Exelon Generation.

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Wetlands and Waterways Program

Elder Ghigiarelli, Jr.
Deputy Program Administrator, Wetlands and Waterways Program
Water Management Administration
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

Re: Application #17-WQC-02, Lower Susquehanna River and Upper Chesapeake Bay, Use 1 & 2 Waters

Dear Mr. Ghigiarelli,

Pursuant to the Maryland Department of the Environment's ("MDE") October 13, 2017 Public Hearing Announcement, Exelon Generation Company, LLC ("Exelon") hereby submits additional comments in support of Exelon's application for a water quality certification ("Application") for the Conowingo Hydroelectric Project ("Conowingo Project"), which was filed on May 17, 2017 in the captioned docket. These comments address, among other things, the comments filed by numerous stakeholders in response to MDE's July 10, 2017 and August 8, 2017 Public Comment notices.

The Application is complete and supported by substantial evidence, and the protection, mitigation, and enhancement ("PM&E") measures proposed therein ensure that the Conowingo Project will continue to comply with applicable Maryland water quality standards.

Sediment

Response to Stakeholder Comments

Sediment introduced into the Susquehanna River originates from upstream point sources and non-point sources, such as agricultural lands and storm water runoff.[1] The Conowingo Project does not generate sediment; instead, it has functioned as the catch basin for sediment generated upstream of the Conowingo Dam.

Congress recognized that operators of water transfer facilities, like dams, are not responsible for the presence of pollutants in the waters they transport.[2] Those pollutants often enter water bodies through point and non-point sources located far from water transfer facilities and beyond the control of project operators. Congress properly envisioned that the Clean Water

[1] URS Corporation and Gomez and Sullivan Engineers. 2012. Sediment Introduction and Transport Study (RSP 3.15).
[2] U.S. Environmental Protection Agency. *Agency Interpretation on Applicability of Section 402 of the Clean Water Act to Water Transfers*, 7 (Aug. 5, 2005).

Act would not impose requirements on these facilities to address regional water quality problems. Indeed, Congress generally intended that pollution be controlled at the source whenever possible, and that regional pollution problems be addressed through water resource planning and land use regulations which attack the problem at its source.[3] Given that it is upstream sources, not Conowingo Project operations, that introduce sediment into the Susquehanna River, mitigation of sediment impacts should be focused on where the sediment originates.

Nonetheless, various parties assert that Exelon should be required to continue to study the impacts of the sediment that has accumulated behind the Conowingo Dam, dredge Conowingo Pond to create additional capacity to trap sediment, or be required to mitigate the impacts of any sediment that may be "scoured" from Conowingo Pond during high flow events. Earthjustice[4] asks that any water quality certification for the Conowingo Project include a detailed analysis of the effects of climate change. Earthjustice also proposes Exelon contribute financially to a specific plan for removing at least 4 million tons of sediment annually from Conowingo Pond and to eventually remove 100 million tons of material from the reservoir that would be "vulnerable to scouring during the proposed license period . . ."[5]

Similarly, the Clean Chesapeake Coalition ("CCC") requests that MDE require Exelon to develop a sediment management plan that will be reviewed and approved prior to dredging operations, apparently assuming that Conowingo Pond will be dredged.[6] CCC also recommends that Exelon be required to establish a dedicated fund to "mitigate the undeniable environmental and economic damages caused by the nutrients and sediments trapped behind Conowingo Dam that are scoured into the Maryland portion of the Bay in shock-loading proportions during storm events."[7] CCC suggests various sediment-related reopener clauses that MDE should consider including in the water quality certification for the Conowingo Project, including a reopener if there is "[a] weather event resulting in a significant release of scoured sediments . . ."[8]

Although the Chesapeake Bay Foundation ("CBF") acknowledges that "the origin of the sediment and nutrients from behind the Dam is mostly from upstream of Conowingo," CBF claims that "the Dam does alter the form of these sediments and nutrients and the timing by which they enter the Chesapeake Bay."[9] CBF asserts that any water quality certification must contain conditions that mitigate for downstream water quality violations resulting from scour events.[10]

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[3] *Id.* at 8. ("Indeed, Congress generally intended that pollutants be controlled at the source whenever possible. See S. Rep. No. 92-414, p. 77 (1972) (justifying the broad definition of navigable waters because it is 'essential that discharge of pollutants be controlled at the source'). Rather, those problems are more sensibly addressed through water resource planning and land use regulations, which attack the problem at its source. See, e.g., CWA § 102(b) (reservoir planning); CWA§ 208(b)(2)(F) (land use planning to reduce agricultural nonpoint sources of pollution); CWA § 319 (nonpoint source management programs); and CWA§ 401 (state certification of federally licensed projects).").

[4] Earthjustice, Lower Susquehanna Riverkeeper, and Waterkeepers Chesapeake filed joint comments. For the purposes of these comments, Earthjustice refers to all three parties.

[5] Earthjustice September 11, 2017 Comments at 10.

[6] Clean Chesapeake Coalition August 16, 2017 Comments at 9-10.

[7] *Id.* at 11.

[8] *Id.* at 13.

[9] Chesapeake Bay Foundation August 23, 2017 Comments at 2.

[10] *Id.* at 6.

CBF suggests that such measures could include financial assistance for nutrient reduction projects upstream of Conowingo Dam.[11]

Exelon recognizes that the Susquehanna River and Chesapeake Bay are treasured environmental resources that must be protected and preserved. The sediment issue is a complex problem. Identifying a practical and cost-effective solution is difficult. It is for that reason that Exelon has actively participated in and provided funding for studies such as the Lower Susquehanna River Watershed Assessment ("LSRWA")[12] and the Lower Susquehanna River Integrated Sediment and Nutrient Monitoring Program ("Sediment Study"),[13] working closely with other key stakeholders, including MDE, the Maryland Department of Natural Resources ("MDNR"), the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the U.S. Geological Survey, and the University of Maryland Center for Environmental Science ("UMCES"). However, Conowingo Project operations introduce negligible amounts of sediment into the water and, therefore, Conowingo Project operations do not *cause* downstream water quality violations that may result from sediment transport.

Moreover, a large-scale dredging project to account for the infill from upstream sources or to prevent scour events would not be economically feasible and likely would provide minimal benefit. The LSRWA specifically analyzed the possibility of increasing storage volume of the Lower Susquehanna River reservoirs. Modeling showed that "[i]ncreasing or recovering storage volume of reservoirs via dredging or other methods is possible, but the Chesapeake Bay ecosystem benefits are minimal and short-lived, and the costs are high."[14] The LSRWA estimated that the removal of 3 million cubic yards (an estimated 2.4 million tons) of sediment, would cost $48 million to $270 million annually.[15] Further, "the positive impacts that dredging may produce are significantly minimized because the majority of the sediment load during a scour event is coming from the watershed."[16] For example, "[d]uring Tropical Storm Lee in 2011, the Susquehanna River watershed above the dam provided approximately 80 percent of the sediment load delivered to the Bay, only 20 percent scoured from the trapped sediment."[17]

The environmental consequences of dredging, which have not been studied, also likely would be adverse. Dredging and dewatering via settling cause changes to ambient conditions which affect the exchange of chemical constituents in the sediment, pore water, and the water

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[11] *Id.*

[12] U.S. Geological Survey, *et. al.*, *Lower Susquehanna River Watershed Assessment, Maryland and Pennsylvania* (May 2015) (hereinafter, "LSRWA").

[13] The Sediment Study was a multi-year study designed to quantify the amount of suspended sediment concentration, associated nutrients, suspended sediment load, and nutrient load present in the major entry points to the Lower Susquehanna River Reservoir System and the upper Chesapeake Bay. Exelon contributed $3.5 million to fund the Sediment Study.

[14] LSRWA at Table 5-10.

[15] *Id.*

[16] *Finding Cooperative Solutions to Environmental Concerns with the Conowingo Dam to Improve the Health of the Chesapeake Bay: Hearing Before the Senate Committee on Environment and Public Works, Subcommittee on Water and Wildlife*, 113th Cong. 8 (2014) (Statement of Colonel J. Richard Jordan, III, Commander and District Engineer, U.S. Army Corps of Engineers, Baltimore District).

[17] *Id.* at 7. *See also* Appendix C.

column.[18] Sediment resuspended during dredging operations likely would settle near the site of dredging or be transported by prevailing currents. The development of sediment plumes of increased suspended sediment concentration and turbidity would impact fish and benthic organisms, and sediment deposition may adversely affect benthic habitats and organisms, including the beds of aquatic vegetation known to be in Conowingo Pond. The effects of sediment plumes that may develop at a single dredging site would be compounded by the concurrent operation of multiple dredging sites. The probability of a detrimental effect of a dredging project from exposure to resuspended sediment can be viewed as a combination of concentration and duration,[19] none of which is known at present. Sediment plumes not only affect aquatic habitat but also the public water supply intakes[20] in Conowingo Pond. Dredging operations also generate noise above the water and underwater.[21] Nearby noise receptors that may be adversely impacted include boaters and shoreline users as well as terrestrial wildlife and aquatic biota. Bald eagles are particularly sensitive to such noise during the nesting and wintering periods.

Regardless of the dredging methodology utilized, the dredged material would have to be dewatered, a process that has its own environmental consequences. The biogeochemistry of nitrogen and phosphorus in Conowingo Pond sediments was investigated by UMCES.[22] Substantial amounts of adsorbed ammonium were found in Conowingo Pond sediment and high concentrations of the ammonium would likely be released as the addition of water for sediment slurrying occurs. This ammonia gas may be released to the atmosphere during dewatering at a combined disposal facility ("CDF") if the pH rises due to the presence of algae. Similarly, soluble reactive phosphorus ("SRP"), which binds to iron oxide minerals formed during dredging due to oxidation, can be released during dewatering due to changes in pH. Given that a dewatering site of approximately 600 acres[23] would be needed to accommodate 2-3 million cubic yards of dredged sediment, it is likely that new dewatering sites would have to be constructed upstream of Conowingo Pond. Creating such a large dewatering site could result in significant land use changes, as a substantial amount of land clearing and grading would be needed to produce a suitably large and flat site. Some potential land use changes that could result from construction of the dewatering facilities include deforestation and loss of terrestrial habitat, fragmentation of existing terrestrial habitat, and increased runoff generated by impervious surface areas.

Exelon also notes that the parties have mischaracterized the nature and impacts of scour events. During the period 2008-2014, nine high flow events occurred on the Lower Susquehanna

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[18] Palermo, M. R., Schroeder, P. R., Estes, T.J. and Francingues, N.R. Technical Guidelines for Environmental Dredging of Contaminated Sediments. ERDC/EL TR-08-29. 2008; U.S. Army Corps of Engineers. Dredging and Dredged Material Management. Engineering Manual. EM 1110-2-5025. 2015.

[19] Clarke, D. G., and Wilber, D. H. "Assessment of potential impacts of dredging operations due to sediment resuspension." DOER Technical Notes Collection (ERDC TN-DOER-E9). 2000.

[20] The City of Baltimore and Chester Water Authority both use Conowingo Pond as a source for public water supply.

[21] Reine, K., Clarke D., and Dickerson, C. Characterization of underwater sounds produced by hydraulic and mechanical dredging operations. J. Acoust. Soc. Am. 135 (6). 2014.

[22] Cornwell, J., Owens, M. Perez, H., and Vulgaropulos, Z. The Impact of Conowingo Particulates on the Chesapeake Bay: Assessing the Biogeochemistry of Nitrogen and Phosphorus in Resources and the Chesapeake Bay. UMCES Contribution TS-703-17. 2017.

[23] This figure is a linear proration based on the five-acre site currently being used by MDE to process 25,000 cubic yards. *See* Maryland Environmental Service Request for Proposals: Conowingo Capacity Recovery and Innovative Reuse and Beneficial Use Pilot Project, Project ID No. 1-18-3-21-8, at 16 (Aug. 31, 2017).

River with peak flows greater than or equal to 250,000 cfs. Based on the results of the modeling that was conducted during this period in support of the Sediment and Nutrient Monitoring Program, it was observed that of these nine storms, only two resulted in net erosion (*i.e.*, scour) from Conowingo Pond: Tropical Storm Lee (peak flow of 775,000 cfs) and the April 2011-B high flow event (peak flow of 352,000 cfs).[24] Analysis of the modeling results demonstrated that it is clear that scour is not just a function of flow but also of the timing of the storm and storm duration. For example, the April 2011-B event (peak flow of 352,000 cfs) occurred six days after a flow event with a peak flow of 281,000 cfs had ended and was net scour; however, the March 2011 high flow event which had a peak flow of 484,000 cfs was net depositional. In these instances, the timing of the previous high flow event had a greater impact on the sediment transport dynamics than the peak flow itself. In addition, the storm duration can impact whether a storm results in net deposition or scour, as demonstrated by the April 2011-B event which lasted six days. As such, there is no one set flow at which net scour occurs (*i.e.*, a scour threshold) and each high flow event has its own unique characteristics and sediment and nutrient transport processes.

Finally, it is important to note that sediment scoured from Conowingo Pond is less reactive than that which is transported from the watershed as washload (which accounts for up to 80 percent of the total sediment load to the Chesapeake Bay during a high flow event).[25] In addition to scouring less reactive material, if net scour occurs at all, Conowingo Pond still traps sediment and associated nutrients, which are more reactive, during large flow events. In other words, if net scour occurs, Conowingo Pond sediment transport processes essentially swap out more reactive material that is transported and deposited into Conowingo Pond with less reactive eroded material that is then transported to the Chesapeake Bay, thus providing a benefit to Bay water quality. Even in a state of dynamic equilibrium, Conowingo Pond still provides a benefit to Bay water quality as sediment and associated nutrients deposited in the Pond, even if temporarily, become less reactive than those nutrients which are passed directly through the Pond as washload. If the nutrients passing into Conowingo Pond from the Holtwood Project ("Holtwood") were directly transported to the Chesapeake Bay, the more reactive material transported from upstream would instead travel directly to the Chesapeake Bay in a more reactive state than it does due to the presence of Conowingo Pond.

Draft Conowingo WIP

In response to elevated pollution upstream of the Conowingo Project, which is directly responsible for the accelerated rate of Conowingo infill, the Chesapeake Bay Partnership is considering a "Conowingo Watershed Implementation Plan" ("Draft Conowingo WIP").[26] While

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[24] In contrast, six of these nine storms resulted in net erosion from Lake Aldred, the impoundment behind Holtwood. *See* Memorandum from Gomez and Sullivan Engineers, D.P.C. to Colleen Hicks *et al.*, Exelon Corporation, (Jan. 19, 2017).

[25] *Finding Cooperative Solutions to Environmental Concerns with the Conowingo Dam to Improve the Health of the Chesapeake Bay: Hearing Before the Senate Committee on Environment and Public Works, Subcommittee on Water and Wildlife*, 113th Cong. 8 (2014) (Statement of Colonel J. Richard Jordan, III, Commander and District Engineer, U.S. Army Corps of Engineers, Baltimore District).

[26] *See Conowingo Watershed Implementation Plan*, December 19, 2017 Draft (available at https://www.chesapeakebay.net/channel_files/25523/draft_conowingo_wip_framework_december_19_to_psc.pdf) (accessed on December 28, 2017). The draft states that all Chesapeake Bay Partnership jurisdictions recognize that "[e]levated pollution levels upstream of the reservoir accelerate the rate at which the Conowingo reservoir has filled." *Id.* at 3.

acknowledging that the "trapping of pollutants by the Conowingo Reservoir over the past 80+ years has benefited the water quality of the Bay" and "benefitted states by lessening load reduction responsibilities,"[27] the Draft Conowingo WIP proposes that Exelon be required – through the Maryland water quality certification – to fund mitigation measures to address the impact of upstream sources of pollution, including pollution sources in Pennsylvania and New York.[28] The Clean Water Act does not provide a legal basis that would enable the Draft Conowingo WIP to impose a requirement on Exelon to mitigate the impacts associated with upstream pollution sources.

Upstream sources in New York and Pennsylvania have essentially used Conowingo Pond as a landfill—a "sink" that has captured pollution and masked its impact to the Chesapeake Bay for over 80 years. As the Draft Conowingo WIP acknowledges, this has created a free-rider issue whereby upstream states have been given a pass in the form of lesser "load reduction responsibilities."[29] Now that Conowingo Pond is full, the Draft Conowingo WIP contemplates that Exelon should fund measures to mitigate upstream pollution sources or pay for the costs associated with dredging to create additional room in the Reservoir that would further mask the impacts of upstream pollution sources. Thus, at its core, the Draft Conowingo WIP seeks to shift responsibility away from pollution sources and onto Exelon as a means to reduce the cost and regulatory burdens associated with pollution impacts to the Chesapeake Bay attributable to sources in New York and Pennsylvania.

Exelon has consistently stated throughout the relicensing process that it is open to providing some level of support to improve Chesapeake Bay water quality as part of a settlement agreement. Maryland, however, cannot mandate through the water quality certification or any other means that Exelon fund mitigation measures to address the water quality impacts of other pollution sources, particularly sources in other states. Moreover, the Draft Conowingo WIP inexplicably incorporates only the Conowingo Dam into its mitigation plan when the two reservoirs immediately upstream (Lake Aldred and Lake Clarke) are also in a state of dynamic equilibrium, and presumably there are many other dams in the Susquehanna Basin and other basins that drain directly into the Chesapeake Bay that also are in a state of dynamic equilibrium.

Congress never intended the water quality certification process to be used as a mechanism to shift responsibility away from pollution sources. Section 401 requires applicants to ensure *their* activities will comply with water quality standards; to the extent an applicant's activities are a source of pollution that affects water quality, the pollution impact must be mitigated. Section 401 of the Clean Water Act, however, does not create an opportunity for States to require applicants to subsidize the mitigation costs of other pollution sources. Any attempt to require Exelon to fund mitigation measures that address the water quality impacts of upstream sources is an overreach, without precedential support, and would not withstand judicial review.

E3 Report

At the December 5, 2017 public hearing on the Conowingo Project's water quality certification application, The Nature Conservancy ("TNC") referenced a report entitled "An

[27] *Id.*
[28] *Id.* at 5-6.
[29] *Id.* at 3.

Economic Analysis of the Conowingo Hydroelectric Project Generating Station" prepared by Energy + Environmental Economics ("E3 Report").[30] The E3 Report purports to demonstrate that Exelon has "available headroom—after a 10 percent rate of return" of $27 million to $44 million annually ". . . that could be used towards mitigation efforts . . ."[31]

The E3 Report is irrelevant to the determination of whether the Conowingo Project's proposed operations will continue to comply with applicable water quality standards. Moreover, as a tool for analysis, its assumptions, methodology, and conclusions are so fatally flawed as to render the report meaningless.

The Clean Water Act authorizes Maryland to impose conditions on Exelon to ensure that the activities for which Exelon seeks a federal permit (*i.e.*, operation of the Conowingo Hydroelectric Project) comply with state water quality standards. The Clean Water Act does not authorize Maryland to impose mitigation measures based on an applicant's perceived financial condition or ability to pay; rather, the scope of mitigation must have a direct and proportional relationship to the identified impact. There is no support in the text of the Clean Water Act, its legislative history, or applicable precedent that would suggest that Exelon's mitigation requirements should be tied to anything other than the impact its activities may have on water quality. In this case, while Exelon has indicated a willingness to play a constructive role in preserving and enhancing the environmental values of the Chesapeake Bay, the record is bereft of any evidence that Exelon is a source of sediment pollution. Stakeholders should harbor no illusion that Exelon will leave unchecked any attempt to distort the water quality certification proceeding and use it to extract funding from a perceived "deep pocket."

Even if a project's "economic analysis" were an appropriate consideration in a water quality certification proceeding, the E3 Report lacks credibility given its faulty assumptions and seeming lack of knowledge about, and understanding of, the PJM Interconnection, L.L.C. ("PJM") market. Specifically, the E3 Report, which relies on 2013 costs and revenues, fails to account for changes in the PJM capacity market and makes no effort to analyze the significant decline in energy prices that have occurred since 2013 and which are expected to remain flat for the foreseeable future.[32] Consequently, the E3 Report grossly overestimates the future revenues of the Conowingo Project. Given the infirmities inherent in TNC's analysis, and a complete lack of relationship between the report and the legal standards governing a water quality proceeding, MDE should reject the E3 Report as meritless and outside the scope of this proceeding.

Flows

As discussed in the Application, Exelon has proposed to increase its minimum flows and make them continuous year-round. The flow conditions proposed in the Application provide for an operational regime that adequately mitigates the impacts of the Conowingo Project and protects aquatic biota and their associated habitats, ensuring that the waters below the Conowingo Project

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[30] Energy + Environmental Economics. An Economic Analysis of the Conowingo Hydroelectric Generating Station (Aug. 8, 2017).
[31] *Id.* at Executive Summary.
[32] An assessment of the E3 Report, prepared by the Northbridge Group, is included in the supplemental documentation filed with these comments.

will remain suitable for all Use II-P designated uses. Therefore, MDE should accept the flow regime proposed in the Application without modification.

Exelon's Flow Proposal Protects Aquatic Habitat and Complies with Maryland Water Quality Standards

The Susquehanna River Basin Commission ("SRBC") and TNC propose an alternative flow regime to the flow regime Exelon proposed in the Application.[33] SRBC asserts that Exelon's proposed flow regime entails decreases in minimum flows for August and the first half of September, which are critical low-flow months.[34] According to SRBC, Exelon's proposed minimum flow regime would result in maximum weighted usable area habitat values less than 60 percent for several key target species and their life stages.[35] TNC argues that the minimum flow conditions proposed in the Application "will not mitigate the impacts of the Project's regulation of flow on resources of the lower Susquehanna River."[36] TNC also attaches to its comment letter testimony from Dr. Clair Stalnaker reviewing the Conowingo Project instream flow study (RSP 3.16).

While Exelon's proposed flow regime differs from TNC and SRBC's alternative flow proposal, Exelon's proposal complies with applicable Maryland water quality standards. FERC's independent environmental analysis found that Exelon's current flow regime is generally adequate for protection of aquatic resources downstream of the Conowingo Project, though it noted that some adjustments to these flows—such as eliminating short periods (*i.e.*, 6-hour intervals) of zero minimum flow[37] in December through February and increasing the minimum flow from 5,000 to 7,500 cubic feet per second ("cfs") in the first half of June—could provide additional protection for downstream aquatic habitat.[38] Notably, Exelon incorporated substantially all of FERC's recommended improvements to the flow proposal contained in the Application and exceeded those recommendations, most importantly during the spring American shad and river herring passage and spawning season.

TNC and SRBC's flow proposal rationale relies heavily on optimizing total river habitat, without providing any context to the location, areal extent, or quality of the habitat. One of the benefits of conducting the two-dimensional modeling of the reach downstream of the Conowingo Project was the resulting detailed habitat maps for various species and lifestages. These maps (included as part of the RSP 3.16 study report), along with the persistent habitat maps, visually show the location and quality of habitat downstream of the Conowingo Project, providing context that is not clear in strictly numerical total habitat analyses. This is important when determining flow recommendations, as the maps allow one to quickly assess how habitat changes in quality

[33] SRBC's comments indicate that its flow proposal is attached, but the flow proposal was inadvertently omitted from SRBC's filings. Based on correspondence with SRBC, it is Exelon's understanding that SRBC's flow proposal is the same as TNC's proposal. Email from John Balay, Susquehanna River Basin Commission, to Gary Lemay, P.E., Gomez and Sullivan Engineers, DPC (Oct. 23, 2017).

[34] Susquehanna River Basin Commission August 23, 2017 Comments at 2.

[35] *Id.*

[36] The Nature Conservancy August 23, 2017 Comments at 6.

[37] Although no operational releases are made from the Conowingo Project during these periods, there is leakage flow from dam of approximately 800 cfs that is provided to the river reach.

[38] Final Multi-Project Environmental Impact Statement for Hydropower Licenses, FERC Docket Nos. P-405-106 *et al.*, at 412 (Mar. 2015) (hereinafter, "FEIS").

and location over a range of flows, thus assessing the total available (or potentially available) habitat in context. This is particularly important when considering persistent habitat.

While each species and lifestage has different preferences, Exelon found the maps showed that under all the proposed flow regimes:

1) Habitat would remain generally poor throughout the reach for most species.[39] This is primarily due to the predominantly bedrock substrate, as most of the species evaluated have a low preference for bedrock substrate.[40]

2) Quality habitat (combined suitability[41] ≥ 0.5) would remain very limited for most species, and is usually confined to fairly small areas of the river, such as downstream of Rowland Island and around the complex of islands in the tidally-influenced area near Spencer Island.

As an example of this, Figures 1 through 3 on the following pages show habitat maps for the American shad spawning lifestage, shortnose sturgeon spawning lifestage and for caddisfly (a macroinvertebrate species).[42] The maps show that there is a relatively limited amount of high-quality habitat in the entire river reach for these species/life stages over the operational flow range of the Conowingo Project.

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[39] Striped bass appear to be the one exception to this, as they prefer bedrock substrates and thus have high quality habitat throughout the river at a range of flows.

[40] As noted in RSP 3.15 (Sediment Introduction and Transport Study), "Historical information and geological data suggest that prior to construction of Conowingo Dam the river had great enough energy and stream power throughout the Project area to sustain a mobile bedload with little sediment deposition until the river mouth was reached." This indicates that the reach below Conowingo Dam has likely been a primarily bedrock channel since before Conowingo Dam was constructed.

[41] Habitat is generally described for a given species/life stage using a 0 to 1 scale. A suitability index value of 0 indicates no habitat value, while a suitability index value of 1 indicates optimal habitat value.

[42] Figures 1 through 3 utilize maps contained in RSP 3.16 Appendix E, but provide an adjusted color scale to better distinguish between high-quality and low-quality habitat. Exelon has provided similarly updated versions of all the habitat maps contained in RSP 3.16 Appendix E in the supplemental documentation filed with these comments.

