to be increased to match the desired minimum shell width standard. Age estimation for individual whelk and mean annual growth rates were calculated for each species by sex and showed that channeled whelks grow faster than knobbed whelks and females of both species grow faster and larger than their male counterparts. Size-at-maturity analyses indicate approximately 20% of female and 95% of male channeled whelk mature at current minimum sizes; approximately 80% of female and 100% of male knobbed whelk are mature at current minimum sizes. Age-at-maturity analyses indicate that 50% of female channeled whelks are mature at 8.3 years; 50 % of male channeled whelks are mature at 7.2 years; 50% of female knobbed whelks are mature at 8.7 years; and 50% of male knobbed whelks are mature at 6.1 years. Age-at-size analyses (growth rate) indicate female channeled whelk reaching current legal minimum shell width in approximately 7.70 years; male channeled whelk in approximately 8.70 years; female knobbed whelk in approximately 9.14 years; and male knobbed whelk in approximately 10.58 years. Does this information, particularly size-at-maturity for female channeled whelk, warrant any additional fishery restrictions?
Inland Fisheries #2	
Tuesday, April 21, 2015 1:00 p.m. - 4:00 p.m.	
	An integrated application for modeling environmental change, population response and management alternatives in streams *BH Letcher, USGS Conte Anadromous Fish Research Center, Turners Falls, MA; JD Walker, Walker Environmental Engineering, Brunswick, ME; DJ Hocking, KP O'Neil, CN Jennison, AR Rosner — USGS Conte Anadromous Fish Research Center, Turners Falls, MA; M Hodge, Hodge Water Resources LLC, Brookline, MA; EH Grant, USGS Patuxent Science Center, Turners Falls, MA; RA Katz, MJ O'Donnell — USGS Conte Anadromous Fish Research Center, Turners Falls, MA*
1:00 p.m.	Regional models can be useful for characterizing spatial variation, making robust predictions and estimating effects across wide environmental ranges. We have developed hierarchical, or nested, regional models for stream flow, stream, temperature, and brook trout occupancy. This hierarchical framework across space is very powerful for estimating outcomes for locations with limited or no response variable data because they can ‘borrow’ information from the hierarchy. In an effort to maximize the utility of these models by making them updatable and accessible, we have also developed a web application that links the models together and links databases to the models. This integrated Spatial Hydro-Ecological Decision Support system (SHEDS) allows rapid updating of model results as new data become available, putting the models in the hands of the users and creating a stronger link between data collection and model results. SHEDS allows hindcasting of stream flows and temperatures by catchment as well as forecasting under alternate

	future scenarios. These environmental predictions are often useful on their own, but can also be linked to predict probabilities of occupancy for brook trout. For example, the user can examine regional maps and use slider bars to visualize the effects of changing forest cover or air temperature on stream temperature, flow, and brook trout occupancy. Future versions of SHEDS will incorporate components of structured decision making and will accommodate alternate models.
1:20 p.m.	**Understanding Stream Crossing Options to get the Most out of your Project Reviews** *John Perry, Maine Department of Inland Fisheries and Wildlife* As stream crossing designs, materials, and construction techniques have evolved, so has the concern about stream habitat connectivity and overall stream health. In recent years there has been a strong push towards designing stream crossings to achieve at least bankfull width (BFW) of the stream, or ideally 1.2 BFW and larger. However, while this is the "gold-plated" option, the reality is that budgetary and logistical constraints often force state transportation agencies to prolong the life of the existing structure through less expensive, and less desirable (from the resource perspective) rehabilitation methods. Without proper design and oversight of construction, these less preferable methods can result in prolonging poor habitat connectivity, or only minimally improving them. Due to the available options of stream crossing strategies that transportation agencies have at their disposal, it is critical that the reviewing resource agency has a full understanding of potential project impacts on aquatic resources. The author has the unique perspective as having worked both as a biologist for a transportation agency, focusing on cost-effective fish passage strategies to meet permitting requirements, and now as a biologist for a resource agency, reviewing and commenting on stream crossing designs. This presentation covers many different options when it comes to rehabilitating or replacing a stream crossing structure. While this presentation deals mainly with crossing designs typically used by transportation agencies, the principles can be applied to municipal and private entities. An overview of several of these structure types and their implications will be discussed.
