

2014 Rainbow Smelt (*Osmerus mordax*) Survey Mount Desert Island, Maine.

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Background

In 2012, the Regional Conservation Plan for Anadromous Rainbow Smelt (*Osmerus mordax*) in the U.S. Gulf of Maine was endorsed by Maine's Dept. of Marine Resources (MDMR). The plan identified many actions to be undertaken to first understand the causes of and then halt the decline of this once culturally, economic and ecologically important diadromous fish species. One of the identified actions was to conduct surveys to determine if historically documented populations in the Gulf of Maine (Enterline et al. 2012) still had evidence of spawning and use of stream mouths as egg beds. If spawning sites were identified during the surveys, the surveyors were to estimate the approximate number of spawning adults, or the area occupied by eggs and the approximate density of eggs in the bed area, and the location.

Introduction

Early in 2014, Dr. Chris Petersen (College of the Atlantic) and Bruce Connery (Acadia National Park) discussed with Dr. Claire Enterline (MDMR) how Chris and Bruce might conduct or lead presence/absence surveys of historically documented rainbow smelt runs (personal conservation, C. Enterline; MDMR) on Mount Desert Island (MDI). On March 28th a scouting trip of the MDI historic spawning sites resulted in a pilot survey strategy (<http://www.maine.gov/dmr/smelt/documents/painstruct.pdf>) to document the presence of adults smelt and spawning activity at historic ovi-position (egg-bed stream) habitat. A few streams that were reported as being historic spawning habitat were found to be of poor habitat or unavailable to smelt because of area development and dropped from the list of survey study sites. At the same meeting, Dr. Enterline suggested conducting a parallel assessment of spawning activity using a live-capture & data collection survey method at a site that held particular promise.

Approximately a month later Bruce and Chris were joined by Billy Helprin (Maine Coast Heritage Trust) to establish the live-capture netting site at the mouth of Babson Creek. During this same time Chris and Bruce had begun to conduct surveys for rainbow smelt at more than a dozen historic streams (i.e., brooks) on MDI (see map).

Methods

The sea-run rainbow smelt spring spawning inventory of historical spawning sites (See Figure 1) were conducted at least once a week with the objective being to confirm the current status of streams historically used by rainbow smelt for spawning. Surveys were conducted by Chris, COA students, and Bruce by visiting streams close to the night high tide during the spawning activity period for MDI (late April through early June west of the Penobscot River). Areas being used by spawning adults were to be documented (GPS), measured (i.e., ovi-position area), and provide estimates of amount of coverage. Pictures of ovi-position areas (i.e., egg beds) were encouraged at the next low tide period. Daytime visits of these streams during low tides were used primarily to further confirm

whether spawning adults had been present by the presence of eggs, and if so, to estimate size of the egg bed(s). During evening high tides, surveys of the study sites could be conducted of these areas to observe and document adult smelt, spawning activity, and areas of spawning activity. The surveys were recorded on DMR survey forms.

Conducting the live-capture netting at Babson Brook occurred during daytime low-tides, usually 2 hours on either side of dead low tide. The nets were checked daily by Chris, Billy, Bruce, or some combination of them based on low-tide forecasts. One or more persons entered the water and removed tie-down lines to the tail (capture funnel) and sides of the net allowing the observer to check the last and subsequent net trap sections or baffles. Fish, other animals, and debris (i.e., rockweed fragments, eel grass, etc.) were removed by opening the tail of the net to allow small and medium dip nets to reach forward into the baffles to extract the contents. Fish were identified, measured for length, and recorded with digital cameras and this information was recorded on data sheets. The net was re-closed and re-secured.

Results

Generally speaking, these two survey approaches failed to find areas where rainbow smelt had spawned and had deposited eggs at any of the twelve stream or brooks historically documented as spawning sites or upon recent visits were considered smelt ovi-position habitat.

