NEAFWA ABSTRACT ARCHIVES: 2014 Fisheries Sessions

Freshwater Fisheries	
Monday, April 14, 2014 10:30 am - 5:00 pm	
10:30 am – 5:00 pm	**Determining the Efficacy of a Standard Denil Fish Ladder for Alewife (Alosa pseudoherangus) passage USING PIT TAGS in a New Hampshire Coastal River** *Kevin Sullivan, NH Fish and Game Department & University of New Hampshire; David Berlinsky, University of New Hampshire; Michael Bailey, US Fish and Wildlife Service* River herring (alewife and blueback herring), were once considerably more abundant in coastal rivers along the east coast, but like many anadromous fish species exhibited a precipitous decline and were declared a "species of concern" in 2006. The causes for these declines are widespread, but exclusion from freshwater spawning areas caused by dam construction is a likely contributor. Population estimates of New Hampshire river herring are derived by counting and releasing individuals that become trapped in standard denil fish ladders during their vernal spawning ascent of six coastal rivers. Inaccuracies in these population estimates may arise if significant numbers of fish fail to ascend the ladders but successfully spawn downstream from the dam. To evaluate the passage efficiency and better understand the behavior of river herring movements within a standard denil fish ladder, a tagging study was conducted using passive integrated transponder (PIT) tags. Throughout the duration of the 2013 spring spawning run (4/25 - 6/18), 622 adult alewives were internally tagged with 23mm HDX PIT tags and their ascent monitored with an eight antenna array, constructed on baffles within the fish ladder. Preliminary efficacy results indicate peak attraction of approximately 62% to the fish ladder with 61% successful passage, with very few failed attempts (fallback). Behavioral observations suggest that if closed, during high-use periods, the ladders may become saturated and prevent additional fish ascension. Also, diel and seasonal ascension motivation was determined and repeated attempts to ascend the ladder were enumerated. This information increases our understanding of fish ladder use by alewives and improves the accuracy of our spawning population estimates.
10:50 - 11:10 am	**Looking for landscape and site-scale correlates of localized extirpation in Bridle Shiner (Notropis bifrenatus).** *Kasey C. Pregler, University of Connecticut, Department of Ecology & Evolutionary Biology; Neal Hagstrom, Connecticut Department of Energy & Environmental Protection, Inland Fisheries Division; Jason Vokoun, University of Connecticut, Wildlife and Fisheries Conservation Center, Department of Natural Resources and the Environment; Eric Schultz, University of Connecticut, Department of Ecology & Evolutionary Biology* Bridle shiner (Notropis bifrenatus) is apparently declining over most of its range and is currently listed as a species of concern in Connecticut. Recent research indicates the apparent decline of bridle shiner in this state is in part due to changes in sampling gear used for statewide surveys. Seining used 50 years ago is demonstrably more effective at capturing bridle shiner than the currently favored and more frequently used electrofishing gear. The present study is a reevaluation of the distribution of this species in light of this recent finding. We seined all known historic sites in Connecticut and found some populations once thought to be extirpated are extant, but an overall alarming range reduction is evident where the number of site occurrences has declined 60% over 50 years. Using a GIS approach we identified site- and landscape-scale habitat measures

	and land use changes that are most predictive of extirpation, which will provide needed context on declines in this species and potential avenues for conservation actions.
11:10 am – 11:30 am	**Recolonization history of the longnose dace (Rhinichthys cataractae) as revealed by population structure in southern Lake Champlain drainages.** *Meriel Brooks, Ph.D., Green Mountain College* In 2006 Phillipe Girard and Bernard Angers published a study (Can. J. Fish. Aquat. Sci. 63:1429-1438) describing the impact of a postglacial marine invasion (Champlain Sea) on genetic diversity of long nosed dace (Rhinichthys cataractae) populations in Quebec. They found a clear genetic signature of population extirpation and recolonization, fairly low genetic diversity, and 2 major clades with 2 subdivisions each. This study extends their results to populations of the same species that would also have been affected by the Champlain Sea in the Poultney and Mettowee Rivers of the southern Lake Champlain drainage in New York and Vermont. We sampled to allow comparisons of populations within the Poultney river, between the two rivers, and between southern and northern drainages (Girard and Angers results). We used mtDNA from the D-loop region and for our populations found increased variability (14% relative to 6%), but the variants fit within the same clades. We also found population differences within the Poultney River along a longitudinal gradient as well as between river population differences, all haplotypes occurred in each river but not in each population. The increased genetic variability of the southern populations (New York and Vermont) relative to the northern (Quebec) may indicate increased sources of colonists for the southern populations.
11:30 am – 11:50 am	**Assessing the Role of Angling-Induced Evolution in Shaping Connecticut Largemouth Bass Populations** *Justin Davis, CT DEEP Inland Fisheries Division; Robert Jacobs, CT DEEP Inland Fisheries Division; Eileen O'Donnell, CT DEEP Inland Fisheries Division; Jason Vokoun, UConn Department of Natural Resources and the Environment; Jan-Michael Hessenauer, UConn Department of Natural Resources and the Environment* Examples of evolutionary change in exploited fish populations, a phenomenon commonly referred to as "fisheries-induced evolution" (FIE), are now myriad and have led to a growing call for the development of "evolutionarily-enlightened" fisheries management practices. The foundational discoveries elucidating FIE were made in commercially exploited fish stocks, but relatively little effort has been devoted to assessing whether recreational angling might also act as a strong selective agent. Recent research on largemouth bass, a popular and widely distributed freshwater gamefish, has shown that individual largemouth bass vary in their vulnerability to angling, and that physiological and behavioral traits relevant to vulnerability are heritable. In Connecticut, we have a unique opportunity to test the hypothesis that FIE has altered largemouth bass populations because a) we have small bass populations that experience high fishing pressure (i.e. there is potential for strong selection), and b) we have numerous drinking water reservoirs that are closed to fishing and support unexploited bass populations. Previous research by the DEEP Inland Fisheries Division (IFD) demonstrated that largemouth bass in unexploited drinking water reservoirs were much more vulnerable to angling than bass from public lakes, a dynamic that we now believe may be partially attributable to evolutionary selection against high vulnerability in public lakes. IFD, in cooperation with the UConn Department of Natural Resources and the Environment, has embarked on a multi-faceted research project to investigate the potential for angling-induced evolution in Connecticut largemouth bass populations, and

	to assess the potential for remediation of undesirable evolutionary change via re-introduction of desirable genes from unexploited reservoir bass populations.
BREAK 11:50 am - 1:30 pm	
Freshwater Fisheries	
1:30 pm - 1:50 pm	**The remarkable recovery of Columbia Basin sockeye salmon** *Jeffrey K. Fryer, Columbia River Inter-Tribal Fish Commission* In the past 20 years, Columbia Basin sockeye salmon runs have increased from a low of less than 9000 fish to a record run of 500,000 in 2012. In 1991, Snake River sockeye were the first salmon stock listed under the Federal Endangered Species act with remaining Columbia Basin stocks were at levels many thought warranted listing. In 2012, the record run resulted in a record sport and tribal harvest of over 162,000 sockeye with tagging and escapement data suggesting an additional 200,000 sockeye disappeared on the upstream migration. By examining fishing data and visual counts combined with PIT and acoustic tag data, it is possible to partition mortality and missing sockeye on their upstream migration. Columbia Basin sockeye salmon have benefited from a fortuitous mix of good environmental conditions, beneficial management actions, and neglect, at least until recent years, from harvest groups. However, renewed interest from harvest groups has resulted in a situation where expectations have grown to the point where seemingly record runs are required every year to meet both harvest commitments and escapement goals.
1:50 pm - 2:10 pm	**A milestone on the Penobscot: removing Veazie Dam to improve habitat access for sea-run fish as part of the Penobscot River Restoration Project** *George Aponte Clarke, Penobscot River Restoration Trust; Joseph McLean, Wright-Pierce; Laura Rose Day, Penobscot River Restoration Trust; Jonathan Edgerton, Wright-Pierce; Matt Bernier, NOAA Restoration Center; Steven Shepard, U.S. Fish & Wildlife Service* The Penobscot River's native sea-run fish species exist today as only small fractions of their historic numbers, underscoring the need for resilience in the ecosystem. The cumulative effects of multiple dams pose known negative impacts to sea-run fish recovery including passage inefficiencies. At the same time, the Penobscot River holds great potential for sea-run fish recovery through strategic dam removal, especially of lower watershed dams. In an unprecedented collaboration, the Penobscot Indian Nation, seven conservation groups, hydropower companies, and state, federal, and tribal agencies, are working together to restore fisheries through Penobscot River Restoration Project. This plan includes a combination of dam removal, fish passage improvements and reconfigured hydro operations to vastly improve habitat access and connectivity while maintaining energy generation. This ecosystem-focused effort addresses the full assemblage of 11 native fish species by strategically removing some dams and improving fish passage at others. Successful project implementation should help revive native fisheries, restore ecosystem functions, create economic opportunity, and enhance social and cultural traditions (angling, paddling, wildlife viewing) in New England's second largest river system. The Penobscot River Restoration Trust, with public and private partners, achieved