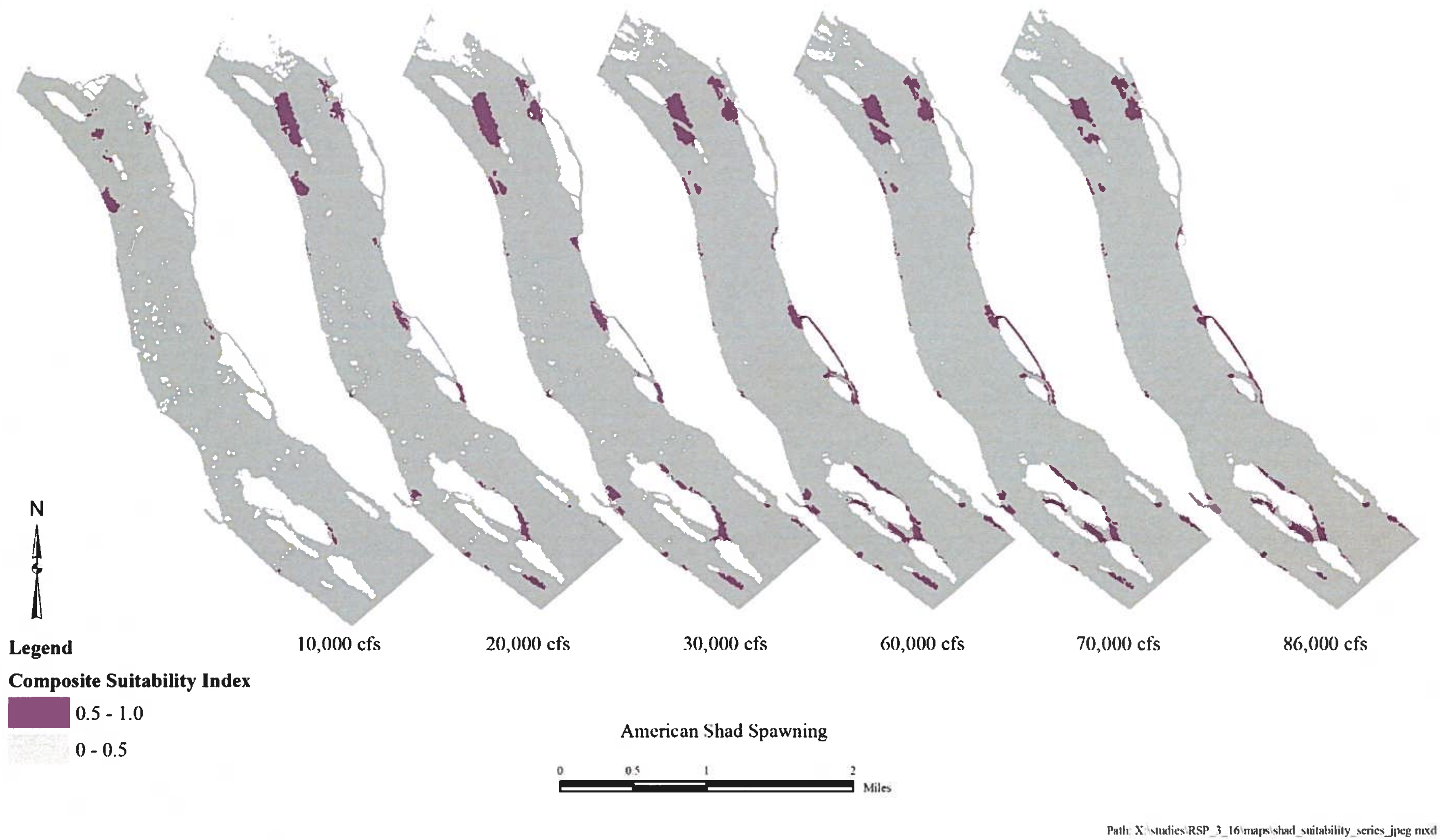

Figure 1: American Shad spawning lifestage habitat maps at various flows.

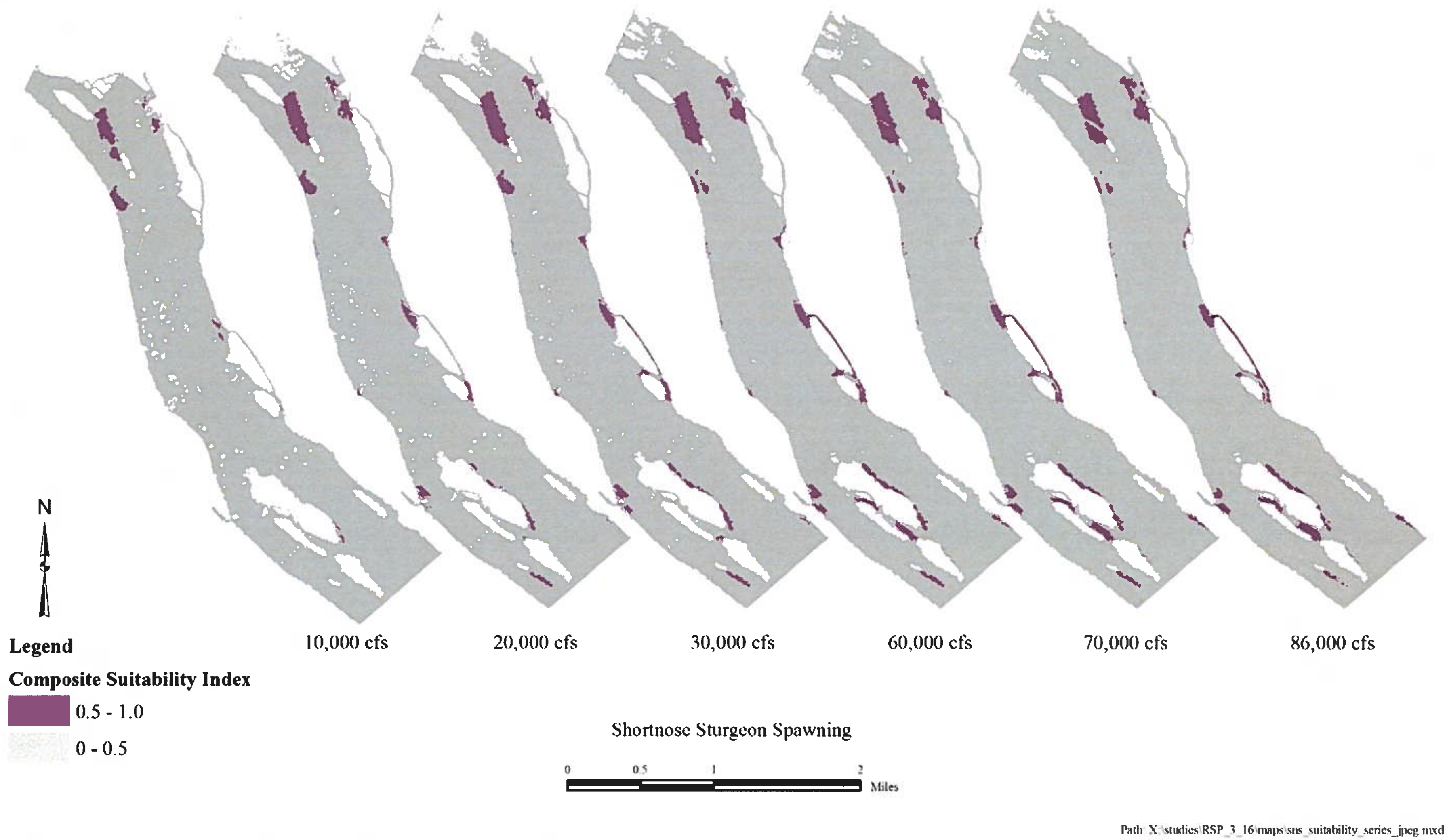

Figure 2: Shortnose Sturgeon spawning lifestage habitat maps at various flows.

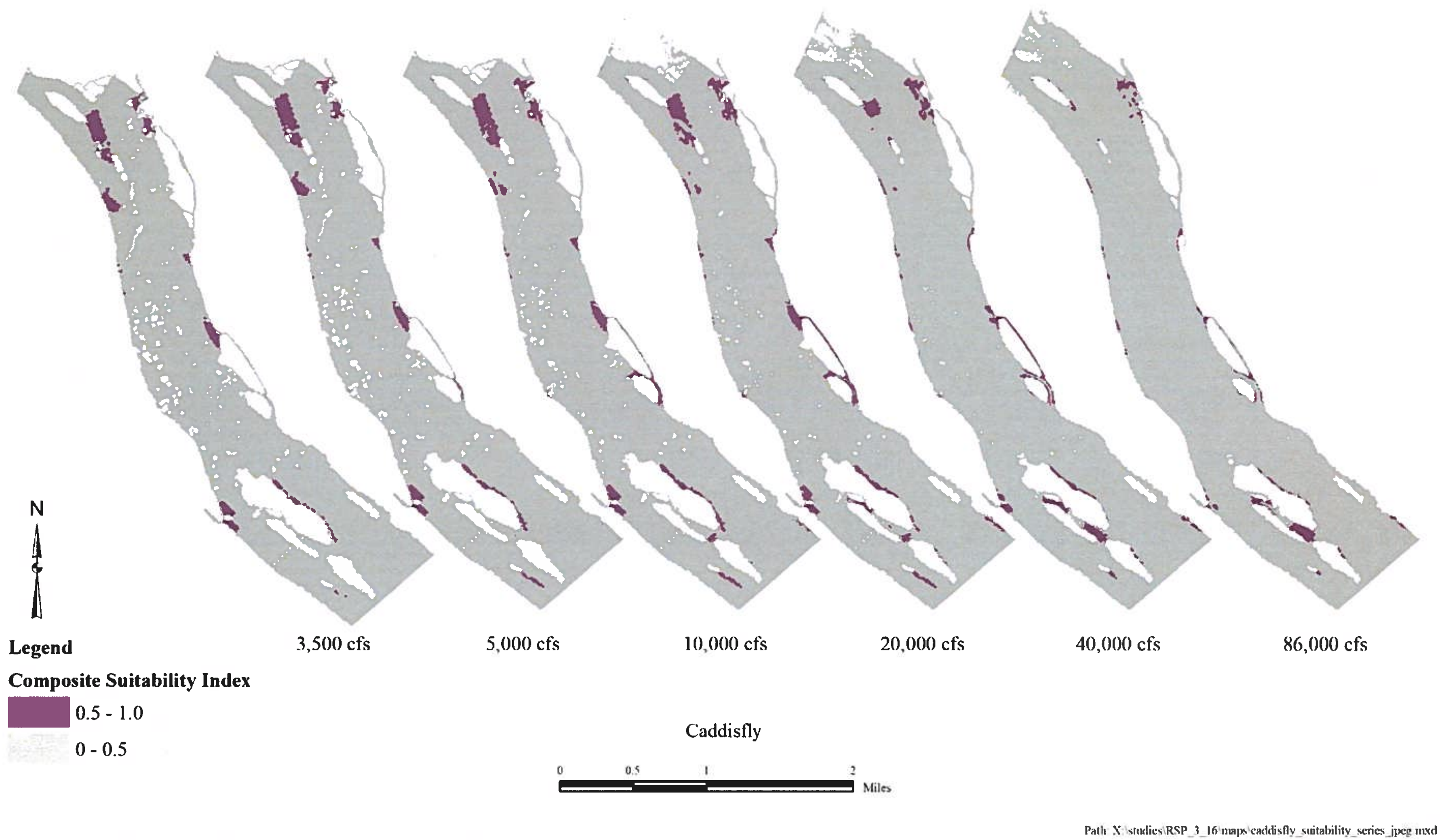

Figure 3: Caddisfly (Trichoptera) habitat maps at various flows

Exelon also used habitat time series data[43] to evaluate different flow proposals in the context of actual river flows. A number of potential flow scenarios were run through the OASIS model as part of RSP 3.11, and then combined with results from RSP 3.16 to produce habitat time series. The results were shared with interested licensing stakeholders (SRBC, TNC, and MDNR). While there are many ways to interpret habitat time series, the use of habitat duration statistics can help identify "habitat bottlenecks,"[44] which may play an important role in the utilization of aquatic habitat.[45, 46] Dr. Stalnaker's testimony states that one of the resource agencies' "*fundamental objectives* for this relicensing are to significantly reduce the frequency and magnitude of habitat bottlenecks from present project operations for species of concern."[47]

Exelon's analysis found that similar habitat bottlenecks would exist under TNC's proposed flow regime, run-of-river operations, and Exelon's proposed flow regime. Specifically, using the same models as TNC, Exelon conducted a habitat time series analysis structured after the analysis completed as part of the Upper Delaware River Instream Flow Incremental Method ("IFIM") study.[48] The Upper Delaware River IFIM study utilized a habitat duration analysis focused on habitat bottlenecks, recognizing that periods of limited habitat are likely more useful for analyzing "limiting events." The Upper Delaware River IFIM study used a habitat duration time series plot to assess habitat bottlenecks, which Exelon has adopted here.

Exelon examined the 25th percentile (*i.e.*, 75th exceedance percentile) of daily habitat values over the course of a year. Values were calculated by calculating the 25th percentile habitat values by calendar day of the year over the entire OASIS model run period (hourly outputs from 1930-2007), such that all hourly values for June 1 were analyzed together, same for June 2, and so on. Other values, such as the 10th percentile (*i.e.*, 90th exceedance percentile) have also been suggested as a potential assessment metric,[49] which may more directly assess habitat minima rather than just bottlenecks. Exelon's analyses were calculated for both the 10th and 25th percentile (90th and 75th exceedance percentiles, respectively), and the results are shown in Appendix A (25th percentile values) and Appendix B (10th percentile values) for the seasons in which the respective species/life stages are expected to be present in the river. Four scenarios were evaluated: baseline conditions, Exelon's flow proposal, TNC's flow proposal, and the run-of-river scenario. Based on these analyses, Exelon found that, in general, there is very little difference between many of the flow

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[43] A habitat time series is a combination of a flow time series with a habitat vs. flow relationship.

[44] A habitat bottleneck is "[a] constraint on a species' ability to survive, reproduce, or recruit to the next life stage that results from reductions in available habitat extent and/or capacity and reduces the effectiveness of traditional fisheries management options to control mortality and spawning stock biomass." Atlantic States Marine Fisheries Commission Habitat Management Series #13, Habitat Bottlenecks and Fisheries Management. Winter 2016.

[45] Bovee, K.D., Lamb, B.L., Bartholow, J.M., Stalnaker, C.B., Taylor, J., and Henriksen, J., 1998, Stream Habitat Analysis using the Instream Flow Incremental Methodology: U.S. Geological Survey, Information and Technology Report USGS/BRD-1998-0004, 131 p.

[46] Bovee, K.D., Waddle, T.J., Bartholow, J., and Burris, L., 2007, A Decision Support Framework for Water Management in the Upper Delaware River: U.S. Geological Survey Open-File Report 2007–1172, 122 p.

[47] TNC Comments, Attachment 3 at 5 (emphasis in original).

[48] Bovee, K.D, Waddle, T. J., Bartholow, J., Burris L. 2007. A Decision Support Framework for Water Management in the Upper Delaware River, Open-File Report 2007-1172.

[49] Bovee, K.D., Lamb, B.L., Bartholow, J.M., Stalnaker, C.B., Taylor, J., and Henriksen, J., 1998, Stream Habitat Analysis using the Instream Flow Incremental Methodology: U.S. Geological Survey, Information and Technology Report USGS/BRD-1998-0004, 131 p.

scenarios in both a relative and absolute sense from the standpoint of preventing habitat bottlenecks.

TNC's Filing Misrepresents Studies in the Record

TNC's filing also mischaracterizes studies in the record. For example, Dr. Stalnaker's testimony claims that Exelon's instream flow study is incomplete. This is not accurate; Exelon completed all tasks as described in RSP 3.11 and RSP 3.16, which included developing a two-dimensional hydraulic and habitat model, developing an hourly operations model of the lower Susquehanna River reservoir system, using the operations model to evaluate various potential flow scenarios at the Conowingo Project, and developing habitat time series outputs by combining the operations model output for various flow scenarios with the habitat model results.[50] Upon detailed review of Dr. Stalnaker's testimony, it appears TNC did not review in their entirety all the relevant study plans and reports (RSP 3.11 and 3.16), as several steps noted by TNC as "incomplete" or "missing" were either conducted and included as part of the RSP 3.11 and 3.16 study reports or were not part of the FERC-approved study plan, which was developed in consultation with licensing stakeholders. For example:

1) The testimony indicates that hydrologic time series were not produced for baseline and proposed alternative Conowingo Project operation flow schedules (Step 3). This is incorrect. Results for the baseline and alternative flow regimes were shared with stakeholders in a January 2012 RSP 3.11 and RSP 3.16 study addendum.[51] These results also were shared directly with licensing stakeholders, including TNC. Indeed, TNC references the results from the baseline and several alternative operating scenarios in Attachment 2 – Appendix 1 of its comment letter.

2) The testimony indicates that results should be stratified into various hydrologic conditions (dry, moderate, wet years). This was addressed as part of RSP 3.11, which included modeling an extended period-of-record from calendar year 1930 through 2007. This extended period covered a range of hydrologic conditions, including extreme droughts as well as very wet periods.

3) The testimony indicates that the proposed operational scenarios should be compared against the baseline scenario using habitat time series. As noted above, baseline and alternative proposal hydrology results and their resulting habitat time series data were shared directly with licensing stakeholders, including TNC.

Ramping Restrictions Are Not Justified

SRBC recommends seasonal maximum ramping rate restrictions "to improve persistent habitat for target species downstream and to avoid stranding and mortality of a variety of aquatic

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[50] *See* Exelon. 2012. Operations Modeling Baseline and Production Run Report Addendum, RSP 3.11: Conowingo Hydroelectric Project, FERC Project Number 405; Exelon. 2012. Instream Flow Habitat Assessment below Conowingo Dam, RSP 3.16 Addendum – Habitat Time Series Report: Conowingo Hydroelectric Project, FERC Project Number 405.

[51] Exelon. 2012. Instream Flow Habitat Assessment below Conowingo Dam, RSP 3.16 Addendum – Habitat Time Series Report: Conowingo Hydroelectric Project, FERC Project Number 405.

organisms, as well as to improve fish passage."[52] However, there is no need to impose ramping restrictions on the Conowingo Project, as there is no evidence that stranding is having an adverse impact on migrating and resident fish populations. Exelon's surveys revealed that stranding affects very few migratory fish. In fact, during the four stranding studies within and just downstream of the spillway reach below Conowingo, only 108 stranded American shad were observed.[53] Of those American shad observed as stranded, only 46 were observed dead.[54] In 2010, MDNR estimated that there were between 65,286 and 147,679 American shad in the tailrace below Conowingo; thus, the observed fatalities represent between 0.0007 percent and 0.000003 percent of the total American shad available for passage. As FERC concluded in its FEIS, "[a]lthough implementing run-of-river or TNC Flow Regime flows could reduce this source of mortality, the results of Exelon's stranding surveys indicate that the magnitude of this benefit would be minor."[55]

Moreover, both historic and current fish population data collected within Conowingo Pond and in the Susquehanna River below the Conowingo Project document the existence of a healthy and robust fishery. In addition, data from creel surveys of Conowingo Pond[56] and the Lower Susquehanna River[57] clearly indicate a strong and healthy year-round sport fishery.

Long-term fish collections at the Conowingo Project's East and West Fish Lifts are dominated by gizzard shad, channel catfish, common carp, and white perch, and are similar to those observed in electrofishing, gill net, and ichthyoplankton sampling conducted below the Conowingo Project during the 1980s.[58] Since the 1970s, some changes to the fish species assemblage are evident. Specifically, gizzard shad have trended upward in abundance, while some other species have declined. White crappie catches at the West Fish Lift have declined substantially since the mid-1970s, and it has been noted that one of the primary mechanisms of low recruitment of white crappie is the competition for zooplankton with juvenile gizzard shad.[59]

In 1997, 1999, and 2001, significant catches of blueback herring were made at the Conowingo Project's East Fish Lift. Since 2002, however, very few blueback herring have been passed. This decline likely reflects recent population declines coast-wide due to a number of potential causes including habitat loss, targeted or bycatch in commercial fisheries, and increased numbers of striped bass and other predators.[60]

Aside from the aforementioned changes in the fish population segments, the fish species assemblage has remained diverse below the Conowingo Project with the same core group of

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[52] Susquehanna River Basin Commission August 23, 2017 Comments at 4.
[53] Normandeau Associates and Gomez and Sullivan Engineers. 2012. Flow ramping and stranding study (RSP 3.8). Kennett Square, PA: Exelon Generation, LLC.
[54] *Id.*
[55] FEIS at 150.
[56] Normandeau Associates and Gomez and Sullivan Engineers. 2012. Conowingo Pond creel survey (RSP 3.25A).
[57] Normandeau Associates and Gomez and Sullivan Engineers. 2012. Lower Susquehanna River creel survey (RSP 3.25B).
[58] Normandeau Associates and Gomez and Sullivan Engineers. 2012. Characterization of Downstream Aquatic Communities (RSP 3.18).
[59] Normandeau Associates. 1994. Analysis of potential factors affecting the white crappie population in Conowingo Pond.
[60] Normandeau Associates and Gomez and Sullivan Engineers. 2012. Characterization of Downstream Aquatic Communities (RSP 3.18).

species as was observed in the 1980s. The fish lift catches have ranged from 30 to 49 taxa annually at the West Fish Lift and 25 to 45 taxa annually at the East Fish Lift. The length/weight relationship of several species recently collected at the West Fish Lift was similar to those collected from 1982 to 1987. Both the 1980s fish collections and those collected in 2010 were comparable to those from other normal, natural populations and are indicative of relatively favorable conditions and habitats in the lower Susquehanna River.[61] Thus, contrary to SRBC and TNC's assertions, Exelon's proposed flow regime does provide for sufficient habitat downstream of the Conowingo Project without the addition of ramping restrictions.

SRBC and TNC's Flow Regime Renders Management of Conowingo Pond Levels Unworkable

TNC and SRBC's significantly higher proposed minimum flows at the Conowingo Project and proposed two-tier operation would substantially undermine the generation value of the Conowingo Project, and occasionally render management of Conowingo Pond levels unworkable. In addition, the restrictions proposed by TNC and SRBC would severely curtail Conowingo Project and Muddy Run Pumped Storage Project ("Muddy Run Project") operations, as well as create additional water management challenges within Conowingo Pond and the Lower Susquehanna River, and with competing water uses (*i.e.*, water supply, power generation, and recreation).

Although Conowingo Pond was originally created to allow generation of power by the Conowingo Project, over time it has become a stable source of water storage for other key purposes. Thus, the water in Conowingo Pond is now utilized for public water supply, recreation, additional hydroelectric power generation by the Muddy Run Project, and cooling of various power generation facilities, including the Peach Bottom Atomic Power Station ("Peach Bottom") and the York Energy Center. If the elevation of Conowingo Pond falls below certain minimum levels, these other beneficial uses are jeopardized.

While depletion of Conowingo Pond storage is a relatively infrequent occurrence under current conditions, it would occur much more frequently under the flow regime proposed by TNC and SRBC. A key component of the TNC/SRBC flow proposal is tying minimum flow releases to flows at the upstream Marietta USGS gage. However, an important point of context that TNC and SRBC fail to acknowledge is the existence of two peaking hydroelectric plants downstream of the Marietta USGS gage that can greatly influence inflow to Conowingo Pond. These two plants have minimal or no continuous flow release requirements at any point in the year, and frequently shut down Conowingo Pond inflow for extended periods under some conditions. The Safe Harbor Project ("Safe Harbor") has no minimum flow requirement, and can generate at up to 110,000 cfs.[62] Holtwood, located immediately downstream of Safe Harbor and immediately upstream of the Conowingo Project, must continuously release 800 cfs or net inflow if releases from Safe Harbor are less than 800 cfs.[63] Therefore, due to the "or net inflow" component of Holtwood's

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[61] Normandeau Associates and Gomez and Sullivan Engineers. 2012. Characterization of Downstream Aquatic Communities (RSP 3.18).

[62] Safe Harbor's operating capacity of approximately 110,000 cfs is approximately 24,000 cfs greater than Conowingo Dam's maximum operating capacity of 86,000 cfs.

[63] Holtwood must also release, on a daily basis, 98.7 percent of the Conowingo Project's minimum flow requirement or net inflow if Safe Harbor releases are less than that.

minimum flow requirement, when Safe Harbor shuts down flow releases, Holtwood effectively also has no continuous flow requirement. Under the Conowingo Project's existing (baseline) flow regime, and all of the currently proposed flow alternatives, the Conowingo Project must pass the seasonal minimum flows (or Marietta inflow, if less) on an instantaneous basis regardless of actual inflow to Conowingo Pond, even if the upstream projects are releasing little or no water. As a result, the storage capacity of Conowingo Pond is depleted.

Output from the OASIS model, developed as part of RSP 3.11, of the TNC/SRBC flow proposal illustrates this situation. Figure 4 depicts Muddy Run Project storage and Conowingo Pond levels for the June 5 through 13 period. Figure 5 shows Holtwood outflow (Conowingo Inflow) and Conowingo Outflow. In this mid-June scenario, the Conowingo Project must meet a weekend minimum pond level of 107.2 feet (NGVD29 datum) on June 9 and 10 while maintaining the TNC/SRBC minimum flow requirement. At the same time, Conowingo Pond inflow from Holtwood continues to fluctuate, meaning the Conowingo Project must rely on Conowingo Pond's limited storage to effectively re-regulate the river. This quickly results in depletion of the available Conowingo Pond storage. In such instances, the only way to avoid Conowingo Pond dropping to critical elevations and meet the minimum flow requirements would be to utilize water stored by the Muddy Run Project to supplement river flow. This is atypical operation for the Muddy Run Project, which generally does not operate much during the weekend as power prices are generally low. The end result is that the Conowingo Project cannot be used for peaking operations due the minimum flow and pond level constraints, and the Muddy Run Project must generate during times of low power prices, while Holtwood continues to operate in a typical peaking pattern.

Figure 4: Muddy Run Project Reservoir (red) and Conowingo Pond (blue) Water Levels, June 5 through 13, under TNC/SRBC Flow Proposal. The blue line represents Conowingo Pond levels, and the red line represents Muddy Run Project storage levels.

