# Flanders Stream Restoration
# 2014 Volunteer Count Report

***Prepared by Maine Dept. of Marine Resources, October 2014***
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## *Background:*

In 2012, the aging Thorne Road culvert crossing over Flanders Stream was successfully replaced. The project used Stream-Smart principles that made the crossing more resilient to storm flows, and less maintenance-prone. Just downstream, the project team also replaced a crumbling fish ladder with a series of rock weirs that act like a natural cascade that gradually helps migrating fish reach the elevation of the new culvert. The new design is capable of boosting the productivity of a commercially harvested alewife run on the stream. With the help of dedicated community volunteers, the Maine Coastal Program, DMR, and the town of Sullivan conducted pre- and post-construction alewife monitoring that confirmed the project's alewife restoration value.

The town of Sullivan partnered with a variety of organizations to implement the Thorne Road project over several years of planning and fundraising. The Gulf of Maine Council, National Oceanographic and Atmospheric Administration, U.S. Fish and Wildlife Service, Maine Department of Marine Resources, Maine Natural Resources Conservation Program, and Corporate Wetlands Restoration Partnership provided funding and technical assistance.

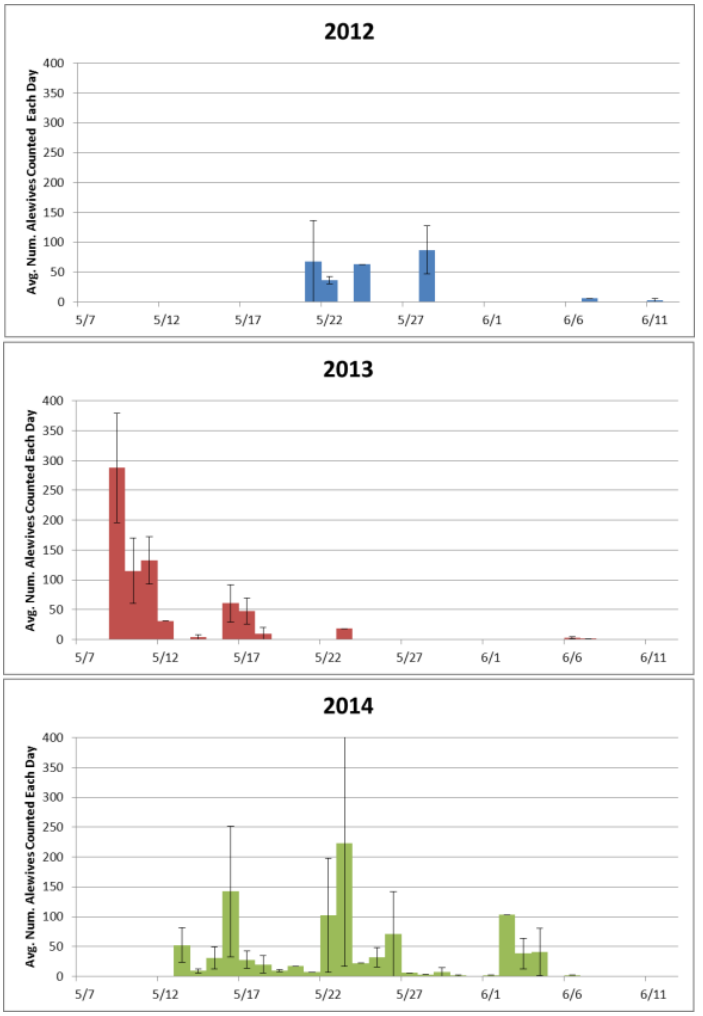
## *Alewife Run Monitoring:*

In an effort to show how the new culvert improved fish passage, we established a monitoring program to count the number of alewives passing through a weir installed roughly 200 feet upstream of the culvert. Counts lasted 30 minutes during different "blocks" of time, where each day was divided into a certain number of counting blocks. In 2012, 30-minute counts were performed during two 6-hour blocks, three days a week. In 2013, 30-minute counts were performed during three 4-hour blocks, three days a week. Counts were not performed during the four days a week when the run was commercially harvested and a fish trap blocked upstream migration. In 2014, the count was performed every day (30-minute counts, four times a day) because the harvest allowed for continuous upstream passage.