	significant restoration milestones including removal of Great Works Dam (2012) and Veazie Dam (2013). Wright-Pierce Engineering and the Penobscot Trust will highlight the recent Veazie Dam removal and key elements of the process such as hydrologic analysis, water control, construction sequencing, adaptation to one of the wettest years in recent record, and conservation engineering and project implementation in the multi-stakeholder team setting.
2:10 pm - 2:30 pm	**Results of 2012 and 2013 Downstream American Eel Passage Radio-Telemetry Studies, UPM Madison Paper, Madison, Maine** *Jesse F. Wechsler, Sr. Fisheries Scientist, Kleinschmidt; David Lovley, Sr E/I Project Eng & Hydro Operations Supervisor, UPM Madison* In 2012 and 2013, Kleinschmidt staff surgically tagged 64 adult silver eel to monitor downstream passage past the Anson and Abenaki hydropower projects, which are owned and operated by UPM Madison Paper Industries (MPI) to support energy demand for paper production. The facilities are located adjacent to one another on the Kennebec River in central Maine in the towns of Anson and Madison, approximately 75 river miles upstream of the Kennebec River estuary. Researchers monitored available passage routes (e.g., interim eel bypasses, minimum flow gates / spill, and turbine passage) in the fall of 2012 and 2013 with 15+ automated stationary radio-telemetry receiver and antenna arrays. Two Oregon RFID half-duplex PIT tag readers with associated loop wire antennas were also installed to detect eel utilizing a secondary downstream bypass pipe at the Anson station. A tally of downstream eel passage through available routes as well as information pertaining to the fate of tagged fish (e.g., lost signal, immobility/mortality) was developed to summarize and evaluate passage at both stations. In 2012, 22 of 25 eel (88%) migrated downstream to or past the Abenaki station, indicating successful passage past the Anson station by any route, and 23 of 26 eel (88.5%) passed the downstream most monitoring station alive, indicating successful passage past the Abenaki station. Six eel moved past the Abenaki station during high-river flows associated with Hurricane Sandy (October 30 and October 31, 2012). MPI completed a 2nd study in 2013 to validate the results of the 2012 work (results pending).
2:30 pm - 2:50 pm	**Evidence of Fisheries Induced Evolution from Recreationally Exploited Largemouth Bass Populations** *Jan-Michael Hessenauer, Wildlife and Fisheries Conservation Center, Department of Natural Resources and Environment, University of Connecticut; Jason Vokoun, Wildlife and Fisheries Conservation Center, Department of Natural Resources and Environment, University of Connecticut; Justin Davis, Inland Fisheries Division, Connecticut Department of Energy and Environmental Protection; Robert Jacobs, Inland Fisheries Division, Connecticut Department of Energy and Environmental Protection; Eileen O'Donnell, Inland Fisheries Division, Connecticut Department of Energy and Environmental Protection; Cory Suski, Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign* Understanding the possible evolutionary effects of anthropogenic activities on wild populations of fish and wildlife is important for informed management and future conservation. Increasing evidence links evolutionary changes with exploitation of commercially fished stocks, but less research has investigated the effects of recreational angling. Experiments in selective breeding have determined that some Largemouth Bass (Micropterus salmoides) are more vulnerable to recreational angling than others; high vulnerability individuals have been documented to have higher metabolic rates, provide better parental care, and have higher fitness in the absence of angling, relative to lower

	vulnerability individuals and that these traits are heritable. Corroboration of these results from wild populations has been difficult because few unexploited populations of Largemouth Bass have been studied for comparison. For the current study, we collected age-0 Largemouth Bass from two unexploited Connecticut drinking water reservoirs, and two heavily fished reservoirs, and stocked them into a common 0.11 acre rearing pond during fall 2012 to quantify the effects of fishing exploitation on metabolic characteristics. Individuals were allowed to acclimate to pond conditions throughout the summer of 2013 to eliminate plastic effects associated with environmental conditions. During fall 2013 we estimated field metabolic rates for one individual from each population per day (~25 total individuals per population) using computerized intermittent-flow respirometry. A mixed-model ANCOVA was used to analyze the data, and revealed that individuals originating from the unexploited drinking water reservoirs had higher metabolic rates than individuals from the heavily fished populations ($P<0.05$). These findings are consistent with the expectations of fisheries induced evolution for exploited populations, suggesting that recreational angling may be an evolutionarily relevant force.
BREAK 2:50 pm - 3:20 pm	
Freshwater Fisheries	
3:20 pm - 3:40 pm	**You can sink but you cannot hide: substrate penetration by lake trout eggs and their sculpin predators** *Benjamin T. Szydlowski, University of Vermont; Lee Simard, University of Vermont; Alex Sotola, University of Vermont; J. Ellen Marsden, University of Vermont* Lake trout spawn in fall, and their eggs develop slowly during the winter until hatching in spring; consequently, their eggs are vulnerable to predation for several months. To protect their eggs, lake trout spawn over rocky substrates so that the eggs can settle into interstices where few predators can reach them. Small-bodied egg predators such as sculpins (Cottus spp.) and crayfish are capable of limited movement into interstitial spaces to forage. We investigated egg settlement and sculpin burrowing among rocks of varying size. To determine the potential depth of egg settlement, we filled a 1.3 m square chamber to varying depths with rocks of several sizes (average dimension 2.5, 7.6, and 12.7 mm), either sorted or mixed; 200 ball bearings were dropped into the chamber, and the number that fell to the bottom of the pile were counted for each depth of rocks. To determine actual depth of egg penetration, we repeated the trials with rocks in a water-filled cylinder, using fresh lake trout eggs. There was a direct relationship between size of the substrate and depth to which eggs or ball bearings penetrated. Eggs settled to the base of columns as deep as 1 m. Sculpins were also capable of penetrating to the base of 1 m deep columns of rock. Thus, although the reproductive strategy of hiding eggs in rocky reefs is likely effective at protecting eggs from most predators, and from being dislodged by turbulence, sculpins are highly adapted for accessing this ?hidden? energy resource.
3:40 pm - 4:00 pm	**Effect of lake fragmentation by causeways on lake whitefish population structure** *Tyler Parent, University of Vermont; William C. Kilpatrick, University of Vermont; Luc Bernacki, University of Vermont; J. Ellen Marsden, University of Vermont* Habitat fragmentation in aquatic systems is generally associated with barriers in lotic habitats, but has seldom been studied in lakes. Lake Champlain has been fragmented in the last 160 years by construction of 10 causeways between and among islands and the mainland. Openings in most of the causeways are narrow (< 200 m) and less than 4 m deep, potentially limiting movement of many aquatic species among basins. We

	examined possible effects of these causeways on the genetic structure of lake whitefish populations. We hypothesized that passage of this coldwater species through causeways would be restricted during periods of thermal stratification. Whitefish were collected from two adjacent sites (3.7 km apart) in the Main Lake, three distal sites in the contiguous Main Lake (22 to 58 km apart), and three adjacent sites (4 ? 4.5 km apart) in one of the basins isolated from the Main Lake by causeways; we then compared isolation by distance and isolation by causeways. Nine microsatellite loci were amplified from 190 individuals. Population structure was examined using genetic distance, Fst, and AMOVA. Preliminary data indicate individuals from adjacent sites within the Main Lake and the isolated basin were most similar, and those from distal sites in the Main Lake, without a barrier between them were more similar to each other than to populations separated by a causeway. These data suggest lake whitefish populations have been isolated by causeways, resulting in genetic sub-structuring.
4:00 pm - 4:20 pm	**A Study of Climate Change Variables on Select; Cold, Cool and Warm Water Fish of Lake Ontario** *Barbara J. McKay Archibald, Department of Geography, Pennsylvania State University; Joseph A. Bishop, Department of Geography, Pennsylvania State University* Organisms are sensitive to the fluctuations in their environments. In the last century the earth?s temperature has increased 0.74oC as a result of increases in atmospheric greenhouse gasses. Current projections indicate the temperature will increase between 1.1 and 6.5oC by 2100. To date climate changes have altered the distributions, frequencies, and lifecycles of species, and researchers expect these trends to continue. The effected species include fish, and fish studies indicate, warm water fish populations increase during warm periods and cool and cold water fish populations increase during cool periods. This study explores 41 habitat and climate variables as I model the impacts of climate change on freshwater fish in Lake Ontario. I use Coastal (Gap Analysis Program) GAP modeling techniques to build three model sets (habitat, climate, and habitat-climate) for current and future habitats for representative cold, cool, and warm water fish. I use canonical correspondence analysis (CCA) to identify influential variables, neural network analysis to build fish models, and ESRI?s ArcGIS to map habitats. Upon inspection of preliminary maps the fish habitat distributions are complex and the fish population projections diverge from expected patterns of decreasing cold water fish populations and increasing warm water fish populations as the climate changes. Results suggest that the methodology is good and current data models are promising, but the models? details need refinement to offer reliable projections for future fish populations, habitats, and conservation needs. Once we can reliably project these elements, we will improve future fish stock management as the climate changes.
4:20 pm - 4:40 pm	**New York Black Bass Anglers: Perspectives on Fisheries Management and Tournaments** *Nancy Connelly, Cornell University; Shaun Keeler, NYS Department of Environmental Conservation Bureau of Fisheries; Jeff Loukmas, NYS Department of Environmental Conservation Bureau of Fisheries; and Barbara Knuth, Cornell University* Fishery managers in New York were interested in better understanding the views of black bass anglers on a variety of management topics, including their views on the addition of a statewide catch and release season, special regulations to increase the number or size of black bass, and black bass fishing tournaments occurring in New

