

**FINAL STUDY REPORT  
CONOWINGO POND CREEL SURVEY  
RSP 3.25A**

**CONOWINGO HYDROELECTRIC PROJECT**

**FERC PROJECT NUMBER 405**



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## **EXECUTIVE SUMMARY**

Exelon Generation Company, LLC (Exelon) has initiated with the Federal Energy Regulatory Commission (FERC) the process of relicensing the 573-megawatt Conowingo Hydroelectric Project (Conowingo Project). The current license for the Conowingo Project was issued on August 14, 1980 and expires on September 1, 2014. FERC issued the final study plan determination for the Conowingo Project on February 4, 2010, approving the revised study plan with certain modifications.

The final study plan determination included a requirement for Exelon to conduct a creel survey on the Conowingo Pond (CP) above Conowingo Dam. The objectives of this study are to: 1) determine angling effort estimates; 2) determine catch and harvest estimates and rates; and 3) identify demographics and biological data of fish caught for both boat and shore anglers on Conowingo Pond above Conowingo Dam. The survey was conducted from March 1, 2010 to February 28, 2011.

An initial study report (ISR) was filed on June 2, 2011, containing Exelon's 2010 study findings. A meeting was held on August 23 and 24, 2011 with resource agencies and interested members of the public. Formal comments on the ISR including requested study plan modifications were filed with FERC on March 21, 2012 by several resource agencies and interested members of the public. Exelon filed responses to the ISR comments with FERC on April 20, 2012. On May 21, 2012, FERC issued a study plan modification determination order. The order specified what, if any, modifications to the ISR should be made. For this study, FERC's May 21, 2012 order required no modifications to the original study plan. This final study report is being filed with the Final License Application for the Project.

The spring-fall survey was conducted from March 1 through November 30, 2010. Data on fishing pressure by shore anglers and from boats were collected from 42 scheduled weekly aerial counts. Forty-one aerial flights and one thorough ground count were conducted between the hours of 0801-1647 h; with the average count start time of 1145 h. Count efforts recorded 497 "actively fishing" boats and 189 shore anglers. The scope of the creel survey also entailed interviewing boat and shore anglers at 13 access points from the Norman Wood Bridge (PA Rt. 372), just below Holtwood Dam, to the Conowingo Dam.

A total of 646 boat anglers representing 365 fishing parties were interviewed. Weekend boat parties accounted for over 76% of all boat parties interviewed; summer (June 1 – September 6) accounted for 44% of boat parties interviewed. The average number of anglers per party was 1.8 and average fishing time per trip was 5.3 hours.

The largest proportion (49.7%) of boat anglers sought black bass (smallmouth bass, *Micropterus dolomieu* and largemouth bass, *Micropterus salmoides*) combined. Boat anglers interviewed seeking “anything” was high in the spring (47.8%) and 38.0% overall.

Interviews were used for a total of 71 shore angler parties representing 152 shore anglers at all sites but Glen Cove, where shore fishing is not allowed. Seasonally, 47.4% of shore party interviews occurred during summer and only 14.0% in the fall. The average fishing trip time for shore angling parties was 2.1 hours. “Casual” anglers not seeking a particular species, accounted for 124 of the 155 (80.0%) shore anglers interviewed.

Of total estimated effort of angling of 69,469 hours, boat anglers accounted for 49,225 hours (70.9%) and shore anglers accounted for 20,244 hours (29.1%). Weekend estimated effort (52,169 h) was three times higher than weekday effort (17,300 h); estimated effort during the summer accounted for 54% of the total hours.

The estimated number of trips taken by anglers was 9,288 boat trips and 9,640 shore trips. Estimated boat effort during summer accounted for 48% of hours and 50% of all boat trips, while estimated shore effort during summer accounted for 68.5% of hours and 71.9% of all trips. Boat and shore anglers combined expended 26,077 hours and 4,656 trips targeting black bass.

Boat and shore anglers caught an estimated 44,526 fish. Smallmouth bass accounted for 25.7% of the fish caught. Of the 2,676 fish harvested (i.e., kept), 1,627 were channel catfish (*Ictalurus punctatus*), of which nearly 74.2% were harvested during the summer. Of the nearly 11,000 sunfish (*Lepomis* spp.) and crappie (*Pomoxis* spp.) caught, none were harvested by either boat or shore anglers. The retention rate of fish by boat (5.3%) and shore (8.9%) anglers combined was 6.0%.

The overall CPUE (catch per-unit-effort) for boat and shore anglers were 0.65 and 0.24 fish/hour (fish/h), respectively, while the respective overall harvest per-unit-effort (HPUE) was 0.04 and 0.02 fish/h. The percent standard error, PSE, was relatively low (10.8%) for boat angler overall CPUE.

Targeted CPUE rates for boat anglers were highest for anglers seeking channel catfish (2.38 fish/h), and the HPUE for channel catfish was 1.43 fish/h. The majority of boat anglers targeted black bass and the CPUE for smallmouth bass and largemouth bass was 0.46 and 0.24 fish/h, respectively. No smallmouth and largemouth were harvested (HPUE = 0.0 fish/h).

Of the species of fish targeted by shore anglers, only common carp and smallmouth bass were caught by shore anglers targeting them. Targeted CPUE for shore anglers seeking common carp was highest at 0.45

fish/h. Smallmouth bass CPUE was 0.09 fish/h. The HPUE for common carp and smallmouth bass was 0.0 fish/h.

Approximately 65% of all anglers interviewed resided locally, i.e., in York and Lancaster Counties, PA and Harford and Cecil Counties, MD. Nearly 50% of all shore anglers were from Lancaster, PA. Besides Pennsylvania residents (72%), and Maryland residents (26%), anglers from five other states were interviewed.

Length measurements of fish harvested by boat anglers were obtained from 44 fish representing four species. Flathead catfish (*Pylodictis olivaris*) accounted for 61.4% of all harvested fish measured and ranged from 17 to 32 inches long. Most of the flathead catfish (66.7%) were measured in the spring. Measured channel catfish were between 11 and 23 inches and accounted for 29.5% of the harvested fish measured, with 84.6% of the channel catfish being harvested in the spring and summer combined.

Boat anglers also provided a measured or estimated length (to the nearest inch) of numerous fish released back into Conowingo Pond. Boat anglers provided estimated lengths or measurements for 13 species or species groups released totaling 954 fish. Smallmouth bass (366) and largemouth bass (202) combined comprised 31% of the released fish measured, with 77% of the black bass that were released reported as legal ( $\geq 12$  inches).

Length measurements were obtained from only five fish harvested by shore anglers, which included two common carp and three channel catfish. The two common carp measured between 20 and 21 inches and the three channel catfish between 13 and 17 inches were harvested by shore anglers in the spring and summer.

Shore anglers reported measured or estimated lengths for 65 fish that were released, consisting of eight species or species groups. Black bass accounted for 50.8% of released fish measured by shore anglers; lengths ranged from 8 to 19 inches.

Sixteen black bass and four catfish tournaments were known on the Conowingo Pond in 2010. Of the 222 boat anglers who fished the black bass tournaments, a total of 482 bass were weighed in. Most tournaments were held by local clubs. The catfish tournaments, sponsored by Catfish Nation, supported 105 boat anglers which weighed in 127 catfish. Glen Cove and Dorsey Park hosted the most of the tournaments, but a few were out of Muddy Creek Access.

The winter portion of the Conowingo Pond creel survey occurred between 1 December 2010 and 28 February 2011. During this period, 13 aerial flights occurred between 0911-1601 h. Winter count efforts



recorded only six boat and two shore anglers. Ice started in the tributaries and coves in early December and by mid December the Peach Bottom Atomic Power Station warm-water discharge was locked in by ice. Ice fishing holes were observed at Funk's Run Pond and Broad Creek in January. By mid February the Conowingo Pond was free from ice except for a small portion of Funk's Run Pond.

During winter, completed boat angler interviews totaled 22 boat anglers representing 13 parties, with an average of 1.7 anglers per boat. Six fish species or species groups were sought, with the largest proportion (36.4%) seeking largemouth bass. All boat anglers reported to be fishing the Peach Bottom Atomic Power Station warm-water discharge.

Winter shore angler interviews consisted of four shore angler representing three angling parties. Two anglers at Conowingo Creek were seeking walleye. Funk's Run Pond was the other location where shore anglers were interviewed. An ice angler responded crappie was targeted and another shore angler responded "anything."

Biological data were collected on fish that were harvested or released only for boat anglers because shore anglers did not catch any fish during the winter period. Length measurements were taken on six harvested fish, of which three were flathead catfish (17-26 inches) and three were walleye (16-17 inches). Length measurements were also reported on 47 fish of eight species. Majority of the fish released (72.3%) were largemouth bass (25) and smallmouth bass (9) combined, with only three of the largemouth bass were not legal to harvest.

No estimated or expanded values could be calculated for the winter portion of the Conowingo Pond creel survey due to the lack of angling pressure.

## TABLE OF CONTENTS

<b>1.0</b>	<b>Introduction and Background .....</b>	<b>1</b>
<b>2.0</b>	<b>Methods.....</b>	<b>3</b>
2.1	Study Area .....	3
2.2	General Survey Design Characteristics .....	4
2.2.1	Aerial Count Flights .....	5
2.2.2	Ground Intercept Survey .....	5
2.3	Data Management.....	7
2.4	Computational Methods for Boat and Shore Angler Survey .....	7
<b>3.0</b>	<b>RESULTS (Spring-Fall) .....</b>	<b>11</b>
3.1	Observed Data .....	11
3.1.1	Aerial Count Flights .....	11
3.1.2	Boat Angler Interviews.....	12
3.1.3	Species Sought by Boat Anglers.....	12
3.1.4	Shore Angler Interviews.....	13
3.1.5	Species Sought by Shore Anglers.....	14
3.2	Angling Effort Estimates .....	14
3.3	Catch and Harvest Estimates .....	15
3.3.1	Boat Angler Catch and Harvest .....	15
3.3.2	Shore Angler Catch and Harvest .....	16
3.3.3	Retention Rate .....	16
3.4	Catch and Harvest Rates .....	16
3.4.1	General Rates.....	17
3.4.2	Targeted Species Rates .....	18
3.5	Angler Demographics .....	18
3.6	Biological Data .....	19
3.6.1	Boat Anglers .....	19
3.6.2	Shore Anglers .....	19
3.6.3	Boat and Shore Anglers Combined .....	20
3.7	Tournaments .....	20
3.7.1	Black bass.....	20
3.7.2	Catfish .....	21
<b>4.0</b>	<b>Winter Survey Observed Data.....</b>	<b>22</b>
4.1	Aerial Counts .....	22
4.2	Boat Interviews.....	22
4.3	Species sought by Boat Anglers .....	23
4.4	Shore Interviews .....	23
4.5	Species Sought by Shore Anglers.....	23

4.6 Biological data on Species Caught by Anglers..... 23

**5.0 Conclusion ..... 25**

**REFERENCES..... 26**

## LIST OF TABLES

<b>Table 3.1.1-1: Distribution of Angler counts between day types and time of day, CP, 2010. ....</b>	<b>27</b>
<b>Table 3.1.1-2: Seasonal boat and shore angler counts from observations By Subsections in CP, 2010. ....</b>	<b>28</b>
<b>Table 3.1.2-1: Seasonal counts of boat parties interviews at CP, 2010.....</b>	<b>29</b>
<b>Table 3.1.2-2: Monthly counts of boat parties interviewed at CP, 2010. ....</b>	<b>30</b>
<b>Table 3.1.2-3: Seasonal completed boat information interviewed at CP, 2010. ....</b>	<b>31</b>
<b>Table 3.1.2-4: Mean trip lengths for completed boat parties at CP, 2010. ....</b>	<b>32</b>
<b>Table 3.1.3-1: Species targeted, Monthly, by boat anglers at CP, 2010. ....</b>	<b>33</b>
<b>Table 3.1.3-2: Species targeted, Seasonally, by boat anglers at CP, 2010.....</b>	<b>34</b>
<b>Table 3.1.4-1: Number of complete and incomplete trip interviews on the CP, 2010.....</b>	<b>35</b>
<b>Table 3.1.4-2: Seasonal shore information (complete and incomplete trips) interviewed at CP, 2010.....</b>	<b>36</b>
<b>Table 3.1.4-3: Seasonal counts of completed shore parties interviewed at CP, 2010.....</b>	<b>37</b>
<b>Table 3.1.4-4: Monthly counts of complete and incomplete shore anglers interviews on cp, 2010. .</b>	<b>38</b>
<b>Table 3.1.4-5: Mean trip length for completed shore anglers at CP, 2010. ....</b>	<b>39</b>
<b>Table 3.1.5-1: Species sought, monthly, by shore anglers in CP, 2010.....</b>	<b>40</b>
<b>Table 3.1.5-2: Species sought, seasonally, by shore anglers in CP, 2010.....</b>	<b>41</b>
<b>Table 3.2-1: Estimated effort with PSE of anglers fishing in CP, 2010.....</b>	<b>42</b>
<b>Table 3.2-2: Estimated number of trips by anglers at CP, 2010.....</b>	<b>43</b>
<b>Table 3.2-3: Estimated effort of anglers by day type fishing at CP, 2010.....</b>	<b>44</b>
<b>Table 3.2-4: Effort for boat and shore anglers combined seeking trout and black bass at CP, 2010.....</b>	<b>45</b>
<b>Table 3.2-5: Seasonal Effort for black bass by anglers at CP, 2010.....</b>	<b>46</b>
<b>Table 3.3-1: Catch and harvest estimates by boat and shore anglers combined at CP, 2010. ....</b>	<b>47</b>
<b>Table 3.3.1-1: Expanded boat catch and harvest estimates at CP, 2010.....</b>	<b>48</b>
<b>Table 3.3.2-1: Expanded shore catch and harvest estimates at CP, 2010. ....</b>	<b>49</b>
<b>Table 3.3.3-1: Retention rates for fish at CP, 2010. ....</b>	<b>50</b>
<b>Table 3.4.1-1: Seasonal overall catch and harvest per-unit-effort rates at CP, 2010.....</b>	<b>51</b>

<b>Table 3.4.1-2: Seasonal overall catch and harvest per-unit-effort rates, with PSE at CP, 2010.....</b>	<b>52</b>
<b>Table 3.4.1-3: Overall catch and harvest rates for species by boat Anglers in CP, 2010. ....</b>	<b>53</b>
<b>Table 3.4.1-4: Overall catch and harvest rates for species by shore anglers at CP, 2010. ....</b>	<b>54</b>
<b>Table 3.4.2-1: Targeted catch and harvest rates for anglers at CP, 2010. ....</b>	<b>55</b>
<b>Table 3.4.2-2: Targeted catch and harvest rates, seasonally, for boat anglers at CP, 2010. ....</b>	<b>56</b>
<b>Table 3.4.2-3: Targeted catch and harvest rates, seasonally, for species sought by shore anglers in CP, 2010. ....</b>	<b>57</b>
<b>Table 3.5-1: Angler demographics for anglers at CP, 2010. ....</b>	<b>58</b>
<b>Table 3.6.1-1: Length frequency by 1 inch total length groups for harvested fish caught by boat anglers in CP, 2010. ....</b>	<b>59</b>
<b>Table 3.6.1-2: Length frequency by 1 inch total length groups for harvested fish caught, seasonally, by boat anglers in CP, 2010.....</b>	<b>60</b>
<b>Table 3.6.1-3: Length frequency by 1 inch total length groups for released fish caught by boat anglers in CP, 2010. ....</b>	<b>61</b>
<b>Table 3.6.1-4: Length frequency by 1 inch total length groups for released fish caught, seasonally, by boat anglers in CP, 2010.....</b>	<b>62</b>
<b>Table 3.6.2-1: Length frequency by 1 inch total length groups for harvested fish caught by shore anglers in CP, 2010. ....</b>	<b>64</b>
<b>Table 3.6.2-2: Length frequency by 1 inch total length groups for harvested fish caught, seasonally, by shore anglers in CP, 2010.....</b>	<b>65</b>
<b>Table 3.6.2-3: Length frequency by 1 inch total length groups for released fish caught by shore anglers in CP, 2010. ....</b>	<b>66</b>
<b>Table 3.6.2-4: Length frequency by 1 inch total length groups for released fish caught, seasonally, by shore anglers in CP, 2010.....</b>	<b>67</b>
<b>Table 3.7.1-1: Summary of conowingo pond black bass tournament activity, 2010.....</b>	<b>68</b>
<b>Table 3.7.2-1: Summary of conowingo pond catfish tournaments activity, 2010.....</b>	<b>69</b>
<b>Table 4.1-1: Distrubtuion of angler counts between day types and time of day over CP, winter 2010-2011. ....</b>	<b>70</b>
<b>Table 4.1-2: Aerial Observations of boat and shore angler on CP, winter 2010-2011.....</b>	<b>71</b>
<b>Table 4.2-1: Number of angler interviews per location and method in CP, winter 2010-2011.....</b>	<b>72</b>
<b>Table 4.2-2: Number of boat parties interviewed at CP, winter 2010-2011. ....</b>	<b>73</b>

<b>Table 4.2-3: Monthly counts of boat parties interviews at CP, winter 2010-2011. ....</b>	<b>74</b>
<b>Table 4.2-4: Average number of anglers per party in CP, winter 2010-2011.....</b>	<b>75</b>
<b>Table 4.3-1: Species sought by anglers in CP, winter 2010-2011.....</b>	<b>76</b>
<b>Table 4.4-1: Number of shore parties interviews at CP, winter 2010-2011.....</b>	<b>77</b>
<b>Table 4.4-2: Monthly counts of shore parties interviews at CP, winter 2010-2011.....</b>	<b>78</b>
<b>Table 4.6-1: Length frequency by 1 inch total length groups for harvested fish caught by boat anglers on CP, winter 2010-2011. ....</b>	<b>79</b>
<b>Table 4.6-2: Length frequency by 1 inch total length groups for released fish caught by boat anglers on CP, winter 2010-2011. ....</b>	<b>80</b>

**LIST OF FIGURES**

**Figure 2.1-1: Aerial Photograph of CP..... 81**

**Figure 3.1.2-1: Boat Angler Use Profiles (Spring-fall) for Temporal Strata..... 82**

**Figure 3.1.4-1: Shore Angler Use Profiles (Spring-Fall) for Temporal Strata..... 85**

**Figure 3.6.3-1: Size of Released black bass by anglers on CP..... 88**



## **LIST OF APPENDICES**

- Appendix A-1: Random Aerial Flight Schedule.**
- Appendix A-2: Random Ground survey Schedule (Spring-fall).**
- Appendix A-3: Random Ground survey Schedule (winter).**
- Appendix B-1: Standard Operating Procedure.**
- Appendix B-2: Coding Manual.**
- Appendix B-3: Standardized aerial count form.**
- Appendix B-4: Standard Site Count Form.**
- Appendix B-5: Standardized Ground Survey Interview Form.**
- Appendix B-6: Site Description and Routes.**
- Appendix C: Photographs.**
- Appendix D-1: Estimated effort of anglers fishing at CP, 2010.**
- Appendix D-2: Mean trip length for anglers targeting various species at CP, 2010.**
- Appendix D-3: Observed fish caught and harvested from CP, 2010.**
- Appendix D-4: Expanded boat catch and harvest estimates at CP, 2010.**
- Appendix D-5: Expanded shore catch and harvest estimates at CP, 2010.**
- Appendix D-6: Expanded boat catch and harvest estimates by day type at CP, 2010.**
- Appendix D-7: Expanded shore catch and harvest estimates by day type at CP, 2010.**
- Appendix D-8: General seasonal species catch and harvest rates for CP, 2010.**
- Appendix D-9: General species catch and harvest rates for CP, 2010.**
- Appendix D-10: Targeted catch and harvest rates for anglers on CP, 2010.**
- Appendix D-11: Targeted catch and harvest rates for boat anglers at CP, 2010.**
- Appendix D-12: Targeted catch and harvest rates for shore anglers at CP, 2010.**
- Appendix D-13: Sizes of fish released and harvested at CP, 2010.**
- Appendix D-14: Chronological list of black bass tournaments held on CP, 2010.**
- Appendix D-15: Chronological list of catfish tournaments held on CP, 2010.**

## LIST OF ABBREVIATIONS

### *Agencies*

FERC	Federal Energy Regulatory Commission
MDE	Maryland Department of Environment
MDNR	Maryland Department of Natural Resources
PBAPS	Peach Bottom Atomic Power Station

### *Miscellaneous*

ILP	Integrated Licensing Process
MW	megawatt

## Glossary of Terms and Acronyms

angler trip	a measure of angling effort, calculated by dividing angler-hours (also a measure of effort) by mean trip length in hours.
angler-hour	basic unit of angler effort
black bass	fishes with the genus <i>Micropterus</i> ; herein, includes largemouth bass and smallmouth bass.
casual angler	an angler not seeking a particular species, just fishing.
catch	all fish caught by an angler
CP	Conowingo Pond
CPUE	acronym for catch-per-unit-effort; catch rate. Herein, fish caught per angler-hour; a measure of angler success.
targeted fishery	effort by anglers targeting a specific species (e.g., largemouth bass) or group of fishes (black bass, sunfish).
fishing trip	Generally, time spent on shore or in a boat fishing. Fisheries managers view trip narrowly as “all or a portion of a day spent fishing”. Economists view a trip more broadly as “total time spent in an area over one or more days that includes fishing, but may include other pursuits as well”.
h	hours
harvest	fish caught that are kept by the angler
HPUE	acronym for harvest-per-unit-effort; harvest rate. Herein, fish harvested per angler-hour; a measure of angler success
PSE	proportional standard error (standard error of estimate/the estimate X 100), a measure of precision.
retention rate	the proportion of fish caught that were harvested by an angler (same as harvest rate).
SE	standard error, a precision measure of an estimate

## **1.0 INTRODUCTION AND BACKGROUND**

Exelon Generation Company, LLC (Exelon) has initiated with the Federal Energy Regulatory Commission (FERC) the process of relicensing the 573-megawatt (MW) Conowingo Hydroelectric Project (Project). Exelon is applying for a new license using the FERC's Integrated Licensing Process (ILP). The current license for the Conowingo Project was issued on August 14, 1980 and expires on September 1, 2014.

As required by the ILP, Exelon filed their Pre-Application Document (PAD) and Notice of Intent (NOI) with FERC on March 12, 2009. On June 11 and 12, 2009, a site visit and two scoping meetings were held at the Project for resource agencies and interested members of the public. Following these meetings, formal study requests were filed with FERC by several resource agencies. Many of these study requests were included in Exelon's Proposed Study Plan (PSP), which was filed on August 24, 2009. On September 22 and 23, 2009, Exelon held a meeting with resource agencies and interested members of the public to discuss the PSP.

Formal comments on the PSP were filed with FERC on November 22, 2009 by Commission staff and several resource agencies. Exelon filed a Revised Study Plan (RSP) for the Project on December 22, 2009. FERC issued the final study plan determination for the Project on February 4, 2010, approving the RSP with certain modifications.

The final study plan determination included a requirement for Exelon to conduct a creel survey on the Conowingo Pond above Conowingo Dam (CP) and the lower Susquehanna River. Due to the extensive amount of data, above and below the Conowingo Dam, and the extended length of the Conowingo Pond survey, these creel reports will be represented individually.

Previous survey data demonstrated the popularity and angler success of crappie (*Pomoxis* spp.), sunfish (*Lepomis* spp.), and black bass (*Micropterus* spp.). The objectives of this study are to: 1) determine angling effort estimates; 2) determine catch and harvest estimates and rates 3) identify demographics and biological data from both boat and shore anglers on the Conowingo Pond. The creel data reported for Conowingo Pond will be used in conjunction with the Recreational Needs and Assessment (RSP 3.26) to address any angler opportunities on Conowingo Pond.

An initial study report (ISR) was filed on June 2, 2011, containing Exelon's 2010 study findings. A meeting was held on August 23 and 24, 2011 with resource agencies and interested members of the public. Formal comments on the ISR including requested study plan modifications were filed with FERC

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Conowingo Pond, the lower most impoundment on the Susquehanna River, was formed in 1928 by the backwater of Conowingo Hydroelectric Dam (River Mile 10). The Pond is bounded upstream by Holtwood Dam (River Mile 24), which was built in 1914. It has a surface area of about 9,000 acres with a storage capacity of 310,000 acre-ft. It is 14 miles long and averages one mile in width. The average depth of the Pond is 20 ft with some areas that may exceed 100 ft. A Boater Restriction Zone located about 400 yards upstream of Conowingo Dam was used as the downstream most boundary for this study and the Norman Wood Bridge (Pennsylvania Route 372) was the upstream boundary. Conowingo Pond receives a thermal discharge from Peach Bottom Atomic Power Station (PBAPS), the discharges from Muddy Run Pumped Storage and Holtwood Dam. Conowingo Pond is used as a public water supply source for the City of Baltimore and Chester Water Authority.

## **2.0 METHODS**

### **2.1 Study Area**

The CP is located in northeastern Maryland between Harford and Cecil Counties in Maryland and southeast Pennsylvania between York and Lancaster Counties. The lower portion of CP is 34 miles northeast of Baltimore, Maryland and 34 miles west of Wilmington, Delaware, while the upper portion of CP is 24 miles southeast of York, Pennsylvania and 15 miles from Lancaster, Pennsylvania. The combined population of adjacent Harford and Cecil Counties is about 350,000 people (2009 U.S. Census; <http://quickfacts.census.gov/qfd/states/24000.html>), and Lancaster and York Counties are home to about 55,000 and 40,000 residents, respectively (2006 U.S. Census; <http://quickfacts.census.gov/qfd/states/42/4287048.html>). Recreational angling is enhanced by the diverse habitats available within CP plus the variety of species including smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), common carp (*Cyprinus carpio*), channel catfish (*Ictalurus punctatus*) and recently introduced flathead catfish (*Pylodictis olivaris*).

The CP includes a wide variety of fishing habitats for all seasons of the year. The upstream-most reach is the tailrace of the Holtwood Dam with fluctuating water levels and currents dependent on river flows and number of units in operation. The habitat in the upper three miles includes large outcrops of rock and swift water. Most of CP is more typical lacustrine habitat typically found in impoundments, water levels can fluctuate within Conowingo Pond with the number of units in operation at Conowingo Dam, Holtwood Dam and Muddy Run Pumping Station.

As seen in Figure 2.1-1, the interview sites around the Project Area are widely spread out. For this survey, the Project Area was divided into four sections. The largest two sections included the area of Conowingo Pond in MD and the area of Conowingo Pond in PA. Although the thermal discharge of PBAPS within Conowingo Pond in PA, data from the area of the PBAPS plume are recorded separately. The thermal discharge extended to the MD/PA border and was extended out 100 yards from the west shore. The fourth section included all backwatered tributaries that were accessible by boat or shore from the confluence (mouth) of the tributary and CP upstream to the Project Boundary.

The Maryland section includes Funk's Run Pond (site 214), Conowingo Creek (site 215), and Broad Creek (site 212) which are backwatered (tributaries), with the latter two having boat ramps. Funk's Run Pond is a flooded pond-like area with minimal access to boats. Broad Creek is lined with cabins and docks. Glen Cove Marina (site 213) is also located in Maryland. Line Bridge Road (site 211) dead ends at CP with minimal shoreline access and a few cabins along the shoreline. Line Bridge Road site was

discontinued after July because only one shore angling party was interviewed during the first four months of the survey.

Boat angler interviews were conducted at five select boat ramps on the CP. The northern most boat ramp, Muddy Creek Access (site 201), is a PA Fish and Boat Commission ramp and only PA registered boats may launch ([Figure 2.1-1](#)). The two marinas, Peach Bottom (site 204) and Glen Cove (site 213), are pay-to-launch facilities. Dorsey Park (site 203) is only open dawn to dusk. Conowingo Creek launch (site 215) is only open during times of no spill at Conowingo Dam.

Shore angler interviews provided data to characterize the angler sample by season, by access point, and overall ([Figure 2.1-1](#)). Shore angling occurred at all but one site (Glen Cove, Site Shore 213 where angling is prohibited). Four shore sites make up the shoreline in the Maryland section, while six sites make up the Pennsylvania section. Of the four shore sites within Maryland, most could either be a backwatered tributary or a reservoir mainstem site. Broad Creek (site 212) could only be a tributary site. Of the six Pennsylvania shore sites only one site, Peach Bottom Marina/shoreline (site 204), could be reservoir mainstem or backwatered tributary site, while all other sites were only reservoir mainstem sites.

During the winter survey, creel clerks visited seven interview sites and started at 0800 h. Sites were driven in a clockwise rotation with a random starting location. Survey day was no longer than 9 hours. Winter survey interviews were done with any angler that was seen during a route, and the creel clerk had the ability to return to a site if time allowed.

The Pennsylvania section includes the discharges from PBAPS and Muddy Run Pumped Storage Project along with the tailrace of Holtwood Dam. This section also includes Peters Creek, Fishing Creek, and Muddy Creek, which are all flooded creek channels. Peters Creek has Peach Bottom Marina (site 202) and a boat launch. All other boat ramps are on the mainstem of the reservoir.

#### General Survey Design Characteristics

The Conowingo Pond creel study was assessed with a complemented survey ([Pollock et al. 1994](#)) that combined aerial counts of fishing boats and shore anglers with information obtained from ground interviews at boat ramps and shore fishing access points. The Conowingo Pond creel survey extended from 1 March 2010 to 28 February 2011. The interview period was 10 hours during spring, summer, and fall and was for no longer than nine hours during winter.

The 12-month time frame was stratified into four seasons. The seasons were of unequal lengths and were developed to reflect Maryland and Pennsylvania State fishing regulations as follows:

- Spring = 1 March – 31 May;
- Summer = 1 June – 6 September;
- Fall = 7 September – 30 November;
- Winter = 1 December 2010 – 28 February 2011.

Weekdays and weekend days/holidays represented temporal strata within each season.

Opening days were not separated out because of unforeseen issues for aerial flight (weather).

### **2.1.1 Aerial Count Flights**

Weekly aerial flights were made by helicopter flown at about 200 ft above ground level that identified shore anglers and boats with anglers that were actively fishing. An approximately equal number of weekday and weekend/holiday flights were achieved by alternating flight days between day types throughout the survey. The specific flight day within a week was chosen at random ([Appendix A-1](#)). Flight times were distributed throughout the day. All shore anglers and actively-fishing boats<sup>1</sup> were counted on a standardized aerial count form ([Appendix B-3](#)). Active fishing boats were identified by location, activity, or visible gear. Flights were short, typically lasting 30 minutes but including a slow pass just off one shoreline and back the other slowing at locations where numerous shore anglers or boats were seen.

### **2.1.2 Ground Intercept Survey**

Two weekend days and two weekdays per week throughout the survey were randomly selected for interviews ([Appendix A-2](#) and [A-3](#)). On designated federal (US) holiday weekends, two of three days were randomly selected. Survey technicians split time (up to 10 hours) between five or six locations, depending on site popularity, on a predetermined random route. Virtually all anglers were contacted by stationing a creel technician at a non-fixed location to observe an overall site. Photo documentation of the sites is found in [Appendix C](#).

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<sup>1</sup> Fishing and non-fishing boats were distinguished by different methods. First, indication of a non-fishing boat was the observation of visible wake. A boat that was stationary or slowly moving was not always deemed “actively” fishing, this was determined if fishing rods were examined in the angler’s hands or the observation of light reflecting off fishing line that was coming from the boat. The height at which these aerial flights were flown was at most 200 feet off the water surface, but could have been as low as 50 feet off the water depending on the area, and the weather.



Start time and initial location of interviews were each selected randomly from among a series of potential starting times (0700 h-1100 h, depending upon day length). Ground interviews followed a schedule utilizing random start times depending on length of daylight. The surveys could begin as late as 1100 h during summer (but no later than 0700 h in November) to be completed by dark. Winter survey interviews started at 0800 h and were to be completed by dark. Technicians interviewed all returning or exiting anglers during the wait period at each site. The length of time at each site varied depending on patterns of observed angler usage. The number of boat and shore anglers interviewed was recorded on the standard site count form ([Appendix B-4](#)). Completed trip interview data were recorded on a standardized ground survey interview form for all exiting fishing boats and shore anglers ([Appendix B-5](#)). Interrupted fishing trips that returned to the ramp for thunderstorms, food, fuel, or mechanical problems were considered completed trips. Additionally, survey technicians had the flexibility to obtain interviews by roving among shore anglers during periods of low angler abundance, as also described by [Smucker et al. \(2009\)](#).

With the increase of late evening fishing, noted by creel clerks, we performed a limited number of summer nighttime interviews. These afterdark interviews occurred at the Muddy Creek Access and Conowingo Creek where sites are considered safe (good lighting and easy access).

Interviews of boat and shore anglers acquired catch and harvest data, angler demographics, targeted species, released/harvested fish length information, and temporal trip data needed to calibrate fishing pressure counts as detailed in [Lockwood et al. \(2001\)](#). Similar methods were used by [Smucker et al. \(2009\)](#).

Boat angler interviews were conducted at the selected boat ramps on the CP. The northern most boat ramp, Muddy Creek Access (site 201), is a PA Fish and Boat Commission ramp and only PA registered boats may launch ([Figure 2.1-1](#)). The two marinas, Peach Bottom (site 204) and Glen Cove (site 213), are pay-to-launch facilities. Dorsey Park (site 203) is only open dawn to dusk. Conowingo Creek launch (site 215) is only open during times of no spill at Conowingo Dam.

Shore angler interviews could have occurred at the all but one site (Glen Cove, site 213) to provide data to characterize the angler sample by season, by access point, and overall ([Figure 2.1-1](#)). Four shore sites make up the shoreline in the Maryland section, while six sites make up the Pennsylvania section. Of the four shore sites within Maryland, most could either be a tributary or a reservoir mainstem site. Broad Creek (site 212) could only be a tributary site. Of the six Pennsylvania shore sites only one site, Peach Bottom Marina/shoreline (site 204), could be reservoir mainstem or tributary site, while all other sites were only reservoir mainstem sites.

During the winter survey, creel clerks visited seven sampling sites and started at 0800 h. Sites were driven in a clockwise rotation with a random starting location. Survey day was no longer than 9 hours. Winter survey interviews were done with any angler that was seen during a route, and the creel clerk had the ability to return to a site if time allowed.

Creel technicians kept a journal to record daily observations of information and events not included on the survey instruments. These journals proved useful when describing or explaining the overall survey data, including angler comments, as well as observations made by the angler or creel clerk.

## 2.2 Data Management

Field data quality control began with a review of each day's data sheets for accuracy and completeness by the survey technician prior to delivery to the field coordinator. The field coordinator completed data sheet reviews before submittal for electronic processing. Questions and data gaps were resolved prior to data entry.

All aerial counts, site interview counts and ground interview data were doubled-keyed to separate databases. Database listings were produced and compared to original data sheets, and any corrections made as necessary. Following these Quality Assurance steps, the data were loaded into a SAS Version 9.1 database for all calculations.

## 2.3 Computational Methods for Boat and Shore Angler Survey

Effort estimates for boat and shore fisheries were based on the weekly helicopter flights that counted actively fishing boats and shore anglers. Effort estimates in angler hours were developed as described in [Lockwood et al. \(2001\)](#). The expansion from boat counts and shore anglers counts to angler hours of effort depends upon development of "angler use profiles" based on ground interview data. These profiles were developed for each of the six angler strata (season = 3; day type = 2) from all the interviews in the stratum. Winter profiles could not be developed because of the insufficient data that was collected. Each profile describes the hourly distribution of anglers on the water throughout a fishing day in the respective stratum.

Factors  $e_{pt}$  for expanding counts for  $i = 1-24$  hours are

$$e_{pt} = \frac{1}{b_{pt}} \sum_{i=1}^{24} b_{pi}$$

where  $b_{pt}$  = number of parties each hour of the day during the period.

Since it represented a minimal portion of the overall effort variance, the variance attributable to the expansion factors derived from the “angler use profiles” was not included in the overall effort variance calculations (Roger Lockwood, Michigan Department of Natural Resources, personal communication to John Magee, Gomez and Sullivan Engineers, Normandeau 2004). Each individual aerial count ( $B_{pt}$ ) was then expanded by  $e_{pt}$  and the number of days in the season ( $D_p$ ) to estimate effort ( $E_{pt}$ ) in angler-hours.

$$E_{pt} = B_{pt} D_p e_{pt}$$

In other words, the instantaneous aerial count ( $B_{pt}$ ) was expanded by the proportion of the fishing activity  $t$  that hour of the day ( $e_{pt}$ ) as derived from the angler use profiles and the number of days in the season ( $D_p$ ).

Mean effort for the season was estimated by averaging over  $n$  counts in the period.

$$\bar{E}_p = \frac{1}{n_p} \sum_{i=1}^{n_p} E_{pi}$$

Where  $E_{pi}$  is the individual effort estimate made from each aerial count.

Estimated variance for  $\bar{E}_p$  is

$$\hat{V}ar(\bar{E}_p) = \left[ 1 - \frac{n_p}{D_p} \left( \frac{\sum_{i=1}^n (\bar{E}_p - E_{pi})^2}{n_p (n_p - 1)} \right) \right] + \left[ \left( \frac{1}{D_p n_p} \right) \sum_{i=1}^{n_p} Var(e_{pi}) \right]$$

Estimated boat anglers hours ( $\hat{E}_{ap}$ ) for the season was derived by multiplying  $\bar{E}_p$  by the mean number of anglers per boat ( $A_p$ ) in the season. The number of anglers per fishing boat was obtained from the ground interviews. Variance of the estimated boat angler hours is

$$\hat{V}ar(\hat{E}_{ap}) = \bar{E}_p^2 \hat{v}ar(A_p) + A_p^2 \hat{v}ar(\bar{E}_p) - \hat{V}ar(A_p) \hat{v}ar(\bar{E}_p).$$

Estimated effort in angler hours was calculated for targeted species. Species-specific effort was the product of the amount of boat angler effort in a primary stratum (e.g., summer) and the proportion of anglers targeting a species in the respective stratum. This method is simplified in that it does not account for variations in trip length among anglers targeting different species.

The effort estimate calculations for shore anglers were identical, utilizing shore angler use profiles determined from completed trip interviews, except that the number of shore anglers was determined directly from aerial flights.

Catch per-unit-effort (CPUE) and harvest per-unit-effort (HPUE) rates were developed mainly from completed trip interviews. A ratio-of-means estimator ([Jones et al. 1995](#); [Lockwood 1997](#); [Pollock et al. 1997](#)) was used to calculate catch and harvest rates within each stratum, which is recommended when using completed trip interviews ([Jones et al. 1995](#)). All rates were expressed as fish per angler-hour (fish/h). Overall rates (all anglers) as well as directed (targeted fishing) rates were calculated. Directed rates were used for various comparisons of angler success. Incomplete fishing trip < 0.5 h were omitted from catch and harvest rate calculations to avoid extreme catch rates ([Pollock et al. 1994](#)).

Two different estimators are commonly used to calculate catch rates. The mean of the ratios estimator is used when incomplete trips predominate the interviews and the ratio-of-means estimator is used when complete trips predominate. Because of the predominance of completed trip interviews, the ratio-of-means estimator was used to calculate catch rates. The ratio-of-means estimator is calculated by dividing the total catch by the total effort of all the interviewed anglers within the stratum. This estimator was defined as:

$$\hat{R}_1 = \left( \frac{\sum_{i=1}^n x_i}{\sum_{i=1}^n c_i} \right)$$

where  $\hat{R}_1$  = mean catch rate or harvest rate for the stratum,

n = the number of party interviews in the stratum,

$x_i$  = the catch or harvest of the  $i$ th party  $i=1, \dots, n$ ,

$c_i$  = the total angler hours expended by the  $i$ th party.

The estimates of variance of the mean catch or harvest rate were calculated by using the single cluster sampling with replacement formula described by [Jones et al. \(1995\)](#):

$$\hat{\text{Var}}(\hat{R}_1) = \frac{1}{N(\bar{x})^2} \left( \frac{\sum_{i=1}^n (x_i - R_1 c_i)^2}{n} \right)$$

where  $\hat{\text{Var}}(\hat{R}_1)$  = estimated variance of the mean catch or harvest rate for anglers,

$\hat{R}_1$  = mean catch or harvest rate for anglers,

n = the number of party interviews in the stratum,

$x_i$  = the catch or harvest rate for the  $i$ th party  $i=1, \dots, n$ ,

$c_i$  = the total angler hours expended by the  $i$ th party,

N = number of anglers in the stratum or given day,

$\bar{x}$  = mean angler effort.

Using the variance of the means, the standard error of estimation was calculated as follows:

$$\sqrt{\hat{\text{Var}}(\hat{R}_1)} .$$

Precision of estimates was expressed as proportional standard error (PSE), which is equal to the standard error was divided by the estimate, to calculate PSE. A target PSE for survey estimates, where appropriate, is 20% or less ([Malvestuto 1983](#)).

Catch and harvest for each species by season were the products of effort and overall catch/harvest rates for that species for each day type (weekday, weekend) in a season. Seasonal estimates were the sum of the two day type estimates per season.

### **3.0 RESULTS (SPRING-FALL)**

The Spring-Fall data are provided separately from the winter data because of the insufficient data that was collected during the winter. No angler-use-profiles could be developed because of the insufficient data collected during the winter (see Section 4.0).

#### **3.1 Observed Data**

##### **3.1.1 Aerial Count Flights**

A total of 42 angler count flights were scheduled during the March 2010 through December 2010 period; however, 41 were flown ([Table 3.1.1-1](#)). The initial scheduled flight on March 1, 2010, was replaced by a thorough ground count due contractual issues with the flight service. This ground-based count occurred at the scheduled time and included multiple views of the river, with the use of binoculars, from Conowingo Creek and Funk's Run Pond to Muddy Creek Access, Wissler's Run, and multiple stops for shore angler counts. The only location that could not be observed was the thermal plume at PBAPS, but no boat trailers were observed at any boat ramp during this ground-based survey. The scheduled April 3 flight was not flown due to inclement weather. As seen in [Table 3.1.1-1](#), the number of flights was equal among survey temporal stratum (season and day type). All count start times occurred between 0801-1647 h, with the average count start time of 1145 h

Overall count efforts recorded 497 "actively fishing" boats. A total of 247 boats were on CP PA (49.7%) with 131 boats in CP MD (26.4%), 65 boats in PBAPS plume (13.1%), and 54 boats in tributaries (10.8%). Actively fishing boats favored the PA section of CP during the spring and summer ([Table 3.1.1-2](#) and [Figure 2.1-1](#)). During the fall, boat anglers were found equally in MD and PA portion of the Conowingo Pond.

Boats in transit trailing a "visible wake" or with no fishing rods visible were treated as not actively fishing and were not counted. However, changing locations was a normal activity during many fishing trips. Such boaters may have simply been anglers moving from one location or other feature to another. The number of boats that were anglers changing fishing locations (relative to the other listed possibilities) is unknown, but if substantial, may lead to an underestimate of boat fishing effort since fishing boats "in transit" were omitted from estimated effort calculations (see Section 2.4).

Count efforts recorded a total of 189 "actively fishing" shore anglers, 138 of which were observed fishing the PA section. Shore fishing in the PA section combined for more than 73.0% overall and 88.9% of the shore anglers in the spring and summer ([Table 3.1.1-2](#)). Aerial counts were not recorded by individual site but it was recorded by segment (CP MD, CP PA, Broad Creek, Peach Bottom Thermal Plume, etc. see

[Appendix B-3](#)). Shore anglers “actively fishing” were counted if anglers were seen with fishing rod in hand or within close proximity of the gear. Anglers that were observed sitting down away from the water’s edge with rod not facing the body of water were not counted as actively fishing.

### **3.1.2 Boat Angler Interviews**

Weekend boat parties accounted for almost 79% of all boat parties interviewed; 44% of boat parties were interviewed in summer ([Table 3.1.2-1](#)). Boat fishing interviews were highest in June (18.9%) and September (18.4%), while November (2.2%) and March (6.0%) were lowest ([Table 3.1.2-2](#)).

The Conowingo Pond completed boat interviews sample totaled 646 boat anglers representing 365 angling parties ([Table 3.1.2-3](#)). The average number of anglers per boat was 1.8. The average length of a completed boat fishing trip was 5.3 h ([Table 3.1.2-4](#)). Summer weekday fishing trip length was noticeably shorter (3.6 h) than trips during any other season/day type (5.0-5.9 h).

Boat angler use profiles developed from CP interview data within each of six strata (three seasons, two day types) depicted the aggregated number of boat fishing parties on the water throughout the sampled fishing days ([Figures 3.1.2-1](#)). All profiles suggested that peak boat fishing activity was achieved by or before mid-day regardless of season or day type. Peak usage typically extended to 1100 or 1300 h, then declined steadily throughout the afternoon and evening. Each profile was used in combination with the corresponding aerial boat counts to estimate boat fishing pressure. Although little evidence of increased evening fishing was recorded we commonly saw boats launched during evening surveys. Additional nighttime surveys were conducted to capture some evening/night boat fishing activity.

### **3.1.3 Species Sought by Boat Anglers**

Eleven fish species or species groups were targeted by boat anglers ([Tables 3.1.3-1](#) and [3.1.3-2](#)). Among boat anglers that targeted a species or species group, the largest proportion (49.7%) throughout the survey sought black bass (smallmouth bass and largemouth bass, combined). Over 50% of boat anglers were seeking black bass in summer and fall, but only 36.1% in the spring ([Table 3.1.3-2](#)). When angler specified a certain species of black bass, largemouth bass was a 2:1 favorite.

Among other boat anglers with a species or species group preference were catfish, striped bass (*Morone saxatilis*), sunfish, and crappie. Catfish species (channel and flathead) were most sought by boat anglers in March (19.1%) and September (17.7%), while striped bass was sought after by a few anglers in March and October ([Table 3.1.3-1](#)). Other boat anglers sought crappie and walleye (*Sander vitreus*) in the spring season ([Table 3.1.3-2](#)). Sunfish and northern pike (*Esox lucius*) were only sought by a few anglers.



During the spring, summer, and fall seasons combined, 38.0% of boat anglers interviewed did not have a preference for a particular species and expressed, “anything”, with 47.8% of these “casual” anglers being in the spring ([Table 3.1.3-2](#)). Nearly 60% of the boat anglers in April expressed “anything” ([Table 3.1.3-1](#)).

### **3.1.4 Shore Angler Interviews**

Overall, the majority (80.3%) of shore angler interviews were completed trips ([Table 3.1.4-1](#)). At least 72.7% of the shore interviews during any season were complete; with only 2 of the 24 (8.3%) shore interviews being incomplete during spring season.

Shore anglers surveyed (57 complete and 14 incomplete trips) totaled 152 anglers representing 71 angling parties ([Table 3.1.4-2](#)). Seasonally, 47.4% of the completed shore fishing interviews were in the summer, while only 14.0% were in the fall ([Table 3.1.4-3](#)). Summer weekends accounted for one third of all completed shore surveys. Peak shore angler interviews occurred in August (21.1%), with interviews in May and July being just slightly lower ([Table 3.1.4-4](#)). The lowest number of angler interviews occurred in March, October, and November totaling 16.9% of all shore surveys.

The average number of anglers per party was 2.1 and was similar between all seasons ([Table 3.1.4-2](#)). The average length of a completed shore fishing trip was 2.1 h ([Table 3.1.4-5](#)). Completed trip length was higher during the weekdays in the spring (2.4 h) and summer (2.6 h), than weekend shore fishing trip which lasted 1.8 h for each of these seasons. Fall weekday trips lasted 1.6 h.

Shore angler use profiles data within each of six strata (three seasons, two day types) depicted the aggregate number of shore anglers fishing throughout the sampled fishing days ([Figure 3.1.4-1](#)). All profiles suggested that peak shore fishing activity was achieved after noon into early evening regardless of season or day type. Peak usage typically extended to 1200 or 1600 h, after an incline starting in the morning. Each profile was used in combination with the corresponding aerial shore counts to estimate shore fishing pressure. Although little evidence of increased evening fishing was recorded, we commonly observed anglers during evening surveys. Additional nighttime surveys were conducted to capture some evening/night shore fishing activity.

The temporal and spatial distribution of ground interviews generally mimicked shore access site usage as determined by aerial count. Shore anglers frequently refused to participate at a substantially higher (though not quantified) rate than for boat anglers.

### **3.1.5 Species Sought by Shore Anglers**

“Casual” anglers, not seeking a particular species, accounted for 124 of 155 (80.0%) shore anglers interviewed on Conowingo Pond ([Table 3.1.5-1](#)). As seen in [Table 3.1.5-2](#), the percentage of such “casual” anglers was over 80% during the spring and summer and was greater than 55% during the fall. Anglers without a species preference were over 50% in all months, but this non-specificity was extremely high in May and June, 96.3% and 89.5%, respectively ([Table 3.1.5-1](#)).

CP shore anglers targeted five fish species plus the two species groups including: “black bass” and “catfish” ([Table 3.1.5-1](#)). Shore anglers did not seek any species or group more than another. Black bass was targeted by 8.4% of the shore anglers. Eight anglers reported seeking either common carp or catfish. Most anglers seeking catfish did not specify which species was targeted. Walleye was only sought in March by shore anglers. No one species was targeted every month.

More boat anglers targeted a certain species of fish than shore anglers. Shore anglers were less specific and simply specified a group of fish such as black bass, catfish, or anything (see [Section 3.1.3](#), [Table 3.1.5-2](#)).

### **3.2 Angling Effort Estimates**

Total boat and shore angling effort estimated for CP during the survey period was 69,469 angler hours; the proportional standard error (PSE) was 14.4% ([Table 3.2-1](#)). The boat angling effort estimate (49,225 angler hours; PSE = 20.1%) was more than double the estimate for shore (20,244 angler hours; PSE = 6.6%) anglers. The PSE for boat anglers are good while the PSE for shore anglers is very good. Weekend estimated effort (52,169 h) was three times higher than weekday effort (17,300 h), and estimated effort during the summer alone accounted for 54% of the total hours ([Appendix D-1](#)).

The estimated number of trips taken by anglers was 9,288 boat trips and 9,640 shore trips ([Table 3.2-2](#)). The estimated number of boat trips and shore trips peaked in summer (4,733 and 6,934 trips, respectively). Angling hours were three times higher for weekends (52,169 h) than weekdays (17,300 h, [Table 3.2-3](#)).

Seasonally, estimated boat effort during summer accounted for 48% of hours and 50% of the boat trips ([Tables 3.2-2](#) and [3.2-3](#)). More angler hours were expended during fall on fewer trips than occurred in summer due to the additional length of fish trips. Weekend boat angler trips contributed 76% of the total estimated effort hours ([Table 3.2-3](#)).

Shore anglers effort in angler hours (13,867) and trips (6,934) were highest in the summer ([Table 3.2-2](#)). The shore effort angler hours (740) and trips (352) were lowest during the fall. Over 96% of angler hours and trips occurred in spring and summer ([Tables 3.2-2](#) and [3.2-3](#)). A calculated PSE was 6.6% of the total hour effort estimate indicating very good precision ([Appendix D-1](#)). Angler trips were calculated only by season to enhance the sample size of completed trips.

Mean trip length in hours for all anglers targeting various species is found in [Appendix D-2](#).

Anglers in the CP expended a substantial effort targeting black bass ([Table 3.2-4](#)). Recreational anglers in the CP targeting black bass accounted for the 26,077 hours and 4,656 trips. Of the estimated effort for black bass, 93.6% of the effort was from boat anglers, of which the majority (54.9%) was during summer ([Table 3.2-5](#)).

### **3.3 Catch and Harvest Estimates**

The observed (raw) total fish catch and harvest for the interviewed boat and shore fisheries are listed separately in [Appendix D-3](#). The various temporal catch and harvest estimates for all fish were based on the raw data summarized in [Appendix D-4](#) through [D-7](#). It was estimated that CP anglers caught 44,526 fish and harvested 2,676 fish ([Table 3.3-1](#)). The species of fish with the highest percentage of the total fish caught (11,447), by shore and boat anglers combined, was smallmouth bass. Channel catfish was the dominate species harvested (1,627 fish). During spring and fall, smallmouth bass represented 34.1% and 36.1% of the estimated catch; while channel catfish and bluegill (*Lepomis macrochirus*) combined represented 54.0% of the catch in the summer. Approximately 86% of the harvest in the summer was channel catfish; with 74.2% of the channel catfish harvested during this season. Nearly 90% of the catch and harvest was from the spring and summer combined.

#### **3.3.1 Boat Angler Catch and Harvest**

Boat anglers caught an estimated 35,483 of a least 18 species or species groups ([Table 3.3.1-1](#)). Smallmouth bass ranked first in the estimated total catch by boat anglers with 28.5%. Channel catfish ranked second with 24.2% of the total estimated catch, but dominated the estimated harvest with 63.7% of the 1,867 fish harvested. Crappies, the sunfish group (*Lepomis* spp., bluegill, pumpkinseed (*L. gibbosus*), green sunfish (*L. cyanellus*)) and rock bass (*Ambloplites rupestris*) accounted for 21.4% of the total estimated catch, but none of these species were harvested by boat anglers. Most of the remainder of fish harvested by boat anglers was flathead catfish (27.8%). although flathead catfish only accounted for 4.0% of the total catch.

Largest seasonal catch total (20,872) and harvest total (1,081) of fish by boat anglers occurred in summer ([Table 3.3.1-1](#)). Channel catfish accounted for 31.5% of the catch, but 96.4% of the summer harvest. During the summer smallmouth bass, largemouth bass, and bluegill combined for 60.8% of the estimated catch and 0.0% of the estimated harvest. Flathead catfish was the only other species harvested in summer by boat anglers. The majority (75.4%) of the harvest in the spring was flathead catfish. Smallmouth bass dominated the catch in spring and fall with 40.1% and 38.0%, respectively.

Summer and fall fishery by boat anglers for black bass was substantial and the total catch on summer and fall exceeded that in spring season ([Table 3.3.1-1](#)). A total of 63% of the black bass were caught during the summer and fall. Black bass were only harvested in fall; of the 79 black bass harvested, 44 were largemouth bass and 35 were smallmouth bass. Other species that were caught and harvested were 27 striped bass in the fall and 52 walleye.

### **3.3.2 Shore Angler Catch and Harvest**

The total estimated catch by shore anglers was 9,043 fish of six species plus two species groups ([Table 3.3.2-1](#)). The catch by shore anglers represented four species groups. Black bass and the sunfish group each accounted for 30% of the total estimated catch. Catfish species (including channel catfish) totaled 19.0% of the total catch, with common carp accounting for the 20.7%. An expanded total of 808 fish representing two species was harvested by shore anglers, with common carp accounting for 371 and channel catfish accounting for 437..

The largest catch and harvest of fish by shore anglers occurred in spring ([Table 3.3.2-1](#)). Smallmouth bass and largemouth bass were the dominate fish caught in spring, comprising 50.3% of the 4,938 fish caught, but no harvest of black bass was reported by shore anglers.

Channel catfish and common carp were the only fish harvested by shore anglers ([Table 3.3.2-1](#)). The 205 common carp and 272 of 410 channel catfish caught in the spring were harvested. Common carp were caught in all three seasons, but carp were not harvested in the fall.

### **3.3.3 Retention Rate**

The retention rate of fish by boat and shore anglers combined was 6.0% ([Table 3.3.3-1](#)). The retention rate of shore anglers (8.9%) was higher than for boat anglers (5.3%) in 2010.

## **3.4 Catch and Harvest Rates**

Both general and targeted rates are discussed in this section. General catch and harvest rates are calculated for all anglers and are those utilized in catch and harvest calculations. General catch and

harvest rates are also particularly useful when describing the overall Conowingo Pond shore fishery since the majority of shore anglers were generalists and about 80% of shore anglers interviewed targeted “Anything”. By comparison, 62% of boat anglers targeted a species or species group during their trips, so targeted catch and harvest rates are the most useful when discussing the boat fishery.

### **3.4.1 General Rates**

The CPUE and HPUE values by species for anglers seasonally and overall are listed in [Appendix D-8](#) and [D-9](#).

Boat angler overall CPUE and HPUE were 0.65 and 0.04 fish/h, respectively ([Table 3.4.1-1](#)). CPUE was highest among summer boat anglers at 0.79 fish/h (SE = 0.14) and lowest in the fall at 0.42 fish/h (SE = 0.07). The PSE for catch rates for boat anglers was good for all three seasons (16.7-17.7%), and overall 10.8% ([Table 3.4.1-2](#)). The boat angler HPUE was highest in the summer (0.06 fish/h), but lowest in the fall (0.02 fish/h).

The highest overall CPUE for resident species caught by boat anglers are found in [Table 3.4.1-3](#). Black bass (smallmouth and largemouth bass combined) were sought by nearly 50% of boat anglers ([Table 3.1.3-2](#)). Smallmouth bass CPUE was highest overall (0.20 fish/h), during the spring (0.35 fish/h) and fall (0.22 fish/h) of the species that were caught ([Table 3.4.1-3](#)). No smallmouth and largemouth bass were harvested (HPUE = 0.00 fish/h). During the summer, bluegill CPUE (0.33 fish/h) was the highest followed by channel catfish (0.26 fish/h). The overall HPUE of channel and flathead catfish were 0.03 and 0.01 fish/h, respectively. Flathead catfish in the spring had the highest HPUE of any season at 0.05 fish/h, while channel catfish HPUE was the highest in the summer (0.03 fish/h).

Shore angler overall CPUE and HPUE were 0.24 and 0.02 fish/h, respectively ([Table 3.4.1-1](#)). The CPUE was highest in the spring at 0.46 fish/h (SE = 0.36) and lowest in the fall at 0.03 fish/h (SE = 0.03). The PSE for the shore angler CPUE was poor for all seasons ([Table 3.4.1-2](#)). The HPUE in the fall was 0.00 fish/h as no angler reported fish harvested.

The overall CPUE of largemouth bass (0.06 fish/h) was highest among all species caught by shore anglers, although largemouth bass were caught only in the spring (CPUE = 0.26 fish/h, [Table 3.4.1-4](#)). No smallmouth and very few largemouth bass were harvested during the survey (HPUE < 0.01 fish/h). Common carp was the only species that was caught in every season, but common carp was only harvested in the spring (HPUE = 0.02 fish/h). Channel catfish was caught in spring and summer and was the only species harvested in more than one season.

### 3.4.2 Targeted Species Rates

All targeted species CPUE and HPUE for boat and shore anglers are found in [Appendix D-10](#) through [D-12](#).

Channel catfish (eight anglers) had the greatest targeted CPUE for boat anglers with 2.38 fish/h (SE = 1.97, [Table 3.4.2-1](#)). The HPUE of channel catfish was also the highest by boat anglers at 1.43 fish/h (SE = 2.26). Smallmouth bass (84 anglers) and largemouth bass (160 anglers) were the most targeted species by boat anglers and had a CPUE of 0.46 fish/h (SE = 0.10) and 0.24 fish/h (SE = 0.05), respectively. The HPUE of flathead catfish by boat anglers was 0.29 fish/h (SE = 0.28).

Seasonally, channel catfish CPUE and HPUE was highest during the summer (2.38 and 1.43 fish/h, respectively), although only eight boat anglers targeted channel catfish ([Table 3.4.2-2](#)). The CPUE and HPUE were identical for flathead catfish (four anglers) in the spring at 0.36 fish/h, indicating that all flathead catfish that were caught were harvested. Smallmouth bass CPUE was highest among all targeted fish during the spring (0.61 fish/h) and decreased throughout the year, but had a HPUE 0.00 fish/h during all seasons. Largemouth bass CPUE was relatively similar between seasons with a slight decrease throughout the year; largemouth bass was only harvested in the fall (HPUE = 0.01 fish/h).

Seasonal targeted CPUEs for the species targeted by shore anglers are shown in [Table 3.4.2-3](#). Common carp and smallmouth bass (overall CPUE of 0.45 and 0.09 fish/h, respectively) were the only targeted species caught from shore, but neither species was harvested by anglers seeking these fish (HPUE of both species was 0.00 fish/h) ([Table 3.4.2-1](#)).

Seasonally, the targeted CPUE for common carp (three anglers) in the summer was 0.93 fish/h, and was highest among any species targeted ([Table 3.4.2-3](#)). The targeted CPUE of common carp (five anglers) during the fall was 0.10 fish/h. Smallmouth bass CPUE (0.27 fish/h) in summer was for only two anglers.

### 3.5 Angler Demographics

Residents of Lancaster County and York County, PA along with Cecil County, and Harford County, MD known collectively as “bordering residents”, formed approximately 64% of boat anglers and 71% of shore anglers interviewed ([Tables 3.5-1](#)). Nearly 50% of all shore anglers were from Lancaster County, PA, while no shore anglers from Harford County, MD were interviewed. Anglers from Pennsylvania represented about 72% of all anglers, while 26% of anglers interviewed were Maryland residents. Further, there was little seasonal variation in residence patterns for either fishery. Besides Pennsylvania and Maryland residents, anglers from five other states were interviewed.

### 3.6 Biological Data

Number of fish, lengths of released and harvested fish, and seasons are provided in [Appendix D-13](#).

#### 3.6.1 Boat Anglers

Length measurements of fish harvested by boat anglers were obtained from 44 fish representing four species ([Table 3.6.1-1](#)). Flathead catfish accounted for 61.4% of the fish harvested, ranging from 17 to 32 inches long. Most of the flathead catfish (18 of 27, 66.7 %) were measured in the spring ([Table 3.6.1-2](#)). Measured channel catfish were between 11 and 23 inches and accounted for 29.5% of the harvested fish, with 84.6% (11 of 13) of the channel catfish being harvested in the spring and summer combined. Three walleye measuring 16 through 19 inches were harvested in the spring, while a smallmouth bass measuring 16 inches was harvested in the fall.

Anglers also provided a measured or estimated length (to the nearest inch) of numerous fish released back into the CP. Boat anglers provided estimated lengths or measurements for 13 species or species groups released totaling 954 fish ([Table 3.6.1-3](#)). Smallmouth bass (366) and largemouth bass (202) combined comprised 59.5% of these fish with 84.5% of the black bass released reported as legal ( $\geq 12$  inches) to harvest. Channel catfish up to 31 inches accounted for 16.7% of the fish the measured and released. Sunfish spp., bluegill and rock bass accounted for 16.0% of the fish estimated and released.

Smallmouth bass comprised the highest percentage of the measured released fish during the spring (44.6%), summer (28.3%), and fall (46.7%) with smallmouth bass ranging from 6 to 23 inches ([Table 3.6.1-4](#)). Largemouth bass up to 23 inches ranked second and accounted for 23.6% of the measured fish during the spring and 23.9% of the measured fish during the summer. Channel catfish ranged from 6 to 24 inches in the fall and ranked second with 16.0% of the measured released fish. Three nine inch black crappies (*Pomoxis nigromaculatus*) were released in the spring along with three striped bass up to 16 inches. Striped bass hybrids (*Morone saxatilis* X *M. chrysops*) up to 23 inches were measured and released in the fall. Other species or species groups that were measured and released include: common carp, walleye, and sunfish spp., which includes bluegill (*Lepomis macrochirus*) and rock bass (*Ambloplites rupestris*).

#### 3.6.2 Shore Anglers

Length measurements were obtained from only five fish harvested by shore anglers; two common carp and three channel catfish ([Table 3.6.2-1](#)). Two common carp measuring 20 and 21 inches were caught in the spring and summer ([Table 3.6.2-2](#)). Three channel catfish, 13, 14 and 17 inches, were harvested by shore anglers in the spring and summer.



Shore anglers also provided a measured or estimated length (to the nearest inch) of numerous fish released back into CP. Shore anglers reported estimated lengths or measurements for 65 fish that were released, consisting of eight species or species groups ([Table 3.6.2-3](#)). Black bass ranging from 8 to 19 inches accounted for 50.8% of measured fish released; 57.6% of these were largemouth bass which were all released in the spring ([Table 3.6.2-4](#)). Measured smallmouth bass up to 18 inches accounted for 30.0% of the measured released fish during in the spring season, while five 5-inch bluegill accounted for 20.8% of the measured and released fish in the summer. Common carp accounted for the only measured and released fish in the fall season and also one-third of the measured released fish in the summer. Other species or species groups that were measured and released by shore angler included: three catfish (10-15 inches), nine bluegill (up to 8 inches), two rock bass (5-6 inches), and five sunfish (5-6 inches, [Table 3.6.2-3](#)).

### **3.6.3 Boat and Shore Anglers Combined**

Fish length measurements of harvested and released fish by boat and shore anglers in the CP are described in this section. Channel catfish (16 individuals) and flathead catfish (27 individuals) combined accounted for 87.8% of the species harvested by boat and shore anglers ([Tables 3.6.1-1](#) and [3.6.2-1](#)).

