Coalition To Protect Our Environment

712 West 26th St. Wilmington, DE 19802

3/16/2009

Comments to the Nuclear Regulatory Commission on the status of Salem 1 and 2 Nuclear Plants

Hello, my name is Richard Schneider, from Delaware. I am a member of the organization called "Coalition to Protect our Environment.

There is a major problem with Salem units 1 and 2. It is the devastating destruction of hundreds of millions of fish every year, year after year, because of the outdated open loop cooling system.

The Salem units 1 and 2 do not have closed loop cooling systems, cooling towers. They draw in 3 billion gallons of water a day. This kills millions of fish a year, year after year. It is one giant death machine. It does not discriminate. It kills all species, all ages.

This needless and senseless massive fish kill can be stopped by building closedloop cooling, cooling towers. Hope Creek, next to Salem has a cooling tower, so it can be done.

Salem 1 and 2 have been killing millions of fish every year for decades. Salem 1 and 2 shold have built closed loop cooling systems over 30 years ago when the Clean Water Act section 316-B of the `1970's told them to stop kiling the fish.

A recent federal court ruling in 2007 also ordered facilities to stop the fish kill. The federal legislation and the recent 2007 federal court ruling state that the "Best Technology Available", not second best must be used to stop the fish kill. Presently, closed loop cooling is considered the "Best Technology Available".

A meager effort of fixing a few acres of wetlands does not even come close to compensate for the massive fish kill. The federal law and federal court ruling say "Best" efforts which is closed loop cooling.

I have some important information about the fish kill problem for the Nuclear Regulatory Commission.

The first is an excellent Wilmington, DE News Journal article by Jeff Montgomery about the massive fish kill along the Delaware River. Here is an important paragraph from the article, "For example, the nuclear reactor at Hope Creek, near the Salem units, already uses a cooling tower. It kills 12 million juveniles a year. Salem which draws from the river kills 354 million a year.

↓ Fish

The second News Journal article by Jeff Montgomery dated January 27th, 2007, explains the recent 2007 federal court ruling which again states the 'Best Technology Available', not second best, should be used to save the Fish.

The third piece of very important information is a fish kill report by the Fisheries Division of the Delaware Department of

Natural Resources and Environmental Control (DNREC). The report is on the Valero Refinery in Delaware City, DE, across the river from the Salem 1 and 2 units. The Valero refinery draws in 450 million gallons of water a day. Salem 1 and 2 draw in 3 billion gallons of water a day, six times as much as the refinery.

The Valero refinery fish kill report states that the refinery's fish kill is doing great harm to the fish. Closed loop cooling towers should be used at the refinery to stop the fish kill.

In the report are also several comments about the dual harmful effect of Salem 1 and 2, and the Valero refinery on the fisheries. This is an excellent report that must be considered.

A section of the report discussing striped bass show the harmful combined effect of the refinery and the Salem 1 and 2 plants. It states "In summary, when the kill of these two plants are combined for 1998, the resulting estimate indicates that the plants killed more than half of tyhe striped bass in the River."

If Salem 1 and 2 are allowed to operate in the future, they must obey all rules and regulations to receive a permit extension. The federal Clean Water Act, section 316-B and the recent federal court ruling of 2007 mandate "Best Technology Available". closed loop cooling.

The Nuclear Regulatory Commission needs to apply these two laws to the Salem facility.

The Nuclear Regulatory Commission needs to protect the aquatic life in the Delaware River because the Salem units are destroying it. We are just trying to protect this great natural resource, the Delaware River and Bay and its aquatic life.

Thank you.
Richard Schneider
Richard Schneider

Stripers - ~~seabass~~ so low commercial Fishing banned for 5 years 1985-1990
weakfish - sea trout 1980 to 1990 reduction 8 to 15% of 1980 level

Impacts of Impingement and Entrainment Mortality by the Delaware City Refinery on Fish Stocks and Fisheries in the Delaware River and Bay

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October 9, 2008

Two primary sources of information for the following comments are the reports by Normandeau Associates, Inc (2001) and ESSA Technologies, Ltd. (2001). The former report presents the results of two years of sampling impingement and entrainment impacts of the refinery at Delaware City, which at that time was operated by Motiva Enterprises. The report utilizes the sample data to conduct equivalent adult modeling. That method develops estimates of the number of animals that would have survived to the adult stage if they had not been killed by the plant. The approach is helpful because immature aquatic organisms have very low natural survival rates. Consequently, it can be difficult to evaluate the impact to adult stocks when hundreds of thousands or millions of eggs, larvae or juveniles are killed by an industrial water intake.

The report also estimates conditional mortality rates via empirical transport modeling for weakfish and bay anchovy. Conditional mortality rates estimate the annual mortality rate of a stock of fish due to an industrial intake, conditional on the assumption that the plant is the only source of mortality. Normandeau presents modeling results for only four species: striped bass, weakfish, white perch and bay anchovy. The report presents no data on blue crab losses, despite the fact that blue crab is the target of a relatively intense commercial fishery in the lower Delaware River and Delaware Bay, seasonally adjacent to the refinery. While the report presents impingement collection results for all finfish species, it presents no entrainment data on any species besides the four focus species. Entrainment is usually the largest source of mortality by far in industrial intakes.

Neither equivalent adult modeling nor conditional mortality rate estimation include compensation by fish populations. Compensation refers to the idea that survivors of impingement and entrainment can compensate for the loss of other fish by surviving at a higher rate, due to the reduction of competition. Consequently, the estimates are sometimes referred to as worst case scenarios. This is the standard approach in assessing impingement and entrainment impacts (Barnthouse et al. 1984).

The ESSA report contains a critical review of Normandeau (2001). The Essa report commends the Normandeau report for "providing good, conservative first estimates of the numbers of striped bass, bay anchovy, weakfish and white perch that are killed from entrainment and impingement at the refinery from 1998 to 2000. " Essa (2001) also describes the estimated mortality rates as "notably high", and comments, "... the number of estimated equivalent adults lost to the refinery greatly exceed some recreational landings for the study period."

The sampling conducted by Normandeau began in April 1998 and ran until March 2000. For all practical purposes for fish life in the Delaware River, this period encompasses two biological years. April 1998 through March 1999 will be referred to as 1998. April 1999 through March 2000 will be referred to as 1999. Species discussed spawn in spring and summer, and the winter period is not a period of high activity, although some animals are impinged and entrained, particularly Atlantic croaker, which spawns in the fall on the continental shelf. Large numbers of larval croaker enter the tidal Delaware River in fall and early winter.

By and large in these comments, I accept the estimates of losses presented in the Normandeau report. I did develop an estimate of the conditional mortality rate of striped bass due to the refinery, which Normandeau did not provide. I also extended the equivalent adults estimates to produce models that estimate harvest foregone by the fishery due to refinery kill.

Initial reading of the report shows fairly large variation between the two years in estimated equivalent adults of weakfish and striped bass. For striped bass, estimated Equivalent Adults killed were roughly 40,000 in 1998 and roughly 12,000 in 1999. For weakfish, the pattern is reversed, with roughly 30,000 in 1998 and 50,000 in 1999. To explain this pattern, we need to examine the rainfall totals for those years with their effects on the salinity distribution in the estuary, which can be thought of as displaying an estuary gradient from high at the mouth to freshwater at the upper reaches. The distribution of salinity has over-riding effects on the distribution of estuarine organisms.

