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29 March 2013

Mr. John K. Bullard, Regional Administrator
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, MA 01930-2276

Dr. Amy Hull, Branch Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Program
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: **Draft Monitoring Plan Required by Reasonable and Prudent Measure #1 of the Final Biological Opinion for Continued Operation of Indian Point Nuclear Generating Unit Nos. 2 and 3**

Dear Mr. Bullard and Dr. Hull:

Please find enclosed one copy of the following proposed, draft monitoring plan that was prepared on behalf of Entergy Nuclear Operations, Inc. ("Entergy") Indian Point Energy Center ("IPEC") by Normandeau Associates, Inc. ("Normandeau") and ASA Analysis and Communications, Inc. ("ASA") to address Reasonable and Prudent Measure ("RPM") #1 as specified in Terms and Conditions ("T&C") #1 of the Final Biological Opinion for Continued Operation of Indian Point Nuclear Generating Unit Nos. 2 and 3 dated 30 January 2013:

> **"Proposed Draft Monitoring Plan for Indian Point Energy Center Take of Atlantic and Shortnose Sturgeons by Impingement at Cooling Water Intakes" 29 March 2013.**

A copy of this letter and the Draft Monitoring Plan were also sent by Email to the members of your staff identified in the enclosed distribution list. As discussed with your staff, we look forward to meeting with them at the Indian Point facility in the near future for a tour of the intakes, to discuss implementation of the proposed draft study plan, and to answer any remaining questions that you may have.

Sincerely,

NORMANDEAU ASSOCIATES, INC.

Mark T. Mattson

Mark T. Mattson, Ph.D.
Vice President

IE25
NRR

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Email Distribution List 29 March 2013 (those with mailing addresses will also receive printed copy):

"Proposed Draft Monitoring Plan for Indian Point Energy Center Take of Atlantic and Shortnose Sturgeons by Impingement at Cooling Water Intakes" 29 March 2013.

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> **"Proposed Draft Monitoring Plan for Indian Point Energy Center Take of Atlantic and Shortnose Sturgeons by Impingement at Cooling Water Intakes" 29 March 2013.**

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Proposed Draft Monitoring Plan for Indian Point Energy Center Take of Atlantic and Shortnose Sturgeons by Impingement at Cooling Water Intakes

Presented to:
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Submitted:
29 March 2013

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1.0 Introduction

1.1 Regulatory Context

On 30 January, 2013, the National Marine Fisheries Service (NMFS) issued a final Biological Opinion (Opinion) and Incidental Take Statement (ITS) authorizing takes of shortnose and Atlantic sturgeon during the continued operation of the Indian Point Energy Center (IPEC) pursuant to existing operating licenses and proposed renewed operating licenses to be issued by the U.S. Nuclear Regulatory Commission (NRC). In the Opinion, NMFS addressed shortnose sturgeon and the Gulf of Maine Distinct Population Segment (DPS), the New York Bight DPS, and the Chesapeake Bay DPS of Atlantic sturgeon.

Among other things, the Opinion requires that "Entergy must develop a proposed, draft monitoring plan designed to document all shortnose and Atlantic sturgeon impinged at IP1, IP2 and IP3 (trash racks and intake screens) while these facilities are operating under their existing operating licenses and the proposed renewed operating licenses. The draft monitoring plan must be provided to NMFS and NRC within 60 days of the issuance of this Opinion for NMFS review and approval." The Opinion also contains Reasonable and Prudent Measures (RPMs) and Terms and Conditions (T&C) that are to be "developed in coordination with the action agency and applicant, if any, to ensure that the measures are reasonable" (USFWS & NMFS, 1998).

This document provides Entergy's proposed monitoring plan for NMFS' review in a manner that is responsive to the RPMs and T&C, while accounting for NMFS' fundamental findings in the Opinion and ITS. The proposed plan addresses RPMs #1-#5, and T&C #1-8 of the Opinion as completely as possible; however, there are certain aspects of the T&C that cannot reasonably be implemented at IPEC. The plan identifies departures from the T&C, provides an explanation for the departure, and presents reasonable alternatives that will still achieve the objectives of the monitoring plan.

1.2 Description of IPEC and Operations Relevant to the Proposed Monitoring Plan

Entergy Nuclear Operations, Inc. (Entergy) currently operates two NRC-licensed pressurized water reactors and associated generating units (IP2 and IP3; collectively, IPEC). These units condense the steam exiting the turbines by transferring heat to water withdrawn from the Hudson River, which is then discharged back to the river. Maximum cooling water flow is 840,000 gpm at each unit.

Both IP2 and IP3 also use once-through systems to manage auxiliary heating loads, referred to as service water systems. These service water systems at IP2 and IP3 are significantly smaller than the cooling water systems, with maximum (design) service water flow of 30,000 gpm at IP2 and 36,000 gpm at IP3 (Enercon 2010), although service water flows are typically 15,000 gpm or less for each unit. The cooling water system for IP1 was originally designed to provide 280,000 gpm before the generating unit was retired in November 1974. The cooling water pumps at the IP1 intake were removed in the 1990s, but the IP1 service water system is still operational and provides up to 16,000 gpm of supplemental service water for IP2 if needed.

1.2.1 Cooling Water Intake Structures

Cooling water for IP2 and IP3 is obtained through their respective cooling water intake structures (CWISs), located approximately 700 feet apart along the eastern shoreline of the Hudson River at approximately Hudson River mile 42.8 (42.8 miles upstream from the southern end of Battery Park in lower Manhattan). The CWISs are located within IPEC's federally mandated Safety and Security Zone (S&SZ).

The IP2 intake structure contains seven bays or channels, which are separated by 3-foot thick concrete walls (Figure 1-1). Each intake bay is equipped with a debris wall that extends to a depth of -1 foot mean sea level (MSL), and a vertical bar rack, or trash rack, with 3-inch spaces between bars, to prevent large pieces of debris from entering the structure. The bar racks extend the full height of the opening (-27 ft to -1 ft MSL). Design velocities through the bar racks for the six cooling water intake bays range from 0.5 to 0.8 fps depending on pumping rate and tide height. Design velocity through the bar rack protecting the service water bay in the center of the intake structure at IP2 ranges from 0.06 fps to 0.17 fps. The design of the intake with the top of the trash bar rack submerged 1 ft below MSL and near the opening of each intake bay minimizes the buildup of debris on the bar racks, and there is no need for a mechanized cleaning system. The bar racks are inspected twice annually, and any accumulated large debris is removed at that time.

The IP3 intake structure, located south of the IP1 intake, consists of a concrete structure with nine openings which provide flow to a common plenum (Figure 1-2). The seven openings along the face (western side) of the intake are each equipped with a debris wall and vertical bar rack similar to those at IP2. Design velocity through the bar racks is 0.5 to 0.9 fps depending on cooling water flow rate and water level. Actual velocities through the seven bar racks is less than the design value because there are two additional openings, one at the north end and one at the south end of the structure (Figure 1-2). These openings contain additional bar racks. As at IP2, debris accumulation on the bar racks at IP3 has not been an issue because the racks are submerged 1 ft below MSL and are located at the outer edge of the intake structure. The IP3 intakes are cleared of any built-up debris accumulation during twice annual inspections.

Unlike the seven isolated bays at the IP2 intake structure, the design of the IP3 intake structure makes it possible for fish that pass through the trash racks associated with any of the seven openings on the western side of the structure to swim within the structure parallel to the traveling screens and exit the structure through the openings at the north and south ends.

The IP1 intake structure is located between the IP2 and IP3 intakes (south of IP2 and north of IP3), behind a pile-supported dock. The IP1 intake is outfitted with coarse bar screens (3.5 inch on center spacing, 3 inch open space) at each of four intake bays, which are arranged in two sets of two bays each. Since the original IP1 intake was designed to accommodate 280,000 gpm of cooling water flow, but now withdraws no more than 16,000 gpm of service water flow, the through bar rack intake velocities at IP1 are considerably lower than at IP2 or IP3. A single 0.125-inch mesh dual- flow screen is located within the service water portion of each of the two intake bay sets at IP1. Each dual flow traveling screen at IP1 has a design through-screen velocity estimated as less than 0.5 ft/second, which is considered to be the best technology available (BTA) for reducing impingement by USEPA in their proposed regulations of cooling water intake structures at existing facilities (40CFR §125.94(b)(2) (28 March 2011).

1.2.2 Cooling Water Flow Management

The dual speed cooling water pumps at IP2 and variable speed cooling water pumps at IP3 were installed in the mid-1980s to minimize impingement and entrainment of fish by reducing the amount of water used for cooling. Since the amount of water needed for efficient operation varies with the river temperature, cooling water flow is reduced as much as 50% during winter months when river temperature is at its annual low. Lower flow rates not only reduce the amount of water withdrawn, but also reduce the intake velocity, facilitating escapement of fish that otherwise might be susceptible to impingement.

At IP2, each of the six of the cooling water bays provides water to an individual cooling water pump, which is located 35 feet behind the traveling screens. At the maximum pumping rate (140,000 gpm per pump), the maximum (at mean low water) calculated through-screen velocity for the IP2 traveling screens is 1.6 fps (Enercon 2010). The IP2 cooling water pumps can also be operated at 84,000 gpm, which proportionally reduces the maximum average through-screen velocity to 1 fps. For the service water intake bay at IP2, the maximum through-screen velocity is 0.35 fps when all six service water pumps are operated at a maximum (design) capacity of 30,000 gpm.

The six IP3 cooling water pumps, each enclosed in an intake bay and located 28 feet behind the traveling screens, have a continuously variable capacity between 70,000 and 140,000 gpm. Three of the bays are also equipped with 3,200 gpm screen wash pumps. The seventh bay, located in the center of the structure, provides water to the six service water pumps, which have a maximum combined capacity of 36,000 gpm. As at IP2, the maximum average through-screen velocity for the cooling water bays is 1.6 fps (Enercon 2010), and is 0.4 fps for the service water bay.

The dual-flow screens in the IP1 intake filter the water drawn by the single 16,000-gpm service water pump and the two 1500-gpm spray wash pumps in each of the two intake bay sets. The screens are washed automatically when water level differences between the front and back of the screens exceed predetermined settings. Materials removed from the traveling screen mesh are sluiced to the Hudson River in the wash water flow. During normal operation only one of the two service water pumps and two of the spray wash pumps is in operation at any given time at IP1(Enercon 2010).