Black bass were mainly caught by anglers and lengths are shown in [Figure 3.6.3-1](#).

## **3.7 Tournaments**

### **3.7.1 Black bass**

At least 16 black bass tournaments took place on the Conowingo Pond in 2010. ([Table 3.7.1-1](#)). A complete chronological listing of the 16 known black bass tournaments held along with associated event data is found in [Appendix D-14](#). The primary boat ramps/facilities used for black bass tournaments included: Glen Cove Marina, Dorsey Park, and Muddy Creek Access. Of the 222 anglers who fished in the 16 tournaments, 482 black bass were weighed in.. Most of the black bass tournaments were held by local clubs. A regional tournament, Fishers of Men Tournament, held on June 19, 2010 out of Dorsey Park was the only non-club tournament, and it had 26 anglers. Two club black bass tournaments had over 20 anglers, but the average angler per tournament was about 13. Glen Cove Marina was the site of seven black bass tournaments of 64 anglers which weighted in a total of 196 fish ([Table 3.7.1-1](#)). Dorsey Park is the most central ramp in CP and was the launch site of six black bass tournaments consisting of 123 anglers which brought 235 black bass to the weigh-in. Three black bass tournaments were held at Muddy Creek Access weighing in 51 black bass among the 35 anglers.

### **3.7.2 Catfish**

Four catfish tournaments were held on Conowingo Pond in 2010 ([Table 3.7.2-1](#)). A chronological listing of the four known catfish tournaments held along with associated event data is found in [Appendix D-15](#). The four catfish tournaments, sponsored by Catfish Nation, supported 105 anglers which weighed in 127 catfish ([Table 3.7.2-1](#)). Any species of catfish could be weighed-in. Muddy Creek Access and Dorsey Park each hosted one tournament, while Glen Cove marina hosted two tournaments.

#### **4.0 WINTER SURVEY OBSERVED DATA**

Observed data collected in the winter are discussed in this section. As few boat and shore anglers were observed during the aerial surveys and encountered during ground interviews, there was insufficient data to estimate angler hours of effort and to develop “angler use profiles”. As a result, only observed data are presented.

##### **4.1 Aerial Counts**

A total of 13 angler count flights were scheduled during the 1 December 2010 through 28 February 2011 period ([Table 4.1-1](#)). The distribution between day type was nearly equal. Start times of angler count flight were between 0911 and 1611, with the majority happening between 1100-1400 h.

During the aerial flights, only six “actively fishing” boats were observed ([Table 4.1-2](#)). PBAPS thermal discharge was the dominant location (66.7%) of the boats during the winter. On 17 February 2011, one boat was observed in the PA section of Conowingo Pond and one was observed in Broad Creek. Count efforts recorded two shore anglers observed fishing the PA section of the CP.

During aerial count flights, observations were made of the water conditions of CP. On the 10 December flight, the tributaries (e.g., Broad Creek, Funk’s Run Pond.) were starting to ice over. The aerial flight, eight days later, determined that access to the PBAPS thermal discharge was blocked by ice that covered about 65% of CP. On the 16 January flight, six ice fishing holes were observed at Funk’s Run Pond. Two ice fishing holes at Broad Creek were seen on 30 January; by this time, CP only had ice in the backwatered tributaries and coves. By the 17 February flight only half of Funk’s Run Pond showed ice cover and the main body of CP was ice free.

##### **4.2 Boat Interviews**

Boat angler interviews were conducted at the selected boat ramps on the CP. Dorsey Park accounted for 12 of the 13 (92.3%) of the boat angler interviews and one interview was at Muddy Creek Access ([Table 4.2-1](#)). All boat interviews responded that they fished the PBAPS thermal discharge. Weekend boat parties accounted for almost 77% of the boat parties interviewed ([Table 4.2-2](#)). Boat fishing interviews was highest in February (69.2%) and lowest in January (7.7%, [Table 4.2-3](#)).

The Conowingo Pond completed boat interviews sample totaled 22 boat anglers representing 13 angling parties ([Table 4.2-4](#)). The average number of anglers per boat was 1.7.

### **4.3 Species sought by Boat Anglers**

Six fish species or species groups were targeted by the CP boat fishery ([Table 4.3-1](#)). Among boat anglers that targeted a species or species group, the largest proportion (36.4%) sought largemouth bass. Among other boat anglers with a species or species group preference were catfish spp. (22.7%) and walleye (13.6%). During the winter, boat anglers interviewed (18.2%) did not have a particular species and expressed, “anything”.

### **4.4 Shore Interviews**

The three shore angler interviews during the winter occurred at tributary sites in MD. Two of the three interviews occurred at Funk’s Run Pond (66.7%) and the other interview occurred at Conowingo Creek ([Table 4.2-1](#)). Only one of the shore interviews was a complete fish trip, which happened to be an ice fisherman at Funk’s Run Pond on 23 January 2011 ([Table 4.4-1](#)). All shore interviews occurred on weekends. Two shore parties were interviewed in January, one interview in December and none in February ([Table 4.4-2](#)).

Shore anglers surveyed (complete and incomplete) totaled four anglers representing three angling parties ([Table 4.2-4](#)). The average number of anglers per party was 1.3.

### **4.5 Species Sought by Shore Anglers**

Crappie and walleye were the only fish sought by shore anglers during the winter, along with “anything” ([Table 4.3-1](#)). Two shore anglers (one party) at Conowingo Creek were seeking walleye, while an angler at Funk’s Run Pond was targeting crappie. The angler interviewed at Funk’s Run Pond in December was seeking “anything”.

### **4.6 Biological data on Species Caught by Anglers**

Length measurements of fish harvested by boat anglers were obtained from six fish representing two species ([Table 4.6-1](#)). Three flathead catfish, ranging from 17 to 26 inches long, and three walleye (16-17 inches long) were harvested. No shore anglers interviewed harvested fish. The six fish that were harvested were from interviews that occurred at Dorsey Park.

Anglers also provided a measured or estimated length (to the nearest inch) of fish released back into the CP. Boat anglers provided estimated lengths or measurements for eight species released totaling 47 fish ([Table 4.6-2](#)). Largemouth bass (25) and smallmouth bass (9) combined comprised 72.3% of the released fish measured; all but three largemouth bass released were reported as legal ( $\geq 12$  inches) to harvest. Five walleye were measured and released by boat anglers; with only one walleye that was released reported as

legal ( $\geq 15$  inches) to harvest. Two (legal to harvest) 22-inch hybrid striped bass were released, along with three flathead catfish up to 25 inches. Other species that boat anglers reported as measured prior to release were a common carp (22 inches), a channel catfish (15 inches), and a 20-inch gizzard shad. All released fish that were reported to creel clerks were from boats that launched from Dorsey Park, the closest ramp to the PBAPS thermal discharge. No shore anglers reported releasing any fish during their fishing trips.

## 5.0 CONCLUSION

The winter portion of the CP creel survey did not generate any estimated or expanded values due to a lack of angling pressure. The winter portion was done to determine the angling pressure at the PBAPS thermal discharge or opportunity to ice fish in the tributaries like Broad Creek and Funk's Run Pond. The weather during the winter of 2010-2011 provided ice on CP. This ice could have been too thin for many shore anglers to access due to safety reasons, but also blocking boat anglers from launching boats and navigating to PBAPS discharge.

In contrast to winter, surveys during spring, summer, and fall provided a good description of the fishery on Conowingo Pond. Fishing pressure in the CP was dominated by anglers fishing for black bass. During the summer and fall, over half the boat anglers were seeking black bass, with the weekend fishing pressure predominating. The estimated catch of black bass was 18,466, but a harvest of only 79 black bass was estimated. Catfish (flathead and channel) were dominant in the harvest of fish by anglers, where an estimated 2,147 of 12,428 catfish were harvested. Of the estimated 11,000 sunfish and crappie species caught, surprisingly none were harvested.

The type of fisherman could have influenced the catch/harvest of fish. Black bass fishing has become popular to anglers as a catch-and-release fishery along with weekend tournaments especially for boat anglers. A large number of shore anglers responded "anything" or a species group when asked primary species sought. This could be due to the number of casual anglers, especially the shore anglers.

Relatively precise estimates of angler efforts were obtained in the present survey. Proportional standard error (PSE) was 6.6% on the overall shore fishing effort. For the overall boat fishery effort estimate, it was 20.1%. The desired precision for angler survey estimates is 20.0% or better ([Malvestuto 1983](#)).

The overall CPUE rates were relatively precise for boat anglers as well. The PSEs for overall rates for boat anglers were 16.7 to 17.7% for each of the seasons and was 10.8% for the entire season on CPUE. However, precision on the PSE for CPUE for shore anglers was poor (58.3%).

The creel data reported in this report will be used with the RSP 3.26 (Recreational Needs and Assessment) data to determine improvements for angling below Conowingo Dam.

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**TABLE 3.1.1-1: DISTRIBUTION OF ANGLER COUNTS BETWEEN DAY TYPES AND TIME OF DAY, CP, 2010.**

<b>Daytype/Time</b>	<b>Spring</b>	<b>Summer</b>	<b>Fall</b>	<b>Total</b>
Weekend/holiday	8	7	6	21
Weekday	<b>7</b>	8	6	21
0801 - 1100	6	10	3	19
1100-1400	<b>5</b>	1	4	10
1400 - 1647	4	4	5	13
<b>Total flights</b>	<b>15</b>	<b>15</b>	<b>12</b>	<b>42</b>

\*Average stat time 1145 h.

Bold indicates ground count (March 1)



**TABLE 3.1.1-2: SEASONAL BOAT AND SHORE ANGLER COUNTS FROM OBSERVATIONS BY SUBSECTIONS IN CP, 2010.**

Season	Location	Weekday		Weekend/holidays		Total	
		N boats	Shore anglers	N boats	Shore anglers	N boats	Shore anglers
Spring	CP Maryland	2	2	33	2	35	4
	Tributaries						
	Funk's Run Pond	2	0	2	2	4	2
	Conowingo Creek	0	2	2	12	2	14
	Broad Creek	3	0	4	2	7	2
	PBAPS Plume	3	0	34	3	37	3
	CP Pennsylvania	7	4	81	59	88	63
	<b>Total</b>	<b>17</b>	<b>8</b>	<b>156</b>	<b>80</b>	<b>173</b>	<b>88</b>
Summer	CP Maryland	6	2	59	1	65	3
	Tributaries						
	Funk's Run Pond	0	0	4	0	4	0
	Conowingo Creek	0	1	6	7	6	8
	Broad Creek	5	4	20	4	25	8
	PBAPS Plume	2	1	9	1	11	2
	CP Pennsylvania	30	26	92	33	122	59
	<b>Total</b>	<b>43</b>	<b>34</b>	<b>190</b>	<b>46</b>	<b>233</b>	<b>80</b>
Fall	CP Maryland	3	0	28	0	31	0
	Tributaries						
	Funk's Run Pond	0	0	2	3	2	3
	Conowingo Creek	0	0	0	0	0	0
	Broad Creek	2	2	2	0	4	2
	PBAPS Plume	3	0	14	0	17	0
	CP Pennsylvania	6	8	31	8	37	16
	<b>Total</b>	<b>14</b>	<b>10</b>	<b>77</b>	<b>11</b>	<b>91</b>	<b>21</b>
Total	CP Maryland	11	4	120	3	131	7
	Tributaries						
	Funk's Run Pond	2	0	8	5	10	5
	Conowingo Creek	0	3	8	19	8	22
	Broad Creek	10	6	26	6	36	12
	PBAPS Plume	8	1	57	4	65	5
	CP Pennsylvania	43	38	204	100	247	138
	<b>Total</b>	<b>74</b>	<b>52</b>	<b>423</b>	<b>137</b>	<b>497</b>	<b>189</b>

**TABLE 3.1.2-1: SEASONAL COUNTS OF BOAT PARTIES INTERVIEWS AT CP, 2010.**

<b>Season</b>	<b>Day Type</b>	<b>N</b>	<b>% within season</b>	<b>% within survey</b>
Spring	Weekday	24	24.0	
	Weekend	76	76.0	
		100		27.4
Summer	Weekday	33	20.4	
	Weekend	129	79.6	
		162		44.4
Fall	Weekday	20	19.4	
	Weekend	83	80.6	
		103		28.2
Total	Weekday	77	21.1	
	Weekend	288	78.9	
		365		

**TABLE 3.1.2-2: MONTHLY COUNTS OF BOAT PARTIES INTERVIEWED AT CP, 2010.**

<b>Month</b>	<b>N</b>	<b>%</b>
March	22	6.0
April	36	9.9
May	42	11.5
June	69	18.9
July	39	10.7
August	41	11.2
September	67	18.4
October	41	11.2
November	8	2.2
<b>TOTAL</b>	<b>365</b>	

**TABLE 3.1.2-3: SEASONAL COMPLETED BOAT INFORMATION INTERVIEWED AT CP,  
2010.**

<b>Season</b>	<b>N anglers</b>	<b>N parties</b>	<b>Angler per survey</b>
Spring	176	100	1.8
Summer	295	162	1.8
Fall	175	103	1.7
<b>Total</b>	<b>646</b>	<b>365</b>	<b>1.8</b>

**TABLE 3.1.2-4: MEAN TRIP LENGTHS FOR COMPLETED BOAT PARTIES AT CP, 2010.**

<b>Season</b>	<b>Day Type</b>	<b>N</b>	<b>Mean trip length (hrs)</b>	<b>SE</b>
Spring	Weekday	24	5.6	0.3
	Weekend	76	5.0	0.3
		100	5.2	0.2
Summer	Weekday	33	3.6	0.3
	Weekend	129	5.4	0.2
		162	5.0	0.2
Fall	Weekday	20	5.1	0.5
	Weekend	83	5.9	0.2
		103	5.7	0.2
Total	Weekday	77		
	Weekend	288		
		365	5.3	0.1

**TABLE 3.1.3-1: SPECIES TARGETED, MONTHLY, BY BOAT ANGLERS AT CP, 2010.**

Species sought	March		April		May		June		July		August		September		October		November		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Northern pike	2	4.8																	2
Catfish	6	14.3	4	6.3	5	6.8	2	1.6	5	7.5	5	6.3	22	17.7	2	3.0			51
Channel catfish									3	4.5	5	6.3							8
Flathead catfish	2	4.8	2	3.1			1	0.8											5
Striped bass	2	4.8					1	0.8							3	4.5			6
Black bass					2	2.7	22	18.0	4	6.0	7	8.9	22	17.7	20	30.3	2	16.7	79
Smallmouth bass	8	19.0	5	7.8	15	20.3	17	13.9	4	6.0	15	19.0	14	11.3	6	9.1			84
Largemouth bass	7	16.7	15	23.4	13	17.6	33	27.0	24	25.8	24	30.4	25	20.2	14	21.2	5	41.7	160
Sunfish							2	1.6											2
Crappie					1	1.4													1
Walleye	2	4.8			3	4.1													5
Anything sought for	13	31.0	38	59.4	35	47.3	44	36.1	27	40.3	23	29.1	41	33.1	21	31.8	5	41.7	247
	<b>42</b>		<b>64</b>		<b>74</b>		<b>122</b>		<b>67</b>		<b>79</b>		<b>124</b>		<b>66</b>		<b>12</b>		<b>650</b>

**TABLE 3.1.3-2: SPECIES TARGETED, SEASONALLY, BY BOAT ANGLERS AT CP, 2010.**

Species sought	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Northern pike	2	1.1					2	0.3
Catfishes	15	8.3	12	4.1	24	13.7	51	7.8
Channel catfish			8	2.7			8	1.2
Flathead catfish	4	2.2	1	0.3			5	0.8
Striped bass	2	1.1	1	0.3	3	1.7	6	0.9
Black bass	2	1.1	38	12.9	39	22.3	79	12.2
Smallmouth bass	28	15.6	46	15.6	10	5.7	84	12.9
Largemouth bass	35	19.4	83	28.1	42	24.0	160	24.6
Crappie	1	0.6					1	0.2
Walleye	5	2.8					5	0.8
Sunfish			2	0.7			2	0.3
Anything sought for	86	47.8	104	35.3	57	32.6	247	38.0
	180		295		175		650	

**TABLE 3.1.4-1: NUMBER OF COMPLETE AND INCOMPLETE TRIP INTERVIEWS ON THE CP, 2010.**

Type of fishing	Season	Day type	Completed trips	Incomplete trips
Boat	Spring	Week day	24	
		Weekend	76	
	Summer	Week day	33	
		Weekend	129	
	Fall	Week day	20	
		Weekend	83	
Shore	Spring	Week day	10	
		Weekend	12	2
	Summer	Week day	8	3
		Weekend	19	6
	Fall	Week day	2	1
		Weekend	6	2



**TABLE 3.1.4-2: SEASONAL SHORE INFORMATION (COMPLETE AND INCOMPLETE TRIPS) INTERVIEWED AT CP, 2010.**

<b>Season</b>	<b>N anglers</b>	<b>N parties</b>	<b>Angler per survey</b>
Spring	51	24	2.1
Summer	80	36	2.2
Fall	21	11	1.9
<b>Total</b>	<b>152</b>	<b>71</b>	<b>2.1</b>

**TABLE 3.1.4-3: SEASONAL COUNTS OF COMPLETED SHORE PARTIES INTERVIEWED AT CP, 2010.**

<b>Season</b>	<b>Day type</b>	<b>N</b>	<b>% within season</b>	<b>% within survey</b>
Spring	Weekday	10	45.5	
	Weekend	12	55.5	
		22		38.6
Summer	Weekday	8	29.6	
	Weekend	19	70.4	
		27		47.4
Fall	Weekday	2	25.0	
	Weekend	6	75.0	
		8		14.0
Total	Weekday	20	35.1	
	Weekend	37	64.9	
		57		

**TABLE 3.1.4-4: MONTHLY COUNTS OF COMPLETE AND INCOMPLETE SHORE ANGLERS INTERVIEWS ON CP, 2010.**

<b>Month</b>	<b>N</b>	<b>%</b>
March	5	7.0
April	7	9.9
May	12	16.9
June	8	11.3
July	10	14.1
August	15	21.1
September	7	9.9
October	3	4.2
November	4	5.6
<b>Total</b>	<b>71</b>	

**TABLE 3.1.4-5: MEAN TRIP LENGTH FOR COMPLETED SHORE ANGLERS AT CP, 2010.**

<b>Season</b>	<b>Day Type</b>	<b>N</b>	<b>Mean trip length (hrs)</b>	<b>SE</b>
Spring	Weekday	10	2.4	1.0
	Weekend	12	1.8	0.2
		22	2.1	0.5
Summer	Weekday	8	2.6	0.8
	Weekend	19	1.8	0.2
		27	2.0	0.3
Fall	Weekday	2	1.6	0.3
	Weekend	6	2.2	1.0
		8	2.1	0.7
Total	Weekday	20		
	Weekend	37		
		57	2.1	0.2

**TABLE 3.1.5-1: SPECIES SOUGHT, MONTHLY, BY SHORE ANGLERS IN CP, 2010.**

Species sought	March		April		May		June		July		August		September		October		November		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Common carp											3	7.3	4	26.7			1	12.5	8	5.2
Catfishes							2	10.5	3	18.8							2	25.0	7	4.5
Channel catfish	1	14.3																	1	0.6
Black bass					1	3.7													1	0.6
Smallmouth bass													3	20.0					3	1.9
Largemouth bass			3	17.6					2	12.5	3	7.3			1	20.0			9	5.8
Walleye	2	28.6																	2	1.3
Anything sought for	4	57.1	14	82.4	26	96.3	17	89.5	11	68.8	35	85.4	8	53.3	4	80.0	5	62.5	124	80.0
	<b>7</b>		<b>17</b>		<b>27</b>		<b>19</b>		<b>16</b>		<b>41</b>		<b>15</b>		<b>5</b>		<b>8</b>		<b>155</b>	

**TABLE 3.1.5-2: SPECIES SOUGHT, SEASONALLY, BY SHORE ANGLERS IN CP, 2010.**

Species sought	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Common carp			3	3.6	5	23.8	8	5.2
Channel catfish	1	2.0					1	0.6
Catfish			5	6.0	2	9.5	7	4.5
Black bass	1	2.0					1	0.6
Smallmouth bass			2	2.4	1	4.8	3	1.9
Largemouth bass	3	5.9	5	6.0	1	4.8	9	5.8
Walleye	2	3.9					2	1.3
Anything sought for	44	86.3	68	81.9	12	57.1	124	80.0
	<b>51</b>		<b>83</b>		<b>21</b>		<b>155</b>	

**TABLE 3.2-1: ESTIMATED EFFORT WITH PSE OF ANGLERS FISHING IN CP, 2010.**

	Boat total			Shore total			Overall total		
	Angler Hours	SE	PSE	Angler Hours	SE	PSE	Angler Hours	SE	PSE
Total	49,225	9888.4	20.1	20,244	1332.0	6.6	69,469	9977.7	14.4

**TABLE 3.2-2: ESTIMATED NUMBER OF TRIPS BY ANGLERS AT CP, 2010.**

<b>Boat</b>				
<b>Season</b>	<b>Anglers hours</b>	<b>Mean trip length (h)</b>	<b>Trips</b>	<b>% trips</b>
Spring	15,215	5.2	2,926	30.9
Summer	23,664	5.0	4,733	50.0
Fall	10,347	5.7	1,815	19.2
<b>Total</b>	<b>49,225</b>	<b>5.3</b>	<b>9,288</b>	

<b>Shore</b>				
<b>Season</b>	<b>Anglers hours</b>	<b>Mean trip length (h)</b>	<b>Trips</b>	<b>% trips</b>
Spring	5,637	2.1	2,684	26.9
Summer	13,867	2.0	6,934	69.5
Fall	740	2.1	352	3.5
<b>Total</b>	<b>20,244</b>	<b>2.1</b>	<b>9,640</b>	



**TABLE 3.2-3: ESTIMATED EFFORT OF ANGLERS BY DAY TYPE FISHING AT CP, 2010.**

	<b>Boat</b>					
	<b>Weekday</b>		<b>Weekend</b>		<b>Total</b>	
	<b>Angler Hours</b>	<b>%</b>	<b>Angler Hours</b>	<b>%</b>	<b>Angler Hours</b>	<b>%</b>
Spring	2,353	20.0	12,862	34.3	15,215	30.9
Summer	6,798	57.9	16,865	45.0	23,664	48.1
Fall	2,595	22.1	7,752	20.7	10,347	21.0
<b>Total</b>	<b>11,745</b>	<b>23.9</b>	<b>37,480</b>	<b>76.1</b>	<b>49,225</b>	

	<b>Shore</b>					
	<b>Weekday</b>		<b>Weekend</b>		<b>Total</b>	
	<b>Angler Hours</b>	<b>%</b>	<b>Angler Hours</b>	<b>%</b>	<b>Angler Hours</b>	<b>%</b>
Spring	851	15.3	4,786	32.6	5,637	27.8
Summer	4,554	82.0	9,313	63.4	13,867	68.5
Fall	150	2.7	590	4.0	740	3.7
<b>Total</b>	<b>5,555</b>	<b>27.4</b>	<b>14,689</b>	<b>72.6</b>	<b>20,244</b>	

**TABLE 3.2-4: EFFORT FOR BOAT AND SHORE ANGLERS COMBINED SEEKING TROUT AND BLACK BASS AT CP, 2010.**

<b>Species Group</b>	<b>Estimated effort (h)</b>	<b>Mean trip length (h)</b>	<b>Estimated trips</b>
Black bass	26,077	5.6	4,657

**TABLE 3.2-5: SEASONAL EFFORT FOR BLACK BASS BY ANGLERS AT CP, 2010.**

<b>Method</b>	<b>Season</b>	<b>Estimated effort (h)</b>	<b>%</b>
Boat	Spring	5,619	23.0
	Summer	13,396	54.9
	Fall	5,380	22.1
		24,395	
Shore	Spring	442	26.3
	Summer	1,169	69.5
	Fall	71	4.2
		1,682	

**TABLE 3.3-1: CATCH AND HARVEST ESTIMATES BY BOAT AND SHORE ANGLERS COMBINED AT CP, 2010.**

Species	Spring		Summer		Fall		Total	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
Gizzard shad	12	0					12	0
Common carp	241	205	1428	166	264	0	1933	371
Catfish	836	0	361	0			1197	0
Channel catfish	1719	367	7239	1208	849	52	9807	1627
Flathead catfish	690	395	180	39	553	87	1424	520
Smallmouth bass	5082	0	4606	0	1759	35	11447	35
Largemouth bass	3197	0	3077	0	744	44	7019	44
Sunfish	404	0	605	0	277	0	1286	0
Bluegill	1787	0	6112	0	186	0	8085	0
Rock bass	587	0	848	0	43	0	1478	0
Green sunfish			13	0			13	0
Pumpkinseed			26	0			26	0
White crappie			13	0			13	0
Black crappie	54	0					54	0
Striped bass	66	0			27	27	93	27
White perch			90	0			90	0
Walleye	242	35	142	0	150	17	533	52
Striped bass hybrid					18	0	18	0
<b>Total</b>	<b>14917</b>	<b>1001</b>	<b>24740</b>	<b>1413</b>	<b>4869</b>	<b>262</b>	<b>44526</b>	<b>2676</b>

**TABLE 3.3.1-1: EXPANDED BOAT CATCH AND HARVEST ESTIMATES AT CP, 2010.**

Species	Spring				Summer				Fall				Total			
	Catch	%	Harvest	%	Catch	%	Harvest	%	Catch	%	Harvest	%	Catch	%	Harvest	%
Gizzard shad	12	0.1	0	0.0									12	0.0	0	0.0
Common carp	36	0.4	0	0.0					27	0.6	0	0.0	63	0.2	0	0.0
Catfish	426	4.3	0	0.0	258	1.2	0	0.0					684	1.9	0	0.0
Channel catfish	1176	11.8	95	18.1	6577	31.5	1042	96.4	849	18.3	52	20.0	8602	24.2	1190	63.7
Flathead catfish	690	6.9	395	75.4	180	0.9	39	3.6	553	11.9	87	33.1	1424	4.0	520	27.8
Largemouth bass	1790	17.9	0	0.0	3077	14.7	0	0.0	744	16.1	44	16.9	5612	15.8	44	2.4
Smallmouth bass	4005	40.1	0	0.0	4338	20.8	0	0.0	1759	38.0	35	13.4	10101	28.5	35	1.9
Sunfish	199	2.0	0	0.0	193	0.9	0	0.0	277	6.0	0	0.0	669	1.9	0	0.0
Bluegill	968	9.7	0	0.0	5284	25.3	0	0.0	186	4.0	0	0.0	6437	18.1	0	0.0
Green sunfish					13	0.1	0	0.0					13	0.0	0	0.0
Pumpkinseed					26	0.1	0	0.0					26	0.1	0	0.0
Rock bass	315	3.2	0	0.0	682	3.3	0	0.0	43	0.9	0	0.0	1041	2.9	0	0.0
White crappie					13	0.1	0	0.0					13	0.0	0	0.0
Black crappie	54	0.5	0	0.0									54	0.2	0	0.0
Striped bass	66	0.7	0	0.0					27	0.6	27	10.3	93	0.3	27	1.4
White perch					90	0.4	0	0.0					90	0.3	0	0.0
Walleye	242	2.4	35	6.7	142	0.7	0	0.0	150	3.2	17	6.5	533	1.5	52	2.2
Striped bass hybrid									18	0.4	0	0.0	18	0.1	0	0.0
<b>Total</b>	<b>9979</b>		<b>524</b>		<b>20872</b>		<b>1081</b>		<b>4632</b>		<b>262</b>		<b>35483</b>		<b>1867</b>	

**TABLE 3.3.2-1: EXPANDED SHORE CATCH AND HARVEST ESTIMATES AT CP, 2010.**

Species	Spring				Summer				Fall				Total			
	Catch	%	Harvest	%	Catch	%	Harvest	%	Catch	%	Harvest	%	Catch	%	Harvest	%
Common carp	205	4.1	205	43.0	1428	36.9	166	50.0	237	100.0	0	0.0	1870	20.7	371	45.8
Catfish	410	8.3	0	0.0	103	2.7	0	0.0					513	5.7	0	0.0
Channel catfish	543	11.0	272	57.0	663	17.1	166	50.0					1206	13.3	437	54.1
Smallmouth bass	1078	21.8	0	0.0	269	6.9	0	0.0					1346	14.9	0	0.0
Largemouth bass	1407	28.5	0	0.0									1407	15.6	0	0.0
Sunfish	205	4.1	0	0.0	412	10.7	0	0.0					617	6.8	0	0.0
Bluegill	819	16.6	0	0.0	828	21.4	0	0.0					1648	18.2	0	0.0
Rock bass	272	5.5	0	0.0	166	4.3	0	0.0					437	4.8	0	0.0
<b>Total</b>	<b>4938</b>		<b>476</b>		<b>3869</b>		<b>332</b>		<b>237</b>		<b>0</b>		<b>9043</b>		<b>808</b>	

**TABLE 3.3.3-1: RETENTION RATES FOR FISH AT CP, 2010.**

<b>No. caught</b>	<b>No. harvested</b>	<b>Retention rate (%)</b>
<b>Boat</b>		
35,483	1,867	5.3
<b>Shore</b>		
9,043	808	8.9
<b>Combined</b>		
44,526	2,675	6.0

**TABLE 3.4.1-1: SEASONAL OVERALL CATCH AND HARVEST PER-UNIT-EFFORT RATES AT CP, 2010.**

	Spring				Summer				Fall				Overall			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Boat	0.69	0.12	0.04	0.02	0.79	0.14	0.06	0.07	0.42	0.07	0.02	0.01	0.65	0.07	0.04	0.03
Shore	0.46	0.36	0.03	0.02	0.16	0.08	0.01	0.02	0.03	0.03	0.00	0.00	0.24	0.14	0.02	0.01



**TABLE 3.4.1-2: SEASONAL OVERALL CATCH AND HARVEST PER-UNIT-EFFORT RATES, WITH PSE AT CP, 2010.**

	Spring				Summer				Fall				Overall			
	CPUE	PSE	HPUE	PSE	CPUE	PSE	HPUE	PSE	CPUE	PSE	HPUE	PSE	CPUE	PSE	HPUE	PSE
Boat	0.69	17.4	0.04	50.0	0.79	17.7	0.06	116.7	0.42	16.7	0.02	50.0	0.65	10.8	0.04	75.0
Shore	0.46	78.3	0.03	66.7	0.16	50.0	0.01	200.0	0.03	100.0	0.00	-	0.24	58.3	0.02	50.0

**TABLE 3.4.1-3: OVERALL CATCH AND HARVEST RATES FOR SPECIES BY BOAT ANGLERS IN CP, 2010.**

Species	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Channel catfish	0.09	0.20	0.01	0.03	0.26	0.21	0.03	0.08	0.09	0.10	0.01	0.03	0.17	0.10	0.03	0.07
Flathead catfish	0.08	0.15	0.05	0.12	0.01	0.01	0.00	0.00	0.05	0.09	0.01	0.05	0.03	0.03	0.01	0.02
Smallmouth bass	0.35	0.36	0.00	0.00	0.18	0.11	0.00	0.00	0.22	0.36	0.00	0.02	0.20	0.06	0.00	0.00
Largemouth bass	0.12	0.14	0.00	0.00	0.14	0.10	0.00	0.00	0.08	0.12	0.01	0.02	0.10	0.04	0.00	0.00
Bluegill	0.05	0.11	0.00	0.00	0.33	0.74	0.00	0.00	0.02	0.05	0.00	0.00	0.08	0.10	0.00	0.00

**TABLE 3.4.1-4: OVERALL CATCH AND HARVEST RATES FOR SPECIES BY SHORE ANGLERS AT CP, 2010.**

Species	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Common carp	0.02	0.01	0.02	0.01	0.05	0.04	0.00	0.00	0.03	0.03	0.00	0.00	0.04	0.02	0.01	0.00
Channel catfish	0.04	0.03	0.02	0.02	0.04	0.01	0.01	0.01					0.03	0.01	0.01	0.01
Smallmouth bass	0.16	0.13	0.00	0.00	0.01	0.02	0.00	0.00					0.05	0.03	0.00	0.00
Largemouth bass	0.26	0.22	0.00	0.00									0.06	0.05	0.00	0.00

**TABLE 3.4.2-1: TARGETED CATCH AND HARVEST RATES FOR ANGLERS AT CP, 2010.**

<b>Fishing type</b>	<b>Anglers interviewed</b>	<b>Targeted species</b>	<b>CPUE</b>	<b>SE</b>	<b>HPUE</b>	<b>SE</b>
Boat	8	Channel catfish	2.38	1.97	1.43	2.26
	5	Flathead catfish	0.35	0.27	0.29	0.28
	84	Smallmouth bass	0.46	0.10	0.00	0.00
	160	Largemouth bass	0.24	0.05	0.00	0.00
	5	Walleye	0.30	0.17	0.00	0.00
Shore	8	Common carp	0.45	0.55	0.00	0.00
	3	Smallmouth bass	0.09	0.08	0.00	0.00

**TABLE 3.4.2-2: TARGETED CATCH AND HARVEST RATES, SEASONALLY, FOR BOAT ANGLERS AT CP, 2010.**

Season	Targeted species	Anglers interviewed	CPUE	SE	HPUE	SE
Spring	Flathead catfish	4	0.36	0.36	0.36	0.36
	Smallmouth bass	28	0.61	0.21	0.00	0.00
	Largemouth bass	35	0.30	0.14	0.00	0.00
	Walleye	5	0.30	0.17	0.00	0.00
Summer	Channel catfish	8	2.38	1.97	1.43	2.26
	Flathead catfish	1	0.32	0.00	0.00	0.00
	Smallmouth bass	46	0.39	0.11	0.00	0.00
	Largemouth bass	83	0.22	0.05	0.00	0.00
Fall	Smallmouth bass	10	0.28	0.23	0.00	0.00
	Largemouth bass	42	0.20	0.08	0.01	0.01

**TABLE 3.4.2-3: TARGETED CATCH AND HARVEST RATES, SEASONALLY, FOR SPECIES SOUGHT BY SHORE ANGLERS IN CP, 2010.**

Season	Angler interviewed	Targeted species	CPUE	SE	HPUE	SE
Summer	3	Common carp	0.93	0.00	0.00	0.00
	2	Smallmouth bass	0.27	0.00	0.00	0.00
Fall	5	Common carp	0.10	0.22	0.00	0.00

**TABLE 3.5-1: ANGLER DEMOGRAPHICS FOR ANGLERS AT CP, 2010.**

Region	Boat							
	Spring		Summer		Fall		Overall	
	Number anglers	% angler by season	Number anglers	% angler by season	Number anglers	% angler by season	Number anglers	% anglers
Lancaster Co	57	32.4	116	39.7	54	30.9	227	35.3
York Co	38	21.6	55	18.8	31	17.7	124	19.3
Chester Co	13	7.4	20	6.8	19	10.9	52	8.1
Berks Co	4	2.3	6	2.1	5	2.9	15	2.3
Delaware Co	2	1.1	10	3.4	7	4.0	19	3.0
Other PA	9	5.1	19	6.5	13	7.4	41	6.4
Baltimore	30	17.0	34	11.6	20	11.4	84	13.1
Cecil Co	12	6.8	18	6.2	15	8.6	45	7.0
Harford Co	5	2.8	5	1.7	6	3.4	16	2.5
Other MD	3	1.7	7	2.4	5	2.9	15	2.3
VIRGINIA	2	1.1	2	0.7			4	0.6
WEST VIRGINIA	1	0.6					1	0.2
	<b>176</b>		<b>292</b>		<b>175</b>		<b>643</b>	

Region	Shore							
	Spring		Summer		Fall		Overall	
	Number anglers	% angler by season	Number anglers	% angler by season	Number anglers	% angler by season	Number anglers	% anglers
Lancaster Co	18	35.3	43	53.1	11	52.4	72	47.1
York Co	4	7.8	7	8.6	4	19.0	15	9.8
Berks Co	2	3.9					2	1.3
Chester Co			2	2.5			2	1.3
Delaware Co	1	2.0					1	0.7
Other PA			7	8.6			7	4.6
Baltimore	12	23.5	6	7.4	2	9.5	20	13.1
Cecil Co	7	13.7	14	17.3			21	13.7
Other MD	3	5.9					3	2.0
FLORIDA	4	7.8					4	2.6
NEW JERSEY					4	19.0	4	2.6
COLORADO			2	2.5			2	1.3
	<b>51</b>		<b>81</b>		<b>21</b>		<b>153</b>	

**TABLE 3.6.1-1: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED FISH CAUGHT BY BOAT ANGLERS IN CP, 2010.**

	Length in inches																			Total	%
	11	12	13	14	16	17	18	19	20	21	22	23	24	26	27	29	30	31	32		
Channel catfish	1	2	3	5					1			1								13	29.5
Flathead catfish						2		2	4	1	1	2	4	3	2	3	1	1	1	27	61.4
Smallmouth bass					1															1	2.3
Walleye					1		1	1												3	6.8
	<b>1</b>	<b>2</b>	<b>3</b>	<b>5</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>5</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>44</b>	



**TABLE 3.6.1-2: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED FISH CAUGHT, SEASONALLY, BY BOAT ANGLERS IN CP, 2010.**

	Spring																				
	Length in inches																			Total	%
	12	13	14	16	17	18	19	20	21	22	23	24	26	27	29	30	31	32			
Channel catfish	2	1	3																6	22.2	
Flathead catfish					1		2	2	1	1	1	2	1	2	2	1	1	1	18	66.7	
Walleye				1		1	1												3	11.1	
																			<b>27</b>		

	Summer							
	Length in inches						Total	%
	11	13	20	23	24			
Channel catfish	1	2	1	1		5	62.5	
Flathead catfish			1	1	1	3	37.5	
						<b>8</b>		

	Fall								
	Length in inches							Total	%
	14	16	17	20	24	26	29		
Channel catfish	2							2	22.2
Flathead catfish			1	1	1	2	1	6	66.7
Smallmouth bass		1						1	11.1
								<b>9</b>	

**TABLE 3.6.1-3: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR RELEASED FISH CAUGHT BY BOAT ANGLERS IN CP, 2010.**

	Length in inches																						Total	%			
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	26			31	32	
Common carp																			1		3	1			5	0.5	
Catfish									7	3	3															13	1.4
Channel catfish			5		17	1	13	1	23	8	14	18	21	1	15	4	11		1	1	4		1			159	16.7
Flathead catfish									1	1	1	7	2		7		2	1			1			1		24	2.5
Striped bass							1				1		1													3	0.3
Rock bass		1	9	2	11		3	1	1	1	1															30	3.1
Bluegill	33	22	20		7	1																				83	8.7
Smallmouth bass			1	1	7	2	37	21	41	49	57	66	37	21	20	2	3			1						366	28.4
Largemouth bass			1		2		8	8	11	8	42	48	34	21	11	2	3	1			2					202	21.2
Black crappie						3																				3	0.3
Sunfish	8	17	11	4																						40	4.2
Walleye							3		2	4	2	5	1	5		2										24	2.5
Hybrid striped bass																		1		1						2	0.2
	<b>2</b>	<b>40</b>	<b>47</b>	<b>7</b>	<b>44</b>	<b>7</b>	<b>65</b>	<b>31</b>	<b>86</b>	<b>74</b>	<b>121</b>	<b>144</b>	<b>96</b>	<b>48</b>	<b>53</b>	<b>10</b>	<b>19</b>	<b>3</b>	<b>2</b>	<b>5</b>	<b>8</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>954</b>		

**TABLE 3.6.1-4: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR RELEASED FISH CAUGHT, SEASONALLY, BY BOAT ANGLERS IN CP, 2010.**

	Spring																						Total	%
	Length in inches																							
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	23	24	26	31	32		
Common carp																			1	1			2	0.8
Catfish									1														1	0.4
Channel catfish		3		1			1	4	1	3	2	15		2		4					1		37	15.3
Flathead catfish										1				6								1	8	3.3
Striped bass						1				1		1											3	1.2
Rock bass		2	1	5																			8	3.3
Bluegill	1			3	1																		5	2.1
Smallmouth bass				2		7	4	13	9	18	22	14	11	8									108	44.6
Largemouth bass							2	2	6	13	13	8	1	5	2	2	1	2					57	23.6
Black crappie					3																		3	1.2
Sunfish	1																						1	0.4
Walleye						1		1	4	1		1			1								9	3.7
																							<b>242</b>	

	Summer																			Total	%			
	Length in inches																							
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	24						
Catfish									7	3	2												12	3.0
Channel catfish					14		4		12		8	13	5	1	10		4	2					73	18.0
Flathead catfish									1	1	1	1					2						6	1.5
Rock bass		1	7		6		2	1	1	1	1												20	4.9
Bluegill	25	18	20		4																		67	16.5
Smallmouth bass			1		4	2	9	7	14	22	25	12	10	4	1	1	3						115	28.3
Largemouth bass					1		3		1		20	29	22	15	5		1						97	23.9
Sunfish	1		8	4																			13	3.2
Walleye							2		1														3	0.7
																							<b>406</b>	

**TABLE 3.6.1-4: CONTINUED.**

	Fall																							
	Length in inches																							
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	%	
Common carp																			1		2	3	1.0	
Channel catfish			2		2	1	9		7	7	3	3	1		3	4	3		1	1	2	49	16.0	
Flathead catfish											5	2		1				1			1	10	3.3	
Rock bass				1			1															2	0.7	
Bluegill	8	3																				11	3.6	
Smallmouth bass				1	1		21	10	14	18	14	32	13	6	11	1				1		143	46.7	
Largemouth bass			1		1		5	6	8	2	9	6	4	5	1							48	15.7	
Sunfish	7	16	3																			26	8.5	
Walleye											1	5		5		1						12	3.9	
Striped bass hybrid																		1		1		2	0.7	
																						<b>306</b>		

**TABLE 3.6.2-1: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED FISH CAUGHT BY SHORE ANGLERS IN CP, 2010.**

	Length in inches						%
	13	14	17	20	21	Total	
Common carp				1	1	2	40.0
Channel catfish	1	1	1			3	60.0
	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>5</b>	

**TABLE 3.6.2-2: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED FISH CAUGHT, SEASONALLY, BY SHORE ANGLERS IN CP, 2010.**

	Spring			
	Length in inches			
	14	17	21	Total
Common carp			1	1
Channel catfish	1	1		2

	Summer		
	Length in inches		
	13	20	Total
Species			
Common carp		1	1
Channel catfish	1		1

**TABLE 3.6.2-3: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR RELEASED FISH CAUGHT BY SHORE ANGLERS IN CP, 2010.**

	Length in inches																Total	%
	5	6	8	9	10	12	13	14	15	16	17	18	19	20	23	31		
Common carp				1			1					4		1	1	1	9	13.8
Catfish					1				2								3	4.6
Channel catfish						2			1			1					4	6.2
Rock bass	1	1															2	3.1
Bluegill	5		4														9	13.8
Smallmouth bass			1			3	2	3	2	1	1	1					14	21.5
Largemouth bass						3	3	3	2	2	2	2	2				19	29.2
Sunfish	4	1															5	7.7
	<b>10</b>	<b>2</b>	<b>5</b>	<b>1</b>	<b>1</b>	<b>8</b>	<b>6</b>	<b>6</b>	<b>7</b>	<b>3</b>	<b>3</b>	<b>8</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>65</b>	

**TABLE 3.6.2-4: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR RELEASED FISH CAUGHT, SEASONALLY, BY SHORE ANGLERS IN CP, 2010.**

	Spring													
	Length in inches												Total	%
	5	6	8	12	13	14	15	16	17	18	19			
Catfish							2						2	5.0
Channel catfish				1									1	2.5
Rock bass	1												1	2.5
Bluegill			4										4	10.0
Smallmouth bass			1	2	1	3	2	1	1	1			12	30.0
Largemouth bass				3	3	3	2	2	2	2	2		19	47.5
Sunfish		1											1	2.5
													<b>40</b>	

	Summer												Total	%
	Length in inches													
	5	6	9	10	12	13	15	18	20	23	31			
Common carp			1					4	1	1	1	8	33.3	
Catfish				1								1	4.2	
Channel catfish					1		1	1				3	12.5	
Rock bass		1										1	4.2	
Bluegill	5											5	20.8	
Smallmouth bass					1	1						2	8.3	
Sunfish	4											4	16.7	
												<b>24</b>		

	Fall		
	Length in inches		
	13	Total	%
Common carp	1	1	100.0



**TABLE 3.7.1-1: SUMMARY OF CONOWINGO POND BLACK BASS TOURNAMENT ACTIVITY, 2010.**

<b>Tournament location</b>	<b>N Anglers</b>	<b>N Tournaments</b>	<b>N Fish Weighed</b>
Glen Cove	64	7	196
Muddy Creek	35	3	51
Dorsey Park	123	6	235
<b>Total</b>	<b>222</b>	<b>16</b>	<b>482</b>

**TABLE 3.7.2-1: SUMMARY OF CONOWINGO POND CATFISH TOURNAMENTS  
ACTIVITY, 2010.**

<b>Tournament location</b>	<b>N anglers</b>	<b>N Tournaments</b>	<b>N Fish Weighed</b>
Glen Cove	43	2	49
Muddy Creek	28	1	33
Dorsey Park	34	1	45
<b>Total</b>	<b>105</b>	<b>4</b>	<b>127</b>

**TABLE 4.1-1: DISTRUBTUION OF ANGLER COUNTS BETWEEN DAY TYPES AND TIME OF DAY OVER CP, WINTER 2010-2011.**

<b>Daytype/Time</b>	<b>Winter</b>
Weekend/holiday	7
Weekday	6
0911 - 1100	3
1100-1400	7
1400 - 1601	3
<b>Total flights</b>	<b>13</b>

**TABLE 4.1-2: AERIAL OBSERVATIONS OF BOAT AND SHORE ANGLER ON CP, WINTER 2010-2011.**

		<b>N Boats</b>	<b>Shore anglers</b>
Winter	CP Maryland		
	Funks Run Pond		
	Conowingo Creek		
	Broad Creek	1	
	PBAPS Plume	4	
	CP Pennsylvania	1	2
<b>Total</b>		<b>6</b>	<b>2</b>

**TABLE 4.2-1: NUMBER OF ANGLER INTERVIEWS PER LOCATION AND METHOD IN CP, WINTER 2010-2011.**

<b>Boat interviews</b>			
<b>Site location</b>	<b>N parties</b>	<b>N anglers</b>	<b>%</b>
Muddy Creek Access	1	3	7.7
Dorsey Park	12	19	92.3
<b>Total</b>	<b>13</b>	<b>22</b>	

<b>Shore interviews</b>			
<b>Site location</b>	<b>N anglers complete</b>	<b>N anglers incomplete</b>	<b>%</b>
Funks Pond	1	1	50.0
Conowingo Creek		2*	50.0
<b>Total</b>	<b>1</b>	<b>3</b>	

\* These two anglers formed one party

**TABLE 4.2-2: NUMBER OF BOAT PARTIES INTERVIEWED AT CP, WINTER 2010-2011.**

<b>Season</b>	<b>Day Type</b>	<b>N</b>	<b>% within season</b>
Winter	Weekday	3	23.1
	Weekend	10	76.9
<b>Total</b>		<b>13</b>	

**TABLE 4.2-3: MONTHLY COUNTS OF BOAT PARTIES INTERVIEWS AT CP, WINTER 2010-2011.**

<b>Month</b>	<b>N</b>	<b>%</b>
December	3	23.1
January	1	7.7
February	9	69.2
<b>Total</b>	<b>13</b>	

**TABLE 4.2-4: AVERAGE NUMBER OF ANGLERS PER PARTY IN CP, WINTER 2010-2011.**

<b>Boat</b>		
<b>N anglers</b>	<b>N parties</b>	<b>Angler per survey</b>
22	13	1.7

<b>Shore</b>		
<b>N anglers</b>	<b>N parties</b>	<b>Angler per survey</b>
4	3	1.3



**TABLE 4.3-1: SPECIES SOUGHT BY ANGLERS IN CP, WINTER 2010-2011.**

Species sought	Boat		Shore	
	N	%	N	%
Catfish	4	18.2		
Flathead catfish	1	4.5		
Striped bass	1	4.5		
Black bass	1	4.5		
Largemouth bass	8	36.4		
Crappie			1	25.0
Walleye	3	13.6	2	50.0
Anything sought for	4	18.2	1	25.0
<b>Total</b>	<b>22</b>		<b>4</b>	

**TABLE 4.4-1: NUMBER OF SHORE PARTIES INTERVIEWS AT CP, WINTER 2010-2011.**

<b>Season</b>	<b>Day Type</b>	<b>N incomplete</b>	<b>N complete</b>	<b>% within season</b>
Winter	Weekday			0.0
	Weekend	1	2	100.0
<b>Total</b>		<b>1</b>	<b>2</b>	

**TABLE 4.4-2: MONTHLY COUNTS OF SHORE PARTIES INTERVIEWS AT CP, WINTER 2010-2011.**

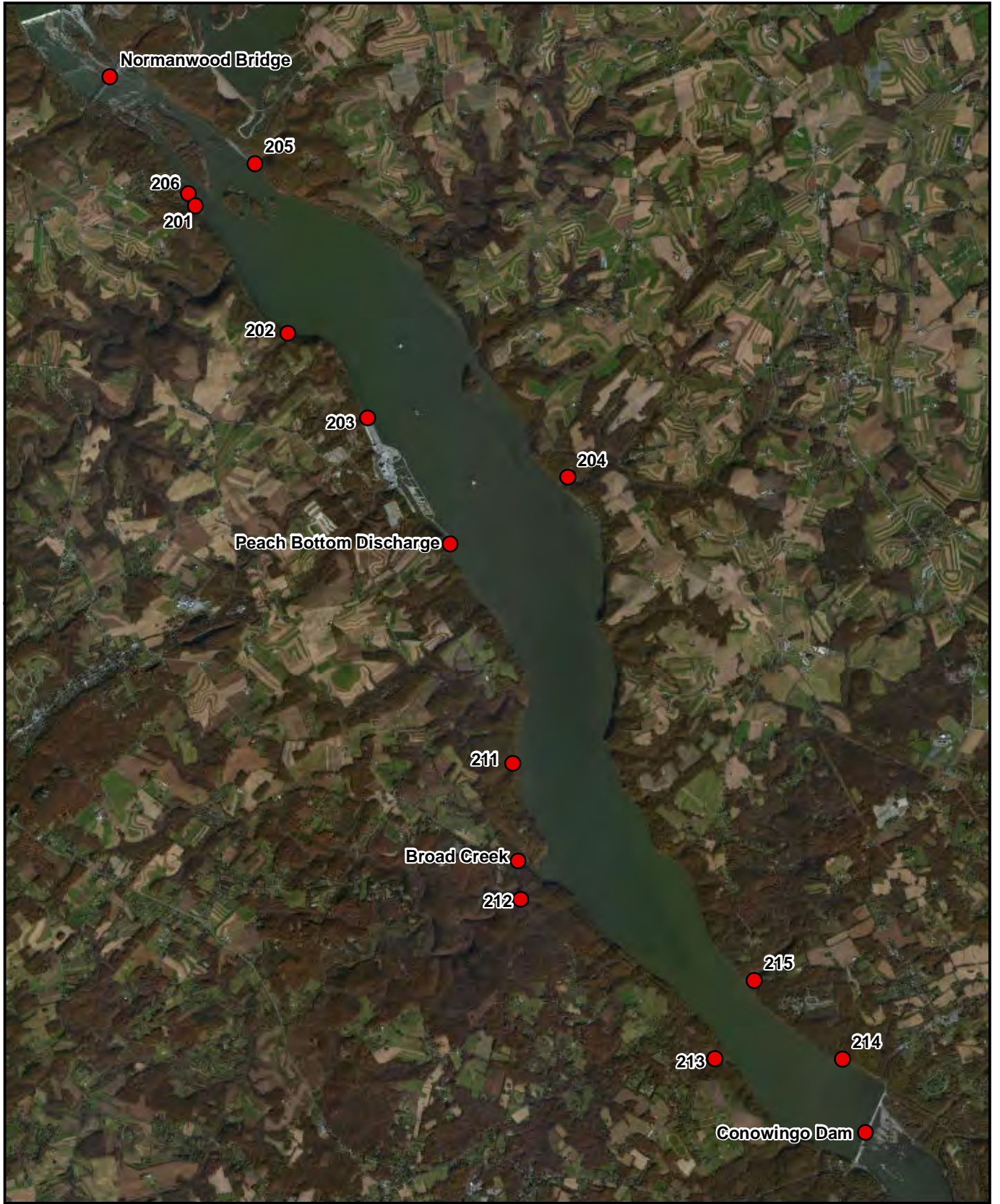
<b>Month</b>	<b>N</b>	<b>%</b>
December	1	33.3
January	2	66.7
February	0	0.0
<b>Total</b>	<b>3</b>	

**TABLE 4.6-1: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED FISH CAUGHT BY BOAT ANGLERS ON CP, WINTER 2010-2011.**

	Length in inches				Total
	16	17	19	26	
Flathead catfish		1	1	1	3
Walleye	1	2			3
<b>Total</b>					<b>6</b>

**TABLE 4.6-2: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR RELEASED FISH CAUGHT BY BOAT ANGLERS ON CP, WINTER 2010-2011.**

	Length in inches												Total	%
	< 12	12	13	14	15	16	17	18	20	22	23	25		
Gizzard shad									1				1	2.1
Common carp										1			1	2.1
Channel catfish					1								1	2.1
Flathead catfish									1			2	3	6.4
Smallmouth bass			1		4		2	1	1				9	19.1
Largemouth bass	3	2	1	4	4	7	3	1					25	53.2
Walleye			1	3				1					5	10.6
Hybrid striped bass										2			2	4.3
<b>Total</b>													<b>47</b>	



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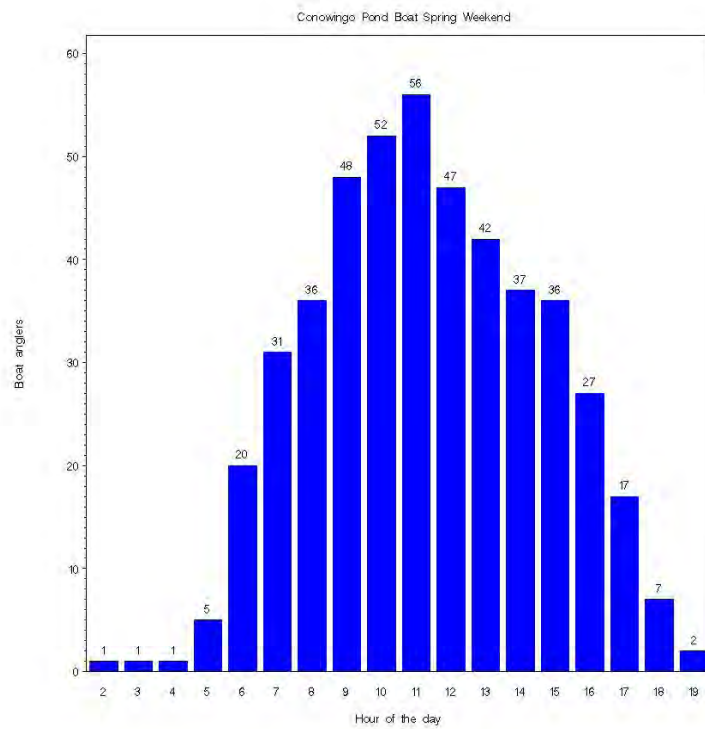
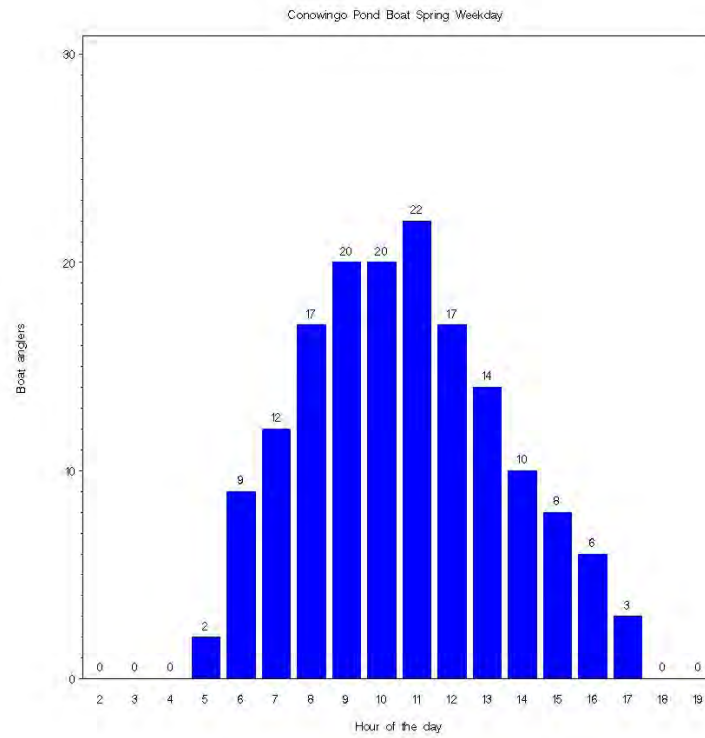
RSP STUDY 3.25  
**CONOWINGO HYDROELECTRIC PROJECT**  
**PROJECT NO. 405**

0 0.5 1 2  
 1 inch = 1.4 miles  
 Miles

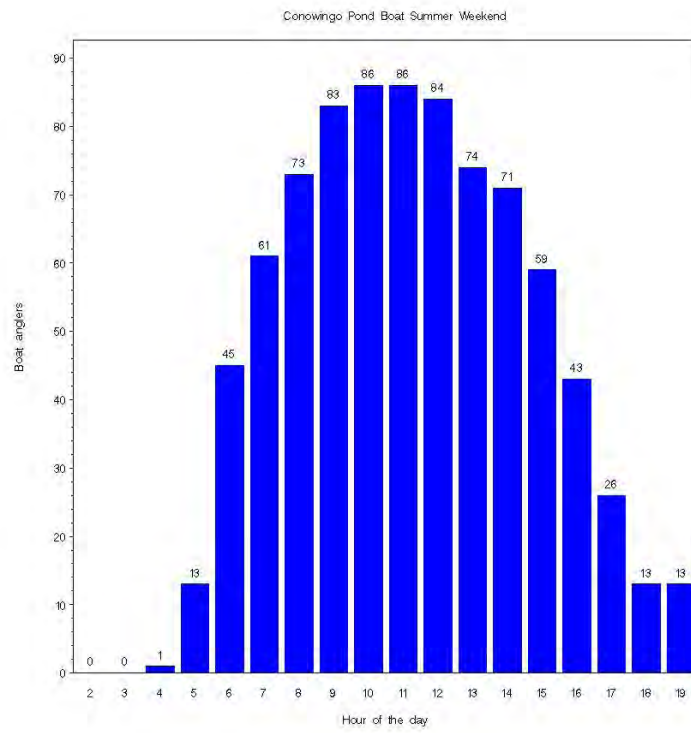
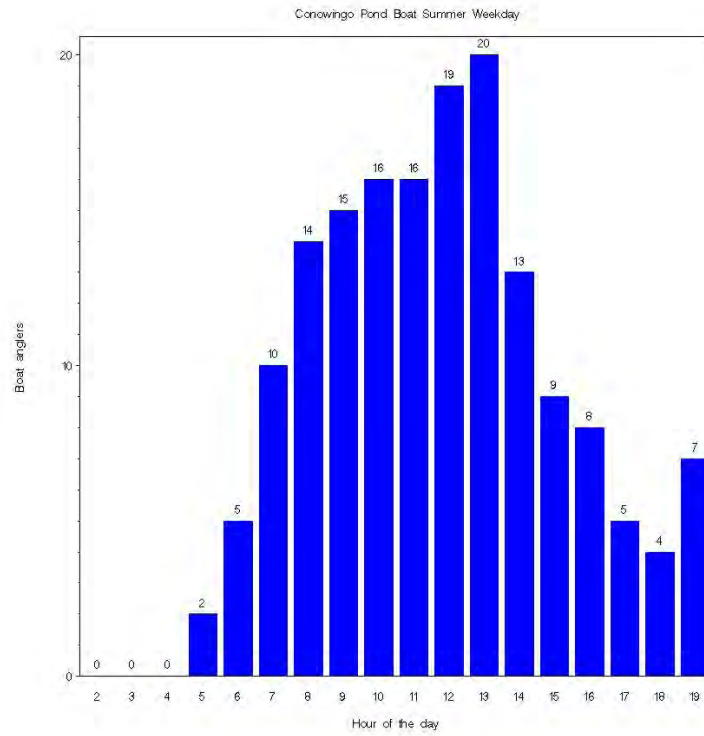
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Figure 2.1-1.  
 Figure Title: **Conowingo Pond Interview Locations.**

**FIGURE 3.1.2-1: BOAT ANGLER USE PROFILES (SPRING-FALL) FOR TEMPORAL STRATA.**

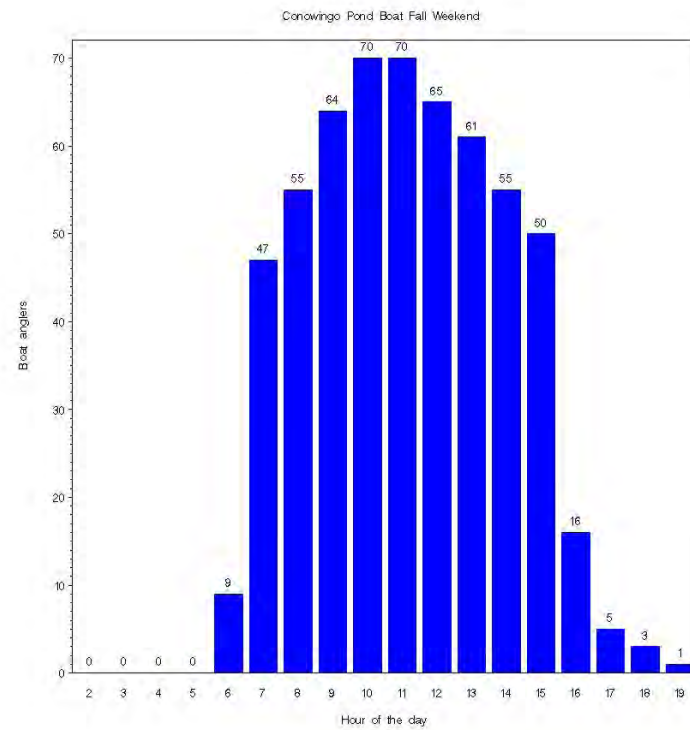
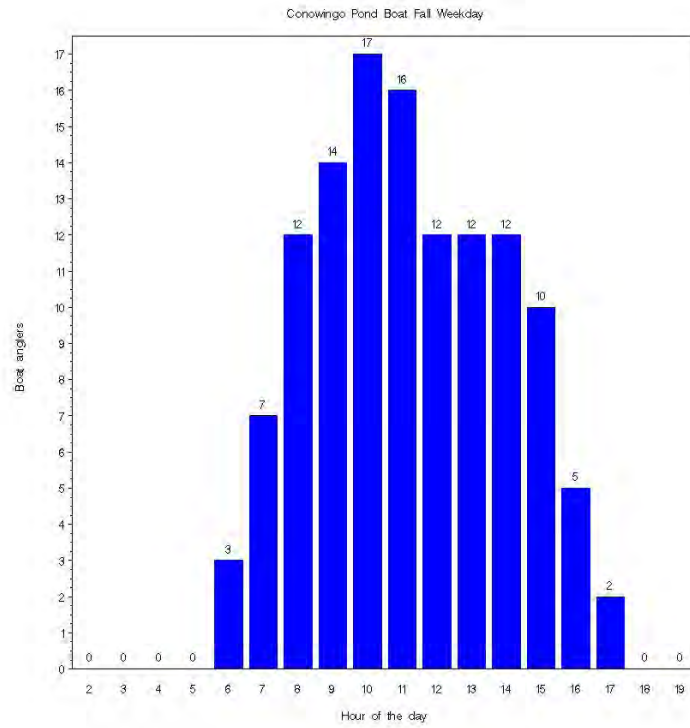