In 1999, a drought year occurred. This shortage of rainfall caused the River's salinity at the refinery to be much higher in 1999. Higher salinities in 1999 are illustrated in Figure 6 of the Normandeau report. Consequently, striped bass larvae and juveniles would tend to be further up the River above the refinery, since striped bass spawn in freshwater. Conversely, weakfish spawn down the Bay, and would tend to move further up the River in higher numbers near the refinery in years when salinity moves further up the estuary. The lower number of striped bass killed in 1999, then, can be explained by the fact that they had shifted distribution further up-River, while greater numbers of weakfish killed in 1999 is explained by their shift further up the Bay and further up the lower River in greater abundance that year. A normal non-drought year may tend to be more similar to 1998 than to 1999, producing a greater impact on striped bass than on weakfish. White perch showed a pattern similar to striped bass, with much higher numbers killed in 1998.

STRIPED BASS

Striped bass are the most valuable finfish produced in the Delaware River. They command a high price in commercial markets and are valued by recreational fishers because they attain big game size in inshore waters and are available to a wide range of fishermen as a result. Normandeau estimates that 16.5 million striped bass larvae and juveniles were killed in 1998, and that 8.5 million were killed in 1999. Low natural survival rates of these early life stages mean that a relatively small proportion of these totals would have survived to older ages if they had not been killed by the plant. Normandeau estimates that 39,819 bass would have survived to age 4 if not killed by the plant during 1998, and that 12,129 would have survived if not killed in 1999.

In recent years, the recreational minimum size for striped bass in Delaware has been 28". Annually, the Delaware Division of Fish and Wildlife, in conjunction with the Pennsylvania Fish and Boat Commission, conducts an electro-fishing survey of the Delaware River spawning stock of striped bass on the spawning grounds in the River.

Striped bass have divergent life histories for males and females with different migration patterns or lack thereof, different growth rates, and consequent different harvest rates at age as a function of minimum size regulations. I divided the equivalent adults in to 50% males and 50% females. Tag-recapture data for mature males pooled determined the average harvest rate for ages 3 through 17 combined was 7% (DDFW 2008). Tag recapture data indicates that most of the harvest of males below 28" occurs in the Chesapeake Bay, where the minimum size is 18". Bass can reach the Chesapeake via the C & D Canal. The data indicates that by age 7, 7 of 11 females (64%) exceed 28", so I modeled female harvest beginning at that age. I assumed that annual instantaneous natural mortality is 0.15, as the Atlantic States Marine Fisheries Commission Striped Bass Technical Committee does.

Tables 1 and 2 of Normandeau (2001) show the loss to the fishery from the estimated equivalent recruits killed in 1998 and 1999, respectively. Note that the loss would have occurred over a number of years, calculated here through age 13, although older striped bass are normally found in the spring spawning stock survey. For each year class (fish born in any one year, say 1998), we can sum the total losses to the fishery over the life time of that year class. For the 1998 kill, the estimated number lost to the fishery would have been 12,872 striped bass. For the last five years (2003-2007), the average number of striped bass landed by the Delaware recreational fishery is estimated to be 20,165. Therefore, the loss from the 1998 kill would be 64% of that total. In fact, if the fish had not been killed by the refinery, not all the catch would have occurred in Delaware, since striped bass migrate along the Atlantic coast and between Delaware River and Chesapeake Bay via the Chesapeake and Delaware Canal. However, a significant portion could have occurred in the Delaware River and Bay, since males tend to remain in their natal estuary and females return annually to spawn once they become mature. For the 1999 kill estimated at 12,129 Equivalent Adults at age 4, the number lost to the fishery is estimated at 3,921 striped bass, equivalent to 19% of the average recreational landings (Table 2).

Normandeau does not indicate the conditional mortality rate for striped bass for these two years. Consequently, I employed Equivalent Recruit modeling based on the methods used in Kahn (2000) to estimate the number that would have survived to six months of age if not killed by the plant (Table 3). Since we have estimates of absolute abundance of age six-month striped bass in the Delaware River annually from 1980 through 2007 (Kahn et al. 1998 and updated data), we can then estimate the conditional mortality rate. For 1998 and 1999, the estimates are 27% and 5%, respectively. One reason for the decline in mortality rate in 1999 was that drought conditions prevailed. Declines in fresh-water flow cause the striped bass spawning area and nursery grounds to move upriver, farther into Pennsylvania and away from the Refinery location. Years with normal precipitation may tend to have higher mortality then drought years, as evidenced here by the higher kill estimated for 1998.

One aspect of industrial water removal from the Delaware River that has barely been addressed is the cumulative impact of the many different intakes on the River and on the fishery resources produced by the River and Bay. Since the Normandeau report

has data for 1998, and the PSE&G report on Salem Nuclear Generating Station (1999) also had data for 1998, I was able to combine the two sources to estimate a combined conditional mortality rate for 1998. Once the estimated number of Equivalent Recruits from each plant is added to the estimated number alive in the River, the total number of striped bass that would have survived is larger than when each plant's impact is considered in isolation. That is because each plant's kill is added to the number of surviving bass. Consequently, each plant kills a smaller share of the total individually, but the combined mortality rate is larger than either individually. The estimated number of live 6-month old bass in 1998 was 1.274 million. The number of Equivalent recruits at age 6 months from the refinery kill was 0.471 million, and the number from Salem was 1.169 million. When the two estimates from the two plants are summed, the total is 1.640 million, which exceeds the number of survivors. This total does not include other large sources of mortality, such as the Edgemoor Power Plant or additional sources in New Jersey or Pennsylvania that are also located in striped bass nursery areas. In isolation, the refinery mortality rate was estimated as 27%, while the Salem rate was estimated as 48%. When the two were combined, the total conditional mortality rate was 56%. In summary, when the kill of the two plants are combined for 1998, the resulting estimate indicates that the plants killed more than half of the bass in the River.

WEAKFISH

Total estimated numbers of weakfish killed by the refinery are presented in Tables 8 and 13 of Normandeau (2001). These numbers sum to 680,000 in 1998 and 1.743 million in 1999. The estimation of equivalent adults is quite low from these numbers killed. That is due to Normandeau's use of an extremely high estimate of natural mortality obtained from PSE&G (1999). The estimate is based on the ratio of catches of yearling weakfish to catches the previous year of young-of-year weakfish in the DFW juvenile trawl survey. The mortality calculation assumes that catchability of young-of-year weakfish is the same as that of larger yearling weakfish and ignores the probable gear avoidance behavior of yearling weakfish when they encounter juvenile trawl gear. This highly questionable assumption will likely greatly overestimate natural mortality rate and produce an estimate of Equivalent Adults that is probably biased low, underestimating the refinery's impact.