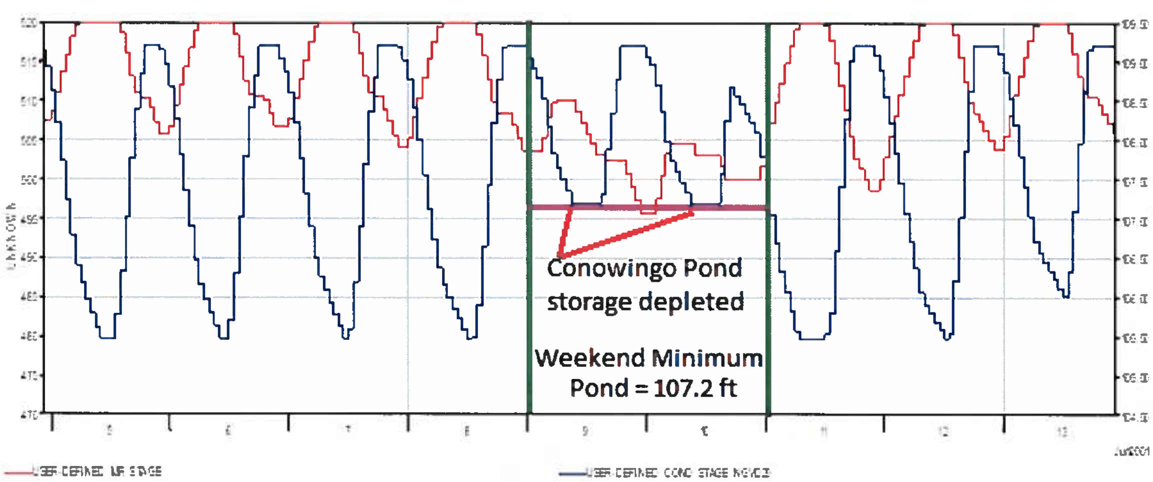
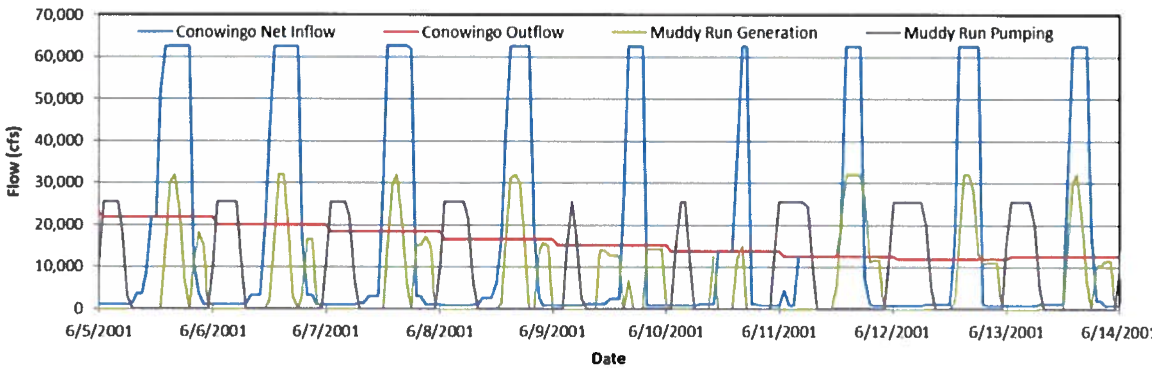


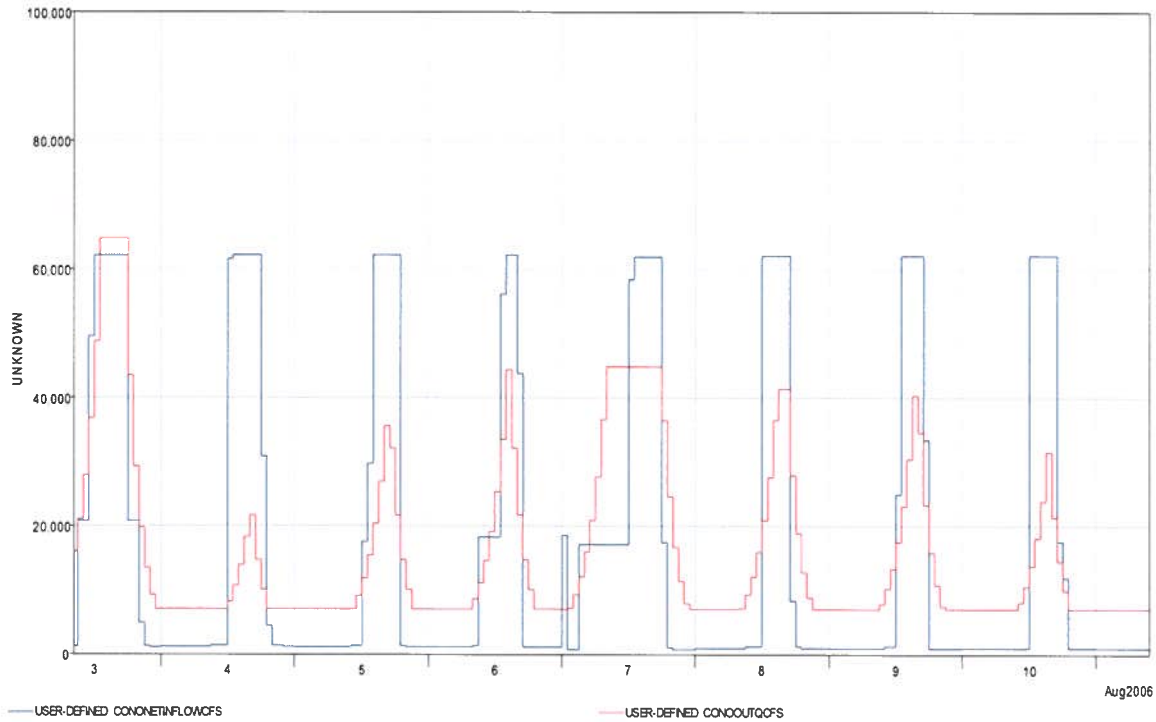
Figure 5: Holtwood Outflow (blue) and Conowingo Outflow (green), June 5 through 13, under TNC/SRBC Flow Proposal.



In the past, Muddy Run Project storage has rarely been used to supplement river flow and maintain Conowingo Pond levels when upstream dams curtail flow releases in response to electric grid demands. However, under TNC and SRBC's proposal, Exelon would be forced to utilize Muddy Run Project storage to maintain Conowingo Pond elevation levels and downstream flow releases much more frequently than in the past, impacting both air emissions and costs in the region as costlier carbon-based generation may be dispatched by PJM to make up for the absence of Muddy Run and Conowingo Project operations.

This situation is illustrated using output from the OASIS model for the summer period of August 3 through 10. In this scenario, the higher minimum flows prevent the Conowingo Project from reaching its peak generation of approximately 86,000 cfs during the peak electric demand hours. As a result, PJM will need to use costlier generation (carbon based fuel) to support the summer peak, and the Conowingo Project may not be able to support the electric grid during emergencies (electric grid stability). At the same time, Holtwood passes its peak capacity of approximately 65,000 cfs for several hours each day. When the peak hours are over, Holtwood returns to passing its substantially lower minimum flow, at the same time the Conowingo Project must pass higher minimum flows, which depletes Conowingo Pond storage. In addition, while Holtwood has a continuous minimum flow it must pass, it is on an "or net inflow" basis. Thus, if Safe Harbor turns off their generation, which it typically does during off-peak periods, then Holtwood does not have to pass its continuous minimum flow to Conowingo Pond; instead it passes inflow from Safe Harbor, which in this case is zero.

Figure 6: Holtwood Outflow (blue) and Conowingo Project Outflow (red), August 3 through 10, under TNC/SRBC Flow Proposal



This also adds important context to the "run-of-river" scenario that TNC requests be treated as an "alternative baseline."[64] In the run-of-river scenario, the Conowingo Project is required to pass prorated flows from the USGS Marietta Gage while the two projects between the Marietta Gage and Conowingo Pond continue peaking operations, essentially requiring Exelon to compensate for others' impacts on the river as a result of upstream operations. This is problematic because, as discussed above, Conowingo Pond has relatively little storage relative to the magnitude of Susquehanna River flows, particularly during the summer recreation season. Using Conowingo Pond's storage to re-regulate upstream projects' flow fluctuations is inequitable and unnecessary.

Fish, Aquatic Life, and Wildlife

The PM&E measures described in the Application will ensure that the waters below the Conowingo Project will remain suitable for all the Use II-P designated uses relating to fish, aquatic

[64] It is FERC policy that the environmental baseline on relicensing is the environment as it exists at the time of relicensing, not pre-project conditions. *Am. Rivers v. FERC*, 187 F.3d 1007, *amended and rehearing denied*, 201 F.3d 1186 (9th Cir. 1999). FERC's use of existing conditions rather than pre-project conditions has been affirmed by federal courts. *See, e.g.*, *id.*; *Conservation Law Fund v. FERC*, 216 F.3d 41 (D.C. Cir. 2000).

life, and wildlife. Accordingly, MDE should reject commenters' requests to modify or supplement the PM&E measures set forth in the Application.

Trap and Transport Program

As described in the Application, Exelon and the U.S. Department of the Interior ("Interior") executed a Settlement Agreement that requires Exelon to make significant investments in fish passage measures during the term of the new license. The cornerstones of the Settlement Agreement are a trap and transport program designed to jump start American shad population growth, a suite of improvements upon issuance of the new license, and an adjusted passage efficiency formula that informs the timing of additional capital investments in volitional fish passage facilities to accommodate the growth of the American shad population.

TNC's concern that the Settlement Agreement "does not expressly limit use of trap-and-transport in favor of increasing volitional passage over the proposed 50-year term of the license . . ." is misplaced. In addition to jump starting the recovery of the American shad population, the trap and transport program is designed to hedge the risk posed to the American shad population if upstream facilities fail to increase their passage efficiencies. When developing its Alternative Prescription for Fishways for the Conowingo Project ("Alternative Prescription"), Exelon utilized the same population models employed by Interior to analyze various options. Exelon determined that by incorporating a program to trap and transport American shad from the Conowingo Project to above the York Haven Project ("York Haven"), the population benefits of Exelon's Alternative Prescription far exceeded those provided by Interior's Preliminary Prescription for Fishways ("Preliminary Prescription"), which assumed volitional passage alone at the Conowingo, Holtwood, Safe Harbor, and York Haven.[65] This is in large part because the actual long-term passage efficiencies at the upstream facilities at York Haven and Holtwood are 14 percent and 32 percent, respectively.[66]

Key resource agencies and stakeholders have recognized that a trap and transport program will be vital to restoring the American shad population of the Susquehanna River.[67] That is because, without a trap and transport program, the lower passage efficiencies of the upstream projects have significant implications for American shad population growth. For example, the chart below compares the projected American shad population above York Haven under the

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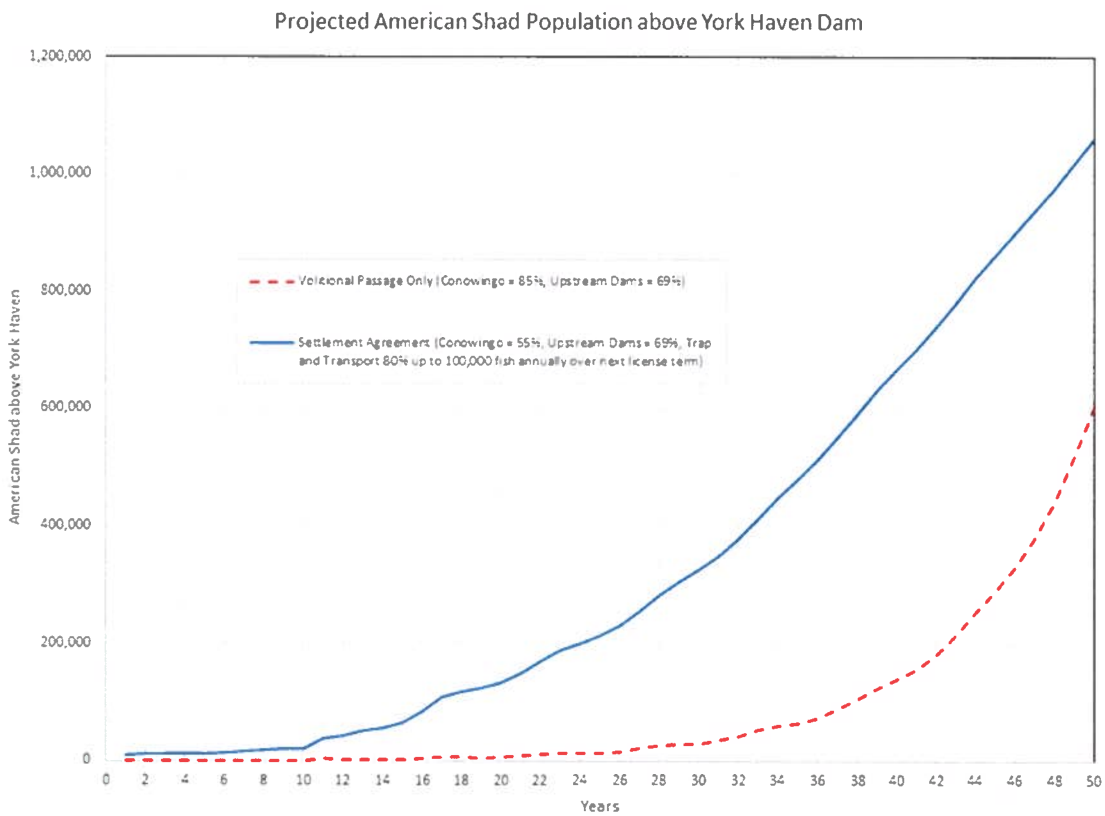
[65] Exelon Generation Company, LLC's Submittal of an Alternative Fishway Prescription for the Conowingo Hydroelectric Project (FERC Project No. 405), FERC Docket No. P-405-106 (filed Sept. 11, 2015).

[66] Normandeau Associates. 2015. Passage Data from Safe Harbor, Holtwood, and York Haven Hydroelectric Facilities.

[67] *See, e.g.*, Testimony of Genevieve LaRouche, U.S. Fish and Wildlife Service Chesapeake Bay Office Field Office Supervisor before the Senate Environment and Public Works Subcommittee on Water and Wildlife (May 5, 2014) ("We believe cessation of the program for trapping and transporting shad upstream of York Haven also affected the [American shad] decline. Consequently, few adult American shad were able to reach the important spawning and rearing habitat in the Susquehanna River. Restarting trap and transport operations, reducing fish passage delays, and improving fish passage efficiency will be paramount for migratory fish restoration in the Susquehanna River."); Comments of the United States Department of the Interior Fish and Wildlife Service (on behalf of the Susquehanna River Anadromous Fish Restoration Cooperative) on the Draft Environmental Impact Statement, Project Nos. P-405-106, P-2355-018, and P-1888-030 (filed Sept. 29, 2014) ("SRAFRC agrees with the draft [Environmental Impact Statement] in that trap and transport should be reinstated while population numbers are currently at a low level . . . A trap and transport program could be very beneficial to expediting the re-building of the Susquehanna shad population, especially considering the current low population numbers.").

Settlement Agreement and under volitional passage alone. The volitional passage scenario assumes that the Conowingo Project reaches a volitional passage efficiency of 85% and that all three upstream facilities reach a passage efficiency of 69%,[68] a generous assumption given that the actual long-term passage efficiencies at York Haven and Holtwood are 14 percent and 32 percent, respectively.[69]



As the chart above demonstrates, supplementing the Conowingo Project's volitional passage facilities with a trap and transport program allows for greater benefits for the American shad population than volitional passage alone. That is because a trap and transport program ensures that significant numbers of American shad will reach suitable spawning habitat, even if the fish passage facilities at Holtwood, Safe Harbor, and/or York Haven are underperforming[70] or unexpectedly taken out-of-service. Consequently, an express limitation on the future use of trap

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[68] This is the long-term passage efficiency average at Safe Harbor, which is acknowledged as the dam with the highest passage efficiency on the Susquehanna River. *See also* Testimony of Genevieve LaRouche, U.S. Fish and Wildlife Service Chesapeake Bay Office Field Office Supervisor before the Senate Environment and Public Works Subcommittee on Water and Wildlife (May 5, 2014) ("Currently, only Safe Harbor Dam is close to meeting the fish passage criteria.").

[69] Normandeau Associates. 2015. Passage Data from Safe Harbor, Holtwood, and York Haven Hydroelectric Facilities.

[70] In November 2017, for example, a determination was made that Holtwood failed to meet the fish passage efficiency targets established in its water quality certification.

and transport would be counterproductive and harmful to the Susquehanna River American shad population.

The adjusted passage efficiency formula, which will be used to establish the Conowingo Project's upstream passage efficiency, begins with the passage efficiency of the volitional passage facilities at the Conowingo Project and adjusts that passage efficiency to reflect a credit that Exelon receives for its trap and transport program.[71] After Exelon completes the initial upgrades identified in the Settlement Agreement, if the calculated upstream passage efficiency for the Conowingo Project is below 85 percent, then the Settlement Agreement requires Exelon to invest in additional fish passage measures including the construction of a new volitional West Fish Lift facility and additional entrance galleries at the existing East Fish Lift. While the value of the "credit" is likely to be significant in the early years of the new license, the credit diminishes over time as the population increases.[72] Therefore, it is contemplated that Exelon will make additional investments in *volitional* passage facilities over the mid-to-latter part of the new license.

The parties' agreement to use the adjusted passage efficiency rather than the actual passage efficiency to trigger modifications is perhaps the most crucial element of the Settlement Agreement. The adjusted passage efficiency ensures that additional improvements are commensurate with passage efficiency shortfalls and reflect anticipated growth in population levels through a diminishing trap and transport credit. Gradual increases in population will trigger incremental improvements over time, while significant population growth will trigger more substantial improvements. Said differently, the adjusted passage efficiency guarantees that additional volitional fish passage facilities are implemented when they are needed.

TNC's argument that use of the adjusted passage efficiency will result in the delay or complete deferral of structural and operational modifications again misses the mark. Significant additional structural and operational modifications are required and phased in over time to address population growth. Exelon will invest in substantial improvements to the Conowingo Project's fish passage facilities upon issuance of the new license. Additional structural and operational modifications, beyond Exelon's significant initial investments, are anticipated in the second half of the license precisely because the population modeling indicates that is when such measures will be needed. But if the American shad population grows at a faster rate than the modeling projects, then additional structural and operational modifications will be implemented sooner. Therefore, the adjusted passage efficiency is a suitable trigger for additional PM&E measures because it accounts for growth in the American shad population by reducing the value of the trap and transport credit when such growth occurs. As a result, additional improvements to fish passage facilities correspond to anticipated needs driven by population increases.

MDE should reject TNC's proposed modifications of the fish passage measures contained in the Settlement Agreement. The Settlement Agreement represents a negotiated settlement in which Exelon agreed to do substantially more than required by law. In particular, the efficiency credit was integral to achieving a negotiated settlement and was a recognition of the value of Exelon's commitment to transport American shad *above York Haven*. TNC's proposed

[71] Settlement Agreement, Attachment A (Modified Prescription for Fishways), at Appendix B.

[72] The trap and transport credit formula incorporates as an input the total population of American shad below Conowingo Dam. As the American shad population increases, the value of the trap and transport credit diminishes.

modifications would materially alter the agreement between Exelon and Interior and would allow either party to terminate the Settlement Agreement by its terms.[73]

Northern Map Turtle

Since 2008, Exelon has funded several studies related to Northern Map Turtles in the Susquehanna River above and below the Conowingo Project. These studies were conducted by researchers from Towson University and addressed several aspects related to habitat use, population assessment, nesting and basking use, as well as pilot studies related to improving nesting (*i.e.*, brush clearing) and basking habitat (*i.e.*, artificial basking structures). Exelon does not believe that the Conowingo Project is adversely affecting the Northern Map Turtle population in the Susquehanna River.

TNC asserts that Conowingo Project operations "have been shown to adversely impact map turtle habitats important for reproduction, adult and juvenile growth and hibernation."[74] According to TNC, "generation flows inundate basking activity by an estimated 50 percent."[75] TNC also claims that the Conowingo Project's "peaking has also been shown to hinder short- and long term [sic] movements . . ."[76]

The literature TNC cites, however, does not appear to support these claims. While Richards and Seigel (2009) found that high flows drastically alter habitat, they did not conclude that basking habitat is reduced by "an estimated 50 percent."[77] And Richards-Dimitrie (2011) explicitly found that "high flow rates do not seem to be hindering movement . . ."[78] Moreover, studies funded by MDNR and Exelon from 2008 found that the greatest threats to the Maryland Northern Map Turtle are predation and human disturbance. Specifically, these studies determined that Northern Map Turtle nesting occurs along relatively open areas on both in-river islands, along the banks of Octoraro Creek and Deer Creek, and in the town of Port Deposit from May-July, but that nesting areas are heavily disturbed by humans and most nests (up to 100 percent in some years) are destroyed by predators.[79] Also, human recreation, such as jet-skies, slow-moving or moored fishing boats, fast-moving fishing boats, kayaks and canoes, and swimmers, and individuals floating on inner tubes, often disturb Northern Map Turtle basking activities.

[73] *See* Settlement Agreement § 1.10.
[74] TNC Comments at 10.
[75] *Id.* (citing Richards, T.M. and R.A. Seigel 2009. Habitat use of Northern Map Turtles (Grapemys geographica) in an altered system, the Susquehanna River, Maryland (USA). Presentation at the 2009 Ecological Society of America.; Richards-Dimitrie, T.M. 2011. Spatial ecology and diet of Maryland endangered northern Map Turtles (Graptemys geographica) in an altered river system: Implications for conservation and management. Graduate Thesis. Department of Biological Sciences, Towson University, Towson, MD.).
[76] *Id.* (citing Richards and Seigel 2009 &2011).
[77] Richards and Seigel (2009).
[78] Richards (2011) at 30; *see also id.*at 2 ("high flows from the dam . . . may not heavily impact movement of turtles.").
[79] Seigel, Richards et al. Effectiveness of Nest Site Restoration for the Endangered Northern Map Turtle. (2016).

Atlantic and Shortnose Sturgeon

There is no evidence that Atlantic sturgeon or shortnose sturgeon have occupied the Susquehanna River at any time in recent history. Accordingly, there is no evidence that Conowingo Project operations adversely impact shortnose or Atlantic sturgeon.

TNC disagrees with Exelon's conclusion that "continued operation of the Project as Exelon proposes would not be likely to adversely affect these species."[80] TNC asserts that "proposed minimum flows are expected to provide less than 50 percent of maximum available spawning habitat for shortnose sturgeon and less than 25 percent of available habitat for shortnose sturgeon fry development."[81] According to TNC, given that "Atlantic sturgeon use similar spawning habitat, effects are expected to be similar."[82] TNC claims that "sturgeon have occurred on the reach of river affected by the Project, and changes in project operations could nonetheless benefit Atlantic sturgeon."[83]

TNC is mistaken. The most recent sighting of Atlantic sturgeon was in 1987 near the mouth of the Susquehanna River, which is outside of the river reach affected by the Project.[84] Similarly, the most recent report of shortnose sturgeon occurring below Conowingo Dam occurred in 1986.[85]

Furthermore, extensive scientific and commercial data indicates that Atlantic and shortnose sturgeon do not occupy the Susquehanna River. The most informative contemporary data regarding distribution of sturgeon in the upper Chesapeake Bay is derived from the United States Fish and Wildlife Service ("USFWS") coast-wide sturgeon tagging database and the USFWS and MDNR reward program for live sturgeon captured in the Maryland portion of Chesapeake Bay. Welsh et al. (2002a) compiled reports from the reward program for 1996-2000 depicting the distribution of collections reported throughout much of the upper Chesapeake Bay.[86] Only two Atlantic sturgeon were from as far up from the Chesapeake Bay as Elk Neck, which is adjacent to the Susquehanna River, and no Atlantic sturgeon were from the Susquehanna River. Shortnose sturgeon collections were reported from the upper Chesapeake Bay, Sassafras, Bohemia, and Elk Rivers, and no shortnose sturgeon were from the Susquehanna River.[87] An updated database of Atlantic sturgeon captures reported in the coast-wide sturgeon tagging database and the Maryland reward program was provided by the USFWS in the fall of 2010.[88] Overall, 122 Atlantic sturgeon were reported from the upper Chesapeake Bay, defined here as north of Annapolis, Maryland, and its tributary rivers. Again, no Atlantic or shortnose sturgeon were reported in the Susquehanna River.

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[80] TNC Comments at 10.
[81] *Id.*
[82] *Id.*
[83] *Id.* at 11.
[84] *Endangered and Threatened Species; Designation of Critical Habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic Sturgeon*, 81 Fed. Reg. 35,701, 35,707 (Jun. 3, 2016)
[85] T. Brush, Normandeau Associates, personal communication.
[86] Welsh, S.A., S.M. Eyler, M.F. Mangold, and A.J. Spells. 2002a. Capture Locations and Growth Rates of Atlantic Sturgeon in the Chesapeake Bay. American Fisheries Society Symposium 28: 183-194.
[87] *Id.*
[88] Sheila Eyler, USFWS, personal communication.

Exelon also monitored the Susquehanna River for sonic transmitter tagged sturgeons from other river systems (Delaware River, Potomac River) during 2010 and 2011 with fixed station acoustic telemetry receivers.[89] Monitoring was conducted with active acoustic receivers when a number of Atlantic sturgeon might have been present.[90] No tagged Atlantic or shortnose sturgeon were recorded in the Susquehanna River in either 2010 or 2011. As an additional data point, Exelon has been operating at least one fish lift at the Conowingo Dam since 1972. In 45 years of fish lift operations, not one Atlantic or shortnose sturgeon has been collected.

The relicensing studies and associated data provide sufficient context to determine that the Conowingo Project does not adversely affect shortnose and Atlantic sturgeon. Nevertheless, to further ensure that the Conowingo Project will not adversely affect any sturgeon, a draft Biological Assessment has been prepared and filed with FERC with a copy provided to the National Marine Fisheries Service.[91] Exelon also intends to implement a sturgeon handling plan that will aid in ensuring that any collections, should they occur, will be non-lethal.[92]

Sufficiency of Application

As part of FERC's Integrated Licensing Process, Exelon developed and conducted 32 FERC-approved resource studies examining the benefits and impacts of the Conowingo Project. Exelon also conducted 15 FERC-approved resource studies for the Muddy Run Project, many of which informed the development of the Final License Application ("FLA") for the Conowingo Project. In addition, as required by the National Environmental Protection Act, FERC conducted a separate analysis of the environmental impacts of the Conowingo Project and the other Susquehanna River hydroelectric projects, producing a FEIS that was nearly 900 pages. The FEIS also considered and responded to the substantial comments submitted by interested stakeholders in response to Exelon's FLA and FERC's Draft Environmental Impact Statement. These analyses, which Exelon provided with its Application and comprise almost 14,000 pages of materials, demonstrate that, with the PM&E measures Exelon proposed in its Application, the Conowingo Project complies with applicable Maryland water quality standards. The Application and supporting documents sufficiently demonstrate that the Conowingo Project will continue to meet all applicable water quality standards.

CCC asserts that Exelon's Application is premature because the Sediment Study has not been released to the public for review, the Chesapeake Bay Total Maximum Daily Load ("TMDL") midpoint assessment has not yet been completed, and "information is lacking to measure the impacts that sediment and associated nutrient loading from Conowingo reservoir . . . scour have on the water quality of the lower Susquehanna River and Chesapeake Bay."[93] Accordingly, CCC

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[89] Normandeau Associates and Gomez and Sullivan Engineers. 2012b. Shortnose and Atlantic sturgeon life history studies. RSP 3.22, Conowingo Hydroelectric Project. FERC Project Number 405. 2011 Consolidated Report. Prepared for Exelon.

[90] Fisher, M.T. 2009a. State of Delaware annual compliance report for Atlantic sturgeon. Delaware Division of Fish and Wildlife Department of Natural Resources and Environmental Control; Fisher, M.T. 2009b. Atlantic Sturgeon progress report state wildlife grant, Project T-4-1. Delaware Division of Fish and Wildlife, Department of Natural Resources and Environmental Control.