	York. We conducted a mail survey in 2012 of 1,500 anglers who indicated in a 2007 statewide survey that black bass was among their top two favorite species to fish for in New York. The adjusted response rate to the survey was 58%. Some key findings were: (1) most anglers wish to see the catch and release season (winter/spring non-harvest season) for black bass continued; (2) a majority of anglers support special regulations if the special regulations are intended to increase the number of black bass on waters the anglers fish or if the regulations would increase their chances of catching a larger black bass; and (3) the far majority of anglers wish to keep the harvest season dates as is, as well as maintain the current minimum size limit. We also found that while two-thirds of anglers had not participated in a black bass tournament in New York in the past 5 years and had no interest in participating in the future, they did not think tournaments should be banned. They tended to agree that tournaments provide a boost to the regional economy but felt they should be held only on larger waters, and that tournaments reduce the quality of the fishing experience for non-tournament anglers. These results are useful to fishery managers as they consider possible management actions, as well as to others interested in promoting tournaments.
4:40 pm - 5:00 pm	**Compensatory Growth and Lipid Generation in 'Threespine Stickleback' (Gasterosteus aculeatus)** *Miguel L. Reyes, Clark University; John A. Baker, Clark University* Many organisms exhibit compensatory growth (CG), an accelerated growth rate during recovery from a total or partial food deprivation than during periods of continuous food availability. However, many aspects of compensatory growth are still poorly understood, such as how compensatory growth potential may change during the life of the organism. We studied compensatory growth in the threespine stickleback (Gasterosteus aculeatus), with one objective being to analyze the potential for, and impact of, CG in threespine sticklebacks across their first few months of life, a period corresponding to their first growing season. We hypothesized that fish exposed to a diet deficit in the second month of life, and then returned to an optimal diet, would take longer to achieve a normal growth trajectory than would sticklebacks exposed to diet deprivation in the third and fourth months of life. A second objective was to assess if body lipid content was related to compensatory growth. Our hypothesis here was that stickleback exposed to a diet deficit during earlier stages would fail to recover adequate energy storage reserves. Recent CG models suggest that appetite is regulated in accordance to maintaining a ratio of reserve to body lipid levels. Contrary to our above mentioned hypotheses, our results show that upon comparison with young fish continuously fed an ad libitum diet, one and two month old fish exposed to a diet deficit are better able to regain optimal growth trajectories and regenerate lipids than populations exposed to food deprivation at three months of age.
Brook Trout Symposium	
Monday, April 14, 2014 10:30 am - 5:00 pm	
10:30 am - 10:50 am	**The Importance of Scale: Assessing and Predicting Brook Trout Status** *Mark Hudy, USGS; Keith Nislow, USFS; Eric P. Smith, Virginia Tech; Arthur Cooper, Michigan State; Dana Infante; Michigan* Occupancy models are of increasing interest to managers and natural resource decision makers. Assessment of status and trends, as well as the specific drivers influencing occupancy, both may change as a function of scale, and analyses conducted at multiple scales can help identify important mechanisms leading to changes in distributions. We

	analyzed extensive fine-scale occupancy data across the southern historic range of the Brook Trout, Salvelinus fontinalis to determine which landscape metrics and thresholds were useful in predicting Brook Trout presence across three relevant spatial scales and how Brook Trout occupancy varied by scale. Percentage occupancy declined markedly with increased spatial resolution, as 52% of watersheds but only 32% of sub-watersheds and 14% of catchments were occupied. Across all three scales, habitats which were exclusively occupied by native Brook Trout (without nonnative trout) were rare (<10%). Classification and regression tree models using derived landscape predictor variables were developed for three classification cases: Case 1:(Brook Trout; no Brook Trout), Case 2 (Brook Trout; nonnative trout only; no trout), and Case 3 (Brook Trout only; Brook Trout and nonnative trout; nonnative trout only and no trout). Model results were sensitive to both scale and the number of classification categories with respect to classification accuracy, variable selection, and variable threshold values. Classification accuracy tended to be lowest at the finest (catchment) scale potentially reflecting stochastic population processes and barriers to movement. Classification rates for the overall models were: Case 1: Watershed (80.19%); Sub-watershed (85.06%); Catchment (71.13%); Case 2: Watershed (69.31%); Sub-watershed (68.72%); Catchment (57.38%); Case 3: Watershed (58.91%); Sub-watershed (59.83%); Catchment (47.59%). Our multiscale approach revealed soil permeability (positive) and atmospheric pollution (negative) to be important predictors. The predicted occupancy and observed status of Brook Trout appear to be influenced by the scale at which the data are collected and reported.
10:50 am - 11:10 am	**Eastern brook trout integrated spatial data and tools** *Jason A. Coombs, University of Massachusetts Mark Hudy, US Geological Survey; Keith H. Nislow, US Forest Service; Amanda R. Colton, US Forest Service* This talk will detail the present status of the Eastern Brook Trout Joint Venture (EBTJV) catchment-level assessment, describe the new riparian prioritization for climate-change resilience (RPCCR) tool, and demonstrate their accessibility, operation, and interaction through use of a web map viewer. Catchment-Level Assessment: During 2006, the EBTJV undertook the task of determining brook trout population status across its historic eastern range at the subwatershed level, culminating in the release of the Eastern Brook Trout: Status and Threats report. However, while the initial assessment was an excellent start, the subwatershed level was not detailed enough to inform many state biologists trying to conduct on the ground brook trout restoration and enhancement projects. In an effort to make available the most accurate, fine-scale, and current information on brook trout population status throughout its native eastern range, the EBTJV is working to update the initial report at the NHD+ catchment scale. RPCCR Tool: Provision of shade via riparian restoration is a well-established management adaptation strategy to mitigate temperature increases in streams. Effective use of this strategy is contingent upon accurately identifying vulnerable, unforested riparian areas in priority coldwater stream habitats. The RPCCR is an interactive web-based tool which is designed to allow managers to rapidly identify these high-priority riparian restoration targets.
11:10 am - 11:30 am	**Patch-based metrics: A cost effective method for short- and long-term monitoring of EBTJV wild brook trout populations?** *Andrew R. Whiteley, Department of Environmental Conservation, University of*

	Massachusetts, Amherst, MA; Mark Hudy, U.S. Geological Survey, Ecosystems Mission Area, Reston, VA; Zachary Robinson, Department of Environmental Conservation, University of Massachusetts, Amherst, MA; Jason A. Coombs, U.S. Forest Service, Northern Research Station, University of Massachusetts, Amherst, MA; and Keith Nislow, U.S. Forest Service, Northern Research Station, University of Massachusetts, Amherst, MA The wild Brook Trout Salvelinus fontinalis resource throughout the range of the Eastern Brook Trout Joint Venture (EBTJV) has been significantly reduced over the last 150 years and faces ongoing and future threats from climate change, land use changes, invasive species, and loss of genetic integrity. Monitoring both short- and long-term trends on individual Brook Trout populations and the resource as a whole are important needs of managers. Currently, standard population estimates using mark-recapture and depletion removal estimates are not viable for large scale monitoring because of expense, inability to detect trend (i.e. large coefficient in variation), and problems expanding the sample to the entire population. However, extensive fine-scale occupancy data (at the catchment level) exist for many states. We used this fine-scale catchment data to identify unique "patches" of Brook Trout. We define a "patch" as a group of contiguous catchments occupied by wild Brook Trout. Patches are not connected physically (separated by a dam, unoccupied warm water habitat, downstream invasive species, etc.) and are generally assumed to be genetically isolated. The median patch size from Pennsylvania to the southern range distribution edge is 850 ha and 85.3% of patches were less than 3,000 ha in area. With preliminary patch-level genetic data from Virginia, we found a strong positive relationship between patch size and effective number of breeders (Nb; an indicator of reproductive output and success), with notable outliers associated with patches that contain reclaimed habitat (positive residuals) and the presence of invasive Rainbow Trout Oncorhynchus mykiss (negative residuals). We also found that subsamples from large patches yield similar estimates of genetic metrics, which suggests that our patch-based approach should be applicable even to potentially problematic large patches. We recommend the use of patches for large-scale monitoring of eastern Brook Trout. Recommended patch metrics include: number of patches with allopatric populations (Brook Trout only), number of patches with sympatric nonnative trout populations, average size of patches, number of patches increasing in size (connectivity), number of patches decreasing in size, number of patches with decreasing or stable genetic diversity, and number of patches with increasing, decreasing or stable Nb. A monitoring design combining fixed annual "sentinel" patches and a rotating panel design for other patches has the potential to be a cost effective tool for managers to detect trends in wild Brook Trout populations.
11:30 am - 11:50 am	**Stream flow and temperature effects on salmonid population dynamics: integrated modeling across scales and data types** *Benjamin H. Letcher, S.O. Conte Anadromous Fish Research Center, US Geological Survey/Leetown Science Center; Yoichiro Kanno, S.O. Conte Anadromous Fish Research Center, US Geological Survey/Leetown Science Center; Keith H. Nislow, 2Northern Research Station, USDA Forest Service, University of Massachusetts, Amherst; Paul Schueller, S.O. Conte Anadromous Fish Research Center, US Geological Survey/Leetown Science Center; Ronald Bassar, S.O. Conte Anadromous Fish Research Center, US Geological Survey/Leetown Science Center; Ana Rosner, S.O. Conte Anadromous Fish Research Center, US Geological Survey/Leetown Science Center; Jason A. Coombs, 2Northern Research Station, USDA Forest Service, University of Massachusetts, Amherst; Krzysztof Sakrejda, S.O. Conte Anadromous Fish Research Center, US Geological Survey/Leetown Science Center; Michael Morrissey, S.O. Conte*

	Anadromous Fish Research Center, US Geological Survey/Leetown Science Center; Douglas Sigourney, S.O. Conte Anadromous Fish Research Center, US Geological Survey/Leetown Science Center; Andrew Whiteley, Department of Environmental Conservation, University of Massachusetts, Amherst; Matthew O'Donnell, S.O. Conte Anadromous Fish Research Center, US Geological Survey/Leetown Science Center; Todd Dubreuil, S.O. Conte Anadromous Fish Research Center, US Geological Survey/Leetown Science Center A major challenge in ecology is developing robust models of population response to environmental change that work well across space. In the last decade, researchers have begun developing so-called integrated models that attempt to bridge the gap between specificity and generality by combining data sources into a single modeling framework. We present results from an integrated effort aimed at understanding how brook trout respond to variation in stream flow and temperature. Integrating data from presence/absence surveys, abundance surveys and mark-recapture studies, we identified that dynamics are dominated by egg/fry survival and that high flow in the autumn and low flow in the winter increase recruitment. Also, adult survival was positively correlated with spring temperature. Results from all three data sources generally agreed in magnitude and direction of environmental effects, strengthening confidence in inferences. These relationships between environmental variation and population dynamics generate response surfaces that can be used to forecast future population dynamics in response to environmental change.
BREAK 11:50 am - 1:30 pm	
Brook Trout Symposium	
1:30 pm - 1:50 pm	**Comparison of Historic and Contemporary Molecular Methods to Assess North Carolina?s Brook Trout** *Jacob M. Rash, North Carolina Wildlife Resources Commission; Barbara A. Lubinski, USGS-Leetown Science Center; and Tim L. King, USGS-Leetown Science Center* The North Carolina Wildlife Resources Commission (NCWRC) has been involved in a long-term effort to identify and genetically type wild Book Trout populations within the state. To date, over 600 wild Brook Trout populations have been identified and of these, 480 have been genotyped at the creatine kinase locus. Results from allozyme testing indicate that 38.3% of the populations are southern origin, 9.6% are northern origin and 52.1% are of mixed genetic origin. Although these historic data have contributed to the NCWRC?s understanding of the State?s Brook Trout populations, knowledge gaps concerning genetic relationships of the species within North Carolina persist. To address this research need an extensive survey of genetic diversity and variation at 13 microsatellite loci is being conducted. To date, this research has been able to provide significant insight into demographic history of and the evolutionary relatedness among previously uncharacterized Brook Trout populations. Utilization of microsatellite loci and pooling both phylogeographic and hatchery collections as a baseline for assignment scores provided us with a sound methodology to examine hatchery influence and heritage within collections. However, initial comparisons between allozyme and microsatellite assignments show inconsistent agreement. Thus far, tissue samples from 57 collections have been compared via the two techniques and 42.1% (N = 24) of collections received different assignments than those provided by original allozyme analyses. This differentiation is important to managers as they reflect on historic data and its implications to past, present, and future conservation efforts.

