Conewago Creek Initiative

Comparative Fish Survey Report

Prepared by Jessica S. Moldofsky for the Conewago Creek Initiative

July 25, 2012

A compilation of historic fish survey data from:

1972, 1973, 2007, 2012

I. Background

This report highlights and compares fish survey data gathered from historic fish surveys in 1972, 1973 and 2007, as well as a survey conducted this year, on June 28th, 2012.

The location of the fish surveys is the Conewago Creek in Dauphin and Lancaster Counties. The sampling occurred in the stretch of creek that runs through the Hershey Meadows restoration site. This restoration project began in 2009 on Hershey Trust property, to repair nearly a mile of eroded stream banks and 15 acres of wetlands between routes 743 and 283, adjacent to the Conewago Recreational Trail. The restoration was led by the U.S. Fish and Wildlife Service and the Tri-County Conewago Creek Association. On this site, steep banks were leveled out and log and rock structures were installed to increase fish habitat and stabilize the banks. Wetlands were restored in the floodplain to increase the site's infiltration capacity and reduce pollutants entering the stream. Twenty acres of native trees and shrubs were planted alongside the stream to create a forest buffer.

Routine fish sampling is an essential component of ongoing monitoring to gauge effectiveness of restoration projects and overall water quality in the Conewago Creek Watershed. The provided data compares the number of species present in each of the four survey years, the number of species per fish family, and the tolerability of the species. The method of fishing included electrofishing and seine netting, for the 1972 and 1973 surveys, and electrofishing for the 2007 and 2012 surveys.

Note: The 1972 and 1973 fish data used for this report represents an average number of fish, due to the sampling records recorded as a range, rather than specific count. The data was recorded as:

Present: (1-4)	*Common: (5-24)*	*Abundant: (25+)*
Average Used: 2.5	*Average Used 14.5*	*Used: 25*

II. Data

The 1972 survey found 18 species of fish, out of the 164 fish collected. There was 1 Darter species, 5 Sunfish species, 7 Minnow species, 1 Catfish species, 2 Sucker species, 1 Pike species and 1 Killifish species. There were 2 intolerant species, 9 intermediate species and 7 tolerant species recorded.

The 1973 survey found 18 species of fish, out of the 299 fish collected. There was 1 Darter species, 5 Sunfish species, 8 Minnow species, 1 Catfish species, 1 Sucker species, 1 Pike species and 1 Killifish species. There were 2 intolerant species, 9 intermediate species, and 7 tolerant species recorded.

The 2007 survey found 12 species of fish, out of the 123 fish collected. There was 1 Darter species, 3 Sunfish species, 4 Minnow species, 1 Catfish species, 2 Sucker species, and 1 Killifish Species. There were no intolerant species, 7 intermediate species and 5 tolerant species recorded.

The 2012 survey found 24 species of fish, out of the 882 fish collected. There were 2 Darter species, 11 Minnow species, 6 Sunfish species, 2 Catfish species, 2 Sucker Species and 1 Killifish Species. There were 3 intolerant species, 14 intermediate species and 6 tolerant species recorded.

III. Discussion

The data collected from the four survey years provides a quantitative method for evaluating ecosystem health. Evaluation of this data illustrates a direct correlation between the number of fish species and stream health. A direct correlation also exists between the number of intolerant species and stream health.

It can be concluded that 2007 exemplified poorer stream health, compared to the other three survey years. 2007 only recorded 12 species overall, the lowest number of species of any of the surveys. As well, this year produced the lowest number of species in each tolerability class, as represented in figure 1. 2007 also stands out as a survey year of decreased water quality due to the consistently lowest (or tied for lowest) number of species in each family, compared to the other years, as seen in figure 2.