**FIGURE 3.1.2-1: CONTINUED.**

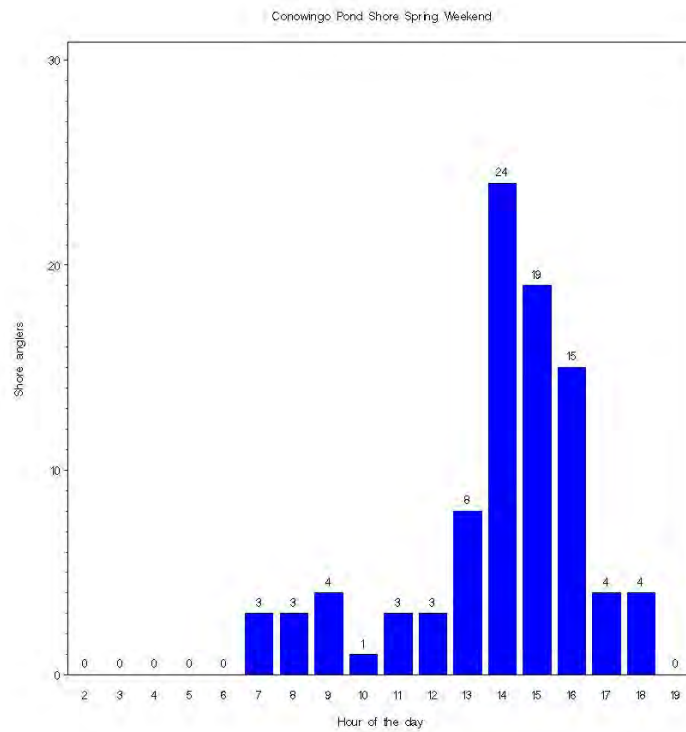
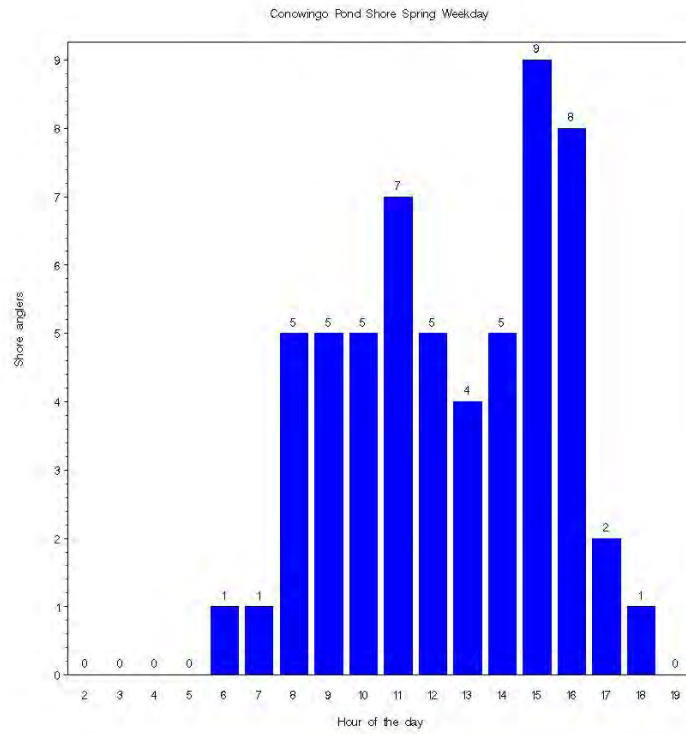




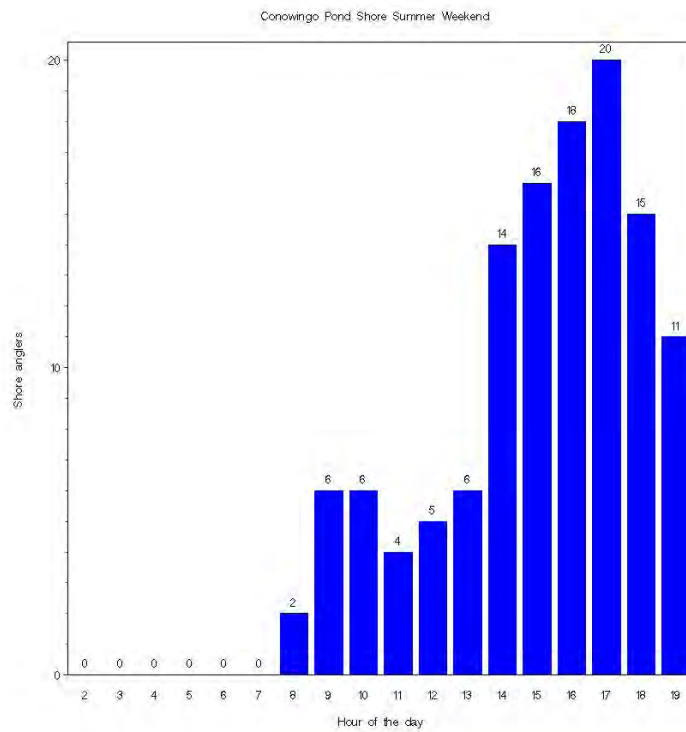
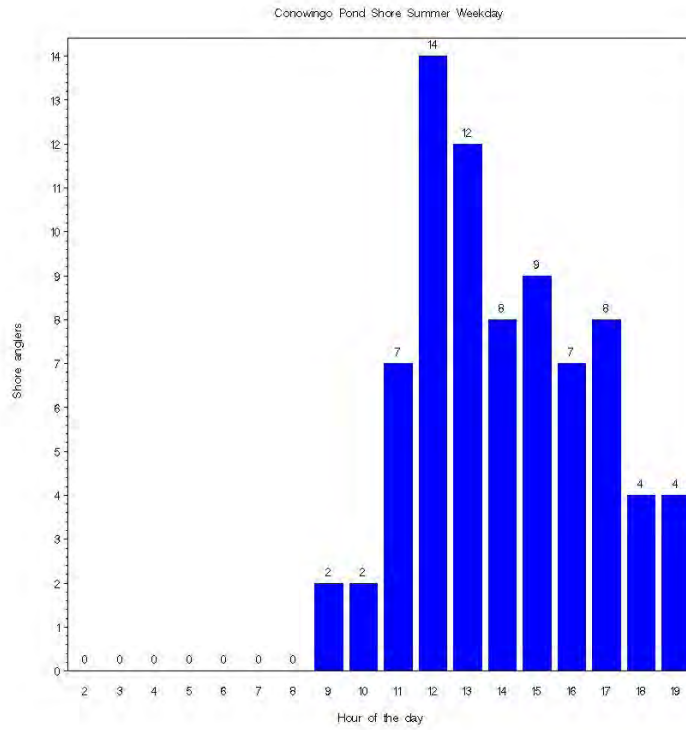
**FIGURE 3.1.2-1: CONTINUED.**



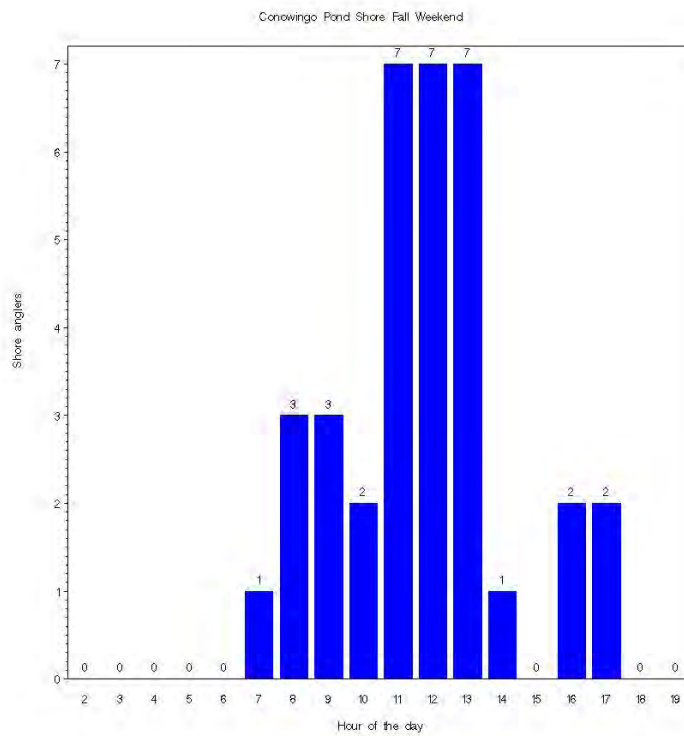
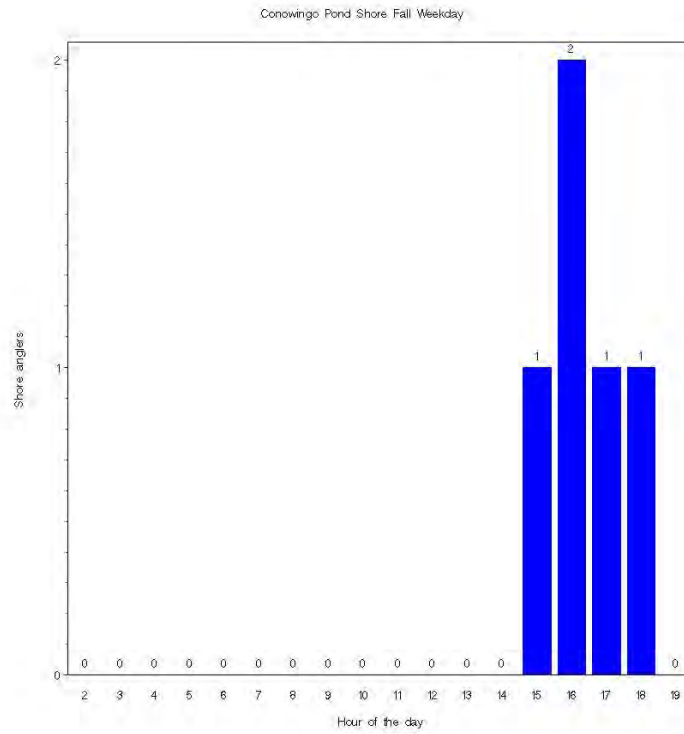
**FIGURE 3.1.4-1: SHORE ANGLER USE PROFILES (SPRING-FALL) FOR TEMPORAL STRATA.**



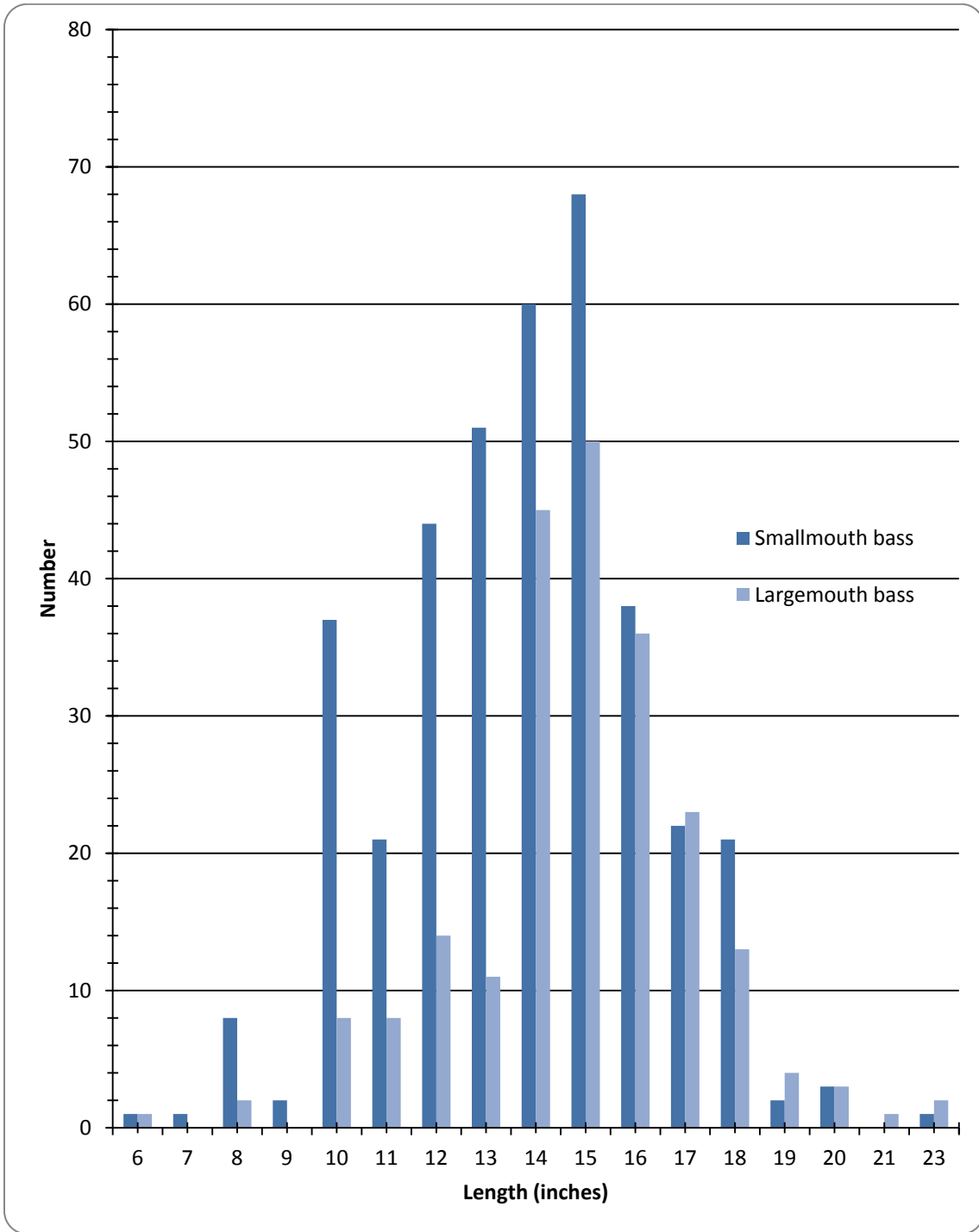
**FIGURE 3.1.4-1: CONTINUED.**



**FIGURE 3.1.4-1: CONTINUED.**



**FIGURE 3.6.3-1: SIZE OF RELEASED BLACK BASS BY ANGLERS ON CP.**



**APPENDIX A-1: RANDOM AERIAL FLIGHT SCHEDULE.**

# Aerial Survey - CP

Spring 2010	Date	Route	Day type	# of flights
Weekday 1-7 March	3/1	DNF *		
Weekday 15-21 March	3/18	2	Weekend/Holiday	7
Weekend 8-14 March (make-up)	3/20	1	Weekday	7
Weekday 1-7 March (make-up)	3/24	1		
Weekend 22-28 March	3/27	1		
Weekday 29-4 April	3/31	3		
Opening Day 3 April	4/3	DNF *		
Weekend 5- 11 April	4/11	3		
Weekday 12-18 April	4/13	2		
Weekend 19-25 April	4/24	2		
Weekday 26-2 May	4/27	1		
Weekday 10-16 May	5/10	4		
Weekend 10-16 May	5/15	1		
Weekend 3-9 May (make-up)	5/16	3		
Weekday 24-30 May	5/26	4		
Weekend 17-23 May (make-up)	5/29	2		

Summer 2010	Date	Route	Day type	# of flights
Weekday 31-6 June	6/1	1		
Weekend 31-6 June	6/5	1		
Weekday 7-13 June	6/10	3	Weekend/Holiday	7
Weekend 14-20 June	6/19	1	Weekday	8
Weekday 21-27 June	6/22	3		
Weekend 28-4 July	7/3	3		
Weekday 5-11 July	7/9	3		
Weekend 12-18 July	7/17	2		
Weekday 19-25 July	7/21	1		
Weekend 26- 1 August	8/1	4		
Weekday 2-8 August	8/2	2		
Weekend 9-15 August	8/15	1		
Weekday 16-22 August	8/17	1		
Weekend 23-29 August	8/29	3		
Weekday 30-5 Sept.	9/1	1		

Fall 2010	Date	Route	Day type	# of flights
Weekday 13-19 Sept.	9/13	3		
Weekend 6-12 Sept. (make-up)	9/18	1		
Weekday 27-3 Oct.	9/28	4	Weekend/Holiday	6
Weekend 20-26 Sept. (make-up)	10/2	3	Weekday	6
Weekend 4-10 Oct	10/9	2		
Weekday 11-17 Oct.	10/12	2		
Weekend 18-24 Oct.	10/24	3		
Weekday 25-31 Oct.	10/26	3		

Weekend 1-7 Nov.	11/7	2
Weekday 8-14 Nov.	11/8	1
Weekend 15-21 Nov.	11/21	1
Weekday 22-28 Nov.	11/23	3

Winter 2010	Date	Day type	# of flights
40- Weekend 29-5 Dec.	12/5		
41- Weekday 6-12 Dec.	12/9		
42- Weekend 13-19 Dec.	12/18	Weekend/Holiday	7
43- Weekday 20-26 Dec.	12/20	Weekday	6
44- Weekend 27-2 Jan.	1/2		
45- Weekday 3-9 Jan.	1/5		
46- Weekend 10-16 Jan.	1/16		
47- Weekday 17-23 Jan.	1/21		
48- Weekend 24-30 Jan.	1/30		
49- Weekday 31-6 Feb.	2/1		
50- Weekend 7-13 Feb.	2/13		
51- Weekday 14-20 Feb.	2/17		
52- Weekend 21-27 Feb.	2/27		

Frequency	# Flights
Monday	6
Tuesday	10
Wednesday	6
Thursday	3
Friday	3
Saturday	13
Sunday	14

\* Did not fly (DNF) because of paperwork and bad weather conditions



**APPENDIX A-2: RANDOM GROUND SURVEY SCHEDULE (SPRING-FALL).**

## Ground Survey - CP

	Schedule week	Day	Date	Route	Start Time
Spring	Weekday 1-7 March	Monday	3/1	C	800
	Weekday 1-7 March	Tuesday	3/2	D	800
	Weekday 1-7 March	Wednesday	3/3	F	800
	Weekend 1-7 March	Saturday	3/6	D	800
	Weekend 1-7 March	Sunday	3/7	C	800
	Weekday 8-14 March	Tuesday	3/9	B	700
	Weekday 8-14 March	Friday	3/12	F	700
	Weekend 8-14 March	Saturday	3/13	D	700
	Weekend 8-14 March	Sunday	3/14	A	800
	Weekday 15-21 March	Wednesday	3/17	B	900
	Weekday 15-21 March	Friday	3/19	F	900
	Weekend 15-21 March	Saturday	3/20	A	800
	Weekend 15-21 March	Sunday	3/21	B	700
	Weekday 22-28 March	Wednesday	3/24	B	900
	Weekday 22-28 March	Friday	3/26	E	800
	Weekend 22-28 March	Saturday	3/27	A	900
	Weekend 22-28 March	Sunday	3/28	D	900
	Weekday 29-4 April	Monday	3/29	A	700
	Weekday 29-4 April	Thursday	4/1	C	700
	Weekend 29-4 April	Friday	4/2	B	800
	Weekend 29-4 April	Saturday	4/3	D	800
	Weekday 5- 11 April	Wednesday	4/7	C	800
	Weekday 5- 11 April	Friday	4/9	B	1000
	Weekend 5- 11 April	Saturday	4/10	F	1000
	Weekend 5- 11 April	Sunday	4/11	E	900
	Weekday 12-18 April	Thursday	4/15	F	700
	Weekday 12-18 April	Friday	4/16	F	900
	Weekend 12-18 April	Saturday	4/17	A	800
	Weekend 12-18 April	Sunday	4/18	B	800
	Weekday 19-25 April	Monday	4/19	F	800
	Weekday 19-25 April	Wednesday	4/21	B	900
	Weekend 19-25 April	Saturday	4/24	A	800
	Weekend 19-25 April	Sunday	4/25	C	1000
	Weekday 26-2 May	Tuesday	4/27	A	800
	Weekday 26-2 May	Friday	4/30	E	1000
	Weekend 26-2 May	Saturday	5/1	E	900
	Weekend 26-2 May	Sunday	5/2	A	800
	Weekday 3-9 May	Tuesday	5/4	B	800
	Weekday 3-9 May	Friday	5/7	A	800
	Weekend 3-9 May	Saturday	5/8	C	900
	Weekend 3-9 May	Sunday	5/9	B	700
	Weekday 10-16 May	Thursday	5/13	C	800
	Weekday 10-16 May	Friday	5/14	C	1000
	Weekend 10-16 May	Saturday	5/15	B	800
	Weekend 10-16 May	Sunday	5/16	A	900
	Weekday 17-23 May	Wednesday	5/19	A	1000
	Weekday 17-23 May	Friday	5/21	A	800
	Weekend 17-23 May	Saturday	5/22	F	900
	Weekend 17-23 May	Sunday	5/23	A	800
	Weekday 24-30 May	Monday	5/24	A	900
	Weekday 24-30 May	Friday	5/28	D	700

	Weekend 24-30 May	Saturday	5/29	A	1000
	Weekend 24-30 May	Monday	5/31	D	800
Summer	Weekday 31-6 June	Tuesday	6/1	C	900
	Weekday 31-6 June	Wednesday	6/2	F	900
	Weekday 31-6 June	Friday	6/4	B	800
	Weekend 31-6 June	Saturday	6/5	F	700
	Weekend 31-6 June	Sunday	6/6	A	1100
	Weekday 7-13 June	Tuesday	6/8	A	800
	Weekday 7-13 June	Wednesday	6/9	B	900
	Weekend 7-13 June	Saturday	6/12	E	700
	Weekend 7-13 June	Sunday	6/13	D	900
	Weekday 14-20 June	Monday	6/14	A	1000
	Weekday 14-20 June	Friday	6/18	F	800
	Weekend 14-20 June	Saturday	6/19	B	900
	Weekend 14-20 June	Sunday	6/20	B	700
	Weekday 21-27 June	Wednesday	6/23	C	700
	Weekday 21-27 June	Thursday	6/24	B	800
	Weekend 21-27 June	Saturday	6/26	B	1100
	Weekend 21-27 June	Sunday	6/27	E	800
	Weekday 28-4 July	Tuesday	6/29	A	1100
	Weekday 28-4 July	Wednesday	6/30	F	1100
	Weekend 28-4 July	Saturday	7/3	A	900
	Weekend 28-4 July	Monday	7/5	C	800
	Weekday 5-11 July	Tuesday	7/6	B	900
	Weekday 5-11 July	Wednesday	7/7	B	700
	Weekend 5-11 July	Saturday	7/10	C	900
	Weekend 5-11 July	Sunday	7/11	E	1000
	Weekday 12-18 July	Tuesday	7/13	E	800
	Weekday 12-18 July	Wednesday	7/14	D	700
	Weekend 12-18 July	Saturday	7/17	D	1100
	Weekend 12-18 July	Sunday	7/18	F	900
	Weekday 19-25 July	Monday	7/19	D	1000
	Weekday 19-25 July	Tuesday	7/20	C	1000
	Weekend 19-25 July	Saturday	7/24	B	800
	Weekend 19-25 July	Sunday	7/25	F	1000
	Weekday 26- 1 August	Monday	7/26	C	800
	Weekday 26- 1 August	Thursday	7/29	E	900
	Weekend 26- 1 August	Saturday	7/31	E	900
	Weekend 26- 1 August	Sunday	8/1	D	700
	Weekday 2-8 August	Monday	8/2	F	900
	Weekday 2-8 August	Thursday	8/5	F	700
	Weekend 2-8 August	Saturday	8/7	E	1000
	Weekend 2-8 August	Sunday	8/8	A	1000
	Weekday 9-15 August	Tuesday	8/10	D	900
	Weekday 9-15 August	Thursday	8/12	A	800
	Weekend 9-15 August	Saturday	8/14	C	700
	Weekend 9-15 August	Sunday	8/15	E	800
	Weekday 16-22 August	Wednesday	8/18	A	700
	Weekday 16-22 August	Friday	8/20	C	900
	Weekend 16-22 August	Saturday	8/21	E	900
	Weekend 16-22 August	Sunday	8/22	E	700
	Weekday 23-29 August	Wednesday	8/25	D	1000
	Weekday 23-29 August	Thursday	8/26	A	800
	Weekend 23-29 August	Saturday	8/28	A	900

	Weekend 23-29 August	Sunday	8/29	C	800
	Weekday 30-5 Sept.	Wednesday	9/1	A	1000
	Weekday 30-5 Sept.	Friday	9/3	B	800
	Weekend 30-5 Sept.	Saturday	9/4	B	900
	Weekend 30-5 Sept.	Sunday	9/5	E	900
Fall	Weekday 6-12 Sept.	Thursday	9/9	E	800
	Weekday 6-12 Sept.	Friday	9/10	F	900
	Weekend 6-12 Sept.	Saturday	9/11	F	700
	Weekend 6-12 Sept.	Sunday	9/12	B	900
	Weekday 13-19 Sept.	Wednesday	9/15	E	900
	Weekday 13-19 Sept.	Thursday	9/16	A	700
	Weekend 13-19 Sept.	Saturday	9/18	D	900
	Weekend 13-19 Sept.	Sunday	9/19	E	800
	Weekday 20-26 Sept.	Monday	9/20	E	800
	Weekday 20-26 Sept.	Friday	9/24	B	700
	Weekend 20-26 Sept.	Saturday	9/25	B	900
	Weekend 20-26 Sept.	Sunday	9/26	A	800
	Weekday 27-3 Oct.	Monday	9/27	C	900
	Weekday 27-3 Oct.	Friday	10/1	F	900
	Weekend 27-3 Oct.	Saturday	10/2	A	700
	Weekend 27-3 Oct.	Sunday	10/3	E	700
	Weekday 4-10 Oct	Tuesday	10/5	A	800
	Weekday 4-10 Oct	Friday	10/8	C	800
	Weekend 4-10 Oct	Saturday	10/9	E	800
	Weekend 4-10 Oct	Sunday	10/10	D	700
	Weekday 11-17 Oct.	Monday	10/11	D	800
	Weekday 11-17 Oct.	Friday	10/15	E	700
	Weekend 11-17 Oct.	Saturday	10/16	D	800
	Weekend 11-17 Oct.	Sunday	10/17	C	700
	Weekday 18-24 Oct.	Wednesday	10/20	D	800
	Weekday 18-24 Oct.	Thursday	10/21	C	800
	Weekend 18-24 Oct.	Saturday	10/23	E	800
	Weekend 18-24 Oct.	Sunday	10/24	D	800
	Weekday 25-31 Oct.	Tuesday	10/26	A	800
	Weekday 25-31 Oct.	Thursday	10/28	D	700
	Weekend 25-31 Oct.	Saturday	10/30	C	800
	Weekend 25-31 Oct.	Sunday	10/31	B	800
	Weekday 1-7 Nov.	Monday	11/1	A	700
	Weekday 1-7 Nov.	Friday	11/5	A	800
	Weekend 1-7 Nov.	Saturday	11/6	F	700
	Weekend 1-7 Nov.	Sunday	11/7	D	700
	Weekday 8-14 Nov.	Wednesday	11/10	C	700
	Weekday 8-14 Nov.	Thursday	11/11	F	700
	Weekend 8-14 Nov.	Saturday	11/13	F	700
	Weekend 8-14 Nov.	Sunday	11/14	F	700
	Weekday 15-21 Nov.	Monday	11/15	A	700
	Weekday 15-21 Nov.	Friday	11/19	C	700
	Weekend 15-21 Nov.	Saturday	11/20	A	700
	Weekend 15-21 Nov.	Sunday	11/21	C	700
	Weekday 22-28 Nov.	Monday	11/22	C	700
	Weekday 22-28 Nov.	Tuesday	11/23	E	700
	Weekend 22-28 Nov.	Saturday	11/27	B	700
	Weekend 22-28 Nov.	Sunday	11/28	A	700

**APPENDIX A-3: RANDOM GROUND SURVEY SCHEDULE (WINTER).**

# Winter Ground Survey - CP

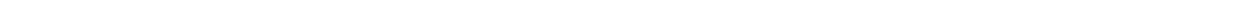
Starting Location -

	Survey Week	Day	Date	Route	Start Time
Winter	Weekday 29-5 Dec.	Wednesday	12/1	B	800
	Weekday 29-5 Dec.	Thursday	12/2	E	800
	Weekend 29-5 Dec.	Saturday	12/4	F	800
	Weekend 29-5 Dec.	Sunday	12/5	A	800
	Weekday 6-12 Dec.	Wednesday	12/8	G	800
	Weekday 6-12 Dec.	Friday	12/10	B	800
	Weekend 6-12 Dec.	Saturday	12/11	A	800
	Weekend 6-12 Dec.	Sunday	12/12	B	800
	Weekday 13-19 Dec.	Tuesday	12/14	E	800
	Weekday 13-19 Dec.	Thursday	12/16	B	800
	Weekend 13-19 Dec.	Saturday	12/18	G	800
	Weekend 13-19 Dec.	Sunday	12/19	A	800
	Weekday 20-26 Dec.	Monday	12/20	D	800
	Weekday 20-26 Dec.	Tuesday	12/21	D	800
	Weekend 20-26 Dec.	Friday	12/24	E	800
	Weekend 20-26 Dec.	Sunday	12/26	A	800
	Weekday 27-2 Jan.	Tuesday	12/28	F	800
	Weekday 27-2 Jan.	Friday	12/31	G	800
	Weekend 27-2 Jan.	Saturday	1/1	F	800
	Weekend 27-2 Jan.	Sunday	1/2	G	800
	Weekday 3-9 Jan.	Wednesday	1/5	A	800
	Weekday 3-9 Jan.	Thursday	1/6	F	800
	Weekend 3-9 Jan.	Saturday	1/8	G	800
	Weekend 3-9 Jan.	Sunday	1/9	F	800
	Weekday 10-16 Jan.	Monday	1/10	D	800
	Weekday 10-16 Jan.	Thursday	1/13	C	800
	Weekend 10-16 Jan.	Saturday	1/15	F	800
	Weekend 10-16 Jan.	Monday	1/17	B	800
	Weekday 17-23 Jan.	Tuesday	1/18	C	800
	Weekday 17-23 Jan.	Wednesday	1/19	A	800
	Weekend 17-23 Jan.	Saturday	1/22	B	800
	Weekend 17-23 Jan.	Sunday	1/23	D	800
	Weekday 24-30 Jan.	Tuesday	1/25	D	800
	Weekday 24-30 Jan.	Thursday	1/27	A	800
	Weekend 24-30 Jan.	Saturday	1/29	A	800
	Weekend 24-30 Jan.	Sunday	1/30	A	800
	Weekday 31-6 Feb.	Wednesday	2/2	G	800
	Weekday 31-6 Feb.	Friday	2/4	B	800
	Weekend 31-6 Feb.	Saturday	2/5	A	800
	Weekend 31-6 Feb.	Sunday	2/6	B	800
	Weekday 7-13 Feb.	Monday	2/7	E	800
	Weekday 7-13 Feb.	Tuesday	2/8	C	800
Weekend 7-13 Feb.	Saturday	2/12	F	800	
Weekend 7-13 Feb.	Sunday	2/13	B	800	
Weekday 14-20 Feb.	Tuesday	2/15	C	800	
Weekday 14-20 Feb.	Thursday	2/17	F	800	
Weekend 14-20 Feb.	Saturday	2/19	E	800	
Weekend 14-20 Feb.	Sunday	2/20	F	800	
Weekday 21-27 Feb.	Tuesday	2/22	E	800	
Weekday 21-27 Feb.	Thursday	2/24	E	800	
Weekend 21-27 Feb.	Saturday	2/26	C	800	
Weekend 21-27 Feb.	Sunday	2/27	C	800	

**APPENDIX B-1: STANDARD OPERATING PROCEDURE.**

**Standard Operating Procedures for the Exelon Susquehanna River Creel Survey for the  
Conowingo Project, 2010-2011**

**DRAFT**





## TABLE OF CONTENTS

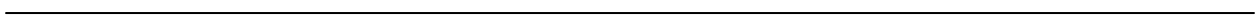
1.0	Introduction.....	5
1.1	General Approach.....	5
1.2	Fisheries Objectives and General Procedure for Selecting Anglers for Interview .....	8
1.3	Recreational Survey Objectives.....	<b>Error! Bookmark not defined.</b>
2.0	Creel and Recreational Survey Data Collection Sites.....	11
3.0	Basics of Data Collection.....	14
3.1	Fisheries-Creel Survey.....	<b>Error! Bookmark not defined.</b>
3.1.1	Shore-Angler Surveys.....	<b>Error! Bookmark not defined.</b>
3.1.2	Boat Angler Surveys .....	15
3.1.3	Additional Biological Data and Method of Coding Samples.....	16
3.2	Recreational Survey.....	<b>Error! Bookmark not defined.</b>
3.3	Aerial Survey of Boats Used for Fishing .....	17
3.4	Conditions Where There is Potential to Modify Procedure for the Creel Study South- North- and Boat Ramp Routes in Fall-Winter .....	<b>Error! Bookmark not defined.</b>
3.4.1	Revision to the South-Route SOP Caused by Potential Fall-Winter Conditions.....	<b>Error! Bookmark not defined.</b>
3.4.2	Semi-Permanent Variation in the SOP.....	<b>Error! Bookmark not defined.</b>
3.4.3	Conditional Fall-Winter Procedures .....	<b>Error! Bookmark not defined.</b>
3.4.4	General Objectives.....	<b>Error! Bookmark not defined.</b>
3.4.5	Safety .....	<b>Error! Bookmark not defined.</b>
3.4.6	North and Boat Routes.....	<b>Error! Bookmark not defined.</b>
4.0	Schedules and Creel Routes .....	18
5.0	Data Custody.....	19
6.0	Safety .....	19
7.0	Example Creel Survey Interview Introduction to Anglers.....	19
8.0	Phone Numbers.....	20
8.1	Police and Exelon Security and Related Phone Numbers .....	20
8.2	Creel Personnel Phone Numbers .....	20
9.0	Route-Site Directions .....	21

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## **ATTACHMENTS**

A - Data Forms and Coding Manual

B - Site Descriptions, Routes, Driving Directions



## **1.0 INTRODUCTION**

### **1.1 General Approach**

The data forms associated with this standard operating procedure (SOP) are designed to document the fisheries and recreational use of the resources associated with the Conowingo Project on the Susquehanna River. The Conowingo Project consists of distinct survey reaches below and above Conowingo Dam. The Susquehanna River is located at the head of the Chesapeake Bay and defined in this study as extending from the river mouth at the lowermost railroad bridge (Amtrak) to the tailrace of Conowingo Dam and, above the dam, from the boating limit located in Conowingo Pond upriver to the PA state road 372 bridge (Norman Wood Bridge), including both east and west river banks. Normandeau personnel will collect angler data, catch data, and supporting information which will assist the Exelon in their re-licensing of the Conowingo Project.

This SOP was prepared to provide field personnel general criteria for making on-site decisions related to data collection and as a guide to completing data forms. The data forms provide a script, via data-fields, to prompt technicians to the questions to be asked of anglers, and to document angler responses. The SOP also describes the objectives of the creel study. Understanding study objectives will assist field personnel in the appropriate application of the procedures outlined below.

This SOP includes the following attached data forms and related materials:

- Form DCS.10, Susquehanna River Creel Survey Site Count Form;
- Form GSF.10, (a single-sided, 1 page form), Susquehanna River Creel Survey Interview Data Sheet; and
- Form ASF2.10, Conowingo Project Aerial Survey.
- The coding instructions specific to these forms.
- Information on access sites in the survey

Note that it is possible data forms or coding instructions will be revised as the project progresses to reflect collection of more appropriate data. Coding manuals are typically "living documents" and designed to accommodate flexible survey needs. Creel technicians will be informed as soon as possible about changes

in data collection or recording. Unused, older data forms should be properly discarded upon receipt of revised forms. Technicians will be notified promptly if any there have been any revisions to the survey forms. Revision numbers (e.g., Form GSF.11, ...13, etc.) appear in the title of the form. Depending on the type of revision to a form the SOP may or may not be revised.

It is intended that personnel working on this project, through training, will be familiar with the forms and data fields prior to reviewing the SOP. Normandeau personnel must understand the type of data to be entered, specific to each data-field in a form, prior to data collection.

Although all study personnel work for Normandeau, they indirectly represent Gomez and Sullivan Engineers and Exelon. Creel technicians should always be courteous, and in the event an angler declines an interview or is belligerent in any way thank them for their time and move to the next angler/boat. An example of a verbal introduction a creel technician can use when approaching an angler is presented in Section 7.0. If anglers request details of the study beyond those found in this SOP the technician can direct them to contact Mr. Bob Judge of Exelon Public Affairs at 610-765-5331

Recreational and creel data will be obtained at numerous sites on the lower Susquehanna River below Conowingo Dam (see map, Figure 1) or on Conowingo Pond (see map, Figure 2). At prescribed sites creel data will be collected from individual shore/boat anglers or shore/boat fishing parties when they are finished fishing, or by a roving survey option, which allow interviews during low angler abundance. A roving survey yields mostly incomplete-trip interviews of shore anglers. Completed trip interviews will occur as shore or boat anglers exit a site. Interviews will be obtained from each individual or party that is shore/boat fishing or exiting a site as time permits. The type of interview, complete or incomplete, will be noted on the data sheet (GSF.10).

For boat anglers the creel technician will collect data from an individual who represents all persons aboard (e.g., a charter-boat captain, or party spokesman) and presents the boats' catch data collectively. The boat interviews will typically occur when a boat has returned from a fishing trip (a completed trip survey). Interruptions greater than 30 minutes in boat fishing to return for gas or lunch, or to pick up additional passengers, should be treated as break in fishing and recorded as a completed trip.

The Creel Survey Form GSF.10 is universal for conducting boat or shore angler interviews. However, not all fields are used at each site or in every type of interview. During some site visits a Form GSF.10 will be filled out for a boat survey but another GSF.10 might be filled out for a shore angler interview. When no anglers are present during the period of a site visit only the appropriate space on the Site Count Form (DCS.10) needs to be completed for that site.

The boat and shoreline angler surveys will be completed a minimum of 4 days per week from March 1, 2010 through November 30, 2010. (Note: a winter angling survey will be conducted on Conowingo Pond only during 1 December 2010 to 28 February 2011. Procedures may differ slightly for the winter survey). During most weeks, two weekday surveys and both weekend days will be scheduled. Surveys can also occur on holiday weekends (e.g., Memorial Day, July 4<sup>th</sup>, Labor Day), where two of the three days will be surveyed. A fishing day is defined to start no later than 0700 h and extends until 2100 h, at the latest. Clerks must move along a prescribed route on a time schedule to visit the required number of sites within a shift. Specific shift times for surveys will vary depending upon random selection of an initial start time for the day and seasonal day length. A survey day will consist of a 10-hour day including defined location times, including travel time between sites. The daily start time selected must accommodate all interview periods and required travel time. Thus, a daily start time will occur between 0700 and 1100 h, and be finished between 1700 and 2100 h. A monthly schedule will specify survey start times reflecting varying day length throughout the survey period. Based on the monthly schedule that specifies start time, wait times, and estimated travel times between sites, the technician will determine when to leave a site and proceed to the next site.

Aerial (helicopter) surveys to count shore anglers and fishing boats will be completed once a week on alternating weekend/holiday and weekday daytypes, with additional specified opening day surveys. Due to design considerations flights may occur during morning (0700-1100 h), mid-day (e.g. 1100-1500 h), or evening (1500-1900 h). The lower Susquehanna River below Conowingo Dam will be partitioned for counts into three reaches termed tidal, non-tidal, and tailrace (Figure 1). Conowingo Pond will be partitioned for counts into two reaches termed Maryland and Pennsylvania (Figure 2). Within the Conowingo Pond in Maryland, three sub-areas exist termed Funks Pond, Conowingo Creek, and Broad Creek. The Conowingo Pond-Pennsylvania portion will have a sub-area termed Peach Bottom Plume. The number of shore anglers and fishing boats will be identified and summed separately for each count area or sub-area.

## **1.2 Fisheries Objectives and General Procedure for Selecting Anglers for Interview**

The main objective of the field creel survey is to obtain the most accurate and precise angler catch data as possible. These data will be used along with fishing effort data to estimate catch and harvest. To accomplish these objectives Exelon needs creel survey personnel at shore and boat ramp sites to obtain interview information from boat and shore anglers returning from a fishing trip. The time spent fishing and the number and species of fish caught and harvested (i.e., number of fish kept and not returned to the water) by the angler(s) are the most important data for the creel study and are to be documented on survey-specific data forms. These data are used to, among other things, estimate the catch-per-unit-effort (CPUE) and ultimately the estimated fish harvest from the Susquehanna River.

For each daily survey, note the arrival time at the scheduled access site on Form DCS.10. A second data sheet, Form GSF.10 (one form per angler or angling party) will be completed only when an interview is attempted or completed (i.e., if there are no anglers at a site during a shift, Form GSF.10 will NOT be filled in for that site). The types of fisheries and related data to be placed in data fields on Form DCS.10 and GSF.10 are relatively straightforward as scripted. Some data will be provided by the creel clerk (e.g., place and time of interview) and other data will be obtained from the angler (e.g., number and species of fish caught, length of time fished and biological data). At the conclusion of the wait period at a site, record the total number of anglers that were interviewed (complete and incomplete fishing trips) by fishing mode (shore or boat) at that site during the wait period on the DCS.10 Form. The summed total will represent all anglers or a subsample that were interviewed. Record all angler interview data on Form GSF.10.

Interviews will be completed for all anglers at a site or a subset of these anglers (subsample) as time permits. At times during the interview period, high activity will not permit effective interviews of all anglers exiting a site. During these instances, the creel clerk will systematically select which shore anglers to interview or boat anglers to interview. If there are more anglers or parties completing trips and exiting a site than can be interviewed, the technician might elect to interview every second, third or fourth angler or angler party and so on. When time is limiting it is not necessary to interview all anglers. It is more important to get a complete and accurate set of data from each angler or party interviewed. The fishing success of anglers will also extend the time needed per interview as will any collection of biological data (see Section 3.0).

**NOTE:** if the creel clerk determines that an angler's statements seem purposely misleading or unrealistic, it should be noted on the "comments" line as suspicious data and/or field voided in consultation with the project manager. For purposes of safety and data integrity technicians will avoid contact with persons who are obviously intoxicated or belligerent.

Biological data collection (fish lengths) is important, but it is not necessary to obtain this information from the fish of all anglers (boat or shore) interviewed except as time permits. Collection of biological data should be minimized (2-3 anglers/parties per site will be adequate if angler sub-sampling is necessary) or eliminated when it will prevent interviews of anglers who are in a hurry to leave. Fish measurements should be obtained only after an angler grants permission.





## **2.0 CREEL SURVEY DATA COLLECTION SITES**

### **Below Conowingo Dam**

Creel data are to be collected from boat anglers returning to public boat launch sites and marinas in the Conowingo Project on the lower Susquehanna River (boat interviews are completed trips). Angler interviews will also be collected from shore anglers completing trips fishing (i.e., returning to vehicle), or actively fishing (incomplete trip) at these 13 sites below the Conowingo Project.

#### **Conowingo Dam Tailrace (non-tidal)**

- Fisherman's Park/Conowingo tailrace
- Shures landing/ hiking trail
- Mouth of Octoraro Creek

Fisherman's Park and Shures Landing are along the west shoreline (Harford County) (see Figure 1); Octoraro Creek is along the east shoreline (Cecil County).

#### **Tidal Susquehanna River**

- Mouth of Deer Creek
- Old Mill Area
- Lapidum ramp/shoreline
- McLhinney Park
- Jean Roberts Park ramp/shoreline
- Perryville Municipal ramp
- Owens Marina Ramp
- Port Deposit Municipal ramp/shoreline
- Rock Run Marina
- Port Deposit VFW

The first five listed sites in tidal water are along the west shoreline (Harford County) (see Figure 1); Deer Creek, Old Mill, and Lapidum are in Susquehanna State Park. The remaining sites are along the east shoreline (Cecil County).

### **Above Conowingo Dam**

Creel data (completed trip boat interviews) are to be collected from anglers returning to the public boat launch sites and marinas on Conowingo Pond. Creel angler interviews (complete and incomplete trip) will also be collected from anglers fishing from shore at these 10 sites above the Conowingo Project.

#### **In Pennsylvania**

- Muddy Creek PFBC Access/shoreline at Lock 15
- Coal Cabin ramp/Peach Bottom township park
- Dorsey Park ramp/shoreline
- Peach Bottom Marina (Peter's Creek) and RR tracks
- Wissler's Run Park

The first three sites listed above are along the west shoreline (York County) (see Figure 2); the last two sites are along the east shoreline (Lancaster County).

#### **In Maryland**

- Line Bridge Road
- Broad Creek ramp/shoreline
- Glen Cove Marina
- Funks Pond
- Conowingo Creek ramp/shoreline

The first three listed sites are along the west shoreline (Harford County) (see Figure 2); the last two sites are along the east shoreline (Cecil County).

Attachment B provides directions to each boat ramp and shore angling site. The sites are grouped geographically into routes for the daily creel surveys. A survey day can consist of interviews with boat and shore anglers at a given site as well as only boat or only shore surveys at other sites. Attachment B also provides site data codes, and information that facilitates the sampling approach for each site. (Note: the routes were designed to avoid tolls on the Rt. 40 bridge. A non-toll crossing does exist from Perryville to Havre de Grace traveling westward only).

### **3.0 BASICS OF CREEL SURVEY DATA COLLECTION**

#### **3.1 Shore Angler Surveys**

Data related to angler surveys are to be collected by the technician and recorded as appropriate on survey-specific forms listed in Section 1. The headings for data fields on the forms typically provide direction relative to the type of information that will be placed in a field. For all angler interviews, as scripted on the creel data forms, questions will be asked such as what fish species they sought (targeted), duration of the fishing trip, whether the trip is a complete or incomplete, total number by species of fish kept, and the number by species of fish released.

Survey form DCS.10 will be filled out each day for each survey route. The form is intended to record information such as survey type, site name, time the site is visited, and the count of anglers interviewed by fishing method at each site visited as the survey progresses. Survey form GSF.10 will be completed only when an interview is attempted. The coding manual provided as Attachment B describes how each data field should be completed in the field.

Form DCS.10 will be reviewed at the end of each site visit and at the end of a shift to ensure that all applicable fields on that form are completed as appropriate. When interview form GSF.10 has been used, it will be reviewed at the end of EACH interview to immediately ensure that all applicable fields on that form are completed as appropriate. Pencils will be used to record data. If errors are found, the technician will strike through the error and write the correction and date beside the strike. Do not erase errors.

#### **3.1 Shore Angler Surveys**

Shore fishing surveys will yield many incomplete-trip interviews (anglers remain actively fishing), but can also intercept anglers that are quitting (complete trips). After an angler provides the primary information (e.g., target species, time spent fishing, catch), with permission the total length (TL) of any harvested fish may be recorded. When time permits, length data from all game fish harvested will be collected. Game fish encountered will include striped bass, smallmouth bass, largemouth bass, walleye, channel catfish, and flathead catfish. When anglers

are numerous and the measuring process impacts collection of fish catch data from other anglers, the technician will randomly sub-sample anglers to interview and/or the anglers from which to obtain fish lengths and other biological data. Alternatively, the technician may randomly subsample (i.e. avoid intentional selection of the largest or smallest individuals) a portion of the retained catch.

This SOP provides flexibility for technicians during surveys at sites with both shore and boat angling activity. The primary goal at such sites is to obtain completed-trip interviews of both angler types. However, near the end of the prescribed wait time at an access site, the technician may obtain interviews from available shore anglers actively fishing. Such incomplete trip interviews should not be obtained at the expense of additional completed trip interviews.

### **3.2 Boat Angler Surveys**

The interview data forms for boat surveys are identical to those used for shore anglers (review Section 3.1), although there are differences in interview procedures. The form GSF.10 was designed to accommodate these differences. Foremost is the need to determine from the angler or party spokesman where the party fished. A map of the survey area will be used to help the angler identify river locations where he fished. If the boat anglers have fished all or a portion of their trip in the Chesapeake Bay or Susquehanna Flats (south of the Havre de Grace Amtrak bridge), the party should be interviewed and the location noted appropriately on the interview sheet. These anglers will be treated separately.

Boat fishing is often completed by a group of anglers (an angling party) and catch data such as targeted species, number caught and kept, etc. are to be reported for the party. However, the data will be normally obtained from an individual on the boat who represents all persons aboard as a spokesman (could also be a charter boat captain), though the total number of anglers in the boat party is to be recorded.

Boat interviews will typically occur when a boat has returned from a fishing trip (a completed trip survey). In addition, for most boat fishing surveys an interruption in fishing for fuel or food that involves a return to the launch ramp or marina for more than 30 minutes is a significant break in

fishing and thus the trip can be considered complete to that point. The type of trip (complete) will always be noted in the appropriate field on the data form. The residence of the angler(s), (e.g., zip codes, or city/state) will be obtained. However, a charter boat captain's residence is not to be included on the data form, except where it is the same as one or more of his clients.

Launch conditions and traffic at the time of the interview can dictate where and how an interview is conducted. If there are few or no other boats waiting to use the dock facilities the technician can interview the boat angler(s) as the opportunity is presented at the launch. If the launch is busy, the technician will try to record the interview data after the boat has been loaded on the trailer and pulled to a convenient and safe location (tie-down). At no time shall the technician's activities impede the use of the launch facilities by other parties or endanger themselves or others.

If a boat party indicates they have fished the Susquehanna River and also below the Amtrak Bridge at the mouth of the Susquehanna River (on the Flats) but they cannot determine the length of time at each site and/or which fish were caught where, the data they could provide cannot be used. The technician should end the interview, noting the attempt to interview on form GSF.10, and thank the anglers. If, in the technician's opinion, a group of anglers are providing a reasonable estimate of the species and number of fish caught, kept, and returned, their information can be included in the data form and will be considered valid.

### **3.3 Additional Biological Data and Method of Coding Samples**

Biological data (i.e., in addition to measuring total length, TL) will be collected opportunistically for the following species as listed below.

- Smallmouth bass--TL plus number legal and number sub-legal released.
- Largemouth bass-- TL plus number legal and number sub-legal released.
- Striped bass-- TL plus number legal and number sub-legal released.
- Yellow perch-- TL plus number released.

- Walleye--TL only
- Channel catfish—TL only
- Flathead catfish—TL only

Individual fish species data codes are listed on the bottom of Form GSF.10. Instructions for coding length and released fish data are including in the GSF.10 coding manual (Attachment B). Additional information to facilitate biological data collection is provided in the Coding Manual.

### **3.4 Aerial Survey of Boats Used for Fishing**

Instantaneous aerial counts will be conducted on one randomly chosen day each week. A 50/50 split between weekday and weekend/holiday strata will be obtained by alternating daytypes throughout the season along with the opening days. Two aerial surveys on designated “opening days” are also scheduled. These include: special striped bass catch and release season, March 1; regular striped bass harvest season, June 1). All fishing boats on the Susquehanna River will be counted. Non-fishing recreational boats (e.g., water skiing, swimming) may be noted. No counts are necessary of commercial boat traffic or tour boats, if any.

Two categories of fishing boat will be recognized: (1) boats actively engaged in fishing, and (2) boats underway (in transit). A vessel (boat, canoe, kayak) will be considered a fishing boat actively engaged in fishing if any of its occupants are observed holding a fishing rod, landing net, or a fish. A slowly moving boat without a visible wake will also be considered actively fishing if downriggers are deployed, or occupants are drift fishing or trolling but not holding equipment or fish. A vessel will be considered a fishing boat underway if none of its occupants are observed holding a fishing rod, landing net, or fish, but if the boat is observed to have downriggers or fishing rods on board and is producing an obvious, visible wake. All other vessels will be considered non-fishing boats.

Boat counts will be recorded separately on form ASF2.10 for two segments of the Conowingo Project (Figures 1 and 2): the lower Susquehanna River (Amtrak Bridge in Havre de Grace north

to the Conowingo Dam); and the Conowingo Pond (Conowingo Dam north to PA state road 372, Norman Wood Bridge). A laminated map will aid counters during flights.

### **3.5 Creel Survey Journals**

Field technicians will maintain a daily log of their activity in a journal. The purpose is to provide information that will assist interpretation of the formal survey data. For each daily survey the date, time, and survey location (Lower Susquehanna River or Conowingo Pond) will be noted. Anecdotal information and observations by the creel clerk or angler that augment the formal data recorded on survey forms should be recorded and noted by access point. Such information may include weather conditions that affect fishing activity, favored fishing locations, angler remarks about river conditions and fishing, etc.

### **4.0 SCHEDULES AND CREEL SURVEY ROUTES**

The schedule for the creel survey is a separate document that identifies the personnel, dates, shift times, and randomly selected starting locations for the daily creel surveys. The aerial count survey schedule is found in the same document. Flight schedules may be modified either due to bad weather and/or equipment malfunctions. Ground survey schedules were developed to maximize interview time but also to respond to clerk observations. The schedules will provide information on survey start times, sites to be visited, routes of travel, time intervals at each site on a route or survey, etc. Directions to sites are provided in Section 9, Attachment C. All creel technicians will consult the schedules to determine their daily responsibilities.

The creel survey will be conducted at each site on a route for a set prescribed time. The length of a creel survey day will be no longer than 10 hours but not starting before 0700 h and not ending after 2100 h. Route information including: specific route (order of sites), starting time, wait time for each site, and estimated travel time between sites is provided in Attachment C. It is the technician's responsibility to calculate the clock times for arrival and departure from an access point based on initial survey start time, wait time, and estimated travel time to the next site.



Interviews will not be initiated if they cannot be completed prior to ending time. For safety, all interviews and site visits will end and the technicians will be at their vehicle prior to darkness.

## **5.0 DATA CUSTODY**

Data sheets will be retained by the technician until delivered to specific locations identified by the Field Crew Leader (FCL) or picked up in the field by the FCL. Preliminary data delivery locations are Normandeau's Muddy Run Laboratory and the West Fish Lift trailer when on-site at Conowingo Dam. (Note: the trailer is expected to be at the dam through at least October). When Muddy Run Lab is open, completed data sheet sets may be delivered to Terry Euston, Mike Martinek, or Sid Graver. On weekends or after hours, a drop box is available inside the entry-way at the north end of the building. A similar site inside the West Lift trailer will be identified; an access key to the trailer will be available inside the Conowingo guard shed with proper ID.

The number and kinds of sheets delivered or transferred will be documented, dated and all parties involved will initial the transfer(s). Following review by the FCL, all original data forms and a data custody cover sheet will be sent to a permanent Normandeau office location for data entry and storage.

## **6.0 SAFETY**

Creel survey technicians will receive Exelon safety training and materials prior to survey start-up. Technicians will be cognizant of surroundings, suspicious people in the area, weather and footing (ice/snow/mud), and rising water conditions. Technicians are not to place themselves in situations where their safety is in undue jeopardy. Be aware of cell phone usage while driving and the laws about this in each state. Section 8 of the SOP provides lists of phone numbers for local emergencies (911) and various Exelon Security numbers. Use them in an emergency or if in danger. Survey field personnel should call the FCL with any questions.

## **7.0 EXAMPLE CREEL SURVEY INTERVIEW INTRODUCTION TO ANGLERS**

An example approach for initiating a boat or shore interview is:

“Hello, I work for Normandeau Associates and I’m conducting a fisheries survey on behalf of Exelon Power. If you have a few minutes I’d like to ask some general questions about your fishing trip today.” Proceed with the interview only if permission is granted. If, during the interview, anglers ask for more specifics on the Conowingo Power Project or the reasons for the survey, direct them to call Mr. Bob Judge at (610) 765-5331.

If an individual is not interested, thank them and move to the next. The approach is to always be courteous, even if the angler is not. If the angler agrees to the interview, ask the questions listed on the creel forms as appropriate. **NOTE:** When conducting an interview, do not delay anglers or boats if there are other boats waiting to use the launch.

When finished with the main portion of the interview, and the angler has kept some fish, ask:

“Do you mind if I take length measurements of your fish?” Respect their decision to decline. Also, if the creel clerk observes that the angler has misidentified a fish, or harvested a species during a closed season, note this discretely on the data sheet and correct it after the interview. It is not necessary and may even be detrimental to “correct” the angler. Use discretion.

## **8.0 PHONE NUMBERS**

### **8.1 Police, Exelon Security, and Related Phone Numbers**

Police Emergency, any jurisdiction **911**

Conowingo Dam Control Room 410-457-2422

Exelon-Peach Bottom Security 717-456-4212

Exelon-Peach Bottom Control Room 717-456-4221

Exelon Public Relations Contact – Bob Judge 610-765-5331

### **8.2 Creel Personnel Phone Numbers**

Michael Martinek, FCL, cell 410-937-6461; office 717-548-6416

Normandeau Associates-Muddy Run, PA 717-548-2121; FAX 717-548-2592

Terry Euston--home phone 717-464-4455; office direct 717-548-6439

Add staff-cell; home

## **9.0 ROUTE AND SITE DIRECTIONS; SITE LIMITS**

See Attachment B.

**APPENDIX B-2: CODING MANUAL.**

# 2010 Coding instructions for Susquehanna River Creel Survey

General information for coding data forms.

Leading zeros are not necessary. Time and date are always 4 and 6 digits respectively. Do not add decimals, if a decimal is required, it will be hard coded on the form. Where there are decimal fields, if the number is a whole number, a "0" must be coded in the decimal field. It is not necessary to slash "0's". Time is always recorded as military, 24 h clock. If a number is incorrect and needs to be changed, strike through the incorrect number and write the correct number adjacent.

It will be the responsibility of the creel clerk to review his/her forms for legibility, completeness and accuracy at the completion of each day before surrendering the data.

Common abbreviations used in this manual are: h = hour; LSR = Lower Susquehanna River, below dam to railroad bridge; Susq. = Susquehanna; MRRL = Muddy Run Recreational Lake; CP = Conowingo Pond.

## GROUND SURVEY INTERVIEW FORM (GSF.10)

The top part of the GSF is the header information, and the middle part of the GSF is the catch information. The header and catch info *is a total for the party*.

If additional pages are required, no matter what the reason i.e. additional zip codes, additional fish info - **only shaded areas on the header part of the GSF will be repeated onto additional pages.**

Page__of__	number of pages; usually will be 1 of 1; if there are more than 10 species caught or length information is for more than 10 fish, complete page 2 with the exact angler information and complete the additional catch information; if more than one county or state is represented in the interview sequence, use as many pages as needed to code all counties, states/countries ( <i>not in the database</i> ), if there are 2 fishing methods (shore and boat) use 2 pages and code appropriately
Client Code	1342 client code is hard coded; <i>not in the database</i>
Investigator Initials	record appropriate initials of person completing the form
Sample Date	Six digit number, month, day, year
Interview Location Description _____	refer to code list or map/chart for appropriate code write the location name ( <i>not in the database</i> )
Fishing Mode	appropriate code from list; boat includes canoe, kayak; shore includes wading, tubing; dip net is fishing by net of any kind
Fishing Location	appropriate code from list; codes 1-5 represent LSR; 6-8 are CP; 9 is MRRL
Weather Code	appropriate code (one) from the list provided; dark is not a code-judge from the sky the same as during the day; if wind is a factor make note in the margin.
Angler Count	total number of anglers in <i>party</i>
Party Interview Identifier	number sequentially by day, begin with 1, number to as many interviews as

completed **that day**, identifier will be unique for each interview. When within the party there are more than three (3) different zip codes for cities, states or countries, then the party identifier will remain the same for all pages needed to complete additional city, state or country information. All pages are from the same interview therefore, the identifier will remain the same for all pages. Shaded areas will be repeated on additional pages. Catch information *is for the entire party* (no matter how many pages are required to get the county, state or country information) and will be completed only **once** on the first page; the page numbers should reflect the number of pages needed to complete all the information. **Remember** catch information *is for the entire party*, not by county, so if more than 11 species are caught and additional pages are needed, the catch may be recorded on page 2. **Catch information is never duplicated** on the data form. **Note:** only information written in the blocks will be entered into the database, if there are 2 answers to the same field, additional forms must be completed.

Interview Start Time	beginning time of interview (24 h clock, 4 digits required)
Fishing Start Time	time anglers started fishing (24 h clock, 4 digits), if time is for the previous day code with "H" in Remarks Codes
Fishing Stop Time	time anglers stopped fishing if trip is complete (24 h clock, 4 digits), if incomplete leave time blank
Trip Complete	appropriate code for yes or no; <b>must be recorded</b>
Tournament	appropriate code from list
Primary Species Sought	appropriate species code, refer to bottom of GSF or species code list
Zip #1	appropriate Zip code, use this if all in the party are from the same city; refer to Party Identifier instructions.
City/State/Country	appropriate City, State or Country corresponding to the zip code. Refer to Party Identifier instructions.
# at Zip #1	<b>total number in the party</b> , that are fishing residing at the zipcode as recorded in Zip #1
Zip #2	if needed, appropriate zipcode if persons in the party are from a different city.
City/State/Country	appropriate City, State or Country corresponding to the zip code. Refer to Party Identifier instructions.
# at Zip #2	<b>total number in the party</b> , that are fishing residing at the zipcode as recorded in Zip #2

Zip #3	if needed, appropriate zipcode if persons in the party are from a different city.
City/State/Country	appropriate City, State or Country corresponding to the zip code. Refer to Party Identifier instructions.
# at Zip #3	<b>total number in the party</b> , that are fishing residing at the zipcode as recorded in Zip #3

**Total Catch Information for Party**

Remember, catch information is only recorded once regardless of the number of pages needed to complete the county, state or country information.

Species Name	common name of fish; useful if species code is not known at the time of interview ( <i>not in the database</i> )
Species Code	appropriate code from species list (refer to laminated or master for complete list of common names and codes)
Length	length will be recorded as Total Length to the nearest inch, (tape measure); angler estimated lengths may be recorded in inches for striped bass, small and large mouth bass; if no length is available or for a large number of fish(> 10) record count only. <b>DO NOT record a length range</b> i.e. 10 to 15 inches. Length will be recorded (not estimated) for striped bass during the catch and release season, After June 1, record legal length of kept fish, number of legal released and number sub-legal released fish.
Comments	notes concerning the specific fish ( <i>not in the database</i> ) This area may be used to tally (tick marks) multiple fish with the same length.
Measured Count	measured count will be the total fish at that length measurement; most often will be "1"; if multiple fish with the same length have been measured and tick marks are recorded in the comments section, the measured count will be the sum of the tick marks for that length; if no fish are measured (interval code 00), measured count will be blank; if released fish length has been estimated by the angler and a length is recorded, use interval 25.
Release Count	total number of fish of that species released; if not measured, record 0 in measured count (interval 00); if estimated length by angler (interval code 25) the number will be recorded in the measured count block.
Harvest Count	total number of fish kept of that species; should be the same as measured count if the angler will allow fish to be measured

Remarks Codes appropriate code(s) from Remarks list, as many as apply - see list at the bottom of the page

Interval Code appropriate interval code for length measurement - see list below; this code is very important, be sure to use the correct code that applies.

Note: If there are more than 11 species caught or length information is obtained for more than 11 fish, complete page 2 by repeating only the 5 shaded areas in the heading from page 1, then complete the additional catch information. **NEVER** repeat fish information.

**CODES:**

Interval codes codes for use in the interval code box  
Species codes codes for the most common species found to be recorded in the header primary species sought code box  
Remarks codes codes for use in the remarks codes box

**AERIAL SURVEY FORMS**

The 3 river segments in the shaded area will be used for the LSR aerial survey. The 6 unshaded areas will be used for the CP aerial survey. Record the appropriate count time for the survey in progress.

**Conowingo Project  
Recreational Fishery Survey Form (ASF2.10)**

Page\_\_of\_\_ number of pages; usually will be 1 of 1;  
Client Code client code is hard coded; (*not in the database*)  
Investigator Initials record appropriate initials of person completing the form  
Sample Date six digit number, month, day, year  
Day Type appropriate day code from list  
Time of Day appropriate time of day code from the list  
Count Time  
    Start    Stop beginning and ending time of aerial observation for either LSR or CP  
Flight Route appropriate flight route code  
Weather Code appropriate weather code from list  
River Segment pre coded field  
Total total count for actively fishing boats observed (first line)  
total count for shore individuals fishing observe (second line)  
Tally and Notes Section note all observations in the tributary (ies); by tick mark or numbers for each category (*not in the database*).



Actively Fishing Boat Count Applies to the first line for each river segment  
 Shore Individual Fishing Count Applies to the second line for each river segment

Remarks: record any comments that apply (use the back of the sheet if necessary).

**Muddy Run Rec. Lake  
 Recreational Fishing Survey (ASF.10)**

Complete the form the same as for the ASF2.10 form, completing each River Segment as appropriate.

