

HISTORY OF THE DEVELOPMENT OF FISH PASSAGE FACILITIES AT FERC LICENSED PROJECTS ON THE LOWER SUSQUEHANNA RIVER

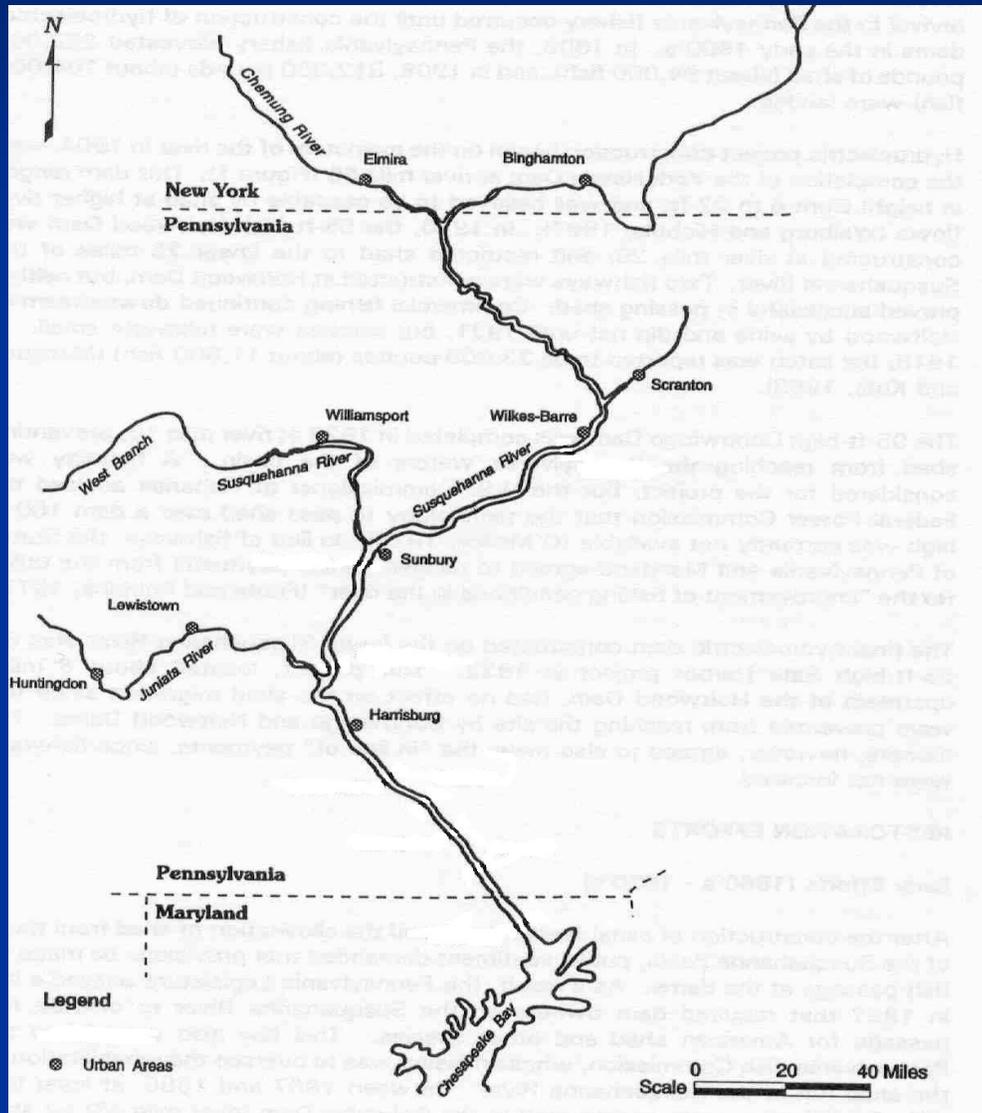
Peter S. Foote
The Louis Berger Group, Inc.
180 Rambling Road
East Amherst, NY 14051



HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

- Original distribution of American shad
- Early dam construction (1800's)
- Hydroelectric dam construction (1904 – 1930)
- Early shad restoration efforts (1860's – 1940's)
- Modern restoration efforts (1950's – present)
- Recent fish passage data

