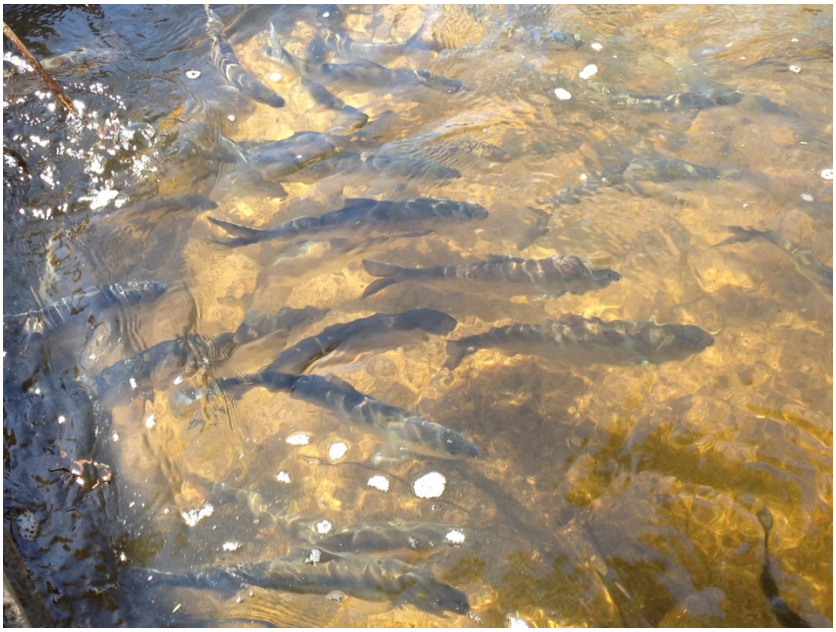
Quality Assurance Project Plan

For

Highland Lake Alewife (*Alosa pseudoharengus*) Count Data Collection



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Background and purpose of the study:

Monitoring of the unharvested alewife run at Highland Lake serves as an indicator of broader trends for the alewife fishery in Maine by virtue of the fact that fishery-independent data is collected. There are roughly 20 locations in Maine where population size estimates for alewife are collected. Most of those locations are harvest sites, where the number of fish counted are actually the number removed (i.e., do not spawn). By state statute every alewife harvest must be closed for three days a week (Maine Statutes Title 12; 9-1; Ch. 605, 5; §6131 2-A). Consequently, at harvested sites the number of spawning alewife (not harvested) is estimated by dividing the total harvest by seven then multiplying by three. A few locations provide harvest independent counts. These runs are either harvested or are collecting data in preparation for a harvest application in the future.

Currently, there are only three sites in the state where alewife count data is collected on the number of spawning adults from non-harvested populations. These locations, Highland Lake, Westbrook, ME (southern), Brunswick Dam, Brunswick, ME (central) and St. Croix River, Milltown, ME (eastern), serve as sentinel counts. Here we define a sentinel count as one where fluctuations in the population are attributable to natural variation in the ecosystem rather than direct harvest impacts.

The purpose of this study is to maintain and extend the effort started at Highland Lake in 2004, which is providing a harvest independent accounting of alewife escapement in southern Maine. According to landings data collected by Maine DMR, alewife harvests have declined steadily through time, a trend reflected coast wide which spawned an attempt to list river herring (collectively alewife and blueback herring *A. aestivalis*) in 2009[1]. However, harvesters attribute this decline more to declining effort than declining fish abundance. Maine DMR has committed concerted effort to tracking the sustainability of alewife harvests around the state and maintained a number of counting efforts to track trends in fish abundance.[2]

Rationale for selecting the site:

One of the reasons for choosing Highland as a site to make a long-term investment in alewife monitoring is because of years of existing data. The count site is well established and the methods have been refined for a single counter and multiple participant volunteer counts. The University of Southern Maine (USM) has invested heavily in the volunteer count, starting in 2014 with receipt of a National Fish and Wildlife Foundation restoration grant. In 2017, USM will continue to oversee the alewife count with support provided by the Presumpscot Regional Land Trust (PRLT), a local land trust with vested interest and the volunteer pool to maintain the alewife count long-term, for volunteer management and outreach. This protocol and the appendices are products of the 2014 NFWF project.

