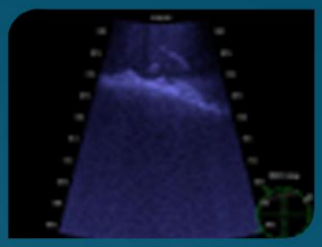
LAKE STURGEON STEWARDSHIP & ENHANCEMENT PROGRAM



Lake Sturgeon Spawning Habitat Enhancement Project

Report 09-01
February 2010

Manitoba Hydro

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Report # 09-01

A Draft Report Prepared

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By

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1.0 Introduction

Environmental studies conducted at Pointe du Bois by North/South Consultants Inc. since 2006 have revealed that the area below the Pointe du Bois GS (tailrace) and spillway are utilized by lake sturgeon for spawning (Figure 1). Specific spawning locations were identified during egg mat studies conducted in 2007 and 2008. In 2007, during a non-spill event, lake sturgeon spawned across the face of the generating station, including in front of unit 16 (Figure 2). In 2008, during a spill event, much of the lake sturgeon spawning activity was shifted to the area below the spillway. Although some spawning still occurred below the powerhouse, the area downstream of unit 16 was abandoned.

The area downstream of unit 16 has a depth of between 4.5 and 6.5 m. In 2008 and 2007, maximum water velocities were 0.7 and 0.8 m/sec, respectively, which fall within optimal velocities for lake sturgeon spawning. Substrates and flow diversity in this area are however, believed to be sub-optimal. The substrate in this area consists of small cobbles and gravel which provides few interstitial spaces for egg incubation and little flow diversity.

2.0 Objectives

To test the potential for creating suitable conditions for lake sturgeon spawning below a powerhouse tailrace, a project was proposed to enhance spawning habitat downstream of the Pointe du Bois GS. If sturgeon could be enticed to spawn in created habitat below the powerhouse it would provide greater certainty to regulators when approving compensation plans to offset habitat losses in the future. The project would also provide important information with regard to the key physical conditions that sturgeon are seeking out when selecting spawning areas, which will be valuable in the design of future mitigation and compensation plans.

3.0 Description of Enhancement WorK

The habitat in the area below unit 16 was enhanced in late April 2009 by introducing substrates composed of boulders and cobbles that provide interstitial spaces for protecting eggs and incubation; and also larger boulders at the upstream end of the introduced substrates were added to create turbulence and flow diversity for spawning. The area below unit 16 was selected for enhancement because it provided suitable water velocities and had suboptimal substrates and flow diversity. It also was in close proximity to the dock, facilitating construction, and would require shutting down only two units for construction.

The size distribution for the introduced substrates were as follows: 100% < 60 cm, 75% < 40cm, 100% > 20 cm. Turbulence was provided on the spawning site by placing four larger rocks with volumes of approximately 1-1.5 m^3 at the upstream end of the introduced substrate. The enhanced area that was created was approximately 3.5 m x 6 m and was located approximately 25 m from the face of the GS and 40 m from the shore (Figure 3).

4.0 Enhancement MonitorinG Methods

The enhanced spawning ground was monitored by two methods during spring 2009.

Egg collection mats were placed on and around enhancement area to search for direct evidence of spawning (Figure 4). The sampling gear consisted of 39x19x9 cm cinder blocks wrapped with furnace air filter material measuring 90x30 cm held in place using bungee cords. The mats were arranged in transects running parallel with the river flow, at approximately 20 to 25 m intervals for the spawning program with additional mats placed on and near the enhanced spawning grounds for monitoring purposes. The majority of transects consisted of four to five egg collection mats spaced 20 to 25 m apart along a braided nylon rope, however, some transects only had two mats and individual mats were also set. A large anchor was attached to the upstream end of each transect and one or more floats were attached to the downstream end for retrieval. The egg collection mats were pulled up every two to three days so that the air filters could be removed and inspected for eggs and replaced. GPS coordinates, depth, and velocity were recorded at each mat location.

A Didson sonar camera was used to monitor the enhanced area and surrounding habitat during spawning period to determine if lake sturgeon were attracted to the area and if any potential spawning events occurred there (Figure 5). The Didson camera was mounted to the boat's bench and lowered approximately 0.5 m below the surface. The boat was moored just downstream of the enhancement area at a suitable angle for a surface mounted camera. Monitoring of the enhanced spawning ground commenced on 27 May for several hours and continued on the 28 and 29 May. An attempt was made on 29 May to move the camera near unit 2 where spawning was known to have occurred, however, the wooden bracket holding the camera was not stable enough to withstand the flow. From 2-3 June several attempts were made to monitor the spawning ground, but technical difficulties with the camera (image distortion) precluded effective monitoring. After contacting the manufacturer of the camera, the problem was rectified and monitoring was recommenced from 4-7 June. The spawning ground was monitored for approximately 6 hours per day from 4-7 June.

