Penobscot Science Exchange Fall 2010 Meeting

November 4, 2010 9:00am-12:00pm

UM Senator George Mitchell Center: 107 Normal Smith Hall

**9:10-10:30 Research Presentations (15min with 5min discussion)**

1. **Steven Coghlan – The salmon-bass competition study, Sedgeunkedunk fish community, and Sesgeunkedunk lamprey.**

Projects – Results in review from Atlantic salmon study

Three-pronged approach to salmon-bass study

* some sites in Penobscot
* Early part of year, salmon use variety of depths and velocities
* Summer – smallmouth bass share same habitats
* Late summer – habitat shift back to normal

Competitive effects important in warm dry years, not cold wet years (2009).

Dam removal in Sedgeunkedunk Stream

-Mill Dam removed in 2009, meadow dam turned into fishway in 2008

- Electrofishing 2 times per year to measure count, weigh fish for passage study

- Density highest below dam, before removal

- After removal, no fish at previous below-dam site. Densities much higher above dam site after removal.

Sea Lamprey study

* Mark-recapture shows presence in rocky substrate areas
* No data from 2009 due to flooding/ice
* Spawning run 2x as long after removal, much farther upstream

Take home message – Removal of dam creates an almost immediate effect in runs beyond the dam site. Juvenile Atlantic salmon in just 3 days made it 2km farther beyond site than previous year.

1. **Ian Kiraly – Penobscot Fish Community Monitoring**

Examine of community composition (resident and diadromous species) from electroshock study.

Interesting finds – striped bass near Bangor, long-nose sucker by Great Works dam, migrating eels below Milford dam.

Discussion:

Impounded areas still fairly shallow, mostly shoreline surveys.

No northern pike or central mud minnows found.

Surveyed a few miles up Pushaw stream.

Next year: repeating the same work to get 2011 survey of composition.

1. **Alice Kelly – Geomorphology Monitoring Update**

Abiotic focus from Department of Earth Sciences

Ongoing monitoring survey to document conditions with aerial and satellite photos along Penobscot for pre- and post-dam removal.

Sites chosen with help from USGS to do detailed cross sections of river

* Piscataquis River
* Howland Bridge (2 sites)
* Multiple locations in main-stem of Penobscot

Digital photography at shoreline to get baseline conditions (GPS location, azimuth of photo, notes, time, date, 1 upstream, 1 downstream at each site, etc.)

Photos taken during each season and during notable events such as unusual flow conditions

Sequential photos of permanent features such as bridges, rapids at Milford Dam, etc.

Archived and keyed to Google Earth. At each location you can find the series of photos taken sequentially at that location. Can also access notes at that location.

User-friendly format to share the conditions of each site throughout year and over several year period.

Problems:

Permission from landowners (finding people, getting permission)

Consistency of photo sites must be accurate. Ice flows and other conditions can prevent similar photos during specific seasons (ice flows, spring flow pulse).

Underwater photography:

Video photography at USGS survey transects. Color video camera mounted vertically on USGS boat. Takes continuous video stream of substrate.

6 Transects taken on Penobscot, 1 on Piscataquis.

Problems with surface obstacles (buoy lines), submerged obstacles that interfere with mounted camera, water depth.

Can take still images from video.

Next steps:

Ongoing survey. Archive has been set up with video to supplement it. Geophysics with bathymetry and seismic reflection to be conducted in spring and fall. Bank sediment surveys also taken using fixed-square technique (0.5m2). Continue with fall and winter photographic survey in 2010. Fall conducted in November, Winter taken in February. Add USGS cross section (topography) into database starting in winter.

So far: 4 rounds of photographic surveys have been taken. 2 Underwater camera surveys taken. Now need to link with topographic surveys form USGS.

Discussion:

Link already made to previous study sites from the KMZ file on Google Earth. KMZ file easily accessed on DSRRN – Penobscot Exchange website. Contact Matt from NOAA or DSRRN to get help if needed.

USGS has already done the detailed topography so distances/gauges can be used from that rather than, for instance, adding a meter-stick at far bank for photography.

Substrate of channel is quite course (gravel to boulders) with less fine-grain sediment. Complex geological system. Channel was probably armored, fine grain sediment moved in glacial periods.