1.2.3 Optimized Ristroph-Type Traveling Water Screens

The IP2 and IP3 intakes are outfitted with optimized Ristroph-type traveling screens and fish handling and return systems. The Ristroph-type screens and fish return systems were operational at IP3 in 1990, and at IP2 in 1991, following a collaborative research, design, and validation effort among the former owners of IP2 and IP3, the New York State Department of Environmental Conservation (NYSDEC), and the scientific advisor to the Hudson River Fisherman's Association (HRFA, now Riverkeeper).

The Ristroph-type screens have the following aquatic organism protection features:

- **Dual-speed continuous rotation -** The screens are rotated continuously. Under low debris loading conditions, the screens are rotated at 2.5 fpm and under high debris loading at 10 fpm. Impingement on the screens and mortality of those organisms that are impinged is less likely to occur when low through-screen velocities are maintained by the continuous removal of debris. Continuous rotation also minimizes the time that impinged organisms are retained on the screen panels or in the fish buckets. These features significantly reduce the potential stress on impinged organisms.
- **Smooth screen mesh -** The 0.5 inch × 0.25 inch clear opening slot mesh on the screen panels is smooth, to minimize abrasion to fish transferred into the fish return systems.
- **Flow deflector lip on fish buckets -** The curved lip at the leading edge of the fish buckets is designed to minimize vortex stress on fish inside the buckets. The lip eliminates turbulent flow in the interior of the buckets and provides sufficient water depth to allow fish to maintain a stable, upright position (Fletcher 1985).
- **Dual-pressure spray wash systems -** The screens encounter a series of spray washes in the operating rotation. First, high-pressure sprays are used to remove debris from the screen mesh surface. During this process, deflector plates are used to protect aquatic organisms in the fish buckets. Low-pressure sprays are then used to gently remove aquatic organisms from the fish buckets for release through the fish return system. Finally, another series of high-pressure sprays are used to wash off any remaining debris to prevent "carryover" into the intake bays and assist in maintaining the available open area of each screen panel to reduce the potential for impingement.

The current fish handling and return systems at IPEC also incorporate several design features specifically selected to enhance fish survival:

- Separate fish return and debris return systems are provided.
- Fish return systems have smooth surface coatings and gentle transition sections to minimize the potential for fish abrasion during transport.
- Design water depths are maintained to allow the fish to remain in a stable, upright position during transport.
- Design trough/sluice water velocities are maintained between 2 fps and 5 fps, which are sufficient to transport the organisms back to the river while minimizing stress during transport.
- Return pipe discharge locations were selected following dye and fish release studies to minimize the potential for re-impingement.

Collectively, the optimized Ristroph-type screens and the fish return systems, both developed through the extensive collaborative process referenced above, reflected first-in-kind design when installed, and continue to reflect state-of-the-art design today. The effectiveness of the modified Ristroph-type screens in reducing impingement losses was demonstrated in studies showing the technology to be fully optimized as BTA for impingement (Fletcher 1990), a conclusion supported by the inclusion of the IPEC configuration as BTA for impingement on a nationwide basis (USEPA 2011).

Entergy proposes to continue operating IPEC using this once-through cooling system for the duration of its operating licenses, or until a different system is determined to be BTA for the IPEC facility and the alternative system can be permitted, constructed, and installed.

2.0 Monitoring Program

The implementation schedules for monitoring (1) trash racks, (2) intake bays, (3) the traveling screens, as well as (4) collecting ancillary data associated with sturgeon occurrences, are set forth in the program components below (with references to the specific section of the Opinion in which the program element is specified).

2.1 Monitoring at Trash Racks

Monitoring sturgeons at the trash racks is specified by RPM#1, and T&C#s 1.a, 1.b, and 1.c of the Opinion.

2.1.1 IP2 and IP3

The main focus of trash rack monitoring is on moribund or dead sturgeon, which would be impinged at the trash racks solely because they are incapable of escapement. Specifically, since sturgeon large enough to become impinged on the trash racks are also large enough to easily avoid or overcome the intake approach velocity at the trash racks ranging from 0.5 to 0.9 fps, the only sturgeon likely to be found against the trash racks are ones that died before encountering the IPEC intake and drifted against the trash racks in the intake flow.

It is expected that sturgeon impingement on the trash racks will be extremely infrequent because (1) sturgeon large enough that they could not fit through the trash racks (i.e., those greater than 3 inches in limiting body width dimensions, or approximately 600 mm total length) would have few predators and low natural mortality rates and (2) closure of the shad and sturgeon fisheries in the Hudson River has eliminated the fisheries by-catch mortality that was the likely source of many previously observed sturgeon impingements at IPEC.

There are no feasible access points to assess impingement at the trash racks from the bulkheads at the CWISs, either directly by visual observation or with remote sensing equipment. The only practical method of detecting impingement on the trash racks is to use a sampling vessel equipped with mobile imaging sonar. Due to the expected low frequency of occurrence, as well as the expense, difficulty, and safety concerns inherent in conducting sampling vessel operations at the face of an operating intake structure, Entergy proposes to monitor the trash racks once weekly (except in extreme weather conditions such as ice flows in the winter or high winds, waves, and other storm events) during the first two years of the monitoring program. This frequency of monitoring, which is commonly used for impingement sampling programs, will be used to evaluate whether trash rack monitoring frequency should be increased, decreased, or discontinued altogether in remaining years.

Another consideration determining the appropriate monitoring frequency is the rate at which dead fish are likely to deteriorate to the extent that they can no longer be detected.

Degradation of fish carcasses results from scavenger predation and bacterial decomposition, with both processes occurring more rapidly at warmer temperatures. Weekly monitoring at the trash racks should be frequent enough so that decomposition does not prevent the detection and collection of any dead impinged sturgeon. If deterioration of sturgeon impinged on trash racks in less than a week is indicated by the presence of decayed sturgeon or sturgeon parts in traveling screen impingement collections (Section 2.3), then a deterioration rate study will be designed in conjunction with NMFS and conducted to establish the appropriate adjustment to the trash rack monitoring frequency.

Examination of trash racks for impinged sturgeon will be conducted using a mobile imaging sonar unit called an Adaptive Resolution Imaging Sonar (ARIS) Explorer 1800, manufactured by Sound Metrics Corporation (Figure 2-1), deployed from a sampling vessel in front of each intake bay. ARIS is a further development of the successful dual-frequency identification sonar ("DIDSON") technology, with increased resolution and reliability, enhanced electronic capabilities, and decreased weight and power consumption. This technology can distinguish sturgeon from other fishes (Nelson et al. 2010) and was effective within a range of 20 m in detecting white sturgeon and estimating their sizes in spawning concentrations in the Columbia River (Crossman *et al.* 2011).

Any sturgeon will be removed from the trash racks with a long handled (35 ft -40 ft) dip net while observing the positioning of the net opening with the ARIS to guide it to the impinged fish. This dip net is a wire basket mounted in a frame that slides down and up on grooved rollers or guides that align with the 3.5-inch on center spacing of the bar racks to guide the net as it is lowered through the water while being pressed against the trash rack by the intake current. Any sturgeon removed from the trash racks will be processed as described in Section 2.4.

2.1.2 IP1

The Unit 1 trash racks are deeply recessed behind the fuel dock, which precludes access to the outside of the trash racks by boat, and there are no deck openings that would provide access from above. It is therefore not possible to effectively monitor the IP1 trash racks. Given the unknown but low expected frequency of occurrence at the IP2 and IP3 trash racks, and the much lower flows and associated through-rack intake velocity at IP1 (about 1% of the flow rate for all three units combined), it is expected that impingement at IP1 trash racks would be exceedingly rare. Indeed, expected impingement would be well below the typical thresholds for considering impingement impacts, particularly (1) for robust species, such as sturgeon, and (2) because any sturgeon impinged on the IP1 trash racks was likely dead before becoming impinged. For these reasons, trash rack monitoring of Unit 1 is not reasonable in light of the fundamental objectives of the Opinion and monitoring program.

2.1.3 Trash Rack Monitoring Implementation Schedule, Modifications, and Permits

Trash rack monitoring at IP2 and IP3 will be implemented within 120 days of NMFS' final approval of this monitoring plan.

Trash rack monitoring will not require any modification to IPEC's intake structures that would need NRC or State of New York approvals before implementation. Although no physical plant alterations are required for trash rack monitoring, prior to implementation

IPEC will need to approve the project-specific Health and Safety Plan (HASP), and provide the necessary security clearance for the observer boat to approach the intake structures.

2.2 Monitoring in Forebays

The Opinion requires monitoring for and removal of sturgeons from the intake forebays (spaces between the trash racks and the traveling screens) in RPM#1 and T&C#s 1.d, 1.e, and 1.f. There are several reasons why this requirement is not reasonable to implement at IPEC. First, any live sturgeon in the forebays will either swim back out into the river voluntarily through the trash racks or they will be collected on the continuously rotating Ristroph screens and released back into the river via the fish return troughs, making their removal from the forebays unnecessary. Second, this location is very difficult to access and would not be a place where people could work safely. Third, detection of sturgeon within the forebays would be difficult because the imaging sonar technology used for detection would not work well in this confined space due to interference from the structures. Fourth, even if sturgeon could be detected, it would not be possible to capture and remove them in a way that would impose less stress than allowing them to either return to the river voluntarily or be collected on the Ristroph screens (a system proven to produce high survival rates).

Thus, this is not a reasonable monitoring requirement for implementation at IPEC.

2.3 Monitoring at Traveling Screens

Monitoring, detection, and handling of sturgeons impinged on the traveling screens is required by RPM#1 and T&C#1.e of the Opinion.

As described in Section 1, IPEC's traveling screens meet USEPA's definition of Best Available Technology for reducing impingement mortality by (1) ensuring that aquatic organisms are retained on the screens for a very short time due to continuous rotation, (2) using modified "buckets" that provide a haven of stilled water protecting fish from turbulence before the screen rotates above the water, (3) having a specially designed wash system to remove organisms from the screens with a minimum of damage, (4) employing optimized return trough designs to eliminate damage during transit back to the river, and (5) releasing fish at locations selected to minimize re-impingement and predation. This entire system, designed and installed more than 20 years ago through the cooperative efforts of the IPEC owners, NYSDEC, and HRFA, minimizes mortality of fish and other organisms that interact with the traveling screens, if it is allowed to operate as designed.