5.0 Results and Discussion

In 2009 spawning occurred from late May to early June at Pointe du Bois and evidence of spawning was found in both the powerhouse tailrace and spillway areas. Egg mats and drift traps indicated that spawning was more prevalent on the spillway side than in the powerhouse tailrace area. In the powerhouse tailrace, eggs were predominantly collected from the area below units 1 and 2 (east side of station) (Figure 6).

At least two egg mats were located on the constructed spawning grounds during the observed spawning period and an additional six egg mats were located in close proximity (Figure 7). No eggs were collected on or near the constructed spawning ground during spring 2009. Lack of use of the enhanced spawning ground by lake sturgeon could be due to various reasons including an abundance of more desirable/suitable spawning areas present in other locations; substrate and/or velocity were not optimal, or that spawning occurred there but went undetected by the egg collection mats.

Turbulence in the powerhouse tailrace area and the unfixed mount set up limited the stability of the Didson camera. Despite the unstable image we were able to recognize the spawning substrate and any fish on or near it using the camera (Figure 8). The enhanced spawning ground was monitored intermittently from 27 May to 7 June, however, technical problems were persistent until 4 June. A bottom mounted set up may be more appropriate for future monitoring projects.

The first evidence of any lake sturgeon utilizing the enhanced spawning ground occurred on 2 June when a large bodied fish appeared adjacent to it. The number of fish located on or near the reach was highest around June 4 and 5. Most fish were observed using the area adjacent to the introduced substrates or swimming

briefly onto the constructed spawning ground and then off it again and appeared to use the current break created by the larger boulders at the upstream end of the reach (Figure 9). Multiple fish were observed on several occasions; however, observation did not suggest that spawning had taken place. Species identifications could not be confirmed, although the large size of the fish observed suggested that most were lake sturgeon.

6.0 Summary

Spawning occurred in the powerhouse tailrace and spillway areas with higher number of eggs present near unit 2 in the powerhouse tailrace and on the eastern side of the spillway. It appeared that sturgeon were attracted to the high flows exiting the turbines and spillway, but were utilizing the current edges adjacent to the main flow. No eggs were collected on or near the enhanced spawning grounds. Didson acoustic camera images showed large fish, which were likely sturgeon, on and near the enhanced spawning grounds, but spawning behaviour was not observed. A bottom mounted camera would likely be more suitable if future monitoring occurs.

7.0 Recommendations

Egg deposition data from the powerhouse tailrace suggest that lake sturgeon are relating to areas immediately below the powerhouse particularly when a combination of high and low flow areas are present due to unit operation. The lake sturgeon are likely relating to areas at the edge of high currents where suitable substrates exist (Figure 10).

It is recommended that additional enhancements be focused closer to the powerhouse. Based on previous spawning location information from the powerhouse tailrace and knowledge of the substrate present in the area, construction of an additional spawning ground could be conducted in two locations:

a) In close proximity to the station and adjacent to units 13, 14, or 15 (Figure 11).

Construction of a spawning ground in this area would place the substrate in closer proximity to maximum flows where less than suitable substrates currently exist (Figure 12). Increasing the amount of larger cobble and boulder materials would provide more suitable substrate for egg deposition and incubation and would diversify flows. Construction of the spawning ground at this location would also allow for manipulation of unit operation to assess and potentially increase spawning activity in the area.

b) In close proximity to the station and adjacent to or in front of units 5 and 6 (Figure 11).

Construction of a spawning ground in this location would place it in an area adjacent to existing areas that are known to be preferred for spawning. This site is in close proximity to the higher flow rates of unit 1 (a Straflo unit), which spawning sturgeon may be keying in on. There are some substrates in front of units 5and 6 that are suitable, but placement of additional substrates and larger boulders would increase the area f suitable substrates and increase flow diversity (Figure 12). This location also would allow for manipulation of unit operation to asses and enhance spawning conditions.

The recommended size of the constructed spawning grounds would be approximately 20 m long by a width sufficient to encompass a single unit plus the areas between the adjacent units. The recommended substrate size range to be introduced into these areas would be similar to those added to the area downstream of unit 16, consisting of boulders and cobble ranging from 100% < 60 cm, 75% < 40 cm, and 100% > 20 cm.