At the Babson Creek sampling site, where a fyke net (provided by Gregory Burr, Region C, Maine Inland Fisheries and Wildlife) was placed approximately 150m downstream of the Route 198 culvert on April 30th. The net was checked daily until it was removed May 28, 2014. This was a large fyke net, and although it could have been placed to block the entire channel, it was limited to just a proportion of the channel, less than 50% of the channel was blocked at high tides. Few fish were caught in the trap, with only one smelt caught on May 28th, 2014 (Table 1). Other fish caught included brook trout (3, (*Salvelinus fontinalis*)), an American eel (1, (*Anguilla rostrata*)) and a fathead minnow (1, (*Pimephales promelas*)). On several days the net contained one to several European green crabs (*Carcinus maenas*), which occurred approximately two weeks after the net was placed and opened (Table 1). The net had a relatively large mesh that may have allowed for escapement of some fish. Twice medium-sized (~100 – 140mm) brook trout were caught in the mesh. Also on 2 occasions the net was ripped leaving one to a few 5" and larger openings, allowing for escapement of fish and invertebrates. The cause of the openings is unknown. In addition to the fyke net surveys, the most likely ovi-position habitat upstream of the net was surveyed weekly (five times) for eggs from late April through late-May, and no eggs were ever observed.

In addition to the work on Babson Creek, egg surveys were done on several other streams around MDI from mid-April through mid-May. The schedule of sampling for these streams is listed in the attached spreadsheet. No eggs were found in censuses at Breakneck, Pray's, the stream feeding the southern side of Clark Cove, Little Harbor, Hunters, Canon, Breakneck, Asticou, Denning, and Seal Cove Brooks. Surveys in 2013 had found that several brooks identified as possible or historic smelt spawning brooks,

had poor or no spawning habitat (i.e., Tinker, Southwest, Jones Marsh, etc.) and these were not surveyed in 2014. In addition, two single surveys were done on streams at the head of Somes Sound (draining Whalesback area) after someone reported seeing smelt in the area, with no eggs found.

Discussion

These surveys documented that rainbow smelt are not using historically documented spawning streams on MDI, at least at levels where eggs or egg-beds could be recognized. The survey of a few other streams that had suitable-looking appearing habitat and no historic documentation is further confirmation that very little, or no, spawning is occurring in historically documented locations on MDI. The live-trapping survey, while conducted for almost a month, only was able to trap one adult (male) smelt on the last day. The netting of only one adult at the end of the survey could mean 1) surveys should be conducted later in the spring (which is near the end of reported spawning window, i.e., continued through the first full week of June), 2) that very few fish are attempting to spawn and thus more thorough surveys or netting efforts will need to be conducted to document those streams with low or remnant numbers of spawning adults, 3) that trapping with appropriate-sized nets that cover the full width of the high-tide times for the surveyed brooks will be required to document these low remnant spawning populations, or 4) a combination of some or all of these suggestions. Although no eggs nor an egg bed was documented upstream of the netting site, the use of a smelt or other similar-sized fish net with smaller mesh might provide different results. Also we learned that using a live-capture netting survey method might require the checking of the net at the following low-tide period (i.e., during the night) to minimize or eliminate opportunistic foraging by predators (primarily mink, otters, etc.) and assure that trapped fish or other animals were actually documented.

The egg bed surveys conducted at other possible spawning streams also produced no indication that adult smelt were using them for oviposition. These surveys might be continued one to two weeks later, similar to the period that the live-trapping surveys would be conducted. The additional effort for a few weeks might not produce any different findings, but doing so could more confidently state that smelt were not using one to all of these streams for spawning.

Conclusion / Recommendations

The findings of these surveys are disappointing in that MDI has lost what appears to be a once prominent diadromous species. It does provide a better understanding for MDMR of the re-shaping of the species distribution in the GOM and for a small area of central Maine's inter-coastal habitats. These data are valuable in understanding what actions and measures will be needed for these areas to once again become important to the restoration of rainbow smelt.