**4. Kevin Simon – Measuring lake& stream response to alewife restoration at Sedgeunkedunk stream and beyond.**

UMaine School of Biology and Ecology.

Collaboration with Mick Demi, Steve Coghlan, Rory Saunders (NOAA).

Lake and stream response to alewife restoration – focus on alewife because that is a major component of a return. Have large cascading effects on zooplankton and downwards. Effects in one system (lake or stream) can have cascading effects due to connectivity.

Pre- and post- monitoring over long term. BACI design with replicate control.

Sites:

Fields pond – restored

Brewer, Swetts – no access, no plans for removals in near term

Alamoosik, Toddy – access

Pre = 2008, 2009, 2010

Post = 2011+

Bi-weekly sampling after ice-off to early October.

Response Variables:

Zooplankton – size, biomass, composition of community

Phytoplankton – chlorophyll a, community composition

Chemistry – TN, TP, secchi, temperature, dissolved oxygen (DO)

Fish – stable isotopes, trap netting (focus on Fields pond, Swetts).

Typical zooplankton trends – mean size

* Fields pond – static size structure
* Alamoosook lake – decrease in mean size over year as alewives return, small rebound in October.

How will sites like Fields Pond change now that alewives can gain access with dam removal? Will it look like Alamoosook Lake in future?

Alewife effects across trophic gradients:

4 lakes examined.

Methods: Comparison of spring and summer

* Zooplankton size, biomass, community
* Phytoplankton – chlorophyll a
* Trophic cascades: ratio of chlorophyll a to zooplankton biomass

Results:

* Consistent crash in Zooplankton size over year in alewife systems, not in alewife-lacking systems
* Zooplankton biomass increases with TP
* Biomass decreases from spring to summer in all lakes, except Sebasticook Lake (actually gets bigger due to change in trophic state).
* Cascading effect depend on trophic state (Chla:TP ratio)

Linking lakes to streams:

* Particle export from lakes to streams (size, C:N:P, marine nutrients (C, N, S). Effects community structure, biomass and size of zooplankton in streams.

Seasonal changes in lake-stream export:

* Alewife vs. non-alewife sites. Particle size distribution does not change in non-alewife systems. In alewife systems, large particle size export disappears from spring to summer due to consumption of zooplankton. Seasonal context to alewife presence/absence.

What happens when dams removed?

* Depends on trophic state of system
* Effects will be manifested in both lakes and streams (direct interaction and system connectivity).
* Long-term pre-dam removal exists for Sedgeunkedunk stream. 2011 will be first post-dam survey year.

Discussion:

Alewife distribution is patchy spatially within a lake. Use 2 stations (particularly for biomass, not as much for size of zooplankton) in order to capture the variability.

Would like to have juvenile alewife density in lakes, don’t have the data.

**4. Joe Zydlewski – Passage and Interactions of anadromous fish in the Penobscot River.**

Since 2004: Survival and behavior of migration of Atlantic Salmon smolts in Penobscot and Piscatiquis.

* Acoustic telemetry – series of receivers to detect released, tagged fish with acoustic transmitters. Tags are ½ size of AAA battery surgically implanted in fish.
* Survival estimation (Cormack – Jolly- Seber). Measure passage at multiple sites downstream from fish release. Calculate odds of getting measured at particular point (error of measurements) and probability of survival at that point in river. – RKM vs. Cumulative mortality.
* Ex: Howland Dam had highest site mortality in 2006 compared to W. Enfield Dam and Milford Dam.

Monitoring smolts from imprinting tools:

* 3 Pools at W. Enfield dam to acclimate fish to “natal” stream. Impact of time spent away from natal stream? Sampled pools for olfactory. Does housing fish in river change survival? 3rd Year of this release.
* Measure physiology
* Survival to the ocean of imprinted smolts. Can track disappearance through river or successful survival out to Ocean. 2 Years for some sites, 1 year for others. Unclear at this time about success at each site over 2 year period.

Response to community components of Atlantic salmon nursery streams to MDNs.

* Are marine derived nutrients responsive to changes in nutrients delivered by restored anadromous fish populations?
* Controlled experiments with carcass analogs to supplement nutrients. Effect on macroinvertebrate response (biomass, community), and nutrients in stream.