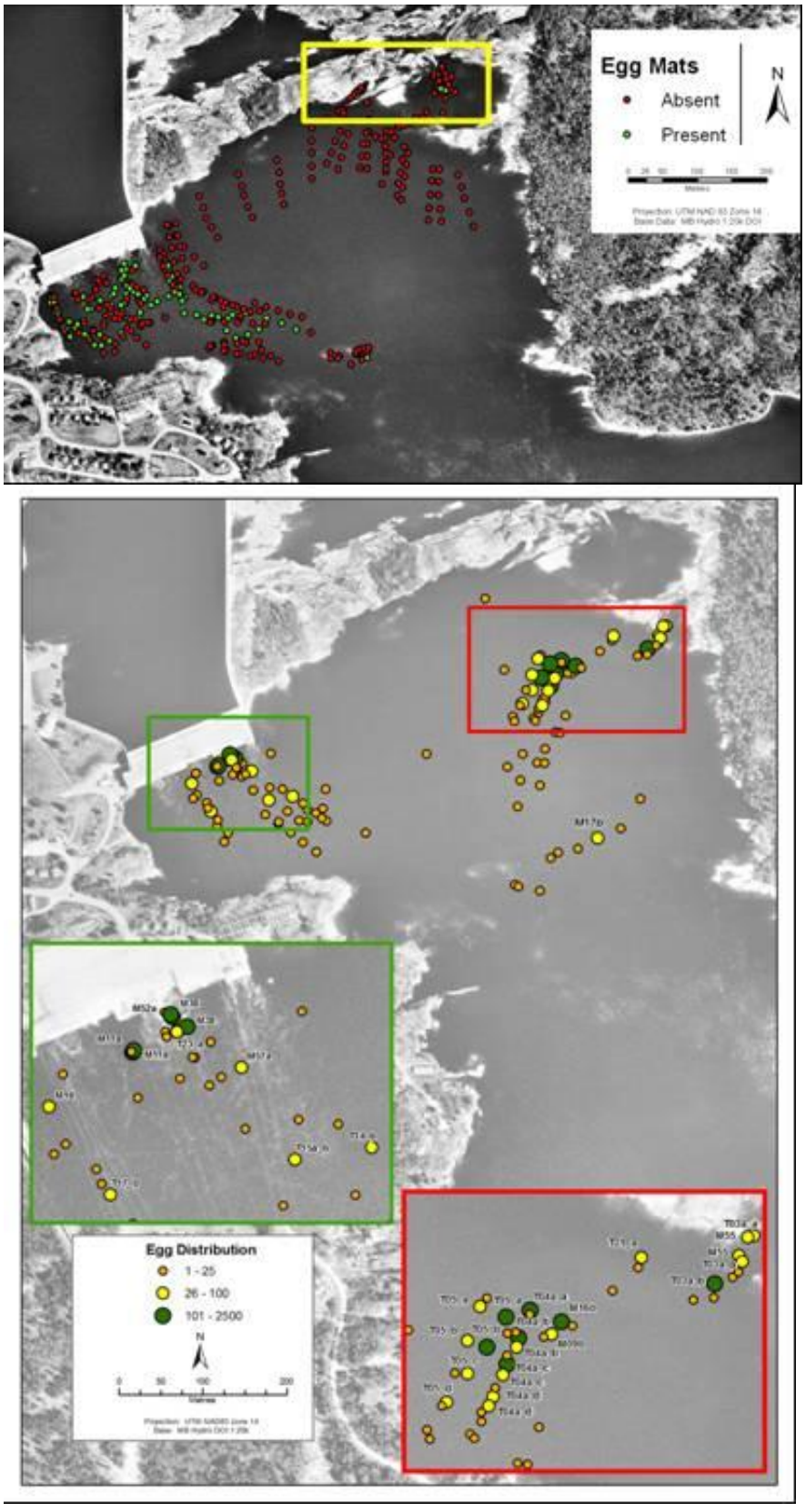

Figure 1. Egg mat results from 2007 (top) and 2008 (bottom) indicating where lake sturgeon eggs were captured.