The following are recommendations by the authors and surveyors of this pilot investigation.

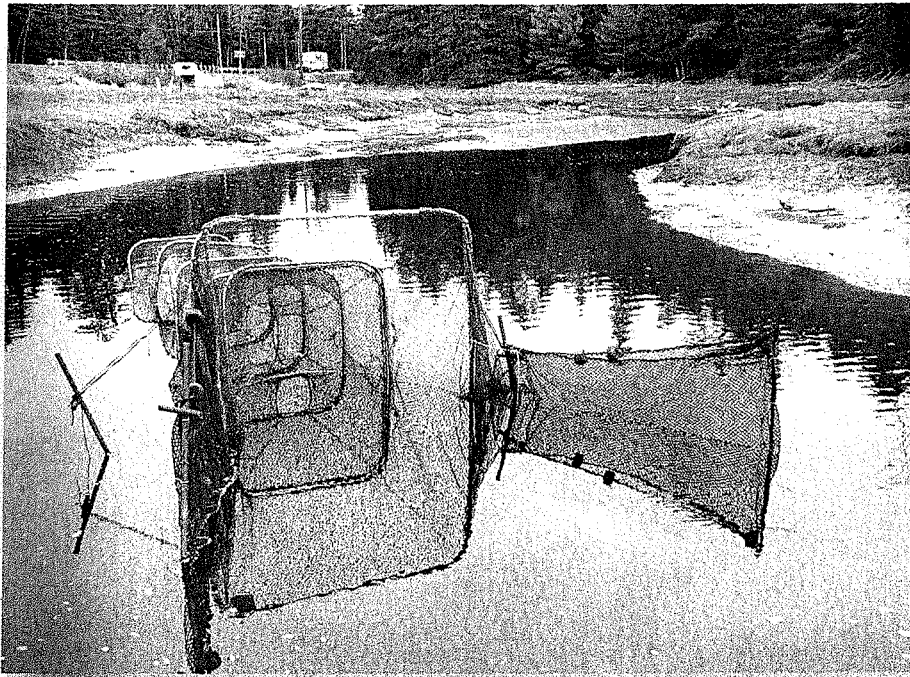
- 1) Future or follow-up surveys be conducted only at the streams with the highest likelihood of spawning based on habitat, proximity to spawning streams on the mainland or know areas of staging smelt;
- 2) Future surveys should be conducted into early June. Perhaps only once a week surveys are needed in late April, while twice a week surveys could be necessary later in May and early June to detect what could be low-density egg beds
- 3) Conduct the surveys with at least two people to strengthen the chances of detecting low numbers of eggs in a bed. Two person teams would be especially helpful in late May and early June.
- 4) Make arrangements to use a fyke net, or dual fyke-net design that has a smaller mesh net size for any live-trapping survey. Continue the survey into early June.
- 5) Purchase and place water temperature data loggers in the surveyed streams and upper marine areas and seek support from local organizations to conduct water condition assessments (flow, salinity, etc.) as basic information that could be important to future restoration efforts.
- 6) Seek assistance from local historical groups, college students and professors, to mine historic data from local sources and to seek testimonials from older MDI residents who know of or can recall going smelt harvesting prior to 1980 and to prepare this information into a report of the role that this diadromous fish played in the lives of MDI residents.

Finally, on May 8 Chris Petersen and Bob DeForrest were visiting Morancy Stream in Sullivan and talked to the elver fishermen there, and Chris gave them his number in case they saw any smelt activity. On May 12 they left a message that they had had extensive spawning on their elver nets. Such outreach and contacting of area residents could prove valuable to more accurately identifying the timing of spawning on MDI. It also might provide opportunities for citizen science to aid in better coverage of the possible study sites and an increased awareness by local residents of the changes occurring locally and an opportunity to support restoration efforts.