[91] A copy of the Draft Biological Assessment was filed with FERC on January 5, 2017 and is included in the supplemental documentation filed with these comments.

[92] A copy of the draft sturgeon handling plan is included as Appendix A to the Draft Biological Assessment.

[93] Clean Chesapeake Coalition August 16, 2017 Comments at 2.

requests that MDE delay the processing of Exelon's application "to ensure ample time for the [CCC] and other stakeholders to review the scientific findings of the Sediment Study once released to the public and to considered [sic] the implications of a recalibrated Bay TMDL on Maryland's water quality standards and limitations."[94] CBF also argues that incorporating the finding of the Sediment Study and suggested additional model runs should occur prior to any hearing on the Application.[95] Similarly, Earthjustice argues that MDE should reject Exelon's Application if MDE finds that more information and study is required to support the certification conditions that it requests.[96] Earthjustice also cites the unavailability of the results of the Sediment Study, asserting that "this is a serious omission" because "the need for additional study was the primary reason given for delaying the process . . ."[97] Both CCC and Earthjustice contend that the Application is deficient because the studies Exelon cited in support of the Application, including the LSRWA, are flawed.[98]

As Exelon has stated each time it has filed its water quality certification with the state, while Exelon agreed to provide funding for the Sediment Study at the request of MDE, Exelon believes its Application has been complete and sufficient since the first time it was submitted in 2014. Even without the Sediment Study, there is sufficient evidence in the record to demonstrate that the Conowingo Project, as proposed, is consistent with applicable Maryland water quality standards. Exelon spent more than $25 million dollars developing the FLA, Application, and supporting reports and documentation, and submitted nearly 14,000 pages of studies, reports, and other documentation supporting its Application. All the reports and studies were conducted in good faith by reputable experts in their fields.[99] Indeed, the LSWRA, which both CCC and Earthjustice criticize heavily, was a joint effort between MDE and the U.S. Army Corps of Engineers, TNC and SRBC both participated in major technical portions of the study, and CBF and the Lower Susquehanna Riverkeeper attended quarterly meetings and provided feedback and information throughout the LSRWA assessment process.[100] That commenters can engineer criticisms of the reports in the record or generate additional research questions is simply not evidence that the Application is incomplete or premature. The Application is complete, supported by substantial evidence, and should be processed without delay.

If, however, MDE incorporates any aspect of the TMDL midpoint assessment into its decision-making regarding Exelon's water quality certification, including any aspect of the Chesapeake Bay Partnership modeling program, due process requires that Exelon be afforded an opportunity to review, analyze, and comment on the information relied upon by MDE. In particular, MDE would need to provide sufficient detail to Exelon regarding all model

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[94] *Id.*
[95] Chesapeake Bay Foundation August 23, 2017 Comments at 7.
[96] Earthjustice Comments at 10.
[97] *Id.*
[98] Clean Chesapeake Coalition August 16, 2017 Comments at 4-7; Earthjustice September 11, 2017 Comments at 10-15.
[99] *Finding Cooperative Solutions to Environmental Concerns with the Conowingo Dam to Improve the Health of the Chesapeake Bay: Hearing Before the Senate Committee on Environment and Public Works, Subcommittee on Water and Wildlife*, 113th Cong. 7 (2014) (Statement of Colonel J. Richard Jordan, III, Commander and District Engineer, U.S. Army Corps of Engineers, Baltimore District).
[100] LSRWA at 1.

assumptions, calibrations, sensitivity analyses, results, and interpretations that MDE uses to support its water quality certification findings.

License Term

Exelon initially requested that FERC issue a new 46-year license for the Conowingo Project. However, considering the substantial investments Exelon has committed to make during the term of the new license, Exelon subsequently requested that FERC instead issue a 50-year license for the Conowingo Project,[101] and the Application specifically mentions that Exelon requested a 50-year license from FERC.[102] Although most of the commenters seem to be aware of this change,[103] Exelon seeks to explicitly clarify this point to avoid any potential confusion.[104]

Catwalk

Although not specifically mentioned by commenters, Exelon seeks to clarify that it proposes to leave the catwalk closed to the public, as described in the FLA. Ongoing security and safety concerns arising from the catwalk's proximity to the Conowingo Project powerhouse, and the catwalk's use by Exelon employees for Conowingo Project operations, preclude Exelon from providing public access to this facility. After the September 11, 2001 terrorist attacks, Exelon conducted a security review of the Project. As a result of this review, Exelon concluded that "allowing the general public to access the project works, particularly the catwalk at the powerhouse, places the project and public at risk."[105] In October 2001, Exelon closed the catwalk to the public. These security measures were coordinated with FERC through a series of letters and site visits. Moreover, Exelon's recreation studies demonstrate that existing facilities—including the $4 million Fisherman's Park facility that was approved by FERC after the catwalk was closed in October 2001—are more than adequate to meet recreation demand at the Conowingo Project.

After Exelon closed the catwalk to the public, it conducted a study of potential alternative recreational fishing opportunities at Conowingo. Exelon prepared an application to amend the license to provide for alternative public fishing access, including access for those with disabilities. Prior to filing its application with FERC, Exelon consulted with various Federal and state agencies to obtain comments on the proposed recreational facilities. By letter dated May 24, 2006, the licensees provided the following entities with a copy of the application for the proposal: the United States Fish and Wildlife Service; MDNR; Maryland Department of the Environment; Maryland

[101] *See* Conowingo Hydroelectric Project Relicensing Offer of Settlement and Explanatory Statement, at 3 (May 12, 2016) ("Accordingly, Exelon respectfully requests that [FERC] . . . issue a new 50-year license for Conowingo . . ."); Reply Comments of Exelon Generation Company, LLC, FERC Docket No. P-405-106, at 2 (Jun. 13, 2016) ("the fish passage protection, mitigation, and enhancement ("PM&E") measures established in the Offer of Settlement, combined with other PM&E measures that Exelon will implement during the term of the new license, justify a 50-year license. Accordingly, Exelon respectfully requests that [FERC] . . . approve the Offer of Settlement, and issue a new 50-year license for Conowingo.").

[102] Application at 15 ("Exelon is requesting that FERC issue a new license for the continued operation of the facility under FERC jurisdiction for a period of 50 years.").

[103] *See* Earthjustice September 11, 2017 Comments at 1 (referring to Exelon's request "for a new 50-year license . . ."); Chesapeake Bay Foundation August 23, 2017 Comments at 1 ("for a project that will persist over the next 50 years or more.");

[104] *See* Clean Chesapeake Coalition August 16, 2017 Comments at 3 (referring to "the 46-year relicensing term sought by Exelon . . .")

[105] *Susquehanna Power Co. & PECO Energy Power Co.*, 119 FERC ¶ 62,088 at p. 64,247 (2007).

Department of State Planning; Maryland Historic Trust (the State Historic Preservation Officer); Cecil County Board of Parks and Recreation; Harford County Department of Planning and Zoning; Harford County Department of Parks and Recreation; SRBC; and CBF. No comments were received.[106] Exelon also held meetings with resource agencies and the general public on October 13 and November 28, 2005, and May 6, 2006.

In July 2006, Exelon filed an application to amend the Conowingo Project recreational facilities.[107] The application proposed to permanently discontinue public use of the catwalk for fishing and remove references to it as a fishing platform from Exhibit R of the Project license. To mitigate for the loss of the catwalk, Exelon proposed additional recreation facilities at Fisherman's Park on the west side of the river and public fishing access along the banks of Octoraro Creek on the east side of the river.

FERC publicly noticed the application and received several comments on the proposal which were considered in FERC's review. On May 1, 2007, FERC, after balancing security concerns with the need for public access for recreation,[108] approved the license amendment.[109] FERC acknowledged that the closure of the catwalk "has been the result of years of consideration and assessment" by Exelon and that "[t]here have been many meetings, site visits, and exchanges of correspondence on this matter . . . ."[110] In approving Exelon's proposal, FERC held that the alternative fishing sites would "provide safe, secure and enjoyable fishing opportunities that are accessible to all ages, and to those with disabilities" and that Exelon's proposal would "provide additional and improved recreational facilities that adequately take into account public safety and project security."[111]

Exelon has since completed construction of the Octoraro Creek and Fisherman's Park facilities at a cost of $4 million. The new facility at Fisherman's Park, located in close proximity to the catwalk, provides anglers, including those with disabilities, with approximately 70 feet of shoreline, including boardwalks and observation platforms. In addition to the new facility, nearly all of the west shoreline along the tailrace is available to anglers. The Octoraro Creek site allows easy access to the creek for approximately one-half mile from Maryland Route 222 to the creek's confluence with the Susquehanna River. Exelon also constructed a new parking area and ADA pathway to the creek to allow access to Octoraro Creek site.

Despite previous recent determinations (1) finding that closing the catwalk was in the public interest, and (2) approving Exelon's plan to expend $4 million in alternative fishing facilities, FERC required Exelon to conduct additional studies addressing whether the catwalk should be reopened to the public. The studies, performed by an independent security consultant, included a catwalk vulnerability assessment and a separate feasibility assessment.[112] Both reports

[106] *Id.* at p. 64,248.
[107] Application to Amend Exhibit R to Reflect Changes in Access for Recreational Fishing, Project No. 405-071 (filed July 28, 2006).
[108] Letter from Chairman Jon Wellinghoff to U.S. Senator Robert P. Casey, Jr. at 1, Project No. 405-000 (issued May 20, 2009).
[109] *Susquehanna Power Co. & PECO Energy Power Co.*, 119 FERC ¶ 62,088 at p. 64,249.
[110] *Id.*
[111] *Id.*
[112] Exelon. 2012. RSP 3.32: Re-Evaluate the Closing of the Catwalk to Recreational Fishing: Conowingo Hydroelectric Project, FERC Project Number 405.

concluded that the catwalk posed a significant risk to public safety and security[113] and recommended that the catwalk remain closed to the public.

In addition to catwalk-specific studies, Exelon conducted a Recreation Facility Inventory and Estimated Recreation Use Report (RSP 3.26).[114] This study, using methods approved by FERC, clearly indicated that the existing facilities meet current and projected use. This is especially true for Fisherman's Park and Octoraro Creek Access, which had capacity uses of 27 percent and 17 percent (average weekend day use), respectively.[115] Moreover, shoreline fishing has an expected growth rate over the next several decades (2008-2050) of only 24 percent, and may even decline, which clearly shows an additional fishing facility is not required to meet demand.[116]

Supplemental Documentation

Exelon has attached the additional documentation referenced in these comments, as well as additional documents that may be relevant to MDE's consideration of the Application. A list of the additional documents being submitted with these comments is provided as Attachment 1.

Conclusion

The Conowingo Project, as proposed, is consistent with applicable Maryland water quality standards, and the Application is complete and supported by substantial evidence. MDE should reject the commenters' proposed modifications of and additions to the measures proposed in the Application, and process the Application without delay.

Exelon reserves the right to respond to any additional comments or information added to the administrative record after the filing of this letter and its attachments. Please do not hesitate to contact the undersigned if you have any questions or require additional information regarding this matter.

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[113] The Conowingo Project is categorized by FERC as a Security Group 1 project and by the North American Electric Reliability Corporation as a critical national asset subject to NERC-CIP standards. The Conowingo Project could be the subject of a threat by terrorists seeking to disrupt the electric power grid.

[114] Exelon. 2012. Recreational Inventory and Needs Assessment, RSP 3.26: Conowingo Hydroelectric Project, FERC Project Number 405.

[115] RMP at 6-16.

[116] *Id.* at 7-1, 7-4; Exhibit E at E-3-239.

Sincerely,

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Email: Colleen.hicks@exeloncorp.com

CC: Denise Keehner (MDE)
Andrea Baker (MDE)
Jonathan May (MDE)

ATTACHMENT 1

SUPPLEMENTAL DOCUMENTATION

1. U.S. Environmental Protection Agency. Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorous and Sediment. December 2010.

2. Exelon Generation Company, LLC's Submittal of an Alternative Fishway Prescription for the Conowingo Hydroelectric Project (FERC Project No. 405), FERC Docket No. P-405-106 (filed Sept. 11, 2015).

3. USGS, *et. al.* Lower Susquehanna River Watershed Assessment, Maryland and Pennsylvania. May 2015.

4. Conowingo Pond Coring Study: Integrated Sediment and Nutrient Monitoring Program. AECOM. December 2015.

5. Hydrodynamic and Sediment Transport Analyses for Conowingo Pond. HDR. June 2017.

6. Addendum: Hydrodynamic and Sediment Transport Analyses for Conowingo Pond. HDR. June 2017.

7. Lower Susquehanna River Reservoir System Sediment Transport Modeling Results Summary. Gomez and Sullivan Engineers. January 2017.

8. Conowingo Pond Mass Balance Model. HDR. June 2017.

9. Scott, Steve *et al.* Lower Susquehanna River Reservoir System Model Enhancements Peer Review. 2016.

10. Lake Clarke and Lake Aldred Sediment Transport Modeling: Final Report. West Consultants, Inc. May 2017.

11. Cornwell, J., Owens, M. Perez, H., and Vulgaropulos, Z. 2017. The Impact of Conowingo Particulates on the Chesapeake Bay: Assessing the Biogeochemistry of Nitrogen and Phosphorus in Resources and the Chesapeake Bay. UMCES Contribution TS-703-17. July 2017.

12. Testa, Jeremy. Modeling Sediment Nutrient and Oxygen Cycling in the Conowingo Reservoir and Upper Chesapeake Bay. University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory. UMCES CBL 2017-060. July 2017.

13. Lower Susquehanna River Integrated Sediment and Nutrient Monitoring Program - Lower Susquehanna River Suspended Sediment & Nutrient Sampling: Final Report. Gomez and Sullivan Engineers. July 2017.

14. Finding Cooperative Solutions to Environmental Concerns with the Conowingo Dam to Improve the Health of the Chesapeake Bay: Hearing Before the Senate Committee on

Environment and Public Works, Subcommittee on Water and Wildlife, 113th Cong. 8 (2014) (Statement of Colonel J. Richard Jordan, III, Commander and District Engineer, U.S. Army Corps of Engineers, Baltimore District).

15. Exelon Sediment Study Funding Letter Agreement.

16. Proposal for Lower Susquehanna River Reservoir System Model Enhancements in Support of the 2017 Chesapeake Bay TMDL Midpoint Assessment. Exelon Generation Company, LLC. January 2016.

17. Conowingo Articles.

18. Updated Quality Habitat Maps.

19. Conowingo Hydroelectric Project Draft Biological Assessment, FERC Docket No. P-405 (filed Jan. 5, 2018).

20. Endangered and Threatened Species; Designation of Critical Habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic Sturgeon, 81 Fed. Reg. 35,701 (Jun. 3, 2016).

21. Welsh, S.A., S.M. Eyler, M.F. Mangold, and A.J. Spells. 2002a. Capture Locations and Growth Rates of Atlantic Sturgeon in the Chesapeake Bay. American Fisheries Society Symposium 28: 183-194.

22. Fisher, M.T. 2009a. State of Delaware annual compliance report for Atlantic sturgeon. Delaware Division of Fish and Wildlife Department of Natural Resources and Environmental Control.

23. Atlantic States Marine Fisheries Commission Habitat Management Series #13, Habitat Bottlenecks and Fisheries Management. Winter 2016.

24. Bovee, K.D., Lamb, B.L., Bartholow, J.M., Stalnaker, C.B., Taylor, J., and Henriksen, J., 1998, Stream Habitat Analysis using the Instream Flow Incremental Methodology: U.S. Geological Survey, Information and Technology Report USGS/BRD-1998-0004, 131 p.

25. Bovee, K.D., Waddle, T.J., Bartholow, J., and Burris, L., 2007, A Decision Support Framework for Water Management in the Upper Delaware River: U.S. Geological Survey Open-File Report 2007–1172, 122 p.

26. Palermo, M. R., Schroeder, P. R., Estes, T.J. and Francingues, N.R. 2008. Technical Guidelines for Environmental Dredging of Contaminated Sediments. ERDC/EL TR-08-29 September 2008.

27. U.S. Army Corps of Engineers. 2015b. Dredging and Dredged Material Management. Engineering Manual. EM 1110-2-5025. July 2015.

28. Clarke, D. G., and Wilber, D. H. (2000). "Assessment of potential impacts of dredging operations due to sediment resuspension," DOER Technical Notes Collection (ERDC TN-DOER-E9), U.S. Army Engineer Research and Development Center, Vicksburg, MS. www.wes.army.mil/el/dots/doer

29. Reine, K., Clarke D., and Dickerson, C. 2014. Characterization of underwater sounds produced by hydraulic and mechanical dredging operations. J. Acoust. Soc. Am. 135 (6), June 2014.

30. Maryland Environmental Service Request for Proposals: Conowingo Capacity Recovery and Innovative Reuse and Beneficial Use Pilot Project, Project ID No. 1-18-3-21-8, at 16 (Aug. 31, 2017).

31. Normandeau Associates. 1994. Analysis of potential factors affecting the white crappie population in Conowingo Pond.

32. U.S. Environmental Protection Agency. Agency Interpretation on Applicability of Section 402 of the Clean Water Act to Water Transfers. August 2005.

33. Conowingo Hydroelectric Project Relicensing Offer of Settlement and Explanatory Statement (May 12, 2016).

34. Reply Comments of Exelon Generation Company, LLC, FERC Docket No. P-405-106 (Jun. 13, 2016).

35. Application to Amend Exhibit R to Reflect Changes in Access for Recreational Fishing, Project No. 405-071 (filed Jul. 28, 2006).

36. Letter from Chairman Jon Wellinghoff to U.S. Senator Robert P. Casey, Jr. at 1, Project No. 405-000 (issued May 20, 2009).

37. Seigel, Richards et al. Effectiveness of Nest Site Restoration for the Endangered Northern Map Turtle. 2016.

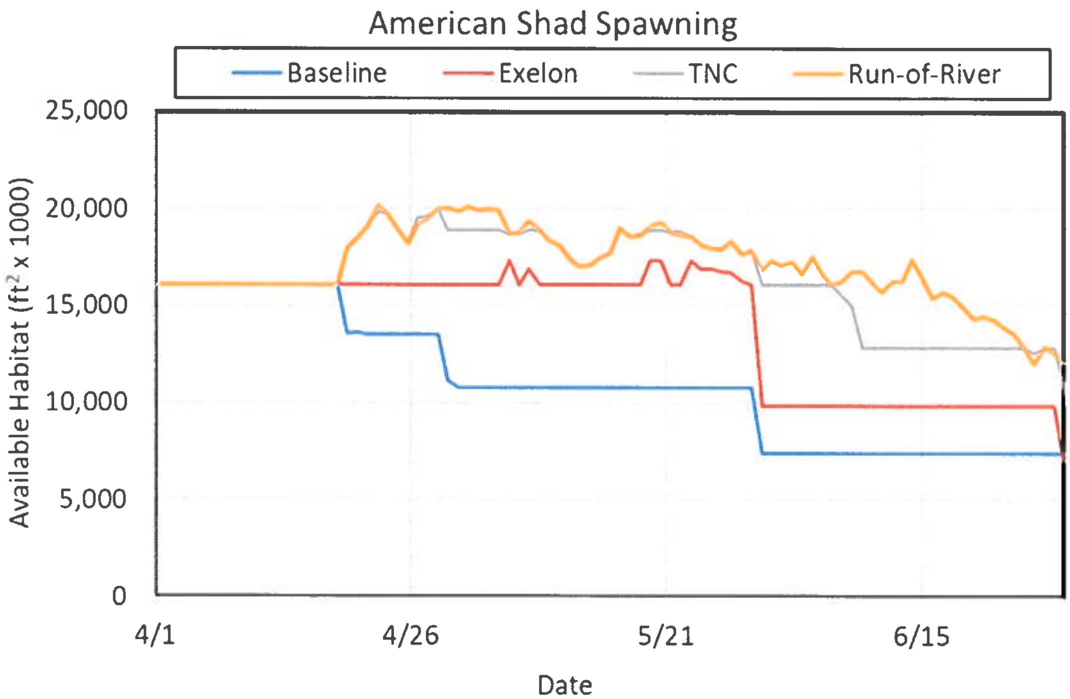
38. Northbridge Group. Review of E3 Analysis of Conowingo Revenues. January 2018.

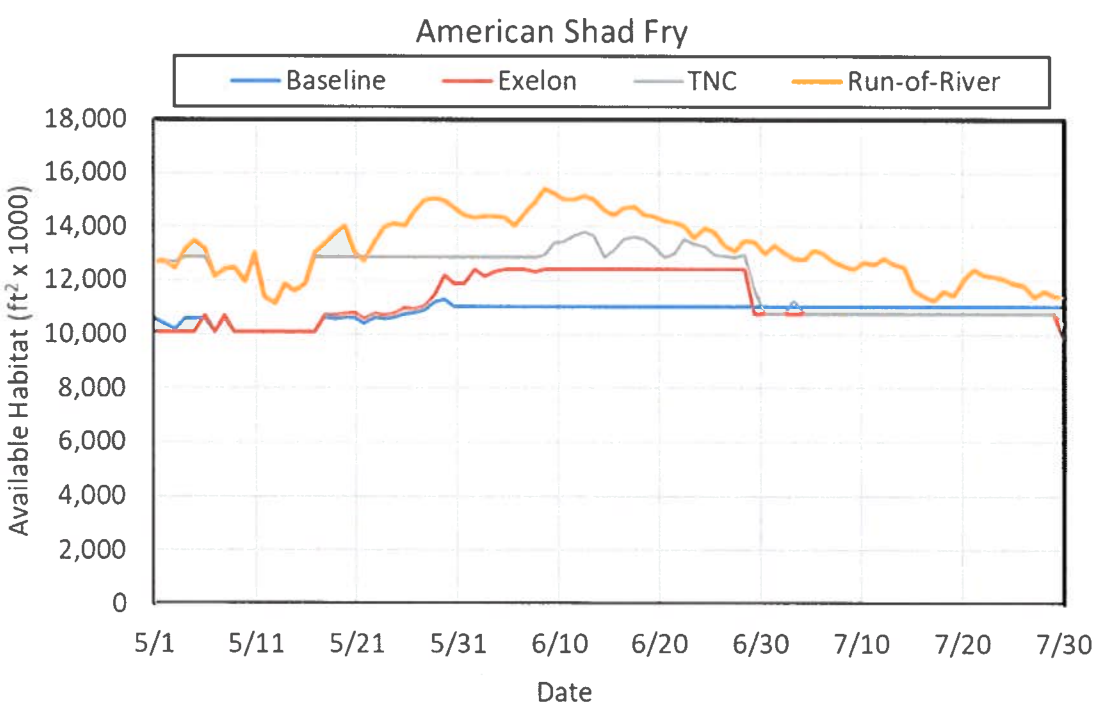
39. Fisher, M.T. 2009b. Atlantic Sturgeon progress report state wildlife grant, Project T-4-1. Delaware Division of Fish and Wildlife, Department of Natural Resources and Environmental Control.