Estimates of Equivalent Adult weakfish killed by the plant are only calculated to age one, because 90% of weakfish spawn at age one, in contrast to striped bass, which do not mature until older ages. That consideration aside, the estimates were 50,047 from the 1999 kill and 29,595 from the 1998 kill. The most recent coastwide stock assessment of weakfish (Kahn et al. 2006) found that the natural mortality rate of weakfish has increased since 1995, and that this increase has caused a severe decline of the weakfish stock coastwide, with attendant declines in landings. Currently, Delaware fishery weakfish landings in Delaware Bay are at record lows, and the Division of Fish and Wildlife's adult fish research trawl survey has a truncated age structure and reduced density from the peaks in the mid-late 1990s. The increase in natural mortality means that the number of Equivalent Adults would actually decline at a higher rate when

modeled at older ages. The recent severe declines in the stock, however, mean that the additional mortality imposed by the refinery is of grave concern.

I used the estimated Equivalent Adults produced by Normandeau and input them into a Harvest Foregone model, similar to the one presented above for striped bass. This model estimates the landings the fishery could have experienced if the refinery kill had not occurred. The increased natural mortality estimates from the 2006 coastwide assessment were employed for ages above age 1; these higher rates would tend to reduce the harvest foregone, as weakfish will not survive as long to be landed by the fishery at higher natural mortality rates. The assumed instantaneous fishing mortality rate was 0.25, which was the estimate produced by the recent stock assessment.

The estimated total number that could have been landed by the fishery was 3,584 from the 1998 kill and 5,699 from the 1999 kill (Tables 4, 5). These numbers are the sum of catches expected at each age through age six from the Equivalent Adults estimated for the two years. However, they can be used as rough estimates of the total number that is lost to the fishery in any given year. In any given year, fish of a range of ages are part of the catch, so the total for a year is similar to the total from kill in any one year that is summed over years. The two sums are roughly equivalent, assuming the original refinery kill would produce roughly the same number of equivalent adults each year. For example in 2007, fish of ages three to as high as ten could have been caught in Delaware. Fish that would have been any of those ages, if not killed by the refinery, could have been available to the fishery. A comparison of the harvest foregone estimates with recent landings is somewhat problematic because landings have been declining steadily. In 2007, the National Marine Fisheries Service estimate of the number of weakfish landed in Delaware by the recreational fishery was only 4,132 weakfish. Five years earlier in 2002, the estimate was that 121,884 weakfish were landed in the state recreationally. This is a decline of almost two orders of magnitude. The average number landed recreationally over the last five years was 12,157 weakfish. The estimated harvest foregone from the 1998 and 1999 refinery kill ranged from 29% to 46% of this number.

The kill by the refinery is not expected to decline as the adult stock of weakfish has declined. That is because neither the coastwide assessment, nor the Delaware Division of Fish and Wildlife's index of Young of Year weakfish abundance has declined to any significant extent. Consequently, available data indicates that the production of young-of-year weakfish has not declined. Rather survival to catchable sizes has declined dramatically.

Normandeau (2001) estimated the weakfish conditional mortality rate for 1998 as 7.7%. This indicates that of every 13 weakfish produced in Delaware Bay, one would be killed at the refinery. This should be put in the context of an estimated mortality rate of 17% by the Salem Nuclear Generating Station (PSE&G 1999). The combined mortality rate of these two facilities would then be 22.9%, meaning that roughly 23% of all weakfish produced in Delaware Bay would be killed by one of these two facilities. According to data presented by Normandeau, who cited PSE&G (1999), sampling in the estuary indicated that by mid-summer, up to 99% of YOY weakfish in the entire Bay and

River system are located in zones subject to entrainment into the refinery, meaning a very high proportion of the stock is subject to entrainment and impingement. Note that if data had been available to estimate a mortality rate for 1999, it is probable that it would have been higher then that of 1998, due to the drought conditions which produced the higher Equivalent Adult kill that year.

BAY ANCHOVY

Anchovies are important forage fish for many fish targeted by commercial and recreational fisheries, including weakfish, younger striped bass, Atlantic croaker (J. Nye, NMFS, personal communication), summer flounder and bluefish. Total numbers estimated killed from Tables 8 and 13 of Normandeau (2001) were 17,388,596 in 1998 and 16,732,149 in 1999. Estimated Equivalent Adults killed by the refinery were 1.5 million in both years. Normandeau (2001) estimated that 19.0% of anchovy in the Delaware Bay and River stock were killed by the refinery in 1998. This level exceeds the threshold of 15% set by Versar (1991) as an upper limit for mortality of a forage species. Normandeau states that the reason that mortality was estimated to be that high from the refinery in that year is that bay anchovy, a small species, is vulnerable to entrainment as a juvenile for a long period. Second, juveniles in the Delaware estuary system were heavily concentrated in a region near the refinery that was subject to entrainment during the period from late June through November. The cumulative impact of continual entrainment mortality over that period produced the relatively high mortality estimate.

Normandeau (2001) did not develop a Production Foregone model to estimate the loss in predator biomass attributable to refinery-induced anchovy mortality. The destruction of one-fifth of the anchovy stock in the Bay and River reduces the potential abundance and density of this important forage species to the point that attraction of desirable predators mentioned above to Delaware Bay and the production of younger predators targeted by the fisheries could be reduced to a significant degree. The Salem generating Station also exerts a high mortality rate on bay anchovy. The combined impact of these two facilities is even more deleterious than each considered alone.

WHITE PERCH

Total numbers of white perch estimated killed in the larval and juvenile stages were 7.38 million in 1998 and 90,000 in 1999. Normandeau estimates the equivalent adults at age two as 219,914 from the 1998 kill and 108,377 from the 1999 kill. Impingement of juveniles and adults was the major source of loss of white perch in 1999, but entrainment was the major loss source in 1998.

White perch are targets of recreational fishers, particularly during their spring spawning run, when they are found far up in tidal tributaries. The DFW trawl survey in the Delaware River collects ripe adults and high numbers of young of year white perch, which is the most abundant species in the River stations. NMFS estimates of the number of white perch landed in Delaware in the last five years have ranged between 30,000 and 65,000 fish. We currently do not have estimates of the harvest rate in Delaware, which makes it difficult to estimate the harvest foregone.

CONCLUSION

The conclusions drawn from the above estimates, mathematical modeling results and attempts to view results in the context of current fishery landings are that the refinery has a surprisingly large impact on the fish and fisheries of the Delaware River and Bay. Located in the nursery zone of striped bass, the finfish with the highest value that is produced in the River (Atlantic sturgeon excepted), the refinery may be reducing potential harvest by thousands of fish annually. Recent Delaware recreational harvests of striped bass have been declining to the level of an estimated 10,095 fish in 2007. The harvest foregone due to the refinery is estimated to be between 3,921 from the 1999 kill and 12,872 fish from the 1998 kill. This range is from about 40% to almost 130% of the most recent harvest. The combination of this refinery kill and that estimated for the Salem Generating Station in 1998 is estimated to exceed the number of surviving striped bass produced in 1998.

The mortality of weakfish due to the refinery is of special concern, since weakfish have declined throughout their range coastwide. The Delaware Bay stock has seen one of the earliest and steepest declines. The harvest foregone that I have estimated from the kill of weakfish by the refinery is roughly equal or greater than the 2007 recreational harvest in number.