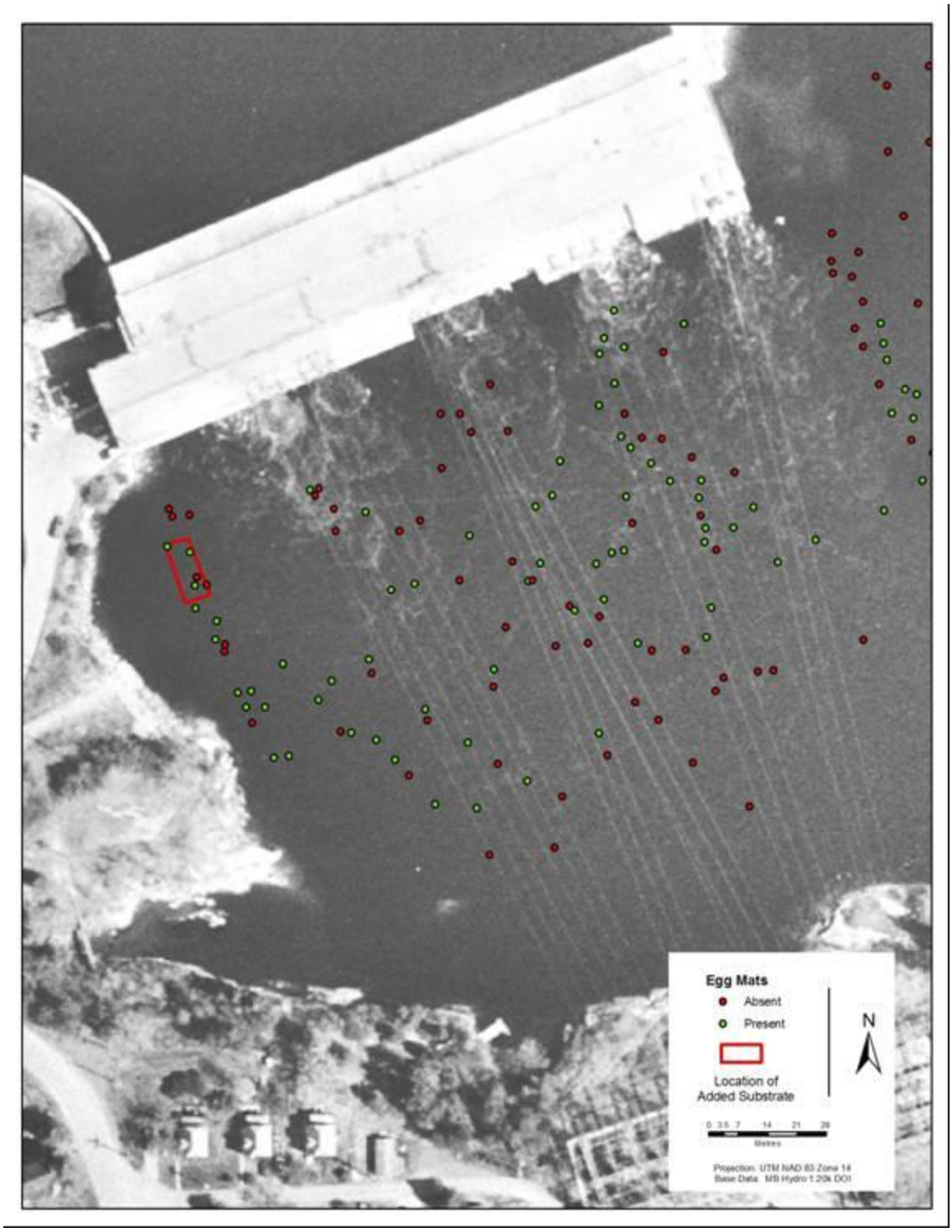

Figure 2. Location of enhanced substrate below unit 16 along with egg mat results from 2007 during a non-spill year.