40. Normandeau Associates. 2015. Passage Data from Safe Harbor, Holtwood, and York Haven Hydroelectric Facilities.

APPENDIX A

CONOWINGO HABITAT TIME SERIES DURATION FIGURES, BASED ON A DAILY 25 PERCENT EXCEEDANCE VALUE


American Shad Spawning
Baseline
Exelon
TNC
Run-of-River
25,000
20,000
15,000
10,000
5,000
0
Available Habitat (ft² x 1000)
4/1
4/26
5/21
6/15
Date


American Shad Fry
Baseline
Exelon
TNC
Run-of-River
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Available Habitat (ft² x 1000)
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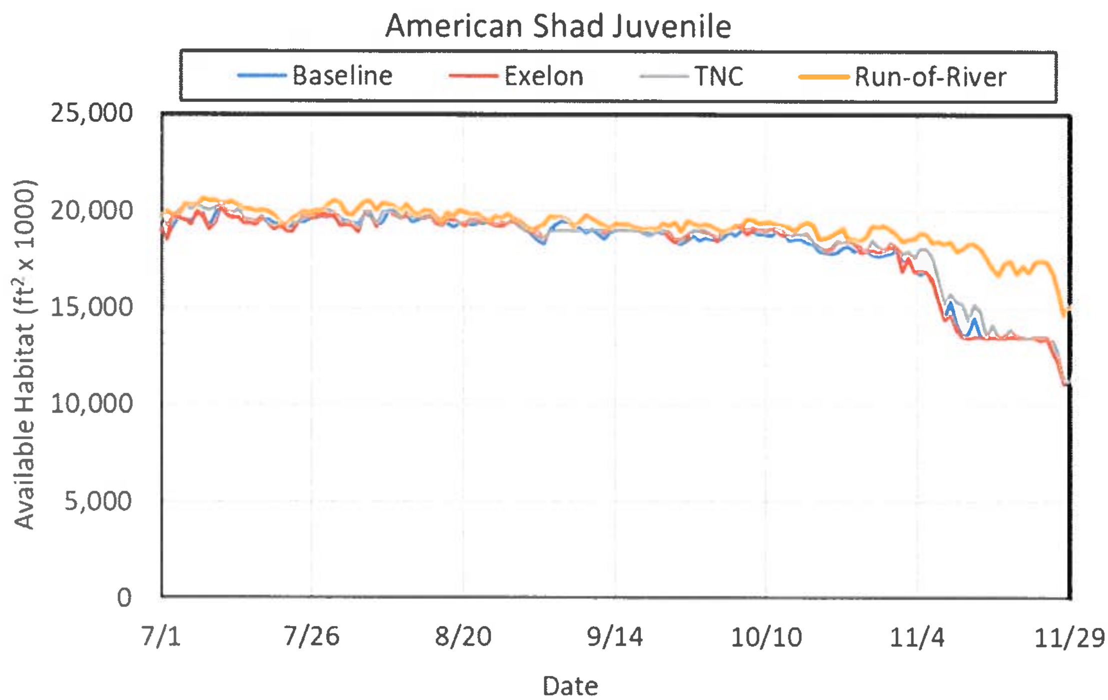
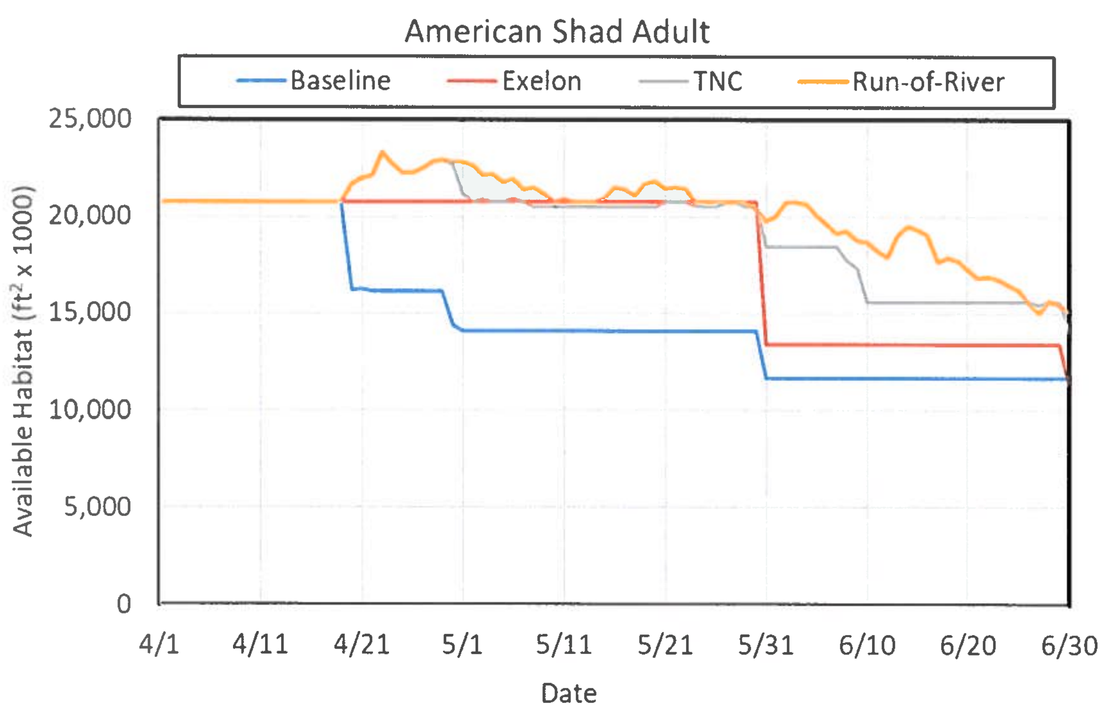
5/11
5/21
5/31
6/10
6/20
6/30
7/10
7/20
7/30
Date


American Shad Juvenile
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
25,000
20,000
15,000
10,000
5,000
0
7/1
7/26
8/20
9/14
10/10
11/4
11/29
Date


American Shad Adult
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
25,000
20,000
15,000
10,000
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4/21
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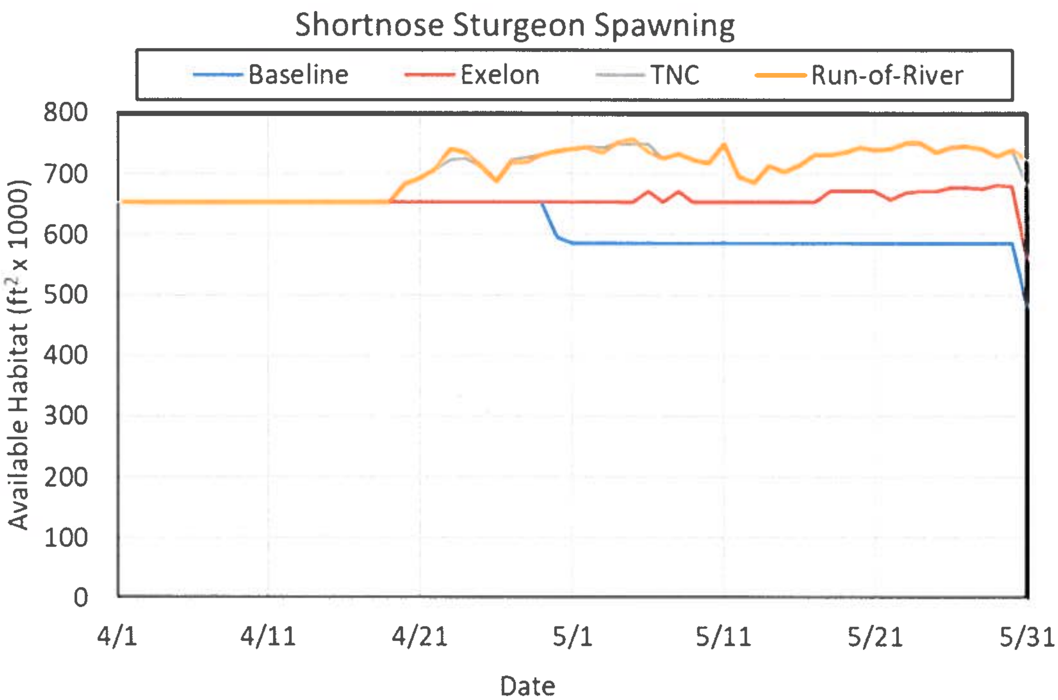
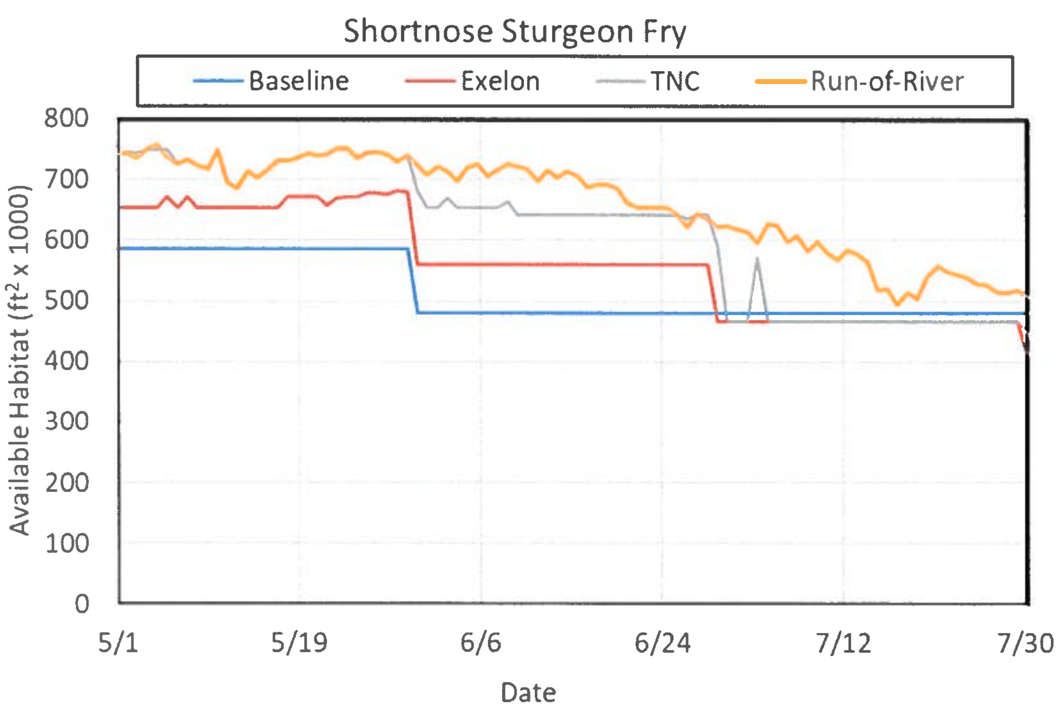
6/20
6/30
Date


Shortnose Sturgeon Spawning
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft2 x 1000)
800
700
600
500
400
300
200
100
0
4/1
4/11
4/21
5/1
5/11
5/21
5/31
Date


Shortnose Sturgeon Fry
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft2 x 1000)
800
700
600
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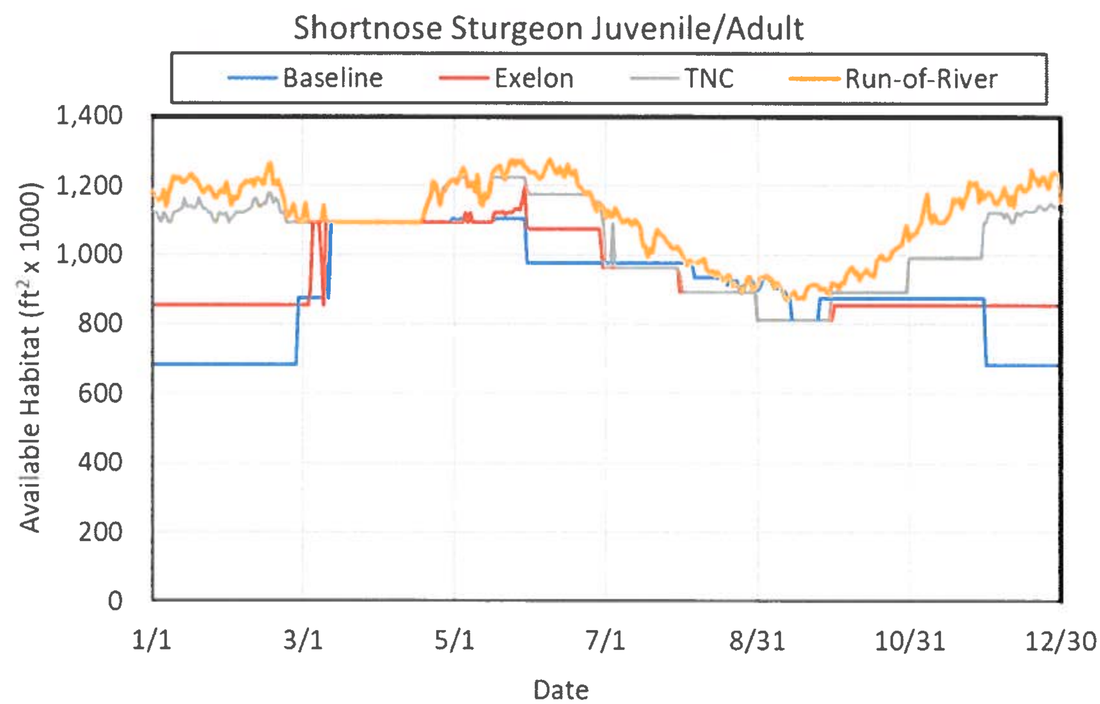
0
5/1
5/19
6/6
6/24
7/12
7/30
Date


Shortnose Sturgeon Juvenile/Adult
Baseline
Exelon
TNC
Run-of-River
1,400
1,200
1,000
800
600
400
200
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Available Habitat (ft² x 1000)
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3/1
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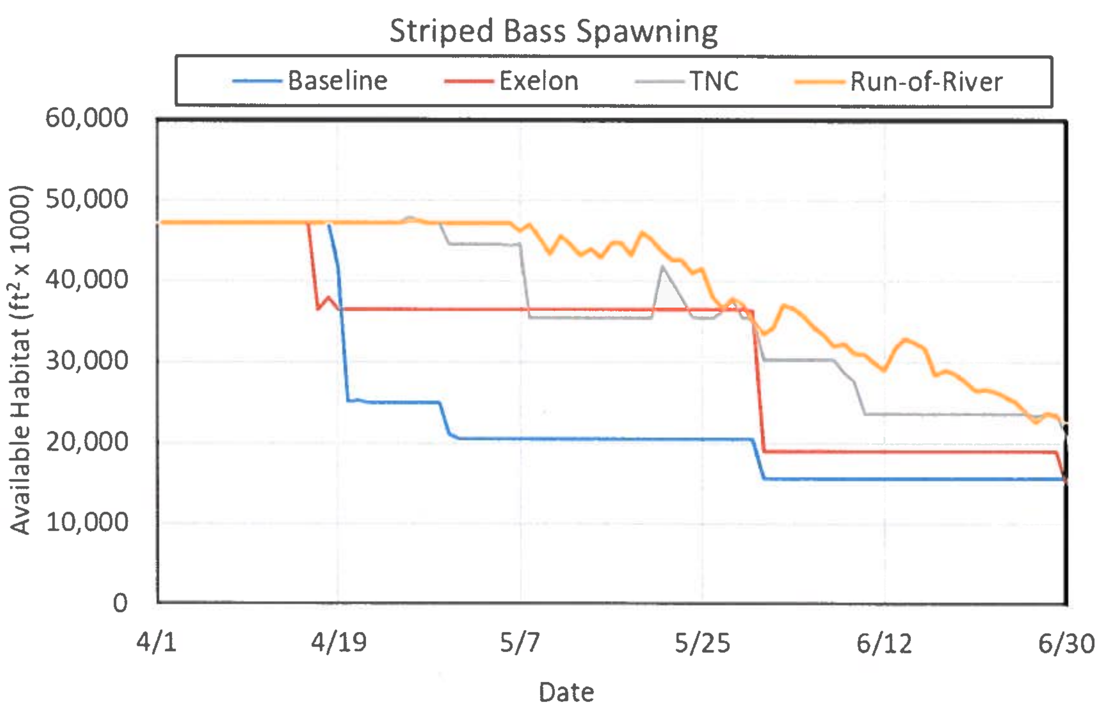
7/1
8/31
10/31
12/30
Date


Striped Bass Spawning
Baseline
Exelon
TNC
Run-of-River
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50,000
40,000
30,000
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10,000
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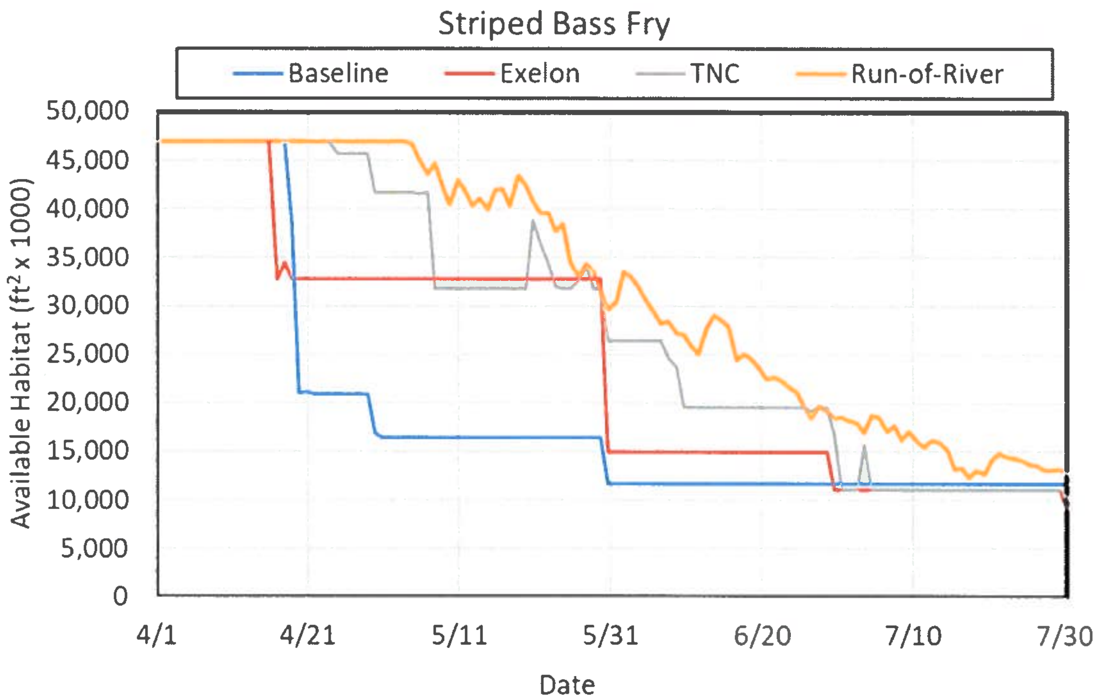
Available Habitat (ft² x 1000)
4/1
4/19
5/7
5/25
6/12
6/30
Date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Baseline
Exelon
TNC
Run-of-River
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25,000
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4/1
4/21
5/11
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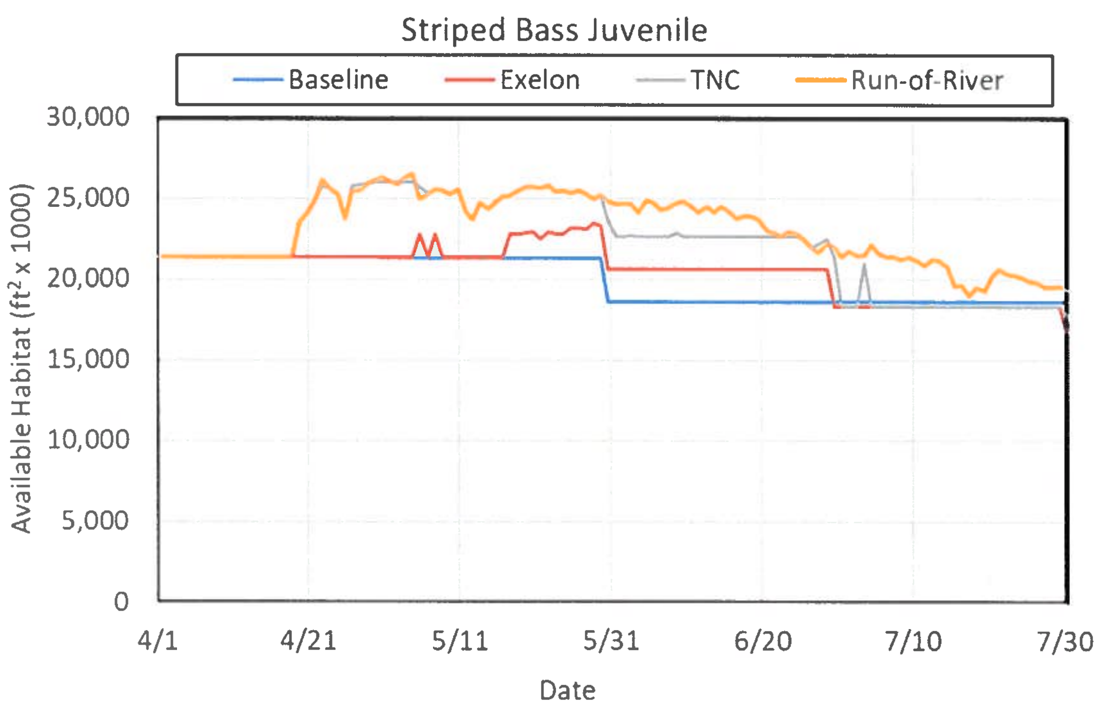
7/10
7/30
Date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Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
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4/21
5/11
5/31
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7/10
7/30
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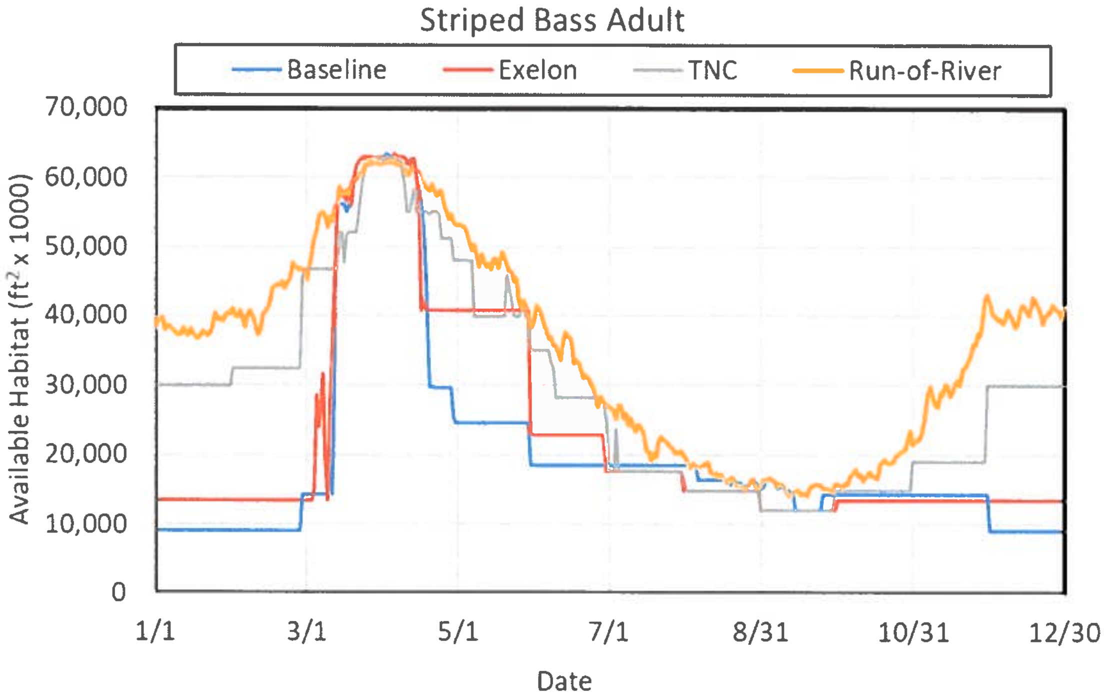
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Exelon
TNC
Run-of-River
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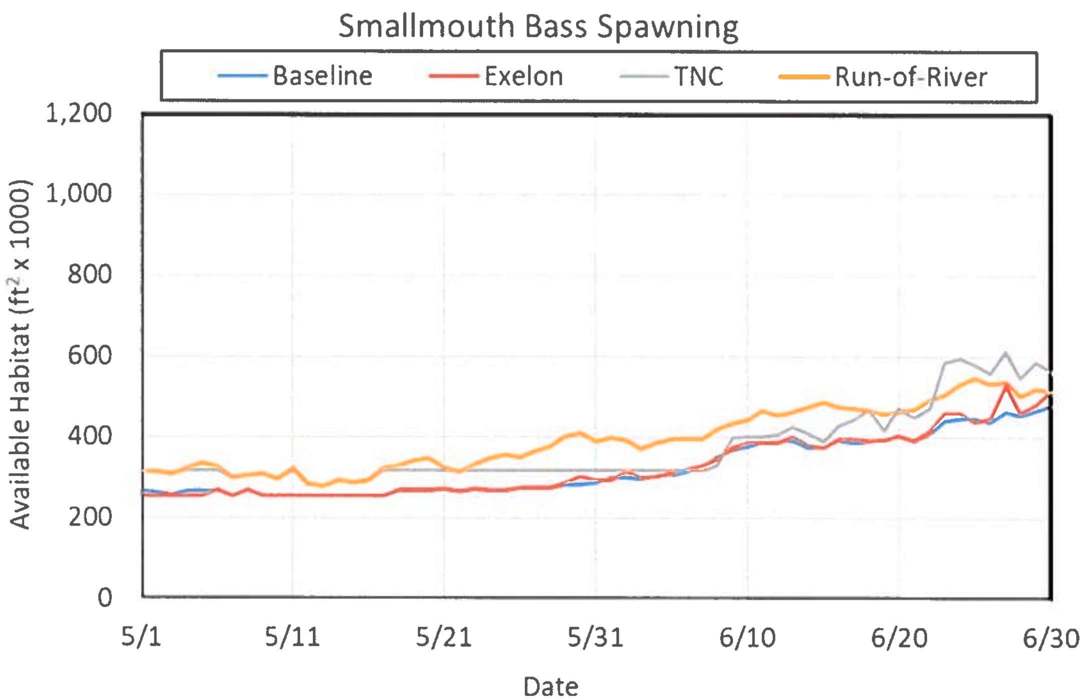
10/31
12/30
Date