1:50 pm - 2:10 pm	**Rewilding Native Trout: Opportunities for Stronghold Development through Portfolio Planning** *Amy Haak and Jack Williams, Trout Unlimited* We describe a systematic approach to aquatic conservation planning that applies the financial concepts of portfolio management to trout conservation and can be utilized to establish larger stronghold populations. We use the 3-R framework to describe the portfolio of native trout: Representation (genetic, life history, and geographic diversity), Resilience (large populations and large habitat patches), and Redundancy (multiple populations within geographic units). Viewed from this framework, most of the more vulnerable trout taxa have portfolios that inadequately address Resilience because past management has focused primarily on isolating populations to maintain genetic purity while underemphasizing life history diversity and stronghold development. As these trout are 'rewilded' and their portfolios rebalanced with the addition of larger stronghold populations, numerous other benefits to aquatic biodiversity can accrue, including restoration of the broader ecological functions of native trout and the conservation of other native fishes within their ecosystems. The rewilding approach also is consistent with climate adaptation strategies that recognize the need for conservation actions to be planned and conducted at a landscape scale capable of providing resistance and resilience to habitats and target populations.
2:10 pm - 2:30 pm	**Short-term and seasonal movements of Brook Trout in the Upper Savage River Watershed, Garrett County, MD** *Matthew T. Sell, Maryland Department of Natural Resources, Fisheries Service; Alan A. Heft, Maryland Department of Natural Resources, Fisheries Service; David C. Kazyak, Appalachian Laboratory, University of Maryland Center for Environmental Science; Robert H. Hilderbrand, Appalachian Laboratory, University of Maryland Center for Environmental Science; Raymond P. Morgan II, Appalachian Laboratory, University of Maryland Center for Environmental Science* We used radio telemetry to determine movement patterns of adult Brook Trout Salvelinus fontinalis in the upper Savage River, Garrett County, Maryland. The lower main stem river is a stocked fishery (daily creel of 5 trout), whereas the rest of the watershed is managed as wild trout water, artificial lures only, with no harvest of Brook Trout. Our objective was to determine if fluvial Brook Trout use the lower reaches of the river seasonally, where they are susceptible to harvest. Sixteen large Brook Trout (> 240 mm total length) were implanted with radio tags and located regularly over the tag lifespan (~1 year). Most fish (10 of 16) migrated upstream (>100 m) to upper river reaches or tributaries in late spring as lower main stem water temperatures neared 20?C. The mean upstream movement was 5.9 km, with one individual exceeding 11 km. Some fish (2 of 16) moved <100 m, remaining in relatively deep pools near their tagging location. All tagged Brook Trout were sedentary from late June into October, moving only slightly (<100 m) to spawn. After spawning all but two of the migratory fish quickly moved (within 7 d) back to the general areas in the main stem river where they were tagged; many (7 of 10) returned to the same pool. Consequently, fluvial Brook Trout mobility and the timing of their movements make them susceptible to angling harvest in the lower main stem Savage River.
2:30 pm - 2:50 pm	**Muskies and Bass in the St. John River Watershed: An overview of a decades-long species invasion into brook trout country** *Jeremiah Wood, Maine Department of 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.
BREAK 2:50 pm - 3:20 pm	
Brook Trout Symposium	
3:20 pm - 3:40 pm	**The Maine Brook Trout Pond Survey Project: Volunteer Anglers Survey Remote Ponds for Presence of Previously Undocumented Wild Brook Trout Populations** *Emily Bastian, Maine Audubon Society (MAS); Sally Stockwell (MAS); Jeff Reardon, Trout Unlimited (TU); Merry Gallagher, Maine Department of Inland Fisheries and Wildlife (MDIFW); and Joseph Dembeck, (MDIFW)* The Maine Brook Trout Pond Survey Project?a collaborative effort by TU, MDIFW and MAS?uses volunteer anglers and standardized gill net surveys in a two-step process to assess previously unsurveyed ponds and identify undocumented populations of wild brook trout. Maine contains literally hundreds of ponds that have never been surveyed following robust, standardized methodology. Many of these waters are in remote, forested portions of the state where the presence of native populations of brook trout is highly likely. From 2011-2013, more than 200 volunteer anglers donated over 4100 hours to initially survey 256 remote ponds. The volunteer anglers provide invaluable information regarding the ability to access the remote pond and information pertaining to wild brook trout presence based on angling results and observation. Volunteer anglers examine the shoreline of each pond and observe signs (e.g. stored boats) of angling use. Volunteer anglers caught brook trout in 54 of these ponds, all of which were recommended for follow-up standardized net surveys. Perceived trout or signs of persistent angling use were observed in an additional 51 ponds, and most of these were also recommended for follow-up standard survey effort. Over the 3 year period, 109 ponds were recommended to MDIFW for standardized remote pond surveys. Volunteer angler results focus limited resources for standard net surveys on waters where brook trout are perceived to be present. Directions provided by volunteers to access each water substantially reduce the amount of staff time required to complete each survey.
3:40 pm - 4:00 pm	**The Maine Brook Trout Pond Survey Project: Standard Net Surveys Confirm Undocumented Wild Brook Trout Populations Previously Identified By Volunteer Anglers** *Jeff Reardon, Trout Unlimited; Merry Gallagher and Joseph Dembeck, Maine Department of Inland Fisheries and Wildlife; Emily Bastian and Sally Stockwell, Maine Audubon Society*

	The Maine Brook Trout Pond Survey Project?a collaborative effort by Trout Unlimited (TU), Maine Department of Inland Fisheries and Wildlife (MDIFW) and Maine Audubon (MAS)?uses volunteer anglers and standard net surveys in a two-phase approach to assess previously unsurveyed ponds and identify undocumented populations of wild brook trout. From 2011-2013, volunteer anglers caught or observed wild brook trout in 109 previously unsurveyed ponds. This volunteer survey effort was intended to (1) identify ponds where undocumented wild brook trout populations likely exist and (2) increase MDIFW?s efficiency in documenting wild brook trout populations for conservation and management. In 2012 and 2013, two-person survey crews contracted by MDIFW completed gill net and minnow trap surveys on 45 of the 109 ponds identified by volunteers. Surveyors also measure pond depth, collect a water temperature profile, measure basic water chemistry; estimate the fish community; and characterize the brook trout population of the pond. Brook trout were confirmed in 34 of 45 surveyed ponds. Combined with results from the volunteer angling surveys, these standard net surveys demonstrate that volunteer data is useful to direct agency staff resources to waters where brook trout populations are highly likely and thus reduces the staff commitment necessary to complete the survey process by eliminating the need for pond access reconnaissance. There is a high degree of concurrence between angler observations of brook trout and confirmation by standardized survey, but discrepancies highlight the value of standardized survey. Standardized surveys also collect substantial additional information that is important to prioritize conservation and management actions.
4:00 pm - 4:20 pm	**Evaluating fish passage through retrofit culverts using Radio Frequency Identification (RFID)** *Gautreau, M., S. Peake, and R. A. Curry. Canadian Rivers Institute, Department of Biology, University of New Brunswick, Fredericton, New Brunswick, Canada.* The improper design or maintenance of culverts has the potential to create barriers in aquatic systems, which may lead to fish stock declines. Problem culverts are often retrofitted with fish passage structures as a cheaper alternative to replacement. The purpose of this research is to evaluate the effectiveness of culvert retrofit designs for fish passage commonly used in New Brunswick. Ten sites were outfitted with RFID equipment, each with four antennae, which were situated to assess entrance and passage of fish through the fishway and culvert. Fish were surgically implanted with passive integrated transponder (PIT) tags and released. The species tagged, when present, were: brook trout, Salvelinus fontinalis; white sucker, Catostomas commersoni; American eel, Anguilla rostrata; creek chub, Semotilus atromaculatus; Atlantic salmon parr, Salmo salar, and rainbow trout, Oncorhynchus mykiss. As tagged fish moved through the sites, the RFID equipment recorded the antenna number, tag number, date and time. At each site, data loggers recorded temperature and water depth. A total of 929 fish were tagged between the sites, and 60% were detected by the RFID systems. Passage success of detected fish varied between sites (0 ? 82%), possibly reflecting the differences in the retrofit designs. The relationship between fish passage success, retrofit design, and environmental conditions will be discussed, as will the issues that were encountered during the course of the study.
4:20 pm - 4:40 pm	**The future of brook trout in a changing climate and landscape** *Jefferson Tyrell Deweber, Pennsylvania Cooperative Fish and Wildlife Research Unit,*