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Susquehanna River Basin

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

- Original distribution of shad:
 - Up to Binghamton, NY, over 300 miles from the river mouth
 - Larger tributaries such as the Juniata River
 - Pennsylvania landings of an estimated 2 million pounds (670,000 fish)
 - Additional landings in NY, MD, VA

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Seine haul – mouth of Susquehanna
River, late 1800's

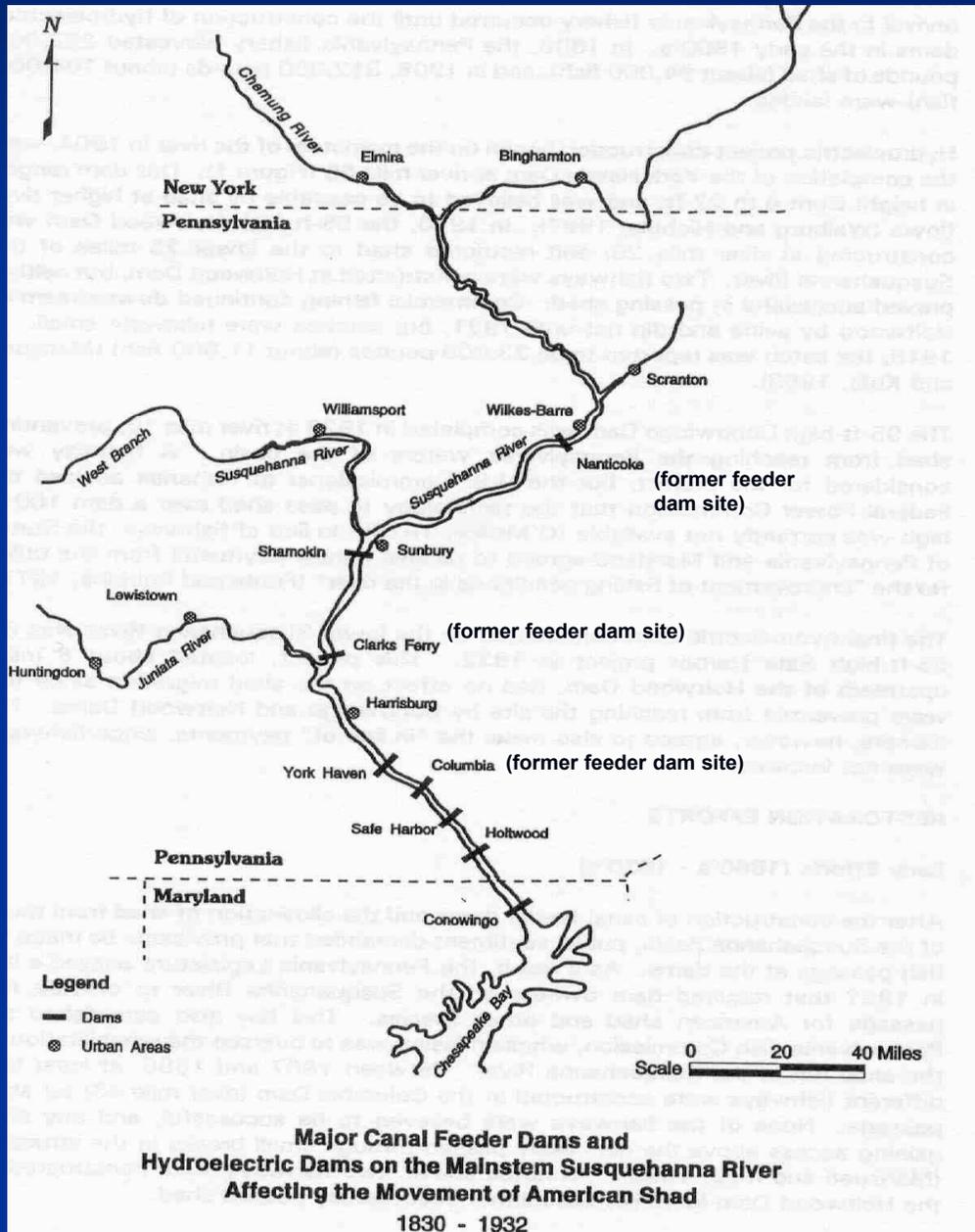
HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

- Early dam construction (1800's)
 - 1830's – canal feeder dam construction
 - Columbia Dam (1835) had greatest effect – only 43 miles from river mouth
 - Also problems with poor water quality and over harvest
 - Shad runs significantly declined from 1835 – 1890 (PA landings of 205,000 pounds)
 - Mid 1890's – abandonment of canal feeder dams and small revival of shad fishery (PA landings of 312,000 pounds in 1908)