**CREEL SURVEY  
 DAILY COUNT SUMMARY  
 SITE COUNT FORM (DCS.10)**

Page \_\_ of \_\_ number of pages; usually will be 1 of 1

Client Code client code is hard coded; *not in the database*

Investigator Initials record appropriate initials of person/s completing the form

Route A B C D E F G H (circle 1) circle one appropriate route code, *not in database*

Sample Date Six digit number, month, day, year for the entire form

Day Type Appropriate code

Weather Appropriate code

Section Appropriate code

Site Code refer to code list or map/chart for appropriate code  
 Site Description \_\_\_\_\_ write the location name (*not in the database*)

Site Arrival Time record time of arrival to site, 24 h clock, 4 digits

Site Departure Time record time of departure from site, 24 h clock, 4 digits

Boat Anglers Interviewed record total number of parties interviewed

Shore Anglers Interviewed record total number of anglers/parties interviewed

\_\_\_\_\_ space for short notes, (*not in database*)

Comments: record any appropriate comments (continue on back if necessary)

## SUSQUEHANNA CREEL SURVEY CODES LIST

CLIENT CODE - 1342

### REMARKS CODES (Add as needed)

D - undersized fish released  
H - fishing time represents previous day  
L - legal sized fish released  
N - no creel information, reluctant angler  
P - physical deformity  
Q - fungus  
R - skin lesion  
X - tagged fish  
T - tumor  
Z - additional information

### INTERVAL CODES

00 - not measured/count  
01 - measured to the nearest inch total length  
25 - angler estimated in inches

### MOST COMMON FISH SPECIES CODES

000	No species caught	130	SUNFISH sp.
480	Anything	121	rock bass (redeye)
001	American eel	122	redbreast sunfish
010	HERRING sp.	123	green sunfish
012	hickory shad	124	pumpkinseed
014	American shad (white)	125	bluegill
015	gizzard shad (mud)	119	BLACK BASS
016	SHAD sp.	126	smallmouth bass
030	TROUT sp.	127	largemouth bass
031	rainbow trout	131	CRAPPIE sp.
032	brown trout	128	white crappie
033	brook trout	129	black crappie
037	golden trout	232	STURGEON sp.
041	chain pickerel	005	shortnose sturgeon
042	northern pike	321	Atlantic sturgeon
043	muskellunge	142	yellow perch
201	tiger musky	145	walleye
050	MINNOW sp.	<u>SALTWATER SPECIES</u>	
054	common carp	151	Atlantic needlefish
057	golden shiner	186	bluefish
080	SUCKER sp.	191	spot
081	quillback	231	longnose gar
082	white sucker		
084	northern hogsucker		
085	shorthead redhorse		
090	CATFISH sp.		
091	white catfish		
092	yellow bullhead		
093	brown bullhead		
094	channel catfish		
098	flathead catfish		
111	white perch		
112	striped bass (striper, rockfish)		
200	hybrid striped bass		

## LOCATION CODES

### Lower Susquehanna River

<u>Maryland</u>	<u>Code</u>	<u>Survey Type</u>	
<b><u>Non-tidal</u></b>			
Fisherman's park and Conowingo tailrace	101		Shore
Shures Landing and hiking trail	102	Boat	Shore
Mouth of Octoraro Creek	103		Shore
<b><u>Tidal</u></b>			
Mouth of Deer Creek (Susq. St. Park)	111		Shore
Old Mill Area (Susq. St. Park)	112		Shore
Lapidum ramp and shoreline	113	Boat	Shore
McLhinney Park (HdG)	114		Shore
Jean Roberts Park ramp and shoreline (HdG)	115	Boat	Shore
Perryville Municipal ramp	116	Boat	
Ramps and shoreline around Perryville ramp	117	Boat	Shore
Port Deposit Municipal ramp and shoreline	118	Boat	Shore
Rock Run Marina (Port Deposit)	119	Boat	
Port Deposit - VFW area	120		Shore
<b>Conowingo Pond</b>			
<b><u>Pennsylvania</u></b>			
Muddy Creek Access and shoreline at Lock 15	201	Boat	Shore
Coal Cabin ramp and Peach Bottom township park	202	Boat	Shore
Dorsey Park ramp and park	203	Boat	Shore
Peach Bottom Marina (Peter's Creek) and RR tracks	204	Boat	Shore
Wissler Run Park	205		Shore
<b><u>Maryland</u></b>			
Line Bridge Park	211		Shore
Broad Creek ramp and shoreline	212	Boat	Shore
Glen Cove Marina	213	Boat	
Funks Pond	214		Shore
Conowingo Creek ramp and shoreline	215	Boat	Shore
<b><u>Muddy Run Recreation Lake</u></b>			
Boat ramp/livery area and associated shorelines	301	Boat	Shore
Picnic area near dam spillway	302		Shore

**APPENDIX B-3: STANDARDIZED AERIAL COUNT FORM.**

## Conowingo Project Recreational Fishery Survey Aerial Survey Form ASF2.10

Investigator Initials

--	--	--

Sample Date

month	day	year			

Day Type

	1 - Weekday
	2 - Weekend
	3 - Opening Day

Time of Day

	1 - A.M.
	2 - Mid day
	3 - P.M.

Count Time

Start					Stop				

Wind

	1 - calm
	2 - light
	3 - moderate
	4 - strong

Flight Route

	1 - Havre de Grace - CP - MRRL
	2 - MRRL - CP - Havre de Grace
	3 - CP - Havre de Grace - MRRL
	4 - MRRL - Havre de Grace - CP

Weather Code

	1 - Sunny
	2 - Partly Cloudy
	3 - Overcast
	4 - Raining
	5 - Windy
	6 - Foggy
	7 - Snow

	River Segment	Total	Tally and Notes Section	
MD	Tidal			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Non-Tidal			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Tailrace			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Conowingo Pond			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Broad Creek			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Conowingo Creek			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Funk's Run			Actively Fishing Boat Count Shore Individual Fishing Count
PA	Conowingo Pond			Actively Fishing Boat Count Shore Individual Fishing Count
PA	Peach Bottom Plume			Actively Fishing Boat Count Shore Individual Fishing Count

**APPENDIX B-4: STANDARD SITE COUNT FORM.**

**CREEL SURVEY  
DAILY COUNT SUMMARY  
SITE COUNT FORM DCS.10**

Investigator Initials

--	--	--	--	--	--

Route: **A B C D E F G H** (circle 1)

--	--	--	--	--	--

month      day      year

Sample Date

Day Type

	1 - weekend/ holiday
	2 - weekday
	3 - Opening day

Weather

	1 - Sunny
	2 - Partly Cloudy
	3 - Overcast
	4 - Rain
	5 - Windy
	6 - Fog
	7 - Snow

Section

	1 - Lower Susquehanna River
	2 - Conowingo Pond
	3 - MRRL

Site Code

--	--	--

Site Arrival Time

--	--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description:

Site Code

--	--	--

Site Arrival Time

--	--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description:

Site Code

--	--	--

Site Arrival Time

--	--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description:

Site Code

--	--	--

Site Arrival Time

--	--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description:

Site Code

--	--	--

Site Arrival Time

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Site Departure Time

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Boat Anglers Interviewed

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Shore Anglers Interviewed

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Site Description:

Site Code

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Site Arrival Time

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Site Departure Time

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Boat Anglers Interviewed

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Shore Anglers Interviewed

--	--	--

Site Description:

Site Code

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Site Arrival Time

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Site Departure Time

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Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description:

Site Code

--	--	--

Site Arrival Time

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Site Departure Time

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Boat Anglers Interviewed

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Shore Anglers Interviewed

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Site Description:

Comments: (continue comments on back if needed)

**APPENDIX B-5: STANDARDIZED GROUND SURVEY INTERVIEW FORM.**





**APPENDIX B-6: SITE DESCRIPTION AND ROUTES.**

Site Codes for CP interview locations

Site Description	Site Code	Survey Type		
<b>Pennsylvania</b>				
Muddy Creek Access	201	Boat	Shore	Both
Coal Cabin ramp and Peach Bottom township park	202	Boat	Shore	Both
Doresy Park ramp and park	203	Boat	Shore	Both
Peach Bottom Marina (Peter's Creek) and RR tracks	204	Boat	Shore	Both
Wissler Run Park	205		Shore	
Lock 15	206		Shore	
<b>Maryland</b>				
Line Bridge Park	211		Shore	
Broad Creek ramp and shoreline	212	Boat	Shore	Both
Glen Cove Marina	213	Boat		
Funks Pond	214		Shore	
Conowingo Creek ramp and shoreline	215	Boat	Shore	Both

**Conowingo Pond Access Sites: Characteristics and Sampling Approaches**

<b>Access site</b>	<b>Site Code</b>	<b>Site Type</b>	<b>Shore</b>	<b>Sampling Approach</b>
Muddy Creek PFBC Access	201	B/S	W	Intercept anglers retrieving boats during tie-down or returning to parking lot from shore
Lock 15	206	K/S	W	Intercept anglers retrieving kayaks or returning to parking lot from shore
Cold Cabin Park/ramp	202	B	W	Intercept anglers retrieving boats during tie-down; interview shore anglers if any
Dorsey Park Ramp-PBAPS	203	B/S	W	Intercept anglers retrieving boats during tie-down or returning to parking lot from shore
Line Bridge Rd	211	S	W	Short wait time; if nobody at site, OK to move to next location
Broad Creek ramp	212	B	W	Intercept returning boat anglers during tie-down at ramp
Glen Cove Marina ramp	213	B	W	Intercept anglers retrieving boats during tie-down or from floating docks
Wissler Run Park	205	S	E	Check shoreline at mouth of run or concrete walkway near pavillion
Peach Bottom Marina/RR tracks	204	B/S	E	Look for empty trailers in parking lot. Also, check along RR tracks & PB beach ramp
Conowingo Creek ramp	215	B/S	E	Intercept anglers retrieving boats during tie-down; interview shore anglers if any
Funks Run Pond	214	S	E	Park; walk down to pond. Wait for exiting anglers; interview anglers near end of wait time; check RR

Key: S = shore/wade; B = boat; K = kayak/canoe.

Split Lock 15 and Muddy Creek Access due to amount of pressure and anglers exit. July

Dropped Line Bridge Road due to lack of fishing and shoreline access. July

**Conowingo Pond-Angler Survey Routes During Spring, 2010.**

<b>Route A Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Muddy Creek access ramp	240	10
Cold Cabin ramp/park	60	20
Wissler Run Park	60	15
Peach Bottom Marina/RR tracks	60	15
Conowingo Creek ramp	120	end

<b>Route B Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Conowingo Creek ramp	120	15
Peach Bottom Marina/RR tracks	60	15
Wissler Run Park	60	20
Cold Cabin ramp/park	60	10
Muddy Creek access ramp	240	end

<b>Route C Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Dorsey Park	189	12
Line Bridge road	63	5
Broad Creek	126	8
Glen Cove Marina	126	10
Funks Run Pond	63	end

<b>Route D Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Funks Run Pond	63	10
Glen Cove Marina	126	8
Broad Creek	126	5
Line Bridge road	63	12
Dorsey Park	189	end

<b>Route E Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Conowingo Creek	108	10
Funks Run Pond	54	8
Glen Cove Marina	108	35
Muddy Creek access ramp	216	12
Cold Cabin Park/ramp	54	end

<b>Route F Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Broad Creek	136	5
Line Bridge road	68	12
Dorsey Park ramp	204	20
Wissler Run Park	68	15
Peach Bottom Marina/RR tracks	68	end

Conowingo Pond-Angler Survey Routes during summer, 2010

# SUMMER

<b>Route A Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Muddy Creek access ramp	185	5
Lock 15	92	10
Wissler Run Park	92	15
Peach Bottom Marina/RR tracks	46	15
Conowingo Creek ramp	139	end

<b>Route B Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Conowingo Creek ramp	139	15
Peach Bottom Marina/RR tracks	46	15
Wissler Run Park	92	10
Lock 15	92	5
Muddy Creek access ramp	185	end

<b>Route C Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Dorsey Park	204	7
Cold Cabin Park/ramp	51	15
Broad Creek	102	8
Glen Cove Marina	152	10
Funks Run Pond	51	end

<b>Route D Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Funks Run Pond	51	10
Glen Cove Marina	152	8
Broad Creek	102	15
Cold Cabin Park/ramp	51	7
Dorsey Park	204	end

<b>Route E Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Conowingo Creek	126	10
Funks Run Pond	42	8
Glen Cove Marina	126	35
Muddy Creek access ramp	168	2
Lock 15	84	end

<b>Route F Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Broad Creek	108	15
Cold Cabin Park/ramp	54	7
Dorsey Park ramp	217	20
Wissler Run Park	108	15
Peach Bottom Marina/RR tracks	54	end

**Conowingo Pond-Angler Survey Routes during winter, 2010-2011.**

Starting Location	Site name	Site Code	Wait Time (min)	Drive Time (min)
A	Glen Cove Marina	213	ad/hoc	8
B	Broad Creek	212	78	15
C	Dorsey Park	203	156	12
D	Muddy Creek Access	201	78	10
E	Wissler Run	205	39	22
F	Conowingo Creek	215	39	8
G	Funks Run Pond	214	78	10

All sites are done in a clockwise order. North direction on the west shore and South of the east shore.  
All routes will start at 800, and be no longer than 9 hours.

**APPENDIX C: PHOTOGRAPHS.**



Site 201 Muddy Creek Access



Site 202  
Coal Cabin Ramp





Site 203  
Dorsey Park Ramp



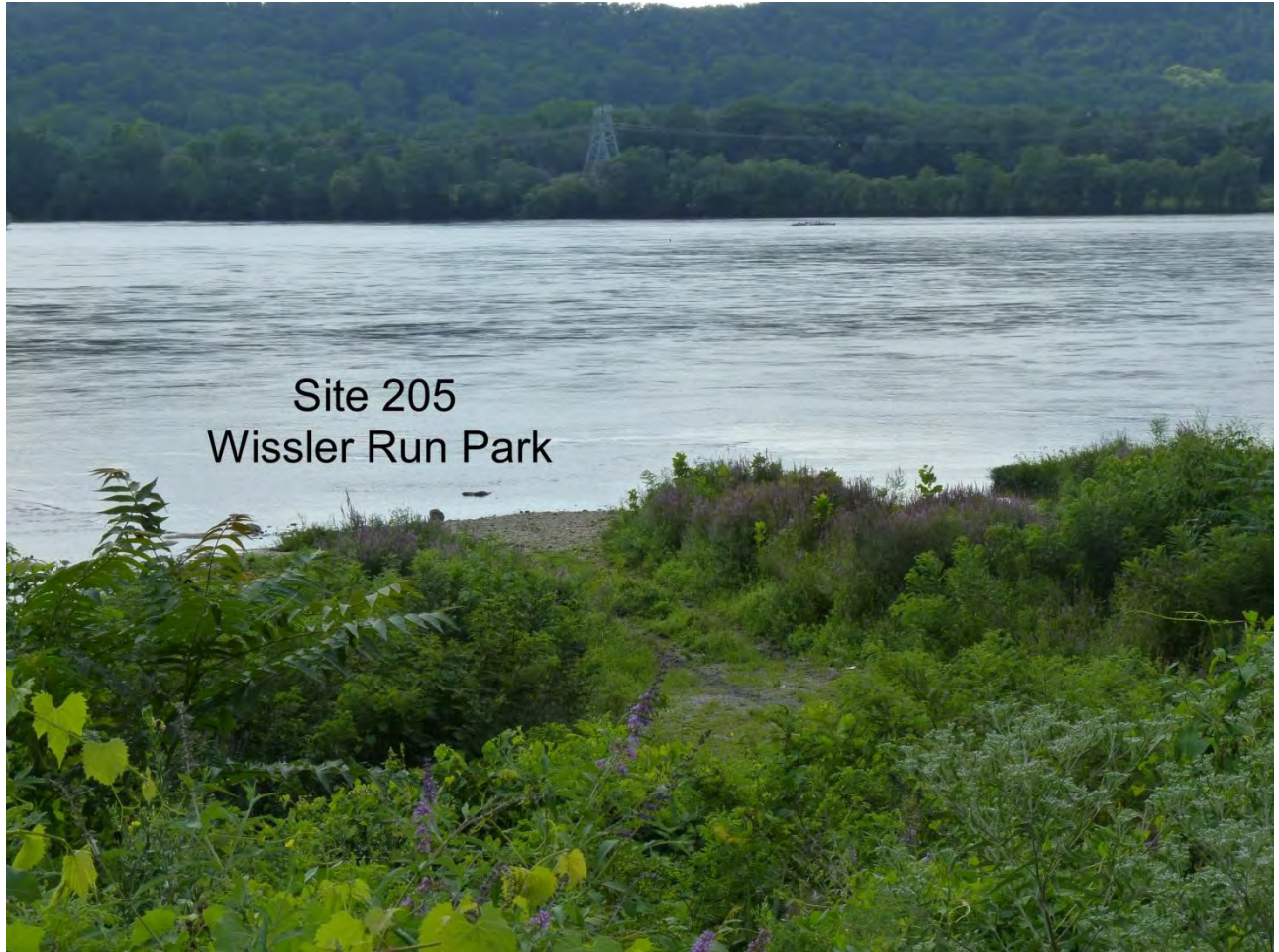


Site 204  
Peach Bottom Beach



Site 204  
Peach Bottom Marina





Site 205  
Wissler Run Park



Site 205  
Wissler Run Park





Site 206  
Lock 15





Site 206  
Lock 15





Site 211  
Line Bridge Park

Site 212  
Broad Creek Ramp





Site 213  
Glen Cove Marina





Site 214  
Funks Pond Parking Lot



Site 214  
Funks Pond





Site 215  
Conowingo Creek Ramp



Site 215  
Conowingo Creek Ramp





**APPENDIX D-1: ESTIMATED EFFORT OF ANGLERS FISHING AT CP, 2010.**

**Estimated effort of anglers fishing in the CP, 2010.**

***Boat***

	Weekday			Weekend			Total		
	Angler Hours	SE	PSE	Angler Hours	SE	PSE	Angler Hours	SE	PSE
Spring	2353	899.4	38.2	12862	4478.5	34.8	15215	4567.9	30.0
Summer	6798	3475.0	51.1	16865	7171.3	42.5	23664	7968.9	33.7
Fall	2595	1125.2	43.4	7752	3485.2	50.0	10347	3662.3	35.4
Total	11745	3761.7	32.0	37480	9145.0	24.4	49225	9888.4	20.1

***Shore***

	Weekday			Weekend			Total		
	Angler Hours	SE	PSE	Angler Hours	SE	PSE	Angler Hours	SE	PSE
Spring	851	101.2	11.9	4786	572.5	12.0	5637	581.4	10.3
Summer	4554	455.8	10	9313	1093.3	11.7	13867	1184.5	8.5
Fall	150	147.5	98.3	590	105.9	17.9	740	181.6	24.5
Total	5555	489.6	8.8	14689	1238.7	8.4	20244	1332.0	6.6

Weekday effort	Weekend effort	Spring effort	Summer effort	Fall effort
17,300 hours	52,169 hours	20,852 hours	37,531 hours	11,087 hours

**APPENDIX D-2: MEAN TRIP LENGTH FOR ANGLERS TARGETING VARIOUS SPECIES  
AT CP, 2010.**

Mean trip length for anglers targeting various species in CP, 2010.

Targeted species	Mean trip length		
	N	(hrs)	SE
Northern pike	1	3.5	0.0
Common carp	2	1.9	0.6
Catfish	24	6.0	0.5
Channel catfish	4	5.5	1.7
Flathead catfish	3	6.7	0.2
Striped bass	3	4.3	1.8
Black bass	46	6.5	0.4
Smallmouth bass	52	5.0	0.3
Largemouth bass	103	5.5	0.2
Sunfish	1	8.3	0.0
Crappie	1	3.0	0.0
Walleye	3	4.6	0.6
Anything	179	3.8	0.2

**APPENDIX D-3: OBSERVED FISH CAUGHT AND HARVESTED FROM CP, 2010.**

List of fish caught and harvested in CP, 2010.

Common name	Boat		Shore	
	Caught	Harvested	Caught	Harvested
Gizzard shad	1	0		
Common carp	5	0	11	2
Catfish	37	0	3	0
Channel catfish	580	91	8	3
Flathead catfish	116	37		
Smallmouth bass	683	3	14	0
Largemouth bass	355	4	19	0
Sunfish	52	0	5	0
Bluegill	279	0	9	0
Rock bass	66	0	3	0
Green sunfish	1	0		
Pumpkinseed	2	0		
White crappie	1	0		
Black crappie	3	0		
White perch	7	0		
Striped bass	7	3		
Walleye	39	4		
Hybrid striped bass	2	0		
	2236	142	72	5

**APPENDIX D-4: EXPANDED BOAT CATCH AND HARVEST ESTIMATES AT CP, 2010.**

Expanded boat catch and harvest estimates on CP, 2010.

Species	Spring				Summer				Fall				Total			
	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
Bluegill	968	1515.6	0	0.0	5284	8465.8	0	0.0	186	274.1	0	0.0	6437	8604.8	0	0.0
Bullhead catfishes	426	951.9	0	0.0	258	362.9	0	0.0					684	1018.7	0	0.0
Channel catfish	1176	1118.0	95	207.8	6577	4246.7	1042	2523.8	849	685.9	52	121.7	8602	4444.6	1190	2535.2
Flathead catfish	690	814.6	395	687.1	180	174.4	39	100.4	553	600.8	87	236.8	1424	1027.2	520	733.7
Gizzard shad	12	39.1	0	0.0						0.0		0.0	12	39.1	0	0.0
Largemouth bass	1790	1418.7	0	0.0	3077	1552.1	0	0.0	744	666.9	44	84.0	5612	2206.0	44	84.0
Rock bass	315	483.7	0	0.0	682	541.9	0	0.0	43	72.7	0	0.0	1041	730.0	0	0.0
Smallmouth bass	4005	2282.7	0	0.0	4338	2054.7	0	0.0	1759	1709.1	35	69.7	10101	3514.7	35	69.7
Striped bass	66	91.1	0	0.0		0.0			27	61.8	27	61.8	93	110.1	27	61.8
Walleye	242	273.9	35	113.2	142	154.1	0	0.0	150	176.7	17	56.8	533	360.5	52	126.6
Black crappie	54	143.0	0	0.0									54	143.0	0	0.0
Common carp	36	67.4	0	0.0					27	61.0	0	0.0	63	90.9	0	0.0
Lepomis sp	199	474.9	0	0.0	193	264.4	0	0.0	277	426.6	0	0.0	669	690.9	0	0.0
Green sunfish					13	33.3	0	0.0					13	33.3	0	0.0
Pumpkinseed					26	66.6	0	0.0					26	66.6	0	0.0
White crappie					13	33.3	0	0.0					13	33.3	0	0.0
White perch					90	234.7	0	0.0					90	234.7	0	0.0
Striped bass hybrid									18	54.8	0	0.0	18	54.8	0	0.0
Total	9979	3593.0	524	726.7	20872	9846.2		2525.8	4632	2121.6	262	299.7	35483	23403.4	1867	3611.1



**APPENDIX D-5: EXPANDED SHORE CATCH AND HARVEST ESTIMATES AT CP, 2010.**

**Expanded shore catch and harvest estimates on CP, 2010.**

Species	Spring				Summer				Fall				Total			
	Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE
Common carp	205	173.1	205	173.1	1428	943.4	166	129.8	237	232.3	0	0.0	1870	986.9	370	216.3
Catfish	410	333.0	0	0.0	103	153.1	0	0.0					513	366.5	0	0.0
Channel catfish	543	287.2	272	190.9	663	341.4	166	129.8					1206	446.2	437	230.8
Smallmouth bass	1078	623.8	0	0.0	269	214.1	0	0.0					1346	659.5	0	0.0
Largemouth bass	1407	1036.3	0	0.0									1407	1036.3	0	0.0
Sunfish	205	163.9	0	0.0	412	665.4	0	0.0					617	685.3	0	0.0
Bluegill	819	682.2	0	0.0	828	519.8	0	0.0					1648	857.7	0	0.0
Rock bass	272	185.3	0	0.0	166	132.5	0	0.0					437	227.9	0	0.0
<b>Total</b>	<b>4938</b>	<b>1487.6</b>	<b>476</b>	<b>257.7</b>	<b>3869</b>	<b>1344.0</b>	<b>331</b>	<b>183.5</b>	<b>237</b>	<b>232.3</b>	<b>0</b>	<b>0.0</b>	<b>9043</b>	<b>2018.2</b>	<b>808</b>	<b>316.4</b>

**APPENDIX D-6: EXPANDED BOAT CATCH AND HARVEST ESTIMATES BY DAY TYPE AT  
CP, 2010.**

Expanded boat catch and harvest estimates by day type at CP, 2010.

		Spring				Summer				Fall				Total			
		Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE
Weekday	Gizzard shad	12	39.1	0	0.0									12	39.1	0	0.0
	Catfish	46	156.2	0	0.0	155	331.4	0	0.0					201	366.3	0	0.0
	Channel catfish	253	759.5	23	77.1	1586	1433.6	0	0.0	309	323.0	34	115.2	2147	1654.2	57	138.6
	Flathead catfish	310	568.7	195	449.4	39	83.1	0	0.0	103	241.8	69	230.5	452	623.5	264	505.1
	Smallmouth bass	1126	1382.0	0	0.0	1199	1023.9	0	0.0	840	1547.6	17	57.6	3165	2313.7	17	57.6
	Largemouth bass	287	375.4	0	0.0	1199	1000.4	0	0.0	240	427.3	17	56.8	1726	1150.8	17	56.8
	Sunfish		0.0		0.0	39	83.1	0	0.0	51	166.8	0	0.0	90	186.4	0	0.0
	Bluegill	80	232.1	0	0.0	3946	8346.2	0	0.0	69	135.7	0	0.0	4095	8350.5	0	0.0
	Rock bass	207	417.2	0	0.0	271	391.9	0	0.0	34	67.3	0	0.0	512	576.3	0	0.0
	Striped bass	12	37.7	0	0.0									12	37.7	0	0.0
	Walleye	115	177.7	35	113.2	39	83.1	0	0.0	69	123.8	17	56.8	222	232.0	52	126.6
	<b>Total</b>	<b>2447</b>	<b>1799.5</b>	<b>253</b>	<b>469.8</b>	<b>8472</b>	<b>8605.1</b>	<b>0</b>	<b>0.0</b>	<b>1714</b>	<b>1675.2</b>	<b>154</b>	<b>276.0</b>	<b>12633</b>	<b>8949.4</b>	<b>407</b>	<b>544.9</b>
Weekend	Common carp	36	67.4	0	0.0					27	61.0	0	0.0	63	90.9	0	0.0
	Catfish	380	939.0	0	0.0	103	148.1	0	0.0				0.0	483	950.6	0	0.0
	Channel catfish	923	820.4	72	193.0	4991	3997.4	1042	2523.8	540	605.1	18	39.2	6454	4125.3	1132	2531.5
	Flathead catfish	380	583.3	199	519.7	142	153.3	39	100.4	450	550.1	18	54.3	972	816.3	256	532.1
	Smallmouth bass	2879	1816.8	0	0.0	3138	1781.4	0	0.0	919	725.3	18	39.3	6936	2645.8	18	39.3
	Largemouth bass	1503	1368.1	0	0.0	1878	1186.7	0	0.0	504	512.0	27	61.9	3885	1882.1	27	61.9
	Sunfish	199	474.9	0	0.0	154	251.0	0	0.0	225	392.6	0	0.0	579	665.3	0	0.0
	Bluegill	887	1497.7	0	0.0	1338	1418.2	0	0.0	117	238.1	0	0.0	2342	2076.3	0	0.0
	Rock bass	109	244.9	0	0.0	412	374.3	0	0.0	9	27.5	0	0.0	529	448.2	0	0.0
	Green sunfish					13	33.3	0	0.0					13	33.3	0	0.0
	Pumpkinseed					26	66.6	0	0.0					26	66.6	0	0.0
	White crappie					13	33.3	0	0.0					13	33.3	0	0.0
	Black crappie	54	143.0	0	0.0									54	143.0	0	0.0
	Striped bass	54	82.9	0	0.0				0.0	27	61.8	27	61.8	81	103.4	27	61.8
	White perch					90	234.7	0	0.0					90	234.7	0	0.0
	Walleye	127	208.4	0	0.0	103	129.7	0	0.0	81	126.1	0	0.0	311	276.0	0	0.0
	Striped bass hybrid									18	54.8	0	0.0	18	54.8	0	0.0
	<b>Total</b>	<b>7532</b>	<b>3109.9</b>	<b>272</b>	<b>554.4</b>	<b>12399</b>	<b>4785.3</b>	<b>1081</b>	<b>2525.8</b>	<b>2918</b>	<b>1301.9</b>	<b>108</b>	<b>117.0</b>	<b>22849</b>	<b>5853.7</b>	<b>1460</b>	<b>2588.6</b>
Grand total		9979	3593.0	524	726.7	20872	9846.2	1081	2525.8	4632	2121.6	262	299.7	35483	10693.8	1867	2645.3

**APPENDIX D-7: EXPANDED SHORE CATCH AND HARVEST ESTIMATES BY DAY TYPE  
AT CP, 2010.**

Expanded shore catch and harvest estimates by day type at CP, 2010.

		Spring				Summer				Fall				Total			
		Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE
Weekday	Common carp					103	153.1	0	0.0					103	153.1	0	0.0
	Catfish					103	153.1	0	0.0					103	153.1	0	0.0
	Channel catfish	134	90.4	67	75.1									134	90.4	67	75.1
	Smallmouth bass	668	567.1	0	0.0	103	169.7	0	0.0					771	591.9	0	0.0
	Largemouth bass	1202	1020.7	0	0.0									1202	1020.7	0	0.0
	Sunfish					412	665.4	0	0.0					412	665.4	0	0.0
	Rock bass	67	56.7	0	0.0									67	56.7	0	0.0
	Total	2071	1172.5	67	75.1	722	720.0	0	0.0					2792	1376.0	67	75.1
Weekend	Common carp	205	173.1	205	173.1	1325	930.9	166	129.8	237	232.3	0	0.0	1767	974.9	370	216.3
	Catfish	410	333.0	0	0.0									410	333.0	0	0.0
	Channel catfish	410	272.6	205	175.5	663	341.4	166	129.8					1072	436.9	370	218.3
	Smallmouth bass	410	259.8	0	0.0	166	130.5	0	0.0					575	290.7	0	0.0
	Largemouth bass	205	178.9	0	0.0									205	178.9	0	0.0
	Sunfish	205	163.9	0	0.0									205	163.9	0	0.0
	Bluegill	819	682.2	0	0.0	828	519.8	0	0.0					1648	857.7	0	0.0
	Rock bass	205	176.5	0	0.0	166	132.5	0	0.0					370	220.7	0	0.0
Total	2867	915.4	410	246.5	3147	1134.9	331	183.5	237	232.3	0	0.0	6251	1476.4	741	307.3	
Grand Total	4938	1487.6	476	257.7	3869	1344.0	331	183.5	237	232.3	0	0.0	9043	2018.2	808	316.4	

**APPENDIX D-8: GENERAL SEASONAL SPECIES CATCH AND HARVEST RATES FOR CP,  
2010.**

**Seasonal species catch and harvest rates in CP, 2010.**

Boat	Spring				Summer				Fall			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Gizzard shad	0.00	0.02	0.00	0.00								
Common carp	0.00	0.01	0.00	0.00					0.00	0.01	0.00	0.00
Catfish	0.02	0.07	0.00	0.00	0.01	0.03	0.00	0.00				
Channel catfish	0.09	0.20	0.01	0.03	0.26	0.21	0.03	0.08	0.09	0.10	0.01	0.03
Flathead catfish	0.08	0.15	0.05	0.12	0.01	0.01	0.00	0.00	0.05	0.09	0.01	0.05
Smallmouth bass	0.35	0.36	0.00	0.00	0.18	0.11	0.00	0.00	0.22	0.36	0.00	0.02
Largemouth bass	0.12	0.14	0.00	0.00	0.14	0.10	0.00	0.00	0.08	0.12	0.01	0.02
Sunfish	0.02	0.04	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.06	0.00	0.00
Bluegill	0.05	0.11	0.00	0.00	0.33	0.74	0.00	0.00	0.02	0.05	0.00	0.00
Rock bass	0.05	0.10	0.00	0.00	0.03	0.04	0.00	0.00	0.01	0.02	0.00	0.00
Green sunfish					0.00	0.00	0.00	0.00				
Pumpkinseed					0.00	0.00	0.00	0.00				
White crappie					0.00	0.00	0.00	0.00				
Black crappie	0.00	0.01	0.00	0.00								
Striped bass	0.00	0.01	0.00	0.00					0.00	0.01	0.00	0.01
White perch					0.01	0.02	0.00	0.00				
Walleye	0.03	0.05	0.01	0.03	0.01	0.01	0.00	0.00	0.02	0.03	0.00	0.01
Striped bass hybrid									0.00	0.01	0.00	0.00

Shore	Spring				Summer				Fall			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Common carp	0.02	0.01	0.02	0.01	0.05	0.04	0.00	0.00	0.03	0.03	0.00	0.00
Catfish	0.03	0.03	0.00	0.00	0.02	0.02	0.00	0.00				
Channel catfish	0.04	0.03	0.02	0.02	0.04	0.01	0.01	0.01				
Smallmouth bass	0.16	0.13	0.00	0.00	0.01	0.02	0.00	0.00				
Largemouth bass	0.26	0.22	0.00	0.00								
Sunfish	0.02	0.01	0.00	0.00	0.06	0.11	0.00	0.00				
Bluegill	0.06	0.05	0.00	0.00	0.05	0.03	0.00	0.00				
Rock bass	0.02	0.02	0.00	0.00	0.01	0.01	0.00	0.00				



**APPENDIX D-9: GENERAL SPECIES CATCH AND HARVEST RATES FOR CP, 2010.**

Species catch and harvest rates for Conowingo Pond, 2010.

	Boat				Shore			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Black crappie	0.00	0.00	0.00	0.00				
Bluegill	0.08	0.10	0.00	0.00	0.03	0.02	0.00	0.00
Bullhead catfishes	0.01	0.02	0.00	0.00	0.01	0.01	0.00	0.00
Channel catfish	0.17	0.10	0.03	0.07	0.03	0.01	0.01	0.01
Common carp	0.00	0.00	0.00	0.00	0.04	0.02	0.01	0.00
Flathead catfish	0.03	0.03	0.01	0.02				
Gizzard shad	0.00	0.00	0.00	0.00				
Green sunfish	0.00	0.00	0.00	0.00				
Largemouth bass	0.10	0.04	0.00	0.00	0.06	0.05	0.00	0.00
Lepomis sp	0.02	0.02	0.00	0.00	0.02	0.01	0.00	0.00
Pumpkinseed	0.00	0.00	0.00	0.00				
Rock bass	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00
Smallmouth bass	0.20	0.06	0.00	0.00	0.05	0.03	0.00	0.00
Striped bass	0.00	0.00	0.00	0.00				
Striped bass hybrid	0.00	0.00	0.00	0.00				
Walleye	0.01	0.01	0.00	0.00				
White crappie	0.00	0.00	0.00	0.00				
White perch	0.00	0.01	0.00	0.00				

**APPENDIX D-10: TARGETED CATCH AND HARVEST RATES FOR ANGLERS ON CP, 2010.**

Targeted catch and harvest rates for anglers on CP, 2010

Fishing type	Targeted species	CPUE	SE	HPUE	SE
Boat	Northern pike	0.00	0.00	0.00	0.00
	Catfish	0.07	0.09	0.00	0.00
	Channel catfish	2.38	1.97	1.43	2.26
	Flathead catfish	0.35	0.27	0.29	0.28
	Black bass	0.00	0.00	0.00	0.00
	Smallmouth bass	0.46	0.10	0.00	0.00
	Largemouth bass	0.24	0.05	0.00	0.00
	Sunfish	0.00	0.00	0.00	0.00
	Crappie	0.00	0.00	0.00	0.00
	Striped bass	0.00	0.00	0.00	0.00
	Walleye	0.30	0.17	0.00	0.00
Shore	Common carp	0.45	0.55	0.00	0.00
	Catfish	0.00	0.00	0.00	0.00
	Channel catfish	0.00	0.00	0.00	0.00
	Black bass	0.00	0.00	0.00	0.00
	Smallmouth bass	0.09	0.08	0.00	0.00
	Largemouth bass	0.00	0.00	0.00	0.00
	Walleye	0.00	0.00	0.00	0.00

**APPENDIX D-11: TARGETED CATCH AND HARVEST RATES FOR BOAT ANGLERS AT  
CP, 2010.**

Targeted catch and harvest rates for boat anglers on the CP, 2010.

Season	Targeted species	CPUE	SE	HPUE	SE
Spring	Northern pike	0.00	0.00	0.00	0.00
	Catfish	0.26	0.27	0.00	0.00
	Flathead catfish	0.36	0.36	0.36	0.36
	Black Bass	0.00	0.00	0.00	0.00
	Smallmouth bass	0.61	0.21	0.00	0.00
	Largemouth bass	0.30	0.14	0.00	0.00
	Crappie	0.00	0.00	0.00	0.00
	Striped bass	0.00	0.00	0.00	0.00
	Walleye	0.30	0.17	0.00	0.00
Summer	Catfish	0.00	0.00	0.00	0.00
	Channel catfish	2.38	1.97	1.43	2.26
	Flathead catfish	0.32	0.00	0.00	0.00
	Black bass	0.00	0.00	0.00	0.00
	Smallmouth bass	0.39	0.11	0.00	0.00
	Largemouth bass	0.22	0.05	0.00	0.00
	Sunfish	0.00	0.00	0.00	0.00
	Striped bass	0.00	0.00	0.00	0.00
Fall	Catfish	0.00	0.00	0.00	0.00
	Black bass	0.00	0.00	0.00	0.00
	Smallmouth bass	0.28	0.23	0.00	0.00
	Largemouth bass	0.20	0.08	0.01	0.01
	Striped bass	0.00	0.00	0.00	0.00

**APPENDIX D-12: TARGETED CATCH AND HARVEST RATES FOR SHORE ANGLERS AT  
CP, 2010.**

Targeted catch and harvest rates for shore anglers on the CP, 2010.

Season	Targeted species	CPUE	SE	HPUE	SE
Spring	Channel catfish	0.00	0.00	0.00	0.00
	Black bass	0.00	0.00	0.00	0.00
	Largemouth bass	0.00	0.00	0.00	0.00
	Walleye	0.00	0.00	0.00	0.00
Summer	Common carp	0.93	0.00	0.00	0.00
	Catfish	0.00	0.00	0.00	0.00
	Smallmouth bass	0.27	0.00	0.00	0.00
	Largemouth bass	0.00	0.00	0.00	0.00
Fall	Common carp	0.10	0.22	0.00	0.00
	Catfish	0.00	0.00	0.00	0.00
	Smallmouth bass	0.00	0.00	0.00	0.00
	Largemouth bass	0.00	0.00	0.00	0.00



**APPENDIX D-13: SIZES OF FISH RELEASED AND HARVESTED AT CP, 2010.**

Fish lengths of fish caught in Conowingo Pond, 2010.

Species	Number Released	Released (inches)	Number Harvested	Harvested (inches)
Common carp	14	9 - 31	2	20 - 21
Catfish	16	10 - 15		
Channel catfish	163	6 - 31	16	11 - 23
Flathead catfish	24	12 - 32	27	17 - 32
Smallmouth bass*	380	6 - 23	1	16
Largemouth bass*	221	6 - 23		
Sunfish	45	4 - 7		
Bluegill	92	4 - 9		
Rock bass	32	5 - 14		
Black crappie	3	9		
Walleye**	24	10 - 19	3	16 - 19
Striped bass***	3	10 - 16		
Hybrid striped bass***	2	21 - 23		

\* Smallmouth and largemouth bass must be 12 inches or larger after June 16 to harvest.

\*\* Walleye must be 15 inches or larger to harvest.

\*\*\* Striped bass and hybrid striped bass must be larger than 18 inches to harvest.

**APPENDIX D-14: CHRONOLOGICAL LIST OF BLACK BASS TOURNAMENTS HELD ON  
CP, 2010.**

Black Bass Tournaments that were held on CP, 2010

Date	Sponsor/Club	Ramp	# of anglers	# fished weighed in	Species of fish	Interviewed
1-May	Fish On Bass Anglers	Glen Cove	24	96	Black Bass	N
22-May	River Ratz Bassmasters	Glen Cove	8	24	Black Bass	N
23-May	Chesapeake Bass Anglers	Glen Cove	12	41	Black Bass	N
19-Jun	Fishers of Men Mid Atalantic Division	Dorsey Park	26	59	Black Bass	N
7-Aug	Lancaster county bass masters	Dorsey Park	17	34	Black Bass	N
21-Aug	Local Club	Dorsey Park	17	9	Black Bass	N
11-Sep	Champions Choice Bassmasters	Glen Cove	7	2	Black Bass	Y
11-Sep	River Hill Bassmaster	Muddy Creek	17	18	Black Bass	N
19-Sep	Local Club	Muddy Creek	8	15	Black Bass	Y
25-Sept.	Local Club	Dorsey Park	16	46	Black Bass	N
26-Sept.	Local Club	Dorsey Park	28	37	Black Bass	N
10-Oct	Lancaster county bass masters	Dorsey Park	19	50	Black Bass	Y
16-Oct	Baltimore Bass Chasers	Glen Cove	6	14	Black Bass	N
24-Oct	Brandywine Bassmaster	Muddy Creek	10	18	Black Bass	N
30-Oct	Open Tournament	Glen Cove	2	7	Black Bass	Y
14-Nov	Baltimore Bass Chasers	Glen Cove	5	12	Black Bass	N

**APPENDIX D-15: CHRONOLOGICAL LIST OF CATFISH TOURNAMENTS HELD ON CP,  
2010.**

Catfish tournaments that were held on CP, 2010.

Date	Sponsor/Club	Ramp	# of anglers	shed weight	Species of fish	Interviewed
5-Jun	Catfish nation, MD chapter	Glen Cove	22	33	Catfish sp.	N
26-Jun	Catfish Nation, MD/PA chapter	Dorsey Park	34	45	Catfish sp.	N
27-Aug	Catfish nation, MD chapter	Glen Cove	21	16	Catfish sp.	N
25-Sept.	Catfish Nation, PA chapter	Muddy Creek	28	33	Catfish sp.	Y

**FINAL STUDY REPORT  
LOWER SUSQUEHANNA RIVER CREEL SURVEY  
RSP 3.25B**

**CONOWINGO HYDROELECTRIC PROJECT**

**FERC PROJECT NUMBER 405**



*Prepared for:*



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**August 2012**

## **EXECUTIVE SUMMARY**

Exelon Generation Company, LLC (Exelon) has initiated with the Federal Energy Regulatory Commission (FERC) the process of relicensing the 573-megawatt Conowingo Hydroelectric Project (Conowingo Project). The current license for the Conowingo Project was issued on August 14, 1980 and expires on September 1, 2014. FERC issued the final study plan determination for the Conowingo Project on February 4, 2010, approving the revised study plan with certain modifications.

The final study plan determination required Exelon to conduct a creel survey downstream of Conowingo Project. The objectives of this study are to: 1) determine the angling effort estimates; 2) determine the catch and harvest estimates and rates; and 3) identify demographics and biological data of fish caught for both boat and shore anglers the lower Susquehanna River (herein LSR) downstream of Conowingo Dam.

An initial study report (ISR) was filed on May 27, 2011, containing Exelon's 2010 study findings. A meeting was held on August 23 and 24, 2011 with resource agencies and interested members of the public. Formal comments on the ISR including requested study plan modifications were filed with FERC on March 21, 2012 by several resource agencies and interested members of the public. Exelon filed responses to the ISR comments with FERC on April 20, 2012. On May 21, 2012, FERC issued a study plan modification determination order. The order specified what, if any, modifications to the ISR should be made. For this study, FERC's May 21, 2012 order required no modifications to the original study plan. This final study report is being filed with the Final License Application for the Project.

The survey was conducted from March 1 through November 30, 2010. Data on fishing pressure by shore anglers and from boats were collected from 42 weekly counts. Forty-one aerial flights and one thorough ground count were conducted between the hours of 0801-1647 h; with the average count start time of 1145 h. Count efforts recorded 853 "actively fishing" boats and 1,741 shore anglers.

The survey also entailed interviewing boat and/or shore anglers at 13 access points from the west shoreline below the Conowingo Dam tailrace downstream to the Amtrak Bridge at Havre de Grace, MD near the mouth of the Susquehanna River.

A total of 797 boat anglers representing 383 fishing parties were interviewed. Weekend boat parties accounted for over 70% of all boat parties interviewed; spring accounted for 40% of boat parties interviewed. The average number of anglers per party was 2.1 and average fishing time per trip was 4.4 hours.



Most boat anglers sought “anything”. However, among boat anglers who fished for a particular species, striped bass (*Morone saxatilis*) was most frequently sought, especially in April and November. Blue crab (*Callinectes sapidus*) was highly sought in September (49%) and October (34%).

A total of 664 shore angler parties representing 1,120 shore anglers were interviewed at 11 access sites. Seasonally, 47% of shore party interviews occurred during spring. The average fishing trip time for shore angling parties was 3.1 hours.

Species sought by shore anglers differed seasonally. In spring shore anglers (56%) sought “shad” (*Alosa* spp.), while in fall (34%) and summer (21%) shore anglers sought striped bass.

Little difference in estimated angling effort was observed between boat and shore anglers. Of the total estimated effort of angling of 235,903 hours, boat anglers accounted for 114,142 hours and shore anglers accounted for 121,761 hours.

Boat and shore anglers combined expended 24,261 hours and 5,274 trips targeting black bass (*Micropterus* spp.). Black bass is defined as smallmouth bass (*Micropterus dolomieu*) and largemouth bass (*Micropterus salmoides*) combined.

LSR anglers caught an estimated 264,429 fish and 60,874 blue crabs. White perch (*Morone americana*) accounted for 37.1% of the fish caught. Of the 37,391 fish harvested, 20,085 were white perch; the number of perch harvested was approximately the same by boat and shore anglers. Of 5,810 striped bass (*Morone saxatilis*) harvested, 83.3% were by shore anglers. The retention rate of all fish by boat and shore angler combined was 14.1%. Nearly all (99%) of the blue crab (*Callinectes sapidus*) reported were harvested.

The overall CPUE (catch per-unit-effort) for boat and shore anglers were 1.15 and 1.25 fish/h, while the overall harvest per-unit-effort (HPUE) was 0.13 and 0.18 fish/h, respectively.

CPUE rates for boat anglers targeting a particular species (targeted CPUE) were highest for those seeking white perch (3.69 fish/h). The targeted HPUE for white perch was also highest at 0.76 fish/h, indicating most boat anglers released their catch. Targeted CPUE and HPUE was identical for blue crabs and was extremely high for boat anglers in the fall at 6.2 crabs/h, indicating all crabs were harvested.

Targeted CPUEs for shore anglers were highest for the migratory species: American shad and hickory shad (*Alosa sapidissima* and *A. mediocris*), striped bass, and white perch. Shore anglers targeted hickory shad and American shad in the spring only and the targeted CPUE was 2.31 fish/h and 1.04 fish/h,

respectively. White perch and striped bass were targeted in all seasons and the targeted CPUE of these species were 1.58 fish/h and 0.33 fish/h, respectively. Striped bass was the dominant species sought by shore angler in the LSR.

Approximately 56% of all anglers interviewed resided locally, i.e., in Baltimore County, Cecil County or Harford County, MD. Besides Maryland residents (65%), and Pennsylvania residents (32%), anglers from nine other states and the District of Columbia were interviewed.

Length measurements of fish harvested by boat anglers were obtained from 230 fish representing seven species. White perch accounted for approximately 48% of all harvested fish measured and ranged from 3 to 12 inches long. Measured channel catfish (*Ictalurus punctatus*) were between 12 and 31 inches and accounted for 91% of the harvested fish measured in the summer, and 44% during the fall.

Anglers also provided a measured or estimated length (to the nearest inch) of numerous fish released back into the LSR. Boat anglers provided estimated lengths or measurements for 14 species or species groups released totaling 707 fish. Black bass comprised 31% of the released fish measured or estimated; 77% of the black bass released were reported as legal (+12 inches) to harvest.

Length measurements were also obtained from 389 fish of 13 species or species groups harvested by shore anglers. White perch between 4 and 13 inches and striped bass ranging from 12 to 34 inches dominated the harvested fish measured.

Shore anglers reported measured or estimated lengths for 432 fish that were released, consisting of 17 species or species groups. Striped bass accounted for 34% of released fish measured or estimated by shore anglers; lengths ranged from 4 to 54 inches. White perch up to 9 inches accounted for 39% of the fish measured and released.

The survey methods employed during 2010 generated relatively precise estimates of overall angler effort. Precision in terms of proportional standard error (PSE) was considered good for boat (20.0%) and for shore (3.7%) angler effort.

## TABLE OF CONTENTS

<b>1.0 Introduction.....</b>	<b>1</b>
<b>2.0 Methods.....</b>	<b>3</b>
2.1 Study Area.....	3
2.2 General Survey Design Characteristics .....	3
2.2.1 Aerial Count Flights .....	4
2.2.2 Ground Survey.....	4
2.3 Data Management.....	5
2.4 Computational Methods for Boat and Shore Angler Survey .....	5
<b>3.0 Results.....</b>	<b>9</b>
3.1 Observed Data .....	9
3.1.1 Aerial Count Flights .....	9
3.1.2 Boat Angler Interviews.....	10
3.1.3 Species Sought by Boat Anglers.....	11
3.1.4 Shore Angler Interviews .....	11
3.1.5 Species Sought by Shore Anglers.....	12
3.2 Angling Effort Estimates.....	13
3.3 Catch and Harvest Estimates.....	14
3.3.1 Boat Angler Catch and Harvest .....	14
3.3.2 Shore Angler Catch and Harvest .....	15
3.3.3 Blue Crab Catch and Harvest .....	15
3.3.4 Retention Rate .....	16
3.4 Catch and Harvest Rates .....	16
3.4.1 General Rates.....	16
3.4.2 Targeted Species Rates .....	17
3.4.3 Targeted Rates for Tailrace vs. Tidal and Non-tidal .....	18
3.5 Angler Demographics .....	19
3.6 Biological Data .....	19
3.6.1 Boat Anglers.....	20
3.6.2 Shore Anglers .....	21
3.7 Ancillary Data and Observations.....	21
3.7.1 Fishing Tournaments.....	21
3.7.2 Bait Collection.....	22
3.7.3 Nighttime Surveys.....	22
3.7.4 Blue Crabs .....	22
<b>4.0 Summary and Conclusion .....</b>	<b>24</b>
<b>References.....</b>	<b>26</b>

## LIST OF TABLES

<b>TABLE 3.1.1-1: DISTRIBUTION OF ANGLER COUNTS BETWEEN DAY TYPE AND TIME OF DAY OVER, LSR, 2010.</b>	<b>27</b>
<b>TABLE 3.1.1-2: SEASONAL BOAT AND SHORE ANGLER COUNTS FROM OBSERVATIONS OF THE LSR, 2010.</b>	<b>28</b>
<b>TABLE 3.1.2-1: SEASONAL COUNTS OF COMPLETED BOAT PARTIES INTERVIEWED AT LSR, 2010.</b>	<b>29</b>
<b>TABLE 3.1.2-2: MONTHLY COUNTS OF COMPLETED BOAT PARTIES INTERVIEWS AT LSR, 2010.</b>	<b>30</b>
<b>TABLE 3.1.2-3: SEASONAL COMPLETED BOAT INFORMATION INTERVIEWED AT LSR, 2010.</b>	<b>31</b>
<b>TABLE 3.1.2-4: MEAN TRIP LENGTHS FOR COMPLETED BOAT PARTIES AT LSR, 2010.</b>	<b>32</b>
<b>TABLE 3.1.3-1: SPECIES TARGETED, MONTHLY, BY BOAT ANGLERS AT LSR, 2010.</b>	<b>33</b>
<b>TABLE 3.1.3-2: SPECIES TARGETED, SEASONALLY, BY BOAT ANGLERS AT LSR, 2010.</b>	<b>34</b>
<b>TABLE 3.1.4-1: SEASONAL SHORE INFORMATION (COMPLETE AND INCOMPLETE TRIPS) INTERVIEWED AT LSR, 2010.</b>	<b>35</b>
<b>TABLE 3.1.4-2: SEASONAL COUNTS OF COMPLETED SHORE PARTIES INTERVIEWED AT LSR, 2010.</b>	<b>36</b>
<b>TABLE 3.1.4-3: MONTHLY COUNTS OF COMPLETE AND INCOMPLETE SHORE PARTIES INTERVIEWS AT LSR, 2010.</b>	<b>37</b>
<b>TABLE 3.1.4-4: MEAN TRIP LENGTHS FOR COMPLETED SHORE ANGLERS AT LSR, 2010.</b>	<b>38</b>
<b>TABLE 3.1.5-1: SPECIES SOUGHT, MONTHLY, BY SHORE ANGLERS, LSR, 2010.</b>	<b>39</b>
<b>TABLE 3.1.5-2: SPECIES SOUGHT, SEASONALLY, BY SHORE ANGLERS AT LSR, 2010.</b>	<b>40</b>
<b>TABLE 3.1.5-3: DISTRIBUTION OF SHORE ANGLERS SEEKING A PARTICULAR SPECIES OR SPECIES GROUP ON LSR, 2010.</b>	<b>41</b>
<b>TABLE 3.2-1: ESTIMATED EFFORT OF ANGLERS FISHING, LSR, 2010.</b>	<b>45</b>
<b>TABLE 3.2-2: ESTIMATED NUMBER OF TRIPS BY ANGLERS, LSR, 2010.</b>	<b>46</b>
<b>TABLE 3.2-3: ESTIMATED DAY TYPE EFFORT OF ANGLERS FISHING IN THE LSR, 2010.</b>	<b>47</b>
<b>TABLE 3.2-4: EFFORT FOR BOAT AND SHORE ANGLERS COMBINED SEEKING BLACK BASS, LSR, 2010.</b>	<b>48</b>

<b>TABLE 3.2-5: ESTIMATED EFFORT, SEASONALLY, FOR BLACK BASS BY ANGLERS IN THE LSR, 2010. ....</b>	<b>49</b>
<b>TABLE 3.3-1: EXPANDED CATCH AND HARVEST ESTIMATES FOR BOAT AND SHORE ANGLERS COMBINED ON LSR, 2010. ....</b>	<b>50</b>
<b>TABLE 3.3.1-1: EXPANDED BOAT CATCH AND HARVEST ESTIMATES THE LSR, 2010... 51</b>	
<b>TABLE 3.3.2-1: EXPANDED SHORE CATCH AND HARVEST ESTIMATES ON THE LSR, 2010. 52</b>	
<b>TABLE 3.3.4-1: RETENTION RATES FOR FISH, LSR, 2010.....</b>	<b>53</b>
<b>TABLE 3.4.1-1: SEASONAL OVERALL CATCH AND HARVEST PER-UNIT-EFFORT RATES WITHOUT BLUE CRAB, LSR, 2010.....</b>	<b>54</b>
<b>TABLE 3.4.1-2: SEASONAL OVERALL CATCH AND HARVEST PER-UNIT-EFFORT RATES, WITH PERCENT STANDARD ERROR AT LSR, 2010. ....</b>	<b>55</b>
<b>TABLE 3.4.1-3: SPECIES OVERALL CATCH AND HARVEST RATES FOR DOMINANT SPECIES CAUGHT BY SHORE ANGLERS IN LSR, 2010. ....</b>	<b>56</b>
<b>TABLE 3.4.1-4: SEASONAL CATCH AND HARVEST RATES, INCLUDING BLUE CRABS, FOR ANGLERS ON LSR, 2010. ....</b>	<b>57</b>
<b>TABLE 3.4.2-1: TARGETED CATCH AND HARVEST RATES FOR ANGLERS ON LSR, 2010.58</b>	
<b>TABLE 3.4.2-2: TARGETED CATCH AND HARVEST RATES FOR BOAT ANGLERS ON THE LSR, 2010.....</b>	<b>59</b>
<b>TABLE 3.4.2-3: TARGETED CATCH AND HARVEST RATES FOR SHORE ANGLERS ON THE LSR, 2010. ....</b>	<b>60</b>
<b>TABLE 3.4.3-1: TARGETED CATCH AND HARVESTED RATES FOR SHORE ANGLERS FOR CONOWINGO TAILRACE AND THE TIDAL/NON-TIDAL OF THE LSR, 2010. ....</b>	<b>61</b>
<b>TABLE 3.5-1: ANGLER DEMOGRAPHICS FOR ANGLERS IN THE LSR, 2010.....</b>	<b>62</b>
<b>TABLE 3.6-1: MEASURED SAMPLE OF STRIPED BASS HARVESTED IN THE LSR, 2010... 64</b>	
<b>TABLE 3.6-2: SIZES OF STRIPED BASS RELEASED IN THE LSR, 2010. ....</b>	<b>65</b>
<b>TABLE 3.6.1-1: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED FISH CAUGHT BY BOAT ANGLERS ON LSR, 2010. ....</b>	<b>66</b>
<b>TABLE 3.6.1-2: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED, SEASONALLY, FISH CAUGHT, SEASONALLY, BY BOAT ANGLERS ON LSR, 2010. ....</b>	<b>67</b>
<b>TABLE 3.6.1-3: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR RELEASED FISH CAUGHT BY BOAT ANGLERS ON LSR, 2010. ....</b>	<b>68</b>

**TABLE 3.6.1-4: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR  
RELEASED FISH CAUGHT, SEASONALLY, BY BOAT ANGLERS ON LSR, 2010. .... 69**

**TABLE 3.6.2-1: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR  
HARVESTED FISH CAUGHT BY SHORE ANGLERS ON LSR, 2010. .... 72**

**TABLE 3.6.2-2: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR  
HARVESTED FISH CAUGHT, SEASONALLY, BY SHORE ANGLERS ON LSR , 2010. .... 73**

**TABLE 3.6.2-3: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR  
RELEASED FISH CAUGHT BY SHORE ANGLERS ON LSR DURING 2010..... 76**

**TABLE 3.6.2-4: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR  
RELEASED FISH CAUGHT, SEASONALLY, BY SHORE ANGLERS ON LSR, 2010..... 77**

**TABLE 3.7.1-1: FISHING TOURNAMENTS OR EVENTS OCCURRED ON THE LSR, 2010... 80**

**LIST OF FIGURES**

**FIGURE 2.1-1: LOWER SUSQUEHANNA RIVER INTERVIEW LOCATIONS..... 81**

**FIGURE 3.1.2-1: BOAT ANGLER USE PROFILES FOR TEMPORAL STRATA..... 82**

**FIGURE 3.1.4-1: SHORE ANGLER USE PROFILES FOR TEMPORAL STRATA. .... 85**

**FIGURE 3.6.1: SIZES OF HARVESTED WHITE PERCH BY ANGLERS ON THE LSR, 2010. 88**

**FIGURE 3.6.2: SIZES OF HARVESTED CHANNEL CATFISH BY ANGLERS ON THE LSR, 2010 . .... 89**

**FIGURE 3.6.3: SIZES OF HARVESTED STRIPED BASS BY ANGLERS IN THE LSR, 2010. .. 90**

**FIGURE 3.6.4: SIZES OF RELEASED BLACK BASS BY ANGLERS ON THE LSR, 2010. .... 91**

**FIGURE 3.6.5: SIZES OF RELEASED STRIPED BASS BY ANGLERS IN THE LSR, 2010..... 92**

## **LIST OF APPENDICES**

- APPENDIX A-1: RANDOM AERIAL FLIGHT SCHEDULE.**
- APPENDIX A-2: RANDOM GROUND SURVEY SCHEDULE.**
- APPENDIX B-1: STANDARD OPERATING PROCEDURE.**
- APPENDIX B-2: CODING MANUAL.**
- APPENDIX B-3: STANDARDIZED AERIAL COUNT FORM.**
- APPENDIX B-4: STANDARD SITE COUNT FORM.**
- APPENDIX B-5: STANDARDIZED GROUND SURVEY INTERVIEW FORM.**
- APPENDIX B-6: SITE DESCRIPTION AND ROUTES.**
- APPENDIX C: PHOTOGRAPHS.**
- APPENDIX D-1: ESTIMATED EFFORT OF ANGLERS FISHING IN THE LSR, 2010.**
- APPENDIX D-2: MEAN TRIP LENGTH FOR ANGLERS TARGETING VARIOUS SPECIES IN THE LSR, 2010.**
- APPENDIX D-3: OBSERVED FISH CAUGHT AND HARVESTED ON THE LSR, 2010.**
- APPENDIX D-4: EXPANDED BOAT CATCH AND HARVEST ESTIMATES THE LSR, 2010.**
- APPENDIX D-5: EXPANDED BOAT CATCH AND HARVEST ESTIMATES BY DAY TYPE AT LSR, 2010.**
- APPENDIX D-6: EXPANDED SHORE CATCH AND HARVEST ESTIMATES ON THE LSR, 2010.**
- APPENDIX D-7: EXPANDED SHORE CATCH AND HARVEST ESTIMATES BY DAY TYPE AT LSR, 2010.**
- APPENDIX D-8: GENERAL SEASONAL SPECIES CATCH AND HARVEST RATES IN LSR, 2010.**
- APPENDIX D-9: GENERALSSPECIES CATCH AND HARVEST RATES FOR THE LSR, 2010.**
- APPENDIX D-10: TARGETED CATCH AND HARVEST RATES FOR ANGLERS IN THE LSR, 2010.**
- APPENDIX D-11: TARGETED SEASONAL CATCH AND HARVEST RATES FOR BOAT ANGLERS ON THE LSR, 2010.**
- APPENDIX D-12: TARGETED SEASONAL CATCH AND HARVEST RATES FOR SHORE ANGLERS ON THE LSR, 2010.**



**APPENDIX D-13: TARGETED SEASONAL CATCH AND HARVESTED RATES FOR BOAT ANGLERS FOR CONOWINGO TAILRACE AND THE TIDAL/NON-TIDAL REACH OF THE LSR, 2010.**

**APPENDIX D-14: TARGETED SEASONAL CATCH AND HARVESTED RATES FOR SHORE ANGLERS FOR CONOWINGO TAILRACE AND THE TIDAL/NON-TIDAL REACH OF THE LSR, 2010.**

**APPENDIX D-15: SIZE OF FISH WERE CAUGHT AND HARVESTED IN THE LSR, 2010.**

## GLOSSARY OF TERMS AND ACRONYMS

angler trip	a measure of angling effort, calculated by dividing angler-hours (also a measure of effort) by mean trip length in hours.
angler-hour	basic unit of angler effort
black bass	species within the genus <i>Micropterus</i> ; includes largemouth and smallmouth bass.
catch	all fish caught by an angler
CPUE	acronym for catch-per-unit-effort; catch rate. Herein, fish caught per angler-hour; a measure of angler success.
targeted fishery	effort by anglers targeting a specific species (e.g., striped bass) or group of fishes (black bass, sunfish).
fishing trip	Generally, time spent on shore or in a boat fishing.
h	hours
harvest	fish caught that are kept by the angler
HPUE	acronym for harvest-per-unit-effort; harvest rate. Herein, fish harvested per angler-hour; a measure of angler success
PSE	proportional standard error (standard error of estimate/the estimate X 100), a measure of precision.
QA	quality assurance
retention rate	the proportion of fish caught that were harvested by an angler.
SE	standard error, a precision measure of an estimate

### *Agencies*

FERC	Federal Energy Regulatory Commission
MDE	Maryland Department of Environment
MDNR	Maryland Department of Natural Resources

### *Miscellaneous*

MW	megawatt
ILP	Integrated Licensing Process

## 1.0 INTRODUCTION

Exelon Generation Company, LLC (Exelon) has initiated with the Federal Energy Regulatory Commission (FERC) the process of relicensing the 573-megawatt (MW) Conowingo Hydroelectric Project (Project). Exelon is applying for a new license using the FERC's Integrated Licensing Process (ILP). The current license for the Conowingo Project was issued on August 14, 1980 and expires on September 1, 2014.

As required by the ILP, Exelon filed their Pre-Application Document (PAD) and Notice of Intent (NOI) with FERC on March 12, 2009. On June 11 and 12, 2009, a site visit and two scoping meetings were held at the Project for resource agencies and interested members of the public. Following these meetings, formal study requests were filed with FERC by several resource agencies. Many of these study requests were included in Exelon's Proposed Study Plan (PSP), which was filed on August 24, 2009. On September 22 and 23, 2009, Exelon held a meeting with resource agencies and interested members of the public to discuss the PSP.