	The Pennsylvania State University; Tyler Wagner, Pennsylvania Cooperative Fish and Wildlife Research Unit, USGS The brook trout is a culturally, economically and ecologically important species that is sensitive to warming stream temperatures and habitat degradation. I will describe our assessment of how projected climate and land use changes may alter river water temperatures and how these thermal changes might alter the suitability of habitat for brook trout throughout the Eastern U.S. We describe how we combined models to predict water temperature and brook trout occurrence with climate and land use change projections to determine how brook trout habitat may change in the future. Warmer air temperatures and increases in human land cover are very likely to result in widespread losses of habitat suitable for brook trout. Our results also suggest that riparian forests may be able to mitigate air temperature increases and maintain thermal suitability for brook trout in some cases, but other management strategies will be needed to address these potential impacts in Pennsylvania.
4:40 pm - 5:00 pm	**5 in 5: A Sebago TU Initiative to Reclaim 5 Ponds in 5 Years - in partnership with MDIFW Region A** *Brad Ronco, Sebago Chapter of Trout Unlimited LL Bean Fly Fishing Rep* The Sebago Chapter of Trout Unlimited has strategically partnered with the Maine Department of Inland Fisheries and Wildlife to address one of the most serious management issues facing fishery resources managers in Maine: the illegal introduction of invasive fish stocked in quality brook trout ponds located in southern Maine. The Chapter has raised considerable funds and garnered a considerable volunteer base to assist with the implementation of chemical reclamation projects. Small, higher elevation headwater ponds that have the potential to develop high quality brook trout fisheries are a focus of reclamation efforts. Two waters (Little Colcord and Abbott's ponds) have been treated under the partnership and several others are planned for 2014. The success of this partnership is in part rooted in a shared vision by two organizations to improve brook trout fisheries in an area of the state, where established fish communities have largely displaced high quality traditional pond brook trout fisheries. A number of active, highly motivated members of the Chapter have created an effective partnership where donated funds and man power support efforts by the Department to plan, permit, and implement these reclamations. Partnerships within the Department, with property owners, and other commercial enterprises played an important role in the implementation of each project.
Brook Trout Symposium	
Tuesday, April 15, 2014 10:30 am - 4:10 pm	
10:30 am - 10:50 am	**Benefits of Stream Simulation Designed Road-Stream Crossings beyond Aquatic Organism Passage: Flood Resiliency, Biological Productivity, and Economics** *Dr. Nick Schmal, Regional Fishery Program Leader, USDA Forest Service, Eastern Region, Milwaukee, WI (presenter); Dr. Sue Eggert, Research Aquatic Scientist, USDA Forest Service, Northern Research Station, Grand Rapids, MN; Robert Gubernick, Watershed Restoration Geologist-Technical Services Team, USDA Forest Service, Eastern Region, Duluth, MN; Brian Austin, Civil Engineer, USDA Forest Service, Green Mountain and Finger Lakes National Forests, Rutland, VT; Dale Higgins, Forest Hydrologist, USDA Forest Service, Chequamegon-Nicolet National Forest, Park Falls, WI; Daniel McKinley, Forest Fishery Biologist, Green Mountain and Finger Lakes National Forests, Rutland, VT*

	With increasing miles of fragmented stream habitat due to undersized or failed road-stream crossings, restoring connectivity by eliminating physical barriers to aquatic species has become a priority for Eastern Region National Forests. Stream simulation design is a geomorphic and ecologically-based approach to designing road-stream crossings that mimics natural channel structure, sediment characteristics, water velocity, depths, and resting areas for aquatic organisms. Although aquatic organism passage has been the primary design priority of stream simulation design, our work in the Green Mountain and Chequamegon-Nicolet National Forests has demonstrated additional benefits of flood resiliency, improved food web function, and economic savings. During Tropical Storm Irene in 2011, two completed stream simulation design projects in the Green Mountain National Forest received high flows during the sustained heavy rains. Unlike many traditional hydraulically designed crossings on state and town highways, these structures received no damage and traffic was able to be maintained immediately following the storm. In the Chequamegon-Nicolet National Forest research examining differences in habitat (depth, water velocity, and substrate composition) and food web responses (periphyton, organic matter, and invertebrate standing crops) associated with stream simulation design crossings vs. bankfull width design crossings demonstrated that habitat characteristics, basal food resources, and invertebrate communities at stream simulation crossings more closely reflected natural reference reaches than those at bankfull width crossings. Higher invertebrate biomass within stream simulation culverts represents additional food resources available to fish, amphibians, and mammals, increasing overall biological productivity and recreational opportunities for fishing or trapping. Although stream simulation culvert installation costs are 10-30% higher than traditional hydraulic designs, cost savings from reduced maintenance, lack of failure from flooding and increased structure lifespan are substantial. Together our results highlight ecosystem services such as flood resiliency and biological productivity along with economic benefits gained by using stream simulation design at road-stream crossings.
10:50 am - 11:10 am	**Reclamation and Restoration of Big Reed Pond, a Historic Arctic Char Salvelinus alpinus Ecosystem in Maine** *Frank Frost, Maine Inland Fisheries and Wildlife* Big Reed Pond once supported self-sustaining populations of brook trout Salvelinus fontinalis and Arctic char that provided a unique, back-country angling experience in northern Maine. A recent invasive fish (confirmed present, 1991) threatened the long-term viability of the endemic salmonid species. Since rainbow smelt Osmerus mordax became established in the late 1980s, char and trout abundance dropped precipitously. A stakeholders group began meeting in 2006 and charted a course of restoration outlined in a peer reviewed plan; the restoration model we developed consisted of: 1) establishing captive populations for both fishes, 2) chemical reclamation with rotenone, and 3) reintroduction of the endemic fish group, which also consists of northern redbelly dace Phoxinus eos. Prior to rotenone treatment in October 2010, we began an intensive, three year effort to capture and relocate adult and juvenile Arctic char and brook trout. Since reclamation, we have reintroduced char and trout, cultured and reared at a private hatchery, and continue to monitor their survival, growth, and reproduction. Brook trout have established a rapidly growing and reproducing natural population. We have documented wild spawning of reintroduced trout. To date, we have not documented any spawning activity of char despite the presence of mature individuals over a three year period.

11:10 am - 11:30 am	**Moosehead Lake Weir Project** *Tim Obrey, Maine Department of Inland Fisheries and Wildlife* From 2009-2011, fisheries biologists from the Maine Department of Inland Fisheries and Wildlife operated a picket weir on two of the primary brook trout spawning tributaries to Maine?s largest wild brook trout lake. Moosehead Lake is a 75,000 acre oligotrophic lake that supports principal fisheries for wild brook trout, wild lake trout, and wild/hatchery landlocked salmon. There are several tributaries and outlets to the lake that provide spawning habitat for the lake?s resident brook trout and the Roach River and Socatean Stream are known to have large spawning runs. The purpose of the study was to duplicate a similar effort in 1958 on Socatean Stream and to gather data on post-spawning mortality, seasonal movements, utilization of winter sanctuary areas, frequency of spawning, and homing of wild brook trout. Over 1,200 wild brook trout were handled during the study. A select number were implanted with ATS radio transmitters to facilitate year-round tracking while others were PIT tagged. Post-spawning mortality ranged from 51-64%. Areas closed to ice fishing decades ago to protect over wintering brook trout were very effective based on radio telemetry data. Between 12-16% of adult brook trout returned to spawn in the consecutive fall and post-spawning mortality rates were similar to first time spawners. A picket weir can be a very effective tool for sampling large numbers of wild brook trout during the spawning run. It is very economical and field staff can install and move the equipment as needed, even to very remote sites. Data collected during this study will be important not only for the management of Moosehead Lake, but also for other lake populations of wild brook trout across their range.
11:30 am - 11:50 am	**Status of a Freshwater Ecosystem after a Hurricane Event** *Dan Sinopoli, Burnt Hills-Ballston Lake High School Science Research Student, Mentor: Professor Clifford Kraft, Cornell University* Brook trout (Salvelinus fontinalis) are classic indicators of ecosystem health. They are very particular when it comes to where they can live. Brook trout were studied to determine how they and in turn, the stream system had recovered after Hurricane Irene in 2011. From July to early November, water temperature and ambient light were recorded using data loggers in six different locations in Styles Brook of the eastern Adirondacks. Two sets of dissolved oxygen readings were monitored at three sites. Brook trout were visually surveyed and underwater video was taken throughout the stream to document presence and behavior. Scales were safely taken from nine fish for aging. Stream bottom sediment was obtained in one heavily damaged area of Styles Brook to be analyzed. Temperature and dissolved oxygen levels were excellent for brook trout survival. Underwater video documented feeding and territorial behaviors by brook trout. Sediment revealed to be thousands of years old, evidence of the damage caused by Hurricane Irene. Fish aging indicated trout being born in this stream after Irene. It was concluded that certain areas of Styles Brook can still support and propagate brook trout despite the devastation caused by Irene.
BREAK 11:50 am - 1:30 pm	
Brook Trout Symposium	
1:30 pm - 1:50 pm	**Following the Path of Recovery: The Chickley River, a Case Study** *David B. Foulis, Massachusetts Department of Environmental Protection; Beth Lambert, Massachusetts Division of Ecological Restoration; Andrew Madden,*