Highland Lake, located in Westbrook, Maine, is the headwater of Mill Brook, which drains into the Presumpscot River then Casco Bay. The lake is 640 acres with a max depth 67 feet. The south basin forms a head pond retained by a ~12 ft. tall dam. The current dam and fishway were constructed in 1987 after a major storm caused the old dam to fail. The

[1] NMFS [National Marine Fisheries Service]. 2013. Endangered Species Act Listing Determination for Alewife and Blueback Herring. Federal Register 78: 48944-48994.

[2] Maine Dept. of Marine Resources. Augusta, ME. http://www.asmfc.org/files/RiverHerringSFMPs/ME_ RiverHerring _SFMP .pdf

fish ladder is 140' long and has gone through multiple iterations of modifications and improvements, the latest completed in 2006. Adult alewife were stocked into the lake from 2000 – 2003. Prior to 1990, when a fishway was completed at the Smelt Hill Hydropower project, alewife had not had access to the Presumpscot River and its tributaries in over 100 years.

Monitoring was initiated by Maine Dept. of Marine Resources to track the response of the population to stocking and improved fish passage. Available manual counts are listed in the table below. DMR observed the alewife population doubling for two generations, but the low counts in 2008 flagged a problem with passage elsewhere in the river. Alewife migration to Highland Lake seems to have been impacted by poor passage through two inadequately sized and set concrete box culverts under a major arterial road (Rt. 302) to Portland. These passage barrier was addressed in 2011 when the culverts were replaced by Maine DOT. Since then, alewife counts have increased into the tens of thousands.

	2004	2008	2009	2012	2014	2015	2016
River Herring Counts	7569	1146	6204	49,486	55,782	8686	43,643
Volunteer Participation					11	23	25
One-day Student Participation					10	0	15
Fish Run Date Range					5/20 – 6/14	5/28 – 6/1	5/25 – 6/20
Volunteer Participation Date Range					5/20 – 6/14	5/17 – 6/7	5/1 – 6/19

Brief description of the methods and protocols in place:

As part of the NFWF grant, USM developed training materials for volunteers related to the alewife count. These included emails telling volunteers where to go and how to count and a google calendar that allowed volunteers to sign up for count slots and allowed the volunteer coordinator to keep track of effort. The first count was attended by the volunteer coordinator to train the volunteer in how to record their observations. A dedicated data sheet was created and copies were stored on-site in a sheltered location to facilitate data collection.

The program uses a modified Nelson (2006)[3] counting method that was identified as appropriate for Maine by MDMR.

- The counting day, between 7am and 7pm, is divided into four time blocks of three hours each. Within the three hour block, one volunteer is sought to count for a single 30 minute period.
- Volunteers use a tally counter (hand click counter) to keep track of how many alewives pass into the head pond.
- Observations are recorded onto a dedicated data sheet, with name, day, time slot, count, temperature, water level, and "other" observation data.
- Time block count estimates are made by multiplying each count by 6 to scale up from 30 minutes to 180 minutes, since the counts themselves are only 30 minutes long.

[3] Nelson, G.A. 2006. A Guide to Statistical Sampling for the Estimation of River Herring Run Size Using Visual Counts. In Massachusetts Division of Marine Fisheries Technical Report TR-25, 33. Gloucester, MA: Massachusetts Division of Marine Fisheries.

- Daily passage estimates are made by adding all time block estimates and total escapement by summing over all days counted.
- Missed counts are estimated as a linear extrapolation of counts in the periods before and after the missed period.

Additional detail is provided in the Operations Schedule table below (pp. 6-8).