Formal comments on the PSP were filed with FERC on November 22, 2009 by Commission staff and several resource agencies. Exelon filed a Revised Study Plan (RSP) for the Project on December 22, 2009. FERC issued the final study plan determination for the Project on February 4, 2010, approving the RSP with certain modifications.

The final study plan determination included a requirement for Exelon to conduct a creel survey on Conowingo Pond and the lower Susquehanna River downstream of Conowingo Dam (LSR). Due to the extensive amount of data, above and below the Conowingo Dam, and the extended length of the Conowingo Pond survey, these creel reports will be represented individually. Previous survey data demonstrated the popularity and angler success of migratory species such as: American and hickory shad (*Alosa sapidissima* and *A. mediocris*), striped bass (*Morone saxatilis*), and white perch (*Morone americana*). The objectives of this study are to: 1) determine the angling effort estimates; 2) determine the catch and harvest estimates and rates 3) identify demographics and biological data from both boat and shore anglers on the lower Susquehanna River. The creel data reported of the LSR will be used in conjunction with the Recreational Needs and Assessment (RSP 3.26) to address any angling opportunities in the LSR.

An initial study report (ISR) was filed on May 27, 2011, containing Exelon's 2010 study findings. A meeting was held on August 23 and 24, 2011 with resource agencies and interested members of the public. Formal comments on the ISR including requested study plan modifications were filed with FERC

on March 21, 2012 by several resource agencies and interested members of the public. Exelon filed responses to the ISR comments with FERC on April 20, 2012. On May 21, 2012, FERC issued a study plan modification determination order. The order specified what, if any, modifications to the ISR should be made. For this study, FERC's May 21, 2012 order required no modifications to the original study plan. This final study report is being filed with the Final License Application for the Project.

The Susquehanna River below Conowingo Dam flows approximately 10 miles before entering Chesapeake Bay. The tailrace of Conowingo Dam for this study is defined as the area immediately downstream of the dam for approximately one mile. The non-tidal portion of the Susquehanna River encompasses approximately three miles of river length, from about one mile below Conowingo Dam downstream to the mouth of Deer Creek (a tributary), which is the approximate natural upstream limit of tidal influence. The tidal portion of the river is the six miles downstream of the mouth of Deer Creek to the mouth of the Susquehanna River at the head of the Chesapeake Bay. At the point where the Susquehanna River flows into the bay, the average depth is 30 feet.

## **2.0 METHODS**

### **2.1 Study Area**

The LSR is located below Conowingo Dam in northeastern Maryland between Harford and Cecil counties in MD. LSR is 34 miles northeast of Baltimore, MD and 34 miles west of Wilmington, DE. The combined population of adjacent Harford and Cecil counties is about 350,000 people (2009 U.S. Census; <http://quickfacts.census.gov/qfd/states/24000.html>). Recreational angling is enhanced by the migratory fish available to both shore and boat anglers plus the variety of resident species including smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), and walleye (*Sander vitreus*).

The area of the LSR includes a variety of fishing habitats. The upstream most section is the tailrace of the Conowingo Dam with fluctuating water levels depending on the number of units generating. The non-tidal section includes the Octoraro Creek mouth and extends to the mouth of Deer Creek, which is also affected by fluctuation water levels. The lower most section is the tidal section which extends from the mouth of Deer Creek to the lower railroad bridge (Amtrak Bridge) at the mouth of the Susquehanna River at Havre de Grace, MD. The whole study area comprises 10 river miles. The areas beyond the mouth of the river or the creeks were not sampled in this study ([Figure 2.1-1](#)).

### **2.2 General Survey Design Characteristics**

The 2010 lower Susquehanna River creel study (1 March to 30 November) was assessed with a complemented survey ([Pollock et al. 1994](#)) that combined aerial counts of fishing boats and shore anglers with information obtained from ground interviews at boat ramps and shore fishing access points over a period of 10 hours.

The nine-month time frame was stratified into three seasons. The fishing seasons, of unequal lengths, were developed to reflect Maryland State fishing regulations as follows:

- Spring = 1 March – 31 May;
- Summer = 1 June – 6 September;
- Fall = 7 September – 30 November.

Weekdays and weekend days/holidays represented temporal strata within each season.

### 2.2.1 Aerial Count Flights

Weekly aerial flights were made by helicopter flown at about 200 ft above ground level and identified shore anglers and boats with anglers that were actively fishing. An approximately equal number of weekday and weekend/holiday flights was achieved by alternating flight days between day types throughout the survey. The specific flight day within a week was chosen at random ([Appendix A-1](#)). Flight times were distributed throughout the day. All shore anglers and actively-fishing<sup>1</sup> boats were counted on a standardized aerial count form ([Appendix B](#)). Active fishing boats were identified by location, activity, or visible gear. Flights were short, typically lasting 30 minutes but included a slow pass just off one shoreline and back the other slowing at locations of seen abundance of anglers or boats ([Figure 2.1-1](#)).

### 2.2.2 Ground Survey

Two weekend days and two weekdays per week throughout the survey were randomly selected for interviews ([Appendix A-2](#)). On designated federal (US) holiday weekends, two of three days were randomly selected. Clerks split time between five or six locations depending on site popularity and route that was selected for a period up to 10 hours. Virtually all anglers were contacted by stationing a creel technician at a non-fixed location to observe an overall site. Photo documentation of the sites are found in [Appendix C](#). Ground interviews on the LSR followed a schedule utilizing random start times depending on length of daylight. Additionally, survey technicians had the flexibility to obtain interviews by roving among shore anglers during periods of low angler abundance, as reported by [Smucker et al. \(2009\)](#).

Start time and initial location of interviews were each selected randomly from among a series of potential starting times (0700 h-1100 h, depending upon day length). The surveys could begin as late as 1100 h during summer (but no later than 0700 h in November) to be completed by dark. Technicians interviewed all returning or exiting anglers during the wait period at each site. The length of time at each site varied depending on the patterns of observed angler usage with more time was spent at sites with more anglers. The number of boat and shore anglers interviewed was recorded on the standard site count form ([Appendix B](#)). Completed trip interview data were recorded on a standardized ground survey interview

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<sup>1</sup> Fishing and non-fishing boats were distinguished by different methods. First, indication of a non-fishing boat was the observation of visible wake. A boat that was stationary or slowly moving was not always deemed “actively” fishing, this was determined if fishing rods were examined in the angler’s hands or the observation of light reflecting off fishing line that was coming from the boat. The height at which these aerial flights were flown was at most 200 feet off the water surface, but could have been as low as 50 feet off the water depending on the area, and the weather.

forms for all exiting fishing boats and shore anglers ([Appendix B](#)). Interrupted fishing trips that returned to the ramp for thunderstorms, food, fuel, or mechanical problems were considered completed trips.

With the increase of late evening fishing, noted by the creel clerks, we performed a limited number of summer nighttime interviews. These after dark interviews occurred at “safe” sites along the lower Susquehanna River that were observed as sites used for nighttime fishing activity. These “safe” sites included good lighting and easy access.

Interviews of boat and shore anglers acquired catch and harvest data, angler demographics, targeted species, released/harvested fish length information, and temporal trip data needed to calibrate fishing pressure counts, as detailed in [Lockwood et al. \(2001\)](#). Similar methods were used by [Smucker et al. \(2009\)](#). Creel technicians kept a journal to record daily observations of information and events not included on the survey instruments. These journals proved useful when describing or explaining the overall survey data, including angler comments, as well as observations made by the angler or creel clerk.

### **2.3 Data Management**

Field data quality control began with a review of each day’s data sheets for accuracy and completeness by the survey technician prior to delivery to the field coordinator. The field coordinator completed data sheet reviews before submittal for electronic processing. Questions and data gaps were resolved prior to data entry.

All aerial counts, site interview counts, and ground interview data were doubled-keyed to separate databases. Database listings were produced and compared to original data sheets, and any corrections made as necessary. Following these quality assurance (QA) steps the data were loaded into a SAS Version 9.1 database for all calculations.

### **2.4 Computational Methods for Boat and Shore Angler Survey**

Effort estimates for boat and shore fisheries were based on the weekly helicopter flights that counted actively fishing boats and shore anglers. Effort estimates in angler hours were developed as described in [Lockwood et al. \(2001\)](#). The expansion from boat counts and shore anglers counts to angler hours of effort depends upon development of “angler use profiles” based on ground interview data. These profiles were developed for each of the six angler strata (season = 3; day type = 2) from all the interviews in the stratum. Each profile describes the hourly distribution of anglers throughout a fishing day in the respective stratum.

Factors  $e_{pt}$  for expanding counts for  $i = 1-24$  hours are

$$e_{pt} = \frac{1}{b_{pt}} \sum_{i=1}^{24} b_{pi}$$

where  $b_{pt}$  = number of parties each hour of the day during the period.

Since it represented a minimal portion of the overall effort variance, the variance attributable to the expansion factors derived from the “angler use profiles” was not included in the overall effort variance calculations (Roger Lockwood, Michigan Department of Natural Resources, personal communication to John Magee, Gomez and Sullivan Engineers, Normandeau 2004). Each individual aerial count ( $B_{pt}$ ) was then expanded by  $e_{pt}$  and the number of days in the season ( $D_p$ ) to estimate effort ( $E_{pt}$ ) in angler-hours.

$$E_{pt} = B_{pt} D_p e_{pt}$$

In other words, the instantaneous aerial count ( $B_{pt}$ ) is expanded by the proportion of the fishing activity t that hour of the day ( $E_{pt}$ ) as derived from the angler use profiles and the number of days in the season ( $D_p$ ).

Mean effort for the season was estimated by averaging over  $n$  counts in the period.

$$\bar{E}_p = \frac{1}{n_p} \sum_{i=1}^{n_p} E_{pi}$$

Where  $E_{pi}$  is the individual effort estimate made from each aerial count.

Estimated variance for  $\bar{E}_p$  is

$$\hat{\text{Var}}(\bar{E}_p) = \left[ 1 - \frac{n_p}{D_p} \left( \frac{\sum_{i=1}^n (\bar{E}_p - E_{pi})^2}{n_p (n_p - 1)} \right) \right] + \left[ \left( \frac{1}{D_p n_p} \right) \sum_{i=1}^{n_p} \text{Var}(e_{pi}) \right]$$

Estimated boat anglers hours ( $\hat{E}_{ap}$ ) for the season was derived by multiplying  $\bar{E}_p$  by the mean number of anglers per boat ( $A_p$ ) in the season. The number of anglers per fishing boat was obtained from the ground interviews. Variance of the estimated boat angler hours is



$$\hat{Var}(\hat{E}_{ap}) = \bar{E}_p^2 \hat{var}(A_p) + A_p^2 \hat{var}(\bar{E}_p) - \hat{Var}(A_p) \hat{var}(\bar{E}_p).$$

Estimated effort in angler hours was calculated for targeted species. Species-specific effort was the product of the amount of boat angler effort in a primary stratum (e.g., summer) and the proportion of anglers targeting a species in the respective stratum. This method is simplified in that it does not account for variations in trip length among anglers targeting different species.

The effort estimate calculations for shore anglers were identical, utilizing shore angler use profiles determined from completed trip interviews, except that the number of shore anglers was determined directly from aerial flights.

Catch per-unit-effort (CPUE) and harvest per-unit-effort (HPUE) rates were developed mainly from completed trip interviews. A ratio-of-means estimator ([Jones et al. 1995](#); [Lockwood 1997](#); [Pollock et al. 1997](#)) was used to calculate catch and harvest rates within each stratum, which is recommended when using completed trip interviews ([Jones et al. 1995](#)). All rates are expressed as fish per angler-hour (fish/h). Overall rates (all anglers) as well as directed (targeted fishing) rates were calculated. Directed rates were used for various comparisons of angler success. Incomplete fishing trip < 0.5 h were omitted from catch and harvest rate calculations to avoid extreme catch rates ([Pollock et al. 1994](#)).

Two different estimators are commonly used to calculate catch rates. The mean of the ratios estimator is used when incomplete trips predominate the interviews and the ratio-of-means estimator is used when complete trips predominate. Because of the predominance of completed trip interviews, the ratio-of-means estimator was used to calculate catch rates. The ratio-of-means estimator is calculated by dividing the total catch by the total effort of all the interviewed anglers within the stratum. This estimator was defined as:

$$\hat{R}_1 = \left( \frac{\sum_{i=1}^n x_i}{\sum_{i=1}^n c_i} \right)$$

where  $\hat{R}_1$  = mean catch rate or harvest rate for the stratum,

n = the number of party interviews in the stratum,

$x_i$  = the catch or harvest of the  $i$ th party  $i=1, \dots, n$ ,

$c_i$  = the total angler hours expended by the  $i$ th party.

The estimates of variance of the mean catch or harvest rate were calculated by using the single cluster sampling with replacement formula described by [Jones et al. \(1995\)](#):

$$\hat{\text{Var}}(\hat{R}_1) = \frac{1}{N(\bar{x})^2} \left( \frac{\sum_{i=1}^n (x_i - R_1 c_i)^2}{n} \right)$$

where  $\hat{\text{Var}}(\hat{R}_1)$  = estimated variance of the mean catch or harvest rate for anglers,

$\hat{R}_1$  = mean catch or harvest rate for anglers,

$n$  = the number of party interviews in the stratum,

$x_i$  = the catch or harvest rate for the  $i$ th party  $i=1, \dots, n$ ,

$c_i$  = the total angler hours expended by the  $i$ th party,

$N$  = number of anglers in the stratum or given day,

$\bar{x}$  = mean angler effort.

Using the variance of the means, the standard error of estimation was calculated as follows:

$$\sqrt{\hat{\text{Var}}(\hat{R}_1)} .$$

Precision of estimates was expressed as proportional standard error (PSE), which is equal to the standard error, was divided the estimate to calculate PSE. A target PSE for survey estimates, where appropriate, is 20% or less ([Malvestuto 1983](#)).

Catch and harvest for each species by season were the products of effort and overall catch/harvest rates for that species for each day type (weekday, weekend) in a season. Seasonal estimates were the sum of the two day type estimates per season.

### **3.0 RESULTS**

#### **3.1 Observed Data**

##### **3.1.1 Aerial Count Flights**

A total of 42 angler count flights were scheduled during the March through November 2010 period; 41 flights were flown ([Table 3.1.1-1](#)). The initial flight on March 1, 2010, opening day for catch-and-release season for striped bass, was replaced by a thorough ground count due to paperwork. This ground-based count of actively fishing boats occurred at the scheduled time and included multiple views of the river, with the use of binoculars, from Perryville ramp to Fisherman's Park at Conowingo Dam and multiple stops for shore angler counts. The number of angler counts was similar among survey temporal strata (day type and number of counts compared to the days per season). All count start times occurred between 0801-1647 h, with the average count start time of 1145 h.

During the aerial flights, actively fishing boats favored the tidal section of the LSR during the spring and summer and slightly less in the fall ([Table 3.1.1-2](#) and [Figure 2.1-1](#)). Count flights recorded 853 "actively fishing" boats, with 720 boats (84% of boats) in the tidal section.

Boats in transit trailing a "visible wake" or with no fishing rods visible were treated as not actively fishing and were not counted. However, changing locations was a normal activity during many fishing trips. Such boat anglers may have simply been anglers moving from one location or other feature to another. The number of boats that were anglers changing fishing locations (relative to the other listed possibilities) is unknown, but if substantial, may lead to an underestimate of boat fishing effort since fishing boats "in transit" were omitted from estimated effort calculations (see Section 2.4).

Count flights recorded a total of 1,741 "actively fishing" shore anglers, 947 of which were observed fishing the tailrace, 673 fishing tidal waters, and the rest (121) fishing the non-tidal section of the LSR ([Table 3.1.1-2](#)). Shore fishing at tailrace and tidal sections combined accounted for more than 91.6% of the observed counts in any one season and 93% overall. Although aerial counts were not recorded by individual site but it was recorded by river segment. During spring, 432 of the 876 shore anglers observed were within the tidal section of the LSR, primarily between the Deer Creek and Port Deposit ramp area. Shore anglers preferred the tailrace section (54%) over the course of the survey. Shore anglers "actively fishing" were counted if anglers were seen with fishing rod in hand or within close proximity of the gear. Anglers that were observed sitting down away from the water's edge with rod not facing the body of water were not counted as actively fishing.

### 3.1.2 Boat Angler Interviews

Boat angler interviews were conducted at the selected boat ramps on the LSR. All but one boat ramp was in the tidal section of the river; Shures landing (site 102) was located in the tailrace of Conowingo Dam. Boat ramps at Jean Roberts Park (site 115), Perryville Municipal (site 116), Port Deposit Municipal (site 118), and Rock Run Marina (site 119) were used during the complete survey. Boat launches that were not sampled during the entire study were Lapidum (Site 113) and a private ramp Owens (Site 117). Lapidum opened for public use on 2 June, but Owens (Site 117) was closed to the public after 15 April ([Figure 2.1-1](#)).

Overall, the number of complete boat interviews were equal during spring and summer (approximately 36.5%); during all seasons weekend interviews accounted for over 70% of all boat interviews ([Table 3.1.2-1](#)). Completed boat fishing party interviews were relatively consistent from month to month except for March, July and November where these interviews were slightly lower ([Table 3.1.2-2](#)).

The completed boat interviews sample totaled 797 boat anglers representing 382 angling parties ([Table 3.1.2-3](#)). The overall average was 2.1 anglers per boat for 382 fishing parties ([Table 3.1.2-3](#)). The average number of anglers per boat was slightly higher during spring, and slowly decreased over the year with the lowest in the fall.

The average length of a completed boat fishing trip was 4.4 h ([Table 3.1.2-4](#)). Trip length average was greatest during the summer weekday (4.7 h), but fall weekday boat fishing trips (3.8 h) was the lowest. Weekend and spring weekday boat fishing trips were similar to the overall trip average length.

Boat angler use profiles developed from interview data within each of six strata (three seasons, two day types) depicted the aggregated number of boat fishing parties on the water throughout the sampled fishing days ([Figure 3.1.2-1](#)). All profiles were unimodal and suggested that peak boat fishing activity was achieved by or before noon regardless of season or daytype. Peak usage typically extended to 0900-1200 h, then declined steadily throughout the afternoon and evening. Although little evidence of increased evening fishing was recorded, we commonly saw boats launched during evening surveys. Additional night-time surveys were conducted to capture some evening/night boat fishing activity. Two of the boat launches on the LSR are not open all night long. Lapidum boat launch closes at dusk while Shures Landing closes one hour after sunset. Each profile was used in combination with the corresponding aerial boat counts to estimate boat fishing pressure.

### 3.1.3 Species Sought by Boat Anglers

Thirteen species or species groups were targeted by the boat fishery ([Tables 3.1.3-1](#) and [3.1.3-2](#)). Overall, boat anglers that targeted a particular species sought striped bass (20.5%). In March, boat anglers (45%) sought yellow perch (*Perca flavescens*), while in April, June, October, and November; the boat anglers sought striped bass. However, angler preference differed between months. In May boat anglers seeking white perch formed 35% of those interviewed, while largemouth bass was the most sought after species in July and August ([Table 3.1.3-1](#)).

For the survey period, striped bass (20.5%) was the most sought after species with angler preference peaking in April and May ([Tables 3.1.3-1](#) and [3.1.3-2](#)). Other boat anglers with a species preference were targeting white perch (10.1%), catfish (Family *Ictaluridae*, 6.3 %), and shad (*Alosa* spp., 3.9%). During the spring, summer, and fall, 24% of combined boat anglers interviewed did not express a species preference (“Anything”), with summer being the highest at 28.7%. These boat anglers seeking “Anything” are collectively known as “casual” anglers.

Boat anglers seeking black bass accounted for 20.1% of anglers in 2010 ([Table 3.1.3-2](#)). During the summer, black bass (*Micropterus* spp., smallmouth and largemouth bass combined) was the most sought after species by boat anglers (36.9%) with largemouth bass being most dominant. The pursuit of black bass peaked in August when nearly half (44.1%) of boat anglers sought bass ([Table 3.1.3-1](#)).

The blue crab (*Callinectes sapidus*), was highly sought after by boat anglers in fall ([Table 3.1.3-2](#)). In September and October the boat anglers sought this species, 48.9 and 33.8%, respectively ([Table 3.1.3-1](#)). It is highly sought after in the Chesapeake Bay in the commercial and recreational fishery.

### 3.1.4 Shore Angler Interviews

Shore angler interviews occurred at 12 of the 13 sites to provide data to characterize the angler sample by season, by access point, and overall ([Figure 2.1-1](#)). Most (83%) of all the shore party interviews were from completed trips. Of the 346 incomplete shore party trips overall, 87 occurred in the spring. Nearly all the summer and fall shore interviews parties were from completed trips.

Shore anglers surveyed (554 complete and 110 incomplete interviews) totaled 1,120 anglers representing 664 angling parties ([Table 3.1.4-1](#)). Seasonally, nearly 47% of the 554 completed shore interviews occurred during spring and decreased steadily throughout the year ([Table 3.1.4-2](#)). Weekends in the spring accounted for about 30% of all completed shore surveys. The peak number of shore angler interviews (complete and incomplete) occurred in April (25.2%), and lowest number of angler interviews (4.1%) occurred in November ([Table 3.1.4-3](#)).

The average number of anglers per party was 1.7, and the average length of a completed shore fishing trip was 3.1 h ([Tables 3.1.4-1](#) and [3.1.4-4](#)). The lowest number of completed angler interviews was during the fall but this time of year accounted for the longest mean fishing time. The lowest number of completed angler interviews was during the fall but this time of year accounted for the longest mean fishing time. Completed average trip length was greatest during the weekdays in the fall (3.8 h) with fall weekend trips lasting about the same (3.7 h). The average length per fishing trip in the spring (3.0 h) and summer (2.9 h) were less than the mean of the study (3.1 h).

The temporal and spatial distribution of ground interviews generally mimicked shore access site usage as determined by aerial count. Shore anglers frequently refused to participate in the survey and at a substantially higher (though not quantified) rate than for boat anglers.

Shore angler use profiles developed from interview data within each of six strata (three seasons, two day types) depicted differences in peak fishing activity ([Figure 3.1.4-1](#)). The spring and fall profiles suggested that peak shore fishing activity was achieved by early-afternoon regardless of day type, while summer profiles suggested that peak shore fishing activity was achieved in late afternoon or evening. Peak usage for spring and fall typically extended to 1200-1400 h, then declined steadily throughout the afternoon and evening. During the summer, data showed evidence of increased evening fishing on weekdays; we saw shore anglers arrive during evening surveys. Each profile was used in combination with the corresponding aerial shore angler counts to estimate shore angler fishing pressure.

### **3.1.5 Species Sought by Shore Anglers**

Shore anglers targeted 12 fish species; four species groups including: “shad”, “sucker” (Family *Catostomidae*), “black bass”, and “catfish”; and blue crab ([Table 3.1.5-1](#)). As [Table 3.1.5-2](#) shows “shad” (*Alosa* spp. combined minus gizzard shad, *Dorosoma cepedianum*) were sought after in the spring (39.3%) while striped bass was highly targeted during fall (33.7%) and summer (20.7%). Blue crabs were only sought in September by shore anglers ([Table 3.1.5-1](#)). Catfishing below Conowingo Dam peaked in the summer; most anglers indicated catfish but did not specify which species was targeted. Examined monthly, white perch was targeted by 11.3% shore anglers during the spring months (March, April and May). Walleye (*Sander vitreus*) were mainly targeted in March (12.8%) and November (23.1%). No one species was targeted every month.

“Casual” anglers, not seeking a particular species, accounted for 42.1% of shore anglers interviewed ([Table 3.1.5-2](#)). The percentage of such “casual” anglers was greatest (55.4%) during summer and lowest

in the spring (33.7%). Besides April (27.2%), anglers without a species preference were 35% percent or greater ([Table 3.1.5-1](#)). In June, almost 68% of shore anglers did not have a species preference.

Whereas boat anglers targeted a certain species of fish, the shore angler were less specific and simply specified a group of fish such as shad or catfish (see Section 3.1.3, [Table 3.1.5-1](#)). These groups of fish targeted by shore anglers comprised of 17.2% of all fish targeted in 2010. The “generalist” nature of shore bass anglers conformed to that of most other shore anglers.

The tailrace accounted for nearly 54% of interviews with anglers that were targeting a particular species or species group ([Table 3.1.5-3](#)). Fisherman’s Park (wharf and beach) and the mouth of Deer Creek were the busiest sites in the spring and accounted for 68% of all surveys conducted in the spring of anglers targeting a particular species.

### **3.2 Angling Effort Estimates**

Total boat and shore angling effort estimated for LSR during the survey period was 235,903 angler hours; PSE was 9.9% ([Table 3.2-1](#)). The total angling effort estimate was remarkable similar for boat (114,142 angler hours; PSE = 20.0%) and shore (121,761 angler hours; PSE = 3.7 %) anglers. The PSE for boat anglers are good while the PSE for shore anglers is very good. Weekend estimated effort (133,968) was slightly higher than weekday effort (101,935). Most of the estimated effort (81.4%) occurred during the spring and summer combined ([Appendix D-1](#)).

The estimated number of trips taken by boat anglers was 25,941 and 39,278 shore trips ([Table 3.2-2](#)). The estimated number of boat trips decreased each season while nearly 90% of the shore trips occurred in the spring and summer combined. The estimated number of trips taken by boat anglers were higher on weekends, whereas the number of shore trips was taken evenly among weekend and weekday.

Seasonally, estimated boat effort during spring accounted for 44% of hours and trips ([Tables 3.2-2](#) and [3.2-3](#)). More angler hours were expended during summer on fewer trips than occurred in spring due to the additional length of fish trips. Weekend boat angler effort hours contributed 63.8% of the total, and spring weekend alone accounted 53.5% of the weekend effort hours ([Table 3.2-3](#)).

Shore anglers effort in angler hours (52,376) and trips (18,061) were highest in the summer, although shore effort angler hours (51,545) and trips (17,182) were just slightly less during the spring ([Table 3.2-2](#)). Over 85% of angler hours and nearly 90% of trips occurred in spring and summer combined ([Tables 3.2-2](#) and [3.2-3](#)). A calculated PSE was 3.7% of the total hour effort estimate indicating very good

precision. Angler trips were calculated only by season to enhance the sample size of completed trips. Shore angling hours were nearly identical between weekdays and weekends.

Mean trip length in hours for all anglers targeting various species is found in [Appendix D-2](#).

Anglers expended a substantial effort targeting black bass ([Table 3.2-4](#)). Recreational anglers in the LSR targeting black bass accounted for the 24,261 hours and 5,274 trips. Of the estimated effort for black bass, 92.1% of the effort was from boat anglers, with the majority (62.2%) of the effort from the summer ([Table 3.2-5](#)).

### **3.3 Catch and Harvest Estimates**

The observed (raw) total fish catch and harvest for the interviewed boat and shore fisheries are listed separately in [Appendix D-3](#). The various temporal catch and harvest estimates for all fish were based on the raw data summarized in [Appendix D-4 through D-7](#). Without blue crabs (crab) included, anglers caught an estimated 264,429 fish and harvested 37,391 fish ([Table 3.3-1](#)). Most fish caught (98,224) and harvested (20,085), by shore and boat angler combined, were white perch. During spring, hickory shad and white perch represented 75.7% of the estimated boat and shore catch; while only white perch dominated (80.7%) the harvest in the spring. Nearly 76% of the catch of fish and 49% of the harvest of fish occurred in the spring. An additional 60,874 blue crabs were estimated to be caught of which 60,580 crabs were harvested.

#### **3.3.1 Boat Angler Catch and Harvest**

Boat anglers caught an estimated 133,971 of a least 18 species or species groups ([Table 3.3.1-1](#)). White perch accounted for 52.0% of the total catch. Migratory species including shad spp., American shad, hickory shad, and river herring along with striped bass and white perch totaled approximately 74% of all fish caught. An estimated 16,108 fish was harvested by boat anglers from LSR, of which 10,727 (66.6%) were white perch. Most of the remainder of fish harvested by boat anglers was channel catfish (12.8%) and yellow perch (10.8%), but channel catfish and yellow perch combined accounted for 15.8% of the total catch.

Highest seasonal catch (102,995) and harvest total (12,378) of fish by boat anglers occurred in spring ([Table 3.3.1-1](#)). White perch dominated the seasonal catch (59.9%) and harvest (80.4%) in the spring. Most of the white perch (88.6%) caught and harvested (97.8%) occurred during the spring. Shad spp. including American shad, hickory shad, and river herrings were caught only in the spring and represented 19.1% of the spring catch; an estimated 200 river herrings were harvested by boat anglers. Yellow perch were caught during the spring and summer but only harvested in the spring. Channel catfish represented



29% of the catch but 77.3% of the harvest during the summer. Striped bass accounted for 41.5% of the fall catch, and 36.5% of the harvest in the fall. Of the 970 striped bass that were harvested by the boat anglers, 78% were during the fall.

Summer fishery by boat anglers for black bass was substantial and the total summer catch exceeded that in other seasons ([Table 3.3.1-1](#)). Although Maryland State tidal fishing regulations state that only bass 15 inches or longer can be harvested before June 16, thereafter black bass can be harvested with a 12 inch minimum size. About 64% of the black bass were caught during the summer, but no black bass were harvested. Only an estimated 296 largemouth bass were harvest with 263 of these bass were harvested in the fall.

### **3.3.2 Shore Angler Catch and Harvest**

The total catch by shore anglers was 130,452 fish of at least 23 species or species groups ([Table 3.3.2-1](#)). Hickory shad dominated and formed 41.7% of all fish caught, but no hickory shad can be harvested. White perch and striped bass ranked second and third among species caught. Migratory species such as, white perch and striped bass combined with the shad group including shad spp., American shad, hickory shad, and river herrings to account for 84.4% of all fish caught. White perch dominated the overall harvest with 44.0% of the 21,280 fish harvested. Striped bass and catfish spp. including channel and flathead catfish combined accounted for 50% of the harvest. Other species that were caught but not harvested included: American eel, Atlantic needlefish, fallfish and rainbow trout. Shore anglers also caught but rarely kept gizzard shad, smallmouth bass, largemouth bass, yellow perch and an assortment of sunfish spp.

The largest catch of fish by shore anglers occurred in spring ([Table 3.3.2-1](#)). The Shad group was the dominate taxa caught in spring, comprising 68.2% of the 97,483 fish caught but no harvest from this group was reported by shore anglers. White perch dominated (81.4%) the harvest during the spring and was the only migratory species harvested during the spring by shore anglers. The largest harvest of fish occurred during summer where white perch and striped bass combined accounted for 58.1% of the 10,611 fish harvest. Striped bass dominated and accounted for 67.0% of the 4,541 fish harvested in fall, which was 62.9% of the striped bass harvest but only 35.8% of the catch of striped bass.

### **3.3.3 Blue Crab Catch and Harvest**

Blue crabs were a large portion of the catch and harvest by boat anglers during the summer and fall. A total of 53,910 crabs were caught and 53,616 crabs were harvested ([Table 3.3.1-1](#)). The majority of the

crabs were caught (97%) and harvested (97.7%) during the fall. The number of crabs caught and harvested far exceeded the number of fish caught and harvested during the fall.

Blue crabs were caught and harvested by shore anglers. An estimated 4,334 blue crabs were caught and harvested during fall by shore anglers representing 62.2% of the 6,964 blue crabs caught and harvested ([Table 3.3.2-1](#)).

### **3.3.4 Retention Rate**

The retention rate of fish by boat and shore anglers combined was 14.1% ([Table 3.3.4-1](#)). The retention rate of shore anglers (16.3%) was slightly higher than for boat anglers (12.0%) in the LSR in 2010.

## **3.4 Catch and Harvest Rates**

Both general and targeted rates are discussed in this section. General catch and harvest rates are calculated for all anglers and are those utilized in catch and harvest calculations. General catch and harvest rates are also particularly useful when describing the overall lower Susquehanna River shore fishery since the majority of shore anglers were generalists and about 42% of shore anglers interviewed targeted “Anything”. By comparison, 76% of boat anglers targeted a species or species group during their trips, so targeted catch and harvest rates are the most useful when discussing the boat fishery.

### **3.4.1 General Rates**

The CPUE and HPUE values for anglers for all species combined seasonally and overall are listed in [Appendix D-8 and D-9](#).

Boat angler overall CPUE and HPUE, without blue crab, were 1.15 and 0.13 fish/h, respectively ([Table 3.4.1-1](#)). CPUE was highest among spring boat anglers at 2.08 fish/h (SE = 0.44) and lowest in the fall at CPUE of 0.33 fish/h (SE = 0.09). The PSE for catch rates for boat anglers was fair for all three seasons (21.2-27.1%), but the overall CPUE PSE (16.5%) was considered good ([Table 3.4.1-2](#)). The boat angler HPUE was highest in the spring (0.24 fish/h) and lowest in the summer (0.04 fish/h).

Shore angler overall CPUE and HPUE were 1.25 and 0.18 fish/h, respectively ([Table 3.4.1-1](#)). The CPUE was highest in the spring at 1.96 fish/h (SE = 0.26) and lowest in the fall at 0.37 fish/h (SE = 0.07). The PSE for the shore angler CPUE was good for all seasons especially for spring at 6.1% and overall at 11.2% ([Table 3.4.1-2](#)). The low HPUE in the spring (0.12 fish/h) could possibly be due to the catch and return fishery of American shad and hickory shad.

The CPUE and HPUE for the primary migratory species and resident species are found in [Table 3.4.1-3](#). The shad group including Shad spp., American shad and hickory shad combined were sought by nearly

21% of shoreline anglers and virtually all in the spring ([Table 3.1.5-2](#)). Striped bass was mainly sought by shore anglers during the summer and fall, whereas white perch was mainly sought in the spring. The resident species were only sought by 5.7% of the shore anglers.

The overall CPUE of hickory shad (0.55 fish/h), was highest among all species caught in the LSR by shore anglers ([Table 3.4.1-3](#)). The white perch overall CPUE of 0.26 fish/h ranked second, but the overall HPUE (0.08 fish/h) was higher than any other species. Seasonally, the CPUE of hickory shad was higher than any other species during the spring (1.15 fish/h). The CPUE of striped bass was highest during the summer (0.24 fish/h) and fall (0.21 fish/h). The CPUE and HPUE of smallmouth bass and largemouth bass was 0.00 fish/h, although a few smallmouth and largemouth bass were caught but rarely harvested by shore anglers. CPUE and HPUE for channel catfish was seen in all season and was the highest CPUE (0.07 fish/h) and HPUE (0.03 fish/h) of the resident species.

With blue crabs included, the CPUE in fall for all boat anglers (2.36 fish/h) was highest overall, but both CPUE and HPUE had a PSE of over 35% ([Table 3.4.1-4](#)). Boat angler CPUE was lowest in the summer (0.68 fish/h). The boat angler HPUE was especially high in fall (2.12 fish/h) due to the large harvest of blue crabs. However the overall CPUE and HPUE for shore anglers, with blue crabs included, were only slightly affected compared to boat anglers. CPUE in the fall was slightly higher, 0.53 fish/h in fall with blue crabs included compared to 0.37 fish/h without blue crabs ([Tables 3.4.1-1](#) and [3.4.1-4](#)). HPUE for the fall was nearly double with the harvest of blue crabs included (0.33 fish/h) compared with blue crabs included (0.17 fish/h).

### **3.4.2 Targeted Species Rates**

All targeted species CPUE and HPUE for boat and shore anglers for individual species that were targeted are found in [Appendix D-10 through D-12](#).

Blue crab (82 anglers) and hickory shad (1 angler) had the greatest targeted CPUE for boat anglers with 4.57 crabs/h (SE = 2.09) and 4.21 hickory shad/h ([Table 3.4.2-1](#)). For the 82 anglers that targeted blue crabs, the HPUE was 4.56 crabs/h, just slightly lower than the CPUE as most anglers harvested them. Since hickory shad are strictly a catch and release fish, no fish were or could be harvested. Both the targeted CPUE and HPUE for blue crab during the primary fishery (in terms of targeted effort and catch) in fall was 6.20 fish/h (SE = 2.51), as all blue crabs during this season was harvested ([Table 3.4.2-2](#)).

The white perch CPUE (3.69 fish/h) and HPUE (0.76 fish/h) were the highest among fish that were harvested by boat anglers. The 35 anglers that targeted yellow perch had a CPUE of 1.85 fish/h but a PSE

of 93.5%. Largemouth bass had the highest CPUE (0.68 fish/h) among the resident species and were sought by 107 boat anglers.

The targeted CPUE for white perch was highest in the spring based on 74 boat anglers, and this CPUE approached 4.0 fish/h and HPUE was 0.82 fish/h ([Table 3.4.2-2](#)). Only three boat anglers targeted white perch but had the highest CPUE among summer at 1.78 fish/h, but three boat anglers targeting white perch in the fall had a CPUE and HPUE of 0.00 fish/h.

Boat anglers targeting channel catfish (three) had the highest CPUE of the fall at 1.33 fish/h but a HPUE of 0.00 fish/h. Channel catfish's HPUE for summer was 0.30 fish/h and a CPUE of 0.46 fish/h for the 14 boat anglers targeting channel catfish. Striped bass was sought after by 38 boat anglers during the fall and had a CPUE of 0.29 fish/h and a HPUE of 0.08 fish/h.

Targeted CPUE and HPUE for the species most often targeted by shore anglers ([Table 3.1.5-2](#)) is shown in [Table 3.4.2-3](#). The targeted CPUE of hickory shad and American shad (2.31 and 1.04 fish/h, respectively) were highest among all species caught from shore, but the HPUE of these species are 0.00 fish/h ([Table 3.4.2-1](#)). The seasonally PSE of CPUE for hickory shad was the lowest at 17.7% for shore anglers. Blue crab overall targeted CPUE of 2.01 crab/h ranked second, but the HPUE (2.01 crab/h) was higher than for any other species. All blue crabs that were caught were harvested.

Seasonally, the targeted CPUE for hickory shad (84 shore anglers) and American shad (37 shore anglers) was only from the spring ([Table 3.4.2-3](#)). The targeted CPUE and HPUE for blue crab were identical in the summer (1.65 crabs/h) and fall (2.40 crabs/h). White perch was targeted by nine anglers and the CPUE (1.61 fish/h) and HPUE (0.59 fish/h) was highest among harvested fish in the spring, but the HPUE was higher in summer (1.25 fish/h).

Striped bass was sought by the most anglers during the summer and fall. Seventy-seven shore anglers targeted striped bass in the summer and CPUE was 0.57 fish/h, with a HPUE of 0.13 fish/h. The targeted CPUE of striped bass was lower in the fall (0.25 fish/h) for the 55 anglers, but HPUE of 0.14 fish/h was similar.

### **3.4.3 Targeted Rates for Tailrace vs. Tidal and Non-tidal**

Targeted CPUE and HPUE rates were calculated for Conowingo tailrace vs. tidal/non-tidal reach for boat and shore anglers seeking various species. The number of boat parties interviewed in the tailrace was too low to be compared to tidal/non-tidal reach. ([Appendix D-13](#)).

Shore angler targeted CPUE and HPUE rates for tailrace could be compared to that of these rates in tidal/non-tidal reach due to the amount of anglers in each area targeting the same species. For all species targeted in the tailrace and the tidal/non-tidal reach are found in [Appendix D-14](#).

In the spring, the hickory shad CPUE were nearly identical; the 17 shore anglers had a CPUE of 2.27 fish/h in the tailrace compared to the 38 shore anglers that had a CPUE of 2.32 fish/h in the tidal/non-tidal reach ([Table 3.4.3-1](#)). White perch was another species that was sought in the spring by shore anglers in both the tailrace and tidal/non-tidal reach. The targeted CPUE of white perch in the tailrace was slightly higher at 1.87 fish/h than the CPUE of 1.60 fish/h of the tidal/non-tidal reach. The HPUE of white perch for the tailrace and tidal/non-tidal reach were 0.53 and 0.59 fish/h, respectively.

Other fish species that were caught and harvested in tailrace by shore anglers were channel catfish and white perch in the summer, walleye and carp in the fall, and striped bass in both of these seasons. White perch had the highest CPUE and HPUE (2.97 fish/h) in the summer. Striped bass was the dominant fish species sought by shore anglers in the tailrace in the summer (CPUE = 0.65 fish/h) and fall (CPUE = 0.26 fish/h), but both seasons had identical HPUE of 0.15 fish/h.

White perch (CPUE = 0.72 fish/h) in the summer and smallmouth bass (CPUE = 0.31 fish/h) in the fall were the only two fish species for which a targeted CPUE could be calculated for shore anglers in the tidal/non-tidal reach ([Table 3.4.3-1](#)). Shore anglers targeted CPUE and HPUE of 1.65 crabs/h was highest for anglers in the summer seeking blue crabs while the targeted CPUE and HPUE of 1.27 crabs/h was highest in the fall in the tidal/non-tidal reach.

### **3.5 Angler Demographics**

Residents of Baltimore County, Cecil County, and Harford County, MD known collectively as “local residents”, formed approximately 56% of total anglers interviewed ([Tables 3.5-1](#)). Anglers from Maryland together represented about 65% of all anglers. Lancaster County, Chester County, and York County, PA contributed formed 24% of all angler interviewed. There was little seasonal variation in residence patterns for either boat or shore fishery. Besides Maryland residents, and Pennsylvania residents (32%), anglers from nine other states and the District of Columbia were interviewed.

### **3.6 Biological Data**

Fish length measurements of harvested fish by anglers in the LSR are described in this section. White perch (241 individuals) were the dominant fish harvested by anglers and sizes are shown in [Figure 3.6-1](#). Channel catfish were also harvested by anglers in a variety of sizes and are shown in [Figure 3.6-2](#). Striped

bass were also harvested by anglers with a minimal size of 18 inches, and is shown by inches in [Table 3.6-1](#) and [Figure 3.6-3](#).

Anglers provided measurements for released fish caught in the LSR. Black bass lengths reported by boat and shore anglers are shown in [Figure 3.6-4](#). Spring and summer/fall seasons for released striped bass by anglers are shown within [Table 3.6-2](#) and [Figure 3.6-5](#) along with overall released lengths.

The “catfish” group ([Table 3.3.1](#)) included some identified catfish but anglers were reluctant to permit examination of some fish, and also were usually not specific about channel catfish, flathead catfish, or brown bullheads released. According to the anglers that released catfish, the majority of the angler responded channel catfish when asked which species. Channel catfish had high percentages compared to other species that were measured and released in the summer and the fall.

Additional number of fish, lengths of released and harvested fish, and seasons are provided in [Appendix D-15](#).

### **3.6.1 Boat Anglers**

Length measurements of fish harvested by boat anglers were obtained from 230 fish representing six species and “river herrings” ([Table 3.6.1-1](#)). White perch accounted for 47.8% of the fish harvested, ranging from 3 to 12 inches long. Most of the white perch (92 %) were measured in the spring. Measured channel catfish were between 12 and 31 inches and accounted for 90.6% of the harvested fish measured in the summer, and 44.2% during the fall ([Table 3.6.1-2](#)). During the fall, striped bass up to 23 inches accounted for 30.2% of the measured fish harvested. Forty yellow perch measuring between 9 and 13 inches were harvested in the spring, while three largemouth bass measuring 16-18 inches were harvested in the fall.

Anglers also provided a measured or estimated length (to the nearest inch) of numerous fish released back into the LSR. Boat anglers provided estimated lengths or measurements for 14 species or species groups released totaling 707 fish ([Table 3.6.1-3](#)). Measured black bass, equally represented, comprised 31.2% of the released fish measured; with 76% of the black bass that were released reported as legal ( $\geq 12$  inches) to harvest. White perch ranging from 3 to 8 inches accounted for 23.3% of the measured fish released. Measured channel catfish up to 28 inches accounted for 20.8% of the fish released back into LSR. Striped bass accounted for 15.3% of the overall measured and released fish, with 53% being legal ( $\geq 18$  inches) to harvest.

In the spring, white perch was responsible for 47.1% of the measured and released fish, ranging from 4 to 8 inches ([Table 3.6.1-4](#)). Striped bass up to 42 inches accounted for 20.4% of the measured fish, during the spring. Measured black bass between 4 and 21 inches dominated the summer and fall with 46.1% and 31.1%, respectively.

### **3.6.2 Shore Anglers**

Length measurements were obtained from 389 fish of 12 species and a species group, “catfish”, harvested by shore anglers ([Table 3.6.2.1](#)). White perch between 4 and 13 inches and striped bass ranging from 12 to 34 inches dominated the harvested fish measured. Measured white perch accounted for 78.5% fish harvested in the spring by the shore anglers, while striped bass dominated (67.0%) the measured harvested fish during the fall ([Table 3.6.2-2](#)). During the summer, measured channel catfish accounted for 32.7% of the fish harvested by shore angler, ranging from 12 to 27 inches. Other species that were measured and harvested included: 17 flathead catfish (15-38 inches), 12 common carp (15-31 inches), eight walleye (17-26 inches), a yellow perch (8 inches), a smallmouth bass (12 inches) and three largemouth bass (18-22 inches).

Shore anglers also provided a measured or estimated length (to the nearest inch) of numerous fish released back into LSR. Shore anglers reported estimated lengths or measurements for 432 fish that were released, consisting of 17 species or species groups ([Table 3.6.2-3](#)). Striped bass accounted for 33.8% of released fish measured by shore anglers; lengths ranged from 4 to 54 inches. Striped bass accounted for and increased from 23.8% to 37.4 to 45.6% of measured fish released during the spring, summer, and fall, respectively ([Table 3.6.2-4](#)). White perch up to 11 inches accounted for 23.8% of all fish measured and released by shore anglers. Most of the white perch (64.1%) were measured and released in the spring ([Tables 3.6.2-3](#) and [3.6.2-4](#)). Channel catfish, ranging from 10 to 30 inches, accounted for 28.9% of the measured and released fish in the fall and 16.1% of the measured and released fish in the summer ([Table 3.6.2-4](#)). Other species that were released after being measured included: 11 walleye (10-28 inches), six yellow perch (4-13 inches), four common carp (20-25 inches), nine smallmouth bass (7-18 inches), nine largemouth bass (12-18 inches), and a single Atlantic needlefish (*Strongylura marina*, 6 inches).

## **3.7 Ancillary Data and Observations**

### **3.7.1 Fishing Tournaments**

Two fishing tournaments took place on the lower Susquehanna River in 2010 ([Table 3.7.1-1](#)). On June 5, 2010 a striped bass tournament was held which included about 60 anglers and was sponsored by Port Deposit Chamber of Commerce and Exelon Power, although no one was interviewed. Three anglers (one boat) were interviewed on March 6, 2010 that participated in a yellow perch tournament that was held at



the Northeast Park; these anglers launched out of Perryville Municipal Ramp (site 116). Other tournaments took place in the upper Bay, mostly out of Northeast River (Anchor Marine) and Havre de Grace (Tydings Marina), which could have increased the boat activity of the LSR.

### **3.7.2 Bait Collection**

LSR anglers also harvested white perch to use as baitfish by hook-and-line. This practice involves anglers catching white perch by hook-and-line and then using them as bait for striped bass. No information was taken for this practice, but it was noted by creel clerks.

### **3.7.3 Nighttime Surveys**

Five nighttime surveys were conducted after normal survey hour because of the observations by creel clerks on the arrival of shore anglers in late evening ([Figure 3.1.4-1](#)). These five nighttime sampling events occurred when a random day sample time and ending location were ending the latest and were conducted at a “safe” site. A “safe” sites had good lighting, and easy walking such as Port Deposit Municipal ramp and park (site 118), Fisherman’s Park and Wharf (site 101), and Jean Roberts Park (site 115).

Interviews of four nighttime shore anglers were obtained at Port Deposit. One of the shore anglers was seeking walleye, but the other three anglers were seeking “anything”. Only one legal largemouth bass was caught by these anglers

Jean Roberts Park was only sampled once for total of two boat anglers. The boat anglers at Jean Roberts Park at night were seeking largemouth bass, but caught six legal smallmouth bass, one legal largemouth bass, and one channel catfish.

The Fisherman’s Park, which closes one hour after sunset, was sampled twice and accounted for 28 shore anglers interviewed. These shore anglers were seeking striped bass (9 anglers), catfish (5 anglers), or “anything” (14 anglers). These shore anglers harvested 19 of the 21 legal striped bass and released 44 sublegal striped bass (< 18 inches). White perch had the highest retention rate (89.2%); with 33 of the 37 white perch harvested. Twenty-three fish from the species group “catfish” were caught, including six flathead catfish, seven channel catfish, and four unidentified catfish, which were harvested. One smallmouth bass and one Atlantic needlefish were caught and released.

### **3.7.4 Blue Crabs**

Angler, boat and shore, sought blue crabs in late summer and early fall. Anglers reported their harvested catch usually as bushel(s) but sometimes as dozens. The creel staff typically received harvested catch data



but not released catch data. Minimal size for a legal blue crab during this time was 5 ¼ inches. According to [www.bluecrabs.info/buying\\_hards.htm](http://www.bluecrabs.info/buying_hards.htm), the average number of blue crabs (5 ½ -6 ½ inches) in a bushel was about 70 crabs. Shore anglers reported catching 109 blue crabs at Jean Roberts Park and 21 blue crabs from Port Deposit. Boat angler returned to the four lower boat ramps. Port Deposit (six bushel), Perryville (three and a half bushel), Lapidum (nearly three bushel), and Jean Roberts (two bushel) were harvested by boat anglers interviewed. A bay sport license in Maryland allows a boat angler to harvest at least one bushel. Only data from boat anglers that crabbed the Susquehanna River were used in calculations, but no data were recorded for anglers below the Amtrak Bridge at the mouth of the Susquehanna River. Two other commercial crabbers (5 bushel combined) were interviewed at Port Deposit and Lapidum but the data were not used.

#### 4.0 SUMMARY AND CONCLUSION

Fishing pressure was dominated by anglers fishing for migratory species such as American shad, hickory shad, white perch and striped bass. Hickory shad use Octoraro and Deer Creeks as spawning tributaries to the lower Susquehanna River, and shore access to these creek mouths is used by many shore anglers during the spring. American shad can be sought after in the tailrace of Conowingo Dam along with other locations along the LSR during spring. Striped bass are mainly sought by boat angler downstream of Lapidum in the catch and release section of the LSR. Large striped bass use the upper bay and tributaries as spawning areas in March and April. White perch had the highest estimated catch and harvest of any fish in the LSR in spring and summer.

The summer and fall fishing pressure was targeted towards catfish and black bass along with striped bass and white perch. The estimated catch and harvest of striped bass dominated during this time of year. Estimates of over 18,000 striped bass were caught, of which nearly 5,800 were harvested by anglers. Catfish, mainly channel catfish were caught in the summer along with black bass.

According to the shore angler estimate, the shore anglers primarily caught (84.4%) migratory species, while an estimated 73.5% of catch by boat anglers were migratory fish species. Majority of yellow perch were catch in the spring by boat angler in the tidal section of the LSR. Blue crab were caught and harvested in the LSR possibly due to the low flows in the river which may have increased the percentage of fresh water within the tidal section of the LSR.

The type of fisherman could have influenced the catch/harvest of fish in the LSR during the summer and fall. Black bass fishing has become popular as a catch and release fishery along with weekend tournaments especially for boat anglers. A large number of anglers responded “anything” or a species group when asked primary species sought. This could be due to the number of casual anglers or anglers being able to catch more than one species on the same bait or lure.

The survey methods employed during the 2010 generated relatively precise estimates of angler efforts. Proportional standard error (PSE) was 3.7% of the shore fishing effort estimate. The PSE for the overall boat fishery effort estimate was relatively high at 20.0%. The desired precision for angler survey estimates  $\leq 20.0\%$  is considered good ([Malvestuto 1983](#)).

The general CPUE rates were relatively precise for LSR anglers, especially shore anglers. The PSEs for general rates for shore anglers were 6.1 to 18.9% for each of the seasons, with an overall season CPUE of 11.2%, indicating a good precise value. The PSE for the overall general CPUE for boat anglers (16.5%) was good, but somewhat higher (less precise) for individual seasons (21.2-27.3%). This was most likely

due to differences in sample size, being larger for combined anglers for the study than individual seasons within the study.

The targeted species CPUE rates were not as precise as the overall CPUE because the targeted CPUEs were based on fewer data points (i.e., anglers). Many anglers were not seeking a particular species and many shore anglers were generalists (i.e., “any species” was targeted). Hickory shad CPUE was the most precise PSE of anyone species when sought by shore anglers at 17.7%.

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**TABLE 3.1.1-1: DISTRIBUTION OF ANGLER COUNTS BETWEEN DAY TYPE AND TIME OF DAY OVER, LSR, 2010.**

<b>Daytype/Time (h)*</b>	<b>Spring</b>	<b>Summer</b>	<b>Fall</b>	<b>Total</b>
Weekend/holiday	8	8	6	22
Weekday	<b>7</b>	7	6	20
0801-1100	6	10	3	19
1100-1400	<b>5</b>	1	4	10
1400-1647	4	4	5	13
Total flights	15	15	12	42

\* Allocation to time category based on start time

**Bold indicates ground count (March 1)**

**TABLE 3.1.1-2: SEASONAL BOAT AND SHORE ANGLER COUNTS FROM OBSERVATIONS OF THE LSR, 2010.**

	<b>Tailrace</b>					
	<b>Weekday</b>		<b>Weekend</b>		<b>Total</b>	
	<b>Boats</b>	<b>Shore anglers</b>	<b>Boats</b>	<b>Shore anglers</b>	<b>Total Boats</b>	<b>Shore anglers</b>
Spring	2	89	16	281	18	370
Summer	14	145	17	250	31	395
Fall	3	73	3	109	6	182
<b>Total</b>	<b>19</b>	<b>307</b>	<b>36</b>	<b>640</b>	<b>55</b>	<b>947</b>

	<b>Non-tidal</b>					
	<b>Weekday</b>		<b>Weekend</b>		<b>Total</b>	
	<b>Boats</b>	<b>Shore anglers</b>	<b>Boats</b>	<b>Shore anglers</b>	<b>Total Boats</b>	<b>Shore anglers</b>
Spring	4	14	20	60	24	74
Summer	13	8	28	29	41	37
Fall	9	7	4	3	13	10
<b>Total</b>	<b>26</b>	<b>29</b>	<b>52</b>	<b>92</b>	<b>78</b>	<b>121</b>

	<b>Tidal</b>					
	<b>Weekday</b>		<b>Weekend</b>		<b>Total</b>	
	<b>Boats</b>	<b>Shore anglers</b>	<b>Boats</b>	<b>Shore anglers</b>	<b>Total Boats</b>	<b>Shore anglers</b>
Spring	42	91	298	341	340	432
Summer	58	59	196	87	254	146
Fall	35	24	91	71	126	95
<b>Total</b>	<b>135</b>	<b>174</b>	<b>585</b>	<b>499</b>	<b>720</b>	<b>673</b>

	<b>Summary</b>	
	<b>Boats</b>	<b>Shore anglers</b>
Tailrace	55	947
Non-tidal	78	121
Tidal	720	673
	<b>853</b>	<b>1741</b>

**TABLE 3.1.2-1: SEASONAL COUNTS OF COMPLETED BOAT PARTIES INTERVIEWED AT LSR, 2010.**

<b>Season</b>	<b>Day Type</b>	<b>N</b>	<b>% within season</b>	<b>% within survey</b>
Spring	Weekday	34	24.3	
	Weekend	106	75.7	
		140		36.6
Summer	Weekday	39	28.1	
	Weekend	100	71.9	
		139		36.4
Fall	Weekday	25	24.3	
	Weekend	78	75.7	
		103		27.0
Total	Weekday	98	25.7	
	Weekend	284	74.3	
		<b>382</b>		

**TABLE 3.1.2-2: MONTHLY COUNTS OF COMPLETED BOAT PARTIES INTERVIEWS AT LSR, 2010.**

<b>Month</b>	<b>N</b>	<b>%</b>
March	34	8.9
April	46	12.0
May	60	15.7
June	52	13.6
July	28	7.3
August	47	12.3
September	49	12.8
October	43	11.2
November	23	6.0
<b>TOTAL</b>	<b>382</b>	



**TABLE 3.1.2-3: SEASONAL COMPLETED BOAT INFORMATION INTERVIEWED AT LSR, 2010.**

<b>Season</b>	<b>N anglers</b>	<b>N parties</b>	<b>Angler per survey</b>
Spring	319	140	2.3
Summer	293	139	2.1
Fall	185	103	1.8
<b>Totals</b>	<b>797</b>	<b>382</b>	<b>2.1</b>

**TABLE 3.1.2-4: MEAN TRIP LENGTHS FOR COMPLETED BOAT PARTIES AT LSR, 2010.**

<b>Season</b>	<b>Day Type</b>	<b>N</b>	<b>Mean trip length (hrs)</b>	<b>SE</b>
Spring	Weekday	34	4.3	0.4
	Weekend	106	4.4	0.3
		140	4.4	0.2
Summer	Weekday	39	4.7	0.3
	Weekend	100	4.6	0.2
		139	4.6	0.1
Fall	Weekday	25	3.8	0.3
	Weekend	78	4.4	0.2
		103	4.2	0.2
<b>Total</b>	<b>Weekday</b>	<b>98</b>		
	<b>Weekend</b>	<b>284</b>		
		<b>382</b>	<b>4.4</b>	<b>0.1</b>

**TABLE 3.1.3-1: SPECIES TARGETED, MONTHLY, BY BOAT ANGLERS AT LSR, 2010.**

Species sought	March		April		May		June		July		August		September		October		November		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Hickory shad			1	0.9															1
American shad			3	2.8	2	1.4													5
Shad			15	13.9	11	7.9													26
Catfish					3	2.1	13	12.4	5	8.3	4	3.9	3	3.4			3	7.0	31
Channel catfish					2	1.4	4	3.8	6	10.0	4	3.9			3	3.8			19
White perch	8	10.3	17	15.7	49	<b>35.0</b>	1	1.0			2	2.0	1	1.1	3	3.8			81
Striped bass	11	14.1	40	<b>37.0</b>	34	24.3	25	<b>23.8</b>	2	3.3	10	9.8	8	9.1	18	<b>22.5</b>	17	39.5	165
Black bass							8	7.6	9	15.0	5	4.9	6	6.8	2	2.5	2	4.7	32
Smallmouth bass			1	0.9			5	4.8			12	11.8	5	5.7					23
Largemouth bass	6	7.7	6	5.6	11	7.9	13	12.4	17	<b>28.3</b>	28	<b>27.5</b>	15	17.0	10	12.5	1	2.3	107
Yellow perch	35	<b>44.9</b>																	35
Walleye					2	1.4											2	4.7	4
Anything sought for	18	23.1	25	23.1	26	18.6	36	<b>34.3</b>	21	<b>35.0</b>	25	24.5	7	8.0	17	21.3	18	41.9	193
Blue crab											12	11.8	43	<b>48.9</b>	27	<b>33.8</b>			82
	<b>78</b>		<b>108</b>		<b>140</b>		<b>105</b>		<b>60</b>		<b>102</b>		<b>88</b>		<b>80</b>		<b>43</b>		<b>804</b>

**TABLE 3.1.3-2: SPECIES TARGETED, SEASONALLY, BY BOAT ANGLERS AT LSR, 2010.**

Species sought	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Hickory shad	1	0.3					1	0.1
American shad	5	1.5					5	0.6
Shad	26	8.0					26	3.2
Catfish	3	0.9	22	7.5	6	3.2	31	3.9
Channel catfish	2	0.6	14	4.8	3	1.6	19	2.4
White perch	74	22.7	3	1.0	4	2.2	81	10.1
Striped bass	85	26.1	42	14.3	38	20.5	165	20.5
Black bass			26	8.9	6	3.2	32	4.0
Smallmouth bass	1	0.3	19	6.5	3	1.6	23	2.9
Largemouth bass	23	7.1	63	21.5	21	11.4	107	13.3
Yellow perch	35	10.7					35	4.4
Walleye	2	0.6			2	1.1	4	0.5
Anything sought for	69	21.2	84	28.7	40	21.6	193	24.0
Blue crab			20	6.8	62	33.5	82	10.2
	<b>326</b>		<b>293</b>		<b>185</b>		<b>804</b>	

**TABLE 3.1.4-1: SEASONAL SHORE INFORMATION (COMPLETE AND INCOMPLETE TRIPS) INTERVIEWED AT LSR, 2010.**

<b>Season</b>	<b>N anglers</b>	<b>N parties</b>	<b>Angler per survey</b>
Spring	591	346	1.7
Summer	366	207	1.8
Fall	163	111	1.5
<b>Totals</b>	<b>1120</b>	<b>664</b>	<b>1.7</b>

**TABLE 3.1.4-2: SEASONAL COUNTS OF COMPLETED SHORE PARTIES INTERVIEWED AT LSR, 2010.**

<b>Season</b>	<b>Day type</b>	<b>N</b>	<b>% within season</b>	<b>% within survey</b>
Spring	Weekday	92	35.5	
	Weekend	167	64.5	
		259		46.8
Summer	Weekday	94	50.5	
	Weekend	92	49.5	
		186		33.6
Fall	Weekday	52	47.7	
	Weekend	57	52.3	
		109		19.7
	Weekday	238	43.0	
	Weekend	316	57.0	
<b>Total</b>		<b>554</b>		

**TABLE 3.1.4-3: MONTHLY COUNTS OF COMPLETE AND INCOMPLETE SHORE PARTIES INTERVIEWS AT LSR, 2010.**

<b>Month</b>	<b>N</b>	<b>%</b>
March	98	14.8
April	167	25.2
May	81	12.2
June	48	7.2
July	53	8.0
August	88	13.3
September	55	8.3
October	47	7.1
November	27	4.1
<b>Total</b>	<b>664</b>	

**TABLE 3.1.4-4: MEAN TRIP LENGTHS FOR COMPLETED SHORE ANGLERS AT LSR, 2010.**

<b>Season</b>	<b>Day type</b>	<b>N</b>	<b>Mean trip length (hrs)</b>	<b>SE</b>
Spring	Weekday	92	2.8	0.2
	Weekend	167	3.1	0.2
		259	3.0	0.1
Summer	Weekday	94	3.0	0.2
	Weekend	92	2.7	0.2
		186	2.9	0.1
Fall	Weekday	52	3.8	0.3
	Weekend	57	3.7	0.3
		106	3.7	0.2
	Weekday	238		
	Weekend	316		
<b>Total</b>		554	3.1	0.1



**TABLE 3.1.5-1: SPECIES SOUGHT, MONTHLY, BY SHORE ANGLERS, LSR, 2010.**

Species sought	March		April		May		June		July		August		September		October		November		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Hickory shad	18	9.2	60	20.7	6	4.8													84	7.3
American shad	2	1.0	20	6.9	15	11.9													37	3.2
Gizzard shad	2	1.0	2	0.7															4	0.3
Shad	15	7.7	81	27.9	23	18.3													119	10.4
Common carp	1	0.5	8	2.8							4	2.6	2	2.1					15	1.3
Suckers																	3	7.7	3	0.3
Catfish	8	4.1	8	2.8	4	3.2	5	6.0	21	22.3	21	13.5	2	2.1	4	5.9			73	6.4
Channel catfish	3	1.5			1	0.8	3	3.6			2	1.3							9	0.8
Flathead catfish	9	4.6																	9	0.8
White perch	22	11.3	27	9.3	20	15.9	7	8.3	6	6.4					1	1.5			83	7.2
Striped bass	6	3.1	2	0.7			12	14.3	20	21.3	33	21.3	29	30.5	26	38.2	12	30.8	140	12.2
Black bass									1	1.1							1	2.6	2	0.2
Smallmouth bass									1	1.1	2	1.3	2	2.1					5	0.4
Largemouth bass			1	0.3	2	1.6					2	1.3	1	1.1	4	5.9			10	0.9
Yellow perch	7	3.6	2	0.7															9	0.8
Walleye	25	12.8			5	4.0					1	0.6			1	1.5	9	23.1	41	3.6
Anything sought for	77	39.5	79	27.2	50	39.7	57	67.9	45	47.9	90	58.1	38	40.0	32	47.1	14	35.9	482	42.1
Blue crab													21	22.1					21	1.8
	<b>195</b>		<b>290</b>		<b>126</b>		<b>84</b>		<b>94</b>		<b>155</b>		<b>95</b>		<b>68</b>		<b>39</b>		<b>1146</b>	