It can be concluded that 2012 exemplifies improved stream health, compared to the other three survey years. This can be seen by both the number of species in each tolerability class, as well as the largest number of species per family. In 2012, there was the largest number of species in each family, compared to the other three survey years. There were 11 minnow species, compared to 7 in 1972, 8 in 1973 and 4 in 2007. There were 6 sunfish species, compared to 5 in 1972 and 1973 and 3 in 2007. There were 2 darter species, compared to 1 in 1972, 1973 and 2007. As well, there were 2 catfish species, compared to 0 in 1972, and 1 in 1973 and 2007. In 2012, there was also the highest number of overall species, 23 species, compared to 18 in 1972, 18 in 1973 and 12 in 2007. There was also the highest number of intolerant species, 3, compared to 2 in 1972 and 1973, and 0 in 2007. The number of intermediate species was also the highest in 2012, at 15, compared to 9 in 1972 and 1973 and 7 in 2007. An increase in intolerant species represents increases in water quality and increased habitat since improved water quality and habitat allows more sensitive fish species to exist. Some main factors that affect survival of intolerant fish include water temperature, nutrient and sediment loads, spawning substrate, stream bottom and bank substrate, and available overhead shade. These aspects are a component of both water quality as well as overall available stream habitat.

While the total number of fish collected drastically increased from 164 in 1972 to 882 in 2012, this cannot be used as an indication of water quality due to the lack of information about the length in time or distance of the sampling in previous years. The number of fish collected could potentially indicate stream health, however it could also be due in part to other factors such as the length of stream sampled, the number of passes made with the electroschocking gear, the strength of the shocking, and the conductivity of the water at the time of the shocking.

The overall general trend of data shows stream health decreasing from 1972 to 2007, and then increasing beyond 1972 levels by 2012. However, more data would be needed in order to generate more accurate results. A probable cause for the degradation from 1972 to 2007 could be increased nonpoint pollution runoff and

related land use practices, including agricultural runoff, historic livestock pasturing activities, lack of riparian buffers, increased stormwater runoff from development and conversion to imperviousness, and increased stream bank erosion and instability. The increased stream health in 2012 can be attributed to the Hershey Meadows stream restoration project, which began in 2009. Improvements to the creek banks, creek bottom and surrounding riparian corridors are visible and evident from before and after photos. (See photos 1-4). Stream bank stabilization structures serve a dual purpose as fish habitat improvement structures. These structures are functioning well at the site and have added productive fish habitat, as evidenced by the increased fish species diversity.

Photo 1. 2009 "Before" photo of Conewago Creek at Hershey Meadows site, shortly after implementation of a log vein deflector and a mud sill.
Photo Credit: Jim Shortle

Photo 2. 2012 "After" photo of the Conewago Creek at Hershey Meadows site, showing improved stream banks.
Photo Credit: Anna Marie Nachman

Photo 3. 2009 "Before" photo of Conewago Creek prior to restoration.
Photo credit: Matt Royer

Photo 4. 2012 "After" photo of Conewago Creek following restoration.
Photo Credit: Matt Royer

Photo 5. Electroshocking a deep hole in the Conewago Creek.
Photo Credit: Jessica Moldofsky