Data quality:

Training is the first level of data quality assurance. The volunteer coordinator is the ultimate arbiter of data quality. All new volunteers do at least their first count with the volunteer coordinator. The volunteer coordinator is in charge of collecting the data sheets on a semi-daily schedule and entering the observations into a spreadsheet and into an online citizen science data portal.

As part of the NFWF project, USM researchers paired volunteer counts with underwater video recording and an electronic counter to determine the most accurate counting method. Volunteer counts were accurate up to about 150 alewife per 30 minutes. The higher the observed passage on the video the larger the deviation by volunteers. Volunteers tended to undercount the number of fish.

- Species identification

Generally, alewives are obvious because of their narrow shape and tell-tale swimming style. They also make up over 99% of the fish entering the lake once the runs starts. Identification mistakes are possible but not likely and not likely to affect the total count estimate significantly. According to video footage, non-alewife are rarely seen at the top of the ladder once the alewife run has started and alewife crowd the ladder exit.

- Coordinator check-ins

The coordinator is available to assist any volunteers who decide they need extra direction or guidance in the counting process. This includes shadow counting and help with fish identification. The coordinator will also attempt to schedule an overlapping counting session (5- 15 minutes in length) with each volunteer to check count accuracy and advise on improving accuracy.

Coordinators will also use data entry to check-in on problems with volunteers performing the counts. Count data sheets will be collected weekly and entered into Excel. In the past, low counts, particularly on sunny, warm days early in the run, have been used to trigger obstruction searches in the stream. Comment sections mention when run-back activity begins (adults start moving back downstream), which triggers installation of a screen and daily run-back purges (lifting the screen so run-backs can exit the lake after the last counting session of the day. Run counts themselves are highly variable and thus not a good indicator of QC problems alone.

- Training for volunteers if necessary

Training is performed by the volunteer coordinator for each new volunteer and any experienced volunteer that requests it. Volunteer coordinators will check in with each volunteer, at the count site if possible, and verify their comfort level with the counting process. This will also be an opportunity to shadow count

- Reporting

Data will be stored at Anecdata.org., a citizen science project database hosted by Mount Desert Island Biological Laboratory. A copy of the data will also be stored at PRLT in excel format. Excel files of daily count and other observations will be shared with Casco Bay Estuary Partnership and USM. Total counts will be shared with Highland Lake Association and MDMR.

Mill Brook Blockage and Highland Lake River Herring Monitoring Program
Annual Operations Schedule

Considerations: This timetable presents a sequence of events. While they are meant to be orderly, many of the individual efforts and activities occur simultaneously and thus are ad hoc. However, each one becomes more or less of a priority during the monitoring season. For example, recruitment and registration (sending out announcements promoting participation with the run) will be a priority earlier in the monitoring season compared to later in the monitoring season when training and retention are of greater importance.

Recruitment = Recruitment is the act of promoting, thus soliciting, participation of citizens with an environmental monitoring program.
Registration = Registration is the act of taking-in the volunteers to document their interests so they can be functionally aligned, or not, with program goals and objectives.
Training = Training is the act of explaining and showing volunteers how to conduct the environmental monitoring methods.
Retention = Retention efforts are acts to encourage and enable existing volunteers to continue or increase their role in the programs.
Reassignment = Rather than dismissal, approach volunteer reassignment as a way to reposition volunteer somewhere in the program