Modifications to the system, and operation in a way that would ensure that all (as opposed to a representative sample of) sturgeon are detected, identified, and handled, will result in unnecessary mortality on many other species of impinged fish, particularly clupeids (herrings) and engraulids (anchovies), which are not as hardy as sturgeons. For this reason, we propose a sampling approach to this requirement that will permit accurate estimation of the levels of sturgeon impingement (Cochran 1977), while still allowing most other impinged fish to be returned rapidly to the river and minimize their mortality.

2.3.1 Traveling Screen Monitoring at IP2 and IP3

Consistent with the shared goal (by Entergy, NYSDEC, HRFA, and presumably also NMFS) of minimizing stress on all impinged fish (including sturgeon), sturgeon that are collected by the continuously rotated traveling screens will be sampled during one 24-hour sampling event per week at each operating unit during the first year of monitoring. In the second year, Entergy will consider and discuss with NMFS whether a variable frequency sampling plan can be implemented in which that sampling effort is redistributed among seasonal sampling strata (Mattson *et al.* 1988) to better reflect the observed seasonality of sturgeon impingement. If the variable frequency plan is not adopted, the year one methodology described below will be followed in year two.

To enable IPEC's fish handling and return system to convey live impinged fish promptly back into the Hudson River with minimal stress, fish in the screen wash flow in the fish return sluices will be diverted by modified fish sluice sections into temporary holding tanks. The tanks will be designed to minimize handling stress and sized to accommodate maximum expected impingement loadings of fish over 24 hours, considering both the number and sizes of fishes that could be impinged. Tanks will normally be staffed for one eight-to-ten-hour shift each sampling day to process the fish and debris collected over the previous 24 hours. All fish and debris collected will be examined for the presence of sturgeon, and any sturgeon found will be removed and processed as described in Section 2.4. Fish other than sturgeon will be allowed to return to the river in the screen wash flow downstream from the sampling devices without being processed.

Suitable locations for the required sampling tanks were identified at both IP2 and IP3 during a site visit on 26 February 2013, and will be a topic of discussion during the proposed intake tour with NMFS:

> IP2 – There are two separate sluice systems, each serving three of the six CW pumps. Each of the IP2 fish sluices drops below deck level soon after passing the last of the three screens it services, and the junction of the flows from the two fish sluices is below deck. A separate holding tank will be installed at each of the two fish sluices at IP2 (South for screens 21-23, and North for screens 24-26), where there is available space for an above-deck tank that can drain into the below-deck sluice (Figure 2-2).
>
> IP3 – The single fish sluice will be diverted into a single collection tank located between the discharge canal and the building housing the traveling screens (Figure 2-3).

Each holding tank will be fitted with a screened area of 0.5 inch x 0.25 inch mesh to temporarily retain all fish and debris for examination. The mesh will surround the top of the tank to maximize filtering area and therefore minimize through-mesh velocity, minimizing both the stress on the fish and the potential for debris to clog the mesh.

Although holding stress in the collection tanks will be minimized to the extent possible, the holding period of up to 24 hours will be likely to induce some mortality, particularly in pelagic, active swimming species, such as herrings and anchovies. Consistent with hatchery experience, it is expected that sturgeons will not be adversely affected by retention in the tanks for this 24-hour period because juvenile and adult shortnose sturgeon have been held in hatchery facilities with cylindrical outdoor tanks for periods of months to years for experimental testing (Collins *et al.* 2002).

Apart from minimizing physical stress from turbulence, the two critical aspects that control survival rates of fish in holding tanks are biomass density (kg/m^3) and turnover rate, which is the number of tank volumes exchanged per hour (Wedemeyer 2001). The tanks must be large enough to avoid overcrowding, but small enough so that the flow rate through the tanks generated by the screen wash water will provide adequate water exchange, thus maintaining favorable dissolved oxygen concentrations and preventing accumulation of metabolic wastes. The critical aspects of density and turnover are determined by three factors: the flow rate through the tank, the total biomass of fish, and the size of the tank (Wedemeyer 2001). Tank dimensions will be designed to maintain acceptable levels of biomass density and turnover rate within the constraints of (1) the maximum flow rate, (2) the maximum anticipated impingement rate, (3) available space, and (4) practical limits of the size tank that can be tended by a crew of two in a reasonable amount of time.

2.3.2 Traveling Screen Monitoring at IP1

Due to the extremely low flows at IP1, where only one set of service water pumps and screen wash pumps are in use at an intake structure designed for much higher flow rates, the amount of water withdrawn is so small and the intake velocities are so low that expected impingement is nearly zero. NMFS expectation stated in the Opinion, based on the proportion of water withdrawn at IP1 but not considering the lower intake velocities, is a rate of 1 shortnose sturgeon and 1 Atlantic sturgeon per 10 years of operation. Furthermore, each dual flow traveling screen at IP1 has a design through-screen velocity estimated as less than 0.5 ft/second, which is considered to be the best technology available (BTA) for reducing impingement by USEPA in their proposed regulations of cooling water intake structures at existing facilities (40CFR §125.94(b)(2) (28 March 2011). Therefore, it is not reasonable to expend the time and effort to monitor for events that are this infrequent, particularly if the same information can be gained by monitoring at locations where expected occurrences are much more frequent.

2.3.3 Traveling Screen Monitoring Implementation Schedule, Modifications, and Permitting

Once both NMFS and NYSDEC have approved the final monitoring plan, there are certain reviews required by IPEC (including an engineering structural analysis of load-bearing requirements) to ensure that continued safe operation of IPEC is not jeopardized by the proposed CWIS modifications. Traveling screen monitoring is proposed to be implemented within approximately 180 days after the later of NYSDEC's approval of the monitoring plan and the associated changes to the design and operation of the Ristroph screen system or the completion of the NRC-mandated modification review discussed below.

Traveling screen monitoring will require modification of the NYSDEC-approved fish return systems to allow diversion of the flow in the fish sluices into holding tanks and drainage from the tanks back into the fish return system farther downstream. Thus, NYSDEC's prior approval will be required before making these changes to IPEC's fish return system and its operation, including temporary stoppage of traveling screen washing and rotation to connect modified sluice sections to the tanks. Consultations will be held with NYSDEC during the finalization of the monitoring plan to obtain in advance their necessary approval.

Entergy also provided the following list of steps that likely will be required to install the collection tanks and modify the fish sluices at IP2 and IP3 in compliance with all applicable IPEC procedures:

- Obtain a Project Manager/Engineer and project team
- Develop a Project Plan
- Obtain detailed cost estimate and funding approval
- Obtain plant approval from engineering change review group and other management committees, as needed
- Develop an Engineering Request and Engineering Change
- Develop a Risk Management Plan
- Perform a 10CFR50.59 screening to determine if an NRC review is required (an NRC review is not likely to be required)
- Determine the actual screen wash flow rates to enable finalization of the size and design of the collection tanks
- Perform an engineering structural analysis to ensure that flooring and underground utilities can support the weight of the filled tanks at the chosen locations
- Obtain a contractor
- Procure the equipment
- Develop IPEC operating procedures
- Develop biologist Standard Operating Procedures (SOP)
- Connect the completed system and test it

2.4 Fish Handling Procedures

Any sturgeon collected will be processed as required under the federal Endangered Species Act following the stated RPMs and T&Cs of the Opinion.

2.4.1 Live Fish

All live sturgeon will be processed as specified in RPM#2 and T&C#3 of the Opinion by the procedures described in this section to check for previously applied tags, measure the length and weight, record any physical abnormalities, photograph the specimen if smaller than 250 mm total length (TL), apply an external tag if the specimen is larger than 250 mm TL and was not previously tagged, apply a magnetic tag if one is not already present, collect a genetic sample, and release the specimen away from the intake via the existing fish return system.

Previously applied tags could include yellow USFWS Floy tags, Carlin-Ritchie disc tags, or passive-integrated transponder (PIT) tags. A hand-held PIT tag reader will be used to examine for the presence of internal PIT tags. The tag type and number of any tags found will be recorded and the condition of the tag insertion site will be noted (whether healed or infected).

The total length (TL) will be measured to the nearest mm and the fish will be weighed to the nearest gram.

Any obvious physical abnormalities, such as fin rot, will be noted.

Photographs will be taken of sturgeon smaller than 250 mm TL and any recaptured previously tagged specimens to provide verification of the species identification. Three digital photographs of each specimen will include a close-up of the eyes with a mm ruler for scale, a close-up of the mouth with a mm rule for scale, and a close-up side view of the base of the anal fin to reveal the presence or absence of anal scutes.

If the sturgeon is larger than 250 mm TL and was not previously tagged, a Floy dart tag will be attached to the dorsal fin base by inserting the tag forward and angled slightly downward through the dorsal pterygiophores and twisting it to ensure anchor attachment.

Before a sturgeon is released alive it will be tagged with a PIT tag (if one is not already present) to assess re-impingement and post impingement handling and tagging survival. The tag will be inserted with a large hypodermic needle under the third or fourth dorsal scute by first puncturing in a fleshy area and then positioning the needle to push up underneath the scute. The fish will be scanned with the PIT tag reader and the tag number will be recorded.

A genetic sample will be collected by the procedures in Section 2.4.3 from each live sturgeon that was not previously tagged.

To minimize the risk of re-impingement or exposure to the thermal plume, live sturgeon will be released in the screen wash flow through existing return sluices, which were designed to transport impinged fish to locations sufficiently deep and far enough from the intakes to avoid the thermal plume and the intakes.

2.4.2 Dead Fish

All dead sturgeon will be processed as specified in RPM#3 and T&C#4 of the Opinion. Dead sturgeon will be checked for previously applied tags. External criteria will be used to determine if a dead sturgeon was freshly killed or previously dead. The nature of observed external injuries will be described. Genetic samples will be collected by the procedures in Section 2.4.3 from all dead sturgeons that were not previously tagged. Dead specimens or body parts of Atlantic and shortnose sturgeon retrieved from the IPEC intakes will be photographed, measured, and retained. They will be frozen until transferred to NMFS or to an appropriately permitted research facility designated by NMFS, so that a necropsy can be conducted in an attempt to determine the cause of death.