	Massachusetts Division of Fisheries and Wildlife; Misty-Anne R. Marold, Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife; Robert J. McCollum, Massachusetts Department of Environmental Protection; Dana J. Ohman, Massachusetts Division of Fisheries and Wildlife; Caleb Slater, Massachusetts Division of Fisheries and Wildlife Record high flow events from 2011 Tropical Storms Irene and Lee left a lasting impression on residents of the Northeast. Flashfloods resulted in channel alterations, mobilization of trees and substrate, and damage to infrastructure. In response, excavators and bulldozers were used to create drastic unplanned channel alterations which created trapezoidal channels with high berms. These actions removed beneficial organic matter, woody material, pool features, and riffle features from the channel. The Chickley River in Hawley, MA was one such coldwater stream that underwent approximately 7.9 kilometers of channelization and streambed excavation. A working group of state agency staff, including fisheries and aquatic biologists, regulators, and a geomorphologist, assembled to direct the recovery, and chose to jump start natural river processes. Removing berms, returning substrate to the active channel, returning large woody material at different flow elevations, and creating deformable habitat features, allowed the river to start to regain equilibrium. The construction portion of the recovery was completed in fall and early winter of 2012. The Division of Fisheries and Wildlife has monitored fish communities in the Chickley River annually since 2004. The 2012 survey, obtained after the drastic channel alterations but prior to initiating the recovery process, showed a dominance of longnose and blacknose dace, with very few coldwater fish present. In 2013, longnose suckers, a coldwater species and a species of special concern, increased in river reaches where recovery had been initiated. Preliminary data suggest the importance of jumpstarting natural recovery processes in streams following extreme manipulation.
1:50 pm - 2:10 pm	**A model for predicting daily river water temperature in the Northeast and its utility for river management** *Jefferson Tyrell Deweber, Pennsylvania Cooperative Fish and Wildlife Research Unit, The Pennsylvania State University; Tyler Wagner, Pennsylvania Cooperative Fish and Wildlife Research Unit, USGS* Water temperature is a fundamental property of river habitat and regional predictive models can provide critical input to the management process by predicting thermal characteristics at unsampled sites and under potential future scenarios (e.g., climate or land use changes). We developed an artificial neural network (ANN) model to predict mean daily water temperature in individual stream reaches during the warm season (May-October) throughout the native range of brook trout Salvelinus fontinalis in the eastern U.S. Our model included air temperature, landform attributes and forested land cover and predicted mean daily water temperatures with moderate accuracy as determined by root mean squared error (RMSE) at 1005 training sites (RMSE = 1.97?C) and at 54 validation sites withheld during model training (RMSE = 1.85?C). The most important predictors were mean daily air temperature, prior 7 day mean air temperature, and network catchment area. Catchment aspect and forest land cover at both riparian and catchment extents had relatively weak but clear positive and negative effects, respectively. Predicted mean July water temperature for the 1980-2010 modeling period matched expected spatial trends with cooler temperatures in headwaters and at higher elevations and latitudes. Our regional ANN is a useful tool for predicting water temperatures in sampled and unsampled rivers under current conditions and future

	projections of climate and land use change, thereby providing information that is valuable to management of river ecosystems and biota such as brook trout.
2:10 pm - 2:30 pm	**High Hopes, A River Restoration Story** *Walter S. Brown, WV Division of Natural Resources* This presentation is a story about a ghost town, the historic town of Spruce, high atop Cheat Mountain, one of the highest, coldest and most remote places in West Virginia. It is also the story of a ghost fishery, the fabulous brook trout fishery that once existed in Upper Shavers Fork of the Cheat River and how that fishery was impacted by industrial logging and railroads. Finally, it is a story of the roles that history and science have played in a massive trout habitat restoration effort underway on the mountain. The presentation consists of a 15-minute, self-narrated video. The project leader will be available for questions following the presentation.
2:30 pm - 2:50 pm	**Using patterns of genetic diversity to detect the signal of supplemental and restorative stocking among native brook trout (Salvelinus fontinalis) populations** *Tim King, USGS, A.W. Aunins, USGS* The dramatic decrease in the range of Brook trout (Salvelinus fontinalis) combined with the historic use of hatchery-reared brook trout for supplemental and restorative stocking underscores the need to recognize the evolutionary relationship among stream populations. A suite (N=13) of microsatellite DNA markers has been surveyed of allelic variation in over 16,000 fish from 450 collections comprising the species' native range as well as, 13 hatchery populations. This survey identified evolutionary relationships among populations, yielded a wide range of allelic diversity, demonstrated high levels of genetic differentiation at all hierarchical levels studied (individual to watershed), and documented similar levels of differentiation among collections within drainages and among collections between drainage basins. Retrospective monitoring (i.e., coalescent simulations) of S. fontinalis populations has illuminated previously undetected demographic histories (e.g., supplemental or restorative stocking; bottlenecks) and shed light on past and future evolutionary trajectories of populations at previously intractable scales. The demographic history of each defined population is being determined through estimates of time (T; in generations) to the most recent common ancestor. This analysis also allowed determination of the demographic trend of each collection (i.e., increasing or decreasing effective population size; (r)), and provides a robust estimate of the current effective population size (Ne) for each population. The working assumption being - populations with greater T values have persisted longer and are more likely to be adapted to the physiological and immunological challenges of their current environment. In the absence of a defined suite of adapted genes, populations with greater T and Ne values could therefore serve as the more adaptable populations for use in restoration efforts.
BREAK 2:50 pm - 3:20 pm	
Brook Trout Symposium	
3:20 pm - 3:40 pm	**Understanding Angler Expectations: Developing a Trout Management Plan for the Upper Androscoggin River located in Southwestern Maine** *Francis Brautigam and Jim Pellerin, Maine Department of Inland Fisheries and Wildlife Sebago Lake Region* The Maine Department of Inland Fisheries and Wildlife recently completed a trout management plan for a popular fishing reach on the Androscoggin River located

	between Gilead and Rumford, Maine. The planning effort was undertaken to provide focus and direction in the management of river fisheries, an initiative undertaken in response to growing angler interest and reported changes in the fishery. The management plan attempts to balance biological, environmental, and social considerations and placed heavy reliance upon input from a public workgroup comprised of area businesses, guides, and anglers. An important role of the public work group was discussing elements of the plan including changes observed in the fishery and the river, as well as angler concerns and future expectations. Topics discussed in the plan included public access, river aesthetics, habitat, stocking, wild trout, trout growth and size, angler catch, public use, and regulations. Public outreach provided through the working group formed the basis for developing management objectives and action items, which were based on four key expectations: 1) provide adequate long term access for various user groups, 2) maintain river aesthetics and scenery, 3) provide relatively high trout catch rates for 10 ? 14? trout, and 4) provide opportunity for catching some trout of larger size quality. Plan objectives include numerous stocking changes, enhancing the contribution of wild rainbow trout, developing a baseline monitoring data collection program, providing assurances of public access, investigating opportunities to enhance fish holding structure, and supporting local planning efforts to protect scenic and aesthetic qualities.
3:40 pm - 4:00 pm	**Habitat Variables Influencing the Return of Hatchery-Reared Fall-Yearling Brook Trout in Maine Waters** *Wes Ashe, Scott Davis, Maine Dept. Inland Fisheries and Wildlife* The Maine Department of Inland Fisheries and Wildlife (MDIFW) stocks over one million brook trout (Salvelinus fontinalis) statewide annually and at a substantial cost to the State of Maine. Considerable hatchery production is dedicated to the rearing of larger fall-yearling brook trout (FY BKT) (age-1+, ~12”), which are stocked in the fall and primarily into marginal waters with limited summer holdover potential. However, most of these waters are suitable for fall to spring survival, and thus provide popular fishing opportunities for Maine ice anglers. Given the financial investment put forth by MDIFW in providing a FY BKT program, waters destined for stocking should be selected based on a specific suite of habitat criteria that promote higher angler returns. Therefore, the goal of this study was to investigate those habitat variables that contribute most to the “catchability” of stocked FY BKT. Based on this research, we recommend that MDIFW fisheries biologists adopt a tiered, decision tree selection process by which regional waters proposed for FY BKT stockings be evaluated and chosen based on specific habitat thresholds in order to allocate resources more efficiently and increase angler returns. Ultimately, both fisheries biologists and the angling public will benefit by a more focused approach to FY BKT stockings.
4:00 pm - 4:20 pm	**A Collaborative Approach to Fisheries Management in the Kennebec River – Solon Reach** *Jason Seiders, Scott Davis, and Wes Ashe, Maine Department of Inland Fisheries & Wildlife* The Solon Reach of the Kennebec River (from Solon to Madison, ME) is a 14-mile stretch of river with wild populations of landlocked salmon and brook trout, and a stocked brown trout fishery. This past spring (2013), the Maine Department of Inland Fisheries and Wildlife (Region B) in collaboration with Brookfield Renewable Energy Partners began a radio telemetry project in Solon as part of the FERC relicensing for the Williams Hydroelectric Project. The data gathered from this project have provided

	regional fisheries biologists with a better understanding of species-specific information regarding seasonal movements, potential causes of mortality, spawning and recruitment, habitat preferences, and fish response to temperature changes and flow events. This information coupled with historic data were relayed to local anglers, fishing guides, and the media at a public presentation in November 2013, and provided biological justification for regulation changes and new stocking strategies.
4:20 pm - 4:40 pm	**Detecting the Undetectable: A case study of illegal summer flounder harvested under the Research Set-Aside (RSA) program** *Todd J. Smith, NOAA Fisheries Office of Law Enforcement* The Research Set-Aside (RSA) program provides scientists with a mechanism to fund research projects, which are beneficial to successful fisheries management. It also provides participating fishermen with a chance to catch and keep more fish, many of which are readily available, high-value species. From August, 2010 thru November, 2013, NOAA's Office of Law Enforcement (OLE) conducted a criminal investigation into the unreported harvest and sale of summer flounder caught while utilizing the RSA program. This presentation will discuss the following: • Methods used by the fishermen and dealer to conceal the illicit landings of summer flounder • Tactics that law enforcement personnel can use to help identify and pursue cases involving unreported and mis-reported fish harvest/landings • Problems and solutions with the enforceability of the RSA program • Lessons learned from this case • End results
Marine Fisheries	
Tuesday, April 15, 2014 10:30 am - 5:00 pm	
10:30 am - 10:50 am	**When is a smolt not a smolt? Identifying predation in the Penobscot River estuary using acoustic telemetry.** *Graham S. Goulette, NOAA Fisheries Service, NEFSC/Maine Field Station; James P. Hawkes, NOAA Fisheries Service, NEFSC/Maine Field Station; Joe Zydlewski, U.S. Geological Survey, Maine Cooperative Fish and Wildlife Research Unit, University of Maine & University of Maine, Department of Wildlife Ecology* Acoustic telemetry is a widely used tool that has proved effective in characterizing fish behavior and assessing survival over various spatial and temporal scales. In the Penobscot River, a network of stationary receivers has been used since 2005 to study the downstream migration of wild and hatchery origin Atlantic salmon smolts. To date, this network has produced thousands of smolt movement tracks. Appropriate interpretation of these data, however, depends upon exclusion of any spurious or erroneous information. While some obvious specious track data can be readily excluded, other tracks that appear ?abnormal? or ?inconsistent? with previously observed patterns are problematic. These observations could be either novel information or unrepresentative data (indicative of mortality or a predation event). Analysis of individual smolt tracks has allowed us to infer when predation events occur. Using additional knowledge of the system?s geography and potential smolt predators (e.g. striped bass and cormorants), we