References

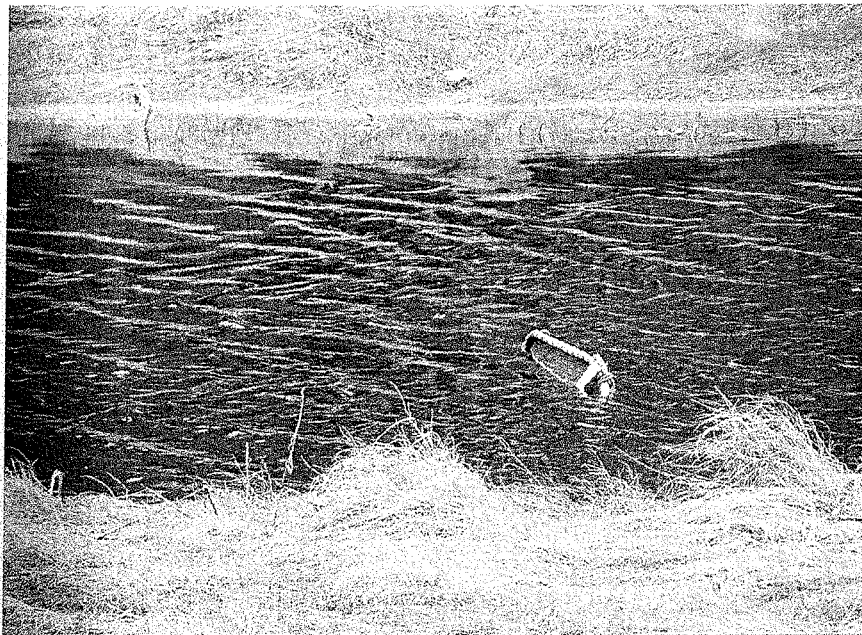
Enterline, C.L., B. Chase, J.M. Carloni, K. E. Mills 2012. A Regional Conservation Plan for Anadromous Rainbow Smelt the U.S. Gulf of Maine.

Photo Record of Live-trapping Survey



Creek smelt survey net initial configuration on April 30th, 2014

Babson



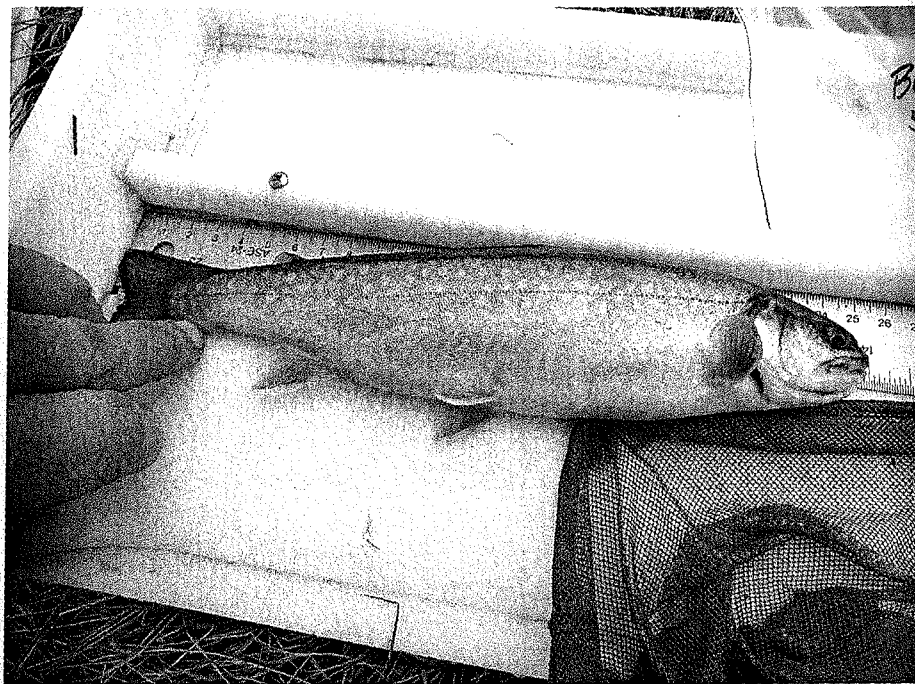
Top of net opening just visible near high tide April 30th, 2014