2.4.3 Genetic Samples

RPM#4 and T&C#5 of the Opinion requires that a genetic sample will be taken from any live or dead Atlantic or shortnose sturgeon collected that was not previously tagged.

A new pair of latex gloves and a new scalpel blade will be used for each individual fish to avoid cross-contamination of genetic material. If contamination occurs, that genetic sample will be discarded.

A 1 cm^2 section will be cut from a pelvic fin and placed in a vial of 95% to 100% ethanol that has not been denatured with methanol or other chemical additives. The vial will be taped to prevent leakage, labeled with the sample number and fish identification number using a permanent marker, and sealed in a small Ziploc bag labeled internally and externally with the sample number.

Genetic samples will be kept in a cooler on ice until returning to the field laboratory, where they will be refrigerated until they are shipped to NMFS or the analytical laboratory designated by NMFS.

2.5 Ancillary Data

2.5.1 Temperature

RPM#1 and T&C#1.l of the Opinion specifies temperature measurements at the trash racks and at the traveling screens, at surface, mid-depth, and bottom for each unit when a take of either species of sturgeon is observed. It is not possible to determine exactly when or where impingement events will have occurred within the previous 24 hours. At IP2, the CWIS fish return design is such that it will be possible to determine whether a take on a traveling screen occurred at screens 21-23 or at screens 24-26 (Figure 2-2), but not the depth at which it was impinged. At IP3, the CWIS design is such that it will not be possible to determine at which screen a take occurred, or at which depth (Figure 2-3).Therefore, given the general stability of thermal conditions, the typical absence of thermal stratification (ASA 2011), and the amount of information already available on thermal conditions near the intakes, this level of additional data collection is unnecessary.

There are no sources of heat addition during the transit of the water through the trash racks to the traveling screens and to the condensers. Therefore, the current hourly measurement of temperatures at the condenser inlet water boxes provides an accurate description of the depth-averaged water temperatures at the intakes. The large volume and degree of mixing in the Hudson near IPEC due to the channel configuration and tidal currents makes it a fairly stable thermal environment that is not prone to rapid temperature changes. What vertical temperature structure that exists is due primarily to the IPEC discharge plume that rises to the surface and during flood tides may be recirculated back to the intakes. The thermal stratification and plume characteristics are well-described by recent data collection and modeling efforts (ASA 2011).

In light of the available information and the inability to precisely determine the time or location of an impingement event, the requirement for additional temperature data measured at the bar racks and traveling screens as specified in RPM#1 and T&C#1.l of the Opinion does not reasonably or materially advance the purposes of the Opinion or the monitoring program.

RPM#1 and T&C#1.l of the Opinion will be addressed by reporting intake temperature obtained from plant operating records and reported in summarized format (mean, standard deviation, maximum and minimum) for each sampling event when a sturgeon of either species is observed on the trash racks or traveling screens.

2.5.2 Water Velocity

RPM#1 and T&C 1.k of the Opinion specifies measuring actual water velocity at the trash racks (approach velocity and through the rack), in the intake forebays, and at the traveling screens (both approach velocity and through-screen velocity) at all three units "so that this information can be reported any time a take occurs." The statement of the purpose for velocity monitoring appears to presume that some relationship between velocity and impingement could be determined from the data so that either (1) intakes could be designed or operated to keep velocity below some threshold for impingement, or (2) velocity monitoring will provide an advance signal of high potential impingement so that preventive measures can be taken. Although this goal is admirable, the actual situation at IPEC is that there are many reasons why this would be a futile effort:

1. Velocities at the IP1 intake, both at the trash racks and traveling screens are already well below the 0.5 fps through screen value that USEPA considers sufficient to eliminate impingement concerns.
2. Due to the way that Indian Point is operated, intake velocity is relatively constant. Although the IPEC pumps can pump at different rates (IP2 at 60% or 100%, IP3 at a continuum of 50%-100%), the amount of water needed at any given time is determined by the river temperature. Therefore pumping rates, and subsequently intake velocities, actually have little variation from one day to the next.
3. Due to the design of the bar racks, their location at the outer edge of the intake structures, and the ecology of the Hudson River estuary, the trash racks do not have debris accumulations sufficient to block flow and substantially increase velocities at either the trash racks or traveling screens. The trash racks also serve to straighten the intake currents that pass through them, thus reducing the variation in velocity across the ascending face of the Ristroph-type traveling screens. Trash racks are cleaned only twice per year, during a semi-annual inspection, which is frequent enough to avoid high intake velocity incidents. The Ristroph-type traveling screens are cleaned continuously.
4. Sturgeon impingement events are not likely to be frequent enough to establish a meaningful relationship with velocity. Even if there is a large enough sample size, the low amount of flow variation will make establishing any relationship extremely unlikely.
5. It will not be possible to determine which Ristroph-type traveling screens an impingement occurred on, therefore the exact velocity at the place of impingement cannot be determined.
6. The impracticality of continuous monitoring of sturgeon interaction with either the bar racks or traveling screens, and the herculean effort required to monitor velocity at all bar racks and traveling screens, would make it impossible to relate actual impingement events to a specific velocity.
7. Velocity will differ over the face of both the bar racks and trash racks.
8. Measurements of actual through-screen velocity are not possible in the field for the Ristroph-type traveling screens.

Rather than continuous measurement of intake velocities at each unit, Entergy proposes to measure the approach velocities upstream from the bar racks, using acoustic Doppler velocity (ADV) meters deployed at four different times during the first study year to characterize the range of variation expected. Ambient river current velocity, flow direction, and tide height will be measured to establish river flow boundary conditions simultaneously with the bar rack approach velocity measurements using acoustic Doppler current profilers (ADCPs) deployed in the river near the intakes. Bar rack approach velocity measurements will be taken at middle and upstream intake bays at IP2 and at IP3. Due to the difficulties of access at IP1 and at the forebays in front of the traveling screens, no velocity measurement will be taken there.

Velocity measurements will be taken to represent the variation observed across the upstream face of each bar rack sampled, at nine points located at the intersection of three horizontal and vertical lines spread evenly among three depths and three lateral positions. The velocity measurements will be taken during peak and slack tidal currents at four times during the first year, representing high intake flow rates (140,000 gpm per pump) and high tide height, high intake flow rates and low tide height, low intake flow rates (~84,000 gpm per pump) and high tide height, and low intake flow rates and low tide height. Velocities through the bar racks and through the traveling screens will be calculated using each set of observations during the first year and the associated physical dimensions of the racks and screens.

2.5.3 Plant Operating Data

RPM#1 and T&C 1.m of the Opinion requires that the plant operating conditions at each unit are documented for the previous 48 hours associated with each take, the field staff will contact the control room and obtain and record data provided by the plant operators regarding the number of circulating pumps operating.

2.5.4 Ancillary Data Collection Implementation Schedule, Monitoring, and Permits

Ancillary data collection will be implemented when sturgeon impingement monitoring is initiated (except for water velocity and temperature measurements at the CWIS, which will be conducted only during the first year of the monitoring period). No NRC or State of New York approvals are required before implementation of ancillary data collection. No physical plant alterations are necessary to allow ancillary data collection to be implemented, but recording condenser inlet temperatures in a computer file (Section 2.5.1 above) will require a procedural modification at IPEC.

2.6 Reporting

This section describes procedures for reporting to NMFS all sturgeon incidental takes and sample transfers as required by RPM#5 and T&C#s 6, 7 and 8 of the Opinion.

2.6.1 Take Notification

NMFS will be notified within 24 hours of finding any live or dead Atlantic or shortnose sturgeon in association with the IPEC intakes as required by RPM#5 T&C#6 of the Opinion. The form for reporting each incidental take of any sturgeon (alive or dead) is shown in Figure 2-4.

2.6.2 Annual Report

An annual report of all incidental takes of Atlantic and shortnose sturgeon occurring at the IPEC intakes during each calendar year will be submitted to NMFS and NRC by 15 February of the following year as required by RPM#5 T&C#7 of the Opinion. The annual report will include any necropsy reports of specimens, all incidental take reports, photographs, a record of all sightings of Atlantic or shortnose sturgeon in the vicinity of Indian Point, conditions at the time of the take (IPEC operations as well as environmental conditions including water temperature and water flow), and a record of when inspections of the intake trash bars and Ristroph screens were conducted. The report will include a summary table of environmental sampling data in the format specified by NMFS (Figure 2-5). The annual report will also identify any potential measures to reduce shortnose or Atlantic sturgeon impingement, injury, and mortality at the intake structures along with any plans to implement those measures.

Following the submittal of each annual report and prior to 15 April of each year, Entergy will participate in a meeting or conference call with NMFS and NRC to discuss the take information of the prior year and any changes to the monitoring program that NMFS, NRC, or Entergy believes are necessary as required by RPM#5 T&C#8 of the Opinion.

2.6.3 Genetic Samples

As specified in the NMFS instructions for collecting, certifying, identifying, and shipping sturgeon tissue samples (Figure 2-6), each shipment of sturgeon genetic tissue samples will be accompanied by (1) a completed Certification of Species, Sample Identification, and Chain of Custody form for each fish (Figure 2-7); (2) a completed Summary Sheet for Genetic Tissue Samples form if the shipment contains multiple samples (Figure 2-8); (3) a completed NMFS Guidelines for Air-Shipment of "Excepted Quantities" of Ethanol Solutions form (Figure 2-9); and (4) a copy of the ESA permit authorizing the collection of the sample(s). Because the origin of impinged fish factors into the take limits specified in the ITS, Entergy requests to receive the results of the genetic analysis as testing is completed on each fish.

2.6.4 Dead Sturgeon or Sturgeon Parts

If any dead specimens of Atlantic or shortnose sturgeon are found in association with the IPEC intakes, after they are processed as described in Section 2.4.2, NMFS may request transfer of the specimens to NMFS or to a NMFS-approved laboratory or researcher for necropsy. In addition to the take notification form (Section 2.6.1), a Sturgeon Salvage form (Figure 2-10) will also be submitted to NMFS, to document the disposition of each dead specimen.