Month	Week	Mill Brook Blockage Monitoring Program Annual Operations Schedule	Highland River Herring Monitoring Program Annual Operations Schedule
January	Week 1	Provide 1 unit of newsworthy media to existing volunteer team once during January	"
	Week 2	Provide 1 unit of newsworthy media to existing volunteer team once during January	"
	Week 3	Provide 1 unit of newsworthy media to existing volunteer team once during January	"
	Week 4	Provide 1 unit of newsworthy media to existing volunteer team once during January	"
February	Week 1	**Program Coordination Planning** - Prepare meeting agenda for Program Advisory Committee; ask if any existing volunteers want to participate in the planning and operating the Mill Brook run.	"
	Week 2	**Program Coordination Planning** - Meet with Program Advisory Committee - Identify date to meet and train volunteers. Develop recruitment messaging, such as sentinel run because not harvested, Maine's economic vitality, environmental conservation/health, and supports rehabilitation of depleted ecologically and economically significant species.	"
	Week 3	**Program Coordination Planning –** Inventory all groups to recruit/promote programs through: Recruitment – Reach out to existing volunteers to promote continuation of their involvement. This is a good time to ask if any existing volunteers want to take on more of a leadership/coordinator role. Messaging should promote it as a team in need of low-commitment volunteer support to solve an environmental problem.	"
	Week 4	**Program Coordination** - Recruitment – Reach out to existing groups to promote beaver dam monitoring and management; continue to inventory new groups to recruit/promote through.	"
March	Week 1	**Program Coordination** - Recruitment - Solicit groups to promote beaver dam monitoring and management; continue to inventory groups to recruit through.	"
	Week 2	**Program Coordination** - Strategic planning and recruitment activities – Solicit groups to promote beaver dam monitoring and management.	"
	Week 3	**Program Coordination – Volunteer Appreciation Event** - Hold meet and greet/education event with potential volunteers; provide overview of program(s); first volunteer training at event; encourage intra-volunteer socialization as it contributes to the overall experience.	"
	Week 4	**Volunteer Monitoring - Blockage Monitoring -** Conduct comprehensive Mill Brook blockage assessment – document all	"

		blockages and their type and relative intensity – contact associated landowners and Inland fish and wildlife to get permission to breach dams; always check to see if official permits are needed to breach dams at beginning of season.	
April	Week 1	**Volunteer Monitoring - Blockage Monitoring –** Begin conducting comprehensive Mill Brook blockage assessment – document all blockages and their type and relative intensity.	**Program Coordination** - Continue program coordination efforts with the recruitment and registration dimension of coordination as priority, followed by training and communication when necessary. Cater to volunteers who will want information "how to" upfront, emphasize availability of training to others. Make sure new volunteers are tracked and trained early.
	Week 2	**Volunteer Monitoring - Blockage Monitoring -** Conduct comprehensive Mill Brook walk – Begin breaching known intense blockages.	**Program Coordination** - Continue program coordination efforts with the recruitment and registration dimension of coordination as priority, followed by training and communication when necessary. Cater to volunteers who will want information "how to" upfront, emphasize availability of training to others. Make sure new volunteers are tracked and trained early.
	Week 3	**Volunteer Monitoring - Blockage Monitoring -** Continue conducting comprehensive Mill Brook walk -	**Program Coordination** - Continue program coordination efforts with the recruitment and registration dimension of coordination as priority. Communication and training with interested individuals should start to take priority. Make sure new volunteers are tracked and trained early.
	Week 4	**Volunteer Monitoring - Blockage Monitoring** – Continue conducting comprehensive Mill Brook walk - Beaver Dam	**Program Coordination** - Continue program coordination efforts with communication and training with interested individuals taking priority. Start holding training days at site. Hold one-on-one training days for volunteers that need that level of support. Recruit and register when possible.
May	Week 1	**Volunteer Coordination/Management -** Run starts – Monitor for new beaver dams and maintain breached ones.	**Volunteer Coordination/Management** – Fish run starts – Communicating with and supporting (e.g., training on site) registered volunteers is priority. Continue volunteer recruitment, registration, training and reassignment when necessary.
	Week 2	**Volunteer Coordination/Management -** Run starts – Monitor for new beaver dams and maintain breached ones.	**Volunteer Coordination/Management** – Fish are running – Communicating with and supporting (e.g., training on site) registered volunteers is priority. Continue volunteer recruitment, registration, training and reassignment when necessary. Provide feedback via email blast to volunteer group; most fish counted, top volunteer, etc.
	Week 3	**Volunteer Coordination/Management -** Run starts – Monitor for new beaver dams and maintain breached ones.	**Volunteer Coordination/Management** – Fish are running – Communicating with and supporting (e.g., training on site) registered volunteers is priority. Continue volunteer recruitment, registration, training and reassignment when necessary.
	Week 4	**Volunteer Coordination/Management -** Run starts – Monitor for new beaver dams and maintain breached ones.	**Volunteer Coordination/Management** – Fish are running – Communicating with and supporting (e.g., training on site) registered volunteers is priority. Continue volunteer recruitment, registration, training and reassignment when necessary.
June	Week 1	**Program Coordination – Retention –** Compile and compare results from last year results. Volunteer results do not need to be scientific results.	**Program Coordination – Retention –** Compile and compare results from last year results. Volunteer results do not need scientific results.
	Week 2	**Program Coordination** – **Retention** – Analyze and write up results.	**Program Coordination** – **Retention** – Analyze and write up results.
	Week 3	**Program Coordination** - **Retention** – Feedback results to volunteers.	**Program Coordination** - **Retention** – Feedback results to volunteers.
	Week 4	**Retention efforts** – **Volunteer Appreciation Event** – Share results – In 2014 the NFWF research team and Highland Lake Association collaboratively wrapped this into the Highland Lake Associations meeting, which worked well. PRLT meeting as well.	**Retention efforts** – **Volunteer Appreciation Event** – Share results – In 2014 the NFWF research team and Highland Lake Association collaboratively wrapped this into the Highland Lake Associations meeting, which worked well. PRLT meeting as well.
July	Week 1	Provide 1 unit of media to existing volunteer team once in July	"
	Week 2	Provide 1 unit of media to existing volunteer team once in July	"
	Week 3	Provide 1 unit of media to existing volunteer team once in July	"
	Week 4	Provide 1 unit of media to existing volunteer team once in July	"
August	Week 1	**Program promotion** – publicize count data if possible so citizenry knows the population made it and the fry (baby) need to make it back out to the ocean to make all efforts pertinent	
	Week 2	**Program promotion** – publicize count data if possible so citizenry knows the population made it and the fry (baby) need to make it back out to the ocean to make all efforts pertinent	