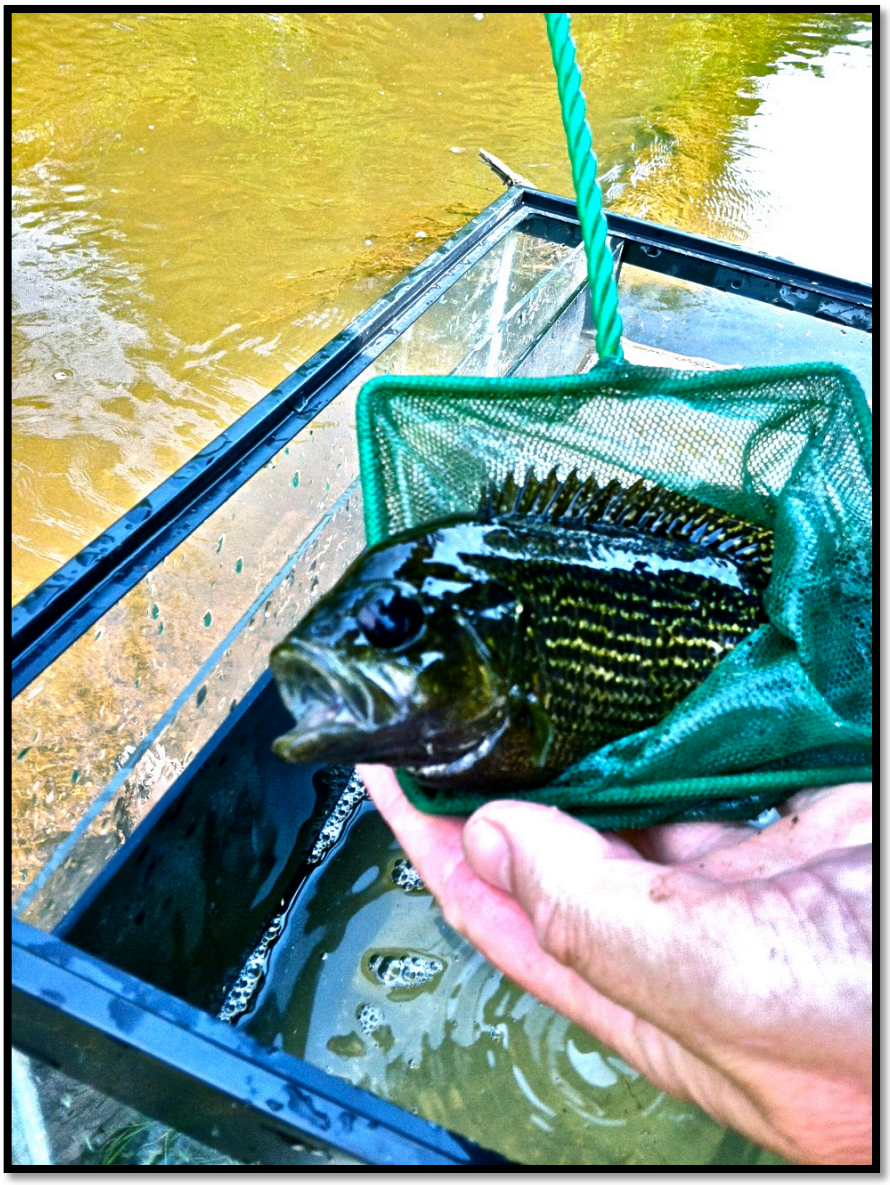

Photo 6. 70 rock bass were caught in this summer's electroshocking survey of the Conewago Creek. Rock bass are classified as an intermediate tolerance species, in the sunfish family.
Photo credit: Jessica Moldofsky