2.7 Training of Field Biologists

Qualifications of all personnel who will be handling sturgeon will include previous training and experience in the implementation of NMFS Permit to Take Protected Species for Scientific Purposes Permit No. 17095 (and its predecessor, Permit No. 1580) for the Hudson River Biological Monitoring Program (HRBMP). All field personnel participating in the IPEC sturgeon monitoring will be required to read the SOP and will be provided with the appropriate training. Monitoring personnel unfamiliar with a task will be directly supervised by an experienced technician for at least the first two attempts and be subjected to 100% inspection of at least the first five samples analyzed independently.

2.8 QA/QC Procedures

The basis for all quality control (QC) and quality assurance (QA) monitoring of program activities will be the SOP, consisting of written documentation of sampling and data collection protocols. The SOP will function to (1) insure that consistent and appropriate procedures are followed, (2) provide Entergy with documentation of the procedures used, and (3) enable a QA auditor observing program activities to determine whether the required procedures are being followed.

QC will be conducted continually by qualified project staff. All field observations and measurements of sturgeon (identification, length, weight, injury, condition, tag numbers, etc.) will be subject to a standard and appropriate QC and QA review based on a Military Inspection Standard (MIL-STD) inspection plan derived from MIL-STD 1235 Single and Multiple Level Continuous Sampling Procedures and Tables for Inspection by Attributes to achieve a 10% Average Outgoing Quality Limit (AOQL). QC re-inspections for these sample processing tasks will be performed according to the continuous sampling plan CSP-1 at the 10% AOQL level, to insure that at least 90% of samples satisfy the project's acceptance criteria. This level of quality meets or exceeds New York, industry-wide, and HRBMP standards for fisheries measurement data.

All final data files and reports will be subject to a standard and appropriate QC inspection to achieve a 1% AOQL so that the final data files will be certified through statistical inspection to document that less than one record (line of data) out of every 100 records will be in error. A QC inspection plan (CSP-1) will be used at the 1% AOQL level to insure that values of all variables in at least 99% of the data records provided in each data file correctly correspond to values coded on the original data sheets. This level of quality meets or exceeds New York, industry-wide, and HRBMP standards for fisheries data files.

At least one QA Audit of the field activities described in Sections 2.1 and 2.3 through 2.5 above will be performed per year to verify adherence to the technical protocols specified in the SOP and verify the effectiveness of the QC system. QA auditors will be technically qualified to evaluate the activities being observed but independent from the project team. The audits will cover all activities described in the SOP, including transfer of data from field to completed data deliverables. The audit results will be documented in a written report for review by project management, Normandeau corporate management, and Entergy.

3.0 Literature Cited

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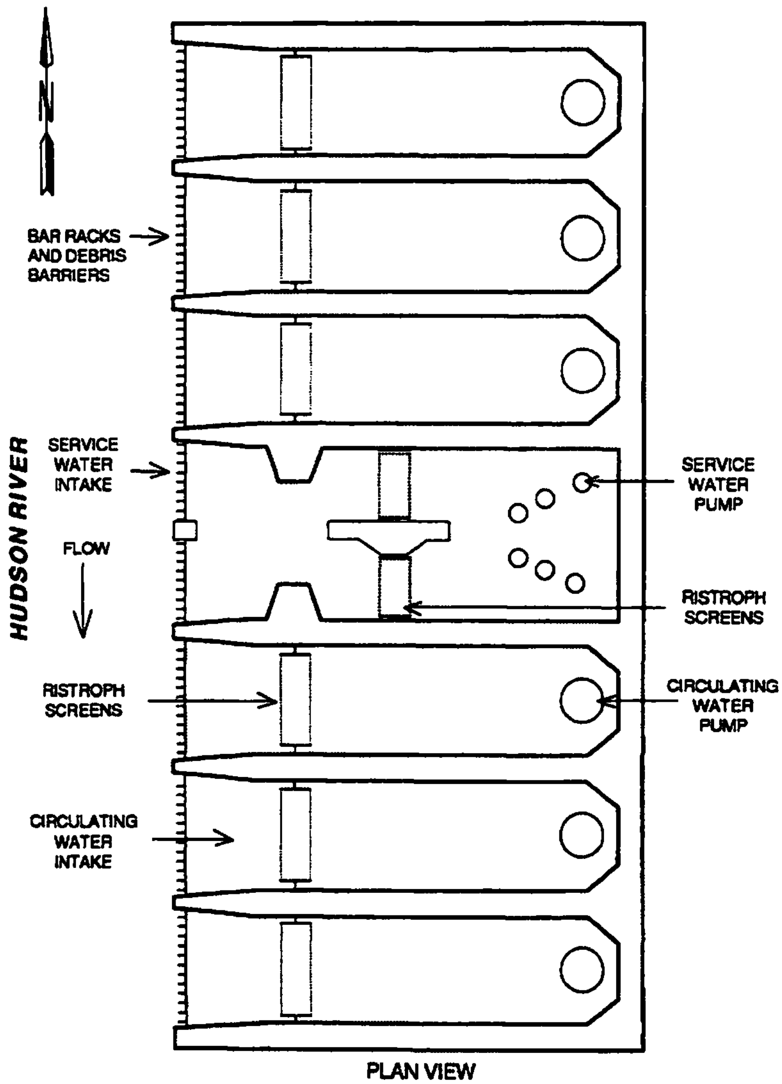
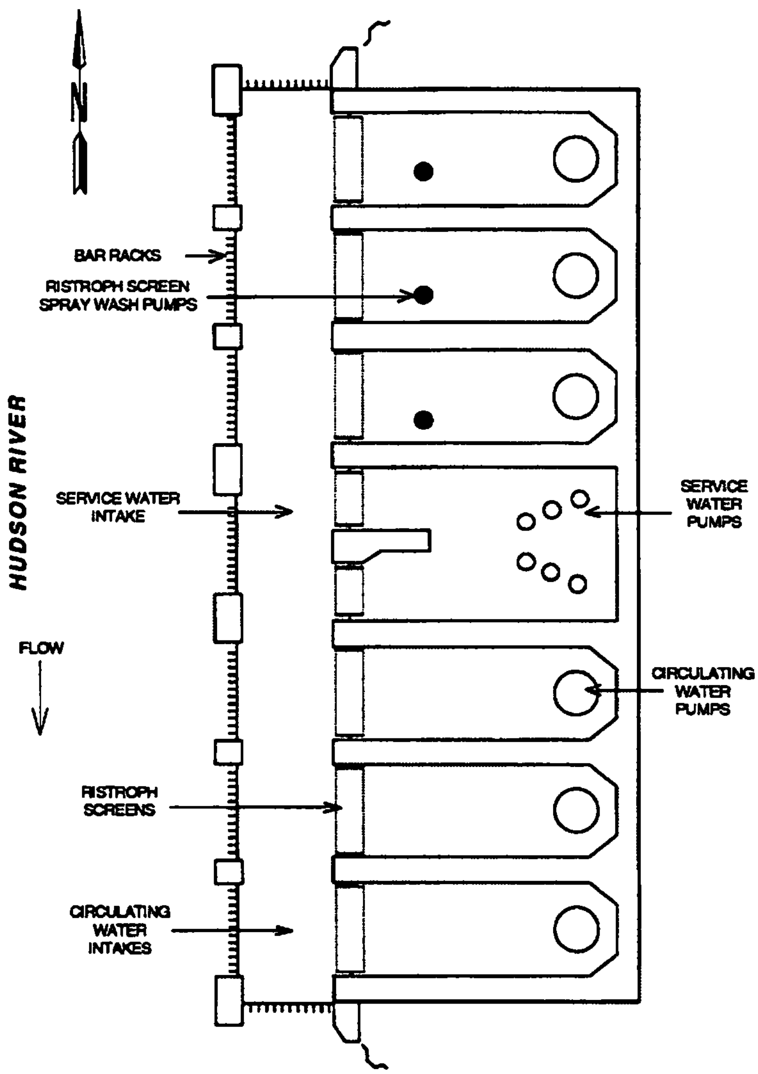
Figures



Source: Con Ed and NYPA 1990, Indian Point Units 2 and 3 Ristroph Screen Fish Return System Prototype Evaluation and Siting Study.

Figure 1-1. Indian Point Unit 2 cooling water intake.



Source: Con Ed and NYPA 1990, Indian Point Units 2 and 3 Ristroph Screen Fish Return System Prototype Evaluation and Siting Study.

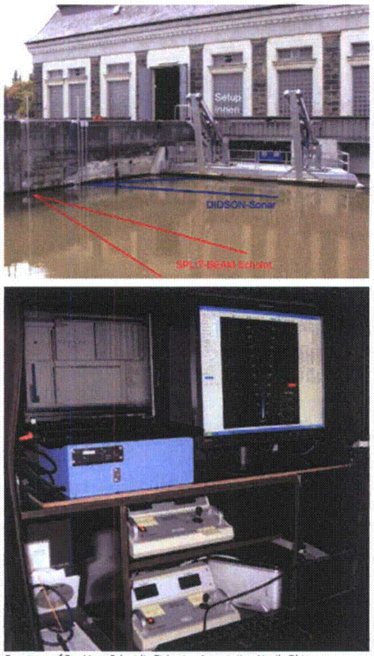
Figure 1-2. Indian Point Unit 3 cooling water intake.