**TABLE 3.1.5-2: SPECIES SOUGHT, SEASONALLY, BY SHORE ANGLERS AT LSR, 2010.**

Species sought	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Hickory shad	84	13.7					84	7.3
American shad	37	6.1					37	3.2
Gizzard shad	4	0.7					4	0.3
Shad	119	19.5					119	10.4
Common carp	9	1.5	4	1.1	2	1.2	15	1.3
Suckers					3	1.8	3	0.3
Catfish	20	3.3	48	12.9	5	3.1	73	6.4
Channel catfish	4	0.7	5	1.3			9	0.8
Flathead catfish	9	1.5					9	0.8
White perch	69	11.3	13	3.5	1	0.6	83	7.2
Striped bass	8	1.3	77	20.7	55	33.7	140	12.2
Black bass			1	0.3	1	0.6	2	0.2
Smallmouth bass			3	0.8	2	1.2	5	0.4
Largemouth bass	3	0.5	2	0.5	5	3.1	10	0.9
Yellow perch	9	1.5					9	0.8
Walleye	30	4.9	1	0.3	10	6.1	41	3.6
Anything sought for	206	33.7	206	55.4	70	42.9	482	42.1
Blue crab			12	3.2	9	5.5	21	1.8
	<b>611</b>		<b>372</b>		<b>163</b>		<b>1146</b>	

**TABLE 3.1.5-3: DISTRIBUTION OF SHORE ANGLERS SEEKING A PARTICULAR SPECIES OR SPECIES GROUP ON LSR, 2010.**

Species sought	Site 101							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Hickory shad	18	13.6					18	5.7
American shad	25	18.9					25	7.9
Shad	50	37.9					50	15.8
Common carp	8	6.1	4	3.5	2	2.9	14	4.4
Catfish	4	3.0	40	34.8	3	4.3	47	14.9
Channel catfish	1	0.8	3	2.6			4	1.3
Black bass					1	1.4	1	0.3
White perch	5	3.8	5	4.3			10	3.2
Striped bass			63	54.8	53	76.8	116	36.7
Walleye	21	15.9			10	14.5	31	9.8
<b>Total (% within season)</b>	<b>132</b>		<b>115</b>		<b>69</b>		<b>316</b>	

Species sought	Site 102							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Hickory shad	9	30.0					9	5.8
American shad	2	6.7					2	1.3
Shad	3	10.0					3	1.9
Catfish	2	6.7	1	16.7			3	0.6
Black bass			1	16.7			1	6.5
Striped bass	6	20.0	4	66.7			10	6.5
Walleye	8	26.7					8	5.2
<b>Total (% within season)</b>	<b>30</b>		<b>6</b>				<b>36</b>	

Species sought	Site 103							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Hickory shad	1	6.3					1	6.3
Shad	4	25.0					4	25.0
Flathead catfish	9	56.3					9	56.3
Yellow perch	2	12.5					2	12.5
<b>Total (% within season)</b>	<b>16</b>						<b>16</b>	

**TABLE 3.1.5-3: CONTINUED.**

Species sought	Site 111							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Hickory shad	53	38.1					53	35.3
American shad	7	5.0					7	4.7
Shad	49	35.3					49	32.7
Sucker					3	30.0	3	2.0
Catfish	12	8.6					12	8.0
Smallmouth bass			1	100	2	20.0	3	2.0
Largemouth bass					4	40.0	4	2.7
White perch	18	12.9					18	12.0
Striped bass					1	10.0	1	0.7
<b>Total (% within season)</b>	<b>139</b>		<b>1</b>		<b>10</b>		<b>150</b>	

Species sought	Site 112							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Hickory shad	3	16.7					3	12.5
American shad	3	16.7					3	12.5
Shad	11	61.1					11	45.8
Catfish			5	100.0			5	20.8
Striped bass					1	100.0	1	4.2
Walleye	1	5.6					1	4.2
<b>Total (% within season)</b>	<b>18</b>		<b>5</b>		<b>1</b>		<b>24</b>	

Species sought	Site 113							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Channel catfish	1						1	9.1
Largemouth bass			1				1	9.1
White Perch	1						1	9.1
Striped bass			8				8	72.7
<b>Total (% within season)</b>	<b>2</b>		<b>9</b>				<b>11</b>	

Species sought	Site 114							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
White Perch	3	100.0					3	100.0

**TABLE 3.1.5-3: CONTINUED.**

Species sought	Site 115							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Common carp	1	6.3					1	2.8
Smallmouth bass			2	20.0			2	5.6
Largemouth bass					1	10.0	1	2.8
White perch	15	93.8					15	41.7
Striped bass			2	20.0			2	5.6
Blue crab			6	60.0	9	90.0	15	41.7
<b>Total (% within season)</b>	<b>16</b>		<b>10</b>		<b>10</b>		<b>36</b>	

Species sought	Site 116							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Largemouth bass	1	100					1	33.3
White Perch			2	100			2	66.7
<b>Total (% within season)</b>	<b>1</b>		<b>2</b>				<b>3</b>	

Species sought	Site 117							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Largemouth bass	1	20.0					1	20.0
Yellow perch	4	80.0					4	80.0
<b>Total (% within season)</b>	<b>5</b>						<b>5</b>	

Species sought	Site 118							
	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Gizzard shad	2	5.4					2	3.9
Shad	2	5.4					2	3.9
Catfish	2	5.4			2	66.7	4	7.8
Channel catfish	2	5.4					2	3.9
Largemouth bass	1	2.7					1	2.0
White perch	25	67.6	4	36.4	1	33.3	30	58.8
Striped bass	1	2.7					1	2.0
Yellow perch	2	5.4					2	3.9
Walleye			1	9.1			1	2.0
Blue crab			6	54.5			6	11.8
<b>Total (% within season)</b>	<b>37</b>		<b>11</b>		<b>3</b>		<b>51</b>	

**TABLE 3.1.5-3: CONTINUED.**

<b>Species sought</b>	<b>Site 120</b>							
	<b>Spring</b>		<b>Summer</b>		<b>Fall</b>		<b>Total</b>	
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
Largemouth bass			1	100.0			1	100.0

**TABLE 3.2-1: ESTIMATED EFFORT OF ANGLERS FISHING, LSR, 2010.**

	Boat total			Shore total			Overall total		
	Angler Hours	SE	PSE	Angler Hours	SE	PSE	Angler Hours	SE	PSE
Total	114142	22863.1	20.0	121761	4506.1	3.7	235903	23302.9	9.9

**TABLE 3.2-2: ESTIMATED NUMBER OF TRIPS BY ANGLERS, LSR, 2010.**

Season	Boat			
	Anglers hours	Mean trip length (h)	Trips	% trips
Spring	50359	4.4	11445	44.2
Summer	37693	4.6	8194	31.6
Fall	26091	4.2	6212	23.9
<b>Total</b>	<b>114142</b>	<b>4.4</b>	<b>25941</b>	

Season	Shore			
	Anglers hours	Mean trip length (h)	Trips	% trips
Spring	51545	3.0	17182	43.7
Summer	52376	2.9	18061	46.0
Fall	17840	3.7	4822	12.3
<b>Total</b>	<b>121761</b>	<b>3.1</b>	<b>39278</b>	



**TABLE 3.2-3: ESTIMATED DAY TYPE EFFORT OF ANGLERS FISHING IN THE LSR, 2010.**

	<b>Boat</b>					
	<b>Weekday</b>		<b>Weekend</b>		<b>Total</b>	
	<b>Angler Hours</b>	<b>%</b>	<b>Angler Hours</b>	<b>%</b>	<b>Angler Hours</b>	<b>%</b>
Spring	11414	27.6	38946	53.5	50359	44.1
Summer	17396	42.0	20296	27.9	37693	33.0
Fall	12563	30.4	13527	18.6	26091	22.9
<b>Total</b>	<b>41373</b>	<b>36.2</b>	<b>72769</b>	<b>63.8</b>	<b>114142</b>	

	<b>Shore</b>					
	<b>Weekday</b>		<b>Weekend</b>		<b>Total</b>	
	<b>Angler Hours</b>	<b>%</b>	<b>Angler Hours</b>	<b>%</b>	<b>Angler Hours</b>	<b>%</b>
Spring	22514	37.2	29031	47.4	51545	42.3
Summer	28538	47.1	23838	39.0	52376	43.0
Fall	9511	15.7	8330	13.6	17840	14.7
<b>Total</b>	<b>60562</b>	<b>49.7</b>	<b>61199</b>	<b>50.3</b>	<b>121761</b>	

**TABLE 3.2-4: EFFORT FOR BOAT AND SHORE ANGLERS COMBINED SEEKING BLACK BASS, LSR, 2010.**

<b>Species Group</b>	<b>Estimated effort (h)</b>	<b>Mean trip length (h)</b>	<b>Estimated trips</b>
Black bass	24,261	4.6	5274

**TABLE 3.2-5: ESTIMATED EFFORT, SEASONALLY, FOR BLACK BASS BY ANGLERS IN THE LSR, 2010.**

<b>Method</b>	<b>Season</b>	<b>Estimated effort (h)</b>	<b>%</b>
Boat	Spring	4210	18.8
	Summer	13893	62.2
	Fall	4232	18.9
		22335	
Shore	Spring	242	12.3
	Summer	843	43.0
	Fall	876	44.7
		1961	

**TABLE 3.3-1: EXPANDED CATCH AND HARVEST ESTIMATES FOR BOAT AND SHORE ANGLERS COMBINED ON LSR, 2010.**

Species	Spring		Summer		Fall		Total	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
American eel	33				44		77	0
Shad	796						796	0
American shad	14831						14831	0
Hickory shad	68731						68731	0
River herring	1756	200					1756	200
Gizzard shad	3406	66			385	79	3791	145
Rainbow trout	33						33	0
Common carp	483	143	145	107	162	162	790	412
Fallfish					197		197	0
Catfish	1265	22	1424	755	63		2752	777
Channel catfish	6113	1033	10692	3882	3483	1113	20288	6028
Flathead catfish	817	77	1686	829	625	333	3128	1239
Brown bullhead	100						100	0
Largemouth bass	1923	66	4074	35	1002	302	6999	403
Smallmouth bass	697		3385	35	838		4920	35
Striped bass	6630	67	9388	1943	8795	3800	24813	5810
White perch	82973	14938	13675	4580	1576	567	98224	20085
Sunfish			277		144		421	0
Bluegill	229		875	35	21		1125	35
Rock bass	133	33	41				174	33
Green sunfish	33	33					33	33
Walleye	612	88	56	35	639	258	1307	381
Yellow perch	8886	1740	219	35			9105	1775
Atlantic needlefish			38				38	0
<b>Total w/o crab</b>	<b>200480</b>	<b>18505</b>	<b>45937</b>	<b>12271</b>	<b>17974</b>	<b>6614</b>	<b>264429</b>	<b>37391</b>
Blue crab			4153	3859	56721	56721	60874	60580

**TABLE 3.3.1-1: EXPANDED BOAT CATCH AND HARVEST ESTIMATES THE LSR, 2010.**

Species	Spring				Summer				Fall				Total			
	Catch	%	Harvest	%	Catch	%	Harvest	%	Catch	%	Harvest	%	Catch	%	Harvest	%
Shad	33	0.0	0	0.0									33	0.0	0	0.0
American shad	4633	4.5	0	0.0									4633	3.5	0	0.0
Hickory shad	14371	14.0	0	0.0									14371	10.7	0	0.0
River herring	633	0.6	200	1.6									633	0.5	200	1.2
Common carp	33	0.0	0	0.0									33	0.0	0	0.0
Catfish	631	0.6	0	0.0					63	0.8	0	0.0	694	0.5	0	0.0
Channel catfish	3968	3.9	387	3.1	6600	29.0	1281	77.3	1726	21.0	399	19.2	12294	9.2	2067	12.8
Flathead catfish	110	0.1	0	0.0	381	1.7	21	1.3	130	1.6	88	4.2	620	0.5	108	0.7
Brown bullhead	100	0.1	0	0.0									100	0.1	0	0.0
Largemouth bass	1748	1.7	33	0.3	3932	17.3	0	0.0	963	11.7	263	12.7	6643	5.0	296	1.8
Smallmouth bass	564	0.5	0	0.0	3168	13.9	0	0.0	750	9.1	0	0.0	4481	3.3	0	0.0
Striped bass	5579	5.4	67	0.5	765	3.4	147	8.9	3408	41.5	757	36.5	9752	7.3	970	6.0
White perch	61661	59.9	9951	80.4	6901	30.3	209	12.6	1051	12.8	567	27.3	69613	52.0	10727	66.6
Sunfish									105	1.3	0	0.0	105	0.1	0	0.0
Bluegill	131	0.1	0	0.0	806	3.5	0	0.0	21	0.3	0	0.0	957	0.7	0	0.0
Rock bass	100	0.1	0	0.0	41	0.2	0	0.0					141	0.1	0	0.0
Walleye	33	0.0	0	0.0	21	0.1	0	0.0					54	0.0	0	0.0
Yellow perch	8667	8.4	1740	14.1	147	0.6	0	0.0					8814	6.6	1740	10.8
<b>Total w/o crab</b>	<b>102995</b>		<b>12378</b>		<b>22760</b>		<b>1657</b>		<b>8217</b>		<b>2074</b>		<b>133971</b>		<b>16108</b>	
Blue crab					1523		1229		52387		52387		53910		53616	

**TABLE 3.3.2-1: EXPANDED SHORE CATCH AND HARVEST ESTIMATES ON THE LSR, 2010.**

Species	Spring				Summer				Fall				Total			
	Catch	%	Harvest	%	Catch	%	Harvest	%	Catch	%	Harvest	%	Catch	%	Harvest	%
American eel	33	0.0	0	0.0					44	0.5	0	0.0	77	0.1	0	0.0
Shad	763	0.8	0	0.0									763	0.6	0	0.0
American shad	10198	10.5	0	0.0									10198	7.8	0	0.0
Hickory shad	54360	55.8	0	0.0									54360	41.7	0	0.0
River herring	1123	1.2	0	0.0									1123	0.9	0	0.0
Gizzard shad	3406	3.5	66	1.1					385	3.9	79	1.7	3791	2.9	145	0.7
Rainbow trout	33	0.0	0	0.0									33	0.0	0	0.0
Common carp	450	0.5	143	2.3	145	0.6	107	1.0	162	1.7	162	3.6	757	0.6	412	1.9
Fallfish									197	2.0	0	0.0	197	0.2	0	0.0
Catfish	634	0.7	22	0.4	1424	6.1	755	7.1					2058	1.6	776	3.6
Channel catfish	2145	2.2	646	10.5	4092	17.6	2601	24.5	1757	18.0	714	15.7	7994	6.1	3961	18.6
Flathead catfish	707	0.7	77	1.3	1305	5.6	808	7.6	495	5.1	245	5.4	2507	1.9	1130	5.3
Largemouth bass	175	0.2	33	0.5	142	0.6	35	0.3	39	0.4	39	0.9	356	0.3	107	0.5
Smallmouth bass	133	0.1	0	0.0	217	0.9	35	0.3	88	0.9	0	0.0	437	0.3	35	0.2
Sunfish					277	1.2	0	0.0	39	0.4	0	0.0	316	0.2	0	0.0
Bluegill	98	0.1	0	0.0	69	0.3	35	0.3					167	0.1	35	0.2
Rock bass	33	0.0	33	0.5									33	0.0	33	0.2
Green sunfish	33	0.0	33	0.5									33	0.0	33	0.2
Striped bass	1051	1.1	0	0.0	8623	37.1	1796	16.9	5387	55.2	3043	67.0	15060	11.5	4839	22.7
White perch	21312	21.9	4987	81.4	6774	29.2	4371	41.2	525	5.4	0	0.0	28611	21.9	9358	44.0
Walleye	579	0.6	88	1.4	35	0.2	35	0.3	639	6.5	258	5.7	1252	1.0	381	1.8
Yellow perch	219	0.2	0	0.0	72	0.3	35	0.3					292	0.2	35	0.2
Atlantic needlefish					38	0.2	0	0.0					38	0.0	0	0.0
<b>Total w/o blue crab</b>	<b>97483</b>		<b>6128</b>		<b>23212</b>		<b>10611</b>		<b>9757</b>		<b>4541</b>		<b>130452</b>		<b>21280</b>	
Blue crab					2630		2630		4334		4334		6964		6964	

**TABLE 3.3.4-1: RETENTION RATES FOR FISH, LSR, 2010.**

<b>No. caught</b>	<b>No. harvested</b>	<b>Retention rate (%)</b>
<b>Boat</b>		
133,971	16,108	12.0
<b>Shore</b>		
130,452	21,280	16.3
<b>Combined</b>		
264,423	37,391	14.1

**TABLE 3.4.1-1: SEASONAL OVERALL CATCH AND HARVEST PER-UNIT-EFFORT RATES WITHOUT BLUE CRAB, LSR, 2010.**

	Spring				Summer				Fall				Overall			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Boat	2.08	0.44	0.24	0.11	0.63	0.14	0.04	0.02	0.33	0.09	0.09	0.05	1.15	0.19	0.13	0.04
Shore	1.96	0.26	0.12	0.04	0.61	0.10	0.28	0.07	0.37	0.07	0.17	0.03	1.25	0.14	0.18	0.03



**TABLE 3.4.1-2: SEASONAL OVERALL CATCH AND HARVEST PER-UNIT-EFFORT RATES, WITH PERCENT STANDARD ERROR AT LSR, 2010.**

	Spring				Summer				Fall				Overall			
	CPUE	PSE	HPUE	PSE	CPUE	PSE	HPUE	PSE	CPUE	PSE	HPUE	PSE	CPUE	PSE	HPUE	PSE
Boat	2.08	21.2	0.24	45.8	0.63	22.2	0.04	50.0	0.33	27.3	0.09	55.6	1.15	16.5	0.13	30.8
Shore	1.96	6.1	0.12	33.3	0.61	16.4	0.28	25.0	0.37	18.9	0.17	17.6	1.25	11.2	0.18	22.2

**TABLE 3.4.1-3: SPECIES OVERALL CATCH AND HARVEST RATES FOR DOMINANT SPECIES CAUGHT BY SHORE ANGLERS IN LSR, 2010.**

Species	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Shad	0.02	0.02	0.00	0.00									0.01	0.01	0.00	0.00
American shad	0.21	0.11	0.00	0.00									0.10	0.04	0.00	0.00
Hickory shad	1.15	0.43	0.00	0.00									0.55	0.15	0.00	0.00
Striped bass	0.03	0.03	0.00	0.00	0.24	0.12	0.05	0.03	0.21	0.15	0.12	0.07	0.12	0.03	0.04	0.01
White perch	0.36	0.17	0.10	0.07	0.19	0.12	0.12	0.11	0.04	0.12	0.00	0.00	0.26	0.09	0.08	0.03
Largemouth bass	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
Smallmouth bass	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Channel catfish	0.04	0.03	0.02	0.02	0.11	0.06	0.07	0.05	0.07	0.09	0.03	0.06	0.07	0.02	0.03	0.01
Walleye	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.01	0.01	0.01	0.01	0.00	0.00

**TABLE 3.4.1-4: SEASONAL CATCH AND HARVEST RATES, INCLUDING BLUE CRABS, FOR ANGLERS ON LSR, 2010.**

	<b>Boat</b>					
	<b>CPUE</b>	<b>SE</b>	<b>PSE</b>	<b>HPUE</b>	<b>SE</b>	<b>PSE</b>
Spring	2.08	0.44	21.2	0.24	0.11	45.8
Summer	0.68	0.15	22.1	0.09	0.05	55.6
Fall	2.36	0.82	34.7	2.12	0.83	35.2
	<b>Shore</b>					
	<b>CPUE</b>	<b>SE</b>	<b>PSE</b>	<b>HPUE</b>	<b>SE</b>	<b>PSE</b>
Spring	1.96	0.26	13.3	0.12	0.04	33.3
Summer	0.68	0.11	16.2	0.35	0.10	28.6
Fall	0.53	0.15	28.3	0.33	0.14	42.4

**TABLE 3.4.2-1: TARGETED CATCH AND HARVEST RATES FOR ANGLERS ON LSR, 2010.**

Fishing type	Anglers interviewed	Targeted species	CPUE	SE	PSE	HPUE	SE	PSE
Boat	5	American shad	0.76	0.86	113.2	0.00	0.00	0.0
	1	Hickory shad	4.21	0.00	0.0	0.00	0.00	0.0
	165	Striped bass	0.25	0.14	56.0	0.02	0.01	50.0
	81	White perch	3.69	1.42	38.5	0.76	0.41	53.9
	107	Largemouth bass	0.68	0.29	42.6	0.28	0.12	42.9
	23	Smallmouth bass	0.28	0.06	21.4	0.01	0.01	100.0
	19	Channel catfish	0.43	0.13	30.2	0.00	0.00	0.0
	4	Walleye	0.00	0.00	0.0	0.00	0.00	0.0
	35	Yellow perch	1.85	1.73	93.5	0.33	0.49	153.1
	82	Blue crab	4.57	2.09	45.7	4.56	2.09	45.8
Shore	37	American shad	1.04	0.40	38.5	0.00	0.00	0.0
	84	Hickory shad	2.31	0.41	17.7	0.00	0.00	0.0
	140	Striped bass	0.38	0.10	26.3	0.13	0.03	23.1
	83	White perch	1.58	0.43	27.2	0.66	0.25	37.9
	10	Largemouth bass	0.33	0.22	66.7	0.00	0.00	0.0
	5	Smallmouth bass	0.19	0.17	89.5	0.00	0.00	0.0
	9	Channel catfish	0.24	0.18	75.0	0.09	0.11	122.2
	41	Walleye	0.14	0.08	57.1	0.03	0.02	66.7
	21	Blue crab	2.01	0.95	47.3	2.01	0.95	47.3

**TABLE 3.4.2-2: TARGETED CATCH AND HARVEST RATES FOR BOAT ANGLERS ON THE LSR, 2010.**

Season	Anglers interviewed	Targeted species	CPUE	SE	HPUE	SE
Spring	5	American shad	0.76	0.86	0.00	0.00
	1	Hickory shad	4.21	0.00	0.00	0.00
	85	Striped bass	0.33	0.25	0.01	0.01
	74	White perch	3.93	1.54	0.82	0.45
	23	Largemouth bass	0.35	0.12	0.00	0.00
	1	Smallmouth bass	0.50	0.00	0.00	0.00
	2	Channel catfish	1.31	0.00	0.55	0.00
	35	Yellow perch	1.85	1.73	0.33	0.49
Summer	42	Striped bass	0.07	0.06	0.02	0.02
	3	White perch	1.78	1.26	0.14	0.05
	63	Largemouth bass	0.30	0.09	0.00	0.00
	19	Smallmouth bass	0.42	0.16	0.00	0.00
	14	Channel catfish	0.46	0.22	0.30	0.13
	20	Blue crab	0.62	0.84	0.57	0.86
Fall	38	Striped bass	0.29	0.17	0.08	0.05
	4	White perch	0.00	0.00	0.00	0.00
	21	Largemouth bass	0.18	0.07	0.03	0.03
	3	Smallmouth bass	0.43	0.11	0.00	0.00
	3	Channel catfish	1.33	0.00	0.00	0.00
	62	Blue crab	6.20	2.51	6.20	2.51

**TABLE 3.4.2-3: TARGETED CATCH AND HARVEST RATES FOR SHORE ANGLERS ON THE LSR, 2010.**

	<b>Anglers Interviewed</b>	<b>Species</b>	<b>CPUE</b>	<b>SE</b>	<b>HPUE</b>	<b>SE</b>
Spring	119	Shad	0.03	0.04	0.00	0.00
	37	American shad	1.04	0.40	0.00	0.00
	84	Hickory shad	2.31	0.41	0.00	0.00
	9	Common carp	0.12	0.10	0.09	0.08
	20	Catfish	0.12	0.19	0.00	0.00
	4	Channel catfish	0.04	0.06	0.00	0.00
	3	Largemouth bass	0.79	0.42	0.00	0.00
	9	White perch	1.61	0.50	0.59	0.26
	30	Walleye	0.08	0.06	0.02	0.02
	9	Yellow perch	0.07	0.09	0.00	0.00
Summer	5	Channel catfish	0.69	0.06	0.30	0.31
	77	Striped bass	0.57	0.17	0.13	0.05
	13	White perch	1.56	0.65	1.25	0.73
	12	Blue crab	1.65	1.16	1.65	1.16
Fall	2	Common carp	0.25	0.00	0.25	0.00
	2	Smallmouth bass	0.31	0.20	0.00	0.00
	55	Striped bass	0.25	0.09	0.14	0.04
	10	Walleye	0.35	0.22	0.05	0.05
	9	Blue crab	2.40	1.26	2.40	1.26

**TABLE 3.4.3-1: TARGETED CATCH AND HARVESTED RATES FOR SHORE ANGLERS  
FOR CONOWINGO TAILRACE AND THE TIDAL/NON-TIDAL OF THE LSR, 2010.**

<b>Subsection</b>	<b>Season</b>	<b>N</b>	<b>Targeted species</b>	<b>CPUE</b>	<b>SE</b>	<b>PSE</b>	<b>HPUE</b>	<b>SE</b>	<b>PSE</b>
Tailrace	Spring	20	American shad	1.33	0.43	32.3	0.00	0.00	0.0
		17	Hickory shad	2.27	0.74	32.6	0.00	0.00	0.0
		3	Common carp	0.13	0.11	84.6	0.09	0.09	100.0
		4	White perch	1.87	1.01	54.0	0.53	0.29	54.7
		22	Walleye	0.08	0.06	75.0	0.02	0.02	100.0
Tidal and non-tidal	Spring	40	Shad	0.06	0.07	116.7	0.00	0.00	0.0
		6	American shad	0.03	0.06	200.0	0.00	0.00	0.0
		38	Hickory shad	2.32	0.48	20.7	0.00	0.00	0.0
		5	Catfish	0.18	0.29	161.1	0.00	0.00	0.0
		2	Channel catfish	0.05	0.07	140.0	0.00	0.00	0.0
		3	Largemouth bass	0.79	0.42	53.2	0.00	0.00	0.0
		31	White perch	1.60	0.51	31.9	0.59	0.26	44.1
		6	Yellow perch	0.07	0.09	128.6	0.00	0.00	0.0
Tailrace	Summer	2	Channel catfish	0.69	0.06	8.7	0.30	0.31	103.3
		48	Striped bass	0.65	0.19	29.2	0.15	0.05	33.3
		2	White perch	2.97	1.03	34.7	2.97	1.03	34.7
Tidal and non-tidal	Summer	4	White perch	0.72	0.20	27.8	0.22	0.19	86.4
		2	Blue crab	1.65	1.16	70.3	1.65	1.16	70.3
Tailrace	Fall	1	Common carp	0.25	0.00	0.0	0.25	0.00	0.0
		36	Striped bass	0.26	0.09	34.6	0.15	0.04	26.7
		7	Walleye	0.35	0.22	62.9	0.05	0.05	100.0
Tidal and non-tidal	Fall	2	Smallmouth bass	0.31	0.20	64.5	0.00	0.00	0.0
		2	Blue crab	1.27	0.32	25.2	1.27	0.32	25.2

**TABLE 3.5-1: ANGLER DEMOGRAPHICS FOR ANGLERS IN THE LSR, 2010.**

Region	Boat fishing							
	Spring		Summer		Fall		Overall	
	Number anglers	% angler by season	Number anglers	% angler by season	Number anglers	% angler by season	Number anglers	% anglers
Baltimore	53	16.5	118	40.3	65	34.9	236	29.5
Cecil Co	107	33.3	58	19.8	58	31.2	223	27.9
Harford Co	10	3.1	20	6.8	6	3.2	36	4.5
Other MD	25	7.8	22	7.5	10	5.4	57	7.1
Lancaster Co	38	11.8	28	9.6	21	11.3	87	10.9
Chester Co	28	8.7	10	3.4	3	1.6	41	5.1
York Co	24	7.5	3	1.0	7	3.8	34	4.3
Delaware Co	14	4.4	6	2.0	7	3.8	27	3.4
Berks Co	1	0.3					1	0.1
Other PA	19	5.9	14	4.8	6	3.2	39	4.9
VIRGINIA			9	3.1	1	0.5	10	1.3
CONNECTICUT	1	0.3					1	0.1
NEW JERSEY	1	0.3	5	1.7			6	0.8
WEST VIRGINIA					2	1.1	2	0.3
	<b>321</b>		<b>293</b>		<b>186</b>		<b>800</b>	



**TABLE 3.5-1: CONTINUED.**

Region	Shore fishing (complete and incomplete)							
	Spring		Summer		Fall		Overall	
	Number anglers	% angler by season	Number anglers	% angler by season	Number anglers	% angler by season	Number anglers	% anglers
Baltimore	166	27.4	123	33.3	58	36.0	347	30.6
Cecil Co	82	13.6	75	20.3	27	16.8	184	16.2
Harford Co	33	5.5	20	5.4	5	3.1	58	5.1
Other MD	87	14.4	19	5.1	17	10.6	123	10.8
Lancaster Co	91	15.0	63	17.1	29	18.0	183	16.1
Chester Co	21	3.5	28	7.6	9	5.6	58	5.1
York Co	52	8.6	4	1.1	6	3.7	62	5.5
Delaware Co	14	2.3	2	0.5	3	1.9	19	1.7
Berks Co	15	2.5	1	0.3			16	1.4
Other PA	34	5.6	10	2.7	5	3.1	49	4.3
NEW YORK	4	0.7	9	2.4			13	1.1
NORTH CAROLINA	2	0.3					2	0.2
VIRGINIA	2	0.3	8	2.2	2	1.2	12	1.1
DISTRICT OF COLUMBIA			3	0.8			3	0.3
OHIO			3	0.8			3	0.3
MISSOURI	1	0.2					1	0.1
NEW JERSEY	1	0.2					1	0.1
OKLAHOMA			1	0.3			1	0.1
	<b>605</b>		<b>369</b>		<b>161</b>		<b>1135</b>	

**TABLE 3.6-1: MEASURED SAMPLE OF STRIPED BASS HARVESTED IN THE LSR, 2010.**

	<b>Spring (March 1 - May 31)</b>		
	<b>&lt; 18 inches</b>	<b>18 - 28 inches</b>	<b>≥ 28 inches</b>
Boat	0	2	0
Shore	0	0	0
	<b>Summer/Fall (June 1 -November 30)</b>		
	<b>&lt; 18 inches</b>	<b>18 - 28 inches</b>	<b>≥ 28 inches</b>
Boat	0	13	0
Shore	7	94	9

**TABLE 3.6-2: SIZES OF STRIPED BASS RELEASED IN THE LSR, 2010.**

	<b>Spring (March 1 - May 31)</b>		
	<b>&lt; 18 inches</b>	<b>18 - 28 inches</b>	<b>≥ 28 inches</b>
Boat	18	22	9
Shore	26	9	5
	<b>Summer/Fall (June 1 -November 30)</b>		
	<b>&lt; 18 inches</b>	<b>18 - 28 inches</b>	<b>≥ 28 inches</b>
Boat	33	26	0
Shore	61	45	0

**TABLE 3.6.1-1: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED FISH CAUGHT BY BOAT ANGLERS ON LSR, 2010.**

	Length in inches																					Total	%			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23			25	26	31
River herrings								6																	6	2.6
Channel catfish										4	4	1	7	2	7	10	10	2	2		2	1	1	1	54	23.5
Flathead catfish																					1		1		2	0.9
Largemouth bass														1	1	1									3	1.3
White perch	1	1	8	9	23	37	10	7	11	3															110	47.8
Striped bass																1	4	5	2	2	1				15	6.5
Yellow perch								36	1	2		1													40	17.4
																									<b>230</b>	

**TABLE 3.6.1-2: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED, SEASONALLY, FISH CAUGHT, SEASONALLY, BY BOAT ANGLERS ON LSR, 2010.**

	Spring																	
	Length in inches																Total	%
	3	4	5	6	7	8	9	10	11	12	13	17	18	19	20	23		
River herrings								6									6	3.9
Channel catfish										1		1	1	1	1	1	6	3.9
White perch	1	1	1	9	23	36	9	7	11	3							101	65.2
Striped bass														2			2	1.3
Yellow perch							36	1	2		1						40	25.8
																	<b>155</b>	

	Summer													Total	%
	Length in inches														
	8	9	12	13	15	16	17	18	19	21	23				
Channel catfish			1	4	6	2	3	6	6	1			29	90.6	
Flathead catfish											1		1	3.1	
White perch	1	1											2	6.3	
													<b>32</b>		

	Fall															Total	%
	Length in inches																
	5	12	14	15	16	17	18	19	20	21	22	23	25	26	31		
Channel catfish		2	1	1		3	3	3	1	1		1	1	1	1	19	44.2
Flathead catfish													1			1	2.3
White perch	7															7	16.3
Striped bass							1	2	5	2	2	1				13	30.2
Largemouth bass					1	1	1									3	7.0
															<b>43</b>		

**TABLE 3.6.1-3: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR RELEASED FISH CAUGHT BY BOAT ANGLERS ON LSR, 2010.**

	Length in inches																												Total	%						
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	28	29	30	32			35	36	37	42		
River herrings							3	1	4																								8	1.1		
Common carp																												1						1	0.1	
Catfish										1						3		1																5	0.7	
Channel catfish				1		5		4	1	23	24	9	12	13	11	5	6	12		6	1	7	6		1								147	20.8		
Flathead catfish							3			2		1	4	1				1					2											14	2.0	
White perch	4	1	39	38	21	62																												165	23.3	
Striped bass			2			1		5		10		8	6	7	12	5	1	14		14		2	10	2	2	1		1	2	1	1	1	108	15.3		
Rock bass					1			1																										2	0.3	
Bluegill		2	2	11	8	2		1																										26	3.7	
Smallmouth bass		1		1		5	2	26	4	21	7	18	4	8	7	2	4																	110	15.6	
Largemouth bass						3		9	1	5	7	16	26	26	8	3	3	1	1	1														110	15.6	
Sunfish		5																																5	0.7	
Yellow perch						4																												4	0.6	
Walleye								1		1																									2	0.3
																																			<b>707</b>	

**TABLE 3.6.1-4: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR RELEASED FISH CAUGHT, SEASONALLY, BY BOAT ANGLERS ON LSR, 2010.**

	Spring																												Total	%		
	Length in inches																															
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22	23	24	25	26	28	29	30	32	35	36			37	42
River herrings						3	1	4																						8	3.3	
Common carp																									1					1	0.4	
Catfish									1							1														2	0.8	
Channel catfish			1						2		4	5	4		1		7		1		4		1							30	12.5	
Flathead catfish											1										2									3	1.3	
White perch	1	37	19		56																									113	47.1	
Striped bass		2					4		4		4	2	1	1	4		2	2		2	10	2	2	1		1	2	1	1	1	49	20.4
Bluegill	2			1																										3	1.3	
Smallmouth bass							5			2		1			2															10	4.2	
Largemouth bass									1	2	7	4	1	1	1	1	1													19	7.9	
Yellow perch					1																									1	0.4	
Walleye							1																							1	0.4	
																														<b>240</b>		

**TABLE 3.6.1-4: CONTINUED.**

	Summer																					
	Length in inches																					
	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	24	Total	%
Channel catfish						4		4	16	6	4	7	9	10	3	6	3		3	2	77	25.2
Flathead catfish							3		2			2	1				1				9	2.9
White perch	4			13	17	5															39	12.7
Striped bass						1		1	3		2	3	1	1							12	3.9
Rock bass					1			1													2	0.7
Bluegill			1	11	7	2		1													22	7.2
Smallmouth bass		1		1		1	2	18	19	4	11	3	8	6	1	2					77	25.2
Largemouth bass						1		6	1	5	9	14	17	7	1	2		1			64	20.9
Yellow perch						3															3	1.0
Walleye									1												1	0.3
																					<b>306</b>	



**TABLE 3.6.1-4: CONTINUED.**

	Fall																				Total	%
	Length in inches																					
	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19	20	22	24	25			
Catfish														3						3	1.9	
Channel catfish					1		1	5	18	1			1	1		2	3	5	2	40	24.8	
Flathead catfish											2									2	1.2	
White perch		2	6	4	1															13	8.1	
Striped bass								3		2	1	5	10	1	1	12	12			47	29.2	
Bluegill		1																		1	0.6	
Smallmouth bass					4	3	4	2	1	7			1	1						23	14.3	
Largemouth bass					2	3	1	4	1	5	5	5		1						27	16.8	
Sunfish	5																			5	3.1	
																				<b>161</b>		

**TABLE 3.6.2-1: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED FISH CAUGHT BY SHORE ANGLERS ON LSR, 2010.**

	Shore fishing																														Total	%		
	Length in inches																																	
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	34			38	
Gizzard shad										1		1			1	1																4	1.0	
Common carp												1		1	1		1		1	1		1	2		1		1	1				12	3.1	
Catfish										4		5	6					1														17	4.4	
Channel catfish								1			8	11	14	11	5	9	8	2	2	2	2	1	1	2		3	1					83	21.3	
Flathead catfish														5	2	1	1			1		1	1		1					1		17	4.4	
White perch	6	10	24	30	29	17	9	4	1	1																					131	33.7		
Striped bass										1	2			2		2	6	17	19	6	13	6	8	9	7	3	4	1	1		2	1	110	28.3
Rock bass					1																												1	0.3
Bluegill							1																										1	0.3
Smallmouth bass											1																						1	0.3
Largemouth bass																		1			1	1											3	0.8
Yellow perch					1																												1	0.3
Walleye															1	1	1	1	1				2		1								8	2.1
																																	<b>389</b>	

**TABLE 3.6.2-2: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR HARVESTED FISH CAUGHT, SEASONALLY, BY SHORE ANGLERS ON LSR , 2010.**

	Spring																									Total	%
	Length in inches																										
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	24	25	26	27	28	30			
Gizzard shad									1		1														2	1.5	
Common carp																				1	2		1	1	5	3.8	
Catfish											1														1	0.8	
Channel catfish										1		3	2	1	3		1	2	1			1			15	11.5	
White perch	4	3	16	24	24	16	9	4	1	1															102	78.5	
Rock bass					1																				1	0.8	
Largemouth bass																		1							1	0.8	
Walleye														1		1	1								3	2.3	
																										<b>130</b>	

**TABLE 3.6.2-2: CONTINUED.**

	Summer																										Total	%
	Length in inches																											
	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29			
Common carp													1	1				1								3	1.9	
Bullhead catfishes								4		4	6			1				1								16	10.3	
Channel catfish								5	8	12	8	1	8	3	2	1		1				1		1		51	32.7	
Flathead catfish												5	2	1							1					2	11	7.1
White perch	2	7	8	6	5	1																				29	18.6	
Striped bass								1	2		1			5	8	8	3	4	2		1	3	1	1	1	41	26.3	
Bluegill							1																			1	0.6	
Smallmouth bass								1																		1	0.6	
Largemouth bass																		1								1	0.6	
Yellow perch					1																					1	0.6	
Walleye														1												1	0.6	
																										<b>156</b>		

**TABLE 3.6.2-2: CONTINUED.**

	Fall																									Total	%
	Length in inches																										
	10	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30	31	32	34	38				
Gizzard shad							1	1																	2	1.9	
Common carp					1					1			1								1				4	3.9	
Channel catfish	1	3	2	2		2		2				1	1		1		1	1							17	16.5	
Flathead catfish								1			1		1			1						1		1	6	5.8	
Striped bass					1		2	1	9	11	3	9	4	8	8	4	2	3	1			2	1		69	67.0	
Largemouth bass								1																	1	1.0	
Walleye											1			2		1									4	3.9	
																									<b>103</b>		

**TABLE 3.6.2-3: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR RELEASED FISH CAUGHT BY SHORE ANGLERS ON LSR DURING 2010.**

	Length in inches																									Total	%			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	24	25	28	30	32			36	37	54
American eel													1											1					2	0.5
Hickory shad												11																	11	2.5
Gizzard shad										1																			1	0.2
Shad					1						4																		5	1.2
Fallfish											3								2										5	1.2
Common carp																		1			1	2							4	0.9
Catfish											13	3	5	3			1												25	5.8
Channel catfish									5		10		11	10	7		9	1	11	1	1	1		1	1				69	16.0
Flathead catfish									2	1			1	4			3		3		1	1	1		1		1		19	4.4
White perch	10	1	27	29	9	24	1		2																				103	23.8
Striped bass		1			10	6	1	10	1	7	4	10	5	24	8	19	3	21	2	4	3	2		1	1	1	1	1	146	33.8
Smallmouth bass					1			5		1					1	1													9	2.1
Largemouth bass										1		3	1	3		1													9	2.1
Sunfish		2	1	2		1																							6	1.4
Yellow perch		1	1		2	1						1																	6	1.4
Walleye								1				1	1	1		3	1			1	1		1						11	2.5
Atlantic needlefish				1																									1	0.2
																													432	

**TABLE 3.6.2-4: LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS FOR RELEASED FISH CAUGHT, SEASONALLY, BY SHORE ANGLERS ON LSR, 2010.**

	Spring																								Total	%		
	Length in inches																											
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	20	22	24	25	28	30	32	36	37			54	
American eel													1													1	0.6	
Hickory shad												11															11	6.5
Gizzard shad										1																	1	0.6
Shad					1					4																	5	3.0
Common carp																1		1	2								4	2.4
Catfish										2	3	1			1												7	4.2
Channel catfish										2		1	5		1	6											15	8.9
Flathead catfish													1			1			1								3	1.8
White perch	10	1	19	17	2	16	1																				66	39.3
Striped bass					10	2		5	1	5		2	1		3	4			2			1	1	1	1	1	40	23.8
Smallmouth bass					1			1																			2	1.2
Largemouth bass												2	1	3													6	3.6
Yellow perch		1	1		2						1																5	3.0
Walleye																		1			1						2	1.2
																											<b>168</b>	

**TABLE 3.6.2-4: CONTINUED.**

	Summer																							Total	%
	Length in inches																								
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22	24	30	36				
Catfish									11		4	3											18	10.3	
Channel catfish							3		2		10	2	3		5	1	2						28	16.1	
Flathead catfish							2	1			1				3		1				1	1	10	5.7	
White perch		8	12	7	8			2															37	21.3	
Striped bass	1				4	1	5		2	4	7	4	20	3	3		9	1	1				65	37.4	
Smallmouth bass							4		1														5	2.9	
Largemouth bass									1		1				1								3	1.7	
Sunfish	2	1	2		1																		6	3.4	
Yellow perch					1																		1	0.6	
Atlantic needlefish			1																				1	0.6	
																							<b>174</b>		

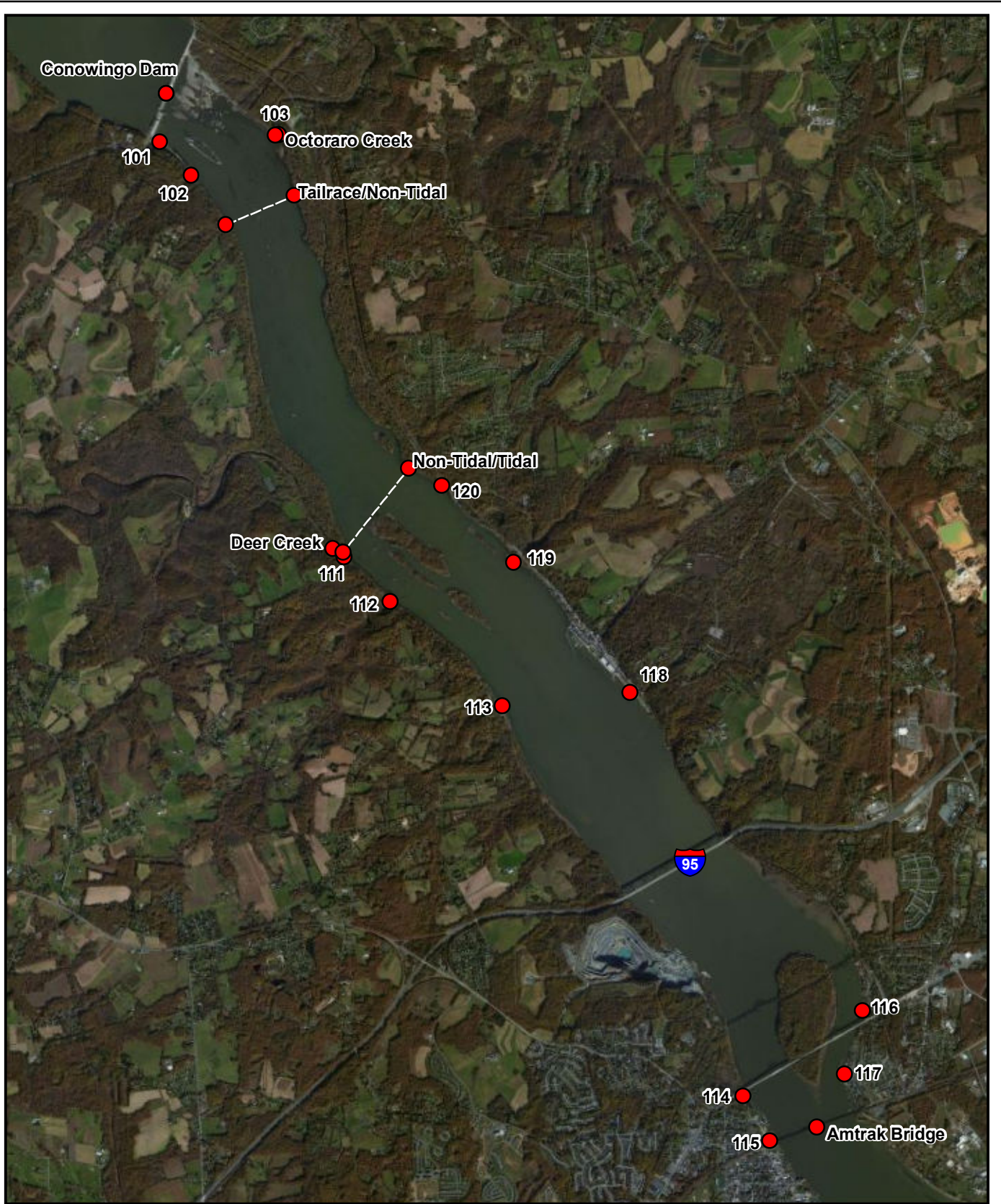


**TABLE 3.6.2-4: CONTINUED.**

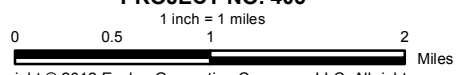
	Fall															Total	%
	Length in inches																
	10	12	14	15	16	17	18	19	20	21	22	24	28	30			
American eel															1	1	1.1
Fallfish		3							2							5	5.6
Channel catfish	2	6		3	4		3		3	1	1	1	1	1	26	28.9	
Flathead catfish				3					1		1	1			6	6.7	
Striped bass			1		4	5	13	3	8	2	3	2			41	45.6	
Smallmouth bass						1	1								2	2.2	
Walleye	1		1	1	1		3	1				1			9	10.0	
															<b>90</b>		

**TABLE 3.7.1-1: FISHING TOURNAMENTS OR EVENTS OCCURRED ON THE LSR, 2010.**

<b>Date</b>	<b>Sponsor/Club</b>	<b>Ramp (area)</b>	<b># of anglers</b>	<b>Any creel data</b>	<b>Species of fish</b>
3/6	CCA and Herb's tackle	Northeast Park,	175	1 boat interviewed at Perryville	Yellow Perch
6/5	Port Deposit Chamber of Commerce & Exelon Power	Port Deposit Municipal & Fisherman's Wharf	60	No one interviewed	Striped Bass



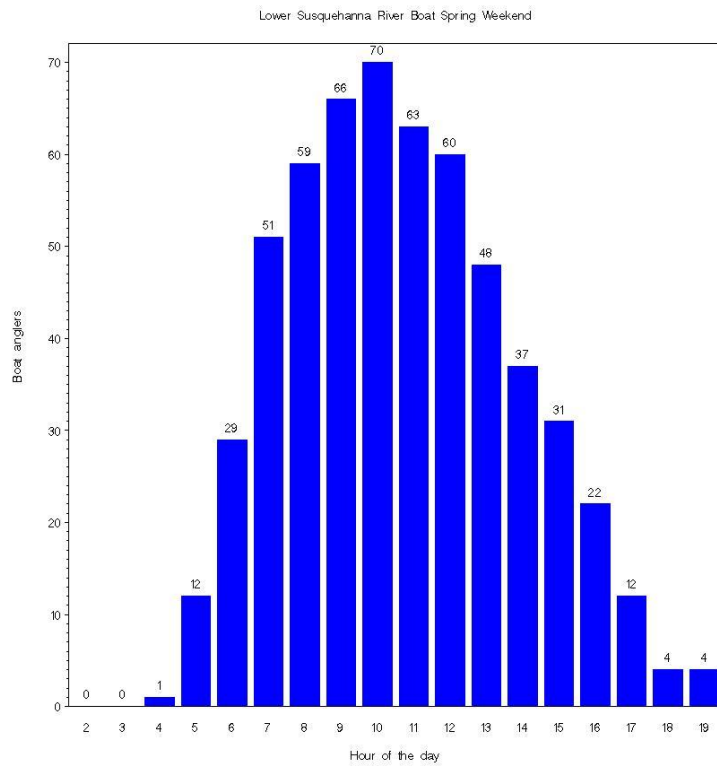
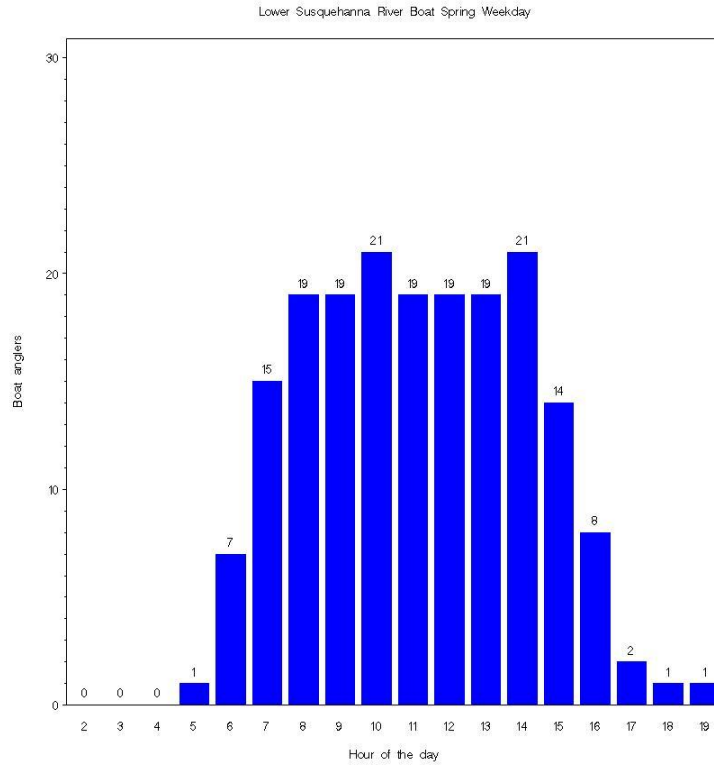
**EXELON GENERATION COMPANY, LLC**  
 RSP STUDY 3.25  
 CONOWINGO HYDROELECTRIC PROJECT  
 PROJECT NO. 405



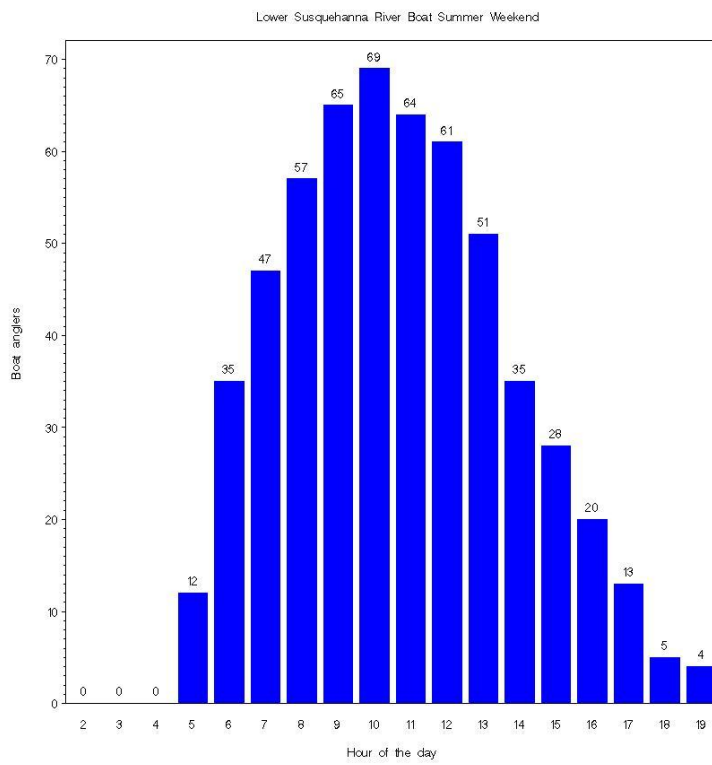
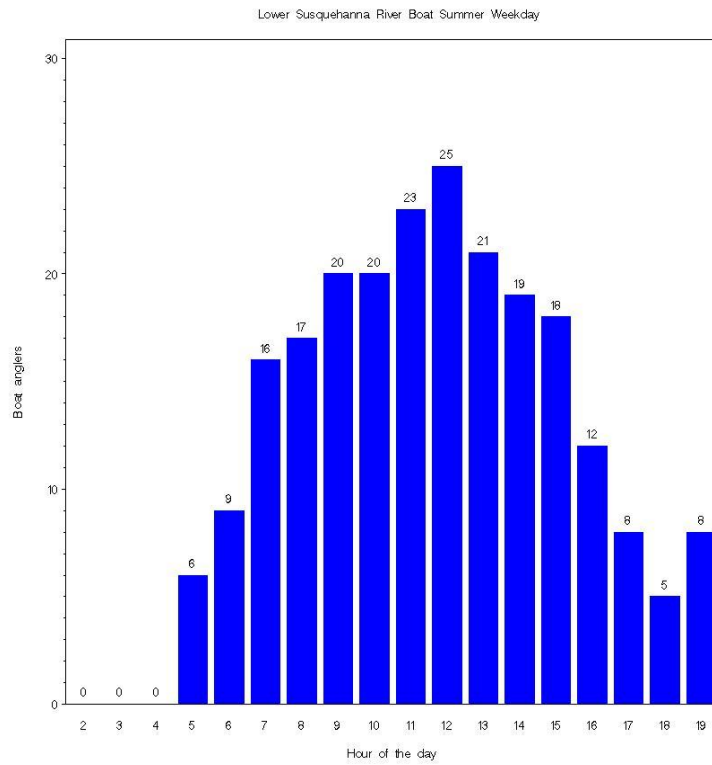
Copyright © 2012 Exelon Generation Company, LLC. All rights reserved.

Figure 2.1-1.  
 Figure Title: Lower Susquehanna River Interview Locations.

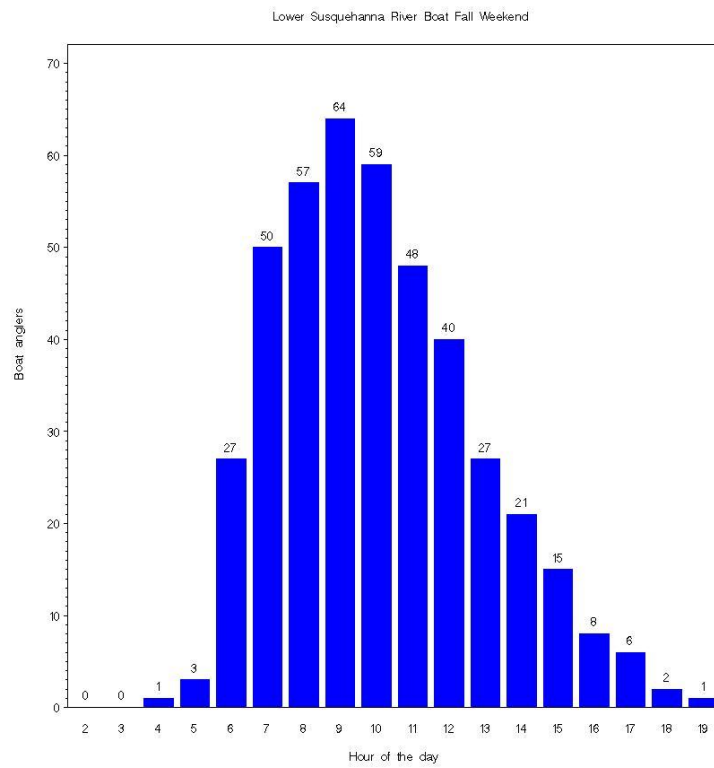
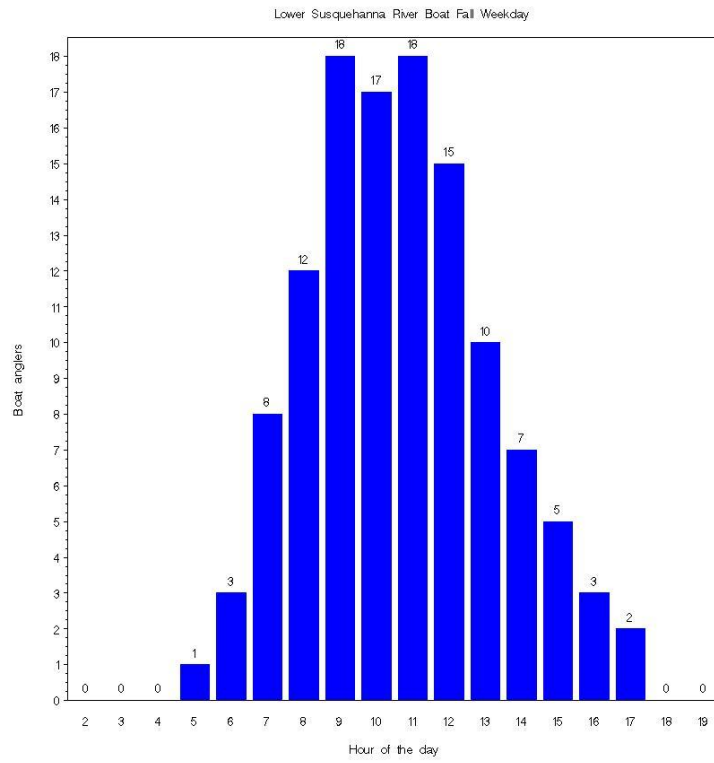
**FIGURE 3.1.2-1: BOAT ANGLER USE PROFILES FOR TEMPORAL STRATA.**



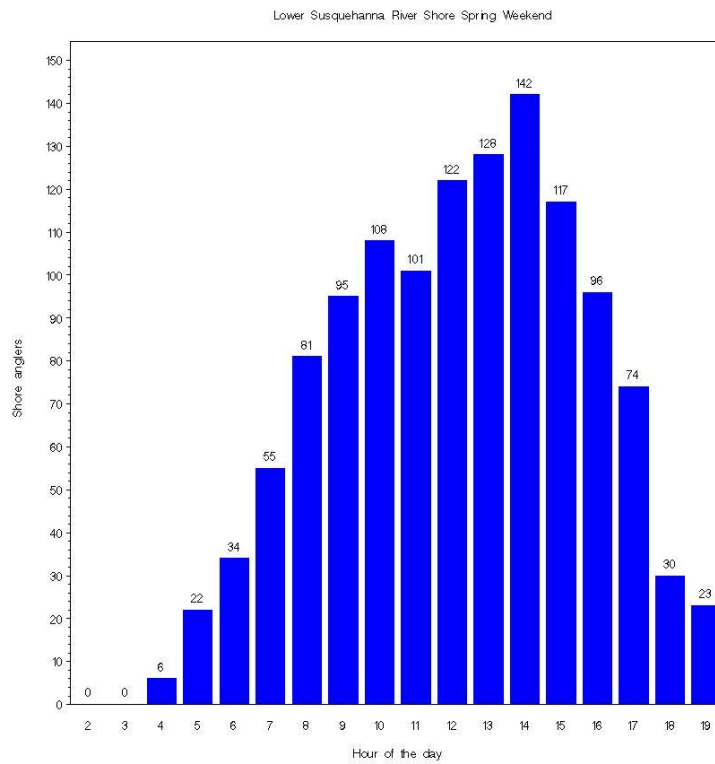
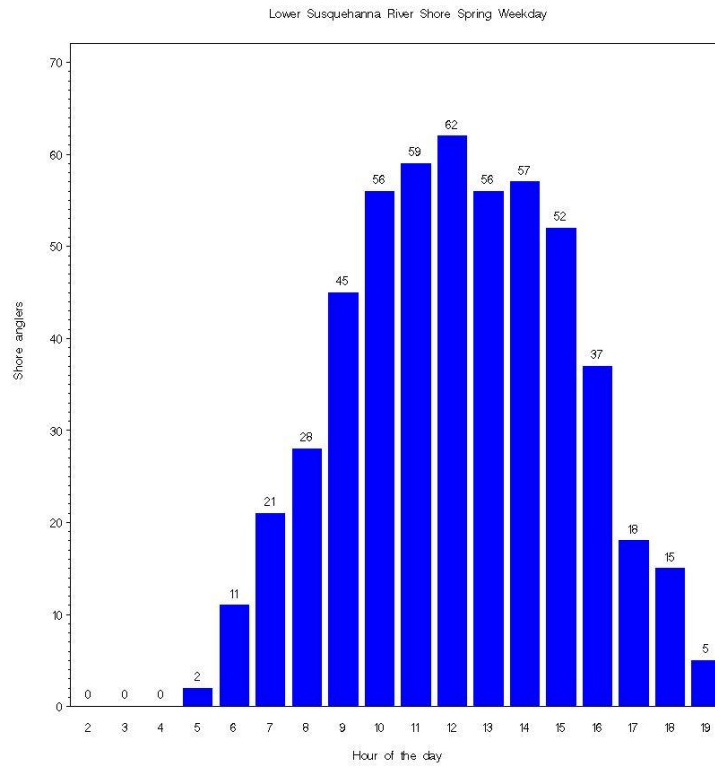
**FIGURE 3.1.2-1: CONTINUED.**