The rather surprising estimate provided by Normandeau that the refinery kills an estimated 19% of the total bay anchovy stock in the Bay and River indicates that the refinery could be having a noticeable impact on the total productivity of the Bay and River for the production of desirable predator species as well as reducing the attraction of adult predators. The combination of the refinery and the Salem Generating Station is certainly taking a significant part of the forage base of Delaware Bay. This is especially true because bay anchovy is a small-bodied species vulnerable for much of its lifespan, as the Normandeau report points out.

While the impacts of facilities such as the refinery, which withdraws several hundred million gallons of cooling water per day, are normally considered in isolation, the joint impact of all such facilities is of a quite large magnitude. Consequently, the impact of each site should be reduced to the extent possible in order to reduce the overall degradation of fisheries and ecosystem integrity. The only feasible method of producing a large reduction in entrainment and impingement mortality at this facility is the installation of closed-cycle cooling. The refinery has been operating with its current intake structures since the early 1950s; significant improvement appears to be long overdue.

REFERENCES CITED

Note: Fish Killed two ways : terms used

Entrainment - Fish sucked through like a train through a tunnel.

Impinged - Fish pinned against debri's screen

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Normandeau Associates, I. 2001. Impingement and entrainment at the cooling water intake structure of the Delaware City refinery, April 1998-March 2000. Spring City, PA.

Table 1. Striped bass harvest foregone from the estimated Equivalent Adults from the 1998 kill at the Delaware City Refinery. The original estimate at age 4 was 39,819 age 4 striped bass (Normandeau 2001).
I assumed a 50:50 sex ratio. Natural mortality is assumed to equal 14% per year.
Males are assumed to have a 7% exploitation rate per year (DDFW 2008).
Females are assumed to have a 24% exploitation rate once they reach age 7.

		MALES		FEMALES	
		Number Alive, Jan. 1	Landings, No.	Number Alive, Jan. 1	Landings, No.
2002	4	19,910		19,910	
2003	5	17,136	1,200	17,136	
2004	6	13,752	963	14,749	
2005	7	11,036	773	12,695	3,047
2006	8	8,857	620	8,095	1,943
2007	9	7,108	498	5,161	1,239
2008	10	5,704	399	3,291	790
2009	11	4,578	320	2,098	504
2010	12	3,674	257	1,338	321
2011	13	2,366	136	853	205
		Total	5,401	Total	8048
		total landed, sexes combined		13,449	

Table 2. Striped bass harvest foregone from the estimated Equivalent Adults from the 1999 kill at the Delaware City Refinery. The original estimate at age 4 was 12,129 age 4 striped bass (Normandeau 2001).
I assumed a 50:50 sex ratio. Natural mortality is assumed to equal 14% per year.
Males are assumed to have a 7% exploitation rate per year (DDFW 2008).
Females are assumed to have a 24% exploitation rate once they reach age 7.

		MALES		FEMALES	
		Number Alive, Jan. 1	Landings, No.	Number Alive, Jan. 1	Landings, No.
2003	4	6,064		6,064	
2004	5	5,219	365	5,219	
2005	6	4,189	293	4,492	
2006	7	3,361	235	3,867	928
2007	8	2,698	189	2,465	592
2008	9	2,165	152	1,572	377
2009	10	1,737	122	1,002	241
2010	11	1,394	98	639	153
2011	12	1,119	78	408	98
2012	13	898	63	260	62
		Total	1,595	Total	2,451
		total landed, sexes combined		4,046	

Table 3. Estimation of Equivalent Recruit losses due to entrainment and impingement of YOY striped bass and the Conditional Mortality rate by the Delaware City Refinery for 1998 and 1999, and for the Salem Nuclear Station for 1998. A combined mortality rate is estimated for 1998 from the two plants. Input data for SNGS from Kahn (2000). Input parameter values for z_j, d_j and djHAT are provided.

YS = Yolk-Sac, PYSL = Post Yolk Sac Larvae, JUV1 = First stage Juvenile (to age 6 months)

	Eggs	YS Larvae	PYS Larvae	Juv 1	
Z_j	0.69	0.368	0.1104	0.0175	
d_j	2	6	46	114	Untill October 15
d_j HAT	0.679335628	1.600160319	6.222252148	32.32124805	

PLANT	YEAR	Number Eggs Entrained	Number Surviving to YS Larvae	Num. YSL Entrained	Num. Surv. To PYSL	Num. PYSL Entrained	Num. Surv. To JUV1
DCR	1999	160,000	64,323	20,000	11,032	7,860,000	97,396
DCR	1998	40,000	16,081	1,700,000	338,485	15,340,000	192,058
COMBINED	1998						
SNGS	1998	1,714,186	689,134	384,612,806	76,255,534	54,805,461	1,153,696

CONTINUED

Table 3, continued. CMR = Conditional Mortality Rate

Num JUV1 Entrained	Total JUV1 from entrainment	Num JUV1 Impinged	NUM Impinged JUV1 surviving	Equivalent Recruits, Oct. 15 Num JUV1 10/15	Num alive in River from NJ YOY Index as of 10/15	Total JUV1 including Plant Losses as of 10/15	Conditional Mortality Rate	YEAR	SOURCE
620,000	717,396	1,199	287	97,863	1,848,580	1,946,443	0.05	1999	DCR
3,270,000	3,462,058	314	75	470,962	1,274,547	1,745,509	0.27	1998	DCR
				1,639,938	1,274,547	2,914,485	0.56	1998	COMBINED
7,430,940	8,584,636	5,631	1,348	1,168,976	1,274,547	2,443,523	0.478	1998	SNGS

Table 4. Weakfish harvest foregone from the Equivalent Adult total estimated by Normandeau (2001) from the 1998 kill by the Delaware City refinery. M is the instantaneous natural mortality rate estimated based on the 2006 coastwide weakfish stock assessment (Kahn et al. 2006). Instantaneous fishing mortality rate is 0.25

YEAR	M	AGE	number alive, Jan. 1	Landings, No.
1999	0.51	1	29,595	0
2000	0.60	2	17,772	0
2001	0.60	3	9,753	1,888
2002	0.75	4	5,353	985
2003	0.41	5	2,528	526
2004	0.57	6	1,678	185
			total	3,584

Table 5. Weakfish harvest foregone from the Equivalent Adult total estimated by Normandeau (2001) from the 1999 kill by the Delaware City refinery. M is the instantaneous natural mortality rate estimated based on the 2006 coastwide weakfish stock assessment (Kahn et al. 2006). Instantaneous fishing mortality rate is 0.25

YEAR	M	AGE	number alive, Jan. 1	Landings, No.
2000	0.51	1	50,047	0
2001	0.60	2	27,466	0
2002	0.60	3	15,074	2,774
2003	0.75	4	7,120	1,481
2004	0.41	5	4,725	923
2005	0.57	6	2,662	520
			total	5,699

NOV. 22ND 2008

Q. Have you lost your job or do you know someone who has as a result of the economy?

YESTERDAY'S QUESTION

Q. Do you think Wilmington could support another music venue?

Yes: 43.5% **No:** 56.5%

UNSCIENTIFIC POLL. TOTAL VOTES: 857

Refinery 'overdue' in fish-kill reduction

Report reveals huge impact as Valero seeks to renew permit

By JEFF MONTGOMERY
The News Journal

A new state fishery report concludes that cooling towers are "long overdue" for the Delaware City Refinery, pointing to huge and ongoing losses of fish and other aquatic life in the plant's giant cooling water intakes.