1:40 p.m.	**Preston Brook Culvert Replacement Project, Bolton, VT** *Jaime Masterson, U.S. Fish and Wildlife Service* The U.S. Fish and Wildlife Service (USFWS) partnered with the Vermont Forest, Parks and Recreation Department (VT FPR) to replace a culvert on Preston Brook in Bolton, VT. Preston Brook originates in Camels Hump State Park in Huntington and flows north through Bolton emptying into the Winooski River. An undersized culvert caused severe flooding, sustaining damage in Tropical Storm Irene and then again on July 3, 2013. Major flooding blew out the culvert and took out 70,000 cubic feet of roadway. The culvert was replaced with a pre-fabricated bridge design, which was a first time use for USFWS and VT FPR. The bridge itself is 40ft by 14ft, HS25 rated for logging trucks and only took about 20 minutes to install. Abutments and stream bank work was finished in about 5 days. Overall cost of the bridge and installation was $84,740. This was the only barrier on this stream and opened up over 7 miles of headwaters and reconnected over 9 miles of pristine brook trout habitat.
2:00 p.m.	**Genetic Diversity of Brook Trout (Salvelinus fontinalis) Populations Isolated Due to Abandoned Mine Drainage in the West Branch Susquehanna River Watershed, Pennsylvania** *Frederic J. Brenner, Professor of Biology, Grove City College, Grove City, PA; Shawn M. Rummel, Field and Research Manager, Trout Unlimited Eastern Abandoned Mine Program and PA Brook Trout Habitat Initiative, Lock Haven, PA* The West Branch Susquehanna River watershed is located in northcentral Pennsylvania and contains some of the most pristine brook trout (Salvelinus fontinalis) habitat in Pennsylvania.

	However water quality issues, such as abandoned mine drainage (AMD) and acid deposition have contributed to the decline of brook trout throughout the watershed. Over 20% (1,200 stream miles) of the watershed is impaired by AMD alone. At the population level, one of the negative consequences of AMD is the isolation of brook trout populations and the subsequent loss of genetic diversity in these populations. The purpose of this study was to determine the extent of genetic diversity in brook trout populations isolated by AMD. Tissue samples were collected from brook trout populations in headwater streams throughout the West Branch Susquehanna River watershed. Nucleic DNA was isolated from the samples and primers were designed to amplify microsatellites in the DNA sequence. Using gene scans, the amount of heterozygosity and homozygosity was determined for each fish sampled. Our results indicate that there is isolation due to AMD based on the high frequency of homozygosity observed in the samples. The results of this study demonstrate the importance of prioritizing AMD restoration efforts to areas that will reconnect previously isolated brook trout populations.
BREAK 2:40 p.m.	
3:20 p.m.	**Building statewide capacity for improving road-stream crossings in Massachusetts** *Kristen H. Ferry, Timothy Chorey — Massachusetts Division of Ecological Restoration, Massachusetts Department of Fish and Game* Undersized road-stream crossings or culverts have long been recognized by resource managers to disrupt natural stream processes and obstruct the movement of fish and other aquatic organisms. In addition to resource impacts, storms such as Hurricane Irene in 2011 have increased awareness of undersized culverts in Massachusetts, due to the flooding and road washouts they caused in many communities. Despite this heightened awareness and known impacts to aquatic resources, few road-stream crossing replacement projects meeting Massachusetts Stream Crossing Standards have been completed. In response, the Massachusetts Division of Ecological Restoration has developed a new Stream Continuity Program to provide assistance for municipalities to implement culvert replacement projects that meet improved design standards. The first action of this program was to conduct a formal needs assessment to better understand and quantify the obstacles that infrastructure managers face when replacing culverts. Although project cost was an important factor affecting implementation, other less obvious factors proved critical. This talk will describe the structure of the Stream Continuity Program, review results of the needs assessment, and introduce preliminary tools and approaches being developed to help communities advance culvert replacement projects, simultaneously meeting improved design standards for aquatic organism passage and flood hazard reduction.
3:40 p.m.	**Community Fishing Waters Program: You're Stocking Where?** *Mike Beauchene, CT DEEP Inland Fisheries Division* Participation in recreational fishing has been on a steep decline since a peak in the early 1990's. Fisheries biologists who manage recreational fisheries should be concerned on many levels. Synergistic effects of the loss of revenue from fishing license sales, decrease in the number of engaged constituents, and disconnects in the generational passing of the fishing tradition, could further reduce support for sport fish programs in this era of lean government spending. As of 2011, the Inland Fisheries Division (IFD) has made angler recruitment, retention, and recapture the number one priority. Our goal is to increase participation in fishing 30%, 52,000 more participants, in the five year window of 2011-2016. This presentation will highlight the expansion of the Community Fishing Waters (CFW) program, one of several key strategies we are currently implementing to recruit, retain, and recapture anglers, ultimately increasing angler participation.