**FIGURE 3.1.2-1: CONTINUED.**

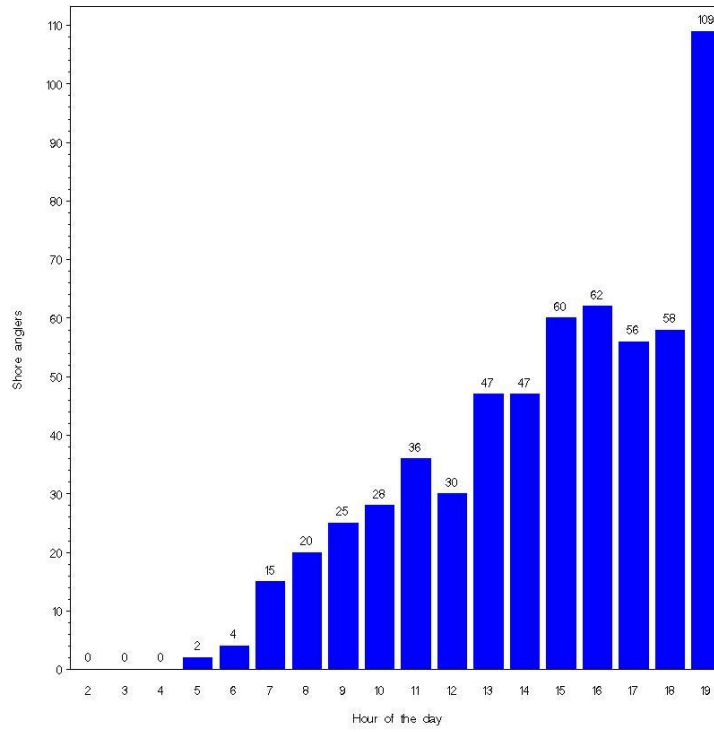


**FIGURE 3.1.4-1: SHORE ANGLER USE PROFILES FOR TEMPORAL STRATA.**

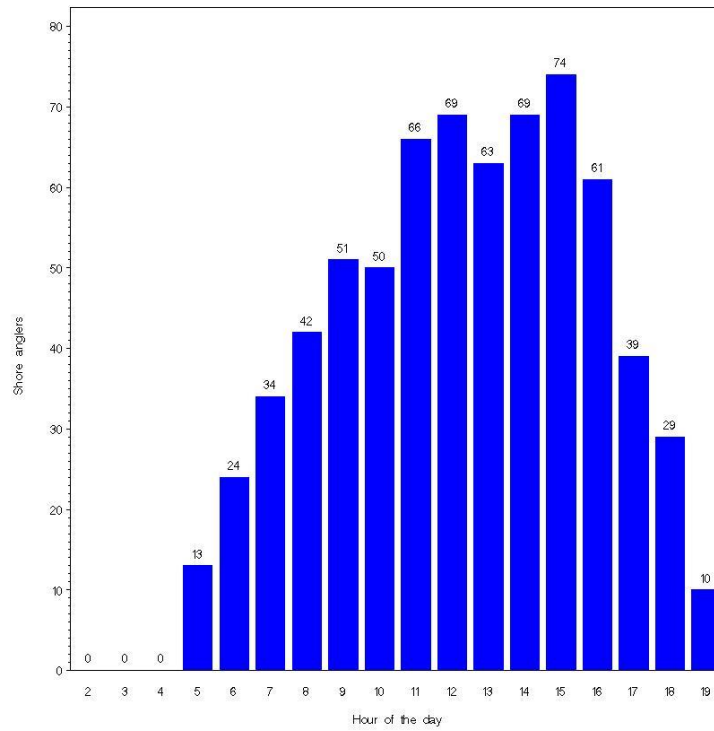


**FIGURE 3.1.4-1: CONTINUED.**

Lower Susquehanna River Shore Summer Weekday



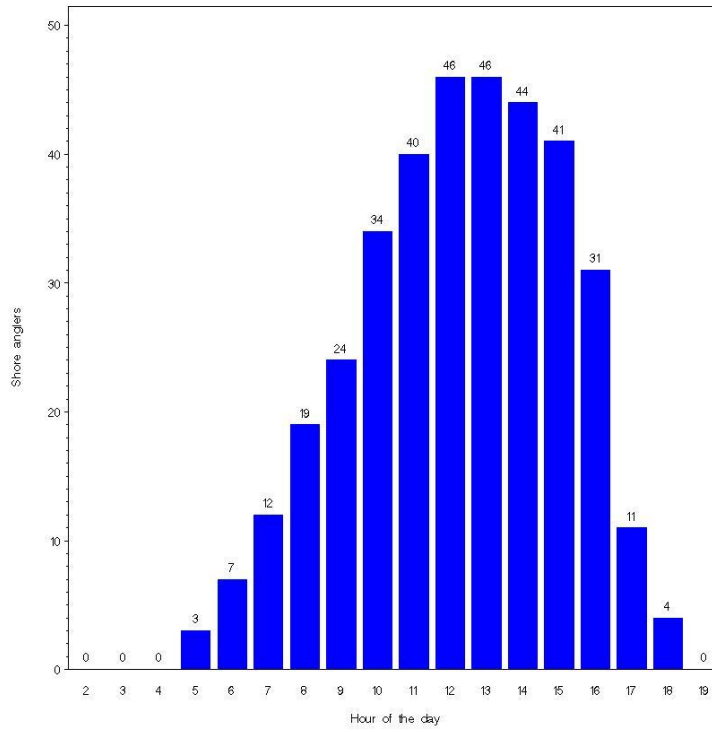
Lower Susquehanna River Shore Summer Weekend



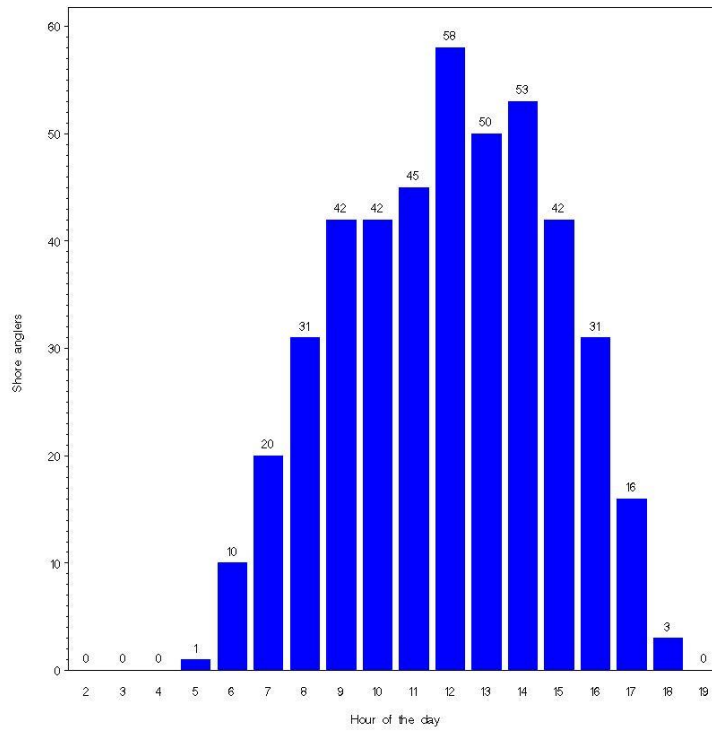


**FIGURE 3.1.4-1: CONTINUED.**

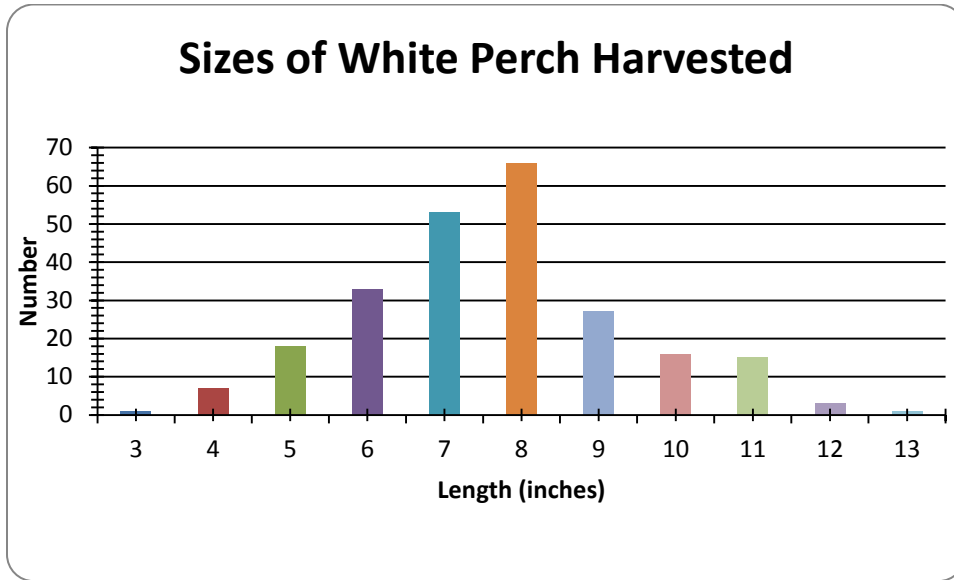
Lower Susquehanna River Shore Fall Weekday



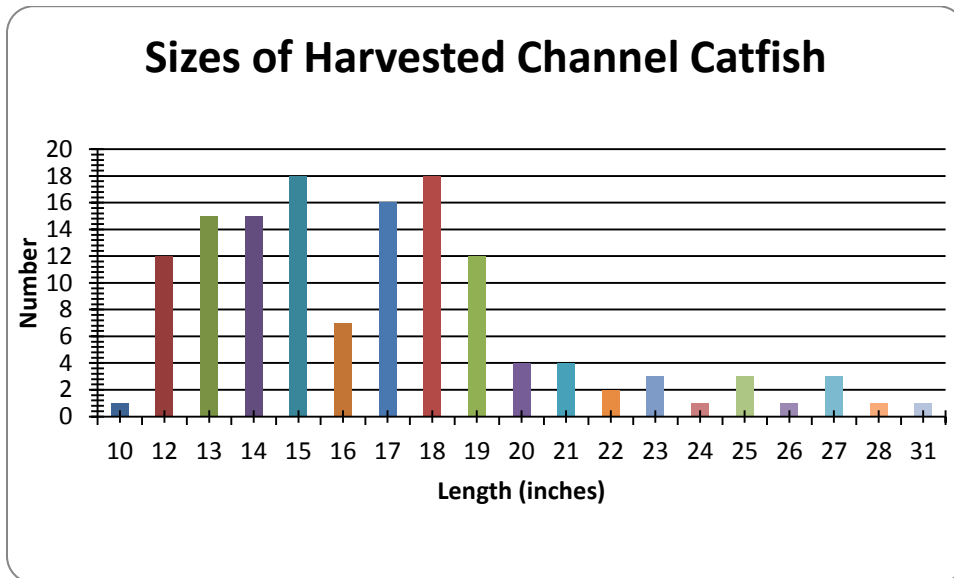
Lower Susquehanna River Shore Fall Weekend



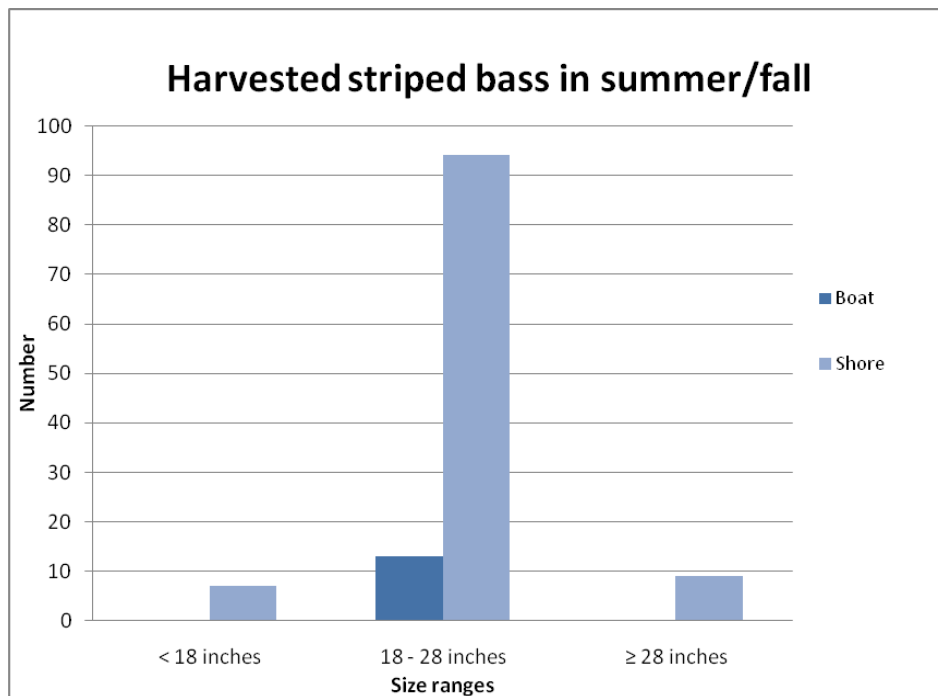
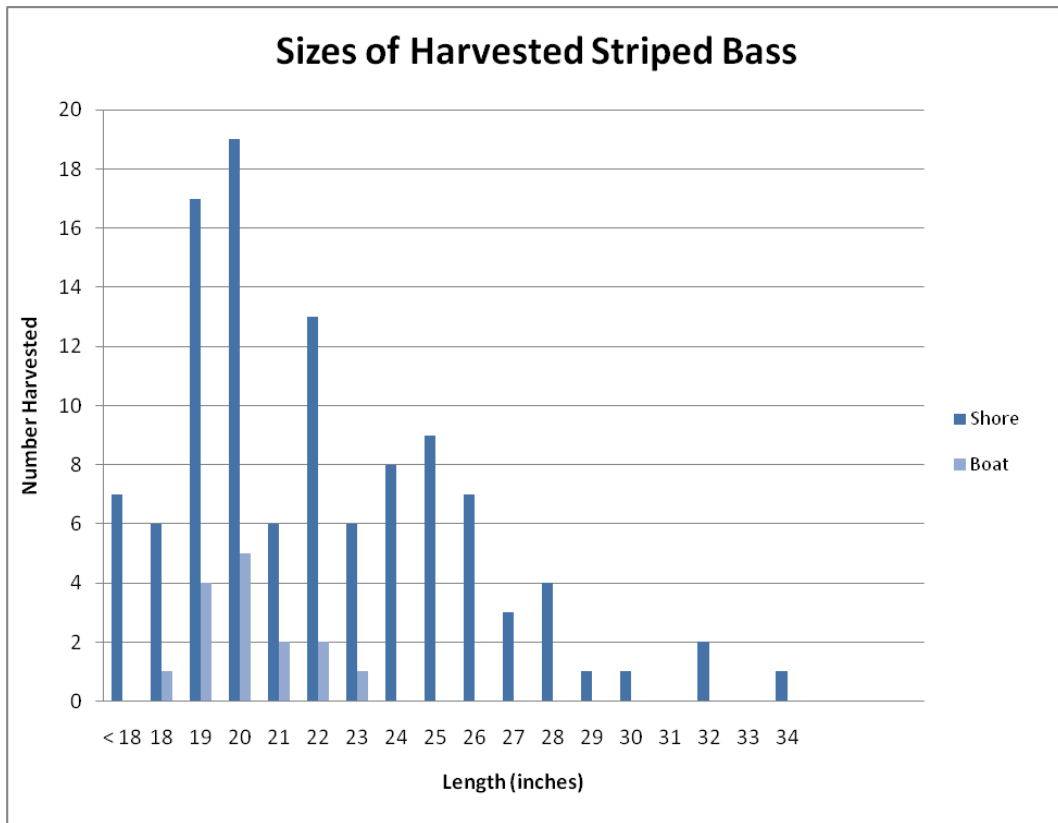
**FIGURE 3.6.1: SIZES OF HARVESTED WHITE PERCH BY ANGLERS ON THE LSR, 2010.**



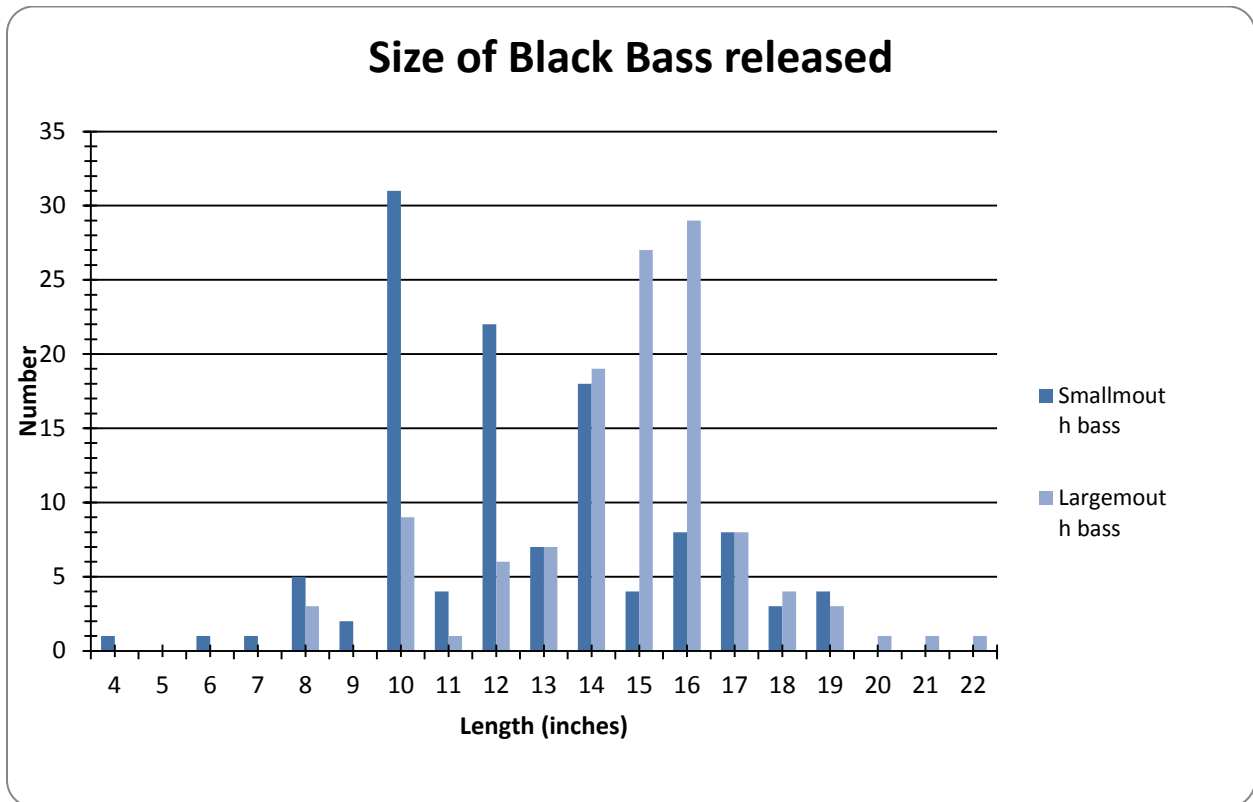
**FIGURE 3.6.2: SIZES OF HARVESTED CHANNEL CATFISH BY ANGLERS ON THE LSR, 2010.**



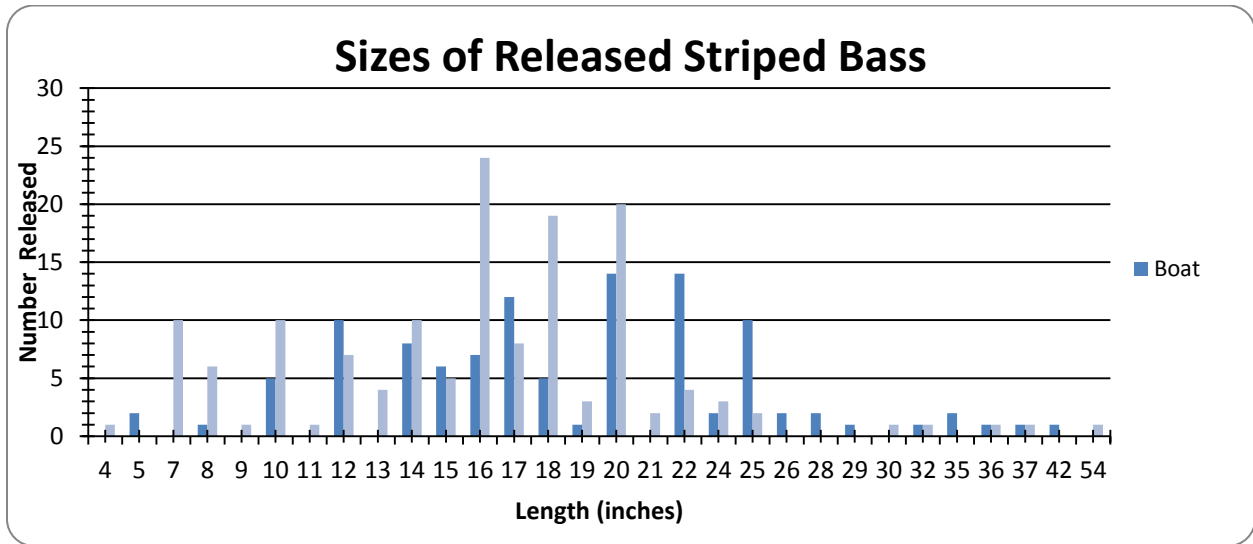
**FIGURE 3.6.3: SIZES OF HARVESTED STRIPED BASS BY ANGLERS IN THE LSR, 2010.**



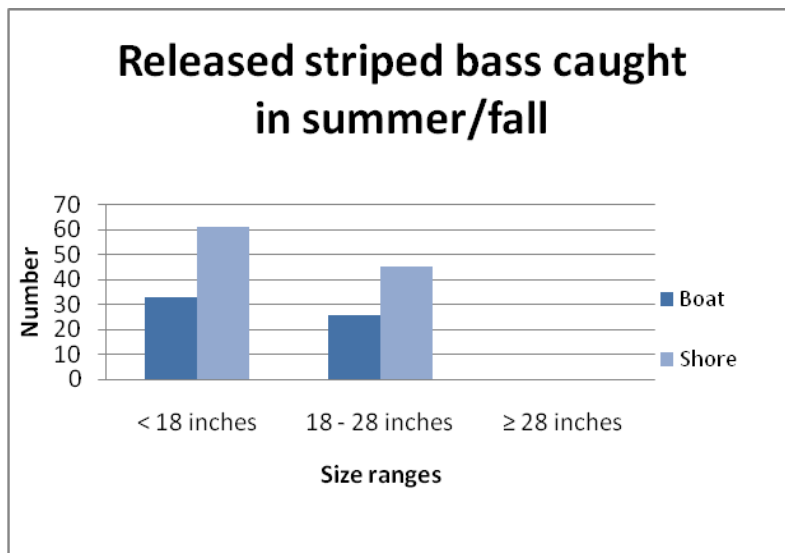
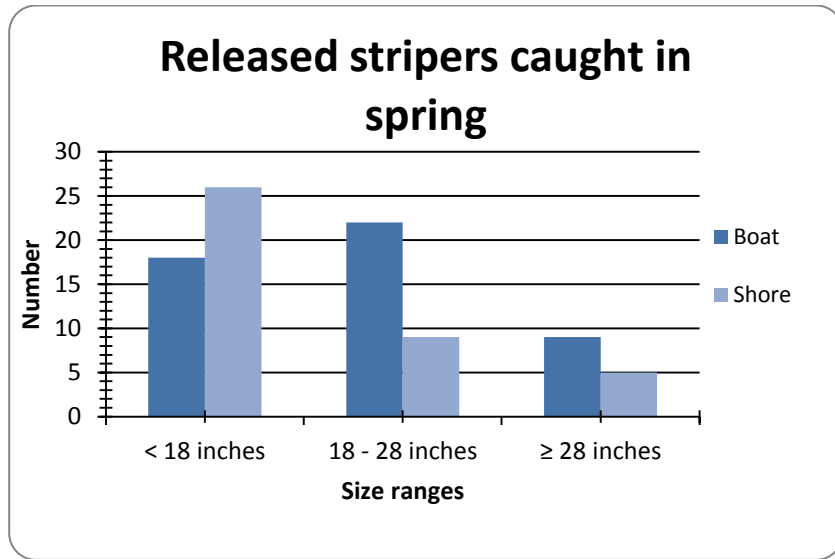
**FIGURE 3.6.4: SIZES OF RELEASED BLACK BASS BY ANGLERS ON THE LSR, 2010.**



**FIGURE 3.6.5: SIZES OF RELEASED STRIPED BASS BY ANGLERS IN THE LSR, 2010.**



**FIGURE 3.6.5: CONTINUED.**



**APPENDIX A-1: RANDOM AERIAL FLIGHT SCHEDULE.**



## Aerial Survey - LSR

Spring 2010	Date	Route	Day type	# of flights
Opening Day 1 March	3/1	DNF *		
Weekday 15-21 March	3/18	2	Weekend/Holiday	6
Weekend 8-14 March (make-up)	3/20	1	Weekday	7
Weekday 1-7 March (make-up)	3/24	1	Opening Days	1
Weekend 22-28 March	3/27	1		
Weekday 29-4 April	3/31	3		
Opening Day 3 April	4/3	DNF *		
Weekend 5- 11 April	4/11	3		
Weekday 12-18 April	4/13	2		
Weekend 19-25 April	4/24	2		
Weekday 26-2 May	4/27	1		
Weekday 10-16 May	5/10	4		
Opening Day 15 May	5/15	1		
Weekend 3-9 May (make-up)	5/16	3		
Weekday 24-30 May	5/26	4		
Weekend 17-23 May (make-up)	5/29	2		

Summer 2010	Date	Route	Day type	# of flights
Opening Day 1 June	6/1	1		
Weekend 31-6 June	6/5	1		
Weekday 7-13 June	6/10	3	Weekend/Holiday	7
Weekend 14-20 June	6/19	1	Weekday	7
Weekday 21-27 June	6/22	3	Opening Days	1
Weekend 28-4 July	7/3	3		
Weekday 5-11 July	7/9	3		
Weekend 12-18 July	7/17	2		
Weekday 19-25 July	7/21	1		
Weekend 26- 1 August	8/1	4		
Weekday 2-8 August	8/2	2		
Weekend 9-15 August	8/15	1		
Weekday 16-22 August	8/17	1		
Weekend 23-29 August	8/29	3		
Weekday 30-5 Sept.	9/1	1		

Fall 2010	Date	Route	Day type	# of flights
Weekday 13-19 Sept.	9/13	3		
Weekend 6-12 Sept. (make-up)	9/18	1		
Weekday 27-3 Oct.	9/28	4	Weekend/Holiday	6
Weekend 20-26 Sept. (make-up)	10/2	3	Weekday	6
Weekend 4-10 Oct	10/9	2		
Weekday 11-17 Oct.	10/12	2		
Weekend 18-24 Oct.	10/24	3		
Weekday 25-31 Oct.	10/26	3		
Weekend 1-7 Nov.	11/7	2		
Weekday 8-14 Nov.	11/8	1		
Weekend 15-21 Nov.	11/21	1		
Weekday 22-28 Nov.	11/23	3		

Frequency	# Flights	Opening Day
Monday	4	
Tuesday	8	1
Wednesday	5	
Thursday	2	
Friday	1	
Saturday	11	1
Sunday	8	

\* Did not fly (DNF) because of paperwork and bad weather conditions

**APPENDIX A-2: RANDOM GROUND SURVEY SCHEDULE.**

## Ground Survey - LSR

Season	Schedule Week	Day	Date	Route	Start Time
Spring	Opening Day 1 March	Monday	3/1	B	700
	Weekday 1-7 March	Tuesday	3/2	G	800
	Weekday 1-7 March	Friday	3/5	H	800
	Weekend 1-7 March	Saturday	3/6	C	700
	Weekend 1-7 March	Sunday	3/7	B	800
	Weekday 8-14 March	Tuesday	3/9	A	800
	Weekday 8-14 March	Thursday	3/11	C	700
	Weekend 8-14 March	Saturday	3/13	B	700
	Weekend 8-14 March	Sunday	3/14	H	700
	Weekday 15-21 March	Wednesday	3/17	G	900
	Weekday 15-21 March	Friday	3/19	A	700
	Weekend 15-21 March	Saturday	3/20	B	700
	Weekend 15-21 March	Sunday	3/21	A	900
	Weekday 22-28 March	Wednesday	3/24	B	900
	Weekday 22-28 March	Thursday	3/25	G	900
	Weekend 22-28 March	Saturday	3/27	H	800
	Weekend 22-28 March	Sunday	3/28	G	800
	Weekday 29-4 April	Tuesday	3/30	D	900
	Weekday 29-4 April	Thursday	4/1	G	900
	Opening Day 3 April	Saturday	4/3	G	900
	Weekend 29-4 April	Sunday	4/4	D	700
	Weekday 5-11 April	Tuesday	4/6	B	900
	Weekday 5-11 April	Friday	4/9	D	700
	Weekend 5-11 April	Saturday	4/10	B	1000
	Weekend 5-11 April	Sunday	4/11	G	700
	Weekday 12-18 April	Monday	4/12	G	900
	Weekday 12-18 April	Wednesday	4/14	H	1000
	Weekend 12-18 April	Saturday	4/17	B	1000
	Weekend 12-18 April	Sunday	4/18	D	700
	Weekday 19-25 April	Monday	4/19	D	700
	Weekday 19-25 April	Wednesday	4/21	H	900
	Weekend 19-25 April	Saturday	4/24	A	900
	Weekend 19-25 April	Sunday	4/25	H	800
	Weekday 26-2 May	Wednesday	4/28	G	700
	Weekday 26-2 May	Friday	4/30	C	700
	Weekend 26-2 May	Saturday	5/1	D	700
	Weekend 26-2 May	Sunday	5/2	G	800
	Weekday 3-9 May	Tuesday	5/4	A	800
	Weekday 3-9 May	Friday	5/7	G	1000
	Weekend 3-9 May	Saturday	5/8	H	1000
	Weekend 3-9 May	Sunday	5/9	D	1000
	Weekday 10-16 May	Tuesday	5/11	B	1000
	Weekday 10-16 May	Thursday	5/13	D	900
	Weekend 10-16 May	Saturday	5/15	G	700
	Weekend 10-16 May	Sunday	5/16	B	700
	Weekday 17-23 May	Tuesday	5/18	B	1000
	Weekday 17-23 May	Wednesday	5/19	C	1000
	Weekend 17-23 May	Saturday	5/22	D	1000
	Weekend 17-23 May	Sunday	5/23	B	700
	Weekday 24-30 May	Wednesday	5/26	B	900
	Weekday 24-30 May	Thursday	5/27	H	700

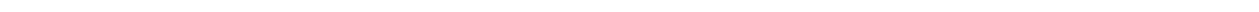
	Weekend 24-30 May	Sunday	5/30	D	800
	Weekend 24-30 May	Monday	5/31	G	700
Summer	Opening Day 1 June	Tuesday	6/1	D	800
	Weekday 31-6 June	Wednesday	6/2	C	1000
	Weekday 31-6 June	Thursday	6/3	B	800
	Weekend 31-6 June	Saturday	6/5	B	1000
	Weekend 31-6 June	Sunday	6/6	E	1100
	Weekday 7-13 June	Monday	6/7	F	1100
	Weekday 7-13 June	Tuesday	6/8	A	900
	Weekend 7-13 June	Saturday	6/12	C	900
	Weekend 7-13 June	Sunday	6/13	C	1100
	Weekday 14-20 June	Tuesday	6/15	E	900
	Weekday 14-20 June	Friday	6/18	F	900
	Weekend 14-20 June	Saturday	6/19	F	900
	Weekend 14-20 June	Sunday	6/20	H	800
	Weekday 21-27 June	Tuesday	6/22	C	800
	Weekday 21-27 June	Friday	6/25	G	900
	Weekend 21-27 June	Saturday	6/26	H	1000
	Weekend 21-27 June	Sunday	6/27	B	900
	Weekday 28-4 July	Monday	6/28	E	1100
	Weekday 28-4 July	Wednesday	6/30	C	1100
	Weekend 28-4 July	Saturday	7/3	G	1100
	Weekend 28-4 July	Monday	7/5	B	1000
	Weekday 5-11 July	Thursday	7/8	A	800
	Weekday 5-11 July	Friday	7/9	C	800
	Weekend 5-11 July	Saturday	7/10	F	1000
	Weekend 5-11 July	Sunday	7/11	G	1000
	Weekday 12-18 July	Tuesday	7/13	B	900
	Weekday 12-18 July	Thursday	7/15	B	900
	Weekend 12-18 July	Saturday	7/17	D	900
	Weekend 12-18 July	Sunday	7/18	F	800
	Weekday 19-25 July	Tuesday	7/20	D	1000
	Weekday 19-25 July	Friday	7/23	E	900
	Weekend 19-25 July	Saturday	7/24	D	800
	Weekend 19-25 July	Sunday	7/25	C	700
	Weekday 26- 1 August	Tuesday	7/27	G	700
	Weekday 26- 1 August	Thursday	7/29	B	900
	Weekend 26- 1 August	Saturday	7/31	A	1000
	Weekend 26- 1 August	Sunday	8/1	F	800
	Weekday 2-8 August	Monday	8/2	D	1000
	Weekday 2-8 August	Friday	8/6	B	900
	Weekend 2-8 August	Saturday	8/7	G	900
	Weekend 2-8 August	Sunday	8/8	A	700
	Weekday 9-15 August	Wednesday	8/11	H	1000
	Weekday 9-15 August	Friday	8/13	G	1000
	Weekend 9-15 August	Saturday	8/14	E	900
	Weekend 9-15 August	Sunday	8/15	E	700
	Weekday 16-22 August	Tuesday	8/17	E	800
	Weekday 16-22 August	Thursday	8/19	A	700
	Weekend 16-22 August	Saturday	8/21	E	800
	Weekend 16-22 August	Sunday	8/22	F	1000
	Weekday 23-29 August	Tuesday	8/24	E	900
	Weekday 23-29 August	Friday	8/27	H	800
	Weekend 23-29 August	Saturday	8/28	G	1000

	Weekend 23-29 August	Sunday	8/29	B	900
	Weekday 30-5 Sept.	Wednesday	9/1	E	900
	Weekday 30-5 Sept.	Thursday	9/2	A	900
	Weekend 30-5 Sept.	Sunday	9/5	H	900
	Weekend 30-5 Sept.	Monday	9/6	A	700
Fall	Weekday 6-12 Sept.	Wednesday	9/8	F	700
	Weekday 6-12 Sept.	Thursday	9/9	F	700
	Weekend 6-12 Sept.	Saturday	9/11	B	800
	Weekend 6-12 Sept.	Sunday	9/12	C	900
	Weekday 13-19 Sept.	Thursday	9/16	B	900
	Weekday 13-19 Sept.	Friday	9/17	E	700
	Weekend 13-19 Sept.	Saturday	9/18	E	800
	Weekend 13-19 Sept.	Sunday	9/19	F	700
	Weekday 20-26 Sept.	Tuesday	9/21	B	700
	Weekday 20-26 Sept.	Wednesday	9/22	E	900
	Weekend 20-26 Sept.	Saturday	9/25	B	900
	Weekend 20-26 Sept.	Sunday	9/26	D	900
	Weekday 27-3 Oct.	Tuesday	9/28	F	800
	Weekday 27-3 Oct.	Friday	10/1	H	800
	Weekend 27-3 Oct.	Saturday	10/2	B	700
	Weekend 27-3 Oct.	Sunday	10/3	C	900
	Weekday 4-10 Oct	Wednesday	10/6	A	700
	Weekday 4-10 Oct	Friday	10/8	B	700
	Weekend 4-10 Oct	Saturday	10/9	D	900
	Weekend 4-10 Oct	Sunday	10/10	H	900
	Weekday 11-17 Oct.	Tuesday	10/12	E	800
	Weekday 11-17 Oct.	Wednesday	10/13	F	800
	Weekend 11-17 Oct.	Saturday	10/16	B	700
	Weekend 11-17 Oct.	Sunday	10/17	D	800
	Weekday 18-24 Oct.	Tuesday	10/19	C	700
	Weekday 18-24 Oct.	Thursday	10/21	D	700
	Weekend 18-24 Oct.	Saturday	10/23	B	700
	Weekend 18-24 Oct.	Sunday	10/24	E	800
	Weekday 25-31 Oct.	Tuesday	10/26	B	800
	Weekday 25-31 Oct.	Friday	10/29	G	800
	Weekend 25-31 Oct.	Saturday	10/30	H	700
	Weekend 25-31 Oct.	Sunday	10/31	A	700
	Weekday 1-7 Nov.	Monday	11/1	F	700
	Weekday 1-7 Nov.	Friday	11/5	D	700
	Weekend 1-7 Nov.	Saturday	11/6	G	800
	Weekend 1-7 Nov.	Sunday	11/7	B	700
	Weekday 8-14 Nov.	Wednesday	11/10	E	700
	Weekday 8-14 Nov.	Thursday	11/11	G	700
	Weekend 8-14 Nov.	Saturday	11/13	G	700
	Weekend 8-14 Nov.	Sunday	11/14	B	700
	Weekday 15-21 Nov.	Monday	11/15	B	700
	Weekday 15-21 Nov.	Tuesday	11/16	B	700
	Weekend 15-21 Nov.	Saturday	11/20	C	700
	Weekend 15-21 Nov.	Sunday	11/21	A	700
	Weekday 22-28 Nov.	Tuesday	11/23	A	700
	Weekday 22-28 Nov.	Wednesday	11/24	G	700
	Weekend 22-28 Nov.	Friday	11/26	D	700
	Weekend 22-28 Nov.	Saturday	11/27	F	700

**APPENDIX B-1: STANDARD OPERATING PROCEDURE.**

**Standard Operating Procedures for the Exelon Susquehanna River Creel Survey for the  
Conowingo Project, 2010-2011**

**DRAFT**



## TABLE OF CONTENTS

1.0	Introduction.....	5
1.1	General Approach.....	5
1.2	Fisheries Objectives and General Procedure for Selecting Anglers for Interview .....	8
1.3	Recreational Survey Objectives.....	<b>Error! Bookmark not defined.</b>
2.0	Creel and Recreational Survey Data Collection Sites.....	11
3.0	Basics of Data Collection.....	14
3.1	Fisheries-Creel Survey.....	<b>Error! Bookmark not defined.</b>
3.1.1	Shore-Angler Surveys.....	<b>Error! Bookmark not defined.</b>
3.1.2	Boat Angler Surveys .....	15
3.1.3	Additional Biological Data and Method of Coding Samples.....	16
3.2	Recreational Survey.....	<b>Error! Bookmark not defined.</b>
3.3	Aerial Survey of Boats Used for Fishing .....	17
3.4	Conditions Where There is Potential to Modify Procedure for the Creel Study South- North- and Boat Ramp Routes in Fall-Winter .....	<b>Error! Bookmark not defined.</b>
3.4.1	Revision to the South-Route SOP Caused by Potential Fall-Winter Conditions.....	<b>Error! Bookmark not defined.</b>
3.4.2	Semi-Permanent Variation in the SOP.....	<b>Error! Bookmark not defined.</b>
3.4.3	Conditional Fall-Winter Procedures .....	<b>Error! Bookmark not defined.</b>
3.4.4	General Objectives.....	<b>Error! Bookmark not defined.</b>
3.4.5	Safety .....	<b>Error! Bookmark not defined.</b>
3.4.6	North and Boat Routes.....	<b>Error! Bookmark not defined.</b>
4.0	Schedules and Creel Routes .....	18
5.0	Data Custody.....	19
6.0	Safety .....	19
7.0	Example Creel Survey Interview Introduction to Anglers.....	19
8.0	Phone Numbers.....	20
8.1	Police and Exelon Security and Related Phone Numbers .....	20
8.2	Creel Personnel Phone Numbers .....	20
9.0	Route-Site Directions .....	21

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## **ATTACHMENTS**

A - Data Forms and Coding Manual

B - Site Descriptions, Routes, Driving Directions



## **1.0 INTRODUCTION**

### **1.1 General Approach**

The data forms associated with this standard operating procedure (SOP) are designed to document the fisheries and recreational use of the resources associated with the Conowingo Project on the Susquehanna River. The Conowingo Project consists of distinct survey reaches below and above Conowingo Dam. The Susquehanna River is located at the head of the Chesapeake Bay and defined in this study as extending from the river mouth at the lowermost railroad bridge (Amtrak) to the tailrace of Conowingo Dam and, above the dam, from the boating limit located in Conowingo Pond upriver to the PA state road 372 bridge (Norman Wood Bridge), including both east and west river banks. Normandeau personnel will collect angler data, catch data, and supporting information which will assist the Exelon in their re-licensing of the Conowingo Project.

This SOP was prepared to provide field personnel general criteria for making on-site decisions related to data collection and as a guide to completing data forms. The data forms provide a script, via data-fields, to prompt technicians to the questions to be asked of anglers, and to document angler responses. The SOP also describes the objectives of the creel study. Understanding study objectives will assist field personnel in the appropriate application of the procedures outlined below.

This SOP includes the following attached data forms and related materials:

- Form DCS.10, Susquehanna River Creel Survey Site Count Form;
- Form GSF.10, (a single-sided, 1 page form), Susquehanna River Creel Survey Interview Data Sheet; and
- Form ASF2.10, Conowingo Project Aerial Survey.
- The coding instructions specific to these forms.
- Information on access sites in the survey

Note that it is possible data forms or coding instructions will be revised as the project progresses to reflect collection of more appropriate data. Coding manuals are typically "living documents" and designed to accommodate flexible survey needs. Creel technicians will be informed as soon as possible about changes

in data collection or recording. Unused, older data forms should be properly discarded upon receipt of revised forms. Technicians will be notified promptly if any there have been any revisions to the survey forms. Revision numbers (e.g., Form GSF.11, ...13, etc.) appear in the title of the form. Depending on the type of revision to a form the SOP may or may not be revised.

It is intended that personnel working on this project, through training, will be familiar with the forms and data fields prior to reviewing the SOP. Normandeau personnel must understand the type of data to be entered, specific to each data-field in a form, prior to data collection.

Although all study personnel work for Normandeau, they indirectly represent Gomez and Sullivan Engineers and Exelon. Creel technicians should always be courteous, and in the event an angler declines an interview or is belligerent in any way thank them for their time and move to the next angler/boat. An example of a verbal introduction a creel technician can use when approaching an angler is presented in Section 7.0. If anglers request details of the study beyond those found in this SOP the technician can direct them to contact Mr. Bob Judge of Exelon Public Affairs at 610-765-5331

Recreational and creel data will be obtained at numerous sites on the lower Susquehanna River below Conowingo Dam (see map, Figure 1) or on Conowingo Pond (see map, Figure 2). At prescribed sites creel data will be collected from individual shore/boat anglers or shore/boat fishing parties when they are finished fishing, or by a roving survey option, which allow interviews during low angler abundance. A roving survey yields mostly incomplete-trip interviews of shore anglers. Completed trip interviews will occur as shore or boat anglers exit a site. Interviews will be obtained from each individual or party that is shore/boat fishing or exiting a site as time permits. The type of interview, complete or incomplete, will be noted on the data sheet (GSF.10).

For boat anglers the creel technician will collect data from an individual who represents all persons aboard (e.g., a charter-boat captain, or party spokesman) and presents the boats' catch data collectively. The boat interviews will typically occur when a boat has returned from a fishing trip (a completed trip survey). Interruptions greater than 30 minutes in boat fishing to return for gas or lunch, or to pick up additional passengers, should be treated as break in fishing and recorded as a completed trip.

The Creel Survey Form GSF.10 is universal for conducting boat or shore angler interviews. However, not all fields are used at each site or in every type of interview. During some site visits a Form GSF.10 will be filled out for a boat survey but another GSF.10 might be filled out for a shore angler interview. When no anglers are present during the period of a site visit only the appropriate space on the Site Count Form (DCS.10) needs to be completed for that site.

The boat and shoreline angler surveys will be completed a minimum of 4 days per week from March 1, 2010 through November 30, 2010. (Note: a winter angling survey will be conducted on Conowingo Pond only during 1 December 2010 to 28 February 2011. Procedures may differ slightly for the winter survey). During most weeks, two weekday surveys and both weekend days will be scheduled. Surveys can also occur on holiday weekends (e.g., Memorial Day, July 4<sup>th</sup>, Labor Day), where two of the three days will be surveyed. A fishing day is defined to start no later than 0700 h and extends until 2100 h, at the latest. Clerks must move along a prescribed route on a time schedule to visit the required number of sites within a shift. Specific shift times for surveys will vary depending upon random selection of an initial start time for the day and seasonal day length. A survey day will consist of a 10-hour day including defined location times, including travel time between sites. The daily start time selected must accommodate all interview periods and required travel time. Thus, a daily start time will occur between 0700 and 1100 h, and be finished between 1700 and 2100 h. A monthly schedule will specify survey start times reflecting varying day length throughout the survey period. Based on the monthly schedule that specifies start time, wait times, and estimated travel times between sites, the technician will determine when to leave a site and proceed to the next site.

Aerial (helicopter) surveys to count shore anglers and fishing boats will be completed once a week on alternating weekend/holiday and weekday daytypes, with additional specified opening day surveys. Due to design considerations flights may occur during morning (0700-1100 h), mid-day (e.g. 1100-1500 h), or evening (1500-1900 h). The lower Susquehanna River below Conowingo Dam will be partitioned for counts into three reaches termed tidal, non-tidal, and tailrace (Figure 1). Conowingo Pond will be partitioned for counts into two reaches termed Maryland and Pennsylvania (Figure 2). Within the Conowingo Pond in Maryland, three sub-areas exist termed Funks Pond, Conowingo Creek, and Broad Creek. The Conowingo Pond-Pennsylvania portion will have a sub-area termed Peach Bottom Plume. The number of shore anglers and fishing boats will be identified and summed separately for each count area or sub-area.

## **1.2 Fisheries Objectives and General Procedure for Selecting Anglers for Interview**

The main objective of the field creel survey is to obtain the most accurate and precise angler catch data as possible. These data will be used along with fishing effort data to estimate catch and harvest. To accomplish these objectives Exelon needs creel survey personnel at shore and boat ramp sites to obtain interview information from boat and shore anglers returning from a fishing trip. The time spent fishing and the number and species of fish caught and harvested (i.e., number of fish kept and not returned to the water) by the angler(s) are the most important data for the creel study and are to be documented on survey-specific data forms. These data are used to, among other things, estimate the catch-per-unit-effort (CPUE) and ultimately the estimated fish harvest from the Susquehanna River.

For each daily survey, note the arrival time at the scheduled access site on Form DCS.10. A second data sheet, Form GSF.10 (one form per angler or angling party) will be completed only when an interview is attempted or completed (i.e., if there are no anglers at a site during a shift, Form GSF.10 will NOT be filled in for that site). The types of fisheries and related data to be placed in data fields on Form DCS.10 and GSF.10 are relatively straightforward as scripted. Some data will be provided by the creel clerk (e.g., place and time of interview) and other data will be obtained from the angler (e.g., number and species of fish caught, length of time fished and biological data). At the conclusion of the wait period at a site, record the total number of anglers that were interviewed (complete and incomplete fishing trips) by fishing mode (shore or boat) at that site during the wait period on the DCS.10 Form. The summed total will represent all anglers or a subsample that were interviewed. Record all angler interview data on Form GSF.10.

Interviews will be completed for all anglers at a site or a subset of these anglers (subsample) as time permits. At times during the interview period, high activity will not permit effective interviews of all anglers exiting a site. During these instances, the creel clerk will systematically select which shore anglers to interview or boat anglers to interview. If there are more anglers or parties completing trips and exiting a site than can be interviewed, the technician might elect to interview every second, third or fourth angler or angler party and so on. When time is limiting it is not necessary to interview all anglers. It is more important to get a complete and accurate set of data from each angler or party interviewed. The fishing success of anglers will also extend the time needed per interview as will any collection of biological data (see Section 3.0).

**NOTE:** if the creel clerk determines that an angler's statements seem purposely misleading or unrealistic, it should be noted on the "comments" line as suspicious data and/or field voided in consultation with the project manager. For purposes of safety and data integrity technicians will avoid contact with persons who are obviously intoxicated or belligerent.

Biological data collection (fish lengths) is important, but it is not necessary to obtain this information from the fish of all anglers (boat or shore) interviewed except as time permits. Collection of biological data should be minimized (2-3 anglers/parties per site will be adequate if angler sub-sampling is necessary) or eliminated when it will prevent interviews of anglers who are in a hurry to leave. Fish measurements should be obtained only after an angler grants permission.

## **2.0 CREEL SURVEY DATA COLLECTION SITES**

### **Below Conowingo Dam**

Creel data are to be collected from boat anglers returning to public boat launch sites and marinas in the Conowingo Project on the lower Susquehanna River (boat interviews are completed trips). Angler interviews will also be collected from shore anglers completing trips fishing (i.e., returning to vehicle), or actively fishing (incomplete trip) at these 13 sites below the Conowingo Project.

#### **Conowingo Dam Tailrace (non-tidal)**

- Fisherman's Park/Conowingo tailrace
- Shures landing/ hiking trail
- Mouth of Octoraro Creek

Fisherman's Park and Shures Landing are along the west shoreline (Harford County) (see Figure 1); Octoraro Creek is along the east shoreline (Cecil County).

#### **Tidal Susquehanna River**

- Mouth of Deer Creek
- Old Mill Area
- Lapidum ramp/shoreline
- McLhinney Park
- Jean Roberts Park ramp/shoreline
- Perryville Municipal ramp
- Owens Marina Ramp
- Port Deposit Municipal ramp/shoreline
- Rock Run Marina
- Port Deposit VFW

The first five listed sites in tidal water are along the west shoreline (Harford County) (see Figure 1); Deer Creek, Old Mill, and Lapidum are in Susquehanna State Park. The remaining sites are along the east shoreline (Cecil County).

### **Above Conowingo Dam**

Creel data (completed trip boat interviews) are to be collected from anglers returning to the public boat launch sites and marinas on Conowingo Pond. Creel angler interviews (complete and incomplete trip) will also be collected from anglers fishing from shore at these 10 sites above the Conowingo Project.

#### **In Pennsylvania**

- Muddy Creek PFBC Access/shoreline at Lock 15
- Coal Cabin ramp/Peach Bottom township park
- Dorsey Park ramp/shoreline
- Peach Bottom Marina (Peter's Creek) and RR tracks
- Wissler's Run Park

The first three sites listed above are along the west shoreline (York County) (see Figure 2); the last two sites are along the east shoreline (Lancaster County).

#### **In Maryland**

- Line Bridge Road
- Broad Creek ramp/shoreline
- Glen Cove Marina
- Funks Pond
- Conowingo Creek ramp/shoreline

The first three listed sites are along the west shoreline (Harford County) (see Figure 2); the last two sites are along the east shoreline (Cecil County).



Attachment B provides directions to each boat ramp and shore angling site. The sites are grouped geographically into routes for the daily creel surveys. A survey day can consist of interviews with boat and shore anglers at a given site as well as only boat or only shore surveys at other sites. Attachment B also provides site data codes, and information that facilitates the sampling approach for each site. (Note: the routes were designed to avoid tolls on the Rt. 40 bridge. A non-toll crossing does exist from Perryville to Havre de Grace traveling westward only).

### **3.0 BASICS OF CREEL SURVEY DATA COLLECTION**

#### **3.1 Shore Angler Surveys**

Data related to angler surveys are to be collected by the technician and recorded as appropriate on survey-specific forms listed in Section 1. The headings for data fields on the forms typically provide direction relative to the type of information that will be placed in a field. For all angler interviews, as scripted on the creel data forms, questions will be asked such as what fish species they sought (targeted), duration of the fishing trip, whether the trip is a complete or incomplete, total number by species of fish kept, and the number by species of fish released.

Survey form DCS.10 will be filled out each day for each survey route. The form is intended to record information such as survey type, site name, time the site is visited, and the count of anglers interviewed by fishing method at each site visited as the survey progresses. Survey form GSF.10 will be completed only when an interview is attempted. The coding manual provided as Attachment B describes how each data field should be completed in the field.

Form DCS.10 will be reviewed at the end of each site visit and at the end of a shift to ensure that all applicable fields on that form are completed as appropriate. When interview form GSF.10 has been used, it will be reviewed at the end of EACH interview to immediately ensure that all applicable fields on that form are completed as appropriate. Pencils will be used to record data. If errors are found, the technician will strike through the error and write the correction and date beside the strike. Do not erase errors.

#### **3.1 Shore Angler Surveys**

Shore fishing surveys will yield many incomplete-trip interviews (anglers remain actively fishing), but can also intercept anglers that are quitting (complete trips). After an angler provides the primary information (e.g., target species, time spent fishing, catch), with permission the total length (TL) of any harvested fish may be recorded. When time permits, length data from all game fish harvested will be collected. Game fish encountered will include striped bass, smallmouth bass, largemouth bass, walleye, channel catfish, and flathead catfish. When anglers

are numerous and the measuring process impacts collection of fish catch data from other anglers, the technician will randomly sub-sample anglers to interview and/or the anglers from which to obtain fish lengths and other biological data. Alternatively, the technician may randomly subsample (i.e. avoid intentional selection of the largest or smallest individuals) a portion of the retained catch.

This SOP provides flexibility for technicians during surveys at sites with both shore and boat angling activity. The primary goal at such sites is to obtain completed-trip interviews of both angler types. However, near the end of the prescribed wait time at an access site, the technician may obtain interviews from available shore anglers actively fishing. Such incomplete trip interviews should not be obtained at the expense of additional completed trip interviews.

### **3.2 Boat Angler Surveys**

The interview data forms for boat surveys are identical to those used for shore anglers (review Section 3.1), although there are differences in interview procedures. The form GSF.10 was designed to accommodate these differences. Foremost is the need to determine from the angler or party spokesman where the party fished. A map of the survey area will be used to help the angler identify river locations where he fished. If the boat anglers have fished all or a portion of their trip in the Chesapeake Bay or Susquehanna Flats (south of the Havre de Grace Amtrak bridge), the party should be interviewed and the location noted appropriately on the interview sheet. These anglers will be treated separately.

Boat fishing is often completed by a group of anglers (an angling party) and catch data such as targeted species, number caught and kept, etc. are to be reported for the party. However, the data will be normally obtained from an individual on the boat who represents all persons aboard as a spokesman (could also be a charter boat captain), though the total number of anglers in the boat party is to be recorded.

Boat interviews will typically occur when a boat has returned from a fishing trip (a completed trip survey). In addition, for most boat fishing surveys an interruption in fishing for fuel or food that involves a return to the launch ramp or marina for more than 30 minutes is a significant break in

fishing and thus the trip can be considered complete to that point. The type of trip (complete) will always be noted in the appropriate field on the data form. The residence of the angler(s), (e.g., zip codes, or city/state) will be obtained. However, a charter boat captain's residence is not to be included on the data form, except where it is the same as one or more of his clients.

Launch conditions and traffic at the time of the interview can dictate where and how an interview is conducted. If there are few or no other boats waiting to use the dock facilities the technician can interview the boat angler(s) as the opportunity is presented at the launch. If the launch is busy, the technician will try to record the interview data after the boat has been loaded on the trailer and pulled to a convenient and safe location (tie-down). At no time shall the technician's activities impede the use of the launch facilities by other parties or endanger themselves or others.

If a boat party indicates they have fished the Susquehanna River and also below the Amtrak Bridge at the mouth of the Susquehanna River (on the Flats) but they cannot determine the length of time at each site and/or which fish were caught where, the data they could provide cannot be used. The technician should end the interview, noting the attempt to interview on form GSF.10, and thank the anglers. If, in the technician's opinion, a group of anglers are providing a reasonable estimate of the species and number of fish caught, kept, and returned, their information can be included in the data form and will be considered valid.

### **3.3 Additional Biological Data and Method of Coding Samples**

Biological data (i.e., in addition to measuring total length, TL) will be collected opportunistically for the following species as listed below.

- Smallmouth bass--TL plus number legal and number sub-legal released.
- Largemouth bass-- TL plus number legal and number sub-legal released.
- Striped bass-- TL plus number legal and number sub-legal released.
- Yellow perch-- TL plus number released.

- Walleye--TL only
- Channel catfish—TL only
- Flathead catfish—TL only

Individual fish species data codes are listed on the bottom of Form GSF.10. Instructions for coding length and released fish data are including in the GSF.10 coding manual (Attachment B). Additional information to facilitate biological data collection is provided in the Coding Manual.

### **3.4 Aerial Survey of Boats Used for Fishing**

Instantaneous aerial counts will be conducted on one randomly chosen day each week. A 50/50 split between weekday and weekend/holiday strata will be obtained by alternating daytypes throughout the season along with the opening days. Two aerial surveys on designated “opening days” are also scheduled. These include: special striped bass catch and release season, March 1; regular striped bass harvest season, June 1). All fishing boats on the Susquehanna River will be counted. Non-fishing recreational boats (e.g., water skiing, swimming) may be noted. No counts are necessary of commercial boat traffic or tour boats, if any.

Two categories of fishing boat will be recognized: (1) boats actively engaged in fishing, and (2) boats underway (in transit). A vessel (boat, canoe, kayak) will be considered a fishing boat actively engaged in fishing if any of its occupants are observed holding a fishing rod, landing net, or a fish. A slowly moving boat without a visible wake will also be considered actively fishing if downriggers are deployed, or occupants are drift fishing or trolling but not holding equipment or fish. A vessel will be considered a fishing boat underway if none of its occupants are observed holding a fishing rod, landing net, or fish, but if the boat is observed to have downriggers or fishing rods on board and is producing an obvious, visible wake. All other vessels will be considered non-fishing boats.

Boat counts will be recorded separately on form ASF2.10 for two segments of the Conowingo Project (Figures 1 and 2): the lower Susquehanna River (Amtrak Bridge in Havre de Grace north

to the Conowingo Dam); and the Conowingo Pond (Conowingo Dam north to PA state road 372, Norman Wood Bridge). A laminated map will aid counters during flights.

### **3.5 Creel Survey Journals**

Field technicians will maintain a daily log of their activity in a journal. The purpose is to provide information that will assist interpretation of the formal survey data. For each daily survey the date, time, and survey location (Lower Susquehanna River or Conowingo Pond) will be noted. Anecdotal information and observations by the creel clerk or angler that augment the formal data recorded on survey forms should be recorded and noted by access point. Such information may include weather conditions that affect fishing activity, favored fishing locations, angler remarks about river conditions and fishing, etc.

### **4.0 SCHEDULES AND CREEL SURVEY ROUTES**

The schedule for the creel survey is a separate document that identifies the personnel, dates, shift times, and randomly selected starting locations for the daily creel surveys. The aerial count survey schedule is found in the same document. Flight schedules may be modified either due to bad weather and/or equipment malfunctions. Ground survey schedules were developed to maximize interview time but also to respond to clerk observations. The schedules will provide information on survey start times, sites to be visited, routes of travel, time intervals at each site on a route or survey, etc. Directions to sites are provided in Section 9, Attachment C. All creel technicians will consult the schedules to determine their daily responsibilities.

The creel survey will be conducted at each site on a route for a set prescribed time. The length of a creel survey day will be no longer than 10 hours but not starting before 0700 h and not ending after 2100 h. Route information including: specific route (order of sites), starting time, wait time for each site, and estimated travel time between sites is provided in Attachment C. It is the technician's responsibility to calculate the clock times for arrival and departure from an access point based on initial survey start time, wait time, and estimated travel time to the next site.

Interviews will not be initiated if they cannot be completed prior to ending time. For safety, all interviews and site visits will end and the technicians will be at their vehicle prior to darkness.

## **5.0 DATA CUSTODY**

Data sheets will be retained by the technician until delivered to specific locations identified by the Field Crew Leader (FCL) or picked up in the field by the FCL. Preliminary data delivery locations are Normandeau's Muddy Run Laboratory and the West Fish Lift trailer when on-site at Conowingo Dam. (Note: the trailer is expected to be at the dam through at least October). When Muddy Run Lab is open, completed data sheet sets may be delivered to Terry Euston, Mike Martinek, or Sid Graver. On weekends or after hours, a drop box is available inside the entry-way at the north end of the building. A similar site inside the West Lift trailer will be identified; an access key to the trailer will be available inside the Conowingo guard shed with proper ID.

The number and kinds of sheets delivered or transferred will be documented, dated and all parties involved will initial the transfer(s). Following review by the FCL, all original data forms and a data custody cover sheet will be sent to a permanent Normandeau office location for data entry and storage.

## **6.0 SAFETY**

Creel survey technicians will receive Exelon safety training and materials prior to survey start-up. Technicians will be cognizant of surroundings, suspicious people in the area, weather and footing (ice/snow/mud), and rising water conditions. Technicians are not to place themselves in situations where their safety is in undue jeopardy. Be aware of cell phone usage while driving and the laws about this in each state. Section 8 of the SOP provides lists of phone numbers for local emergencies (911) and various Exelon Security numbers. Use them in an emergency or if in danger. Survey field personnel should call the FCL with any questions.

## **7.0 EXAMPLE CREEL SURVEY INTERVIEW INTRODUCTION TO ANGLERS**

An example approach for initiating a boat or shore interview is:

“Hello, I work for Normandeau Associates and I’m conducting a fisheries survey on behalf of Exelon Power. If you have a few minutes I’d like to ask some general questions about your fishing trip today.” Proceed with the interview only if permission is granted. If, during the interview, anglers ask for more specifics on the Conowingo Power Project or the reasons for the survey, direct them to call Mr. Bob Judge at (610) 765-5331.

If an individual is not interested, thank them and move to the next. The approach is to always be courteous, even if the angler is not. If the angler agrees to the interview, ask the questions listed on the creel forms as appropriate. **NOTE:** When conducting an interview, do not delay anglers or boats if there are other boats waiting to use the launch.

When finished with the main portion of the interview, and the angler has kept some fish, ask:

“Do you mind if I take length measurements of your fish?” Respect their decision to decline. Also, if the creel clerk observes that the angler has misidentified a fish, or harvested a species during a closed season, note this discretely on the data sheet and correct it after the interview. It is not necessary and may even be detrimental to “correct” the angler. Use discretion.

## **8.0 PHONE NUMBERS**

### **8.1 Police, Exelon Security, and Related Phone Numbers**

Police Emergency, any jurisdiction **911**

Conowingo Dam Control Room 410-457-2422

Exelon-Peach Bottom Security 717-456-4212

Exelon-Peach Bottom Control Room 717-456-4221

Exelon Public Relations Contact – Bob Judge 610-765-5331

### **8.2 Creel Personnel Phone Numbers**

Michael Martinek, FCL, cell 410-937-6461; office 717-548-6416



Normandeau Associates-Muddy Run, PA 717-548-2121; FAX 717-548-2592

Terry Euston--home phone 717-464-4455; office direct 717-548-6439

Add staff-cell; home

## **9.0 ROUTE AND SITE DIRECTIONS; SITE LIMITS**

See Attachment B.

**APPENDIX B-2: CODING MANUAL.**

# 2010 Coding instructions for Susquehanna River Creel Survey

General information for coding data forms.

Leading zeros are not necessary. Time and date are always 4 and 6 digits respectively. Do not add decimals, if a decimal is required, it will be hard coded on the form. Where there are decimal fields, if the number is a whole number, a "0" must be coded in the decimal field. It is not necessary to slash "0's". Time is always recorded as military, 24 h clock. If a number is incorrect and needs to be changed, strike through the incorrect number and write the correct number adjacent.

It will be the responsibility of the creel clerk to review his/her forms for legibility, completeness and accuracy at the completion of each day before surrendering the data.

Common abbreviations used in this manual are: h = hour; LSR = Lower Susquehanna River, below dam to railroad bridge; Susq. = Susquehanna; MRRL = Muddy Run Recreational Lake; CP = Conowingo Pond.

## GROUND SURVEY INTERVIEW FORM (GSF.10)

The top part of the GSF is the header information, and the middle part of the GSF is the catch information. The header and catch info *is a total for the party*.

If additional pages are required, no matter what the reason i.e. additional zip codes, additional fish info - **only shaded areas on the header part of the GSF will be repeated onto additional pages.**

Page__of__	number of pages; usually will be 1 of 1; if there are more than 10 species caught or length information is for more than 10 fish, complete page 2 with the exact angler information and complete the additional catch information; if more than one county or state is represented in the interview sequence, use as many pages as needed to code all counties, states/countries ( <i>not in the database</i> ), if there are 2 fishing methods (shore and boat) use 2 pages and code appropriately
Client Code	1342 client code is hard coded; <i>not in the database</i>
Investigator Initials	record appropriate initials of person completing the form
Sample Date	Six digit number, month, day, year
Interview Location Description _____	refer to code list or map/chart for appropriate code write the location name ( <i>not in the database</i> )
Fishing Mode	appropriate code from list; boat includes canoe, kayak; shore includes wading, tubing; dip net is fishing by net of any kind
Fishing Location	appropriate code from list; codes 1-5 represent LSR; 6-8 are CP; 9 is MRRL
Weather Code	appropriate code (one) from the list provided; dark is not a code-judge from the sky the same as during the day; if wind is a factor make note in the margin.
Angler Count	total number of anglers in <i>party</i>
Party Interview Identifier	number sequentially by day, begin with 1, number to as many interviews as

completed **that day**, identifier will be unique for each interview. When within the party there are more than three (3) different zip codes for cities, states or countries, then the party identifier will remain the same for all pages needed to complete additional city, state or country information. All pages are from the same interview therefore, the identifier will remain the same for all pages. Shaded areas will be repeated on additional pages. Catch information *is for the entire party* (no matter how many pages are required to get the county, state or country information) and will be completed only **once** on the first page; the page numbers should reflect the number of pages needed to complete all the information. **Remember** catch information *is for the entire party*, not by county, so if more than 11 species are caught and additional pages are needed, the catch may be recorded on page 2. **Catch information is never duplicated** on the data form. **Note:** only information written in the blocks will be entered into the database, if there are 2 answers to the same field, additional forms must be completed.

Interview Start Time	beginning time of interview (24 h clock, 4 digits required)
Fishing Start Time	time anglers started fishing (24 h clock, 4 digits), if time is for the previous day code with "H" in Remarks Codes
Fishing Stop Time	time anglers stopped fishing if trip is complete (24 h clock, 4 digits), if incomplete leave time blank
Trip Complete	appropriate code for yes or no; <b>must be recorded</b>
Tournament	appropriate code from list
Primary Species Sought	appropriate species code, refer to bottom of GSF or species code list
Zip #1	appropriate Zip code, use this if all in the party are from the same city; refer to Party Identifier instructions.
City/State/Country	appropriate City, State or Country corresponding to the zip code. Refer to Party Identifier instructions.
# at Zip #1	<b>total number in the party</b> , that are fishing residing at the zipcode as recorded in Zip #1
Zip #2	if needed, appropriate zipcode if persons in the party are from a different city.
City/State/Country	appropriate City, State or Country corresponding to the zip code. Refer to Party Identifier instructions.
# at Zip #2	<b>total number in the party</b> , that are fishing residing at the zipcode as recorded in Zip #2

Zip #3	if needed, appropriate zipcode if persons in the party are from a different city.
City/State/Country	appropriate City, State or Country corresponding to the zip code. Refer to Party Identifier instructions.
# at Zip #3	<b>total number in the party</b> , that are fishing residing at the zipcode as recorded in Zip #3

**Total Catch Information for Party**

Remember, catch information is only recorded once regardless of the number of pages needed to complete the county, state or country information.