Division of Fish & Wildlife officials submitted the analysis amid final maneuvering before a potentially combative public review early next year for the refinery's long-expired permit to tap water from the Delaware River.

Delaware City has authority to take as much as 452 million gallons daily – more than six times the daily summertime amount supplied by all northern Delaware water utilities. Millions of fish and other aquatic organisms caught in the suction die when "impinged" on the refinery's outdated intake screens or when "entrained" inside Valero's miles of piping.

Refinery managers are tentatively projecting a 30-percent cut in water use over the next five years, Valero spokesman Bill Day said. That change would offer far less than the up-to-95-percent reduction in fishery deaths environmental groups say is required under federal rules.

"The only feasible method of producing a large reduction in impingement and entrainment at this facility is the installation of closed-cycle cooling," the report concluded, referring to cooling towers that recycle water like a radiator instead of passing it through just once.

"The refinery has been operating with its current intake structures since the early 1950s; significant improvement appears to be long overdue," the report concluded.

Some 27 percent of all striped bass in the river are killed by the refinery alone, according to the state analysis. Similar losses occur among already troubled weakfish, or sea trout, stocks. Up to one fifth of Delaware River and Bay anchovies – a vital link in the estuary food chain – are lost to the refinery.

"I'm glad to see that the state fisheries office is taking a stand," said Richard Schneider, a member of the Coalition to

See FISH — B2

Fish: Environmental advocates seek tighter restrictions on plants

FROM PAGE B1

Protect Our Environment who has campaigned for cooling tower upgrades at Delaware River power plants for years.

Federal officials, using worst-case approaches, have calculated far worse impacts than Delaware's, estimating that the refinery kills the equivalent of more than 73 million fish, crabs and other species yearly.

Conectiv's Edge Moor power plant and NRG's Indian River plant – both with overdue permits – kill millions more, the Environmental Protection Agency found, and the nearby Salem nuclear reactors kill the equivalent of more than 339 million year-old fish and other creatures.

PSEG Nuclear also is seeking a permit.

Peder Hansen, manager of surface water discharges for the Department of Natural Resources and Environmental Control, said that regulators are still reviewing details of the refinery's permit proposal.

"They're on record as saying they're willing to reduce it by 30 percent," Hansen said. "The question we have is: What do we think is the appropriate goal and what's the time frame to get to the goal."

Big water users are obliged to use "best technology available," or BTA, to minimize harm from their intakes under terms of a 2007 federal court ruling that barred regulators from using cost-benefit tests to justify lesser changes.

But the EPA has advised individual states to use their "best professional judgment" in ordering new controls, pending a rewrite of federal regulations.

Maya K. van Rossum, who directs the regional Delaware Riverkeeper conservation group, described DNREC's latest fish loss estimates as "hugely significant," but said that she was concerned over signs that the agency is willing to give Valero extra time to minimize the losses.

"They've been getting away with this fish slaughter for too many decades," van Rossum said, noting that DNREC's draft permit bluntly declared that a 30 percent reduction would not meet the BTA requirement.

"They make that affirmative statement, but they seem to be saying we're going to allow them to do 30 percent because they're on the path to 90 percent," said van Rossum, whose group was among those that successfully sued to overturn the EPA's more liberal cooling water rules.

Valero's Day confirmed that the company is in talks with DNREC on additional reductions in river water use after the five-year permit ends but said he could not discuss details.

Contact Jeff Montgomery at 678-4277 or jmontgomery@delawareonline.com.

Caucus: Democrats hold 16-5 majority

FROM PAGE B1

Natural Resources and Environmental Control.

The new plan, which took effect Nov. 11, requires waterway buffers in many new developments, improvements in stormwater management and upgrades to septic systems in the region. Sussex County officials said Thursday they plan to sue the state over regulations to the environmentally sensitive Inland Bays watershed.

Simpson said the disputes that are arising downstate about the pollution controls likely will end up in the Legislature for resolution.

Senate Republicans will be entering the 145 General Assembly with a smaller group than last year, when they held eight seats. On Election Day they lost the races for seats that previously were held by retiring Republicans.

The Democrats will hold a 16-5 majority in the Senate, a margin that would theoretically allow them to convene the Senate, have a quorum, pass any type of legislation and adjourn without ever having a Republican present.

But Simpson said he is not concerned about being such a small minority, and that he is sure the five Republicans will be able to impact votes on the floor.

"Generally, no caucus is in agreement 100 percent of the time on any issue," Simpson said. "I think this is a time that if we can get together, we can work with factions across the aisle to get legislation passed or effectively stop some legislation from passing."

Simpson said the efforts to pass the eminent domain legislation that later was vetoed by the governor is a prime example of how the minority can work with groups in the majority.

"I don't want to downplay our role, we'll be the loyal opposition," he said. "But we want to be the group that effectively and positively passes legislation with certain members of the other side."

Simpson has served as a state senator since 1998, when he was first elected to represent the district that includes Milford, Rehoboth Beach and the Long Neck area.

Contact Ginger Gibson at 324-2794

New Castle County

Alexander Karpov and Nadezda Baybula both of Newark.

Matthew J. Makowski and Shannon Lynne Botsford both of Wilmington.

Paul Edwin Marsh Jr. and Jodie Kristina Walls both of Wilmington.

David Pierre Abraham Michel of New York, N.Y., and Guerda Lamy of Seaford.

Sean Patrick Montgomery and Allison Murray both of Linwood, Pa.

Ralph J. Montoro IV and Jennifer Mae Bates both of Port Penn.

Jeremy Joseph Schladweiler and Krista Marie Dowling both of Wilmington.

Maurice A. Walker of Wilmington and Flower Sharrie Green of Bear.

Carroll Chadwick Ballard III and Caroline Carter Duke both of Philadelphia, Pa.

Brian Edward Bowser and Kathleen Marie Baran both of York, Pa.

Sean P. Bradshaw and Erica Lynn Plumley both of West Grove, Pa.

Marc Briggs and Adrienne Christine Conway both of Wilmington.

Mark Stevenson Davis Jr. and Irene Rene Marshall both of Bear.

Shamine Marquis Pettus and Rosetta Maria Orostica both of Middletown.

James Paul Solomon and Stacy Leigh Lapasnick both of Wilmington.

Jason John Springer and Tina LeeAnn Powell both of New Castle.

Clyde A. Torrence Jr. and Michele Renee Yamashita both of Bear.

Parks Cornelius Underdown IV and Megan Emilie Jaquette both of Arlington, Va.

Noble R. Washington Jr. and Mildred R. Washington both of Wilmington.

Badr Avent of Philadelphia, Pa., and Nia Lawana Chisholm of Claymont.

Pondosa L. D. Butler and MiChantel Evette Chandler both of Riverdale, Ga.