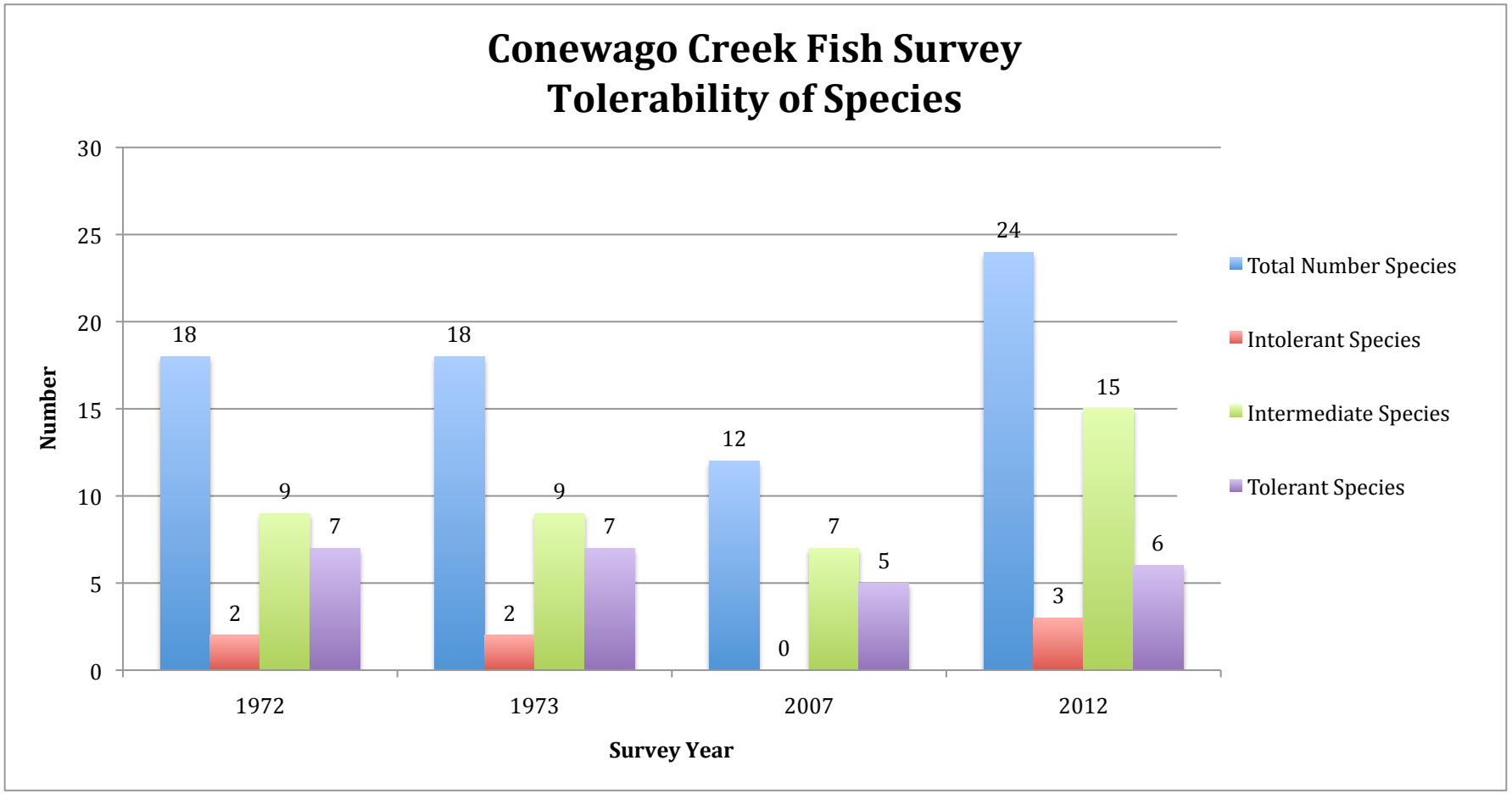

Figure 1.
This graph represents the total number of species recorded at each survey year, as well as the number of species in each tolerability class, including: Intolerant, Intermediate, and Tolerant. The classification of fish species tolerance refers to environmental disturbance and is used to assess ecosystem and water quality conditions. Tolerability measures were created relevant to non-specific stressors, according to the United States Environmental Protection Agency.