Species Name	common name of fish; useful if species code is not known at the time of interview ( <i>not in the database</i> )
Species Code	appropriate code from species list (refer to laminated or master for complete list of common names and codes)
Length	length will be recorded as Total Length to the nearest inch, (tape measure); angler estimated lengths may be recorded in inches for striped bass, small and large mouth bass; if no length is available or for a large number of fish(> 10) record count only. <b>DO NOT record a length range</b> i.e. 10 to 15 inches. Length will be recorded (not estimated) for striped bass during the catch and release season, After June 1, record legal length of kept fish, number of legal released and number sub-legal released fish.
Comments	notes concerning the specific fish ( <i>not in the database</i> ) This area may be used to tally (tick marks) multiple fish with the same length.
Measured Count	measured count will be the total fish at that length measurement; most often will be "1"; if multiple fish with the same length have been measured and tick marks are recorded in the comments section, the measured count will be the sum of the tick marks for that length; if no fish are measured (interval code 00), measured count will be blank; if released fish length has been estimated by the angler and a length is recorded, use interval 25.
Release Count	total number of fish of that species released; if not measured, record 0 in measured count (interval 00); if estimated length by angler (interval code 25) the number will be recorded in the measured count block.
Harvest Count	total number of fish kept of that species; should be the same as measured count if the angler will allow fish to be measured

Remarks Codes appropriate code(s) from Remarks list, as many as apply - see list at the bottom of the page

Interval Code appropriate interval code for length measurement - see list below; this code is very important, be sure to use the correct code that applies.

Note: If there are more than 11 species caught or length information is obtained for more than 11 fish, complete page 2 by repeating only the 5 shaded areas in the heading from page 1, then complete the additional catch information. **NEVER** repeat fish information.

**CODES:**

Interval codes codes for use in the interval code box  
Species codes codes for the most common species found to be recorded in the header primary species sought code box  
Remarks codes codes for use in the remarks codes box

**AERIAL SURVEY FORMS**

The 3 river segments in the shaded area will be used for the LSR aerial survey. The 6 unshaded areas will be used for the CP aerial survey. Record the appropriate count time for the survey in progress.

**Conowingo Project  
Recreational Fishery Survey Form (ASF2.10)**

Page\_\_of\_\_ number of pages; usually will be 1 of 1;  
Client Code client code is hard coded; (*not in the database*)  
Investigator Initials record appropriate initials of person completing the form  
Sample Date six digit number, month, day, year  
Day Type appropriate day code from list  
Time of Day appropriate time of day code from the list  
Count Time  
    Start   Stop beginning and ending time of aerial observation for either LSR or CP  
Flight Route appropriate flight route code  
Weather Code appropriate weather code from list  
River Segment pre coded field  
Total total count for actively fishing boats observed (first line)  
total count for shore individuals fishing observe (second line)  
Tally and Notes Section note all observations in the tributary (ies); by tick mark or numbers for each category (*not in the database*).

Actively Fishing Boat Count Applies to the first line for each river segment  
Shore Individual Fishing Count Applies to the second line for each river segment

Remarks: record any comments that apply (use the back of the sheet if necessary).

**Muddy Run Rec. Lake  
Recreational Fishing Survey (ASF.10)**

Complete the form the same as for the ASF2.10 form, completing each River Segment as appropriate.

**CREEL SURVEY  
DAILY COUNT SUMMARY  
SITE COUNT FORM (DCS.10)**

Page \_\_ of \_\_ number of pages; usually will be 1 of 1

Client Code client code is hard coded; *not in the database*

Investigator Initials record appropriate initials of person/s completing the form

Route A B C D E F G H (circle 1) circle one appropriate route code, *not in database*

Sample Date Six digit number, month, day, year for the entire form

Day Type Appropriate code

Weather Appropriate code

Section Appropriate code

Site Code refer to code list or map/chart for appropriate code  
Site Description \_\_\_\_\_ write the location name (*not in the database*)

Site Arrival Time record time of arrival to site, 24 h clock, 4 digits

Site Departure Time record time of departure from site, 24 h clock, 4 digits

Boat Anglers Interviewed record total number of parties interviewed

Shore Anglers Interviewed record total number of anglers/parties interviewed

\_\_\_\_\_ space for short notes, (*not in database*)

Comments: record any appropriate comments (continue on back if necessary)

## SUSQUEHANNA CREEL SURVEY CODES LIST

CLIENT CODE - 1342

### REMARKS CODES (Add as needed)

D - undersized fish released  
H - fishing time represents previous day  
L - legal sized fish released  
N - no creel information, reluctant angler  
P - physical deformity  
Q - fungus  
R - skin lesion  
X - tagged fish  
T - tumor  
Z - additional information

### INTERVAL CODES

00 - not measured/count  
01 - measured to the nearest inch total length  
25 - angler estimated in inches

### MOST COMMON FISH SPECIES CODES

000	No species caught	130	SUNFISH sp.
480	Anything	121	rock bass (redeye)
001	American eel	122	redbreast sunfish
010	HERRING sp.	123	green sunfish
012	hickory shad	124	pumpkinseed
014	American shad (white)	125	bluegill
015	gizzard shad (mud)	119	BLACK BASS
016	SHAD sp.	126	smallmouth bass
030	TROUT sp.	127	largemouth bass
031	rainbow trout	131	CRAPPIE sp.
032	brown trout	128	white crappie
033	brook trout	129	black crappie
037	golden trout	232	STURGEON sp.
041	chain pickerel	005	shortnose sturgeon
042	northern pike	321	Atlantic sturgeon
043	muskellunge	142	yellow perch
201	tiger musky	145	walleye
050	MINNOW sp.	<u>SALTWATER SPECIES</u>	
054	common carp	151	Atlantic needlefish
057	golden shiner	186	bluefish
080	SUCKER sp.	191	spot
081	quillback	231	longnose gar
082	white sucker		
084	northern hogsucker		
085	shorthead redhorse		
090	CATFISH sp.		
091	white catfish		
092	yellow bullhead		
093	brown bullhead		
094	channel catfish		
098	flathead catfish		
111	white perch		
112	striped bass (striper, rockfish)		
200	hybrid striped bass		



## LOCATION CODES

### Lower Susquehanna River

<u>Maryland</u>	<u>Code</u>	<u>Survey Type</u>	
<b><u>Non-tidal</u></b>			
Fisherman's park and Conowingo tailrace	101		Shore
Shures Landing and hiking trail	102	Boat	Shore
Mouth of Octoraro Creek	103		Shore
<b><u>Tidal</u></b>			
Mouth of Deer Creek (Susq. St. Park)	111		Shore
Old Mill Area (Susq. St. Park)	112		Shore
Lapidum ramp and shoreline	113	Boat	Shore
McLhinney Park (HdG)	114		Shore
Jean Roberts Park ramp and shoreline (HdG)	115	Boat	Shore
Perryville Municipal ramp	116	Boat	
Ramps and shoreline around Perryville ramp	117	Boat	Shore
Port Deposit Municipal ramp and shoreline	118	Boat	Shore
Rock Run Marina (Port Deposit)	119	Boat	
Port Deposit - VFW area	120		Shore
<b><u>Conowingo Pond</u></b>			
<b><u>Pennsylvania</u></b>			
Muddy Creek Access and shoreline at Lock 15	201	Boat	Shore
Coal Cabin ramp and Peach Bottom township park	202	Boat	Shore
Dorsey Park ramp and park	203	Boat	Shore
Peach Bottom Marina (Peter's Creek) and RR tracks	204	Boat	Shore
Wissler Run Park	205		Shore
<b><u>Maryland</u></b>			
Line Bridge Park	211		Shore
Broad Creek ramp and shoreline	212	Boat	Shore
Glen Cove Marina	213	Boat	
Funks Pond	214		Shore
Conowingo Creek ramp and shoreline	215	Boat	Shore
<b><u>Muddy Run Recreation Lake</u></b>			
Boat ramp/livery area and associated shorelines	301	Boat	Shore
Picnic area near dam spillway	302		Shore

**APPENDIX B-3: STANDARDIZED AERIAL COUNT FORM.**

## Conowingo Project Recreational Fishery Survey Aerial Survey Form ASF2.10

Investigator Initials

--	--	--

Sample Date

month	day	year	

Day Type

	1 - Weekday
	2 - Weekend
	3 - Opening Day

Time of Day

	1 - A.M.
	2 - Mid day
	3 - P.M.

Count Time

Start		Stop	

Wind

	1 - calm
	2 - light
	3 - moderate
	4 - strong

Flight Route

		1 - Havre de Grace - CP - MRRL
		2 - MRRL - CP - Havre de Grace
		3 - CP - Havre de Grace - MRRL
		4 - MRRL - Havre de Grace - CP

Weather Code

	1 - Sunny
	2 - Partly Cloudy
	3 - Overcast
	4 - Raining
	5 - Windy
	6 - Foggy
	7 - Snow

	River Segment	Total	Tally and Notes Section	
MD	Tidal			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Non-Tidal			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Tailrace			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Conowingo Pond			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Broad Creek			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Conowingo Creek			Actively Fishing Boat Count Shore Individual Fishing Count
MD	Funk's Run			Actively Fishing Boat Count Shore Individual Fishing Count
PA	Conowingo Pond			Actively Fishing Boat Count Shore Individual Fishing Count
PA	Peach Bottom Plume			Actively Fishing Boat Count Shore Individual Fishing Count

**APPENDIX B-4: STANDARD SITE COUNT FORM.**

**CREEL SURVEY  
DAILY COUNT SUMMARY  
SITE COUNT FORM DCS.10**

Investigator Initials

--	--	--	--	--	--

Route: **A B C D E F G H** (circle 1)

--	--	--	--	--	--

month      day      year

Sample Date

Day Type

--

- 1 - weekend/holiday
- 2 - weekday
- 3 - Opening day

Weather

--

- 1 - Sunny
- 2 - Partly Cloudy
- 3 - Overcast
- 4 - Rain
- 5 - Windy
- 6 - Fog
- 7 - Snow

Section

--

- 1 - Lower Susquehanna River
- 2 - Conowingo Pond
- 3 - MRRL

Site Code

--	--	--

Site Arrival Time

--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description: \_\_\_\_\_

Site Code

--	--	--

Site Arrival Time

--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description: \_\_\_\_\_

Site Code

--	--	--

Site Arrival Time

--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description: \_\_\_\_\_

Site Code

--	--	--

Site Arrival Time

--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description: \_\_\_\_\_

Site Code

--	--	--

Site Arrival Time

--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description: \_\_\_\_\_

Site Code

--	--	--

Site Arrival Time

--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description: \_\_\_\_\_

Site Code

--	--	--

Site Arrival Time

--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description: \_\_\_\_\_

Site Code

--	--	--

Site Arrival Time

--	--	--	--

Site Departure Time

--	--	--	--

Boat Anglers Interviewed

--	--	--

Shore Anglers Interviewed

--	--	--

Site Description: \_\_\_\_\_

Comments: (continue comments on back if needed)

**APPENDIX B-5: STANDARDIZED GROUND SURVEY INTERVIEW FORM.**

**GROUND SURVEY INTERVIEW FORM**  
**GSF.10**

Investigator Initials

Client Code: 1342

--	--	--

Sample Date

month	day	year			

Interview Location

--	--	--

Description: \_\_\_\_\_

Fishing Mode

--

1-Boat  
2-Shore  
3-Dip net

Fishing Location

--

- 1- Tidal
- 2- Non-tidal
- 3- Tidal/Non-Tidal
- 4- Tailrace
- 5- Flats/creek
- 6- Cono Pond
- 7- Tributary
- 8 - P.B. Plume
- 9- MRRL

Weather Code

--

- 1 - Clear
- 2 - Partly Cloudy
- 3 - Overcast
- 4 - Raining
- 5 - Windy
- 6 - Foggy
- 7 - Snow

Angler Count

--	--	--	--

Party Interview Identifier

--	--	--

Interview Start Time

--	--	--	--

Fishing Start Time

--	--	--	--

Fishing Stop Time

--	--	--	--

Trip Complete

--

1 - yes  
2 - no

Tournament

--

1 - yes  
2 - no  
3 - practice

Primary Species Sought

--	--	--

Zip #1

--	--	--	--	--

City/State/Country

# at Zip #1

--	--

Zip #2

--	--	--	--	--

City/State/Country

# at Zip #2

--	--

Zip #3

--	--	--	--	--

City/State/Country

# at Zip #3

--	--

**Total Catch Information for Party**

Species Name	Species Code	Length	Comments	Measured Count	Release Count	Harvest Count	Remarks Codes	Interval Code

**CODES:**  
ALL FISH MEASURED-TOTAL LENGTH; Interval Codes; 01-Total length in inches; 00-not measured/count; 25-Angler Estimated in inches  
**Remarks:**  
D - sub-legal fish released; H - fishing time represents previous day; L - legal fish released; N - no catch information, reluctant angler; P - physical deformity; Q - fungus; R - skin lesion; T - tumor; X - Tagged fish; Z - additional information.  
**Species:**  
000 - No species caught      098 - Flathead catfish      127 - Largemouth bass      Tag info \_\_\_\_\_  
012 - Hickory shad            111 - White perch            128 - White crappie            # / color  
014 - American shad         112 - Striped bass            119 - Black bass  
015 - Gizzard shad          121 - Rock bass                142 - Yellow perch  
016 - Shad sp                 123 - Green sunfish          145 - Walleye  
054 - Common carp          125 - Bluegill                 480 - Anything  
090 - Catfish sp              130 - Sunfish sp  
094 - Channel catfish        126 - Smallmouth bass

**APPENDIX B-6: SITE DESCRIPTION AND ROUTES.**



## Location codes - LSR

## Survey Type

### Site Name and Description

---

#### Tailrace-Non-tidal

Fisherman's park and Conowingo tailrace	101		Shore	
Shures Landing and hiking trail	102	Boat	Shore	Both
Mouth of Octoraro Creek	103		Shore	

#### Tidal

Mouth of Deer Creek (susq. st. park)	111		Shore	
Old Mill Area (susq. st. park)	112		Shore	
Lapidum ramp and shoreline	113	Boat	Shore	Both
McLhinney Park - Canal House (HdG)	114		Shore	
Jean Roberts Park ramp and shoreline (HdG)	115	Boat	Shore	Both
Perryville Municipal ramp	116	Boat		
Ramps and shoreline around Perryville ramp	117	Boat	Shore	Both
Port Deposit Municipal ramp and shoreline	118	Boat	Shore	Both
Rock Run Marina (Port Deposit)	119	Boat		
Port Deposit - VFW area	120		Shore	

## Lower Susquehanna River below Conowingo Dam: Access Site Characteristics and Sampling Approaches

**Note: Lapidum boat ramp closed until June 2 for construction. Check route adjustments.**

Access site	Site Code	Site Type	Shore	Sampling Approach
Tailrace-Fisherman's Park <sup>a</sup>	101	S	W	Intercept anglers exiting from upper bank, wharf, and lower bank from top of wharf access path
Tailrace-hiking trail/landing <sup>a</sup>	102	B/S	W	Intercept anglers retrieving boats or returning to parking lot from hiking path
Octoraro Creek mouth (Rt 222)	103	K/S	E	Short wait time; check for anglers retrieving kayaks/canoes and intercept anglers at creek mouth
Rock Run Marina (Port Deposit)	119	B	E	Intercept returning anglers at ramp
Port Deposit VFW-check	120	S	E	Stop and interview only if vehicles/anglers present, then move on
Port Deposit Municipal Park	118	B/S	E	Intercept exiting anglers at ramp during tie-down or returning from pier or bulkhead; small parking area near pier exit
Perryville Municipal Park <sup>b</sup>	116	B	E	Intercept returning anglers at ramp during tie-down
Owens Docks/ramp <sup>b</sup>	117	B/S	E	Intercept returning anglers at ramp during tie-down or on docks; just south of municipal ramp, March - April only
Deer Creek mouth-Susq St Park	111	K/S	W	Intercept exiting anglers from good vantage point; anglers will return from tidal and non-tidal locations
Old Mill-Susq St Pk	112	K/S	W	Walk along path and intercept exiting anglers; check kayak ramp also
Lapidum ramp-Susq St park	113	B/S	W	Intercept exiting anglers at ramp during tie-down, or from bank; after reopening on June 1
McLhinney Park check (HDG) <sup>c</sup>	114	S	W	Check for parked vehicles; walk to river if vehicle present or seen on bulkhead
Jean Roberts Park ramp (HDG)	115	B/S	W	Intercept returning anglers at ramp during tie-down; check for shore anglers in adjacent lot

Key: S = shore/wade; B = boat; K = kayak/canoe.

<sup>a</sup> Survey as single site (Fishermans Park); split time approx. 2/3-1/3 based on expected heavier use in upper lot/wharf area. Adjusted in July as two different wait times along different routes.

<sup>b</sup> Survey as single site (Perryville); focus on municipal ramp/lot but check Owens docks and ramp early in wait to see if coverage needed.

<sup>c</sup> Survey as single site (McLhinney Park and Canal House); If vehicle present walk to river or check bulkhead.

Lower Susquehanna River below Conowingo Dam-Angler Survey Routes

## SUMMER

<b>Route A Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Fisherman's Park (wharf/beach)	175	8
Octoraro Creek mouth	44	5
Rock Run Marina	88	3
Port Deposit VFW-check	ad hoc	5
Port Deposit Municipal Park	131	10
Perryville Municipal Park	131	end

<b>Route B Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Perryville Municipal Park	132	10
Port Deposit Municipal Park	132	5
Rock Run Marina	88	2
Port Deposit VFW-check	ad hoc	3
Octoraro Creek mouth	44	8
Fisherman's Park (wharf/beach)	176	end

<b>Route C Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Rock Run Marina	86	4
Octoraro Creek mouth	43	8
Fisherman's Park (wharf/beach)	172	10
Port Deposit VFW-check	ad hoc	10
Perryville Municipal Park	129	8
Port Deposit Municipal Park	129	end

<b>Route D Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Port Deposit Municipal Park	129	8
Perryville Municipal Park	129	10
Port Deposit VFW-check	ad hoc	10
Fisherman's Park (wharf/beach)	172	8
Octoraro Creek mouth	43	4
Rock Run Marina	86	end

<b>Route E Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Shures landing - hiking trail	87	12
Deer Creek mouth	87	2
Old Mill-Susq St Pk	87	3
Lapidum ramp	174	15
McLhinney Park-check	ad hoc	5
Jean Roberts Park ramp	130	end

<b>Route F Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Jean Roberts Park ramp	130	5
McLhinney Park-check	ad hoc	15
Lapidum ramp	174	3
Old Mill-Susq St Pk	87	2
Deer Creek mouth	87	12
Shures landing - hiking trail	87	end

<b>Route G Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Lapidum ramp	166	15
McLhinney Park-check	ad hoc	5
Jean Roberts Park ramp	125	25
Shures landing - hiking trail	83	12
Deer Creek mouth	83	2
Old Mill-Susq St Pk	83	end

<b>Route H Start</b>	Wait Time (min)	Est. drive time to next access point (min)
Old Mill-Susq St Pk	83	2
Deer Creek mouth	83	12
Shures landing - hiking trail	83	25
McLhinney Park-check	ad hoc	5
Jean Roberts Park ramp	125	15
Lapidum ramp	166	end

Lower Susquehanna River below Conowingo Dam-Angler Survey Routes

Note: Lapidum ramp closed until June 2; note route changes.

<b>Route A Start</b>	Wait Time (min)	Est. drive time to next access point (min)	Changes
Tailrace-Fisherman's Park	208	8	
Octoraro Creek mouth	52	5	
Rock Run Marina	104	3	
Port Deposit VFW-check	ad hoc	5	
Port Deposit Municipal Park	104	10	
Perryville Municipal Park	104	end	
<b>Route B Start</b>			
Perryville Municipal Park	104	10	
Port Deposit Municipal Park	104	5	
Rock Run Marina	104	2	
Port Deposit VFW-check	ad hoc	3	
Octoraro Creek mouth	52	8	
Tailrace-Fisherman's Park	208	end	
<b>Route C Start</b>			
Rock Run Marina	102	4	
Octoraro Creek mouth	51	8	
Tailrace-Fisherman's Park	204	10	
Port Deposit VFW-check	ad hoc	10	
Perryville Municipal Park	102	8	
Port Deposit Municipal Park	102	end	
<b>Route D Start</b>			
Port Deposit Municipal Park	102	8	
Perryville Municipal Park	102	10	
Port Deposit VFW-check	ad hoc	10	
Tailrace-Fisherman's Park	204	8	
Octoraro Creek mouth	51	4	
Rock Run Marina	102	end	

Note: Lapidum ramp closed until June 2; note route changes.

<b>Route E Start</b>	Wait Time (min)	Est. drive time to next access point (min)	Changes
Deer Creek mouth	192	2	
Old Mill-Susq St Pk	64	3	
Lapidum ramp	192	15	<b>site closed until 6/2</b>
McLhinney Park-check	ad hoc	5	<b>do not schedule Rt E</b>
Jean Roberts Park ramp	128	end	
<b>Route F Start</b>			
Jean Roberts Park ramp	128	5	
McLhinney Park-check	ad hoc	15	
Lapidum ramp	192	3	<b>site closed until 6/2</b>
Old Mill-Susq St Pk	64	2	<b>do not schedule Rt F</b>
Deer Creek mouth	192	end	
<b>Route G Start</b>			
Lapidum ramp	189	12	<b>from 3/1 thru ~ 6/2</b>
McLhinney Park-check	ad hoc	5	PD Municipal--95 min
Jean Roberts Park ramp	126	15	Perryville Municipal--86 min
Deer Creek mouth	189	2	rest of route as scheduled
Old Mill-Susq St Pk	63	end	
<b>Route H Start</b>			
Old Mill-Susq St Pk	63	2	conduct first part of route
Deer Creek mouth	189	15	as scheduled
McLhinney Park-check	ad hoc	5	
Jean Roberts Park ramp	126	15	<b>from 3/1 thru ~ 6/2</b>
Lapidum ramp	189	end	Rock Run Landing--160 min
			substitute for Lapidum

**APPENDIX C: PHOTOGRAPHS.**





Site 101  
Fisherman's Wharf



Site 102  
Shures Landing





Site 103  
Octoraro Creek Mouth









Site 111  
Deer Creek Mouth

Site 112  
Old Mill Shoreline







Site 112  
Old Mill Launch

Site 113  
Lapidum Ramp and Shoreline

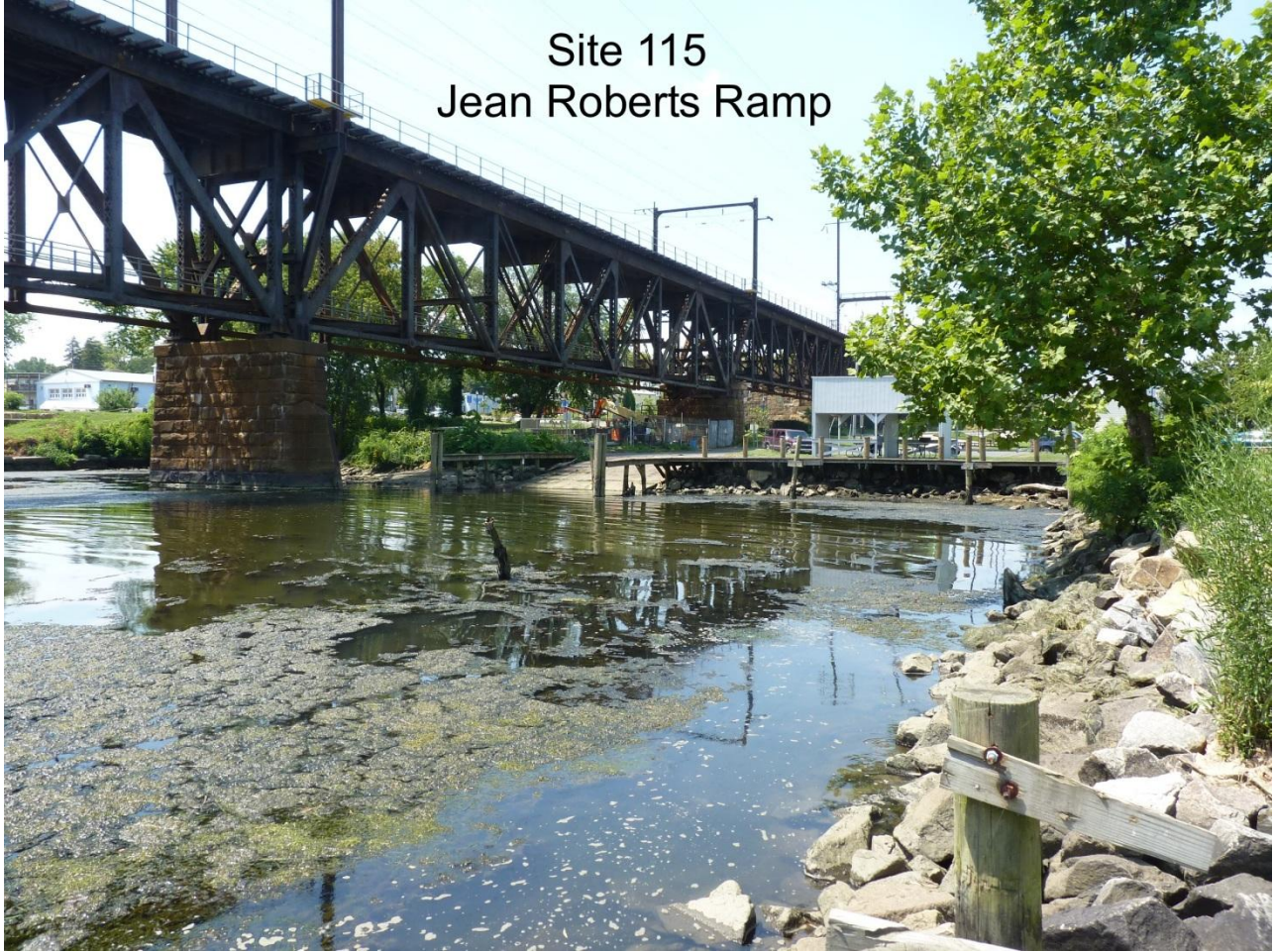




Site 114  
McLhinney Park and Canal House



Site 115  
Jean Roberts Ramp





Site 115  
Jean Roberts Park Shoreline





Site 116  
Perryville Municipal Ramp



Site 117  
Marina near Perryville Ramp



Site 118  
Port Deposit Municipal Pier





Site 118  
Port Deposit Municipal  
Ramp and Shoreline



Site 119  
Rock Run Marina







Site 120  
Port Deposit VFW

**APPENDIX D-1: ESTIMATED EFFORT OF ANGLERS FISHING IN THE LSR, 2010.**



**Estimated effort of anglers fishing in the LSR, 2010.**

**Boat**

	Weekday			Weekend			Total		
	Angler Hours	SE	PSE	Angler Hours	SE	PSE	Angler Hours	SE	PSE
Spring	11414	6321	55.4	38946	14349.4	36.8	50359	15679.8	31.1
Summer	17396	10455.1	60.1	20296	9702.2	47.8	37693	14263.3	37.8
Fall	12563	5857.4	46.6	13527	6254.1	46.2	26091	8568.8	32.8
<b>Total</b>	<b>41373</b>	<b>13548.8</b>	<b>32.7</b>	<b>72769</b>	<b>18416.1</b>	<b>25.3</b>	<b>114142</b>	<b>22863.1</b>	<b>20.0</b>

**Shore**

	Weekday			Weekend			Total		
	Angler Hours	SE	PSE	Angler Hours	SE	PSE	Angler Hours	SE	PSE
Spring	22514	2686.0	11.9	29031	2196.7	7.6	51545	3470	6.6
Summer	28538	2347.2	8.2	23838	1100.3	4.6	52376	2592	4.9
Fall	9511	976.8	10.3	8330	768.5	9.2	17840	1243	7.0
<b>Total</b>	<b>60562</b>	<b>3698.4</b>	<b>6.1</b>	<b>61199</b>	<b>2574.3</b>	<b>4.2</b>	<b>121761</b>	<b>4506</b>	<b>3.7</b>

Weekday effort  
101935 hours

Weekend effort  
133968 hours

Spring effort  
101904 hours

Summer effort  
90069 hours

Fall effort  
43931 hours

**APPENDIX D-2: MEAN TRIP LENGTH FOR ANGLERS TARGETING VARIOUS SPECIES IN THE LSR, 2010.**

Mean trip length for anglers targeting various species in the LSR, 2010.

Targeted species	N	Mean trip length (hrs)	SE
Hickory shad	49	3.3	0.3
American shad	27	3.8	0.5
Gizzard shad	1	4.0	0.0
Shad	66	3.6	0.3
Common carp	6	5.1	0.8
Suckers	1	7.8	0.0
Catfish	36	4.2	0.3
Channel catfish	12	4.3	0.4
Flathead catfish	1	0.5	0.0
White perch	65	3.6	0.3
Striped bass	171	3.7	0.2
Black bass	20	5.4	0.4
Smallmouth bass	19	4.1	0.5
Largemouth bass	70	4.5	0.3
Yellow perch	18	3.0	0.4
Walleye	24	2.0	0.2
Anything	312	3.3	0.1
Blue crab	38	4.4	0.3

**APPENDIX D-3: OBSERVED FISH CAUGHT AND HARVESTED ON THE LSR, 2010.**

Observed fish caught and harvested on the LSR, 2010.

Common name	Boat		Shore	
	Caught	Harvested	Caught	Harvested
American eel			2	0
Shad	1	0	23	0
American shad	139	0	347	0
Hickory shad	404	0	1873	0
River herrings	19	6	46	0
Gizzard shad	23	23	145	4
Rainbow trout			1	0
Common carp	1	0	24	12
Fallfish			5	0
Catfish	21	0	63	21
Channel catfish	428	80	232	114
Flathead catfish	19	2	70	31
Brown bullhead	3	0		
Largemouth bass	219	4	12	3
Smallmouth bass	163	0	12	1
Striped bass	229	22	406	122
White perch	2168	323	889	288
Sunfish	5	0	9	0
Bluegill	28	0	6	1
Rock bass	5	0	1	1
Green sunfish			1	1
Walleye	2	0	39	10
Yellow perch	231	40	11	1
Atlantic needlefish			1	0
Blue crab	1666	1660	178	178

**APPENDIX D-4: EXPANDED BOAT CATCH AND HARVEST ESTIMATES THE LSR, 2010.**

**Expanded boat catch and harvest estimates the LSR, 2010.**

Species	Spring				Summer				Fall				Total			
	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
Shad	33	60.2	0	0.0									33	60.2	0	0.0
American shad	4633	3580.9	0	0.0									4633	3580.9	0	0.0
Hickory shad	14371	10937.2	0	0.0					0.0	0.0			14371	10937.2	0	0.0
River herrings	633	572.9	200	351.4									633	572.9	200	351.4
Common carp	33	58.5	0	0.0									33	58.5	0	0.0
Catfish	631	696.3	0	0.0					63	131.8	0	0.0	694	708.7	0	0.0
Channel catfish	3968	2279.1	387	382.8	6600	3735.6	1281	1023.0	1726	1654.5	399	639.2	12294	4678.3	2067	1265.6
Flathead catfish	110	123.4	0	0.0	381	377.5	21	39.6	130	228.7	88	211.2	620	458.3	108	214.9
Brown bullhead	100	179.2	0	0.0									100	179.2	0	0.0
Largemouth bass	1748	1246.4	33	59.6	3932	2195.0	0	0.0	963	879.2	263	637.0	6643	2672.9	296	639.8
Smallmouth bass	564	506.7	0	0.0	3168	1697.0	0	0.0	750	565.1	0	0.0	4481	1859.1	0	0.0
Striped bass	5579	5439.3	67	86.9	765	754.9	147	279.6	3408	4113.8	757	962.7	9752	6861.5	970	1006.3
White perch	61661	30562.2	9951	6574.4	6901	5391.8	209	294.4	1051	1137.5	567	944.3	69613	31055.0	10727	6648.4
Sunfish									105	220.6	0	0.0	105	220.6	0	0.0
Bluegill	131	203.2	0	0.0	806	1066.9	0	0.0	21	44.0	0	0.0	957	1086.9	0	0.0
Rock bass	100	179.6	0	0.0	41	57.4	0	0.0					141	188.5	0	0.0
Walleye	33	60.3	0	0.0	21	39.9	0	0.0					54	72.3	0	0.0
Yellow perch	8667	10465.7	1740	3375.8	147	283.4	0	0.0					8814	10469.6	1740	3375.8
Blue crab					1523	1990.1	1229	1921.5	52387	36825.0	52387	36825.0	53910	36878.7	53616	36875.1
Total	102995	34836.2	12378	7409.5	24283	7524.7	2886	2214.7	60604	37124.8	54461	36861.3	187881	51462.9	69724	37663.8

**APPENDIX D-5: EXPANDED BOAT CATCH AND HARVEST ESTIMATES BY DAY TYPE AT  
LSR, 2010.**



Expanded boat catch and harvest estimates by day type at LSR, 2010.

		Spring				Summer				Fall				Total			
		Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
Weekday	Hickory shad	3871	6081.5	0	0.0									3871	6081.5	0	0.0
	Catfish	131	204.8	0	0.0									131	204.8	0	0.0
	Channel catfish	435	407.7	87	176.4	3139	3052.8	441	601.2	88	208.7	0	0	3662	3086.9	528	626.5
	Flathead catfish	44	88.6	0	0.0	196	308.9	0	0.0	88	211.2	88	211.2	327	384.5	88	211.2
	Largemouth bass	348	445.9	0	0.0	1864	1749.7	0	0.0	438	772.9	263	637.0	2650	1964.1	263	637.0
	Smallmouth bass	131	201.8	0	0.0	1079	1086.1	0	0.0	350	420.7	0	0.0	1560	1182.1	0	0.0
	Striped bass	3479	5257.4	0	0.0	540	714.2	147	279.6	2715	4060.4	526	936.7	6734	6681.1	673	977.5
	White perch	3262	3687.5	1218	1831.0	1619	1819.9	147	280.0					4880	4112.2	1365	1852.3
	Bluegill	131	203.2	0	0.0	540	1028.9	0	0					670	1048.7	0	0.0
	Yellow perch	4567	8471.2	1740	3375.8	147	283.4	0	0.0					4714	8476.0	1740	3375.8
	Blue crab					294	518.2	0	0.0	24697	28107.4	24697	28107.4	24992	28112.2	24697	28107.4
	Total	16396	12267.1	3045	3844.5	9417	4345.7	736	719.7	28376	28414.4	25573	28131.0	54189	31252.9	29353	28401.6
	Weekend	Shad	33	60.2	0	0.0									33	60.2	0
American shad		4633	3580.9	0	0.0									4633	3580.9	0	0.0
Hickory shad		10500	9090.6	0	0.0					0.0				10500	9090.6	0	0.0
River herrings		633	572.9	200	351.4									633	572.9	200	351.4
Common carp		33	58.5	0	0.0									33	58.5	0	0.0
Catfish		500	665.5	0	0					63	131.8	0	0	563	678.4	0	0.0
Channel catfish		3533	2242.3	300	339.8	3460	2153.1	840	827.7	1639	1641.3	399	639.2	8632	3515.3	1539	1099.6
Flathead catfish		67	86.0	0	0.0	184	217.0	21	39.6	42	87.7	0	0	293	249.4	21	39.6
Brown bullhead		100	179.2	0	0.0									100	179.2	0	0.0
Largemouth bass		1400	1163.9	33	59.6	2068	1325.3	0	0.0	525	419.1	0	0.0	3993	1812.9	33	59.6
Smallmouth bass		433	464.8	0	0.0	2089	1304.0	0	0.0	399	377.2	0	0.0	2921	1434.8	0	0.0
Striped bass		2100	1395.1	67	86.9	225	244.5	0	0.0	693	660.9	231	222.4	3019	1563.0	298	238.7
White perch		58399	30338.9	8733	6314.3	5283	5075.4	61	90.8	1051	1137.5	567	944.3	64732	30781.5	9362	6385.2
Sunfish										105	220.6	0	0.0	105	220.6	0	0.0
Bluegill						266	282.2	0	0.0	21	44.0	0	0	287	285.6	0	0.0
Rock bass		100	179.6	0	0.0	41	57.4	0	0.0					141	188.5	0	0.0
Walleye		33	60.3	0	0.0	21	39.9	0	0.0					54	72.3	0	0.0
Yellow perch		4100	6145.7	0	0.0									4100	6145.7	0	0.0
Blue crab					1229	1921.5	1229	1921.5	27690	23791.9	27690	23791.9	28919	23869.4	28919	23869.4	
Total	86599	32604.9	9333	6334.1	14865	6142.9	2150	2094.5	32228	23893.0	28888	23820.3	133692	40886.3	40371	24736.9	
Grand Total	102995	34836.2	12378	7409.5	24283	7524.7	2886	2214.7	60604	37124.8	54461	36861.4	187881	51462.9	69724	37663.9	

**APPENDIX D-6: EXPANDED SHORE CATCH AND HARVEST ESTIMATES ON THE LSR,  
2010.**

**Expanded shore catch and harvest estimates on the LSR, 2010.**

Species	Spring				Summer				Fall				Total			
	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
American eel	33	49.6	0	0.0					44	116.1	0	0.0	77	126.3	0	0.0
Shad	763	690.1	0	0.0									763	690.1	0	0.0
American shad	10198	4381.2	0	0.0									10198	4381.2	0	0.0
Hickory shad	54360	20609.6	0	0.0									54360	20609.6	0	0.0
River herrings	1123	1097.9	0	0.0									1123	1097.9	0	0.0
Gizzard shad	3406	2120.9	66	99.8					385	626.7	79	170.2	3791	2211.6	145	197.3
Rainbow trout	33	49.7	0	0.0									33	49.7	0	0.0
Common carp	450	252.1	143	116.4	145	130.9	107	109.4	162	280.1	162	280.1	757	398.9	412	322.4
Fallfish									197	410.2	0	0.0	197	410.2	0	0.0
Catfish	634	378.4	22	37.0	1424	1194.7	755	822.9					2058	1253.2	776	823.7
Channel catfish	2145	1244.0	646	390.9	4092	2037.1	2601	1515.9	1757	1539.5	714	1054.9	7994	2840.3	3961	1887.8
Flathead catfish	707	798.7	77	88.7	1305	684.8	808	521.9	495	481.9	245	357.3	2507	1157.2	1130	638.6
Largemouth bass	175	157.2	33	49.4	142	109.4	35	45.2	39	86.0	39	86.0	356	209.9	107	109.0
Smallmouth bass	133	127.2	0	0.0	217	151.5	35	45.6	88	234.0	0	0.0	437	306.4	35	45.6
Sunfish					277	292.3	0	0.0	39	86.9	0	0.0	316	304.9	0	0.0
Bluegill	98	119.7	0	0.0	69	68.2	35	45.2					167	137.7	35	45.2
Rock bass	33	49.1	33	49.1									33	49.1	33	49.1
Green sunfish	33	49.9	33	49.9									33	49.9	33	49.9
Striped bass	1051	628.6	0	0.0	8623	4550.9	1796	971.3	5387	2990.9	3043	1514.7	15060	5481.9	4839	1799.4
White perch	21312	9985.7	4987	2656.1	6774	3911.6	4371	3092.5	525	1404.0	0	0.0	28611	10816.0	9358	4076.6
Walleye	579	581.3	88	81.4	35	45.2	35	45.2	639	650.7	258	285.4	1252	873.7	381	300.2
Yellow perch	219	135.8	0	0.0	72	78.3	35	45.2					292	156.7	35	45.2
Atlantic needlefish					38	64.2	0	0.0					38	64.2	0	0.0
Blue crab					2630	2667.1	2630	2667.1	4334	8256.0	4334	8256.0	6964	8676.1	6964	8676.1
Total	97483	23517.1	6128	2693.4	25842	7023.2	13241		14091	9100.9	8875	8478.9	137416	26176.4	28243	10001.8

**APPENDIX D-7: EXPANDED SHORE CATCH AND HARVEST ESTIMATES BY DAY TYPE  
AT LSR, 2010.**

Expanded shore catch and harvest estimates by day type at LSR, 2010.

	Spring				Summer				Fall				Total			
	Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE	Expanded catch	SE	Expanded harvest	SE
Weekday																
American eel									44	116.1	0	0.0	44	116.1	0	0.0
American shad	2469	2006.7	0	0.0									2469	2006.7	0	0.0
Hickory shad	14489	9696.5	0	0.0									14489	9696.5	0	0.0
River herrings	758	976.5	0	0.0									758	976.5	0	0.0
Gizzard shad	2079	1892.9	0	0.0					306	603.1	0	0.0	2385	1986.6	0	0.0
Common carp	152	147.0	43	73.1	76	96.1	38	63.8	44	116.5	44	116.5	271	210.8	125	151.6
Catfish	368	317.9	22	37.0	1321	1186.9	755	822.9					1689	1228.8	776	823.7
Channel catfish	520	452.2	282	269.0	1773	1514.4	1321	1284.9	613	1007.0	438	956.9	2906	1874.0	2040	1624.5
Flathead catfish	43	73.8	43	73.8	717	552.3	566	478.1	219	351.7	88	228.8	979	658.9	697	535.1
Largemouth bass	108	139.8	0	0.0	38	64.0	0	0.0					146	153.8	0	0.0
Smallmouth bass					113	122.8	0	0.0	88	234.0	0	0.0	201	264.3	0	0.0
Striped bass	520	540.9	0	0.0	5509	4097.4	1207	891.7	2625	1916.7	1663	1176.2	8654	4555.7	2870	1476.0
White perch	2902	2158.4	1040	927.9	4490	3569.5	3056	2847.0	525	1404.0	0	0.0	7917	4401.3	4096	2994.5
Walleye	347	556.5	22	37.0					481	623.0	219	271.7	828	835.4	241	274.2
Yellow perch	87	84.5	0	0.0	38	63.9	0	0.0					124	105.9	0	0.0
Bluegill	65	108.9	0	0.0									65	108.9	0	0.0
Atlantic needlefish					38	64.2	0	0.0					38	64.2	0	0.0
Blue crab									3150	7872.5	3150	7872.5	3150	7872.5	3150	7872.5
Total	24906	10402.8	1451	973.1	14111	5794.3	6943	3385.5	8095	8342.2	5601	8025.9	47112	14539.1	13994	8764.9
Weekend																
American eel	33	49.6	0	0.0									33	49.6	0	0.0
Shad	763	690.1	0	0.0									763	690.1	0	0.0
American shad	7729	3894.6	0	0.0									7729	3894.6	0	0.0
Hickory shad	39871	18186.0	0	0.0									39871	18186.0	0	0.0
River herrings	365	501.8	0	0.0									365	501.8	0	0.0
Gizzard shad	1327	956.7	66	99.8					79	170.2	79	170.2	1406	971.7	145	197.3
Rainbow trout	33	49.7	0	0.0									33	49.7	0	0.0
Common carp	299	204.8	100	90.5	69	88.8	69	88.8	118	254.7	118	254.7	486	338.7	287	284.5
Fallfish									197	410.2	0	0.0	197	410.2	0	0.0
Catfish	265	205.2	0	0.0	104	135.9	0	0.0					369	246.2	0	0.0
Channel catfish	1625	1158.9	365	283.7	2319	1362.5	1280	804.4	1144	1164.5	276	444.0	5088	2134.4	1921	961.6
Flathead catfish	663	795.2	33	49.3	588	404.9	242	209.3	276	329.5	158	274.4	1528	951.3	433	348.6
Largemouth bass	66	71.8	33	49.4	104	88.7	35	45.2	39	86.0	39	86.0	210	142.9	107	109.0
Smallmouth bass	133	127.2	0	0.0	104	88.7	35	45.6					237	155.1	35	45.6
Striped bass	531	320.3	0	0.0	3115	1980.4	588	385.1	2761	2296.0	1381	954.3	6407	3049.0	1969	1029.1
White perch	18410	9749.7	3947	2488.7	2284	1599.6	1315	1207.6					20694	9880.0	5262	2766.2
Sunfish					277	292.3	0	0.0	39	86.9	0	0.0	316	304.9	0	0.0
Bluegill	33	49.5	0	0.0	69	68.2	35	45.2					102	84.3	35	45.2
Rock bass	33	49.1	33	49.1									33	49.1	33	49.1
Green sunfish	33	49.9	33	49.9									33	49.9	33	49.9
Walleye	232	168.1	66	72.5	35	45.2	35	45.2	158	187.7	39	87.2	425	256.0	140	122.1
Yellow perch	133	106.2	0	0.0	35	45.2	35	45.2					167	115.5	35	45.2
Blue crab					2630	2667.1	2630	2667.1	1183	2486.9	1183	2486.9	3813	3646.6	3813	3646.6
Total	72577	21091.1	4677	2511.4	11731	3968.7	6298	3070.6	5996	3637.7	3274	2734.3	90304	21767.4	14249	4817.9
Grand Total	97483	23517.1	6128	2693.4	25843	7023.2	13241	4570.6	14091	9100.9	8875	8478.9	137416	26176.4	28243	10001.8

**APPENDIX D-8: GENERAL SEASONAL SPECIES CATCH AND HARVEST RATES IN LSR,  
2010.**

General seasonal species catch and harvest rates in LSR, 2010.

Boat	Spring				Summer				Fall			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Shad	0.00	0.00	0.00	0.00								
American shad	0.12	0.09	0.00	0.00								
Hickory shad	0.30	0.41	0.00	0.00								
River herrings	0.02	0.01	0.01	0.01								
Common carp	0.00	0.00	0.00	0.00								
Catfish	0.01	0.02	0.00	0.00					0.00	0.01	0.00	0.00
Channel catfish	0.06	0.04	0.01	0.01	0.18	0.13	0.03	0.04	0.06	0.07	0.01	0.03
Flathead catfish	0.00	0.01	0.00	0.00	0.01	0.02	0.00	0.00	0.01	0.01	0.00	0.01
Brown bullhead	0.00	0.00	0.00	0.00								
Largemouth bass	0.03	0.04	0.00	0.00	0.10	0.07	0.00	0.00	0.04	0.05	0.01	0.03
Smallmouth bass	0.01	0.02	0.00	0.00	0.08	0.05	0.00	0.00	0.03	0.03	0.00	0.00
Sunfish									0.01	0.02	0.00	0.00
Bluegill	0.01	0.02	0.00	0.00	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Rock bass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Striped bass	0.18	0.27	0.00	0.00	0.02	0.03	0.00	0.01	0.13	0.20	0.03	0.05
White perch	0.89	0.46	0.17	0.16	0.18	0.18	0.01	0.01	0.08	0.09	0.04	0.08
Walleye	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Yellow perch	0.25	0.51	0.08	0.17	0.01	0.02	0.00	0.00				
Blue crab					0.04	0.07	0.03	0.05	2.01	1.99	2.01	1.99

Shore	Spring				Summer				Fall			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
American eel	0.00	0.00	0.00	0.00					0.00	0.01	0.00	0.00
Shad	0.02	0.02	0.00	0.00								
American shad	0.21	0.11	0.00	0.00								
Hickory shad	1.15	0.43	0.00	0.00								
River herrings	0.04	0.05	0.00	0.00								
Gizzard shad	0.11	0.09	0.00	0.00					0.02	0.03	0.00	0.01
Rainbow trout	0.00	0.00	0.00	0.00								
Common carp	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.02	0.01	0.02
Fallfish									0.01	0.03	0.00	0.00
Catfish	0.02	0.02	0.00	0.00	0.04	0.04	0.02	0.02				
Channel catfish	0.04	0.03	0.02	0.02	0.11	0.06	0.07	0.05	0.07	0.09	0.03	0.06
Flathead catfish	0.01	0.01	0.00	0.00	0.04	0.02	0.02	0.02	0.02	0.03	0.01	0.02
Largemouth bass	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
Smallmouth bass	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.02	0.00	0.00
Sunfish					0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Bluegill	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00				
Rock bass	0.00	0.00	0.00	0.00								
Green sunfish	0.00	0.00	0.00	0.00								
Striped bass	0.03	0.03	0.00	0.00	0.24	0.12	0.05	0.03	0.21	0.15	0.12	0.07
White perch	0.36	0.17	0.10	0.07	0.19	0.12	0.12	0.11	0.04	0.12	0.00	0.00
Walleye	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.01	0.01
Yellow perch	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00				
Atlantic needlefish					0.00	0.00	0.00	0.00				
Blue crab					0.13	0.13	0.13	0.13	0.17	0.45	0.17	0.45

**APPENDIX D-9: GENERAL SPECIES CATCH AND HARVEST RATES FOR THE LSR, 2010.**



General species catch and harvest rates for the LSR, 2010.

	Boat				Shore			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
American eel					0.00	0.00	0.00	0.00
Shad	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
American shad	0.04	0.03	0.00	0.00	0.10	0.04	0.00	0.00
Hickory shad	0.11	0.10	0.00	0.00	0.55	0.15	0.00	0.00
River herrings	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00
Gizzard shad					0.04	0.03	0.00	0.00
Rainbow trout					0.00	0.00	0.00	0.00
Common carp	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Fallfish					0.00	0.00	0.00	0.00
Catfish	0.01	0.01	0.00	0.00	0.02	0.01	0.01	0.01
Channel catfish	0.12	0.04	0.02	0.02	0.07	0.02	0.03	0.01
Flathead catfish	0.01	0.00	0.00	0.00	0.02	0.01	0.01	0.00
Brown bullhead	0.00	0.00	0.00	0.00				
Largemouth bass	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Smallmouth bass	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Sunfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bluegill	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Rock bass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Green sunfish					0.00	0.00	0.00	0.00
Striped bass	0.06	0.04	0.01	0.00	0.12	0.03	0.04	0.01
White perch	0.61	0.24	0.09	0.06	0.26	0.09	0.08	0.03
Walleye	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
Yellow perch	0.06	0.09	0.01	0.02	0.00	0.00	0.00	0.00
Atlantic needlefish					0.00	0.00	0.00	0.00
Blue crab	0.47	0.31	0.47	0.31	0.05	0.05	0.05	0.05

**APPENDIX D-10: TARGETED CATCH AND HARVEST RATES FOR ANGLERS IN THE LSR,  
2010.**

Targeted catch and harvest rates for anglers in the LSR, 2010

Fishing type	Anglers interviewed	Targeted species	CPUE	SE	HPUE	SE	
Boat	26	Shad	0.00	0.00	0.00	0.00	
	5	American shad	0.76	0.86	0.00	0.00	
	1	Hickory shad	4.21	0.00	0.00	0.00	
	31	Catfish	0.01	0.01	0.00	0.00	
	19	Channel catfish	0.68	0.29	0.28	0.12	
	32	Black bass	0.00	0.00	0.00	0.00	
	23	Largemouth bass	0.28	0.06	0.01	0.01	
	107	Smallmouth bass	0.43	0.13	0.00	0.00	
	165	Striped bass	0.25	0.14	0.02	0.01	
	81	White perch	3.69	1.42	0.76	0.41	
	4	Walleye	0.00	0.00	0.00	0.00	
	35	Yellow perch	1.85	1.73	0.33	0.49	
	82	Blue crab	4.57	2.09	4.56	2.09	
	Shore	119	Shad	0.03	0.04	0.00	0.00
		37	American shad	1.04	0.40	0.00	0.00
84		Hickory shad	2.31	0.41	0.00	0.00	
4		Gizzard shad	0.00	0.00	0.00	0.00	
15		Common carp	0.10	0.07	0.09	0.06	
3		Suckers	0.00	0.00	0.00	0.00	
73		Catfish	0.02	0.03	0.00	0.00	
9		Channel catfish	0.24	0.18	0.09	0.11	
9		Flathead catfish	0.00	0.00	0.00	0.00	
2		Black bass	0.00	0.00	0.00	0.00	
10		Largemouth bass	0.33	0.22	0.00	0.00	
5		Smallmouth bass	0.19	0.17	0.00	0.00	
140		Striped bass	0.38	0.10	0.13	0.03	
83		White perch	1.58	0.43	0.66	0.25	
41		Walleye	0.14	0.08	0.03	0.02	
9		Yellow perch	0.07	0.09	0.00	0.00	
21		Blue crab	2.01	0.95	2.01	0.95	

**APPENDIX D-11: TARGETED SEASONAL CATCH AND HARVEST RATES FOR BOAT ANGLERS ON THE LSR, 2010.**

Targeted seasonal catch and harvest rates for boat anglers on the LSR, 2010.

Season	Anglers interviewed	Targeted species	CPUE	SE	HPUE	SE
Spring	26	Shad	0.00	0.00	0.00	0.00
	5	American shad	0.76	0.86	0.00	0.00
	1	Hickory shad	4.21	0.00	0.00	0.00
	3	Catfish	0.10	0.07	0.00	0.00
	2	Channel catfish	1.31	0.00	0.55	0.00
	23	Largemouth bass	0.35	0.12	0.00	0.00
	1	Smallmouth bass	0.50	0.00	0.00	0.00
	85	Striped bass	0.33	0.25	0.01	0.01
	74	White perch	3.93	1.54	0.82	0.45
	35	Yellow perch	1.85	1.73	0.33	0.49
Summer	22	Catfish	0.00	0.00	0.00	0.00
	14	Channel catfish	0.46	0.22	0.30	0.13
	26	Black bass	0.00	0.00	0.00	0.00
	63	Largemouth bass	0.30	0.09	0.00	0.00
	19	Smallmouth bass	0.42	0.16	0.00	0.00
	42	Striped bass	0.07	0.06	0.02	0.02
	3	White perch	1.78	1.26	0.14	0.05
	20	Blue crab	0.62	0.84	0.57	0.86
Fall	6	Catfish	0.00	0.00	0.00	0.00
	3	Channel catfish	1.33	0.00	0.00	0.00
	6	Black bass	0.00	0.00	0.00	0.00
	21	Largemouth bass	0.18	0.07	0.03	0.03
	3	Smallmouth bass	0.43	0.11	0.00	0.00
	38	Striped bass	0.29	0.17	0.08	0.05
	6	White perch	0.00	0.00	0.00	0.00
	2	Walleye	0.00	0.00	0.00	0.00
62	Blue crab	6.20	2.51	6.20	2.51	

**APPENDIX D-12: TARGETED SEASONAL CATCH AND HARVEST RATES FOR SHORE ANGLERS ON THE LSR, 2010.**

Targeted seasonal catch and harvest rates for shore anglers on the LSR, 2010.

Season	Anglers interviewed	Targeted species	CPUE	SE	HPUE	SE
Spring	119	Shad	0.03	0.04	0.00	0.00
	37	American shad	1.04	0.40	0.00	0.00
	84	Hickory shad	2.31	0.41	0.00	0.00
	4	Gizzard shad	0.00	0.00	0.00	0.00
	9	Common carp	0.12	0.10	0.09	0.08
	20	Catfish	0.12	0.19	0.00	0.00
	4	Channel catfish	0.04	0.06	0.00	0.00
	9	Flathead catfish	0.00	0.00	0.00	0.00
	3	Largemouth bass	0.79	0.42	0.00	0.00
	8	Striped bass	0.00	0.00	0.00	0.00
	69	White perch	1.61	0.50	0.59	0.26
	30	Walleye	0.08	0.06	0.02	0.02
	9	Yellow perch	0.07	0.09	0.00	0.00
	Summer	4	Common carp	0.00	0.00	0.00
48		Catfish	0.00	0.00	0.00	0.00
5		Channel catfish	0.69	0.06	0.30	0.31
1		Black bass	0.00	0.00	0.00	0.00
2		Largemouth bass	0.00	0.00	0.00	0.00
3		Smallmouth bass	0.00	0.00	0.00	0.00
77		Striped bass	0.57	0.17	0.13	0.05
13		White perch	1.56	0.65	1.25	0.73
1		Walleye	0.00	0.00	0.00	0.00
12		Blue crab	1.65	1.16	1.65	1.16
Fall	2	Common carp	0.25	0.00	0.25	0.00
	3	Suckers	0.00	0.00	0.00	0.00
	5	Catfish	0.00	0.00	0.00	0.00
	1	Black bass	0.00	0.00	0.00	0.00
	5	Largemouth bass	0.00	0.00	0.00	0.00
	2	Smallmouth bass	0.31	0.20	0.00	0.00
	55	Striped bass	0.25	0.09	0.14	0.04
	1	White perch	0.00	0.00	0.00	0.00
	10	Walleye	0.35	0.22	0.05	0.05
	9	Blue crab	2.40	1.26	2.40	1.26

**APPENDIX D-13: TARGETED SEASONAL CATCH AND HARVESTED RATES FOR BOAT ANGLERS FOR CONOWINGO TAILRACE AND THE TIDAL/NON-TIDAL REACH OF THE LSR, 2010.**



**Targeted seasonal catch and harvested rates for boat anglers for Conowingo tailrace and the tidal/non-tidal reach of the LSR, 2010**

Subsection	Season	N	Targeted species	CPUE	SE	HPUE	SE
Tailrace	Spring	1	Shad	0.00	0.00	0.00	0.00
Tidal and non-tidal	Spring	8	Shad	0.00	0.00	0.00	0.00
		3	American shad	0.76	0.86	0.00	0.00
		1	Hickory shad	4.21	0.00	0.00	0.00
		2	Catfish	0.10	0.07	0.00	0.00
		1	Channel catfish	1.31	0.00	0.55	0.00
		12	Largemouth bass	0.35	0.12	0.00	0.00
		1	Smallmouth bass	0.50	0.00	0.00	0.00
		41	Striped bass	0.33	0.25	0.01	0.01
		29	White perch	3.93	1.54	0.82	0.45
		15	Yellow perch	1.85	1.73	0.33	0.49
Tailrace	Summer	1	Catfish	0.00	0.00	0.00	0.00
		1	Channel catfish	1.62	0.00	0.97	0.00
Tidal and non-tidal	Summer	7	Catfish	0.00	0.00	0.00	0.00
		5	Channel catfish	0.33	0.06	0.22	0.08
		14	Black bass	0.00	0.00	0.00	0.00
		36	Largemouth bass	0.30	0.09	0.00	0.00
		11	Smallmouth bass	0.42	0.16	0.00	0.00
		19	Striped bass	0.07	0.06	0.02	0.02
		2	White perch	1.78	1.26	0.14	0.05
6	Blue crab	0.62	0.84	0.57	0.86		
Tailrace	Fall	2	Striped bass	0.37	0.20	0.37	0.20
Tidal and non-tidal	Fall	3	Catfish	0.00	0.00	0.00	0.00
		1	Channel catfish	1.33	0.00	0.00	0.00
		4	Black bass	0.00	0.00	0.00	0.00
		15	Largemouth bass	0.18	0.07	0.03	0.03
		3	Smallmouth bass	0.43	0.11	0.00	0.00
		21	Striped bass	0.29	0.18	0.06	0.05
		3	White perch	0.00	0.00	0.00	0.00
		1	Walleye	0.00	0.00	0.00	0.00
28	Blue crab	5.16	1.93	5.16	1.93		

**APPENDIX D-14: TARGETED SEASONAL CATCH AND HARVESTED RATES FOR SHORE ANGLERS FOR CONOWINGO TAILRACE AND THE TIDAL/NON-TIDAL REACH OF THE LSR, 2010.**

Targeted seasonal catch and harvested rates for shore anglers for Conowingo tailrace and the tidal/non-tidal reach of the LSR, 2010

Subsection	Season	N	Targeted species	CPUE	SE	HPUE	SE		
Tailrace	Spring	32	Shad	0.00	0.00	0.00	0.00		
		20	American shad	1.33	0.43	0.00	0.00		
		17	Hickory shad	2.27	0.74	0.00	0.00		
		3	Common carp	0.13	0.11	0.09	0.09		
		3	Catfish	0.00	0.00	0.00	0.00		
		1	Channel catfish	0.00	0.00	0.00	0.00		
		1	Striped bass	0.00	0.00	0.00	0.00		
		4	White perch	1.87	1.01	0.53	0.29		
		22	Walleye	0.08	0.06	0.02	0.02		
		Tidal and non-tidal	Spring	40	Shad	0.06	0.07	0.00	0.00
				6	American shad	0.03	0.06	0.00	0.00
				38	Hickory shad	2.32	0.48	0.00	0.00
1	Gizzard shad			0.00	0.00	0.00	0.00		
1	Common carp			0.00	0.00	0.00	0.00		
5	Catfish			0.18	0.29	0.00	0.00		
2	Channel catfish			0.05	0.07	0.00	0.00		
1	Flathead catfish			0.00	0.00	0.00	0.00		
3	Largemouth bass			0.79	0.42	0.00	0.00		
1	Striped bass			0.00	0.00	0.00	0.00		
31	White perch			1.60	0.51	0.59	0.26		
1	Walleye			0.00	0.00	0.00	0.00		
6	Yellow perch			0.07	0.09	0.00	0.00		
Tailrace	Summer	2	Common carp	0.00	0.00	0.00	0.00		
		15	Catfish	0.00	0.00	0.00	0.00		
		2	Channel catfish	0.69	0.06	0.30	0.31		
		1	Black bass	0.00	0.00	0.00	0.00		
		48	Striped bass	0.65	0.19	0.15	0.05		
		2	White perch	2.97	1.03	2.97	1.03		
		Tidal and non-tidal	Summer	3	Catfish	0.00	0.00	0.00	0.00
2	Largemouth bass			0.00	0.00	0.00	0.00		
2	Smallmouth bass			0.00	0.00	0.00	0.00		
4	Striped bass			0.00	0.00	0.00	0.00		
4	White perch			0.72	0.20	0.22	0.19		
1	Walleye			0.00	0.00	0.00	0.00		
2	Blue crab			1.65	1.16	1.65	1.16		
Tailrace	Fall			1	Common carp	0.25	0.00	0.25	0.00
		2	Catfish	0.00	0.00	0.00	0.00		
		36	Striped bass	0.26	0.09	0.15	0.04		
		1	Black bass	0.00	0.00	0.00	0.00		
		7	Walleye	0.35	0.22	0.05	0.05		
Tidal and non-tidal	Fall	1	Suckers	0.00	0.00	0.00	0.00		
		1	Catfish	0.00	0.00	0.00	0.00		
		3	Largemouth bass	0.00	0.00	0.00	0.00		
		2	Smallmouth bass	0.31	0.20	0.00	0.00		
		2	Striped bass	0.00	0.00	0.00	0.00		
		1	White perch	0.00	0.00	0.00	0.00		
		2	Blue crab	1.27	0.32	1.27	0.32		

**APPENDIX D-15: SIZE OF FISH WERE CAUGHT AND HARVESTED IN THE LSR, 2010.**

Size of fish were caught and harvested in the LSR, 2010.

Species	Number Released	Released (inches)	Number Harvested	Harvested (inches)
American eel*	2	15 - 30		
River Herring*	8	9 - 11	6	10
Hickory shad	11	14		
Gizzard shad	1	12	4	12 - 18
Common carp	5	20 - 30	12	15 - 31
Fallfish	5	12, 20		
Channel catfish*	216	6 - 30	136	10 - 31
Flathead catfish*	32	9 - 36	20	15 - 38
Smallmouth bass*	119	4 - 19	1	12 - 22
Largemouth bass*	119	8 - 22	6	18 - 21
Bluegill	26	4 - 10	1	10
Rock bass	2	7, 10	1	8
Yellow perch*	10	4 - 13	41	8 - 13
Walleye*	13	10 - 28	8	17 - 26
White perch	268	3 - 9	241	3 - 13
Striped bass*	252	4 - 37, 42, 54	127	12 - 37
Atlantic needlefish	1	6		

\* Minimum Size/season

American eel - 6 inch

Herring - No minimum size, season closed June 6

Catfish (excluding flathead and bullheads) -10 inch, others no size limit

Yellow perch - 9 inch

Walleye - 15 inch

Smallmouth and largemouth bass - Minimum size 15 inches (March 1 - June 15)

Minimum size 12 inches (June 16 - February 28)

Striped bass - Catch and release season, March 1 - May 15

Catch and keep season, May 16 - May 31 (Lapidum to Port Deposit), 18 - 26 inches

Catch and keep season, June 1 - December 15 (River), 18 - 28 inches, only one over 28 inches