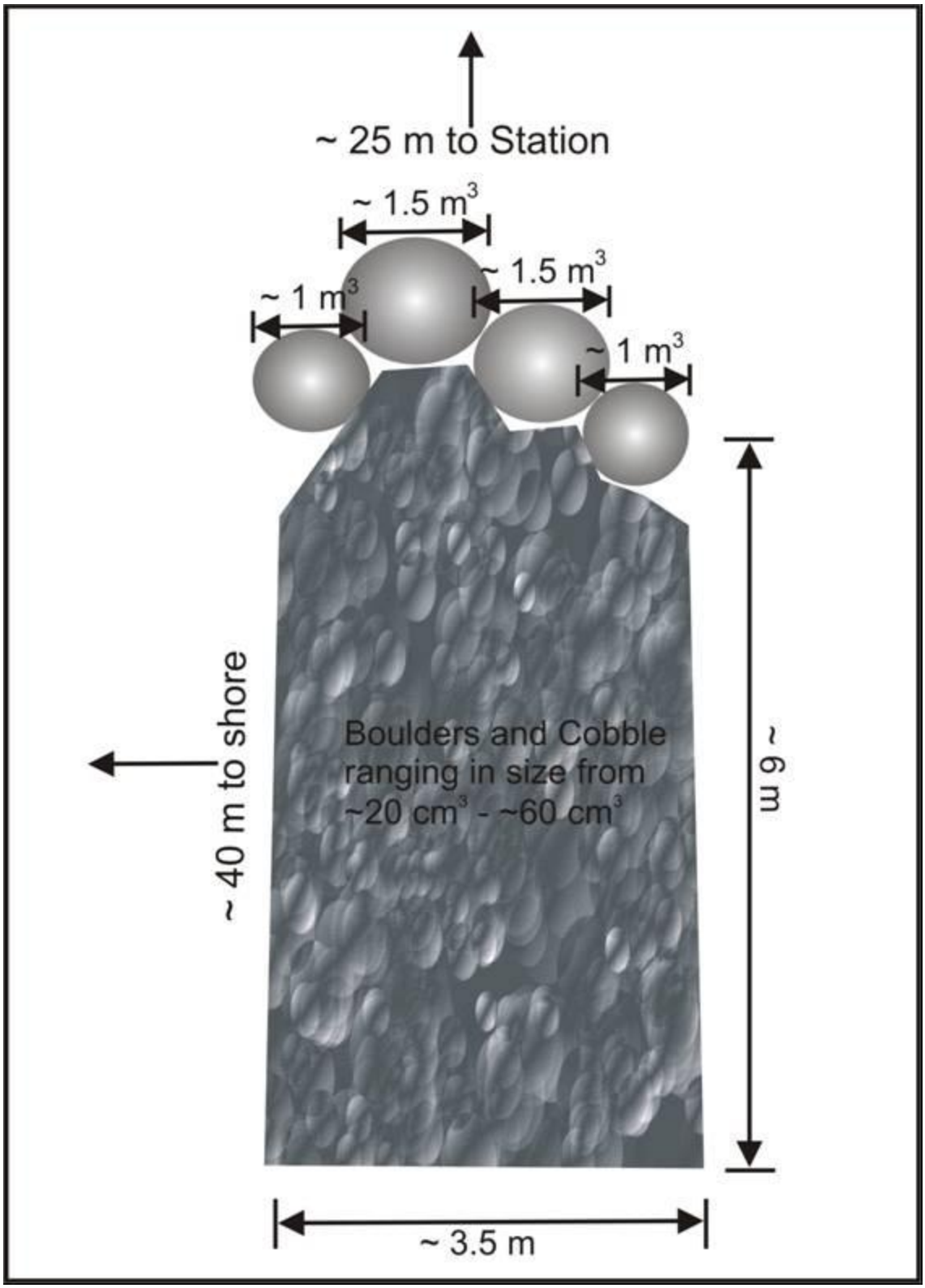

Figure 3. Conceptual drawing of the enhanced spawning habitat created below the Pointe du Bois GS in the vicinity of unit 16.

Figure 4. Egg collection mat device used to monitor spawning on and near the enhanced spawning ground.

Figure 5. Didson sonar camera set up used to monitor the enhanced spawning ground.

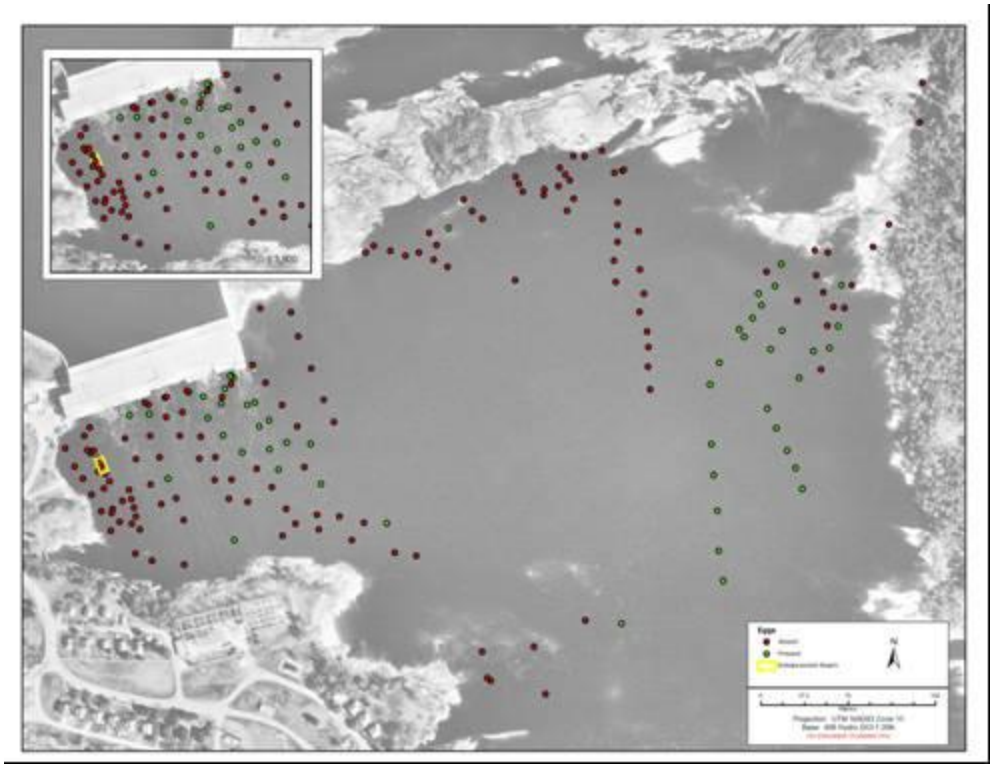

Figure 6. Egg collection mat results from below Pointe du Bois for spring 2009.

