

E11 IAG – Entrainment and Impingement

Meeting Summary: Alabama Power Headquarters, Birmingham, AL Wednesday, February 19, 2003

striped/hybrid bass. Additional research efforts failed to identify any entrainment studies at sites with striped/hybrid bass populations similar to the Coosa and Warrior projects.

Jason explained the reasoning behind his proposal to use ADCNR's striped/hybrid bass stocking data to supplement the entrainment study database. He noted that some reservoirs have not been stocked for several years. Stan and Jim M. indicated that natural reproduction of striped bass upstream of Weiss is partially or fully supporting population levels in several downstream reservoirs, reducing or eliminating the need for supplemental stocking of striped bass in those reservoirs.

The group generally agreed with the suggested approach to assume that 25% of the average number of striped/hybrid bass stocked per stocking year are entrained at each reservoir. It was suggested and agreed to that stocking data should be updated to include the years 2000 – 2002. ADCNR noted that the striped bass number for Weiss was low and should be adjusted to a "stocking or production rate" of 6 fish/acre. ADCNR also noted that high numbers of fish were stocked when the program was begun at each reservoir, potentially inflating the average number of fish stocked. ADCNR suggested removing those atypical years from the stocking data to produce averages that are more consistent with current stocking rates.

Henry Mealing pointed out that since the group was able to agree on an approach to satisfy member concerns about freshwater drum and striped/hybrid bass representation in the entrainment study, the entrainment estimate will be revised and finalized. The next step in the entrainment analysis will involve estimates of turbine mortality. Kleinschmidt will prepare a Draft Final Report of Entrainment and Turbine Mortality for the Group to review and discuss specific turbine mortality rates.

Conclusion

The next meeting of the E11 IAG will occur once the Draft Final Report of Entrainment and Turbine Mortality has been prepared and the Group has had time to review the report. All meeting materials for the IAG will be placed on the website at <http://www.southerncompany.com/alpower/hydro/home>.

MEMORANDUM

TO: E11 Issue Action Group

FROM: Jason Moak

CC: Project Files

DATE: February 13, 2003

RE: E11 IAG Review and Next Steps

Since it has been close to two months since we last met (November 14, 2002) and over a year since this IAG was formed, I thought it would be useful to summarize what we have accomplished thus far.

- We agreed to use a "desktop" or paper-based approach to describe fish impingement, entrainment, and turbine mortality at the Coosa and Warrior Projects;
- We developed seasonal entrainment rates for the Projects based on data from entrainment studies performed at 9 different hydroelectric plants;
- We obtained data depicting the average monthly volume that is passed through the turbines at each Project; and
- We estimated the total number of fish entrained annually and seasonally at each project using the flow data and the entrainment rates.
- We agreed that freshwater drum and striped bass were not represented well in species distribution derived from the 9-site database.
- We examined additional entrainment studies that included freshwater drum and began a more detailed review of striped bass data available in the 9-site database.

As you can see, we have accomplished a great deal over the past year. However, the issues of freshwater drum and striped/hybrid bass representation in the study database have delayed progress and must be resolved before the entrainment analysis can be completed and the turbine mortality and impingement analyses can be performed.

The E11 IAG will meet on February 19th in Birmingham to discuss and attempt to resolve the abovementioned issues. Included in this memo are some proposed methodology and supporting information which should guide our discussions and help us resolve these issues.

Freshwater drum

As you may recall, IAG members raised concerns that freshwater drum are present and likely entrained at Alabama Power's projects, but were not represented in the initial 9-site entrainment study database. Subsequently, in December 2002, IAG members were provided with information on additional entrainment studies at sites that had freshwater drum entrainment.

The ADCNR has reviewed this information and suggested that data on freshwater drum entrainment from the three identified studies – Racine, Oswego, and Townsend – be combined and used to estimate freshwater drum entrainment at Alabama Power’s projects.

Based on this recommendation, I have combined freshwater drum study data from the sites listed above. The following table (Table 1) provides a summary of the seasonal percent composition of freshwater drum at each site, and a seasonal average composition for all three studies.

Table 1. Seasonal and composition of freshwater drum entrainment at three study sites (by percent)

	Oswego	Townsend	Racine	Average
Winter	0.00	0.42	-	0.21
Spring	0.16	1.37	14.02	5.19
Summer	0.95	0.34	13.03	4.77
Fall	0.44	0.00	10.70	3.71
Annual	0.39	0.53	12.58	3.47

I recommend that the IAG agree to the methodology proposed by the ADCNR and accept the average seasonal freshwater drum composition data listed in Table 1. If accepted, this data will be additive to the current database used to estimate entrainment, as suggested by the ADCNR and USFWS. It should be noted that freshwater drum are not present in Lewis Smith Lake. As such, this freshwater drum data would not be used to calculate entrainment estimates for that project. The table below (Table 2) provides estimates of the total number of freshwater drum entrained at each project annually based on data from the three studies.

Table 2. Estimated total number of freshwater drum entrained annually based on data from the Oswego, Townsend, and Racine studies

Site	Estimated total # of fish entrained annually	Estimated total # of freshwater drum entrained annually
Weiss	1,399,555	48,561
Neely Henry	1,506,805	52,283
Logan Martin	1,786,209	61,977
Lay	1,868,646	64,838
Mitchell	2,010,780	69,770
Jordan	1,518,161	52,677
Bouldin	1,627,506	56,471
Bankhead	683,638	23,721

Striped bass and hybrids

Similar to the freshwater drum issue, IAG members raised concerns that striped/hybrid bass are present and likely entrained at Alabama Power's projects, but were underrepresented in the initial entrainment study database. The ADCNR has intermittently stocked striped bass and/or hybrid striped bass in all Alabama Power project reservoirs.