Robert Lee Cameron and Karen R. Fitzgerald both of Claymont.

Nathan Parish Carlson and Ashley Rene Hendrickson both of Port Allegany, Pa.

George E. Green and Victoria L. Kramer both of Newark.

Walter Elijah Gross Jr. of Stone Mountain, Ga., and Ingrid Nikole Wheeler of New Castle.

Stefan D. Roberts of Lansdowne, Pa., and Tracey N. Thomas of Baltimore, Md.

John Sailer III of Wilmington and Nicole Elise Dupre of New York, N.Y.

Andrew Vincent Achiron of Fairfield, Conn., and Laura Annette Kot of West Chester, Pa.

Mohamed Farghal Ahmen and Souad Ghenym both of Newark.

Maximo Roman Almanzar and Ana Concepcion Polanco both of Newark.

Matthew Charles Bastow and Karen Alexis both of Arlington, Va.

Jan. 14, 2007

Cooling systems ravage river life, activists charge

Big industrial sites on the Delaware kill tens of billions of fish, crabs each year

By JEFF MONTGOMERY
The News Journal

A few industrial sites with cooling systems that draw water from the Delaware River are killing tens of billions of fish, fry and crabs each year, making them, by some accounts, the biggest predators in the river.

Now five of the largest water users are up for state permit renewals, giving regulators and environmental groups the chance for a public debate over industrial cooling-water demands.

The giant intakes continuously pump in and discharge river water to cool equipment and systems, sucking trillions of gallons from stretches of the Delaware that include nurseries and feeding grounds for some of the region's most popular and valuable aquatic life, including striped bass and weakfish.

"The river and bay simply cannot sustain this kind of day-in and day-out destruction," said Tracy Carluccio, a staff member for the Delaware Riverkeeper Network.

Carluccio's group last year joined several others in suing the Environmental Protection Agency for failing to control damage from some cooling water intakes. The lawsuit, along with alarming research, has put the issue in the spotlight just as several of the plants come up for new permits.

Some of the fish are trapped on the intake screens, others are descaled. The ones that are pulled through the screens are killed by heat or torn apart by the sheer force of the water.

The deaths caused by the intakes threaten the entire river and bay ecosystem, environmental groups say, and result in tens of millions of dollars in economic losses.

See INTAKES — A6

Intakes: Towers could spare

FROM PAGE A1

The intakes at the Salem nuclear power complex, Conectiv's Edge Moor power plant, the Delaware City refinery and Conectiv's Deepwater, N.J., plant destroy roughly 607 million year-old fish annually – a federal estimate based on industry reports that some experts say might be too low. If fish eggs, larvae and other organisms are added, the number lost rises to tens of billions.

At the river's four largest power plants, annual economic damages are estimated at $49 million, mostly commercial and recreational fishing losses, according to one Environmental Protection Agency study.

"The final estimates may well underestimate the full ecological and economic value of these losses," an EPA research office reported in 2002.

The best alternatives to intakes are massive water-cooling towers, which could dramatically reduce the number of fish killed. But installing the towers would cost hundreds of millions of dollars, which could be passed on to customers.

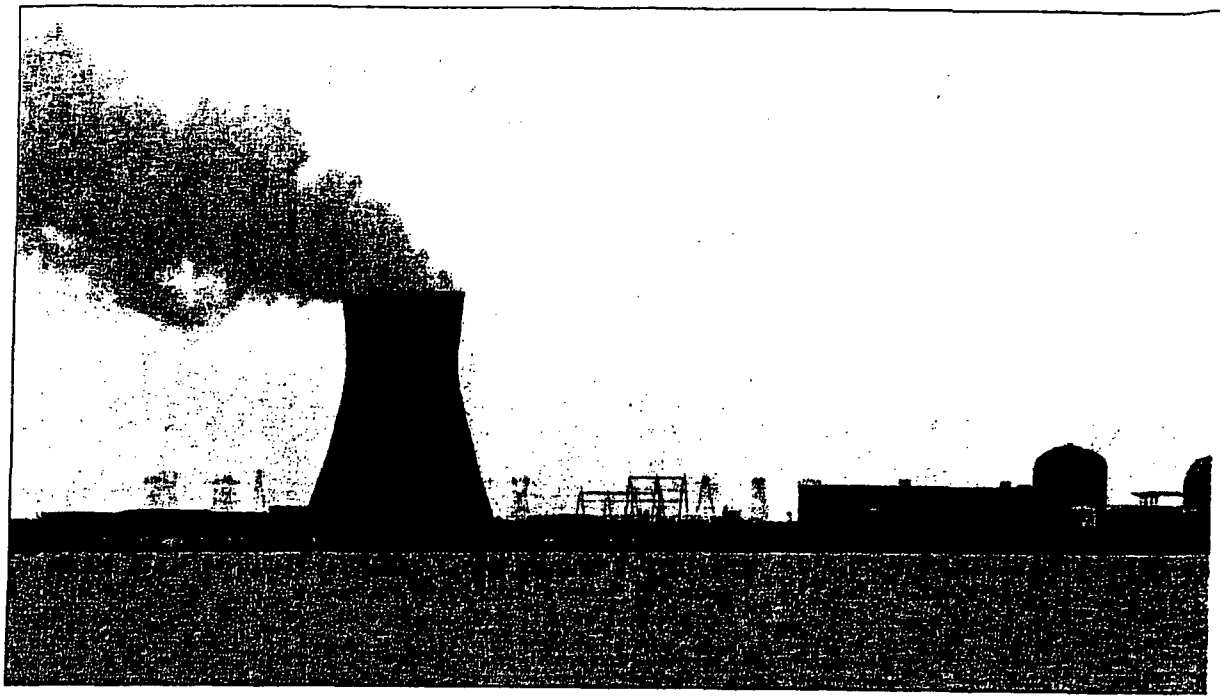
Conectiv's Edge Moor plant draws water from a section of the river near the Cherry Island "flats," a spawning area for striped bass. Financial losses to commercial and recreational fishing due to the kills at Edge Moor were estimated by the federal government at $12.5 million a year.

In Delaware City, the Valero refinery has rendered the entire population of bay anchovies vulnerable, according to a 2001 study. Anchovies are an important food source for many other creatures in the river and bay.