American Shad in Penobscot

* How quickly might shad come back after dam removals? Incomplete knowledge of early life history for shad. Put together early model for sensitivity to stocking, starting population size to start to predict how they might respond.
* Stocking may only have effect if population starts out low.
* Radio telemetry of shad and didson work currently being done.
* Mark-recapture being done to get basic estimate of population size with help of didson and mark-recapture. Now have 2 years of data from base of Veazie dam fishway entrance.
* Didson gives size information, advantage over acoustics.

Adult Salmon tracking:

* Passage of adult salmon at Milford Dam, Great Works and Veazie. Paper in *transactions* out now. Milford has relatively high passage.
* Installation of PIT antennas. Detect fish moving upstream or falling back downstream at each passage site. Salmon RFID tagged at Veazie Dam, processed at upstream.

Questions:

1. **Claire Enterline - Rainbow Smelt.**

Background:

Can live up to 6 years, 10” but more typical of 2-3 years and 6”. Eat plankton, small shrimp and fish.

Spring: spawn at head of tied

Summer: young of the year in estuaries, adult in coastal waters

Fall: Open bays, moving towards shore

Winter: Sheltered bays, large tidal rivers

Identified 3 distinct genetic types

Commercial bait fish in early 1900s, population dramatically has declined in past 100 years. Recreational fisheries in Maine and NH. Shows cyclical pattern with declining peaks – cause for concern.

Threats to spawning:

* Obstructions
* pH (acid rain, land use)
* Habitat alteration
* Eutrophication

Threats to Adults:

* Historical commercial fishery
* Rising ocean temperature
* Marine predation

Project objectives:

Assess threats to spawning rainbow smelt (RBS). Set up monitoring plan.

* Describe spawning population characteristics, genetic distinctions, toxic contaminates in tissues
* Long Creak, Mast Landing, Deer Meadow Brook, Tannery Brook, Chandler, East Bay Brook, sites in MA, NH
* Smelt are in Penobscot Bay, downeast ME, Casco Bay, Sheepscot River – Trawl Survey Data.
* Many caught in spring due to early spawning time – move up into bays by spring Trawl Survey Data

Methods:

* Catch per unit effort, length distribution, sex ratios, age structure, samples for genetics, toxins, pathology analysis. 3 Years of data for all variables.

Results

* Penobscot River has an “extremely” healthy Rainbow Smelt population. CPUE very high in Tannery Brook. Mast Landing has been declining, cyclical?
* Age cohorts variable. Will be measured extensively in next 1-2 years to get better understanding of mortality.

Habitat characteristics also measured

* Periphyton
* Conductivity – metals affecting embryo survival, hatching eggs

GIS Modeling

* Based on index sites, taking region-wide variables (MA, NH, ME) to see road crossing obstructions, wetland, agriculture, etc.
* Determinate model to tie in CPUEs and effects of water quality
* Will be extended to all water sheds in GOM to predict spawning habitat quality

Conservation Strategies:

* Closed commercial fishing of smelt – wasn’t being done so closed.
* Identifying critical EPA thresholds, recommend to towns stream corridors, management ideas
* Stock Enhancement – currently being done in MA. A possibility in ME if a stream was degraded, brought up to standard in water quality.

Further Research:

* Changes in ocean temperature as it relates to declining population
* Shrimp bycatch
* Annual movements

Questions:

Eggs/Young – hatch in 2 weeks, larva go out immediately. Spawn over 4-6 week period. This is critical water quality time. WQ effects spawning success perhaps. Smelt not imprinted on specific location, prefer colder water. Spawning in Penobscot – start in mainstem by Bangor in mid-April, farther south it becomes later (late April, early May).

Tannery Brook did have a tannery. Metals still low in this brook, mainstem sample not taken however.

Economic and Recreational value on Kennebec? None of streams going into Kennebec support spawning populations, probably spawning in mainstem. Ignored in survey because of this – standardized across ME, MA and NH.

Historic evidence – how far up did smelt migrate before dam construction – did not go up too far, not good swimmers. Go all the way to Lake Ontario in one example however.