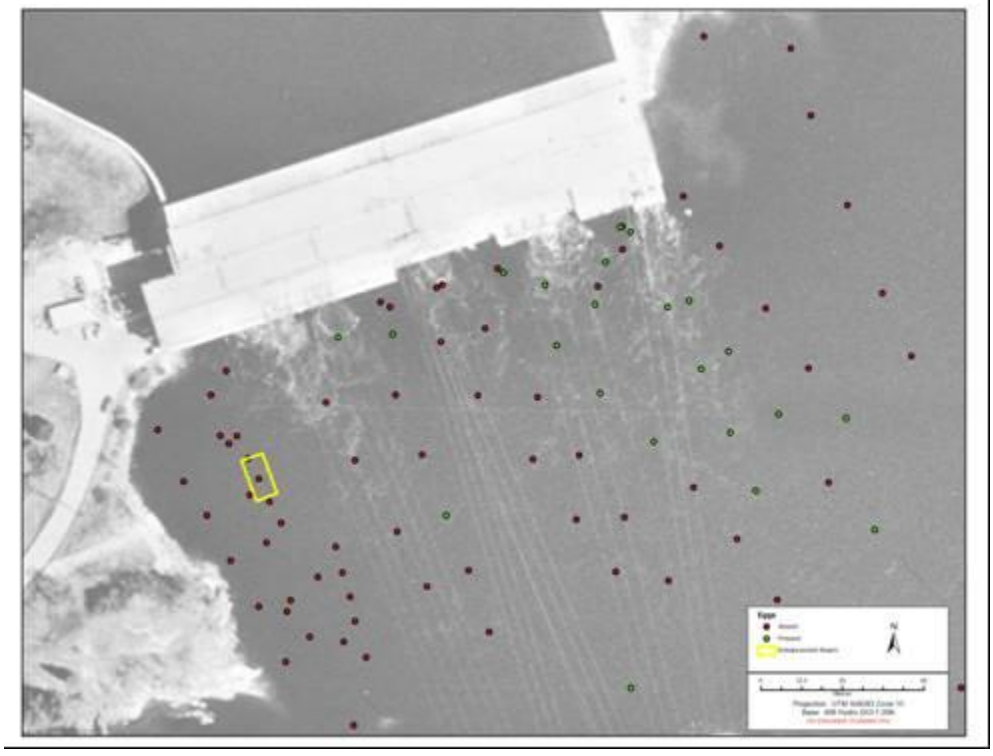

Figure 7. Egg collection mat results from tailrace area including enhanced spawning ground for spring 2009.

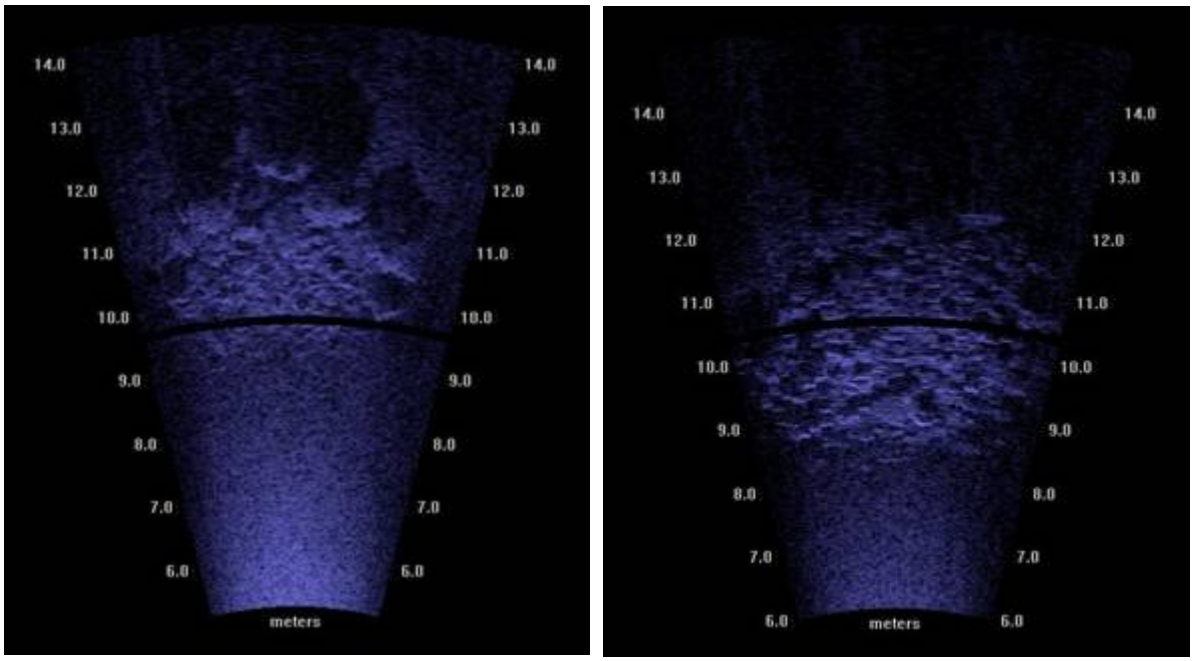

Figure 8. Didson sonar camera image of the enhanced spawning ground created downstream of unit 16.