	have been able to assess predation on smolts through circumstantial evidence. Our findings indicate that between 5% and 20% of tagged smolts suffer predation mortality in the Penobscot River Estuary.
10:50 am - 11:10 am	**The fate of lower mode Atlantic salmon, Salmo salar, stocked into the Penobscot River watershed, Maine** *Andrew O'Malley, University of Maine, Department of Wildlife Ecology; Joseph Zydlewski, University of Maine, Department of Wildlife Ecology & U.S. Geological Survey, Maine Cooperative Fish and Wildlife Research Unit, University of Maine; Oliver Cox, Maine Department of Marine Resources, Bureau of Sea Run Fisheries and Habitat; Peter Ruksznis, Maine Department of Marine Resources, Bureau of Sea Run Fisheries and Habitat; Joan G. Trial, Maine Department of Marine Resources, Bureau of Sea Run Fisheries and Habitat* Hatchery supplementation has been a critical component of Atlantic salmon restoration in Maine, and is thought to have played a key role in preventing extinction. Stocking 18 month smolts usually provides the most cost effective returns. The lower mode, those fish not growing fast enough to assure smolting by the time of stocking, are generally looked at as a byproduct of the smolt program. During 2002 and 2009, between 70,000 and 170,000 marked lower mode Atlantic salmon were stocked into the Pleasant River (Piscataquis County) in late September to early October. Rotary screw traps were fished in the Pleasant River between mid-April and early June from 2004 to 2009. This effort spanned the smolt run and included a minimum of 36 days fished annually. From 2004 to 2006, all marked migrating smolts were sampled while from 2007 to 2010 a daily maximum of five fish were sampled from each year class. Fork length was measured and a scale sample was taken to retrospectively estimate length at age 1 using the intercept-corrected direct proportion model. Lower mode fish were observed to migrate as smolts 8, 20 and rarely 32 months after stocking. Those migrating the next spring were distinctly larger (>12 cm) than those that remained in the river for at least one year. Such data will allow managers to better assess the smolting probability of their product, or match growth rates to a targeted lower mode product.
11:10 am - 11:30 am	**Feeding Habits of Juvenile Alewife in the Penobscot Estuary** *Amy Webb, University of Southern Maine Karen A. Wilson, University of Southern Maine* Alewife have experienced dramatic declines throughout their range. They are a Species of Concern, listed by the National Oceanic and Atmospheric Administration (NOAA) in 2006, yet little is known about critical early life histories of these fish. This study examines the feeding habits of juvenile alewife in the Penobscot River Estuary over time (May, July and September) and space (high and low salinity) using stable isotope values (13C and 34S) and diet analysis. Stomach analysis provides a ?snapshot? of recent foraging (days) in contrast to stable isotope values which integrate diet over time (weeks). Fish were collected by NOAA Fisheries Maine Field Station?s on-going otter trawl. Juvenile alewife were found from May to October in both sections of the estuary (upper salinity: 5-15 ppt, lower salinity 10-20 ppt), ranging in size from 50 mm to 320 mm total length (NOAA, unpublished). Diets showed differences temporally and by fish size . Preliminary results show that alewife consumed primarily copepods, mysids and barnacle larvae based on numbers. In May and September mysids were the primary food source for alewife over 100 mm in total length. Barnacle larvae were present in the

	majority of alewife diets during May and June while copepods were a consistent diet component for all fish sizes and months. These results demonstrate that the estuary is a significant feeding habitat for these fish and is often overlooked as critical habitat.
11:30 am - 11:50 am	**Diadromous fish assemblage assessment in the lower Saco River, ME, 2012-2013** *Kayla Smith, Department of Marine Sciences, University of New England; Carrie Byron, Department of Marine Sciences, University of New England; James Sulikowski, Department of Marine Sciences, University of New England* Coastal watersheds, such as the Saco River estuary (SRE), are known to play an important role in the life history of many diadromous fish species within the Gulf of Maine (GOM). Migratory fishes, key components of estuaries and marine food webs, in the GOM have experienced significant population declines since the early 20th century prompting the need to examine habitat use in order to maintain sustainable populations. Although the lower portion of the SRE serves as a nursery ground and a proposed foraging stop-over site for Atlantic and shortnose sturgeon, little is still known about the abundance and distribution of migratory fishes in small coastal rivers in Maine. To evaluate the structure and spatial resolution of this assemblage, weekly gillnet surveys were conducted at three sites from June-September to record fish presence and environmental conditions (bottom temperature, water column salinity and dissolved oxygen). During 2012 and 2013, the threatened Atlantic sturgeon, endangered shortnose sturgeon, and striped bass were among the 13 marine, diadromous and freshwater species observed representing resident, migratory, and transient life history categories. Fish abundance and diversity was lowest in areas of the estuary with significant salinity mixing and greatest in areas with less tidal influence. Fish species diversity was highest in the mixed middle area of the estuary with a positive correlation observed between fish abundance and temperature. Establishing a baseline dataset of annual fluctuations of diadromous fishes entering and leaving this estuary is essential for future restoration and management of these threatened GOM fish stocks.
BREAK 11:50 am - 1:30 pm	
Marine Fisheries	
1:30 pm - 1:50 pm	**Determining Sex Ratios and Sexual Maturity of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) in the Saco River, Maine** *Carolyn Wheeler, University of New England; Caitlyn Little, University of New England; Gail Wippelhauser, Maine Department of Resources; Gayle Zydlewski, University of Maine; Michael Kinnison, University of Maine; James 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, 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 (steroid hormone analysis, ultrasonography, and external morphological features) are being utilized to non-lethally determine sex ratios, sexual maturity, and reproductive

	status for sturgeon captured within the Saco River watershed. Preliminary results suggest that the combination of these three techniques provides the most accurate assessment of reproductive parameters in Atlantic sturgeon. This study will continue to couple these techniques in order to determine reproductive parameters of Atlantic sturgeon inhabiting the Saco River, which in the future can be applied to other sturgeon populations.
1:50 pm - 2:10 pm	**Is diet related to the movement of Atlantic sturgeon (Acipenser oxyrinchus) in the Saco River estuary?** *Ashleigh Novak, University of New England; Caitlyn Little, University of New England; MS; Gail Wippelhauser, Ph.D., Maine Department of Resources; Gayle Zydlewski, Ph.D., University of Maine; Michael, Kinnison, Ph.D., University of Maine; James Sulikowski, Ph.D., University of New England* Atlantic sturgeon (Acipenser 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 and is currently considered a threatened species in this ecosystem. To investigate the reappearance of this species to the watershed, a comprehensive study of the distribution and movement patterns by means of acoustic telemetry, and diet analysis was established in 2008. A total of 51 sturgeon collected using gill nets were measured, fixed with external and internal tags, including surgically implanted acoustic transmitters. Preliminary observations from the acoustic array in the Saco River have shown that sturgeon preferred to stay within the first few river kilometers of the estuary. Analysis of stomach contents, obtained through gastric lavage, revealed that American sand lance (Ammodytes americanus), which school at the mouth of the river, are the most common prey item retrieved. In addition, the preliminary results of benthic grabs, beam trawls and beach seines conducted within the Saco river, suggest that the distribution of prey items found in the stomach contents, were correlated with the acoustic data. Further research on diet and prey availability for Atlantic sturgeon in the Saco River is needed to better understand the role this habitat plays in their recovery.
2:10 pm - 2:30 pm	**Estimating and mitigating post-release mortality of sublegal Atlantic cod in the Gulf of Maine's recreational hook-and-line fishery.** *Connor W. Capizzano, University of New England; John W. Mandelman, John H. Prescott Marine Laboratory - New England Aquarium; Jeff Kneebone, University of Massachusetts Dartmouth - School for Marine Sciences & Technology; William S. Hoffman, Massachusetts Division of Marine Fisheries; Micah J. Dean, Massachusetts Division of Marine Fisheries; Douglas Zemeckis, University of Massachusetts Dartmouth - School for Marine Sciences & Technology; Marc Stettner; Joe Langan; University of New England; James A. Sulikowski, University of New England* The Atlantic cod, Gadus morhua, is and has been one of the most important commercial and recreational fish species in the western north Atlantic. However, the Gulf of Maine stock has been overexploited over the past century due to commercial industry pressures and, until recently, an increase in the recreational hook-and-line fishery. Since a majority of recreational discards are undersized individuals, management recently reduced the minimum retention size of GOM cod from 24” to 19”to reduce discards due to the 100% mortality upon release assumption used in current stock assessments. The current project aims to discern physical, biological, and other factors most detrimental to