Smallmouth Bass Spawning
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft^2 x 1000)
1,200
1,000
800
600
400
200
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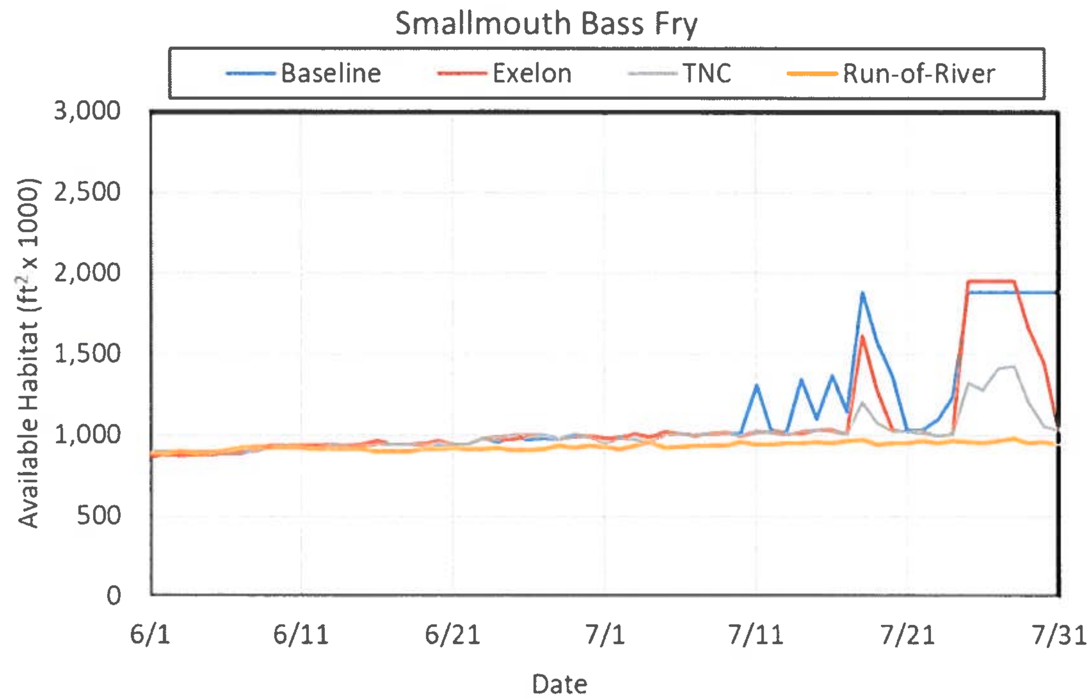
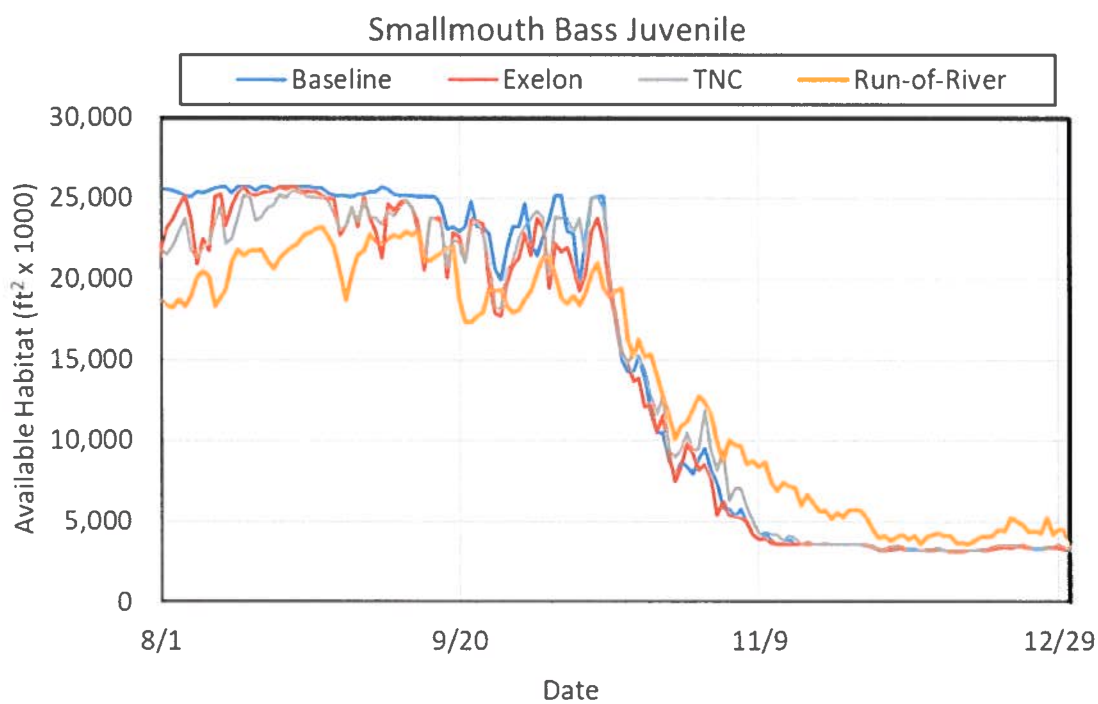
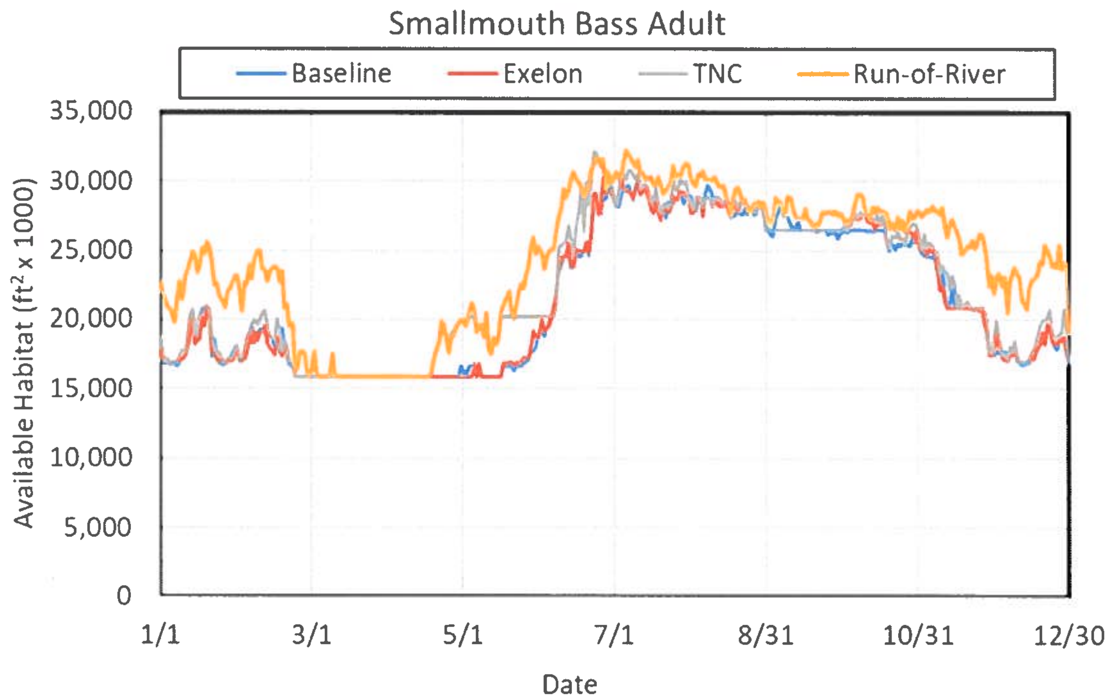
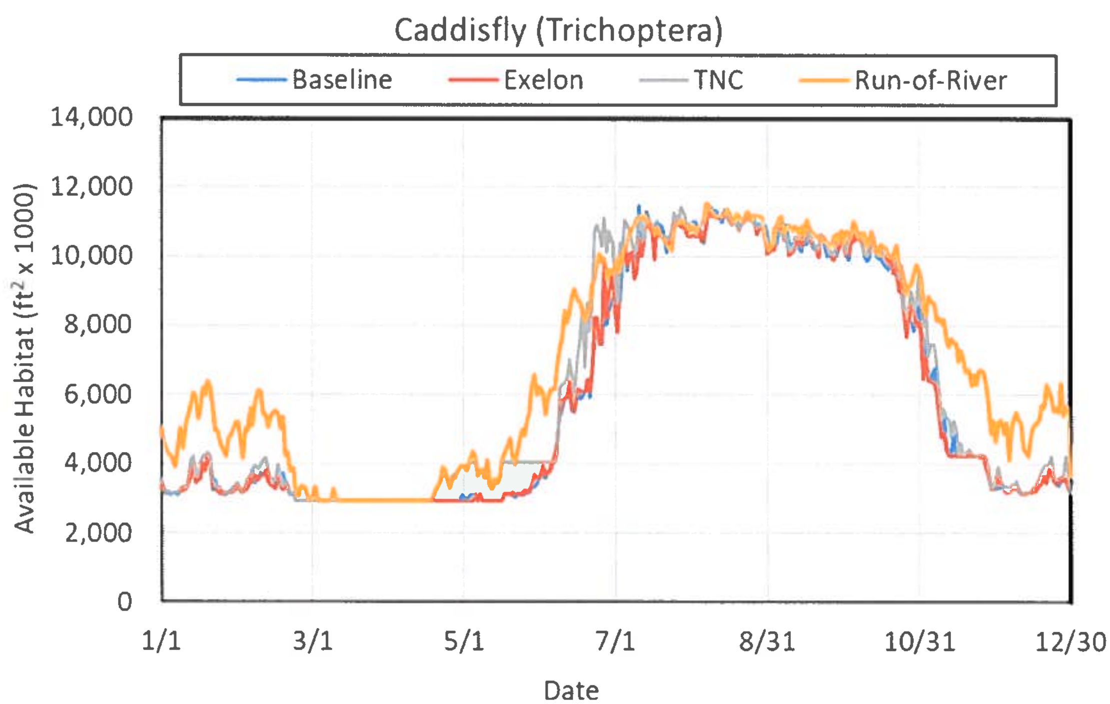
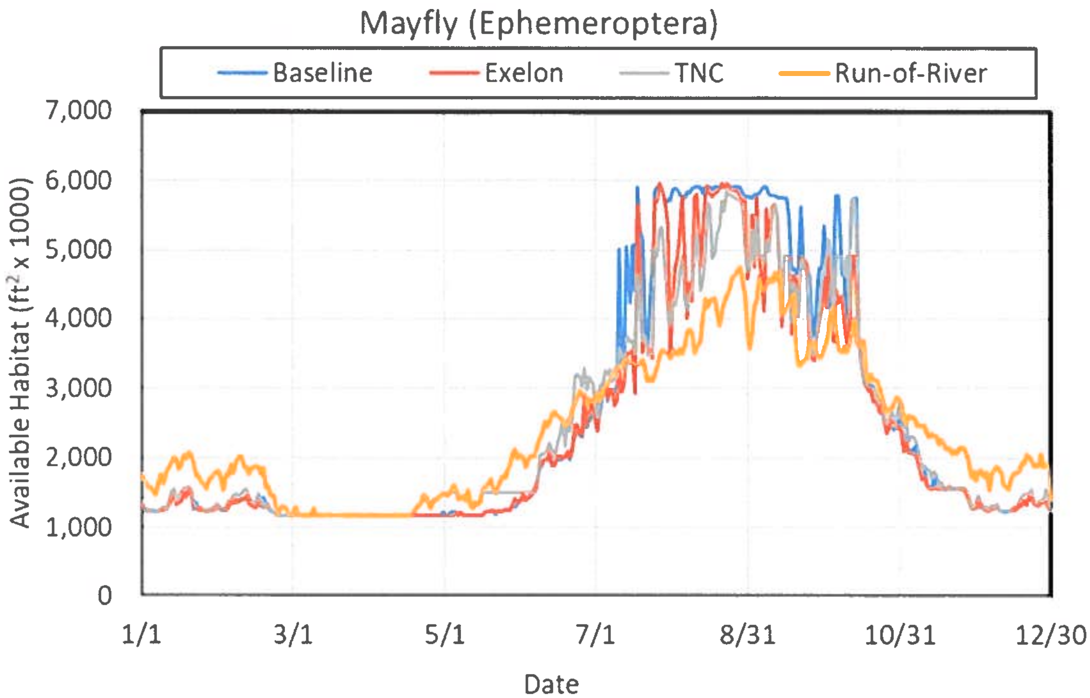
5/1
5/11
5/21
5/31
6/10
6/20
6/30
Date

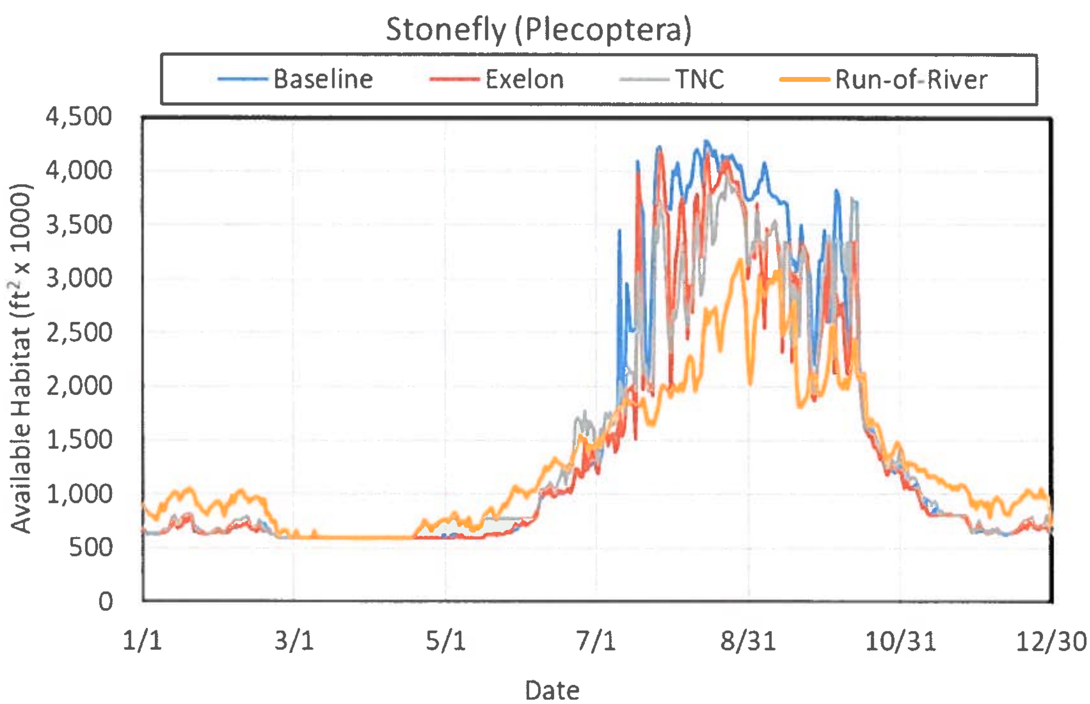

Smallmouth Bass Fry
Baseline
Exelon
TNC
Run-of-River
3,000
2,500
2,000
1,500
1,000
500
0
Available Habitat (ft² x 1000)
6/1
6/11
6/21
7/1
7/11
7/21
7/31
Date

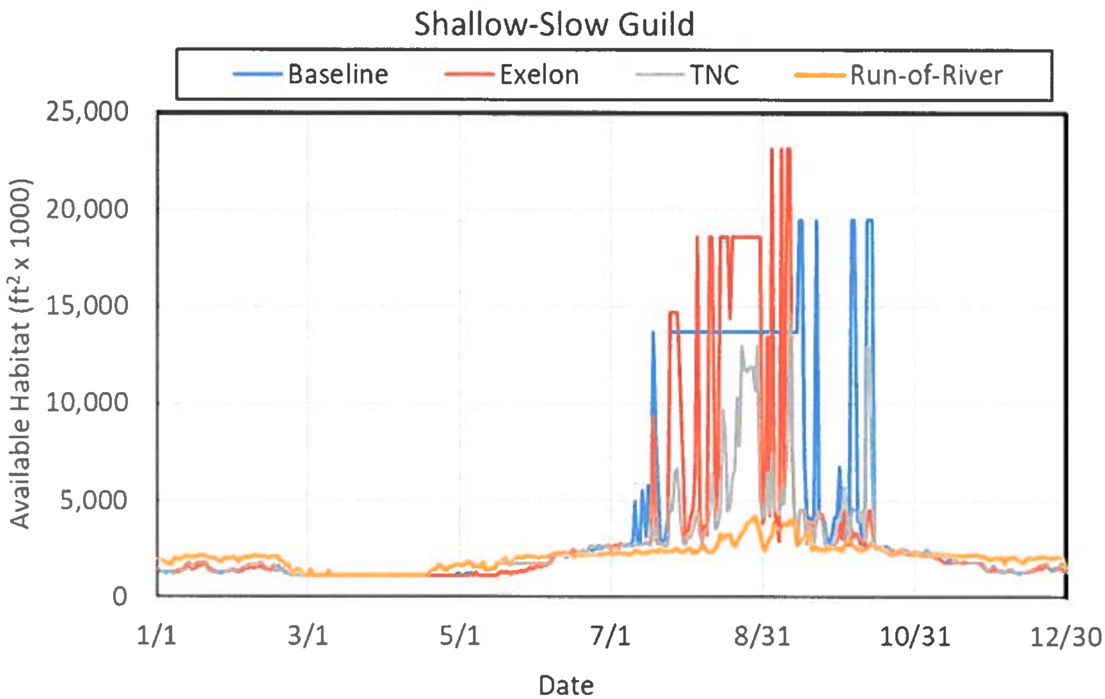

Smallmouth Bass Juvenile
Baseline
Exelon
TNC
Run-of-River
30,000
25,000
20,000
15,000
10,000
5,000
0
Available Habitat (ft² x 1000)
8/1
9/20
11/9
12/29
Date


Smallmouth Bass Adult
Baseline
Exelon
TNC
Run-of-River
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Available Habitat (ft² x 1000)
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

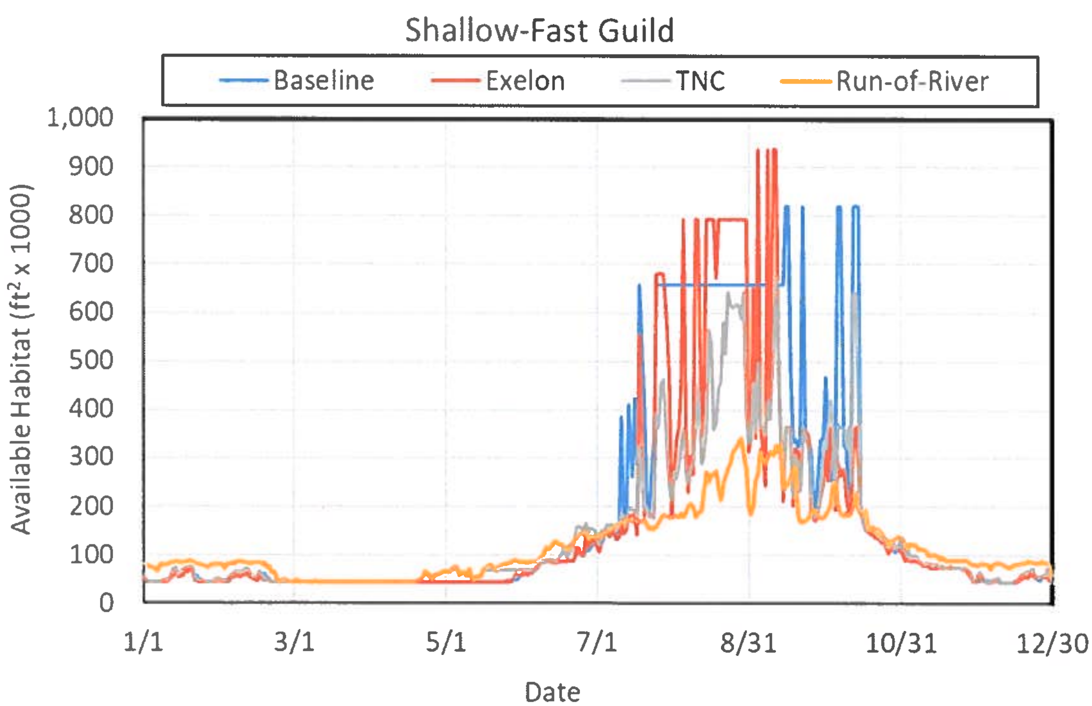

Caddisfly (Trichoptera)
Baseline
Exelon
TNC
Run-of-River
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Available Habitat (ft² x 1000)
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date


Mayfly (Ephemeroptera)
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

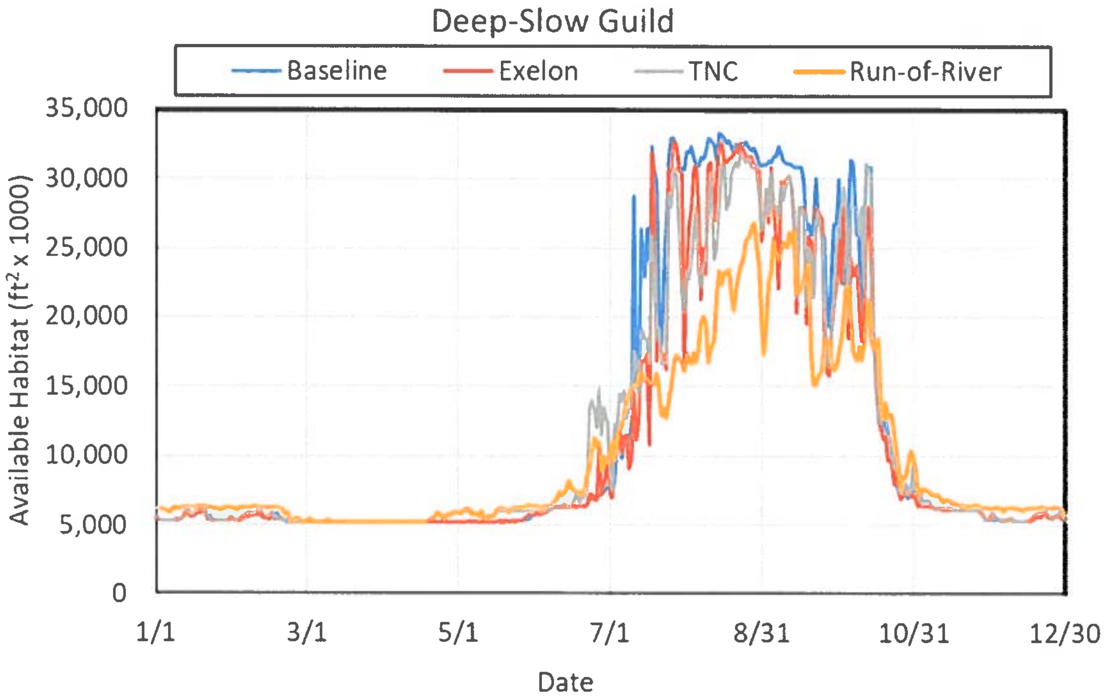

Stonefly (Plecoptera)
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

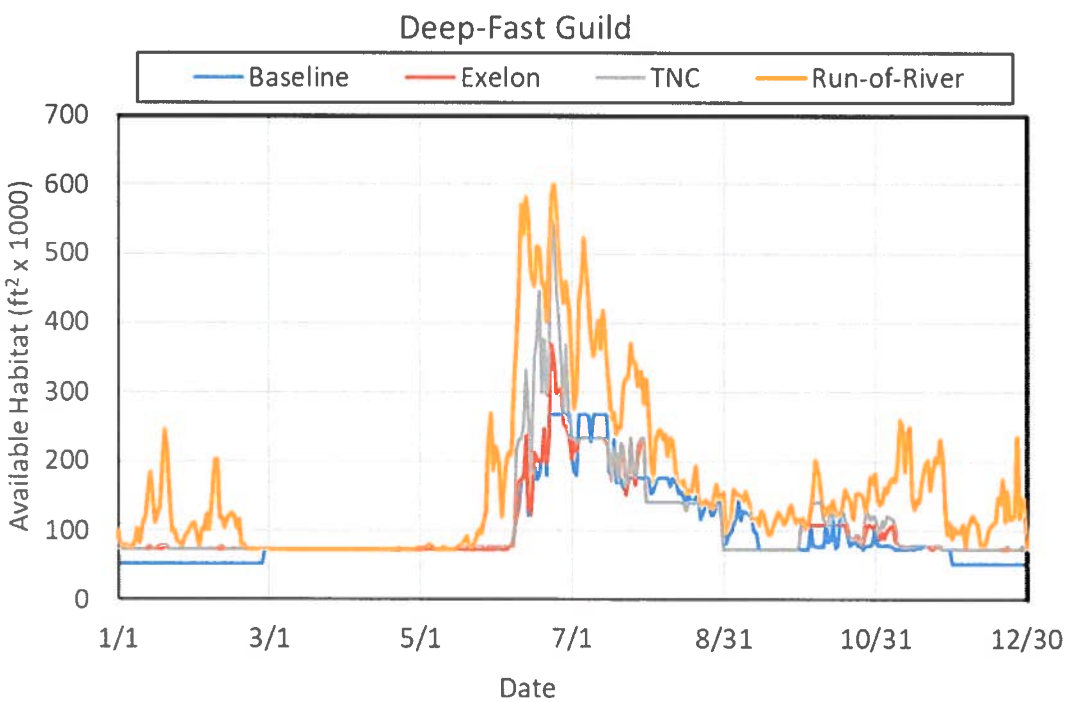


Shallow-Slow Guild
Baseline
Exelon
TNC
Run-of-River
25,000
20,000
15,000
10,000
5,000
0
Available Habitat (ft² x 1000)
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date



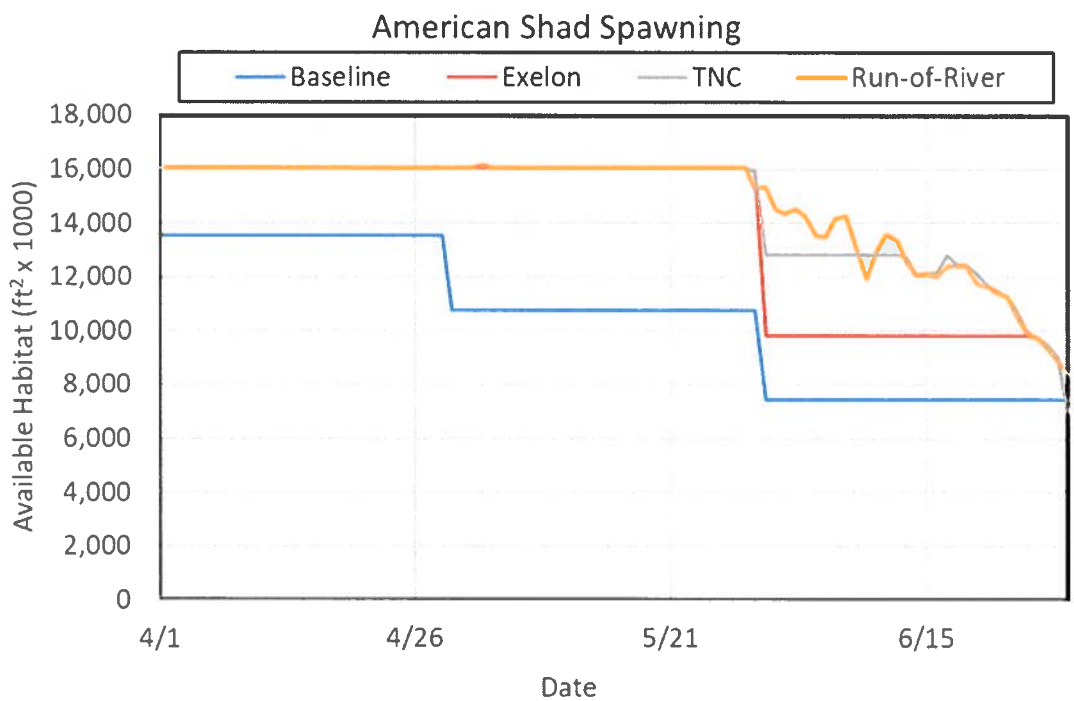
Shallow-Fast Guild
Baseline
Exelon
TNC
Run-of-River
1,000
900
800
700
600
500
400
300
200
100
0
Available Habitat (ft² x 1000)
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

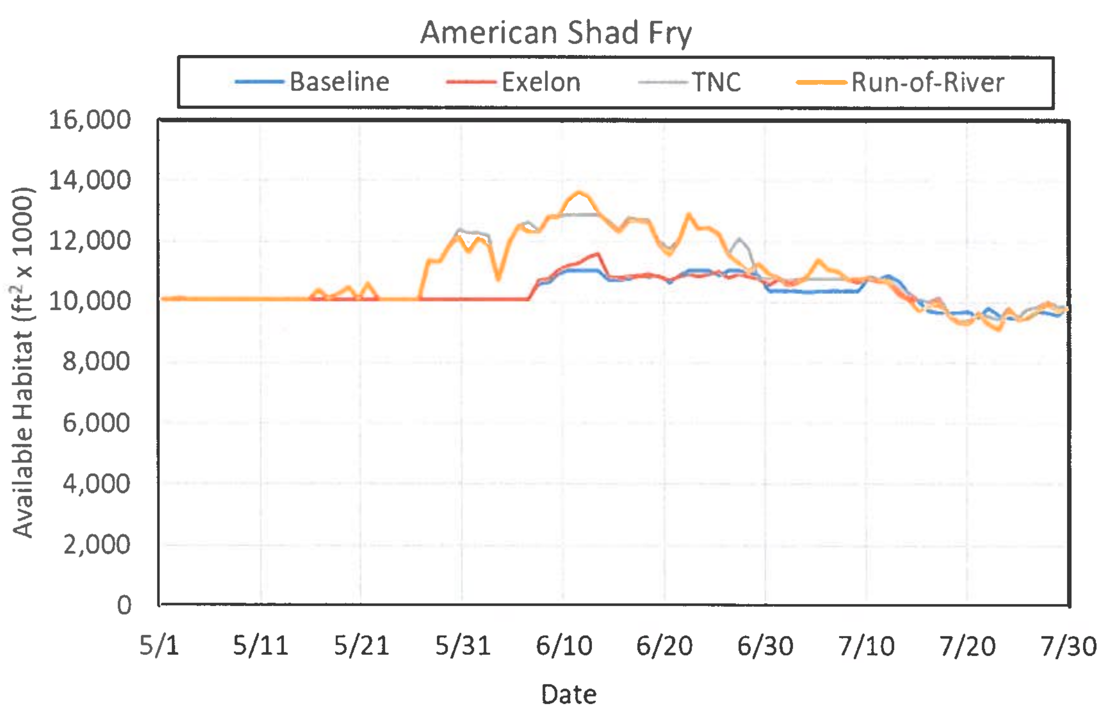

Deep-Slow Guild
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

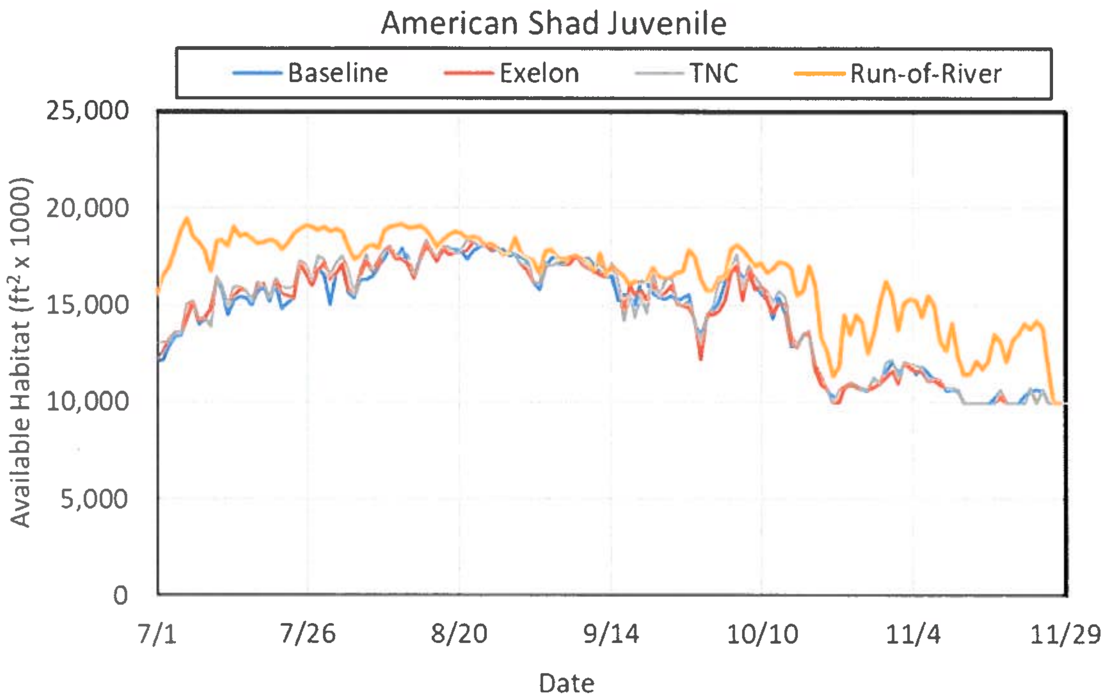

Deep-Fast Guild
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
700
600
500
400
300
200
100
0
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