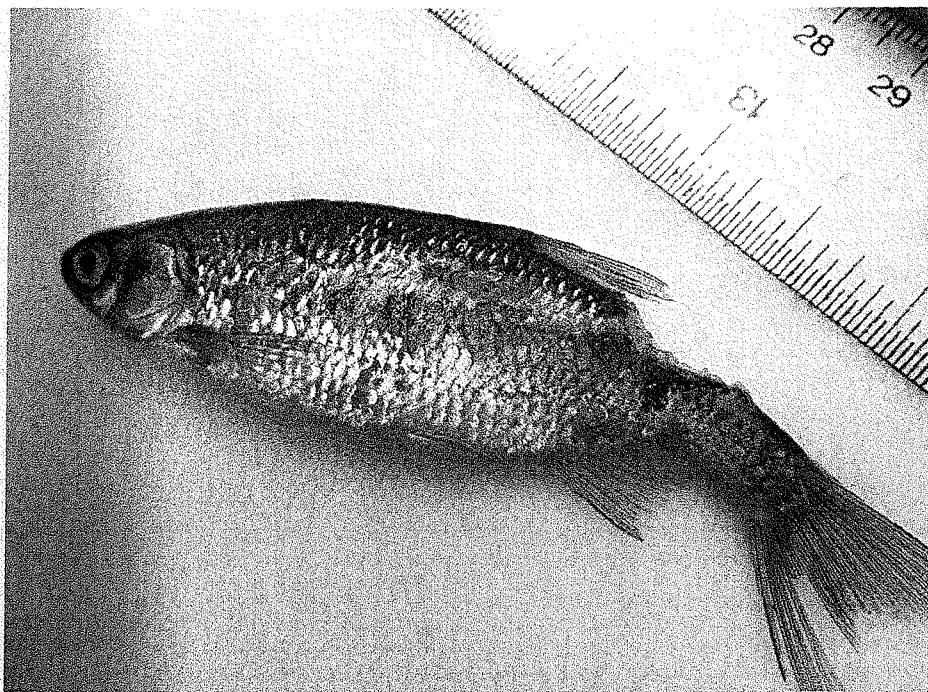
Information sign to explain the net's presence to visitors seeing the net or that were exploring the area.



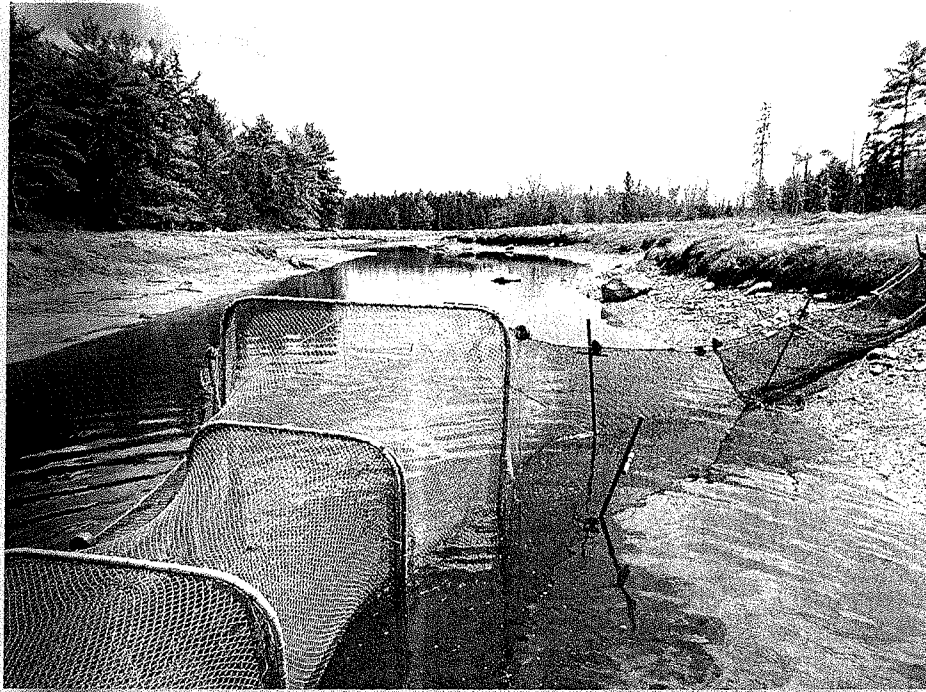
Chris Petersen checking the net at mid-tide on May 2nd, 2014