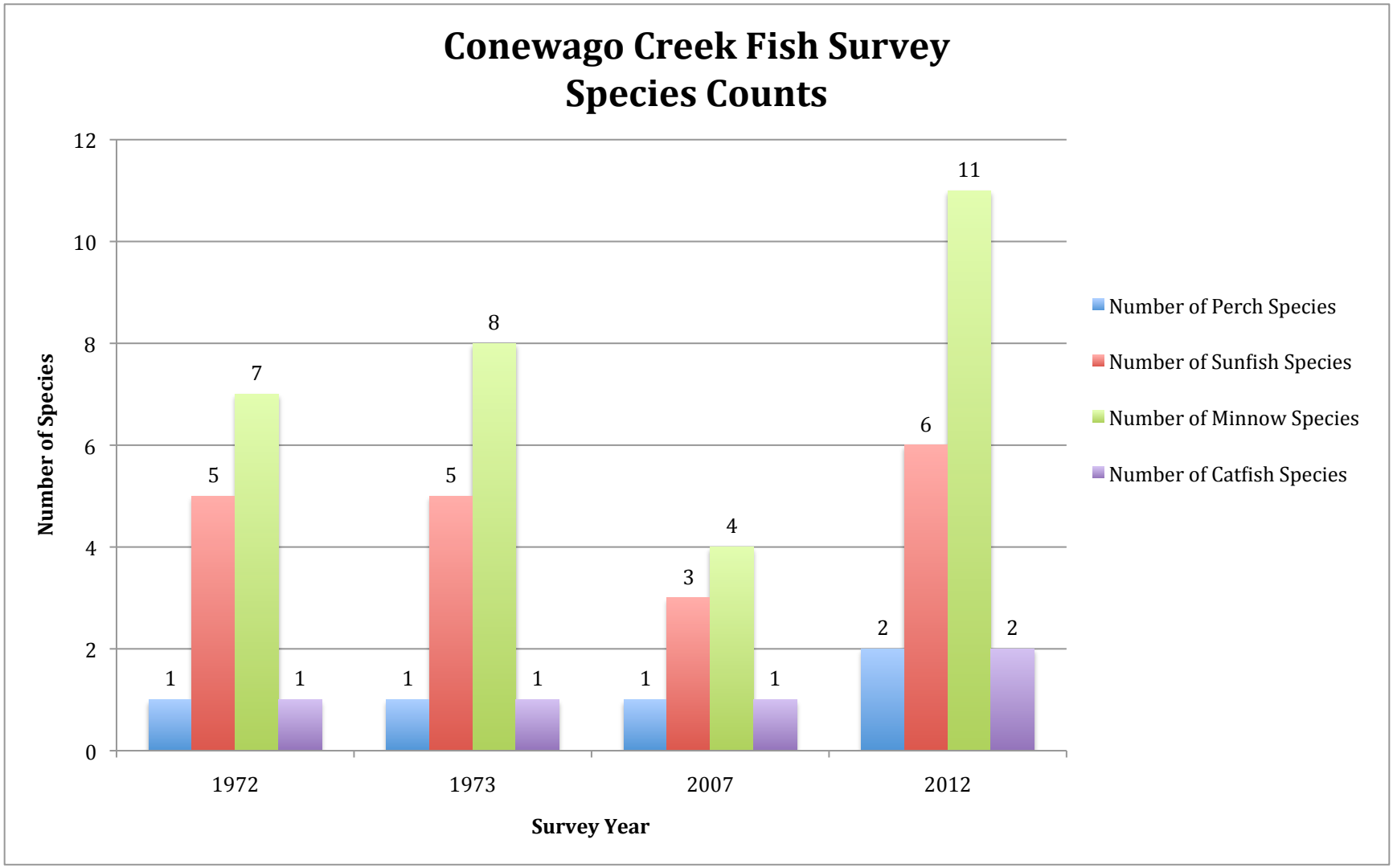

Figure 2.
This graph represents the number of species in each family, during the four survey years.