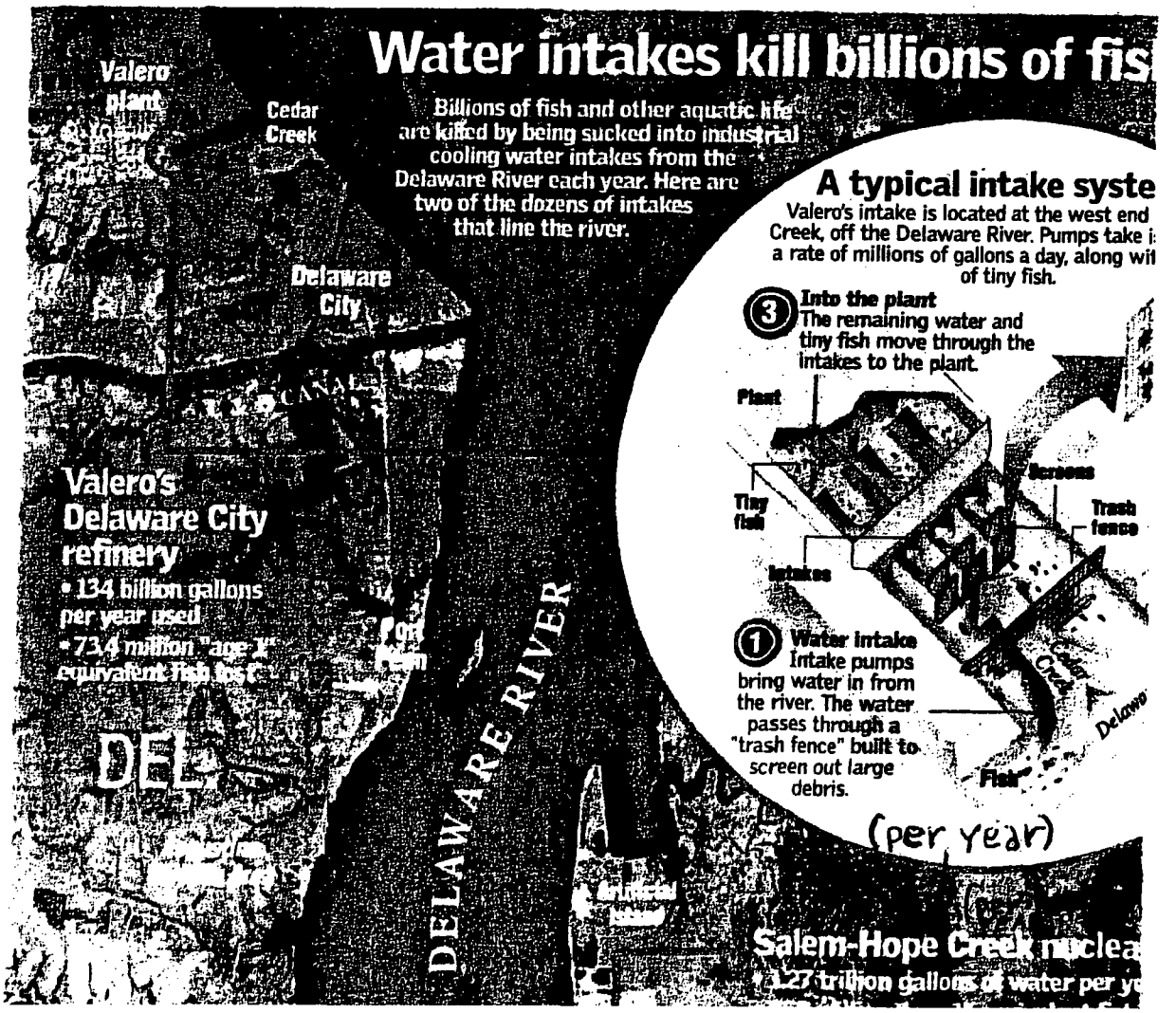
"There hasn't really been a significant change to the intake system at the refinery, I don't believe, since the mid-60s at least," said Roy Miller, who directs state fish and shellfish programs. "It's high time."

In 2002, the EPA estimated that the refinery intakes destroy 775,879 pounds of weakfish annually. Only 16,892 pounds of the popular sport fish are taken by recreational fishing.

A DNREC consultant estimated in 2001 that the refinery killed nearly 40,000 striped bass in a single year, double the number caught from fishing. Counting egg and larval losses, the EPA estimated the same refinery cost the river 662,871 pounds of striped bass, more than four times the number taken by rod



The cooling tower at the Salem-Hope Creek nuclear power plant serves one reactor. Two other reactors do not hav



and reel or net in 2003.

Federal officials estimated fish losses at the Delaware City refinery at $5.8 million annually.

The Delaware City refinery combined with the Salem nuclear plant could kill 34 percent of the bay's anchovy populations each year and as much as 23 percent of the river's weakfish, or sea trout, according to the DNREC consultant's report from 2001.

Details obscured

For decades, the cooling water carnage went on with little notice, obscured in part by huge backlogs in state permit reviews. Most debate flared during the permit reviews carried out for Salem. But few details were available on other large intakes.

"These are hidden, stealth fish kills that take place underwater, out of sight, out of mind," said Maya K. van Rossum, who directs the Delaware Riverkeeper Network. "That's why they're allowed to happen. It changes the whole dynamic of the ecosystem. It changes the whole food chain."

But now, with public pressure growing, regulators are leaning on the plants' operators to change their practices and consider alternatives to the intake water cooling systems.

EPA water resources director Evelyn McKnight said last week her agency has targeted Conectiv's plant and Valero's refinery for renewal of long outdated permits. That permitting process is carried out by the states. During the renewal process for Valero and Conectiv, Delaware regulators said they will push the companies to consider installing cooling water supply systems, which could cost millions.

Those radiator-like cooling towers recycle and reuse water, drastically reducing the number of fish that are killed.

For example, the nuclear reactor at Hope Creek, near the Salem units, already uses a cooling tower. It kills 12 million juvenile fish each year. Salem, which draws from the river, kills 354 million a year.

Tim Dillingham, who directs the American Littoral Society, a conservation group, said state regulators need to press industry to invest in that technology.

"Industry almost across the board has blatantly denied that they're having any impact, which common sense tells us is just not right," Dillingham said. "This really is a case where the industries are using sticks-and-stones kind of technology, and they're asking for a pass. They're saying 'We don't want to be brought into the 21st century in terms of reducing our environmental impact.'"

DNREC Secretary John Hughes said his agency has urged both Valero and Conectiv to consider cooling-water systems that spare more fish.

"We've got a strong argument. I've made the argument personally at the highest levels with Valero that ... they need to look at cooling water as a major investment issue," Hughes said.

DNREC's John Hughes said his agency has urged Valero and Conectiv to consider cooling-water systems that spare more fish.

He added that talks with the refinery have been hampered by repeated ownership and management changes at the complex.

Federal rules allow companies to avoid upgrading their cooling systems if they can prove the changes are too costly.

Valero officials could not be reached for comment on the company's plans.

For the Salem plant, negotiations are more protracted. There, New Jersey regulators are waiting to reissue permits for Salem's intakes until a fight at the nearby Oyster Creek nuclear plant is resolved.

At Oyster Creek, which draws water from a Delaware River tributary, Barnegat Bay, state regulators, the Environmental Protection Agency and National Marine Fisheries Commission all have recommended cooling towers.

Could set precedent

Oyster Creek's owner, AmerGen, has opposed the cooling tower demand, arguing that the project could cost hundreds of millions of dollars.

"I think what happens at Oyster Creek will tell a lot about what will happen at Salem," said Norm Cohen, who directs Unplug Salem, a group that follows PSEG Nuclear's operations closely.

Construction of a new cooling tower at Salem, PSEG Nuclear cautioned, could cost $852 million and force prolonged shutdowns at what is now the nation's second-largest nuclear complex.