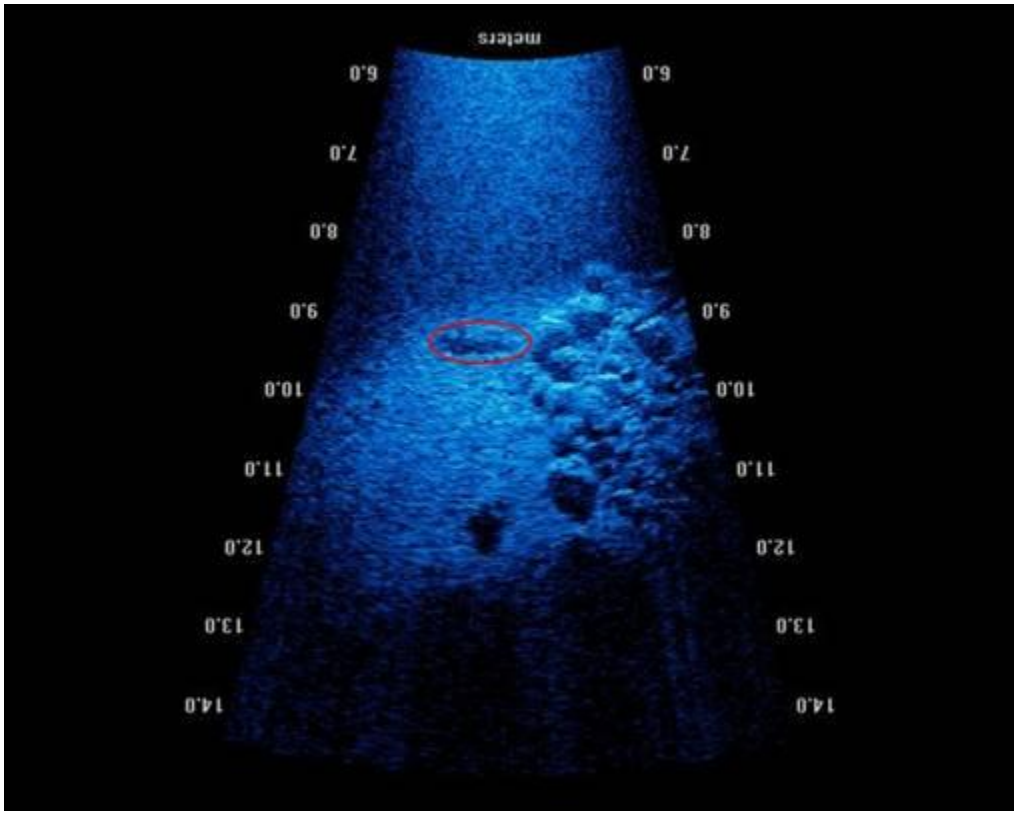

Figure 9. Still image from Didson sonar camera of large bodied fish (indicated by red circle) adjacent to the enhanced spawning ground.

Figure 10. Suitable lake sturgeon spawning substrate below powerhouse tailrace area in vicinity of units 3 and 4.