Brian Harbawks at SMCC has compared Rainbow Smelt genetics from anadromous and freshwater. Found more differences before stocking program, now finding genetic drift.

Measured contaminates in fish bodies and water. Lead, Cadmium, PCBs

**------ Coffee Break -------**

**10:45-11:20 Research Updates (4min updates with 1min discussion)**

**1. Rory and Justin Stevens and Richard Dill: Penobscot Estuarine Fish Community Survey**

Spatial and temporal behavior in estuary of fish community.

Environmental baseline data for hypothesis testing.

Collaborating with Maine DMR.

Objective to establish 5-10 long term index sites to monitor fish assemblage and other variables.

* Penobscot Estuary
  + Winterport, Sandy Point to Fore Point

150ft Beach Seines – working with DMR to get similar mesh sizes. Testing out Fyke nets.

Results:

* 145 Beach Seine Hauls from August– November 2010
* Identified 45 fish and invert species
* 18,400 individuals (27% crustacean)

Future:

* Refine sampling methodologies
* Continue Beach Seining and Fyke Netting
* Implement other gear types – trawls, acoustics, netting
* Continuous environmental monitoring stations
* Looking for collaboration
* To Establish baseline data for estuaries pre-dam removal, particularly for diadromous fish

Questions:

Keeping objectives narrow during initial time, 4 main objectives at this time. Next year, implementing new gear types

**2. Gail Wippelhauser – Penobscot Restoration – Plan Your Work, Work Your Plan**

2008 and 2009

Annual Report – Prepared by Norm Dube

2008 – Historical Counts of other species at Veazie

2009 – DMR and USFWS assessment of alewife brood stock sources

* Public outreach re alewife introduction
* Lake Outlet tours
* Counts of other fish species at Veazie (modified) trap.

2010 - Restoration team

- Wippelhauser, Dill, Kevin Dunham

DMR Initiated stocking in phase 1 lakes

* Chemo pond
  + 750 total on 4 dates
* Mattamiscontis Lake
  + 3200 on 2 dates
* Mud Pond
  + 1630 on 1 date

Informational meetings re alewife stoking at Madagascal Lake, Saponic Lake, Pushaw Lake

Juvenile alewives found on 7/27at Mud Pond, 8/2 at Mattamiscontis Lake, 1000-10000’s juveniles on several dates in October at or below Leonards Mills

Beach Seine survey initiated in September – cooperation with NOAA

DMR, USFWS, NOAA, ASF field trips

Questions?

No immediate plan to expand, planning on working on Pushaw Lake in near term.

1. **Josh – Maine Interagency Stream Connectivity Work Group**

Send representatives to meetings to improve stream connectivity throughout state

-Creating models to prioritize connectivity based on barriers. Where you can get most habitat gains for least amount of money by removing dams and culverts.

-Working Group created by Gov. Baldacci. Report is publically available, provides recommendations. Group has facilitator to provide strong leadership, coordinate projects, manage data, keep focus. 9 Recommendations created.

- Bond supported funding to help with restoration.

- Maps of dams and culverts, ownership, condition, prioritization system based on species. Publically accessible

- Continue inventory. 25% stream road crossings have been inventoried.

- Streamline regulatory approaches. Harder to take out dam than put one in. Make it easier to facilitate this.

- Increased incentives for responsible dam ownership. Find out who owns them, let them know about liabilities (insurance), and importance of fish passage.

- Articulate cost of impaired aquatic ecosystems. Quantify why this is important for Maine.

Report is publically available. Contact Josh or Slade Moore in State Planning Office for more information. Report is NOT online at this point.

Questions:

1. **Karen Wilson – Monitoring the Penobscot using Stable Isotopes to assess Food-Web Structure.**

Focus on alewives because of expectation of large increase. Freshwater 15N signature may become higher and 13C may shift towards more marine signature.

Interested in near-shore marine system. Expectation that NS predators may increase due to increase in alewives.

Collecting at long-term index sites on Penobscot.

* 4 Tributary Sites
* 3 Main-stem sites
* Marine sites: Collecting in 5 areas. Target species was also cod so sampling goes beyond Penobscot Bay.