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

- Hydroelectric dam construction (1904 – 1930)
 - 1904 – York Haven Dam (river mile 65; 6 – 22 ft high) (may be partially passable)
 - 1910 – Holtwood Dam (river mile 25; 55 ft high) (two fishways)
 - 1928 – Conowingo Dam (river mile 10; 95 ft high) (in lieu of payments)
 - 1930 – Safe Harbor Dam (river mile 33; 55 ft high) (in lieu of payments)

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



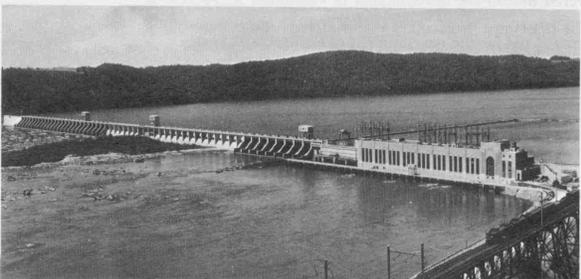
HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



CONOWINGO DAM



HOLTWOOD DAM



SAFE HARBOR DAM



YORK HAVEN DAM

Photo from Carlson, 1968

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

- Early shad restoration efforts (1860's – 1940's)
 - 1867 – PA Fish Commission established to oversee shad restoration
 - 1867 – 1886: Four fishways constructed at Columbia Dam
 - Late 1800's: Restrictions on fishing gear and eel weirs
 - 1910: Two fishways constructed at Holtwood Dam
 - 1873 – 1937: Shad hatcheries (Juniata River, Marietta, Havre de Grace)

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Holtwood Dam from west shore

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Holtwood fish ladder – built 1910

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Shad hatchery – late 1800's

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

- Modern restoration efforts (1950's and 1960's)
 - 1950: Appropriation for 6-year USFWS study of status of Atlantic coast shad fisheries
 - 1952: Walburg study, transport of adult shad from Chesapeake Bay to upper Susquehanna River
 - 1958 – 1960: Whitney study on feasibility of passing shad and other species over Conowingo Dam
 - 1962: Bell and Holmes feasibility study for installing fish passage at the four lower-river hydro dams
 - 1963 – 1966: Carlson study to determine biological suitability of Susquehanna River for shad restoration