Source: EPA

Photo/GLOBEXPLORER

FISH LOSSES ON U.S. WATERWAYS

Fish losses in the Delaware River estuary were among the highest of any examined in several case studies developed by the Environmental Protection Agency.

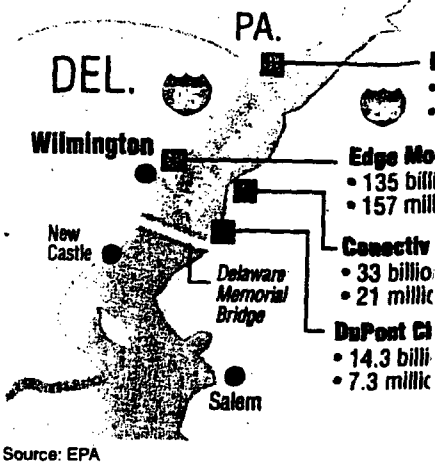
Delaware River losses included an estimated 6.9 million pounds of weakfish, 5.9 million pounds of striped bass, 11.8 million pounds of spot and 17.1 million pounds of Atlantic croaker.

	EQUIVALENT IN FISH LOST	POUNDS OF YEAR-OLD FISH
Delaware River between Marcus Hook, Pa., and Salem, N.J. (7 power plants, 2 refineries, two factories)	615.9 million	72 million
Tampa Bay, Fla. (four power plants, 26 boilers)	18.9 billion	118 million
Ohio River (29 plants, mostly utilities)	36.1 million	11.1 million
Brayton Pt., Mass., power plant (near Fall River, R.I.)	3.84 million	7 million
Detroit Edison Monroe power plant, Mich.	11.6 million	3.4 million

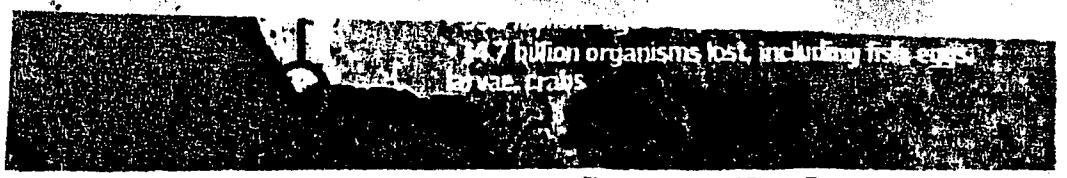
Source: EPA

'Age 1' fish losses

The "age 1 equivalent" number is an es killed by cooling water intakes that are lived long enough to reach 1 year old.



Source: EPA



Photo/GLOBEXPLORER The News Journal/DAN GARROW

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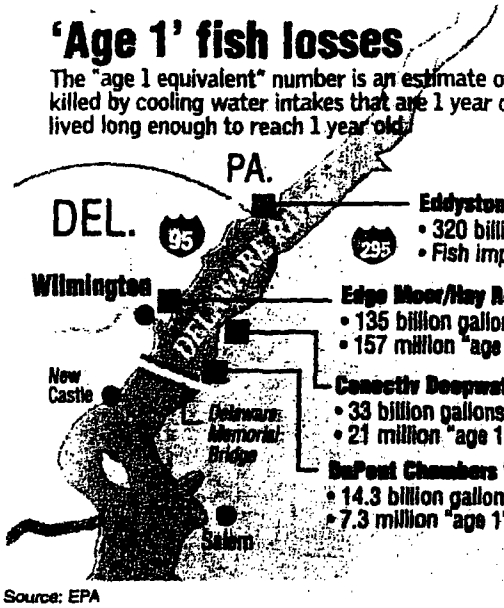
IIVALENT IN ISH LOST	POUNDS OF YEAR-OLD FISH
15.9 million	72 million
18.9 billion	118 million
16.1 million	11.1 million

'Age 1' fish losses

The "age 1 equivalent" number is an estimate of the number of fish killed by cooling water intakes that are 1 year old or would have lived long enough to reach 1 year old.



Source: EPA The News Journal

In the company's application to New Jersey's environmental agency, Salem's owners said the operation has caused "no substantial harm to fisheries."

In lieu of a change to its cooling system, PSEG has restored habitat on thousands of acres of wetlands that it said would offset fish losses at its plant.

The company has financed fish "ladders" to help spawning fish bypass dams around the region as well as improvements in systems that scare fish away from its intakes.

"It was just a buyout," said William "Frenchie" Poulin, a Kent County commercial fisherman and Bowers Beach mayor. "It was just a drop in the bucket to them."

But Miller, fisheries program manager for DNREC, said that PSEG restored tidal flows to thousands of acres of wetlands.

"Did it compensate for what they're killing up at Salem?" Miller asked. "They hired some of the top scientists in the world who claim it compensated."

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Federal judges say utilities must better protect marine life

By JEFF MONTGOMERY, The News Journal
Posted Saturday, January 27, 2007

In what environmental groups call a major victory for the Delaware River, an appeals court Friday rejected federal standards that allow power plants to continue using cooling-water intake systems that kill billions of fish and aquatic life each year.

A three-judge panel of the 2nd Circuit Court of Appeals struck down Environmental Protection Agency regulations that allowed power plants to avoid building cooling towers or other systems that protect fish from getting caught up and killed by intakes.

On Delaware River, utility and industrial intakes draw billions of gallons of water to cool down equipment. But they also suck in and kill billions of creatures. Environmental groups say the losses threaten the river's ecosystem.

The court said utilities must use the best technology available to minimize fish losses. Using cost-benefit studies, utilities had claimed the marshland and water restoration projects they financed made up for the loss to aquatic life.

The EPA accepted the industry alternatives at PSEG Nuclear's Salem plant and other sites. But in its ruling, the court rejected the general use of systems that fail to minimize direct, plant-related environmental damage. "The statutory directive requiring facilities to adopt the best technology cannot be construed ... to take measures that produce second-best results," the court's opinion, still subject to appeal, noted. PSEG Nuclear, the owner of the Salem and Hope Creek nuclear plants on the New Jersey shore of the Delaware, has attempted to use marshland restoration projects to make up for fish lost to intakes at the sprawling Salem plant.

The Hope Creek facility uses a cooling tower. "The Delaware has suffered for many years from these big industries and facilities ignoring the law," said Maya K. van Rossum, who directs the Delaware Riverkeeper Network. "They've invested I don't know how much money trying to thwart the application of the law, and now their feet are going to be held to the fire."

Regulators and conservation groups have complained that intakes along the Delaware jeopardize nurseries and feeding grounds for some of the region's most popular and valuable aquatic life. They cause the death of millions of striped bass, weakfish and smaller forage fish. "This historic decision validates what the environmental community has been saying for decades," Alex Matthiessen, president of Riverkeeper Inc., said. "EPA has ... repeatedly failed to protect fish and wildlife from needless devastation at the hands of power plants."

It was unclear Friday what effect the ruling would have on permit applications under review for large water intakes along the Delaware River, including Salem, Conectiv's Edge Moor plant in Wilmington, its Deepwater, N.J., plant and Valero's Delaware City refinery. "This decision by the 2nd Circuit further complicates a very complicated regulatory matter," said Kevin C. Donnelly, water resources director for Delaware's Department of Natural