After examination, it was determined that no study sites in the entrainment database included projects with significant stocked or naturally occurring populations of striped/hybrid bass. Additional research did not identify any entrainment studies at projects with such striped/hybrid bass populations. Due to this lack of information, I thought it useful to examine stocking data and compare it to the existing estimates of striped/hybrid bass entrainment that are based on the current study database.

The table on the following page (Table 3) provides a summary of:

- striped/hybrid bass stocking data for each reservoir,
- the estimated number of striped/hybrid entrained annually at each project based on the existing study database,
- the estimated number of all fish species entrained, and
- the current percent composition of striped/hybrid bass based on the existing study database.

The table also contains data based on two assumptions that I would like the IAG to consider. In the first case, we might assume that half (50%) of all stocked striped/hybrid bass are entrained. Although it is unlikely that this actually occurs at the projects, such an approach could certainly be considered "conservative." In the second case, we might assume that one-quarter (25%) of all stocked striped/hybrid bass are entrained. Although this assumption is likely an overestimation as well, it could still be considered a "conservative" approach and would more accurately depict striped/hybrid bass entrainment than the 50% case. Lacking any site specific entrainment study information, I believe that the IAG should be able to agree to one of these assumptions and move forward in the analysis.

Table 3. Summary of striped bass and hybrid striped bass stocking data and entrainment composition¹

Reservoir	Species	Years	Average Stocked per Year	Estimated # of striped bass/hybrids entrained	Estimated # of fish entrained (all species)	% Composition based on current study database	% Composition if 50% all stocked fish assumed entrained	% Composition if 25% of all stocked fish assumed entrained
Weiss	striped bass	1985 - 1988	27,087	240	1,399,555	0.017	0.97	0.48
Neely Henry	striped bass	1976 - 1995	45,043	45	1,506,805	0.003	1.49	0.75
Neely Henry	hybrid striped bass	1982 - 1993	55,612	159	1,506,805	0.011	1.85	0.92
Logan Martin	striped bass	1972 - 1999	59,252	55	1,786,209	0.003	1.66	0.83
Logan Martin	hybrid striped bass	1976 - 1999	71,515	195	1,786,209	0.011	2.00	1.00
Lay	striped bass	1975 - 1999	55,342	57	1,868,646	0.003	1.48	0.74
Lay	hybrid striped bass	1976 - 1999	51,098	202	1,868,646	0.011	1.37	0.68
Mitchell	striped bass	1975 - 1984	29,450	59	2,010,780	0.003	0.73	0.37
Mitchell	hybrid striped bass	1982 - 1999	36,137	209	2,010,780	0.010	0.90	0.45
Jordan	striped bass	1975 - 1980	57,986	47	1,518,161	0.003	1.91	0.95
Jordan	hybrid striped bass	1981 - 1999	45,110	164	1,518,161	0.011	1.49	0.74
Bouldin	striped bass	1975 - 1980	57,986	47	1,627,506	0.003	1.78	0.89
Bouldin	hybrid striped bass	1981 - 1999	45,110	167	1,627,506	0.010	1.39	0.69
Lewis Smith	striped bass	1984 - 1999	57,063	39	268,576	0.015	10.62	5.31
Bankhead	hybrid striped bass	1987 - 1999	27,578	97	683,638	0.014	2.02	1.01

¹Based on stocking records through 1999 provided by ADCNR and reported in Initial Information Packages

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Meeting Summary: Conference Call Thursday, November 6, 2003

- IAG agreed that freshwater drum and striped bass were not represented well in species distribution derived from the 9-site database.
- IAG examined additional entrainment studies that included freshwater drum and began a more detailed review of striped bass data available in the 9-site database.
- IAG agreed to use data from 3 studies to estimate freshwater drum entrainment (**Appendix A – Feb. 19 Memo**)
- IAG agreed to use selected ADCNR stocking data to better depict striped/hybrid bass entrainment (**Table C-3**)
- IAG members recommended that Kleinschmidt complete the turbine mortality and impingement analyses.
 - Turbine mortality rates were based on a large database of studies for both turbine types. Turbine mortality rates among these studies were fairly consistent for species/family-groups (i.e. little deviation from average) (**Tables 9 & 10**)
 - Impingement analyses compared the sizes and swimming speeds potentially entrained fish to the widths of intake trashracks and intake velocities (**Tables 16 & 17**)

They then asked for comments on the draft report.

Jim McHugh asked that Jason break out the crappie estimates from the rest of the Lepomid family since they are a key management species.

April Hall asked for clarification on the use of data from hydro sites that are smaller than the APC projects. Henry clarified that we addressed that issue early in the process and that entrainment rates for both large and small projects in the SE are comparable and were included in our analysis.

Conclusion

The next meeting of the E11 IAG will occur once the Final Report of Entrainment and Turbine Mortality has been revised and the IAG has had time to review the report. The Group will focus on recommendations for the CCRT and WCRT. All meeting materials for the IAG will be placed on the website at <http://www.southerncompany.com/alpower/hydro/home>.