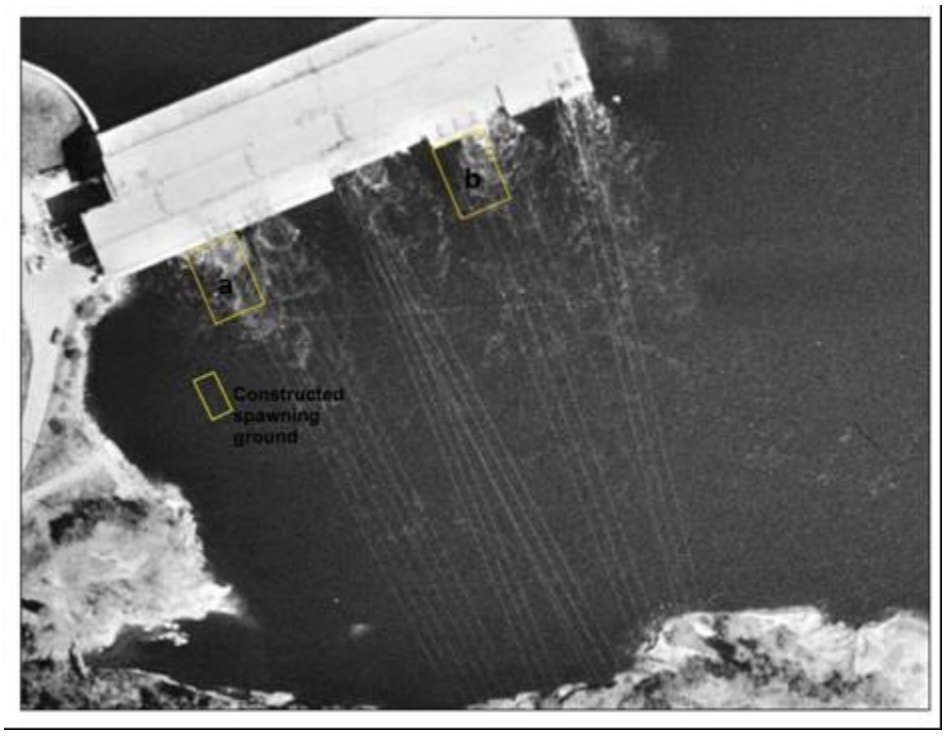

Figure 11. Potential locations for additional spawning ground construction sites. Rectangle **a** indicates the area in front of units 13, 14, or 15; and rectangle **b** indicates the area in front of units 5 and 6.

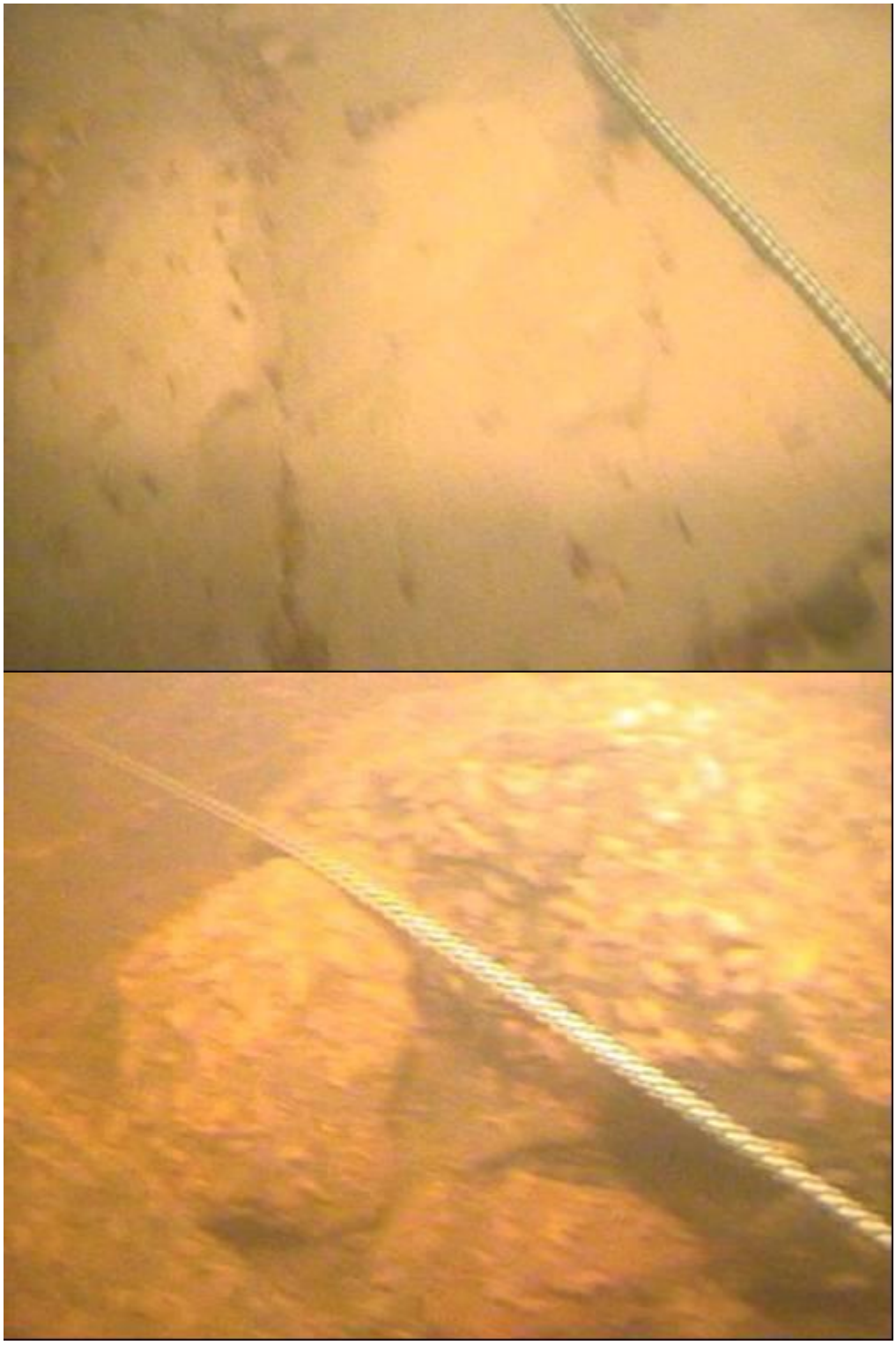

Figure 12. Images of the typical substrates currently present in the areas in front of units 13, 14, and 15 (top) and units 5 and 6 (bottom).