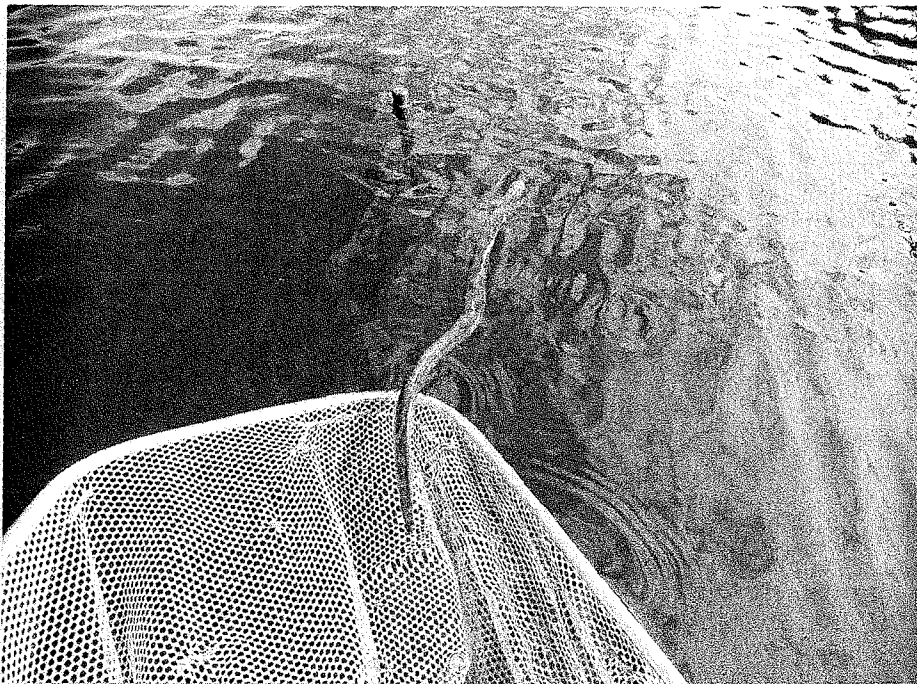
Brook trout captured in net on May 6th, 2014



Fathead minnow captured in net along with the trout shown above. Minnow was dead, perhaps from bite at base of tail from trout (speculation) and associated stress.



View of net looking southeast down Babson Creek, showing extended wing to the west,
May 7th, 2014



Eighteen + inch eel being released after capture in the fyke net, May 16th, 2014.

Table 1. Fyke Net Information, Babson Brook-mouth, Somesville, Mount Desert Island, ME.