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

Conowingo
Fish Trap
1965

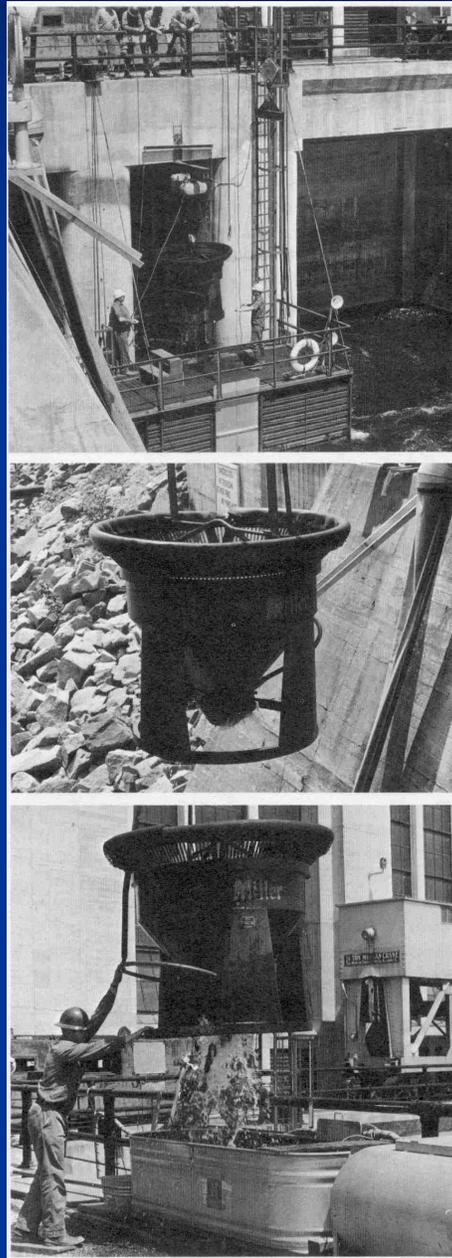
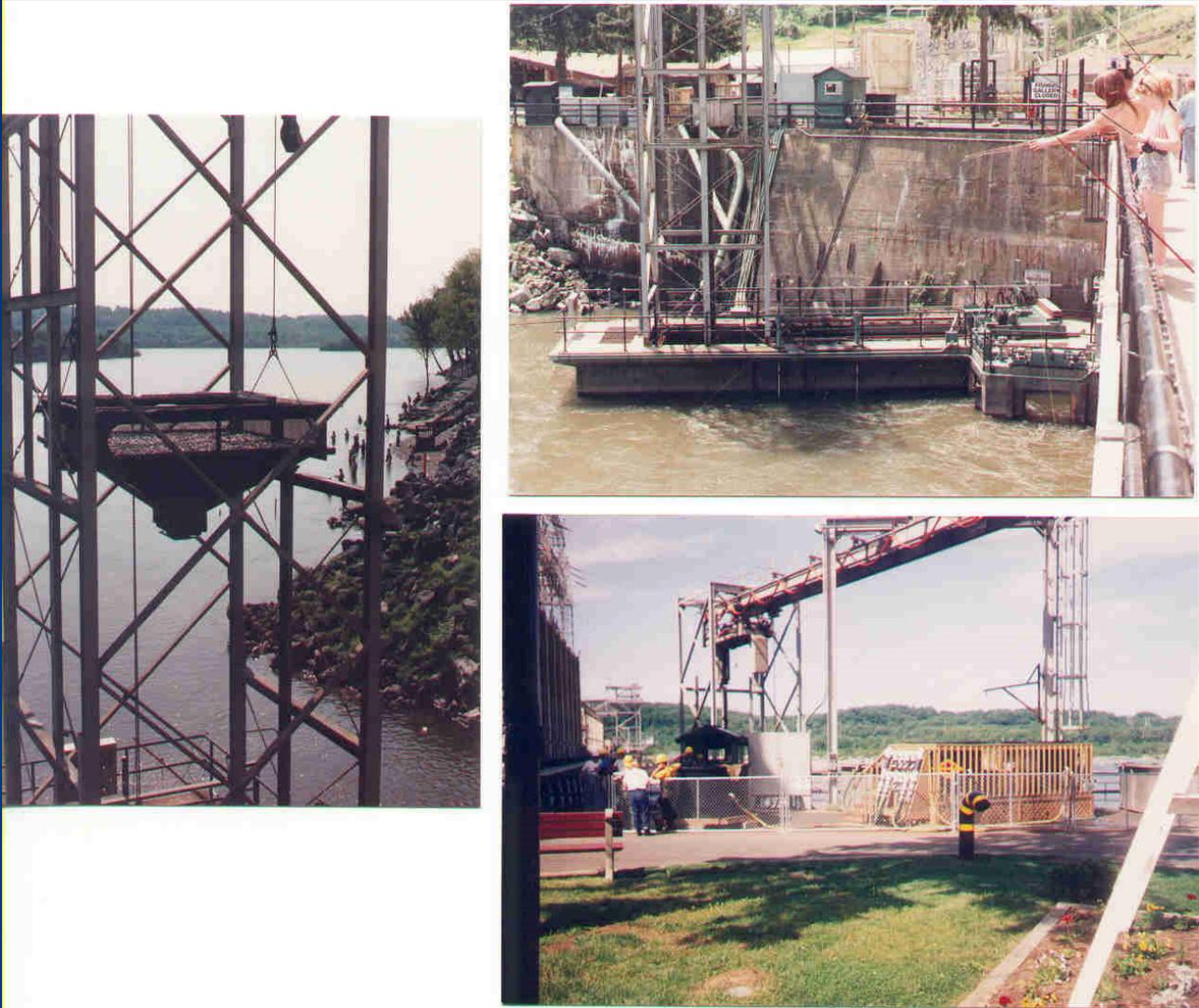


Photo from Carlson, 1968

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

- Modern restoration efforts (1970's)
 - 1970: Settlement agreement to construct and operate a fish trap at Conowingo Dam for 5 years; funding for collection of 50 million shad eggs per year; formation of SRAFRC
 - 1972: Conowingo trap (the West Lift) goes into operation
 - Mid-1970's: Relicensing of four lower-river projects begins; recommendations for fish passage; Van Dyke shad hatchery established
 - 1978: Gilbert Assoc. fishway conceptual design study at Conowingo
 - 1979: Harza fishway conceptual design study at Holtwood, Safe Harbor, York Haven