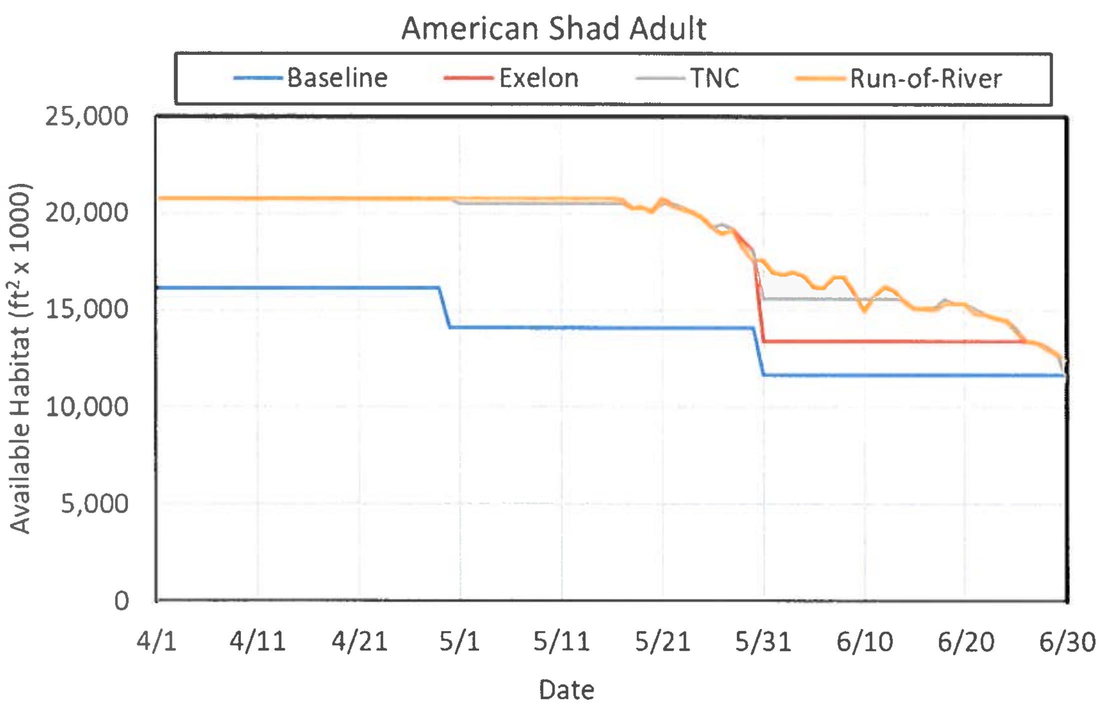
APPENDIX B

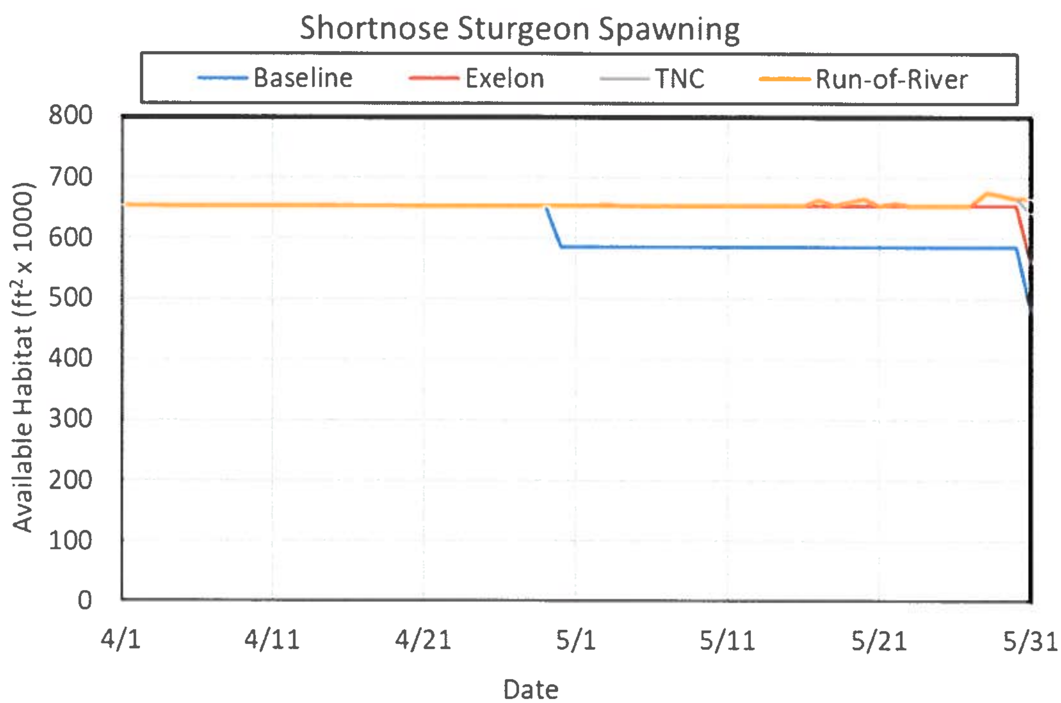
CONOWINGO HABITAT TIME SERIES DURATION FIGURES, BASED ON A DAILY 10 PERCENT EXCEEDANCE VALUE

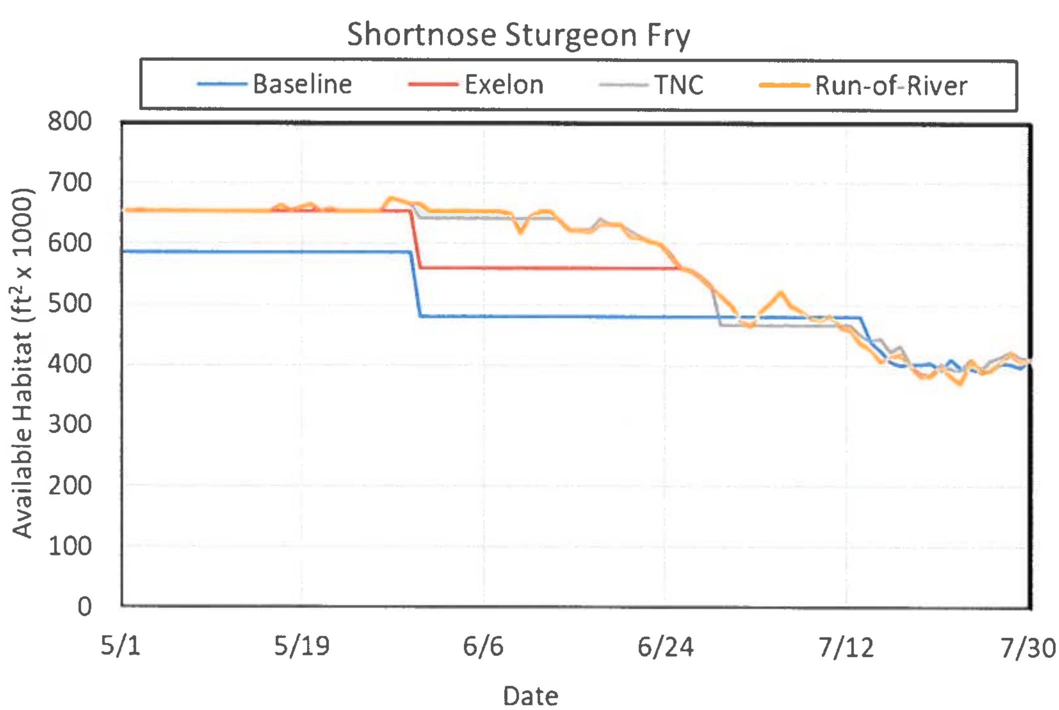

American Shad Spawning
Baseline
Exelon
TNC
Run-of-River
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Available Habitat (ft² x 1000)
4/1
4/26
5/21
6/15
Date

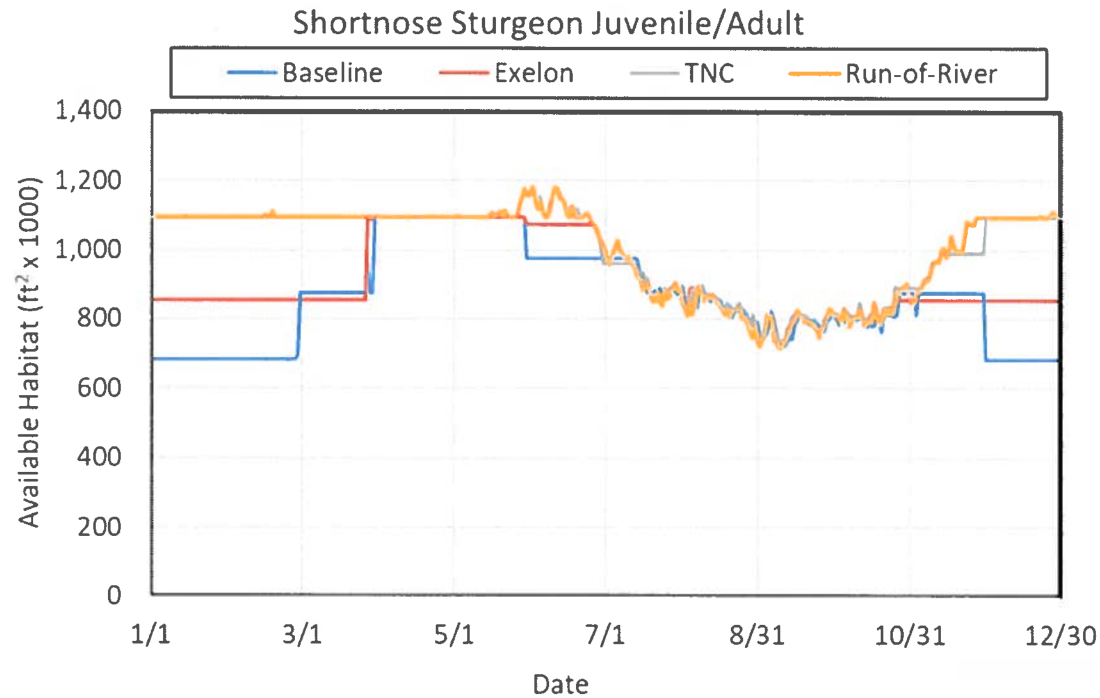

American Shad Fry
Baseline
Exelon
TNC
Run-of-River
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Available Habitat (ft² x 1000)
5/1
5/11
5/21
5/31
6/10
6/20
6/30
7/10
7/20
7/30
Date

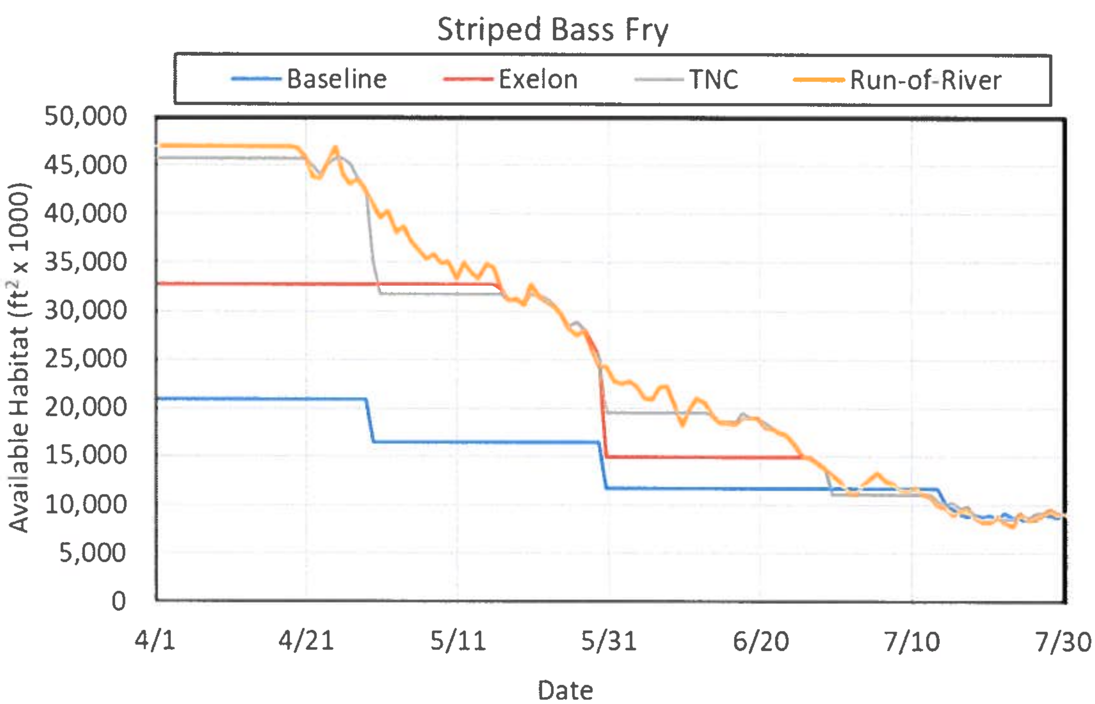

American Shad Juvenile
Baseline
Exelon
TNC
Run-of-River
25,000
20,000
15,000
10,000
5,000
0
Available Habitat (ft² x 1000)
7/1
7/26
8/20
9/14
10/10
11/4
11/29
Date

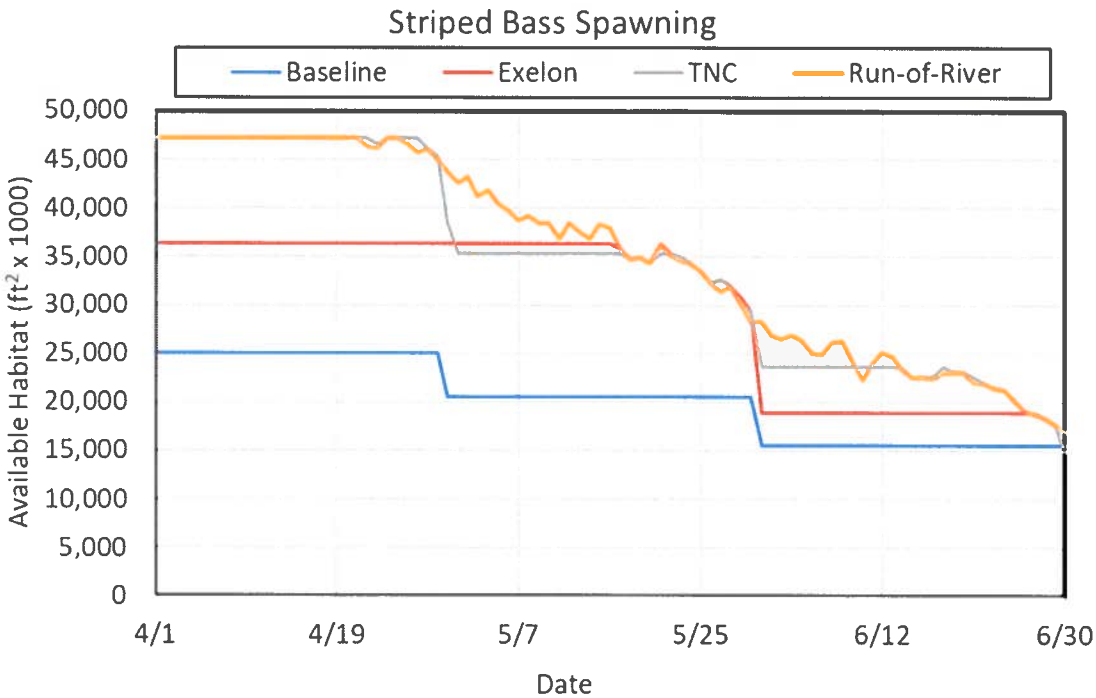

American Shad Adult
Baseline
Exelon
TNC
Run-of-River
25,000
20,000
15,000
10,000
5,000
0
Available Habitat (ft² x 1000)
4/1
4/11
4/21
5/1
5/11
5/21
5/31
6/10
6/20
6/30
Date

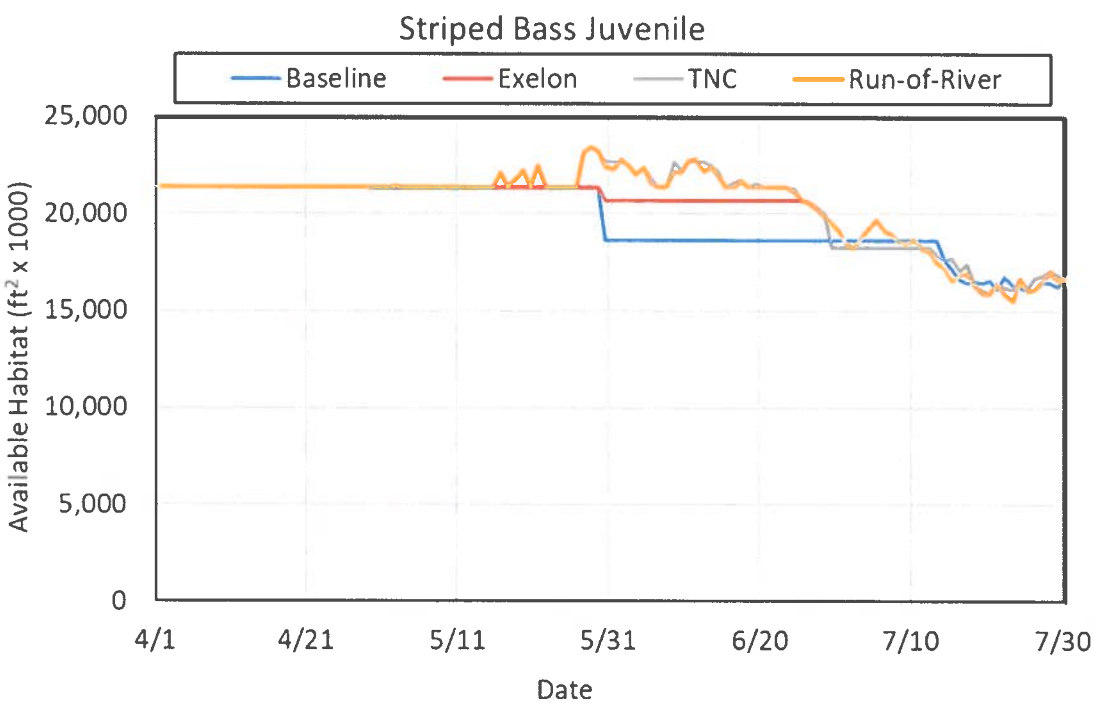

Shortnose Sturgeon Spawning
Baseline
Exelon
TNC
Run-of-River
800
700
600
500
400
300
200
100
0
Available Habitat (ft² x 1000)
4/1
4/11
4/21
5/1
5/11
5/21
5/31
Date

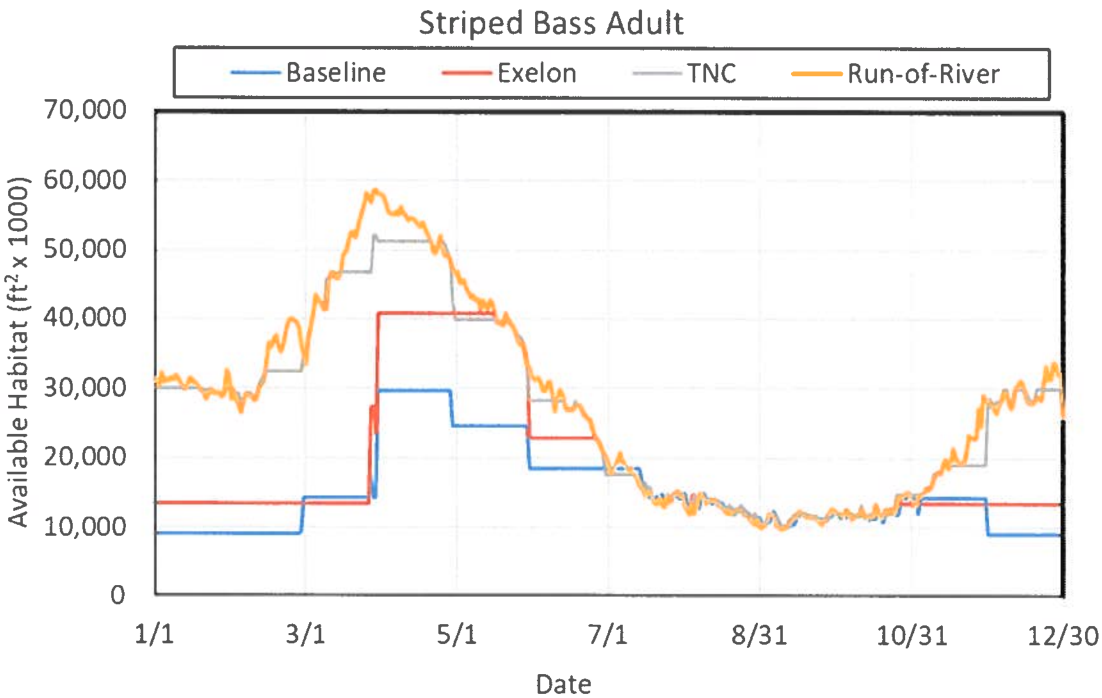

Shortnose Sturgeon Fry
Baseline
Exelon
TNC
Run-of-River
800
700
600
500
400
300
200
100
0
Available Habitat (ft² x 1000)
5/1
5/19
6/6
6/24
7/12
7/30
Date

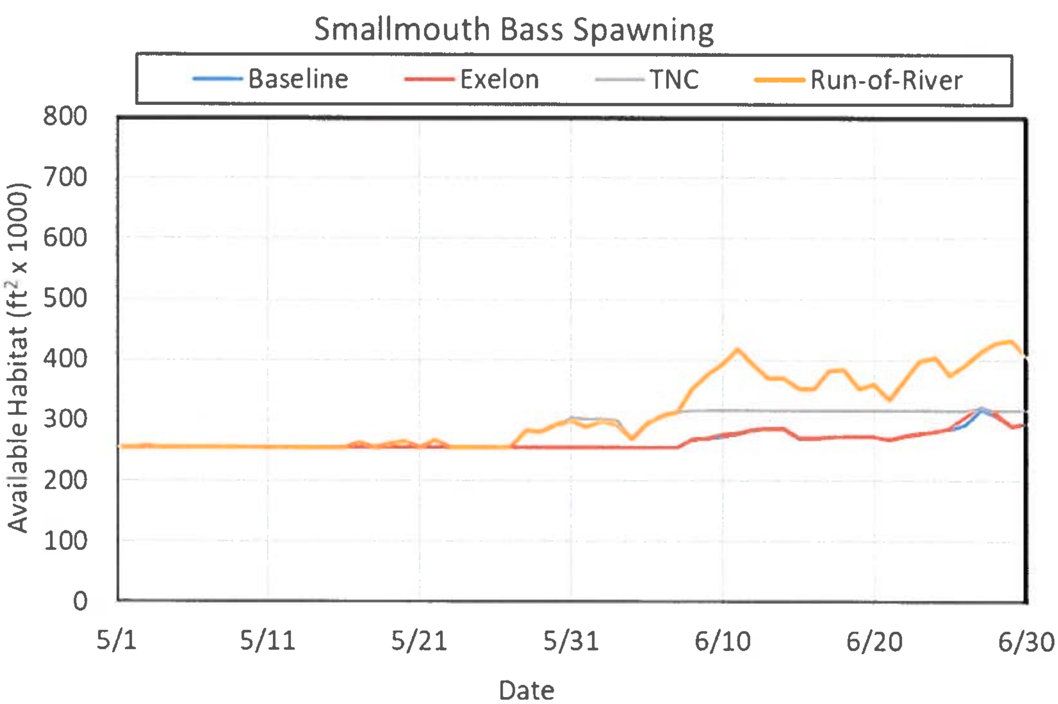

Shortnose Sturgeon Juvenile/Adult
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
1,400
1,200
1,000
800
600
400
200
0
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