## *Results*

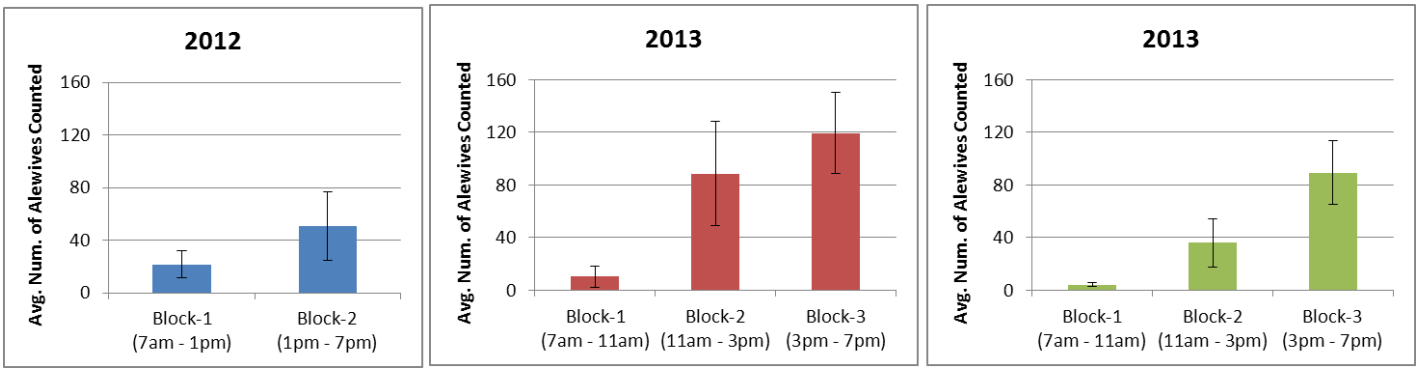
Comparing the number of alewives counted before the culvert was replaced (the 2012 count) to the counts performed after the culvert was replaced (the 2013 and 2014) helps us understand if the new culvert improved fish passage. The 2012 pre-construction average number of alewives counted in each monitoring session was 35.1 alewives. After the new culvert was in place, the average counts were higher, in 2013 the average count was 66.7, and in 2014 the average number of alewives counted during 30-minutes was 37.4.

It is difficult to compare these averages among the years because the sampling effort was expanded so much each year. In 2012, only 13 counts were performed, and these counts were performed primarily at the height of the spawning run, so the data are skewed higher compared to if the entire run was documented (Figure at right of page). In 2012, very few of the volunteers reported seeing no fish pass during their 30-minute count. In 2013, 26 counts were performed, encompassing more of the spawning season. Later in the season, however, fewer counts were performed because heavy rains made it impossible to see fish or unsafe to perform the count. In 2014, 50 counts were performed, fully encompassing the spawning season. In 2014, volunteers were able to perform most of the scheduled counting periods. The result of having more counts performed was that more people recorded seeing zero fish pass. This does not mean that fewer fish passed in 2014, it just means that because counts were performed more frequently, the likelihood of capturing the entire *range* of the run was more likely. This is in fact what the 2014 effort found. The number of alewives counted in 2014 during a 30-min period ranged from zero to a high count of 429 alewives. In 2013, the range was zero to 379. In 2012, the range was zero to 136.




It is also informative to look at the number of times the average daily count exceed a certain threshold. In 2012, the average daily count never exceeded 100 alewives (Figure at right). Comparatively, the average daily count exceeded 100 7 times in 2013, and 6 times in 2014.

The data also showed that the number of alewives passing increased from morning to evening (Figure below). Because fewer counts were performed during the evening count in 2014 (11 counts performed in Block-3, compared to 16 counts in Block-1 and 23 counts in Block-2), the high range, when more alewives likely passed, may be under-represented.



### *Estimating the Run Size*

Since 1984, Maine Department of Marine Resources (DMR) has used the figure of 235 alewives for each lake/pond acre to estimate alewife production. The Department established this value from the commercial harvest in six Maine watersheds for the years 1971-1983, using metrics like the average pounds harvested, the upstream lake acreage of each location, and estimated escapement from the harvest, to determine this figure. The term escapement is used to describe the alewives that are not harvested, but make it to the lake or pond to spawn because they "escape" the harvest either during the days of the week when the harvest is closed or "escape" the harvest by going around the harvest area, like moving past a weir net when there is a gap between the net and the side of the river.

The surface area of Flanders Pond is ~535 acres, so we estimate the Pond could support a run of 125,655 alewives. Commercial harvests in Maine must maintain an average escapement of 35 alewives per acre. For Flanders Pond, this minimum escapement is 18,715 alewives. When no other count is performed, we estimate the escapement from harvest records, with the assumption that the total run would be made up of the harvest (4-days a week) and the calculated escapement estimate (the other 3-days a week). This method, however, can drastically underestimate the total run size (and the escapement) if runs are minimally harvested by choice. This has been the case the past two years at Flanders Stream, when there has been lower harvesting effort.

Using the harvest data, we calculate that the escapement in 2013 was 5,130 alewives and in 2014 was 5,400. The volunteer count data show that the escapement was in fact much larger. Using the volunteer counts, performed 2 or 3 times a day depending on volunteer coverage, we estimate that the escapement (or number of alewives able to reach the pond to spawn) was ~11,932 in 2013 and ~14,796 in 2014. The run count is not estimated using the 2012 data because not enough data were collected to perform a confident analysis. These run size estimates calculated from the volunteer count show that the harvest data may underestimate the true run size for Flanders Stream.

There is error associated with both the volunteer run estimates values since the volunteer counts were also simply estimating the run size, and not every fish was counted. The error is a factor of the variability of daily counts (if a lot of the counts during the same day were about equal, or whether the counts during the same day were very different from each other), the variability of all the daily counts (if the average counts vary a lot from day to day, or are similar), and the amount of volunteer coverage (if most of the counting blocks were in fact counted, or if many of the blocks did not have someone signup or perform a scheduled count). In 2013, fewer counts were performed by design (only performing counts 3 days a week), and because there was less coverage. This led to a large range of error, where we are 95% confident that the true run size (11,932) lies between -84 and 23,948. In 2014, more counts were performed and there was less variability among the counts performed on each day. In 2014, there we are more confident about the estimate (14,796), and the 95% confidence interval is between 13,520 and 16,072.

***Many thanks to all the volunteers who made the count possible!***