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Conowingo West Fish Lift – Built in 1972

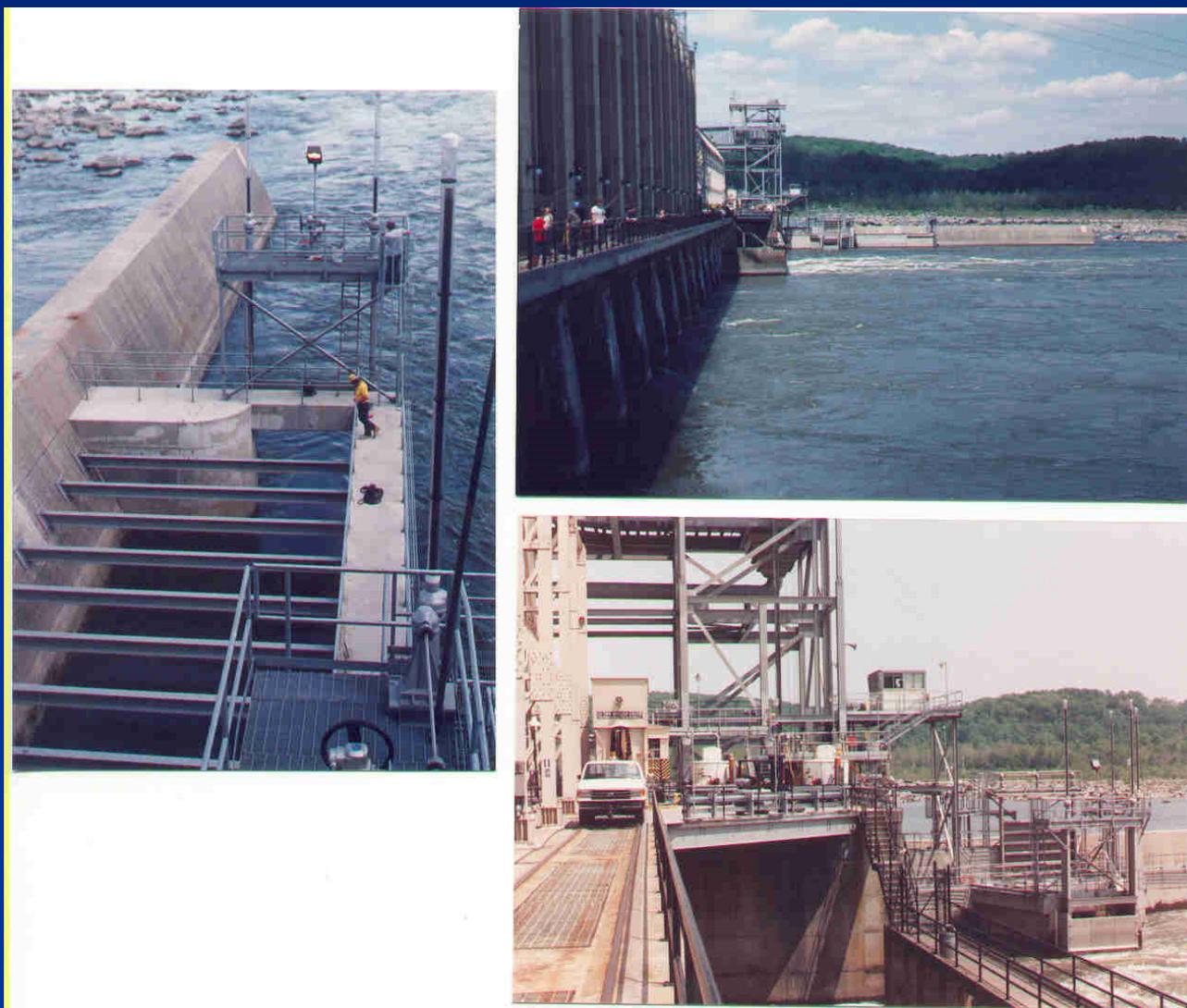
HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

