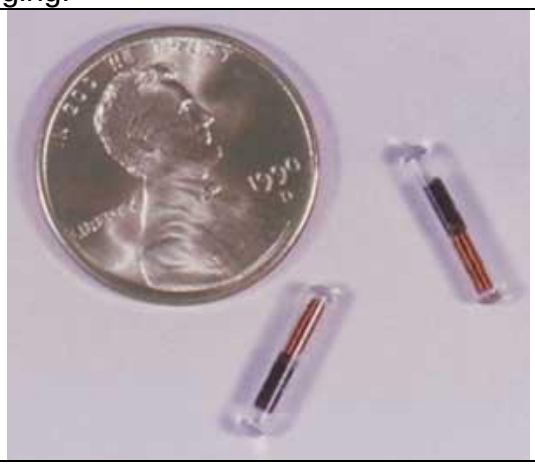
Presentation on River Herring, Kevin Sullivan, NH Fish & Game, Dec. 8, 2015

- river herring basics:
  - generic term for two species: alewives and blueback herring
  - anadromous: spend 9-10 months at sea, reproduce in rivers
  - iteroparous: first attempt to breed at 3-4 years, fully reproductive at 5 years, return to the same river every year until death at 8-10 years
  - Populations are in decline along the eastern seaboard. Federal listing as endangered was considered, but not listed currently due to data gaps and implications for many important fisheries. Another review will take place in 2-3 years.

- Lamprey River river herring:
  - two fish ladders: McCallen Dam in Newmarket built in 1972, Wiswall Dam in Durham built in 2012, both open April through July
  - predominantly alewives in this river, currently only rare blueback herring. (There were higher amount in the past.)
  - Lamprey currently has the highest run in NH.
  - NH F&G gathers data on individual fish caught at the ladders each year. Fish are identified for sex, length, species, and age. Sex can be determined by pressing on the belly: orange gel is eggs from female, white is sperm from male. Scale samples are used to determine age, species, and number of times the fish has spawned.
  - Typically 8-9,000 returning Lamprey River fish are transferred to the Merrimack River to serve as a donor population in recent years. This represents about 10% of the total return.
  - NH F&G also trucks fish to Pawtuckaway Lake for stocking there (500 to 1,000 annually).
- challenges for river herring:
  - Can be legally netted in salt water. Used mostly for bait. (Illegal to net in fresh water during spawning.)
  - Taylor River and Oyster River had good blueback herring runs until 2008, now mostly gone in Taylor and declining quickly in the Oyster.
  - Fast water during flood years (2006, 2007) significantly impairs returns: water is too turbulent for fish to find or pass ladders, actual alewife spawning takes place in calmer water. Flow of 6 feet/second is ideal for river herring for swimming.
  - Spawning often occurs in less than ideal conditions, with 90% occurring during the first 10-14 days of the run. Hormonal urges are strong, but some fish cannot pass barriers, some get tired. Large

masses of non-viable eggs are often found at the base of McCallen Dam and Wadleigh Falls in Lee. Fish leave the river immediately after spawning.
    - Predation seems to be mostly by birds. (Tagged fish suddenly move long distances.)
- tagging:



Passive Integrated Transponder (PIT) tags are about 1 cm long and .2 cm wide. Tags are inserted between muscles on the side and the insertion site is sealed with a form of skin glue. The tags contain microcoils that carry a unique identifying number. As the tagged fish passes stationary detectors, the tag is stimulated to vibrate and the detector records the tag number, detector number, date, and time.

    - McCallen Dam has 8 detectors, starting below the dam and ending at the top of the fish ladder.
- fish ladder effectiveness (of tagged fish):
    - 62-82% of fish pass the ladder at the beginning of the run and then there is a quick decline to 35-59% for the season. The overall rate of successful passage is 42%. From statistics of tagged fish and from visual observations, clearly many fish do not pass the ladder.
    - Fish typically enter the ladder 3-4 times. Fish that make 1.8 attempts at the half way mark generally pass the full ladder. Fish that make 1.3 attempts at the half way mark generally do not pass the full ladder.
    - Fish can stay in the resting pools for days if the ladder is crowded. (McCallen has two resting areas.) Even though flow is lower, fish still expend a lot of energy staying in place. Very little (<1%) of upstream movement has been recorded at night, but some fish move downstream and exit the ladder at night. This is not the norm and makes the Lamprey somewhat unusual. 97% of all movement occurs during daylight.
    - 69,843 fish passed McCallen Dam and 14,812 fish passed Wiswall Dam in 2015. With three years of data, Wiswall is passing 21-38% of the fish that pass through McCallen. Some fish probably spawn on the way; some probably do not have enough energy or motivation to pass Wiswall and some die to natural processes and predation.
- Wadleigh Falls, Lee:
    - The dam is breached on both ends, but natural falls are too much for river herring to pass. Some fish came within an inch or so of clearing the ledge, but no tagged fish in 2014 succeeded. Most fish showed a preference for the Route 152 side of the river versus the Tuttle Road side.

    - Passage might occur with some minor modifications to the river bed that allowed water to flow evenly over a width of a few inches. Major projects such as a fish ladder or complete dam removal are currently not in consideration.
    - The dam and surrounding area are owned privately. Current interpretation of ownership laws indicate that the landowner owns the dam, the river banks, and the river bed in fresh water. The landowner refuses to engage in discussions with NH F&G.
- future work and goals:
    - Where river herring are spawning in the Lamprey (other than at the base of dams) is unknown. NH F&G is working to identify critical spawning habitat.

On a larger scale, NH F&G is working to increase the distance of suitable spawning area so that the fish can find the best habitat.