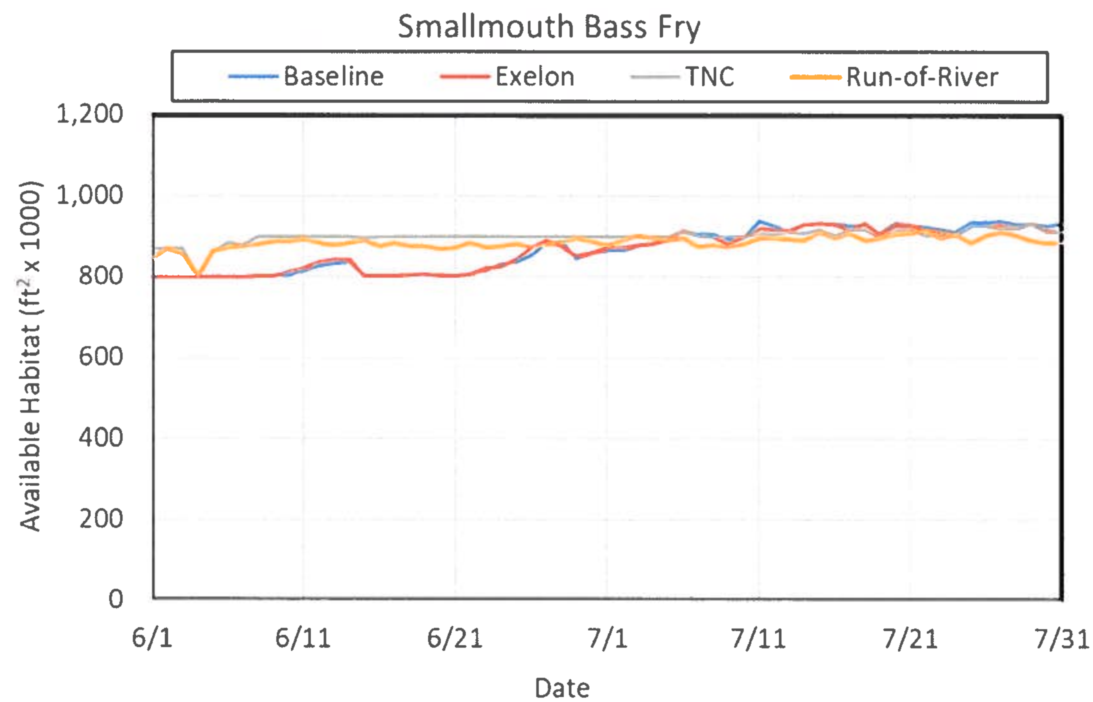

Striped Bass Fry
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
4/1
4/21
5/11
5/31
6/20
7/10
7/30
Date


Striped Bass Spawning
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
4/1
4/19
5/7
5/25
6/12
6/30
Date

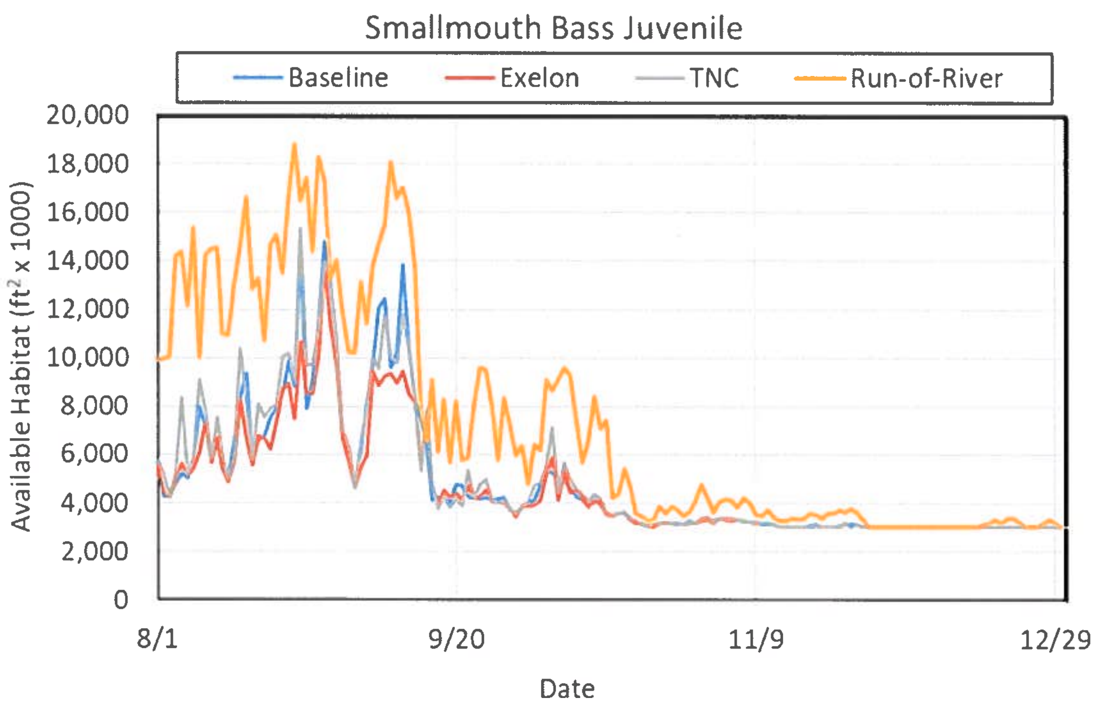

Striped Bass Juvenile
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
25,000
20,000
15,000
10,000
5,000
0
4/1
4/21
5/11
5/31
6/20
7/10
7/30
Date


Striped Bass Adult
Baseline
Exelon
TNC
Run-of-River
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Available Habitat (ft² x 1000)
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

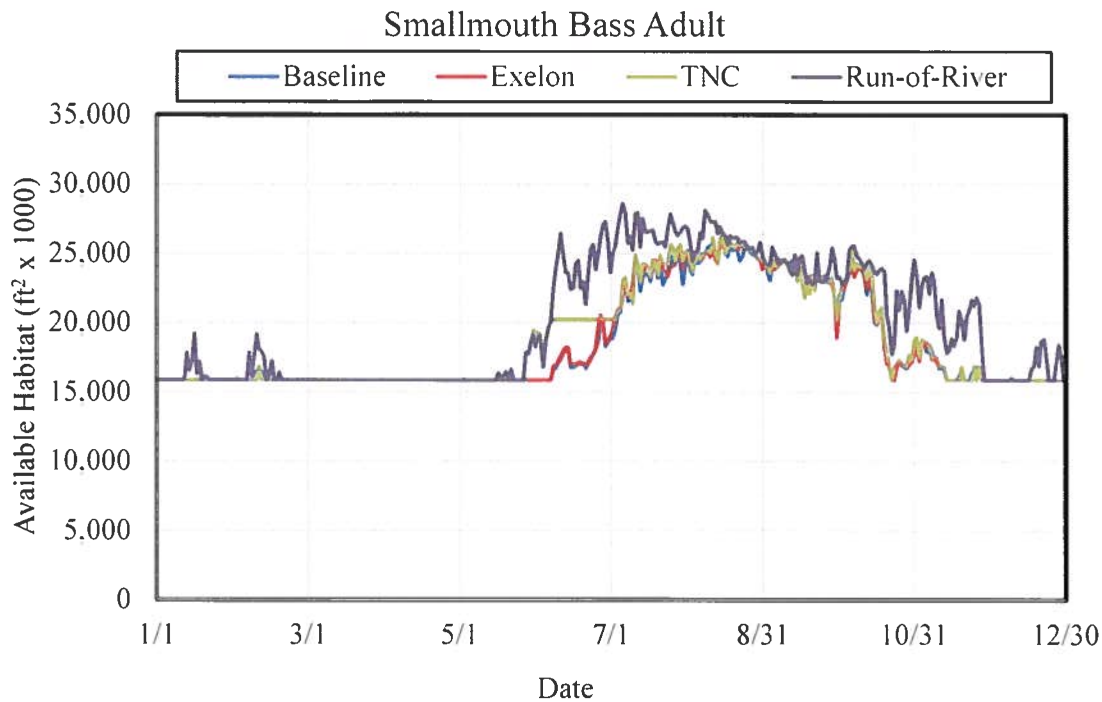

Smallmouth Bass Spawning
Baseline
Exelon
TNC
Run-of-River
800
700
600
500
400
300
200
100
0
Available Habitat (ft² x 1000)
5/1
5/11
5/21
5/31
6/10
6/20
6/30
Date

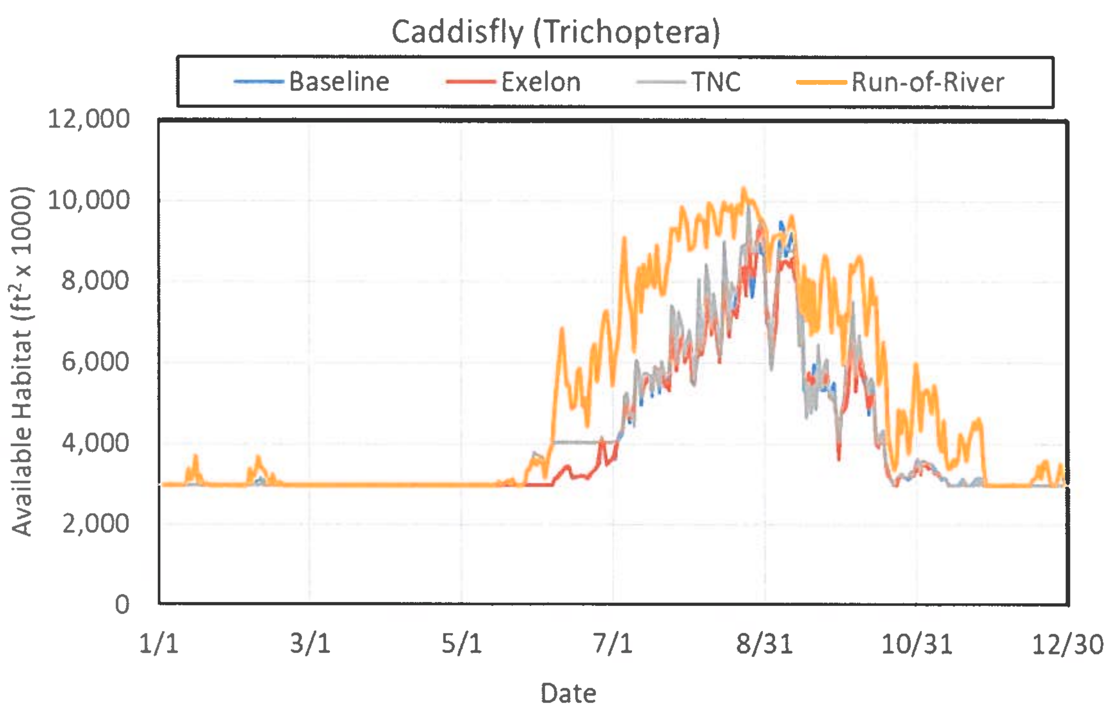


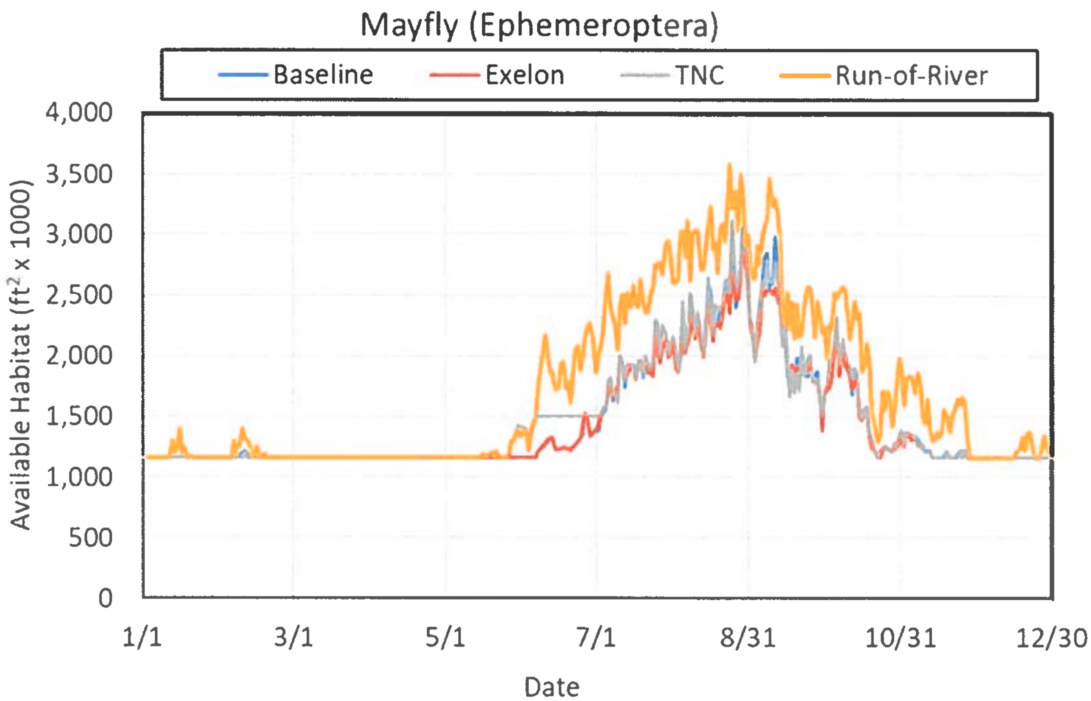
Smallmouth Bass Fry
Baseline
Exelon
TNC
Run-of-River
1,200
1,000
800
600
400
200
0
Available Habitat (ft² x 1000)
6/1
6/11
6/21
7/1
7/11
7/21
7/31
Date

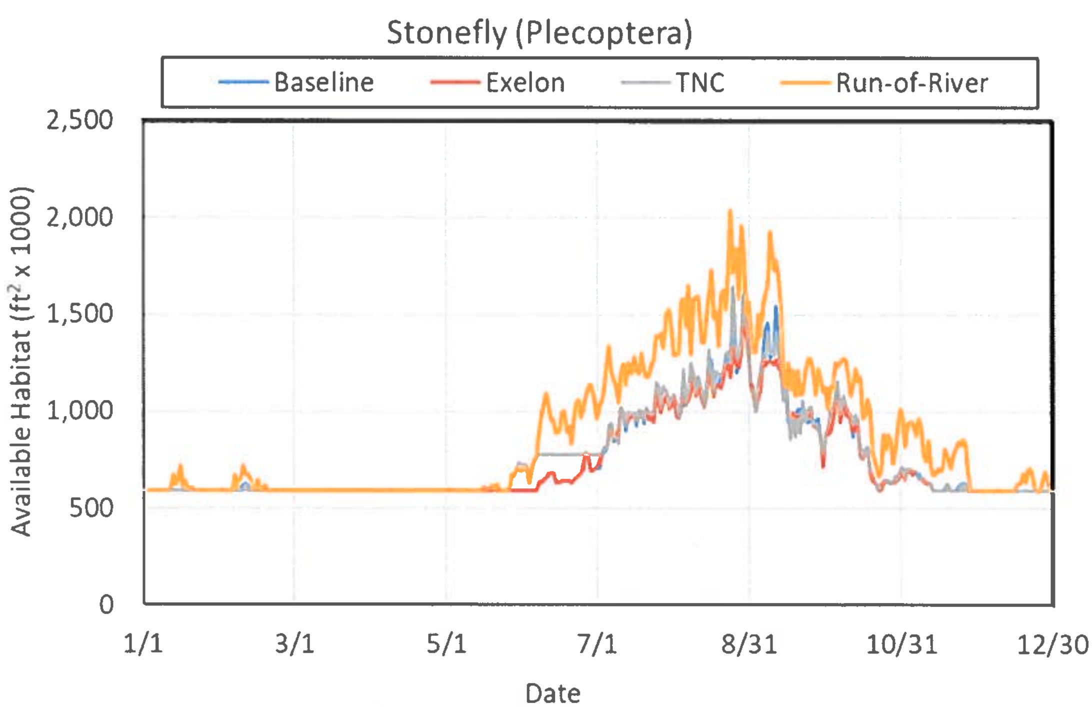


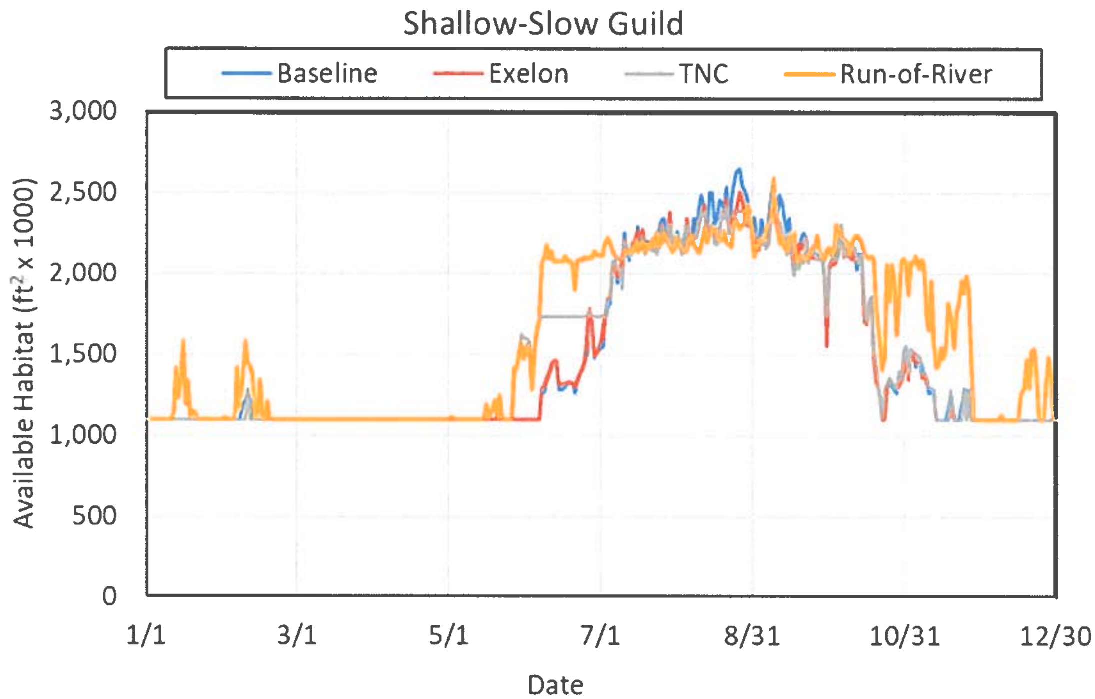
Smallmouth Bass Juvenile
Baseline
Exelon
TNC
Run-of-River
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Available Habitat (ft² x 1000)
8/1
9/20
11/9
12/29
Date

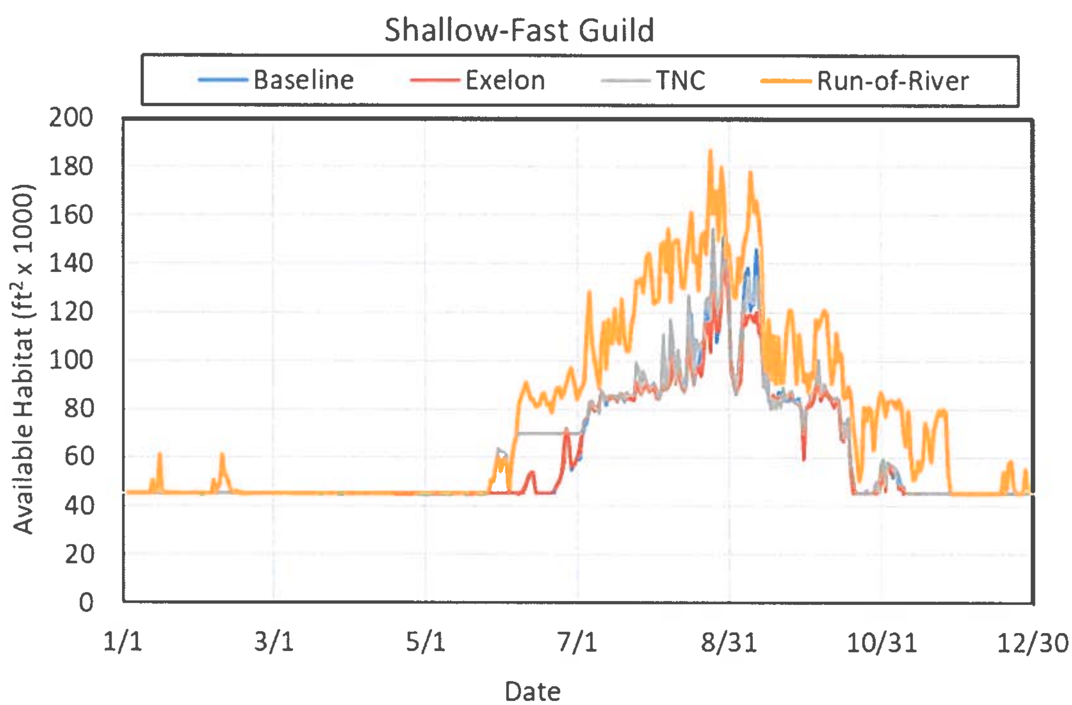

Smallmouth Bass Adult
Baseline
Exelon
TNC
Run-of-River
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Available Habitat (ft² x 1000)
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

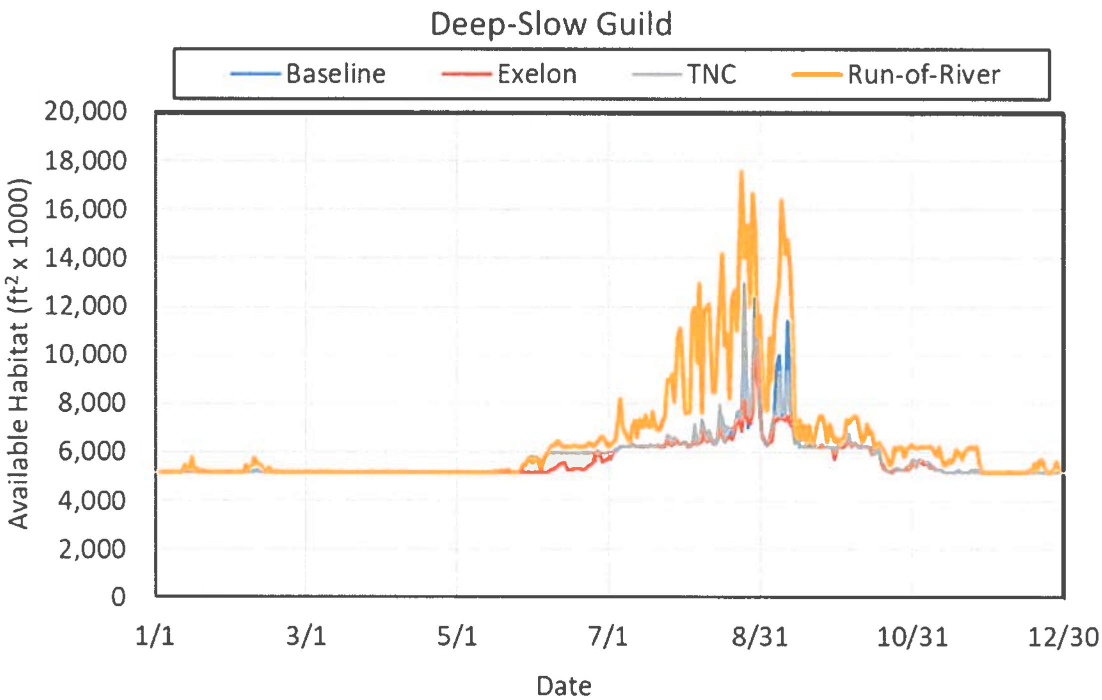

Caddisfly (Trichoptera)
Baseline
Exelon
TNC
Run-of-River
12,000
10,000
8,000
6,000
4,000
2,000
0
Available Habitat (ft² x 1000)
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

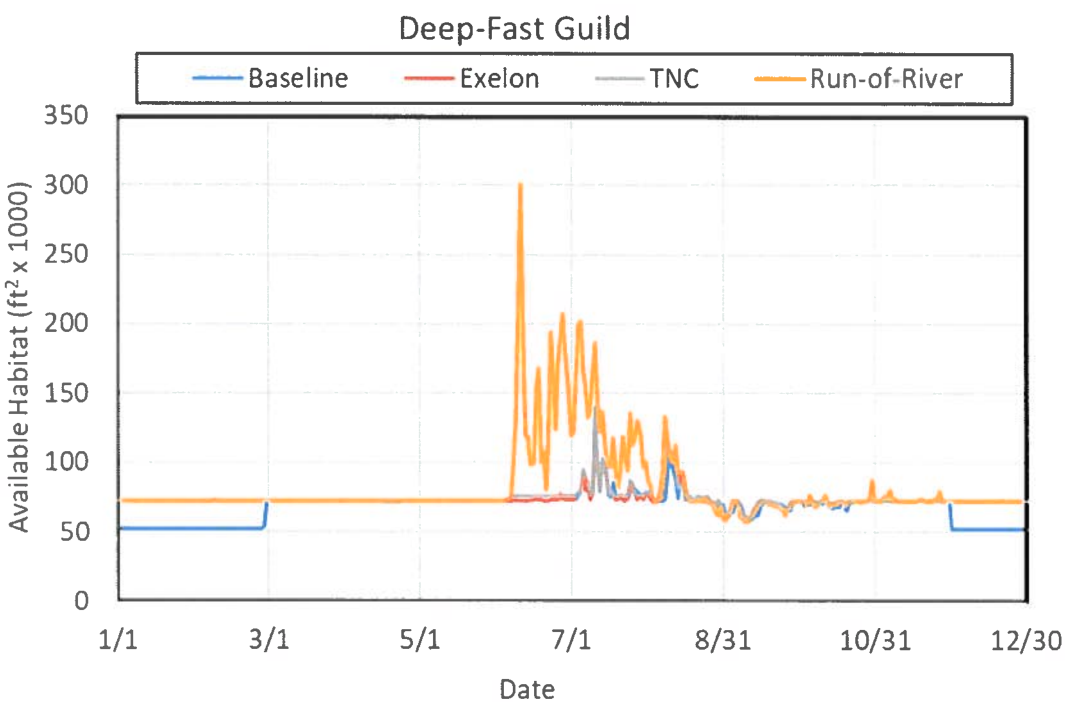

Mayfly (Ephemeroptera)
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date


Stonefly (Plecoptera)
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
2,500
2,000
1,500
1,000
500
0
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date


Shallow-Slow Guild
Baseline
Exelon
TNC
Run-of-River
3,000
2,500
2,000
1,500
1,000
500
0
Available Habitat (ft² x 1000)
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date


Shallow-Fast Guild
Baseline
Exelon
TNC
Run-of-River
200
180
160
140
120
100
80
60
40
20
0
Available Habitat (ft² x 1000)
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date


Deep-Slow Guild
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date


Deep-Fast Guild
Baseline
Exelon
TNC
Run-of-River
Available Habitat (ft² x 1000)
350
300
250
200
150
100
50
0
1/1
3/1
5/1
7/1
8/31
10/31
12/30
Date

APPENDIX C

SATELLITE IMAGE OF WASHLOAD FROM WATERSHED ABOVE THE CONOWINGO PRJOECT DURING TROPICAL STORM LEE

HARRISBURG

SUSQUEHANNA RIVER ABOVE CONOWINGO DAM