- Modern restoration efforts (1980's)
 - 1980: FERC issues four licenses, orders hearing to address fish passage issue
 - 1980: MD closes shad fishery, begins annual population estimates
 - 1981: SRAFRC sets restoration goals: 3 million shad, 20 million river herring
 - 1984: Settlement agreement by Holtwood, Safe Harbor, & York Haven licensees; provides funding for 10-year program to demonstrate if self-sustaining populations could be restored
 - 1989: Conowingo licensee agrees to construct permanent fish lift; agencies request upstream licensees to begin conceptual designs

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

- Modern restoration efforts (1990 - 2000)
 - 1990 – 1991: Acres fishway conceptual design study at Holtwood, Safe Harbor, York Haven
 - 1991: New Conowingo East Lift goes into operation, initially trap and truck
 - 1992: Upstream licensees agree to construct permanent fish facilities
 - 1997: New lifts in operation at Holtwood and Safe Harbor
 - 2000: Vertical slot ladder in operation at York Haven

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Conowingo East Lift - 1991

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Conowingo East Lift - 1991

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Holtwood Fish Lift - 1997

Photo courtesy of Chris Porse, PPL Holtwood LLC

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Holtwood Fish Lift - 1997

Photo courtesy of Chris Porse, PPL Holtwood LLC

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

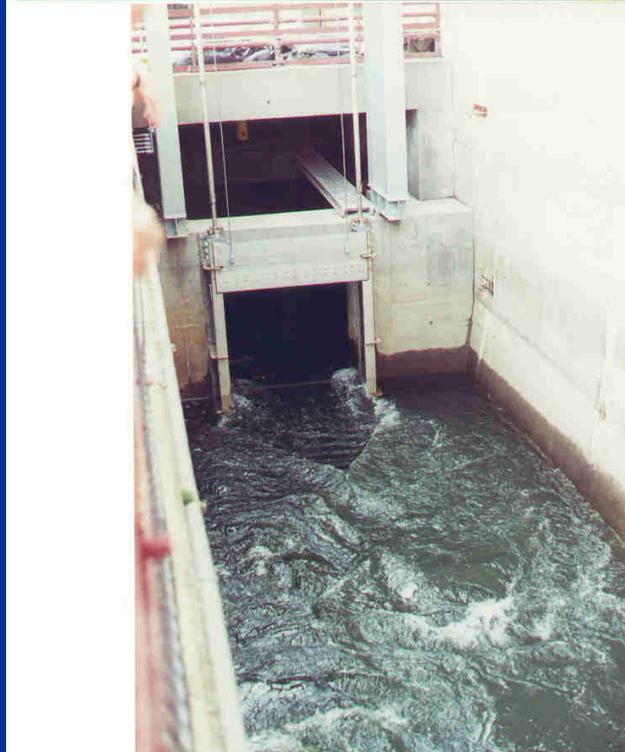


Holtwood Fish Lift - 1997

Photo courtesy of Chris Porse, PPL Holtwood LLC

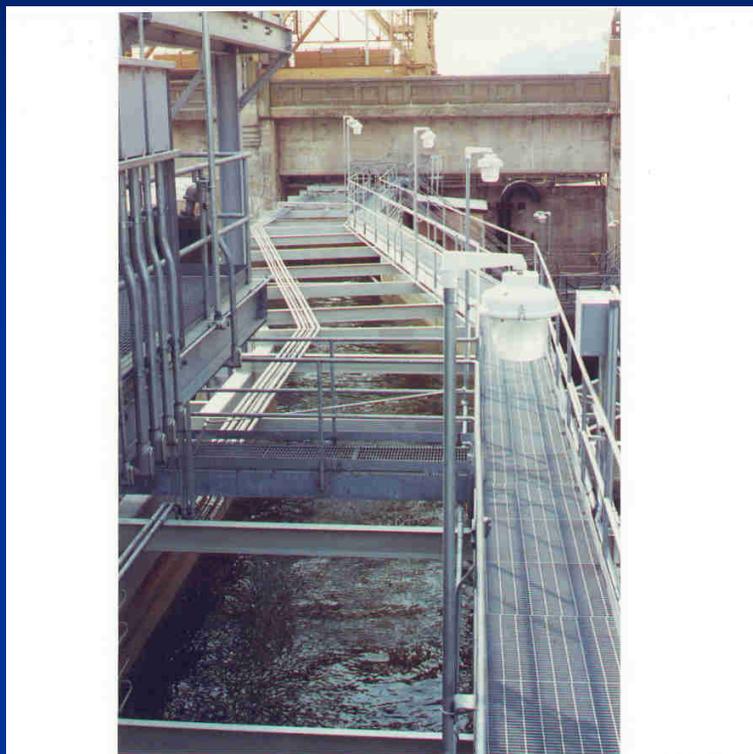
HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