Sturgeon detection by imagining sonar:

- The best image for visual recognition is achieved when the sonar beam pointing angle is shallow relative to the surface of interest such that the sound travels down the surface of the target and reflected back to produce the image. In this application, perhaps 10-30 deg angle down would appropriate at close horizontal distance to the bar racks.
- One-week FREE demo period; rent one for a pilot study
- Rotator available, e.g., to vessel-mount pole. Software allows files to save at any range and orientation automatically starting a programmed duration.
- **ARIS EXPLORER 1800: 1.8 MHz Identification frequency; 1.1 MHz Detection frequency with rotator to control pan, tilt, and roll ; nominal effective range is 35 m detection/ 15 m identification; 3mm to 10 cm downrange resolution**
    - About $80,500
    - Rotator about $2500
    - 1-Month lease = $12,500
- ARIS EXPLORER 3000: 1.8/3.0 MHz, range 15/5 m probably not appropriate for our ranges

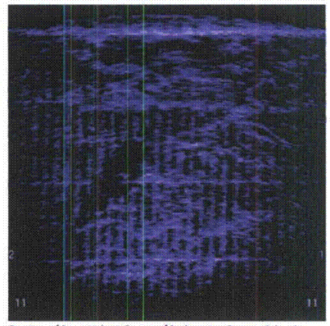
Figure 2-1. Sonar system for detecting shortnose sturgeon or Atlantic sturgeon impinged at the IPEC trash racks.

a



Courtesy of Dr. Marc Schmidt, Fisheries Association North-Rhine Westphalia, Germany

b

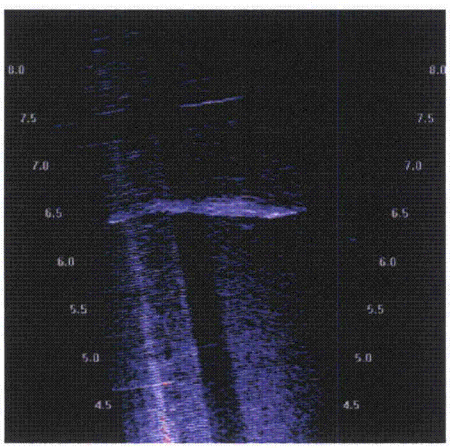


Courtesy of Steve Hiebert, Bureau of Reclamation, Denver, Colorado

THIS IMAGE (ABOVE) WAS CAPTURED WITH A SOUND METRICS IMAGING SONAR

Above-water view

c

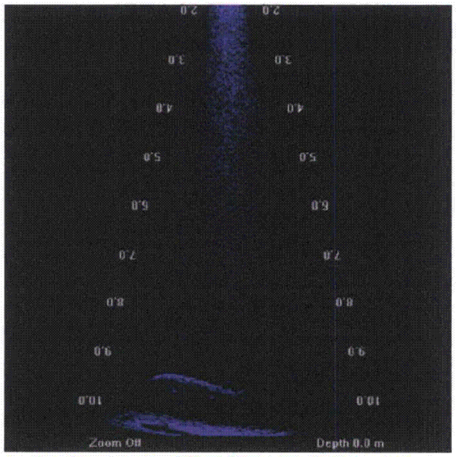


STURGEON NEAR DAM

Clear image showing languid movement of 2-meter sturgeon in dam fishway on the Columbia River, Washington, USA.

(a) Example of fixed-location DIDSON and split-beam echo sounder to monitor fish impingement at a trash rack. (b) Monitoring trash rack effectiveness from 35-50 ft away with 1.8 MHz DIDSON. (c) Acoustic image of sturgeon at a dam from imagining sonar. www.soundmetrics.com

Figure 2-1 (Continued).



FRASER RIVER STURGEON

A sturgeon detected at 10 meters in the Fraser River.

Courtesy of Yunbo Xie, Pacific Salmon Commission, British Columbia, Canada

Acoustic image of sturgeon in river from imagining sonar. www.soundmetrics.com

Figure 2-1 (Continued).

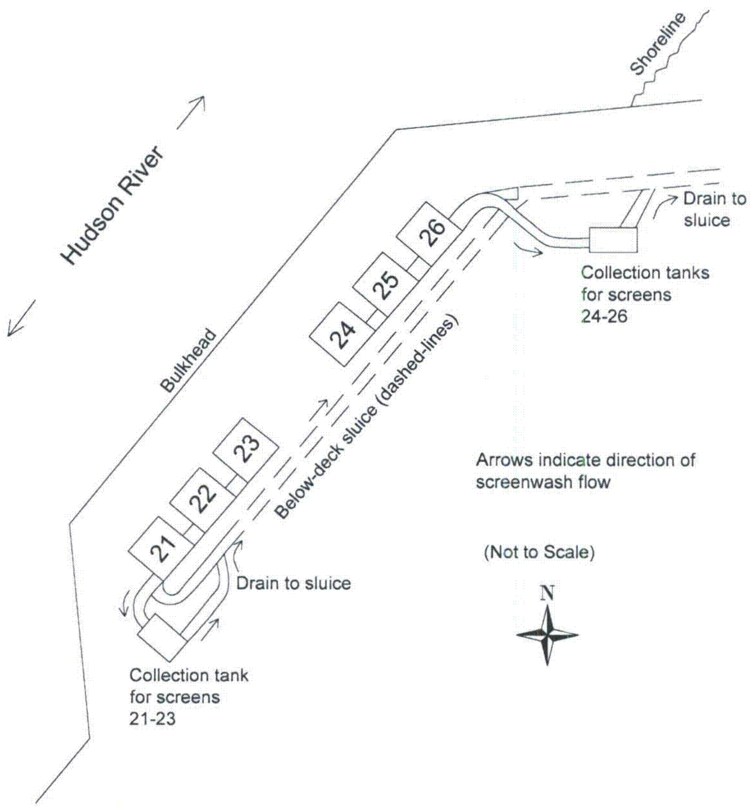


Figure 2-2. Proposed location of collection tanks at Unit 2.

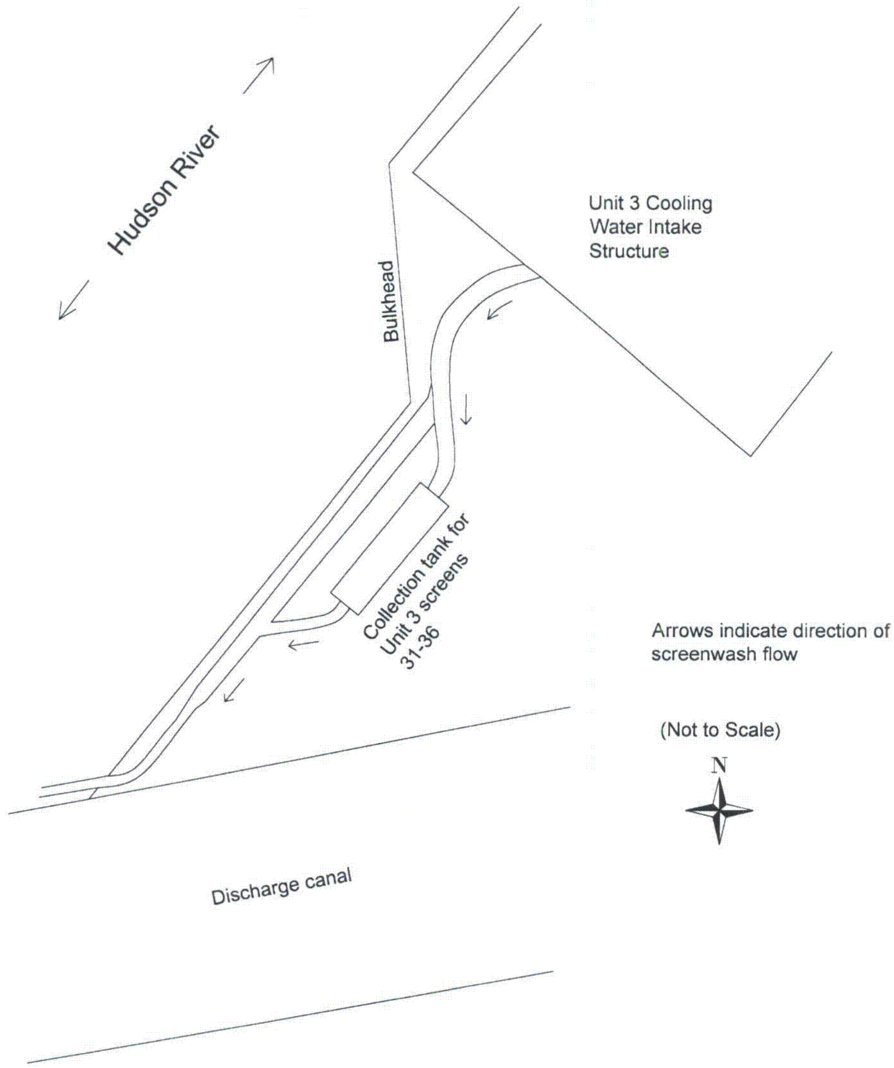


Figure 2-3. Proposed location of collection tank at Unit 3.

Incident Report Sturgeon Take – Indian Point

Photographs should be taken and the following information should be collected from all sturgeon (alive and dead) found in association with the Indian Point intakes. Please submit all necropsy results (including sex and stomach contents) to NMFS upon receipt.

Observer's full name:____
Reporter's full name:____

Species Identification :___________________________________

Site of Impingement (Unit 2 or 3, CWS or DWS, Bay #, etc.):__________________________

Date animal observed:_____________ Time animal observed: ____________________
Date animal collected:_____________ Time animal collected:_____________________

Environmental conditions at time of observation (i.e., tidal stage, weather):

____
____

Date and time of last inspection of intakes:_____________________________
Water temperature (°C) at site and time of observation:____________________
Number of pumps operating at time of observation:_____________________________
Average percent of power generating capacity achieved per unit at time of observation:________
Average percent of power generating capacity achieved per unit over the 48 hours previous to observation:____

Sturgeon Information:
Species ______________________________

Fork length (or total length) ___________________ Weight ____________________

Condition of specimen/description of animal

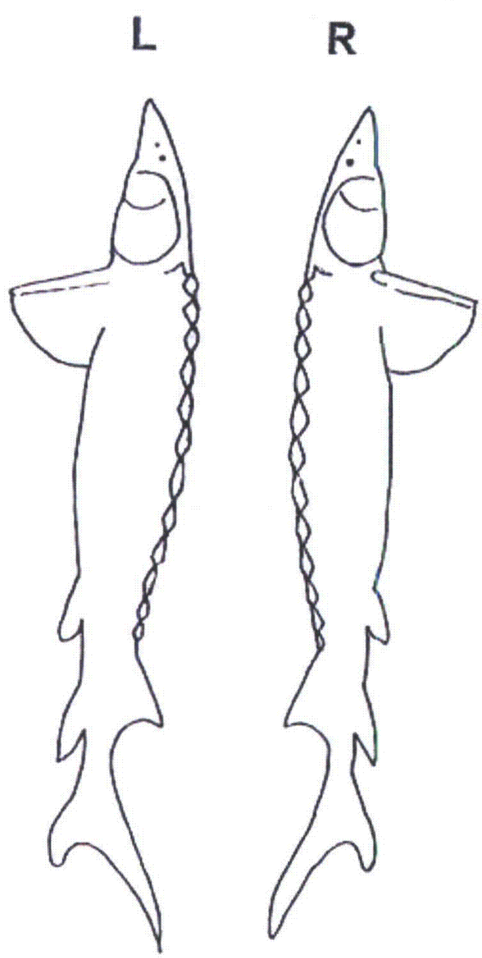
____
____
____
____

Fish Decomposed: NO SLIGHTLY MODERATELY SEVERELY
Fish tagged: YES / NO *Please record all tag numbers.* Tag # ______________

Photograph attached: YES / NO
(please label *species, date, geographic site* and *vessel name* on back of photograph)

Figure 2-4 Incident report form for incidental take of shortnose sturgeon or Atlantic sturgeon by impingement at the IPEC cooling water intakes.