	Week 3	**Program promotion** – publicize count data if possible so citizenry knows the population made it and the fry (baby) need to make it back out to the ocean to make all efforts pertinent	
	Week 4	**Program promotion** – publicize count data if possible so citizenry knows the population made it and the fry (baby) need to make it back out to the ocean to make all efforts pertinent	
September	Week 1		
	Week 2		
	Week 3	**Volunteer Coordination/Management –** Fish outmigration - Monitor for new beaver dams and maintain breached ones	
	Week 4	**Volunteer Coordination/Management –** Fish outmigration - Monitor for new beaver dams and maintain breached ones	
October	Week 1	**Volunteer Coordination/Management –** Fish outmigration - Monitor for new beaver dams and maintain breached ones.	
	Week 2	**Volunteer Coordination/Management –** Fish outmigration - Monitor for new beaver dams and maintain breached ones. **Retention efforts** – Volunteer Appreciation Event - end of year event sometime during the month.	
	Week 3	Retention efforts – end of year event sometime during the month.	
	Week 4	Retention efforts – end of year event sometime during the month.	
November	Week 1	**Retention efforts** – Volunteer Appreciation Event - end of year event sometime during the month	
	Week 2	Provide 1 unit of media to existing volunteer team once in November – maybe story about successful outmigration	
	Week 3	Provide 1 unit of media to existing volunteer team once in November	
	Week 4	Provide 1 unit of media to existing volunteer team once in November	
December	Week 1	Provide 1 unit of media to existing volunteer team once in December	
	Week 2	Provide 1 unit of media to existing volunteer team once in December	
	Week 3	Provide 1 unit of media to existing volunteer team once in December	
	Week 4	Provide 1 unit of media to existing volunteer team once in December	