Results:

* Freshwater systems show low del 13C/del 15N ratio compared to marine systems. Marine also shifted up due to marine nitrogen signature. Blueback, alewife and lamprey caught in freshwater system, still shows marine signature. Mackerel caught in bay show intermediate signature between marine and freshwater – may have been consuming juvenile alewives as they were moving out.
* Connectivity – Using 13C, with little connectivity, will be a clear distinction between freshwater and marine signatures. With high connectivity, the difference should be gradual at the river mouth.

Future:

* Add Kennebec river system in 2010
* Work in post-dam removal for alewives

Questions:

Do signatures reflect what critters are eating NOW or in their life history? It reflects approximately 2-3 months of feeding. Could sample fast turnover tissues such as liver, blood, fish slime to see the eating habits of last day or 2.

1. **Dave Courtemanche, DEP**

Quick Update

River model – draft is complete. Being reviewed and then will become publically available. Deals with oxygen, temperature and nutrients. Send Barbara an update when it is ready to be shared publically.

Quick Update

Federal permits for Great Works and Veazie dam removal will be complete next week.

1. Dale

Preliminary results in, should be ready to present at next PSE Meeting.

**11:20 – 12:00 Research Coordination (10minutes each)**

DSRRN Update: 2.5 more years left on the grant.

April 2010. Resilience of North Atlantic Diadromous Fish Assemblages: a restoration perspective meeting.

* Work on life history variation of diadromous species

Upcoming workshop (Late May 2011):

* Rough Title: Natural Variability in Diadromous Fish Populations and Abiotic/Biotic Systems

3rd Workshop (Jan 2012): Science and Management.

Final Science Symposium (Summer or Fall, 2012).Anticipation for an AFS Symposium within next 2-3 years following this. This can be used to help get the ball rolling for the international meeting.

Update to DSRRN Website: [www.umaine.edu/searunfish/](http://www.umaine.edu/searunfish/)

Send papers and reports to Barbara about recent information regarding Penobscot, GOM to be put on website under Recent Publications

Information in past meetings is available on the website as well as Funding Opportunities, Jobs and any Updates.

Contact Karen, Adria or Barbara for more details or ways to get involved.

**PSE Funding Campaign: Barbara Arter, Karen Wilson, Rory Saunders, Josh Royte**

Created and funding in Fall 2008/2009. Established as a partnership and funded as such. NOAA and Nature Conservancy and Penobscot Trust funded the project.

Funding for first half of 2011 is being funded by the Nature Conservancy, DMR. After February 15th, the exchange cannot exist without additional funds.

Total needed for remainder of 2011: $12,000. $33,000 for additional years.

Josh Royte:

PSE is critical for connecting, making exchange of ideas and information possible. Website and updates help let people learn about funding sources, sampling techniques, available information.

Nature Conservancy has been pleased to contribute but should not be the only ones. Many organizations benefit from the exchange and may consider chipping in to provide the needed funding.

Database gets updated and sent out to many people, lists current and past research projects. Available online.

**The Trust: Matt Collins, Charlie Baeder**

Charlie Baeder, new to the trust, will help coordinate all of the studies relevant to the Trust. [csbaeder@penobscotriver.org](mailto:csbaeder@penobscotriver.org) is the best way to contact Charlie. Charlie worked with Sheepscot River Watershed Council, working on connectivity, culvert inventories and restoration projects. His background before that is in business, focusing on project management. His desk phone is 430-0122.

Funding for The Trust and the NOAA partnership

Funding goes towards the monitoring coordinator position, currently 8 studies focusing on Atlantic salmon pre-monitoring studies. Some funding is being held to ensure these studies can also touch on post-dam removal. Existing studies have been trimmed but were extended for a 4 year period through FY 2014.

Can only guarantee funding one year at a time but is planned through 2014. Collection rounds were limited to keep costs manageable. All 8 studies will continue but were not expanded. The priority of funding goes towards these 8 studies.

Funding becomes available to investigators 12-18 months in advance, not at the start of each field season.

Targets:

Great Works Dam removal July 2011

Veazie Dam – based on Great Works Dam removal and how the process goes as well as funding availability. Also looking at Milford fish passage.

**Final Thoughts:**

Permitting Workshop from 1:00-3:00

Follow up email will be sent by Barbara.

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