	post-release survival by evaluating representative hook-and-line capture and handling methods. Both undersized and just legal cod (13 – 27 in.) were angled and visually inspected (N = 637) on southern Jeffreys Ledge from July to October 2013. Angled cod were caught by either stainless steel jigs (48%) or baited J-hooks (52%) at depths ranging from 146 to 272 ft. Small ultrasonic transmitters equipped with depth sensors (n = 136) were affixed to a select subsample before being released into an acoustic array that would monitor mortality over a 30-day conservative period. A mixed-effects logistic regression model will be applied to the data to determine the effectiveness of the variables as predictors of post-release mortality. Results will be disseminated to management sources and the recreational angling community by various pathways to enhance survival through "best practice guides".
2:30 pm - 2:50 pm	**The Use of Satellite Tags to Redefine Movement Patterns of Spiny Dogfish (Squalus acanthias) along the U.S. East Coast: Implications for Fisheries Management** *Amy Carlson, University of New England; James Sulikowski, University of New England; Eric Hoffmayer, National Marine Fisheries Service, Southeast Fisheries Science Center, Mississippi; Cindy Tribuzio, National Marine Fisheries Service, Alaska Fisheries Science Centre, Auke Bay Laboratories* Spiny dogfish (Squalus acanthias) are assumed to be a highly migratory species, making habitual north-south migrations throughout their Northwestern Atlantic U.S. range. Also assumed to be a benthic species, spiny dogfish stock structure is estimated through NEFSC bottom-trawl surveys. Recent anomalies in population trends, including a recent four-fold increase in spawning stock biomass, suggest alternative movement behaviors may exist for this shark species. To obtain a better understanding of the horizontal and vertical movement dynamics of this species, Microwave Telemetry pop-off satellite archival X-tags were attached to forty adult spiny dogfish at the northern (Gulf of Maine) and southern (North Carolina) extents of their central U.S. geographic range. Reconstructed geolocation tracks ranging in lengths from 2 to 12 months suggest that the seasonal migration patterns appear to be local in nature to each respective northern and southern deployment site, differing from migration patterns from previously published paradigms. Significant differences in distance between deployment location and seasonal geolocations indicate two separate migration patterns. Kernel utilization distribution models also suggest strong separate core home ranges. Significant differences in seasonal temperature and depths between the two regions further substantiate the existence of regional movement patterns between the two groups. Vertical preferences also suggest distinct diel patterns and that this shark may not utilize the benthos as previously thought, potentially decreasing catchability in benthic gear. Based on these new movement findings, further investigations are needed to address the observed differences in habitat utilization, catchability and stock structure for future management purposes.
BREAK 2:50 pm - 3:20 pm	
Marine Fisheries	
3:20 pm - 3:40 pm	**Abundance, assemblage, and distribution of ichthyoplankton around the Saco River Plume** *Bauer TB, University of New England; Smith KM, University of New England; Reynolds JM, University of New England; Hurst AR, University Of New England; Bergeron J, Virginia Institute of Marine Science; Sulikowski JA, University of New England* Located in southern Gulf of Maine, the Saco River Estuary System has been recognized

	as an important nursery area for many fish species. The ecosystem is highly unique due to the shallow freshwater Saco River plume that drastically alters abiotic conditions in Saco Bay. However, the ensuing effects of this plume on biota are not well understood. To better understand how the Saco River plume may be affecting larval fish in Saco Bay, research was conducted between 2006 and 2009, which led to the discovery of 27 ichthyoplankton species. In addition, plume dynamics indicated possible effects on ichthyoplankton distribution. For example, when surface plankton tows were conducted at stations within and outside the plume, a higher density of ichthyoplankton was observed outside the plume. In 2009, mid-water and surface tows were conducted to expand upon the previous sampling to determine if any differences existed in ichthyoplankton vertical distribution around the plume waters. Ichthyoplankton density was significantly greater at the surface than in the mid-water. However, no difference was observed in ichthyoplankton abundance within and outside of the plume in the mid-water areas sampled. The next step in this ongoing project is to further examine ichthyoplankton vertical distribution in Saco Bay in order to determine what abiotic and biotic factors may be effecting any patterns observed. Information gained from this study is crucial for understanding this complex ecosystem, and will allow for better management of the area in the future so that it continues to be an important nursery area.
3:40 pm - 4:00 pm	**Temperature Effect on Gestation and Survivability of the Little Skate (Leucoraja erinacea)** *Ingram NI, UNE; Sulikowski JA, UNE; Tilburg CE, UNE; Koester D, UNE* In the Gulf of Maine (GOM), research suggests that sea surface temperature has increased between 2 and 5°C over the past 40 years and is projected to continue increasing. Most research regarding the effects of climate change has been conducted on teleosts (bony fish), with minimal knowledge of the effects on oviparous (egg laying) elasmobranchs (sharks, skates, and rays). Due to this gap in knowledge, the little skate (Leucoraja erinacea) was used as a model organism in order to better understand the effects of rising sea temperatures on the gestation, growth, and survivability of oviparous elasmobranchs. To investigate the effects, oviposited eggs from a captive breeding stock were equally divided into two conditions to assess the embryonic survivability. One sample group of egg cases was held at ambient temperature conditions, while a second sample group simulated an elevated temperature condition of 5°C above the ambient temperature. Egg cases were candled once a month to determine viability throughout the gestation period. After hatching, each skate was tagged and external measurements including total length, disk width, and mass were recorded before returning the juvenile to a nursery corresponding to their respective condition. Preliminary research indicates that elevated individuals have a lower survivability both before and after hatching, as well as a shorter gestation period, which are analogous to previous research by Palm et al (2011). If current temperature trends continue, the resulting effects could mean an overall lower survivability for oviparous elasmobranchs in the GOM.
4:00 pm - 4:20 pm	**The survival of rajids discarded in the New England scallop dredge fisheries** *Ryan Knotek, University of New England; David Rudders, Virginia Institute of Marine Science; John Mandelman, John H. Prescott Marine Laboratory, New England Aquarium; James Sulikowski, University of New England; Hugues Benoit, Gulf Fisheries Centre, Fisheries and Oceans Canada* Due primarily to regulatory factors, skates from the family Rajidae account for nearly half the total bycatch discarded during commercial fishing operations in the U.S. portion

	of the Northwest Atlantic Ocean. Although the New England scallop dredge fishery has the second highest skate discard rate, no information regarding the resiliency of skates to interaction with this gear type exists. In order to gain insight into species-specific mortality rates in this fishery, 295 tows were conducted across six, seven-day research trips during the 2012-2013 scallop fishing season. A total of 4020 skates spread across three species (little, Leucoraja erinacea, winter, Leucoraja ocellata, and barndoor, Dipturus laevis), were evaluated and scored based on a vitality (i.e. reflex impairment) and condition (i.e. overt physical trauma) index. In order to quantify mortality rates associated with these indexes, a subset of 290 skates were maintained in a novel on-deck refrigerated flow-through seawater system for 72-hours. In addition, this study also assessed the effect of factors such as fishing conditions (e.g. season and depth) and practices (e.g. tow times, volume of catch, deck duration) on post-release mortality. Preliminary data based on condition and vitality indexes, suggests that species-specific difference in post-release mortality exist. For example, highest mortality rates (up to 100%) were observed in barndoor skates while winter skates were found to be most resilient (up to 23.5%) to the impacts of capture by scallop dredge. In addition, these data also suggest that other factors, such as tow duration, can exacerbate mortality rates for skate species assessed thus far in the study.
4:20 pm - 4:40 pm	**A Likely Connection Between Large Increases in Both Cormorants and Bay Scallops** *Clyde L. MacKenzie Jr., James J. Howard Marine Sciences Laboratory* A large increase in abundances of double-crested cormorants (Phalacorcorax auritus) may have resulted in an increase in bay scallops (Argopecten irradians) in two Massachusetts bays. In the past several years, cormorants now live in several roosts of up to 20 or more birds each in Cape Poge Pond on Martha's Vineyard and Nantucket Harbor. They eat fish and probably shrimp that both prey upontiny juvenile bay scallops. The abundance of the red alga (Gracilaria sp.) has spread in wide mats over the sand bottoms and also eelgrass meadows. The eelgrass blades have become less abundant and they are shorter. The mats of the red alga prevent several species of fish and the sand shrimp (Crangon septemspinosa) from living and feeding on the sand bottom. Grass shrimps (Palaemonetes pugio) and brokenback shrimps (Hippolyte zostericola) inhabit eelgrass canopies, but they have become much scarcer in part because of the relative scarcity of the eelgrass. The numbers of small adult and juvenile fishes have declined from 9 to 3 species; and of 3 abundant shrimp species, only the grass shrimp and brokenback shrimp remain but in much lower abundances. Bay scallop larvae readily set on the red alga, and as juveniles they have been surviving well because their predators are nearly absent. The result has been higher abundances of the bay scallops.
4:40 pm - 5:00 pm	**Stakeholder Communication and the Transition to Ecosystem-based Fisheries Management for the Mid-Atlantic and New England Fishery Management Councils** *Biedron, Ingrid, S. Cornell University, Department of Natural Resources; Knuth, Barbara, A. Department of Natural Resources, Cornell University* Ecosystem-based fisheries management considers the interactions between the physical, biological, and human components of ecosystems. We focused on how communication between fisheries stakeholders in the New England and Mid-Atlantic regions influences the potential for regional fishery management council adoption of ecosystem-based fisheries management (EBFM). Participants included regional fishery management

	council members, staff, and Scientific and Statistical Committee members (collectively referred to as Council decision makers) and commercial and recreational fishermen and environmental nongovernmental organization leaders (collectively referred to as stakeholders). We used the concept of "coorientation" to guide collection of quantitative data to characterize communication processes of Council decision makers and stakeholders related to EBFM, through a mail survey distributed to 5,600 Council decision makers and stakeholders in the two regions. The Coorientation Model measures the dynamics of the communication exchange and the levels of agreement in values between Council decision makers and stakeholders (Chaffee & McLeod, 1968; Connelly & Knuth, 2002; Leong, et al., 2008). The study results demonstrated that overall, there was high agreement between Council member and stakeholders beliefs about EBFM. Additionally, the majority of Council member predictions of stakeholder beliefs about EBFM were accurate, with a few exceptions. The research demonstrates high agreement and high accuracy between Council members and stakeholders and highlights opportunities for enhancing inclusiveness and effectiveness of communication and participation strategies by identifying specific areas of disagreement and inaccurate perceptions.