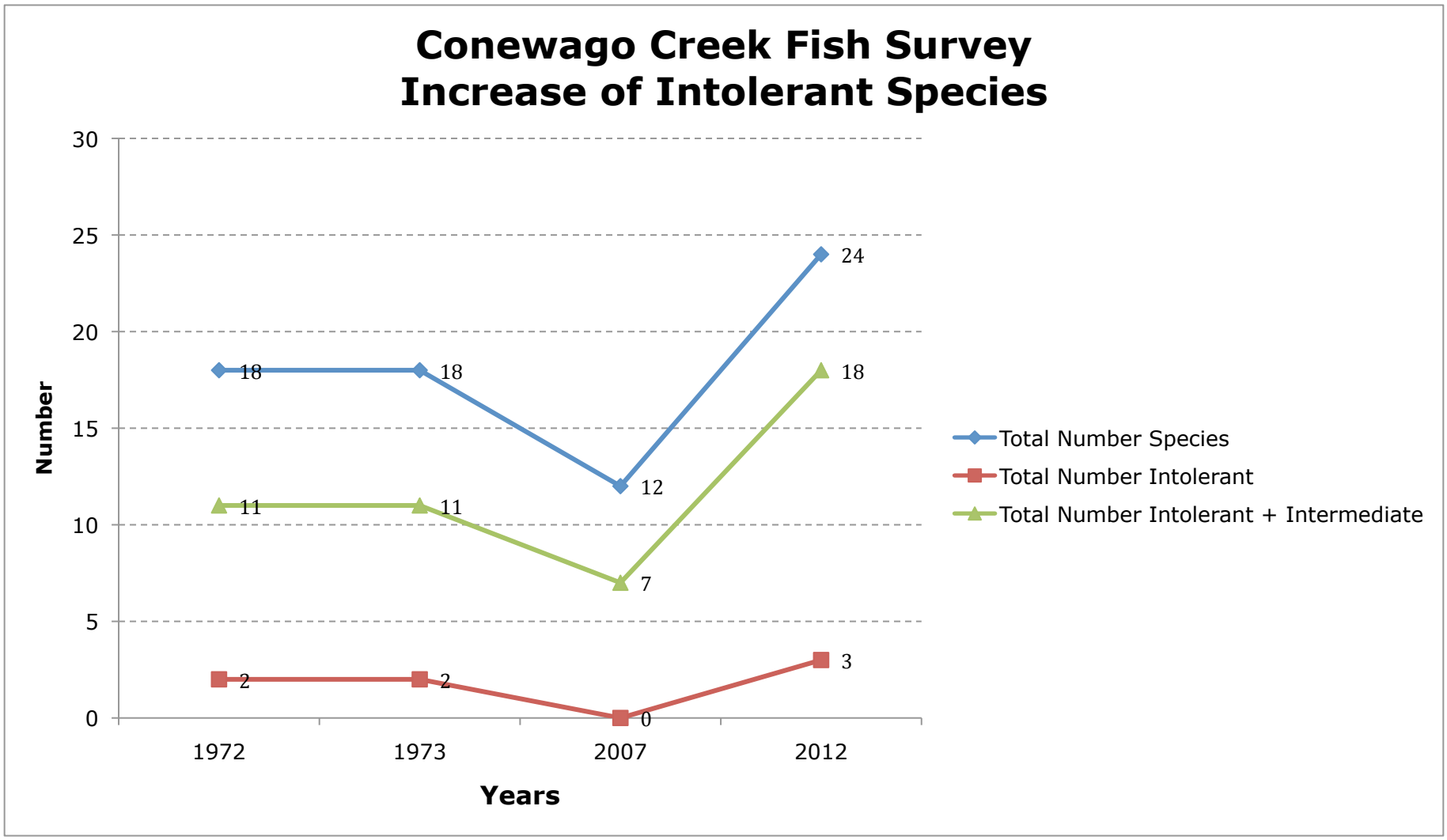

Figure 3.
This graph represents the increase in intolerant and intolerant + intermediate species throughout the survey years. This provides an improved indication of the increase in water quality and/or stream habitat following the Hershey Meadows restoration project. The tolerant species class was not included, as this class does not indicate sensitive species.

Figure 4.

Fish Species Present By Year

	1972	1973	2007	2012
Cyprinidae (Carps and Minnows)				
Campostoma anomalum (Central stoneroller)				*
Cyprinella analostana (Satinfin shiner)	*	*		
Cyprinella spiloptera (Spotfin shiner)	*	*		*
Exoglossum maxillingua (Cutlips minnow)				*
Luxilus cornutus (Common Shiner)			*	*
Nocomis micropogen (River chub)				*
Notemigonus crysoleucas (Golden shiner)	*	*		
Notropis amoenus (Comely shiner)	*	*		
Notropis hudsonius (Spottail shiner)	*	*	*	*
Notropis rubellus (Rosyface shiner				*
Notropis procne (Swallowtail shiner)	*	*		*
Pimephales notatus (Bluntnose minnow)		*		*
Pimephales promelas (Fathead minnow)			*	
Rhinichthys atratulus (Blacknose dace)		*	*	
Rhinichthys cataractae (Longnose dace)				
Semotilus atromaculus (Creek chub)	*			*
Semotilus corporalis (Fallfish)				*
Catostomidae (Suckers)				
Catostomus commersoni (White sucker)	*	*	*	*
Hypentelium nigricans (Northern hog sucker)	*		*	*
Ictaluridae (Bullhead catfishes)				
Ameiurus natalis (Yellow bullhead)	*		*	*
Noturus insignis (Margined madtom)		*		*
Esocidae (Pikes)				
Esox niger (Chain pickerel)	*	*		
Cyprinodontidae (Killifishes)				
Fundulus diaphanus (Banded killifish)	*	*	*	*
Centachidae (Sunfishes)				
Ambloplites rupestris (Rock bass)	*	*	*	*
Lepomis auritus (Redbreast sunfish)	*	*	*	*
Lepomis gibbosus (Pumpkinseed)		*		*
Lepomis macrochirus (Bluegill)	*	*		*
Micropterus dolomieu (Smallmouth bass)	*	*	*	*
Micropterus salmoides (Largemouth bass)				*
Pomoxis nigromaculatus (Black crappie)	*			
Percidae (Perches)				
Etheostoma olmstedi (Tessellated darter)	*	*	*	*
Etheostoma zonale (Banded darter)				*