Netting Days	Rainbow smelt (<i>O. mordax</i>)	Brook trout (<i>S. fontinalis</i>)	Invertebrate green crab (<i>C. maenas</i>)	Fat head minnow (<i>P. promelas</i>)	American eel (<i>A. rostrata</i>)
29	1	3	1 to several (9 days)	1	1

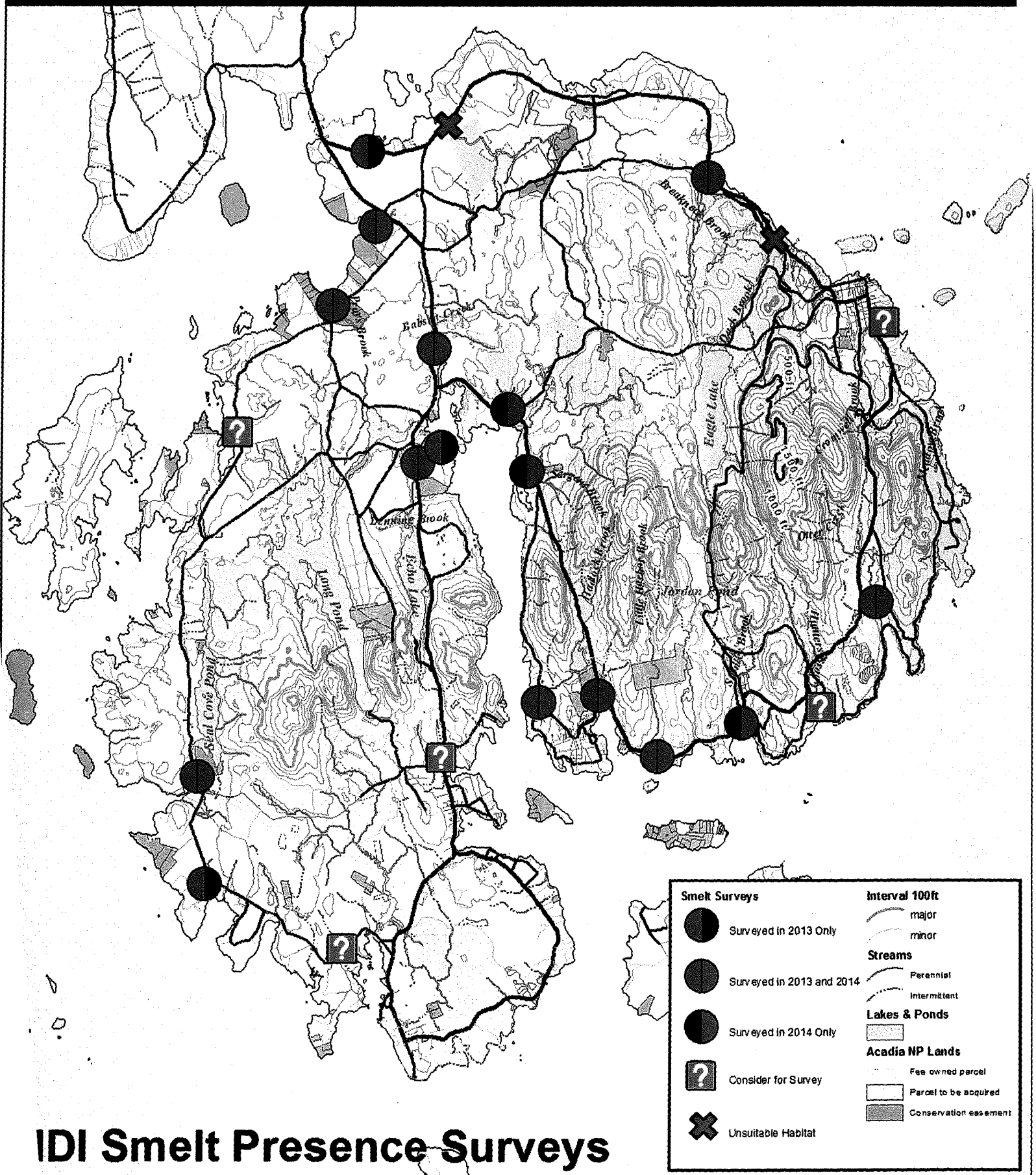
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IDI Smelt Presence Surveys