Safe
Harbor
Fish Lift
1997



HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

Safe
Harbor
Fish Lift
1997

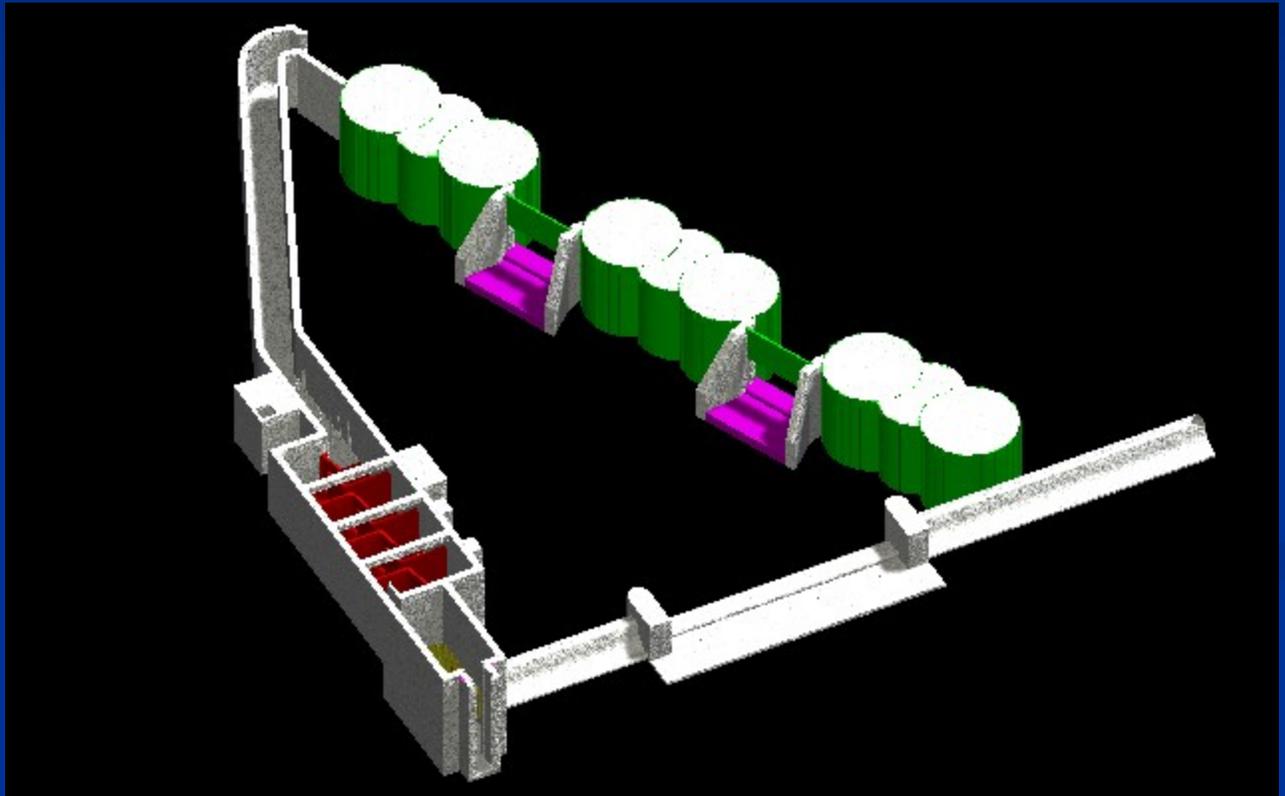


HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



York Haven Fishway - 2000

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



York Haven 3-D Fishway Model

Courtesy of Acres International Corporation

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



York Haven Fishway

Photo courtesy of Kleinschmidt Energy & Water Resource
Consultants

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Fish counts

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

Fish passage counts

Year	Conowingo	Holtwood	S. Harbor	Y. Haven
1972	182	na	na	na
1973	65	na	na	na
1974	121	na	na	na
1975	87	na	na	na
1976	82	na	na	na
1977	165	na	na	na
1978	54	na	na	na
1979	50	na	na	na
1980	139	na	na	na
1981	328	na	na	na
1982	2,039	na	na	na