Draw wounds, abnormalities, tag locations on diagram and briefly describe below



Description of fish condition:

Figure 2-4 (continued).

Appendix 4: Summary of Environmental Sampling Data for Research Activity [1,2]

Date	Species (ASN or SSN)	Unique ID	Location River	Location (Lat/Long or rkm)	Gear & Mesh	Net Set (min/hr)	Bottom Depth (m)	Bottom Temp (°C)	Salinity (ppt)	DO (mg/l)	Total Length (mm)	Total Weight (kg)	Mortality	Comments

1. Please coordinate with NMFS to receive a file copy of this appendix in spreadsheet format.
2. List individual fish (ASN or SNS) concurrently when recording data for multiple sturgeons in a catch

Figure 2-5. Summary form for environmental data associated with incidental take of shortnose sturgeon or Atlantic sturgeon.

Instructions: Collecting, Certifying, Identifying &Shipping Tissue Samples Collected from Sturgeon.

1. **Species Certification**:
For each shipment a "*Certification of Species Identification*" (Section A) must be provided. This form documents the collector has identified the fish or fishes sampled in the shipment as either a shortnose or Atlantic sturgeon. If there is any doubt about the identity of a sample, then mark unknown and include comments on the take.

2. **Sample Identification**:
Assign a unique number identifying each individual fish captured and subsequently sampled. This number must be recorded in Section B and on the collection vial for each sample taken. Record tissue type; preservative used; date of capture; location of capture (river & description, lat/long, river km, and nearest city); length of specimen; weight; and sex, if known. Check the box provided if you are submitting multiple samples, and provide a hard-copy and/or email a copy of the sample spreadsheet with information for each of the data fields listed above.

3. **Tissue Sampling Instructions:**
a. Cleanliness of Samples: Cross contamination should be avoided. For each fish, use a clean cutting tool, syringe, etc. for collecting and handling samples.

b. Preserving & Packaging Samples:
   i. Label vial with fish's unique ID number.
   ii. Place a 1-2 cm^2 section of pelvic fin clip in vial with preservative (95% absolute ETOH (un-denatured), recommended).
   iii. Seal individual vials or containers with leak proof positive measure (e.g., tape).
   iv. Package vials and absorbent within a double sealed container (e.g., zip lock baggie).
   v. Label air package properly identifying ETOH warning label (**See Appendix 3c**).

c. Shipping Instructions:
When shipping samples, place separately Appendix 3a, 3b and 3c (Sample ID and Chain of Custody Forms and Shipping Training Form) in container and seal the shipping box to maintain the chain of custody. (Note: A copy of the ESA permit authorizing the collection of the sample(s) must also accompany the sample(s)).

Important Notice: You must be certified before shipping tissue samples preserved with 95% ETOH in "excepted quantities" (A Class 3 Hazardous Material Due to Flammable Nature). See Appendix 3c: "NMFS Guidelines for Air-Shipment of Excepted Quantities of Ethanol Solutions" to comply with the DOT/IATA federal regulations.

4. **Chain of Custody Instructions:**
The "*Chain of Custody*" (Section C) should be maintained for each shipment of tissue samples and must accompany the sample(s) at all times. To maintain the chain of custody, when sample(s) are transferred, the sample(s) and the documentation should be packaged and sealed together to ensure that no tampering has occurred. All subsequent handlers breaking the seal must also sign and document the chain of custody section.

5. **Contact Information:**
   A. **NMFS, Office of Protected Resources**:
      i. **Primary Contact**: Malcolm Mohead (malcolm.mohead@noaa.gov) Phone: 301/713-2289
      ii. **Primary Contact:** Colette Cairns (colette.cairns@noaa.gov) Phone: 301/713-2289
      i. **Secondary Contact: (Northeast)** Jessica Pruden (jessica.pruden@noaa.gov) Phone: 978/281-9300
      ii. **Secondary Contact: (Southeast)** Stephania Bolden (stephania.bolden@noaa.gov) Phone: 727/824-5312

   B. **NOS Archive:**
      i. **Primary Contact**: Julie Carter (julie.carter@noaa.gov) Phone: 843/762-8547

Figure 2-6. Instructions for collecting, certifying, identifying, and shipping sturgeon tissue samples.

Certification, Identification and Chain of Custody Form for Submitting Sturgeon Genetic Tissue Samples.[1],[2]

(A) CERTIFICATION OF SPECIES (Collector)

I, ______________________, hereby certify that I have positively identified the
Full Name

fish or fishes sampled in this shipment as: ☐ shortnose sturgeon; ☐ Atlantic sturgeon; ☐ other ☐ unknown
based on my knowledge and experience as a ______________________.
Position Job Title

Signature: ______________ Date Identified: ______________
Address: ______________
____
Phone Number: ______________

(B) SAMPLE IDENTIFICATION

Species Identification: ☐ shortnose sturgeon; ☐ Atlantic sturgeon; ☐ unknown
Unique ID No: ________; Tissue Type: ________; Preservative: ________;
Location: (River: ________; River-km: ______; Lat/Long: ________;
River Location Description: ______________);
Total Length (TL) of Specimen (mm): ________ Weight of Specimen (g): ________; Sex (if known) ____

Specific comments on take: ______________________

☐ Check here if multiple samples are submitted and use *Field Collection Report* (Appendix 3b) with the data fields listed in this section.

(C) EVIDENCE OF CHAIN OF CUSTODY

1. ______________ ______________ ______________ ______________
Release Signature | NMFS Permit No. | Method of Transfer | Date

______________ ______________ ______________
Receipt Signature | NMFS Permit No. | Date

2. ______________ ______________ ______________ ______________
Release Signature | NMFS Permit No. | Method of Transfer | Date

______________ ______________ ______________
Receipt Signature | NMFS Permit No. | Date

3. ______________ ______________ ______________ ______________
Release Signature | NMFS Permit No. | Method of Transfer | Date

______________ ______________ ______________
Receipt Signature | NMFS Permit No. | Date

[1] Instructions on next page.
[2] If multiple samples are shipped, attach summary sheet in Appendix 3b.

Figure 2-7. Certification of species, sample identification, and chain of custody form.

Appendix 3b **Summary Sheet for Genetic Tissue Samples [1,2]**

Date	Species	Unique ID.	Genetic Tissue Type	Preservative	Location (River)	Location (River km)	Location (Lat/Long)	Total Length (mm)	Weight (g)	Sex	Comments

1. Please coordinate with NMFS to receive a file copy of this appendix in spreadsheet format.
2. If multiple samples are shipped, attach this form (and disk copy) to supplement Appendix 3a.

Figure 2-8. Summary form for sturgeon genetic tissue samples.

Appendix 3c

NMFS Guidelines for Air-Shipment of "Excepted Quantities" of Ethanol Solutions

These guidelines have been adapted with permission from the University of New Hampshire-Office of Environmental Health & Safety; our appreciation is to Andy Glode for providing reference materials upon which this guide was created.

The U.S. Department of Transportation (DOT: 49 CFR 173.4) and the International Air Transport Association (IATA: 2007 Dangerous Goods Regulations, Sec. 2.7) regulate shipments of ethanol (ETOH) in *excepted quantities*. As a result, specific procedures must be followed as well as certifying proper training of individuals prior to packaging and shipping specimens preserved in ETOH. These guidelines will inform proper shipping and also satisfy certifying requirements. Failure to meet such requirements could result in regulatory fines and/or imprisonment.

Therefore, prior to submitting ETOH preserved samples and appropriate documentation (*e.g.*, a FedEx Airbill) to a carrier, please read, initial and sign this document, affirming you have understood the requirements as outlined. Please include this document in the shipping package and retain a copy for your records.

1) Packages and documents submitted to a carrier must not contain any materials other than those described in this document (*i.e.* containers holding ethanol-preserved specimens and related absorbent and packaging materials). Also, laboratory or sampling equipment, *unrelated documents*, or other goods must be packaged and shipped in separate boxes. (Note: ETOH solutions are not permitted to be transported in checked baggage, carry-on baggage, or airmail.) **I understand (______)**

2) Please read the manufacturer's Material Safety Data Sheet (MSDS) for ETOH recognizing ETOH (55 - 100%) is classed as hazardous flammable material (NFPA Rating = 3). Note also, its vapor is capable of traveling a considerable distance to an ignition source causing "flashback." Properly packaging and labeling shipments of ethanol solutions will minimize the chance of leakage, and would also communicate the potential hazard to transport workers in the event of a leak. **I understand (______)**

a) **Quantity Limits**: Small quantities (inner container less than 30 ml, with a maximum net quantity of 500 ml for the entire package) of ETOH can be shipped with "Excepted Quantities" labels without completion of a Dangerous Goods Declaration. (e.g., If shipping vials having a maximum volume of 10 ml each, you may put up to 50 vials in one box.) **I understand (______)**

b) **Package Components**:

i. ***Inner (primary) packaging (e.g., vial, tube, jar, etc.)***: Do not completely fill inner packaging; allow 10% head-space for liquid expansion. Liquids must not completely fill inner packaging at a temperature of 55°C (130°F). Closures of inner packaging (e.g., vials with tops) must be held securely in place with tape or other positive means. **I understand (______)**

ii. ***Intermediate (secondary) packaging (e.g. Ziplock or other plastic bag)***: Place inner container(s) (*e.g.*, vials with ETOH) into a high-quality plastic bag. Then add an absorbent material capable of absorbing any spillage without reacting with the ethanol. Seal the first bag tightly and then tape the locking seals. Next, seal the inner bag within a second bag for added safety. **I understand (______)**

iii. ***Outer packaging (e.g., cardboard box)***: Ethanol solutions may not be shipped in envelopes, Tyvek® sleaves, or other non-rigid mailers. The dimensions of the outer box must be at least 100 mm (~4 inches) on two sides. Any space between the inner packing containers placed in the outer packaging should be eliminated with additional filler. **I understand (______)**

c) **Package Labels**:

i. ***Dangerous Goods in Excepted Quantities Label* (Figure 1.)**: The label must display a "3" as the ethanol hazard class number using a black marker. You may obtain self-adhesive labels from NMFS, or else, order online. **I understand (______)**

ii. ***Name and Address:*** The outer container must display the name and address of the shipper and consignee. When re-using shipping boxes, completely remove or black out all unnecessary labels or marks. **I understand (______)**

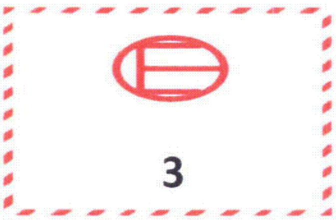


Figure 1. Dangerous Goods in Excepted Quantities label

Figure 2-9. Guidelines and form for air shipment of "excepted quantities" of ethanol solutions.

Appendix 3c (continued)

d) **Package Tests:**
A representative example of packaging used for excepted quantities of ethanol solutions must pass a drop test and compressive load test without any breakage or leakage of any inner packaging and without any significant reduction in package effectiveness. Perform the following tests on a representative example of your packaging and keep a record of the results.

i. ***Drop Test***: Drop a representative package from a height of 1.8 m (5.9 feet) directly onto a solid unyielding surface:

Test Results

a. One drop flat on the base; (____________________)
b. One drop flat on top; (____________________)
c. One drop flat on the longest side; (____________________)
d. One drop flat on the shortest side; and (____________________)
e. One drop on a corner. (____________________)

ii. ***Compressive Load Test***: Apply a force to the top surface of a representative package for a duration of 24 hours, equivalent to the total weight of identical packages if stacked to a height of 3 meters. (____________________)

e) **Package Documentation:**
Proper documentation is required for all shipments of hazardous materials. Incorrect documentation is the most common cause for package refusal. If using documentation for couriers other than FedEx, UPS and DHL, please contact NMFS for assistance.

i. ***FedEx***: For domestic shipments with FedEx Express, fill out the standard US Airbill. Fill out the form completely including the following information:

a. In Section 6, Special Handling, check the box "Yes, Shipper's Declaration not required."
b. On the top of the form above the FedEx tracking number, include the statement, "***Dangerous Goods in Excepted Quantities***" See example in **Figure 2.** **I understand (______)**

ii. ***DHL***: The "*Nature and Quantity of Goods*" box of the air waybill must include "**Dangerous Goods in Excepted Quantities.**" **I understand (______)**

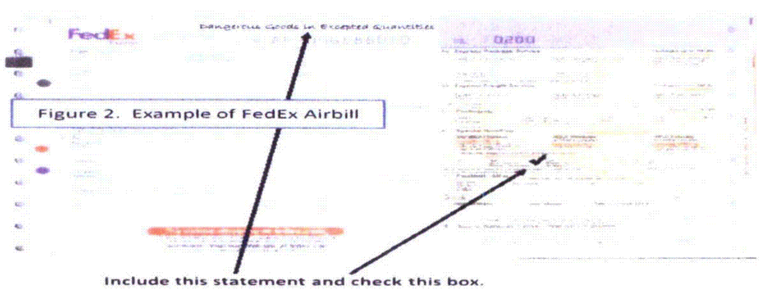


Figure 2. Example of FedEx Airbill

By signing this document, I affirm I understand the hazards associated with ethanol and the shipping requirements for ethanol solutions, as outlined in this guide. I also understand I am required to include a copy of this document in the package and that it should be appended to an ESA permit (if listed samples are shipped).

Print Name:		Signature:	
Employer:		Employer Address:	
Date:			Phone:

Figure 2-9 (continued).

Appendix 5: **Sturgeon Salvage Form**

For use in documenting dead sturgeon in the wild under ESA Permit No. 1614 (version 07-20-2009)

INVESTIGATORS'S CONTACT INFORMATION
Name: First ______________ Last ____________________
Agency Affiliation ______________ Email____________________
Address ____
____
Area code/Phone number ________________________________

UNIQUE IDENTIFIER (Assigned by NMFS)

DATE REPORTED:
Month ☐☐ Day☐☐ Year 20☐☐
DATE EXAMINED:
Month ☐☐ Day☐☐ Year 20☐☐

SPECIES: (check one)
☐ shortnose sturgeon
☐ Atlantic sturgeon
☐ Unidentified *Acipenser* species
Check "Unidentified" if uncertain.
See reverse side of this form.

LOCATION FOUND: ☐Offshore (Atlantic or Gulf beach) ☐Inshore (bay, river, sound, inlet, etc)
River/Body of Water______________ City____________________ State ____
Descriptive location (be specific)______________________________
____
____
Latitude ______________N (Dec. Degrees) Longitude ______________ W (Dec. Degrees)

CARCASS CONDITION at time examined: (check one)
☐ 1 = Fresh dead
☐ 2 = Moderately decomposed
☐ 3 = Severely decomposed
☐ 4 = Dried carcass
☐ 5 = Skeletal, scutes/ cartilage

SEX:
☐ Undetermined
☐ Female ☐ Male
How was sex determined?
☐ Necropsy
☐ Eggs/milt present when pressed
☐ Borescope

MEASUREMENTS: Circle unit
Fork length ________ cm / in
Total length ________ cm / in
Length ☐ actual ☐ estimate
Mouth width (inside lips, see reverse side) ________ cm / in
Interorbital width (see reverse side) ________ cm / in
Weight ☐ actual ☐ estimate ________ kg / lb

TAGS PRESENT? Examined for external tags including fin clips? ☐ Yes ☐ No Scanned for PIT tags? ☐ Yes ☐ No

Tag #	Tag Type	Location of tag on carcass
______________	______________	______________
______________	______________	______________

CARCASS DISPOSITION: (check one or more)
☐1 = Left where found
☐2 = Buried
☐3 = Collected for necropsy/salvage
☐4 = Frozen for later examination
☐5 = Other (describe)
____

Carcass Necropsied?
☐Yes ☐No
Date Necropsied:____________
Necropsy Lead:
____

PHOTODOCUMENTATION:
Photos/vide taken? ☐ Yes ☐ No
Disposition of Photos/Video:__________
____
____

SAMPLES COLLECTED? ☐ Yes ☐ No

Sample	How preserved	Disposition (person, affiliation, use)
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________

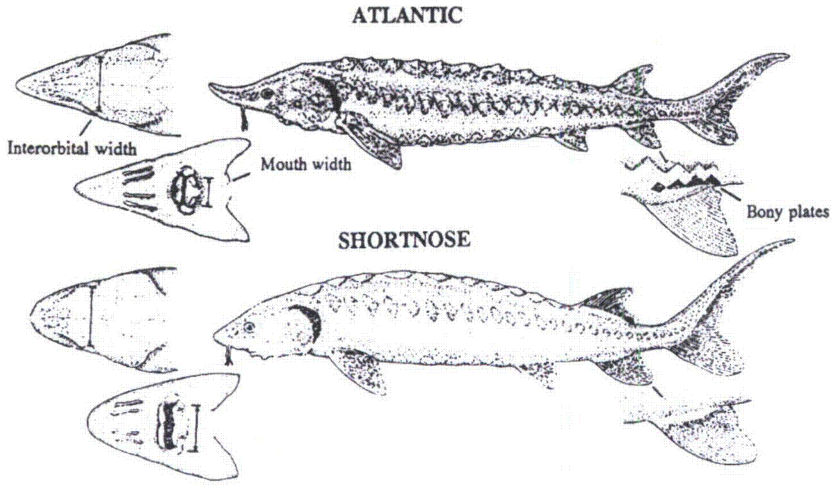
Comments:
____
____
____
____

Figure 2-10. Sturgeon salvage form.

Distinguishing Characteristics of Atlantic and Shortnose Sturgeon (version 07-20-2009)

Characteristic	Atlantic Sturgeon, *Acipenser oxyrinchus*	Shortnose Sturgeon, *Acipenser brevirostrum*
Maximum length	> 9 feet/ 274 cm	4 feet/ 122 cm
Mouth	Football shaped and small. Width inside lips < 55% of bony interorbital width	Wide and oval in shape. Width inside lips > 62% of bony interorbital width
*Pre-anal plates	Paired plates posterior to the rectum & anterior to the anal fin.	1-3 pre-anal plates almost always occurring as median structures (occurring singly)
Plates along the anal fin	Rhombic, bony plates found along the lateral base of the anal fin (see diagram below)	No plates along the base of anal fin
Habitat/Range	Anadromous; spawn in freshwater but primarily lead a marine existence	Freshwater amphidromous; found primarily in fresh water but does make some coastal migrations

* From Vecsei and Peterson, 2004



Describe any wounds / abnormalities (note tar or oil, gear or debris entanglement, propeller damage, etc.). **Please note if no wounds / abnormalities are found.**

____

____

____

____

____

Data Access Policy: Upon written request, information submitted to National Marine Fisheries Service (NOAA Fisheries) on this form will be released to the requestor provided that the requestor credit the collector of the information and NOAA Fisheries. NOAA Fisheries will notify the collector that these data have been requested and the intent of their use.

Submit completed forms (within 30 days of date of investigation) to: Jessica Pruden, Shortnose Sturgeon Recovery Coordinator, NOAA Fisheries Northeast Region, 55 Great Republic Drive, Gloucester, MA 01930. Phone: 978-282-8482; Fax: 978-281-9394; E-Mail Jessica.Pruden@noaa.gov

Figure 2-10 (continued)