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

Fish passage counts

Year	Conowingo	Holtwood	S. Harbor	Y. Haven
1983	413	na	na	na
1984	167	na	na	na
1985	1,546	na	na	na
1986	5,195	na	na	na
1987	7,667	na	na	na
1988	5,169	na	na	na
1989	8,311	na	na	na
1990	15,964	na	na	na
1991 ¹	27,227	na	na	na
1992	36,375	na	na	na
1993	13,546	na	na	na

¹ Conowingo East lift in operation

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE

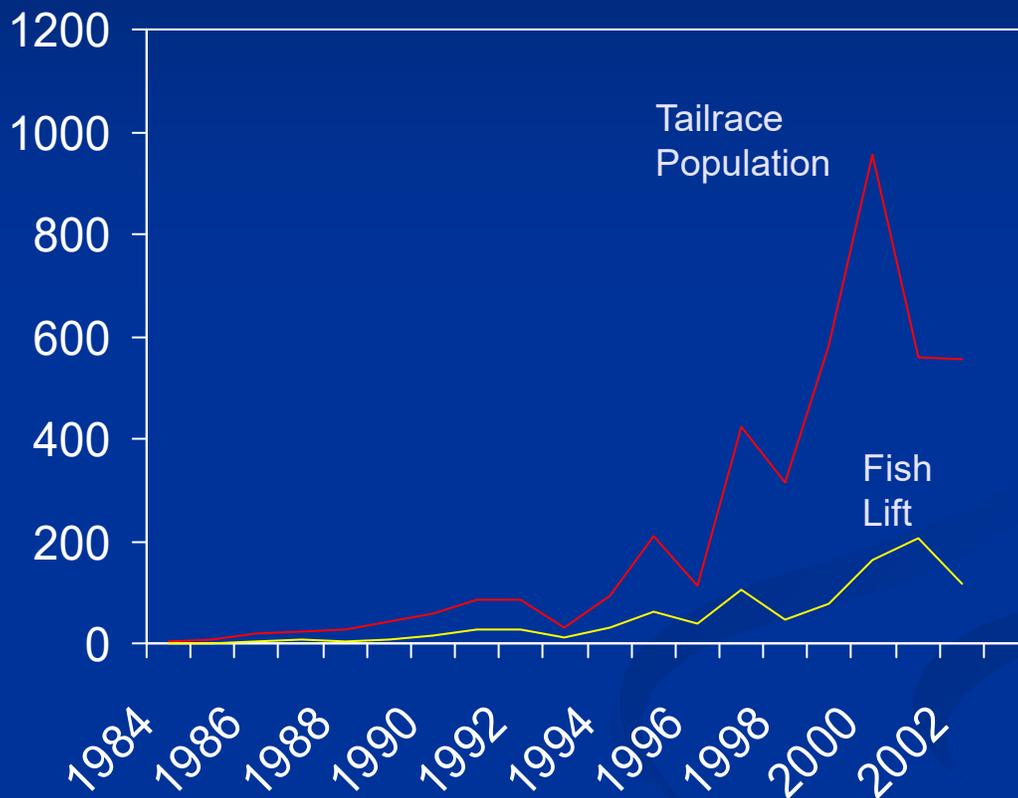
Fish passage counts

Year	Conowingo	Holtwood	S. Harbor	Y. Haven
1994	32,330	na	na	na
1995	61,650	na	na	na
1996	37,513	na	na	na
1997 ²	90,971	28,063	20,828	na
1998	39,904	8,235	6,054	na
1999	69,712	34,702	34,150	na
2000	153,546	29,421	21,079	4,675
2001	193,574	109,976	89,816	16,200
2002	108,001	17,522	11,705	1,555
2003	125,135	25,254	16,646	2,536

² Only Conowingo East Lift counts reported since upstream facilities placed into operation

(Source: Annual Progress Reports of the Susquehanna River Anadromous Fish Restoration Committee)

HISTORY OF SUSQUEHANNA RIVER FISH PASSAGE



Conowingo tailrace population estimates
and fish lift counts

(Source: Annual Progress Reports of the Susquehanna
River Anadromous Fish Restoration Committee)